UPPER TRINITY WATERSHED RESTORATION ASSESSMENT & MANAGEMENT PLAN

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&
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The Bureau of Reclamation
&
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I. Introduction

The 2024 Upper Trinity Watershed Restoration Assessment and Management Plan examines past reports, relevant new data, and recently developed in modeling and assessment tools in order to address current natural resource concerns in the Upper Trinity River Watershed. The primary purpose is to promote efficient development and prioritization of restoration projects that enhance water security and wildfire resilience. The Upper Trinity River Watershed has experienced significant and ongoing negative impacts to natural resources resulting from fire suppression, drought, sedimentation, and legacy mining. This report evaluates several management options to address these impacts within the basin, and the specific data, tools, and other resources which can support that management.

The end goals of the Upper Trinity River Watershed Assessment and Restoration Plan include:

- **A)** Supporting watershed and climate resilience.
- **B)** Promoting forest health and carbon stores and accelerating wildlife protection efforts.
- **C)** Improving water quality.
- **D)** Enhancing habitat for native species.

Basis of Grant Funding:

<u>BOR WaterSmart (WRTC)</u>
The Watershed Research and Training Center (WRTC) conducted landscape-scale watershed restoration planning in the Upper Trinity River Watershed to prioritize and design watershed restoration projects.

<u>CA DOC (TCRCD)</u>
The Trinity County Resource Conservation District (TCRCD), with funding from the California Department of Conservation, assessed actions that help with watershed storage and resiliency over the next 20 years, including streamflow monitoring, stream assessments, and modeling beaver habitat potential.

Assessment Area Description:

<u>Physical and Ecological</u> – The Upper Trinity River Watershed, also known as the North Lake region in Trinity County, is bounded by the Trinity Alps Wilderness to the west, Mount Eddy to the north, Castle Crags to the east, and Lewiston Dam to the south. Besides the Upper Mainstem Trinity River, the major drainages in the North Lake region are Coffee Creek, Stuarts Fork, and the East Fork Trinity River, supplemented by numerous smaller streams. These tributaries all ultimately flow into Trinity Lake, formally known as Claire Engle Reservoir, which is formed by a large earthen dam. Below this dam is another reservoir, Lewiston Lake, that is formed by Lewiston Dam, in the community of Lewiston, CA. These dams separate the Upper Trinity River from the lower Trinity River Watershed.
Elevations in the Upper Trinity River assessment watershed range from 1,800 feet at Lewiston Dam to just over 9,000 feet at the summit of Mount Eddy. The terrain overall is mountainous and quite steep, with complex geology (including extensive areas of serpentine bedrock), geology, and geomorphology. Climate in the assessment area is a mix of hot- and warm-summer Mediterranean, with dry summers and relatively cool wet winters. At higher elevations a substantial proportion of total precipitation falls as snow, which can linger into the summer on north-facing slopes. Snow levels and precipitation levels

more generally, are highly variable between years, with periods of above-average moisture alternating with runs of drought years.

Mixed conifer and oak forests composed of ponderosa, sugar, lodgepole, and various other pines, Douglas-fir, white and red fir, incense cedar, and California black oak dominate the North Lake landscape (United States Department of Agriculture, 2005). There are also large areas of montane chaparral dominated by manzanita and ceanothus species, as well as smaller but ecologically important areas of meadow and riparian woodland. While vegetation in the Upper Trinity River basin is highly diverse, with several rare species present, many plant species and communities are dependent upon fire and other disturbances which have been heavily altered from their historic patterns on the landscape. Vegetative communities are also impacted by forestry and other activities, as well as by invasive species.

Demography and History – The original inhabitants of Trinity County included numerous indigenous peoples, including both Federally recognized Tribes and groups not receiving current Federal recognition. These people actively managed the landscape, in part through the extensive use of fire, to produce an abundance of foods, medicines, and material resources that sustained a diversity of cultures. While indigenous groups in Trinity County are currently restricted by local and Federal policies from applying traditional landscape management practices in many areas, they remain heavily engaged in both policy development and on-the-ground management and restoration (Marks-Block & Tripp, 2021).

Originally known to local indigenous groups by several names, the Trinity River's current etymology stems from Major Pierson Reading, who in 1845, began to call the area Trinity. Major Reading discovered gold in the county in 1848, which caused a large influx of non-indigenous miners and other settlers over the next several years. During the gold rush period, many miners established camps or moved to the area and mined along the Upper Trinity River and its tributaries. By the 1860s, the population of Trinity County overall reached 5,125 people (U.S. Census Bureau, 1950). However, gold mining became less lucrative in the following decade and the population experienced a decrease to 3,218 people. In the mid-1900s, the county transitioned to a timber-centric economy and the population increased by 27.1% to 5,045 from 1940 to 1950 (U.S. Census Bureau, 1950). The historic and current gold mining and timber industries continue to have impacts on water quality, stream connectivity, and forest health across the landscape of Trinity County, including in the Upper Trinity River Basin.

The Trinity Dam was completed by the Bureau of Reclamation in 1963, as part of the development of the Central Valley Project (CVP), a system of dams and canals that supply water to California's Central Valley. The dam's construction effectively separated the Trinity River into upper and lower reaches, with returning anadromous fish unable to move into the upper reach, and out-migrating fish, sediment, logs, and other materials blocked from export to the lower reach. Today, the Upper Trinity River above the dam does not contain anadromous fish runs. The Trinity Dam also allowed for a large proportion of the Trinity River's flow to be diverted and exported for agricultural use outside of Trinity County, causing significant declines in the lower Trinity River's anadromous fish populations. While current flows and water quality in the lower Trinity River are dependent on many factors, management of the Upper Trinity River basin above Trinity Dam ultimately determines the amount of water available for both diversion to the CVP and for fish in the lower river.

Land Ownership – The Upper Trinity River Watershed contains approximately 460,000 acres of land, of which the US Forest Service (USFS) manages 69.7% (305,559 acres) within the Shasta-Trinity National

Forest. Private timberlands account for 26.4% of the watershed and the two largest property owners are Roseburg Lumber Company and Sierra Pacific Industries. The remaining ownership in the North Lake region consists of 3.6% private/residential land, 0.2% of county or state property, and 0.01% of Bureau of Land Management land. The largest communities in the assessment area are Coffee Creek, Covington Mill, Trinity Center, and a portion of Lewiston, all of which are unincorporated. Land ownership outside of communities broadly follows a "checkerboard" pattern with parcels alternating between USFS and private timber industries, a relic of historic land grants to railway companies (Cheever 2005).

II. Need for Supplemental Analysis

The 2024 Upper Trinity River Watershed Restoration Plan considered the recommendations of past analyses, as well as stakeholders' major concerns regarding natural resource management actions in the region. The major recommendations from previous reports include addressing the causes of sedimentation and elevated turbidity, completing fuel reduction efforts, restoring mining sites, and increasing stream connectivity and storage. In addition, recent research continues to emphasize the importance of healthy headwater meadow areas, robust beaver populations, and healthy forest densities to overall watershed health, and particularly the stable provision of water (Hunt et al 2018, Dittbrenner et al 2022, Saksa et al 2019).

Past Assessments:

Trinity County Resource Conservation District – In 2006, the Trinity County Resource Conservation District (TCRCD) developed the Upper Trinity River Watershed Assessment Report and Management and Action Plan, which is the most recent comprehensive assessment of the Upper Trinity Watershed. The primary foci were analyzing turbidity levels, improving water quality, and enhancing forest health (TCRCD, 2006). At the conclusion of the analysis, the TCRCD created a list of management recommendations including:

- Completion of road analyses.
- Development of watershed assessments for each sub-watershed with the prioritization of specific actions to improve water quality.
- Implementation of an aquatic monitoring plan.

A standalone appendix for the 2006 Management and Action Plan, the Upper Trinity River Sediment Source Analysis, was produced by Graham Matthews and Associates to identify sediment sources and quantify sediment delivery and yield in the watershed. While the report found that landslides accounted for a large proportion of total sediment delivery to waterways, approximately 38% of sediment delivery was estimated result from road construction and use (including associated landslides) and timber harvesting activities. The report also noted that 38% of the subwatersheds examined had erosion risk >25% above natural background levels. The following large subwatersheds were identified as having the highest sediment delivery risk:

- Stuart Arm Area
- Snowslide Gulch Area
- East Fork Trinity River
- East Side Trinity
- West Side Trinity

In 2019, the TCRCD released a Trinity River Tributaries Gap and Trend Analysis which encompassed all of Trinity County, including the Upper Trinity or North Lake region (Rupp, 2019). The key issues they noted in this region were:

- The lasting impacts of mining activities, especially on vegetation growth, aquatic habitat, and stream connectivity.
- The lack of fuel reduction efforts in unpopulated areas with high fuel loads.

United States Forest Service – The United States Forest Service completed an Upper Trinity River Watershed Analysis which made a list of priority management recommendations (United States Department of Agriculture, 2005). The major management actions they identified include:

- Treating overstocked and poorly stocked stands.
- Designing fuels management projects in riparian zones to maintain water and soil quality.
- Developing fire protection efforts near communities.
- Completing inventories for sediment delivery.

The USFS, Trinity County, and the Central Federal Lands Highway Division collaborated to develop the Trinity Alps Transportation Study (2019). They reviewed 10 roads that access trailheads, campgrounds, and the Trinity Alps Wilderness while developing a transportation planning document. In order to achieve the goals of the document, the roads were identified, potential projects developed for each route, and the projects received prioritization according to parameters such as road usage, scope, and budget. The overarching objective includes creating a 15 to 20-year plan that prioritizes specific projects that will improve the accessibility of the Trinity Alps Wilderness.

The Trinity Alps Transportation Study looks at the number of culverts, crash history, presence of utilities, and geotechnical observations such as slope, pavement condition, and road width. Additionally, the evaluators recorded conditions and important features of the route including species' habitat, considerations for the waters of the United States including vernal pools and wetlands, presence of cultural resources, and public access to trailheads and campgrounds. Coffee Creek Road, Stuart Fork/Trinity Alps Road, and Swift Creek Road have been identified as the routes most often used by recreators accessing the Trinity Alps Wilderness (Federal Highway Administration 2019). Although the development of this plan evaluates roads in the Upper Trinity Watershed, the need for an assessment of sediment delivery and erosion remains a main consideration for managers of natural resources.

An Assessment of Watershed Vulnerability to Climate Change was compiled by the Forest Service in 2012 includes a chapter on the Shasta-Trinity National Forest (Mai et al 2012), which recommends improving watershed resilience through several actions, including:

- Road improvements to reduce sediment delivery and disconnect channel crossings.
- Implementation of erosion prevention BMPs.
- Riparian improvements—thinning, enhancing native communities.
- Meadow and stream improvements.
- Apply actions strategically (where infrastructure replacements or restoration can be most meaningful to increase aquatic species and watershed resiliency).

Additionally, the USFS established fuel management priorities following this assessment, suggesting the development of fireshed analyses, fuel reduction efforts, and defensible fire zones surrounding communities in the North Lake region.

Additional Assessments – California's Fourth Climate Change Assessment (Kalansky et al 2018) includes a report for the North Coast that details various anticipated regional impacts of climate change, including reduced summer streamflow, increased intra- and interannual climate variability, and increases in climate water deficits for the Upper Trinity assessment area. Selected recommendations for climate adaptation include:

- Protection of climate refugia and migration corridors for wildlife and freshwater species.
- Habitat preservation and restoration, particularly in river, riparian and wetland systems that support high species diversity and cold-water species.
- Fire management, including fuel load reduction by harvest in forests and prescribed fire.
- Short- and long-term planning and investment in transportation, water, and energy infrastructure.

A 2015 update to California's State Wildlife Action Plan (Gonzales and Hoshi) lists fire regime changes, particularly suppression, as a pressure on many different habitat types in the North Coast region. Increased sediment contributions to waterways is called out as a threat, and restoration and enhancement of high-elevation meadows is listed as a priority. Many additional technical reports and research publications are referenced in this report's chapters.

III. Key Issues

Four key issues were selected for intensive assessment based on a thorough review of previous assessment reports focused on the Upper Trinity River Watershed, relevant scientific literature, and current community priorities:

- Roads and Related Infrastructure
- Meadow Health and Extent
- Forest Fuels Management
- Beaver Restoration Opportunities[1]

These key issues address many related resource concerns, including water quantity and quality, community safety, forest health, and biodiversity. For each issue, this report document revisits and supplements previous assessments by updating resource inventories and other datasets, and by investigating new tools to develop and prioritize treatments. Directions for future work, including concept project designs, are also put forward.

The four key issues covered in this report are not mutually exclusive - for example meadow health can be strongly influenced by restoring beavers to an area, or by upslope forest management. However, to facilitate efficient use of the Upper Trinity Watershed Restoration Assessment and Management Plan by land managers, each key issue is the subject of a specific report chapter. These individual chapters are compiled in this document, but can be treated as effectively standalone. However, the data, modeling tools, and assessment and prioritization techniques discussed in these chapters are most beneficially used in concert. Not all investigated tools were used to fully assess the entire Upper Trinity River Watershed, however these tools present a more feasible use case at the sub-basin scale. The case study on the following page is an example of a synergistic sub-basin assessment that identifies priority treatments to address multiple key issues.

[1] The full title of this chapter is 'Stream Level Assessment of the Upper Trinity River Watershed for Beaver Restoration Techniques Using Beaver Dam Analogues and Beaver Translocations', abbreviated here.

Chapter Summaries:

Roads and Related Infrastructure – Roads are found throughout almost all portions of the Upper Trinity River Watershed except for the Trinity Alps Wilderness Area. While roads and other transportation infrastructure (bridges, culverts, etc.) are critical for land management activities, recreation, and community safety, they can also negatively impact local hydrologic processes. One primary impact is sediment generation from road surfaces and cutbanks, which can enter downslope waterways and cause myriad problems for aquatic ecosystems in general and salmonid fishes in particular. Work to resurface, reroute, or decommission roads is extremely expensive and can be contentious; even culvert upgrades can cost several million dollars. Given funding limitations, it is imperative that projects be identified which can maximize sediment reductions and other resource benefits.

This report chapter examines two existing roads databases from the Trinity County Resource Conservation District and the United States Forest Service, both of which were found to accurate for reference purposes, but unsuitable for LiDAR-based modeling applications to estimate sediment production and delivery. Details are provided on the development of a new LiDAR-derived roads layer that can be applied to sediment modeling efforts, in particular the Road Erosion and Sediment Delivery Index (READI) tool. Roads in Mumbo Basin, a potential restoration area, were assessed for sediment generation and delivery to waterways using the READI tool, with various combinations of roads layers and parameter values tested to investigate their impact on model results. The READI model outputs showed clear differences between the different combinations of roads layers and parameter values tested, suggesting that additional refinements to both source data and parameterization are necessary to ensure model accuracy. The need for a validation dataset is also discussed, and examples of potential roads projects to reduce sediment delivery are put forward in an appendix.

Meadow Health and Extent – Meadows make up a small percentage of the landscape in montane environments such as the upper Trinity Basin, but provide disproportionate hydrologic, ecological, and recreational benefits. A complete inventory of the current distribution of meadows in the upper Trinity basin does not exist, which limits efforts to manage the landscape to preserve and enhance existing meadows. Furthermore, evidence from both historical accounts and recent field surveys strongly suggests that many areas in the basin that once supported healthy meadow habitat are now degraded to the point where they are no longer identifiable as meadows based on vegetative characteristics.

In this chapter, a CDFW amphibian-supporting habitats dataset and the USFWS National Wetlands Inventory were examined to determine their completeness and accuracy in the upper Trinity Basin assessment area, in order to estimate the extent and distribution of current wetted features and wetlands, respectively, as proxies for wet meadows. Both datasets were found to have useful qualities, but each also had drawbacks, and did not provide a complete picture of current meadows in the assessment area. Both datasets showed existing meadow features concentrated in high-elevation headwater basins, with particularly high densities in the Trinity Alps Wilderness and the upper reaches of the upper mainstem Trinity River and the East Fork Trinity River.

Two software modeling tools, the Lost Meadow Model and the Wetlands Intrinsic Potential tool, were examined to determine their suitability for helping complete the meadow inventorying efforts described above. Both models were also investigated to determine their effectiveness in predicting currently forested, drained, otherwise degraded areas with potential for meadow restoration. Neither model was completely effective at either task, and struggled in particular with identifying current or potential sloped and drier meadows. However, the Lost Meadow model was effective enough at these tasks to serve as a useful first step in identifying new current meadows or potential restoration areas, prior to more thorough ‘desktop analyses’ or field surveys to refine delineations. The Lost Meadow Model was also found suitable for prioritizing meadow restoration work at the sub-watershed scale based on the ratio of ‘lost’ to existing meadow acreage.

Forest Fuels Management – Forests in the Upper Trinity River Watershed area overstocked in many areas, due in large part to fire suppression, as well as other past management practices. Dense, unhealthy forests have many negative implications for fire safety, water supply, habitat quality, and other topics of concern, but thinning, mastication, prescribed fire and other forms of fuels management are expensive and difficult to implement. Consequently, prioritizing both the type and location to maximize multi-objective benefits is critically important.

This report chapter examines the Land Tender modeling product, developed by Vibrant Planet, as a potential option for assessing the relative benefits of different projects, given different funding levels and general locations. Five different potential project areas were assessed, each with low ($1 million), medium ($5 million), and high ($20 million) project budget caps, for a total of 15 different scenarios. The various output metrics for these scenarios are discussed and various caveats and limitations of Land Tender are identified. Overall Land Tender appears to have some applicability for testing different treatment scenarios and prioritizing projects based on specific objectives. It is also user-friendly and presents an easy way to standardize analyses. However, it is probably best utilized in concert with other analytical tools and in consultation with local experts on key resources and forest conditions. Two appendices to this chapter provide additional details on the potential of cultural and community-based burning, and on prioritizing thinning treatments to maximize snowpack retention.

Beaver Restoration Opportunities – Beavers were historically a keystone species throughout North America, including in the Upper Trinity River Basin, but were eliminated from much of their range in the 19th and early 20th centuries through trapping and habitat destruction. Beaver damming activities slow and spread water across the landscape, diversifying aquatic habitats, providing natural fuel breaks, and enhancing summer baseflows. Beaver restoration is now widely regarded as an efficient and effective way to achieve multiple desirable watershed objectives, but not all reintroduction efforts are successful.

This report chapter, independently produced by the Trinity County Resource Conservation District, investigates several modeling tools that can be used to prioritize beaver reintroduction and habitat improvement projects, notably the Beaver Restoration Assessment Tool, or BRAT. This chapter also compiles and summarizes information of the current and historical use of the Upper Trinity River Basin by beavers, including the results of field verification efforts. A very large number of subwatershed were assessed for stream restoration potential according to multiple metrics, detailed in the chapter’s appendices. Five subwatersheds were identified as top priority restoration candidates and recommended for further assessment and planning.

IV. Case Study and Conclusion

The Mumbo Creek Watershed (HUC-12 180102110301) presents an illustrative case study of how the various assessment and prioritization tools examined in the chapters of this report can be combined to steer management and identify top restoration opportunities. Located in the NE quadrant of the Upper Trinity assessment area, the total watershed area of Mumbo Creek is approximately 13,707 acres, and drains into the East Fork Trinity River. Elevations range from 3,530’ at the confluence to approximately 7,150’ at the top of the eastern crest. The watershed overall is mostly covered by mixed conifer forest, montane chaparral, and rock outcrops/talus slopes. Substantial areas of graminoid-dominated wet meadow are also present, particularly in the upper portion of the watershed (Mumbo Basin).

Resource concerns in the Mumbo Creek Watershed are fairly representative of other headwater basins in the Upper Trinity River assessment area. Meadows are heavily encroached by lodgepole pine and other conifers in many cases, and are also impacted by incision stemming primarily from poor road drainage and undersized culverts. As an additional consequence of a lack of proper road drainage, many road surfaces are also highly eroded and in need of substantial repairs. There are also both non-system roads and redundant or defunct system roads that pass through meadows and other sensitive areas. In contrast to much of the surrounding landscape, the Mumbo Creek Watershed has not experienced a major fire since 1935, which has led to dense forest cover and substantial fuel buildup in certain areas. The Pacific Crest Trail, a USFS campground, and various trailheads are present either in Mumbo Basin or immediately adjacent to it, and could be severely impacted by a high-intensity wildfire. Ultimately, the current conditions in the Mumbo Creek Watershed limit habitat quality, recreational opportunities, transportation system reliability, and downstream water supply.

The Mumbo Creek Watershed was selected for an in-depth assessment based initially on the guidance of several WRTC staff members who had spent time in the area and recalled both significant wetland areas and other natural features, as well as potential resource issues such as undersized and plugged culverts. Formal assessment of the Mumbo Creek Watershed began with a ‘desktop analysis’ in GIS, using a LiDAR DEM hillshade, orthorectified true color and infrared imagery, and various existing data layers, including the Klamath Mountains Lentic Wetland Inventory, National Wetlands Inventory, the new 3DHP streams layer, the Trinity County RCD roads layer, and a land ownership layer. Initial inspection showed that the upper watershed contained several large wetland features, which were predominantly on public land managed by the USFS. These wetland features stood out for both their flat topography and a high vegetation cover (particularly visible in the infrared imagery) but in most cases showed heavy tree cover. Both visual analysis and the Trinity County roads layer showed roads extending into these wetland areas, and also running parallel to them, with some cases of visible incision from culverts leading down into the flatter meadow areas.

The results of this preliminary desktop analysis were interesting enough to prioritize Mumbo Basin for a more thorough field assessment. In late June 2023, immediately after the area became accessible, WRTC staff traveled to the upper watershed to investigate features noticed in the desktop analysis, as well as to conduct a more general survey. Features of interest were photographed and documented for later review, including small incised flowpaths through wet meadow areas, conifer-encroached former meadow areas, abandoned roadways, culvert blockages and evidence of over-road flows and erosion, an undersized and horizontally compressed culvert on Mumbo Creek, and a heavily incised reach below that culvert. Reference photos of healthy meadow habitat and wetland hydrology were also captured. This site visit was incredibly helpful for clarifying the nature of features that were observed in the desktop analysis, as well as for identifying new features of interest that were not easily visible on a screen, such as a very low rise that separated a wetland complex and substantial subsurface flow under a talus slope that had heavily eroded a section of paved road. Many of these features were later able to be identified in the LiDAR hillshade and/or orthoimagery, once we had a clear understanding of what to look for and where. This underscored the continued importance of site visits, both for gathering knowledge about specific project areas and for helping to build a base understanding of how imagery and LiDAR on-screen translates into real-life landscape features.

The combined desktop analysis and field survey results confirmed that there were resources of interest, particularly wet meadow complexes, in Mumbo Basin and that these were degraded by several anthropogenic impacts. These findings set the stage for a more thorough analysis using the modeling tools described in the previous sections, including the Lost Meadow Model, the BRAT beaver suitability model, and the READI road erosion model. Integrating these models provided a much more detailed picture of the resource concerns in the basin (Fig. 1), and what specific project locations and types might be effective in alleviating them. The high beaver occupancy potential and extent of potential meadow areas matched closely with what was noted during a WRTC staff field visit, and several of the road segments modeled as having medium and high sediment-delivery potential were also those noted as having similar issues. However, several problematic road segments noticed during the field visit were not noted in the READI model output, and certain smaller meadow areas were not identified in the Lost Meadow Model projections.

Overall, the suite of datasets and modeling tools investigated in this report's chapters provide a viable means of remotely assessing current conditions and restoration opportunities in upper Mumbo Basin. Given the substantial time and resource commitment required for large numbers of field visits, these new technologies allow for efficient rapid assessment and prioritization of sites within potential project areas, as well as for identifying key sub-basins with high restoration potential within the Upper Trinity River Watershed overall. Certain data and tools may offer more utility than others depending on the funding source and land manager objectives, and all should be used with their limitations and biases kept in mind.

Many of the major recommendations from previous reports (reducing sedimentation, reducing landscape fuels, and increasing stream connectivity and water storage) can be more efficiently addressed using the current generation of datasets and modeling tools investigated in this 2024 Upper Trinity Watershed Restoration Assessment and Management Plan. And, as shown above for Mumbo Basin, these resources can synergize with each other to quickly identify and prioritize new project areas. While many key projects are already identified and in various stages of planning, future assessment work can benefit the Upper Trinity River Basin by applying the tools described here at scale to identify missed restoration opportunities in the watershed.

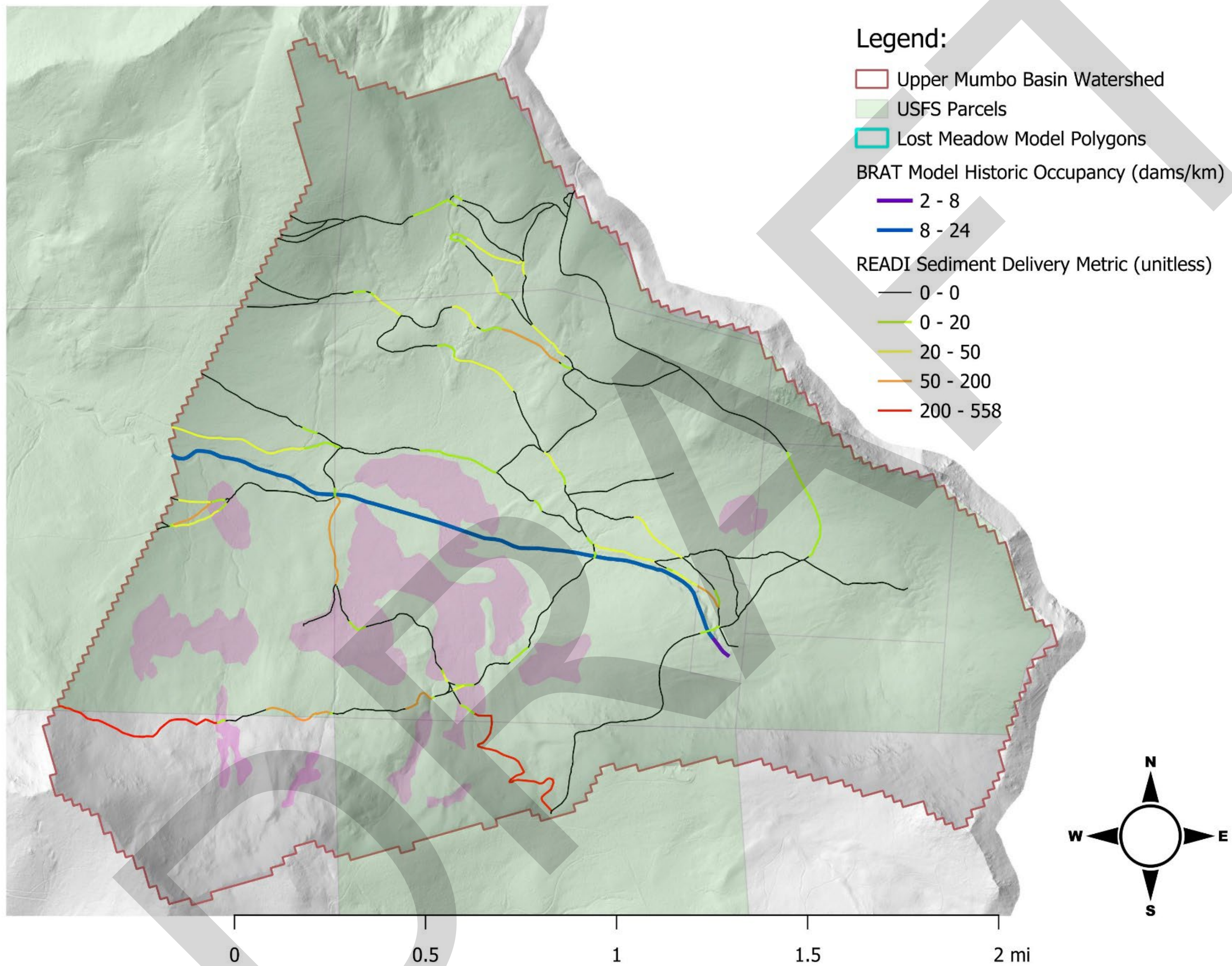

Figure 1. Application of selected modeling tools to Upper Mumbo Basin, showing potential for guiding restoration efforts.

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Chapter 1

Roads and Related Infrastructure

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Chapter 1

Roads and Related Infrastructure

Background and Preliminary Assessment: Erosion contributing to sedimentation of streams and lakes continues to be a major environmental concern in the Upper Trinity River Watershed. Alteration of the quantity and composition of instream sediment including, but not limited to, increases in turbidity, changes in the quantity and quality of suspended sediment, and changes to the timing of sediment entering streams, degrades habitat for salmonids by covering spawning beds and altering channel morphology (NMFS, 2014). Increased sedimentation can also stress salmonid fish such as Coho salmon (*Oncorhynchus kisutch)* by impairing the gill function, reducing levels of dissolved oxygen, and transporting greater amounts of pollutants to waterways. Additionally, sedimentation limits sunlight availability for aquatic vegetation and periphyton, shrinking the base of the aquatic food web and ultimately reducing salmonid growth and feeding rates (NMFS, 2014). Roads in the Upper Trinity watershed are rated as a moderate to high threat to most life history stages of Coho salmon due to their potential for erosion and downstream sediment delivery (NMFS, 2014). In addition to the impacts on native fish species, excessive erosion and sedimentation can potentially limit or degrade recreational opportunities such as fishing, swimming, and boating on local waterways including Trinity Lake.

Roadway surfaces, and exposed surfaces on associated cut and fill areas, can become a source of sediment in stream channels when roads intersect waterways or become hydrologically connected during storm runoff events. Compacted road surfaces and roadside ditches can concentrate and increase runoff flows, leading to gully formation and increases in landscape sediment contribution to streams (Weaver, 2015). Plugged culverts under roads can overtop or blow out, and roads built on steep or unstable slopes may trigger landslides, quickly sending large amounts of sediment downslope to waterways (Weaver, 2015). The exact risk of excessive road-related erosion and sedimentation depends on the road design, surface and fill material, construction techniques used, the amount of use, and the local topography and geology. Improper planning, design, or construction can all result in excessive maintenance or road failure, as well as increased sediment contributions.

Significant activities contributing to increased sediment loading in the Upper Trinity River include timber harvest (especially clearcutting), mining (predominantly legacy), road construction, and erosion from existing roads (USFWS and HVT, 1999). To facilitate resource extraction and other human uses such as recreation, the Upper Trinity River Watershed contains hundreds of miles of County and U.S. Forest Service (USFS) roads and trails leading to mountains, lakes, meadows, and various other attractions, as well as myriad ‘skid’ roads and haul roads accessing legacy and recent logging tracts (Trinity, 2023). In addition to passenger and commercial vehicle traffic, many of these roads are increasingly used for recreational purposes such as hiking, horseback riding, mountain biking, and riding off-highway-vehicles (OHVs). While roads in the Upper Trinity watershed are important to local economic and recreational activities, challenging terrain, an abundance of streams, and the highly diverse underlying geology can lead to poor and variable roadway performance, including issues with erosion (FHWA, 2019).

Many of the roads in the assessment area were constructed with old improper construction technologies and non-engineered alignments where poor soil conditions occur (FHWA, 2019). Prior to the 1950s, hundreds of miles of unpaved road were constructed for timber harvesting on private lands (TCRCD, 2006). Over the past 50 years, the Upper Trinity watershed has seen a decline in timber harvesting (GMA, 2001), however public land timber sales and private timber company management and harvesting activities still require the use of logging roads and skid trails (TCRCD, 2006). According to the Upper Trinity River Watershed Analysis, 10% of total sediment load is due to erosion from active and legacy roads (USDA, 2005), while in the EPA's sediment total maximum daily load (TMDL) document for the Upper Trinity River (2001), roads in the watershed were estimated to contribute approximately 106,747 tons/year of sediment to waterways. Previous reports completed by the USFS (2005, 2019), the TCRCD (2006, 2019) recommend completing road analyses and inventories and then revisiting the list of priority roads requiring restoration due to their failure to meet TMDL goals for sediment. New GIS-based assessment tools may enable efficient and cost-effective analysis and prioritization of road upgrades, decommissioning, and other projects that can reduce road sediment generation and delivery to waterways, but these tools have not yet been trialed or applied in the Upper Trinity Basin.

Two existing roads databases were evaluated to determine their suitability for analysis and roadwork prioritization:

TCRCD County Roads Layer – The Trinity County Resource Conservation District (TCRCD) maintains an up-to-date database of the roads in Trinity County, including county roads, USFS roads, and state highways. This was accessed as a spatial layer provided by the TCRCD and imported into GIS software. Polylines for each county road were originally digitized by hand, referencing aerial imagery from the National Aerial Imagery Program and other sources. Other roads databases (USFS, BLM, etc.) were incorporated to complete the dataset. Attributes for each polyline segment include name, surface type, owner, data source, and FS road number (where applicable). The TCRCD roads layer is comprehensive for Trinity County and is generally suitable for mapping and most basic analyses (e.g., road density in a watershed), as well as being readily accessible. However, there are some discrepancies when compared against high-resolution LiDAR-based digital elevation maps (DEMs), likely because the county roads (and likely other roads) were not digitized referencing that data.

USFS Motor Vehicle Use Map (MVUM) – The US Forest Service (USFS) maintains data on those roads, trails, and areas designated for motor vehicle use under 36 CFR 212.51. This motor vehicle use map (MVUM) was provided to WRTC as a shapefile for GIS analysis, containing polylines representing each road or trail. Attributes include name, route number, other identifying information, road system status, surface type, and detailed information on seasonality and suitability for different vehicle types. However, the MVUM does not cover most areas outside of Forest boundaries, nor is it completely spatially accurate, particularly when referenced against LiDAR coverage. It was used primarily as a reference to supplement or confirm the TCRCD roads layer.

Both existing roads layers are relatively spatially accurate and useful for mapping and basic analyses. Each polyline segment within the layer also contains various relevant attributes, although these are mostly identifiers or general characteristics (e.g. surface type) rather than specific metrics that can be used to refine erosion predictions. However, neither layer conforms to current LiDAR-based DEMs, which severely impacts the accuracy of analyses which derive slope, drainage points (i.e. where the road slope changes from negative to positive), and other fine scale features from the DEM - see Fig. 1 for an example of a mismatch between the TCRCD road layer and the road feature visible in the DEM. As a result, WRTC staff did not find either of the older road layers suitable for modeling erosion from road surfaces.

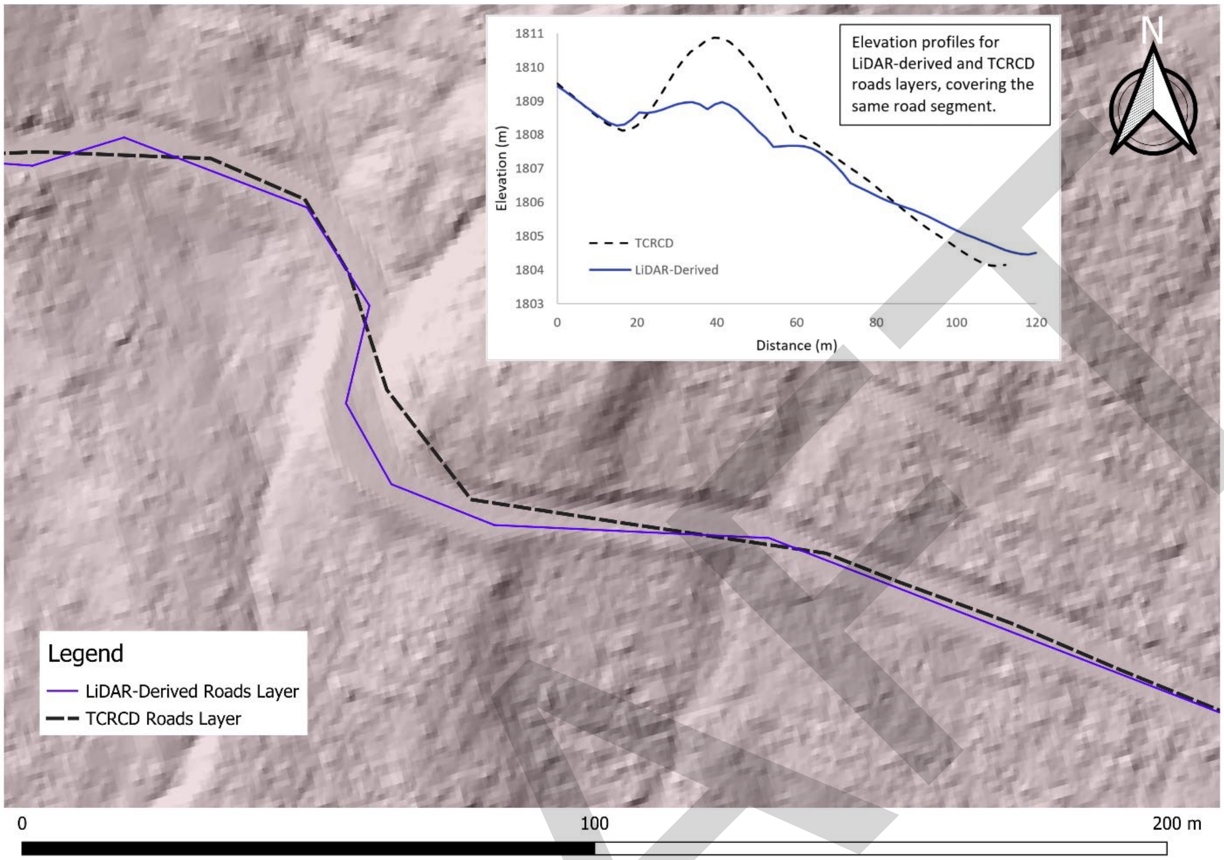

Figure 1. Detail map of USFS Road 39N73A in Mumbo Basin, showing LiDAR-derived (blue) and visually-derived TCRCD (black dashed) road polylines. Note that the TCRCD polyline is within a few meters of the LiDAR-derived polyline at all times, but a small discrepancy occurs where it does not fully curve around a raised area. This leads to an approximately 2m difference in elevation between the two roads (see inset), even though the horizontal discrepancy is <10m. Also note in the inset that the LiDAR-derived elevation profile displays several additional slope inflections (i.e., dips) compared to the TCRDC elevation profile, which is significant for drainage.

LiDAR-Derived Roads Layer Creation: To create a new roads layer for identifying erosion and sedimentation issues, former WRTC staff members developed a LiDAR-based road prism model that generated a probability raster (probability of a surface being a road) using the LiDAR-based DEM. This raster was then classified into a polyline shapefile which is generally extremely well-fitted to roads visible on a DEM hillshade. However, there are some processing artifacts at road junctions (where short linkage segments occur at odd angles) and particularly where there are flat areas in or adjacent to the road, such as landings, parking areas, and larger junctions. In these flat spaces, the model generates a web of short segments, which can greatly increase total road length, in addition to disrupting pathing. Roads below a certain width seem to have not been classified from the probability raster, so most skid roads, OHV trails, etc. are also not included. Additionally, high quality metadata on the creation of this new roads layer does not exist, which limits evaluation and classification at this time. Overall, while artifacts and other shortcomings of this new roads layer limit its suitability for complex analyses without substantial further refinement, it does present a useful counterpart for existing roads layers based on aerial imagery (TCRCD, MVUM) and can be used to test modeling and analysis tools that draw data from a LiDAR-derived DEM.

For primary analysis, the LiDAR-based roads layer was loaded into ESRI ArcMap GIS software and then clipped to the HUC-12 Mumbo Creek (180102110301) watershed for preliminary erosion modeling. Road sections running along the HUC-12 boundaries were added/removed as needed to make complete roads or remove the road entirely, depending on if the majority was in the drainage. Short spur roads (<~100 yards) were deleted and remaining roads were rerouted as needed (minimally in most cases, although in a few cases, pathing followed a creek channel and needed to be more substantially rerouted) to fully conform to LiDAR centerlines. Segment 'tangles' in landings, etc. were removed entirely and junctions were manually reconfigured as needed to conform to LiDAR centerlines. Since each road in the original LiDAR-derived layer was primarily made up of very short polyline segments, individual segments were merged so that contiguous lines were one feature. The Trinity County RCD layer was overlaid to help merge road segments in a way that matched existing discrete roads. Finally, new roads or sections of roads that were not included in the original LiDAR-derived layer were added if they were visually obvious on LiDAR, >10' width, and at least partially included in the Trinity County RCD roads layer. Particular priority was given to features connecting other roads.

Once the LiDAR-derived roads layer was fully updated for the Mumbo Creek Watershed, metadata was added from the Trinity County RCD roads layer, which was considered the most complete source. The TCRCD roads polyline layer was buffered by 20' so that it overlaid almost the entirety of the LiDAR-derived layer, then the buffer polygons were spatially joined to the updated LiDAR roads layer to add TCRCD roads attributes. The attributed layer still required some additional editing to ensure that roads were correctly categorized and that features in the new layer matched the RCD road features. A final check was performed to ensure roads had the correct surface type, which is a potentially important attribute for erosion modeling.

Sediment Generation and Delivery Modeling: Ultimately, the goal of sourcing a roads layer that conformed to modern LiDAR-derived DEMs was to support an assessment of sediment generation and export using the Road Erosion and Sediment Delivery Index (READI; Benda *et al.,* 2019). The READI model, run via the NetMap ArcMap-based tool suite (Benda *et al.*, 2007), predicts the runoff generation capability of road segments, surface erosion from those segments, and sediment delivery from roads to streams. "At the scale of individual road segments, READI can be used as a dimensionless index on inherent erosion potential to prioritize road segments[1] for field validation, maintenance, and remediation" (NetMap documentation). READI was selected for further analysis over other tools (WEPP, etc.) based on feedback from the NetMap developers, who recommended it as more accurate in mountainous landscapes, and better able to take advantage of high-resolution DEMs.

In addition to an imported road network file which can be broken down into segments, READI also incorporates data on terrain, local climate, road characteristics, and soil infiltration rates. Some of these data (terrain from DEMs, climate from existing databases) can be sourced easily, while others (road erosivity, soil infiltration rates) do not have accurate local values in existing databases, vary substantially over fairly small spatial scales in the assessment area, and are difficult to estimate values for without extensive field testing. Certain parameter values for the READI model are automatically drawn from spatial data, while others can be entered as a universal value, or separately defined for different areas in ArcMap.

While a full sensitivity analysis was not undertaken as part of this assessment, WRTC staff investigated which data and parameter values impacted READI results for roads in the Mumbo Creek Watershed, to determine what data-sourcing efforts might be most worthwhile to support future analyses on a larger scale. Specifically, four READI model runs were performed, with the following data and settings:

-Trinity County RCD roads layer without any editing; all READI parameters left at default values.

-WRTC LiDAR-derived roads layer without any editing; all READI parameters left at default values.

-WRTC LiDAR-derived roads layer but with extensive editing, including adding/deleting segments, to reflect actual on-the-ground roads; all READI parameters left at default values.

-WRTC LiDAR-derived roads layer but with extensive editing, including adding/deleting segments, to reflect actual on-the-ground roads; certain parameters, both global and road specific were customized: Erodibility (default value 1.0) was set as 0.03 for paved road surfaces, 0.2 for rocked roads, 1 for native surfaced roads, and 2 for vehicle trails[2]. Width for vehicle trails was set to 4.0m, all other road surface categories were left at 5m width. The minimum segment relief was set at 0.3m rather than the default 1.0m, per advice from NetMap model developers.

The READI model outputs showed clear differences between the different combinations of roads data and parameter values tested (Table 1). Total road length varied by several thousand meters between the Trinity County RCD layer, the original LiDAR-derived layer, and the edited LiDAR-derived roads layer. While inherently unitless and therefore only useful for comparison, the sediment production to delivery ratio (with production and delivery values for each road segment weighted by segment length) was

[1] When roads data is imported into NetMap for analysis, hydrologically discreet segments are automatically generated based on road-stream intersections and topography – these segments are different (and considerably longer) than those in the original LiDAR-derived roads layer.

[2] These erodibility values are derived from a Washington State Department of Natural Resources literature review on erosion from road surfaces (Dubé, Megahan, & McCalmon, 2004). These are average relative sediment production values (higher value equals more sediment produced) and do not necessarily represent the exact degree of surface erodibility from different roads in the assessment area, which depends on many factors: pavement condition, type of gravel or rock used, native surface characteristics, extent of rutting/washerboard, etc.

Table 1: Results of road sediment READI modeling for the different roads layers and parameter combinations tested. Sediment production and delivery are unitless model outputs. Sediment production and delivery values used to calculate ratio are weighted by road segment length.

	Total Road Length (m)	Sediment Production	Sediment Delivery	Weighted Sediment Production:Delivery Ratio	Sediment Delivery per Meter of Road
TCRCD; Default parameters	158109	73615	25989	2.497	0.164
LiDAR-derived/unedited; Default parameters	142329	47966	17232	2.315	0.121
LiDAR-derived/edited; Default parameters	144316	50368	20156	2.333	0.140
LiDAR-derived/edited; Custom parameters	144316	51165	16435	2.644	0.114

relatively consistent but did vary between runs, with the highest value generated by the edited LiDAR-derived roads layer with custom parameters. This same combination produced the lowest distance-standardized sediment delivery value as well. Unfortunately, without detailed validation data on sediment generation and export, it is not possible to distinguish which model performed 'best', only that the parameter values and the nature of the roads data used makes a substantial difference to READI model outputs. However, it does appear likely that using legacy aerial imagery-based roads layers may lead to higher estimates of both sediment production and delivery for a given watershed. This outcome would be expected from a poor fit of the roads layer to the topographic data that the READI model uses, in this case a LiDAR-based high-resolution DEM, given that roads in the assessment area are typically much less steep than the surrounding terrain, and would therefore be modeled as less prone to erosion if accurately delineated.

Visual analysis of sediment delivery from road segments in the Mumbo Creek Watershed (Fig. 2) shows the four READI model run results sharing many road segments with high delivery, relative to other segment values for that run. However, not all segments fell into the same category of relative sediment delivery on all runs, and therefore would not inform roadwork prioritization in the same way. Customizing the READI parameter values to reflect relative erodibility of different road surface types had predictable impacts on sediment export from road segments. Total sediment delivery was also lower using custom parameter values, when comparing runs on the same edited LiDAR-derived roads layer.

Discussion: Overall, the READI model appears to be a useful tool for prioritizing roadwork based on the potential for sediment generation and delivery to waterways, but results are sensitive to the road layer's conformation to the DEM used, and on the values applied for erodibility, width, and other parameters. While this assessment did not include a full sensitivity analysis of the READI model for this region, these results do further emphasize the importance of parameterizing the model as thoroughly and accurately as possible. This includes the generation of LiDAR-based roads layers, whether through algorithmic processing, manual delineation, or a combination, and assigning the correct surface type, ditch width, and other categories associated with parameterization. It also includes research to clarify local values for parameters such as erodibility of different road surface types and the infiltration rates of different soil types underlying ditches and roadcuts.

Crucially, the READI model also requires a local validation dataset to support confident interpretation and application of its results. This could be in the form of quantitative measurements of sediment generation and export from roadways, or potentially a more qualitative classification of road segments based on observed erosion features. The former dataset would allow for a more thorough, quantitative validation of the model, and potentially allow for accurate estimates of actual sediment production. The

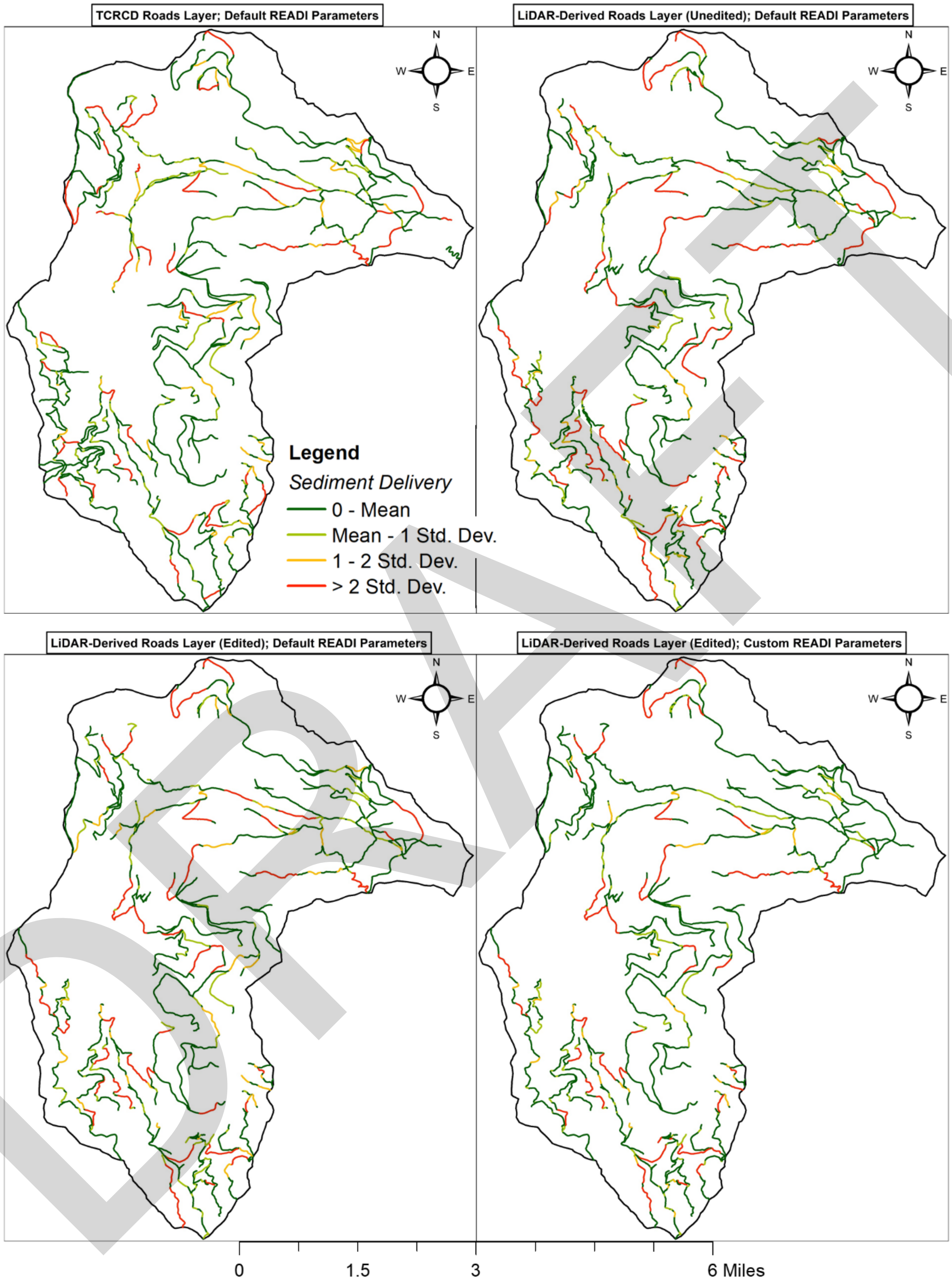

Figure 2. READI model sediment delivery from road sections in the Mumbo Creek Basin, categorized by deviation from mean (for each model run) for comparison of road segments.

latter would not allow for quantification of sediment produced, but would help enable managers to prioritize road segments for improvement in a watershed based on relative READI model output values.

Roads layer development and parameterization, as well as the creation of a validation dataset, would all be demanding undertakings, particularly at the scale of the Upper Trinity River Watershed. This is particularly true due to the diversity of geology and soil types, road surfaces, and management regimes found in the assessment area. There are also nuances in road surface condition and drainage features that are not captured in existing datasets but that likely have a substantial impact on sediment generation and delivery. Nevertheless, given the high cost of road improvement projects, and the damaging impacts of excessive sediment from roads, it may be worth pursuing further to produce a viable prioritization tool. This preliminary analysis shows a wide range of sediment delivery values for different road segments, with the highest modeled risk of sediment delivery to streams concentrated in a relatively small total distance of road (Fig. 3). A properly parameterized and validated READI model, or similar tool, could dramatically reduce the overall cost of sediment abatement in a watershed by ensuring work is targeted to the most critical areas.

The NetMap suite provides a range of other data products and models in addition to READI, which were not fully investigated for this assessment, but could likely prove useful to evaluate areas for erosion potential, flood or landslide risk, aquatic habitat value, or other variables. WRTC intends to continue using the NetMap suite for assessment work and project prioritization and design in the Upper Trinity and will expand its use of the tools available over time. Additional, more specific analyses outside of NetMap should also be performed to help clarify final project designs to address issues identified though READI model analysis or other means. The ProcessSpace tool (Cummings 2023) "automates a detailed catchment-level assessment of streams and channels using LiDAR-derived DEMs to enable visualization of flow path anomalies and restoration opportunities not easily observed in the field or using conventional maps." The ProcessSpace tool was not fully trialed for this assessment, but is a promising way to refine the placement of drainage dips, arch culverts, and other road upgrades so that they interface efficiently with natural flow pathways and avoid further channelization. One anticipated use case is to delineate flow paths before and after road decommissioning performed as part of the Trinity Alps Forest Restoration Project (see Appendix A). Since two major goals of the project were to reconnect wet meadow systems and reestablish distributed natural flow pathways, analysis of pre- and post-project LiDAR data using ProcessSpace and other tools should provide a way to quantitatively estimate project success.

Aquatic systems in the Upper Trinity Basin are heavily impacted by sediment loads, approximately 10% of which are estimated to originate from roads. Both legacy and current roads generate sediment from erosion of exposed surfaces, and from culvert blowouts and other discrete failures. But the proportion of sediment in waterways that originates from particular roads or road sections is hard to estimate, which in turn makes it difficult and expensive to prioritize work to improve road surfaces and drainage infrastructure. GIS-based modeling tools, especially those making use of recently-acquired LiDAR elevation data, can offer a cost-effective and precise method to identify the road sections that produce and deliver the most sediment to waterways, as a way to develop and prioritize road projects. However, to produce meaningful results, these models must be properly parameterized and supplied with accurate data (e.g., a roads layer derived from LiDAR elevation data), which can be difficult to obtain. Models should also be validated against on-the-ground measurements of sediment erosion and delivery

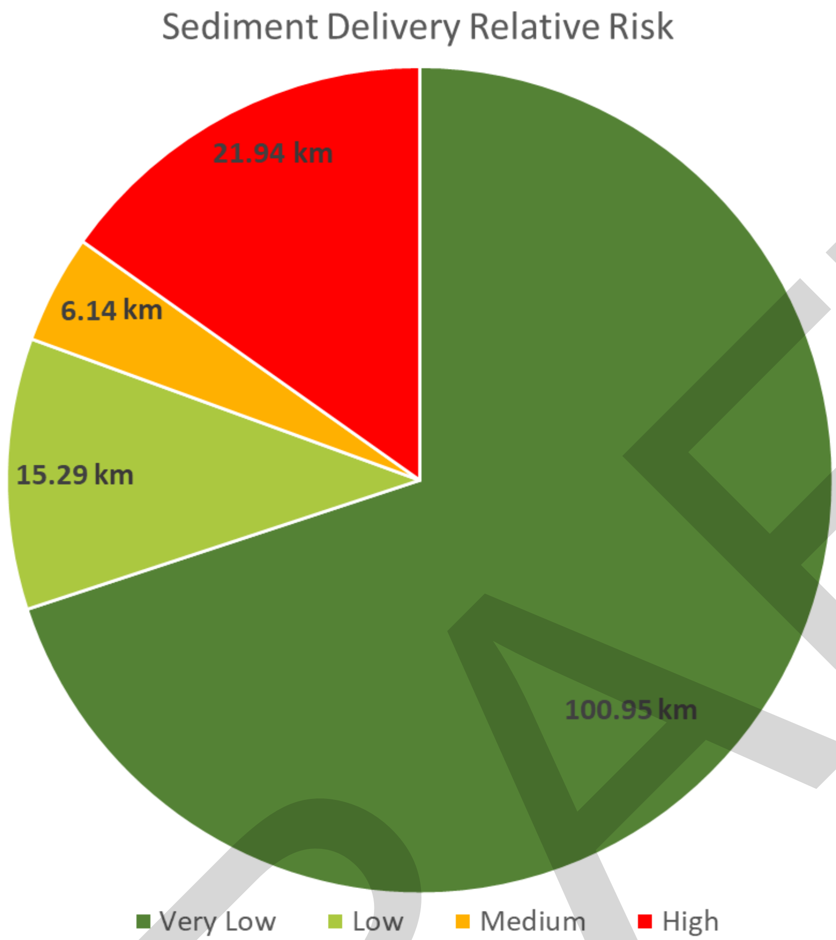

Figure 3. READI model outputs for Mumbo Basin of sediment delivery for the edited LiDAR-derived roads layer with custom parameters. Output values for road segments are grouped by relative risk of sediment delivery, using the same classification scheme as in Fig. 2: 'Very Low' risk encompasses the distance of all road segments with sediment delivery values from zero to the mean (9.01), 'Low' risk is from the mean to one standard deviation above the mean (50.06), 'Medium' risk is from plus one to plus two standard deviations above the mean (91.12), and 'High' risk is greater than two standard deviations above the mean (max value 855.74).

from roads, or at least qualitative condition assessments. These considerations make confident application of the modeling tools assessed in this report problematic at this time; future assessment work should focus on identifying (and determining relevant values for) the critical model parameters for accurate predictions of sediment delivery roads, and on building a road sediment dataset to validate model results against.

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Appendix A: Example and Potential Roads Projects[3]

Trinity Alps Forest Restoration Project – A collaborative project initiated by the Trust for Public Lands (TPL) and supported by the Shasta-Trinity National Forest, WRTC, California Wildlife Conservation Board, Siskiyou Restoration Group, and Sierra Pacific Industries (SPI), the Trinity Alps Forest Restoration Project decommissioned roads to restore hydrologic function and habitat value on five square miles of land formerly owned by SPI, prior to transfer to the USFS. The five parcels, located to the west of Highway 3 between Scott Mountain and Coffee Creek, have immense scenic, recreation, and ecological value, but were degraded (and barred from inclusion in the Trinity Alps Wilderness) by a network of logging roads with associated ditches and culverts. The project decommissioned these roads and restored the natural flow of water across the landscape, expanding and connecting existing wet meadow habitat to help sustain longer more reliable releases of cool water into Scott Mountain, Tangle Blue, and Eagle Creeks.

In total, over 23 miles of road were decommissioned, and 27 'blue line' stream crossings had culverts removed and were recontoured and revegetated with native species, with similar measures taken on dozens of smaller crossings for seasonal streams, spring seeps, and wet meadows. Dry road sections were decompacted to facilitate natural revegetation processes, and dips and outsloped sections were installed to prevent flows from accumulating in and scouring the former roadbed. Ultimately, this project not only allows for these parcels to be transferred to the Shasta-Trinity National Forest for management, but also restored valuable montane meadow habitat and will reduce sediment contributions from roads in the project area to downstream waterways. Sediment inputs will likely continue to decrease over the next several years as the decommissioned roads stabilize and revegetate.

Coffee Creek Road Project – This is a potential project centered around repairing and upgrading the County's Coffee Creek Road, which parallels almost the entire length of Coffee Creek, and contributes substantial sediment to it. The Coffee Creek drainage was also severely burned during the 2021 River Complex fire, and multiple post-fire debris flows have damaged portions of the road. A 2019 study (FHWA) prioritized Coffee Creek Road as the highest priority project in the Upper Trinity assessment area, prior to the additional damage and sediment contributions resulting from the River Complex fire. Community member input solicitated during the 2019 study and at other events have also shown this route to be one of the greatest concerns for safety and road condition. The project as originally proposed would place new aggregate fill on approximately 13 miles of Coffee Creek Road, pave and recondition several additional road sections, conduct fill slope stabilization, and improve trailhead parking areas. Culvert replacements were also recommended for 63 of the 125 culverts identified in the inventory. An updated project plan would likely benefit from extensive upslope stabilization work in the burned area to prevent future debris flows, and potentially upgrades to (or selective decommissioning of) USFS system roads in the burned area as well. This potential project, if implemented, would likely reduce both baseline sediment contributions to Coffee Creek from the roadway, and the risk of debris flows, culvert blowouts, and outboard roadways failures that could contribute occasional very large sediment pulses. See Fig. A1 for preliminary READI model results for the Coffee Creek Watershed, which could help inform future roadwork in the area.

[3] These projects were not initially identified as a result of this assessment, or using the READI model or other tools investigated in this report. However, the methods described in this report could be used to further prioritize sections of road within the scope of these projects, and to refine the placement and specifications of specific design features.

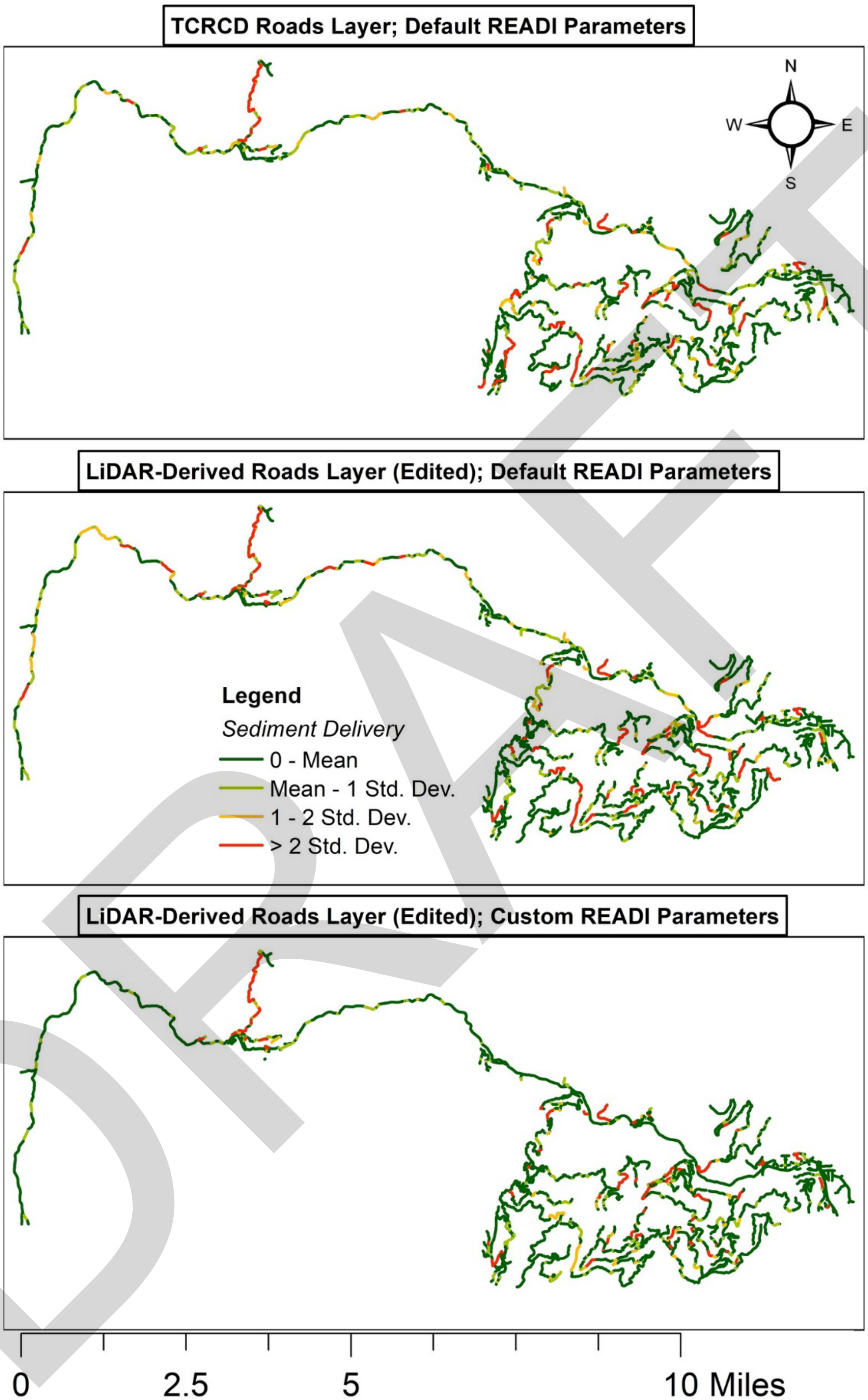

Figure A1. READI model sediment delivery results for the Coffee Creek Watershed road system, using different combinations of parameter values, as in Figure 2. Note the relatively small proportion of road segments with sediment delivery values >2 standard deviations above the mean.

Trinity Alps Trailheads Road Project – Various assessments (FHWA 2019, USDA 2003) and consistent community feedback have prioritized repairs and upgrades to USFS and County roads accessing trailheads for the Trinity Alps Wilderness. These are high use roads for summer recreation, but are also typically steep, unpaved, and subject to harsh winter conditions and flooding from numerous stream crossings. In addition to Coffee Creek, the roads accessing the Stuarts Fork, Long Canyon, Swift Creek, Tangle Blue, and Stoddard Lake trailheads were all identified in the 2019 FHWA report as potential projects, with the Stuart Fork road rating as high priority, and the Long Canyon and Swift Creek roads rating medium priority. These projects would vary in scope and specific objectives, but would generally involve repairs and upgrades to the road surface and drainage features (including culvert replacements), in order to improve user experience and reduce damage from erosion and slope failures.

UPPER TRINITY WATERSHED RESTORATION ASSESSMENT & MANAGEMENT PLAN

Chapter 2

Meadow Health and Extent

Prepared By:
The Watershed Research and Training Center
April, 2024

Grant Funding Provided By:
The Bureau of Reclamation

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Chapter 2

Meadow Health and Extent

Background and Preliminary Assessment: Meadows make up a small percentage of the landscape in montane environments such as the Upper Trinity Basin; however, they provide disproportionate hydrologic, ecological, and recreational benefits. A complete inventory of the current distribution of meadows in the Upper Trinity Basin does not exist, which limits efforts to manage the landscape to preserve and enhance existing meadows. Furthermore, evidence from both historical accounts and recent field surveys strongly suggests that many areas in the basin that once supported healthy meadow habitat are now degraded to the point where they are no longer identifiable as meadows based on vegetative characteristics.

WRTC staff examined a CDFW amphibian-supporting habitats dataset and the USFWS National Wetlands Inventory to determine their completeness and accuracy in the Upper Trinity Basin assessment area, in order to estimate the extent and distribution of current wetted features and wetlands, respectively, as proxies for wet meadows. Both datasets were found to have useful qualities, but each also had drawbacks, and did not provide a complete picture of current meadows in the assessment area. Both datasets showed existing meadow features concentrated in high-elevation headwater basins, with particularly high densities in the Trinity Alps Wilderness and the upper reaches of the upper mainstem Trinity River and the East Fork Trinity River.

<u>Klamath Mountains Lentic Wetlands Inventory (‘CDFW dataset’)</u> – This unpublished dataset is the product of an assessment conducted by Justin Garwood and associates with the California Department of Fish and Wildlife (CDFW) of wet meadows with ponds or other open water (lentic) features capable of supporting amphibian breeding habitat (Fig. 1). The assessment area covered the entire Upper Trinity watershed, as well as the Canyon Creek drainage to the west, the Parks Creek and the upper Sacramento River Basins to the east, and the upper Scott River basin to the north. Wetted landscape features supporting amphibian breeding habitat were identified based on analysis of multiple years of aerial imagery and were later field-verified by Justin Garwood and associates. This dataset does not encompass all meadows in the Upper Trinity Basin, but it does an excellent job of accurately capturing wet meadows and was treated as the ‘gold standard’ in that category[1] for this project, compared to the National Wetland Inventory (NWI) and modeled projections. For use as a comparison to modeled results and the NWI, the CDFW meadow polygons were first clipped to the Upper Trinity Basin watershed boundary, and then all obvious lakes, as opposed to shallow ponds that might support vegetation, were removed. The result was 863 total meadow polygons in the final comparison dataset, compared to 1,638 in the original inventory shapefile provided to WRTC.

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[1] There are numerous classification systems for meadows, wetlands, and related habitats (Benedict *et al.*, 1982, Cowardin, 1979, Ratliff, 1982) based on vegetative, hydrologic and topographic characteristics, but for the purposes of this assessment only three broad categories are referenced. Wet meadows are open vegetated areas supporting wetland plants and/or open water features which may support amphibian breeding habitat; all meadows in the CDFW dataset are wet meadows, but not all wet meadows are necessarily covered by the CDFW dataset since not all support amphibian breeding habitat. Drier meadows do not support substantial wetland vegetation or open water features, usually appearing as flat grassy areas; they are not referred to as ‘dry’ in this assessment since they may still flood seasonally. Sloped meadows are those appearing on substantial slopes, rather than in basins. They are most commonly observed downslope of springs and supporting wetland vegetation.

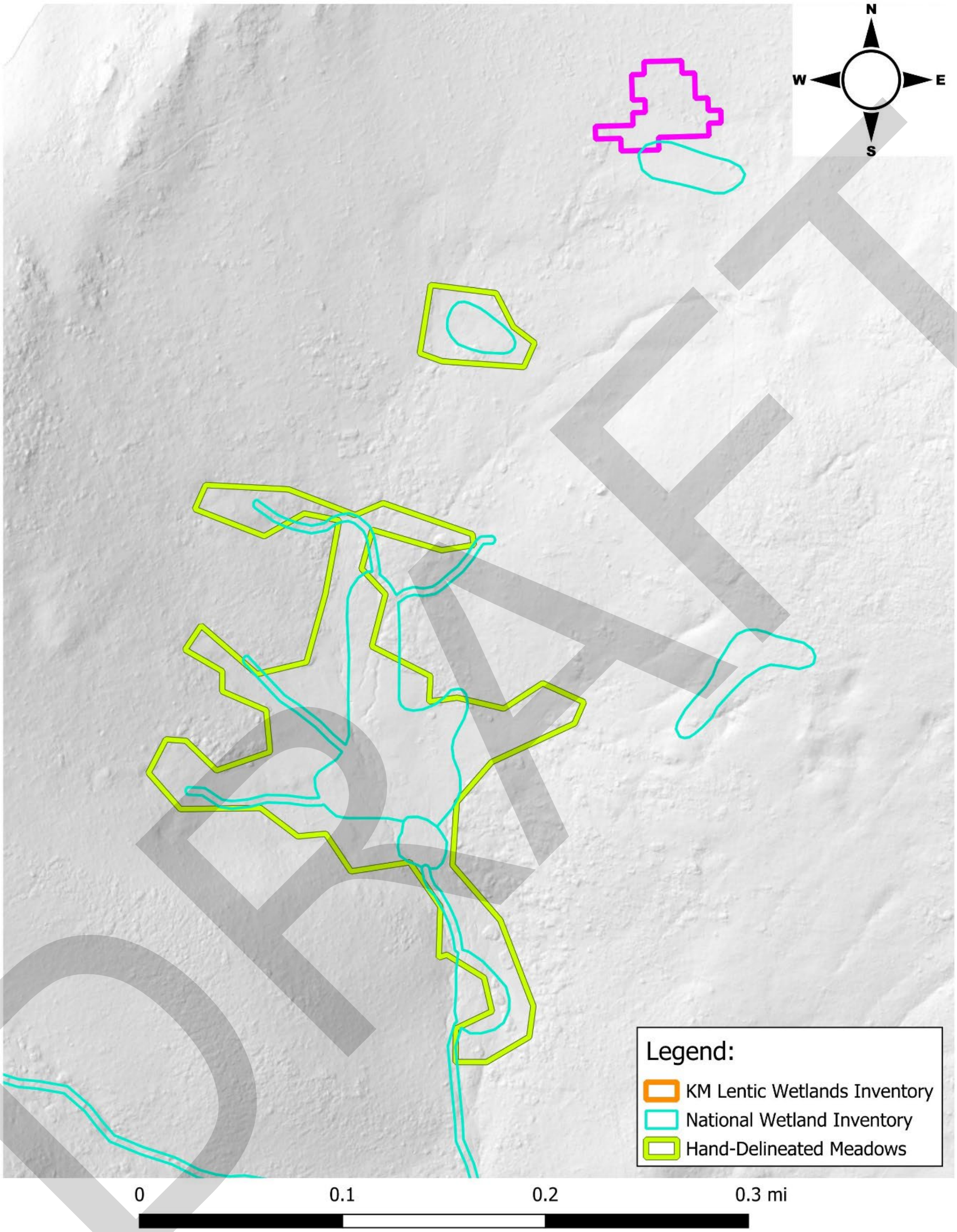

Figure 1. Upper Masterson Meadows in the assessment area, showing existing CDFW dataset and NWI wetland polygons, as well as a new delineation of the wet meadow area done for this project based on imagery and LiDAR data. Note that the CDFW dataset does not capture two additional meadows, as these presumably do not offer amphibian breeding habitat. NWI does have polygons associated with the meadow features, but they are considerably undersized compared to the open meadow area.

National Wetlands Inventory (NWI) – The National Wetlands Inventory is a US Fish and Wildlife Service (USFWS) data product that 'provides the information necessary to manage America's wetland habitats and their associated ecosystem benefits' (Wilen and Bates, 1995). Collection guidelines have not been totally consistent across the NWI's entire collection period, but most data from Trinity County appears to have been delineated by hand in the 1970s based on infrared aerial photography. Complete geographic coverage is available nationally, including for this project area, and wetlands are typed according to the Cowardin System (Cowardin, 1979). The NWI is relatively comprehensive, and is also useful for its ability to compare across regions on a national scale. However, in Trinity County it is prone to projection errors in some areas (Fig. 2), and for meadow delineation purposes often incomplete, generally missing drier meadows that do not include wetland features. For consistency with other data and models in this assessment, lakes were removed from the NWI data and the file was trimmed to the same Upper Trinity Basin watershed boundary using an identical process to that used to prepare the CDFW dataset for this assessment.

Both wet meadow datasets examined for this report show that meadow features are found primarily in the headwater basins of the Upper Trinity River Watershed (Fig. 3), with a smaller number located in or near the floodplains of the mainstem Trinity River and some of the largest tributary streams (Coffee Creek, Swift Creek, East Fork Trinity River). Only a few wet meadows are located in midslope areas. Justin Garwood and his team identified only 1,309 acres (<0.3%) of the Upper Trinity River Watershed (459,347 acres total) as wet meadow habitat, with over half (749 acres) occurring within the Trinity Alps Wilderness Area.

NWI shows a much larger area of wetland,8,899 acres, 3,149 acres of which is within the Trinity Alps Wilderness Area. However, this base acreage is likely a considerable overestimate, since every mile of creek has a 13' buffer of riverine wetland added on each side, which is considerably more than typically exists in this region, at least currently. Also, many of the areas classified as pond type wetlands appear to function as lakes, rather than as seasonally vegetated shallow waters. A more refined estimate incorporating only 50% of pond type wetland area and 20%[2] of riverine type wetland area is 4,618 acres (2,343 in Wilderness). However, this is still a much larger area than the Klamath Mountains Lentic Wetlands Inventory, likely because NWI is not limited to open water amphibian breeding habitat.

Of the 4,618 acres of wetland in the revised NWI dataset, forested/shrub wetland is the largest category, with 2,164 acres (46.9%). While they are not typically obvious meadow features, current forested/shrub wetlands may still contain pockets of meadow, or are encroached former meadow areas suitable for restoration. Freshwater emergent wetlands, which are almost always true wet meadows, comprise 1,256 acres (27.2% of NWI wetlands) within the study area. The pond wetland category, with acreage adjusted to remove permeant shallow lake features, also functions mostly as seasonal wet meadow habitat, and makes up 170 acres (3.7%) of total NWI wetlands. Riverine wetlands (acreage adjusted to account for NWI overestimates) account for the remaining 1,028 acres (22.3%) of NWI wetlands in the Upper Trinity Basin, and vary considerably in terms of supporting wet meadow habitat. However, in many cases, riparian areas that do not currently support meadows may be suitable for restoration through forest thinning or BDA-type treatments to repair incised channels. Some additional

[2] These adjustment percentages were averages based on a visual comparison of NWI wetlands to identifiable wetland features within four representative HUC-8 watersheds in the assessment area.

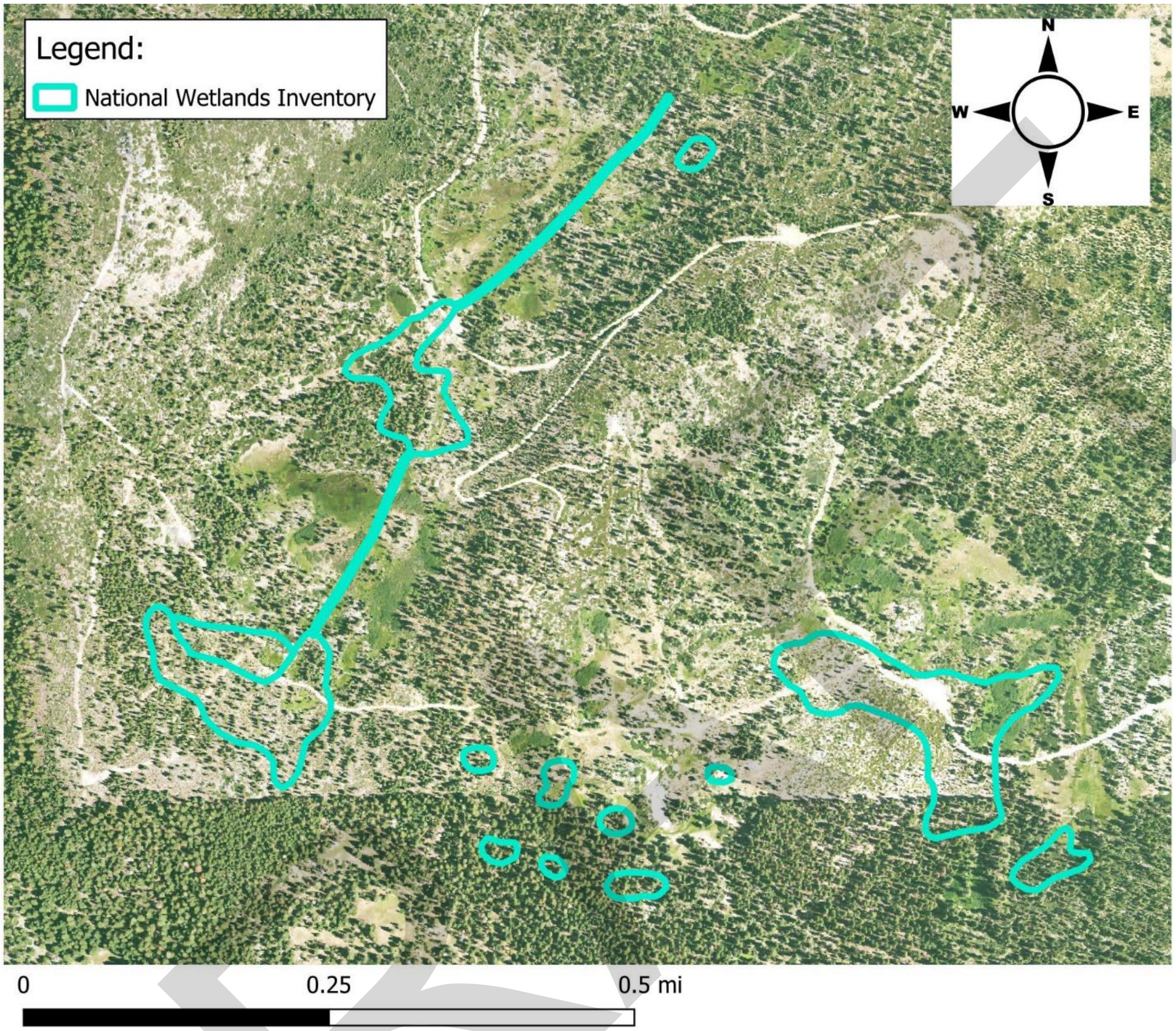

Figure 2. NWI wetland polygons in the assessment area. Note that polygons are offset from obvious wetland features in imagery. This type of projection error was occasionally noted multiple times in the assessment area, but was not ubiquitous.

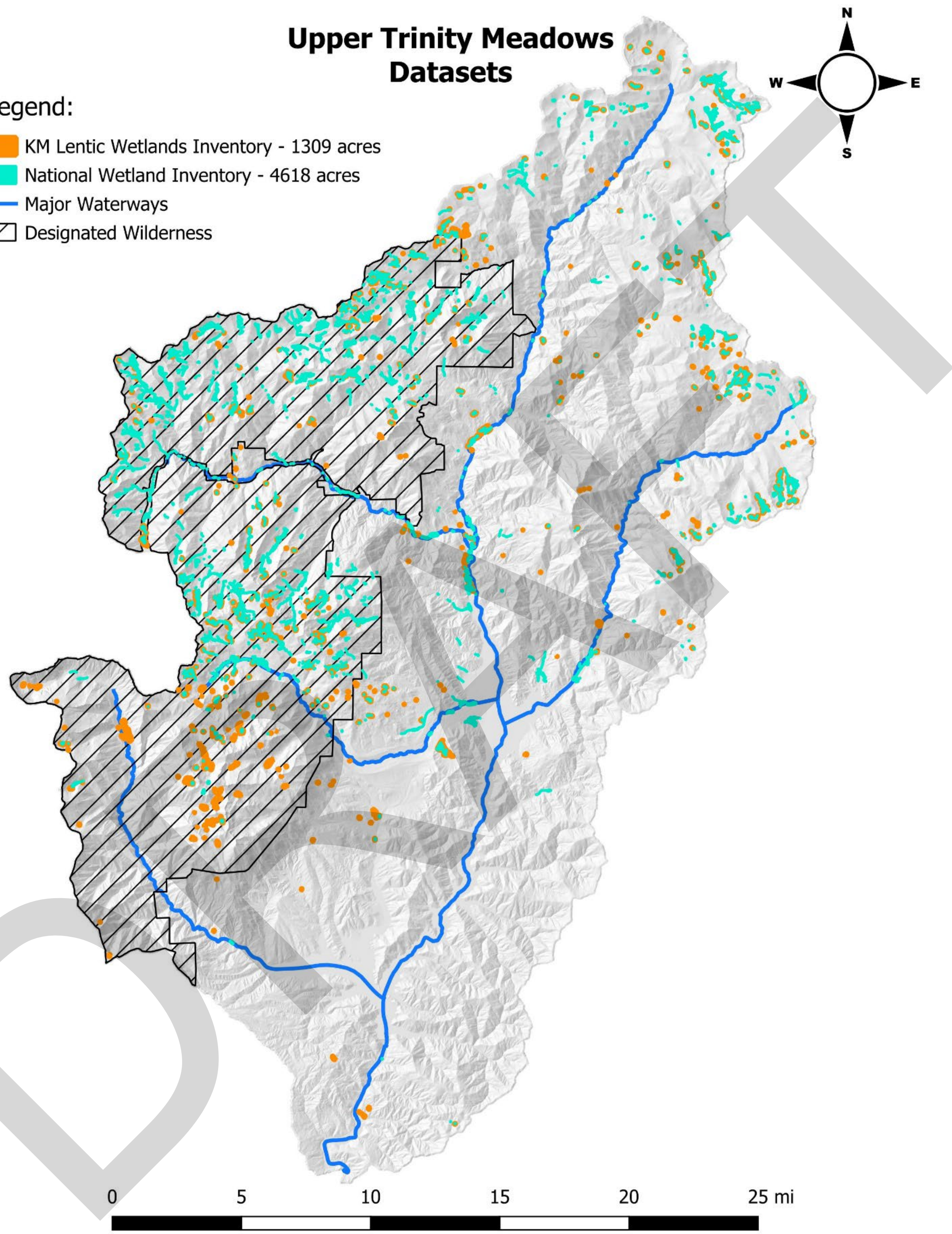

Figure 3. Upper Trinity assessment area with both examined wet meadow datasets displayed. Note wet meadow clusters around the basin rim. Displayed NWI data is revised to remove wetland features associated with perennial ponds and auto-generated for stream corridors; base NWI is 8899 acres.

riparian areas are more heavily degraded from historic mining activities, but could potentially be restored to floodplain meadows via regrading of mine tailings and extensive revegetation plantings.

Overall, a majority of extant wet meadow areas appear to be captured by one or both of these datasets. However, several wet meadows identified through field surveys and/or documented using aerial imagery were either partially or fully missing from one or both datasets, even though they almost certainly qualify as wetland habitat, and potentially support breeding populations of some amphibian species. In addition, neither dataset was intended to delineate and record drier meadows that do not support wetland vegetation or amphibian breeding habitat and, as a result, these drier meadows are not captured. Sloped wetlands were also not well captured, particularly in the CDFW dataset, since they do not typically contain ponds that can support amphibian breeding habitat. While drier and sloped meadows are a relatively small proportion of meadows in the assessment area, they can be a sizeable fraction of total meadow area within particular sub-basins, and provide unique and valuable habitats.

Meadow Model Evaluation and Validation: Two software modeling tools, the Lost Meadow Model and the Wetlands Intrinsic Potential tool, were examined to determine their suitability for helping complete the meadow inventorying efforts described above. Both models were also investigated to determine their effectiveness in predicting currently forested, drained, and otherwise degraded areas with potential for meadow restoration. Neither model was completely effective at either task, and struggled in particular with identifying current or potential sloped and drier meadows. However, the Lost Meadow model was effective enough at these tasks to serve as a useful first step in identifying new current meadows and potential restoration areas, prior to more thorough 'desktop analyses' or field surveys to refine delineations. The Lost Meadow Model was also found suitable for prioritizing meadow restoration work at the sub-watershed scale based on the ratio of 'lost' to existing meadow acreage.

<u>Lost Meadow Model (LMM)</u> – The Lost Meadow Model (LMM; Pope and Cummings, 2023) was developed by USFS staff at the Pacific Southwest Research Station to estimate areas of 'lost' meadows that may have historically supported wet meadow habitat. In practice, this means the model identifies areas with similar hydrogeomorphic conditions to extant meadows, which may be current meadows in various conditions, or areas that historically provided meadow habitat but which have been fully forested and/or drained. A caveat is that the LMM results do not distinguish between recent meadows and those areas which share similar characteristics, but that for one reason or another did not exist as meadows in the past. Identifying the LMM-predicted locations most suitable for meadow restoration therefore requires further on-the-ground investigation of soils and any remaining meadow vegetation, as well as confirming suitable hydrogeomorphic conditions.

To create the Lost Meadow Model, the developers used machine-learning algorithms to identify values associated with current wet meadows for predictor variables including 'local relative elevation, slope, distance to nearest stream channel, and topographic wetness index'. The base data used to generate these values were a 10-meter digital elevation model (DEM) and a streams layer, which provided the topographic and hydrologic context. This process was originally applied to an extensive meadow dataset from the Sierra Nevada ecoregion, consisting of 11,127 meadow features distributed over a 25,300 km^2 study area (Pope and Cummings, 2023). For use in the Upper Trinity Basin assessment area, the LMM was retrained using the Klamath Mountains Lentic Wetlands Inventory dataset, which contained 1,638 polygons, including lakes and wet meadows in several watersheds adjacent to the Upper Trinity Basin.

The LMM originally produced a probability raster, but the dataset received by WRTC for analysis had been classified into polygons demarcating likely meadows.

The Lost Meadow Model polygons generally predicted existing meadows in the Upper Trinity Basin, including some meadows not included in the Klamath Mountains Lentic Wetlands Inventory training dataset. In certain areas, typically where substrate and hydrology are consistent, it proved extremely accurate in delineating the extent of meadows, based on both GIS analysis and field validation. In addition to predicting existing meadows, preliminary field observations of relatively moist areas with fine soils and basin topography, but without current meadow habitat, support the model's ability to predict degraded areas that could potentially support both wet and drier meadows (Fig. 4). True quantitative validation for these 'lost' meadows areas is not feasible, since delineations of the original meadow areas are generally not available. However, the 'lost' areas of meadows predicted by the LMM do generally appear to represent opportunities for restoration and enhancement projects, even if their exact size and boundaries may not be completely accurate.

The LMM shows 8,391 acres (4,867 acres within the Trinity Alps Wilderness Area) of potential meadow areas, including those with existing meadows, in the Upper Trinity Basin (Fig. 5). This estimate is more than six times what was captured in the CDFW training dataset, and almost double the refined NWI estimate of 4,618 acres. The total potential meadow area could actually be considerably higher, since the CDFW training dataset only incorporated meadows containing amphibian breeding habitat, and therefore the LMM does not predict many drier or sloped existing meadows, let alone 'lost' meadows with similar characteristics (Fig. 6). There is also a possibility that some areas which formerly supported meadows in the basin are not captured by the LMM due to heavy incision from hydraulic mining, which has altered the local topography substantially enough that analysis of current DEMs does not suggest suitability for meadow habitat. However, any such 'long lost' meadows would require substantial historical research and field surveys to properly assess and would also likely represent more challenging and expensive restoration opportunities compared to more recently degraded meadows, so their likely absence is more of an academic consideration rather than a practical one.

The LMM in its current state is already useful to identify general restoration areas and provide a ballpark sense of the historical size and scope of meadows at a sub-basin scale. The LMM provides excellent spatial estimates of existing meadows in most areas that do not have substantial hydrologic or geologic idiosyncrasies such as hillslope springs or bedrock outcrops. These factors can have major impacts on meadow presence (Figs. 7 and 8) but the LMM does not currently integrate data beyond geomorphic features and a limited amount of surface hydrology (distance to nearest stream channel) and climatic data (median April snowpack). Therefore, no geologic or groundwater features are explicitly incorporated into the model as predictor variables. In our study area, the LMM has assessed meadow potential in some areas where this is obviously not realistic, such as flat bedrock outcrops. It is doubtful that any model can generate a high-precision estimate of potential meadow areas without incorporating data describing groundwater dynamics and geology, but while in theory these data could be incorporated into the LMM or other models to further refine 'lost' meadow area predictions, these factors are not always well documented within this report's study area.

<u>Wetlands Intrinsic Potential tool ('WIP tool')</u> – The Wetlands Intrinsic Potential tool (WIP; Halabisky *et al.*, 2023) is designed to 'map likely wetland areas in forested watersheds' in the Pacific Northwest by 'detecting hydrological and geomorphological controls', based on digital elevation maps (DEMs) and

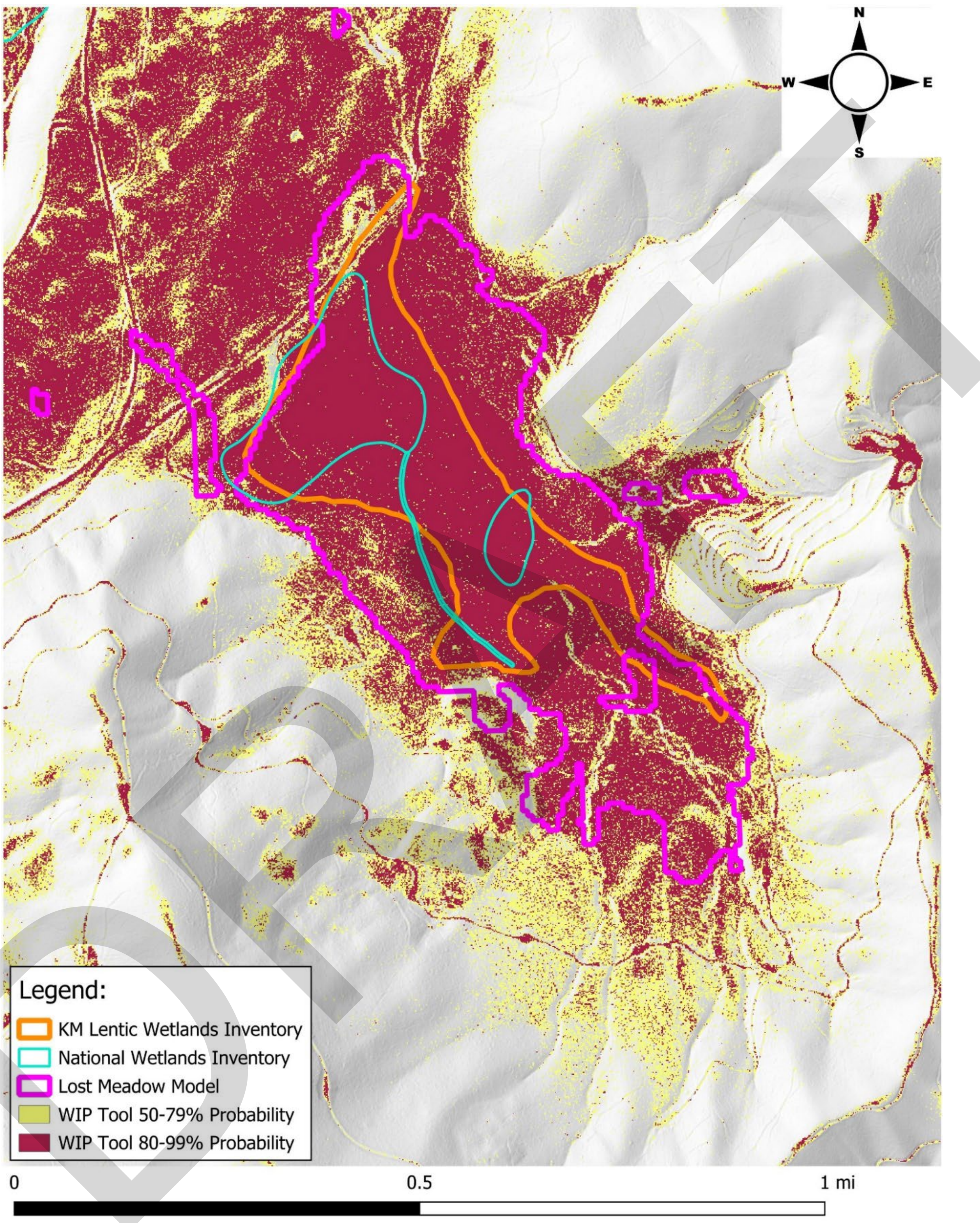

Figure 4. The Norwegian Meadows area near Trinity Center, CA is noted in both datasets and projected by both models as highly probable meadow. However, there are major differences in extent, with both models showing a much larger area of potential meadow than currently exists. NWI also shows a much smaller area of wetland than CDFW's Klamath Mountains Lentic Wetlands dataset.

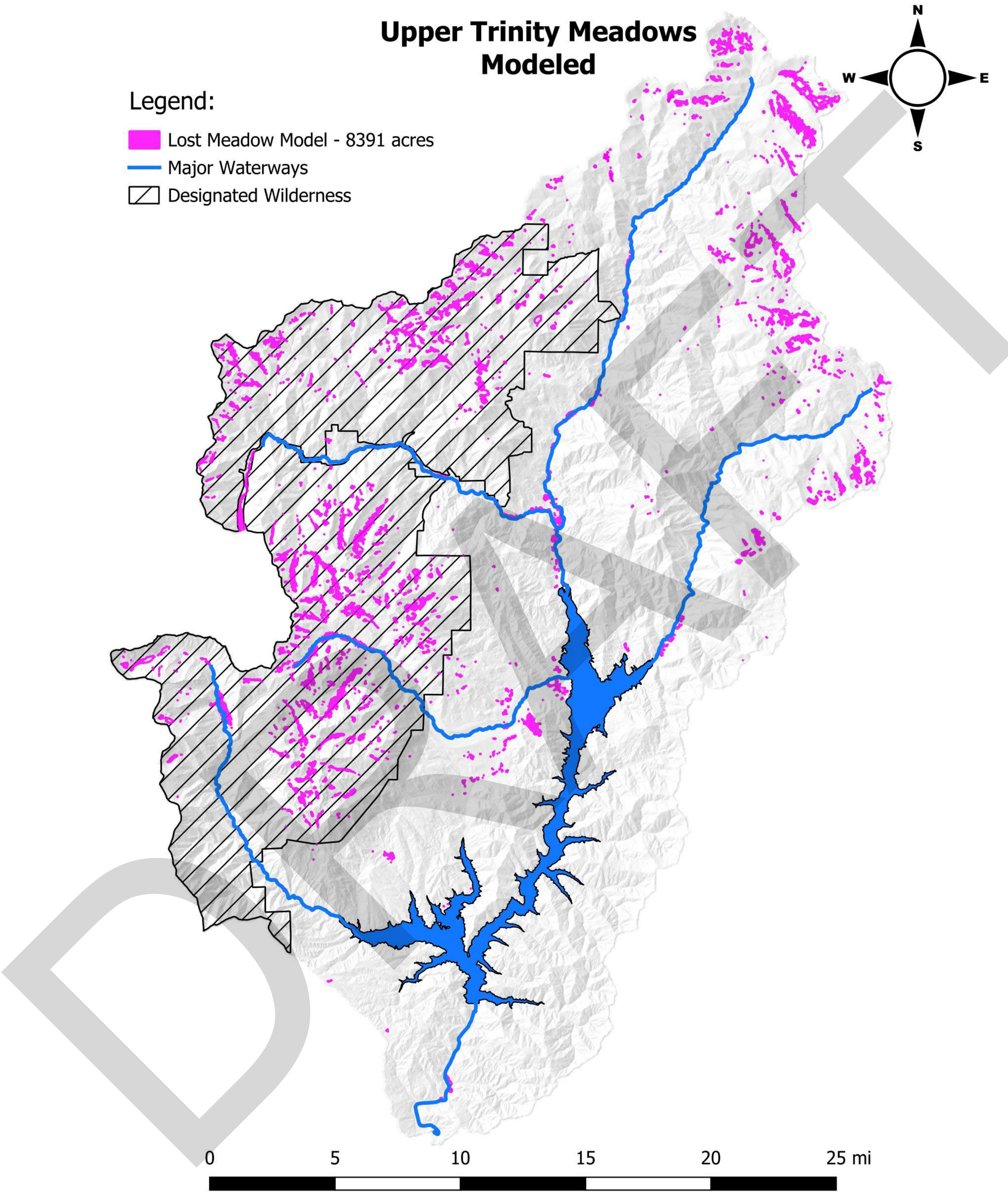

Figure 5. Upper Trinity assessment area with Lost Meadow Model polygons displayed. Note much larger area of wet meadow compared to the NWI (8899 acres, 4618 revised) or the CDFW dataset (1309 acres).

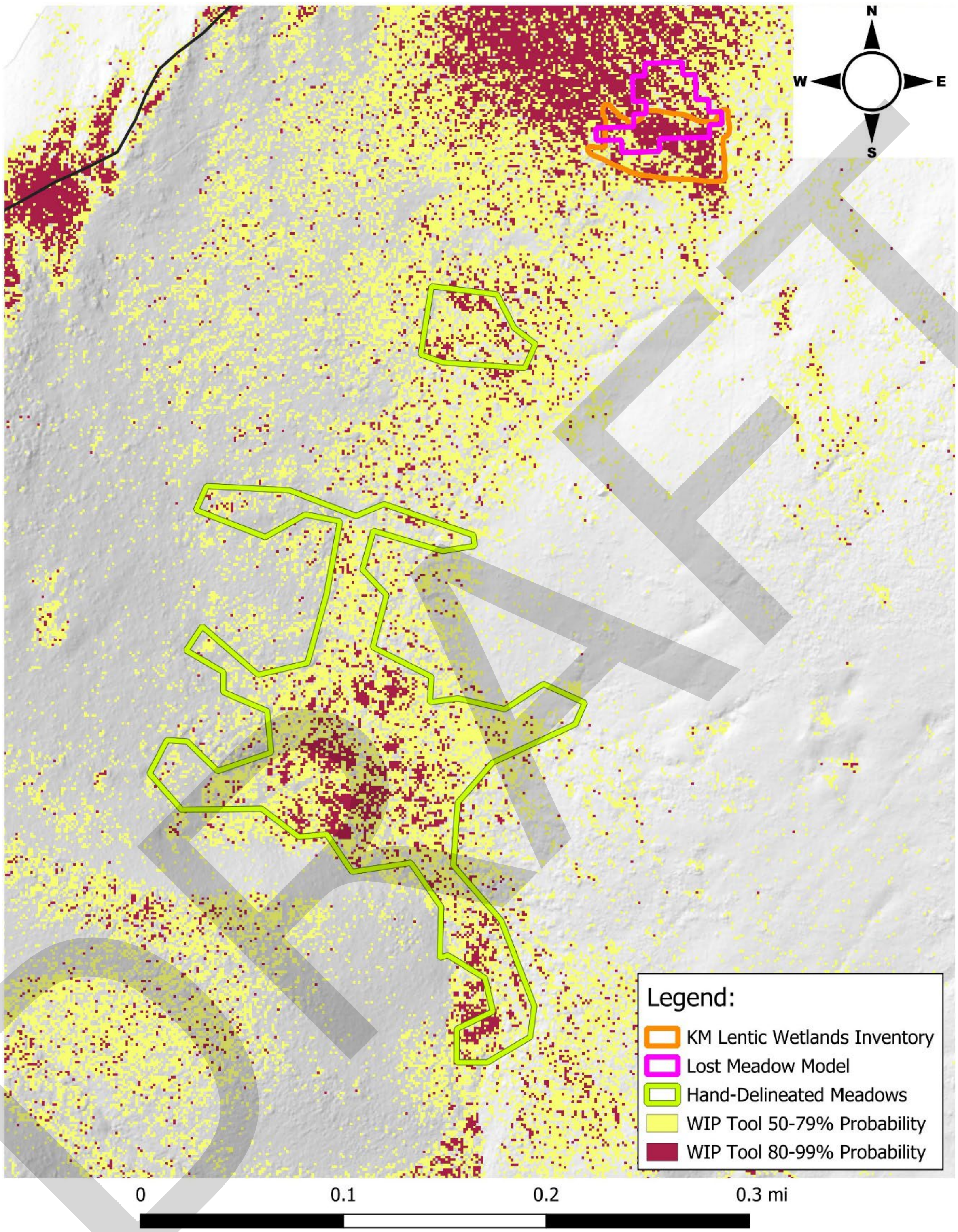

Figure 6. LMM and WIP tool projected likely wet meadow in the Masterson Meadow area (same as Fig. 1). LMM shows only a single small polygon near where the CDFW dataset also shows a wetland feature, but completely misses the larger meadows to the south. The UW forested wetlands model shows much larger areas as high probability, including portions of the larger wetland areas. However, it also shows rocky ridge areas above the meadow as probable wetlands, as well as the roads.

Figure 7. Bear Creek meadows, showing a wet and dry slope in close proximity to each other and appearing very similar in most regards, except for soil moisture and vegetation.

Figure 8. Dry, rocky foreground in Bear Creek meadows is lower than saturated soil in the background, where a spring mound has formed. This type of small-scale hydrologic and geologic diversity makes modeling meadow features extremely challenging.

other remote sensing data. This tool was developed by researchers at the University of Washington (UW) and TerrainWorks, (in collaboration with the WA Department of Ecology and WA Department of Natural Resources) because traditional methods assessing forested wetlands, usually based on infrared aerial imagery, are not well suited for detecting wetland areas beneath canopy cover. In western Washington where this model was developed, there are many forested wetlands, which the WIP tool was designed to detect by assessing multi-scale topographic indicators derived from LiDAR-based DEMs. The WIP tool was not designed specifically for wet meadows, but a large majority of wet meadows in our study area have wetland characteristics, so the WIP tool was deemed suitable for investigation. In theory, this tool could also be used in the Upper Trinity to detect wet meadows that have been heavily encroached by conifers and are no longer easily visible in aerial imagery.

The WIP tool is also based on a machine-learning approach to detect similar topographic conditions to those near the training data, and generates a raster file showing wetland probability. Raster values ranged between 0 and 1, with 1 being 100% assessed probability of wetland - initial validation studies in Washington used a threshold value of 0.5 to demarcate potential wetlands but during our qualitative assessment we also used a secondary threshold of 0.8 to distinguish the most likely areas. The UW model was trained on the same Klamath Mountains Lentic Wetlands Inventory dataset as the Lost Meadow Model, and so should highlight areas with similar multi-scale topographic indicators.

The Wetlands Intrinsic Potential tool results were obtained as probability raster files, rather than polygons, which precluded direct comparisons to both existing datasets and the LMM results without further refinement beyond the scope of this study. However, in general, the WIP tool seems to overestimate meadow coverage by a large degree, frequently predicting roads, ridgetops, and gravel bars as having a very high probability (>80%) of being suitable for wetland/wet meadow habitat (Figs. 4 and 6). While quantitative validation was not performed for this assessment, examination of aerial imagery and LiDAR data, as well as field survey work, showed major inaccuracies in probable wetland area predictions by the WIP tool. Essentially, most flat surfaces were predicted to be current or potential wetlands, regardless of proximity to water, vegetation, or other factors. Conversely, WIP also appears to underestimate or miss sloped meadows which also support wetland habitat. This is not very surprising, since these rarely support amphibian breeding habitat, and so were not included in the CDFW training data; however, combined with the overestimates of flat meadow areas, it suggests that the WIP tool is considering local topographic parameters almost exclusively.

The WIP tool was developed in a different region and for a somewhat different purpose, and does not appear suitable for existing or potential meadow delineation in the study area as currently calibrated. This is primarily due to large overpredictions of wet meadow extent in areas that clearly (from both aerial photos and in-person observation) do not offer suitable conditions. This limits the model's utility in predicting restoration opportunities, since it would lead to overly large and ultimately unproductive projects. While the model framework overall may be effective, it would need to be substantially updated for the purposes of identifying potential meadow areas in the Upper Trinity Basin.

Discussion: Neither existing dataset examined for this assessment provided comprehensive and accurate data on all meadow types in the Upper Trinity Basin. The Klamath Mountains Lentic Wetlands Inventory was highly spatially accurate and nearly comprehensive for the wettest meadows, but did not include any meadows without ponds or other open water features that could support amphibian breeding habitat, even those with wetland characteristics. The National Wetlands Inventory was fairly comprehensive for wet meadows, including those without open water, spring-fed sloped meadows, and wet meadows encroached by woody vegetation, but not for drier meadows without wetland characteristics. NWI was also inaccurate, with notable projection errors, imprecise delineations of existing wetlands, and riparian wetland features that appear to have been auto-generated along all stream corridors in the assessment area. A complete and accurate meadow inventory for all meadow types in the assessment area will therefore require substantial new data collection and specific delineation.

Both the Lost Meadow Model and the Wetland Intrinsic Potential tool were able to identify a large number of current and potential meadow areas in the Upper Trinity Basin; however, the WIP tool as used in this assessment appeared to substantially overpredict potential meadow areas. The LMM predictions were more conservative, but nevertheless displayed both site-specific and systematic errors compared to field and 'desktop' surveys. The site-specific errors in meadow extent are likely due primarily to the Upper Trinity Basin being highly heterogenous for subsurface hydrologic, geologic, and edaphic factors, which neither model considered, relying only on topography and surface hydrology. The largest systemic error was the underprediction of sloped and drier meadows, which can be accounted for by the use of CDFW's amphibian breeding habitat dataset to train both models.

Future efforts to identify existing and potential meadows in the Upper Trinity Basin should prioritize accounting for systemic errors in the Lost Meadow Model by updating the training dataset with examples of sloped and naturally drier, rather than artificially drained, meadows. These extra meadow features could be incorporated into the existing wetted features training data, or potentially multiple versions of the model could be trained and ran on discreet datasets for each meadow type, to specifically identify the different geomorphic parameter values associated with them. The 'opportunity cost' for training and running the LMM is relatively low, so it may be possible to train the model on several different datasets to see which produce the most useful results.

Sloped and drier meadows are worth investigating further, because although they appear to make up a relatively small percentage of all meadows in the Upper Trinity Basin, they were encountered in several field surveys and appear to contain unique botanical assemblages. Sloped meadows also frequently display degradation due to road cuts and associated ditches and culverts that pass through them (Fig. 9). For restoration work focused primarily on attenuating flows from headwater areas, identifying potential sloped and drier meadows may not be a top priority, but future modeling of these areas could benefit work focused on preserving biodiversity and spring water sources, as well as produce a more complete picture of the total meadow area present in the Upper Trinity River Basin.

Additional future modeling efforts could also investigate the potential for changes to the model itself, rather than just the parameter values or training dataset, to better capture the local dynamics of meadow creation and maintenance. Meadow formation in the Klamath Mountains, and in the Upper Trinity Basin in particular, may not always rely on the same processes as in the Sierras, given the differences in geology and climate. The underlying bedrock in the Upper Trinity Basin, and the Klamath Mountains generally, is much more varied than the Sierra Nevada, with substantial areas of ultramafic lithology. The climate in the assessment area is more coastally influenced, elevations are typically lower, and the region experienced less massive recent glaciation compared to the Sierra Nevada. Similarly, there are also substantial geologic and climatic distinctions between the Klamath Mountain region and western Washington, where the WIP tool was developed and tested. Therefore, the LMM model and

Figure 9. Above (left) and below (right) a road paralleling Bear Creek, showing highly sloped 'hanging' wet meadow being intercepted by a roadside ditch. Meadow area below the road is drier and much patchier than above, as a result of diffuse groundwater flows being channelized. This type of meadow degradation is quite common on sloped meadows in the assessment area.

WIP tool developed for those locations may not be optimally designed to capture potential meadow locations in the assessment area. Finally, because the elevation data supporting these tools are all from recent survey work, they will struggle to delineate meadow areas that may have existed prior to large scale disturbances from earlier mining and road-building activities that have fundamentally altered local topography.

An additional modeling opportunity that should be investigated is running the LMM on a higher resolution (~1m) LiDAR-based DEM, rather than the traditional 10m DEM. The increased resolution of the topographic data may help to identify current and potential meadow areas with higher fidelity, although it would also increase the amount of time required to train the model and run it on different landscapes. If processing power is limited, it should be possible to downscale the LiDAR-based DEM to a more workable resolution (e.g., 4m) which should allow for balancing accuracy and run speed. It may also make sense to run the model on smaller areas and merge the outputs, rather than attempting to cover an entire basin in one run.

Lastly, updated LMM meadow polygon delineations produced using an upgraded model as described above could be refined using additional datasets or model outputs. For example, cross-referencing initial LMM outputs with geology reports could remove the areas where deep talus or exposed bedrock likely preclude meadow formation. New tools, such as the Streams Across Landscapes (SAL) model (Graham and Petreshen, personal communication, 2023), can be used to estimate areas hydrologically favorable to meadow restoration by generating maps of soil saturation. However, this development pathway is limited by lack of detailed and field-validated datasets; the complex geology of the Upper Trinity Basin does not lend itself to easy mapping! WRTC will continue exploring new tools and datasets that can help predict and target high-potential meadow restoration sites in the basin, in addition to conducting field assessments as able. KMP will also continue to develop a categorization system for meadows in the Klamath Mountains region, similar to what has been developed for meadows in the Sierra Nevada, in order to refine meadow inventories and guide future restoration work.

While meadow modeling tools such as the LMM have some utility in locating existing meadow features, their primary use moving forward is in predicting areas that are not currently meadow habitat, but where meadows would have likely occurred in the past, and/or could be successfully enhanced. However, just as meadows are created and maintained through numerous and variable processes (Nash, 2018), the reasons for their absence or degradation are not always straightforward. The modeling tools available do not offer explicit insight into the history of a given potential meadow area, and what restoration and enhancement techniques will be most successful in expanding or improving meadow habitat. For some predicted areas of lost meadow, it appears unlikely that meadows were ever found there due to unsuitable substrate such as deep talus fields (too easily drained) or bedrock (extremely limited soil and water retention). Other areas appear to be unsuitable due to a slightly elevated position compared to surrounding, wetter areas. These extremely small elevation differences, often only a few inches, are not always registered by models using existing DEMs but can play an important role in local hydrology, particularly in the shallow soils common in headwater basins.

In ‘lost’ areas that do appear to have topographic and substrate characteristics suitable to support meadow habitat, there are two interacting mechanisms leading to a current lack of healthy meadow habitat: vegetative and hydrologic:

Vegetative degradation, typically encroachment by lodgepole pine and other conifers (Fig. 10), is likely the most common primary mechanism for meadow loss in the assessment areas. Trees crowd and shade out lower-growing species and the higher evapotranspiration rate of large trees reduces available moisture, further transitioning the environment to conifer forest (Haugo and Halpern, 2007). Trees were excluded from many meadow areas in the past by more consistent heavy snowpacks and by frequent fires, often associated with traditional Native American management practices (Lake, 2007). Under current climate conditions and fire suppression regimes, trees are better able to invade meadow systems and transition them to forested habitat types (Lubetkin *et al*., 2017; Norman and Taylor, 2005). Less commonly, areas predicted as 'lost' meadows show dense thickets of alder (typically green alder) and other shrubs, rather than herbaceous and graminoid species. Shrub thickets are common on meadow peripheries in the Upper Trinity River Watershed, and the dynamic interplay between these habitat types is not well understood in this region.

Hydrologic factors that degrade meadows include ditches, incised natural channels, and other drainage features in, above, or below meadows that decrease water table elevations and reduce available moisture for meadow plant species (Nash, 2018). In some cases, the drainage of meadow areas was intentional, as a result of efforts to convert it to pasture, or facilitate the establishment of roads, trails, or other infrastructure. In other cases, meadows are drained due to historic mining, roadcuts, or other activities that inadvertently opened up large channels downstream of the wet meadow, or cut off supplies of water from upslope. Poorly managed grazing, timber harvest, and other activities can also contribute to high peak flows through existing channels due to a lack of cover and soil on the surrounding landscape, which erodes those channels below their historic grade and leads to excessive meadow drainage (Fig. 11).

While a systematic analysis was not undertaken for this project, both field-based and GIS-based investigations show most 'lost' meadows currently present as flat or gently-sloped forested areas, often surrounding a smaller core of extant meadow. Most large LMM-projected meadow polygons are associated with a mapped (NWI or CDFW) meadow area, although there are a few larger LMM-meadows and many smaller ones that are not near any mapped meadow areas. Closer investigation of particular LMM polygons showed frequent signs of anthropogenic impacts, including nearby roads, trails, and mining disturbance. Several field visits produced substantial on-the-ground evidence of anthropogenic impacts that likely led to loss of meadow area – see draft restoration plans in this chapter's appendices for details on current impacts and potential restoration techniques. These site visits also showed that even degraded meadows with a large overstory component retain wetland species and provide some hydrologic benefits, but at reduced levels corresponding to the degree of encroachment (Fig. 10).

Prioritization of restoration and enhancement work using the Lost Meadow Model is already possible at the sub-basin (HUC-12) scale for the Upper Trinity Watershed. While specific LMM polygons may not completely capture extant or degraded meadow areas, the model results at larger spatial scales appear to be accurate enough to generate a useful prioritization metric, namely the ratio of 'lost' meadow area in a sub-basin to the 'found' area of previously-mapped meadows. NWI appears more useful than CDFW for this metric as it is more comprehensive, and ratio at the sub-basin scale is not sensitive to NWI's projection errors and mis-mapping of particular meadows. This 'Lost:Found Ratio' is a useful ballpark proxy for the amount of restoration opportunities available in a given sub-basin, with a higher ratio indicating a relatively larger amount of restoration potential (Fig. 12). However, this is a very coarse

Figure 10. Area in the upper Bear Creek drainage heavily encroached by lodgepole pine, but still supporting wet meadow species.

Figure 11. Areas of poor meadow surface hydrology in Mumbo Basin, showing a headcut feature (top) and incised banks (bottom). Similar signs of degradation are fairly common throughout the assessment area, and offer opportunities for small-scale projects to expand and enhance wet meadow habitat.

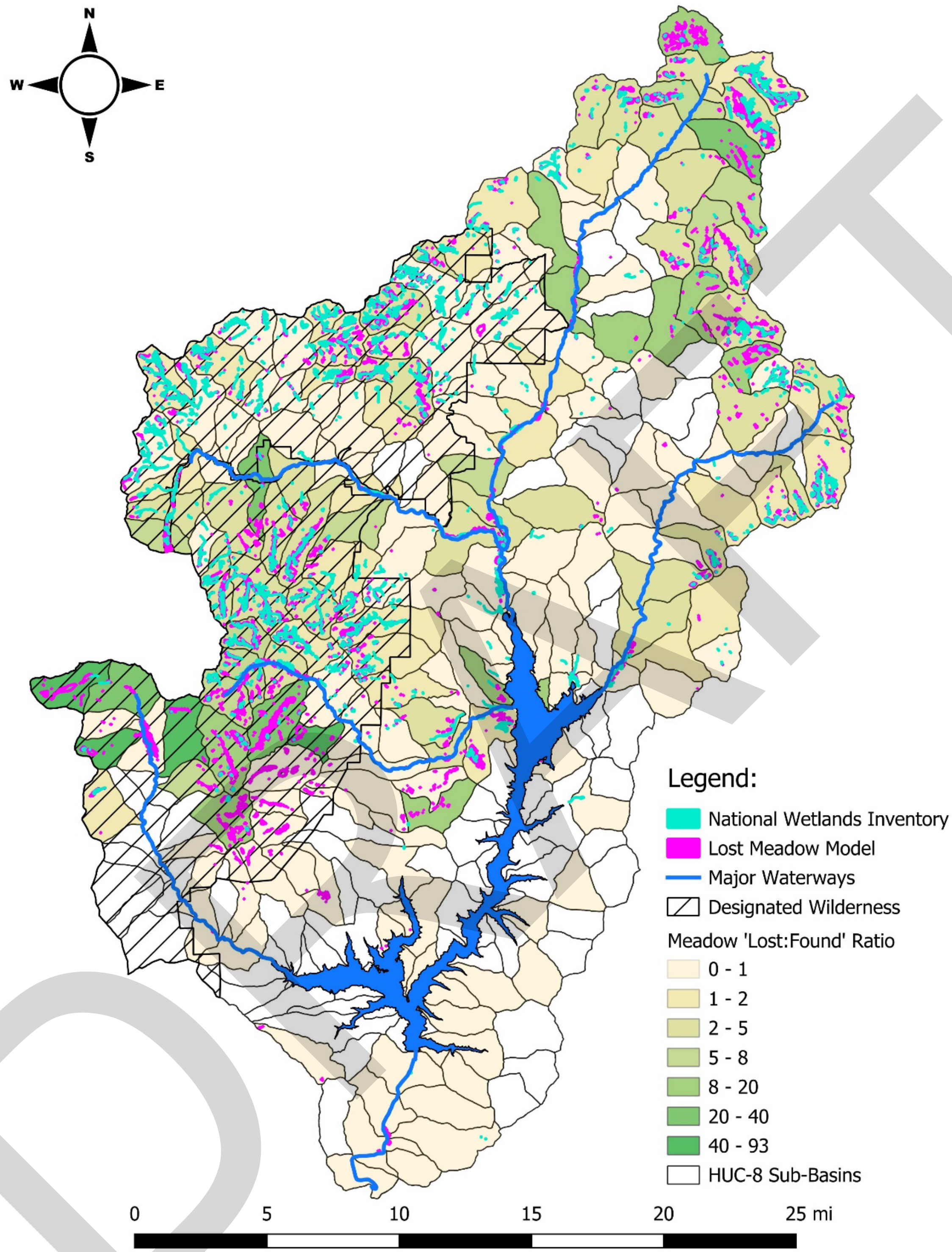

Figure 12. HUC-8 sub-basins within the Upper Trinity Watershed assessment area, with NWI wetland features (excluding lakes and riparian wetlands), LMM-predicted meadow polygons, major waterways, and the Trinity Alps Wilderness Area displayed. HUC-8 sub-basins are color-coded by the ratio of LMM polygon acreage ('Lost' meadows) to mapped NWI meadow polygon acreage ('Found' meadows), with higher 'Lost:Found' ratios in darker greens indicating higher meadow restoration potential. Blank HUC-8 polygons have no ratio due to a lack of LMM acres, NWI acres, or both.

metric to prioritize watersheds for meadow restoration and enhancement work, and does not take into account the specifics of why the LMM projections differ from NWI-mapped meadows (Fig. 13). Sub-basins with very high ratios can also have relatively low absolute areas of both NWI and LMM meadows, which may make restoration work less useful on the scale of the entire assessment area. The LMM is also prone to predicting meadows in areas where unsuitable substrate prevents meadow formation. Lost:Found ratios for sub-basins may therefore be considerably lower in sub-basins where talus and bedrock features are common.

Beyond sub-basin scale restoration potential, meadow restoration work can be further prioritized, both spatially and qualitatively, by assessing funder and land manager goals, as well as funding availability and any restrictions on the type of work performed. Projects where the goal is primarily to restore meadow hydrology and attenuate flows will likely select different restoration sites than those with the main goal of securing habitat for a seasonally-dry meadow specialist grass species. If funding is limited and the sub-basin is primarily designated Wilderness, a large-scale thinning project is likely not viable, but using process-based techniques to repair an incised stream reach could be. Fortunately, many potential meadow restoration projects can provide multiple important benefits that can satisfy different funder and manager objectives. For example, in-channel work to reconnect a floodplain meadow can restore habitat for wetland species and also increase baseflow and decrease temperatures for downstream fisheries. Thinning projects that remove encroaching conifers across a former meadow area can also provide landscape-level firebreaks. WRTC and its partners with the Klamath Meadows Partnership may develop specific prioritization metrics to narrow down potential restoration sites based on particular restoration goals such as habitat enhancement, flow enhancement, firebreak creation, etc.

Consultation with local Native America Tribes should also be pursued early in the prioritization and design process to include Tribal priorities for where to implement projects, and if there are culturally-important species that can benefit from restoration. Project planners can also benefit from traditional ecological knowledge that Tribes may be willing to share (Uprety et. al., 2012), since local histories offer valuable insights into the former conditions of potential restoration sites and can therefore inform realistic restoration goals. Tribes can also build local support for projects, and provide valuable assistance with compliance and permitting, implementation, and long-term management of the area.

Overall, it appears that there is significantly more area with conditions suitable for meadows in the Upper Trinity Basin than area of currently existing meadows. This suggests that conifer thinning, road upgrades, instream work to repair incisions, and other techniques can be used successfully to expand existing meadows and restore former meadows in the assessment area. Meadows provide not only valuable habitat benefits for many native species, but also have an outsized importance in regulating hydrologic processes that can improve aquatic conditions and water provision for downstream fisheries and water users. GIS-based models that estimate potential meadow areas can be used to locate and prioritize restoration sites; however, on-the-ground follow-up and coordination with stakeholders is essential for ultimate project success.

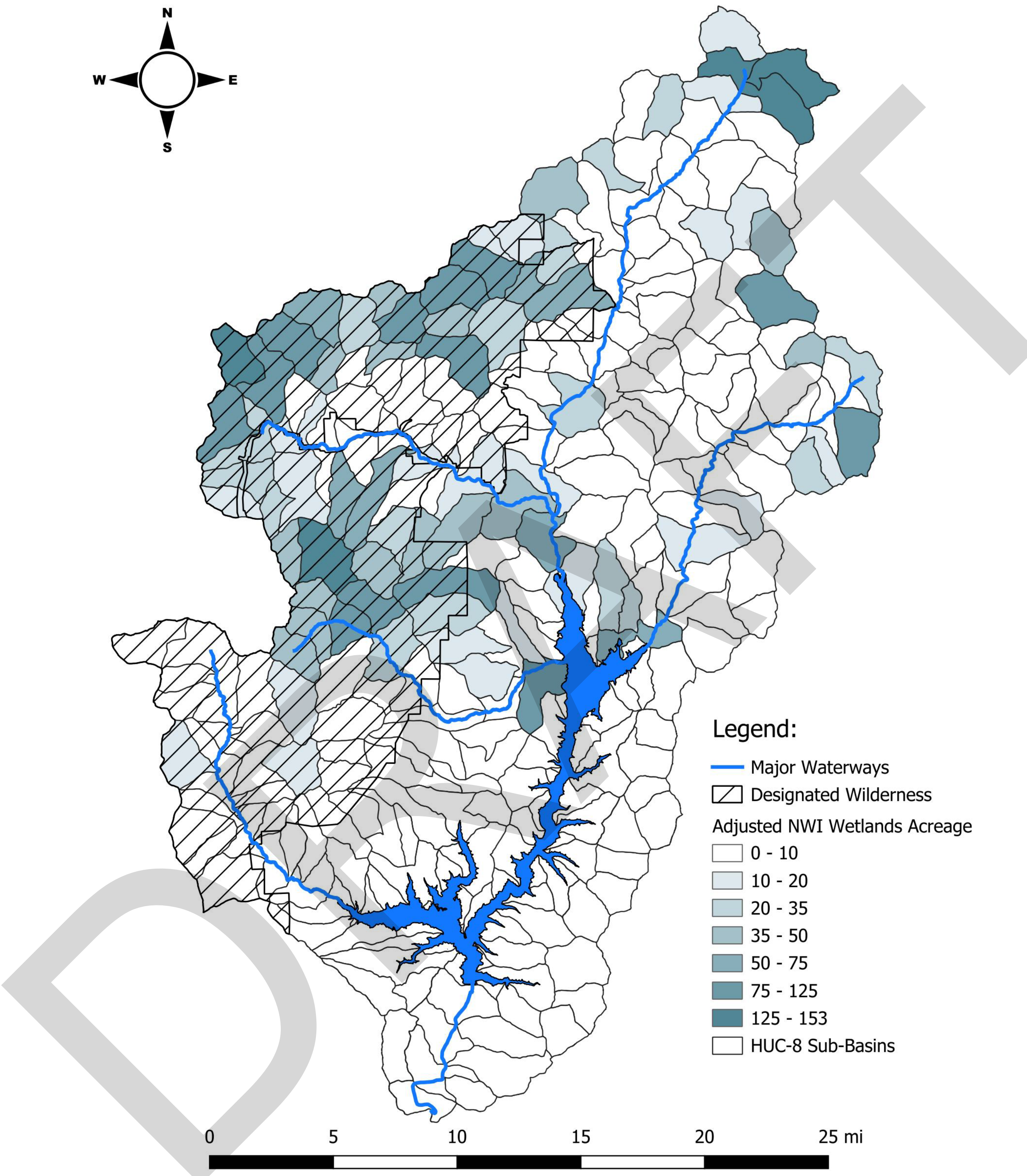

Figure 13. HUC-8 sub-basins within the Upper Trinity Watershed assessment area with major waterways and the Trinity Alps Wilderness Area displayed. HUC-8 sub-basins are color-coded by the total acreage of NWI features, excluding lakes and riparian wetlands, with darker shaded sub-basins containing higher mapped acreages of wetland; note that wetland acreage is not standardized against sub-basin acreage.

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Appendix A: Mumbo Basin Restoration Plan 30%

<u>Site Description</u>

Mumbo Basin is an upper headwater basin in the Trinity River Watershed, contributing flow to Mumbo Creek and ultimately the East Fork of the Trinity River. The overall basin is approximately 1900 acres, which can be roughly divided between a relatively flat lower basin with areas of meadow and conifer forest to the East, a series of upper basins to the South and West (including Mumbo Lakes and some smaller meadows areas), and a large, mostly forested slope to the North. The elevation of the lower basin is approximately 5700’, with the elevation of almost all meadow areas between 5570’ and 6130’. Mumbo Creek at the basin’s eastern edge drains to 5400’, while the peaks on the basin rim are above 7100’. Average annual precipitation for Mumbo Basin is approximately 68”, and USGS StreamStats shows 2-year flood flows as 343 $feet^3$/s, with 10-year flood flows at 804 feet3/s.

Mumbo Basin retains a substantial area (~173 acres) of meadow habitat, scattered throughout the basin in pockets of varying sizes, mostly associated with riparian zones. Meadows also vary in terms of wetness, but most meadow areas appear relatively wet and support wetland vegetation. Most existing wet meadows are graminoid-dominated with abundant forbs and some low shrubs, although lodgepole pine has encroached heavily in many areas. Immediately adjacent to the open meadows are areas of low shrubby understory with *Vaccinium*, *Ceanothus*, and other species with a denser overstory of lodgepole pine. Lodgepole pine that have fallen (or were felled in some cases) into the meadow systems appear to arrest incision and provide an important source of grade stabilization and aquatic structure. The slopes of the basin are mixed conifer forest with areas of manzanita/ceanothus thickets, as well as some sparsely vegetated talus slopes. The entire basin appears to be underlain by large cobbles and boulders, likely glacial outwash, which is covered by several inches to a foot of dark, fine-grained soil in most areas. There may be patches with deeper soil, but this would be the exception rather than the rule. Vegetation differences clearly delineate raised areas adjacent to meadows, even when the absolute elevation difference is very minor.

Mumbo Basin receives water from upper basins and side slopes, as channelized, sheet, and subsurface flows. A large slope to the north of the main basin in particular appears to contribute a substantial amount of water to the basin, mostly as flow passing through porous talus fields. Snowmelt and rain in the upper basins to the east and south are predominantly captured by smaller meadows and Mumbo Lakes before draining into the lower basin, although these flows are probably much more channelized than they were prior to the construction of roads through the basin and the dam at the outlet of Lower Mumbo Lake. A prominent feature in lower Mumbo Basin is a low ridge that separates the main fork of Mumbo Creek coming out of Mumbo Lake from a more southerly channel. These channels at one point pass within <75’ of each other, but are prevented from joining by an almost imperceptible rocky rise, which flares out downstream to around 650’ across. In general, the channel on the north side of the rocky rise is more defined, while the southerly channel is braided. The channels join just upstream of USFS Road 39N29, before passing under a culvert. The channel downstream of that is heavily incised and does not feature large meadow areas, except immediately adjacent to the stream. In general, there do not appear to be large highly-sloped meadows on the periphery of Mumbo Basin, which contrasts somewhat with the Bear Creek and Deadfall basins further north.

Issues Identified

Overall, Mumbo Basin meadows are in fair condition, with major incision starting only just above the culvert on USFS Road 39N29, and native vegetation still largely intact. However, there is substantial conifer encroachment throughout the basin, as well as nascent incision in the larger meadow areas. There are also major problems with road erosion and plugged culverts on USFS road 39N26 which runs parallel to Mumbo Creek to the North. When flows from the northern slope hit the 39N26 road, the upslope ditch is rapidly filled, overflows onto the road and leads to major scour issues on the road itself, which was formerly paved, and also contributes to the formation of flow channels below the road. These channelized flows are eventually leading to erosion in the meadows themselves downslope, although the shallow cobble and boulder substrate appears to prevent any substantial downcutting in most areas. However, scoured areas of rocky fields with thin sediment do not support the same degree of wet meadow vegetation as those with remaining sediment, even if they do not feature deeply inset channels. There are also closed roads in and adjacent to meadow areas that were never fully decommissioned and recontoured, as well as berms associated with those roads, both of which channel flow along them and lead to incision. Additionally, there is disturbance from user roads and OHV use in and around meadows areas.

Restoration Potential

Road Work and Culvert Replacement – Likely the largest restoration opportunity for Mumbo Basin is to majorly revamp the 39N26 road running parallel to Mumbo Creek, by enlarging culverts and adding large dips or other non-channelized flow passage structures. This would be a major undertaking, but the 39N26 road is also being 'decommissioned' by nature rather rapidly! Approximately 20,100 feet of non-system or closed roads in and around the meadows could also be officially decommissioned and regraded as well (Fig. 1), although the erosion problems associated with them appear less problematic. Overall, this road work would drastically reduce channelized flow entering the meadow system, both limiting downcutting in the existing meadows and potentially restoring meadow vegetation in areas currently starved of water. There are likely additional discrete restoration opportunities (culvert replacements, etc.) related to other road crossings in the upper basin, especially under the 39N81 and 39N26 roads. Finally, an undersized, vertically-oriented culvert where Mumbo Creek passes under USFS Road 39N29 below the main meadow area should be removed and replaced with either a ford or a larger and horizontally-oriented culvert. This would alleviate stream energy in this reach, which appears to be causing major incision.

Process-Based Restoration and In-Meadow Tree Removal – A second restoration pathway is to remove conifers (almost all lodgepole pine) from the interior and periphery of the existing meadows (~173 acres) and use these to add large woody debris to incised channel sections and the meadows generally. This added structure could be in the form of Beaver Dam Analogs (BDAs), or simply tree boles contour-felled across scoured channels with slash piled underneath. These treatments would slow flows, arrest both encroachment and downcutting, and improve meadow health and the provision of water downstream during the summer. Thinning by hand and/or with long-reach feller-bunchers should be prioritized, given the fragile nature of the meadows.

Landscape-Scale Thinning - In addition to targeted thinning in and around meadows, there is also the potential for larger scale fuels reduction in Mumbo Basin. This could entail either connecting open meadows with explicit fuel brakes, or thinning larger forested areas to reduce basal area and canopy closure. This would both aid any future fire suppression efforts in the basin, and also likely increase water supply to meadows within the basin due to reduced canopy interception and evapotranspiration. Fuel brakes outside of existing meadow areas should be focused on areas predicted to be suitable meadow habitat (using the Lost Meadow Model or similar), which could regenerate meadow habitat in the basin. Lost Meadow Model predicts approximately 238 acres of meadow habitat within the basin, which is >35% more than is mapped currently, including some severely encroached/degraded meadows.

Other Restoration Pathways – There may be some opportunities for ‘stage-zero’ type fill work in the basin, to repair historical channelization that has led to channel incision, excessive drainage, and the loss of meadow areas. The first step in such work would be to determine which incised sections are natural cuts through glacial debris, and which are relics of mining and other activities. It appears that the most likely candidate areas are above (~450’) and below (~1600’) the 39N29 road culvert, as well as between the 40N26 and 39N81 roads after Mumbo Creek flows out of lower Mumbo Lake. While costly and generating substantial disturbance, stage zero projects in these areas could repair incision, raise local water tables, and increase wet meadow habitat and summer baseflows.

Other potential projects could involve decommissioning or rerouting system roads (e.g. 39N26, 39N81, 29N29A), which presents both regulatory and logistical difficulties but could have major long-term benefits for meadow habitats. There are strong opportunities for beaver reintroduction (Beaver Restoration Assessment Tool shows favorable habitat and high dam building capacity) or restoration plantings as well. Prescribed fire could also be used to further reduce fuel loads, increase streamflow, and regenerate vegetation following thinning efforts, but burning would require substantial study and planning to successfully implement.

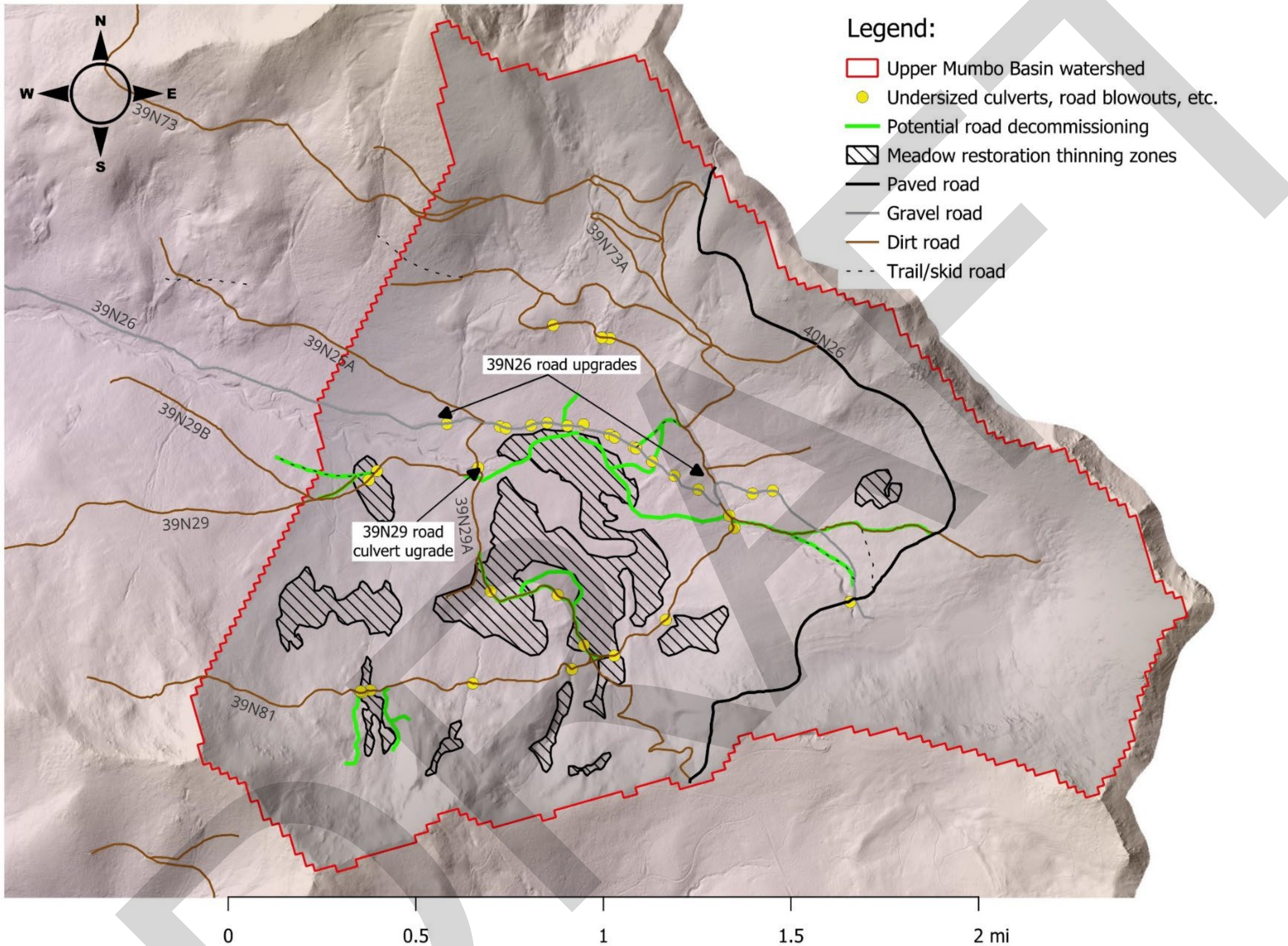

Figure A1. Restoration opportunities in upper Mumbo Basin, focusing on meadow health and extent. Upper Mumbo Basin was defined using the USGS StreamStats tool (https://streamstats.usgs.gov/ss/) to delineate the area draining to a point on Mumbo Creek, which was selected intentionally to encompass the primary meadow restoration areas identified for the overall Mumbo Creek Watershed.

Appendix B: Upper Bear Creek Basin Restoration Plan 30%

Site Description

Bear Creek Basin is an upper headwater basin in the Trinity River Watershed, contributing flow to Bear Creek and ultimately to the upper mainstem Trinity River. The primary upper basin (the area draining into the main culvert under the 40N45 road) is approximately 1344 acres, ranging from 6290' at the road crossing, to just over 8000' along the basin rim. Average annual precipitation is 44.9", falling mostly as snow in the winter and early spring. Immediately below the primary culvert under the 40N45 road, USGS StreamStats shows 2-year flood flows as 150 feet^3/s, with 10-year flood flows at 402 feet^3/s.

Upper Bear Creek Basin contains at least 96 acres of meadow features, including classic wet meadows in former lake basins, spring-fed sloped meadows, and seasonally dry meadows. Outside of the meadows are large areas of montane chaparral (primarily huckleberry oak and manzanita, some true huckleberries, ceanothus, etc.), extensive pine/fir forest, riparian alder thickets, sparsely-vegetated talus fields, and at least one aspen grove. Many of the meadow areas are heavily encroached by lodgepole pine, while others are relatively open. Wet meadow plant diversity is very high, with many sedges and other graminoid species. Common herbaceous species evident at the time of this survey are listed below (in no particular order, nor verified for taxonomic accuracy:

Triantha occidentalis
Caltha leptosepala
Hastingsia alba
Hosackia pinnata
Sidalcea oregana
Allium validum
Darlingtonia californica
Helenium bigelovii
Trifolium longipes
Veratrum californicum
Senecio triangularis
Sisyrinchium bellum/S. elmeri
Dasiphora fruticose
Lilium pardalinum
Narthecium californicum
Viola adunca
Bistorta bistortoides
Calochortus nudus
Aconitum columbianum

The entire basin appears to have a subsurface layer of large cobbles and boulders, which is overlain by several inches of soil in most areas. This resistant substrate appears to prevent any substantial downcutting in any of Bear Creek's channels, even through quite steep reaches. Many wet meadow areas also appear to be fed from subsurface flow coming off of the basin slopes, rather than relying on water from the creek. Slightly raised surfaces are often dryer, but in generally wet areas there are also raised spring mounds that are totally saturated and support lush wetland vegetation. In general, flows emerge and disappear with some regularity throughout the entire basin, with numerous springs supporting large meadows before going subsurface. The slopes on the north/east side of the basin have several wet seep areas, with extremely wet vegetation leading into the main basin, but bisected by a timber harvesting road.

One exception to these general trends is that there are at least two relatively short reaches where the creek has cut down several feet compared to the surrounding landscape. But, this does not appear to be a recent or problematic event – side slopes are shallow, banks are intact, and there are large trees rooted quite close to the current water surface, without evidence of root scour. Another exception is that are also some larger wet meadow features (probably old pond basins) which may have deeper sediment layers. But the flat surfaces also prevent substantial incision and erosion in those cases.

Fish are present quite high into the basin, suggesting very reliable water supply (especially since the survey was after three years of drought). Unclear whether these are native or transplants. There were also plenty of frogs, and numerous insects and birds.

Issues Identified:

Upper Bear Creek Basin is almost entirely intact, with no roads crossing the main drainage above the 40N45 road, no evidence of recent grazing, and abundant and diverse native habitat, including wet meadow features. Model projections show larger areas of meadow than currently exist, but these projections appear to have major issues incorporating subsurface geology and other idiosyncrasies of the basin, so most of the additional modeled meadow area is probably not suitable for restoration. Overall, a large percentage of meadows are heavily encroached by lodgepole pine, which impacts but does not appear to preclude herbaceous and graminoid wet meadow vegetation in the understory. Other tree species (incense cedar and red and white firs) occasionally encroach on meadow areas, but are restricted to scattered patches, while lodgepole pine covers large swaths of what would otherwise be open meadows in the basin. Lodgepole pine trunk diameters average 6"-12", suggesting that encroachment is not a recent phenomenon.

The 40N45A road runs along the northeast side of the Bear Creek drainage, approximately halfway between the 40N45 road and the basin rim. This road does not confine Bear Creek itself, but it does channel substantial flows coming off the northeast basin slope and bisects several sloped meadows. The sections of these meadows below the road appear drier in most areas and with a more prominent channel, compared to the same meadow above the road. Most of the meadows bisected by the 40N45A road quickly turn into alder thickets below the road – it is unclear if these areas would have been more open prior to the road being constructed and flows channelized.

Restoration Potential

Conifer Removal – The easiest and most essential restoration opportunity in Upper Bear Creek Basin is conifer removal, particularly of lodgepole pine in and around wet meadow areas. This could potentially include up to 100 acres of thinning or more, given the extensive areas covered by lodgepole pine. Some cut logs could be placed in stream channels or across slopes with evident scour marks from high flow events, to slow and spread flows and capture sediment. But, true BDAs are neither necessary (due to lack of incision) nor practical (since the substrate will be very difficult to drive posts into and the area is not suitable beaver habitat). Any logging in wet meadow areas should be done with hand crews and at the driest time of the year, preferably in a dry year, to avoid damaging the soils and vegetation.

Road Work – The second restoration opportunity is decommissioning the 40N45A logging road along the north and east slope of the basin. While the road itself is in reasonable condition, it does pass through several spring-fed wet meadow slopes, with the typical uphill ditch configuration condensing flows and limiting wet meadow habitat below the road. The road serves no purpose beyond access for timber harvest, and terminates soon after crossing the wetted slopes. This was formerly commercial timberland, but appears to be USFS currently. Decommissioning (including culvert removal and full recontouring) the road could improve meadow health and expand meadow areas below the road.

Other Restoration Pathways – Lower Bear Creek Basin below the culverted crossing on the 40N45 road were not assessed on this survey, but it is likely in worse condition, and could potentially benefit from more intensive restoration techniques, including BDAs and/or heavy equipment work. Removing or rerouting the 40N45 road is not practical at this time, but additional and/or larger culverts could be installed to limit condensing of flows. Prescribed fire applied to forested slopes throughout the basin could also be used to limit future conifer encroachment and catastrophic fire risk, and to potentially increase water availability in the meadow areas.

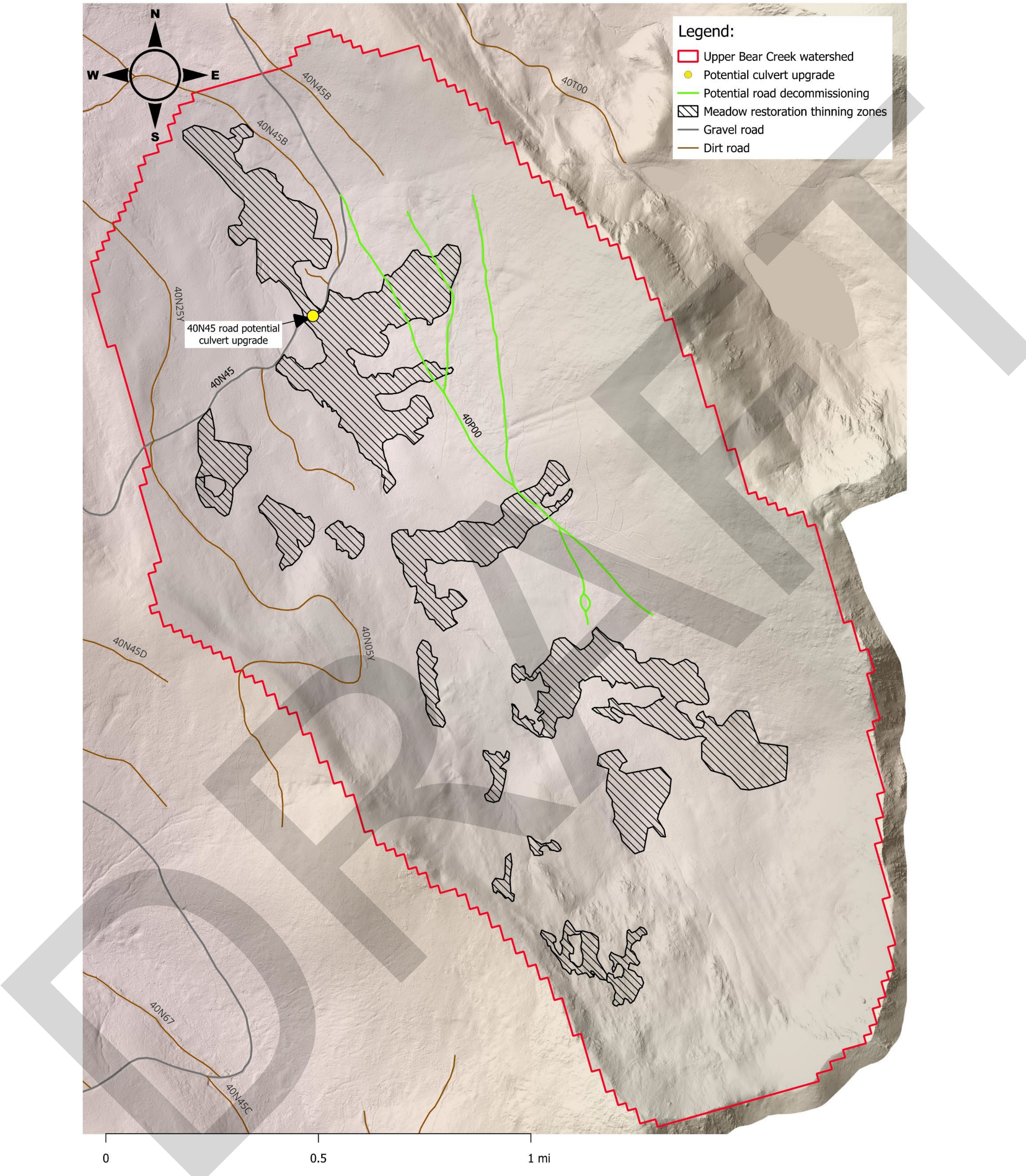

Figure B1. Restoration opportunities in Upper Bear Creek Basin, focusing on meadow health and extent. Upper Bear Creek Basin was defined using the USGS StreamStats tool (https://streamstats.usgs.gov/ss/) to delineate the area draining to a point on Bear Creek, which was selected intentionally to encompass the primary meadow restoration areas identified for the overall Bear Creek Watershed.

UPPER TRINITY WATERSHED

RESTORATION ASSESSMENT

&

MANAGEMENT PLAN

Chapter 3

Forest Fuels Management

Prepared By:
The Watershed Research and Training Center
April, 2024

Grant Funding Provided By:
The Bureau of Reclamation

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Chapter 3
Forest Fuels Management

Background and Preliminary Assessment: Forests in the assessment area, particularly in the Trinity Alps Wilderness, have become densely overstocked at the lower elevations. Wildfire exclusion is often the biggest factor, but a combination of heavy past timber harvest and a near stop in current timber harvest has exacerbated fire suppression and led to a suite of forest structure problems (McCann et al 2020). Overstocked forests with dense, small-diameter trees are widely prevalent, and species diversity is poor in many areas. Monocultures of Douglas-fir or other conifers can become totally dominant, leading to the loss of oak woodlands and other valuable habitats. These dense forests also have extremely high evapotranspiration rates that deplete local water tables (Roche et al 2020). When overstocked forests burn fire severity is often extreme, creating sterile hydrophobic soils that can contribute large sediment loads to downslope waterways (Moody and Martin 2004).

Historically, fire occurred frequently in this highly forested county, both due to natural starts and as part of ubiquitous cultural burning practices employed by indigenous peoples (Appendix A). These wildfires were typically low-severity and increased diversity in multistory forests as it burned through underbrush and preserved larger trees (Donovan and Brown, 2005). Burns also facilitated the seed germination of specific species that require heat, such as knobcone pine. However, starting in the 1900's forest management practices heavily stressed fire suppression and protection of future timber resources, which has had several negative impacts on the forest ecosystem and downslope water resources (Appendix B). These include the accumulation of fuels causing high-severity fires, the disruption of the natural composition of the vegetation, and the increased susceptibility of trees to drought, disease, and pest infestation (Donovan and Brown, 2005). The Trinity County Resource Conservation District and The Watershed Research and Training Center have developed a Community Wildfire Protection Plan to assist in reducing the risk of high-severity fire in Trinity County (2005). However, implementing forest thinning treatments at scale in an efficient, cost-effective manner is an ongoing challenge.

<u>Vibrant Planet Land Tender</u> – Vibrant Planet, founded in 2020 as a public benefit corporation, has developed the Land Tender land management scenario modeling tool to spatially assess tradeoffs on the landscape under mixed priorities from various objectives and stakeholders. If one group prefers carbon protection, while another has water enhancement as a core objective, the model is capable of seeing where these two priorities overlap on the landscape and builds a preliminary assessment on the cost to operate and benefits from mitigated risk to disturbance through proactive restoration. The goal of Land Tender is to streamline and shorten the planning process for forest restoration treatments – from initial conversation through to environmental analysis comment, review periods, and beyond – through the determination of potential projects' relative impact metrics, or Restorative Return on Investment (RROI). "RROI is the impact of the treatment on things of value for a given location, given the landscape's current condition" and can be positive or negative (if a project is damaging) (Vibrant Planet 2024) In Land Tender, those 'things of value' are termed Strategic Areas, Resources, and Assets (SARAs), which are "specific measurable resources that are spatially explicit" such as houses, roads, or other infrastructure, resources such as timber stands, or natural features such as priority habitat for a listed species.

Land Tender employs a risk- and opportunity-based framework to quantify planned and unplanned disturbance effects. This framework calculates landscape-scale information about the RROI that may be achieved from implementing vegetation management treatments. This is a relative impact score, consisting of two component metrics that users interact with in Land Tender: Treatment Effects (TE) and Change in Disturbance Effects (DE). In other words, the TE represents the positive or negative impact the treatment itself has on SARAs. DE represents the impact the treatment has when SARAs are exposed to unplanned disturbance events like wildfire. Treatment Effects are not weighted in determining RROI, since the probability of them occurring (if the treatment is implemented) is 100%. The impact of Disturbance Effects in determining RROI is weighted based on the modeled probability of disturbance events occurring.

Land Tender provides a user interface in which a user can toggle the importance of eight landscape objectives for an imported or manually drawn project area polygon. The Objectives are: (1) Assets, (2) Safety, (3) Recreation, (4) Biodiversity, (5) Ecological Commodity, (6) Carbon, (7) Water, and (8) Science and Culture. When running a scenario, the priority level (from 1 to 5) that the user assigns each Objective in Land Tender acts as a specific multiplier on the Objective's RROI scores; Land Tender calculates the summary RROI score for each Land Tender-defined management unit within the Planning Area based on the user's preferred (higher-weighted) Objectives. The overall Planning Area for Land Tender can be up to region-wide, with the option to delineate smaller project sites within a larger project region for more nuanced analyses. These smaller project sites are referred to as Distinct Management Areas (DIMA). Once the priorities are defined and the area defined, the user can set further constraints the project size and/or budget in order to create realistic planning scenarios.

Land Tender Parameterization and Setup: The Land Tender model product was evaluated to determine its suitability for planning and prioritizing thinning and other forest management practices over different project areas and at different funding levels. A key objective was to determine whether the efficiency of potential projects scaled positively with available budget, due to economies of scale, or negatively due to the impact from treatment coming largely from small but key portions of the potential project area. Five potential project areas within the Upper Trinity River Watershed were modeled at different funding levels, according to specific conservation and resource-protection objectives, with outcomes assessed using various success metrics.

Land Tender uses a host of geospatial and relational data about SARAs, disturbances, potential treatment, post-fire conditions, and departure to compute metrics on management impacts. The Watershed Research and Training Center (WRTC) led an effort to collect and provide accurate local data from the US Forest Service (USFS), Trinity County Resource Conservation District (TCRCD), and other land managers within Trinity County. These data were provided to Vibrant Planet to produce a well-parameterized Land Tender product for the Upper Trinity Assessment area (see Appendix C for details).

Once parameterized, the Land Tender model product was used to assess five DIMAs within the Upper Trinity River Basin - the watershed which feeds into Trinity and Lewiston Lakes, starting at the Lewiston dam and extending north to the county boundaries. These DIMAs represent potential project areas under consideration for thinning and other forestry work for safety and forest health, and for various other projects to protect aquatic resources. Due to the inability for Land Tender to output single projects across non-contiguous polygons within a resource area (except for 'checkerboard' landscapes), new polygons were manually-drawn to encompass the general project area in some cases (Fig. 1).

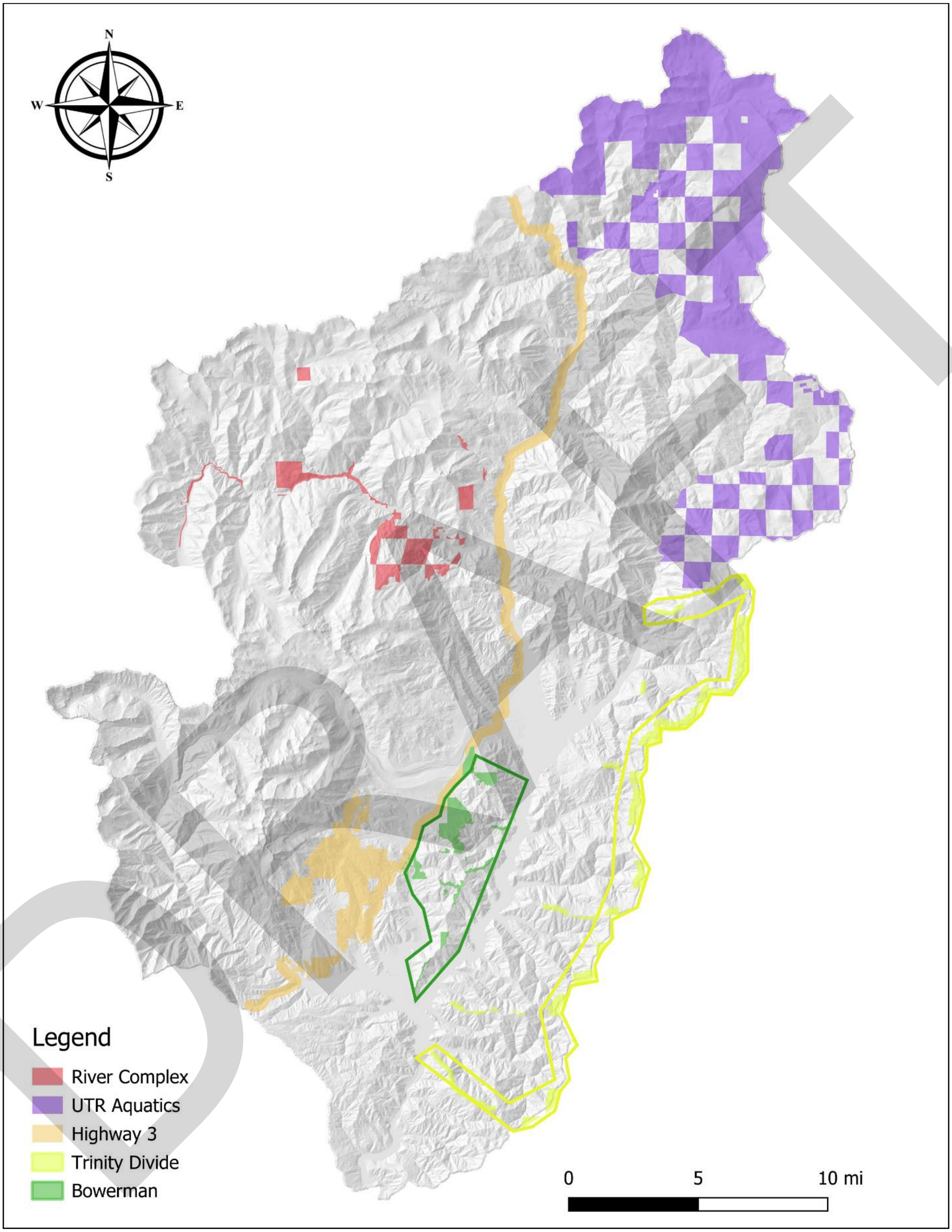

Figure 1. Land Tender DIMAs used in this analysis. Solid lines indicate modified DIMAs to accommodate Land Tender's contiguous feature requirements.

The budget limits used throughout the analysis were:

- Low - $1 million
- Medium - $5 million
- High - $20 million

The Land Tender objective weights were based on likely land manager priorities, with the same values used for all scenarios:

- Assets = 5
- Safety = 5
- Recreation = 0
- Biodiversity = 0
- Ecological Commodity = 0
- Carbon = 0
- Water = 5
- Science & Culture = 0

Additional constraints for all Land Tender scenarios included:

- Maximum project size was set to 500,000 acres.
- Number of projects to output was set to 1.
- All viable mechanical treatments were considered except for the following:
    - Herbicides
    - Herbivory

These analyses produced a variety of output statistics, which are summarized into four categories: (1) Pre-existing conditions, (2) Risk before treatment, (3) Post-treatment benefits, and (4) Restorative return on investment. Metrics of success for each output were evaluated based on the variables below. Since this study is focused on community protection and improving watershed function, some of the metrics were unable to be assessed. Metrics are drawn from the summary statistics calculated for each identified project area prioritized by Land Tender, with the following attributes summarized within each DIMA for the final output:

<u>Pre-existing conditions:</u>

- Treated area (acres)
- Basal area (square feet per acre)
- Quadratic mean diameter (inches)
- Flame length (feet)

<u>Risk before treatment:</u>

- This represents the amount of the land that was exposed to risk per landscape objective. This number was calculated by dividing the current condition values (“[objective]_val0”) by the impact the SARA would have if impacted by a fire before treatment occurred (“[objective]_fr_rsk”). Dividing these two numbers yields a general percentage of each SARA under risk of disturbance.

Post-treatment benefits:

- The acres treated under each type of prescription
- Total cost of operations
- Estimated thousand board feet (MBF) removed
- Product benefit from selling MBF

Restorative return on investment (RROI):

- [objective]_te0 = Normalized Treatment Effects (TE), by Objective. This calculation represents the positive or negative impact the treatment itself has on strategic areas, resources, and assets (SARA). While this can be considered a metric of success, resilience to disturbance may be a more important factor to consider than effects from treatment alone.
- [objective]_de0 = Normalized Change in Disturbance Effects (DE), by Objective. DE represents the impact the treatment has when SARAs are exposed to unplanned disturbance events like wildfire. Positive SARA scores indicate success, with the higher values indicating larger benefits.

Other metrics of success:

- Percent increase in benefit from RROI TE and DE. A percentage increase is a quick way to highlight benefits to the managed landscape going from treatment effects to disturbance.
- RROI per dollar per acre. While RROI is a normalized number based on the investment, there may be value in showing the effectiveness of RROI on a dollar per acre basis.

Additionally, Land Tender identifies a treatment type to fit the objectives defined by the user; see Appendix D for a summary of treatment types identified through during these analyses.

Land Tender Results Evaluation: Running three cost-based iterations of the Land Tender program for all five DIMAs yielded 15 total model outputs, each containing recommended treatment areas and methods, along with various metrics summarizing cost, risk, and benefit. Both existing conditions and model outputs for treatment varied substantially between different DIMAs and cost levels, and do not scale predictably with either DIMA acreage or project cost. However, these results still offer useful information describing some of the characteristics and utilities of Land Tender, as well as some of its apparent quirks.

Table 1 shows pre-existing conditions across all DIMAs with the UTR Aquatics project being the largest project acreage under the medium and high investment scenarios. The River Complex is the largest project acreage under the low investment scenario, but was constrained by DIMA boundaries when expanding to medium and high investment scenarios due to a lack of contiguous area. Under both the $5 million and $20 million caps, Land Tender was only able to allocate $1.5 million within a contiguous DIMA for the River Complex; consequently, this DIMA is excluded from most scenario comparisons in this report. Average flame length across DIMAs varies considerably. The only DIMA with a flame length below 10 feet is for UTR Aquatics. This is not totally unexpected however, as the UTR Aquatics DIMA was selected based on the potential for meadow and aquatic restoration, rather than the need for forest thinning, which was the primary determiner of the other DIMAs.

Table 1: Pre-existing conditions across all DIMAs.

	Low ($1 million)	Medium ($5 million)	High ($20 million)
Highway 3			
Acres treated	299	1,610	5,290
Avg. BA (sqft per acre)	144	133	139
Avg. QMD (in)	19	19	20
Avg. Flame length (ft)	16	11	11
Bowerman			
Acres treated	271	1,126	3,916
Avg. BA (sqft per acre)	101	108	108
Avg. QMD (in)	16	17	17
Avg. Flame length (ft)	13	10	10
Trinity Divide			
Acres treated	251	1,240	4,308
Avg. BA (sqft per acre)	109.6	81	90
Avg. QMD (in)	18.1	15.1	16
Avg. Flame length (ft)	12.39	12	12
UTR Aquatics			
Acres treated	1,050	3,224	10,787
Avg. BA (sqft per acre)	30	31	60
Avg. QMD (in)	7.5	8	12
Avg. Flame length (ft)	5.2	7.4	7.6
River Complex			
Acres treated	1,851	1,925	1,925
Avg. BA (sqft per acre)	65.5	76	76
Avg. QMD (in)	12.4	13.36	13.36
Avg. Flame length (ft)	12.5	11.9	11.9

Treatment costs for each modeled scenario (Table 2) were calculated based on the sum total of all operation costs prescribed within a scenario. Treatment costs surpassed the budget cap applied to each investment scenario but used the projected revenue from sawlogs to keep costs for final project areas within the scenario limit. The most productive location for treatments under medium and high-investment investment scenarios, in terms of product benefit, is part of the Highway 3 DIMA. This DIMA is not coincidentally also the costliest operation across these investment scenarios. The UTR Aquatics DIMA is the inverse, with lower product benefit, but also lower costs.

Table 3 explores the risk to wildfire before treatment occurs within each DIMA. Results indicate that there is uniform risk to Safety, Biodiversity, and Carbon across all DIMAs when exposed to wildfire. Fire is based on a flame length probability score developed by Land Tender. Table 1 records the average flame length per DIMA when exposed to fire without treatment; there is no attribute for flame length post treatment. Percentages represent the total amount of land within Land Tender's priority project that is exposed to risk. Note that for some DIMAs such as Highway 3, as the project size increases due to an increase in budget cap, the percent under risk decreases as the risk is spread across a larger landscape. This is not the case for each DIMA, as illustrated by multiple objectives which appear under risk as the budget cap increases.

Table 2: Treatment costs and benefits across DIMAs and investment scenarios.

	HWY 3	Bowerman	Trinity Divide	UTR Aquatics	River Complex
Low investment - $1 million					
Treatment acres	299	271	251	1,050	1,851
Total Cost	$1,339,622	$1,229,450	$2,468,436	$1,007,180	$1,097,968
Product Benefit	$240,450	$230,450	$558,800	$15,400	$107,800
Est. MBF removed	619	419	1,016	28	196
Medium investment - $5 million					
Treatment acres	1,610	1,126	1,240	3,224	1,925
Total Cost	$6,874,746	$ 5,767,421	$5,706,285	$5,030,634	$1,530,942
Product Benefit	$1,910,700	$ 777,150	$ 721,050	$ 62,150	$199,650
Est. MBF removed	3,474	1,413	1,311	113	363
High investment - $20 million					
Treatment acres	5,290	3,916	4,308	10,787	1,925
Total Cost	$25,597,743	$23,161,326	$22,986,441	$ 21,253,684	$1,530,942
Product Benefit	$5,600,650	$3,184,500	$ 3,009,050	$ 1,305,700	$199,650
Est. MBF removed	10,183	5,790	5,471	2,374	363

Table 4 displays the sum total of Restorative Return on Investment (RROI) for each DIMA across each investment scenario. RROI increases as more money is spent within the DIMA. The greatest RROI score is in the Highway 3 DIMA with the lowest in River Complex. When comparing RROI scores across investment scenarios, the sum of all low-investment projects results in a higher RROI score than any one medium investment, with the exception of Highway 3. This applies to the sum of medium-investments to high-investment projects as well. Similarly, the sum of RROI treatment impacts for all low-investment scenarios is less than all medium-investment scenarios except the Trinity Divide and the River Complex.

Table 5 reviews additional metrics of success for each DIMA that may be useful for decision making, including a calculated score for the RROI divided by the dollar cost per acre of treatment. RROI scores are based on benefits accrued under fire disturbance. Metrics of success are scattered with various trends across investment scenarios per DIMA. The lowest efficiency of RROI per acre is the River Complex while the highest is Highway 3 under the low investment scenario. If the River Complex is ignored due to the DIMA polygon limitation, then we see the lowest RROI per acre score is spending $20 million on the UTR Aquatics DIMA. However, UTR Aquatics is the most efficient spending per RROI and per acre within the high investment scenario.

Table 3: Risk to fire before treatment per DIMA under each investment scenario.

	HWY 3	Bowerman	Trinity Divide	UTR Aquatics	River Complex
Low investment - $1 million					
Assets	--	--	--	--	--
Safety	30%	20%	17%	13%	12%
Recreation	--	--	--	2%	1%
Biodiversity	25%	16%	15%	5%	5%
Ecosystem	--	--	--	--	13%
Carbon	30%	20%	18%	10%	11%
Water	12%	8%	7%	3%	--
Science and Culture	--	--	--	--	--
Medium investment - $5 million					
Assets	2%	4%	--	23%	--
Safety	18%	17%	15%	17%	12%
Recreation	3%	--	1%	3%	1%
Biodiversity	15%	13%	12%	5%	4%
Ecosystem	23%	--	--	--	13%
Carbon	18%	16%	15%	15%	11%
Water	7%	7%	5%	5%	1%
Science and Culture	23%	--	--	--	--
High investment - $20 million					
Assets	2%	6%	--	--	--
Safety	17%	16%	15%	12%	12%
Recreation	3%	--	1%	2%	1%
Biodiversity	14%	13%	12%	1%	4%
Ecosystem	16%	--	19%	18%	13%
Carbon	17%	15%	15%	9%	11%
Water	7%	6%	5%	3%	1%
Science and Culture	23%	5%	--	--	--

Table 4: Restorative Return on Investment from treatment impacts and disturbance from fire across each DIMA and summed across each objective.

	Low $1 million		Medium $5 million		High $20 million	
	Rx only	Disturbed	Rx only	Disturbed	Rx only	Disturbed
HWY 3	(48,307)	688,239	(249,783)	3,140,794	(891,381)	8,361,400
Bowerman	(43,894)	491,362	(159,553)	1,603,138	(603,329)	5,372,782
Trinity Divide	(45,933)	442,707	(144,255)	1,449,570	(506,745)	5,108,869
UTR Aquatics	(99,571)	554,006	(460,334)	1,973,759	(930,701)	3,307,988
River Complex	39,422	89,515	16,740	143,064	16,740	143,064
Total	(198,283)	**2,265,829**	(997,185)	**8,310,325**	(2,915,416)	**22,294,103**

Table 5: Additional metrics of success evaluated for each DIMA.

	HWY 3	Bowerman	Trinity Divide	UTR Aquatics	River Complex
Low investment - $1 million					
$/acre	$ 4,480.34	$ 4,553.52	$ 9,807.06	$ 960.13	$ 636.87
$/RROI	$ 1.95	$ 2.50	$ 5.58	$ 0.55	$ 12.27
RROI/ac	2,302	1,820	1,759	528	52
RROI per $/ac	154	108	45	577	141
Medium investment - $5 million					
$/acre	$ 4,272.68	$ 5,072.49	$ 4,601.62	$ 1,561.34	$ 852.08
$/RROI	$ 2.19	$ 3.60	$ 3.94	$ 0.39	$ 10.70
RROI/ac	1,952	1,410	1,169	613	80
RROI per $/ac	735	316	315	1,264	168
High investment - $20 million					
$/acre	$ 2,513.77	$ 5,929.68	$ 5,334.67	$ 1,970.49	$ 794.89
$/RROI	$ 3.06	$ 4.31	$ 4.50	$ 0.16	$ 10.70
RROI/ac	821	1,376	1,186	307	74
RROI per $/ac	3,326	906	958	1,679	180

Discussion: Land Tender appears to be suitable for assessing landscapes to determine current conditions, fire disturbance risk, and potential treatment areas and methods that maximize benefits to user-specified resources. Once properly parameterized for a given landscape, multiple scenarios can be run quickly and efficiently, and output metrics are concise and useful for project prioritization. Restorative Return on Investment, a key output, is a useful way to summarize both the benefits of a project to current conditions, and the benefits that would be accrued through project implementation given the both the risk of and impacts from fire. Land Tender essentially automates a large number of GIS-based analyses that would otherwise take substantial time and expertise to conduct, allowing relatively non-specialist practitioners to develop and assess multiple scenarios quickly. However, Land Tender does have a number of limitations and caveats that must be considered when using it to plan or prioritize projects across a landscape, which are discussed in detail below.

Care must be taken when delineating polygons for Land Tender to assess, as it does not handle discontinuous project boundaries. This is problematic in the Upper Trinity River Watershed, and for much of the western United States, because of highly heterogenous land ownership patterns where Federal and private lands intermix (Cheever 2005) and ‘island’ parcels are common. Project areas must be contiguous for Land Tender to run optimally, and scenarios comparisons under different funding limits can be constrained by the project boundaries. For example, the River Complex DIMA, which was included as a test case, is composed of multiple discontinuous polygons, which led to Land Tender essentially ‘freezing up’ at a treatment area of 1,925 acres since despite higher funding caps treatment area could not expand to additional polygons.

Land managers will also need to carefully consider how to prioritize projects across multiple project polygons. Depending on the specific metric of success, one project polygon or funding level may look more favorable than the next. Treatment efficiency as measured by RROI per acre (Fig. 2), generally decreases in as funding increases, especially between the $5 million and $20 million scenarios (Table 5). Treatment efficiency as measured by dollar cost per RROI (Fig. 3) correlated positively with funding for the Hwy. 3 and Bowerman projects, negatively with funding for the UTR Aquatics project, and displayed no clear correlation with funding for the Trinity Divide project (Table 5; River Complex is not included in this comparison due to polygon limitations).

Cumulative RROI benefits accrue to higher values over the larger treatment areas generated by higher funding caps. However, RROI does not scale consistently with acreage (Fig. 2) or per acre cost (Fig. 4) between projects, which appears to reflect the varying characteristics of different project areas. In the scenarios tested for this report, $20 million allocated to the Hwy. 3 DIMA generates the most cumulative RROI (Table 4), however, dedicating $20 million to the UTR Aquatics project would treat over twice as many acres (Table 2), even though the RROI for that project is substantially lower.

Overall, results show that $5 million dollars spent on five $1 million projects across the landscape generate a higher RROI score than any single $5 million project within a DIMA, with the exception of the Hwy. 3 project. The same result is also true of completing four $5 million projects (excluding the River Complex) instead of completing one $20 million project. One major caveat is that it is unclear whether Land Tender is incorporating costs associated with planning and permitting projects into its assessment, since these additional expenses would increase fairly linearly with multiple projects and may favor larger single projects even though the RROI generated per dollar of implementation cost is lower. However, a primary benefit of Land Tender is that scenarios can be run quickly and cheaply to determine the relative benefits of various projects, so planners are not reliant on general patterns and can specifically model all projects or combinations of projects under consideration to determine their relative impact and cost-effectiveness. Land Tender results can also be further developed and refined for project prioritization, for example by adding in planning and permitting costs.

Land Tender is capable of calculating a RROI score within a DIMA based on weighted objectives as defined by the user. While the management units (delineated by Land Tender) are ranked across the entire area that the model has been parameterized for, it is not clear if Land Tender is capable of assessing the accrued benefits to lands or SARAs outside the extent of the analyzed DIMA. For example, when analyzing the UTR Aquatics DIMA, Land Tender calculates a RROI score of 3.3 million when investing $20 million (Table 4; Fig. 5). However, the RROI is the cumulative score for each management unit exposed under fire risk within the DIMA, so it does not reflect benefits accrued from project treatments to Trinity Lake, which is located outside of the DIMA. RROI could imply accrued benefits to lands or SARA outside of the DIMA if there was a process by which flow accumulation models were incorporated into how each management unit was ranked within the parameterized area, but more information is needed to determine if that is an option, or even possible, within Land Tender. Land Tender’s initial application for planning thinning treatments and other work in the North Yuba Watershed may be an instructive case study, but a full review of that project was outside the scope of this report.

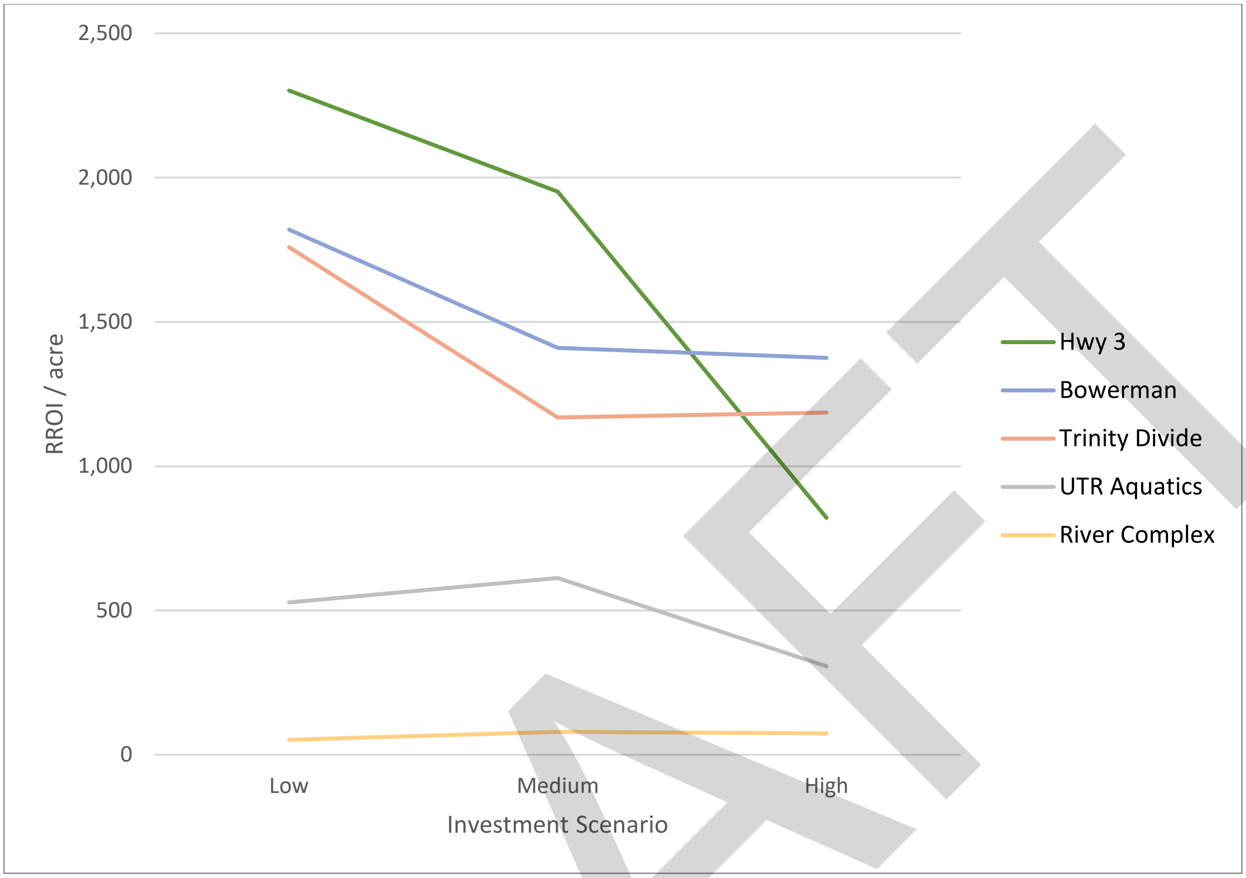

Figure 2. Restorative Return on Investment per acre across DIMAs.

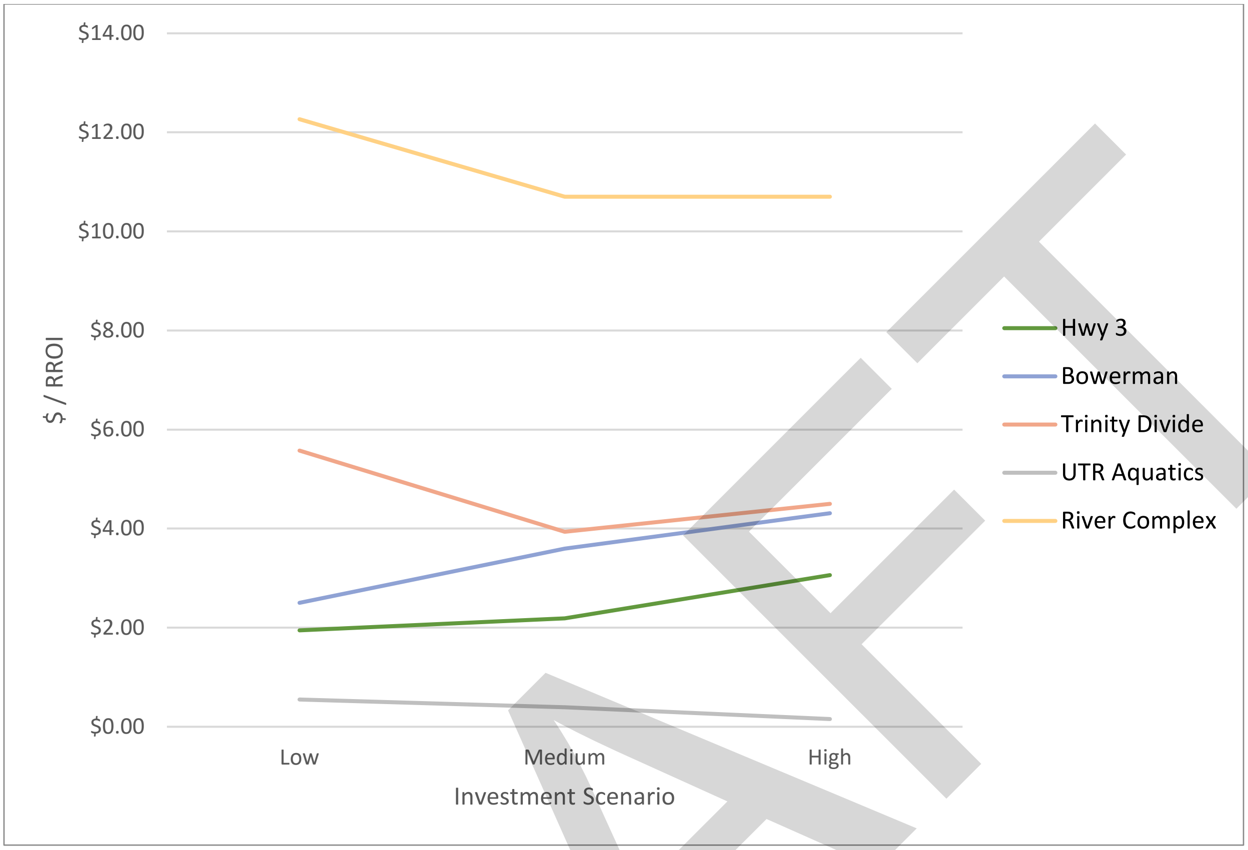

Figure 3. Dollars per unit of Restorative Return on Investment across DIMAs.

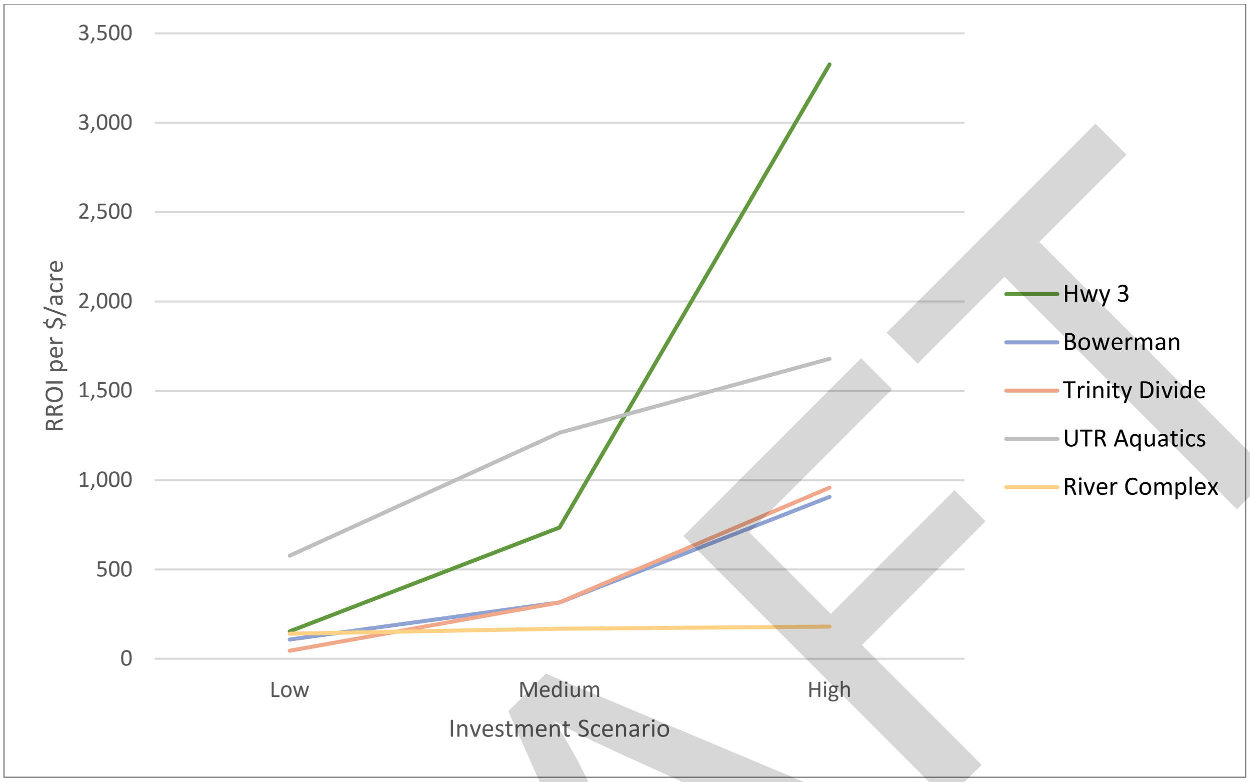

Figure 4. Restorative Return on Investment per acre for each DIMA under low, medium, and high treatment cost scenarios.

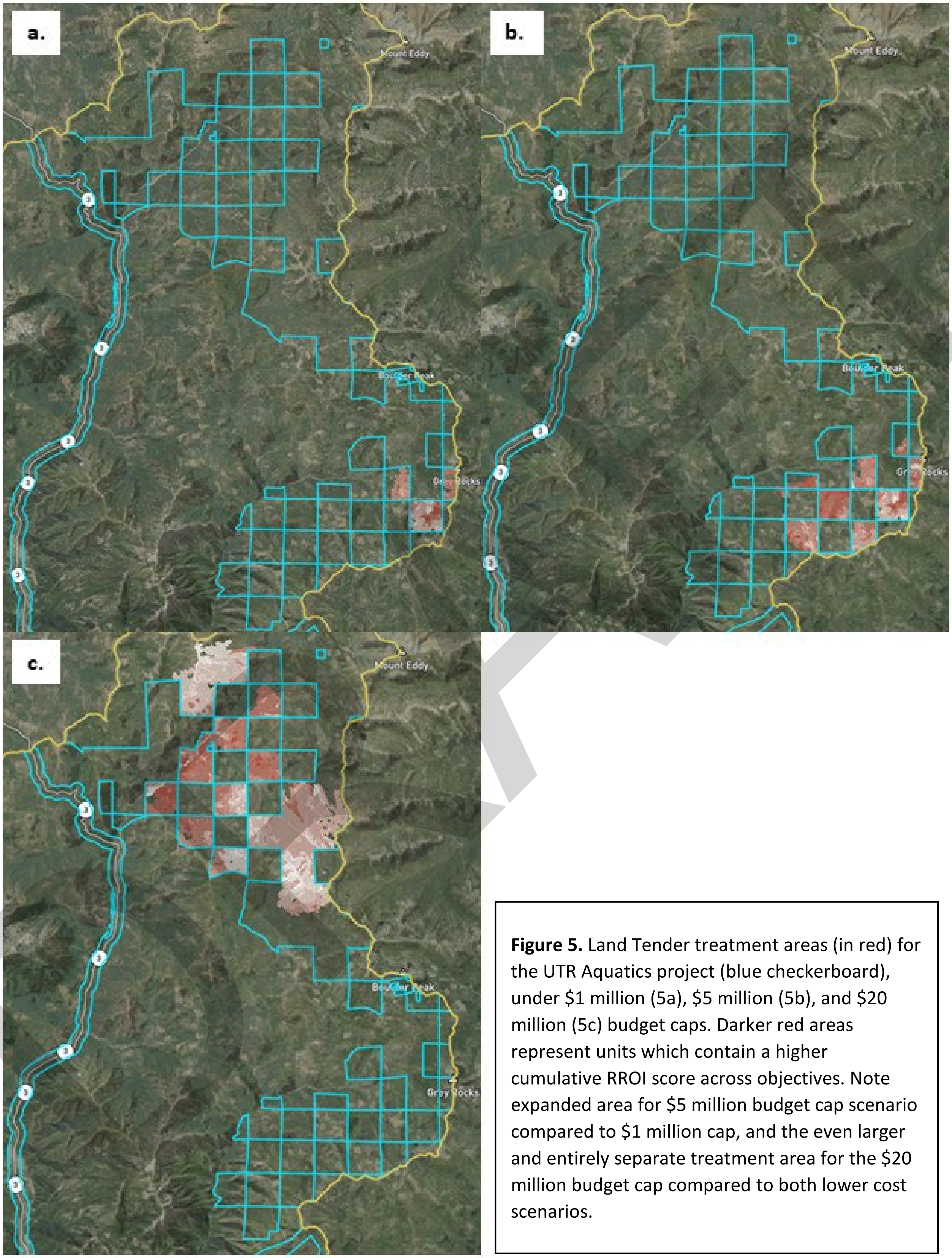

Figure 5. Land Tender treatment areas (in red) for the UTR Aquatics project (blue checkerboard), under $1 million (5a), $5 million (5b), and $20 million (5c) budget caps. Darker red areas represent units which contain a higher cumulative RROI score across objectives. Note expanded area for $5 million budget cap scenario compared to $1 million cap, and the even larger and entirely separate treatment area for the $20 million budget cap compared to both lower cost scenarios.

Overall, Land Tender offers a user-friendly rapid planning and assessment tool, generating a suite of metrics to help land managers prioritize treatment areas within defined spatial and funding constraints. However, given the extensive variety of both input parameters and output metrics, model results may not be completely accurate, care must be taken to avoid or accommodate a number of limitations and caveats. Care must also be taken during the initial parameterization process so that Land Tender can account for specific regional priorities, such as cultural fire practices to benefit beargrass (Xerophylum tenax) or other culturally-important species (see Appendix A). Planners should not rely exclusively Land Tender results to define project boundaries and treatments, but rather incorporate this product as part of a wholistic forest management planning process that incorporates both on-the-ground knowledge and other means of analyzing spatial data.

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Appendix A: Prescribed and Cultural Fire Supplement

Many forests in California are at high risk of catastrophic wildfire and would benefit from ongoing fuel reduction treatment (Valiant et al 2009). Tribes such as the Karuk have managed forested land for generations through cultural burning practices (Marks-Block and Tripp 2021). The Karuk Tribe historically shaped the natural landscape through the reinforcement of the growth of plants well-adapted to low-severity fire. Through this management technique, the burn season lengthens and the interval of fire return shortens, which mirrors the natural forest succession and restores the naturally fire-adapted landscape (Karuk Tribe, 2019).

Fire proves to be essential in shaping riverine habitats (Verkaik et al 2013), and enhancing stream habitat complexity at the landscape-scale for several avian, amphibian, fish, and reptile populations (Hankins 2009). Also, the resulting smoke from fire can cool the temperature of river and streams thus improving fish spawning conditions and water storage. Historical fire regimes allowed for larger trees to remain while killing the undergrowth, which contributed to ladder fuels.

Specifically, the Karuk Tribe has developed the Karuk Climate Adaptation Plan, with one intention being the utilization of cultural indicators to determine when, where, and how to burn specific habitat and apply specific strategies to return to the landscape's historic cultural fire regimes (Karuk Tribe, 2019). Using recent fire footprints and ceremonial ignition points, they plan to identify specific sites for prescribed cultural burning practices, prioritizing cultural and ecological factors. For example, the Karuk Tribe utilizes fire around the full moon in August at the same time the salmon return to the river. The summer fire kills the smaller vegetation that uses surface water to grow which decreases the larger trees' competition for water (Merenlender and Buhler, 2021). These larger trees contribute to decreased water evaporation and higher levels in the streams due to the shade they provide to the streams. Thinning can assist in increasing streamflow in drier years when plants are using at least 80 percent of the precipitation received (Merenlender and Buhler, 2021). However, there are major barriers to cultural burning recognition due to limited tribal land management rights and a lack of acknowledgement of their skills and sovereignty (Norgaard 2014).

The lack of agencies' knowledge about cultural burning creates an additional barrier to the implementation of these effective fire-mitigation processes. Engaging in training and collaborating with local tribes can address this gap in knowledge. One educational program gaining momentum is TREX, a prescribed fire TRaining EXchange providing a one- to two-week experience for attendees. The Karuk Tribe will utilize these exchanges to provide instruction on prescribed cultural burning practices or create partnerships with others while sharing their fire mitigation knowledge with other communities (Karuk Tribe, 2019). Moving forward, land managers in the Upper Trinity River Watershed can benefit from learning from the local tribes and applying cultural burning techniques.

In addition to tribes, prescribed burn associations (PBAs) have begun to utilize fire as a technique to bring together a community while improving forest health. The UC Cooperative Extension county advisors in Humboldt County were the first to start a PBA and coordinate volunteers in burning rangelands (Merenlender and Buhler, 2021). These types of community groups could help steward landscapes in the Upper Trinity River Basin, especially on private lands.

State and Federal foresters, Tribes, and PBAs can also play a key role in post-fire rehabilitation. After severe overstory canopy loss due to wildfire, many managers proceed with revegetation efforts. With the increase in climate change impacts such as drought, the need to consider changing climate zones in replanting proves is increasingly essential. Foresters have begun utilizing assisted migration, the selection of new seeds, typically from southerly or lower-elevation populations, as a response to climate change (Merenlender and Buhler, 2021). The USDA Pacific Southwest Research Station develops tools to help managers make decisions based on "anticipatory planting" which considers the future climate of the area (Merenlender and Buhler, 2021). Using climate models and data to properly select seeds for revegetation will allow for better suited plants to the projected future climatic conditions.

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Appendix B: Forest Management for Snow Water Equivalent Supplement

Many interconnected factors influence snowpack, or snow water equivalent (SWE), in montane landscapes (Anderson *et al*., 2014) such as those found in the Upper Trinity River Watershed. One potentially important factor in forested landscapes is the degree of canopy closure, which influences the amount of snow that can collect on the ground surface, and also the rate at which that snow melts. Thinning dense forests can create the right balance of stand openings and ground shade to maximize snow accumulation on the forest floor (Storck and Lettenmaier, 2002, Varhola *et al.*, 2010, Lundquist *et al.*, 2013).

A previous report by the Northwest California Resource Conservation & Development Council's Five Counties Salmonid Conservation Program (5C) was analyzed to determine whether upland thinning might complement other restoration techniques to enhance water supplies in the assessment area (5C 2017. The report suggested optimal range of canopy closure for SWE maximization and snowmelt delay is ~40% to 60%; 30% closure is not sufficient to prevent growth of dense brush (5C 2017) and 70% closure can increase sublimation and early snowmelt due to the canopy trapping warm air (Dobre *et al.,* 2012). Increasing snow-water-equivalent and delaying snowmelt may also have tangential benefits for meadows, because long periods of snow cover and soil saturation exclude tree seedlings.

Several criteria were found likely to influence how effective thinning treatments were in boosting SWE and extending the snowmelt period in the Trinity River Watershed (5C, 2017):

> Elevation – Elevations between 4,000'-6,000' were noted as having high potential for thinning to improve SWE yields. The lowest elevation where snow accumulation frequently extends into spring is approximately 4,000' (although because local snow monitoring stations are well above this elevation there is limited data on SWE yields) and below ~4,000' there is higher risk of "rain on snow" events that can exacerbate downstream flooding, so intentionally increasing the snowpack at lower elevations is increases flooding risk with minimal benefits. Elevations above 6,000' on the other hand often retain less snowpack due to steeper slopes, and excessive canopy closure is uncommon in forests above 6000'. Additionally, much of the Trinity River Watershed above 6,000' is designated Wilderness, or is otherwise inaccessible, which mostly precludes mechanical thinning methods.
>
> Aspect – North-facing slopes are better suited for activities to increase SWE and extend snowmelt, since they naturally retain snow longer (Clark *et al.*, 2011).
>
> Slope – This was not fully investigated in the previous report; however, WRTC staff and local resource specialists have noted that snowpack typically accumulates more and is retained longer on shallower slopes and flats. These are also the areas that are easiest to thin and offer the most potential for meadow restoration, so prioritizing them for thinning treatments can lead to efficient multi-objective restoration.
>
> Fire History – Recent large wildfires in Trinity River will impact opportunities for some thinning practices. In recently burned areas, there will generally be less canopy cover to thin, but any residual thinning benefits to SWE and water yield may also be reduced due to hydrophobic soils, loss of large wood sediment filters, increased rill and gully erosion, and greater levels of channel

incision (Rhodes and Fissell, 2015). Therefore, thinning projects should be targeted to landscapes that have not experienced recent wildfires.

Vegetation – Hardwood or mixed hardwood-conifer forests are not likely to provide the same benefits from thinning, as hardwood canopies already allow for snowfall to make it to the ground without encouraging brush (5C, 2017). Areas with especially dense canopy cover will also likely benefit more from thinning than those with only marginally high closure.

In summary, thinning efforts to increase SWE and prolong snowmelt should be targeted at low-sloped Northern exposures between 4,000' and 6,000', with dense conifer forest that has not experienced recent wildfire. The effects of thinning to improve SWE and prolong snowmelt are likely to be both transitory (due to natural regrowth) and highly variable between locations thinning may be a cost-effective option to increase downstream water availability in certain instances. In addition, thinning can provide numerous other benefits, including fuels reduction to reduce fire severity, meadow habitat enhancement, and improved forest health.

Updated GIS data availability and modeling techniques developed since 2017 present an opportunity to update and apply the basic analytical framework developed in the 5C report within the Upper Trinity assessment area. Future analyses to identify and prioritize thinning projects should combine LiDAR-based DEM analyses of slope, aspect, and elevation, with data on fire history and vegetation. LiDAR point cloud data may be useful for estimating forest density. High-priority areas identified through 'desktop analyses' should have conditions verified through rigorous field assessments prior to permitting and implementation. The snow-water equivalent model (via NOAA) and evapotranspiration data (e.g. OpenET) could potentially be used to further refine priority areas and could also prove useful for validating the impacts of implemented projects. Finally, local streams that drain thinning project areas should be assessed for restoration opportunities that enhance connections to floodplains, wetlands, and the alluvial aquifer, in order to maximize the benefits from higher landscape SWE accumulation. Flow monitoring (before and after thinning) on these streams should also be conducted to fully assess the impacts of implemented projects over time.

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Appendix C: Data Provided to Vibrant Planet for Parameterization of the Land Tender Product for Use in the Upper Trinity River Basin - Custom/Revised Strategic Areas, Resources, and Asset List

	SARA Name
Assets	Railway Trail
Biodiversity	Spotted Owl Suitable Habitat
	Spotted Owl Critical Habitat
	Spotted Owl ACs
	Large Tree Groves/Old Growth
	Salmonid/Fish Habitat
	Western Pond Turtle
Ecological Commodity	Plantations/Managed Timberlands
Science and Culture	Social Vulnerability Index
Safety	Wildland Urban Interface (Defense Zone)

Appendix D: Land Tender Treatment Codes Generated as part of Scenario Testing

Treatment Code	Method	Prescription	Description
CMR-TH	Complex Mechanical Removal	Thinning	Treatment is generally consistently and equally applied across an area and is focused on significantly reducing the effects of high intensity fire by increasing heterogeneity into the existing forest structure. The treatment is expected to introduce a moderate level of structural variability mostly accomplished as a byproduct from implementation. This treatment may include biomass removal, commercial tree removal or combination of both. Treatment is complex due to many factors such as steep slope and the necessity of specialized equipment such as cable, tethered or helicopter logging methods.
MRM-TH	Mechanical Removal	Thinning	Treatment is generally consistently and equally applied across an area and is focused on significantly reducing the effects of high intensity fire by utilizing ground-based logging methods. This treatment may include biomass removal (non-merchantable), commercial tree removal (merchantable) or a combination of both. Treatment is modeled as a thin from below type prescription. Dominant woody vegetation is moderately affected. Canopy cover is affected by approximately 15%.
MRM-VDT	Mechanical Removal	Variable Density Thinning	Treatment is applied in variable manner and is applied so as to mimic vegetation structure patterns that would exist in the area's intact disturbance regime and includes some smaller openings less than 1 acre increasing heterogeneity into the existing forest structure by utilizing ground-based logging methods. This treatment may include biomass removal (non-merchantable), commercial tree removal (merchantable) or a combination of both.
MRM-SD	Mechanical Removal	Small Diameter	Small diameter thinning (biomass removal) that occurs pre or post timber removal activities and generally only includes the removal of small trees up to 9.9" DBH. Treatment can remove up to 90% of small trees less than 9.9" DBH.
MTH	Manual Removal	Thinning	Treatment is applied consistently and equally applied across an area and is focused on significantly reducing the effects of high intensity fire by hand cutting and piling of vegetation typically consisting of ladder fuels. Dominant woody vegetation is generally unaffected. Any cut material is assumed to be treated by hauling off site,

Treatment Code	Method	Prescription	Description
			chipping or pile burning. Pile burning of the cut material is the modeled method of slash treatment.
RGM-TFF	Mechanical Rearrangement	Mowing	Predominantly achieved by mowers or possibly disking. Treatment is generally consistently and equally applied across an area and is focused on significantly reducing fine fuels and a fire's rate of spread. Woody vegetation is generally unaffected. Disking may be Herbaceous vegetation is significantly affected by 90 to 100%. Rearranged material is left on site. Soil is disturbed by as much as 10%.
RGM-MASL	Mechanical Rearrangement	Mastication	Predominantly achieved by mastication wheeled or tracked machines. Treatment is generally consistently and equally applied across an area and is focused on significantly reducing fine fuels, ladder fuels, and reducing canopy bulk density which decrease a fire's rate of spread, the potential for crown initiation, and the ability for sustained crown fire.
RGM-GMP	Mechanical Rearrangement	Grapple Pile	Applied when high concentrations of down, dead, or lopped vegetative material exist. Some small green vegetation may be removed and piled as well. Grapple piling is used to concentrate residual vegetation into large piles which are subsequently burned. Treatment is generally consistently and equally applied across an area and is focused on significantly reducing fine fuels and a fire's rate of spread.
RXF-GFL	Prescribed Fire	Ground	Ignition of fuels by hand with drip torch or other incendiary device. Treatment is variably distributed based on fuels, topography and season. Rx fire preparation activities may affect other resources depending on preparation activities and are not reflected as part of this treatment. Soil disturbance is insignificant from direct action, but soil impacts may occur when there are high intensity fire patches.
REV-A	Revegetation	All growth forms	Revegetation, including all growth forms, herbaceous, shrubs and trees are focused in areas where natural revegetation is not predicted to occur within a target time frame and/or where specific species are desired. Revegetation alone does not impact existing vegetation or soil, but when used in combination with other techniques to prepare the site can have more impact.

UPPER TRINITY WATERSHED
RESTORATION ASSESSMENT
&
MANAGEMENT PLAN

Chapter 3

Stream Level Assessment of the Upper Trinity River Watershed for Beaver Restoration Techniques Using Beaver Dam Analogues and Beaver Translocations

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STREAM LEVEL ASSESSMENT OF THE UPPER TRINITY RIVER WATERSHED FOR BEAVER RESTORATION TECHNIQUES USING BEAVER DAM ANALOGUES AND BEAVER TRANSLOCATIONS

INTRODUCTION

The Trinity River is greatly impacted by years of historical resource acquisition since the discovery of gold in 1848 (Adkins 65). Widely practiced actions that resulted in large scale landscape and ecological damage include, but are not limited to, highly destructive placer and hydraulic mining, clear cut logging practices, dams and diversions, commercial fishing, and fire suppression and occlusion (Adkins 84-5, 98, 134, 150, 176, 213). Due to the steep and unstable granitic mountains of the Trinity River Basin, the effects of logging practices increased siltation, sedimentation, and landslides, while mining scoured streambeds, removed naturally sorted gravel assemblages, and blasted through streamside benches, releasing further sediments and debris into the river (Adkins 100, 130, 186). Before the 1840s, the Trinity River supported populations of Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch)*, and sockeye salmon (*O. nerka)*, steelhead trout (*O. mykiss)*, Pacific lamprey (*Entosphenus tridentatus)*, and white and green sturgeon (*Acipenser transmontanus, A. medirostris,* respectively) in numbers sustainable for harvest (Adkins 39). Following the discovery of gold, and the installation of the Trinity River and Lewiston Dams, both anadromous and non-anadromous species have suffered dramatic declines from 1848 to 2017 despite attempts to regulate flow regimes (Adkins 167, 176, 184-5, 341, Sullivan and Hileman 124). As of 2022, the Northern California Distinct Population Segment (DPS) of Steelhead Trout is listed under the Endangered Species act as Threatened (NOAA, “Steelhead Trout”). Limitations to population recovery include high levels of siltation, physical barriers preventing access to suitable habitat, and lack of high velocity flows to encourage gravel sorting, resulting in decreased suitable spawning habitats, increased stream temperatures, and anaerobic conditions due to algal blooms in controlled flow regimes (Adkins 130, 343, Cooper-Hertel et al. 9, 13).

Beavers and their activities supply a host of benefits to riparian ecosystems. Within North America, nearly every temperate ecosystem with stream corridors of shrubs and trees historically supported beaver dams (Castro et al. 1). Floodplain wetlands created by beaver dams are often sources of diverse stream conditions and riparian habitats that support birds, waterfowl, fish, aquatic invertebrates, amphibians, and mammals (Castro et al. 3, 5). Beaver dams increase areas of cold water refugia and high-quality diverse habitat for fish, reduce siltation and sedimentation in streams during high flows, detoxify agricultural runoffs, and overtime, increase aggradation to restore incised streams (Castro et al. 8-11, Bouwes et al. 8). The increase in water storage time by beaver dams increases soil saturation and lateral spreading, decreases flammability of surrounding vegetation thus decreasing the severity of high-intensity wildfire burns in riparian corridors, and at large scales can elevate the water table and recharge aquifers (Castro et al. 4, 7, Fairfax and Whittle 1, 6). With increasing drought conditions and climate change, the benefits of beaver dams include increased dynamic floodplain connectivity, establishment of natural fire breaks, and higher habitat resiliency (Jordan and Fairfax 3-4). Aggradation of soils and debris sequester carbon at high rates to reduce atmospheric carbon dioxide, and beaver activities create diverse riparian canopy structures that are more productive and resilient while reducing water temperatures in the face of a changing climate (Jordan and Fairfax 5-6, Wohl 3635).

Despite concerns that beaver dams pose a barrier to fish passage; it was found by Pollock et al that 74% of juvenile steelhead and 91% of Coho salmon were able to move upstream past a beaver dam analogue (BDA) within 3 days (“Field” 10). In follow up experiments, both species were capable of jumping over BDAs between 27-40cm tall, and swim upstream in side channels with slopes of 8-11%. While these values are far from regulatory measurements, it is proposed that the natural variations, decreased stream velocity, and shorter distances made the energy expenditures possible (Pollock et al. “Field” 17-18).

The objectives of this assessment are to utilize the most current modeling approaches and literature available to assess the Upper Trinity River Watershed for its capacity for restoration through the utilization of beavers and their dam building activities. The watershed was assessed for its ability to currently support beaver dam analogs as a form of low-tech process-based restoration, and potentially beaver translocations as a further means to restore long term ecosystem resilience. Translocation assessments are being made in anticipation of the currently in-progress beaver restoration practices and guidelines being developed by the California Department of Fish and Wildlife Service (CDFW) (“Beaver Restoration Program Informational Webinar 052523”).

BACKGROUND

The Upper Trinity River Watershed encompasses approximately 460,000 acres, spanning from Trinity Dam to the south, and north to Scott Mountain Creek at the Trinity County boundary line. The lowest elevation values for the watershed begin at Trinity Lake at approximately 2,333ft and rise to the top of Mount Eddy to the north at 9,032ft. The watershed consists of 19 Hydrologic Unit Code 12 (HUC 12) subwatersheds that contain approximately 2,213 miles of perennial, intermittent, and ephemeral streams (415, 1,124, and 674, respectively) that flow into Trinity Lake above the Trinity Dam (Figure 2). It is estimated that the mean annual water yield of these watersheds combined is 16,742 mm ("Forests to Faucets 2.0"). Completed in 1962, the Trinity Reservoir has a storage capacity of approximately 2,448,00 acre-feet (MP Region Public Affairs 1). Land ownership is primarily the United States Forest Service with designated Recreation and Wilderness areas (69.70%), and Private Timberland (26.40%) (Rupp 14). The watershed is lowly populated, and includes the four communities of Minersville, Covington Mill, Trinity Center, and Coffee Creek (populations of 15, 227, 228, and 288, respectively; Wesley "Community").

The terrain of the Upper Trinity River watershed is highly mountainous, lowly populated, and has limited access to many regions. Ground level conditions for in-stream restoration and beaver presence are widely undocumented due to the vast nature of the region and low prioritization due to its limits to anadromy. Spatial models are often utilized to aid in landscape-scale assessments and management decisions where field-level data collection is not feasible. Such examples include; estimates of historic vegetation changes with fire regimes, spatial prioritization of vulnerable landscapes in agroforestry, and identification of areas of landscape refugia in response to invasive plant pathogens (Wimberly et. al. 116-117; Costa de Mendonça et al. 2; McCarthy et al. 194).

The large scale of this region along with complex landscape features and property boundaries led to the use of the best available modeling approaches as the cornerstone of this assessment, with the support of field verification and additional available datasets where applicable.

Figure 1. Panoramic view of the Upper Trinity River Watershed looking south above Picayune Creek

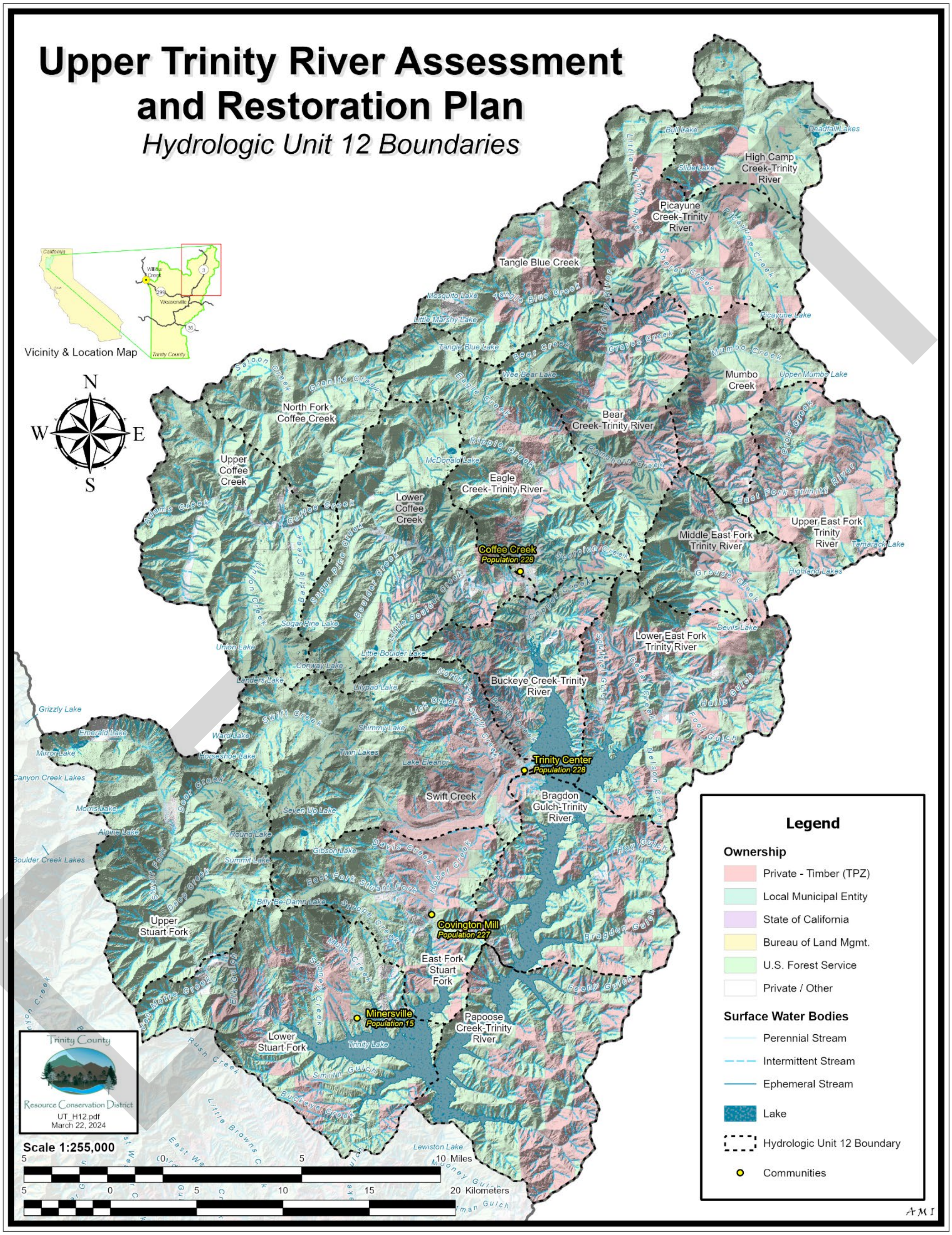

Figure 2. Upper Trinity River Watershed HUC 12 subwatershed boundaries

METHODS

The models utilized in this assessment include the Beaver Restoration Assessment Tool (BRAT, brat.riverscapes.net) the NetMap model by TerrainWorks (terrainworks.com) and the Lost Meadow Model (Pope and Cummings). In order to increase the validity of the model outputs, a select number of sites were field verified for beaver restoration. A literature review was conducted of beaver occurrences and Beaver Presence Surveys conducted by United States Forest Service staff were compiled to estimate known distributions. These habitat sites were then compared with the CDFW Klamath Mountains Lentic Wetlands Inventory (KMLWI) dataset in order to expand identification of wetted regions that could benefit from beaver restoration (CDFW "Klamath"). This primary analysis was then utilized to create both the Restoration Potential and Restoration Priority Matrixes to assist land managers in interpreting the outputs, and help prioritize the restoration sites identified to anticipated restoration goals and funding capabilities.

STREAM IDENTIFICATION

The Upper Trinity River Watershed was divided into the HUC 12 boundaries and streams were reviewed using the TCRCD Hydrography dataset (Wesley "Hydrography"). This dataset contains the streams, tributaries, watersheds, lakes, and river beds of Trinity County. As streams assessed by the BRAT model were systematically reviewed, tributaries were individually identified when they branched off of the main river stem in the subwatershed. Unnamed tributaries upstream were grouped with the downstream, identified as "[Stream Name] & Tributaries". Several tributaries were unnamed and were identified numerical from the upstream end of the watershed to the downstream end. All streams assessed were perennial unless otherwise noted.

MODELING - BRAT MODEL

The BRAT Model 3.1.0 is an open-source Python script that analyzes the potential of the riverscape to support beaver dam-building activities and provides dam density estimates for stream reaches (Gilbert et al.). It was developed in 2018 when the Nature Conservancy contracted with Utah State University in order to assist in the planning of beaver-related projects in California. It is important to understand that the model is not a habitat suitability model, but rather a spatial assessment of streams and the surrounding landscape's capacity to support beavers and their dam building activities.

The model assesses freely available datasets on the following parameters:

- Permanent water sources
- Vegetation within 30m of the stream suitable for foraging and dam building
- Vegetation within 100m of the stream to support expansion of dam complexes and maintain large beaver colonies
- The probability that dams could be built across the stream during low flows
- The probability that a beaver dam could withstand a flood
- Suitable stream gradients
- Exclusion of streams too large for beavers to build and dams to persist

(Macfarlane et al. "California Beaver" 11).

The modeling analysis is focused to United States Geological Survey (USGS) HUC 10 level watersheds within four Environmental Protection Agency (EPA) identified Level III ecoregions of the Sierra Nevada, Cascades, and Klamath mountains of California (Macfarlane et al. "California Beaver" 9).

BRAT outputs for existing dam building capacity with Frequent (8-24 dams/mile) and Pervasive (24-64 dams/mile) values were grouped and identified as "high capacity" streams to serve as the focal point of this assessment. The Frequent categorization was included in the high capacity range due to its ability to capture sites with high potential for restoration, but may be lacking in the vegetation capacity to support beaver populations (Mcfarlane et al. "Modeling" 5, 20). This expanded grouping allows for the identification of sites with high potential for dam building (including beaver dam analogues), and those with the potential for future translocations of beavers.

MODELING – NETMAP

The NetMap toolkit developed by Terrainworks (terrainworks.com) is an advanced spatial analysis program that builds Watershed Assessments (Level 1) across a digital landscape and provides tools to support decision-making relative to natural resources. Example applications include; fisheries management, forestry management, erosion and sediment mapping, and pre/post wildfire planning. For the purposes of this assessment, the Beaver Habitat Tool was utilized. The tool predicts potential locations of beaver habitat based on empirical beaver dam models, with thresholds of 0.3km^2 for slope-area and stream power bankfull discharge of 2,000 Joules per second. NetMap calculates stream power as:

$$SP = pgQs$$

Where SP is stream power, p is specific weight of water (1000 kg/m3), g is acceleration of gravity (9.8 m/s2), discharge at bankfull depth (approximately two-year flood, m3/s) and S is the channel gradient (L/L). The Beaver Habitat Tool was run over the Upper Trinity River Watershed area and set at the default parameters of channel gradient of 4%, drainage area of 0.1 km^2, and 2,000 Joules of stream power as outlined in the supporting study by Pollock et al. (“The Importance of Beaver”, 752).

MODELING – LOST MEADOW MODEL

The Lost Meadow Model was developed by Pope and Cummings in order to identify potential lost meadows at the landscape scale by utilizing geomorphic characteristics similar to extant meadows (6). The model was trained on a meadow dataset from the Sierra Nevada MultiSource Meadow Polygons Compilation Version 2, obtained through the UC Davis Sierra Nevada Meadows Data Clearinghouse (4; meadows.ucdavis.edu). Computations to identify potential lost meadows were run on the Upper Trinity River watershed using predictors of local relative elevation, slope, distance to nearest stream channel, and topographic wetness index (Cummings et al. in review). In order to achieve localized outputs for the Trinity Alps, the model was trained for the Trinity River watershed, utilizing the CDFW KMLWI dataset of wet meadow amphibian habitats (CDFW “Klamath”). Due to the unpublished nature of this dataset, the locations identified are notated, but not reproduced on subwatershed scale maps. This model was reviewed in order to identify locations with multi-faceted restoration opportunities for in-stream and meadow restoration to maximize ecosystem benefits by increasing wetland habitats and in turn biodiversity of locations sensitive to climate change.

BEAVER DISTRIBUTION

To assess the known distribution of beaver within the Upper Trinity River Watershed, a literature review was first conducted to compile records of occurrences within the boundaries of Trinity County, California. The county wide spatial scale was chosen in order to account for high dispersal distances that may overlap into the Upper Trinity River watershed, and identify historic or source populations for future translocations. Beavers have been recorded to disperse in distances upwards of 238 km (147 miles) from their den sites (Hibbard). While this value is an outlier, high dispersal distances are not uncommon in beaver populations. Distances have been reported of 31.68 km in New York and 42.3 km in Montana from natal den sites, and 76.2 km in Wisconsin and 101.8 km in Utah from translocation sites (Sun et al. 395; Ritter 123; Knudsen and Hale; Doden et. al. 10).

Published literature was reviewed to research historical accounts of observations within the Trinity County boundaries. Databases such as iNaturalist (iNaturalist.com) and Global Biodiversity Information Facility (gbif.org) were queried to identify observations of beaver activity and presence with georeferenced locations, and local agencies were contacted to obtain unpublished survey data. For the purposes of this study this was not an exhaustive literature search.

SITE VERIFICATION – BEAVER PRESENCE SURVEYS

The United States Forest Service (USFS) conducted Beaver Presence Surveys in 2016 and 2017 to observe signs of beaver inhabitation within Shasta Trinity National Forest management units along the Trinity River (DeJuilio). Observations included identification of dams, dens or lodges, beaver sightings, scat, fur, scent or scent mounds, chewed branches or logs, beaver tracks, and game camera photos. Presence data was identified as fresh or old, with singular observations made for high quantities of signs indicating beaver presence. Surveyed locations were approximately 1 mile long and included reaches of the Trinity River and tributaries above Lewiston dam and in the Trinity Alps.

SITE VERIFICATION – BEAVER HABITAT SURVEYS

The Trinity County Resource Conservation District (TCRCD) conducted Beaver Habitat Surveys using a combination of the Methow Beaver Habitat Suitability and the Rosgen Stream Classifications protocols. Sites were selected from BRAT outputs that identified high capacity for dam building (8-64 dams/mile) in locations that were easily accessible by the road system. The Methow Beaver Habitat Suitability protocol was utilized to identify characteristics that indicate high quality beaver habitat in order to verify BRAT outputs, and the Rosgen Stream Classification was utilized to assess the level of stream degradation, and estimate potential use and efficacy of beaver restoration techniques.

Methow Beaver Habitat Suitability

Habitat suitability surveys were conducted using the Methow Beaver Project (MBP) Scorecard and protocol. The protocol was developed by the Methow Beaver Project in Washington state to determine habitats that could support relocated beavers and their dam building activities. The MBP has facilitated hundreds of beaver relocations in the past decade, and actively study the components that contribute to successful translocations and the effects of newly relocated beavers on a new habitat. Developed from previous monitoring studies, the MBP scorecard quantifies the suitability of a new release site on the following factors:

- Habitat size
- Stream conditions
- Available forage
- Current herbivory
- Historical beaver use
- Availability of building materials
- Aquatic escape cover
- Ease of access for relocations and monitoring

The total score available is originally 100 points, but similar to the North Fork Kern River study, we also chose to reduce the maximum total to 90 points to compensate for the lack of ability to sample stream flow twice within a season (Lundquist and Dolman 5). The Field Datasheet can be found in **Appendix A** along with the 12 quantitative point categories.

Rosgen Stream Classification

Streams were assessed for the current state of degradation using the Rosgen Stream Classification Technique outlined in the National Engineering Handbook in order to verify model outputs and identify potential restoration opportunities for the use of beavers or beaver dam analogues (NRCS; Pollock et al. "Using Beaver Dams", 6–9). Sites were visually surveyed to identify Rosgen stream types, and width-to-depth and Entrenchment Ratios were measured and calculated to verify classifications as needed. (**Appendix A**). Assessment parameters include; identification of single or multi-thread channels, entrenchment ratio, width-to-depth ratio, sinuosity, slope, and stream bed material size.

SITE VERIFICATION – KLAMATH MOUNTAINS LENTIC WETLANDS INVENTORY

The CDFW Klamath Mountains Lentic Wetlands Inventory dataset contains spatial polygons of wet meadows that have the characteristics to support amphibian populations (CDFW "Klamath"). This dataset was utilized in this analysis due to its field-verified locations, and the identification of wet habitats that have the potential for enhancement by beaver restoration techniques to increase biodiversity, habitat size, and health for amphibians and other wetland species (Romansic et. al 6-7; Zero and Murphy 5; Thompson et al. 9).

RESTORATION POTENTIAL MATRIX

In order to assess tentative locations for restoration feasibility, a restoration potential matrix was developed to cross compare variability between sites and enhance assessment validity. Many of the factors assessed were systematically produced in the BRAT assessment outputs, and additional factors were used to review other restoration models and compare field verified datasets to support the findings.

The following categories were assessed in the Restoration Potential Matrix (Full descriptions can be found in **Appendix D**.)

- Limitations - a BRAT model category that assessed the capacity of a stream to support dam building
- Potential – a BRAT model category that describes the restoration recommendations
- Feasibility – a BRAT model category that estimates the difficulty and timeline required for restoration
- # of Models – the number of restoration models that identified restoration potential at the stream site
  Models reviewed:
    - The BRAT Model
    - The NetMap Model – Beaver Habitat Tool
    - The Lost Meadow Model
- # of Surveys – the number of field surveys that may serve as preliminary field verifications of site conditions
  Survey data reviewed:
    - USFS Beaver Presence Surveys conducted in 2016 and 2017
    - TCRCD Beaver Habitat Assessment Surveys conducted in 2023
    - CDFW Klamath Mountains Lentic Wetlands Inventory (KMLWI)

RESTORATION PRIORITY MATRIX

In order to prioritize locations assessed for restoration, a restoration priority matrix was developed to sort sites by size, ownership, and potential risk to infrastructure in order to further guide land managers and restoration practitioners in their restoration site assessments. The percentage of subwatershed and percentile length of the watershed were calculated using reach lengths produced in the BRAT outputs, along with the BRAT risk categories. The parcel ownership was derived from the Trinity County Parcel Ownership dataset (Wesley "Ownership").

The following categories were assessed in the Restoration Priority Matrix (Full descriptions can be found in **Appendix D**.)

- % Subwatershed – Percentage of stream length with existing dam building capacity that is considered high capacity (8-64 dams/mile) of the individual stream assessed out of the combined high capacity of the HUC 12 subwatershed as a whole
- Length Percentile of Watershed – Percentile ranking of cumulative high capacity reach length across the combined Upper Trinity River Watershed as a whole, calculated exclusively
- Ownership – Ownership of land parcels that the BRAT assessed streams crossed through. If additional owners were found outside of the assessed stream area, it was annotated in the Notes
- Risk – a model category that assigns a risk ranking base off of the approximate distance of the stream to infrastructure (roads, canals, and railroads) or land usage classified as urban or agricultural

STREAM ASSESSMENT SUMMARY

In addition to the Restoration Potential and Restoration Priority matrix categorization, a general review of each subwatershed was conducted to gain further understanding of site characteristics and history. Acreage, stream lengths (perennial and intermittent), and land cover classifications were calculated, and fire history was reviewed. Stream level summaries included BRAT assessed lengths of the streams, slope values, and further explanations of Restoration Potential and Restoration Priority matrices.

Historic fire perimeters from 2013-2023 were reviewed in order to make management and restoration recommendations focused to water quality concerns and reduction of sedimentation into stream in the years post fire (Wesley "Fire Perimeters"). It has been found that sedimentation rates post fire continually decline in the immediate years following the burn, but run-off rates are significant enough to be considered in management decisions until at least year 5 post fire (Mayor et al 73, MacDonald and Robichaud 5, Silins et al. 196). In addition to surface run off sedimentation, the effects of decreased tensile strength in decaying trees of forested landscapes have been shown to produce mass movement events up to 10 years post fire, necessitating long term monitoring (DeGraff et al. 1, Meyer et al. 3027, Macdonald et al. 79).

RESULTS

MODEL OUTPUTS

The BRAT model assessed 784 miles of stream and successfully identified over 634 miles in the Upper Trinity River Watershed that were deemed suitable for the dam building activities of beavers. Out of the streams capable for dam building, 293 miles were calculated to have high dam building capacity. It is estimated that the watershed, as a whole, has the potential to support between 4,787 and 14,152 beaver dams. The NetMap model identified over 4,611 miles of stream in the watershed that contain suitable beaver habitat. Overlap of the models was common but not entirely inclusive due to the variations of computing parameters. Limitations of these models will be addressed in the Discussion. Model outputs can be found in **Appendix E,** accompanying the subwatershed stream assessments maps.

HISTORICAL DISTRIBUTION

The literature review produced a total of 59 observations of beavers in Trinity County starting in 1828 until November 2023. Out of these observations, only 29 were located within the Upper Trinity River Watershed. The review revealed a variety of observations including; anecdotes, historical creek locations, and georeferenced accounts (**Appendix B,** Table 3). Only beaver species identified as the American Beaver, *Castor canadensis* were included. Historical distribution maps were compiled and include; the 1942 CDFW map of the beaver translocations with the state of California, a 2013 beaver distribution map overlaid over the 1942 map, and the most recent 2024 CDFW range map in Trinity County (**Appendix B).**

Beaver translocations were performed in central and northern California by the USFS and the CDFW (formerly California Department of Fish and Game) from August 1936 to September of 1940. By the conclusion of the transplants, 90 native and unfortunately, 5 non-native beavers, had been successfully transplanted into 14 beaver colonies (Tappe 41, **Appendix B,** Table 4). Although none of these translocations were in Trinity County, a notable colony establishment was located in Scott Valley of Siskiyou County, 24 miles north of the Trinity County line.

FIELD VERIFICATION

A total of 3 sites were chosen for field verification to assess the validity of the model outputs. These sites were chosen due to their high restoration potential model outputs for current dam building capacity (Frequent to Pervasive – 8-64 dams/mile), ease of access, and feasibility to field survey. Surveys were conducted on October 2023 and spanned between 0.5-1.2 miles of the stream length. Field surveys and visual observations aligned with BRAT model outputs, successfully identifying dam building capacity in high slope tributaries for BDAs (Nelson Creek), lower gradient systems that have potential to host BDAs and potentially beavers with habitat enhancements and infrastructure modifications (Hobel Creek), and current dam building capacity confirmed with signs of beaver activity (East Fork Trinity River). Survey results can be found in **Appendix C.** The limitations of these surveys will be addressed in the Discussion.

Nelson Creek

Nelson Creek was surveyed for approximately 0.5 miles upstream of East Side Road. Of the reaches selected for field verification, the BRAT outputs estimated slope values ranging from 12.30% to 12.77% and high existing dam building capacity. The survey of this site revealed a single threaded channel with step-pool formations, little floodplain, and slope values ranging from 7% to 14%, resulting in a Rosgen Stream Classification of variations of type A streams. The Methow Beaver Scorecard ranked low with a value of 15 (out of -71 to 90), primarily due to low woody food scores, no history of beaver use, and high gradients. The geomorphic characteristics of high gradients, narrow entrenchment, and steep banks are conducive to large wood recruitment to prolong water storage (which is apparent to be occurring naturally), but does not host many opportunities for lateral spreading and higher volume storage. The installation of BDAs in this site could create a select few ponds that have the potential to increase wetted habitats, and increase water storage time, but it is unlikely to have enough available forage or habitat space to support beaver populations which is confirmed from the BRAT outputs. See photos in Figure 3.

Figure 3. North Branch of the East Fork of Nelson Creek upstream of 36N68 bridge on East Side Road. *Left: High slope step pool characteristics of the Nelson Creek survey reaches. Top Right: Natural wood loading creating a deeper scour pool. Bottom Right: Uncharacteristic reaches with a wider floodplain and low entrenchment.*

Hobel Creek

Hobel Creek was surveyed for approximately 1.2 miles downstream of Bowerman Ridge Road. Of the reaches selected for field verification, the BRAT outputs estimated slope values ranging from 2.94% to 5.16%, high existing dam building capacity with potential for translocations, and elevated risks due to proximity to infrastructure. The survey of this site revealed a disconnected stream with low to moderate entrenchment and slope values ranging from 2% to 8%, resulting in a Rosgen Stream Classification of variations of type B, D, and E streams. The Methow Beaver Scorecard ranked low with a value of 13 (out of -71 to 90), primarily due to low woody food scores and no history of beaver use. Despite low woody food scores on average, there were select reaches that hosted stands of alders and willows, but did not have enough water to support larger populations. Although this creek is listed as perennial, the disconnected segments suggest otherwise outside of winter flows that are contributing to the large wood recruitment found at various reaches. The geomorphic characteristics of low grade, braided channels and select constriction points on the creek that could support the installation of woody structures suggest that this creek could support BDAs, with future vegetation efforts targeting woody forage that could increase the habitat quality in order to support beaver translocations. Despite the lack of a vegetation recommendation in the BRAT model, it was found that the dam building capacity with translocation potential and needs for infrastructure modifications were accurate. See photos in Figure 4.

Figure 4. North Branch of the South Fork of Hobel Creek downstream of Bowerman Ridge Road. *Top Left: Wide, low gradient and lightly forest reaches characteristic of the Hobel Creek survey reaches. Top Right: Natural wood loading and the development of deep scour pools in high flow events. Bottom Left: Dewatered stream reaches with steep bank scour. Bottom Right: Dewatered reaches with grass growth indicative of intermittent flows, on a wide reach with high potential to connect to the floodplain.*

East Fork Trinity River

East Fork Trinity River was surveyed for approximately 0.9 miles downstream of the East Side bridge. Of the reaches selected for field verification, the BRAT outputs estimated slope values ranging from 0.4% to 1.2%, high existing dam building capacity with potential for translocation, and needs for vegetation restoration. The survey of this site revealed a well-developed stream with riffle and run formations, a large floodplain, braided side channels with moderate entrenchment, and slope values ranging from 0.5% to 2.5%, resulting in a Rosgen Stream Classification that includes variations of type B & C streams. The Methow Beaver Scorecard ranked relatively high with a value of 67 (out of -71 to 90), with notable limitations of abundant building materials, floodplain width, and stream substrate. The geomorphic characteristics of low gradients with a wide floodplain and short braided channels that could support dam building activities are supported by the evidence of beaver use found. The installation of BDAs in this site could increase year-round connectivity of the side channels to the floodplain, and abundant woody forage in the braided floodplain offers foraging habitat and deep pools for the translocation of beavers. Despite the BRAT model identifying vegetation needs in only the reach downstream of the bridge, it is still determined as accurate in its predictions of translocation habitat and recommendations of vegetation enhancements to extend the available habitat further upstream. See photos in Figure 5.

Figure 5. East Fork Trinity River downstream of the East Side bridge. *Top Left: Low gradient and wide floodplain characteristic of the East Fork Trinity River survey reaches. Top Right: Narrow and deep side channel near beaver signs. Bottom Left: Abandoned and degrading beaver dam. Bottom Right: Evidence of beaver chew on a submerged log.*

STREAM ASSESSMENTS

Based off of the BRAT assessed streams in the Upper Trinity River Watershed, 210 stream assessments were analyzed and compiled across multiple models, field verified datasets, and site characteristics. Assessment values were categorized in the Restoration Potential and Restoration Priority matrices developed to guide land managers and restoration practitioners to site locations that have potential to meet their management goals. Below are the most notable groupings of site locations. Please note the goal of these assessments is to identify site location that have the potential for restoration, but will still require site specific field verification and thorough review. Full stream assessments can be found in **Appendix D.** High restoration potential refers to dam building activities within the stream, and high capacity refers to densities of 8-64 dams/mile.

In addition to restoration models and related datasets, aerial photographs, road distributions, ownership parcels, and historic fire perimeters were also reviewed to further support recommendations and provide reference to Restoration Priorities (USDA; Wesley "Roads"; Wesley "Ownership"; Wesley "Fire Perimeters"). Accompanying maps of restoration models and publicly available datasets used in analyses can be found in **Appendix E.**

Streams with the highest cumulative high capacity restoration potential in the Upper Trinity River Watershed:

- Mumbo Creek – Mumbo Creek Subwatershed; 8.93 miles
- Stuart Fork & Tributaries – Upper Stuart Fork Subwatershed; 8.02 miles
- Hobel Creek & Tributaries – East Fork Stuart Fork Subwatershed; 5.97 miles
- Picayune Creek & Tributaries – Picayune Creek – Trinity River Subwatershed; 5.91 miles
- Halls Gulch & Tributaries – Lower East Fork Trinity River Subwatershed; 5.56 miles
- Eagle Creek & Tributaries – Eagle Creek – Trinity River Subwatershed; 5.39 miles
- Buckeye Creek & Tributaries – Lower Stuart Fork Subwatershed; 5.38 miles
- Cedar Creek & Tributaries – Lower East Fork Trinity River Subwatershed; 5.37 miles
- East Fork Trinity River – Middle East Fork Trinity River Subwatershed; 5.05 miles

Streams with primarily high restoration potential for dam building and limited additional restoration needs:

- Hobel Creek & Tributaries – East Fork Stuart Fork Subwatershed
- Bull Creek – High Camp Trinity River Subwatershed
- Bowerman Gulch – East Fork Stuart Fork Subwatershed
- Irish Gulch (Intermittent) – Lower Stuart Fork Subwatershed
- Owens Creek – Upper Stuart Fork Subwatershed

Streams identified with high restoration potential and habitat for the translocation of beavers:

- Haylock Gulch (Intermittent) – Lower Stuart Fork Subwatershed
- Picayune Creek & Tributaries – Picayune Creek – Trinity River Subwatershed
- Buckeye Creek & Tributaries – Lower Stuart Fork Subwatershed
- Mumbo Creek – Mumbo Creek Subwatershed
- Smith Gulch (Intermittent) – Lower Stuart Fork Subwatershed
- Stuart Fork & Tributaries – Upper Stuart Fork Subwatershed

Streams with primarily high restoration potential, minor revegetation needs prior to dam building, and multifaceted opportunities with meadow restoration potential:

- Halls Gulch & Tributaries – Lower East Fork Trinity River Subwatershed
- Squirrel Gulch & Tributaries - Lower East Fork Trinity River Subwatershed
- Deadfall Creek & Tributaries – High Camp – Trinity River Subwatershed
- Picayune Creek & Tributaries – Picayune Creek – Trinity River Subwatershed
- South Branch East Fork Trinity River & Tributaries – Upper East Fork Trinity River Subwatershed
- Buckeye Creek & Tributaries – Lower Stuart Fork Subwatershed
- Bear Creek - High Camp – Trinity River Subwatershed

Streams with primarily high restoration potential and infrastructure modification needs:

- Mumbo Creek – Mumbo Creek Subwatershed
- Brush Creek – Buckeye Creek – Trinity River Subwatershed
- Gratten Creek & Tributaries – Swift Creek Subwatershed
- Cedar Creek & Tributaries – Lower East Fork Trinity River Subwatershed
- Copper Creek & Tributaries – Buckeye Creek – Trinity River Subwatershed
- Greenhorn Gulch & Tributaries – East Fork Stuart Fork Subwatershed
- Deadhorse Creek (Intermittent) – Swift Creek

Subwatersheds with the highest cumulative high capacity restoration potential:

- Lower Stuart Fork Subwatershed; 32.82 miles
- Lower East Fork Trinity River Subwatershed; 26.15 miles
- Swift Creek Subwatershed; 25.72 miles
- East Fork Stuart Fork Subwatershed; 24.16 miles
- Picayune Creek – Trinity River Subwatershed; 18.79 miles

Subwatersheds with a fire footprint less than 5 years old and high capacity for dam building that can be utilized to decrease stream sedimentation

- Lower Stuart Fork Subwatershed; 32.82 miles
- Upper Stuart Fork Subwatershed; 16.93 miles
- Eagle Creek – Trinity River Subwatershed; 14.97 miles
- Bear Creek – Trinity River Subwatershed; 14.28 miles
- Lower Coffee Creek Subwatershed; 11.31 miles
- Tangle Blue Subwatershed; 8.06 miles
- North Fork Coffee Creek Subwatershed; 6.11 miles
- Upper Coffee Creek Subwatershed; 5.45 miles

Subwatershed	Stream	High Dam Building Capacity	
		Miles	% of Subwatershed
North Fork Coffee Creek	North Fork Coffee Creek & Tributaries	3.02	49.43%
Upper Coffee Creek	South Fork Coffee Creek & Tributaries	1.9	34.73%
Lower Coffee Creek	Boulder Creek & Tributaries	3.17	28.03%
High Camp – Trinity River	Deadfall Creek & Tributaries	4.25	33.13%
Tangle Blue Creek	Tangle Blue Creek & Tributaries	4.28	53.10%
Picayune Creek – Trinity River	Picayune Creek & Tributaries	5.91	31.45%
Bear Creek – Trinity River	North Fork Ramshorn Creek	3.31	23.16%
Eagle Creek – Trinity River	Eagle Creek & Tributaries	5.39	35.98%
Mumbo Creek	Mumbo Creek	8.93	87.98%
Upper East Fork Trinity River	East Fork Trinity River	4.00	25.82%
Middle East Fork Trinity River	East Fork Trinity River	5.05	41.39%
Lower East Fork Trinity River	Halls Gulch & Tributaries	5.56	21.26%
Upper Stuart Fork	Stuart Fork & Tributaries	8.02	47.34%
East Fork Stuart Fork	Hobel Creek & Tributaries	5.97	24.69%
Lower Stuart Fork	Buckeye Creek & Tributaries	5.38	16.40%
Swift Creek	Swift Creek & Tributaries	4.45	17.31%
Buckeye Creek – Trinity River	Copper Creek & Tributaries	3.66	30.55%
Bragdon Gulch – Trinity River	Bragdon Gulch & Tributaries	3.92	46.01%
Papoose Creek – Trinity River	North Fork Papoose Creek & Tributaries	3.52	19.91%

Table 1. Streams with the highest cumulative high capacity restoration potential of each subwatershed. *Percentage of high dam building capacity in the subwatershed is calculated out of the miles identified as having high capacity for dam building, divided by the total miles assessed by the BRAT model within the subwatershed.*

DISCUSSION

The beaver restoration assessments identified many promising locations that have the potential for beaver dam analogue restoration, beaver translocations, and meadow restoration to enhance wetland habitats and water storage capacity.

LIMITATIONS

Beaver Restoration Assessment Tool:

- At the time of computing, the BRAT model utilized the LANDFIRE 2014 dataset in order to estimate vegetative land cover that was utilized in forage capacity of dam building streams. The age of this dataset precedes fires that highly influenced the landscape. Fire history excluded includes; 2016 Meadow fire, 2018 Delta and Carr fires, 2019 Ramshorn and Eagle fires, 2021 Haypress (River Complex), and the 2023 Mule and Deep fires. It is recommended that vegetative assessments occur in areas affected by these fire footprints before restoration activities take place.
- The BRAT model is run on a 10 meter resolution digital elevation model (DEM) in order to capture the surface level of the landscape and accurately identify the stream banks and side channels used in the analysis. With the high prevalence of mining activity historically and presently, there were several locations identified that were more accurately identified as man-made ditch lines for mining rather than hydrologically native streams. In addition to mining ditch lines, there were several dirt roads analyzed for dam building capacity. These artifacts are common with many geospatial analyses and were removed from the analysis, but should be noted as a factor of consideration in future analyses. Due to the complexities of the Upper Trinity River Watershed, it is highly recommended that future applications of the model are calculated using a 1 m DEM or smaller source file in order to capture a higher resolution of streams and side channels, and produce more accurate hydrologic assessments.

NetMap Model:

- The NetMap model was also run on a 10 m DEM and produced similar, yet different, road and stream artifacts throughout the analysis. These were removed within reason, but some locations had a high likelihood of braided channels and should be ground verified. It is highly recommended that future calculations of the model utilized a 1m DEM in order to capture higher resolution stream data and increase accuracy.
- The Beaver Habitat tool in NetMap was built off of the paper by Pollock et al (2014) where streams with beaver habitation are identified as perennial and with gradients less than 6%. The default settings of the NetMap tool conservatively limit the analysis to stream gradients of less than 4%. This variation in stream gradient creates a discrepancy between the NetMap and BRAT models given that the upper limits to dam building potential in the BRAT model are calculated as far up to 23% before being limited by slope. It is recommended that future analysis consider this limitation and more precise identification of "prime" habitat and its exclusion of low probability, but not uncommon, habitat gradients.

Beaver Distribution Dataset

- Beaver distribution data reviewed publicly available datasets, literature, USFS data, and citizen science from the region, but lacked local CDFW data due to staffing limitations. It is anticipated that due to the increase of funding and focus on beaver restoration techniques, as seen by the 2023 formation of the Beaver Restoration Program within CDFW, that there will be more funding available to collect updated beaver presence data for this region and provide valuable insights into local populations. With the December 2023 translocation of beavers by CDFW (Traverso), it is likely that future reintroductions of beavers onto the landscape in California will become more common place.

Site Verification

- The Methow Beaver Project (MBP) Scorecard was limited in its ability to capture beaver habitat along a linear stream length when its original development was for the use in wetland meadow systems where abundant woody forage and habitat size would be calculated radially in distance from the waterbody. Due to the dynamic vegetative and hydrologic features of the streams surveyed, these values were averaged across the linear length of the stream with high quality habitats annotated. This survey structure can skew data away from localized segments of high-quality habitat when a majority of the stream assessed is degraded or lacks resources for beaver populations.
- The numbers of sites assessed to compare with the model outputs was limited to 3 sites due to staffing and seasonal limitations. It recommended that all sites identified by this assessment are field verified and undergo more thorough analysis at a reach level resolution prior to restoration action.

BEAVER DAM ANALOGUES (BDAS)

The multi-modal assessment approach utilized in this assessment identified many sites within the Upper Trinity River Watershed that have the capacity to support dam building activities in moderate to high densities. This information created a foundational dataset designed to guide land managers and restoration practitioners to potential sites that have the landscape characteristics necessary to support the installation of beaver dam analogues (BDAs). BDAs as a means of restoration to mimic the dam-building activities of beavers and often offer many of the same restoration benefits as beavers themselves of increased water storage, retention, and lateral spreading; enhanced wetland habitats to support higher rates of biodiversity; collection and filtration of sediment and agricultural run-off; and enhanced fire resiliency with saturated fire breaks. (Westbrook et al. 7-8,10; Bylak and Kukula 13; Puttock et al. 440-441; Fairfax and Whittle 7) These man-man structures offer the ability to obtain these restoration benefits without the unanticipated potential damage to property and infrastructure with downed trees and higher water levels, but must be adaptively maintained in a similar fashion that the beavers themselves would. BDAs offer a higher level of precision of installation and targeted site enhancement, but may require longer term maintenance in order to restore the landscape to pre-disturbance conditions and aid in the development of a system capable of producing and sustaining natural wood loading.

BEAVER TRANSLOCATION

The inclusion of potential translocation sites within the BRAT analysis offers a valuable insight into restoration opportunities available by reintroductions of beaver back into the landscape after their eradication. The compilation of historical beaver distributions, present sightings, and model projections provides preliminary support for beaver reintroduction sites that can be field surveyed and reviewed further for suitability. As noted above, dam building activities offer a host of benefits to the stream ecosystem, and including the beaver in that system allows it to be self-sustaining, and increases the biotic and abiotic processes that can support and be supported by their addition. Beavers have been well identified as a keystone species that positively influences hydrology, water quality, nutrient cycling, aquatic vegetation, invertebrates, amphibians, and fish populations (Brazier et al.). With the identification of these multi-faceted benefits and the increased financial support of programs like the CDFW's Beaver Restoration Program, it is anticipated that the future of stream restoration is highly likely to involve beavers.

RECOMMENDATIONS

There were several locations identified for their high restoration capacity, high impact potential for their subwatersheds, and notable potential for multifaceted restoration techniques. These sites should be reviewed further with higher resolution to identify restoration site locations, examine current habitat conditions for enhancement, and assess resource availability for restoration. Recommended sites include:

- Mumbo Creek
- Stuart Fork & Tributaries
- East Fork Trinity River
- Picayune Creek & Tributaries
- Hobel Creek & Tributaries

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Appendix A.

Beaver Dam Suitability Scorecard

Site ID: ________________________ **Date:** _____________________

Observers' Initials: _____________________ **GPS Coordinates:** ___________________

Location Description:____

Notes:____

***Please circle value and then record the corresponding points**

_____**Gradient of Unit:** **(10)** <_3% **(0)** 4-6% **(-10)** 7-9% **(-30)** >_9%

Stream Flow:

_____**Habitat Unit Size:** **(5)** >_1610 m **(4)** 1250-1609m **(3)** 900-1249m **(2)** 550-899m

(1) 200-549m **(0)** 0-199m

_____ **Woody Food Score** = multiply a x b x c

Woody Food (select the highest number possible in each line – then multiply lines)

a. **(3)** Aspen, willow **(2)** Alder **(1)** Other hardwoods
b. **(3)** Within 10 m **(2)** Within 30 m **(1)** Within 100m
c. **(2)** Large amount (hundreds of stems) **(1)** Some (dozens of stems)

_____ **Herbaceous Food** **(10)** Grasses and forbs (aquatic and terrestrial) abundant

(5) No grass/forbs present

_____ **Floodplain Width** **(5)** Wide stream bottom (at least 2x wide as stream) **(0)** Narrow 'V" Channel

_____ **Dominant Stream Substrate**

(5) Silt/Clay/Mud **(2)** Sand **(1)** Gravel **(0)** Cobble **(-1)** Boulders **(-3)** Bedrock

_____ **Historical Beaver Use** **(15)** Old structures present **(0)** No indication of previous occupancy

_____ **Lodge and dam building materials**

(5) Abundant 1-6" diameter woody vegetation available **(-20)** No building material present

_____ **Browsing/Grazing Impacts** **(5)** No impact or obvious presence of browsers **(-10)** Heavy browsing

_____ **Ease of Access** **(2)** Easy travel to deliver beavers and monitor **(-5)** Long hike

_____ **Existing aquatic escape cover** **(10)** Multiple deep pools (>1m deep) **(-10)** No pools

_____ **Total Score** (90 points max)

Figure 6. Methow Beaver Project Field Datasheet (Lundquist and Dolman 21).

1. Gradient			
Slope was measured using an inclinometer at 30m intervals along the length of the meadow			
10 points	**0 points**	**-10 points**	**-30 points**
< 3% Slope	4-6% Slope	7-9% Slope	≥ 9%

***2.* Stream Flow** *(omitted)*					
Estimation of stream flow calculated by averaging highest and lowest flows from two site visits. Cubic feet per second (cfs) were calculated using recommendations from Beardsley et al. (5).					
		Minimum flow (Fall)			
		Garden Hose Flow (0.1 cfs)	Fire Hose Flow (0.5 cfs)	10” Culvert Flow (2.0 cfs)	30” Culvert Flow (5.0 cfs)
Maximum flow (Spring)	Fire Hose Flow (0.5 cfs)	**1 point**	X	X	X
	10” Culvert Flow (2.0 cfs)	**3 points**	**4 points**	X	X
	30” Culvert Flow (5.0 cfs)	**4 points**	**5 points**	**10 points**	X
	Un-wadeable Flow	**1 point**	**3 points**	**2 points**	**1 point**

3. Habitat Unit Size					
Estimated linear length of the habitat location calculated with to the nearest meter (m) using Google Earth					
0 points	**1 point**	**2 points**	**3 points**	**4 points**	**5 points**
0-199m	200-549m	550-899m	900-1,249m	1,250-1609m	≥ 1,610m

4. Woody Food		
Meadows were surveyed around the perimeter and through the center to estimate available woody forage species (aspen, willow, and alder). Points are calculated by the multiplication of woody food **x** proximity **x** number of stems		
Range from	**0 points**	**18 points**
	None present	Hundreds of stems within 10m

5. Herbaceous Food		
Meadows were surveyed around the perimeter and through the center to estimate favored herbaceous food species (i.e. hydric grasses and sedges)		
Range from	**5 points**	**10 points**
	No grasses or forbs present	Aquatic and terrestrial grasses and forbs abundant

6. Floodplain Width		
Floodplain width was measured down the length of the channel and proportional size to the stream was estimated		
Range from	**0 points**	**5 points**
	Narrow “V channel	Wide stream bottom with a flood plain at least twice the width of the stream

7. Dominant Stream Substrate					
Dominant stream substrate was assessed by surveying the length of the channel					
5 points	**2 points**	**1 point**	**0 points**	**-1 points**	**-3 points**
Silt/Clay/Mud	Sand	Gravel	Cobble	Boulders	Bedrock

8. Historical Beaver Use		
Physical evidence of beaver occupancy in the channel (e.g. chewed trees, remnant dams, and lodges)		
0 points		**15 points**
No indications of previous occupancy		Old structures or evidence present
9. Lodge and Dam Building Material		
Meadows were surveyed around the perimeter and through the center to identify the presence of building materials		
Range from	**5 points**	**-20 points**
	Abundance woody vegetation available (1-6" in diameter)	No building materials present
10. Browsing and Grazing Impact		
Meadows were surveyed around the perimeter and through the center to assess current browsing and/or grazing impacts.		
Range from	**5 points**	**-10 points**
	No impact or presence of browsers or grazers	Heavy browsing and/or grazing present
11. Ease of Access		
Meadows were surveyed around the perimeter and the channel was surveyed along its length to assess ease of access for future relocation and monitoring efforts		
Range from	**2 points**	**-5 points**
	Easy to travel to deliver beavers and monitor	Long hike
12. Existing Aquatic Escape Cover		
The length of the channel was surveyed with a stadia rod to determine depth of pools		
Range from	**10 points**	**-10 points**
	Multiple pools > 1 meter deep	No pools present

Table 2. Quantitative categories from the Methow Beaver Project (MBP) scorecard used to assess potential beaver habitats (Lundquist and Dolman 5). *Total maximum points achievable is 100. With the omission of the Stream Flow category, the maximum achievable was reduced to 90 points.*

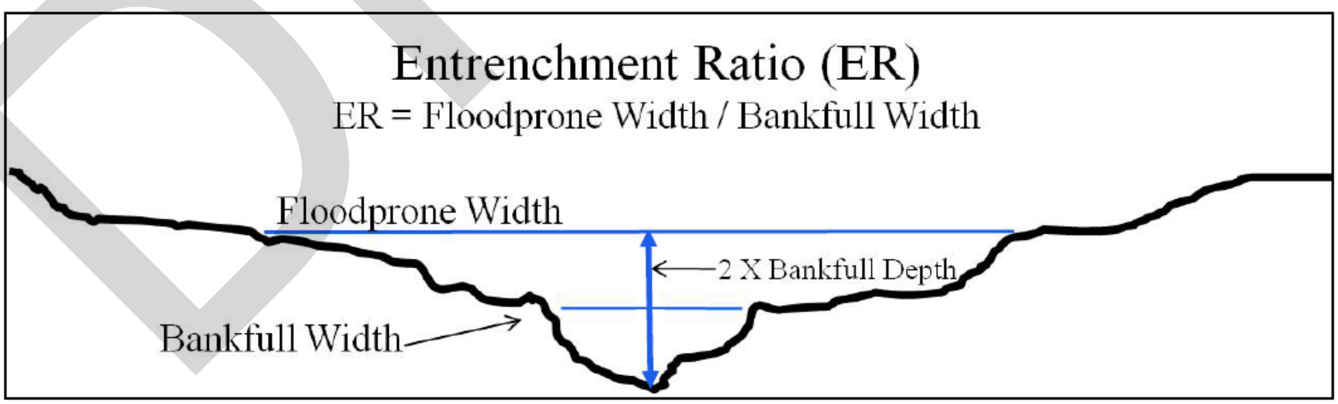

Figure 7. Entrenchment Ratio (Starr et al. 33)

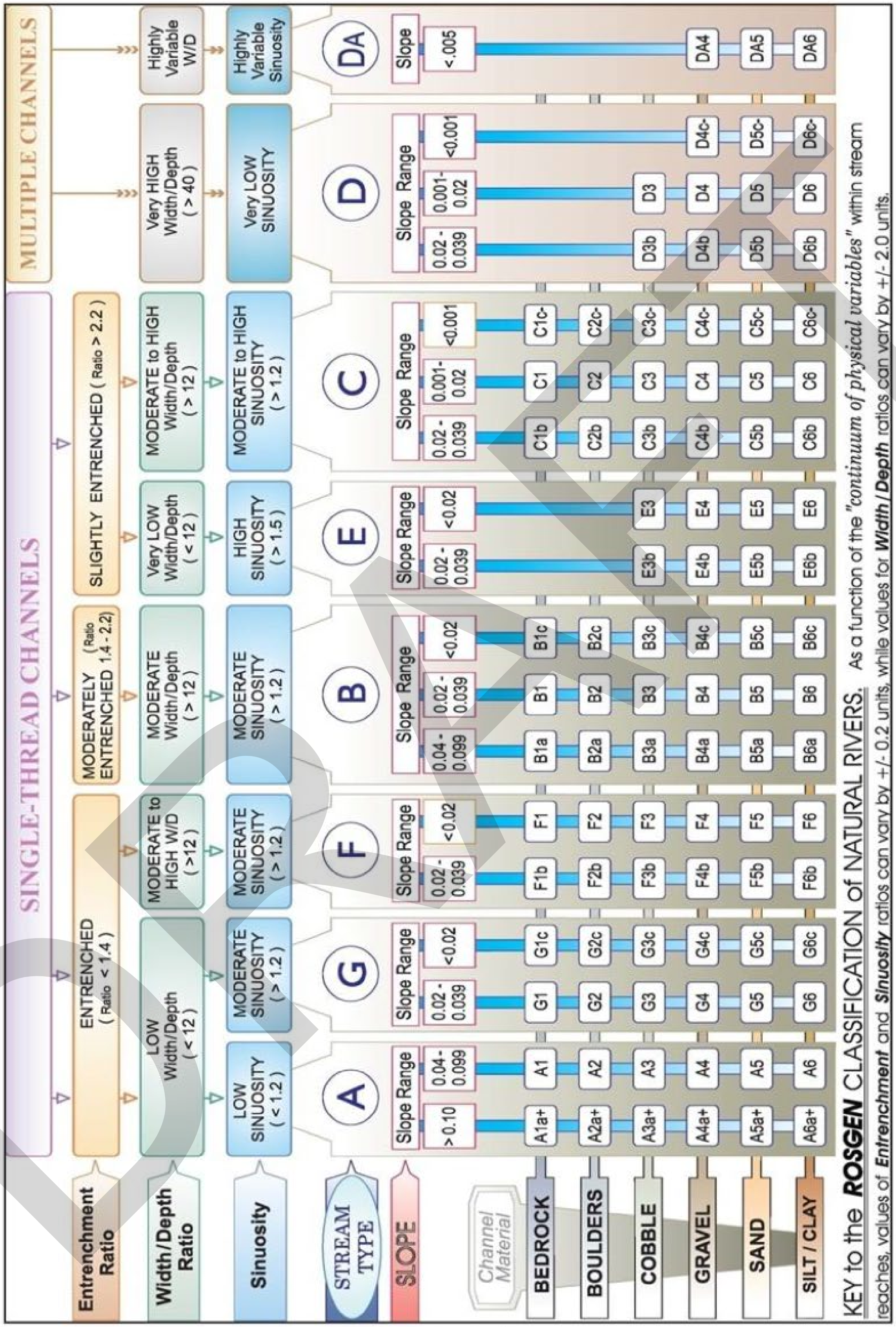

Figure 8. Key to the Rosgen Classifications of Rivers (Rosgen, 1994)

Appendix B.

Beaver Distribution in Trinity County

Date	Location	Details	Citation
5/10/1828	"Main branch of the Trinity River, not far above the mouth of the South Fork, near Burnt Ranch, Trinity County"	*" 'We crossed a creek close by the mouth 15 or 20 yards wide heading south, and emptying into the river east at an course, the current quite swift, and about belly deep to our horses. Some beavers sign discovered by men' Footnote: The camp on the night of May 9-10 was on the main branch of the Trinity River, not far above the mouth of the South fork, near Burnt Ranch, Trinity County, California. "* – Jedediah Smith, 1828	(Dale 238)
5/25/1828	Trinity river above the Klamath river, on the eastern bank	" 'We cannot find out what those Inds. Call themselves; the most of them have wampum and pieces of knives. Some have arrow points of iron; they also have some few beaver and otter skins. Mr. Smith purchases all the beaver fur he can from them.' Footnote: Smith and his party crossed the Trinity above the Klamath and encamped on the eastern bank. The Indians encountered were probably Yurok, who had no name for themselves, but only names for their individual villages." - Jedediah Smith, 1828	(Dale 247)
1991	Trinity River	2 - 12 beavers (*C. canadensis*) spotted on float surveys. See paper for exact reach locations.	(Wilson 43)
2002	South Fork Trinity River	Beavers were observed during the snorkel survey	(Garrison 5)
2008	**Near Eagle Creek Ranch***	Beaver activity reported	(DeJuilio)
2012	600 ft downstream of the Buckhorn Dam	Beaver dam noted	(Naman 8)
8/25/2016	**Upper Trinity River - near Eagle Creek***	Old beaver signs found	(DeJuilio)
8/31/2016	**Upper Trinity River - near Ripple Creek***	Old chewed willows found	(DeJuilio)
8/31/2016	**Upper Trinity River - North of Coffee Creek***	Old beaver signs found	(DeJuilio)
9/1/2016	**Upper Trinity River - upstream of Coffee Creek***	Fresh beaver signs found	(DeJuilio)
9/1/2016	**Lower Coffee Creek***	Fresh beaver signs found	(DeJuilio)
9/7/2016	Trinity River mouth / Trinity Lake	Old chewed alders and willows found	(DeJuilio)
9/8/2016	Upper Trinity River - downstream of Coffee Creek	Fresh beaver signs found	(DeJuilio)
9/12/2016	Lower Swift Creek	Old beaver signs found	(DeJuilio)
9/14/2016	Upper Trinity River - downstream of Sunflower Flat	Old beaver signs found	(DeJuilio)
9/15/2016	East Fork Trinity River	Fresh beaver signs found	(DeJuilio)
9/20/2016	Canyon Creek Lakes	Fresh beaver signs found	(DeJuilio)
9/22/2016	Canyon Creek (40.97523576, -123.0238438)	Dam and chew marks found	("GBIF")
9/26/2016	Upper Trinity River – upstream of Eagle Creek	Old beaver signs found	(DeJuilio)

9/29/2016	Lower Eagle Creek	Fresh beaver signs observed	(DeJuilio)
10/5/2016	Upper Trinity River - upstream of Sunflower Flat	First old sign scattered, mostly chewed sticks and stumps with some willow. Second signs (fresh) started appearing on both sides of stream including chewed downed tree, branches, and fresh willow.	(DeJuilio)
4/27/2017	Trinity River, Near Rush Creek (40.71764127, -122.8239837)	Beaver observed	(“GBIF”)
May 2017	**Lower Swift Creek***	Beaver reported	(DeJuilio)
6/13/2017	**Upper Trinity River – off channel pond***	Old beaver sign found	(DeJuilio)
6/13/2017	**Lower Eagle Creek***	Old beaver sign found	(DeJuilio)
7/11/2017	Goods Creek – upstream of Hayfork Creek	Old chewed stump found	(DeJuilio)
7/31/2017	**Upper Trinity River – upstream of Coffee Creek***	Freshly chewed willows found	(DeJuilio)
7/31/2017	**Upper Trinity River - downstream of Coffee Creek***	Fresh beaver sign found	(DeJuilio)
7/31/2017	**Upper Trinity River – near Eagle Creek***	Old beaver sign found	(DeJuilio)
7/31/2017	**Upper Trinity River - downstream of Alder Gulch***	Old beaver sign found	(DeJuilio)
8/1/2017	**Coffee Creek – North Fork to East Fork***	Old beaver sign found	(DeJuilio)
8/2/2017	**Upper Trinity River - downstream of Sunflower Flat***	Old beaver sign found	(DeJuilio)
8/3/2017	**Stuart Fork Mouth***	Old beaver dam found	(DeJuilio)
8/8/2017	**Upper Trinity River – upstream of Coffee Creek***	Old beaver sign from 2016 found	(DeJuilio)
8/10/2017	Hayfork Creek - downstream of Bridge Gulch	Abandoned beaver dam complex found	(DeJuilio)
8/10/2017	Hayfork Creek – downstream Staffords Crossing	Old beaver sign from 2016 found	(DeJuilio)
8/15/2017	**Lower Stuart's Fork***	Fresh sign in 2016, found abundant fresh sign, multiple bank dens, and saw 2 beavers around 1600 swimming. One was smaller (young of year?) and one was larger (adult) – adult seen swimming out of area with dens and a trail.	(DeJuilio)
8/15/2017	**East Fork Trinity River (lower)***	Old beaver sign from 2016 found	(DeJuilio)
8/17/2017	Canyon Creek – near Ripstein Campground	Old and fresh beaver sign found	(DeJuilio)
8/17/2017	Canyon Creek – downstream of Canyon City	Old and fresh beaver sign found	(DeJuilio)
8/22/2017	Canyon Creek – downstream of Ripstein CG	Old and fresh beaver signs found	(DeJuilio)
9/6/2017	S.F. Trinity River / Prospect Creek	Old and fresh beaver signs found	(DeJuilio)
9/8/2017	EFSF Trinity River – upstream of Prospect Creek	Fresh sign and old dam on a side channel on the east side of the river	(DeJuilio)
9/11/2017	Hayfork Creek – upstream of Goods Creek	Old beaver sign found	(DeJuilio)

9/12/2017	Big Creek	Old beaver sign found	(DeJuilio)
9/14/2017	S.F. Trinity River/Shell Mountain Creek	Old beaver sign found	(DeJuilio)
9/26/2017	East Fork Hayfork Creek	Old and fresh beaver sign found	(DeJuilio)
9/27/2017	Lower Swift Creek	Old beaver sign found	(DeJuilio)
9/28/2017	Union Creek	Old beaver sign found	(DeJuilio)
4/15/2018	Trinity River, South of Rush Creek (40.710495, -122.8179467)	Chew marks found	("GBIF")
8/24/2019	**Northern end of the Trinity River, North of Coffee Creek*** (41.253924, -122.623978)	Beaver observed. [Site is west of Sherer Creek]	("GBIF")
7/13/2020	**Northern end of the Trinity River, North of Coffee Creek*** (41.238706, -122.632208)	"Active lodge and underwater excavations of 'deep' water passages" – Garth Harwood. [Site is across the Trinity River from Tangle Blue Creek]	("GBIF")
8/19/2020	Trinity River near Indian Creek (40.65741333, -122.9114217)	Beaver observed	("GBIF")
9/21/2021	Trinity River near Pelletreau Creek (40.77283833, -123.32885)	Chew marks found	("GBIF")
12/8/2021	South Fork Trinity River (40.56926333, -123.4459217)	Chew marks found	("GBIF")
7/14/2022	Trinity River south of Quinby Creek (40.88624876, -123.5409111)	Chew marks found	("GBIF")
10/7/2022	Lewiston, CA near Muckawee Gulch (40.740863, -122.845529)	Chew marks found	("GBIF")
10/21/2023	Trinity River East of Big Bar (40.736532, -123.23455)	Chew marks found	("GBIF")
11/13/2023	Trinity River Near Douglas City (40.679204, -122.885352)	Beaver observed	("GBIF")

Table 3. Accounts of beaver presence in Trinity County from 1828-2023. USFS beaver survey GPS locations have been omitted to protect potentially sensitive populations. ***Located in the Upper Trinity River Watershed.**

Date	Location	Details	Citation
9/22/1936	Scott Valley, Siskiyou County	4 Shasta Beavers, *Castor subauratus shastensis* (Later reclassified as *C. canadensis),* were translocated. Colony increased to 13 by 1940. Three colonies established near the place of release on Marlahan Slough west of Fort Jones.	(Tappe 42, "Castor subauratus")
8/30/1940	Marlahan Slough, Scott Valley	3 more animals were translocated from Modoc County. Total of 16 beavers in the 3 colonies.	(Tappe 42)
10/29/1939	Little River 8 miles below Crannell in Humboldt County	5 non-native beavers, the only place non-natives were known to have been translocated in Northern California from Bridge Creek, Wheeler County, Oregon.	(Tappe 41)
7/27/1939	Rice Creek, near Lake Pillsbury, Lake County	9 California Golden beaver, *Castor canadensis subauratus*, (Later reclassified as *C. canadensis)* released. By 1940, 8 were alive.	(Tappe 51; "Castor canadensis")
8/25/1940	Rice Creek, near Lake Pillsbury, Lake County	3 more beavers released.	(Tappe 51)

Table 4. Beaver translocations in Central and Northern California by the USFS and CDFG from 1936 to 1940 (Tappe 41).

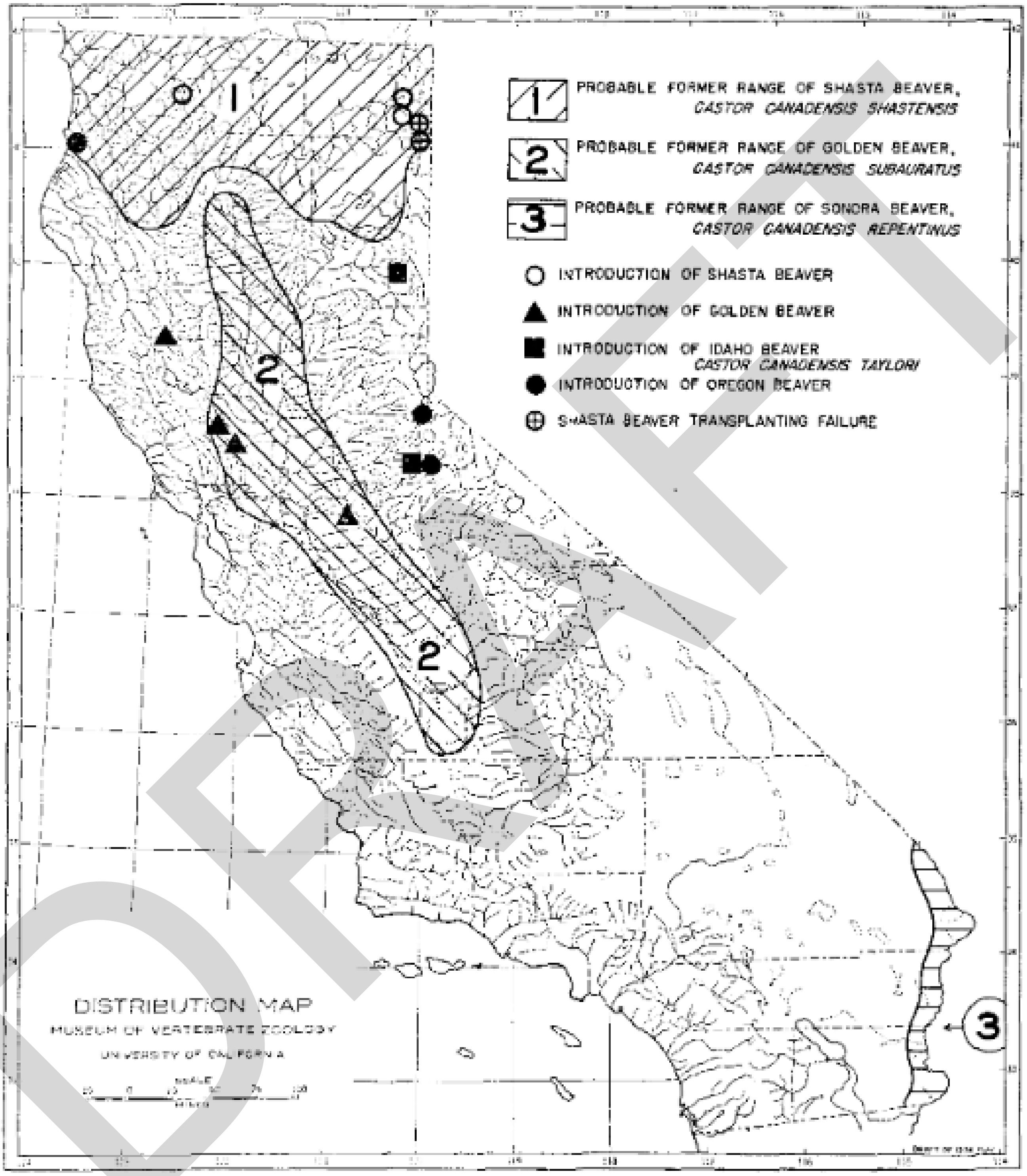

FIG. 2. Probable former range of beavers in California, with location of sites where beavers have been transplanted by governmental agencies in recent years.

Figure 9. Estimated ranges of beavers in California in 1942, with the beaver translocation sites (Tappe 7)

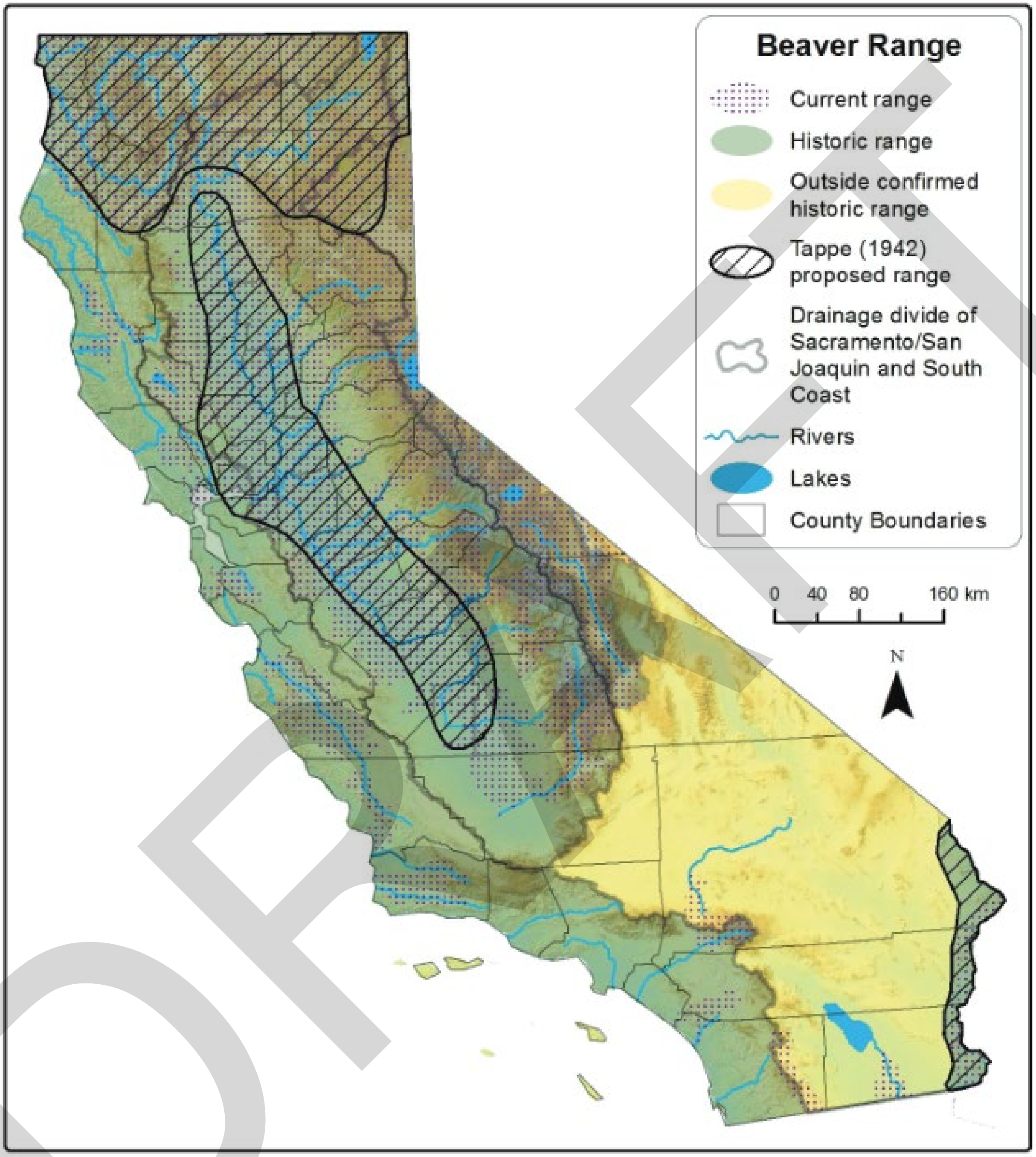

FIGURE 4.—Updated historical range map and current distribution of Castor *canadensis* in California. The current distribution was derived by combining ranges from CDFG (2005) and Asarian (2013) and conversion to 5th-field hydrologic units (watersheds) — except along the Mexican border where original CDFG polygons were retained — and removing Noyo River population in Mendocino County shown in the CDFG (2005) map, which has been extirpated; September 2013.

Figure 10. 2013 Distribution map of American Beavers in California (Lanman et al. 17)

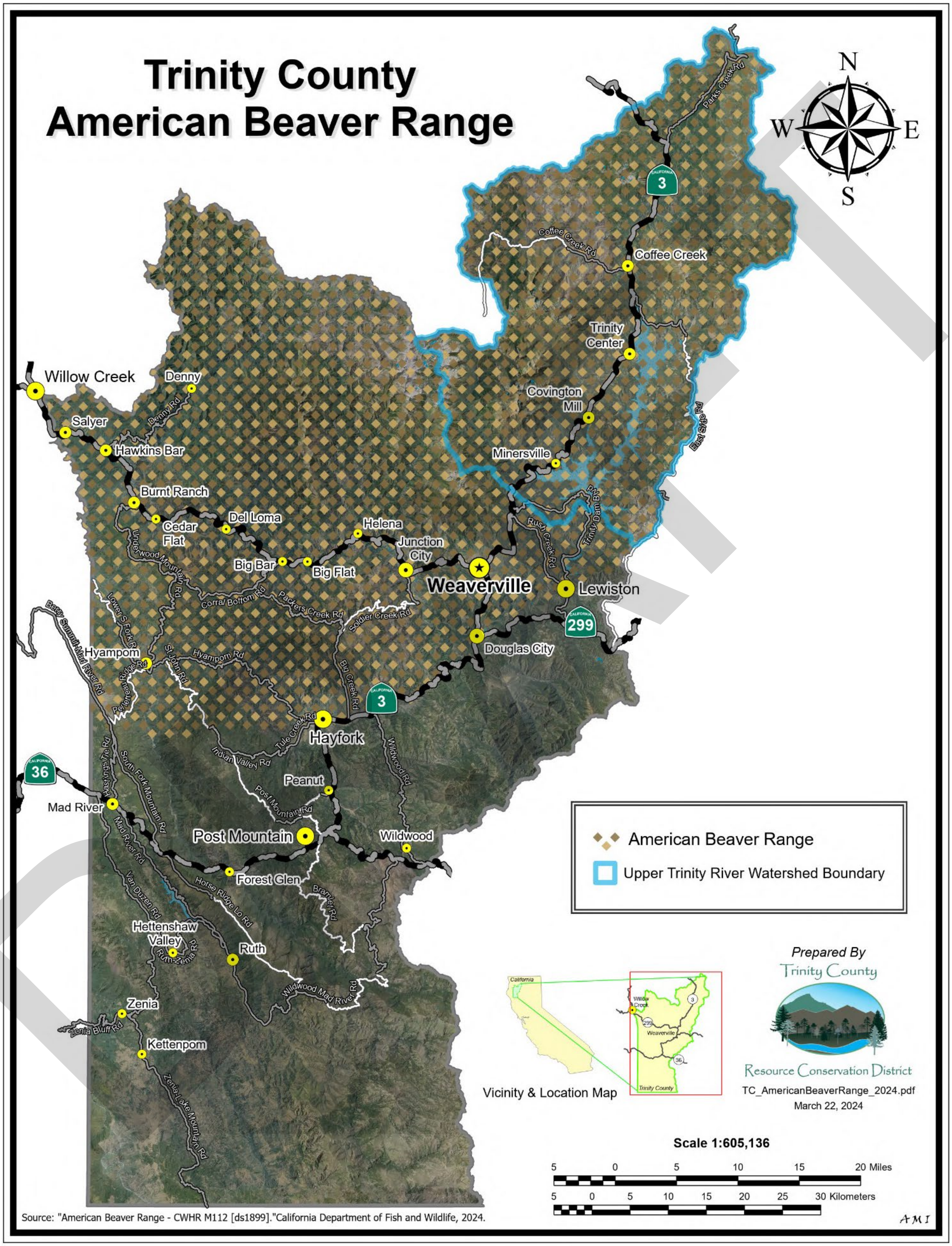

Figure 11. American Beaver Range in Trinity County, California.

Appendix C.

Site ID	Survey Length (miles)	Stream gradient (-30 - +10)	Stream Flow	Habitat Size (+1 - +5)	Food: Woody (+1 - +18)	Food: Herbs (+5 - +10)	Floodplain width (0 - +5)	Substrate (-3 - +5)	Historical Beaver Use (0-+15)	Building materials (-20 - +5)	Grazing use (-10 - +5)	Access (-5 - +2)	Escape Cover (-10 - +10)	Total -71 min, 90 max	Rosgen Stream Classification
North Branch East Fork Nelson Creek	0.5	-30	N/A	2	6	7	2	1	0	-5	5	-5	0	**13**	**A**
North Branch South Fork Hobel Creek	1.2	10	N/A	5	2	7	5	1	0	-12	5	-3	5	**15**	**B, D, & E**
East Fork Trinity River	0.9	10	N/A	2	18	8	3	0	15	0	5	0	10	**67**	**B & C**

Figure 12. Methow Beaver Scorecard and Rosgen Stream Classification Summary

Appendix D.

Stream Restoration Assessment Results

Intent and Interpretation of Results

This assessment is intended to provide land management and restoration practitioners with a coarse overview of the Upper Trinity River Watershed and identification of potential restoration sites that can be assessed further for site viability. Due to the large scale of this watershed, a majority of this assessment was conducted using geospatial modeling and datasets. Accompanying maps of restoration models and publicly available datasets used in analyses can be found in **Appendix E**. Subwatershed assessments were completed at the HUC 12 scale in order to capture higher resolution subwatershed data and provide preliminary restoration recommendations with sufficient data to support further review.

Each subwatershed assessment contains a summary of primary characteristics, fire history, notable assessment results, a summary table of Restoration Potential and Restoration Priority categories (Table 5), and the individual stream summaries based off of the BRAT assessed streams. Only perennial and intermittent streams were assessed to calculate total subwatershed capacity (Table 6), all streams referenced in assessments are perennial unless otherwise noted. Unnamed tributaries were identified numerically from the upstream to downstream end of the waterbody with nearby references points if available. Categories for Restoration Potential were assigned based on the highest percentage of stream length with the associated value, and secondary categories were assigned if a value was identified as a notable sub-category (~30% of stream, or reaches lengths totaling 300-600m less than primary category length). Secondary categories were included in order to further inform managers and practitioners of additional factors to include in analyses and decision making. Stream listings are sorted by potential and variable complexity for ease of interpretation depending the goals of the implementor, they are not ranked by quality or priority.

Examples of interpretive uses of the stream assessments:

- Goal 1: Identify sites with high existing potential for dam building (either analogue or potential translocation, 8-64 dams/mile) with limited need for vegetative adjustments that will provide the longest linear benefit of habitat length to a specific subwatershed. The funding is restricted to federal land and needs to have limited risk to infrastructure.

Example Summary Chart 1

Limitations	Potential	Feasibility	# of Models	# of Surveys		Subwatershed Scale	Length Percentile	Ownership	Risks
						Highest %			

Optional values: # of Models – values closer to 3 will provide more support for multifaceted restoration opportunities such as wet meadow restoration; # of Surveys – values closer to 3 provide more support of estimated conditions and potential with field surveys of variable types; Length Percentile – rank of stream in order of highest linear extent of high capacity in the watershed; Notes – if a site has a remarkable potential for translocation it will be annotated in the Notes, is there is any potential it will be listed in the stream summary.

Note. Categories with two colors in these examples are denoting two values that are valuable to look for when trying to meet these project specific goals, and are not a primary and secondary classification. It is important to understand when reviewing stream assessments that primary and secondary classifications are meant to guide the overarching review of the stream, and exact implementation practices will need to be reviewed further at a reach level scale.

- Goal 2: Identify sites with moderate existing potential for dam building (may be suitable for analogues currently, 2-8 dams/mile) due to geomorphology but may need extensive long-term revegetation to enhance site viability and health (potential translocation in future). The funding is restricted to Private Timberland and must be under 3 miles in stream length with limited risk to infrastructure.

Example Summary Chart 2

Limitations	Potential	Feasibility	# of Models	# of Surveys		Subwatershed Scale	Length Percentile	Ownership	Risks
							54.5 - 85.0		

Optional values: # of Models – values closer to 3 will provide more support for multifaceted restoration opportunities such as wet meadow restoration; # of Surveys – values closer to 3 provide more support of estimated conditions and potential with field surveys of variable types; Subwatershed Scale – percentage of the high capacity found in the stream out of the subwatershed as a whole.

- Goal 3: Identify sites with moderate existing potential for dam building (analogue, 2-8 dams/mile) for stream health restoration, without the future goal of translocation due to high proximity to infrastructure or high urban or agriculture land usage. The project has additional resources to make infrastructure upgrades such as road realignments or adjustments to higher flows with floodplain mitigation, the funding is restricted to Private land and must be under 1 mile in stream length.

Example Summary Chart 3

Limitations	Potential	Feasibility	# of Models	# of Surveys		Subwatershed Scale	Length Percentile	Ownership	Risks
							54.0 – 0.41		

Optional values: # of Models – values closer to 3 will provide more support for multifaceted restoration opportunities such as wet meadow restoration; # of Surveys – values closer to 3 provide more support of estimated conditions and potential with field surveys of variable types Subwatershed Scale – percentage of the high capacity found in the stream out of the subwatershed as a whole.

Restoration Potential

Limitations	Potential	Feasibility	# of Models	# of Surveys
Dam Building Possible	High Restoration Potential	Easiest – Low Hanging Fruit	Number of restoration models that identified areas within the proximity of the creek. Models assessed include; Beaver Restoration Assessment Tool (BRAT), NetMap model, and the Lost Meadow model.	Number of ground surveys that identified beaver inhabitation or restoration potential. Datasets include; USFS Beaver Surveys, TCRCD Beaver Restoration Surveys, and the CDFW Klamath Mountain Lentic Wetland Inventory (KMLWI) dataset.
Not limited by historic vegetation, slope, or existing dam building capacity	High existing dam building capacity with low departure from historic conditions	High existing dam building capacity, low departure from historic conditions, and low risk to infrastructure.		
Slope Limited	Vegetation First Priority	Straight Forward – Quick Return		
	Moderate existing dam building capacity with high departure from historic vegetative conditions	Moderate existing dam building capacity and low departure from historic conditions		
Stream Power Limited	Medium-Low Restoration Potential	Strategic – Long-Term Investment		
Slope values in excess of 23%, prohibiting dam building	Low existing dam building capacity and low departure from historic conditions	Moderate existing dam building capacity and high departure from historic conditions		
	Infrastructure Modification	NA		
	Proximity of less than 30m from infrastructure, or 100m from urban or agricultural land	Variable. No existing dam building capacity with high slope or no departure from historic conditions, or Moderate to High existing dam building capacity with proximity of less than 100m from infrastructure.		
	Other			
	Variable conditions. Often, No existing dam building capacity and no departure from historic conditions			

Restoration Priority

Subwatershed Scale	Length Percentile	Ownership	Risks
Percentage of high capacity stream length in the assessed stream out of all assessed streams in the subwatershed	95.6th - 99.5th Percentile	USFS	Negligible Risk
	Cumulative high capacity stream length is over 5 miles, and ranked across entire UT Watershed	A segment of the assessed stream is owned by the United States Forest Service	Low anthropogenic land use and streams greater than 300m from infrastructure
	85.5th – 95.5th Percentile	USFS - Wilderness	Minor Risk
	Cumulative high capacity stream length is between 3-5 miles, and ranked across entire UT Watershed	A segment of the assessed stream is owned by the United States Forest Service and is classified as Wilderness	Proximity of less than 300m from infrastructure
	54.5th – 85th Percentile	State of CA	Some Risk
	Cumulative high capacity stream length is between 1-3 miles, and ranked across entire UT Watershed	A segment of the assessed stream is owned by the State of California	Proximity of less than 100m from infrastructure
		Municipal	
		A segment of the assessed stream is owned by the local Municipality	
	54th – 0.41th Percentile	Private Timberland	Considerable Risk
	Cumulative high capacity stream length is less 1 mile, and ranked across entire UT Watershed.	A segment of the assessed stream is zoned as timberland as owned by a private entity	Proximity of less than 30m from infrastructure.
	0.4th Percentile	Private	
	High capacity stream length is zero, and ranked across entire UT Watershed.	A segment of the assessed stream is owned by a private landowner	
		3+	
		The assessed stream has 3 or more owner entities along the length of the stream	

Table 5. Restoration Potential and Priority category descriptions**.** *High capacity streams are defined as streams identified by the BRAT model as having existing dam building capacity to support between 8-64 dams per mile. Historic conditions are calculated by the BRAT model using the LANDFIRE 2014 (LF2014 L.4.0) dataset for historic vegetation that is defined as an estimate of vegetative conditions prior to Euro-American settlement. Percentile rankings included all BRAT assessed streams in the Upper Trinity River Watershed and were calculated exclusively. Ownership was categorized from TCRCD Parcel Ownership layer (Wesley "Ownership"). Limitations, Potential, Feasibility, and Risks are categories calculated by the BRAT model and can be examined further in BRAT documentation.*

Subwatersheds of the Upper Trinity River Watershed		Stream Miles			
HUC 10	HUC 12	Perennial	Intermittent	Total	Assessed
Coffee Creek	North Fork Coffee Creek	18.02	26.86	44.88	40.07
	Upper Coffee Creek	26.35	53.41	79.76	67.90
	Lower Coffee Creek	31.35	60.50	91.85	64.33
Tangle Blue Creek – Trinity River	High Camp – Trinity River	12.83	21.83	34.66	29.96
	Tangle Blue Creek	9.91	25.24	35.15	25.21
	Picayune Creek – Trinity River	23.78	32.05	55.83	42.67
	Bear Creek – Trinity River	18.07	47.52	65.60	34.82
	Eagle Creek - Trinity River	25.42	59.83	85.24	46.29
East Fork Trinity River	Mumbo Creek	11.59	15.68	27.27	15.72
	Upper East Fork Trinity River	14.80	40.66	55.46	30.55
	Middle East Fork Trinity River	14.39	26.42	40.80	19.61
	Lower East Fork Trinity River	28.61	94.98	123.59	45.23
Stuart Fork	Upper Stuart Fork	38.80	101.71	140.50	68.96
	East Fork Stuart Fork	28.63	71.98	100.61	40.97
	Lower Stuart Fork	24.25	110.54	134.79	59.80
Swift Creek – Trinity River	Swift Creek	51.60	99.00	150.60	90.22
	Buckeye Creek – Trinity River	14.25	52.71	66.96	23.22
	Bragdon Gulch – Trinity River	7.82	90.09	97.91	12.69
	Papoose Creek-Trinity River	14.74	93.00	107.74	26.68

Table 6. Stream lengths by subwatershed. *Total stream lengths calculated using perennial and intermittent stream length values from TCRCD Hydrography dataset (Wesley "Hydrography") and Assessed stream length values were calculated out of BRAT reach level assessment results.*

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Coffee Creek

North Fork Coffee Creek

The North Fork Coffee Creek subwatershed (HUC 180102110101) encompasses 15,606 acres and contains 45 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (66.17%), Shrub/Scrub (19.60%), and Herbaceous (8.58%) (Dewitz). Restoration assessments of the North Fork Coffee Creek subwatershed reviewed 40.07 miles of stream and identified three locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances between 1-5 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included; North Fork Coffee Creek (3-5 miles), Granite Creek, and Wolford Gulch (each 1-3 miles). Restoration Potential assessments identified that a majority of the streams in the subwatershed require revegetation before dam building can take place, and many sites have naturally low capacity for dam building. Restoration Priority assessments identified no diversity of ownership parcels in the USFS designated Wilderness area, resulting in an overall low risk to infrastructure. See Table 7 for Restoration Potential and Restoration Priority categorizations.

There is a notable fire history in the subwatershed, with the 2014 Coffee fire encompassing the majority of the southeast side, and the 2021 Haypress (River Complex) fire burning the majority of the acreage apart from upper tributaries to the east. At the time of this assessment the Coffee fire footprint is 10 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and is exiting the estimated timeframe for mass movement events due to reduced tensile strength of tree roots. However, the Haypress fire footprint is only 3 years old and may still be producing significant sediment from surface run-off and should be monitored for mass movement events until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management should be considered in future management decisions.

North Fork Coffee Creek Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Daley Gulch (Intermittent)					2	-		0.00%	0.4			
Granite Creek & Tributaries					3	1		19.15%	58.2			
Milk Ranch Creek (Intermittent)					3	1		0.00%	0.4			
South Fork Little Lick Creek (Intermittent)					1	-		3.11%	28.9			
Wolford Gulch & Tributaries					2	-		19.15%	57.8			
North Fork Coffee Creek & Tributaries					3	1		49.43%	85.3			
Saloon Creek & Tributaries					2	1		9.17%	40.2			
Little Lick Creek					2	-		0.00%	0.4			
Snowslide Gulch					1	-		0.00%	0.4			
Schuler Gulch					1	-		0.00%	0.4			
Lick Creek					3	1		0.00%	0.4			
Pierce Gulch (Intermittent)					2	-		0.00%	0.4			

Table 7. Restoration Potential and Priority of streams in the North Fork Coffee Creek Subwatershed

North Fork Coffee Creek Subwatershed Stream Assessments

Daley Gulch (Intermittent)
Of the 1.02 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 14.81% to 18.07% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The Lost Meadow model identified a large area spanning approximately 0.5 miles. This site provides the potential presence of wet meadow habitat that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessments.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Granite Creek & Tributaries
Of the 7.43 miles of assessed stream length, 1.17 miles (15.75%) are categorized as having high dam building capacity. Slope values of the creek range from 3.19% to 31.17% and 5.69% to 14.81% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary classifications were identified as an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost intermittent tributaries to the south. The Lost Meadow model identified a large complex in the upper ends of the creek spanning almost 1.75 linear miles and several large and small areas in the uppermost ends of the tributaries to the north and south. The CDFW Lentic Wetland Inventory dataset included a small area off the mainstem on the southern side of the creek, upstream of the Schuler Gulch confluence. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 19.15% of the high capacity restoration potential in the subwatershed, ranking in the 58.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2014 Coffee fire burned the southern branches and southern side of the creek, and the 2021 Haypress (River Complex) fire encompassed the entire creek. It is recommended that these fire footprints be considered in further restoration actions.

Milk Ranch Creek (Intermittent)
Of the 1.84 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 8.22% to 24.98% for all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an "Strategic" restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and high departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the confluence of the uppermost tributaries. The Lost Meadow model identified a large area at the downstream confluence of the upper ephemeral tributaries, and several small areas in the upper ephemeral tributaries. The CDFW Lentic Wetland Inventory dataset included several areas in the uppermost tributaries. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

South Fork Little Lick Creek (Intermittent)
Of the 0.60 miles of assessed stream length, 0.19 miles (31.67%) are categorized as having high dam building capacity. Slope values of the creek range from 11.82% to 17.79% and 11.82% to 11.82% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions have a low capacity to support dam building activities historically or with restoration efforts. Projects are considered an "Strategic" restoration opportunity due to low risk to infrastructure, low existing dam building capacity, and low departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 3.11% of the high capacity restoration potential in the subwatershed, ranking in the 28.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2014 Coffee and 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Wolford Gulch & Tributaries
Of the 4.93 miles of assessed stream length, 1.17 miles (23.73%) is categorized as high dam building capacity. Slope values of the gulch range from 4.86% to 40.61% and 4.86% to 13.99% for high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The Lost Meadow model identified several large areas in the upper tributaries, and one spanning 1 linear mile. These sites provide the potential presence of wet meadow habitat that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessments.

- **Restoration Priority:** This gulch contains 19.15% of the high capacity restoration potential in the subwatershed, ranking in the 57.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

North Fork Coffee Creek & Tributaries

Of the 11.62 miles of assessed stream length, 3.02 miles (25.99%) are categorized as having high dam building capacity. Slope values of the creek range from 1.59% to 41.49% and 1.74% to 10.46% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered “Straight Forward” due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified a large complex at the uppermost end of the creek to the west and several small areas along the mainstem, and the CDFW Lentic Wetland Inventory dataset included areas in the uppermost tributaries to the west, and uppermost ephemeral tributaries to the southwest downstream of Milk Ranch Creek. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 49.43% of the high capacity restoration potential in the subwatershed, ranking in the 85.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2014 Coffee fire burned the east side of the lower mainstem and the 2021 Haypress (River Complex) fire encompassed the entire creek. It is recommended that these fire footprints be considered in further restoration actions.

Snowslide Gulch
Of the 0.65 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the gulch range from 13.95% to 34.21% for all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. Overall, there were no restoration recommendations made for this gulch, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity that can be reviewed further. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, low departure from historic conditions, and proximity to infrastructure. The BRAT model was the only source that assessed this gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Saloon Creek & Tributaries
Of the 5.34 miles of assessed stream length, 0.56 miles (10.49%) are categorized as having high dam building capacity. Slope values of the creek range from 4.22% to 36.85% and 8.63% to 11.86% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered “Straight Forward” due to low risk, moderate existing dam building capacity, and low departure from historic conditions. The Lost Meadow model identified several areas in the uppermost tributaries and at the confluence with North Fork Coffee Creek. The CDFW Lentic Wetland Inventory dataset included a small area on the eastern side of the creek at the downstream end, and at the top of an ephemeral tributary to the northwest. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 9.17% of the high capacity restoration potential in the subwatershed, ranking in the 40.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Little Lick Creek
Of the 1.81 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 10.18% to 40.96% for all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered “Straight Forward” due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified an area in the uppermost tributary to the northeast. This site provides the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2014 Coffee and the 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Schuler Gulch
Of the 1.18 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 18.76% to 42.85% for all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. For the majority of the gulch, no restoration recommendations made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model was the only source that assessed the gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Lick Creek
Of the 2.88 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 11.48% to 35.91% for all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. However, there were unique reaches with moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost ephemeral tributaries to the east. The Lost Meadow model identified a large complex area at the upper end of the creek and several small areas in the tributary to the north. The CDFW Lentic Wetland Inventory dataset expanded and overlapped the Lost Meadow model predictions in the tributary to the north. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2014 Coffee and 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Pierce Gulch (Intermittent)

Of the 0.76 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 10.81% to 24.53% for all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For the majority of the gulch, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified several areas in the uppermost ends of the gulch. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Upper Coffee Creek

The Upper Coffee Creek subwatershed (HUC 180102110102) encompasses 28,897 acres and contains 80 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (78.02%) and Shrub/Scrub (15.02%) (Dewitz). Restoration assessments of the Upper Coffee Creek subwatershed reviewed 67.90 miles of stream and identified three locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances between 1-3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included; South Fork Coffee Creek, Union Creek. And Coffee Creek. Restoration Potential assessments identified that a majority of the streams in the subwatershed require revegetation before dam building can take place, and many sites have naturally low capacity for dam building or needs for infrastructure modification. Restoration Priority assessments identified a low diversity of ownership parcels in USFS designated Wilderness, with interspersed private parcels that may require additional effort for implementation. Overall, the majority of streams presented low risk to infrastructure. See Table 8 for Restoration Potential and Restoration Priority categorizations.

There is a notable fire history in the subwatershed of the 2021 Haypress (River Complex) fire burning the majority of the acreage apart from upper tributaries to the south. At the time of this assessment the Haypress fire footprint is 3 years old and may still be producing significant sediment from surface run-off due to decrease ground cover and should be monitored for mass movement events due to reduced tensile strength of tree roots until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management should be considered in future management decisions.

Upper Coffee Creek Subwatershed Beaver Dam Analogue Restoration Assessment — Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
North Fork Adams Creek					2	1		0.00%	0.4			
South Fork Coffee Creek & Tributaries					3	1		34.73%	71.5			
Steaveale Creek (Intermittent)					2	-		0.00%	0.4			
Hardscrabble Creek (Intermittent)					1	-		3.47%	27.4			
Hickory Creek					1	1		0.00%	0.4			
Union Creek & Tributaries					3	2		31.99%	69.6			
Adams Creek & Tributaries					3	1		0.00%	0.4			
Pin Creek (Intermittent)					2	1		6.40%	34.1			
Lady Gulch (Intermittent)					2	-		0.00%	0.4			
Deadman Gulch (Intermittent)					2	-		0.00%	0.4			
Deacon Creek (Intermittent)					2	1		0.00%	0.4			
Coffee Creek & Tributaries					3	1		23.40%	60.1			
Rocky Gulch (Intermittent)					2	-		0.00%	0.4			
Poorman Gulch (Intermittent)					1	-		0.00%	0.4			
Thompson Gulch (Intermittent)					1	-		0.00%	0.4			
Battle Creek & Tributaries					3	1		0.00%	0.4			
Crosby Gulch (Intermittent)					2	-		0.00%	0.4			
Chinkhollow Creek (Intermittent)					3	1		0.00%	0.4			
Nicholas Creek (Intermittent)					2	1		0.00%	0.4			

Table 8. Restoration Potential and Priority of streams in the Upper Coffee Creek Subwatershed

Upper Coffee Creek Subwatershed Stream Assessments

North Fork Adams Creek

Of the 1.44 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 9.88% to 24.94% for all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered as a “Straight Forward” restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified several large areas in the uppermost tributaries, and the CDFW Lentic Wetland Inventory data set included an area in the uppermost tributary to the north. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

South Fork Coffee Creek & Tributaries

Of the 9.56 miles of assessed stream length, 1.90 miles (19.87%) are categorized as having high dam building capacity. Slope values of the creek range from 2.07% to 46.56% and 3.47% to 11.29% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary classifications were identified as an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the upper ephemeral tributaries. The Lost Meadow model identified a large complex in the upper tributaries that spans over 1.5 linear miles. The CDFW Lentic Wetland Inventory dataset included several areas in the uppermost tributaries and areas to the southwest of the creek. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 34.73% of the high capacity restoration potential in the subwatershed, ranking in the 71.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Hardscrabble Creek (Intermittent)
Of the 1.95 miles of assessed stream length, 0.19 miles (9.74%) are categorized as having high dam building capacity. Slope values of the creek range from 7.43% to 27.55% and 11.00% to 11.00% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary assessments values were unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 3.47% of the high capacity restoration potential in the subwatershed, ranking in the 27.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Steaveale Creek (Intermittent)
Of the 1.67 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 7.89% to 22.01% for all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. Secondary assessments values were unclassified in feasibility due to complex factors in reaches with moderate capacity and no departure from historic conditions. The Lost Meadow model identified several small areas in the uppermost tributaries. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Hickory Creek
Of the 2.43 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 4.49% to 21.98% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with moderate capacity, low to no departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The CDFW Lentic Wetland Inventory dataset included a large area at the confluence of the uppermost ephemeral and intermittent tributaries on the eastern branch of the creek. This site provides confirmation of the presence of a wet meadow habitat that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Union Creek & Tributaries

Of the 13.63 miles of assessed stream length, 1.75 miles (12.84%) are categorized as having high dam building capacity. Slope values of the creek range from 2.15% to 37.67% and 4.93% to 9.56% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessment identified reaches with medium to low potential that may offer limited returns for restoration efforts due to low capacity for dam building and low departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries to the south and around Union Lake, and USFS beaver surveys. The Lost Meadow model identified several small areas in the upper tributaries, areas around Foster and Union Lake, an upslope area on the eastern side of the creek, and several large complexes in the uppermost tributaries to the south spanning upwards of 2.5 linear miles. The CDFW Lentic Wetland Inventory dataset included several areas from the NetMap model and additional sites in the southernmost tributary. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 31.99% of the high capacity restoration potential in the subwatershed, ranking in the 69.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek except for the uppermost ends of the tributaries to the south and should be considered in further restoration actions.

Adams Creek & Tributaries

Of the 3.14 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 4.46% to 26.62% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Projects are primarily considered as a "Straight Forward" restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the top of the uppermost intermittent tributary. The Lost Meadow model identified several large areas in the uppermost tributaries, and the CDFW Lentic Wetland Inventory dataset included an area from the NetMap model and an additional large area in the northern tributary. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Lady Gulch (Intermittent)

Of the 1.12 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 5.25% to 34.83% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this gulch were unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model near the confluence with Coffee Creek.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Pin Creek (Intermittent)

Of the 1.81 miles of assessed stream length, 0.35 miles (19.34%) are categorized as having high dam building capacity. Slope values of the creek range from 7.75% to 23.06% and 7.75% to 7.87% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered as a “Straight Forward” restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified several small areas along the creek and a large area in the upper ends of the creek, and the CDFW Lentic Wetland Inventory dataset included a small area in the uppermost ephemeral tributary to the east. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 6.40% of the high capacity restoration potential in the subwatershed, ranking in the 34.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Deadman Gulch (Intermittent)

Of the 1.85 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 9.39% to 38.97% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is identified as having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and low departure from historic conditions. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. The Lost Meadow model identified a large area that spans 1 linear mile from the middle of the gulch to the uppermost tributaries. This site provides the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely the USFS designated Wilderness. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Deacon Creek (Intermittent)

Of the 1.26 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 12.22% to 30.80% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek were unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The Lost Meadow model identified a large area in the upper ephemeral tributary to the west, and the CDFW Lentic Wetland Inventory dataset includes several areas in the uppermost ephemeral tributaries. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between the USFS and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Coffee Creek & Tributaries
Of the 14.11 miles of assessed stream length, 1.28 miles (9.07%) are categorized as having high dam building capacity. Slope values of the creek range from 0.19% to 42.09% and 1.92% to 5.45% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek were primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, proximity to infrastructure, and land use intensity. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model along the mainstem and a large complex of streams at the uppermost southern end of the creek. The Lost Meadow model identified several areas along the mainstem, in the uppermost reaches of the tributaries, and a large area spanning over 3 linear miles at the uppermost end of the creek. The CDFW Lentic Wetland Inventory dataset included the large area from the NetMap model and a small area on the south side of the creek upstream of the Deacon Creek confluence. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 23.40% of the high capacity restoration potential in the subwatershed, ranking in the 60.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Rocky Gulch (Intermittent)
Of the 1.24 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 10.15% to 31.15% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this gulch were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The Lost Meadow model identified several small areas in the uppermost tributaries to the west. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Poorman Gulch (Intermittent)
Of the 0.63 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 9.75% to 44.53% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the gulch, no restoration recommendations made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity and vegetation and infrastructure needs that can be reviewed further. Restoration opportunities in this gulch were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model was the only source that assessed the gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Crosby Gulch (Intermittent)
Of the 1.83 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 10.39% to 32.78% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the gulch, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches with medium to low potential that may offer limited returns for restoration efforts due to moderate capacity for dam building and low departure from historic conditions. Restoration opportunities in this gulch were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The Lost Meadow model identified several small areas in the uppermost tributaries to the west. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Thompson Gulch (Intermittent)
Of the 0.90 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 13.11% to 28.35% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the gulch, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this gulch were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model was the only source that assessed the gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Battle Creek & Tributaries

Of the 7.07 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 2.82% to 53.66% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches with medium to low potential that may offer limited returns for restoration efforts due to moderate capacity for dam building and no departure from historic conditions. Restoration opportunities in this creek were unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the upstream end of the creek to the south. The Lost Meadow model identified areas in the upper tributaries and a large area at the upper end of the creek spanning almost 2 linear miles. The CDFW Lentic Wetland Inventory dataset overlapped areas identified by the NetMap model in the upstream end of the creek and included additional areas in the upper tributaries. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the northern downstream half of the creek and should be considered in further restoration actions.

Nicholas Creek (Intermittent)

Of the 0.57 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 18.24% to 42.83% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model downstream of the ephemeral tributary. The CDFW Lentic Wetland Inventory dataset overlapped the same area. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Chinkhollow Creek (Intermittent)
Of the 1.68 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 11.43% to 39.22% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the upstream end of the creek to the south. The Lost Meadow model identified a large area in the uppermost tributaries to the south, the CDFW Lentic Wetland Inventory dataset overlapped areas identified by the NetMap model in the upstream end of the creek to the south and included additional smaller areas downstream. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Lower Coffee Creek

The Lower Coffee Creek subwatershed (HUC 180102110103) encompasses 30,331 acres and contains 92 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (71.74%), Shrub/Scrub (16.60%), Herbaceous (3.98%), and Developed, Open Space (3.40%) (Dewitz). Restoration assessments of the Lower Coffee Creek subwatershed reviewed 64.33 miles of stream and identified four locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances between 1-5 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included; Boulder Creek (3-5 miles), Little Boulder Creek, Coffee Creek, and Sugar Pine Creek (each 1-3 miles). Restoration Potential assessments identified that a majority of the streams in the subwatershed require revegetation before dam building can take place, and many sites have naturally low capacity for dam building. Restoration Priority assessments identified a moderate diversity of ownership parcels, with interspersed private parcels that may require additional effort for implementation. Overall, the majority of streams presented low risk to infrastructure. See Table 9 for Restoration Potential and Restoration Priority categorizations.

There is a notable fire history in the subwatershed of the 2014 Coffee fire burning the upper northwestern corner, and the 2021 Haypress (River Complex) fire burning the majority of the subwatershed apart from upper tributaries to the south. At the time of this assessment the Coffee fire footprint is 10 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and is exiting the estimated timeframe for mass movement events due to reduced tensile strength of tree roots. However, the Haypress fire footprint is only 3 years old and may still be producing significant sediment from surface run-off and should be monitored for mass movement events until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management should be considered in future management decisions.

Lower Coffee Creek Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Morrison Gulch					1	-		4.07%	38.3			Ownership: USFS out of BRAT assessment area
Little Boulder Creek & Tributaries					3	1		17.06%	72.5	3		Ownership: USFS, Private Timber, and Private
Crystal Creek (Intermittent)					1	-		1.68%	30.8			
Coffee Creek & Tributaries					3	2		19.81%	74.4	3		Ownership: USFS, Private Timber, and Private
Wagner Creek (Intermittent)					1	-		6.28%	45			
Sugar Pine Creek & Tributaries					3	1		17.15%	72.9			
Boulder Creek & Tributaries					3	1		28.03%	85.7	3		Ownership: USFS, Private Timber, and Private. High slope tributaries, second review of mainstem recommended
East Fork Coffee Creek & Tributaries					3	1		5.92%	44.5			
Benson Creek (Intermittent)					1	-		0.00%	0.4			
Slide Gulch (Intermittent)					1	-		0.00%	0.4			

Table 9. Restoration Potential and Priority of streams in the Lower Coffee Creek Subwatershed

Lower Coffee Creek Subwatershed Stream Assessments

Morrison Gulch
Of the 0.99 miles of assessed stream length, 0.46 miles (46.46%) are categorized as having high dam building capacity. Slope values of the gulch range from 9.79% to 36.29% and 9.79% to 13.20% for high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and proximity to infrastructure. The BRAT model was the only source that assessed this gulch.

- **Restoration Priority:** This gulch contains 4.07% of the high capacity restoration potential in the subwatershed, ranking in the 38.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland. Note that the USFS parcels are located outside of the BRAT model assessment area. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Little Boulder Creek & Tributaries
Of the 6.68 miles of assessed stream length, 1.93 miles (28.89%) are categorized as having high dam building capacity. Slope values of the creek range from 5.15% to 32.01% and 5.15% to 17.53% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributary to the east of Little Boulder Lake. The Lost Meadow model identified several small areas in the upper ephemeral tributaries, a large area in the uppermost tributary to the southwest, and around Little Boulder Lake. The CDFW Lentic Wetland Inventory dataset included several areas on the downstream end near the confluence with Coffee Creek. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 17.06% of the high capacity restoration potential in the subwatershed, ranking in the 72.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Crystal Creek (Intermittent)
Of the 1.14 miles of assessed stream length, 0.19 miles (16.67%) are categorized as having high dam building capacity. Slope values of the creek range from 7.37% to 34.10% and 7.37% to 7.37% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 1.68% of the high capacity restoration potential in the subwatershed, ranking in the 30.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Coffee Creek & Tributaries
Of the 11.42 miles of assessed stream length, 2.24 miles (19.61%) are categorized as having high dam building capacity. Slope values of the creek range from 0.02% to 48.37% and 0.33% to 3.36% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek and USFS beaver presence surveys. The Lost Meadow model identified several large areas distributed over the middle to downstream end of the creek, and the CDFW Lentic Wetland Inventory dataset included areas on the northside of the creek downstream of Little Boulder Creek. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 19.81% of the high capacity restoration potential in the subwatershed, ranking in the 74.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Wagner Creek (Intermittent)
Of the 2.46 miles of assessed stream length, 0.71 miles (28.86%) are categorized as having high dam building capacity. Slope values of the creek range from 11.88% to 33.55% and 11.88% to 14.69% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 6.28% of the high capacity restoration potential in the subwatershed, ranking in the 45th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Sugar Pine Creek & Tributaries
Of the 5.57 miles of assessed stream length, 1.94 miles (34.83%) are categorized as having high dam building capacity. Slope values of the creek range from 3.91% to 48.78% and 3.91% to 12.46% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary classifications were identified as an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified a large area spanning over 1.5 linear miles from the middle of the creek to the upper tributaries and around Sugar Pine Lake. The CDFW Lentic Wetland Inventory dataset included several small areas along the mainstem and upstream of Sugar Pine Lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 17.15% of the high capacity restoration potential in the subwatershed, ranking in the 72.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the middle and downstream end of the creek and should be considered in further restoration actions.

East Fork Coffee Creek & Tributaries

Of the 15.63 miles of assessed stream length, 0.67 miles (4.29%) are categorized as having high dam building capacity. Slope values of the creek range from 2.47% to 46.29% and 2.47% to 8.49% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries to the northeast and around Stoddard Lake. The Lost Meadow model identified several large complexes in the upper tributaries to the northwest, northeast, and southeast and around Stoddard and McDonald lakes. The CDFW Lentic Wetland Inventory dataset included areas in the uppermost tributaries. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 5.92% of the high capacity restoration potential in the subwatershed, ranking in the 44.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2014 Coffee fire burned the northwestern side of the creek, and the 2021 Haypress (River Complex) fire encompassed the entire creek. It is recommended that these fire footprints be considered in further restoration actions.

Boulder Creek & Tributaries

Of the 19.06 miles of assessed stream length, 3.17 miles (16.62%) are categorized as having high dam building capacity. Slope values of the creek range from 0.42% to 47.99% and 1.96% to 14.55% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. A high percentage of the assessed stream is influenced by the quantity of high slope tributaries and should be reassessed for specific project areas on the mainstem. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributaries and around Boulder Lake. The Lost Meadow model and The CDFW Lentic Wetland Inventory dataset included several areas in the upper tributaries, and around

Conway, Found, Boulder, and Tapie lakes. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 28.03% of the high capacity restoration potential in the subwatershed, ranking in the 85.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the middle and downstream end of the creek and should be considered in further restoration actions.

Benson Creek (Intermittent)
Of the 0.62 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 18.15% to 60.01% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity and infrastructure modification needs that can be reviewed further. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire creek and should be considered in further restoration actions.

Slide Gulch (Intermittent)
Of the 0.75 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the gulch range from 35.55% to 45.61% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. No restoration recommendations were made for the gulch and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed the gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire encompassed the entire gulch and should be considered in further restoration actions.

Tangle Blue Creek – Trinity River

High Camp – Trinity River

The High Camp - Trinity River subwatershed (HUC 180102110201) encompasses 15,086 acres and contains 35 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (75.01%), Shrub/Scrub (16.22%), and Barren Land (6.33%) (Dewitz). Restoration assessments of the High Camp – Trinity River subwatershed reviewed 29.96 miles of stream and identified four locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances between 1-5 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included; Deadfall Creek, the Trinity River (each 3-5 miles), Bull Creek, and Bear Creek (each with 1-3 miles). Restoration Potential assessments identified that several creeks and groupings of reaches currently have high potential for restoration, but many of the streams in the subwatershed still require revegetation before dam building can take place. Restoration Priority assessments identified a low diversity of ownership parcels for ease of implementation, and a majority of streams presented low risk to infrastructure. See Table 10 for Restoration Potential and Restoration Priority categorizations.

High Camp - Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Bull Creek					3	1		8.73%	55.4			
Deadfall Creek & Tributaries					3	1		33.13%	92.4			
Bear Creek					3	1		12.86%	66.8			
Trinity River					1	-		24.71%	86.2			
Chilcoot Creek (Intermittent)					3	1		5.77%	46.4			
High Camp Creek & Tributaries					3	1		7.09%	50.7			
Cedar Creek					2	-		5.85%	47.3			
Slide Creek					2	-		0.00%	0.4			
Nyott Creek (Intermittent)					1	-		0.00%	0.4			
Salt Lick Creek (Intermittent)					2	1		1.87%	32.2			

Table 10. Restoration Potential and Priority of streams in the High Camp – Trinity River Subwatershed

High Camp - Trinity River Subwatershed Stream Assessments

Bull Creek
Of the 2.12 miles of assessed stream length, 1.12 miles (52.83%) are categorized as having high dam building capacity. Slope values of the creek range from 6.86% to 24.84% and 6.86% to 10.67% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the middle of the creek. The Lost Meadow model that identified areas around Bull Creek and a large complex area downstream of the lake, and the Garwood Amphibian dataset included overlapped with the NetMap model. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 8.73% of the high capacity restoration potential in the subwatershed, ranking in the 55.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Bear Creek
Of the 2.82 miles of assessed stream length, 1.65 miles (58.51%) are categorized as having high dam building capacity. Slope values of the creek range from 3.39% to 27.91% and 3.93% to 9.80% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the upstream areas of the creek and uppermost ephemeral tributaries. The Lost Meadow model that identified a very large area almost spanning almost 3 linear miles from the middle to upper ends of the creek, and the Garwood Amphibian dataset included several areas south of the uppermost tributaries. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 12.86% of the high capacity restoration potential in the subwatershed, ranking in the 66.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Deadfall Creek & Tributaries
Of the 7.47 miles of assessed stream length, 4.25 miles (56.89%) are categorized as having high dam building capacity. Slope values of the creek range from 1.71% to 32.18% and 1.71% to 20.82% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model at the first confluence of the intermittent streams and upstream near the Deadfall Lakes. The Lost Meadow model that identified a very large area almost spanning almost 3 linear miles along the mainstem from the middle to the furthest of the Deadfall lakes. The Garwood Amphibian dataset included several large areas at the first confluence in the meadows, at the upper ends of the tributaries downstream of the lakes, on the mainstem downstream of the lakes, and east of the uppermost Deadfall Lake. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 33.13% of the high capacity restoration potential in the subwatershed, ranking in the 92.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a multiple, continuously connected reaches. Parcel ownership of the creek is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Chilcoot Creek (Intermittent)
Of the 1.71 miles of assessed stream length, 0.74 miles (43.27%) are categorized as having high dam building capacity. Slope values of the creek range from 4.72% to 18.51% and 4.72% to 14.06% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with moderate capacity, no departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries. The Lost Meadow model that identified a large area in the uppermost ends of the creek and a smaller area in near the middle of the creek, and the Garwood Amphibian dataset included several areas in the uppermost tributaries. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 5.77% of the high capacity restoration potential in the subwatershed, ranking in the 46.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach.

Parcel ownership of the creek is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Trinity River
Of the 4.69 miles of assessed stream length, 3.17 miles (67.59%) are categorized as having high dam building capacity. Slope values of the river range from 4.00% to 9.23% and 4.00% to 8.95% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. Secondary classifications were identified as "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model was the only source that assessed the river.

- **Restoration Priority:** This river contains 24.71% of the high capacity restoration potential in the subwatershed, ranking in the 86.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS and Private Timberland, and dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

High Camp Creek & Tributaries
Of the 5.29 miles of assessed stream length, 0.91 miles (17.20%) are categorized as having high dam building capacity. Slope values of the creek range from 0.93% to 43.55% and 0.93% to 8.79% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, or proximity to infrastructure. Secondary classifications were identified as "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries. The Lost Meadow model identified a large complex area in the uppermost end of the creek, and the Garwood Amphibian dataset included several areas in the upper tributaries as well and upslope to the west of the creek. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 7.09% of the high capacity restoration potential in the subwatershed, ranking in the 50.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Cedar Creek
Of the 3.42 miles of assessed stream length, 0.75 miles (21.93%) are categorized as having high dam building capacity. Slope values of the creek range from 10.08% to 19.55% and 10.08% to 12.86% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 100m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, or proximity to infrastructure. Secondary classifications were identified as "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model that identified several areas in the uppermost ephemeral tributaries to the southeast, and a large area spanning over 1.2 linear miles. These sites provide potential wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 5.85% of the high capacity restoration potential in the subwatershed, ranking in the 47.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, or no current dam building capacity.

Nyott Creek (Intermittent)
Of the 0.67 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 26.13% to 35.80% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. There were no restoration recommendations made for this creek, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity

Slide Creek
Of the 0.75 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 9.80% to 44.41% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The Lost Meadow model identified several small areas around Slide Lake. These sites provide potential wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity

Salt Lick Creek (Intermittent)
Of the 1.02 miles of assessed stream length, 0.24 miles (23.53%) are categorized as having high dam building capacity. Slope values of the creek range from 13.5% to 32.92% and 13.5% to 14.32% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. Overall, there were no restoration recommendations made for this creek, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities over a majority of the creek either historically or with restoration efforts. However, there were notable reaches that had high existing dam building capacity and should be reviewed further. The Lost Meadow model identified a large area in the uppermost ends of the creek and downstream at the confluence with the ephemeral tributary, and the CDFW Lentic Wetland Inventory dataset included area at the confluence of the creek and ephemeral streams. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 1.87% of the high capacity restoration potential in the subwatershed, ranking in the 32.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Tangle Blue Creek

The Tangle Blue Creek subwatershed (HUC 180102110202) encompasses 14,071 acres and contains 35 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (81.92%) and Shrub/Scrub (13.03%) (Dewitz). Restoration assessments of the Tangle Blue Creek subwatershed reviewed 25.21 miles of stream and identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances between 1-5 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Tangle Blue Creek (3-5 miles) and Scott Mountain Creek (1-3 miles). Restoration Potential assessments identified that a majority of the streams in the subwatershed require revegetation before dam building can take place, but several reach groupings that have high potential for restoration currently. Restoration Priority assessments identified a moderate diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, a majority of streams presented low risk to infrastructure. See Table 11 for Restoration Potential and Restoration Priority categorizations.

There is a nominal fire history in the subwatershed of the 2021 Haypress (River Complex) fire burning a small hillslope to the southwest above Tangle Blue Lake. At the time of this assessment the Haypress fire footprint is only 3 years old and may still be producing noticeable levels of sediment from surface run-off due to decrease ground cover and should be monitored for mass movement events due to reduced tensile strength of tree roots until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream reaches of this watershed should be considered in future management decisions to prevent deleterious effects downstream.

Tangle Blue Creek Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Trinity River					3	-		0.99%	26.5			
Horse Creek					3	1		6.95%	40.7			
Miller Gulch (Intermittent)					2	-		8.06%	43.6			
Tangle Blue Creek & Tributaries					3	1		53.10%	92.8	3		Ownership: USFS - Wilderness, Private Timber, and Private.
Miller Creek (Intermittent)					3	1		12.16%	53.5			
Scott Mountain Creek					3	1		16.38%	62.5	4		Ownership: USFS, Private Timber, Private, and State of CA.
Dan Rice Creek (Intermittent)					1	-		2.36%	31.2			

Table 11. Restoration Potential and Priority of streams in the Tangle Blue Creek Subwatershed

Tangle Blue Creek Subwatershed Stream Assessments

Dan Rice Creek (Intermittent)
Of the 1.04 miles of assessed stream length, 0.19 miles (18.27%) are categorized as having high dam building capacity. Slope values of the creek range from 9.79% to 16.09% and 12.63% to 12.63% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with moderate capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 2.36% of the high capacity restoration potential in the subwatershed, ranking in the 31.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Trinity River
Of the 0.17 miles of assessed stream length, 0.08 miles (47.06%) are categorized as having high dam building capacity. Slope values of the river range from 0.96% to 3.49% and 2.27% to 3.13% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, low departure from historic conditions, or proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the river, and the Lost Meadow model also identified a large area along the mainstem. This site provides potential wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 0.99% of the high capacity restoration potential in the subwatershed, ranking in the 26.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the river is solely Private, and dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure.

Horse Creek
Of the 1.94 miles of assessed stream length, 0.56 miles (28.87%) are categorized as having high dam building capacity. Slope values of the creek range from 0.96% to 3.49% and 2.27% to 3.13% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with moderate capacity and low departure from historic conditions. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the upper intermittent tributary. The Lost Meadow model identified larger areas in the uppermost ends of the creek to the southwest and around Log Lake, and the CDFW Lentic Wetland Inventory dataset included a large area at the southwestern upstream end of the creek. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 6.95% of the high capacity restoration potential in the subwatershed, ranking in the 40.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated as Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Miller Gulch (Intermittent)
Of the 1.31 miles of assessed stream length, 0.65 miles (49.62%) are categorized as having high dam building capacity. Slope values of the gulch range from 6.15% to 18.50% and 6.15% to 11.71% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with moderate capacity, and no departure from historic conditions. The Lost Meadow model identified a small area at the upper end of the gulch to the southwest, and the CDFW Lentic Wetland Inventorys dataset included an expanded area around the Lost Meadow output and several smaller areas on the northern and southern ends of the gulch. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessment.

- **Restoration Priority:** This gulch contains 8.06% of the high capacity restoration potential in the subwatershed, ranking in the 43.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Miller Creek & Tributaries (Intermittent)
Of the 2.62 miles of assessed stream length, 0.98 miles (37.40%) are categorized as having high dam building capacity. Slope values of the creek range from 5.11% to 24.85% and 5.11% to 9.08% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity and no departure from historic conditions. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model at the top of the uppermost tributary. The Lost Meadow model identified several areas in the uppermost tributary to the southwest, and the CDFW Lentic Wetland Inventory dataset included the area noted by the Lost Meadow model and additional area in the middle of the downstream tributary. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 12.16% of the high capacity restoration potential in the subwatershed, ranking in the 53.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Tangle Blue Creek & Tributaries

Of the 14.04 miles of assessed stream length, 4.28 miles (30.48%) are categorized as having high dam building capacity. Slope values of the creek range from 0.47% to 30.91% and 0.67% to 12.90% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem and in the upper most tributaries. The Lost Meadow model identified several small areas along the mainstem, at the upper ends of the ephemeral tributaries, and a large complex around Big Marshy Lake and Little Marshy Lake, around Mosquito Lake, and Tangle Blue Lake. The CDFW Lentic Wetland Inventory dataset included many areas identified by the Lost Meadow model and additional areas in the uppermost tributaries, upstream of Tangle Blue Lake, upstream of Marshy Lake, a large area north of Big Marshy Lake, and additional areas around Mosquito Lake. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 53.10% of the high capacity restoration potential in the subwatershed, ranking in the 92.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to stream proximity of less than 300m from infrastructure. The 2021 Haypress (River Complex) fire burned the upslope in-between the uppermost tributaries northwest of Tangle Blue Lake and should be considered in further restoration actions.

Scott Mountain Creek
Of the 4.10 miles of assessed stream length, 1.32 miles (32.20%) are categorized as having high dam building capacity. Slope values of the creek range from 4.33% to 25.00% and 4.39% to 10.38% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified a large area in the uppermost tributaries to the north, and the CDFW Lentic Wetland Inventory dataset included several large areas in the uppermost ephemeral tributaries. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 16.38% of the high capacity restoration potential in the subwatershed, ranking in the 62.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, Private, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Picayune Creek – Trinity River

The Picayune Creek - Trinity River subwatershed (HUC 180102110203) encompasses 25,370 acres and contains 56 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (87.69%) and Shrub/Scrub (9.14%) (Dewitz). Restoration assessments of the Picayune Creek – Trinity River subwatershed reviewed 42.67 miles of stream and identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Picayune Creek (5+ miles with potential for translocation) and Little Trinity River (3-5 miles). Restoration Potential assessments identified that a majority of the streams in the subwatershed require revegetation before dam building can take place, but Picayune Creek and several groupings of reaches currently have high potential for restoration. Restoration Priority assessments identified a low diversity of ownership parcels for ease of implementation, and overall a majority of streams presented low risk to infrastructure. See Table 12 for Restoration Potential and Restoration Priority categorizations.

Picayune Creek - Trinity River Subwatershed Beaver Dam Analogue Restoration Assessment	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Creek												
Picayune Creek & Tributaries					3	1		31.45%	98.1			Potential: High Restoration Potential - Translocation
Masterson Meadow Creek					3	1		6.92%	61.6			
Unnamed Tributary to the Trinity River 4 (Intermittent)					2	-		1.01%	27.9			
Little Trinity River					3	1		22.30%	91.4			
Little Picayune Creek					3	1		13.30%	78.6			
Sherer Creek & Tributaries					3	1		13.89%	80			
Robbers Meadow Creek & Tributaries					3	1		5.85%	54.9			
Trinity River					3	1		5.27%	54			
Unnamed Tributary to the Trinity River 3 (Intermittent)					1	1		0.00%	0.4			
Unnamed Tributary to the Trinity River 1 (Intermittent)					1	-		0.00%	0.4			
Unnamed Tributary to the Trinity River 2 (Intermittent)					1	-		0.00%	0.4			

Table 12. Restoration Potential and Priority of streams in the Picayune Creek – Trinity River Subwatershed

Picayune Creek - Trinity River Subwatershed Stream Assessments

Picayune Creek & Tributaries
Of the 8.42 miles of assessed stream length, 5.91 miles (70.19%) are categorized as having high dam building capacity. Slope values of the creek range from 3.96% to 29.59% and 3.95% to 10.04% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as having high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries of the creek and around Picayune Lake. The Lost Meadow model that identified over 2 linear miles of large areas in the upper reaches of the creek and around Picayune Lake, and the Garwood Amphibian dataset included several areas in the uppermost tributaries and often overlapped with the NetMap model. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 31.45% of the high capacity restoration potential in the subwatershed, ranking in the 98.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Unnamed Tributary to the Trinity River 3 (Intermittent)
Of the 1.53 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 15.88% to 28.0% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with no capacity, high slope values, or proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to moderate existing dam building capacity, and low to no departure from historic conditions. The CDFW Lentic Wetland Inventory dataset includes a small area north of the upper intermittent tributaries. This site provides the confirmed presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessment.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Unnamed Tributary to the Trinity River 4 (Intermittent)
Of the 1.36 miles of assessed stream length, 0.19 miles (13.97%) are categorized as having high dam building capacity. Slope values of the tributary range from 10.23% to 25.21% and 14.34% to 14.34% on high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with low capacity, variable departure from historic conditions, high slope values, or proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified a small area in the upper ephemeral tributary to the northwest. This site provides the potential presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessment.

- **Restoration Priority:** This tributary contains 1.01% of the high capacity restoration potential in the subwatershed, ranking in the 27.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is solely Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Masterson Meadow Creek
Of the 3.51 miles of assessed stream length, 1.30 mile (37.04%) are categorized as having high dam building capacity. Slope values of the creek range from 3.32% to 28.89% and 3.32% to 12.36% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with low capacity and variable departure from historic conditions. However, secondary assessments identified several reaches that are considered "Straight Forward" due to moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem of the creek. The Lost Meadow model identified several areas in the upper reaches of the creek and uppermost tributaries, and the CDFW Lentic Wetland Inventory dataset included several areas in the uppermost tributaries and between Masterson Meadow Creek and Little Trinity River. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 6.92% of the high capacity restoration potential in the subwatershed, ranking in the 61.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Little Trinity River
Of the 6.06 miles of assessed stream length, 4.19 miles (69.14%) are categorized as having high dam building capacity. Slope values of the river range from 5.13% to 19.05% and 5.40% to 13.42% for high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries. The Lost Meadow model identified several small areas in the uppermost tributaries to the north and one larger area in the same grouping, and the CDFW Lentic Wetland Inventory dataset included areas in the uppermost tributaries downstream of the ephemeral streams. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 22.30% of the high capacity restoration potential in the subwatershed, ranking in the 91.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Little Picayune Creek
Of the 3.74 miles of assessed stream length, 2.5 miles (66.84%) are categorized as having high dam building capacity. Slope values of the creek range from 2.87% to 33.55% and 2.87% to 13.78% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem and in the uppermost tributary. The Lost Meadow model identified almost 1.5 linear miles of large areas in the upper ends of the creek, and the CDFW Lentic Wetland Inventory dataset included two areas in the uppermost tributary and upstream end of an intermittent tributary. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 13.30% of the high capacity restoration potential in the subwatershed, ranking in the 78.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Sherer Creek & Tributaries
Of the 5.11 miles of assessed stream length, 2.61 miles (51.08%) are categorized as having high dam building capacity. Slope values of the creek range from 6.32% to 26.16% and 6.32% to 12.61% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary classifications were identified as "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the confluence of the ephemeral and intermittent streams of the northern branch of Sherer creek to the east. The Lost Meadow model identified several large areas in the upper tributaries to the east, and the CDFW Lentic Wetland Inventory dataset overlapped with the NetMap locations. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 13.89% of the high capacity restoration potential in the subwatershed, ranking in the 80th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Robbers Meadow Creek & Tributaries
Of the 4.55 miles of assessed stream length, 1.10 miles (24.18%) are categorized as having high dam building capacity. Slope values of the creek range from 4.89% to 28.58% and 4.89% to 13.47% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity and no departure from historic conditions. However, secondary assessments identified several reaches that are considered "Straight Forward" due to moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries between the cascading lakes. The Lost Meadow model identified two large area in the uppermost ends of the creek, and the CDFW Lentic Wetland Inventory dataset included an additional area between the lakes. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 5.85% of the high capacity restoration potential in the subwatershed, ranking in the 54.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Trinity River
Of the 5.76 miles of assessed stream length, 0.99 miles (17.19%) are categorized as having high dam building capacity. Slope values of the river range from 0.05% to 13.61% and 1.19% to 4.00% for high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered “Straight Forward” due to moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the river. The Lost Meadow model identified four moderately size areas dispersed along the downstream end of the river, and the CDFW Lentic Wetland Inventory dataset included several small areas at the upstream end of the river on a side channel. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 5.27% of the high capacity restoration potential in the subwatershed, ranking in the 54th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Some Risk due to proximity of less than 100m from infrastructure.

Unnamed Tributary to the Trinity River 1 (Intermittent)
Of the 1.06 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 26.59% to 42.47% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be limited by high slope values exceeding 23% for dam building. There were no restoration recommendations made for this tributary, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity

Unnamed Tributary to the Trinity River 2 (Intermittent)
Of the 1.57 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 13.0% to 38.48% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. Overall, there were no restoration recommendations made for this tributary, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity and various restoration needs that can be reviewed further. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity

Bear Creek – Trinity River

The Bear Creek - Trinity River subwatershed (HUC 180102110204) encompasses 22,201 acres and contains 66 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (78.94%) and Shrub/Scrub (14.46%) (Dewitz). Restoration assessments of the Bear Creek – Trinity River subwatershed reviewed 34.82 miles of stream and identified seven locations with distances between 1-3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. Locations with the longest distances included; North Fork Ramshorn Creek (3-5 miles), Graves Creek, and Ramshorn Creek (each 1-3 miles). Restoration Potential assessments identified that a majority of the streams in the watershed require revegetation before dam building can take place, but several groupings of reaches currently have high potential for restoration. Restoration Priority assessments identified a high diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, a majority of streams presented low risk to infrastructure. See Table 13 for Restoration Potential and Restoration Priority categorizations.

There is a nominal fire history in the subwatershed of the 2013 Little fire burning the northwest upslope of the Trinity River, the 2016 Meadow fire burning the southwestern upslope above the south branch of Graves Creek, and the 2019 Ramshorn fire burning the western upslope above the North Fork Ramshorn Creek. At the time of this assessment the 2013 Little fire footprint is 10 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and has a decreased risk of mass movement events at this age post fire, but can still be opportunistically monitored. The 2016 Meadow fire footprint is 8 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams but should be monitored for mass movement events due to reduced tensile strength of tree roots. The 2019 Ramshorn fire footprint is 5 years old and is also likely to have repaired enough groundcover but should also be monitored for mass movement events. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream reaches of this watershed should be considered in future management decisions to prevent deleterious effects downstream onto the mainstem of the Trinity River.

Bear Creek - Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
South Fork Ramshorn Creek					2	-		11.83%	67.7			
Sunflower Creek					1	-		11.90%	68.2	3		Ownership: USFS, Private Timber, and State of CA
Graves Creek & Tributaries					1	1		18.75%	81.5	3		Ownership: USFS, Private Timber, and State of CA
Unnamed Tributary to the Trinity River 2 (Intermittent)					1	1		0.00%	0.4	3		Ownership: USFS, Private Timber, and State of CA
North Fork Ramshorn Creek					2	-		23.16%	87.6			
Bear Creek					2	1		11.27%	65.4			
Trinity River					3	2		7.63%	54.5	4		Ownership: USFS, Private Timber, Private, and State of CA
Ramshorn Creek & Tributaries					3	-		15.47%	73.9			
Unnamed Tributary to the Trinity River 1 (Intermittent)					1	-		0.00%	0.4	3		Ownership: USFS, Private Timber, and State of CA

Table 13. Restoration Potential and Priority of streams in the Bear Creek – Trinity River Subwatershed

Bear Creek - Trinity River Subwatershed Stream Assessments

Graves Creek & Tributaries

Of the 4.88 miles of assessed stream length, 2.68 miles (54.92%) are categorized as having high dam building capacity. Slope values of the creek range from 3.11% to 38.88% and 3.11% to 14.4% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The CDFW Lentic Wetland Inventory data set includes a small area south of the south branch, downstream of the confluence with the upper tributaries. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** This creek contains 18.75% of the high capacity restoration potential in the subwatershed, ranking in the 81.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2016 Meadow Fire burned southwest of the south branch, below the confluence of the upper tributaries and should be considered in further restoration actions.

Sunflower Creek

Of the 2.62 miles of assessed stream length, 1.70 miles (64.89%) are categorized as having high dam building capacity. Slope values of the creek range from 4.53% to 24.63% and 6.36% to 13.93% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 11.90% of the high capacity restoration potential in the subwatershed, ranking in the 68.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

South Fork Ramshorn Creek
Of the 3.61 miles of assessed stream length, 1.69 miles (46.81%) are categorized as having high dam building capacity. Slope values of the creek range from 4.61% to 34.20% and 4.61% to 12.86% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The Lost Meadow model identified a small area in the uppermost tributary to the south. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** This creek contains 11.83% of the high capacity restoration potential in the subwatershed, ranking in the 67.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Unnamed Tributary to the Trinity River 2 (Intermittent)
Of the 1.49 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 14.35% to 24.42% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors variable capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches as a "Straight Forward" restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The CDFW Lentic Wetland Inventory data set includes several small areas and one linear area following the tributary at the uppermost end. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between the USFS, Private Timberland, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Ramshorn Creek & Tributaries
Of the 3.81 miles of assessed stream length, 2.21 miles (58.01%) are categorized as having high dam building capacity. Slope values of the creek range from 2.32% to 19.52% and 2.32% to 12.24% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model. The Lost Meadow model identified a small area near the confluence with the Trinity River. This site provides the potential presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 15.47% of the high capacity restoration potential in the subwatershed, ranking in the 73.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

North Fork Ramshorn Creek & Tributaries

Of the 6.87 miles of assessed stream length, 3.31 miles (48.18%) are categorized as having high dam building capacity. Slope values of the creek range from 4.58% to 36.0% and 4.58% to 14.75% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The Lost Meadow model identified a small area in the uppermost tributary to the south. This site provides the potential presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessment.

- **Restoration Priority:** This creek contains 23.16% of the high capacity restoration potential in the subwatershed, ranking in the 87.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2019 Ramshorn Fire burned the northwest side of the creek and should be considered in further restoration actions.

Bear Creek

Of the 4.02 miles of assessed stream length, 1.61 miles (40.05%) are categorized as having high dam building capacity. Slope values of the creek range from 5.74% to 18.8% and 5.74% to 14.23% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects were primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with moderate capacity and no departure from historic conditions. The Lost Meadow model identified several moderately sized areas in the upper mainstem, around Big Bear Lake, Little Bear Lake, and Wee Bear Lake. The CDFW Lentic Wetland Inventory data set includes a few areas south of Big Bear Lake and between Wee Bear Lake and Little Bear Lake. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessment.

- **Restoration Priority:** This creek contains 11.27% of the high capacity restoration potential in the subwatershed, ranking in the 65.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated as Wilderness. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Trinity River

Of the 6.20 miles of assessed stream length, 1.09 miles (17.58%) are categorized as having high dam building capacity. Slope values of the river range from 0.11% to 4.28% and 0.96% to 2.09% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. A unique reach was noted to have an enhanced capacity that exceeded their historic conditions, and several were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with low to no capacity, variable departure from historic conditions, or proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the river, and USFS beaver presence surveys. The Lost Meadow model also identified several large areas distributed along the mainstem. The Garwood Amphibian dataset and the NetMap model identified a large area on the east side of the river downstream of Bear River, and upstream and near the middle of an intermittent stream to the Trinity River. This stream was not evaluated by BRAT, so it was not individually assessed. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 7.63% of the high capacity restoration potential in the subwatershed, ranking in the 54.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the river is divided between the USFS, Private Timber, Private, and the State of California. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Unnamed Tributary to the Trinity River 1 (Intermittent)
Of the 1.32 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 4.29% to 48.97% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be limited by high slope values exceeding 23% for dam building. For the majority of the tributary, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between the USFS, Private Timber, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Eagle Creek – Trinity River

The Eagle Creek – Trinity River subwatershed (HUC 180102110205) encompasses 24,664 acres and contains 85 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (78.11%) and Shrub/Scrub (16.77%) (Dewitz). Restoration assessments of the Eagle Creek – Trinity River subwatershed reviewed 46.29 miles of stream and identified five locations with distances over 1 mile that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. With the longest lengths included Eagle Creek (5+ miles), the Trinity River, and Scorpion Creek (each 1-3 miles). Restoration Potential assessments identified that a many of the streams in the watershed require some level of revegetation before dam building can take place, and have varying degrees of capacity with high slope tributaries and proximity to infrastructure. Select reach groupings that have high potential for restoration currently include segments of North Fork Scorpion Creek and Minnehaha Creek. Restoration Priority assessments identified a high diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, a majority of streams presented low risk to infrastructure with few identified as having some risk. See Table 14 for Restoration Potential and Restoration Priority categorizations.

There is a nominal fire history in the subwatershed of the 2019 Eagle fire burning the northwestern hillslope above the confluence of Eagle Creek and the Trinity River, and the 2021 Haypress (River Complex) fire burning the upper high slope tributaries to the west. At the time of this assessment the 2019 Eagle fire footprint is 5 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and but should be monitored for mass movement events due to reduced tensile strength of tree roots. However, the 2021 Haypress fire footprint is only 3 years old and may still be producing significant sediment from surface run-off and should also be monitored for mass movement events until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream reaches of this watershed should be considered in future management decisions to prevent deleterious effects downstream onto the mainstem of the Trinity River.

Eagle Creek - Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
North Fork Scorpion Creek					1	-		8.54%	60.6			
Bloody Run Creek (Intermittent)					3	1		3.74%	39.8			
Trinity River					3	2		18.96%	82.9	4		Ownership: USFS, Private Timber, Private, and State of CA
Snowslide Gulch					1	-		0.00%	0.4			
Unnamed Tributary to the Trinity River					1	1		1.27%	31.7	3		Ownership: USFS, Private Timber, and Private
Ripple Creek					2	1		5.41%	49.2	3		Ownership: USFS - Wilderness, Private Timber, and Private
Minnehaha Creek & Tributaries					1	-		9.21%	63	4		Ownership: USFS - Wilderness, Private Timber, Private, and State of CA ; High slope tributaries, second review of mainstem recommended
Eagle Creek & Tributaries					3	2		35.98%	97.1			High slope tributaries, second review of mainstem recommended
Scorpion Creek & Tributaries					2	1		16.89%	79.6	3		Ownership: USFS, Private Timber, and Private ; High slope tributaries, second review of mainstem recommended
Alder Gulch					1	-		0.00%	0.4	3		Ownership: USFS - Wilderness, Private Timber, and Private

Table 14. Restoration Potential and Priority of streams in the Eagle Creek – Trinity River Subwatershed

Eagle Creek – Trinity River Subwatershed Stream Assessments

North Fork Scorpion Creek
Of the 2.07 miles of assessed stream length, 1.28 miles (61.84%) are categorized as having high dam building capacity. Slope values of the creek range from 5.11% to 30.53% and 5.11% to 19.84% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with low capacity, no departure from historic conditions. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 8.54% of the high capacity restoration potential in the subwatershed, ranking in the 60.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Bloody Run Creek (Intermittent)
Of the 1.89 miles of assessed stream length, 0.56 miles (29.63%) are categorized as having high dam building capacity. Slope values of the creek range from 5.44% to 23.05% and 5.44% to 13.03% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity and low departure from historic conditions. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem and at the confluence of the uppermost ephemeral reaches. The Lost Meadow model identified several groupings of areas in the uppermost ephemeral tributaries, and the CDFW Lentic Wetland Inventory dataset included several areas at the top of ephemeral reaches and a large area at the confluence of the upper ephemeral tributaries. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 3.74% of the high capacity restoration potential in the subwatershed, ranking in the 39.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated as Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the uppermost ephemeral tributaries to the northeast and should be considered in further restoration actions.

Trinity River
Of the 4.69 miles of assessed stream length, 2.84 miles (60.55%) are categorized as having high dam building capacity. Slope values of the river range from 0.04% to 17.89% and 0.54% to 3.49% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, low departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model, and beaver presence surveys conducted by USFS staff. The Lost Meadow model identified several large areas distributed along the mainstem, and the CDFW Lentic Wetland Inventory dataset included several large areas upstream and downstream of the confluence with Ripple Creek. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 18.96% of the high capacity restoration potential in the subwatershed, ranking in the 82.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS, Private Timberland, Private, and the State of California. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure, and secondarily as Minor Risk with stream proximity of less than 300m from infrastructure.

Ripple Creek
Of the 2.82 miles of assessed stream length, 0.81 miles (28.72%) are categorized as having high dam building capacity. Slope values of the creek range from 6.47% to 38.1% and 6.47% to 12.64% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified three small areas in the uppermost tributaries, and the CDFW Lentic Wetland Inventory dataset included an area in the uppermost tributaries at the confluence of the ephemeral tributaries. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessments

- **Restoration Priority:** This creek contains 5.41% of the high capacity restoration potential in the subwatershed, ranking in the 49.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the uppermost tributaries and should be considered in further restoration actions.

Snowslide Gulch
Of the 0.85 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 14.63% to 29.59% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable dam building capacity, no departure from historic conditions, and proximity to infrastructure. The BRAT model was the only source that assessed this gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the upper intermittent tributaries and should be considered in further restoration actions.

Minnehaha Creek & Tributaries
Of the 4.41 miles of assessed stream length, 1.38 miles (31.29%) are categorized as having high dam building capacity. Slope values of the creek range from 6.42% to 42.40% and 8.79% to 21.93% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. This high percentage of the assessed stream is influenced by the quantity of high slope tributaries and should be reassessed for specific project areas on the mainstem. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The CDFW Lentic Wetland Inventory dataset included a few small areas south of the uppermost end of the creek. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessments.

- **Restoration Priority:** This creek contains 9.21% of the high capacity restoration potential in the subwatershed, ranking in the 63th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, Private, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the several of the upper intermittent tributaries, the uppermost end of the creek, and the area southwest of the creek, and should be considered in further restoration actions.

Unnamed Tributary to the Trinity River
Of the 0.90 miles of assessed stream length, 0.19 miles (21.11%) are categorized as having high dam building capacity. Slope values of the tributary range from 6.37% to 25.69% and 6.37% to 6.37% for high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, and no departure from historic conditions. The CDFW Lentic Wetland Inventory dataset included a large area to the west of the uppermost intermittent reach. This site provides the confirmed presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessment.

- **Restoration Priority:** This tributary contains 1.27% of the high capacity restoration potential in the subwatershed, ranking in the 31.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Scorpion Creek & Tributaries
Of the 7.88 miles of assessed stream length, 2.53 miles (32.11%) are categorized as having high dam building capacity. Slope values of the creek range from 2.52% to 43.19% and 2.50% to 19.68% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. A high percentage of the assessed stream is influenced by the quantity of high slope tributaries and should be reassessed for specific project areas on the mainstem. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The Lost Meadow Model identified several small areas in the uppermost tributaries to the east, and the CDFW Lentic Wetland Inventory dataset included a small area at the top end of the southern branch of the creek. These sites provide confirmation of the presence and identify the potential of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessments.

- **Restoration Priority:** This creek contains 16.89% of the high capacity restoration potential in the subwatershed, ranking in the 79.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Eagle Creek & Tributaries

Of the 19.02 miles of assessed stream length, 5.39 miles (28.34%) are categorized as having high dam building capacity. Slope values of the creek range from 1.03% to 55.68% and 1.03% to 17.83% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. A high percentage of the assessed stream is influenced by the quantity of high slope tributaries and should be reassessed for specific project areas on the mainstem. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, low departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries of the northernmost stream, and beaver presence surveys conducted by USFS staff. The Lost Meadow model identified several areas along the mainstem, small complexes in the uppermost ephemeral tributaries to the northwest, and a large complex in the upper ends of the creek spanning almost 3 linear miles. The CDFW Lentic Wetland Inventory dataset included an area south of the creek, upstream at the top of several ephemeral stream, and in the northernmost basin of the creek. These sites provide confirmation of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 35.98% of the high capacity restoration potential in the subwatershed, ranking in the 97.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2019 Eagle fire burned an upslope area north of the confluence with the Trinity River, and the 2021 Haypress (River Complex) burned the uppermost ephemeral tributaries southwest of the creek, in the northwestern upper ephemeral tributaries and on both sides of the ridge northeast of the creek between Tangle Blue Lake. It is recommended that these fire footprints be considered in further restoration actions.

Alder Gulch
Of the 1.75 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the gulch range from 15.03% to 33.98% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments however identified unique reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and proximity to infrastructure. The BRAT model was the only source that assessed this gulch.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is divided between the USFS designated Wilderness, Private Timber, and the Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due proximity of less than 300m from infrastructure.

East Fork Trinity River

Mumbo Creek

The Mumbo Creek subwatershed (HUC 180102110301) encompasses 13,710 acres and contains 27 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (88.48%) and Shrub/Scrub (8.83%) (Dewitz). Restoration assessments of the Mumbo Creek subwatershed reviewed 15.72 miles of stream and identified Mumbo Creek to contain a majority of the high capacity stream reaches in the subwatershed, and the longest cumulative high capacity length in the Upper Trinity River Watershed as a whole, with a distance of 8.93 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues and translocation. Restoration Potential assessments identified that a majority of additional streams in the watershed require revegetation before dam building can take place. Restoration Priority assessments identified a low diversity of ownership parcels for ease of implementation, and overall a majority of streams presented low risk to infrastructure. See Table 15 for Restoration Potential and Restoration Priority categorizations.

Mumbo Creek Subwatershed
Beaver Dam Analogue
Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Mumbo Creek					3	1		87.98%	99.5			Potential: High Restoration Potential - Translocation.
Big Bear Gulch					2	-		5.32%	39.3			
Spike Buck Gulch					1	-		1.87%	27			
Little Bear Gulch					2	-		4.83%	38.8			
Unnamed Tributary to the Mumbo Creek					1	-		0.00%	0.4			

Table 15. Restoration Potential and Priority of streams in the Mumbo Creek subwatershed

Mumbo Creek Subwatershed Stream Assessments

Mumbo Creek
Of the 10.38 miles of assessed stream length, 8.93 miles (86.03%) are categorized as having high dam building capacity. Slope values of the creek range from 1.33% to 39.21% and 1.45% to 15.00% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem and in the upper tributaries near Upper Mumbo Lake and downstream of the lake. The Lost Meadow model identified several small areas along the mainstem to the north, many large areas in the upper ends of the creek, and around Mumbo Lake and Upper Mumbo Lake. The CDFW Lentic Wetland Inventory data set includes areas south of the creek downstream from the uppermost tributaries, on the north side of the creek above the tributary due east of Little Bear Gulch, and on the north and south sides of the creek between the confluence of Little Bear Gulch and Big Bear Gulch. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 87.98% of the high capacity restoration potential in the subwatershed, ranking in the 99.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Big Bear Gulch
Of the 1.42 miles of assessed stream length, 0.54 miles (38.03%) are categorized as having high dam building capacity. Slope values of the gulch range from 8.5% to 15.24% and 8.5% to 8.72% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified a small area near the confluence with Mumbo Creek. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** This gulch contains 5.32% of the high capacity restoration potential in the subwatershed, ranking in the 39.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely the USFS, and dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Spike Buck Gulch
Of the 1.84 miles of assessed stream length, 0.19 miles (10.33%) are categorized as having high dam building capacity. Slope values of the gulch range from 8.29% to 22.7% and 11.81% to 11.81% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered "Straight Forward" due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model was the only source that assessed this gulch.

- **Restoration Priority:** This gulch contains 1.87% of the high capacity restoration potential in the subwatershed, ranking in the 27th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Little Bear Gulch
Of the 1.45 miles of assessed stream length, 0.49 miles (33.79%) are categorized as having high dam building capacity. Slope values of the gulch range from 9.42% to 18.87% and 9.42% to 13.65% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with moderate capacity, no departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The Lost Meadow model identified several large areas in the uppermost ends of the gulch and ephemeral tributaries. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** This gulch contains 4.83% of the high capacity restoration potential in the subwatershed, ranking in the 38.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Unnamed Tributary to Mumbo Creek
Of the 0.63 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 15.37% to 22.13% on all reaches.

- **Restoration Potential:** Overall, the tributary was primarily assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is identified as having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and no departure from historic conditions. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with moderate dam building capacity and no departure from historic conditions. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is solely Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Upper East Fork Trinity River

The Upper East Fork Trinity River subwatershed (HUC 180102110302) encompasses 18,579 acres and contains 55 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (85.12%) and Shrub/Scrub (8.95%) (Dewitz). Restoration assessments of the Upper East Fork Trinity River subwatershed reviewed 30.55 miles of stream and identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included South Branch East Fork Trinity River and East Fork Trinity River. Restoration Potential assessments identified that a majority of the streams in the watershed require revegetation before dam building can take place, but several reach groupings that have high potential for restoration currently including South Branch East Fork Trinity River and Tamarack Creek. Restoration Priority assessments identified a low diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, a majority of streams presented low risk to infrastructure. See Table 16 for Restoration Potential and Restoration Priority categorizations.

Upper East Fork Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
South Branch East Fork Trinity River & Tributaries					3	1		22.92%	89.5			
Tamarack Creek & Tributaries					2	1		10.52%	65.8			
Baker Creek (Intermittent)					3	1		11.49%	70.1			
Unnamed Tributary to East Fork Trinity River (Intermittent)					1	-		0.00%	0.4			
West Branch Crow Creek					3	1		8.39%	61.1			
East Fork Trinity River					3	1		25.82%	90.9			
Smith Creek & Tributaries					3	1		9.36%	63.9			
Crow Creek & Tributaries					3	1		11.49%	70.6	3		Ownership: USFS, Private Timber, and Private.

Table 16. Restoration Potential and Priority of streams in the Upper East Fork Trinity River subwatershed

Upper East Fork Trinity River Subwatershed Stream Assessments

South Branch East Fork Trinity River & Tributaries
Of the 4.96 miles of assessed stream length, 3.55 miles (71.57%) are categorized as having high dam building capacity. Slope values of the creek range from 0.11% to 34.98% and 1.22% to 16.90% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries and downstream of both Twin Lakes and Tamarack Lake. The Lost Meadow model identified several small areas on the mainstem, and several sites on the downstream reaches of both Twin Lakes and Tamarack Lake. The CDFW Lentic Wetland Inventory data set confirms these downstream reaches, and includes an area west of creek that and downstream of the lakes, and between an ephemeral and intermittent stream further downstream. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 22.92% of the high capacity restoration potential in the subwatershed, ranking in the 89.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Baker Creek (Intermittent)
Of the 2.52 miles of assessed stream length, 1.78 miles (70.63%) are categorized as having high dam building capacity. Slope values of the creek range from 6.47% to 18.32% and 6.47% to 14.79% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, there were notable reaches with high existing dam building capacity and high restoration potential that should be reviewed further. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributaries. The Lost Meadow model identified several areas downstream of the upper tributaries, and the CDFW Lentic Wetland Inventory dataset included several areas in the upper tributaries, and along the west and east sides of the creek. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 11.49% of the high capacity restoration potential in the subwatershed, ranking in the 70.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach.

Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Unnamed Tributary to East Fork Trinity River (Intermittent)
Of the 1.46 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 9.94% to 21.8% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered an “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary assessments values were unclassified in feasibility due to complex factors in reaches with low capacity and no departure from historic conditions. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

West Branch Crow Creek
Of the 2.41 miles of assessed stream length, 1.30 miles (53.94%) are categorized as having high dam building capacity. Slope values of the creek range from 7.77% to 19.24% and 7.77% to 13.69% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary classifications were identified as “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries. The Lost Meadow model identified several areas in the upper ephemeral tributaries and a very large area at the upper end of the creek, and the CDFW Lentic Wetland Inventory dataset included several areas in the upper tributaries and ephemeral reaches. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 8.39% of the high capacity restoration potential in the subwatershed, ranking in the 61.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to stream proximity of less than 300m from infrastructure.

Smith Creek & Tributaries
Of the 3.14 miles of assessed stream length, 1.45 miles (46.18%) are categorized as having high dam building capacity. Slope values of the creek range from 4.71% to 21.82% and 4.71% to 9.89% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with low capacity, no departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributaries downstream of Highland Lakes and on the eastern ephemeral tributaries. The Lost Meadow model identified several small areas on the mainstem and several large areas in the upper tributaries to the south and around Highland Lakes. The CDFW Lentic Wetland Inventory dataset included several areas in the upper tributaries of the creek and on the east and west sides. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 9.36% of the high capacity restoration potential in the subwatershed, ranking in the 63.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

East Fork Trinity River
Of the 6.74 miles of assessed stream length, 4.00 miles (59.26%) are categorized as having high dam building capacity. Slope values of the river range from 1.35% to 12.21% and 1.35% to 11.11% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this river were primarily unclassified in feasibility due to complex factors in reaches with moderate land use intensity and high capacity ratings or with proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the river. The Lost Meadow model identified several small areas on the mainstem, a large area at the uppermost end of the tributary to the northeast, and several dispersed areas in the northwest and southeast upper tributaries. The CDFW Lentic Wetland Inventory dataset included a large area at the confluence of several ephemeral streams in the uppermost tributaries. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 25.82% of the high capacity restoration potential in the subwatershed, ranking in the 90.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Tamarack Creek & Tributaries

Of the 2.45 miles of assessed stream length, 1.63 miles (66.53%) are categorized as having high dam building capacity. Slope values of the creek range from 4.34% to 31.59% and 4.34% to 14.7% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek were primarily unclassified in feasibility due to complex factors in reaches with high departure from historic conditions or proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The Lost Meadow model identified several small areas in the uppermost tributaries to the northwest, and the CDFW Lentic Wetland Inventory dataset includes a small area in the uppermost tributaries at the top of an ephemeral stream. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 10.52% of the high capacity restoration potential in the subwatershed, ranking in the 65.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Crow Creek & Tributaries

Of the 6.86 miles of assessed stream length, 1.78 miles (25.91%) are categorized as having high dam building capacity. Slope values of the creek range from 3.89% to 25.69% and 3.89% to 18.26% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Secondary assessments recommend that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Notable reaches were also identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek were unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost ephemeral tributaries to the west. The Lost Meadow model identified several small areas in the uppermost reaches of intermittent and ephemeral tributaries along the mainstem, and a large area in the uppermost tributary to the east. The CDFW Lentic Wetland Inventory dataset overlaps with several of the locations previously noted, in addition to several large areas in the uppermost tributaries to the east and on the west and east sides of the creek mainstem. These sites provide confirmation of the presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 11.49% of the high capacity restoration potential in the subwatershed, ranking in the 70.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, Private. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Some Risk due to proximity of less than 100m from infrastructure.

Middle East Fork Trinity River

The Middle East Fork Trinity River subwatershed (HUC 180102110303) encompasses 12,747 acres and contains 41 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (78.22%) and Shrub/Scrub (16.40%) (Dewitz). Restoration assessments of the Middle East Fork Trinity River subwatershed reviewed 19.61 miles of stream and identified three locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 1 mile that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included East Fork Trinity River (5+ miles), Unnamed Tributary to East Fork Trinity River 2, and Pond Lily Creek (each 1-3 miles). Restoration Potential assessments identified several locations that have high potential for restoration currently, but also that many of the streams in the watershed require revegetation before dam building can take place. Restoration Priority assessments identified a low diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, a majority of streams presented low risk to infrastructure. See Table 17 for Restoration Potential and Restoration Priority categorizations.

Middle East Fork Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Unnamed Tributary to East Fork Trinity River 1					2	-		6.15%	46.9			
East Fork Trinity River					2	1		41.39%	95.7	3		Ownership: USFS, Private Timber, and Private.
Unnamed Tributary to East Fork Trinity River 2 & Tributaries					2	1		20.00%	77.7			
Grouse Creek					3	1		5.41%	44			
Pond Lily Creek & Tributaries					3	1		24.26%	84.3			
Unnamed Tributary to East Fork Trinity River 3 & Tributaries					2	1		2.79%	33.6			
Unnamed Tributary to East Fork Trinity River 4 (Intermittent)					1	-		0.00%	0.4			

Table 17. Restoration Potential and Priority of streams in the Middle East Fork Trinity River subwatershed

Middle East Fork Trinity River Subwatershed Stream Assessments

Unnamed Tributary to East Fork Trinity River 1
Of the 0.75 miles of assessed stream length, 0.75 miles (100%) are categorized as having high dam building capacity. Slope values of the tributary range from 6.05% to 11.49% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this tributary are primarily unclassified in feasibility and is presumed due to proximity of less than 100m from infrastructure. The Lost Meadow model identified several small areas in the uppermost ephemeral tributaries, outside of the BRAT assessment area, that provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat. Additional review of these locations is recommended if seeking to restore reaches of this tributary.

- **Restoration Priority:** This tributary contains 6.15% of the high capacity restoration potential in the subwatershed, ranking in the 46.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is divided between Private Timberland and Private, and dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure

East Fork Trinity River
Of the 5.32 miles of assessed stream length, 5.05 miles (94.92%) are categorized as having high dam building capacity. Slope values of the river range from 0.48% to 3.83% and 0.91% to 3.83% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the river. The CDFW Lentic Wetland Inventory dataset included a small area west of the river and south of Unnamed Tributary to East Fork Trinity River 3 & Tributaries (Perennial) these sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 41.39% of the high capacity restoration potential in the subwatershed, ranking in the 95.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS, Private Timberland, Private. However, dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Unnamed Tributary to East Fork Trinity River 2 & Tributaries
Of the 3.65 miles of assessed stream length, 2.44 miles (66.85%) are categorized as having high dam building capacity. Slope values of the tributary range from 6.83% to 28.36% and 6.83% to 14.50% on high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The Lost Meadow model and CDFW Lentic Wetland Inventory dataset both identified small areas in the uppermost tributaries of the south branch. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** This tributary contains 20.00% of the high capacity restoration potential in the subwatershed, ranking in the 77.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Pond Lily Creek & Tributaries
Of the 4.80 miles of assessed stream length, 2.96 miles (61.67%) are categorized as having high dam building capacity. Slope values of the creek range from 2.70% to 29.76% and 2.70% to 14.72% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with high slope values or proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The NetMap model identified favorable beaver habitats around Pond Lily Lake upstream of the BRAT model assessments that holds potential for habitat enhancement and increased water retention above instream restoration projects in this 1st order stream. The Lost Meadow model identified several areas in the uppermost tributaries to the south, around Pond Lily Lake, and upslope of the mainstem to the north. The CDFW Lentic Wetland Inventory dataset contained several areas west and east of Pond Lily Creek, and in the uppermost tributaries downstream of Pond Lily Lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessed reaches.

- **Restoration Priority:** This creek contains 24.26% of the high capacity restoration potential in the subwatershed, ranking in the 84.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Unnamed Tributary to East Fork Trinity River 3 & Tributaries
Of the 1.51 miles of assessed stream length, 0.34 miles (22.52%) are categorized as having high dam building capacity. Slope values of the tributary range from 11.9% to 32.47% and 12.34% to 13.36% on high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessment identified reaches with medium to low potential that may offer limited returns for restoration efforts due to low capacity for dam building and low departure from historic conditions. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with natural environmental conditions that have low capacity to support dam building activities historically or with restoration efforts. The Lost Meadow model and the CDFW Lentic Wetland Inventory dataset both identified small areas in the uppermost tributary of the south branch of the tributary. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessed reaches.

- **Restoration Priority:** This tributary contains 2.79% of the high capacity restoration potential in the subwatershed, ranking in the 33.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the tributary is solely USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Unnamed Tributary to East Fork Trinity River 4 (Intermittent)
Of the 0.89 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 18.15% to 59.00% on all reaches.

- **Restoration Potential:** Overall, the tributary was primarily assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified limitation of high slope values exceeding 23% for dam building. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions and high slope values do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with natural environmental conditions that have low capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is solely USFS. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Grouse Creek
Of the 2.68 miles of assessed stream length, 0.696 miles (24.63%) are categorized as having high dam building capacity. Slope values of the creek range from 2.82% to 31.52% and 2.82% to 14.26% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with high slope values, variable dam building capacity, and no departure from historic conditions. However, there were notable reaches with high existing dam building capacity and high restoration potential that should be reviewed further. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model around Grouse Lake and downstream of the lake. The Lost Meadow model identified a large area at the top of the creek around Grouse Lake, and the CDFW Lentic Wetland Inventory dataset included habitat downstream of the lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT identified reaches.

- **Restoration Priority:** This creek contains 5.41% of the high capacity restoration potential in the subwatershed, ranking in the 44th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Lower East Fork Trinity River

The Lower East Fork Trinity River subwatershed (HUC 180102110304) encompasses 29,297 acres and contains 124 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (54.81%), Shrub/Scrub (18.97%), and Herbaceous (18.07%) (Dewitz). Restoration assessments of the Lower East Fork Trinity River subwatershed reviewed 45.23 miles of stream and identified five locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included; Halls Gulch, Cedar Creek (each 5+ miles), Squirrel Gulch, Nelson Creek, and East Fork Trinity River (each 3-5 miles). Restoration Potential assessments identified several locations that have high potential for restoration currently, but also that many of the streams in the watershed require revegetation before dam building can take place. Restoration Priority assessments identified a low diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall a majority of streams presented low risk to infrastructure. See Table 18 for Restoration Potential and Restoration Priority categorizations.

There is notable fire history in the subwatershed of the 2018 Delta fire burning the northeastern corner. At the time of this assessment the 2018 Delta fire footprint is 6 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and but should be monitored for mass movement events due to reduced tensile strength of tree roots until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream reaches to the east and up Halls Gulch should be considered in future management decisions to prevent deleterious effects downstream onto the mainstem of East Fork Trinity River and into Trinity Lake.

Lower East Fork Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Menzel Creek/Gulch					1	-		3.52%	51.1			
Halls Gulch & Tributaries					3	1		21.26%	97.6	3		Ownership: USFS, Private Timber, and Private
Squirrel Gulch & Tributaries					3	-		13.31%	88.6	3		Ownership: USFS, Private Timber, and Private
Cabin Gulch (Intermittent)					1	-		2.14%	41.2			
Cedar Creek & Tributaries					3	-		20.54%	96.2			
Nelson Creek & Tributaries					2	1		13.12%	88.1			
East Fork Trinity River					3	3		16.71%	93.8	3		Ownership: USFS, Private Timber, and Private
Watson Creek & Tributaries					1	-		2.14%	41.7	3		Ownership: USFS, Private Timber, and Private
Fool Gulch & Tributaries					2	-		7.27%	72			
Devils Creek (Intermittent)					3	-		0.00%	0.4			
China Creek					1	-		0.00%	0.4			
Unnamed Tributary to East Fork Trinity River					1	-		0.00%	0.4			

Table 18. Restoration Potential and Priority of streams in the Lower East Fork Trinity River subwatershed

Lower East Fork Trinity River Subwatershed Stream Assessments

Menzel Creek/Gulch
Of the 1.44 miles of assessed stream length, 0.92 miles (63.89%) are categorized as having high dam building capacity. Slope values of the creek range from 8.51% to 26.76% and 8.51% to 12.30% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek, and the Lost Meadow model that identified small areas in the uppermost ephemeral tributaries that provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 3.52% of the high capacity restoration potential in the subwatershed, ranking in the 51.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Cedar Creek & Tributaries
Of the 8.28 miles of assessed stream length, 5.37 miles (64.86%) are categorized as having high dam building capacity. Slope values of the creek range from 0.01% to 33.58% and 0.01% to 11.12% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. However, secondary assessments identified several reaches needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek, and the Lost Meadow model that identified small areas in the uppermost ephemeral tributaries that provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat.

- **Restoration Priority:** This creek contains 20.54% of the high capacity restoration potential in the subwatershed, ranking in the 96.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Some Risk due to proximity of less than 100m from infrastructure.

Squirrel Gulch & Tributaries
Of the 3.87 miles of assessed stream length, 3.48 miles (89.92%) are categorized as having high dam building capacity. Slope values of the gulch range from 1.5% to 20.7% and 1.5% to 13.0% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as having high restoration potential due to its current high capacity for dam building with low departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch, and the Lost Meadow model that identified several small areas at the downstream end of the gulch that provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat. Squirrel Creek also had notable beaver habitats identified by the NetMap model, but it was not assessed by the BRAT model.
- **Restoration Priority:** This gulch contains 13.31% of the high capacity restoration potential in the subwatershed, ranking in the 88.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS, Private Timberland, Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Fool Gulch & Tributaries
Of the 4.12 miles of assessed stream length, 1.90 miles (46.12%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.98% to 43.48% and 4.98% to 13.10% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions and high slope values do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The Lost Meadow model that identified several small areas in the uppermost tributaries to the east. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This gulch contains 7.27% of the high capacity restoration potential in the subwatershed, ranking in the 72th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2018 Delta Fire burned the uppermost tributaries to the east and should be considered in further restoration actions.

Watson Creek & Tributaries
Of the 1.91 miles of assessed stream length, 0.56 miles (29.32%) are categorized as having high dam building capacity. Slope values of the creek range from 11.44% to 37.89% and 11.44% to 14.40% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions and high slope values do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity and no departure from historic conditions. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 2.14% of the high capacity restoration potential in the subwatershed, ranking in the 41.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2018 Delta Fire burned the high elevation tributaries and should be considered in further restoration actions.

Nelson Creek & Tributaries
Of the 4.51 miles of assessed stream length, 3.43 miles (76.05%) are categorized as having high dam building capacity. Slope values of the creek range from 1.5% to 37.41% and 1.55% to 14.81% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek, and beaver restoration surveys by TCRCD staff.

- **Restoration Priority:** This creek contains 13.12% of the high capacity restoration potential in the subwatershed, ranking in the 88.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to stream proximity of less than 300m from infrastructure.

Halls Gulch & Tributaries
Of the 9.17 miles of assessed stream length, 5.56 miles (60.63%) are categorized as having high dam building capacity. Slope values of the gulch range from 2.18% to 34.93% and 2.18% to 12.63% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as having high restoration potential due to its current high capacity for dam building with low to no departure from historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch, and the Lost Meadow model that identified two areas in the upper tributaries to the east and north that provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat. The CDFW Lentic Wetland Inventory dataset included three small areas on the upslope of the upstream section on the mainstem, and to the east and west of the gulch. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This gulch contains 21.26% of the high capacity restoration potential in the subwatershed, ranking in the 97.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2018 Delta Fire burned the upstream half of the gulch above the Fool Gulch tributary and should be considered in further restoration actions.

East Fork Trinity River
Of the 7.03 miles of assessed stream length, 4.37 miles (62.16%) are categorized as having high dam building capacity. Slope values of the river range from 0.04% to 6.7% for all reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. Secondary classifications were identified as “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the river, and beaver habitat surveys conducted by both USFS and TCRCD staff. The Lost Meadow model identified a large complex area downstream near the confluence with Trinity Lake, and sites within the CDFW Lentic Wetland Inventory dataset that can provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat. The CDFW Lentic Wetland Inventory dataset included several areas south of Watson Creek, on the west side of East Fork Trinity River, and north of Halls Gulch on the east side of East Fork Trinity River. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 16.71% of the high capacity restoration potential in the subwatershed, ranking in the 93.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS, Private Timberland, and Private. However, dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to stream proximity of less than 300m from infrastructure.

Cabin Gulch (Intermittent)
Of the 1.04 miles of assessed stream length, 0.56 miles (53.85%) are categorized as having high dam building capacity. Slope values of the gulch range from 6.62% to 25.74% and 6.60% to 10.66% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as having high restoration potential due to its current high capacity for dam building with low departure from historic conditions. However, secondary assessments identified reaches with medium to low potential that may offer limited returns for restoration efforts due to moderate capacity for dam building and low departure from historic conditions. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with no capacity and no departure from historic conditions. The BRAT model was the only source that assessed this gulch.

- **Restoration Priority:** This gulch contains 2.14% of the high capacity restoration potential in the subwatershed, ranking in the 41.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely the Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Devils Creek (Intermittent)
Of the 1.93 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 4.94% to 49.05% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. There were no restoration recommendations made for this creek, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model classified this creek as low capacity for dam building, but the NetMap model identified favorable beaver habitat and the Lost Meadow model identified wet meadow restoration areas around Devil's Lake at the top of the creek. This area may provide opportunities for multifaceted restoration sites to improve aquatic and terrestrial habitat and increase water retention at the source of this 1st order stream.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

China Creek
Of the 0.91 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 15.25% to 58.28% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. There were no restoration recommendations made for this creek, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2018 Delta Fire burned a segment midstream of the upper tributary and should be considered in further restoration actions.

Unnamed Tributary to East Fork Trinity River
Of the 1.01 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 18.47% to 40.38% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. Overall, there were no restoration recommendations made for this tributary, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, there were unique reaches with moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Stuart Fork

Upper Stuart Fork

The Upper Stuart Fork subwatershed (HUC 180102110401) encompasses 31,917 acres and contains 140 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (51.58%), Shrub/Scrub (29.13%), Barren Land (5.99%), Herbaceous (4.92%), and Mixed Forest (3.02%) (Dewitz). Restoration assessments of the Upper Stuart Fork subwatershed reviewed 68.96 miles of stream and identified three locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 1 mile that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Stuart Fork (5+ miles), Middle Fork Owens Creek, and Deer Creek (each 1-3 miles). Restoration Potential assessments identified that a majority of the streams in the watershed have naturally low capacity for dam building, but select creeks current have capacity for dam building (Owens Creek and Middle Fork Owens Creek) or needs for revegetation (Sunday Creek and North Fork Owens Creek). Restoration Priority assessments identified a low diversity of ownership parcels in the USFS designated Wilderness, with Sunday Creek and Stuart Fork being the only streams with Private parcels. Overall, the majority of streams presented low risk to infrastructure. See Table 19 for Restoration Potential and Restoration Priority categorizations.

There is nominal fire history in the subwatershed of the 2014 Deer fire burning the western hillslope near the confluence of Deep Creek and Stuart Fork, and the 2023 Deep fire burning the southeastern corner. At the time of this assessment the 2014 Deer fire footprint is 10 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and is exiting the estimated timeframe for mass movement events due to reduced tensile strength of tree roots. However, the Deep fire footprint is less than a year old and is highly likely to produce significant volumes of sediment from surface run-off until 2026, and is suggested to be monitored for mass movement events until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in Deep Creek, Little Deep Creek, and Sunday Creek should be considered in future management decisions to prevent deleterious effects downstream onto the mainstem Stuart Fork.

Upper Stuart Fork Subwatershed Beaver Dam Analogue Restoration Assessment — Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Owens Creek					1	-		2.54%	36.9			
Middle Fork Owens Creek					1	-		8.21%	63.5			
Sunday Creek					1	-		1.48%	32.7			
North Fork Owens Creek					1	-		5.08%	50.2			
Stuart Fork & Tributaries					3	2		47.34%	99			Potential: High Restoration Potential - Translocation
Willow Creek					2	1		0.00%	0.4			
Lightning Creek (Intermittent)					1	-		1.12%	29.3			
Deep Creek & Tributaries					3	1		5.49%	53			
Middle Creek					1	-		3.31%	42.1			
Deer Creek & Tributaries					2	1		15.53%	80.5			High slope tributaries, second review of mainstem recommended
South Fork Owens Creek					1	-		5.49%	51.6			
Bear Gulch					3	1		2.18%	35			
Little Deep Creek					2	1		1.12%	29.8			
Fire Camp Creek (Intermittent)					1	-		0.00%	0.4			
Nancy Creek & Tributaries					1	-		0.00%	0.4			
Salt Creek & Tributaries					2	1		1.12%	30.3			
Boulder Creek & Tributaries					3	1		0.00%	0.4			

Table 19. Restoration Potential and Priority of streams in the Upper Stuart Fork subwatershed

Upper Stuart Fork Subwatershed Stream Assessments

Owens Creek
Of the 0.43 miles of assessed stream length, 0.43 miles (100%) are categorized as having high dam building capacity. Slope values of the creek range from 4.55% to 7.52% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 2.54% of the high capacity restoration potential in the subwatershed, ranking in the 36.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Minor Risk due to proximity of less than 300m from infrastructure.

Middle Fork Owens Creek
Of the 2.14 miles of assessed stream length, 1.39 miles (64.95%) are categorized as having high dam building capacity. Slope values of the creek range from 2.15% to 28.42% and 2.15% to 13.49% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and stream size limitations. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 8.21% of the high capacity restoration potential in the subwatershed, ranking in the 63.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness. Dam building is primarily assessed as Minor Risk due to proximity of less than 300m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure or no current dam building capacity.

Sunday Creek
Of the 1.06 miles of assessed stream length, 0.25 miles (23.58%) are categorized as having high dam building capacity. Slope values of the creek range from 19.60% to 27.64% and 20.82% to 22.61% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 1.48% of the high capacity restoration potential in the subwatershed, ranking in the 32.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2023 Deep fire the north side of the creek and should be considered in further restoration actions.

North Fork Owens Creek
Of the 1.97 miles of assessed stream length, 0.86 miles (43.65%) are categorized as having high dam building capacity. Slope values of the creek range from 6.50% to 42.53% and 6.50% to 13.83% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 5.08% of the high capacity restoration potential in the subwatershed, ranking in the 50.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure or no current dam building capacity, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure.

Stuart Fork & Tributaries
Of the 17.5 miles of assessed stream length, 8.02 miles (45.83%) are categorized as having high dam building capacity. Slope values of the river range from 0.52% to 54.89% and 0.52% to 14.59% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches as high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model throughout the mainstem, in a large area in Morris Meadows, around Sapphire Lake, and USFS beaver presence surveys. The Lost Meadow model identified several areas on the mainstem, around Mirror, Sapphire, and Emerald lakes, downstream of the lakes, and a very large complex in Morris Meadows. The CDFW Lentic Wetland Inventory dataset included a large site upstream of Morris Meadows. sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 47.34% of the high capacity restoration potential in the subwatershed, ranking in the 99th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2014 Deer fire burned a small ridgeline on the eastern upslope above the confluence with Deep River, and the 2023 Deep fire burned upslope on the east side of the river. It is recommended that these fire footprints be considered in further restoration actions.

Willow Creek
Of the 1.32 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 14.04% to 22.11% on all reaches.

- **Restoration Potential:** Overall, the creek was primarily assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and no departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with moderate dam building capacity and no departure from historic conditions. The Lost Meadow model identified a large area in the upper ends of the creek, and several small areas to the south. The CDFW Lentic Wetland Inventory dataset included a small area in the uppermost tributaries to the west. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Lightning Creek (Intermittent)
Of the 0.57 miles of assessed stream length, 0.19 miles (33.33%) are categorized as having high dam building capacity. Slope values of the creek range from 21.73% to 47.53% and 21.73% to 21.73% on high capacity reaches

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. No restoration recommendations were made for the creek and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. There was a unique reach with moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 1.12% of the high capacity restoration potential in the subwatershed, ranking in the 29.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2023 Deep fire burned the upper half of the tributary and should be considered in further restoration actions.

Deep Creek & Tributaries
Of the 8.71 miles of assessed stream length, 0.93 miles (10.68%) are categorized as having high dam building capacity. Slope values of the creek range from 8.54% to 49.98% and 8.75% to 15.04% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessment identified reaches with medium to low potential that may offer limited returns for restoration efforts due to low capacity for dam building and low departure from historic conditions. Unique reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. Unique reaches were noted to have moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributaries to the east. The Lost Meadow model identified several large complexes in the upper tributaries spanning over 1.5 linear miles, and around Echo Lake. The CDFW Lentic Wetland Inventory dataset included several complexes in the upper tributaries, and downstream of Echo Lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 5.49% of the high capacity restoration potential in the subwatershed, ranking in the 53th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2014 Deer fire burned a small ridgeline to the west of the downstream end of the creek, and the 2023 Deep fire burned the lower half of the creek. It is recommended that these fire footprints be considered in further restoration actions.

South Fork Owens Creek
Of the 2.75 miles of assessed stream length, 0.93 miles (33.82%) are categorized as having high dam building capacity. Slope values of the creek range from 8.44% to 32.72% and 8.44% to 15.37% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered “Straight Forward” due to low risk, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 5.49% of the high capacity restoration potential in the subwatershed, ranking in the 51.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as

Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Middle Creek
Of the 1.05 miles of assessed stream length, 0.56 miles (53.33%) are categorized as having high dam building capacity. Slope values of the creek range from 12.82% to 46.01% and 12.82% to 17.85% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 3.31% of the high capacity restoration potential in the subwatershed, ranking in the 42.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Negligible Risk due to proximity of less than 100m from infrastructure or no current dam building capacity.

Deer Creek & Tributaries
Of the 13.61 miles of assessed stream length, 2.63 miles (19.32%) are categorized as having high dam building capacity. Slope values of the creek range from 1.88% to 55.37% and 3.67% to 11.90% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. This high percentage of the assessed stream is influenced by the quantity of high slope tributaries and should be reassessed for specific project areas on the mainstem. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributaries to the northeast, northwest, and around Deer and Round lakes. The Lost Meadow model identified several large complex areas on the northern branch spanning over 1 linear mile, areas on the mainstem spanning over 2.5 linear miles, areas around Luella, Round, and Deer lakes, and downstream of the lakes. The CDFW Lentic Wetland Inventory dataset included a large complex area Round Lake, downstream of the lake, and in the northeastern upper tributaries. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 15.53% of the high capacity restoration potential in the subwatershed, ranking in the 80.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Bear Gulch
Of the 2.87 miles of assessed stream length, 0.37 miles (12.89%) are categorized as having high dam building capacity. Slope values of the gulch range from 1.20% to 54.00% and 1.20% to 5.21% for high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the gulch, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments identified reaches with medium to low potential that may offer limited returns for restoration efforts due to low capacity for dam building and no departure from historic conditions. Unique reaches were noted to have high existing dam building capacity and vegetation needs that can be reviewed further. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and stream size limitations. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream confluence with Stuart Fork. The Lost Meadow model that identified a large area at the confluence with Stuart Fork, several small areas downstream of the upper tributaries, and around Morris and Smith lakes. The CDFW Lentic Wetland Inventory dataset included a small area north of the confluence with Stuart Fork. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This gulch contains 2.18% of the high capacity restoration potential in the subwatershed, ranking in the 35th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Little Deep Creek
Of the 2.44 miles of assessed stream length, 0.19 miles (7.79%) are categorized as having high dam building capacity. Slope values of the creek range from 18.18% to 44.15% and 18.18% to 18.18% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. No restoration recommendations were made for the creek and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Unique reaches were noted to have moderate to high existing dam building capacity and vegetation needs that can be reviewed further. The Lost Meadow model and CDFW Lentic Wetland Inventorys dataset included an area at the top of the uppermost tributaries to the east. This site provides confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 1.12% of the high capacity restoration potential in the subwatershed, ranking in the 29.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as

Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2023 Deep fire burned the lower half of the tributary and the edges of the uppermost tributaries to the north and south, and should be considered in further restoration actions.

Fire Camp Creek (Intermittent)

Of the 0.50 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 22.19% to 45.39% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. No restoration recommendations were made for the creek and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. A unique reach was noted to have moderate existing dam building capacity and vegetation needs that can be reviewed further. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2023 Deep fire burned the upper half of the tributary and should be considered in further restoration actions.

Nancy Creek & Tributaries

Of the 1.93 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 21.57% to 51.89% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. No restoration recommendations were made for the creek and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Salt Creek & Tributaries

Of the 3.80 miles of assessed stream length, 0.19 miles (5.00%) are categorized as having high dam building capacity. Slope values of the creek range from 15.73% to 42.78% and 16.55% to 16.55% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The Lost Meadow model identified several moderately sized areas along the mainstem, around Diamond Lake, and a large area downstream of the lake. The CDFW Lentic Wetland Inventory dataset included a large area downstream of Diamond Lake to the east. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 1.12% of the high capacity restoration potential in the subwatershed, ranking in the 30.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Boulder Creek & Tributaries
Of the 6.31 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 3.10% to 49.66% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For a majority of the stream, no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Unique reaches were noted to have moderate existing dam building capacity and vegetation needs that can be reviewed further. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model upstream and downstream of Alpine Lake. The Lost Meadow model and CDFW Lentic Wetland Inventorys dataset included a small area in the uppermost tributaries to the southwest, around Alpine Lake, and downstream of the lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

East Fork Stuart Fork

The East Fork Stuart Fork subwatershed (HUC 180102110402) encompasses 20,981 acres and contains 101 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (71.27%), Shrub/Scrub (13.92%), Developed, Open Space (5.65%), Barren Land (1.63%), and Herbaceous (2.32%) (Dewitz). Restoration assessments of the East Fork Stuart Fork subwatershed reviewed 40.97 miles of stream and identified three locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Hobel Creek, East Fork Stuart Fork, (each 5+ miles), and Strope Creek (3-5 miles and potential for translocation). Restoration Potential assessments identified several locations that have high potential for restoration currently (Hobel Creek, Bowerman Gulch, and Strope Creek), and a few streams that require revegetation before dam building can take place. Restoration Priority assessments identified a moderate diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, a majority of streams presented low risk to infrastructure, but select locations had higher risks (Greenhorn Gulch). See Table 20 for Restoration Potential and Restoration Priority categorizations.

East Fork Stuart Fork Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Hobel Creek & Tributaries					3	1		24.69%	98.5			
Bowerman Gulch					2	-		6.24%	64.4			
Greenhorn Gulch & Tributaries					2	-		9.84%	77.2	4		Ownership: USFS, Private, Municipal, and State of CA
North Fork Davis Creek					1	-		4.63%	55.9			
Unnamed Intermittent Tributary to Trinity Lake					2	-		1.90%	37.4			
Strope Creek & Tributaries					2	1		17.87%	93.3	3		Potential: High Restoration Potential - Translocation; Ownership: USFS, Private, and State of CA
East Fork Stuart Fork & Tributaries					3	1		18.90%	95.2	4		Ownership: USFS - Wilderness, Private Timber, Private, and State of CA
Davis Creek & Tributaries					3	1		11.58%	82.4			
Sheep Corral Creek					3	1		3.56%	49.7			
Long Canyon					2	1		0.79%	28.4			

Table 20. Restoration Potential and Priority of streams in the East Fork Stuart Fork subwatershed

East Fork Stuart Fork Subwatershed Stream Assessments

Hobel Creek & Tributaries

Of the 6.84 miles of assessed stream length, 5.97 miles (87.28%) are categorized as having high dam building capacity. Slope values of the creek range from 0.67% to 34.75% and 0.67% to 14.24% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek, and beaver restoration surveys by TCRCD staff. The Lost Meadow model that identified several areas on the northside of the mainstem, and 2 larger areas in the uppermost tributaries to the north. These sites provide the potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 24.69% of the high capacity restoration potential in the subwatershed, ranking in the 98.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure or no current dam building capacity.

Bowerman Gulch

Of the 1.69 miles of assessed stream length, 1.51 miles (89.35%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.30% to 14.11% and 4.51% to 14.11% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 6.24% of the high capacity restoration potential in the subwatershed, ranking in the 64.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk due to proximity of more than 300m from infrastructure or no current dam building capacity.

Greenhorn Gulch & Tributaries
Of the 2.79 miles of assessed stream length, 2.38 miles (85.30%) are categorized as having high dam building capacity. Slope values of the gulch range from 3.48% to 20.14% and 3.48% to 20.14% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is identified as having high restoration potential with the sub priority of translocation due to its current high capacity for dam building and low to no departure from historic conditions. Reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 9.84% of the high capacity restoration potential in the subwatershed, ranking in the 77.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS, Municipal, the State of California, and Private. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure, and secondarily as Considerable Risk due to proximity of less than 30m from infrastructure.

North Fork Davis Creek
Of the 1.59 miles of assessed stream length, 1.12 miles (70.44%) are categorized as having high dam building capacity. Slope values of the creek range from 9.10% to 21.34% and 10.40% to 14.24% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 4.63% of the high capacity restoration potential in the subwatershed, ranking in the 55.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Unnamed Tributary to Trinity Lake (Intermittent)
Of the 0.83 miles of assessed stream length, 0.46 miles (55.42%) are categorized as having high dam building capacity. Slope values of the tributary range from 6.06% to 13.39% and 1.04% to 13.39% for high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. A notable reach was identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the tributary.

- **Restoration Priority:** This tributary contains 1.90% of the high capacity restoration potential in the subwatershed, ranking in the 37.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Some Risk due to stream proximity of less than 100m from infrastructure.

Strope Creek & Tributaries

Of the 5.5 miles of assessed stream length, 4.32 miles (78.55%) are categorized as having high dam building capacity. Slope values of the creek range from 3.56% to 35.79% and 3.56% to 12.11% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. The creek is primarily identified as having high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Garwood Amphibian dataset included an area upslope and north of the upper tributaries. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 17.87% of the high capacity restoration potential in the subwatershed, ranking in the 93.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS, the State of California, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 100m from infrastructure.

Davis Creek & Tributaries

Of the 6.42 miles of assessed stream length, 2.80 miles (43.61%) are categorized as having high dam building capacity. Slope values of the creek range from 1.63% to 41.82% and 1.63% to 13.42% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. A unique reach was noted to have an enhanced capacity that exceeded their historic conditions. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model near the confluence with Hobel Creek. The Lost Meadow model that identified several areas near the confluences with North Fork Davis Creek and Hobel Creek, and in the uppermost tributaries to the northwest. The CDFW Lentic Wetland Inventory dataset included the area near the confluence with Hobel Creek and several additional small areas in the upper tributaries to the west. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 11.58% of the high capacity restoration potential in the subwatershed, ranking in the 82.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to stream proximity of less than 300m from infrastructure.

East Fork Stuart Fork & Tributaries

Of the 9.42 miles of assessed stream length, 4.57 miles (48.51%) are categorized as having high dam building capacity. Slope values of the river range from 0.92% to 66.86% and 2.48% to 14.33% for high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This river is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem upstream of Trinity Lake. The Lost Meadow model that identified several large areas in the upper tributaries and around Lake Anna. The CDFW Lentic Wetland Inventory dataset included an area at the confluence with Hobel Creek, around Lake Anna, and Billy Be Damn Lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 18.90% of the high capacity restoration potential in the subwatershed, ranking in the 95.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS designated Wilderness, Private Timberland, the

State of California, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Sheep Corral Creek
Of the 3.44 miles of assessed stream length, 0.86 miles (25.00%) are categorized as having high dam building capacity. Slope values of the creek range from 9.32% to 39.66% and 9.32% to 13.80% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the upper tributaries to the west. The Lost Meadow model that identified a large area in the uppermost tributaries to the northwest, and the CDFW Lentic Wetland Inventory dataset included areas in the NetMap footprint to the west. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 3.56% of the high capacity restoration potential in the subwatershed, ranking in the 49.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Long Canyon
Of the 2.45 miles of assessed stream length, 0.19 miles (7.76%) are categorized as having high dam building capacity. Slope values of the creek range from 10.35% to 56.47% and 13.7% to 13.71% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For the majority of the creek, no restoration recommendations were made and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Secondary assessments identified reaches with medium to low potential that may offer limited returns for restoration efforts due to low capacity for dam building and no departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. The Lost Meadow model that identified a large area in the upper end of the creek spanning over 1.5 linear miles, and the CDFW Lentic Wetland Inventory dataset included a large area downstream of the uppermost ephemeral tributaries to the west. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 0.79% of the high capacity restoration potential in the subwatershed, ranking in the 28.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Lower Stuart Fork

The Lower Stuart Fork subwatershed (HUC 180102110403) encompasses 35,365 acres and contains 135 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (65.57%), Shrub/Scrub (11.92%), Developed, Open Space (6.93%), and Mixed Forest (2.38%) (Dewitz). Restoration assessments of the Lower Stuart Fork subwatershed reviewed 59.80 miles of stream and identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Buckeye Creek (5+ miles, and potential for translocation) and Stuart Fork (3-5 miles). Haylock Gulch and Smith Gulch were also identified for notably viable potential for translocation. Restoration Potential assessments identified several locations that have high potential for restoration currently, but also that many of the streams in the watershed require revegetation before dam building can take place. Restoration Priority assessments identified a moderate diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, the majority of streams presented low risk to infrastructure, but select reaches presented some risk. See Table 21 for Restoration Potential and Restoration Priority categorizations.

There is a nominal fire history in the subwatershed of the 2023 Mule fire burning a small upper tributary at the top of Snowslide Gulch. At the time of this assessment the Mule fire is 1 year old and has a high likelihood of producing noticeable levels of sediment from surface run-off due to decrease ground cover and should be monitored for mass movement events due to reduced tensile strength of tree roots until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream reaches Snowslide Gulch should be considered in future management decisions to prevent deleterious effects downstream into Mule Creek and Trinity Lake.

Lower Stuart Fork Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Irish Gulch (Intermittent)					2	-		5.27%	69.1			
Buckeye Creek & Tributaries					3	-		16.40%	96.6			Potential: High Restoration Potential - Translocation.
Digger Creek					2	-		2.44%	48.8			
Stuart Fork & Tributaries					3	1		12.84%	91.9	3		Ownership: USFS - Wilderness, Private Timber, and Private.
Haylock Gulch (Intermittent)					2	-		2.84%	52.6			Potential: High Restoration Potential - Translocation ; Ownership: Private Timber out of BRAT assessment area
Sawmill Creek					1	-		0.00%	0.4			
Unnamed Tributary to Trinity Lake 1 - Little Mule Creek (Intermittent)					1	-		0.00%	0.4			
Smith Gulch (Intermittent)					2	-		3.96%	62			Potential: High Restoration Potential - Translocation.
Cummings Creek					2	-		3.45%	56.3			
Whitney Gulch & Tributaries					2	1		9.15%	84.8			
Unnamed Tributary to Trinity Lake 2 (Intermittent)					1	-		0.00%	0.4			
Little Mule Creek					1	-		6.95%	75.8			
Slate Creek & Tributaries					2	-		6.83%	74.8	3		Ownership: USFS - Wilderness, Private Timber, and State of CA.
Unnamed Tributary to Trinity Lake 3 - Haylock Gulch (Intermittent)					1	-		0.00%	0.4			
Mule Creek & Tributaries					3	1		8.05%	81	3		Ownership: USFS - Wilderness, Private Timber, and Private.
Elk Gulch					1	-		2.23%	45.9	3		Ownership: USFS, Private Timber, and Private.
Stoney Creek & Tributaries					3	1		7.68%	79.1			
Van Matre Creek & Tributaries					1	1		7.10%	76.7			
Trinity Alps Creek & Tributaries					2	1		2.38%	47.8			
Snowslide Gulch					2	-		2.44%	48.3			

Table 21. Restoration Potential and Priority of streams in the Lower Stuart Fork subwatershed

Lower Stuart Fork Subwatershed Stream Assessments

Irish Gulch (Intermittent)
Of the 1.91 miles of assessed stream length, 1.73 miles (90.58%) are categorized as having high dam building capacity. Slope values of the gulch range from 3.90% to 11.74% and 7.16% to 11.74% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 5.27% of the high capacity restoration potential in the subwatershed, ranking in the 69.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely the USFS, and dam building is primarily assessed as Negligible Risk due to proximity of more than 300m from infrastructure.

Buckeye Creek & Tributaries
Of the 5.71 miles of assessed stream length, 5.38 miles (94.22%) are categorized as having high dam building capacity. Slope values of the creek range from 0.01% to 11.65% and 2.21% to 11.65% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified a small area in the uppermost tributaries to the west. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 16.40% of the high capacity restoration potential in the subwatershed, ranking in the 96.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 100m from infrastructure.

Digger Creek
Of the 0.80 miles of assessed stream length, 0.80 miles (100%) are categorized as having high dam building capacity. Slope values of the creek range from 3.90% to 5.68% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with high capacity, low departure from historic conditions, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the creek.

- **Restoration Priority:** This creek contains 2.44% of the high capacity restoration potential in the subwatershed, ranking in the 48.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure.

Haylock Gulch (Intermittent)

Of the 1.12 miles of assessed stream length, 0.93 miles (83.04%) are categorized as having high dam building capacity. Slope values of the gulch range from 3.65% to 8.35% and 5.34% to 8.35% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is identified as having high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, low departure from historic conditions, proximity to infrastructure, and land usage. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 2.84% of the high capacity restoration potential in the subwatershed, ranking in the 52.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland. Note that the Private Timberland parcels are located outside of the BRAT model assessment area. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Stuart Fork & Tributaries

Of the 6.91 miles of assessed stream length, 4.21 miles (60.93%) are categorized as having high dam building capacity. Slope values of the river range from 0.21% to 44.70% and 0.21% to 13.78% on high capacity reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This river is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the river, and USFS beaver presence surveys. The Lost Meadow model identified a small area downstream of the confluence with Sawmill Creek. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This river contains 12.84% of the high capacity restoration potential in the subwatershed, ranking in the 91.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the river is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Some Risk due to proximity of less than 100m from infrastructure.

Smith Gulch (Intermittent)

Of the 1.51 miles of assessed stream length, 1.30 miles (89.09%) are categorized as having high dam building capacity. Slope values of the gulch range from 2.33% to 10.26% and 2.33% to 10.26% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches as high potential for translocation of beavers due to high stream capacity to support habitat complexes, and low to no departure from historic conditions. Projects are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 3.96% of the high capacity restoration potential in the subwatershed, ranking in the 62th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Cummings Creek

Of the 1.79 miles of assessed stream length, 1.13 miles (63.13%) are categorized as having high dam building capacity. Slope values of the creek range from 7.29% to 58.41% and 7.29% to 21.93% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek.

- **Restoration Priority:** This creek contains 3.45% of the high capacity restoration potential in the subwatershed, ranking in the 56.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timber. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Sawmill Creek
Of the 0.86 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 16.30% to 25.67%.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are primarily considered as a "Straight Forward" restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Unnamed Tributary to Trinity Lake 2 (Intermittent)
Of the 0.48 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 11.58% to 20.57% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with moderate capacity, variable departure from historic conditions, proximity to infrastructure, and land use intensity. The BRAT model was the only source that assessed the tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is solely the USFS, and dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Unnamed Tributary to Trinity Lake 1 – Little Mule Creek (Intermittent)
Of the 0.36 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 13.41% to 19.35% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with moderate capacity and no departure from historic conditions. However, secondary assessments identified a reach that is considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model was the only source that assessed the tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between the USFS and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Little Mule Creek

Of the 2.67 miles of assessed stream length, 2.28 miles (85.39%) are categorized as having high dam building capacity. Slope values of the creek range from 3.99% to 17.56% and 3.99% to 13.21% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Notable reaches were also identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 6.95% of the high capacity restoration potential in the subwatershed, ranking in the 75.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, and secondarily as Minor Risk due to stream proximity of less than 300m.

Whitney Gulch & Tributaries

Of the 3.62 miles of assessed stream length, 3.00 miles (82.87%) are categorized as having high dam building capacity. Slope values of the gulch range from 3.885 to 20.54% and 3.88% to 16.71% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, proximity to infrastructure, and land use intensity. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch. The CDFW Lentic Wetland Inventory dataset included an area above the uppermost intermittent tributaries to the south. This site provides the confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This gulch contains 9.15% of the high capacity restoration potential in the subwatershed, ranking in the 84.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach.

Parcel ownership of the gulch is divided between the USFS and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure or no current dam building capacity, and secondarily as Some Risk due to stream proximity of less than 100m.

Slate Creek & Tributaries
Of the 4.16 miles of assessed stream length, 2.24 miles (53.85%) are categorized as having high dam building capacity. Slope values of the creek range from 3.26% to 30.54% and 3.99% to 13.82% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek.

- **Restoration Priority:** This creek contains 6.83% of the high capacity restoration potential in the subwatershed, ranking in the 74.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and the State of California. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Unnamed Tributary to Trinity Lake 3 – Haylock Gulch (Intermittent)
Of the 0.27 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the tributary range from 18.38% to 30.82% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Projects are primarily considered “Straight Forward” due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. The BRAT model was the only source that assessed the tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Mule Creek & Tributaries

Of the 5.39 miles of assessed stream length, 2.64 miles (48.98%) are categorized as having high dam building capacity. Slope values of the creek range from 1.74% to 60.31% and 1.74% to 14.61% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the downstream end of the creek and around the confluence with Snowslide Gulch. The Lost Meadow model identified a large area downstream of the confluence with Snowslide Gulch, and in the uppermost tributaries to the northwest. The CDFW Lentic Wetland Inventory dataset included a small area downstream of the confluence with Snowslide Gulch on the northern side of the creek. These sites provide the confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 8.05% of the high capacity restoration potential in the subwatershed, ranking in the 81th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Elk Gulch

Of the 2.67 miles of assessed stream length, 0.73 miles (27.34%) are categorized as having high dam building capacity. Slope values of the gulch range from 11.66% to 43.09% and 11.66% to 14.61% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. The BRAT model was the only source that assessed the gulch.

- **Restoration Priority:** This gulch contains 2.23% of the high capacity restoration potential in the subwatershed, ranking in the 45.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS, Private Timberland and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Stoney Creek & Tributaries
Of the 7.55 miles of assessed stream length, 2.52 miles (33.38%) are categorized as having high dam building capacity. Slope values of the creek range from 2.68% to 57.23% and 2.68% to 16.87% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the downstream end of the creek. The Lost Meadow model identified a large area in the uppermost tributaries to the north, and the CDFW Lentic Wetland Inventory dataset included an area in the uppermost tributaries to the northwest. These sites provide the confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 7.68% of the high capacity restoration potential in the subwatershed, ranking in the 79.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Van Matre Creek & Tributaries
Of the 4.67 miles of assessed stream length, 2.33 miles (49.89%) are categorized as having high dam building capacity. Slope values of the creek range from 4.38% to 40.03% and 4.38% to 22.54% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The CDFW Lentic Wetland Inventory dataset included an area in the uppermost tributaries to the southwest. This site provides the confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 7.10% of the high capacity restoration potential in the subwatershed, ranking in the 76.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Trinity Alps Creek & Tributaries
Of the 4.97 miles of assessed stream length, 0.78 miles (15.69%) are categorized as having high dam building capacity. Slope values of the creek range from 9.00% to 40.04% and 9.00% to 14.41% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. For a majority of the stream, no restoration recommendations were made, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The Lost Meadow model identified several small areas in the uppermost tributaries to the north, and a small area on the mainstem. The CDFW Lentic Wetland Inventory dataset included a small area to the northwest of the mainstem in the upper tributaries, and off an intermittent tributary. These sites provide the confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 2.38% of the high capacity restoration potential in the subwatershed, ranking in the 47.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Snowslide Gulch
Of the 2.38 miles of assessed stream length, 0.80 miles (33.61%) are categorized as having high dam building capacity. Slope values of the gulch range from 1.65% to 38.05% and 1.65% to 11.51% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. However, secondary assessments identified reaches that are suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For a majority of the stream, no restoration recommendations were made, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, in addition to other select reaches that were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the end near the confluence with Mule Gulch.

- **Restoration Priority:** This gulch contains 2.44% of the high capacity restoration potential in the subwatershed, ranking in the 48.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2023 Mule fire burned a small area upslope of the northern tributaries and should be considered in further restoration actions.

Swift Creek – Trinity River

Swift Creek

The Swift Creek subwatershed (HUC 180102110501) encompasses 36,047 acres and contains 151 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (58.90%), Shrub/Scrub (27.63%), Developed, Open Space (4.55%), Barren Land (2.98%), and Herbaceous (2.09%) (Dewitz). Restoration assessments of the Swift Creek subwatershed reviewed 90.22 miles of stream identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included North Fork Swift Creek and Swift Creek. Restoration Potential assessments identified that a majority of the streams in the watershed require revegetation before dam building can take place, and many sites with naturally low capacity for dam building or needs for infrastructure modifications. Restoration Priority assessments identified a moderate diversity of ownership parcels with interspersed private parcels that may require additional effort for implementation. Overall, the majority of streams presented low risk to infrastructure, but select reaches presented some risk. See Table 22 for Restoration Potential and Restoration Priority categorizations.

There is a notable fire history in the subwatershed of the 2021 Haypress (River Complex) fire burning the northern corner. At the time of this assessment the Haypress fire footprint is only 3 years old and may still be producing noticeable levels of sediment from surface run-off due to decrease ground cover and should be monitored for mass movement events due to reduced tensile strength of tree roots until year 10 post fire. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream end of Swift Creek should be considered in future management decisions to prevent deleterious effects further downstream.

Swift Creek Subwatershed
Beaver Dam Analogue
Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Gratten Creek & Tributaries					3	-		7.20%	71			
Deadhorse Creek (Intermittent)					1	-		1.79%	37.9			
Pansy Gulch (Intermittent)					2	-		3.62%	52.1			
West Branch North Fork Swift Creek & Tributaries					3	1		8.83%	75.3			
Foster Creek & Tributaries					3	1		7.93%	73.4	3		Ownership: USFS, Private Timber, and Private.
Bear Creek & Tributaries					3	1		6.34%	66.3			
Cement Creek & Tributaries					2	1		10.85%	81.9			
Lick Creek & Tributaries					3	-		4.55%	57.3			
Star Creek (Intermittent)					2	-		0.16%	26			
Landers Creek					3	1		0.00%	0.4			
Sunrise Creek (Intermittent)					3	-		0.00%	0.4			
Parker Creek & Tributaries					2	1		0.00%	0.4			
Rancheria Creek & Tributaries					3	1		11.40%	83.8			
Parry Gulch					3	-		1.36%	34.5			
North Fork Swift Creek & Tributaries					3	1		17.04%	94.3			
Granite Creek & Tributaries					3	1		1.63%	36.4			
Steer Creek (Intermittent)					2	1		0.00%	0.4			
Swift Creek & Tributaries					3	2		17.31%	94.7	3		Ownership: USFS - Wilderness, Private Timber, and Private.
Sandy Gulch (Intermittent)					2	-		0.00%	0.4			

Table 22. Restoration Potential and Priority of streams in the Swift Creek subwatershed

Swift Creek Subwatershed Stream Assessments

Deadhorse Creek (Intermittent)
Of the 1.00 miles of assessed stream length, 0.46 miles (46.00%) are categorized as having high dam building capacity. Slope values of the creek range from 7.43% to 25.50% and 7.43% to 13.20% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity, high slope values, or proximity to infrastructure. However, secondary assessments identified several reaches that are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 1.79% of the high capacity restoration potential in the subwatershed, ranking in the 37.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Gratten Creek & Tributaries
Of the 1.85 miles of assessed stream length, 1.85 miles (100%) are categorized as having high dam building capacity. Slope values of the creek range from 0.61% to 7.86% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low departure from historic conditions. A unique reach was noted to have an enhanced capacity that exceeded its historic conditions. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with high capacity and close proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified several large areas at the confluences of Tough Gus Gulch (Intermittent), Parry Gulch, and the uppermost tributaries to the south. and larger floodplain area. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species in proximity to BRAT assessments.

- **Restoration Priority:** This creek contains 7.20% of the high capacity restoration potential in the subwatershed, ranking in the 71th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between Private Timberland and Private. Dam building is primarily assessed as Considerable Risk with stream proximity of less than 30m from infrastructure, and secondarily as Negligible Risk due to stream proximity of more than 300m from infrastructure.

Pansy Gulch (Intermittent)
Of the 1.26 miles of assessed stream length, 0.93 miles (73.81%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.40% to 18.12% and 4.40% to 13.90% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. A majority of projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The Lost Meadow model identified a large area at the downstream confluence with Parry Gulch. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species in proximity to BRAT assessments.

- **Restoration Priority:** This gulch contains 3.62% of the high capacity restoration potential in the subwatershed, ranking in the 52.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between Private Timberland and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

West Branch North Fork Swift Creek & Tributaries
Of the 6.15 miles of assessed stream length, 2.27 miles (36.91%) are categorized as having high dam building capacity. Slope values of the creek range from 2.65% to 32.27% and 2.65% to 14.42% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, or proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model downstream of Lake Eleanor. The Lost Meadow model also identified many small areas around Lake Eleanor, downstream of the lake, in the upper tributaries to the north, and on the downstream end of the creek. The CDFW Lentic Wetland Inventory dataset overlapped several of the same areas downstream of Lake Eleanor. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** The scale of high capacity restoration potential is 36% of the creek, allowing for a moderate scale of implementation and habitat improvement. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 100m from infrastructure, and secondarily as Minor Risk due to stream proximity of less than 100m from infrastructure.

Star Creek (Intermittent)
Of the 0.84 miles of assessed stream length, 0.04 miles (4.76%) are categorized as having high dam building capacity. Slope values of the creek range from 15.04% to 30.93% and 19.41% to 19.41% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered “Straight Forward” due to low risk, moderate existing dam building capacity, and low departure from historic conditions. The Lost Meadow model identified a small area near the confluence with North Fork Swift Creek on the southern side of the creek. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species in proximity to the BRAT assessments.

- **Restoration Priority:** This creek contains 0.16% of the high capacity restoration potential in the subwatershed, ranking in the 26th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 100m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to stream proximity of less than 100m from infrastructure.

Foster Creek & Tributaries

Of the 2.47 miles of assessed stream length, 2.04 miles (82.59%) are categorized as having high dam building capacity. Slope values of the creek range from 1.09% to 10.80% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with high capacity, high departure from historic conditions, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model along the mainstem and in a large complex area at the uppermost tributaries to the south. The Lost Meadow model and the CDFW Lentic Wetland Inventory dataset overlapped with the NetMap complex area. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 7.93% of the high capacity restoration potential in the subwatershed, ranking in the 73.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Minor Risk with stream proximity of less than 100m from infrastructure, and secondarily as Negligible Risk due to stream proximity of less than 100m from infrastructure.

Bear Creek & Tributaries

Of the 6.70 miles of assessed stream length, 1.63 miles (24.33%) are categorized as having high dam building capacity. Slope values of the creek range from 1.36% to 46.47% and 2.90% to 10.27% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessment identified reaches with medium to low potential that may offer limited returns for restoration efforts due to low capacity for dam building and low departure from historic conditions.

Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low to no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified areas spanning the majority of the creek and many of the upper tributaries, and The CDFW Lentic Wetland Inventory dataset included several areas identified within the Lost Meadow model. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 6.34% of the high capacity restoration potential in the subwatershed, ranking in the 66.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2021 Haypress (River Complex) fire burned across the creek to the north at the confluence of Swift Creek, and should be considered in further restoration actions.

Lick Creek & Tributaries

Of the 5.95 miles of assessed stream length, 1.17 miles (19.66%) are categorized as having high dam building capacity. Slope values of the creek range from 3.40% to 31.14% and 3.40% to 16.90% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries downstream of Shimmy Lake. The Lost Meadow model identified several areas around and downstream of Shimmy Lake, and at the uppermost ends of the tributaries to the north. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 4.55% of the high capacity restoration potential in the subwatershed, ranking in the 57.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Cement Creek & Tributaries

Of the 4.74 miles of assessed stream length, 2.79 miles (58.86%) are categorized as having high dam building capacity. Slope values of the creek range from 5.04% to 24.27% and 5.04% to 17.17% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. A unique reach was noted to have an enhanced capacity that exceeded its historic conditions. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and no departure from historic dam building conditions. The Lost Meadow model identified several large areas in the uppermost tributaries to the north, the CDFW Lentic Wetland Inventory dataset overlapped several of these areas. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 10.85% of the high capacity restoration potential in the subwatershed, ranking in the 81.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Steer Creek (Intermittent)

Of the 1.31 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the creek range from 18.57% to 37.46% on all reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and high slope values. The Lost Meadow model identified several large areas in the uppermost ephemeral tributaries, and the CDFW Lentic Wetland Inventory dataset included a smaller area in the same footprint. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Landers Creek

Of the 1.83 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the creek range from 4.57% to 19.47% on all reaches.

- **Restoration Potential:** Overall, the creek was primarily assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and no departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with moderate dam building capacity and no departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the confluence with Swift Creek, around Landers Lake, and downstream of the lake. The Lost Meadow model identified a large area upstream of the confluence with Sunrise Creek, and the CDFW Lentic Wetland Inventory dataset included areas in the same footprint around Landers Lake and downstream of the lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2021 Haypress (River Complex) fire burned the majority of the creek and should be considered in further restoration actions.

Sunrise Creek (Intermittent)
Of the 1.16 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the creek range from 6.13% to 27.64% on all reaches.

- **Restoration Potential:** Overall, the creek was primarily assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and no departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with moderate dam building capacity, no departure from historic conditions, and high slope values. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified a large area spanning the majority of the creek. These sites provide potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the majority of the creek and should be considered in further restoration actions.

Parker Creek & Tributaries
Of the 5.78 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the creek range from 4.97% to 45.38% on all reaches.

- **Restoration Potential:** Overall, the creek was primarily assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and no departure from historic conditions. Secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions with high slope values do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable dam building capacity, no departure from historic conditions, and high slope values. The Lost Meadow model and CDFW Lentic Wetland Inventorys dataset both identified a large complex area at the uppermost tributaries to the northwest. This site provides confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the creek were categorized for high capacity restoration potential. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2021 Haypress (River Complex) fire the majority of the creek and should be considered in further restoration actions.

Parry Gulch

Of the 0.35 miles of assessed stream length, 0.35 miles (100%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.04% to 4.11% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with high dam building capacity and close proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the downstream end of the gulch. The Lost Meadow model identified a large area at the downstream confluence with Gratten Creek. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species in proximity to the BRAT assessments.

- **Restoration Priority:** This gulch contains 1.36% of the high capacity restoration potential in the subwatershed, ranking in the 34.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely Private, and dam building is primarily assessed as Considerable Risk with stream proximity of less than 30m from infrastructure.

Rancheria Creek & Tributaries

Of the 4.0 miles of assessed stream length, 2.93 miles (73.25%) are categorized as having high dam building capacity. Slope values of the creek range from 1.93% to 39.45% and 1.93% to 22.37% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable dam building capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the creek. The Lost Meadow model identified an area at the confluence with Swift Creek, and the CDFW Lentic Wetland Inventory dataset included several areas in the middle of the creek. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species in proximity to the BRAT assessments.

- **Restoration Priority:** This creek contains 11.40% of the high capacity restoration potential in the subwatershed, ranking in the 83.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between Private Timberland and Private. Dam building is primarily assessed as Considerable Risk with stream proximity of less than 30m from infrastructure, and secondarily as Minor Risk due to proximity of less than 100m from infrastructure.

North Fork Swift Creek & Tributaries
Of the 9.43 miles of assessed stream length, 4.38 miles (46.45%) are categorized as having high dam building capacity. Slope values of the creek range from 0.63% to 31.91% and 0.63% to 14.65% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches with high restoration potential due to current high capacity for dam building with low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the mainstem at the top of the creek around Lilypad Lake. The Lost Meadow model identified an extremely large network of potential meadows around the lake, downstream, and downstream of the confluence with West Branch North Fork Swift Creek. The CDFW Lentic Wetland Inventory dataset included smaller areas around Lilypad Lake. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 17.04% of the high capacity restoration potential in the subwatershed, ranking in the 94.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Minor Risk with stream proximity of less than 100m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 100m from infrastructure or no current dam building capacity

Swift Creek & Tributaries
Of the 25.9 miles of assessed stream length, 4.45 miles (17.18%) are categorized as having high dam building capacity. Slope values of the creek range from 0.65% to 54.77% and 2.93% to 22.12% for high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is identified as primarily having medium to low potential and may offer limited returns for restoration efforts due to its moderate capacity for dam building and no departure from historic conditions. Secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions with high slope values do not have favorable capacity to support dam building activities historically or with restoration efforts. Tertiary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered "Straight Forward" due to low risk, moderate existing dam building capacity, and low departure from historic conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the braided downstream end and southern braids, in the uppermost tributaries, and by the USFS beaver presence surveys. The Lost Meadow model identified many large areas in the downstream braids, the southern braids, around Ward and Horseshoe lakes, and in the uppermost tributaries. The CDFW Lentic Wetland Inventory dataset overlapped several areas in the uppermost tributaries. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** This creek contains 17.31% of the high capacity restoration potential in the subwatershed, ranking in the 94.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2021 Haypress (River Complex) fire burned the northern side of the creek in the uppermost tributaries, and should be considered in further restoration actions.

Granite Creek & Tributaries

Of the 8.67 miles of assessed stream length, 0.42 miles (4.84%) are categorized as having high dam building capacity. Slope values of the creek range from 1.75% to 43.77% and 6.80% to 12.40% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. However, secondary assessments identified reaches that were limited by high slope values exceeding 23% for dam building. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, no departure from historic conditions, and high slope values. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model in the uppermost tributaries, around Granite Lake, downstream of the lake, and at Seven Up Lake. The Lost Meadow model identified several areas along the mainstem, in the uppermost tributaries, around Granite Lake, a large area downstream of the lake, and around Gibson and Seven Up lakes. The CDFW Lentic Wetland Inventory dataset overlapped several areas in the uppermost tributaries and around the lakes. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 1.63% of the high capacity restoration potential in the subwatershed, ranking in the 36.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Sandy Gulch (Intermittent)

Of the 0.83 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the gulch range from 19.03% to 29.88% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be limited by high slope values exceeding 23% for dam building. No restoration recommendations were made for the gulch and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The Lost Meadow model identified a moderately sized complex at the top of the uppermost tributary to the north. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** No reaches of the gulch were categorized for high capacity restoration potential. Parcel ownership of the gulch is solely the USFS designated Wilderness, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity. The 2021 Haypress (River Complex) fire burned across the gulch to the west at the confluence with Parker Creek and should be considered in further restoration actions.

Buckeye Creek – Trinity River

The Buckeye Creek – Trinity River subwatershed (HUC 180102110502) encompasses 16,041 acres and contains 67 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (64.43%), Shrub/Scrub (8.63%), Emergent Herbaceous Wetlands (6.87%), Developed, Open Space (6.09%) and Barren Land (3.33%) (Dewitz). Restoration assessments of the Buckeye Creek – Trinity River subwatershed reviewed 23.22 miles of stream and identified five locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances between 1-3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. Locations with the longest distances included; Restoration Potential assessments identified a few locations with current restoration potential and several with infrastructure modifications and revegetation needs before dam building can take place. Restoration Priority assessments identified a high diversity of ownership parcels, with interspersed private parcels that may require additional effort for implementation. Overall, the majority of streams presented some to low risk to infrastructure, with a few were identified to have some risk. See Table 23 for Restoration Potential and Restoration Priority categorizations.

Buckeye Creek - Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Brush Creek					3	-		14.02%	67.2	3		Ownership: USFS, Private Timber, and Private
Copper Creek & Tributaries					2	-		30.55%	90	3		Ownership: USFS, Private Timber, and Private
Snow Gulch & Tributaries					2	-		9.52%	56.8	3		Ownership: USFS, Private Timber, and Private
Flume Creek (Intermittent)					3	-		4.84%	42.6			
Unnamed Tributary to Trinity Lake (Intermittent)					2	-		3.26%	35.5	3		Ownership: USFS, Private Timber, and Private
Hatchet Creek					2	-		10.10%	58.7	3		Ownership: USFS, Private Timber, and Private
Buckeye Creek & Tributaries					3	-		24.29%	83.4			
Carr Gulch (Intermittent)					2	-		3.42%	36	4		Ownership: USFS, Private Timber, Municipal and Private
Trinity River					3	2		0.00%	0.4	3		Ownership: USFS, Municipal, and Private

Table 23. Restoration Potential and Priority of streams in the Buckeye Creek – Trinity River subwatershed

Buckeye Creek – Trinity River Subwatershed Stream Assessments

Brush Creek
Of the 1.91 miles of assessed stream length, 1.68 miles (87.96%) are categorized as having high dam building capacity. Slope values of the creek range from 2.82% to 11.61% and 2.82% to 8.57% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Projects are primarily considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. Secondary assessments identified reaches with opportunities unclassified in feasibility due to complex factors in reaches with variable capacity, low departure from historic conditions, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the downstream end of the creek. The Lost Meadow model identified an area on the downstream end of the creek on the northern side. This site provides potential presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of BRAT assessments.

- **Restoration Priority:** This creek contains 14.02% of the high capacity restoration potential in the subwatershed, ranking in the 67.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Copper Creek & Tributaries
Of the 5.53 miles of assessed stream length, 3.66 miles (66.18%) are categorized as having high dam building capacity. Slope values of the creek range from 4.02% to 24.7% and 4.02% to 16.86% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is identified as having high restoration potential due to its current high capacity for dam building and low to no departure from historic conditions. Unique reaches were noted to have an enhanced capacity that exceeded their historic conditions, and were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. However, secondary assessments identified a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the creek.

- **Restoration Priority:** This creek contains 30.55% of the high capacity restoration potential in the subwatershed, ranking in the 90th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure, and secondarily as Negligible Risk due to proximity of more than 300m from infrastructure, or no current dam building capacity.

Flume Creek (Intermittent)
Of the 1.08 miles of assessed stream length, 0.58 miles (53.70%) are categorized as having high dam building capacity. Slope values of the creek range from 1.37% to 14.38% and 1.37% to 14.21% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. However, secondary assessments identified a need for infrastructure modifications due to land usage classified as urban or agricultural with a proximity of less than 100m from the stream. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the creek. The Lost Meadow model identified a small area near the confluence with Trinity Lake. This site provides potential presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species in proximity to BRAT assessments.

- **Restoration Priority:** This creek contains 4.84% of the high capacity restoration potential in the subwatershed, ranking in the 42.6th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS and Private Timberland, and dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure.

Snow Gulch & Tributaries
Of the 2.16 miles of assessed stream length, 1.14 miles (52.78%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.09% to 32.58% and 6.08% to 17.16% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. A majority of projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the gulch.

- **Restoration Priority:** This gulch contains 9.52% of the high capacity restoration potential in the subwatershed, ranking in the 56.8th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Unnamed Tributary to Trinity Lake (Intermittent)
Of the 0.94 miles of assessed stream length, 0.39 miles (41.49%) are categorized as having high dam building capacity. Slope values of the tributary range from 3.33% to 28.46% and 13.48% to 14.44% for high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This tributary is primarily identified as needing vegetation restoration to occur first to improve the vegetative habitat for dam building materials. However, secondary assessments identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Restoration opportunities in this tributary are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the tributary.

- **Restoration Priority:** This tributary contains 3.26% of the high capacity restoration potential in the subwatershed, ranking in the 35.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Hatchet Creek
Of the 2.5 miles of assessed stream length, 1.21 miles (48.40%) are categorized as high dam building capacity. Slope values of the creek range from 0.65% to 36.43% and 4.66% to 19.14% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified several reaches with high restoration potential currently due to high capacity for dam building with low to no departure from historic conditions. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the downstream end of the creek.

- **Restoration Priority:** This creek contains 10.10% of the high capacity restoration potential in the subwatershed, ranking in the 58.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between the USFS, Private Timberland, and Private. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure.

Carr Gulch (Intermittent)
Of the 1.05 miles of assessed stream length, 0.41 miles (39.05%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.12% to 24.81% and 11.82% to 20.15% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This gulch is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this gulch are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, high slope values, and proximity to infrastructure. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the downstream end of the gulch.

- **Restoration Priority:** This gulch contains 3.42% of the high capacity restoration potential in the subwatershed, ranking in the 36th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS, Private Timberland, Municipal, and Private. Dam building is primarily assessed as Some Risk with stream proximity of less than 100m from infrastructure.

Buckeye Creek & Tributaries

Of the 6.37 miles of assessed stream length, 2.91 miles (45.68%) are categorized as having high dam building capacity. Slope values of the creek range from 2.64% to 33.91% and 2.64% to 18.93% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. This creek is primarily identified as needing infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. However, secondary assessments identified reaches that vegetation restoration is recommended to occur first to improve the vegetative habitat for dam building materials. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, and proximity to infrastructure. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model at the downstream end of the creek. The Lost Meadow model identified several areas in the downstream end of the creek, in the middle and northern side of the creek, and at the top of the uppermost tributaries to the south. These sites provide the potential presence wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species upstream of the BRAT assessments.

- **Restoration Priority:** This creek contains 24.29% of the high capacity restoration potential in the subwatershed, ranking in the 83.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between the USFS designated Wilderness and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Trinity River

Of the 1.68 miles of assessed stream length, no reaches were categorized as having high dam building capacity. Slope values of the river range from 0.0037% to 2.53% on all reaches.

- **Restoration Potential:** Overall, the river was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. For the majority of the river, no restoration recommendations were made and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts.

However, secondary assessments identified reaches with a need for infrastructure modifications due to roads, canals or railroads with a proximity of less than 30m from the stream, or land usage classified as urban or agricultural is within 100m. It is recommended that these modifications are made prior to restoration to reduce risk to infrastructure from dam building activities and reduce human-wildlife conflicts. Restoration opportunities in this river are primarily unclassified in feasibility due to complex factors in reaches with variable capacity, variable departure from historic conditions, proximity to infrastructure, and land use intensity. The BRAT model assessment is supported by overlapping favorable beaver habitats identified by the NetMap model on the river, and beaver presence surveys by the USFS. The Lost Meadow model identified a large area on the west side of the river, and larger floodplain area. The CDFW Lentic Wetland Inventory dataset overlapped areas identified by the Lost Meadow model on the west side and expanded the footprint upstream and downstream. These sites provide confirmation of the presence of wet meadow habitats that can be enhanced, protected, or expanded to increase biodiversity and habitat for sensitive species.

- **Restoration Priority:** No reaches of the river were categorized for high capacity restoration potential. Parcel ownership of the river is divided between the USFS, Municipal, and Private. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Bragdon Gulch – Trinity River

The Bragdon Gulch – Trinity River subwatershed (HUC 180102110503) encompasses 24,680 acres and contains 98 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (57.27%) and Shrub/Scrub (13.45%) (Dewitz). Restoration assessments of the Bragdon Gulch – Trinity River subwatershed reviewed 12.69 miles of stream and identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Bragdon Gulch and Hay Gulch. Restoration Potential assessments identified that all of the streams in the watershed require revegetation before dam building can take place, but some hold high current dam building potential in smaller reach segments. Restoration Priority assessments identified a low diversity of ownership parcels for ease of implementation and low risk to infrastructure for all streams. See Table 24 for Restoration Potential and Restoration Priority categorizations.

Bragdon Gulch - Trinity River Subwatershed Beaver Dam Analogue Restoration Assessment												
Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Unnamed Tributary to Trinity Lake 2 - West					2	-		8.33%	45.4			
Unnamed Tributary to Trinity Lake 1 - East					2	-		7.16%	43.1			
Bragdon Gulch & Tributaries					2	-		46.01%	90.5			
Hay Gulch & Tributaries					2	-		38.50%	86.7			

Table 24. Restoration Potential and Priority of streams in the Bragdon Gulch – Trinity River subwatershed

Bragdon Gulch – Trinity River Subwatershed Stream Assessments

Unnamed Tributary to Trinity Lake - West
Of the 1.43 miles of assessed stream length, 0.70 miles (49.65%) are categorized as having high dam building capacity. Slope values of the tributary range from 1.79% to 25.88% and 1.79% to 14.58% on high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the tributary.

- **Restoration Priority:** This tributary contains 8.33% of the high capacity restoration potential in the subwatershed, ranking in the 45.4th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is solely the USFS. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Unnamed Tributary to Trinity Lake – East
Of the 0.95 miles of assessed stream length, 0.60 miles (64.21%) are categorized as having high dam building capacity. Slope values of the tributary range from 6.51% to 15.16% and 7.96% to 15.16% on high capacity reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to no departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the tributary.

- **Restoration Priority:** This tributary contains 7.16% of the high capacity restoration potential in the subwatershed, ranking in the 43.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the tributary is divided between the USFS and Private Timberland, and dam building is primarily assessed as Minor Risk due to stream proximity of less than 300m from infrastructure.

Bragdon Gulch & Tributaries
Of the 5.58 miles of assessed stream length, 3.92 miles (70.25%) are categorized as having high dam building capacity. Slope values of the gulch range from 1.48% to 36.42% and 1.48% to 15.26% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential reaches due to high existing dam building capacity with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 46.01% of the high capacity restoration potential in the subwatershed, ranking in the 90.5th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk due to stream proximity of more than 300m from infrastructure or no current dam building capacity.

Hay Gulch & Tributaries
Of the 4.72 miles of assessed stream length, 3.28 miles (69.34%) are categorized as having high dam building capacity. Slope values of the gulch range from .038% to 35.47% and .038% to 19.90% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential reaches due to high existing dam building capacity with low to no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 38.50% of the high capacity restoration potential in the subwatershed, ranking in the 86.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between the USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk due to stream proximity of more than 300m from infrastructure or no current dam building capacity, and secondarily as Minor Risk due to proximity of less than 300m from infrastructure.

Papoose Creek – Trinity River

The Papoose Creek – Trinity River subwatershed (HUC 180102110504) encompasses 27,546 acres and contains 108 miles of stream networks (Table 6). Land cover classes across the watershed are primarily Evergreen Forest (47.85%), Herbaceous (20.54%), and Shrub/Scrub (9.85%) (Dewitz). Restoration assessments of the Papoose Creek – Trinity River subwatershed reviewed 26.68 miles of stream and identified two locations that contained a majority of the high capacity stream reaches in the subwatershed, with distances over 3 miles that could support high frequencies (8 – 64 dams/mile) of beaver dam analogues. These locations included Little Papoose Creek and Papoose Creek. Restoration Potential assessments identified that a majority of streams in the watershed require revegetation before dam building can take place, but still hold high potential in smaller reach groupings for translocation of beavers (Digger Gulch and North Fork Papoose Creek). Restoration Priority assessments identified a low diversity of ownership parcels for ease of implementation and low risk to infrastructure for all streams. See Table 21 for Restoration Potential and Restoration Priority categorizations.

There is notable fire history in the subwatershed of the 2018 Carr fire burning the southeastern corner, and the 2019 Captain fire burning a small area on the northern shoreline of Trinity Lake. At the time of this assessment the 2018 Carr fire footprint is 6 years old and is likely to have repaired enough groundcover to reduce sedimentation into streams by surface run-off and but should be monitored for mass movement events due to reduced tensile strength of tree roots until year 10 post fire. The 2019 Captain fire footprint is 5 years old and is also likely to have repaired enough groundcover to reduce sedimentation, but should be monitored for mass movement events into the lake. Ground verification is required to confirm site erodibility due to variability of vegetative regrowth factors and levels of fire severity. Long term sedimentation management in the upstream reaches and forks of Papoose Creek should be considered in future management decisions to prevent deleterious effects downstream onto the mainstem of Papoose Creek and into Trinity Lake.

Papoose Creek - Trinity River Subwatershed
Beaver Dam Analogue Restoration Assessment

Creek	Restoration Potential	Limitations	Potential	Feasibility	# of Models	# of Surveys	Restoration Priority	Subwatershed Scale	Length Percentile of Watershed	Ownership	Risks	Notes
Little Papoose Creek					2	-		18.61%	87.2			
Papoose Creek					2	-		19.91%	89			
Bear Gulch					2	-		14.08%	78.1			
Feeny Gulch & Tributaries					2	-		9.67%	68.7			
Digger Gulch					2	-		8.99%	64.9			Potential: High Restoration Potential - Translocation
North Fork Papoose Creek & Tributaries					2	-		6.90%	59.2			Potential: High Restoration Potential - Translocation
East Fork Papoose Creek & Tributaries					1	-		7.13%	59.7			
South Fork Papoose Creek & Tributaries					1	-		1.70%	33.1			
Van Ness Creek & Tributaries					2	-		0.00%	0.4			
Unnamed Tributary to Trinity Lake 2 – West (Intermittent)					1	-		13.01%	76.3			
Unnamed Tributary to Trinity Lake 1 - East					1	-		0.00%	0.4			

Table 25. Restoration Potential and Priority of streams in the Papoose Creek – Trinity River subwatershed

Papoose Creek – Trinity River Subwatershed Stream Assessments

Little Papoose Creek

Of the 2.25 miles of assessed stream length, 1.22 miles (54.22%) are categorized as having high dam building capacity. Slope values of the creek range from 1.0% to 30.98% and 9.28% to 14.62% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Notable reaches were also identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an “Easy” restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek.

- **Restoration Priority:** This creek contains 6.90% of the high capacity restoration potential in the subwatershed, ranking in the 59.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is solely the USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

South Fork Papoose Creek & Tributaries

Of the 4.27 miles of assessed stream length, 2.3 miles (53.86%) are categorized as having high dam building capacity. Slope values of the creek range from 2.63% to 42.34% and 2.63% to 13.5% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. Projects are primarily considered an “Easy” restoration opportunity due to low risk to infrastructure, moderate existing dam building capacity, and low departure from historic dam building conditions. The BRAT model was the only source that assessed the creek.

- **Restoration Priority:** This creek contains 13.01% of the high capacity restoration potential in the subwatershed, ranking in the 76.3th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2018 Carr Fire encompassed the entire creek and should be considered in further restoration actions.

Papoose Creek

Of the 1.43 miles of assessed stream length, 0.30 miles (20.98%) are categorized as having high dam building capacity. Slope values of the creek range from 1.48% to 5.32% and 1.79% to 2.37% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Projects are considered an “Strategic” restoration opportunity due to low risk to infrastructure, low existing dam building capacity, and high departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek.

- **Restoration Priority:** This creek contains 1.70% of the high capacity restoration potential in the subwatershed, ranking in the 33.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between USFS and Private Timberland, and dam building is primarily assessed as Minor Risk with stream proximity of less than 300m from infrastructure. The 2018 Carr Fire encompassed the entire creek and should be considered in further restoration actions.

Digger Gulch
Of the 1.26 miles of assessed stream length, 1.26 miles (100%) are categorized as having high dam building capacity. Slope values of the gulch range from 4.48% to 6.88% on all reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential reaches for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 7.13% of the high capacity restoration potential in the subwatershed, ranking in the 59.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is solely USFS, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure.

Feeny Gulch & Tributaries
Of the 3.66 miles of assessed stream length, 3.29 miles (89.89%) are categorized as having high dam building capacity. Slope values of the gulch range from 3.08% to 18.87% and 3.08% to 13.96% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential reaches due to high existing dam building capacity with low to no departure from historic conditions. Notable reaches were also identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an “Easy” restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to moderate departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 18.61% of the high capacity restoration potential in the subwatershed, ranking in the 87.2th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure with a secondary assessment of Minor Risk due to proximity of less than 300m from infrastructure.

North Fork Papoose Creek & Tributaries
Of the 4.34 miles of assessed stream length, 3.52 miles (81.11%) are categorized as having high dam building capacity. Slope values of the creek range from 1.25% to 40.27% and 1.25% to 13.9% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. However, secondary assessments also identified high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek.

- **Restoration Priority:** This creek contains 19.91% of the high capacity restoration potential in the subwatershed, ranking in the 89th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is divided between USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity. The 2018 Carr Fire encompassed the entire creek and should be considered in further restoration actions.

Bear Gulch

Of the 2.52 miles of assessed stream length, 1.59 miles (63.10%) are categorized as having high dam building capacity. Slope values of the gulch range from 3.55% to 36.96% and 3.55% to 17.59% on high capacity reaches.

- **Restoration Potential:** Overall, the gulch was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential reaches due to high existing dam building capacity with no departure from historic conditions. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low to moderate departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the gulch.

- **Restoration Priority:** This gulch contains 8.99% of the high capacity restoration potential in the subwatershed, ranking in the 64.9th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the gulch is divided between USFS and Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure or no current dam building capacity.

Van Ness Creek & Tributaries

Of the 4.38 miles of assessed stream length, 2.49 miles (56.85%) are categorized as having high dam building capacity. Slope values of the creek range from 3.13% to 42.44% and 3.67% to 20.11% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials. Secondary assessments however, identified several reaches that no restoration recommendations were made, and it is presumed that the natural environmental conditions and high slope values do not have favorable capacity to support dam building activities historically or with restoration efforts. Notable reaches were identified as high potential for translocation of beavers due to high stream capacity to support habitat complexes. Restoration opportunities in this creek are primarily unclassified in feasibility due to complex factors in reaches with no capacity, no departure from historic conditions, high slope values, and proximity to infrastructure. However, secondary assessments identified several reaches that are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model assessment was supported by overlapping favorable beaver habitats identified by the NetMap model on the creek.

- **Restoration Priority:** This creek contains 14.08% of the high capacity restoration potential in the subwatershed, ranking in the 78.1th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note that this is total in-stream lengths, not a single continuous reach. Parcel ownership of the creek is divided between USFS and Private Timberland, and dam building is primarily assessed as Minor Risk due to stream proximity of less than 300m from infrastructure, as with a secondary assessment of Negligible Risk with proximity of more than 300m from infrastructure or no current dam building capacity. The 2018 Carr Fire burned the upper ephemeral reaches of the creek not included in the BRAT assessment, but should be considered in further restoration actions.

East Fork Papoose Creek & Tributaries

Of the 1.89 miles of assessed stream length, 1.71 miles (90.48%) are categorized as having high dam building capacity. Slope values of the creek range from 3.50% to 18.45% and 3.5% to 16.91% on high capacity reaches.

- **Restoration Potential:** Overall, the creek was assessed to be suitable for dam building without being limited by historic vegetation, slope, or existing dam building capacity. It is primarily recommended that vegetation restoration occur first to improve the vegetative habitat for dam building materials, but secondary assessments also identified high restoration potential reaches due to high existing dam building capacity with low to no departure from historic conditions. Projects are considered an "Easy" restoration opportunity due to low risk to infrastructure, high existing dam building capacity, and low departure from historic dam building conditions. The BRAT model was the only source that assessed this creek.

- **Restoration Priority:** This creek contains 9.67% of the high capacity restoration potential in the subwatershed, ranking in the 68.7th percentile for cumulative distance of high capacity reaches the Upper Trinity River Watershed as a whole. Note these total in-stream lengths are a single continuous reach. Parcel ownership of the creek is solely Private Timberland, and dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure. The 2018 Carr Fire encompassed the entire creek and should be considered in further restoration actions.

Unnamed Tributary to Trinity Lake 1 – East

Of the 0.24 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the tributary range from 25.60% to 32.95% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be limited by high slope values exceeding 23% for dam building. There were no restoration recommendations made for this tributary, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is solely USFS. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

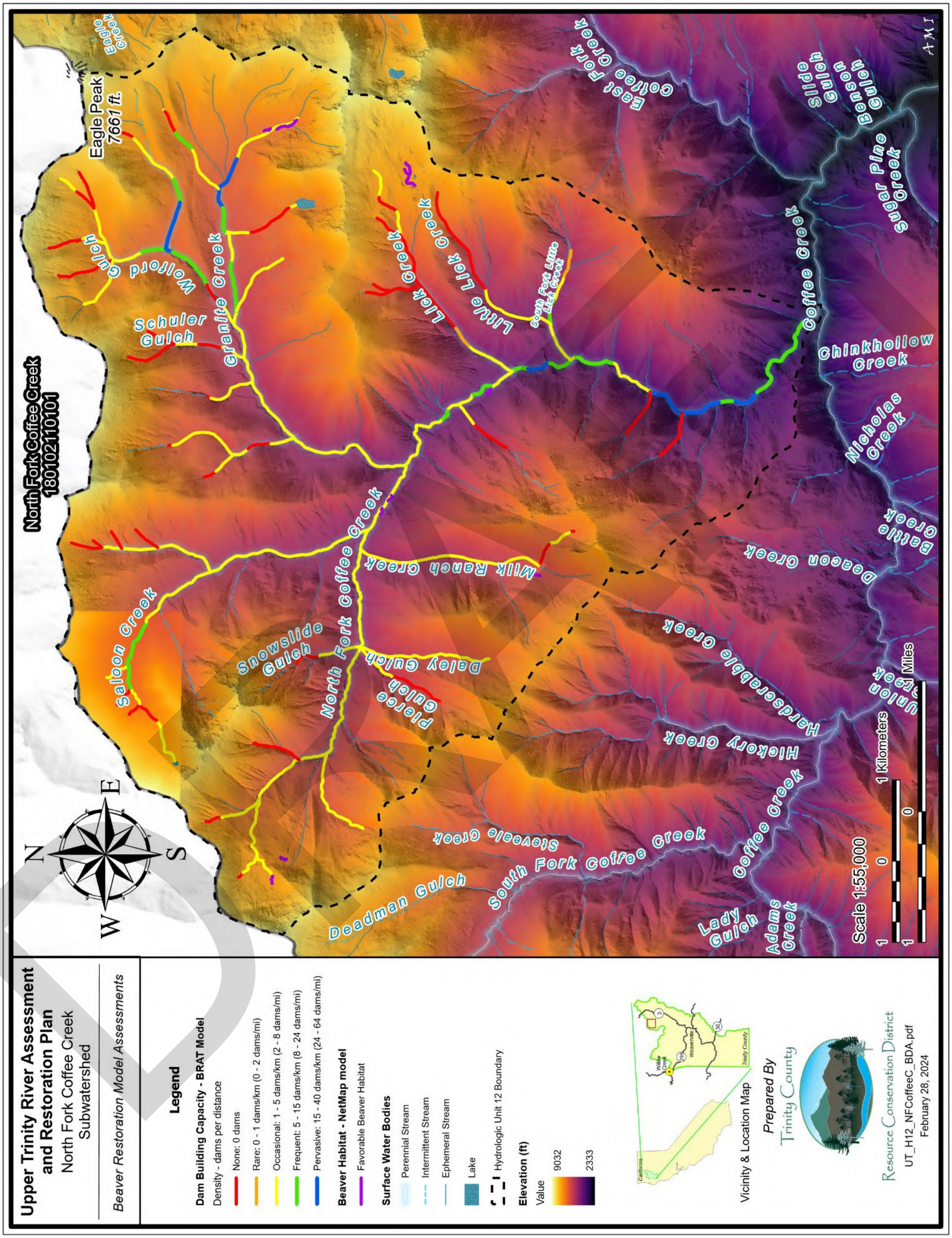
Unnamed Tributary to Trinity Lake 2 – West (Intermittent)

Of the 0.44 miles of assessed stream length, no reaches were categorized as high dam building capacity. Slope values of the tributary range from 2.58% to 50.71% on all reaches.

- **Restoration Potential:** Overall, the tributary was assessed to be limited by high slope values exceeding 23% for dam building. There were no restoration recommendations made for this tributary, and it is presumed that the high slope values and natural environmental conditions do not have favorable capacity to support dam building activities historically or with restoration efforts. The BRAT model was the only source that assessed this tributary.

- **Restoration Priority:** No reaches of the tributary were categorized for high capacity restoration potential. Parcel ownership of the tributary is divided between USFS and Private Timberland. Dam building is primarily assessed as Negligible Risk with stream proximity of more than 300m from infrastructure, or no current dam building capacity.

Appendix E.


Upper Trinity River Assessment and Restoration Plan
North Fork Coffee Creek Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_NFCoffeeC_BDA.pdf
February 28, 2024
North Fork Coffee Creek
180102110101
Eagle Peak
7661 ft.
Eagle Creek
East Fork Coffee Creek
Slide Gulch
Benson Gulch
Sugar Pine Creek
Coffee Creek
Chinkhollow Creek
Nicholas Creek
Battle Creek
Deacon Creek
Hardscrabble Creek
Union Creek
Hickory Creek
Lady Gulch
Adams Creek
Deadman Gulch
South Fork Coffee Creek
Steveale Creek
Wolford Gulch
Granite Creek
Schuler Gulch
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
Milk Ranch Creek
North Fork Coffee Creek
Saloon Creek
Snowslide Gulch
Daley Gulch
Pierce Gulch
Scale 1:55,000
1 Kilometers
1 Miles
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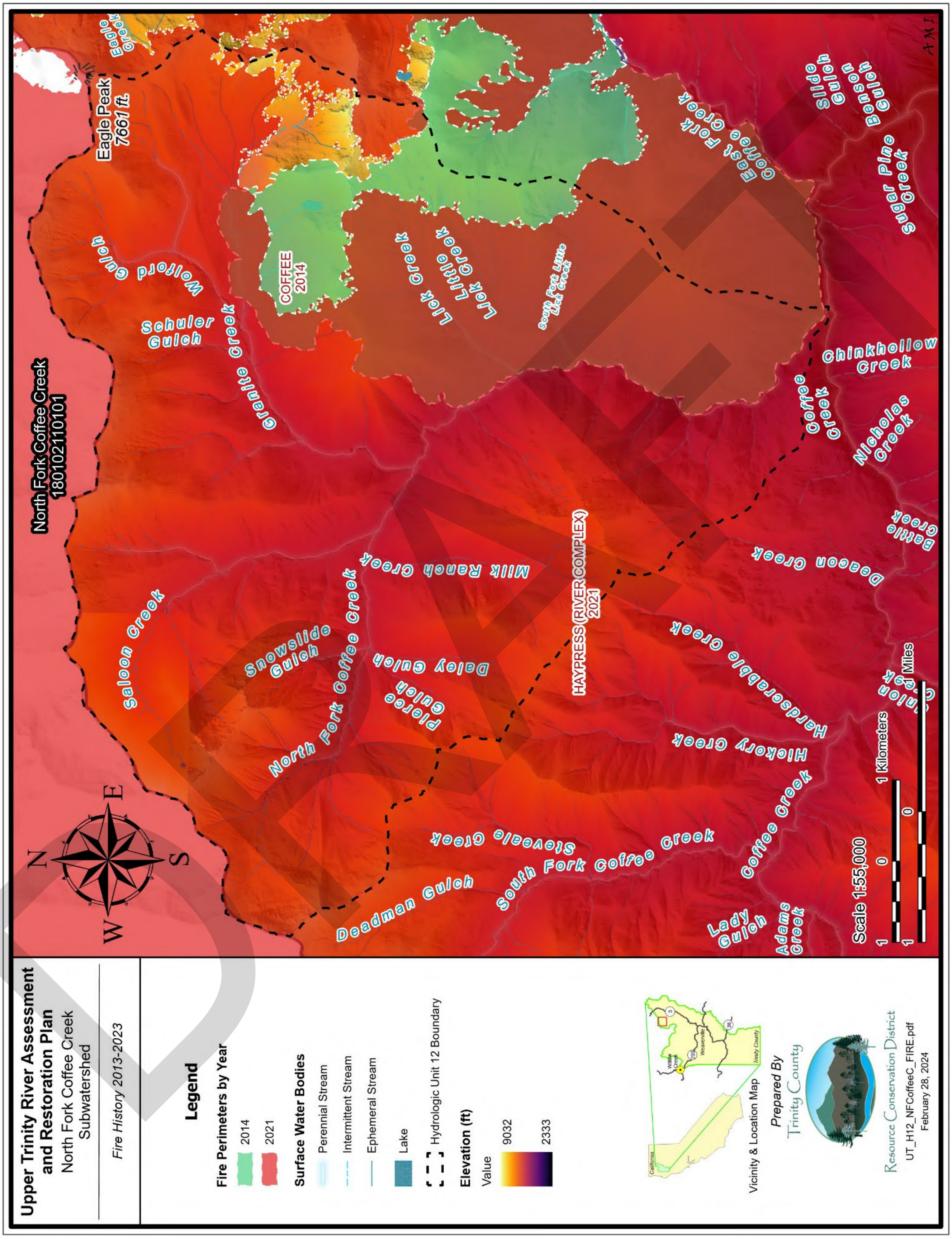
Upper Trinity River Assessment and Restoration Plan
North Fork Coffee Creek Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2014
2021
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_NFCoffeeC_FIRE.pdf
February 28, 2024
North Fork Coffee Creek
180102110101
Eagle Peak
7661 ft.
COFFEE
2014
HAYPRESS (RIVER COMPLEX)
2021
Wolford Gulch
Schuler Gulch
Granite Creek
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Slide Gulch
Benson Gulch
Sugar Pine Creek
Chinkhollow Creek
Coffee Creek
Nicholas Creek
Battle Creek
Deacon Creek
Milk Ranch Creek
Saloon Creek
Snowslide Gulch
North Fork Coffee Creek
Daley Gulch
Pierce Gulch
Hardscrabble Creek
Hickory Creek
Steveale Creek
South Fork Coffee Creek
Coffee Creek
Deadman Gulch
Lady Gulch
Adams Creek
Scale 1:55,000
1 Kilometers
1 Miles
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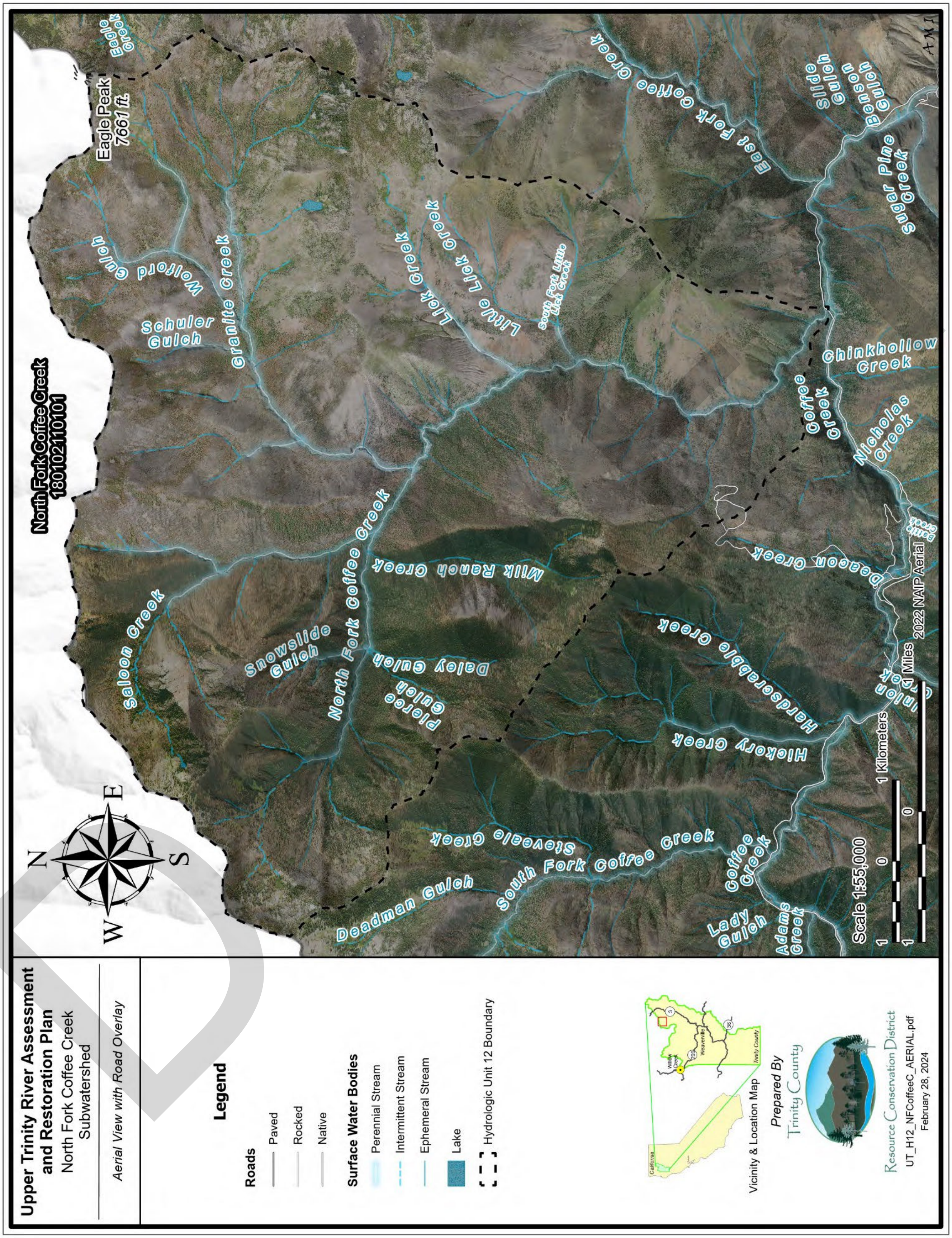
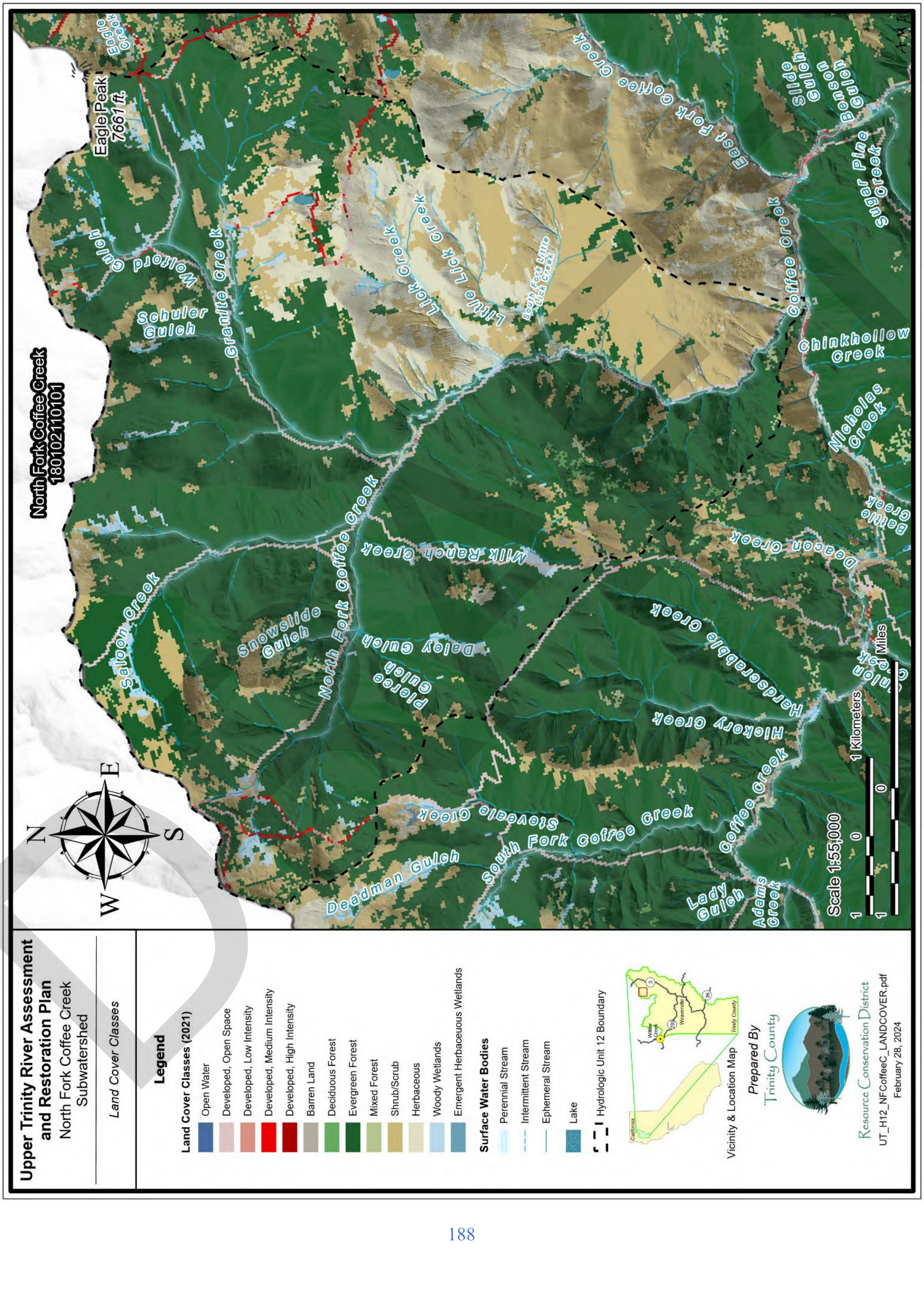

Upper Trinity River Assessment and Restoration Plan
North Fork Coffee Creek Subwatershed
Aerial View with Road Overlay
Legend
Roads
Paved
Rocked
Native
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_NFCoffeeC_AERIAL.pdf
February 28, 2024
North Fork Coffee Creek
180102110101
Eagle Peak
7661 ft.
Eagle Creek
Wolford Gulch
Schuler Gulch
Granite Creek
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Slide Gulch
Benson Gulch
Sugar Pine Creek
Chinkhollow Creek
Coffee Creek
Nicholas Creek
Deacon Creek
Milk Ranch Creek
North Fork Coffee Creek
Saloon Creek
Snowslide Gulch
Daley Gulch
Pierce Gulch
Hardscrabble Creek
Hickory Creek
Steveale Creek
South Fork Coffee Creek
Deadman Gulch
Lady Gulch
Adams Creek
Scale 1:55,000
1 Kilometers
1 Miles
2022 NAIP Aerial



Upper Trinity River Assessment and Restoration Plan
North Fork Coffee Creek Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_NFCoffeeC_LANDCOVER.pdf
February 28, 2024
North Fork Coffee Creek
180102110101
Eagle Peak
7661 ft.
Eagle Creek
Wolford Gulch
Schuler Gulch
Granite Creek
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Slide Gulch
Benson Gulch
Sugar Pine Creek
Coffee Creek
Chinkhollow Creek
Nicholas Creek
Battle Creek
Deacon Creek
Milk Ranch Creek
North Fork Coffee Creek
Saloon Creek
Snowslide Gulch
Daley Gulch
Pierce Gulch
Hardscrabble Creek
Hickory Creek
Steveale Creek
South Fork Coffee Creek
Deadman Gulch
Lady Gulch
Adams Creek
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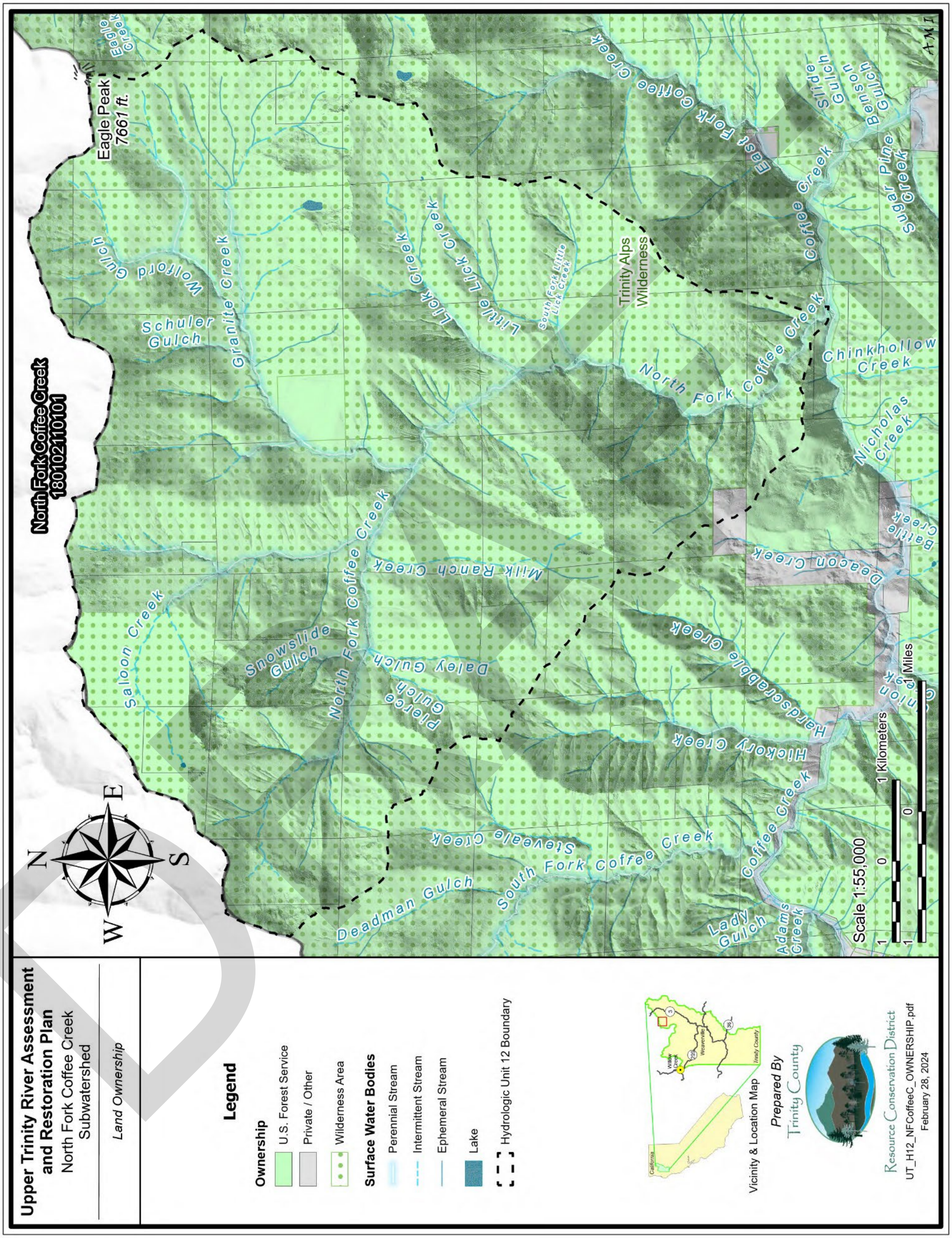
Scale 1:55,000
1 Kilometers
1 Miles


North Fork Coffee Creek
180102110101
Upper Trinity River Assessment and Restoration Plan
North Fork Coffee Creek Subwatershed
Land Ownership
Legend
Ownership
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_NFCoffeeC_OWNERSHIP.pdf
February 28, 2024
Scale 1:55,000
0 1 Kilometers
0 1 Miles
N
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S
W
Eagle Peak
7661 ft.
Eagle Creek
Trinity Alps Wilderness
East Fork Coffee Creek
Coffee Creek
North Fork Coffee Creek
South Fork Coffee Creek
Wolford Gulch
Schuler Gulch
Granite Creek
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
Slide Gulch
Benson Gulch
Sugar Pine Creek
Chinkhollow Creek
Nicholas Creek
Battle Creek
Deacon Creek
Milk Ranch Creek
Saloon Creek
Snowslide Gulch
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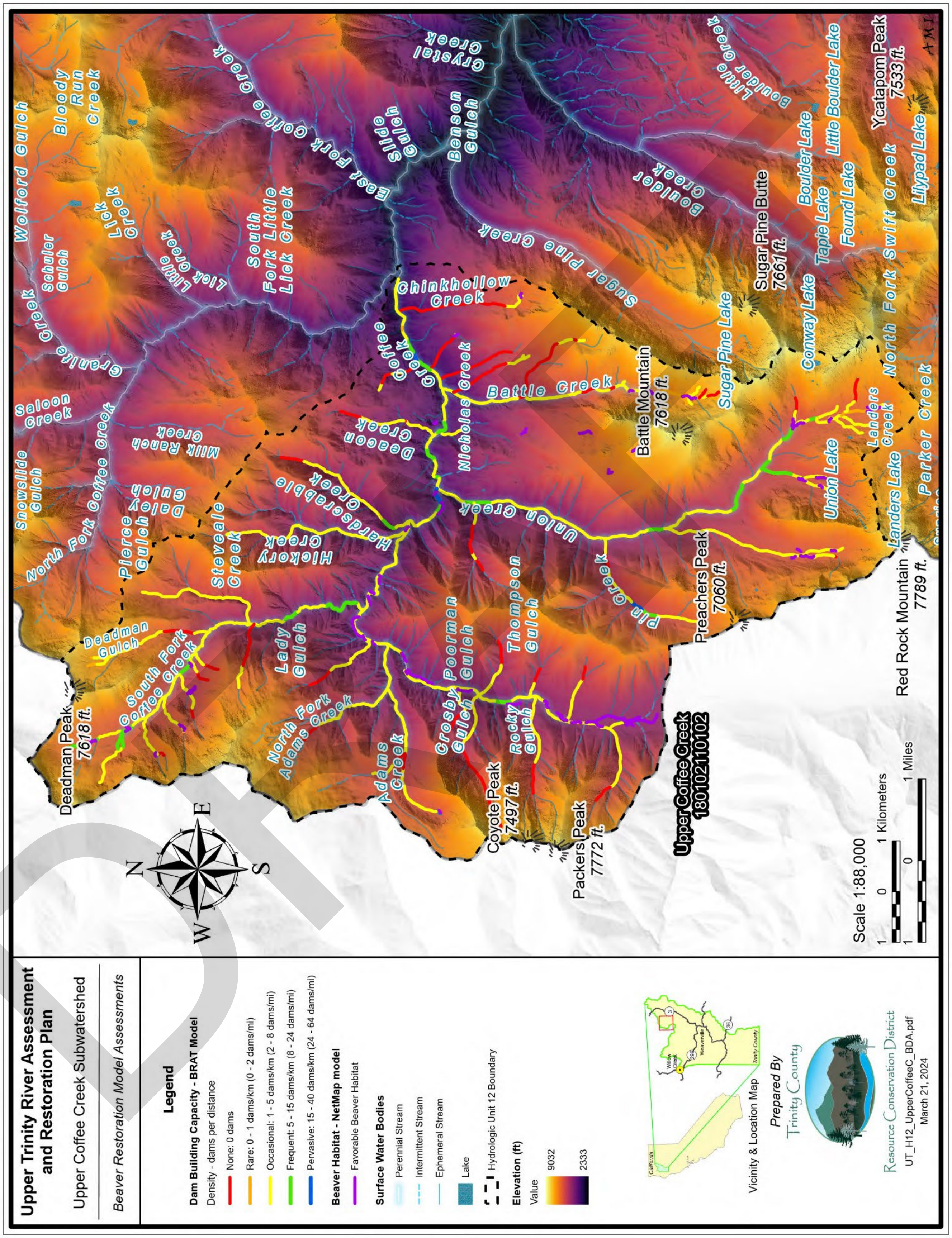
Pierce Gulch
Hardscrabble Creek
Hickory Creek
Union Creek
Steveale Creek
Deadman Gulch
Lady Gulch
Adams Creek


Upper Trinity River Assessment and Restoration Plan
Upper Coffee Creek Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperCoffeeC_BDA.pdf
March 21, 2024
Scale 1:88,000
Kilometers
Miles
Upper Coffee Creek
180102110102
Deadman Peak
7618 ft.
Coyote Peak
7497 ft.
Packers Peak
7772 ft.
Red Rock Mountain
7789 ft.
Preachers Peak
7060 ft.
Battle Mountain
7618 ft.
Sugar Pine Butte
7661 ft.
Ycatapom Peak
7533 ft.
South Fork Coffee Creek
North Fork Adams Creek
Adams Creek
Crosby Gulch
Rocky Gulch
Poorman Gulch
Thompson Gulch
Lady Gulch
Deadman Gulch
Steveale Creek
Hickory Creek
Hardscrabble Creek
Pierce Gulch
Daley Gulch
Snowslide Gulch
North Fork Coffee Creek
Milk Ranch Creek
Saloon Creek
Deacon Creek
Nicholas Creek
Union Creek
Pin Creek
Union Lake
Landers Lake
Landers Creek
Parker Creek
Battle Creek
Coffee Creek
Chinkhollow Creek
Sugar Pine Lake
Sugar Pine Creek
Conway Lake
North Fork Swift Creek
Lilypad Lake
Found Lake
Tapie Lake
Boulder Lake
Little Boulder Lake
Boulder Creek
Little Boulder Creek
Benson Gulch
Slide Gulch
Crystal Creek
East Fork Coffee Creek
South Fork Little Lick Creek
Little Lick Creek
Lick Creek
Schuler Gulch
Granite Creek
Wolford Gulch
Bloody Run Creek
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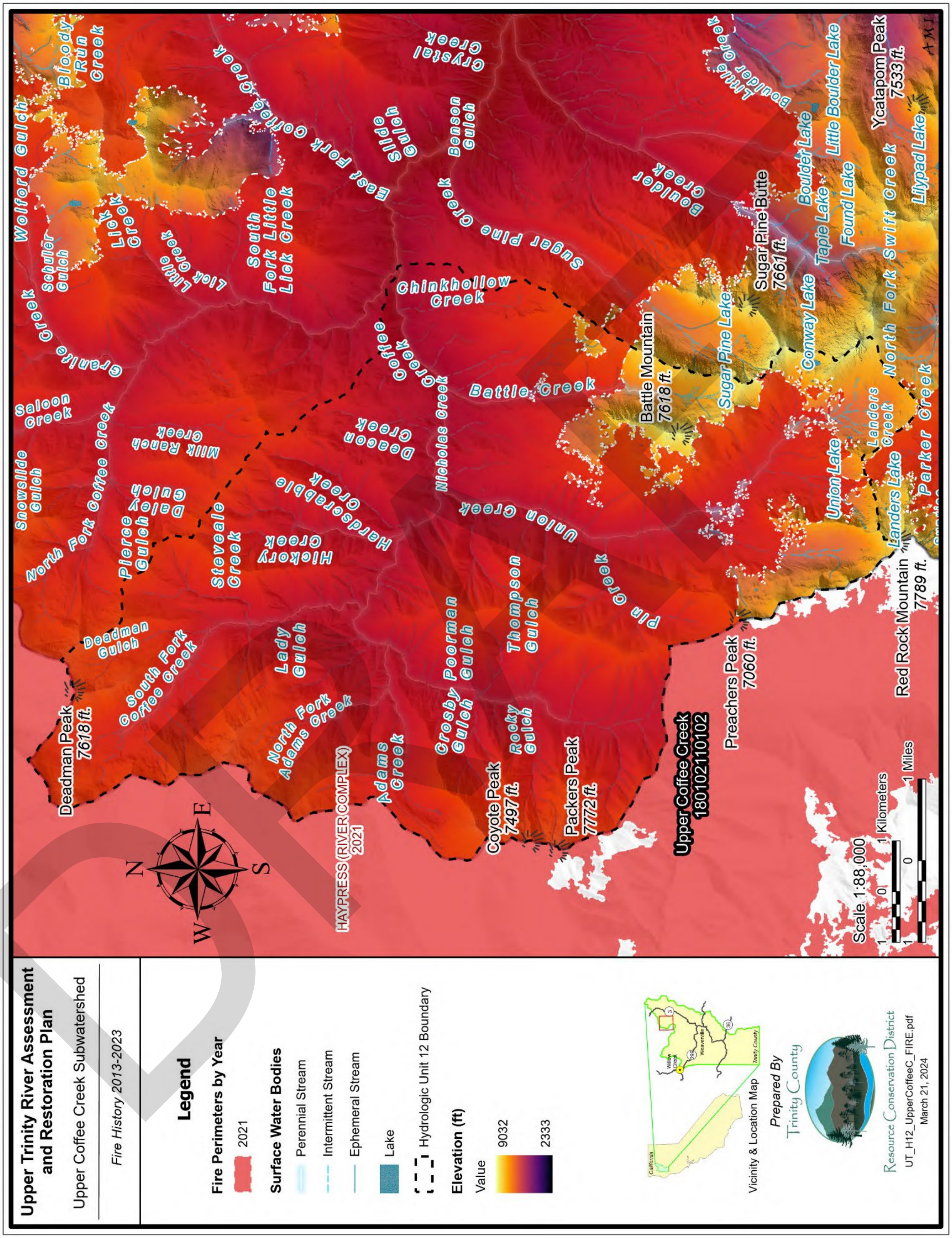

Upper Trinity River Assessment and Restoration Plan
Upper Coffee Creek Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2021
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperCoffeeC_FIRE.pdf
March 21, 2024
HAYPRESS (RIVER COMPLEX) 2021
Upper Coffee Creek
180102110102
Scale 1:88,000
1 Kilometers
1 Miles
Deadman Peak 7618 ft.
Coyote Peak 7497 ft.
Packers Peak 7772 ft.
Preachers Peak 7060 ft.
Red Rock Mountain 7789 ft.
Battle Mountain 7618 ft.
Sugar Pine Butte 7661 ft.
Ycatapom Peak 7533 ft.
Wolford Gulch
Bloody Run Creek
Schuler Gulch
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Slide Gulch
Benson Gulch
Crystal Creek
Granite Creek
Saloon Creek
Snowslide Gulch
North Fork Coffee Creek
Milk Ranch Creek
Daley Gulch
Pierce Gulch
Steveale Creek
Hickory Creek
Hardscrabble Creek
Deacon Creek
Coffee Creek
Chinkhollow Creek
Nicholas Creek
Battle Creek
Sugar Pine Creek
Boulder Creek
Little Boulder Creek
Union Creek
Deadman Gulch
South Fork Coffee Creek
Lady Gulch
Poorman Gulch
Thompson Gulch
Pin Creek
North Fork Adams Creek
Adams Creek
Crosby Gulch
Rocky Gulch
Sugar Pine Lake
Conway Lake
Tapie Lake
Boulder Lake
Little Boulder Lake
Found Lake
Lilypad Lake
Union Lake
Landers Creek
Landers Lake
Parker Creek
North Fork Swift Creek


Upper Trinity River Assessment and Restoration Plan
Upper Coffee Creek Subwatershed
Aerial View with Road Overlay
Legend
Roads
Paved
Rocked
Native
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperCoffeeC_AERIAL.pdf
March 21, 2024
Scale 1:88,000
0 1 Kilometers
0 1 Miles
2022 NAIP Aerial
Upper Coffee Creek
180102110102
Deadman Peak
7618 ft.
Coyote Peak
7497 ft.
Packers Peak
7772 ft.
Red Rock Mountain
7789 ft.
Preachers Peak
7060 ft.
Battle Mountain
7618 ft.
Sugar Pine Butte
7661 ft.
Ycatapom Peak
7533 ft.
Wolford Gulch
Bloody Run Creek
Lick Creek
Schuler Gulch
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Crystal Creek
Slide Gulch
Benson Gulch
Little Boulder Creek
Boulder Creek
Boulder Lake
Little Boulder Lake
Tapie Lake
Found Lake
Conway Lake
North Fork Swift Creek
Lilypad Lake
Sugar Pine Creek
Sugar Pine Lake
Chinkhollow Creek
Nicholas Creek
Coffee Creek
Battle Creek
Granite Creek
Saloon Creek
Snowslide Gulch
North Fork Coffee Creek
Milk Ranch Creek
Deacon Creek
Daley Gulch
Pierce Gulch
Hardscrabble Creek
Steveale Creek
Hickory Creek
Union Creek
Union Lake
Landers Creek
Landers Lake
Parker Creek
Deadman Gulch
South Fork Coffee Creek
Lady Gulch
Poorman Gulch
Thompson Gulch
Pin Creek
North Fork Adams Creek
Adams Creek
Crosby Gulch
Rocky Gulch
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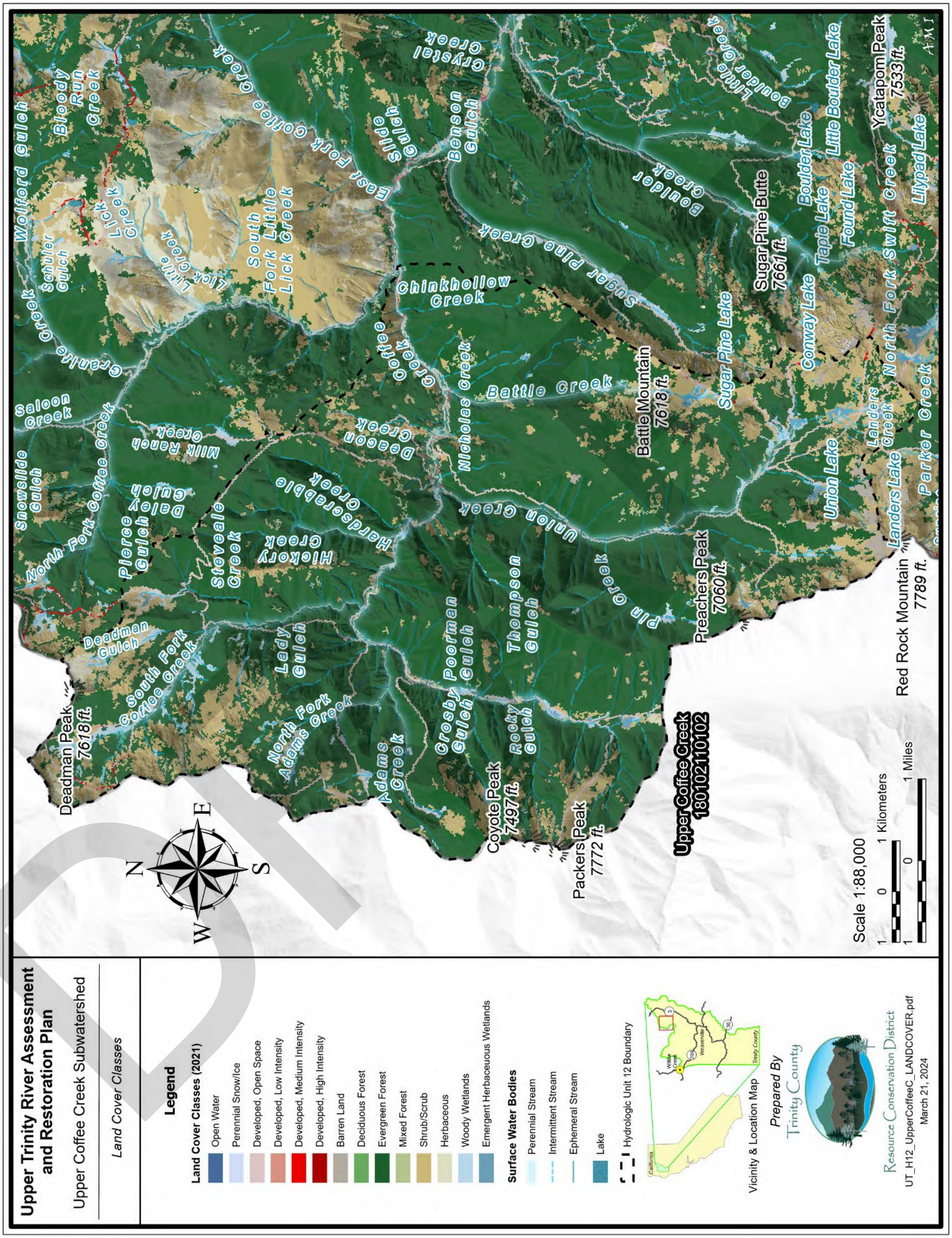
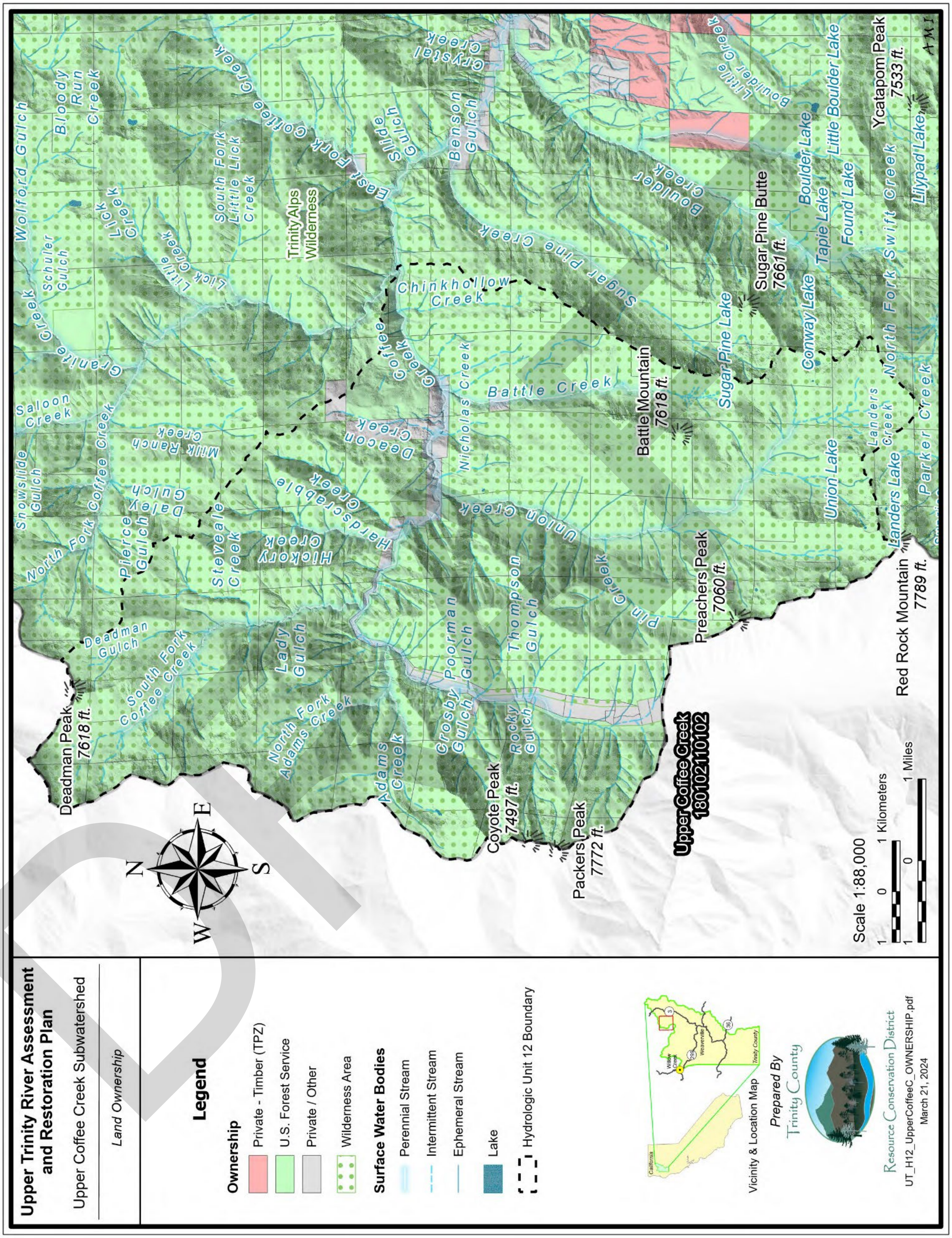
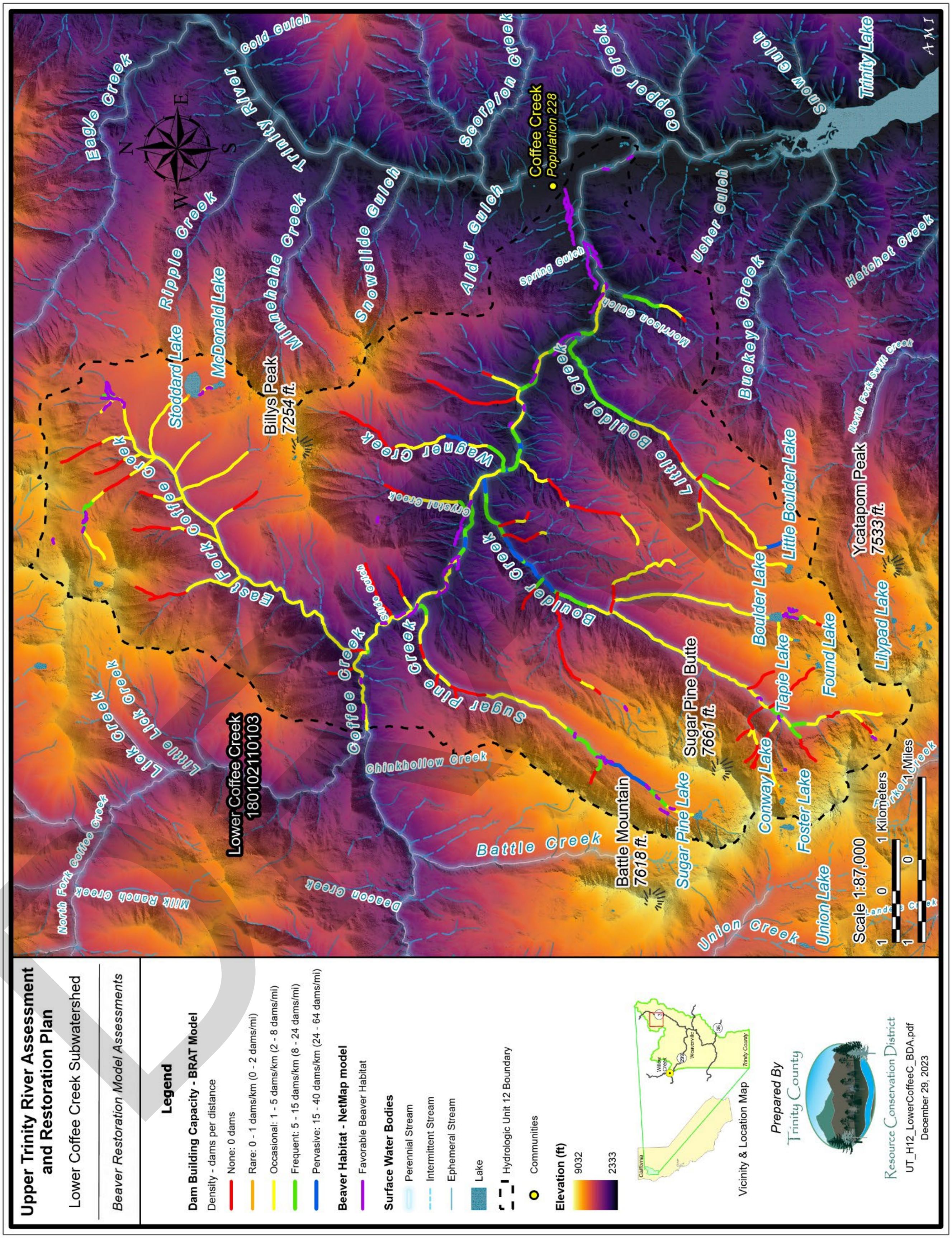
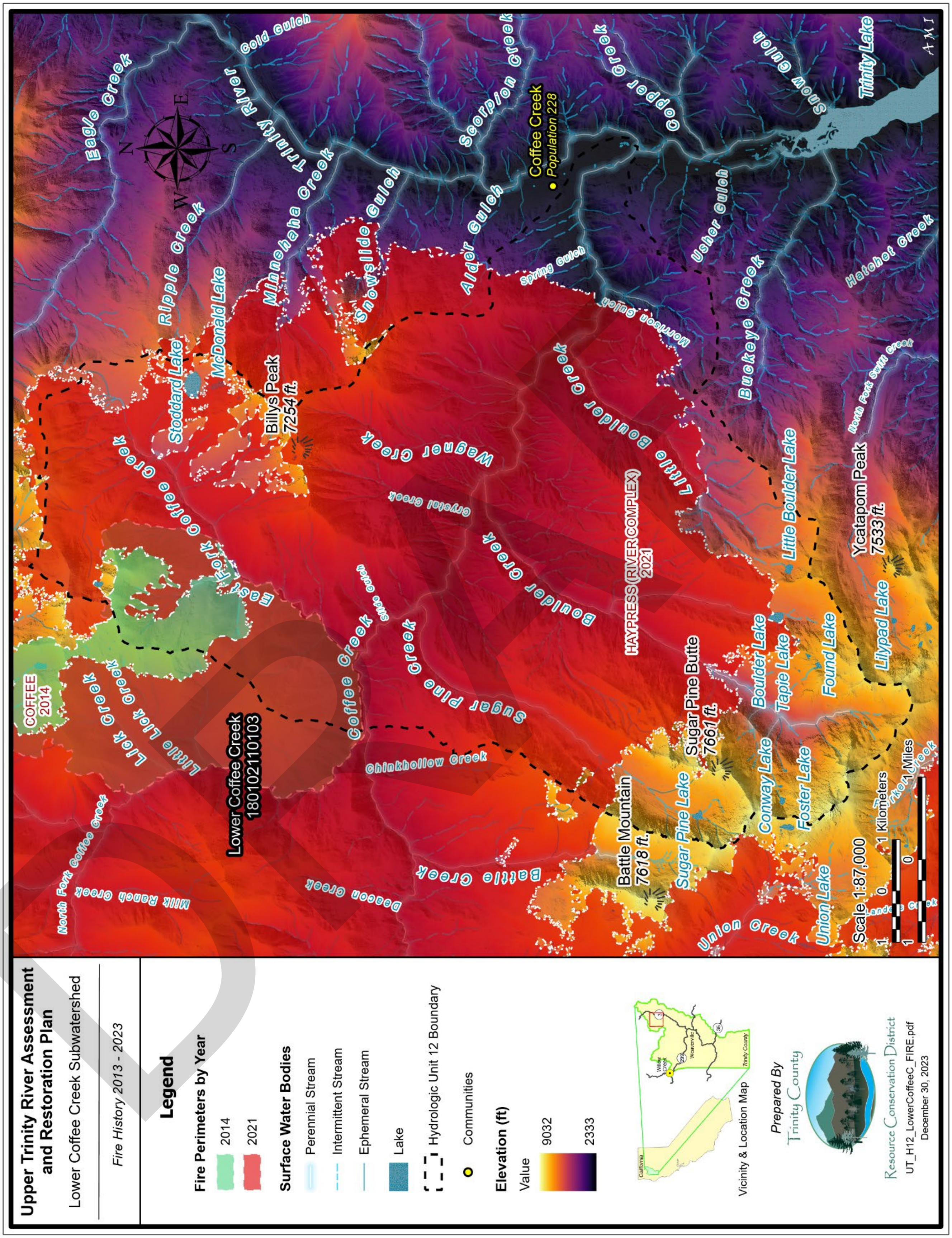

Upper Trinity River Assessment and Restoration Plan
Upper Coffee Creek Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Perennial Snow/Ice
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperCoffeeC_LANDCOVER.pdf
March 21, 2024
Scale 1:88,000
1 Kilometers
1 Miles
N
E
S
W
Upper Coffee Creek
180102110102
Deadman Peak 7618 ft.
Coyote Peak 7497 ft.
Packers Peak 7772 ft.
Preachers Peak 7060 ft.
Red Rock Mountain 7789 ft.
Battle Mountain 7618 ft.
Sugar Pine Butte 7661 ft.
Ycatapom Peak 7533 ft.
Wolford Gulch
Bloody Run Creek
Schuler Gulch
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Slide Gulch
Crystal Creek
Benson Gulch
Granite Creek
Saloon Creek
Chinkhollow Creek
Coffee Creek
Sugar Pine Creek
Boulder Creek
Little Boulder Creek
Snowslide Gulch
North Fork Coffee Creek
Milk Ranch Creek
Deacon Creek
Nicholas Creek
Battle Creek
Sugar Pine Lake
Boulder Lake
Little Boulder Lake
Tapie Lake
Found Lake
Conway Lake
Lilypad Lake
Swift Creek
North Fork Swift Creek
Pierce Gulch
Daley Gulch
Steveale Creek
Hardscrabble Creek
Hickory Creek
Union Creek
Union Lake
Landers Creek
Landers Lake
Parker Creek
Deadman Gulch
South Fork Coffee Creek
Lady Gulch
Poorman Gulch
Thompson Gulch
Pin Creek
North Fork Adams Creek
Adams Creek
Crosby Gulch
Rocky Gulch


Upper Trinity River Assessment and Restoration Plan
Upper Coffee Creek Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperCoffeeC_OWNERSHIP.pdf
March 21, 2024
Upper Coffee Creek
180102110102
Scale 1:88,000
1 0 1 Kilometers
1 0 1 Miles
N
E
S
W
Trinity Alps Wilderness
Deadman Peak 7618 ft.
Coyote Peak 7497 ft.
Packers Peak 7772 ft.
Preachers Peak 7060 ft.
Red Rock Mountain 7789 ft.
Battle Mountain 7618 ft.
Sugar Pine Butte 7661 ft.
Ycatapom Peak 7533 ft.
Wolford Gulch
Bloody Run Creek
Lick Creek
Little Lick Creek
South Fork Little Lick Creek
East Fork Coffee Creek
Crystal Creek
Slide Gulch
Benson Gulch
Little Boulder Creek
Boulder Creek
Boulder Lake
Little Boulder Lake
Tapie Lake
Found Lake
Lilypad Lake
Swift Creek
North Fork Swift Creek
Sugar Pine Creek
Sugar Pine Lake
Conway Lake
Chinkhollow Creek
Coffee Creek
Battle Creek
Nicholas Creek
Deacon Creek
Union Creek
Union Lake
Landers Creek
Landers Lake
Parker Creek
Schuler Gulch
Granite Creek
Saloon Creek
Milk Ranch Creek
Snowslide Gulch
North Fork Coffee Creek
Daley Gulch
Pierce Gulch
Steveale Creek
Hardscrabble Creek
Hickory Creek
Deadman Gulch
South Fork Coffee Creek
Lady Gulch
Poorman Gulch
Thompson Gulch
Pin Creek
North Fork Adams Creek
Adams Creek
Crosby Gulch
Rocky Gulch


Upper Trinity River Assessment and Restoration Plan
Lower Coffee Creek Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerCoffeeC_BDA.pdf
December 29, 2023
Lower Coffee Creek
180102110103
Coffee Creek
Population 228
Billys Peak
7254 ft.
Sugar Pine Butte
7661 ft.
Battle Mountain
7618 ft.
Ycatapom Peak
7533 ft.
Eagle Creek
Ripple Creek
Trinity River
Gold Gulch
Minnehaha Creek
Snowslide Gulch
Alder Gulch
Scorpion Creek
Copper Creek
Snow Gulch
Trinity Lake
Usher Gulch
Spring Gulch
Buckeye Creek
Hatchet Creek
North Fork Swift Creek
Morrison Gulch
Little Boulder Creek
Little Boulder Lake
Boulder Lake
Boulder Creek
Wagner Creek
Crystal Creek
Stoddard Lake
McDonald Lake
East Fork Coffee Creek
Coffee Creek
Sugar Pine Creek
Chinkhollow Creek
Lick Creek
Little Lick Creek
North Fork Coffee Creek
Milk Ranch Creek
Deacon Creek
Battle Creek
Union Creek
Sugar Pine Lake
Conway Lake
Foster Lake
Tapie Lake
Found Lake
Lilypad Lake
Union Lake
Scale 1:87,000
Kilometers
Miles


Upper Trinity River Assessment and Restoration Plan
Lower Coffee Creek Subwatershed
Fire History 2013 - 2023
Legend
Fire Perimeters by Year
2014
2021
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerCoffeeC_FIRE.pdf
December 30, 2023
Coffee Creek
Population 228
Billys Peak
7254 ft.
HAYPRESS (RIVER COMPLEX)
2021
COFFEE
2014
Lower Coffee Creek
180102110103
Sugar Pine Butte
7661 ft.
Battle Mountain
7618 ft.
Ycatapom Peak
7533 ft.
Eagle Creek
Gold Gulch
Trinity River
Scorpion Creek
Copper Creek
Snow Gulch
Trinity Lake
Ripple Creek
Minnehaha Creek
Snowslide Gulch
Alder Gulch
Spring Gulch
Usher Gulch
Hatchet Creek
Stoddard Lake
McDonald Lake
Morrison Gulch
Buckeye Creek
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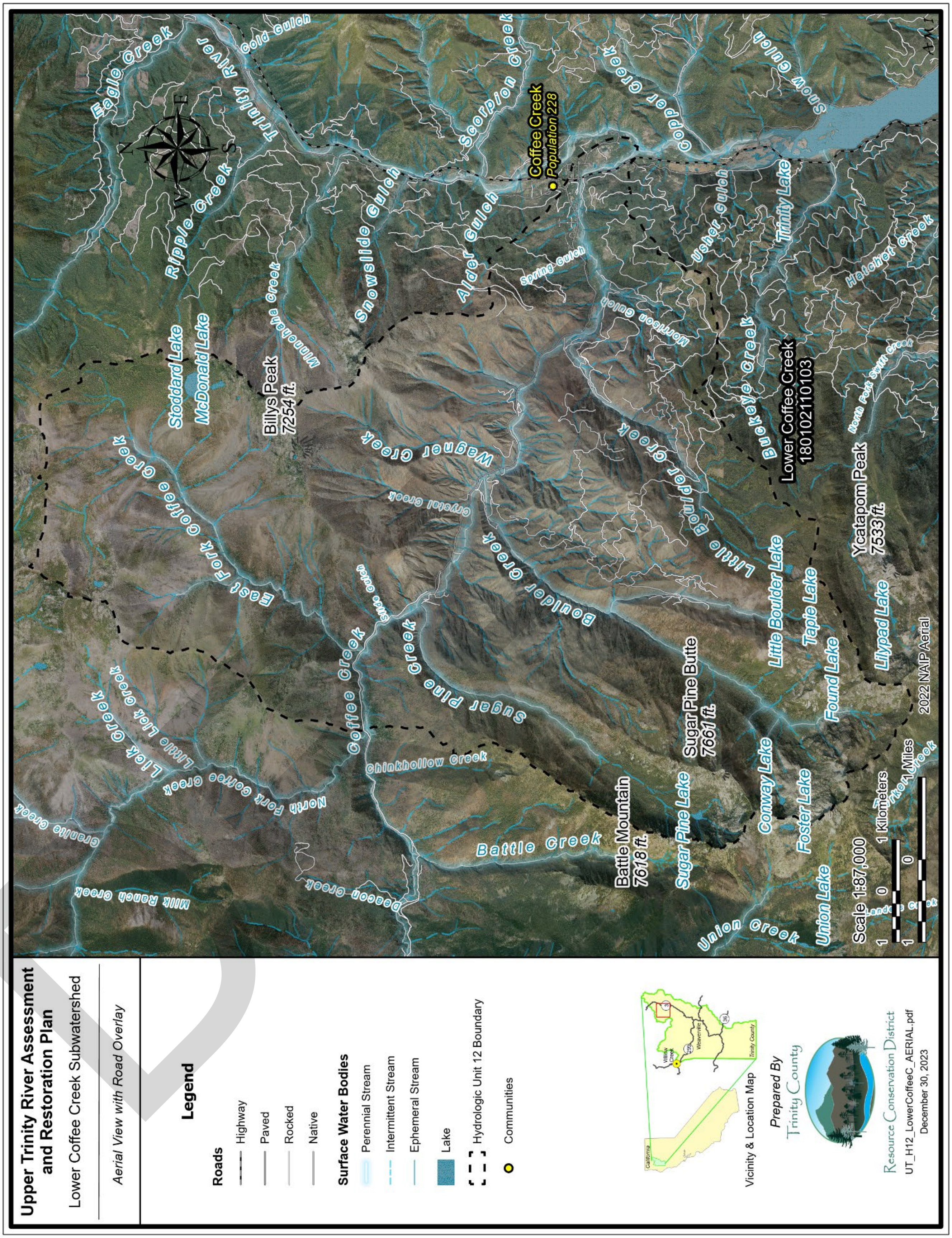
Wagner Creek
Crystal Creek
Boulder Creek
East Fork Coffee Creek
Little Boulder Lake
North Fork Swift Creek
Lick Creek
Little Lick Creek
Coffee Creek
Sugar Pine Creek
Boulder Lake
Tapie Lake
Found Lake
Lilypad Lake
Conway Lake
Foster Lake
Sugar Pine Lake
Chinkhollow Creek
North Fork Coffee Creek
Milk Ranch Creek
Deacon Creek
Battle Creek
Union Creek
Union Lake
Scale 1:87,000
1 Kilometers
1 Miles


Upper Trinity River Assessment and Restoration Plan
Lower Coffee Creek Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerCoffeeC_AERIAL.pdf
December 30, 2023
Scale 1:87,000
1 0 1 Kilometers
1 0 1 Miles
2022 NAIP Aerial
Lower Coffee Creek
180102110103
Coffee Creek
Population 228
Billys Peak
7254 ft.
Sugar Pine Butte
7661 ft.
Battle Mountain
7618 ft.
Ycatapom Peak
7533 ft.
Eagle Creek
Trinity River
Cold Gulch
Scorpion Creek
Copper Creek
Snow Gulch
Ripple Creek
Snowslide Gulch
Alder Gulch
Spring Gulch
Usher Gulch
Trinity Lake
Hatchet Creek
Minnehaha Creek
Morrison Gulch
Buckeye Creek
North Fork Swift Creek
Stoddard Lake
McDonald Lake
Wagner Creek
Boulder Creek
Little Boulder Creek
Crystal Creek
East Fork Coffee Creek
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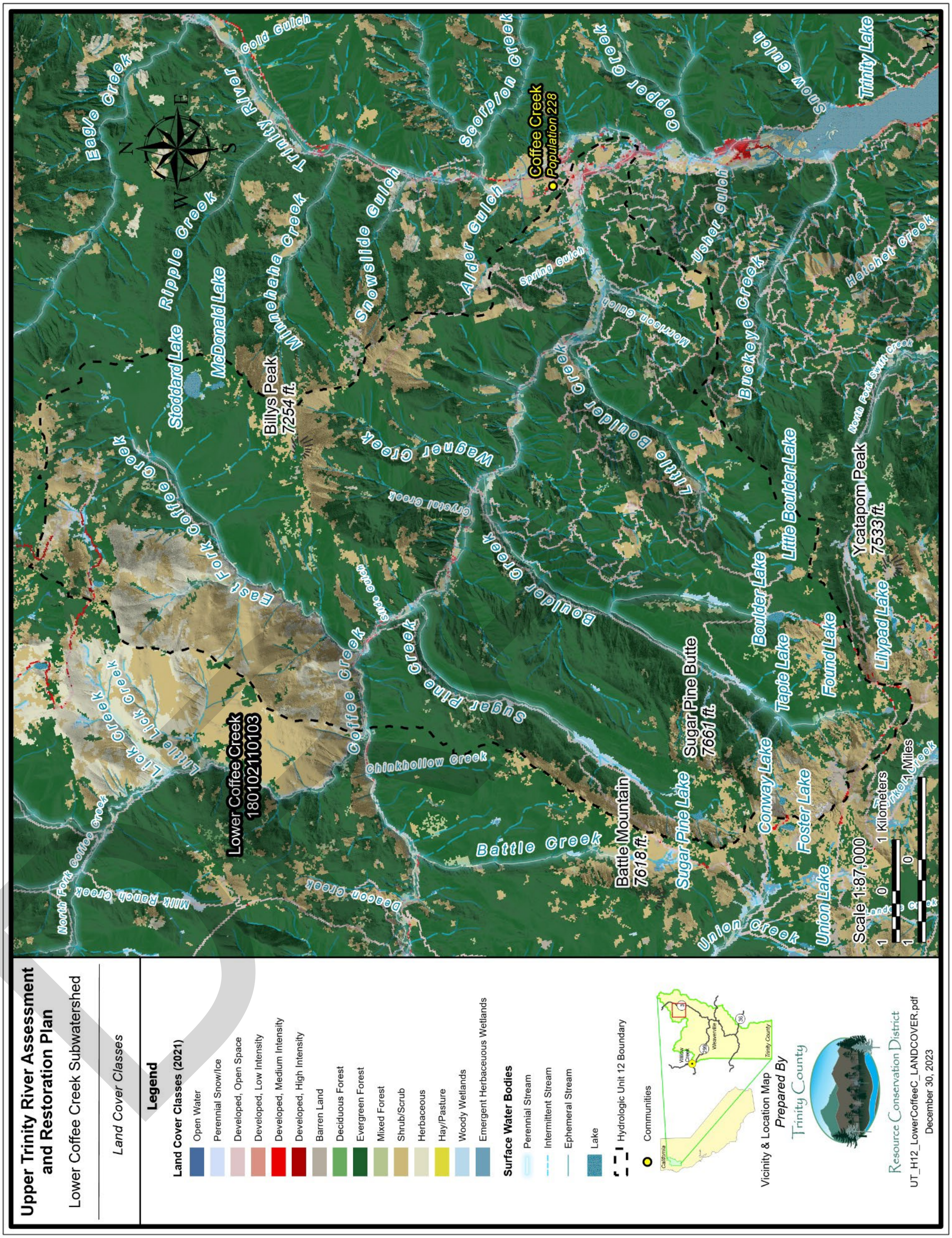
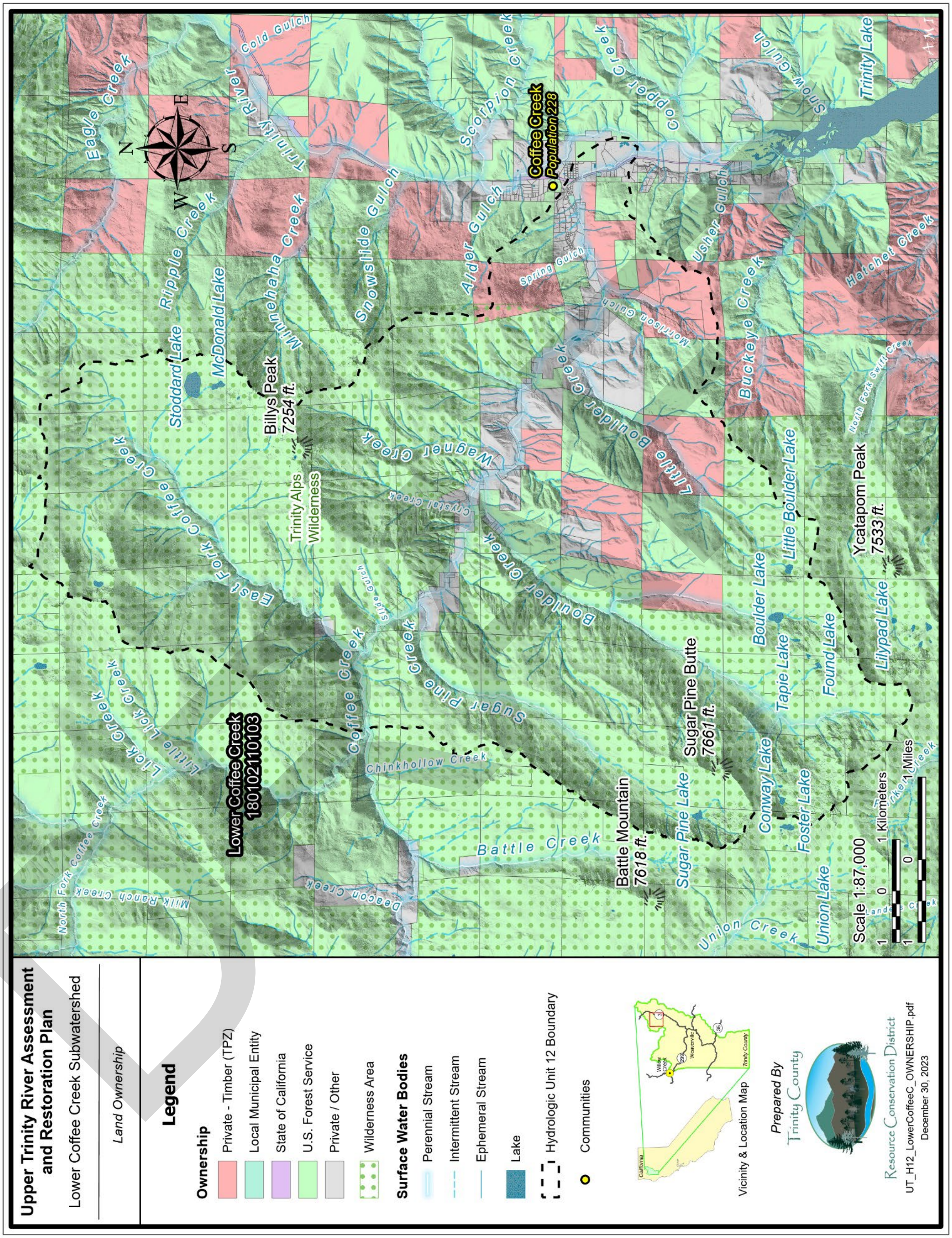
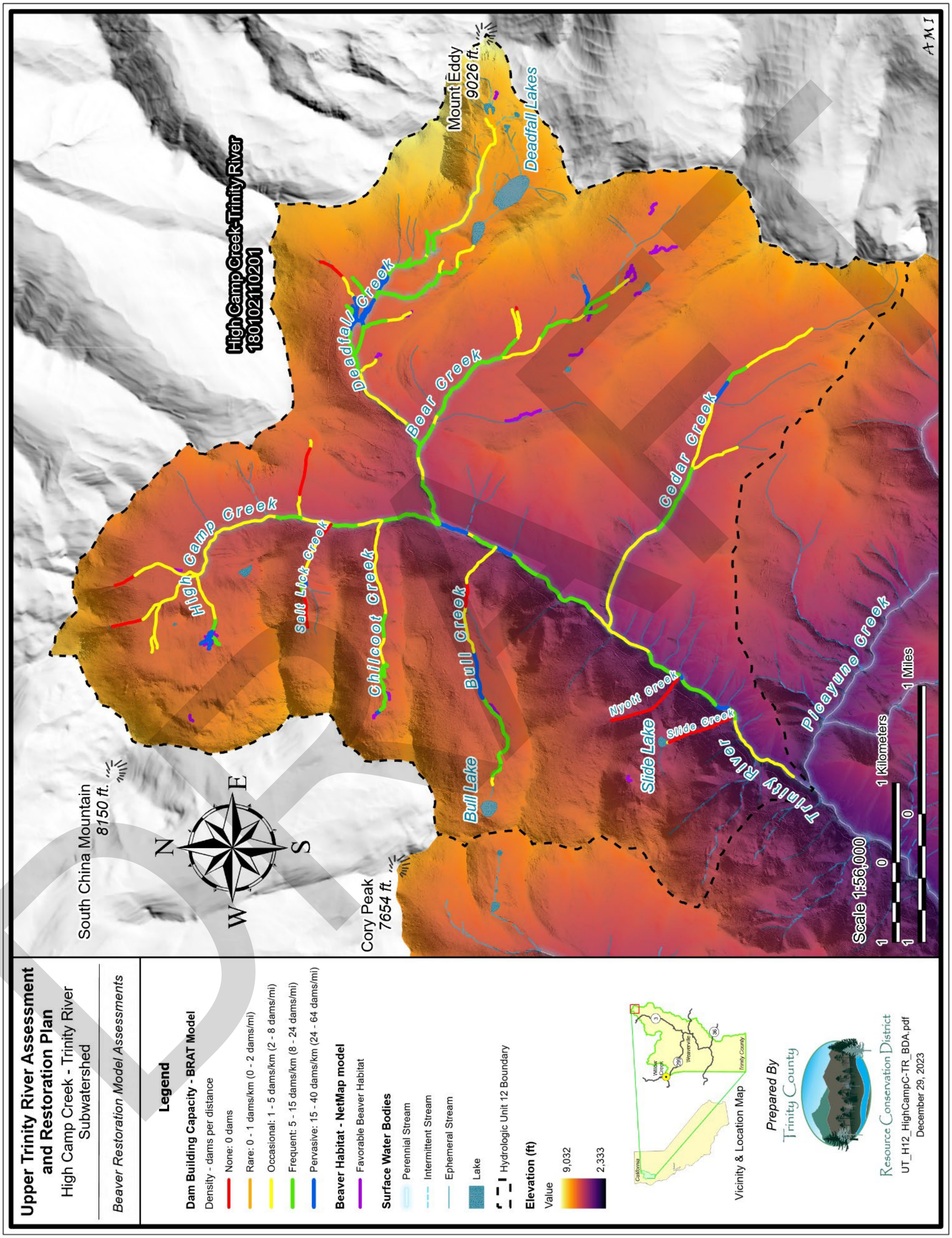
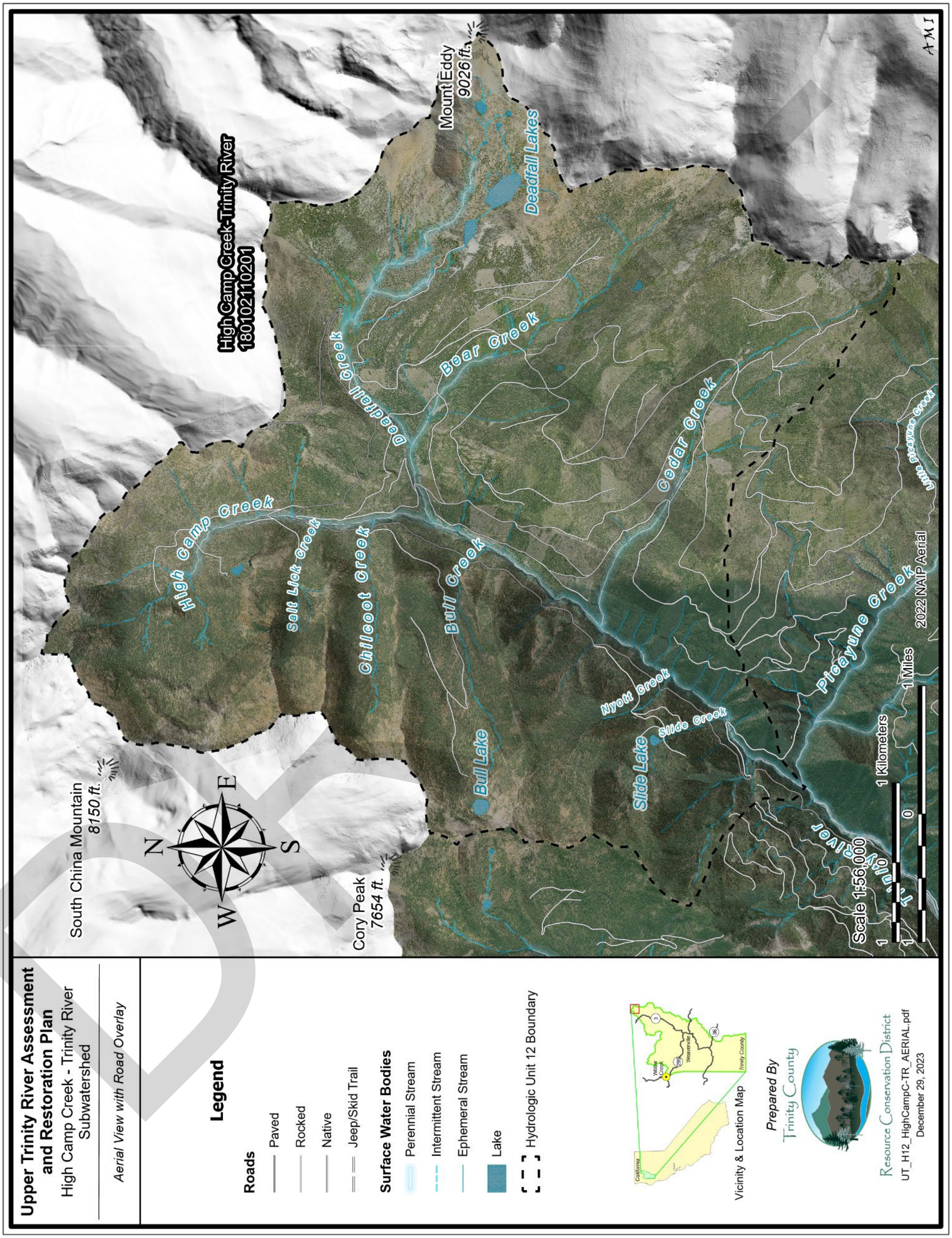
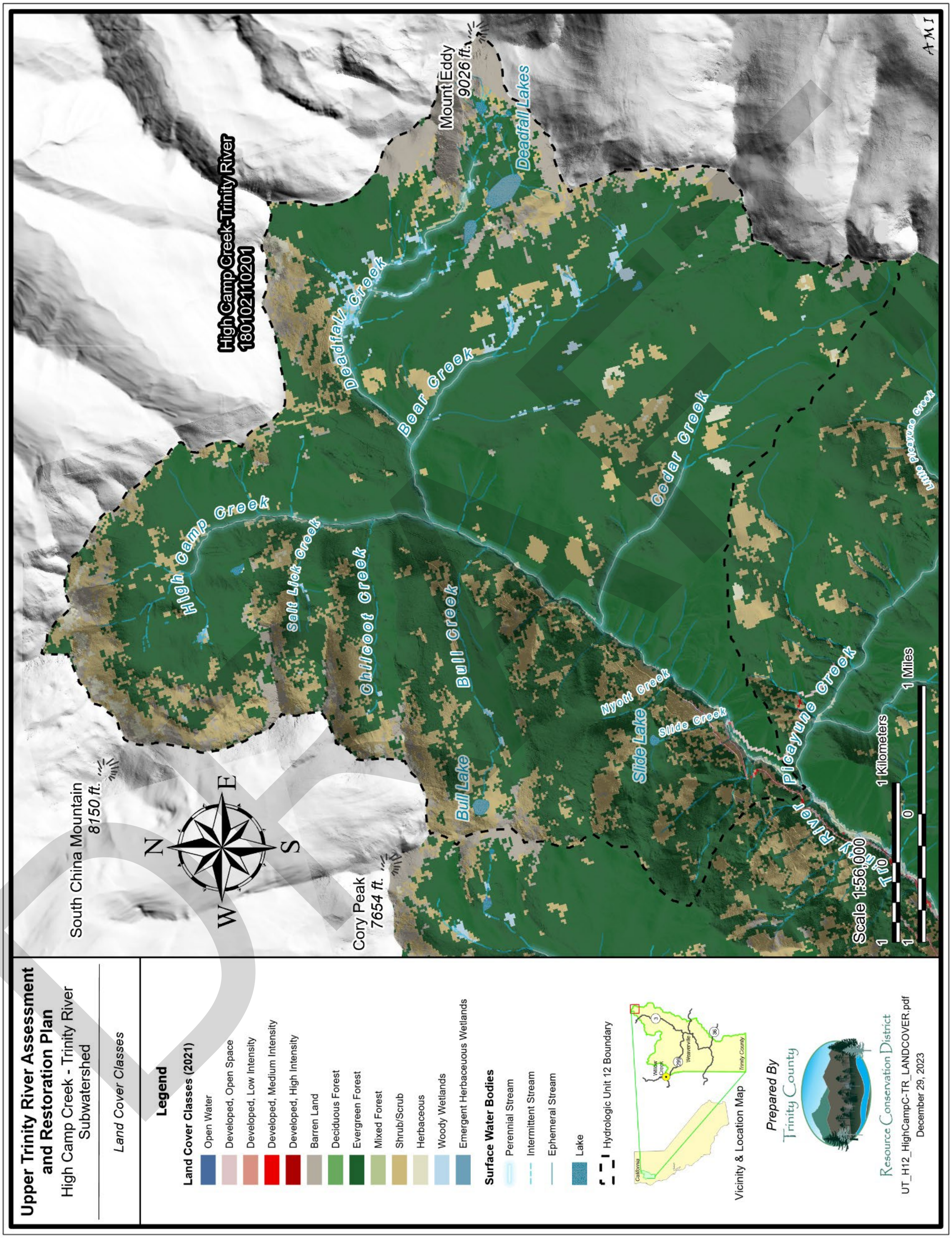
Sugar Pine Creek
Chinkhollow Creek
Lick Creek
Little Lick Creek
North Fork Coffee Creek
Granite Creek
Battle Creek
Sugar Pine Lake
Conway Lake
Foster Lake
Milk Ranch Creek
Deacon Creek
Union Creek
Union Lake

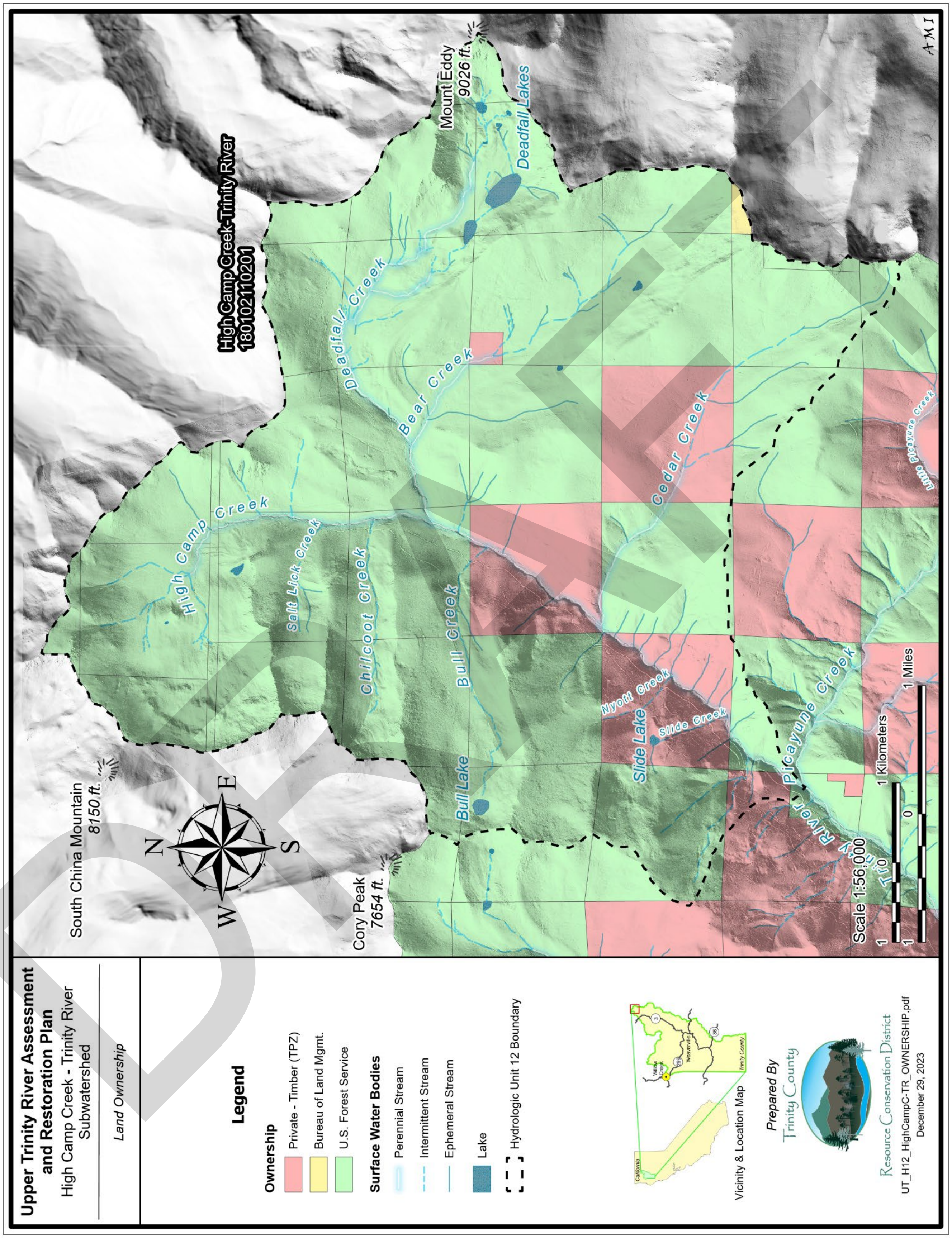

Upper Trinity River Assessment and Restoration Plan
Lower Coffee Creek Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Perennial Snow/Ice
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerCoffeeC_LANDCOVER.pdf
December 30, 2023
Lower Coffee Creek
180102110103
Coffee Creek
Population 228
Billys Peak
7254 ft.
Sugar Pine Butte
7661 ft.
Battle Mountain
7618 ft.
Ycatapom Peak
7533 ft.
Trinity River
Trinity Lake
Eagle Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Scorpion Creek
Copper Creek
Snow Gulch
Alder Gulch
Spring Gulch
Usher Gulch
Morrison Gulch
Buckeye Creek
Hatchet Creek
North Fork Swift Creek
Wagner Creek
Little Boulder Creek
Little Boulder Lake
Crystal Creek
Boulder Creek
Boulder Lake
Tapie Lake
Found Lake
Lilypad Lake
East Fork Coffee Creek
Coffee Creek
Sugar Pine Creek
Sugar Pine Lake
Conway Lake
Foster Lake
Union Lake
Union Creek
Chinkhollow Creek
Battle Creek
Lick Creek
Little Lick Creek
North Fork Coffee Creek
Milk Ranch Creek
Deacon Creek
Cold Gulch
Scale 1:87,000
1 Kilometers
1 Miles

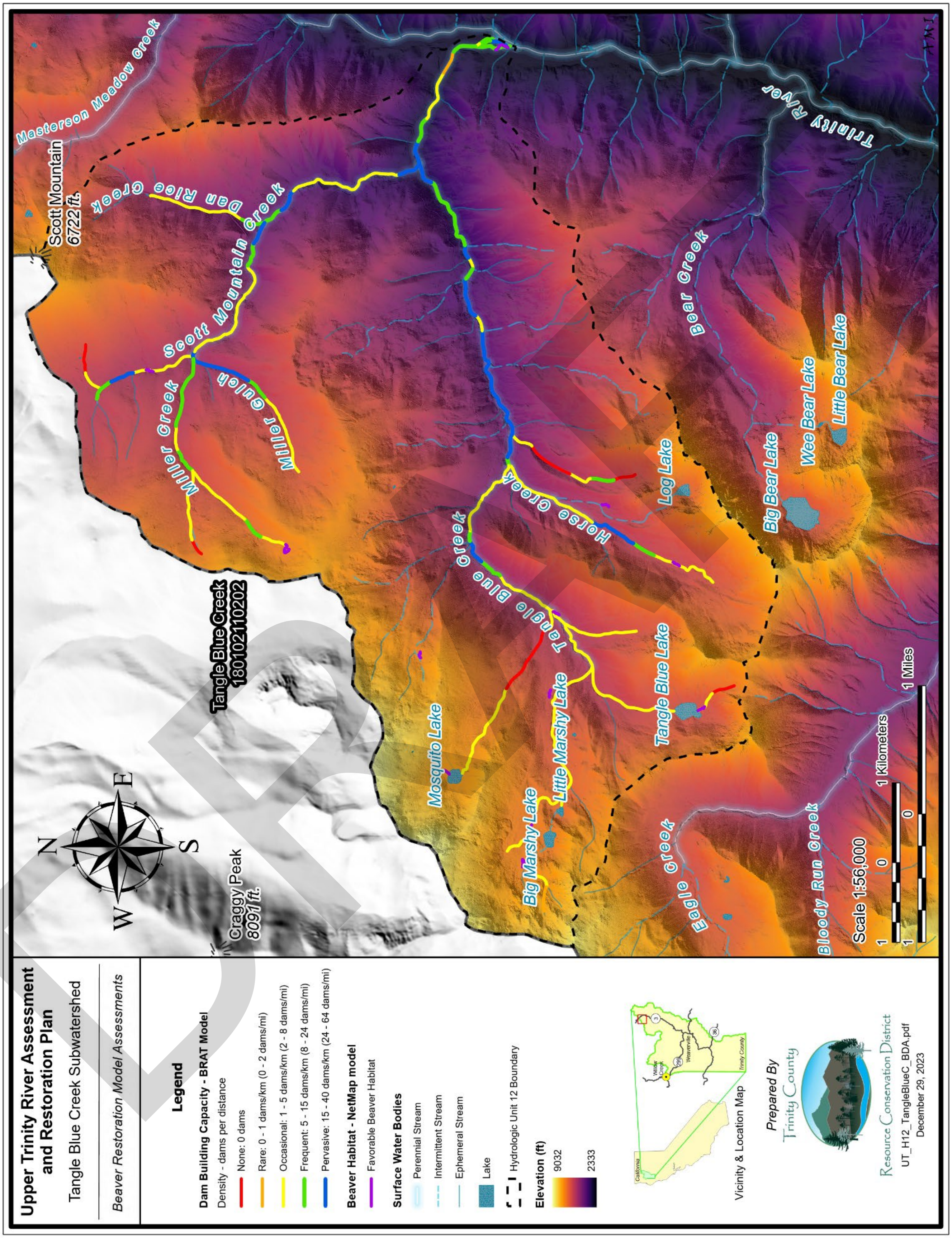

Upper Trinity River Assessment and Restoration Plan
Lower Coffee Creek Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerCoffeeC_OWNERSHIP.pdf
December 30, 2023
Lower Coffee Creek
180102110103
Coffee Creek
Population 228
Trinity Alps
Wilderness
Billys Peak
7254 ft.
Sugar Pine Butte
7661 ft.
Battle Mountain
7618 ft.
Ycatapom Peak
7533 ft.
Eagle Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Trinity River
Cold Gulch
Scorpion Creek
Copper Creek
Snow Gulch
Trinity Lake
Alder Gulch
Spring Gulch
Usher Gulch
Morrison Gulch
Buckeye Creek
Hatchet Creek
North Fork Swift Creek
Little Boulder Creek
Little Boulder Lake
Boulder Lake
Boulder Creek
Wagner Creek
Crystal Creek
East Fork Coffee Creek
Coffee Creek
Sugar Pine Creek
Chinkhollow Creek
Lick Creek
Little Lick Creek
North Fork Coffee Creek
Milk Ranch Creek
Deacon Creek
Battle Creek
Sugar Pine Lake
Conway Lake
Foster Lake
Tapie Lake
Found Lake
Lilypad Lake
Union Lake
Union Creek
Scale 1:87,000
1 0 1 Kilometers
1 0 1 Miles

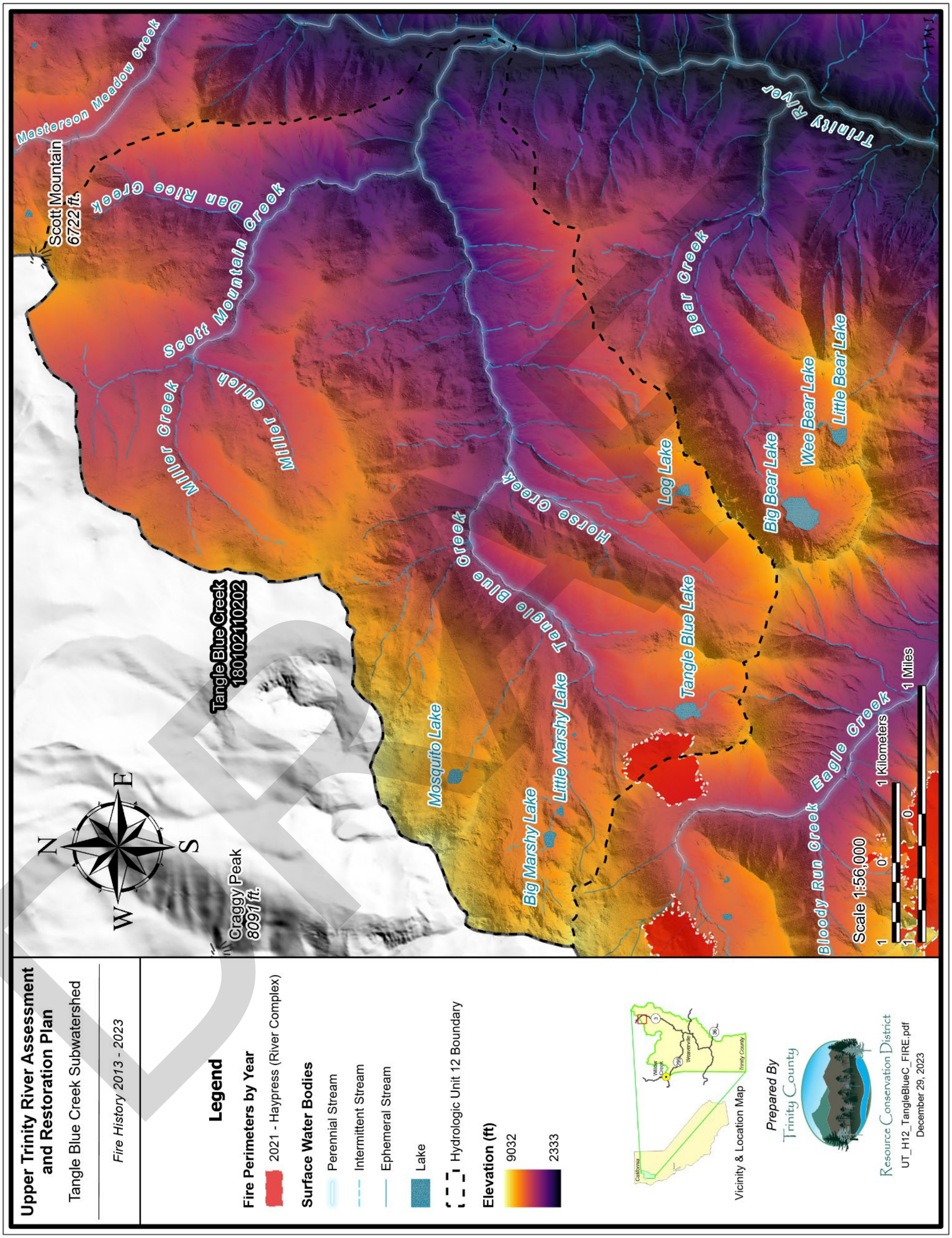

Upper Trinity River Assessment and Restoration Plan
High Camp Creek - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9,032
2,333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_HighCampC-TR_BDA.pdf
December 29, 2023
High Camp Creek-Trinity River
180102110201
Mount Eddy
9026 ft.
Deadfall Lakes
Deadfall Creek
Bear Creek
Cedar Creek
High Camp Creek
Salt Lick Creek
Chilcoot Creek
Bull Creek
Nyolt Creek
Slide Creek
Slide Lake
Bull Lake
Trinity River
Picayune Creek
South China Mountain
8150 ft.
Cory Peak
7654 ft.
N
E
S
W
Scale 1:56,000
1 Kilometers
1 Miles

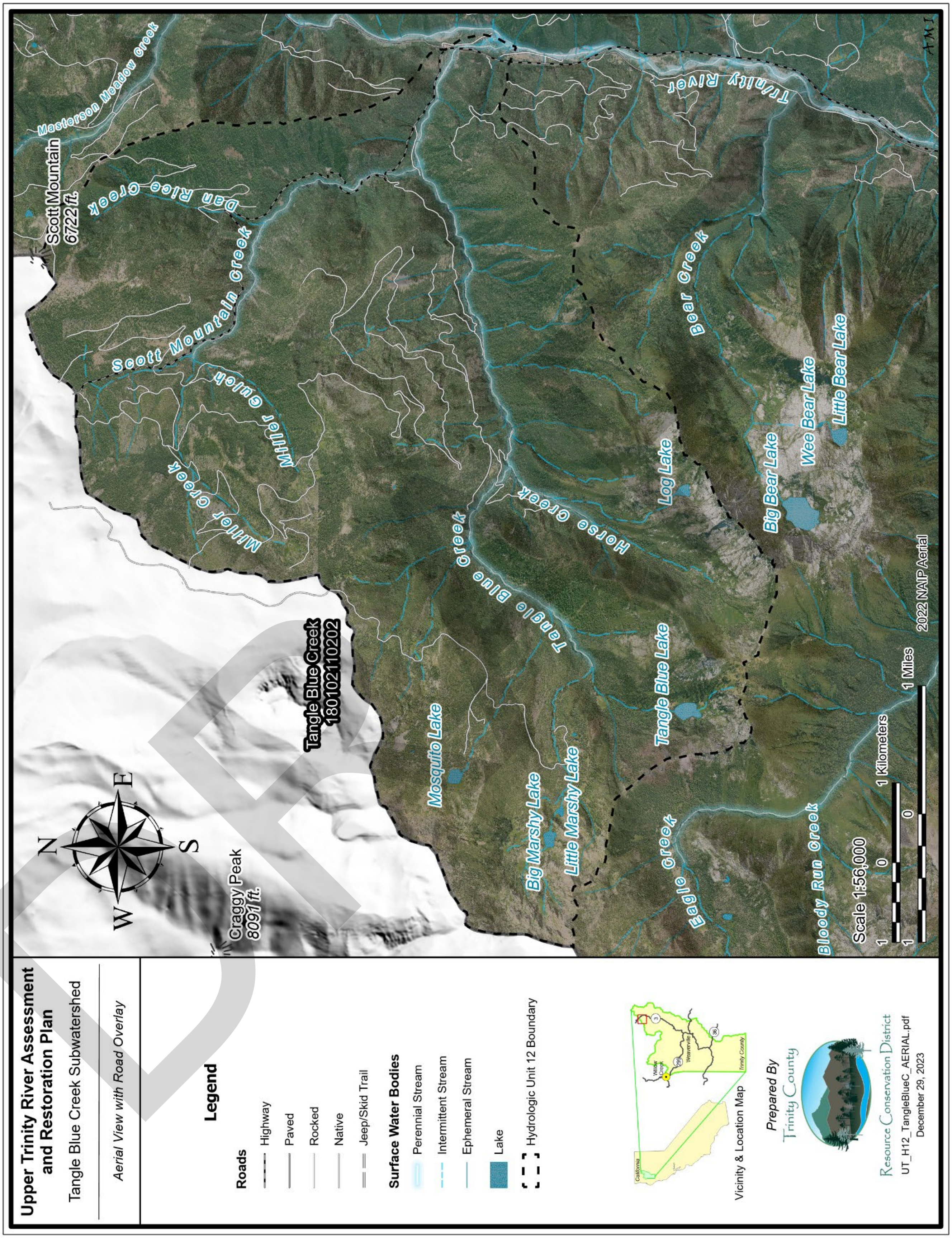

Upper Trinity River Assessment and Restoration Plan
High Camp Creek - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_HighCampC-TR_AERIAL.pdf
December 29, 2023
High Camp Creek-Trinity River
180102110201
Mount Eddy
9026 ft.
Deadfall Lakes
Deadfall Creek
Bear Creek
Cedar Creek
High Camp Creek
Salt Lick Creek
Chilcoot Creek
Bull Creek
Bull Lake
Nyott Creek
Slide Creek
Slide Lake
Picayune Creek
Little Picayune Creek
Trinity River
South China Mountain
8150 ft.
Cory Peak
7654 ft.
N
E
S
W
Scale 1:56,000
1 0 1 Kilometers
1 0 1 Miles
2022 NAIP Aerial

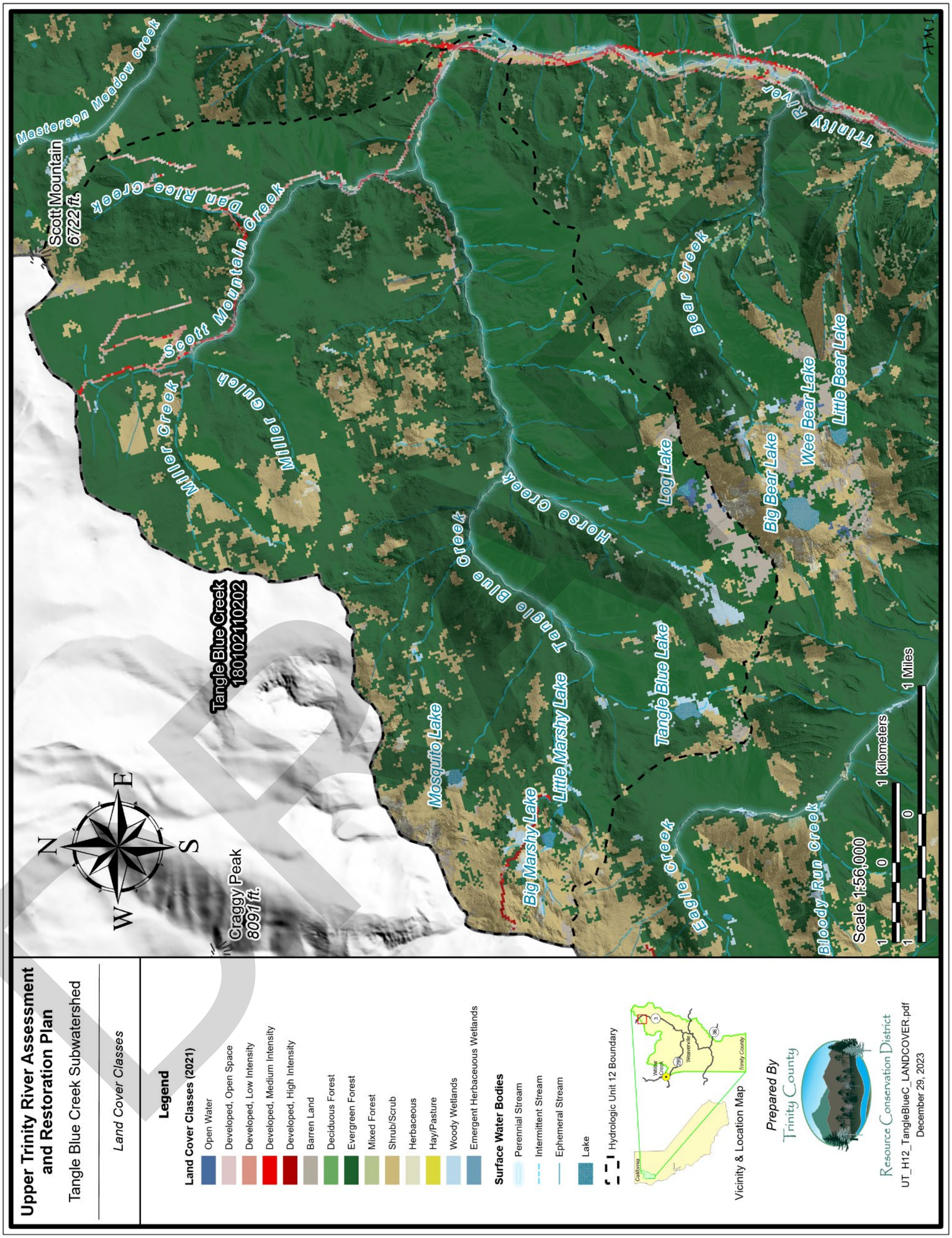

Upper Trinity River Assessment and Restoration Plan
High Camp Creek - Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_HighCampC-TR_LANDCOVER.pdf
December 29, 2023
High Camp Creek-Trinity River
180102110201
Mount Eddy
9026 ft.
Deadfall Lakes
Deadfall Creek
Bear Creek
Cedar Creek
Little Picayune Creek
High Camp Creek
Salt Lick Creek
Chilcoot Creek
Bull Creek
Nyott Creek
Slide Creek
Slide Lake
Bull Lake
Picayune Creek
Trinity River
South China Mountain
8150 ft.
Cory Peak
7654 ft.
N
E
S
W
Scale 1:56,000
1 Kilometers
1 Miles
DRAFT


Upper Trinity River Assessment and Restoration Plan
High Camp Creek - Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Bureau of Land Mgmt.
U.S. Forest Service
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_HighCampC-TR_OWNERSHIP.pdf
December 29, 2023
High Camp Creek-Trinity River
180102110201
Mount Eddy
9026 ft.
Deadfall Lakes
Deadfall Creek
Bear Creek
Cedar Creek
High Camp Creek
Salt Lick Creek
Chilcoot Creek
Bull Creek
Bull Lake
Slide Lake
Nyott Creek
Slide Creek
Picayune Creek
Little Picayune Creek
Trinity River
South China Mountain
8150 ft.
Cory Peak
7654 ft.
N
E
S
W
Scale 1:56,000
1 Kilometers
1 Miles
DRAFT


Upper Trinity River Assessment and Restoration Plan
Tangle Blue Creek Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_TangleBlueC_BDA.pdf
December 29, 2023
Tangle Blue Creek
180102110202
Scott Mountain
6722 ft.
Craggy Peak
8091 ft.
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Miller Creek
Miller Gulch
Trinity River
Bear Creek
Horse Creek
Tangle Blue Creek
Log Lake
Big Bear Lake
Wee Bear Lake
Little Bear Lake
Tangle Blue Lake
Mosquito Lake
Little Marshy Lake
Big Marshy Lake
Eagle Creek
Bloody Run Creek
Scale 1:56,000
1 0 1 Kilometers
1 0 1 Miles
N E S W


Upper Trinity River Assessment and Restoration Plan
Tangle Blue Creek Subwatershed
Fire History 2013 - 2023
Legend
Fire Perimeters by Year
2021 - Haypress (River Complex)
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_TangleBlueC_FIRE.pdf
December 29, 2023
Tangle Blue Creek
180102110202
Scott Mountain
6722 ft.
Craggy Peak
8091 ft.
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Miller Creek
Miller Gulch
Horse Creek
Tangle Blue Creek
Bear Creek
Trinity River
Log Lake
Big Bear Lake
Wee Bear Lake
Little Bear Lake
Tangle Blue Lake
Mosquito Lake
Little Marshy Lake
Big Marshy Lake
Eagle Creek
Bloody Run Creek
Scale 1:56,000
1 0 1 Kilometers
1 0 1 Miles


Upper Trinity River Assessment and Restoration Plan
Tangle Blue Creek Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_TangleBlueC_AERIAL.pdf
December 29, 2023
Tangle Blue Creek
180102110202
Scott Mountain
6722 ft.
Craggy Peak
8091 ft.
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Miller Gulch
Miller Creek
Trinity River
Bear Creek
Little Bear Lake
Wee Bear Lake
Big Bear Lake
Log Lake
Horse Creek
Tangle Blue Creek
Tangle Blue Lake
Mosquito Lake
Big Marshy Lake
Little Marshy Lake
Eagle Creek
Bloody Run Creek
N
E
S
W
Scale 1:56,000
1 0 1 Kilometers
1 0 1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
Tangle Blue Creek Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_TangleBlueC_LANDCOVER.pdf
December 29, 2023
Tangle Blue Creek
180102110202
Scott Mountain
6722 ft.
Craggy Peak
8091 ft.
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Miller Creek
Miller Gulch
Trinity River
Bear Creek
Little Bear Lake
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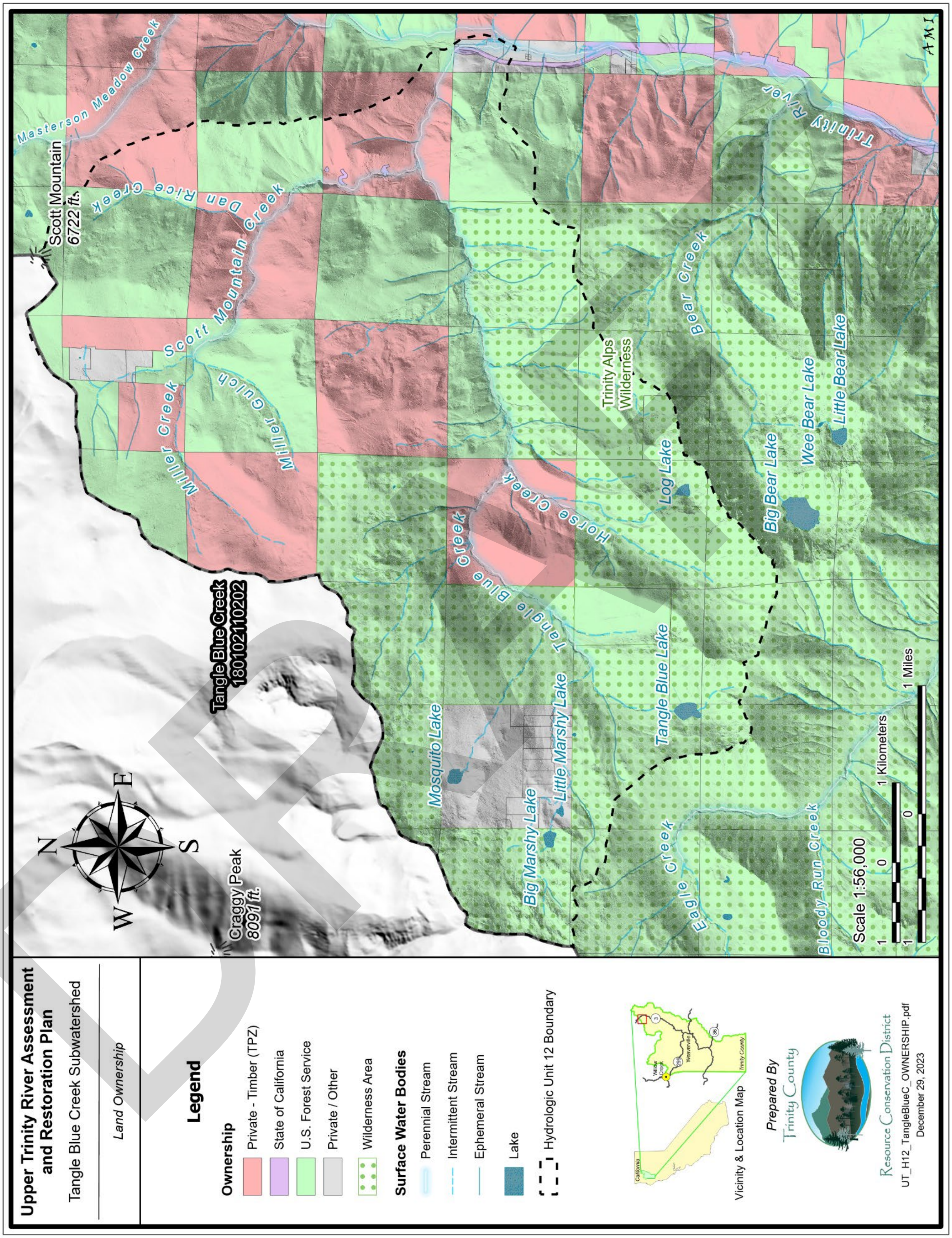
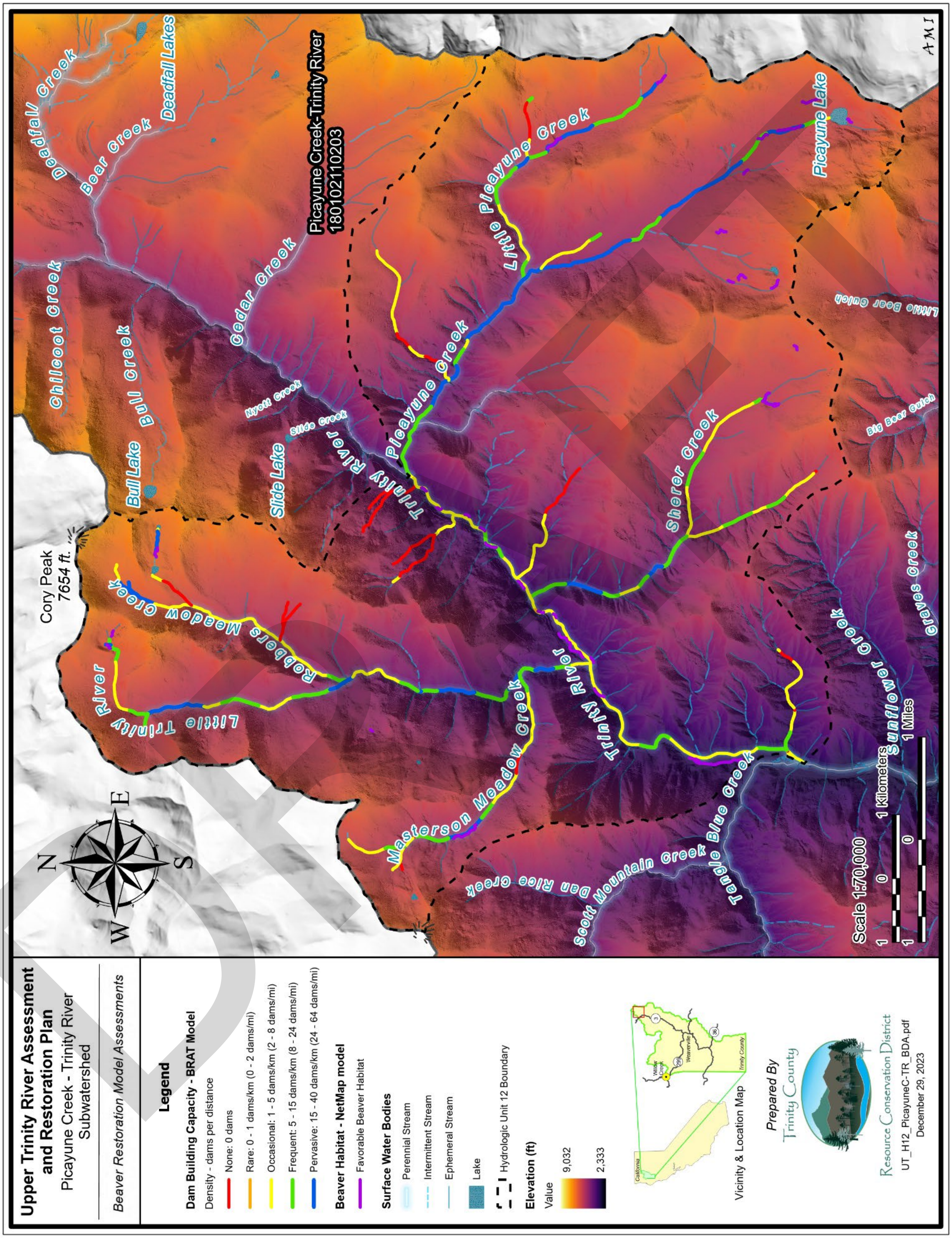
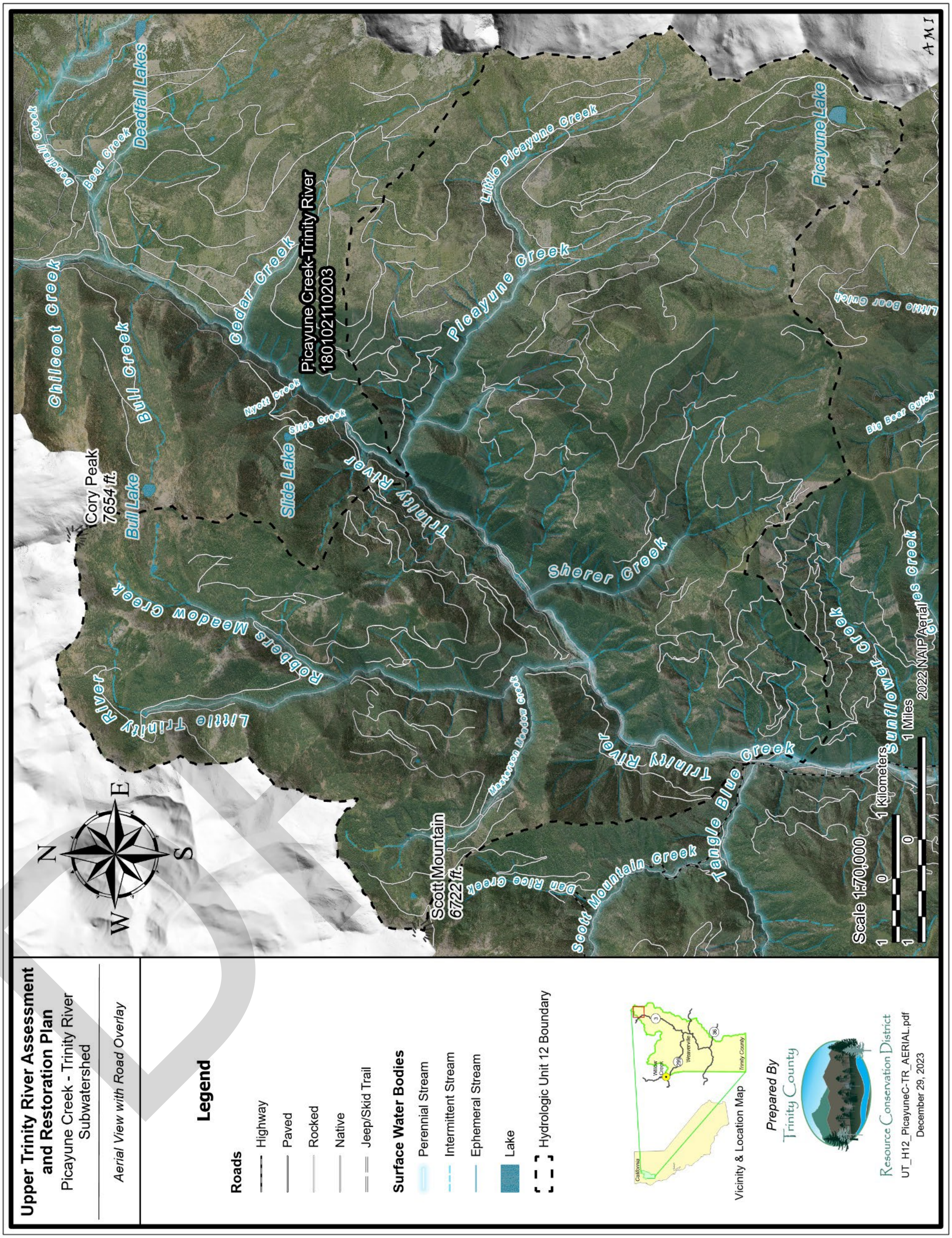
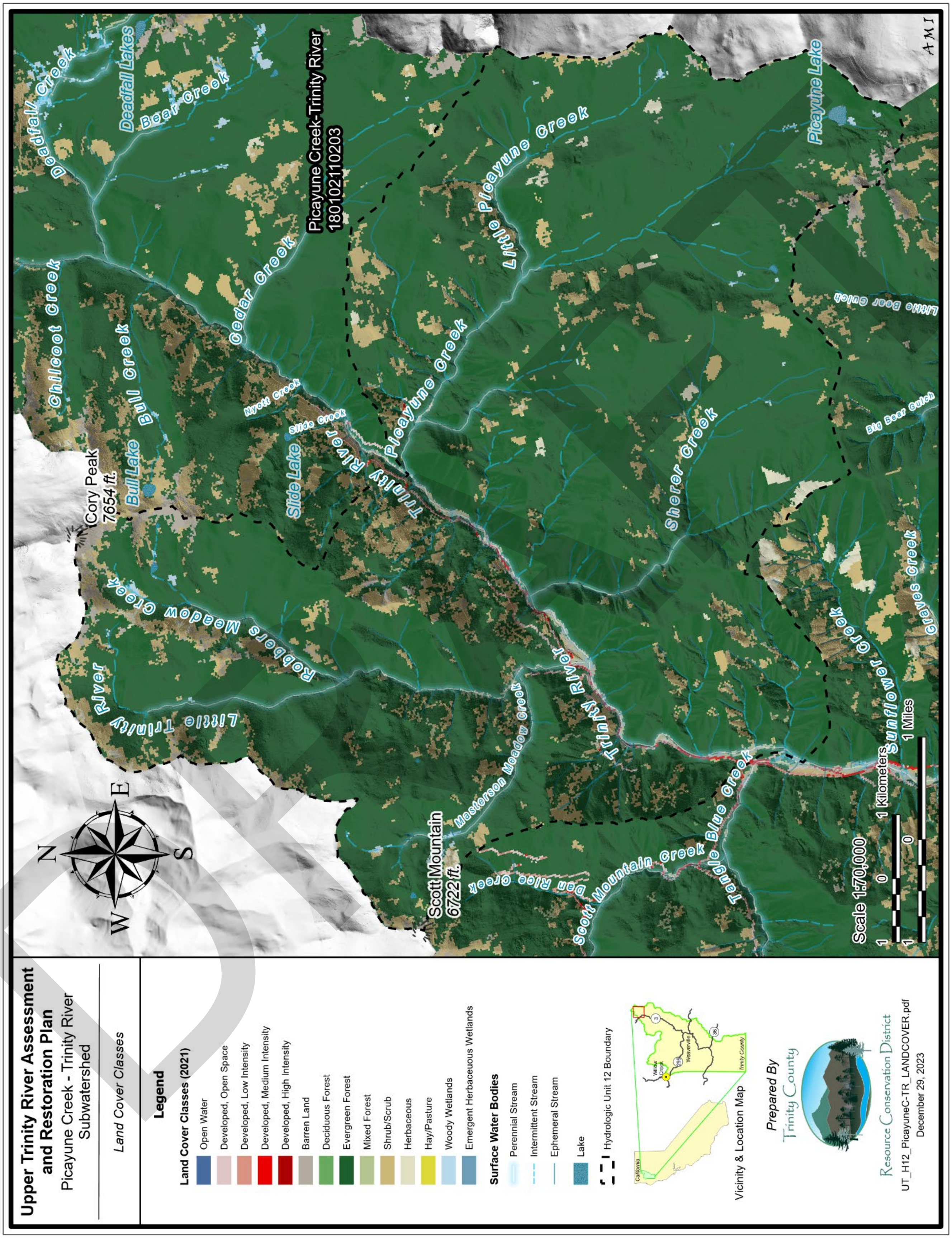
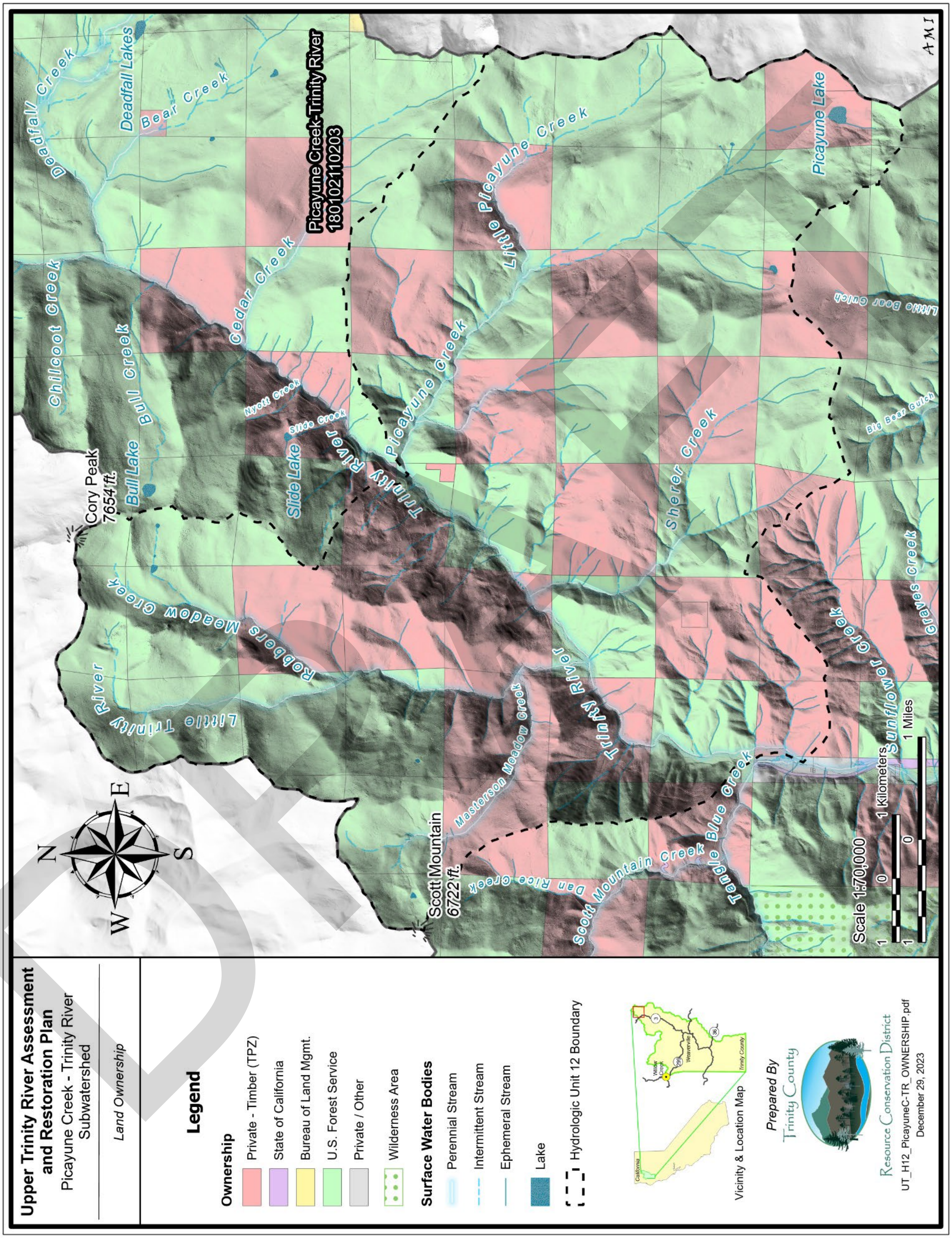
Big Bear Lake
Log Lake
Horse Creek
Tangle Blue Creek
Tangle Blue Lake
Mosquito Lake
Little Marshy Lake
Big Marshy Lake
Eagle Creek
Bloody Run Creek
Scale 1:56,000
1 0 1 Kilometers
1 0 1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Tangle Blue Creek Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_TangleBlueC_OWNERSHIP.pdf
December 29, 2023
Scale 1:56,000
1 0 1 Kilometers
1 0 1 Miles
Tangle Blue Creek
180102110202
Scott Mountain
6722 ft.
Craggy Peak
8091 ft.
Trinity Alps Wilderness
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Miller Creek
Miller Gulch
Horse Creek
Tangle Blue Creek
Bear Creek
Trinity River
Eagle Creek
Bloody Run Creek
Log Lake
Big Bear Lake
Wee Bear Lake
Little Bear Lake
Tangle Blue Lake
Mosquito Lake
Little Marshy Lake
Big Marshy Lake
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Picayune Creek - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9,032
2,333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PicayuneC-TR_BDA.pdf
December 29, 2023
Picayune Creek-Trinity River
180102110203
Cory Peak
7654 ft.
Scale 1:70,000
0 1 Kilometers
0 1 Miles
Deadfall Creek
Bear Creek
Deadfall Lakes
Chilcoot Creek
Bull Creek
Bull Lake
Cedar Creek
Nyott Creek
Slide Creek
Slide Lake
Trinity River
Picayune Creek
Little Picayune Creek
Picayune Lake
Little Bear Gulch
Big Bear Gulch
Sherer Creek
Robbers Meadow Creek
Little Trinity River
Masterson Meadow Creek
Sunflower Creek
Graves Creek
Tangle Blue Creek
Scott Mountain Creek
Dan Rice Creek


Upper Trinity River Assessment and Restoration Plan
Picayune Creek - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PicayuneC-TR_AERIAL.pdf
December 29, 2023
Picayune Creek-Trinity River
180102110203
Cory Peak
7654 ft.
Scott Mountain
6722 ft.
Trinity River
Picayune Creek
Little Picayune Creek
Picayune Lake
Deadfall Lakes
Deadfall Creek
Bear Creek
Cedar Creek
Chilcoot Creek
Bull Creek
Bull Lake
Slide Lake
Slide Creek
Nyott Creek
Sherer Creek
Robbers Meadow Creek
Little Trinity River
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Tangle Blue Creek
Sunflower Creek
Big Bear Gulch
Little Bear Gulch
Scale 1:70,000
1 Kilometers
1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
Picayune Creek - Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PicayuneC-TR_LANDCOVER.pdf
December 29, 2023
Picayune Creek-Trinity River
180102110203
Cory Peak
7654 ft.
Scott Mountain
6722 ft.
Deadfall Creek
Deadfall Lakes
Bear Creek
Chilcoot Creek
Bull Creek
Bull Lake
Cedar Creek
Nyott Creek
Slide Creek
Slide Lake
Trinity River
Picayune Creek
Little Picayune Creek
Picayune Lake
Little Bear Gulch
Big Bear Gulch
Sherer Creek
Robbers Meadow Creek
Little Trinity River
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Tangle Blue Creek
Sunflower Creek
Graves Creek
Scale 1:70,000
1 0 1 Kilometers
1 0 1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Picayune Creek - Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
State of California
Bureau of Land Mgmt.
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PicayuneC-TR_OWNERSHIP.pdf
December 29, 2023
Scale 1:70,000
Kilometers
Miles
N
E
S
W
Picayune Creek-Trinity River
180102110203
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7654 ft.
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Slide Lake
Trinity River
Picayune Creek
Little Picayune Creek
Picayune Lake
Little Bear Gulch
Big Bear Gulch
Sherer Creek
Robbers Meadow Creek
Little Trinity River
Masterson Meadow Creek
Dan Rice Creek
Scott Mountain Creek
Tangle Blue Creek
Sunflower Creek
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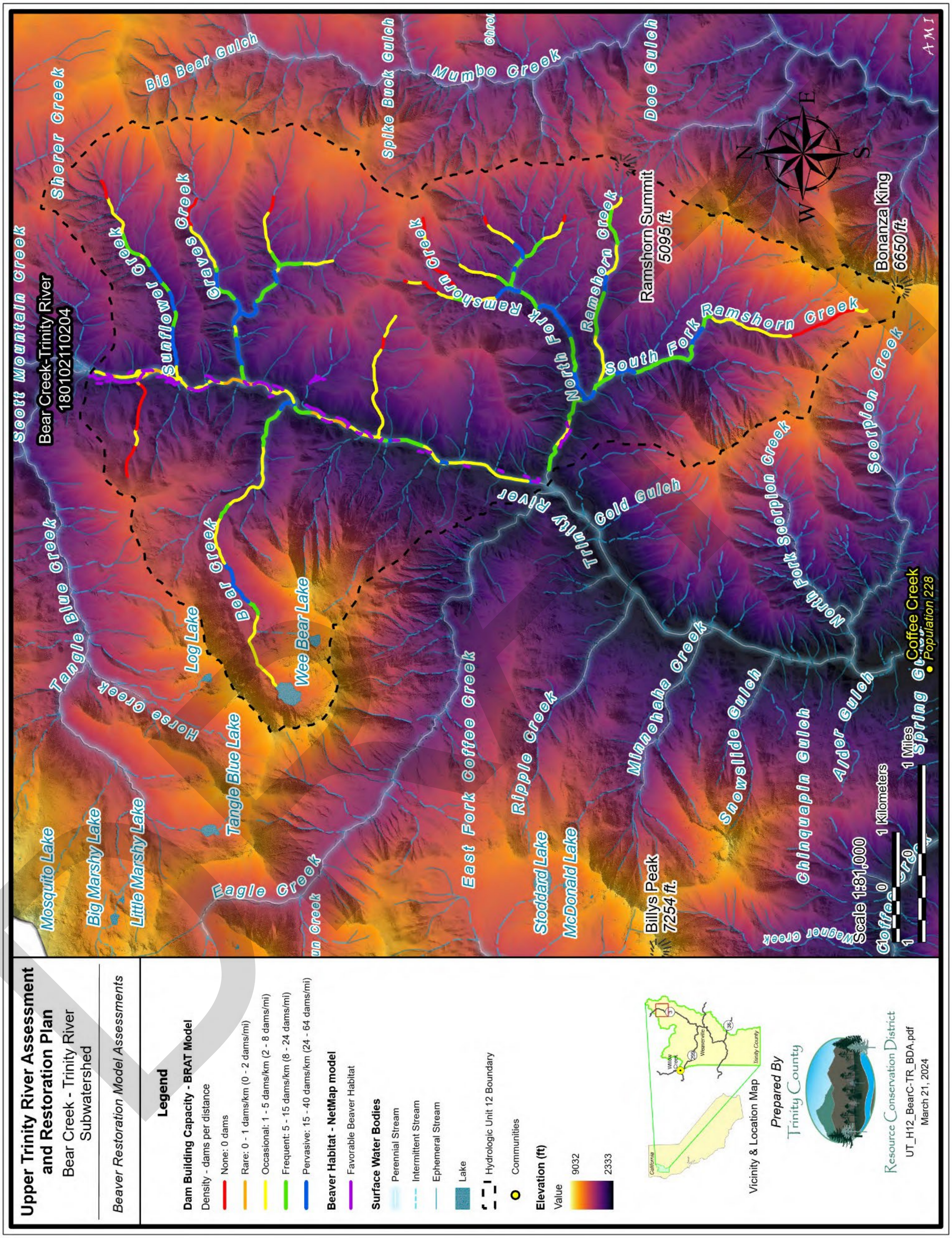
Upper Trinity River Assessment and Restoration Plan
Bear Creek - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
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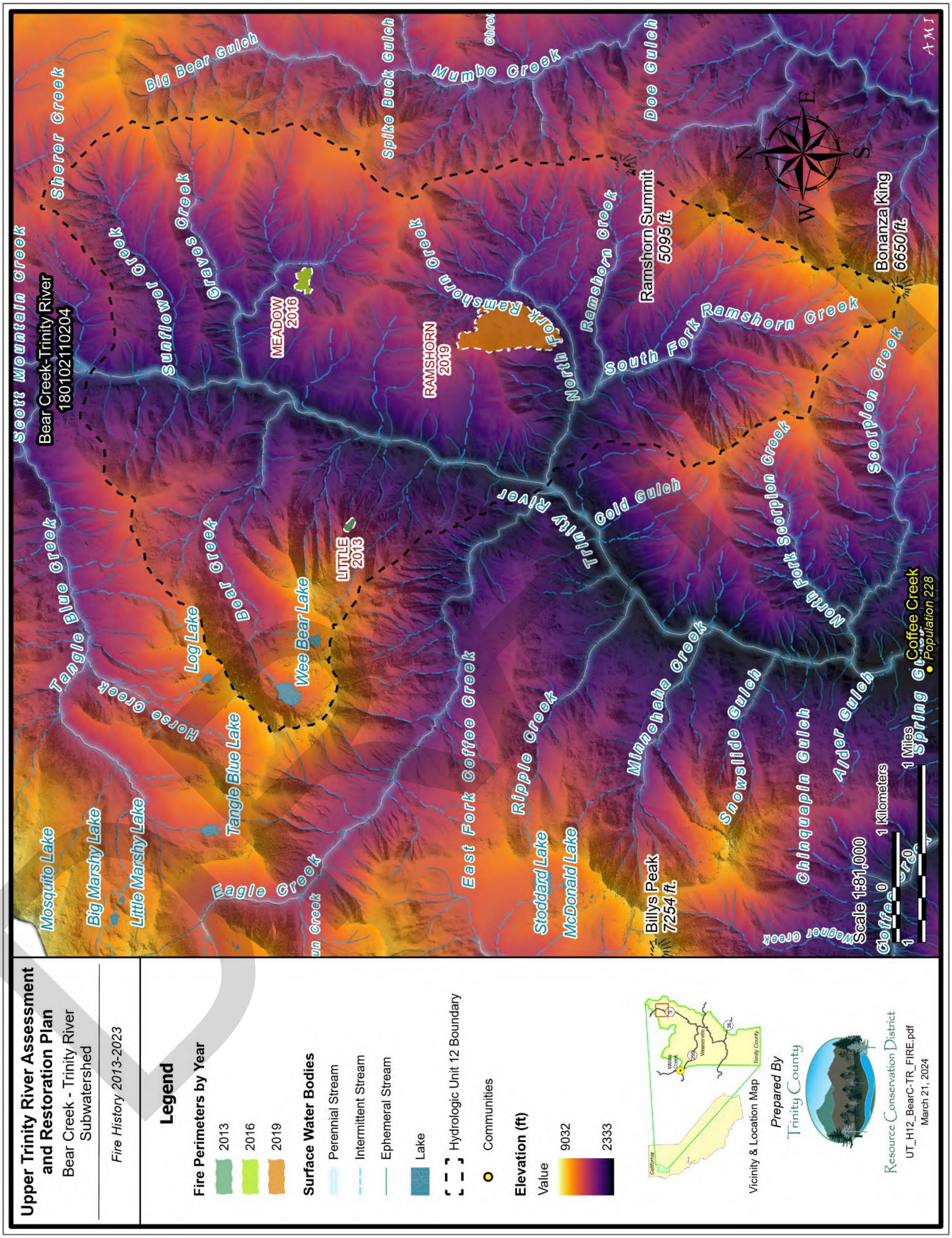
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BearC-TR_BDA.pdf
March 21, 2024
Bear Creek-Trinity River
180102110204
Scott Mountain Creek
Sherer Creek
Big Bear Gulch
Spike Buck Gulch
Mumbo Creek
Doe Gulch
Sunflower Creek
Graves Creek
Ramshorn Creek
North Fork Ramshorn Creek
South Fork Ramshorn Creek
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
Scorpion Creek
North Fork Scorpion Creek
Trinity River
Cold Gulch
Tangle Blue Creek
Log Lake
Bear Creek
Wee Bear Lake
Horse Creek
Tangle Blue Lake
Mosquito Lake
Big Marshy Lake
Little Marshy Lake
Eagle Creek
East Fork Coffee Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Chinquapin Gulch
Alder Gulch
Spring Gulch
Coffee Creek
Population 228
Billys Peak
7254 ft.
Wagner Creek
Scale 1:81,000
1 Kilometers
1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Bear Creek - Trinity River Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2013
2016
2019
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BearC-TR_FIRE.pdf
March 21, 2024
Bear Creek-Trinity River
180102110204
MEADOW 2016
RAMSHORN 2019
LITTLE 2013
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
Billys Peak
7254 ft.
Coffee Creek
Population 228
Scale 1:81,000
1 Kilometers
1 Miles
Trinity River
Scott Mountain Creek
Sherer Creek
Big Bear Gulch
Spike Buck Gulch
Mumbo Creek
Doe Gulch
Sunflower Creek
Graves Creek
Ramshorn Creek
North Fork Ramshorn Creek
South Fork Ramshorn Creek
Scorpion Creek
North Fork Scorpion Creek
Cold Gulch
Tangle Blue Creek
Bear Creek
Log Lake
Wee Bear Lake
Horse Creek
Tangle Blue Lake
Mosquito Lake
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Little Marshy Lake
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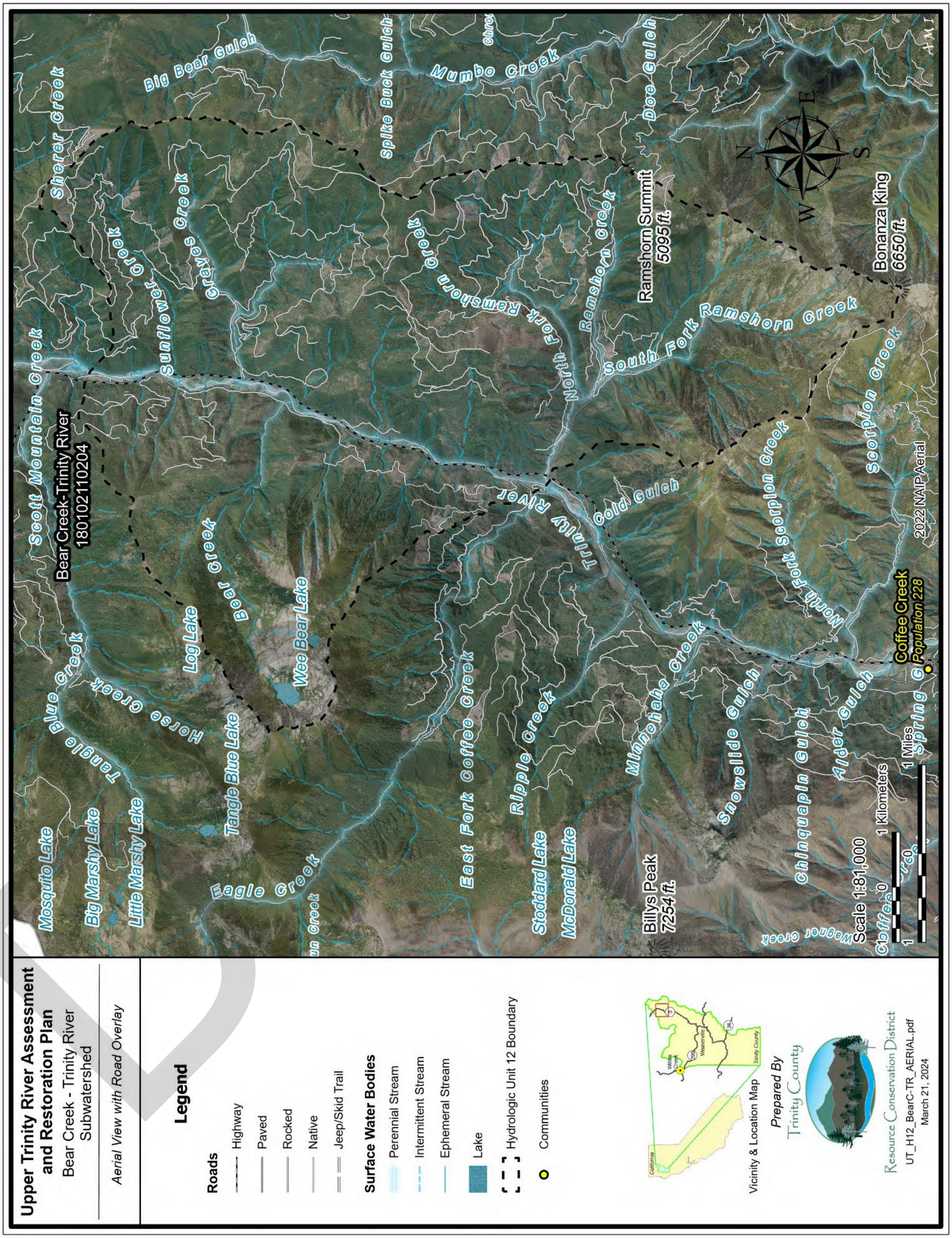
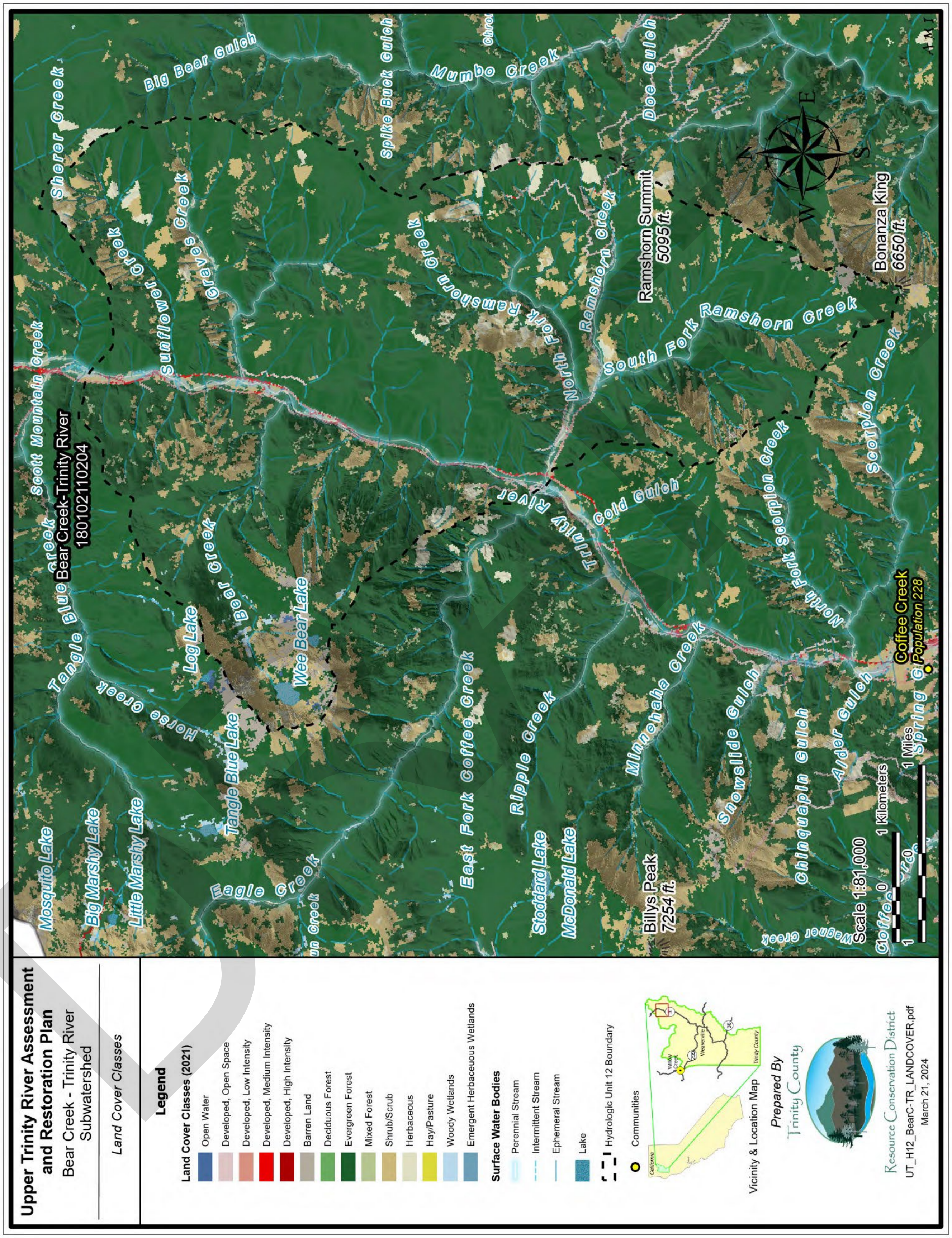
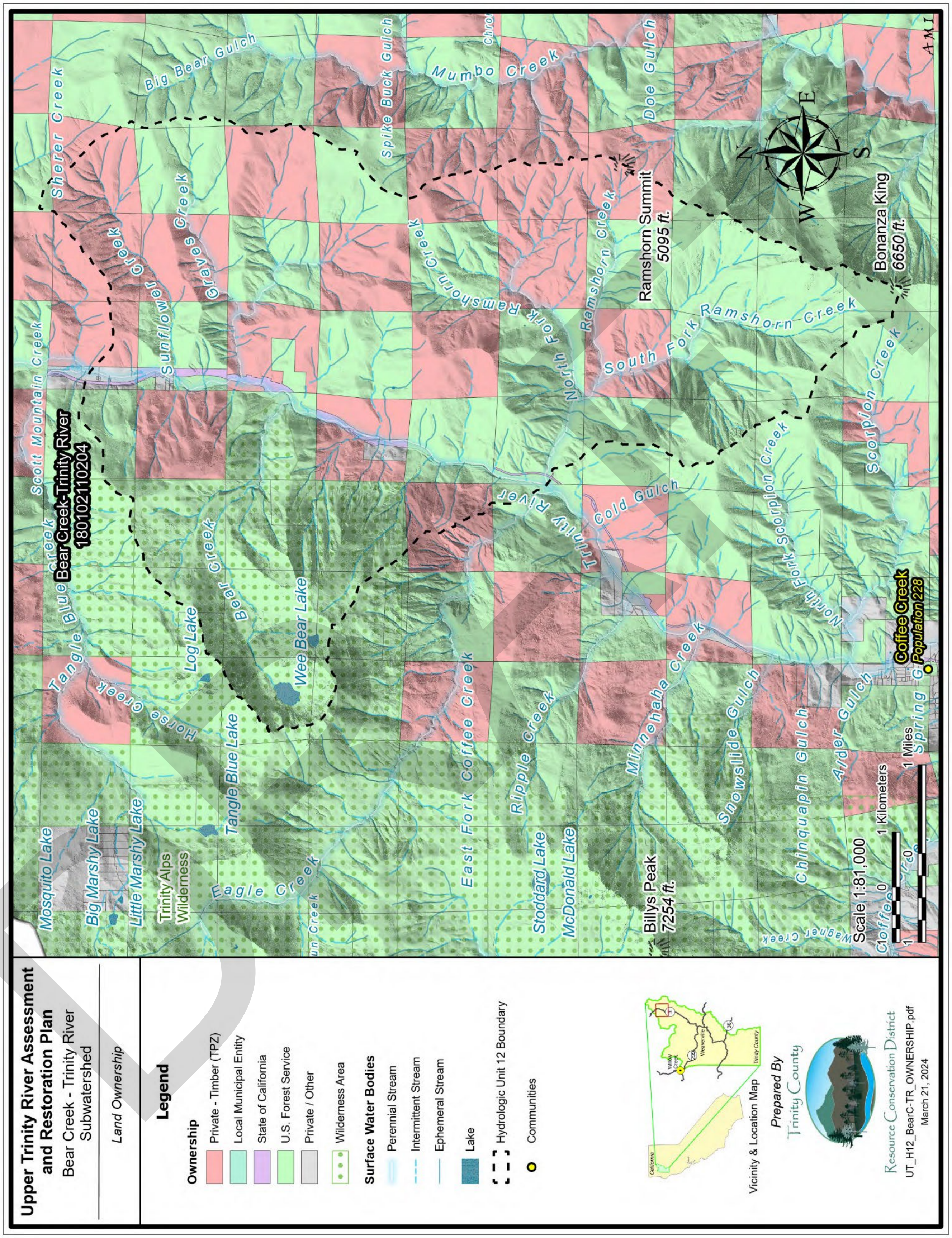
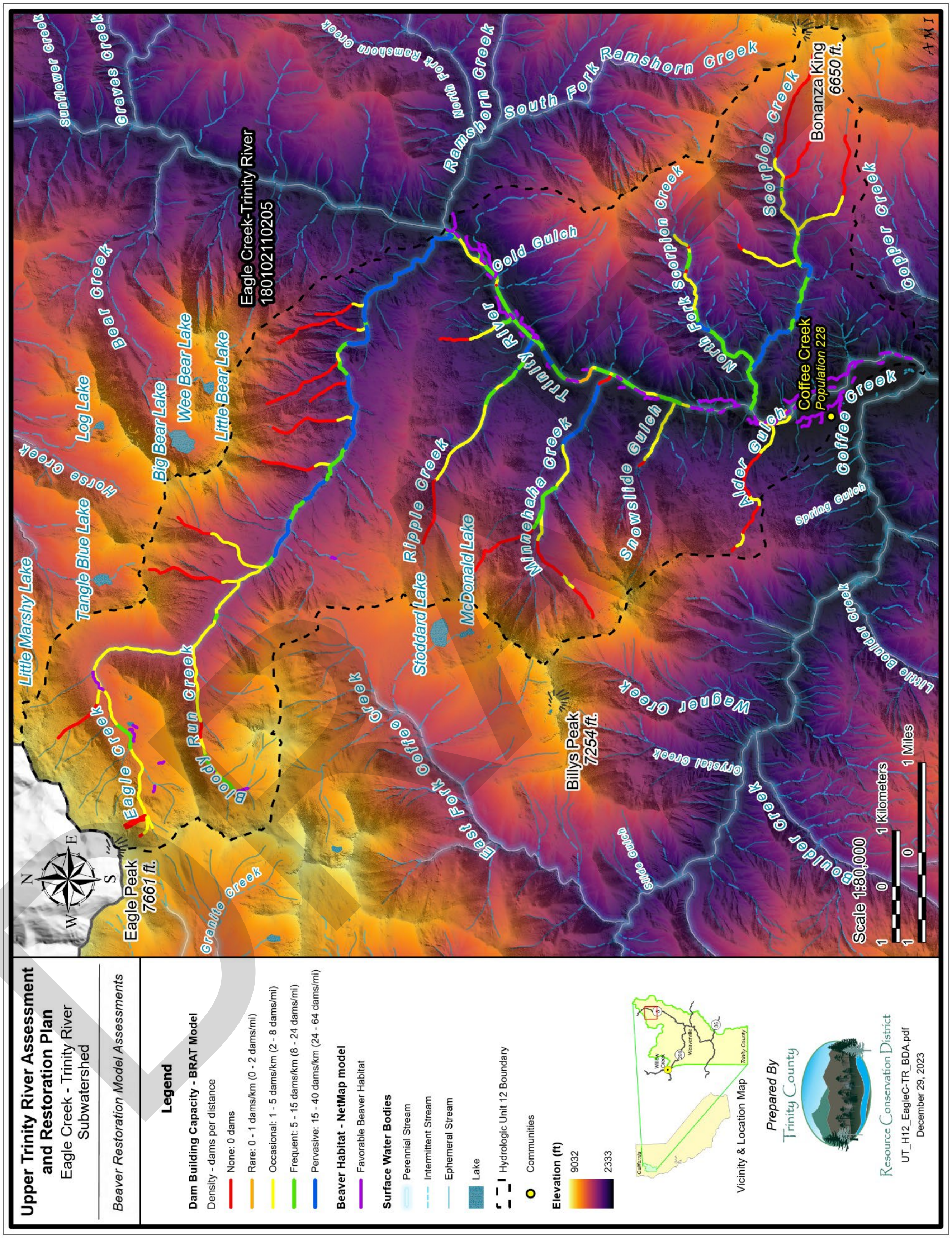
East Fork Coffee Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Chinquapin Gulch
Alder Gulch
Spring Gulch
Wagner Creek



Upper Trinity River Assessment and Restoration Plan
Bear Creek - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BearC-TR_AERIAL.pdf
March 21, 2024
Bear Creek-Trinity River
180102110204
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
Billys Peak
7254 ft.
Coffee Creek
Population 228
Scale 1:81,000
1 Kilometers
1 Miles
2022 NAIP Aerial
Big Bear Gulch
Spike Buck Gulch
Mumbo Creek
Doe Gulch
Sherer Creek
Sunflower Creek
Graves Creek
Scott Mountain Creek
North Fork Ramshorn Creek
Ramshorn Creek
South Fork Ramshorn Creek
Trinity River
Cold Gulch
Scorpion Creek
North Fork Scorpion Creek
Bear Creek
Log Lake
Wee Bear Lake
Tangle Blue Creek
Horse Creek
Tangle Blue Lake
Mosquito Lake
Big Marshy Lake
Little Marshy Lake
Eagle Creek
East Fork Coffee Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Chinquapin Gulch
Alder Gulch
Spring Gulch
Wagner Creek
Coffee Creek
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Bear Creek - Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BearC-TR_LANDCOVER.pdf
March 21, 2024
Bear Creek-Trinity River
180102110204
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
Billys Peak
7254 ft.
Coffee Creek
Population 228
Scale 1:81,000
1 Kilometers
1 Miles
Big Bear Gulch
Sherer Creek
Spike Buck Gulch
Mumbo Creek
Doe Gulch
Sunflower Creek
Graves Creek
Ramshorn Creek
North Fork Ramshorn Creek
South Fork Ramshorn Creek
Scott Mountain Creek
Tangle Blue Creek
Bear Creek
Log Lake
Wee Bear Lake
Trinity River
Cold Gulch
Scorpion Creek
North Fork Scorpion Creek
Horse Creek
Tangle Blue Lake
Mosquito Lake
Big Marshy Lake
Little Marshy Lake
Eagle Creek
East Fork Coffee Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Chinquapin Gulch
Alder Gulch
Spring Gulch
Wagner Creek


Upper Trinity River Assessment and Restoration Plan
Bear Creek - Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BearC-TR_OWNERSHIP.pdf
March 21, 2024
Bear Creek-Trinity River
180102110204
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
Billys Peak
7254 ft.
Coffee Creek
Population 228
Trinity Alps Wilderness
Scale 1:81,000
1 Kilometers
1 Miles
Trinity River
Bear Creek
Tangle Blue Creek
Tangle Blue Lake
Log Lake
Wee Bear Lake
Mosquito Lake
Big Marshy Lake
Little Marshy Lake
Horse Creek
Eagle Creek
East Fork Coffee Creek
Ripple Creek
Stoddard Lake
McDonald Lake
Minnehaha Creek
Snowslide Gulch
Chinquapin Gulch
Alder Gulch
North Fork Scorpion Creek
Scorpion Creek
Cold Gulch
South Fork Ramshorn Creek
North Fork Ramshorn Creek
Ramshorn Creek
Graves Creek
Sunflower Creek
Sherer Creek
Scott Mountain Creek
Big Bear Gulch
Spike Buck Gulch
Mumbo Creek
Doe Gulch


Upper Trinity River Assessment and Restoration Plan
Eagle Creek - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
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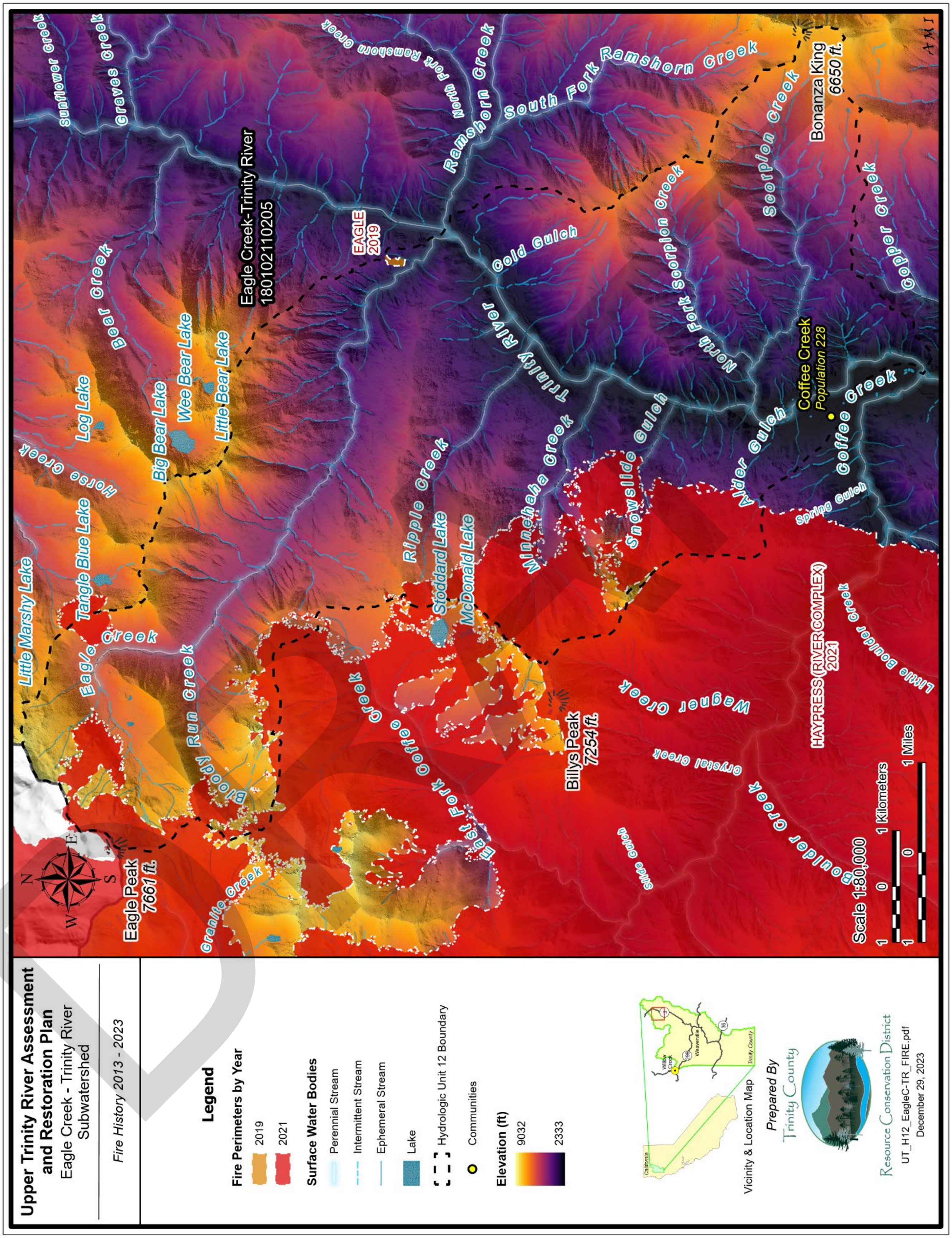
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_EagleC-TR_BDA.pdf
December 29, 2023
Eagle Creek-Trinity River
180102110205
Eagle Peak
7661 ft.
Billys Peak
7254 ft.
Bonanza King
6650 ft.
Coffee Creek
Population 228
Eagle Creek
Bloody Run Creek
Trinity River
Ramshorn Creek
South Fork Ramshorn Creek
North Fork Ramshorn Creek
North Creek
Scorpion Creek
North Fork Scorpion Creek
Cold Gulch
Copper Creek
Alder Gulch
Spring Gulch
Snowslide Gulch
Minnehaha Creek
Ripple Creek
Stoddard Lake
McDonald Lake
East Fork Coffee Creek
Wagner Creek
Crystal Creek
Boulder Creek
Little Boulder Creek
Slide Gulch
Granite Creek
Little Marshy Lake
Tangle Blue Lake
Big Bear Lake
Wee Bear Lake
Little Bear Lake
Log Lake
Bear Creek
Horse Creek
Graves Creek
Sunflower Creek
Scale 1:80,000
1 Kilometers
1 Miles


Upper Trinity River Assessment and Restoration Plan
Eagle Creek - Trinity River Subwatershed
Fire History 2013 - 2023
Legend
Fire Perimeters by Year
2019
2021
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_EagleC-TR_FIRE.pdf
December 29, 2023
Eagle Creek-Trinity River
180102110205
EAGLE
2019
HAYPRESS (RIVER COMPLEX)
2021
Coffee Creek
Population 228
Eagle Peak
7661 ft.
Billys Peak
7254 ft.
Bonanza King
6650 ft.
Trinity River
South Fork Ramshorn Creek
North Fork Ramshorn Creek
Ramshorn Creek
North Creek
Sunflower Creek
Graves Creek
Bear Creek
Log Lake
Big Bear Lake
Wee Bear Lake
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Alder Gulch
Spring Gulch
Coffee Creek
Wagner Creek
Crystal Creek
Boulder Creek
Little Boulder Creek
Slide Gulch
Scale 1:80,000
1 0 1 Kilometers
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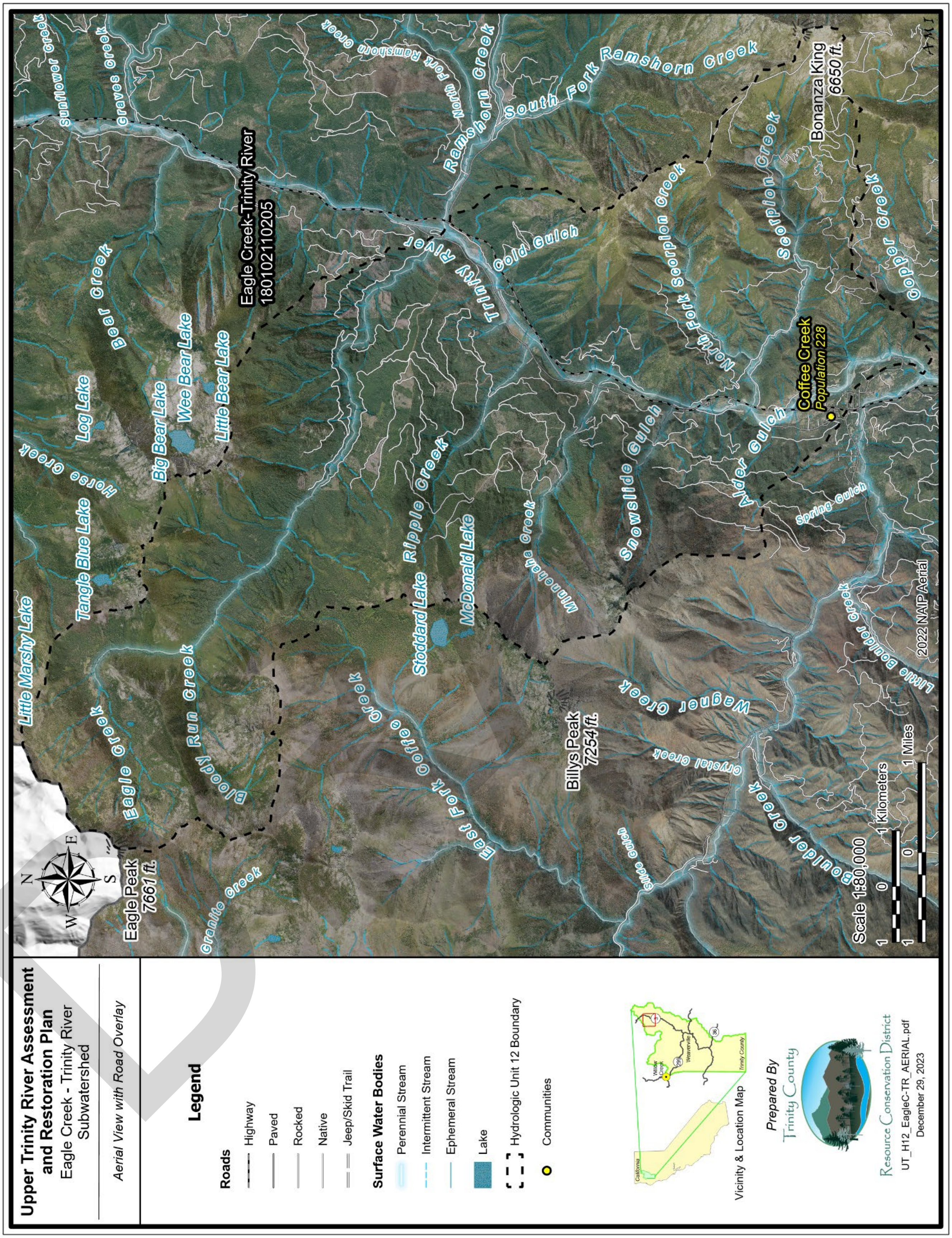
Upper Trinity River Assessment and Restoration Plan
Eagle Creek - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
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Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
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Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_EagleC-TR_AERIAL.pdf
December 29, 2023
Eagle Creek-Trinity River
180102110205
Eagle Peak
7661 ft.
Billys Peak
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Bonanza King
6650 ft.
Coffee Creek
Population 228
Trinity River
South Fork Ramshorn Creek
North Fork Ramshorn Creek
Ramshorn Creek
Sunflower Creek
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Scorpion Creek
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Wagner Creek
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Boulder Creek
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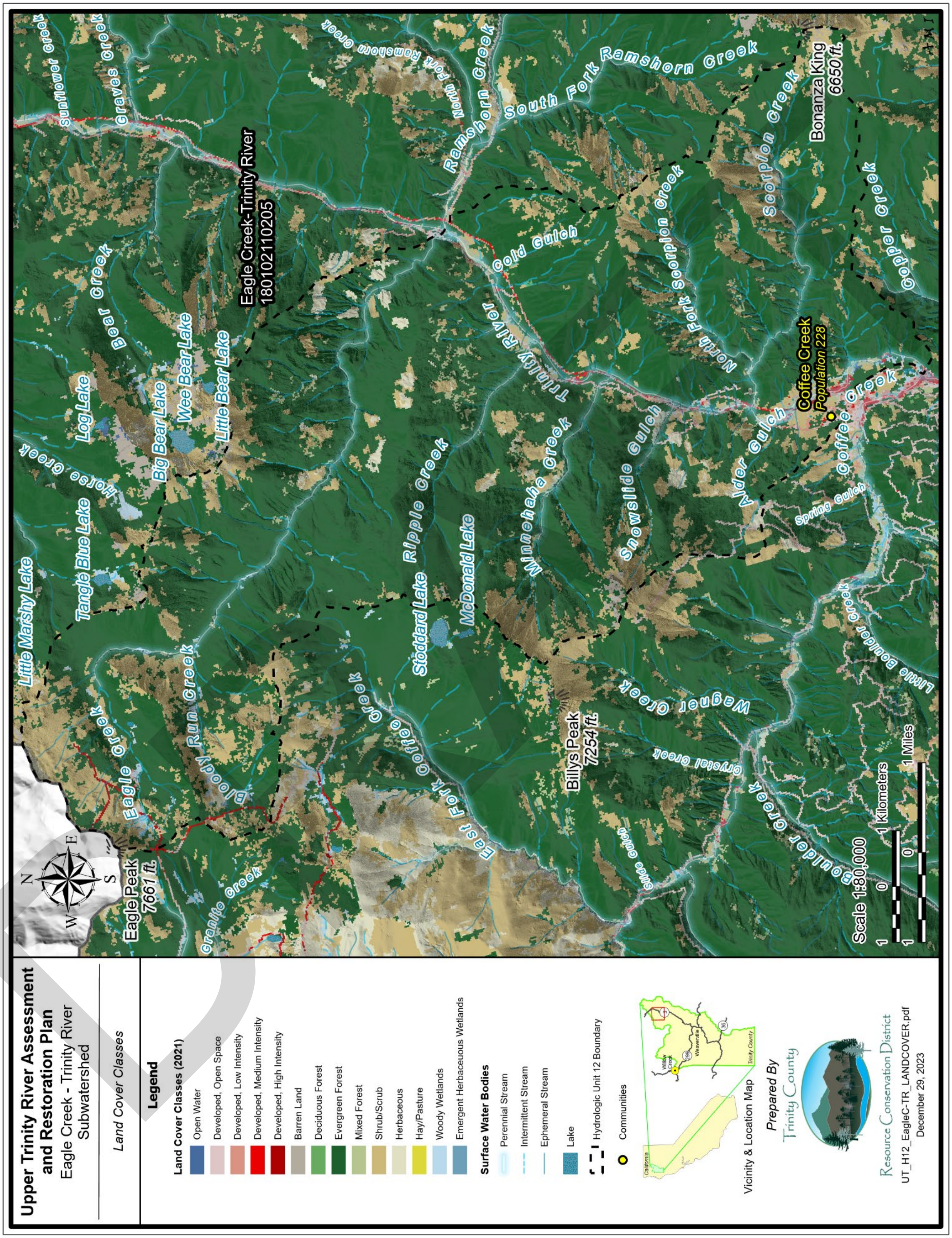
Slide Gulch
Scale 1:80,000
1 Kilometers
1 Miles
2022 NAIP Aerial



Upper Trinity River Assessment and Restoration Plan
Eagle Creek - Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
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Emergent Herbaceous Wetlands
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Perennial Stream
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Ephemeral Stream
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Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_EagleC-TR_LANDCOVER.pdf
December 29, 2023
Eagle Creek-Trinity River
180102110205
Eagle Peak
7661 ft.
Billys Peak
7254 ft.
Bonanza King
6650 ft.
Coffee Creek
Population 228
Trinity River
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Ramshorn Creek
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Eagle Creek
Bloody Run Creek
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East Fork Coffee Creek
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McDonald Lake
Ripple Creek
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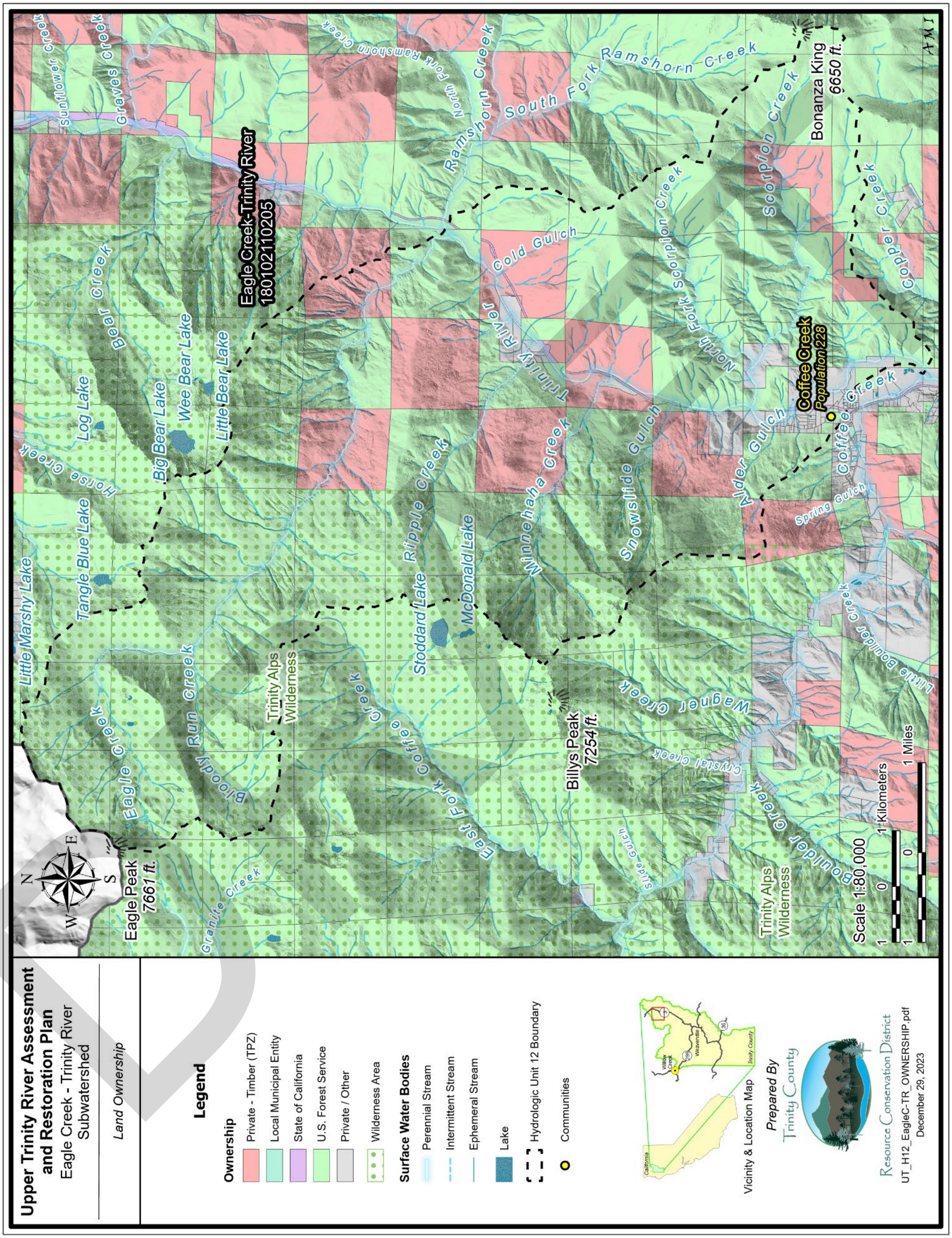
Snowslide Gulch
Cold Gulch
North Fork Scorpion Creek
Scorpion Creek
Copper Creek
Alder Gulch
Coffee Creek
Spring Gulch
Little Boulder Creek
Wagner Creek
Crystal Creek
Boulder Creek
Slide Gulch
Scale 1:80,000
1 0 1 Kilometers
1 0 1 Miles


Upper Trinity River Assessment and Restoration Plan
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Ownership
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State of California
U.S. Forest Service
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Intermittent Stream
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Trinity County
Resource Conservation District
UT_H12_EagleC-TR_OWNERSHIP.pdf
December 29, 2023
Eagle Creek-Trinity River
180102110205
Coffee Creek
Population 228
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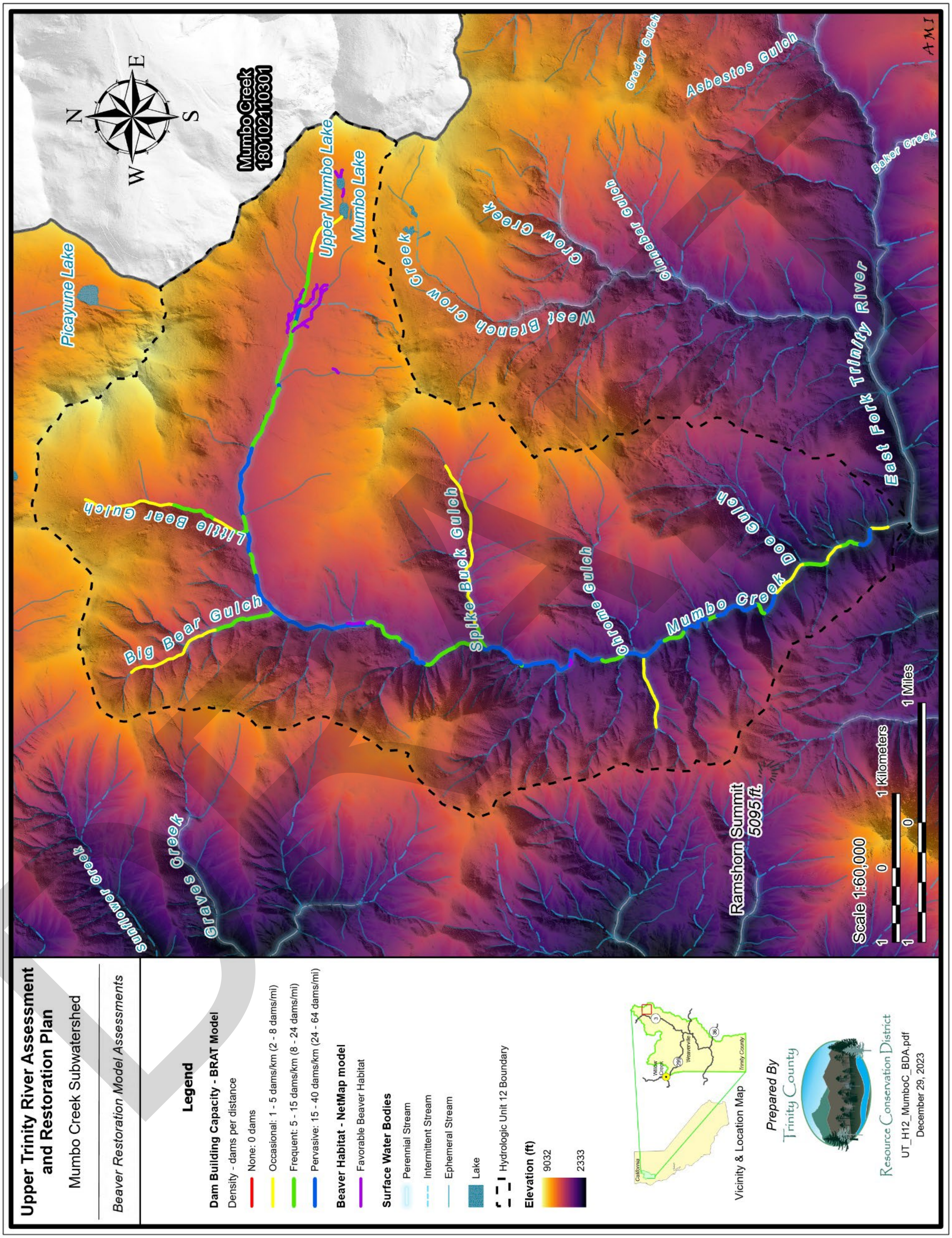
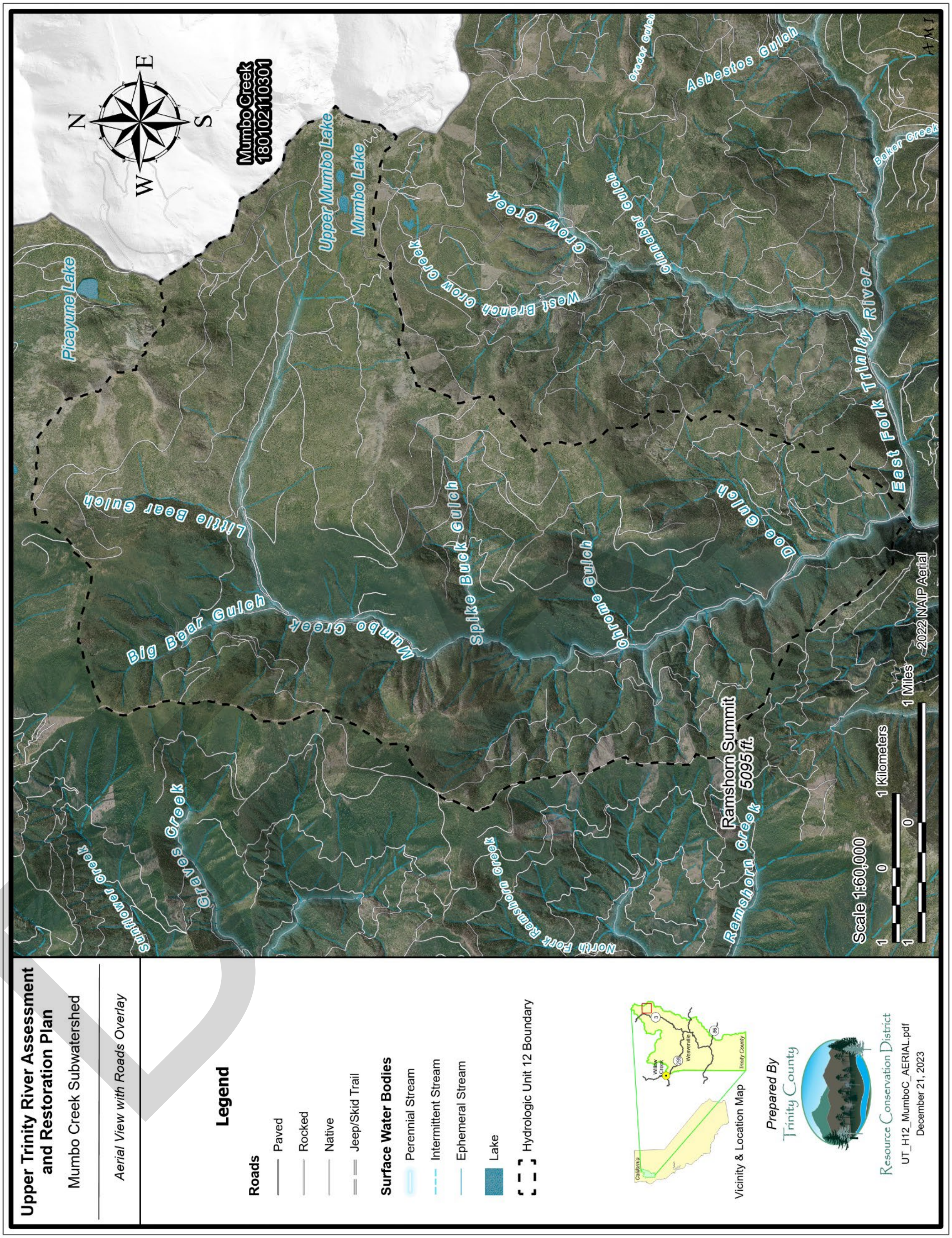
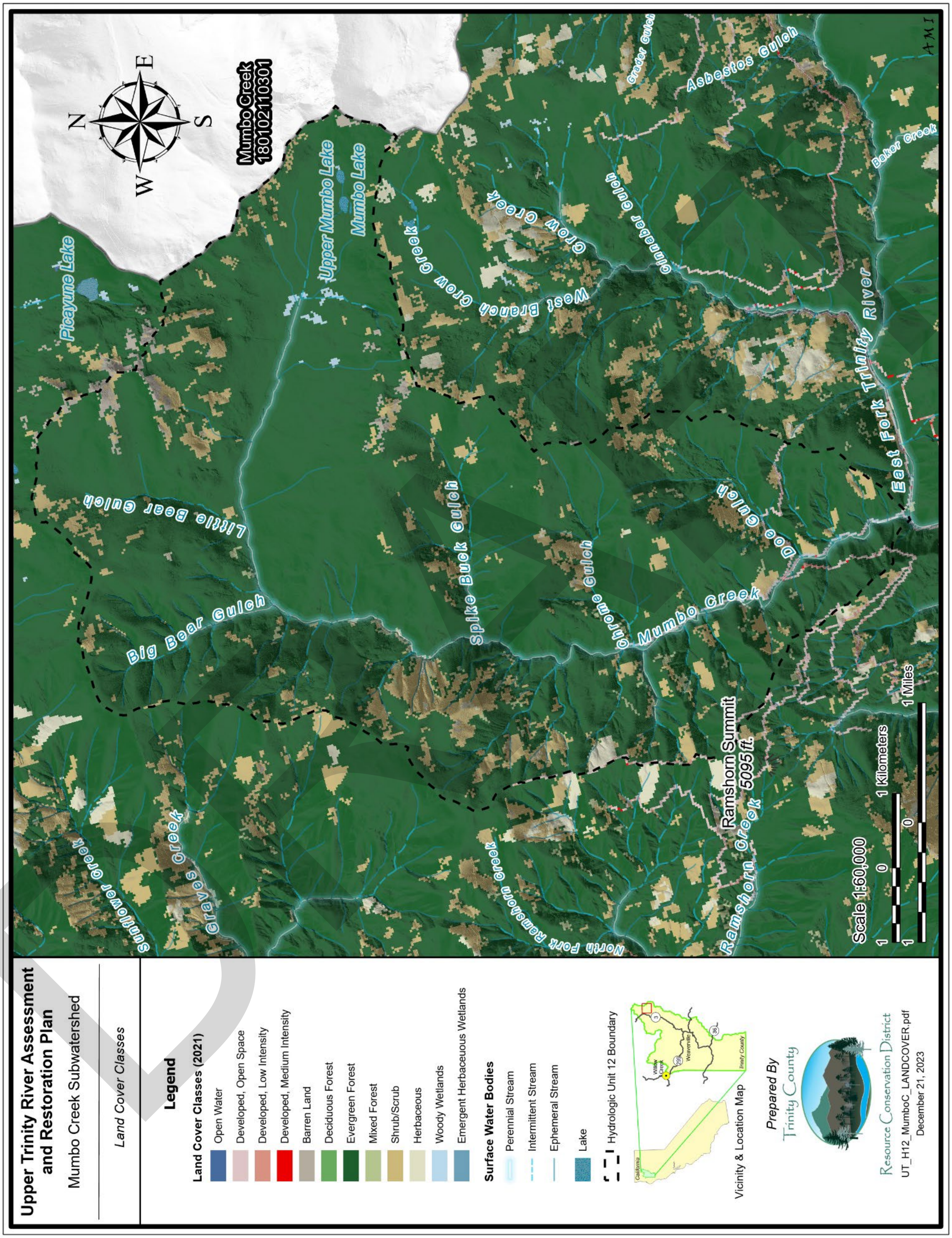
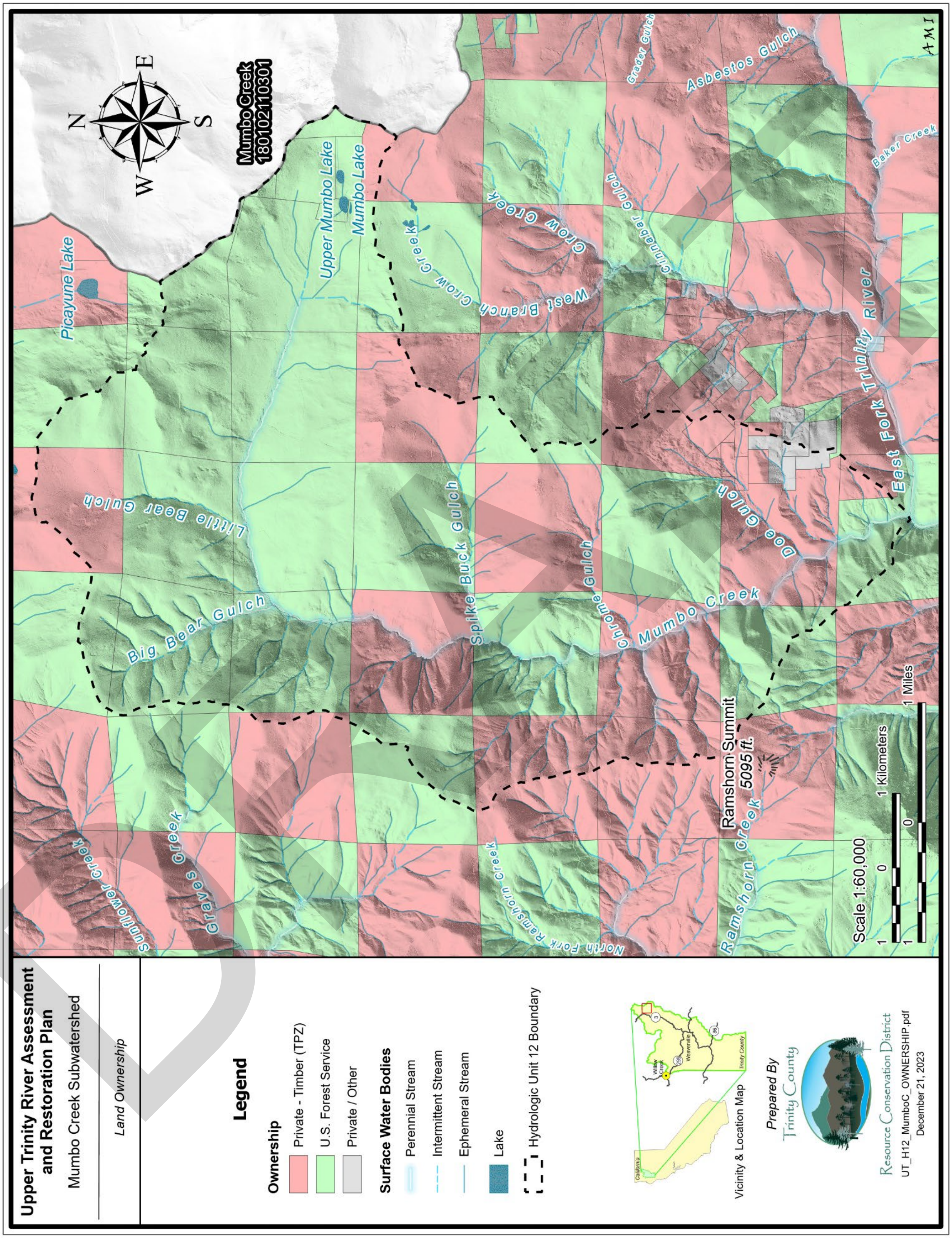
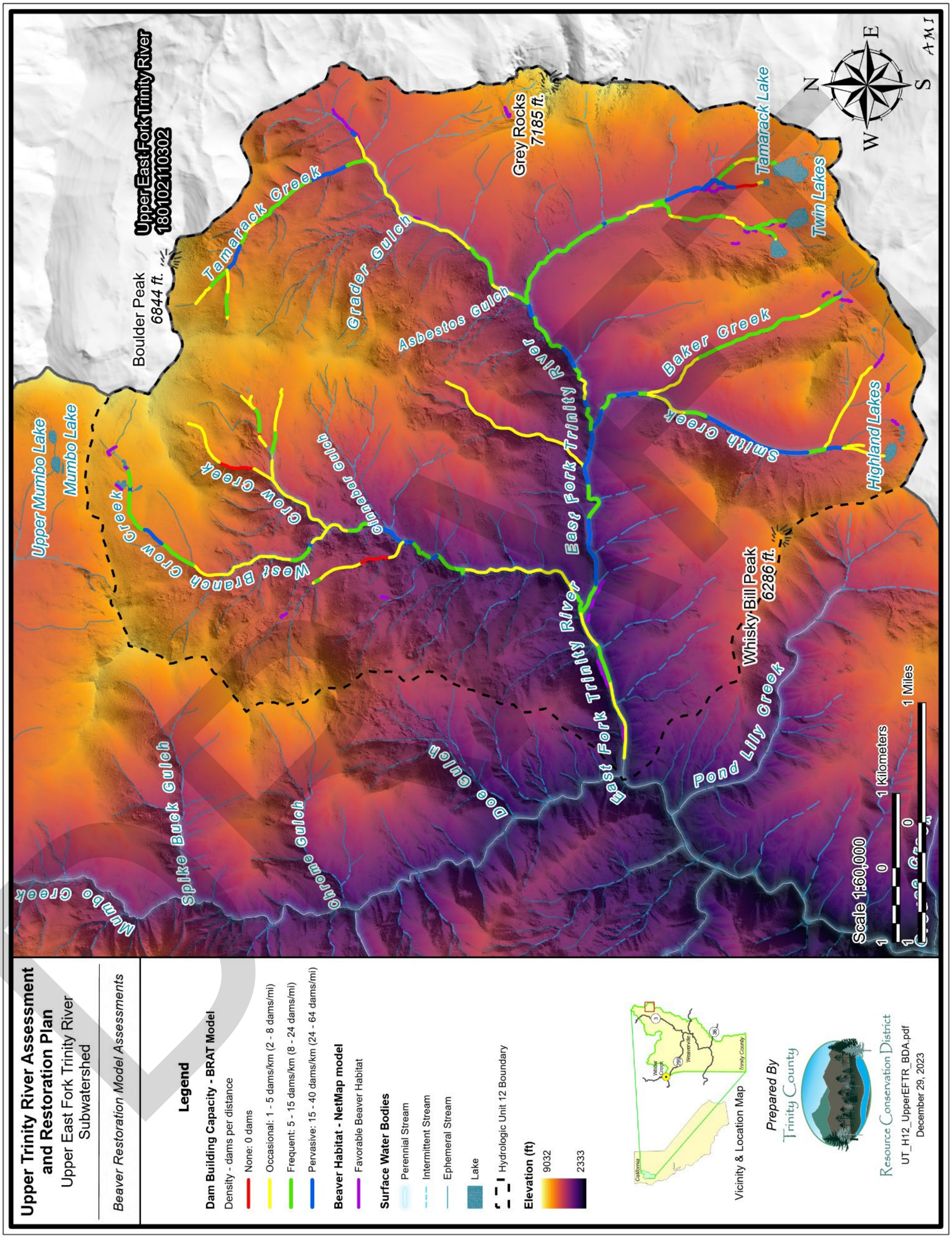
7254 ft.
Bonanza King
6650 ft.
Trinity Alps Wilderness
Scale 1:80,000
Kilometers
Miles
Trinity River
South Fork Ramshorn Creek
Ramshorn Creek
North Fork Ramshorn Creek
Little Marshy Lake
Tangle Blue Lake
Log Lake
Big Bear Lake
Wee Bear Lake
Little Bear Lake
Bear Creek
Horse Creek
Sunflower Creek
Graves Creek
Eagle Creek
Bloody Run Creek
East Fork Coffee Creek
Stoddard Lake
McDonald Lake
Ripple Creek
Minnehaha Creek
Snowslide Gulch
Cold Gulch
North Fork Scorpion Creek
Scorpion Creek
Copper Creek
Alder Gulch
Spring Gulch
Coffee Creek
Little Boulder Creek
Boulder Creek
Wagner Creek
Crystal Creek
Slide Gulch
Granite Creek

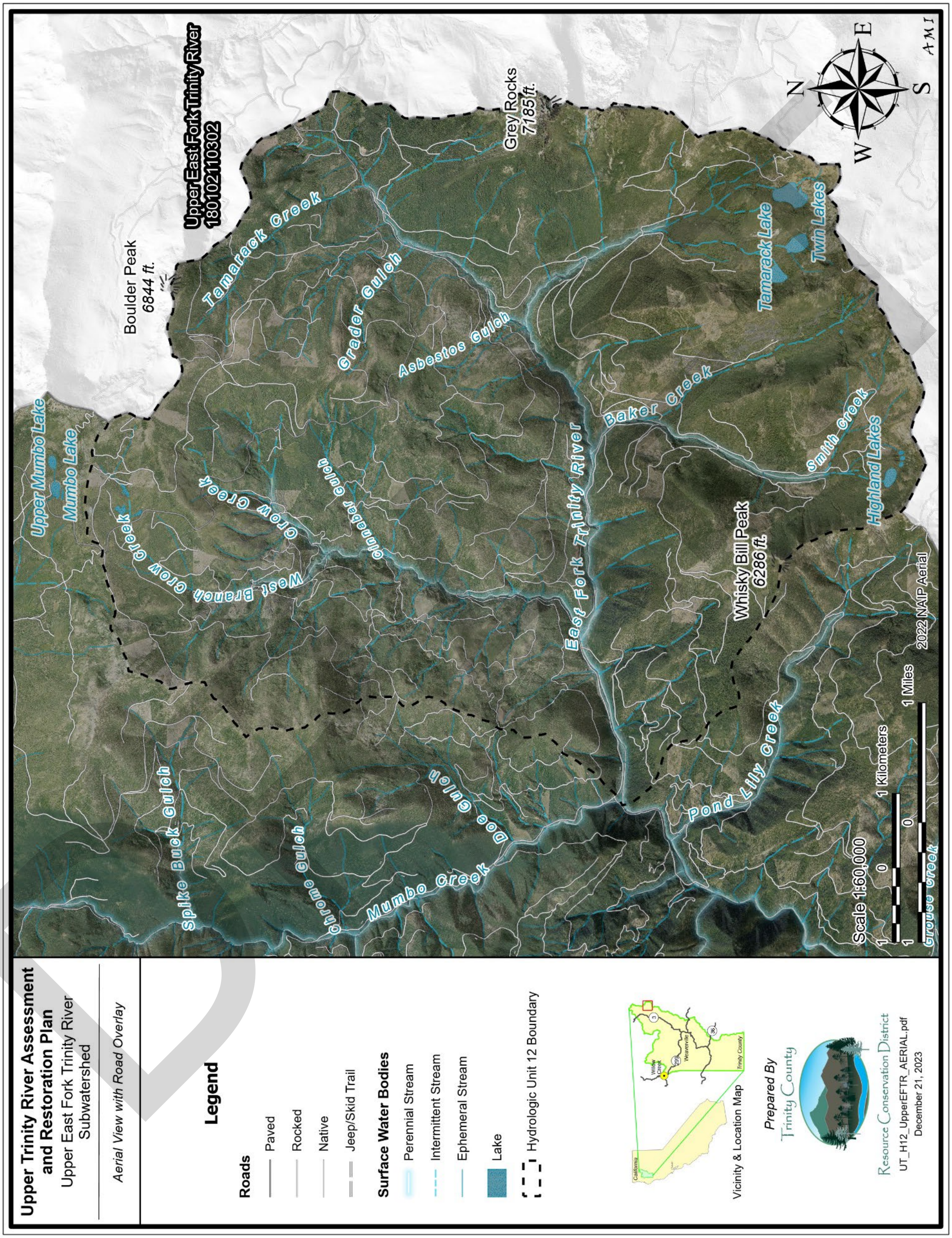

Upper Trinity River Assessment and Restoration Plan
Mumbo Creek Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MumboC_BDA.pdf
December 29, 2023
Mumbo Creek
180102110301
Picayune Lake
Upper Mumbo Lake
Mumbo Lake
Little Bear Gulch
Big Bear Gulch
Spike Buck Gulch
Chrome Gulch
Mumbo Creek
Doe Gulch
East Fork Trinity River
West Branch Crow Creek
Crow Creek
Cinnabar Gulch
Asbestos Gulch
Baker Creek
Sunflower Creek
Graves Creek
Ramshorn Summit
5095 ft.
Scale 1:60,000
1 Kilometers
1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Mumbo Creek Subwatershed
Aerial View with Roads Overlay
Legend
Roads
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MumboC_AERIAL.pdf
December 21, 2023
Mumbo Creek
180102110301
N
E
S
W
Picayune Lake
Upper Mumbo Lake
Mumbo Lake
Crow Creek
West Branch Crow Creek
Cinnabar Gulch
Asbestos Gulch
Baker Creek
East Fork Trinity River
Little Bear Gulch
Big Bear Gulch
Mumbo Creek
Spike Buck Gulch
Chrome Gulch
Doe Gulch
Ramshorn Summit
5095 ft.
Ramshorn Creek
North Fork Ramshorn Creek
Graves Creek
Sunflower Creek
Scale 1:60,000
1 0 1 Kilometers
1 0 1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
Mumbo Creek Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MumboC_LANDCOVER.pdf
December 21, 2023
Mumbo Creek
180102110301
N
E
S
W
Picayune Lake
Upper Mumbo Lake
Mumbo Lake
West Branch Crow Creek
Crow Creek
Cinnabar Gulch
Asbestos Gulch
Baker Creek
East Fork Trinity River
Little Bear Gulch
Big Bear Gulch
Spike Buck Gulch
Chrome Gulch
Mumbo Creek
Doe Gulch
Ramshorn Summit
5095 ft.
Ramshorn Creek
North Fork Ramshorn Creek
Graves Creek
Sunflower Creek
Scale 1:60,000
1 Kilometers
1 Miles


Upper Trinity River Assessment and Restoration Plan
Mumbo Creek Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
U.S. Forest Service
Private / Other
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MumboC_OWNERSHIP.pdf
December 21, 2023
Mumbo Creek
180102110301
Upper Mumbo Lake
Mumbo Lake
Picayune Lake
Little Bear Gulch
Big Bear Gulch
Spike Buck Gulch
Chrome Gulch
Mumbo Creek
Crow Creek
West Branch Crow Creek
Cinnabar Gulch
Grader Gulch
Asbestos Gulch
Baker Creek
East Fork Trinity River
Doe Gulch
Ramshorn Summit
5095 ft.
Ramshorn Creek
North Fork Ramshorn Creek
Graves Creek
Sunflower Creek
Scale 1:60,000
1 Kilometers
1 Miles


Upper Trinity River Assessment and Restoration Plan
Upper East Fork Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperEFTR_BDA.pdf
December 29, 2023
Upper East Fork Trinity River
180102110302
Boulder Peak
6844 ft.
Grey Rocks
7185 ft.
Whisky Bill Peak
6286 ft.
Tamarack Creek
Grader Gulch
Asbestos Gulch
East Fork Trinity River
Baker Creek
Smith Creek
Tamarack Lake
Twin Lakes
Highland Lakes
Upper Mumbo Lake
Mumbo Lake
Crow Creek
West Branch Crow Creek
Cinnabar Gulch
Pond Lilly Creek
Doe Gulch
Chrome Gulch
Spike Buck Gulch
Mumbo Creek
Scale 1:60,000
1 0 1 Kilometers
1 0 1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Upper East Fork Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperEFTR_AERIAL.pdf
December 21, 2023
Upper East Fork Trinity River
180102110302
Boulder Peak
6844 ft.
Grey Rocks
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Whisky Bill Peak
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Mumbo Lake
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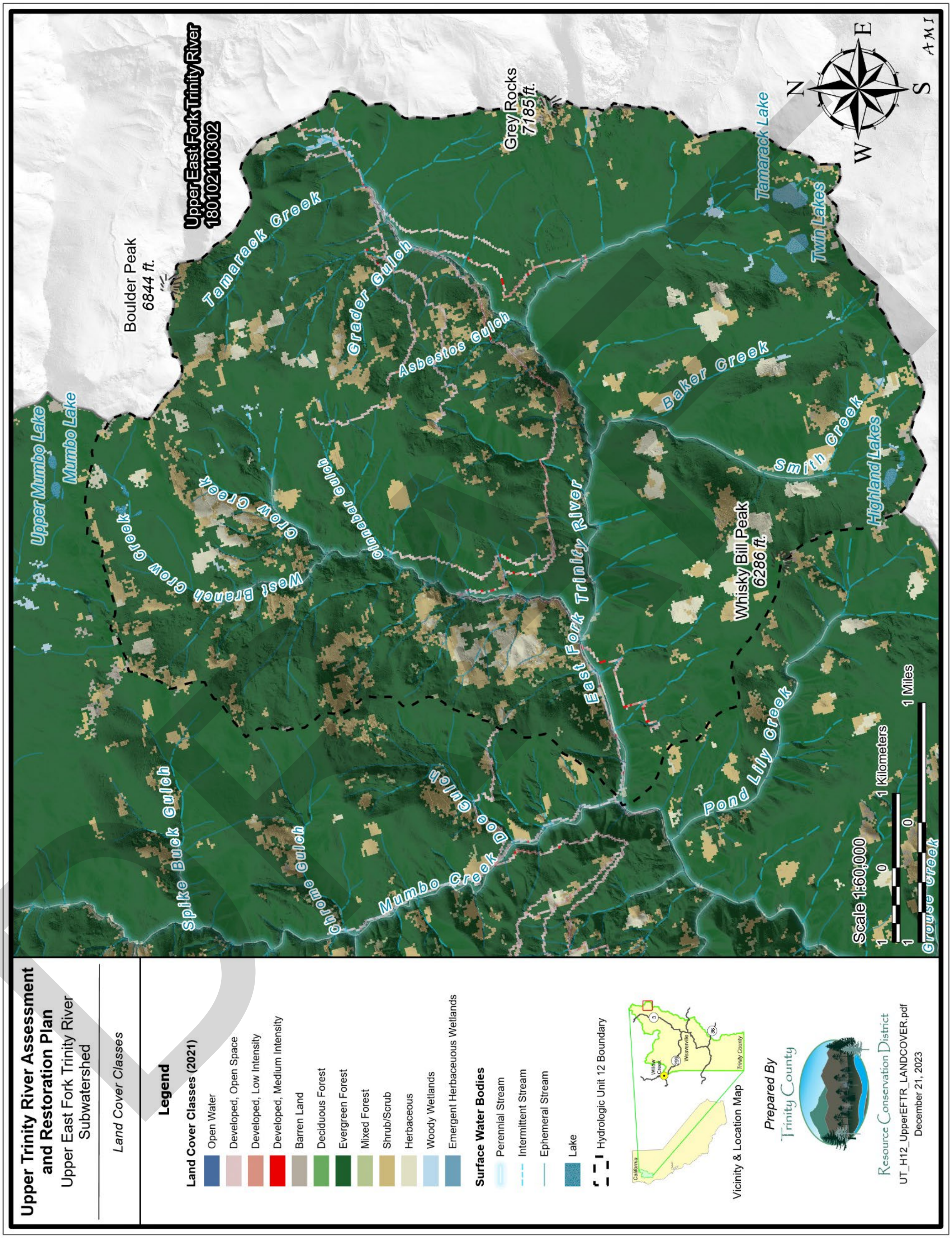
Asbestos Gulch
Crow Creek
West Branch Crow Creek
Cinnabar Gulch
East Fork Trinity River
Baker Creek
Smith Creek
Highland Lakes
Tamarack Lake
Twin Lakes
Spike Buck Gulch
Chrome Gulch
Doe Gulch
Mumbo Creek
Pond Lily Creek
Grouse Creek
Scale 1:60,000
1 Kilometers
1 Miles
2022 NAIP Aerial
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Upper East Fork Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperEFTR_LANDCOVER.pdf
December 21, 2023
Upper East Fork Trinity River
180102110302
Boulder Peak
6844 ft.
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Tamarack Creek
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Twin Lakes
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Upper Mumbo Lake
Mumbo Lake
West Branch Crow Creek
Crow Creek
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Chrome Gulch
Doe Gulch
Mumbo Creek
Pond Lily Creek
Grouse Creek
Scale 1:60,000
1 0 1 Kilometers
1 0 1 Miles
N
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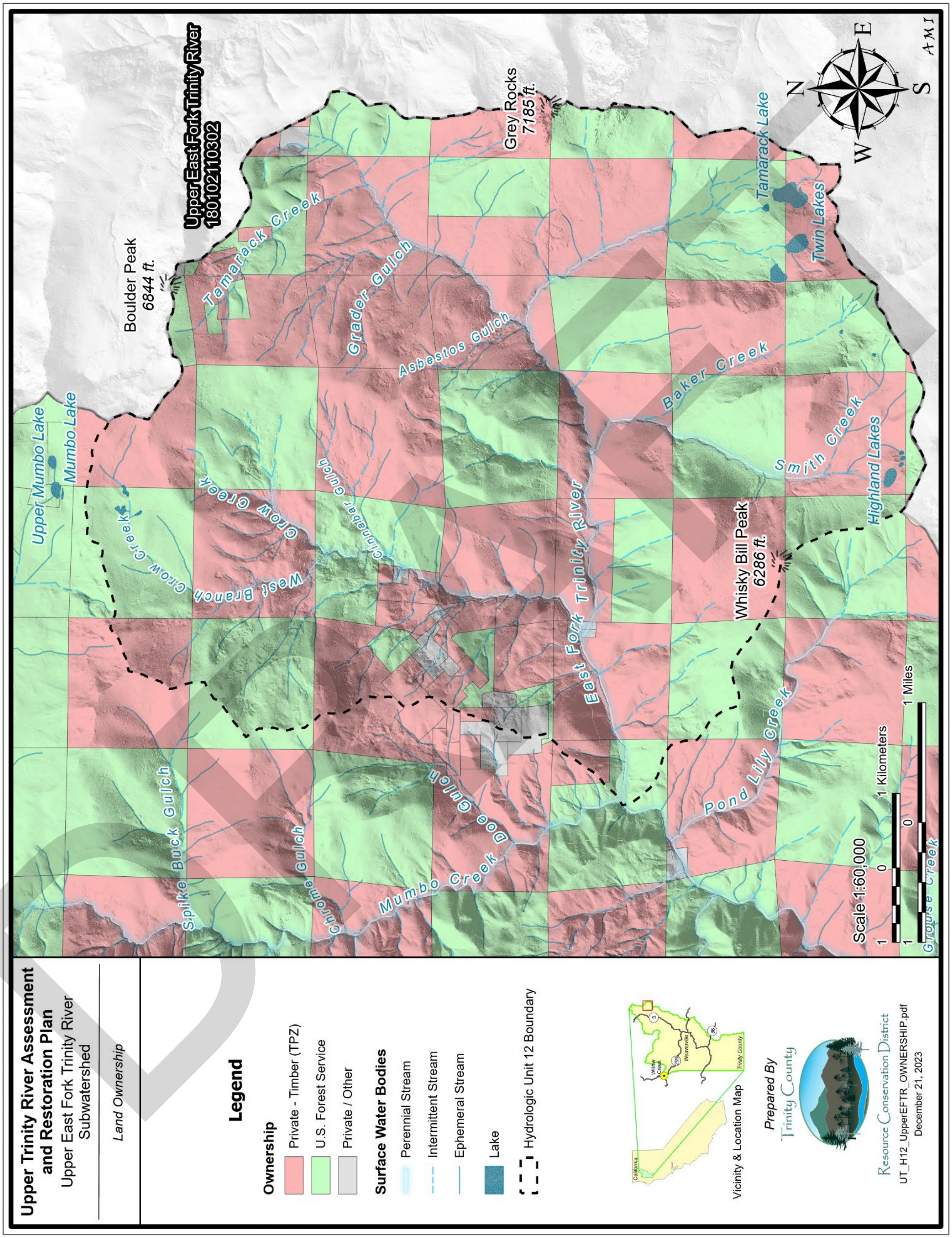
W


Upper Trinity River Assessment and Restoration Plan
Upper East Fork Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
U.S. Forest Service
Private / Other
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperEFTR_OWNERSHIP.pdf
December 21, 2023
Upper East Fork Trinity River
180102110302
Boulder Peak
6844 ft.
Grey Rocks
7185 ft.
Whisky Bill Peak
6286 ft.
Upper Mumbo Lake
Mumbo Lake
Tamarack Creek
Grader Gulch
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Tamarack Lake
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Crow Creek
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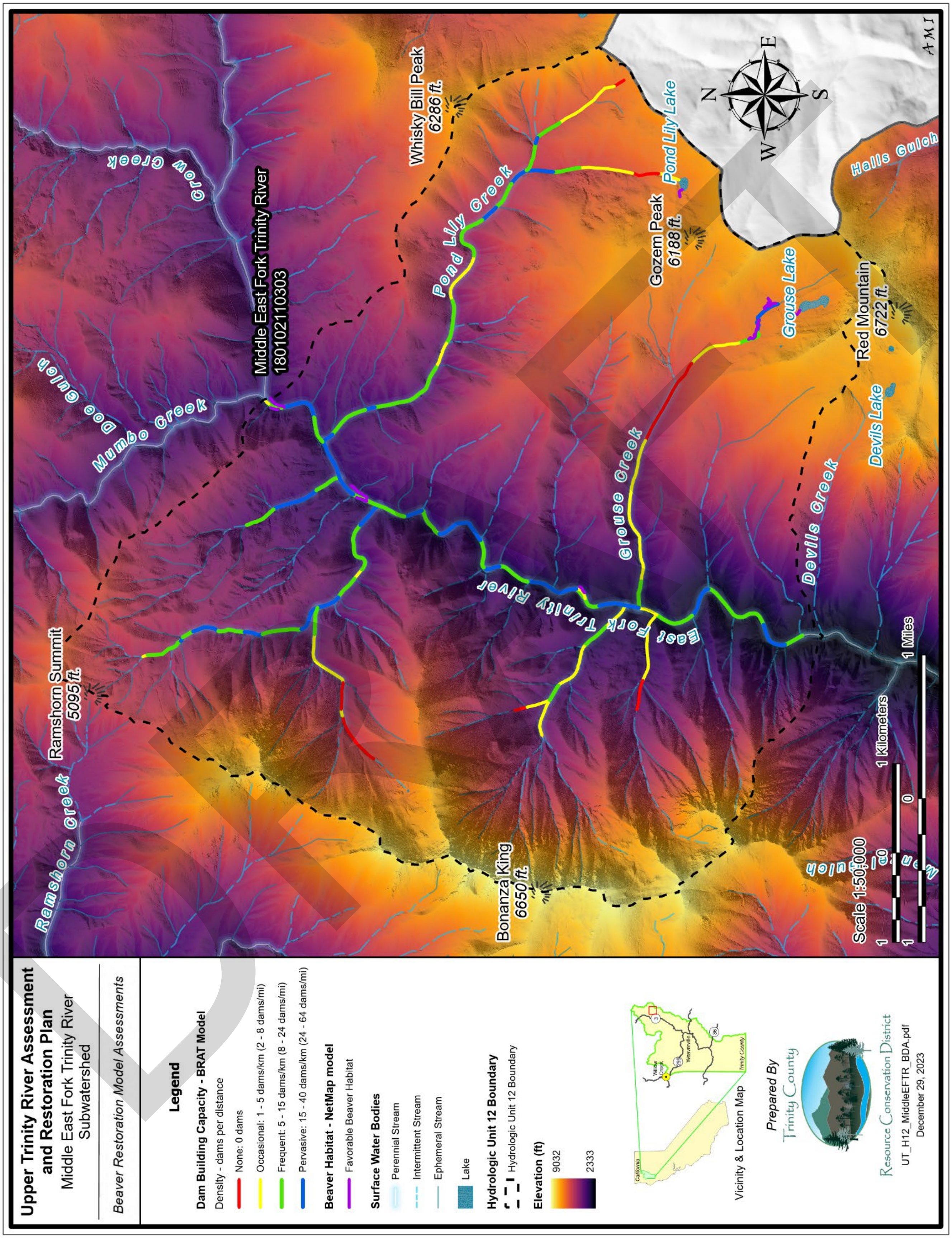
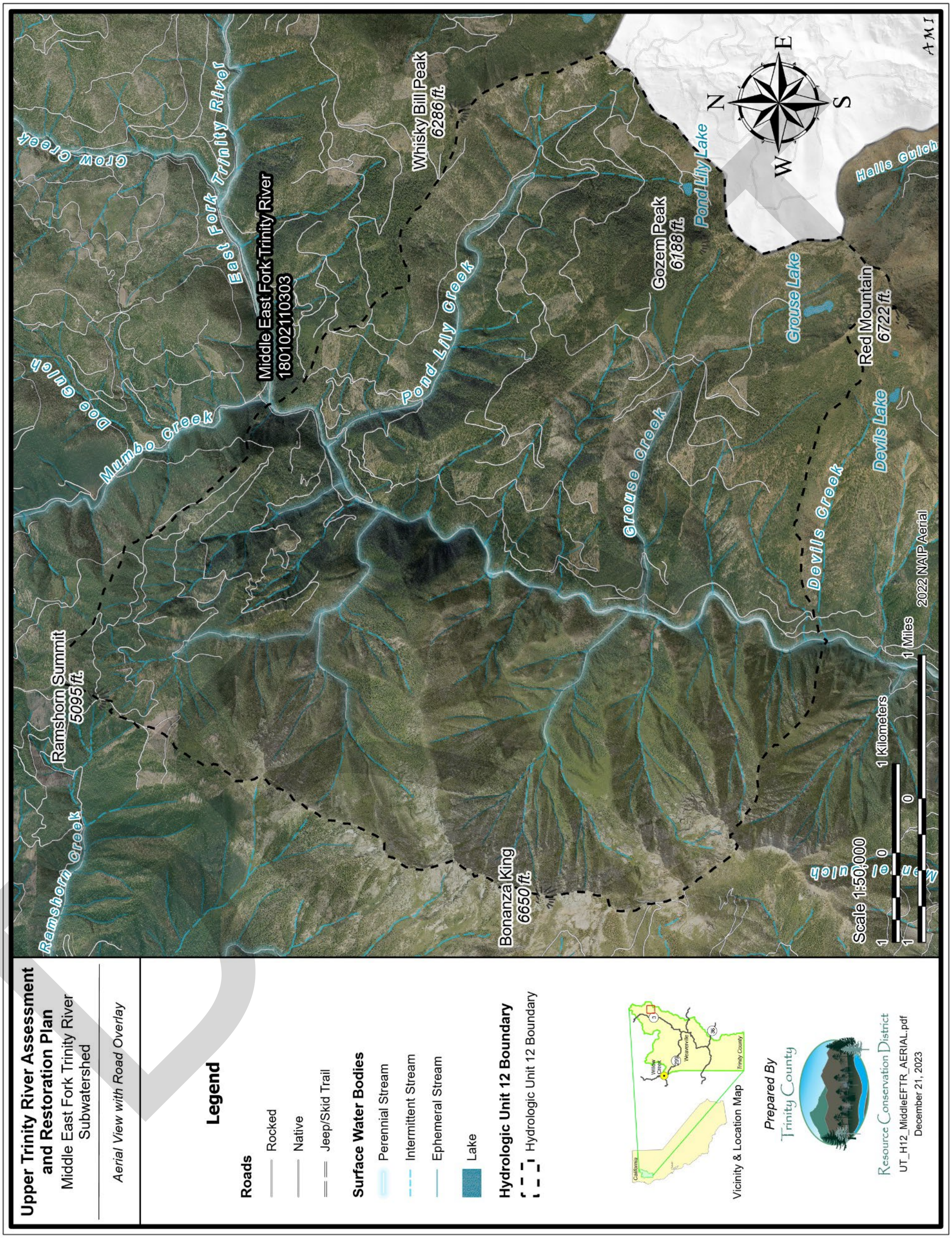
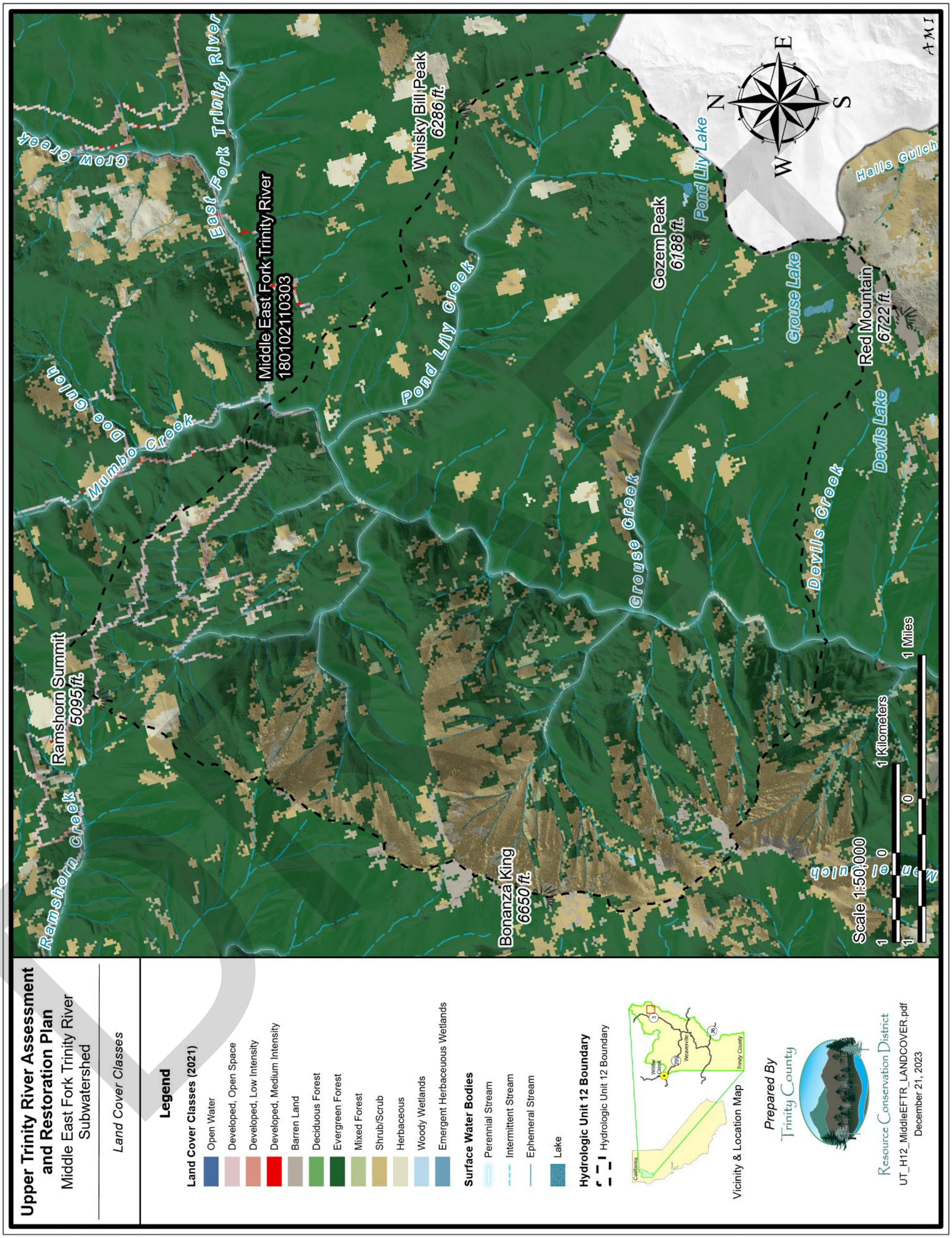
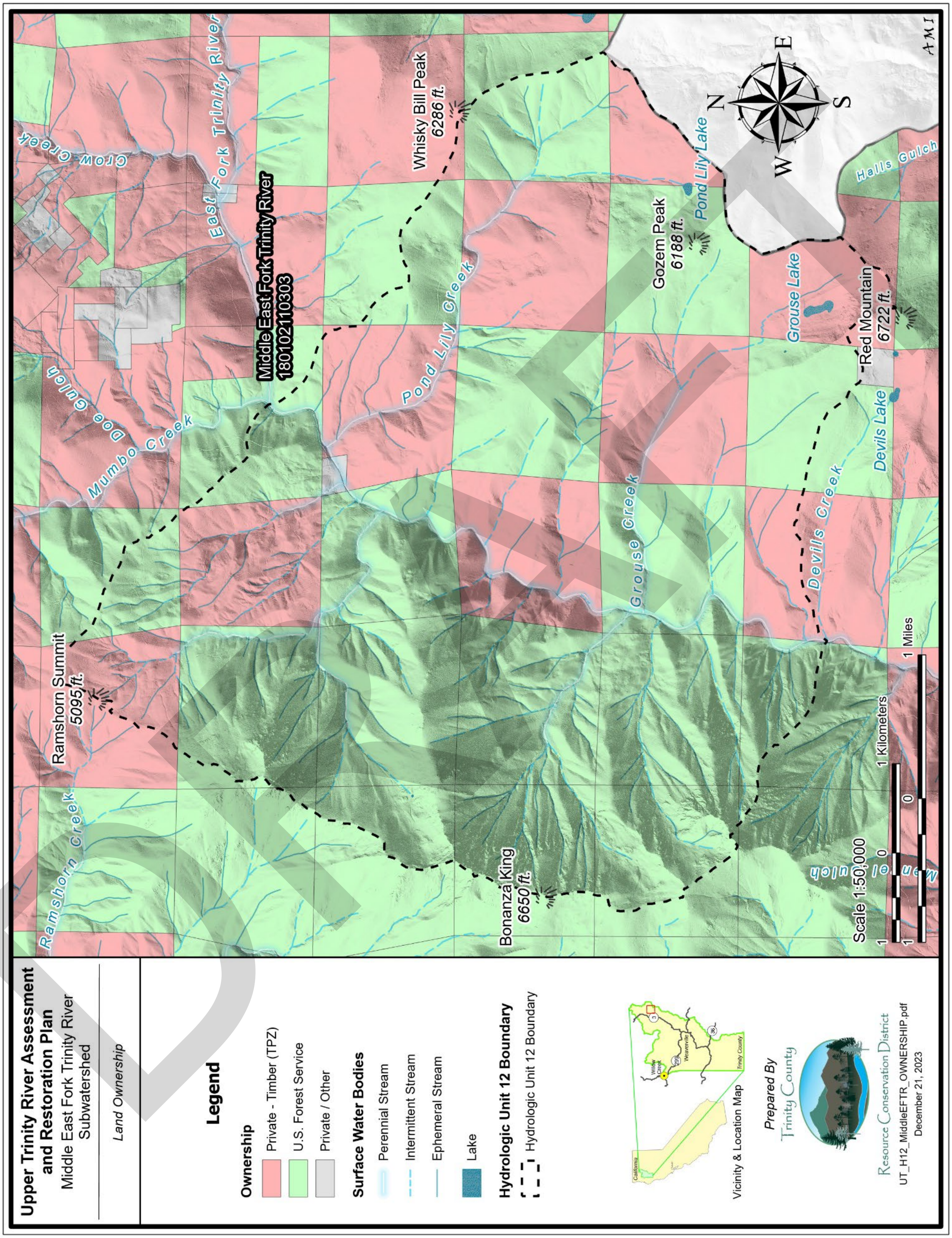
Cinnabar Gulch
East Fork Trinity River
Spike Buck Gulch
Chrome Gulch
Mumbo Creek
Doe Gulch
Pond Lily Creek
Grouse Creek
Scale 1:60,000
1 0 1 Kilometers
1 0 1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Middle East Fork Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Hydrologic Unit 12 Boundary
Elevation (ft)
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MiddleEFTR_BDA.pdf
December 29, 2023
Middle East Fork Trinity River
180102110303
Whisky Bill Peak
6286 ft.
Gozem Peak
6188 ft.
Red Mountain
6722 ft.
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
Pond Lily Creek
Pond Lily Lake
Grouse Creek
Grouse Lake
Devils Creek
Devils Lake
Halls Gulch
Crow Creek
Mumbo Creek
Doe Gulch
Ramshorn Creek
East Fork Trinity River
Scale 1:50,000
1 Kilometers
1 Miles



Upper Trinity River Assessment and Restoration Plan
Middle East Fork Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MiddleEFTR_AERIAL.pdf
December 21, 2023
East Fork Trinity River
Crow Creek
Whisky Bill Peak
6286 ft.
Middle East Fork Trinity River
180102110303
Doe Gulch
Mumbo Creek
Pond Lily Creek
Pond Lily Lake
Gozem Peak
6188 ft.
Grouse Lake
Red Mountain
6722 ft.
Halls Gulch
Grouse Creek
Devils Lake
Devils Creek
Ramshorn Summit
5095 ft.
Ramshorn Creek
Bonanza King
6650 ft.
N
E
S
W
Scale 1:50,000
1 Kilometers
1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
Middle East Fork Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MiddleEFTR_LANDCOVER.pdf
December 21, 2023
Middle East Fork Trinity River
180102110303
East Fork Trinity River
Crow Creek
Doe Gulch
Mumbo Creek
Ramshorn Creek
Ramshorn Summit
5095 ft.
Whisky Bill Peak
6286 ft.
Pond Lily Creek
Pond Lily Lake
Gozem Peak
6188 ft.
Grouse Lake
Grouse Creek
Red Mountain
6722 ft.
Devils Lake
Devils Creek
Halls Gulch
Bonanza King
6650 ft.
Scale 1:50,000
1 Kilometers
1 Miles
N
E
S
W



Upper Trinity River Assessment and Restoration Plan
Middle East Fork Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
U.S. Forest Service
Private / Other
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_MiddleEFTR_OWNERSHIP.pdf
December 21, 2023
Middle East Fork Trinity River
180102110303
East Fork Trinity River
Crow Creek
Doe Gulch
Mumbo Creek
Pond Lily Creek
Pond Lily Lake
Grouse Creek
Grouse Lake
Devils Creek
Devils Lake
Halls Gulch
Ramshorn Creek
Whisky Bill Peak
6286 ft.
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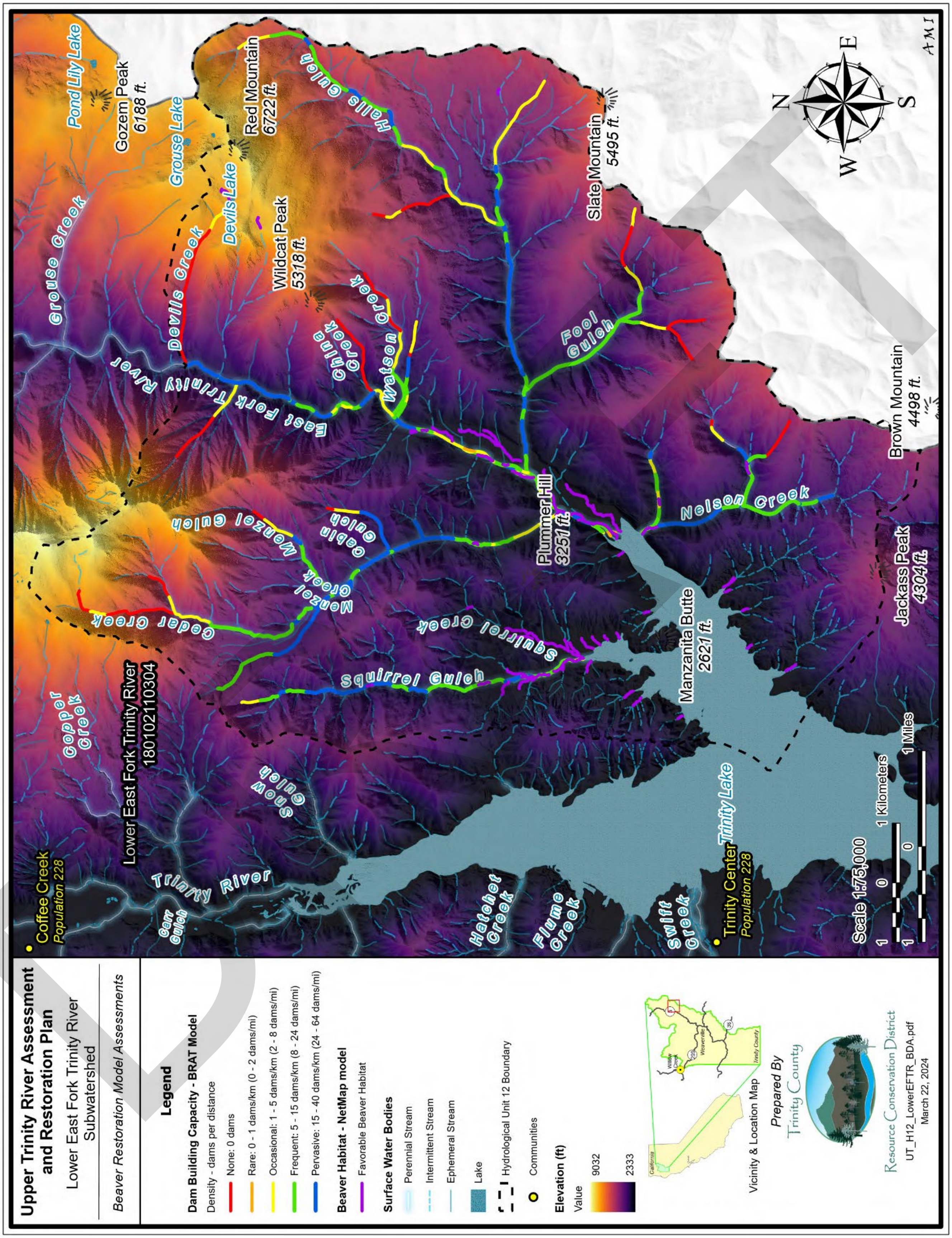
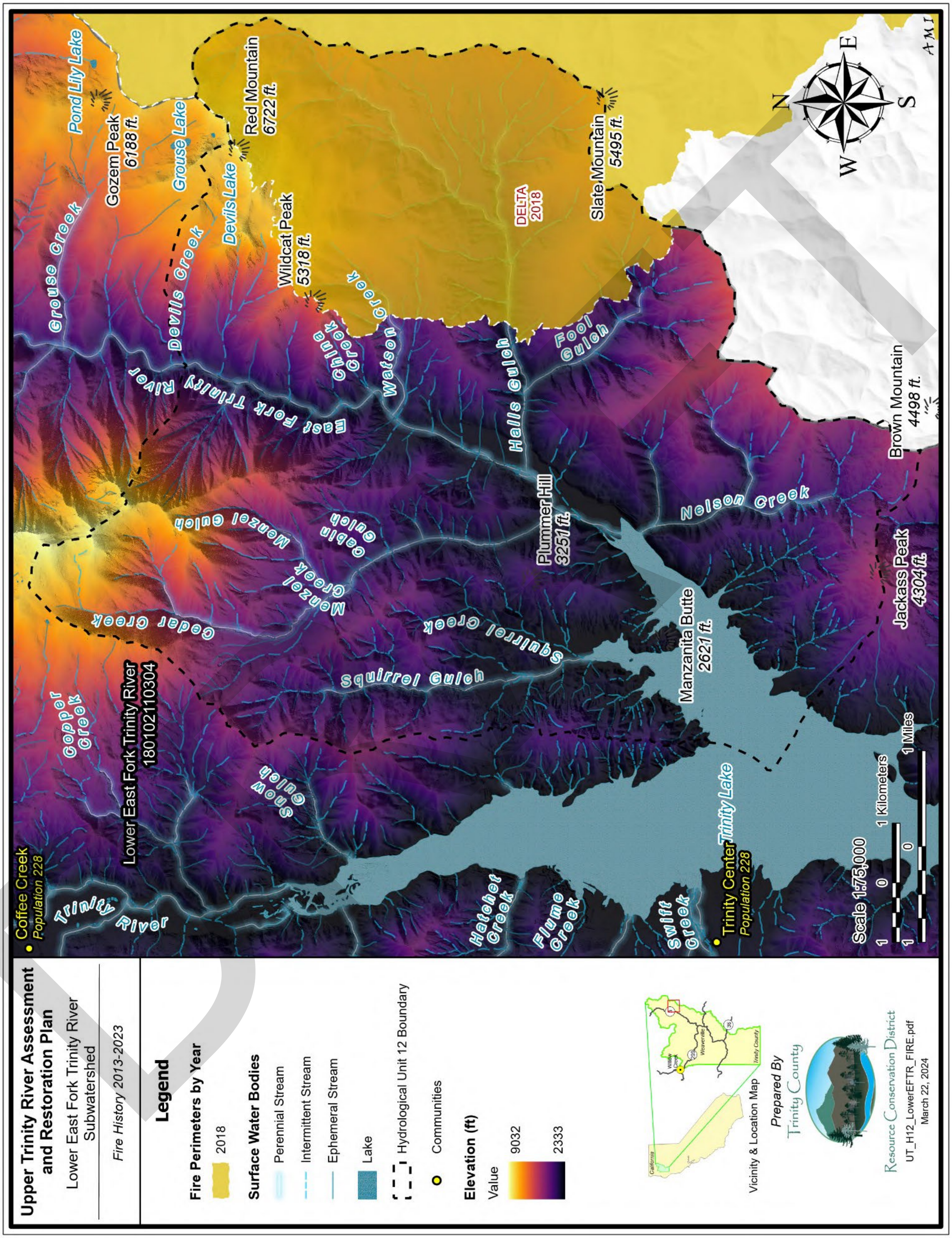
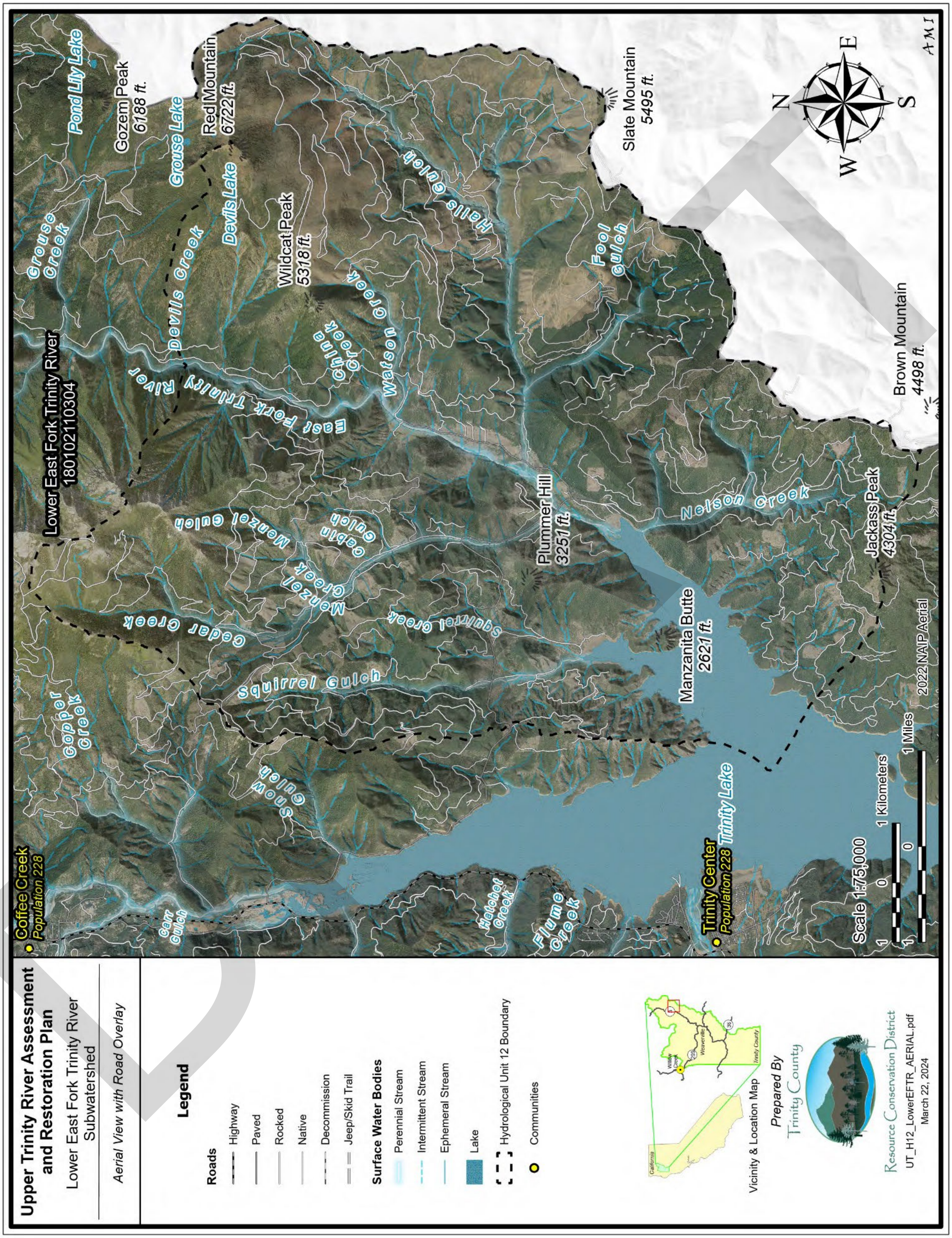
6188 ft.
Red Mountain
6722 ft.
Ramshorn Summit
5095 ft.
Bonanza King
6650 ft.
N
S
E
W
Scale 1:50,000
1 0 1 Kilometers
1 0 1 Miles


Upper Trinity River Assessment and Restoration Plan
Lower East Fork Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerEFTR_BDA.pdf
March 22, 2024
Coffee Creek
Population 228
Trinity Center
Population 228
Lower East Fork Trinity River
180102110304
Pond Lily Lake
Gozem Peak
6188 ft.
Grouse Lake
Red Mountain
6722 ft.
Devils Lake
Wildcat Peak
5318 ft.
Slate Mountain
5495 ft.
Brown Mountain
4498 ft.
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Jackass Peak
4304 ft.
Grouse Creek
Devils Creek
Halls Gulch
East Fork Trinity River
China Creek
Watson Creek
Fool Gulch
Nelson Creek
Menzel Gulch
Cabin Gulch
Menzel Creek
Cedar Creek
Squirrel Creek
Squirrel Gulch
Copper Creek
Snow Gulch
Trinity River
Carr Gulch
Hatchet Creek
Flume Creek
Swift Creek
Trinity Lake
Scale 1:75,000
1 Kilometers
1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Lower East Fork Trinity River Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2018
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerEFTR_FIRE.pdf
March 22, 2024
Coffee Creek
Population 228
Trinity Center
Population 228
Lower East Fork Trinity River
180102110304
Trinity River
Trinity Lake
Pond Lily Lake
Grouse Lake
Devils Lake
Gozem Peak
6188 ft.
Red Mountain
6722 ft.
Wildcat Peak
5318 ft.
Slate Mountain
5495 ft.
DELTA
2018
Brown Mountain
4498 ft.
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Jackass Peak
4304 ft.
Grouse Creek
Devils Creek
East Fork Trinity River
China Creek
Watson Creek
Halls Gulch
Fool Gulch
Nelson Creek
Menzel Gulch
Cabin Gulch
Menzel Creek
Cedar Creek
Squirrel Creek
Squirrel Gulch
Copper Creek
Snow Gulch
Hatchet Creek
Flume Creek
Swift Creek
Scale 1:75,000
1 Kilometers
1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Lower East Fork Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Decommission
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerEFTR_AERIAL.pdf
March 22, 2024
Lower East Fork Trinity River
180102110304
Coffee Creek
Population 228
Trinity Center
Population 228
Trinity Lake
Pond Lily Lake
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4304 ft.
Menzel Gulch
Cabin Gulch
Menzel Creek
Cedar Creek
Squirrel Creek
Manzanita Butte
2621 ft.
Squirrel Gulch
Copper Creek
Snow Gulch
Carr Gulch
Hatchet Creek
Flume Creek
Scale 1:75,000
1 Kilometers
1 Miles
2022 NAIP Aerial
N
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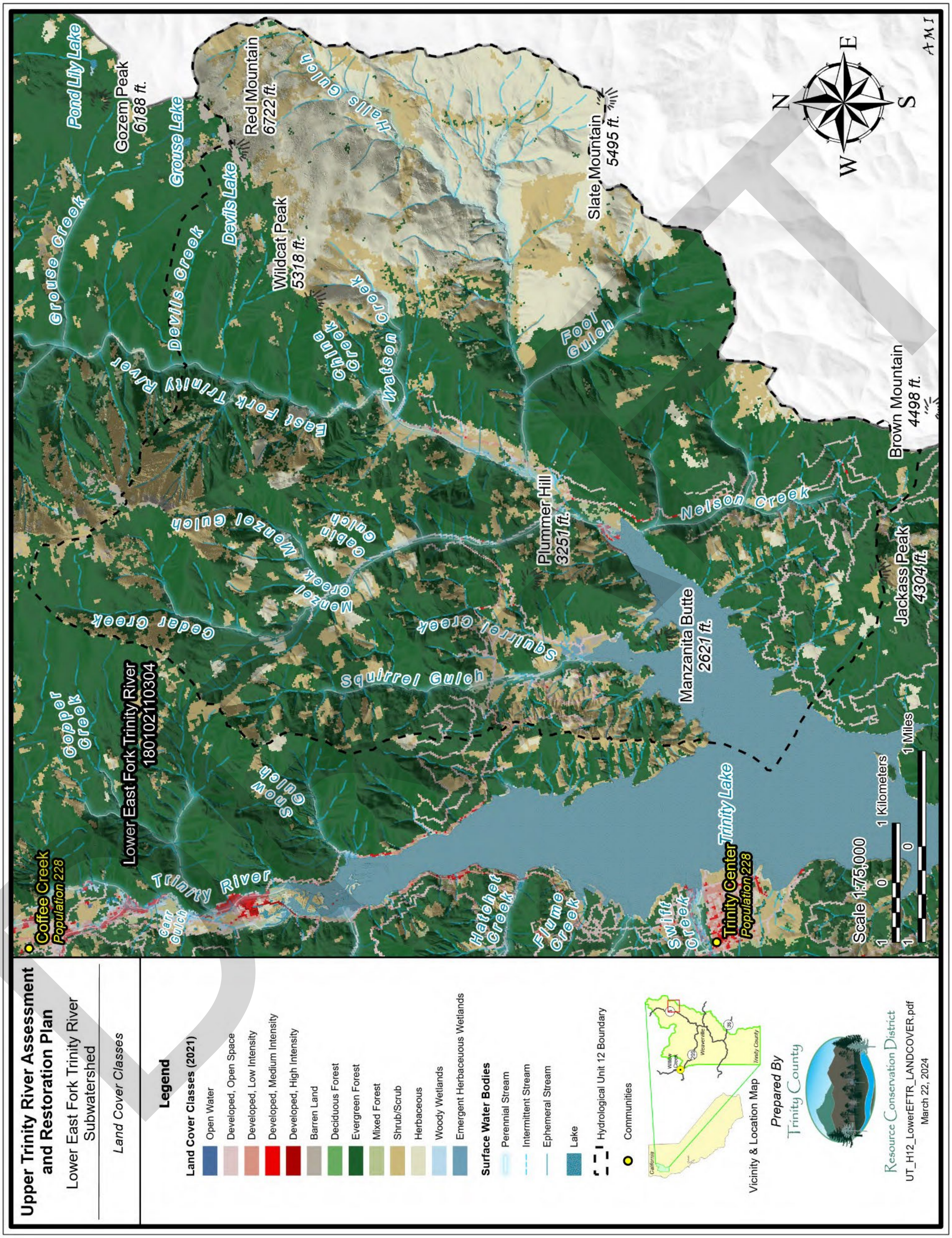
W


Upper Trinity River Assessment and Restoration Plan
Lower East Fork Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
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Trinity County
Resource Conservation District
UT_H12_LowerEFTR_LANDCOVER.pdf
March 22, 2024
Lower East Fork Trinity River
180102110304
Coffee Creek
Population 228
Trinity Center
Population 228
Trinity Lake
Trinity River
Carr Gulch
Hatchet Creek
Flume Creek
Swift Creek
Copper Creek
Snow Gulch
Squirrel Gulch
Squirrel Creek
Cedar Creek
Menzel Creek
Menzel Gulch
Cabin Gulch
Manzanita Butte
2621 ft.
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Wildcat Peak
5318 ft.
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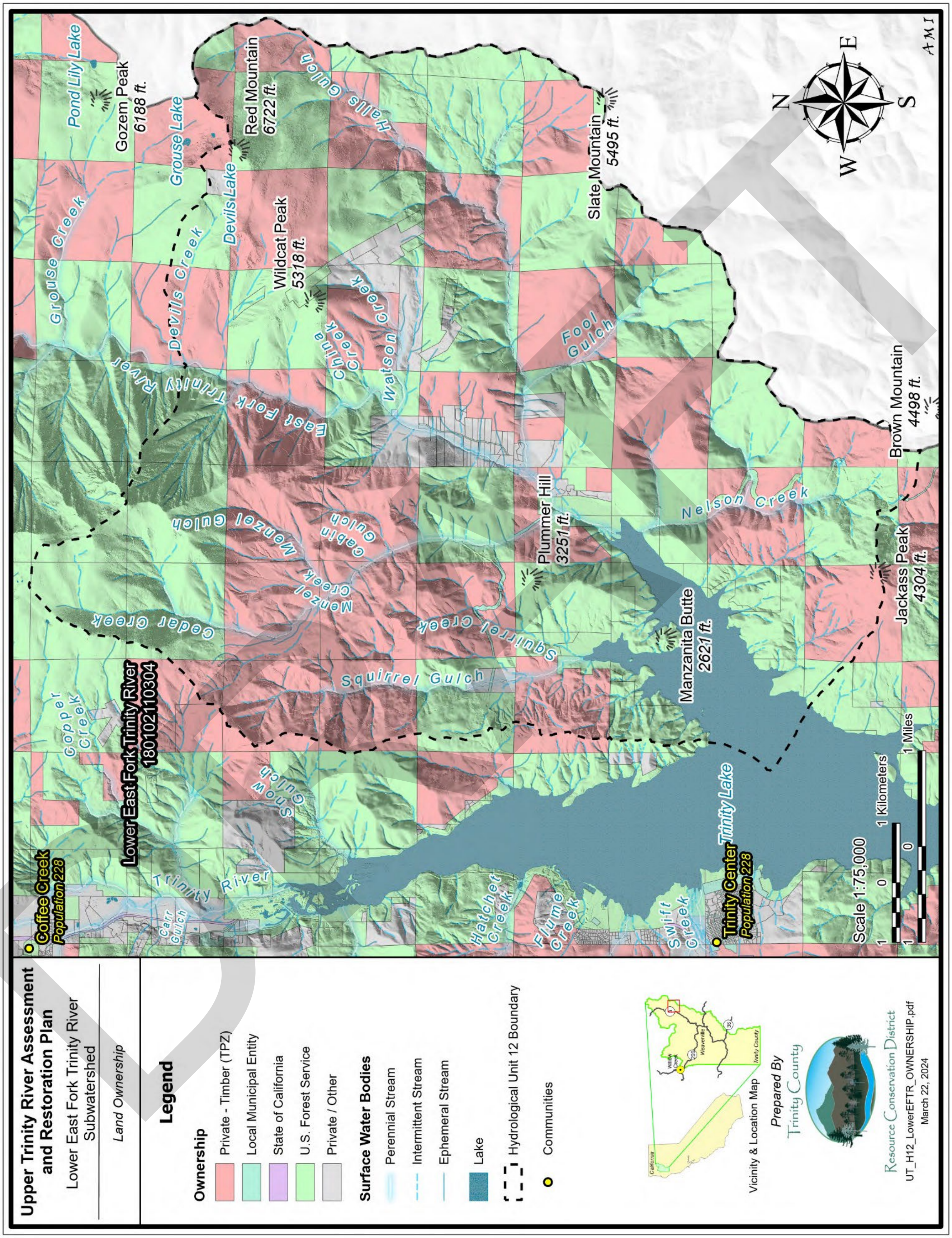
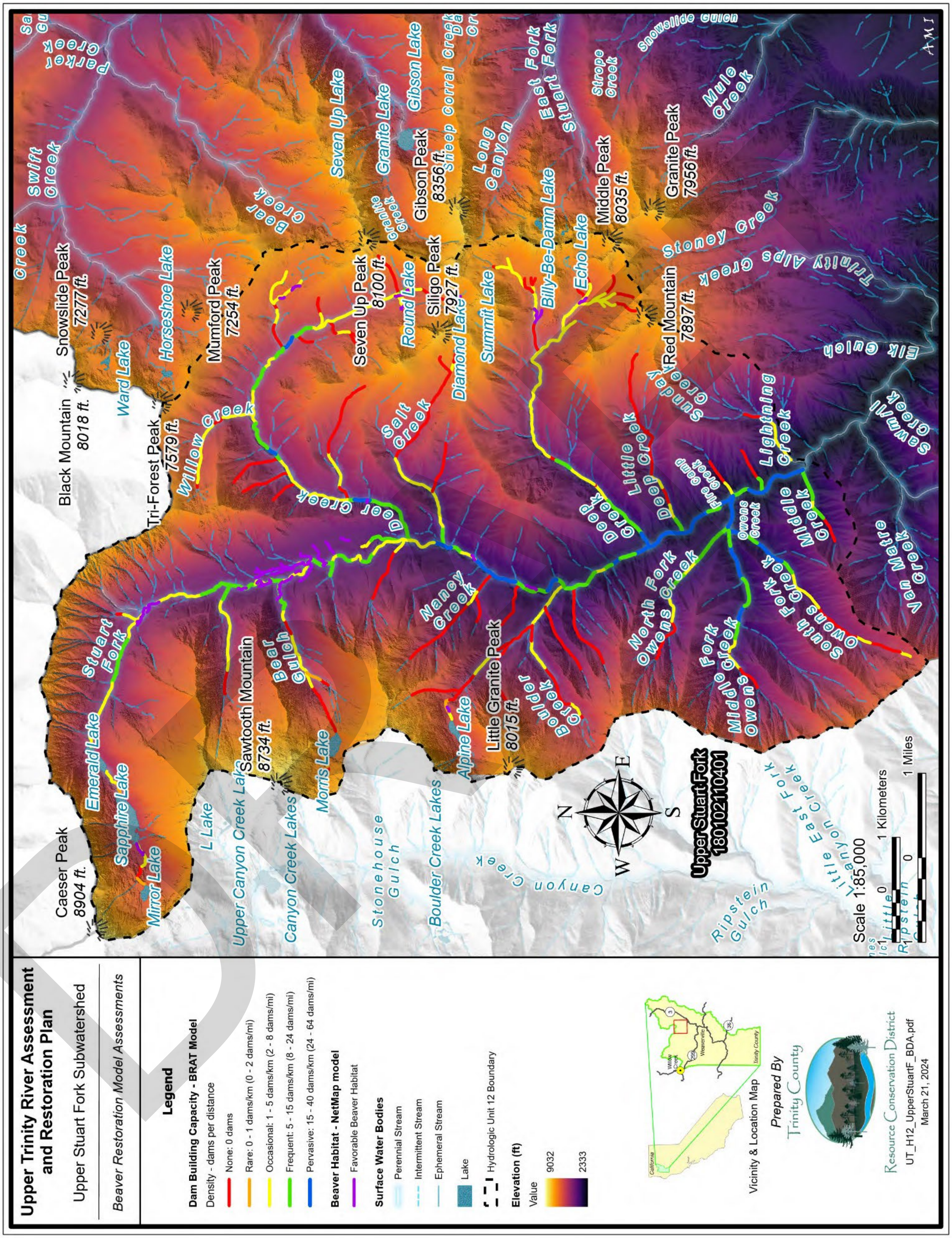
Halls Gulch
Slate Mountain
5495 ft.
N
E
S
W
Scale 1:75,000
1 Kilometers
1 Miles



Upper Trinity River Assessment and Restoration Plan
Lower East Fork Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerEFTR_OWNERSHIP.pdf
March 22, 2024
Lower East Fork Trinity River
180102110304
Coffee Creek
Population 228
Trinity Center
Population 228
Trinity Lake
Trinity River
East Fork Trinity River
Pond Lily Lake
Gozem Peak
6188 ft.
Grouse Lake
Red Mountain
6722 ft.
Devils Lake
Wildcat Peak
5318 ft.
Slate Mountain
5495 ft.
Brown Mountain
4498 ft.
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Jackass Peak
4304 ft.
Grouse Creek
Devils Creek
Halls Gulch
China Creek
Watson Creek
Fool Gulch
Nelson Creek
Menzel Gulch
Cabin Gulch
Menzel Creek
Cedar Creek
Squirrel Creek
Squirrel Gulch
Copper Creek
Snow Gulch
Carr Gulch
Hatchet Creek
Flume Creek
Swift Creek
Scale 1:75,000
1 Kilometers
1 Miles
N
E
S
W



Upper Trinity River Assessment and Restoration Plan
Upper Stuart Fork Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
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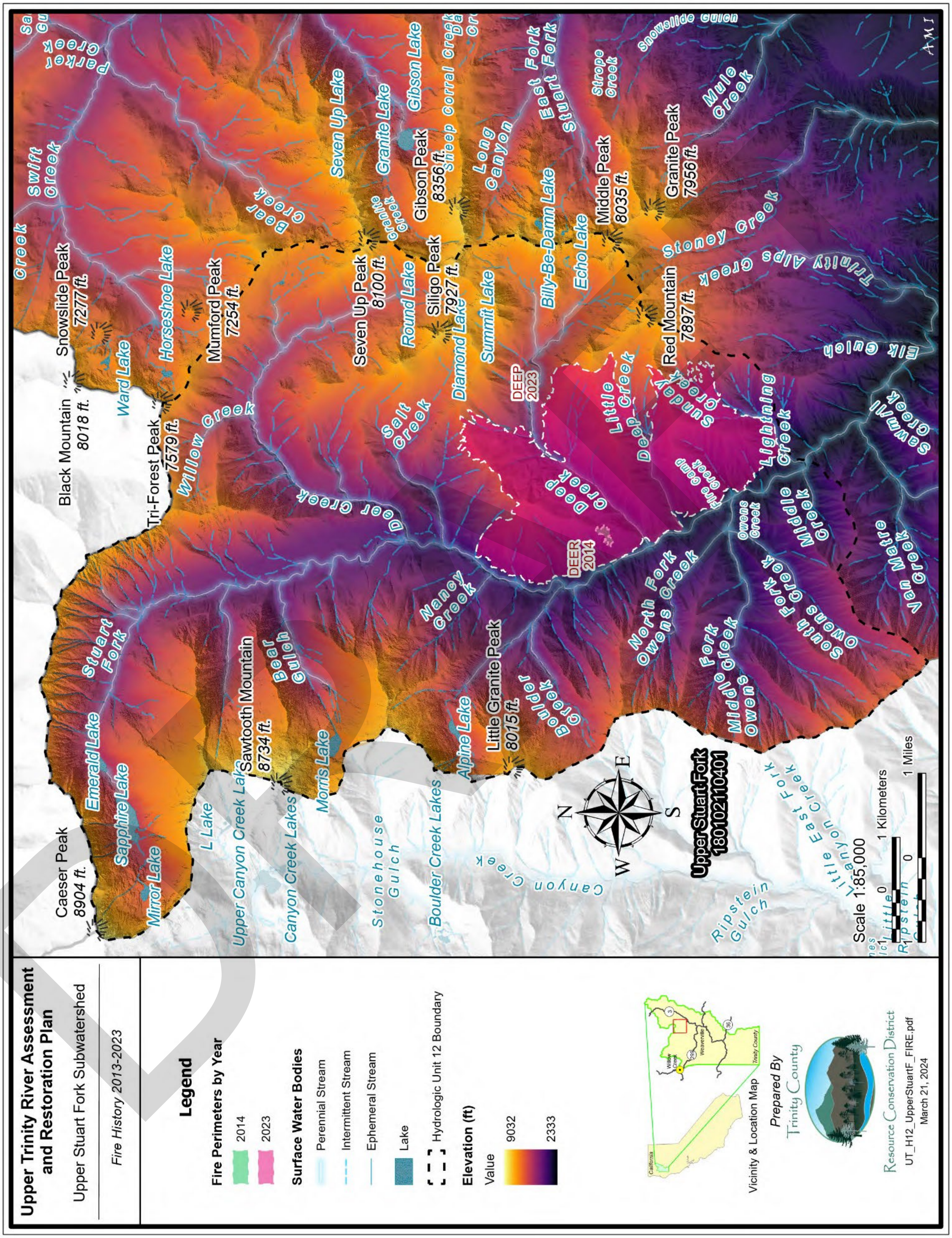
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperStuartF_BDA.pdf
March 21, 2024
Upper Stuart Fork
180102110401
Scale 1:85,000
1 Kilometers
1 Miles
Caeser Peak
8904 ft.
Black Mountain
8018 ft.
Tri-Forest Peak
7579 ft.
Snowslide Peak
7277 ft.
Mumford Peak
7254 ft.
Seven Up Peak
8100 ft.
Siligo Peak
7927 ft.
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Sawtooth Mountain
8734 ft.
Little Granite Peak
8015 ft.
Mirror Lake
Sapphire Lake
Emerald Lake
L Lake
Upper Canyon Creek Lake
Canyon Creek Lakes
Morris Lake
Boulder Creek Lakes
Alpine Lake
Ward Lake
Horseshoe Lake
Seven Up Lake
Granite Lake
Gibson Lake
Round Lake
Diamond Lake
Summit Lake
Billy-Be-Damn Lake
Echo Lake
Stuart Fork
Willow Creek
Deer Creek
Salt Creek
Deep Creek
Little Deep Creek
Nancy Creek
Bear Gulch
Boulder Creek
North Fork Owens Creek
Middle Fork Owens Creek
South Fork Owens Creek
Owens Creek
Middle Creek
Lightning Creek
Sunday Creek
Van Matre Creek
Sawmill Creek
Elk Gulch
Trinity Alps Creek
Stoney Creek
Mule Creek
Strope Creek
East Fork Stuart Fork
Long Canyon
Sheep Corral Creek
Granite Creek
Bear Creek
Swift Creek
Parker Creek
Snowslide Gulch
Stonehouse Gulch
Canyon Creek
Ripstein Gulch
Little Canyon Creek
East Fork


Upper Trinity River Assessment and Restoration Plan
Upper Stuart Fork Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2014
2023
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperStuartF_FIRE.pdf
March 21, 2024
Upper Stuart Fork
180102110401
Scale 1:85,000
0 1 Kilometers
0 1 Miles
Caeser Peak
8904 ft.
Black Mountain
8018 ft.
Tri-Forest Peak
7579 ft.
Snowslide Peak
7277 ft.
Mumford Peak
7254 ft.
Seven Up Peak
8100 ft.
Siligo Peak
7927 ft.
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Sawtooth Mountain
8734 ft.
Little Granite Peak
8015 ft.
DEEP
2023
DEER
2014
Emerald Lake
Sapphire Lake
Mirror Lake
L Lake
Upper Canyon Creek Lakes
Canyon Creek Lakes
Morris Lake
Boulder Creek Lakes
Alpine Lake
Ward Lake
Horseshoe Lake
Round Lake
Diamond Lake
Summit Lake
Seven Up Lake
Granite Lake
Gibson Lake
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Stuart Fork
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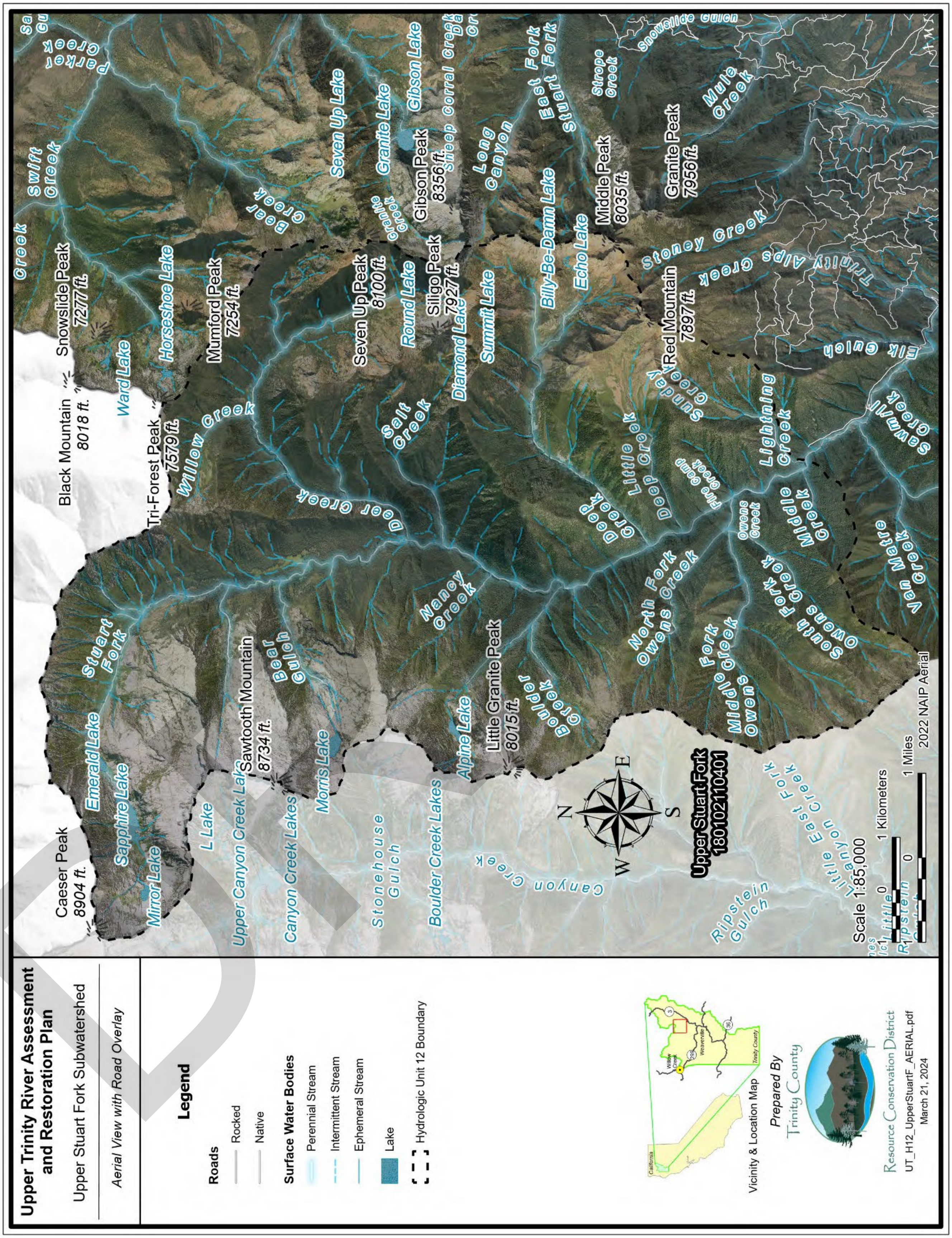
Deer Creek
Salt Creek
Nancy Creek
Bear Gulch
Boulder Creek
Deep Creek
Little Deep Creek
Sunday Creek
Fire Camp Creek
Lightning Creek
North Fork Owens Creek
Middle Fork Owens Creek
South Fork Owens Creek
Owens Creek
Middle Creek
Van Matre Creek
Sawmill Creek
Elk Gulch
Trinity Alps Creek
Stoney Creek
Granite Creek
Bear Creek
Swift Creek
Parker Creek
Long Canyon
Sheep Corral Creek
East Fork Stuart Fork
Strope Creek
Mule Creek
Snowslide Gulch
Canyon Creek
Stonehouse Gulch
Ripstein Gulch
Little East Fork Canyon Creek


Upper Trinity River Assessment and Restoration Plan
Upper Stuart Fork Subwatershed
Aerial View with Road Overlay
Legend
Roads
Rocked
Native
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperStuartF_AERIAL.pdf
March 21, 2024
Upper Stuart Fork
180102110401
Scale 1:85,000
0 1 Kilometers
0 1 Miles
2022 NAIP Aerial
Caeser Peak
8904 ft.
Black Mountain
8018 ft.
Tri-Forest Peak
7579 ft.
Snowslide Peak
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Mumford Peak
7254 ft.
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8100 ft.
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7897 ft.
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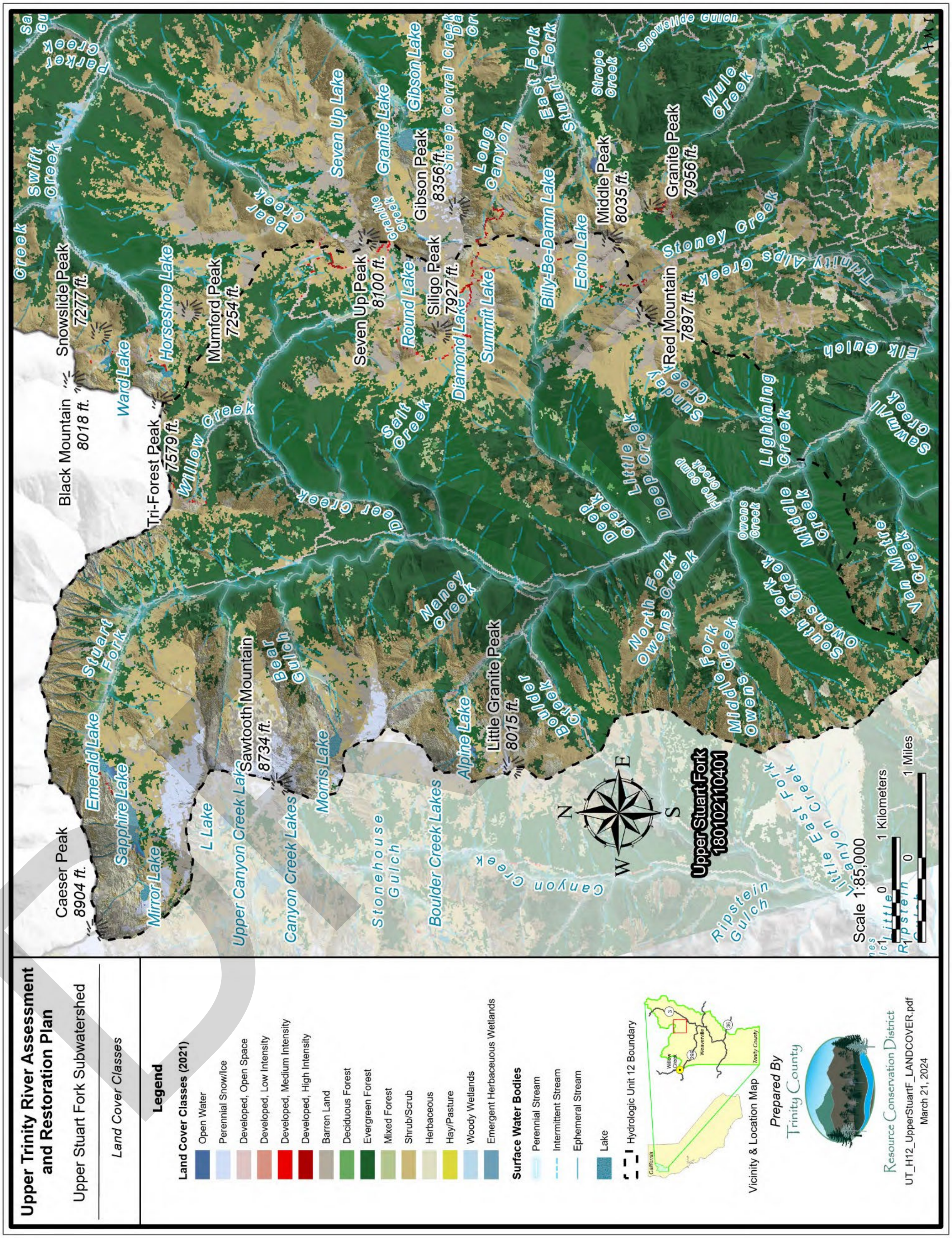
Fire Camp Creek
Lightning Creek
Sawmill Creek
Owens Creek
Middle Creek
North Fork Owens Creek
Middle Fork Owens Creek
South Fork Owens Creek
Van Matre Creek
Stonehouse Gulch
Canyon Creek
Ripstein Gulch
Little Canyon
East Fork


Upper Trinity River Assessment and Restoration Plan
Upper Stuart Fork Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Perennial Snow/Ice
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperStuartF_LANDCOVER.pdf
March 21, 2024
Upper Stuart Fork
180102110401
Scale 1:85,000
0 1 Kilometers
0 1 Miles
Caeser Peak
8904 ft.
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Owens Creek
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Middle Fork Owens Creek
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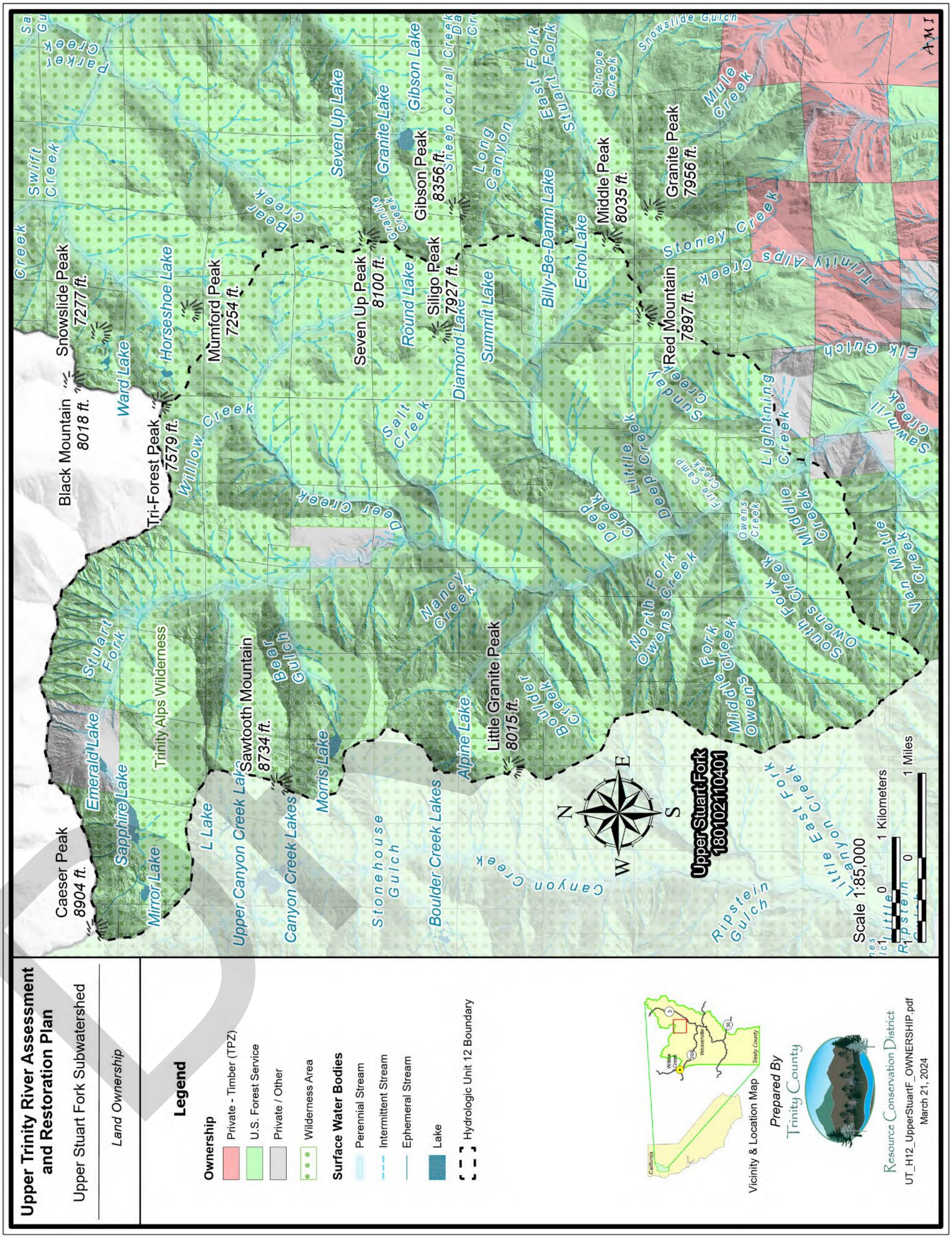
East Fork Stuart Fork
Sheep Corral Creek
Mule Creek
Bear Creek
Swift Creek
Parker Creek
Snowslide Gulch
Stonehouse Gulch
Canyon Creek
Ripstein Gulch
Little East Fork Canyon Creek


Upper Trinity River Assessment and Restoration Plan
Upper Stuart Fork Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_UpperStuartF_OWNERSHIP.pdf
March 21, 2024
Upper Stuart Fork
180102110401
Scale 1:85,000
0 1 Kilometers
0 1 Miles
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8904 ft.
Black Mountain
8018 ft.
Snowslide Peak
7277 ft.
Tri-Forest Peak
7579 ft.
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7254 ft.
Sawtooth Mountain
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7927 ft.
Gibson Peak
8356 ft.
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Red Mountain
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Trinity Alps Wilderness
Emerald Lake
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L Lake
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Horseshoe Lake
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Parker Creek
Bear Creek
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Stonehouse Gulch
Ripstein Gulch
Little East Fork
Canyon Creek
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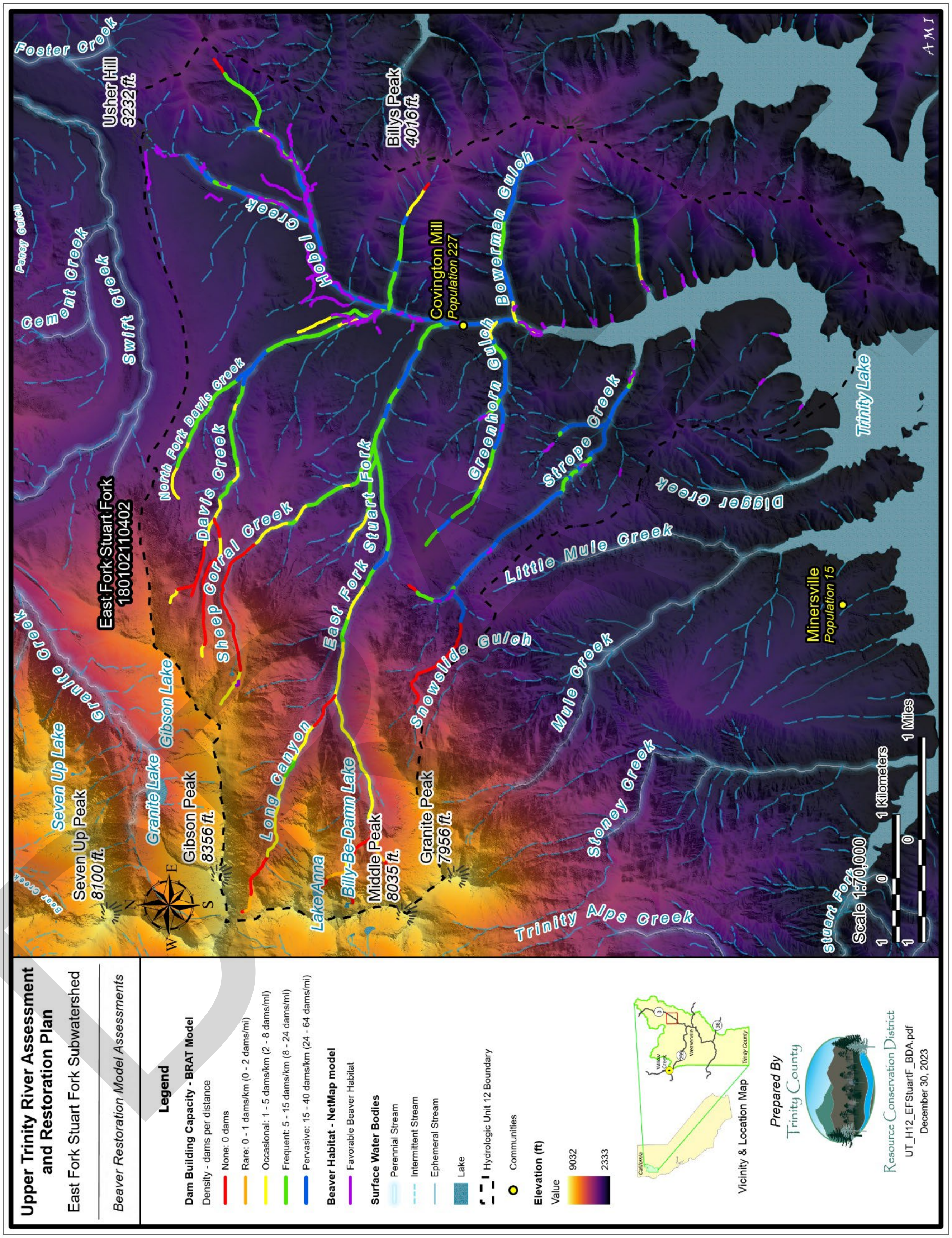
Upper Trinity River Assessment and Restoration Plan
East Fork Stuart Fork Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
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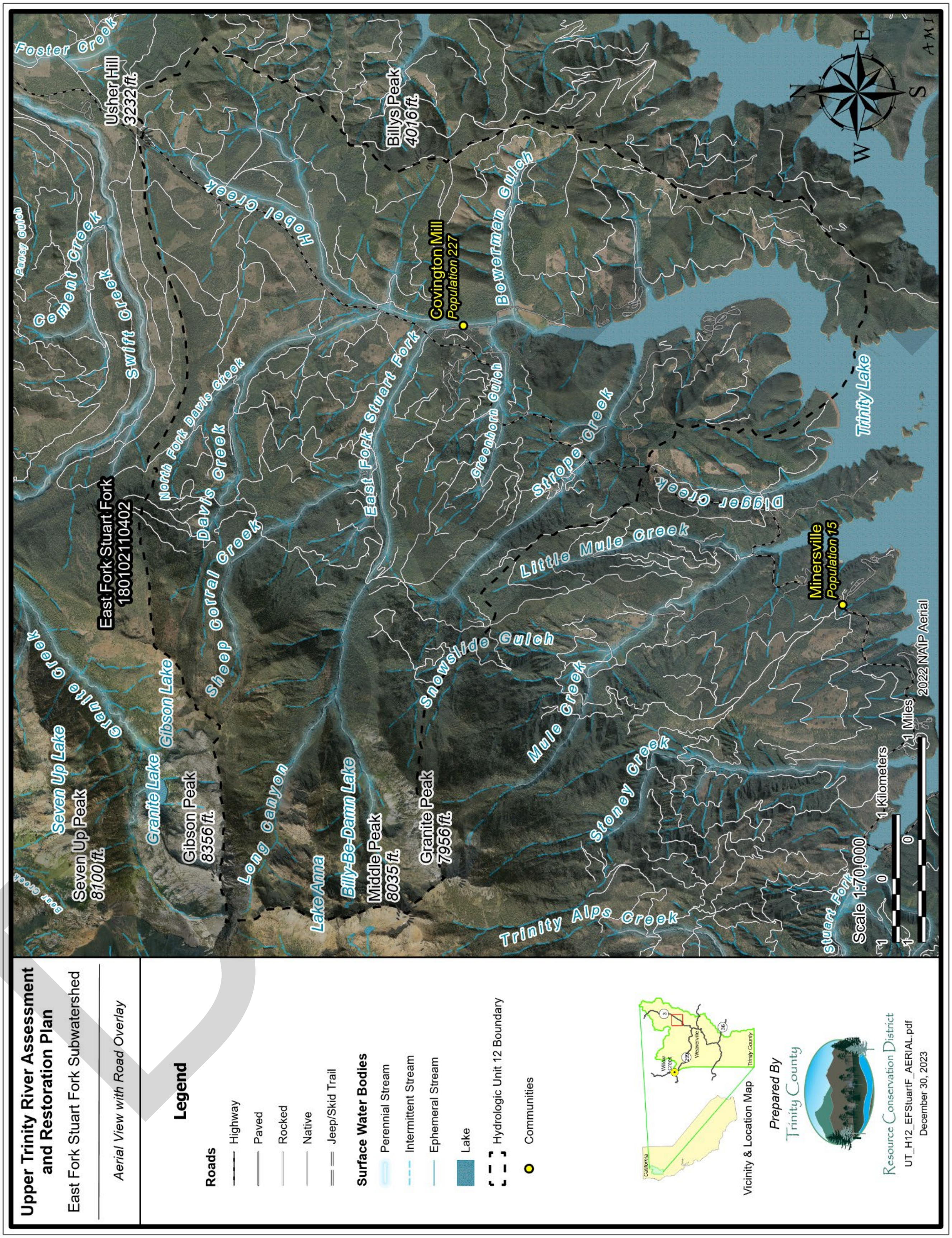
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_EFStuartF_BDA.pdf
December 30, 2023
East Fork Stuart Fork
180102110402
Covington Mill
Population 227
Minersville
Population 15
Usher Hill
3232 ft.
Billys Peak
4016 ft.
Seven Up Peak
8100 ft.
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Foster Creek
Cement Creek
Swift Creek
Hobel Creek
Bowerman Gulch
Greenhorn Gulch
North Fork Davis Creek
Davis Creek
Sheep Corral Creek
East Fork Stuart Fork
Strope Creek
Digger Creek
Little Mule Creek
Snowslide Gulch
Mule Creek
Long Canyon
Stoney Creek
Trinity Alps Creek
Stuart Fork
Granite Creek
Seven Up Lake
Granite Lake
Gibson Lake
Lake Anna
Billy-Be-Damn Lake
Trinity Lake
Scale 1:70,000
1 0 1 Kilometers
1 0 1 Miles


Upper Trinity River Assessment and Restoration Plan
East Fork Stuart Fork Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
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Hydrologic Unit 12 Boundary
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December 30, 2023
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180102110402
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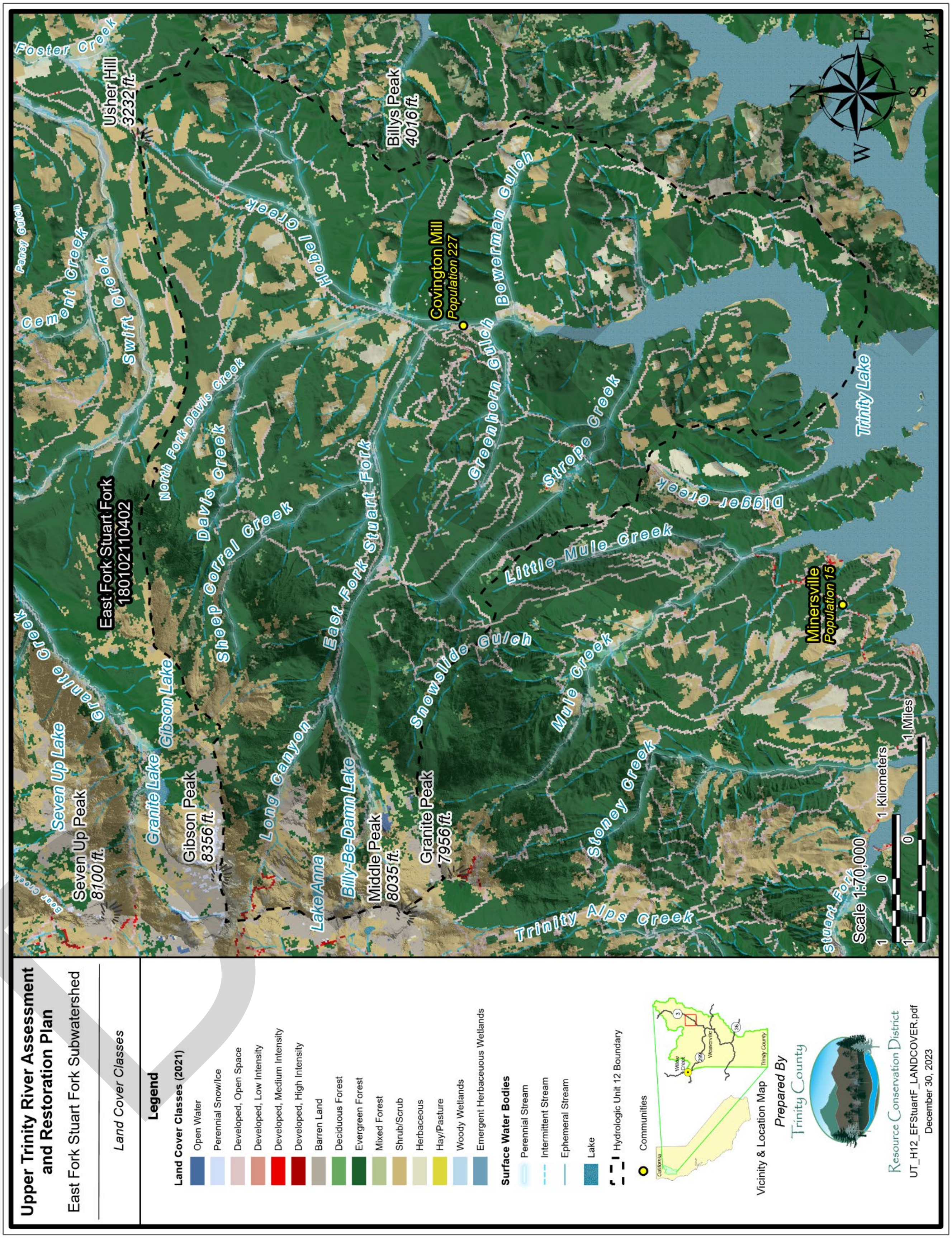
Trinity Alps Creek
Stuart Fork
Trinity Lake
Scale 1:70,000
0 1 Kilometers
0 1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
East Fork Stuart Fork Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Perennial Snow/Ice
Developed, Open Space
Developed, Low Intensity
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Ephemeral Stream
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Vicinity & Location Map
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Resource Conservation District
UT_H12_EFStuartF_LANDCOVER.pdf
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Stoney Creek
Trinity Alps Creek
Stuart Fork
Granite Creek
Seven Up Lake
Granite Lake
Gibson Lake
Long Canyon
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Billy-Be-Damn Lake
Trinity Lake
Scale 1:70,000
1 0 1 Kilometers
1 0 1 Miles
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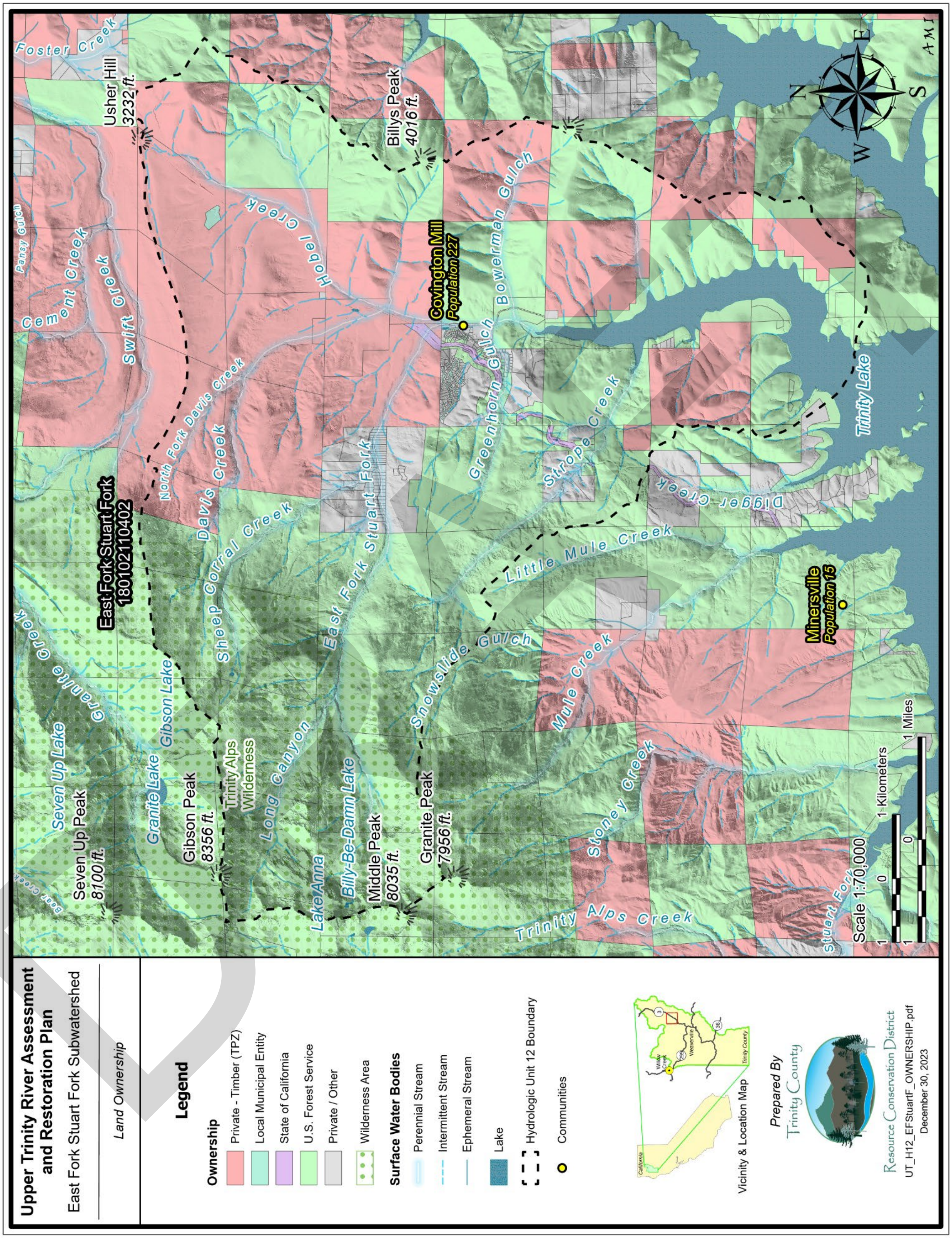

Upper Trinity River Assessment and Restoration Plan
East Fork Stuart Fork Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
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Trinity County
Resource Conservation District
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180102110402
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Granite Peak
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Trinity Alps Wilderness
Trinity Lake
Foster Creek
Cement Creek
Swift Creek
Hobel Creek
Bowerman Gulch
Greenhorn Gulch
North Fork Davis Creek
Davis Creek
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East Fork Stuart Fork
Strope Creek
Digger Creek
Little Mule Creek
Snowslide Gulch
Mule Creek
Stoney Creek
Trinity Alps Creek
Stuart Fork
Granite Creek
Seven Up Lake
Gibson Lake
Granite Lake
Long Canyon
Lake Anna
Billy-Be-Damn Lake
Pansy Gulch
Scale 1:70,000
1 Kilometers
1 Miles
N
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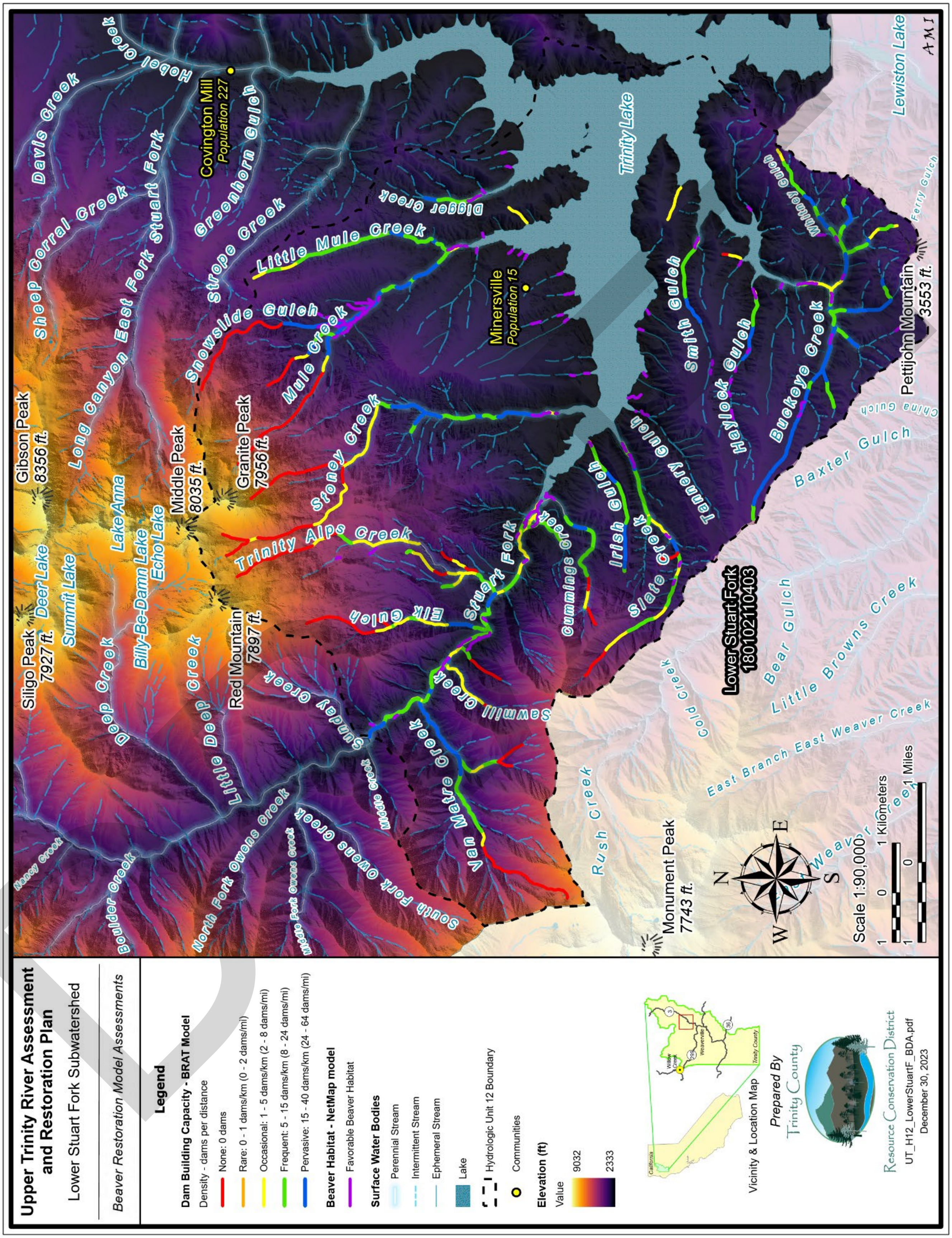
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Communities
Elevation (ft)
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Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerStuartF_BDA.pdf
December 30, 2023
Lower Stuart Fork
180102110403
Trinity Lake
Lewiston Lake
Covington Mill
Population 227
Minersville
Population 15
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8356 ft.
Siligo Peak
7927 ft.
Middle Peak
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Granite Peak
7956 ft.
Red Mountain
7897 ft.
Monument Peak
7743 ft.
Pettijohn Mountain
3553 ft.
Deer Lake
Summit Lake
Lake Anna
Billy-Be-Damn Lake
Echo Lake
Davis Creek
Hobel Creek
Sheep Corral Creek
Long Canyon East Fork Stuart Fork
Greenhorn Gulch
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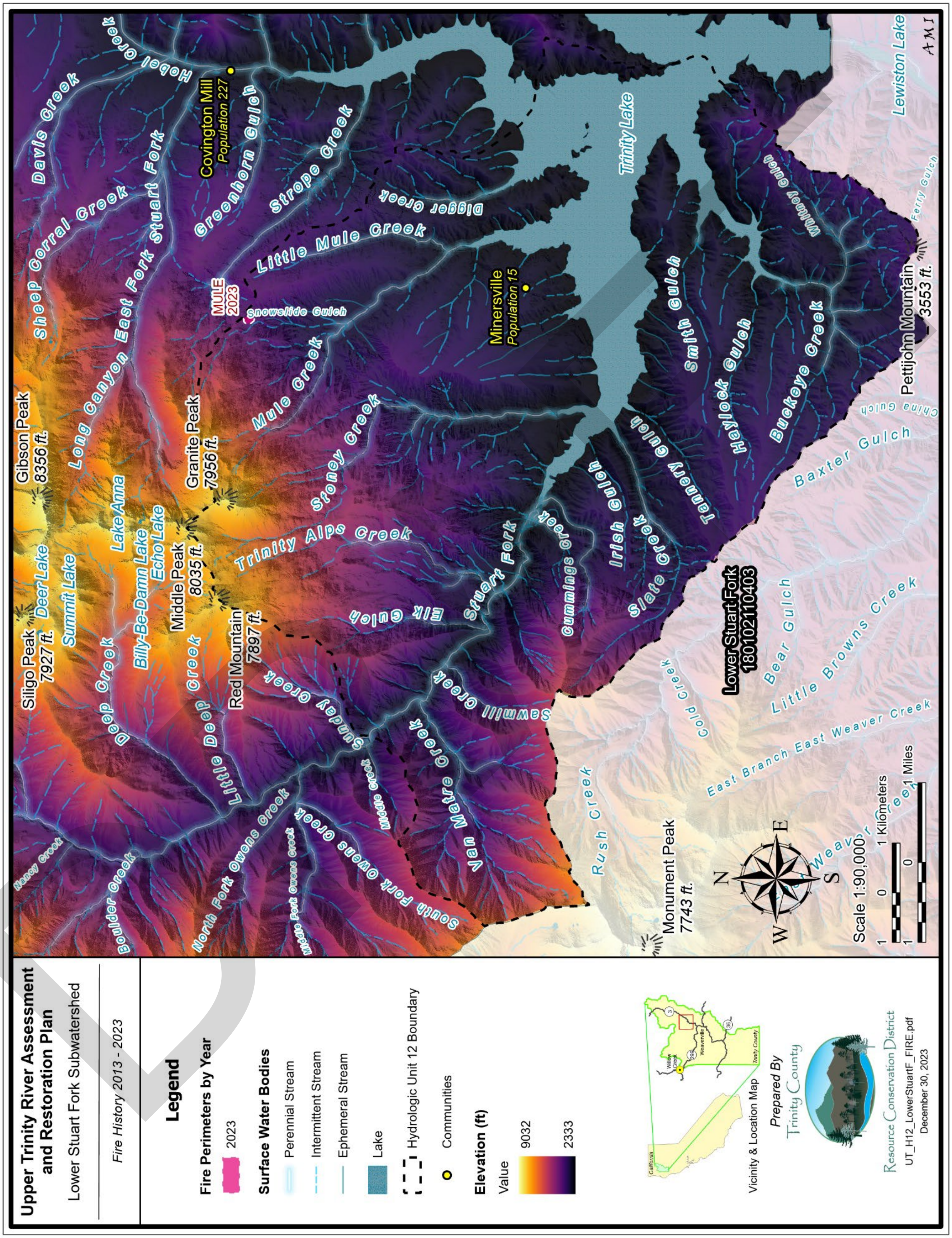
Digger Creek
Little Mule Creek
Snowslide Gulch
Mule Creek
Stoney Creek
Trinity Alps Creek
Elk Gulch
Stuart Fork
Cummings Gulch
Irish Gulch
Slate Creek
Tannery Gulch
Haylock Gulch
Smith Gulch
Buckeye Creek
Whitney Gulch
Ferry Gulch
China Gulch
Baxter Gulch
Bear Gulch
Little Browns Creek
East Branch East Weaver Creek
Cold Creek
Rush Creek
Weaver Creek
Deep Creek
Little Deep Creek
Sunday Creek
Sawmill Creek
Van Matre Creek
Middle Creek
Nancy Creek
Boulder Creek
North Fork Owens Creek
Middle Fork Owens Creek
South Fork Owens Creek
Owens Creek
Scale 1:90,000
Kilometers
Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Lower Stuart Fork Subwatershed
Fire History 2013 - 2023
Legend
Fire Perimeters by Year
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Surface Water Bodies
Perennial Stream
Intermittent Stream
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Hydrologic Unit 12 Boundary
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Elevation (ft)
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Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerStuartF_FIRE.pdf
December 30, 2023
Lower Stuart Fork
180102110403
Trinity Lake
Lewiston Lake
Covington Mill
Population 227
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MULE
2023
Gibson Peak
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Scale 1:90,000
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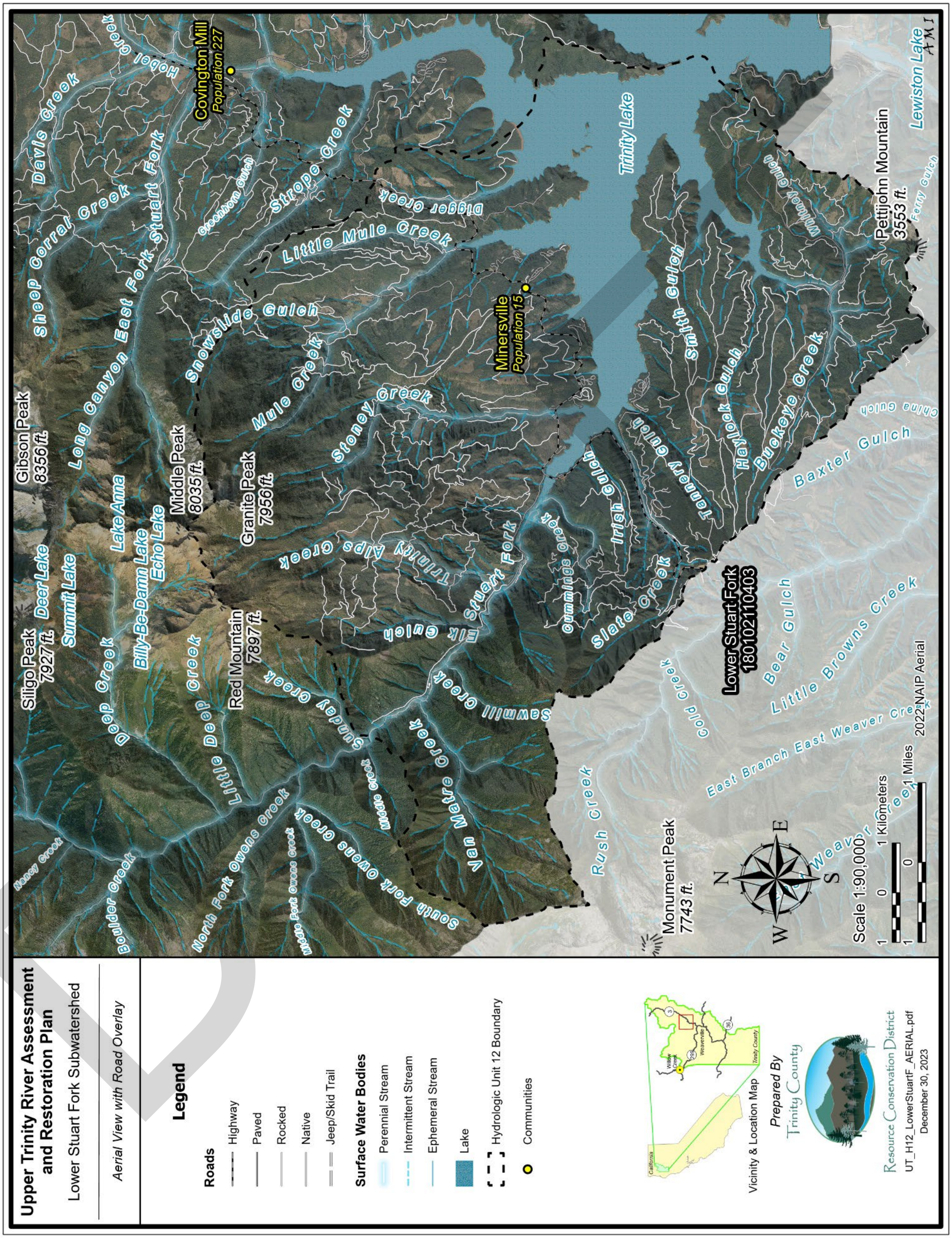
Miles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Native
Jeep/Skid Trail
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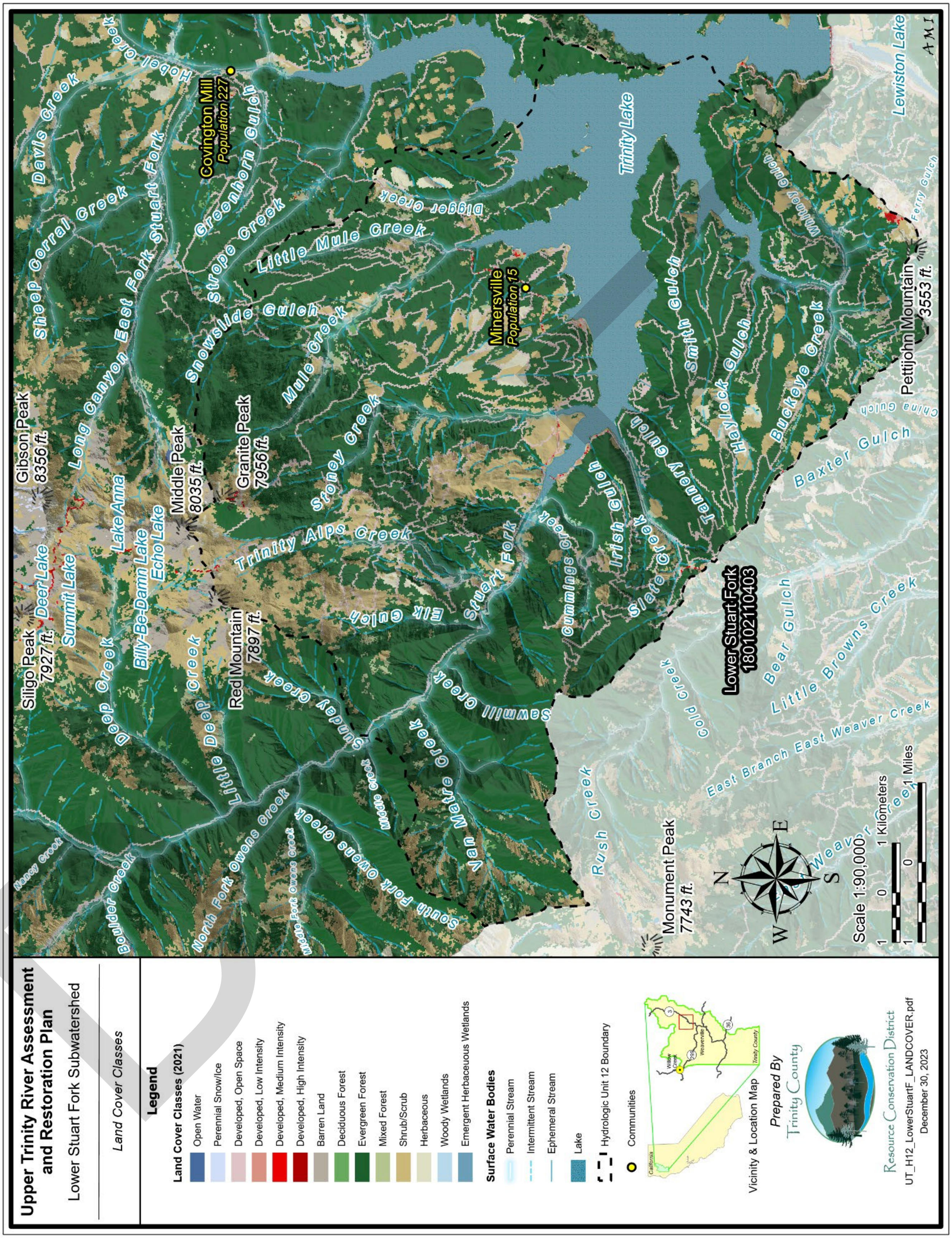
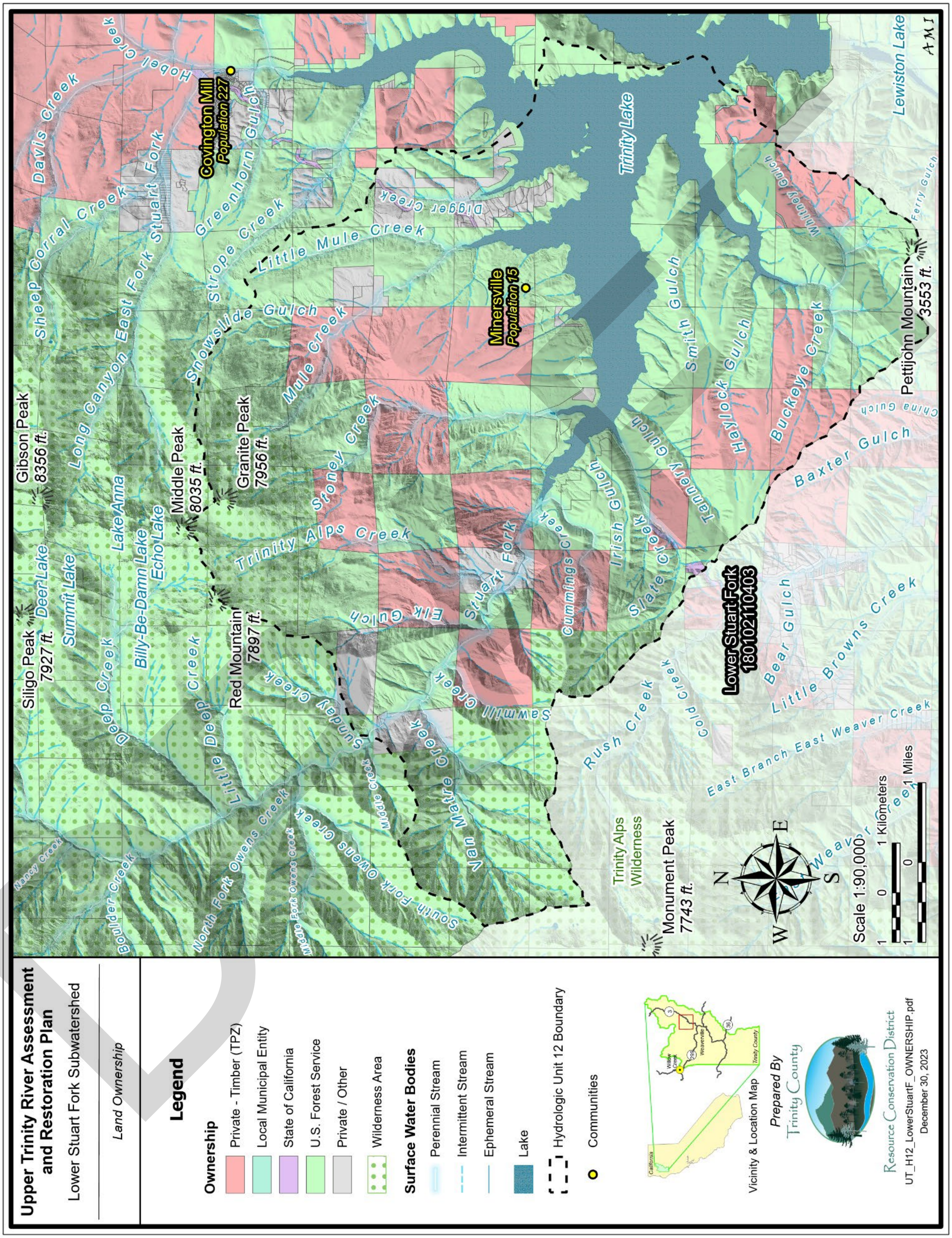
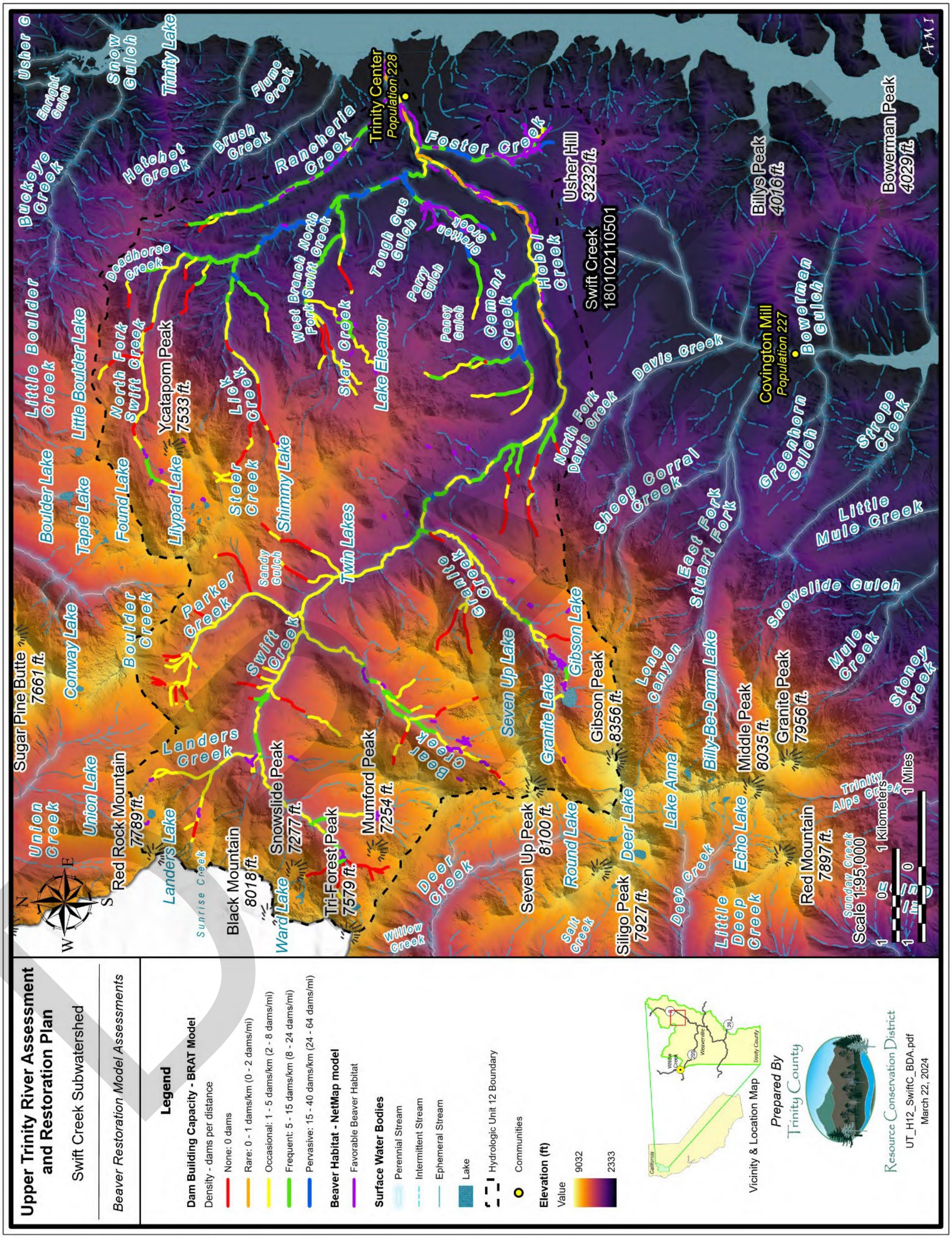
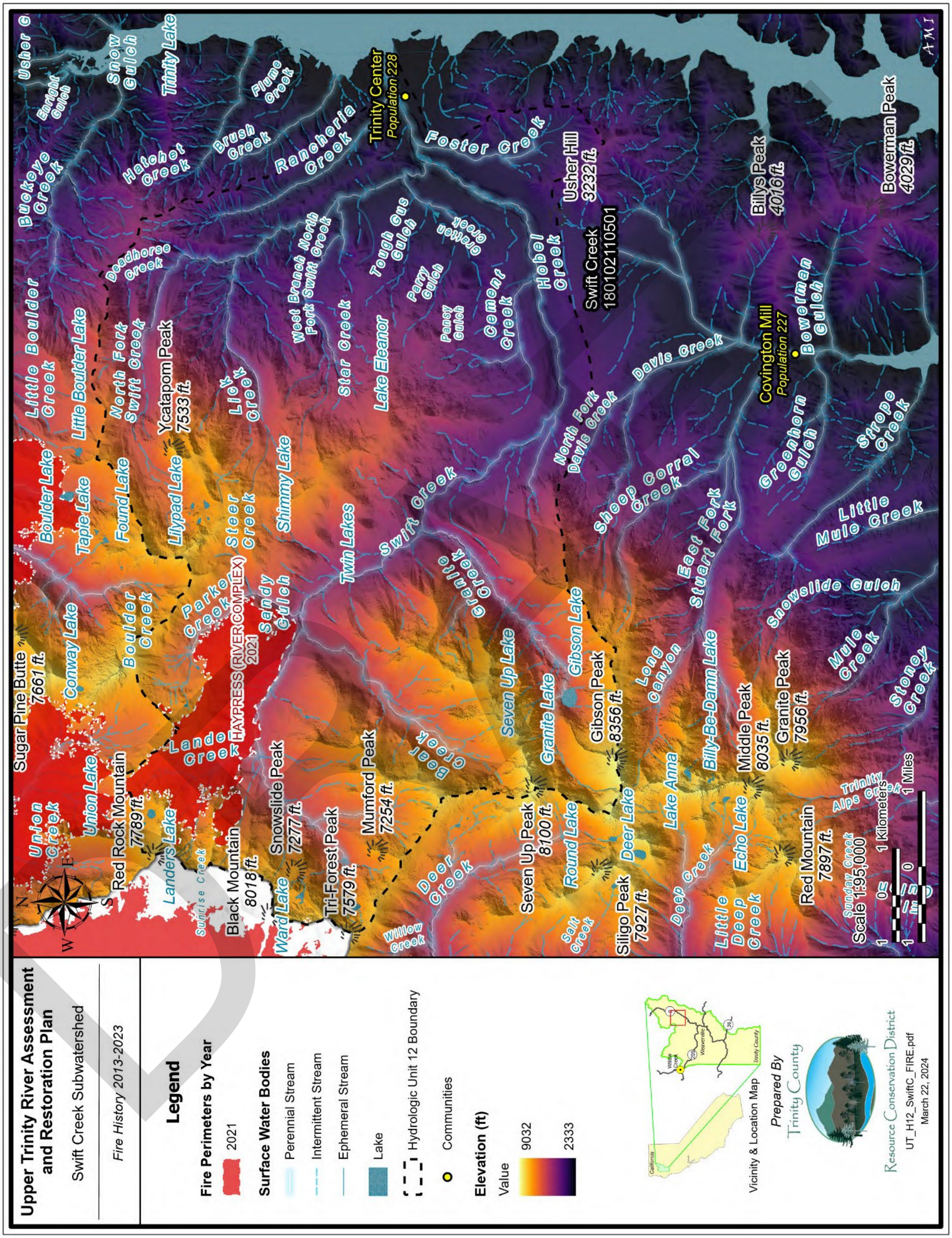
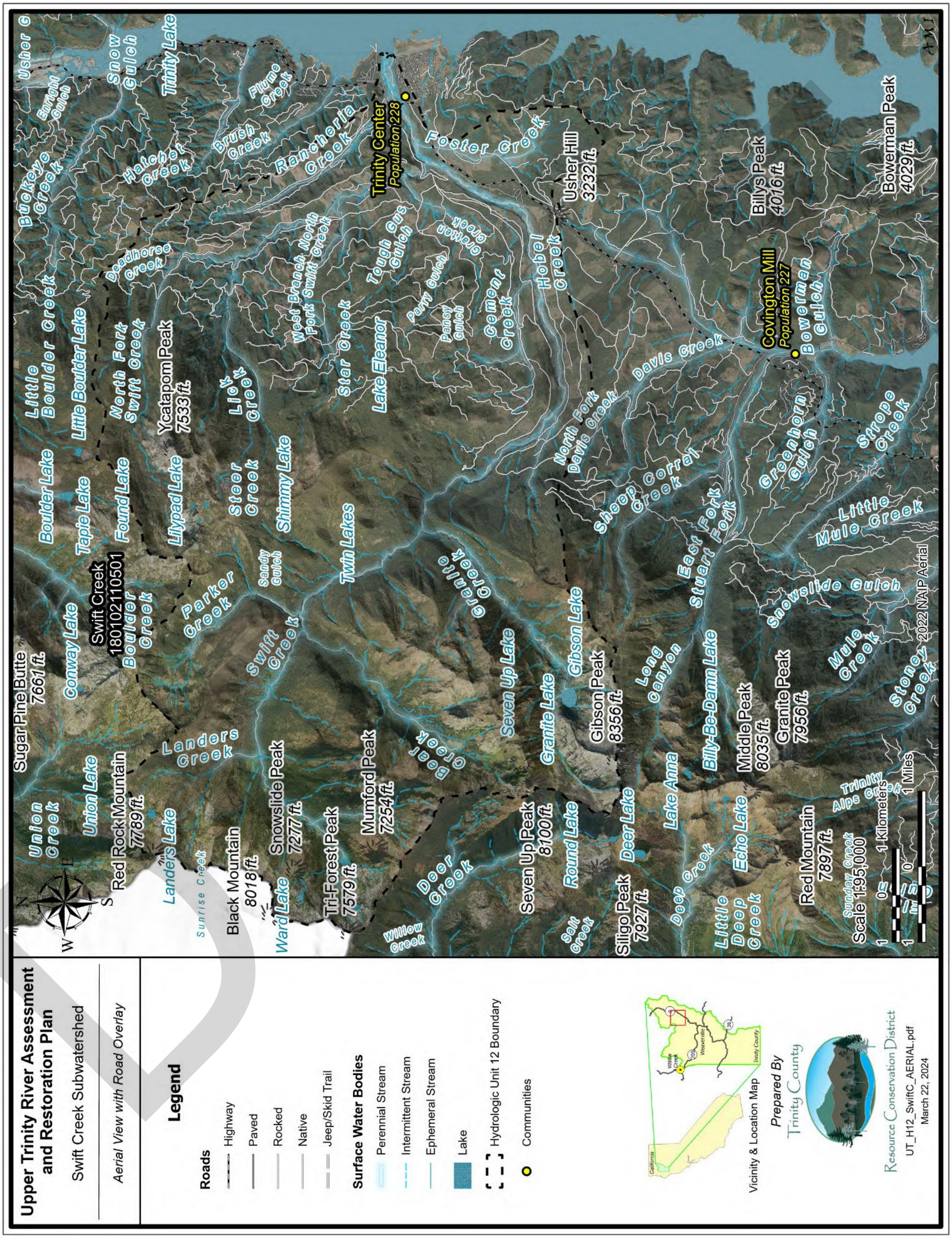
Resource Conservation District
UT_H12_LowerStuartF_AERIAL.pdf
December 30, 2023
Lower Stuart Fork
180102110403
Trinity Lake
Covington Mill
Population 227
Minersville
Population 15
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Siligo Peak
7927 ft.
Red Mountain
7897 ft.
Monument Peak
7743 ft.
Pettijohn Mountain
3553 ft.
Deer Lake
Summit Lake
Lake Anna
Billy-Be-Damn Lake
Echo Lake
Lewiston Lake
Stuart Fork
East Fork Stuart Fork
Long Canyon
Sheep Corral Creek
Davis Creek
Hobel Creek
Strope Creek
Digger Creek
Little Mule Creek
Mule Creek
Snowslide Gulch
Stoney Creek
Smith Gulch
Haylook Gulch
Buckeye Creek
Tannery Gulch
Irish Gulch
Trinity Alps Creek
Cummings Creek
Slate Creek
Elk Gulch
Sawmill Creek
Sunday Creek
Deep Creek
Little Deep Creek
Van Matre Creek
North Fork Owens Creek
South Fork Owens Creek
Boulder Creek
Nancy Creek
Rush Creek
Cold Creek
Bear Gulch
Little Browns Creek
Baxter Gulch
China Gulch
East Branch East Weaver Creek
Scale 1:90,000
1 Kilometers
1 Miles
2022 NAIP Aerial

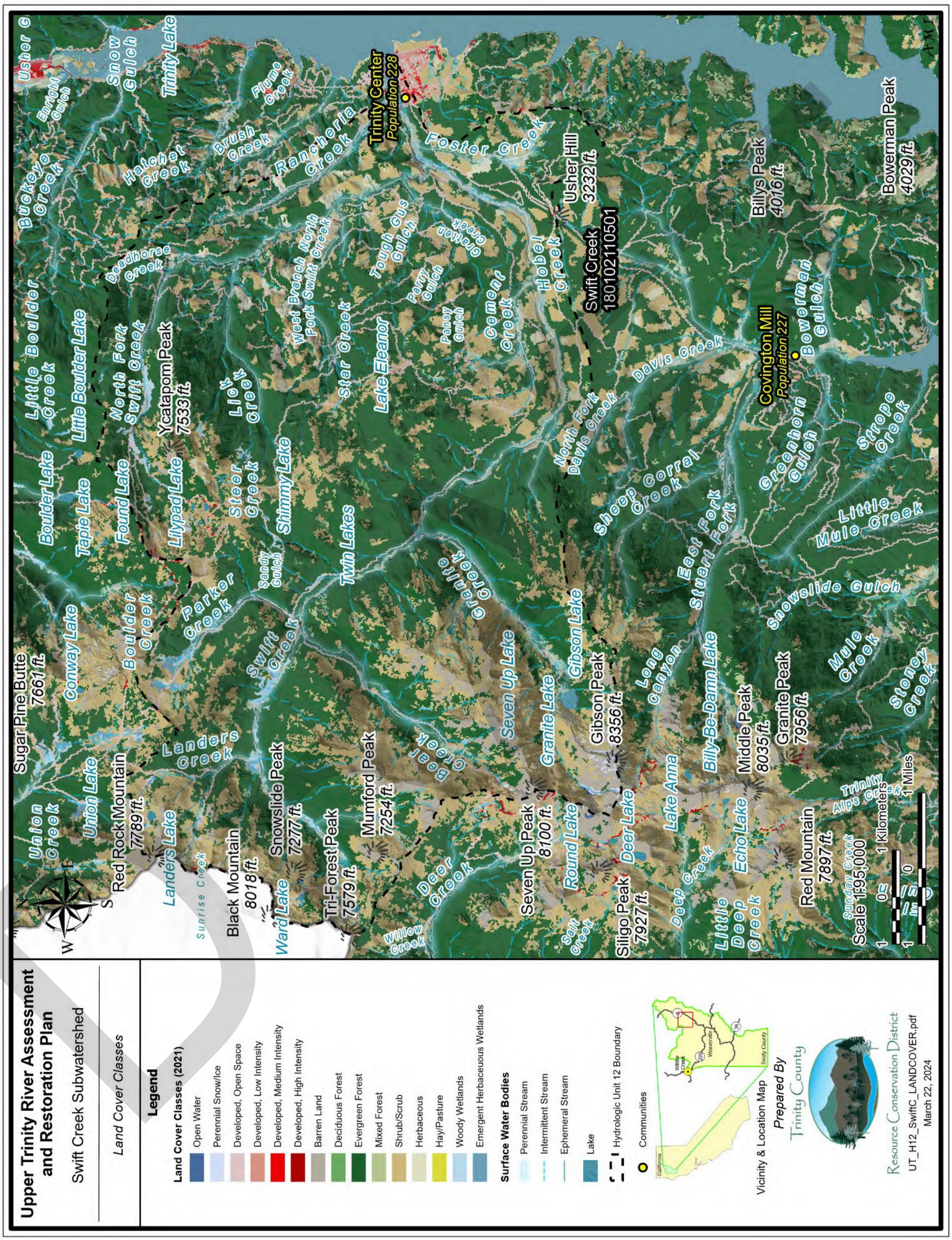

Upper Trinity River Assessment and Restoration Plan
Lower Stuart Fork Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Perennial Snow/Ice
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerStuartF_LANDCOVER.pdf
December 30, 2023
Lower Stuart Fork
180102110403
Trinity Lake
Lewiston Lake
Covington Mill
Population 227
Minersville
Population 15
Gibson Peak
8356 ft.
Siligo Peak
7927 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Monument Peak
7743 ft.
Pettijohn Mountain
3553 ft.
Deer Lake
Summit Lake
Lake Anna
Echo Lake
Billy-Be-Damn Lake
Davis Creek
Sheep Corral Creek
Long Canyon East Fork Stuart Fork
Greenhorn Gulch
Strope Creek
Little Mule Creek
Digger Creek
Snowslide Gulch
Mule Creek
Stoney Creek
Trinity Alps Creek
Elk Gulch
Stuart Fork
Cummings Creek
Irish Gulch
Slate Creek
Tannery Gulch
Smith Gulch
Haylock Gulch
Buckeye Creek
Baxter Gulch
Bear Gulch
Little Browns Creek
Cold Creek
Deep Creek
Little Deep Creek
Sunday Creek
Sawmill Creek
Van Matre Creek
North Fork Owens Creek
South Fork Owens Creek
Boulder Creek
Rush Creek
East Branch East Weaver Creek
Scale 1:90,000
Kilometers
Miles
N
E
S
W

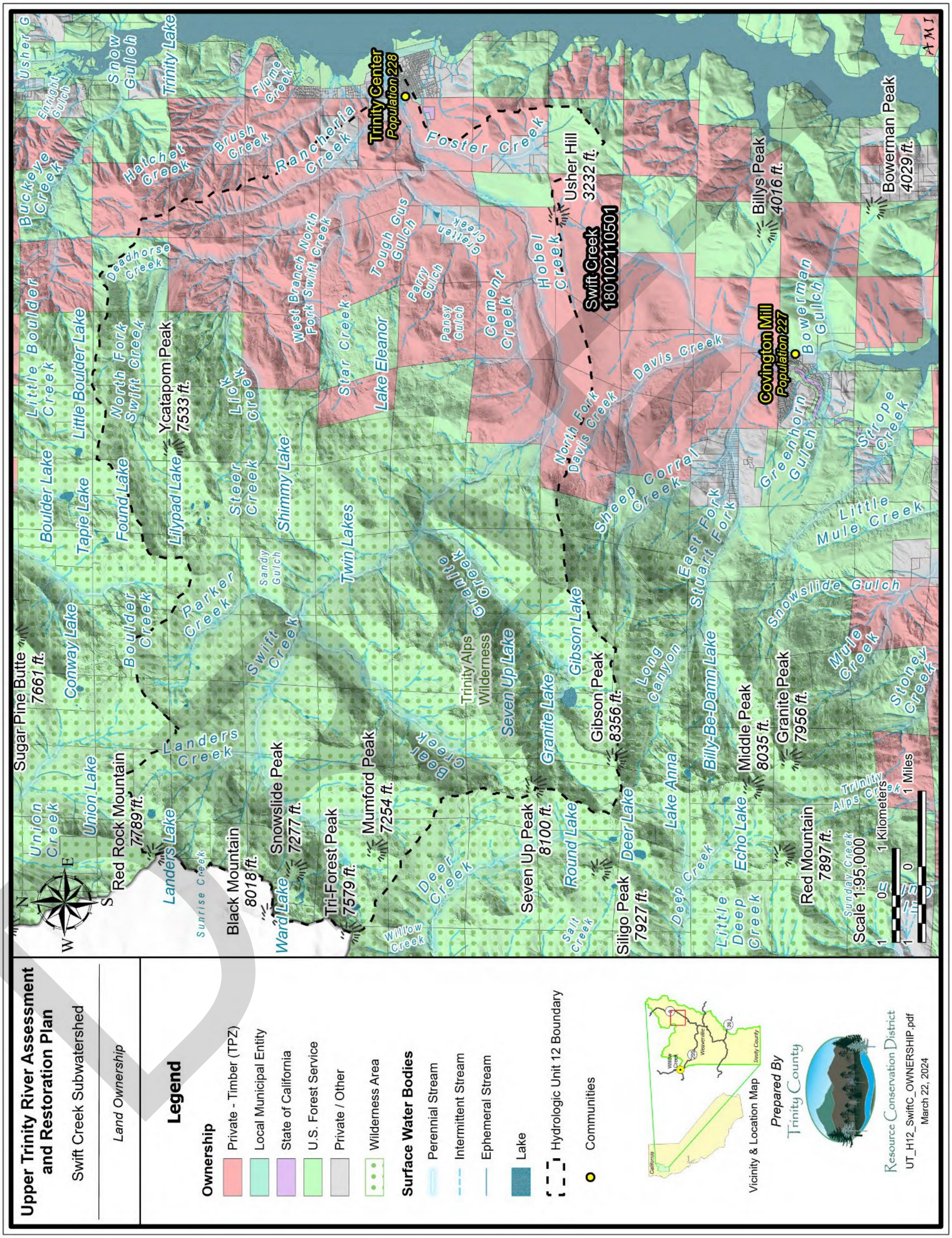

Upper Trinity River Assessment and Restoration Plan
Lower Stuart Fork Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_LowerStuartF_OWNERSHIP.pdf
December 30, 2023
Trinity Lake
Lewiston Lake
Covington Mill
Population 227
Minersville
Population 15
Lower Stuart Fork
180102110403
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Siligo Peak
7927 ft.
Red Mountain
7897 ft.
Monument Peak
7743 ft.
Pettijohn Mountain
3553 ft.
Trinity Alps
Wilderness
Scale 1:90,000
Kilometers
Miles


Upper Trinity River Assessment and Restoration Plan
Swift Creek Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_SwiftC_BDA.pdf
March 22, 2024
Trinity Center
Population 228
Covington Mill
Population 227
Swift Creek
180102110501
Scale 1:95,000
1 Kilometers
1 Miles

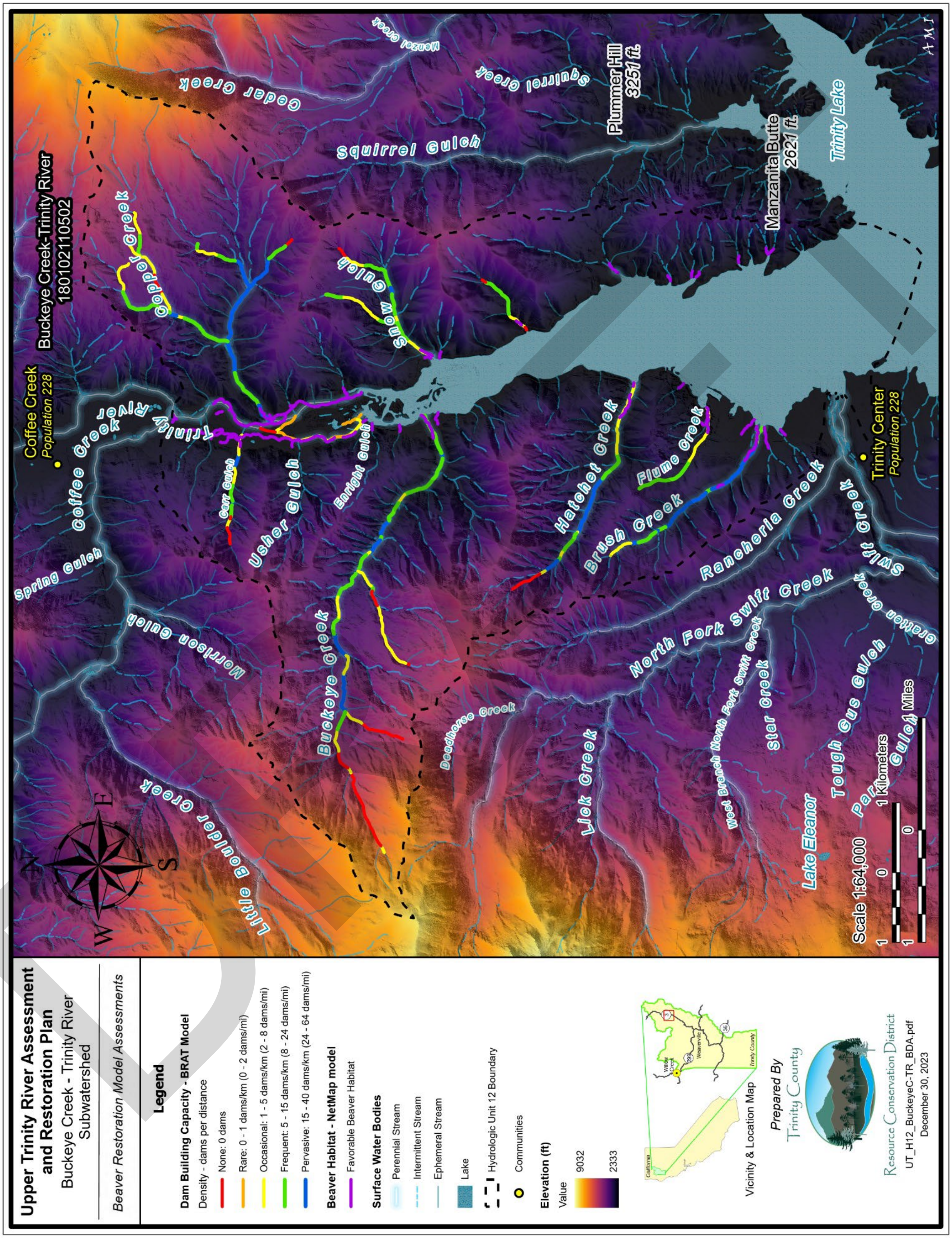

Upper Trinity River Assessment and Restoration Plan
Swift Creek Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2021
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_SwiftC_FIRE.pdf
March 22, 2024
Trinity Center
Population 228
Covington Mill
Population 227
Swift Creek
180102110501
HAYPRESS (RIVER COMPLEX)
2021
Sugar Pine Butte
7661 ft.
Red Rock Mountain
7789 ft.
Black Mountain
8018 ft.
Snowslide Peak
7277 ft.
Tri-Forest Peak
7579 ft.
Mumford Peak
7254 ft.
Seven Up Peak
8100 ft.
Siligo Peak
7927 ft.
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Ycatapom Peak
7533 ft.
Usher Hill
3232 ft.
Billys Peak
4016 ft.
Bowerman Peak
4029 ft.
Trinity Lake
Snow Gulch
Enright Gulch
Flume Creek
Brush Creek
Hatchet Creek
Rancheria Creek
Buckeye Creek
Foster Creek
Deadhorse Creek
West Branch North Fork Swift Creek
Tough Gus Gulch
Gratten Creek
Parry Gulch
Pansy Gulch
Cement Creek
Hobel Creek
Star Creek
Lake Eleanor
Little Boulder Creek
Little Boulder Lake
North Fork Swift Creek
Lick Creek
Davis Creek
North Fork Davis Creek
Bowerman Gulch
Greenhorn Gulch
Strope Creek
Boulder Lake
Tapie Lake
Found Lake
Lilypad Lake
Steer Creek
Shimmy Lake
Swift Creek
Twin Lakes
Sheep Corral Creek
East Fork Stuart Fork
Little Mule Creek
Conway Lake
Boulder Creek
Parker Creek
Sandy Gulch
Granite Creek
Snowslide Gulch
Gibson Lake
Seven Up Lake
Long Canyon
Billy-Be-Damn Lake
Mule Creek
Stoney Creek
Union Creek
Union Lake
Landers Creek
Landers Lake
Sunrise Creek
Ward Lake
Willow Creek
Bear Creek
Granite Lake
Deer Creek
Round Lake
Deer Lake
Lake Anna
Salt Creek
Deep Creek
Echo Lake
Little Deep Creek
Sunday Creek
Trinity Alps Creek
Scale 1:95,000
1 Kilometers
1 Miles

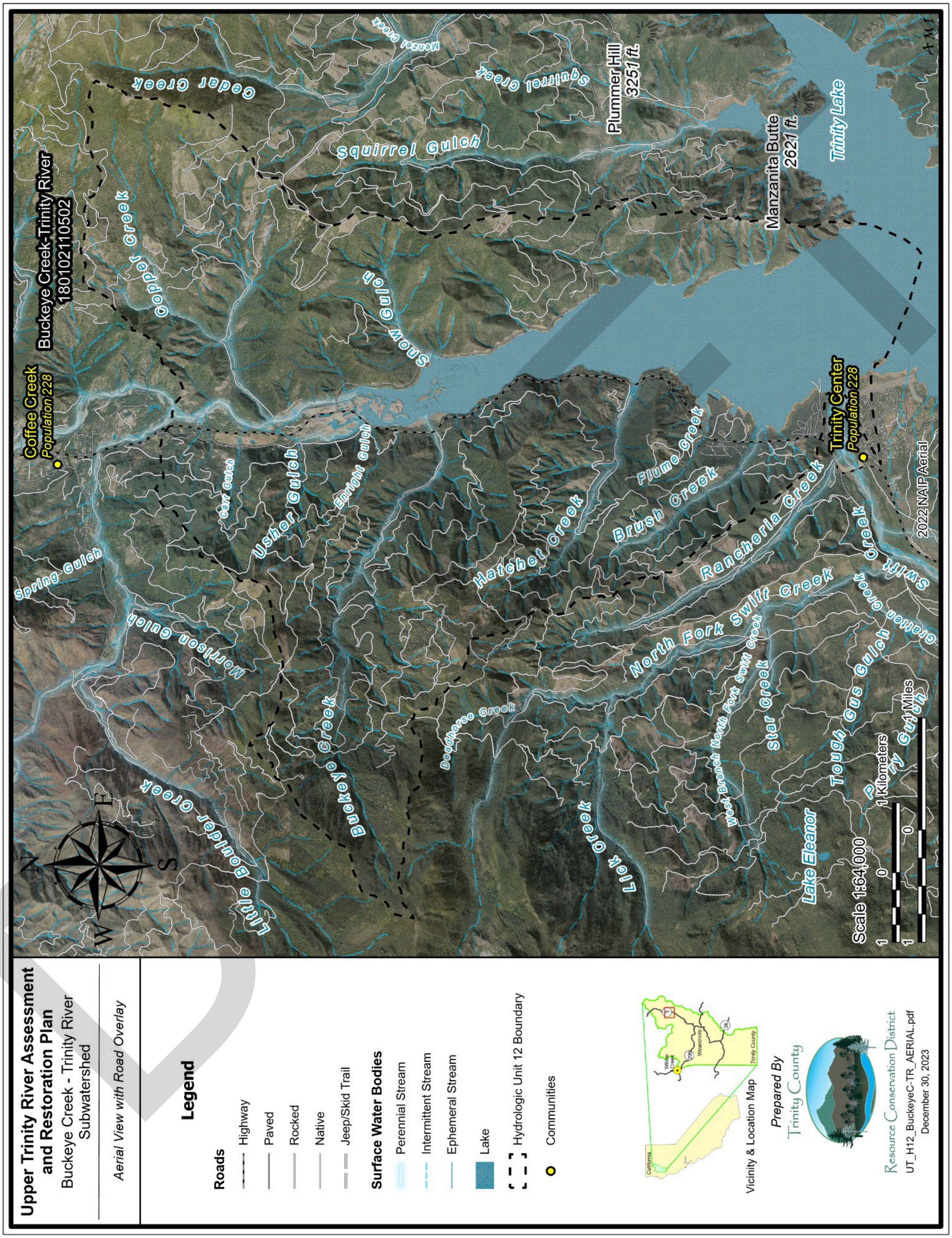

Upper Trinity River Assessment and Restoration Plan
Swift Creek Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_SwiftC_AERIAL.pdf
March 22, 2024
Swift Creek
180102110501
Trinity Center
Population 228
Covington Mill
Population 227
Sugar Pine Butte
7661 ft.
Red Rock Mountain
7789 ft.
Black Mountain
8018 ft.
Snowslide Peak
7277 ft.
Tri-Forest Peak
7579 ft.
Mumford Peak
7254 ft.
Seven Up Peak
8100 ft.
Sligo Peak
7927 ft.
Gibson Peak
8356 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Ycatapom Peak
7533 ft.
Usher Hill
3232 ft.
Billys Peak
4016 ft.
Bowerman Peak
4029 ft.
Union Creek
Union Lake
Landers Lake
Landers Creek
Ward Lake
Conway Lake
Boulder Creek
Boulder Lake
Little Boulder Lake
Little Boulder Creek
Tapie Lake
Found Lake
Lilypad Lake
Parker Creek
Sandy Gulch
Swift Creek
Steer Creek
Shimmy Lake
Twin Lakes
Lick Creek
North Fork Swift Creek
Deadhorse Creek
Buckeye Creek
Hatchet Creek
Brush Creek
Rancheria Creek
Flume Creek
Enright Gulch
Snow Gulch
Trinity Lake
Usher G
Foster Creek
West Branch North Fork Swift Creek
Tough Guy Gulch
Star Creek
Lake Eleanor
Parry Gulch
Pansy Gulch
Cement Creek
Gratten Creek
Hobel Creek
Davis Creek
North Fork Davis Creek
Sheep Corral Creek
East Fork Stuart Fork
Bowerman Gulch
Greenhorn Gulch
Strope Creek
Little Mule Creek
Snowslide Gulch
Mule Creek
Stoney Creek
Granite Creek
Gibson Lake
Seven Up Lake
Granite Lake
Bear Creek
Long Canyon
Billy-Be-Damn Lake
Lake Anna
Deer Lake
Round Lake
Deer Creek
Deep Creek
Echo Lake
Little Deep Creek
Salt Creek
Willow Creek
Sunrise Creek
Sunday Creek
Trinity Alps Creek
2022 NAIP Aerial
Scale 1:95,000
1 Kilometers
1 Miles

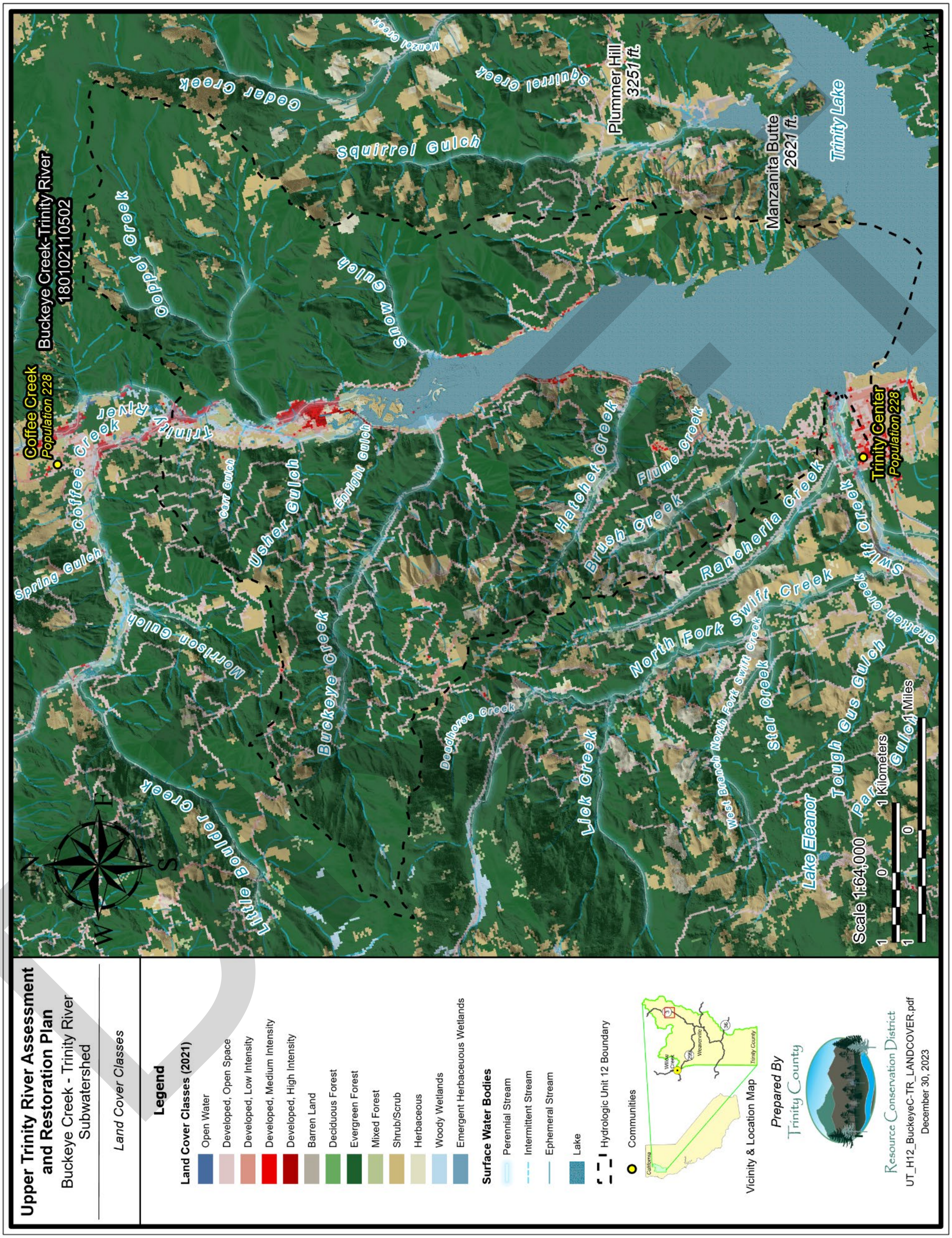

Upper Trinity River Assessment and Restoration Plan
Swift Creek Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Perennial Snow/Ice
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Hay/Pasture
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_SwiftC_LANDCOVER.pdf
March 22, 2024
Trinity Center
Population 228
Covington Mill
Population 227
Swift Creek
180102110501
Usher Hill
3232 ft.
Billys Peak
4016 ft.
Bowerman Peak
4029 ft.
Sugar Pine Butte
7661 ft.
Red Rock Mountain
7789 ft.
Ycatapom Peak
7533 ft.
Black Mountain
8018 ft.
Snowslide Peak
7277 ft.
Tri-Forest Peak
7579 ft.
Mumford Peak
7254 ft.
Seven Up Peak
8100 ft.
Gibson Peak
8356 ft.
Siligo Peak
7927 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Trinity Lake
Boulder Lake
Little Boulder Lake
Tapie Lake
Found Lake
Lilypad Lake
Conway Lake
Union Lake
Landers Lake
Ward Lake
Shimmy Lake
Twin Lakes
Lake Eleanor
Seven Up Lake
Granite Lake
Gibson Lake
Round Lake
Deer Lake
Lake Anna
Billy-Be-Damn Lake
Echo Lake
Swift Creek
Foster Creek
Rancheria Creek
Hatchet Creek
Brush Creek
Buckeye Creek
Flume Creek
Snow Gulch
Little Boulder Creek
Boulder Creek
North Fork Swift Creek
Deadhorse Creek
Parker Creek
Landers Creek
Union Creek
Lick Creek
Steer Creek
Star Creek
Granite Creek
Bear Creek
Deer Creek
Willow Creek
Salt Creek
Deep Creek
Little Deep Creek
Long Canyon
Hobel Creek
Cement Creek
Tough Gus Gulch
Davis Creek
North Fork Davis Creek
Sheep Corral Creek
East Fork Stuart Fork
Greenhorn Gulch
Bowerman Gulch
Strope Creek
Little Mule Creek
Mule Creek
Snowslide Gulch
Stoney Creek
Trinity Alps Creek
Sunday Creek
Sunrise Creek
Scale 1:95,000
Kilometers
Miles

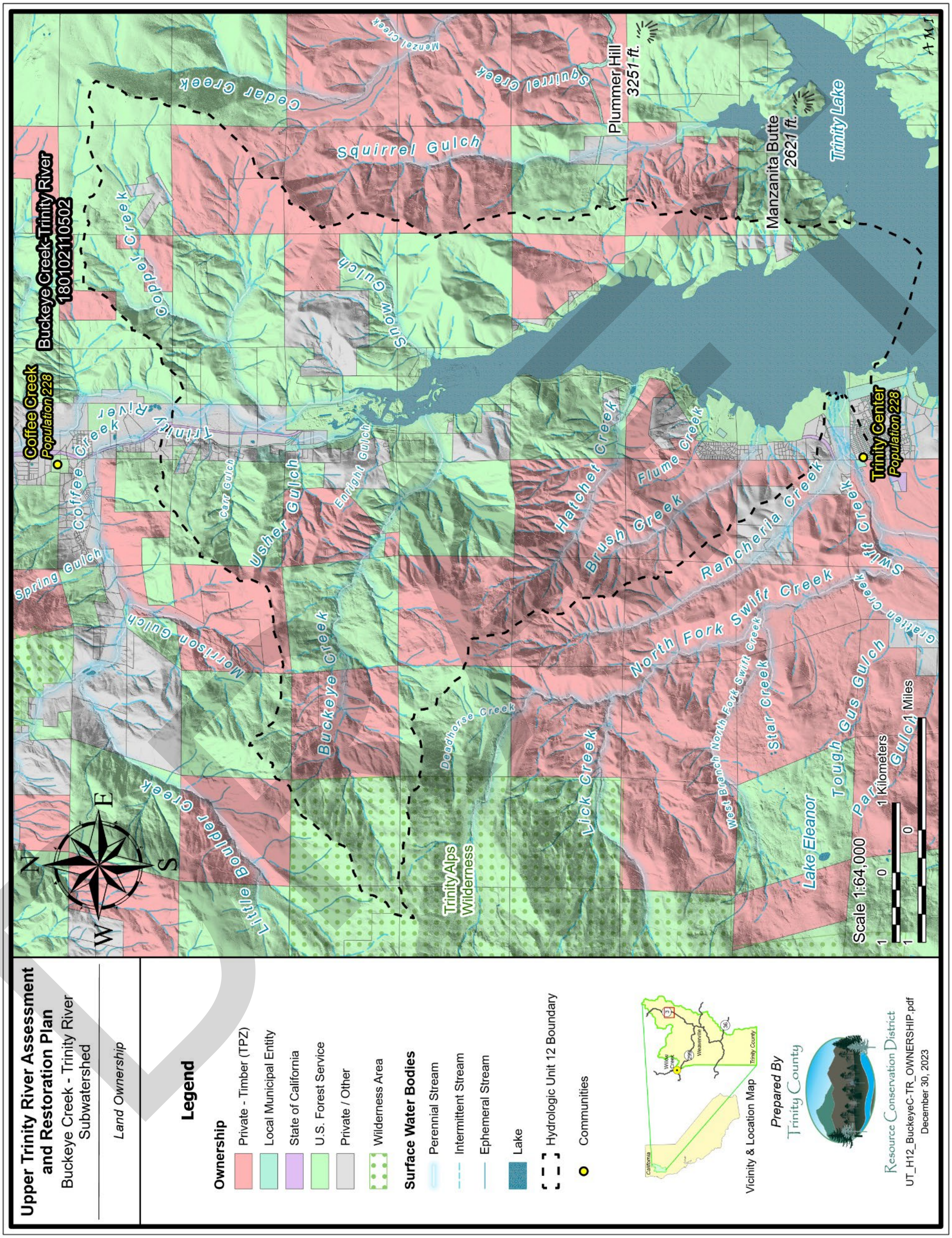


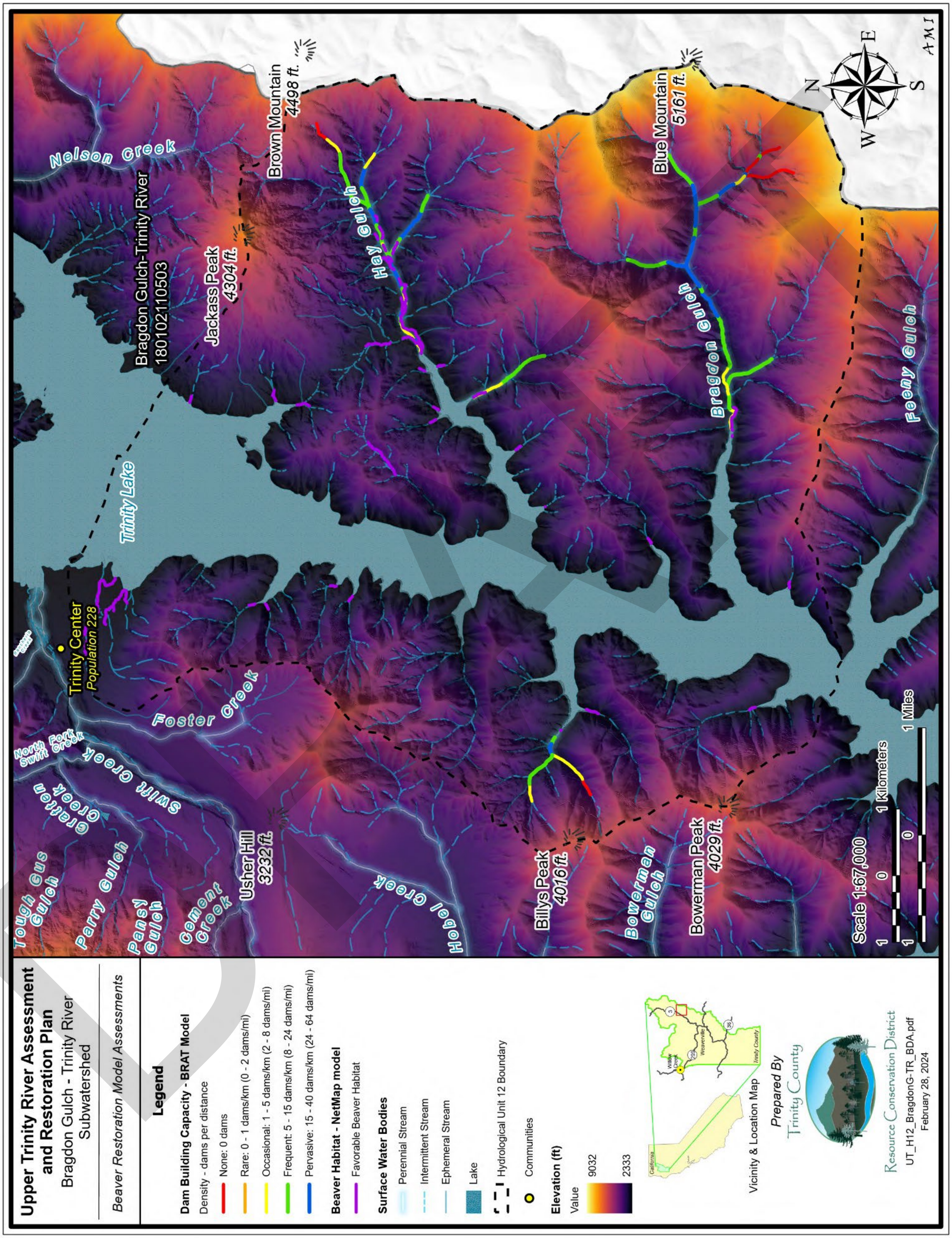
Upper Trinity River Assessment and Restoration Plan
Swift Creek Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_SwiftC_OWNERSHIP.pdf
March 22, 2024
Trinity Center
Population 228
Covington Mill
Population 227
Swift Creek
180102110501
Trinity Lake
Usher Hill
3232 ft.
Billys Peak
4016 ft.
Bowerman Peak
4029 ft.
Ycatapom Peak
7533 ft.
Sugar Pine Butte
7661 ft.
Red Rock Mountain
7789 ft.
Black Mountain
8018 ft.
Snowslide Peak
7277 ft.
Tri-Forest Peak
7579 ft.
Mumford Peak
7254 ft.
Seven Up Peak
8100 ft.
Gibson Peak
8356 ft.
Siligo Peak
7927 ft.
Middle Peak
8035 ft.
Granite Peak
7956 ft.
Red Mountain
7897 ft.
Trinity Alps Wilderness
Scale 1:95,000
1 Kilometers
1 Miles

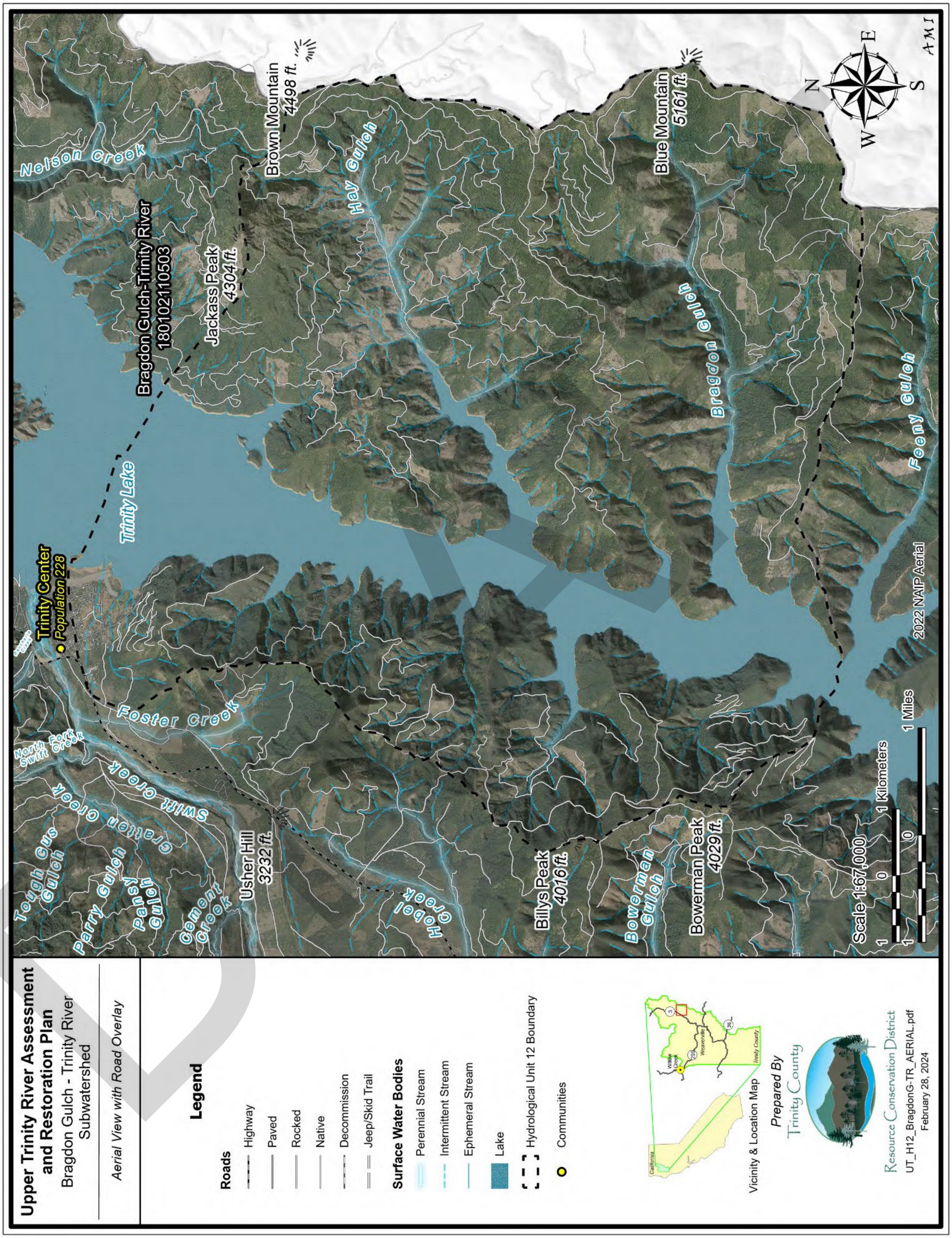

Upper Trinity River Assessment and Restoration Plan
Buckeye Creek - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BuckeyeC-TR_BDA.pdf
December 30, 2023
Buckeye Creek-Trinity River
180102110502
Coffee Creek
Population 228
Trinity Center
Population 228
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Trinity Lake
Cedar Creek
Squirrel Creek
Squirrel Gulch
Copper Creek
Snow Gulch
Trinity River
Coffee Creek
Carr Gulch
Usher Gulch
Enright Gulch
Spring Gulch
Morrison Gulch
Buckeye Creek
Deadhorse Creek
Little Boulder Creek
Lick Creek
Hatchet Creek
Flume Creek
Brush Creek
Rancheria Creek
North Fork Swift Creek
Swift Creek
Graves Creek
West Branch North Fork Swift Creek
Star Creek
Tough Gus Gulch
Lake Eleanor
Scale 1:64,000
1 Kilometers
1 Miles
N
E
S
W

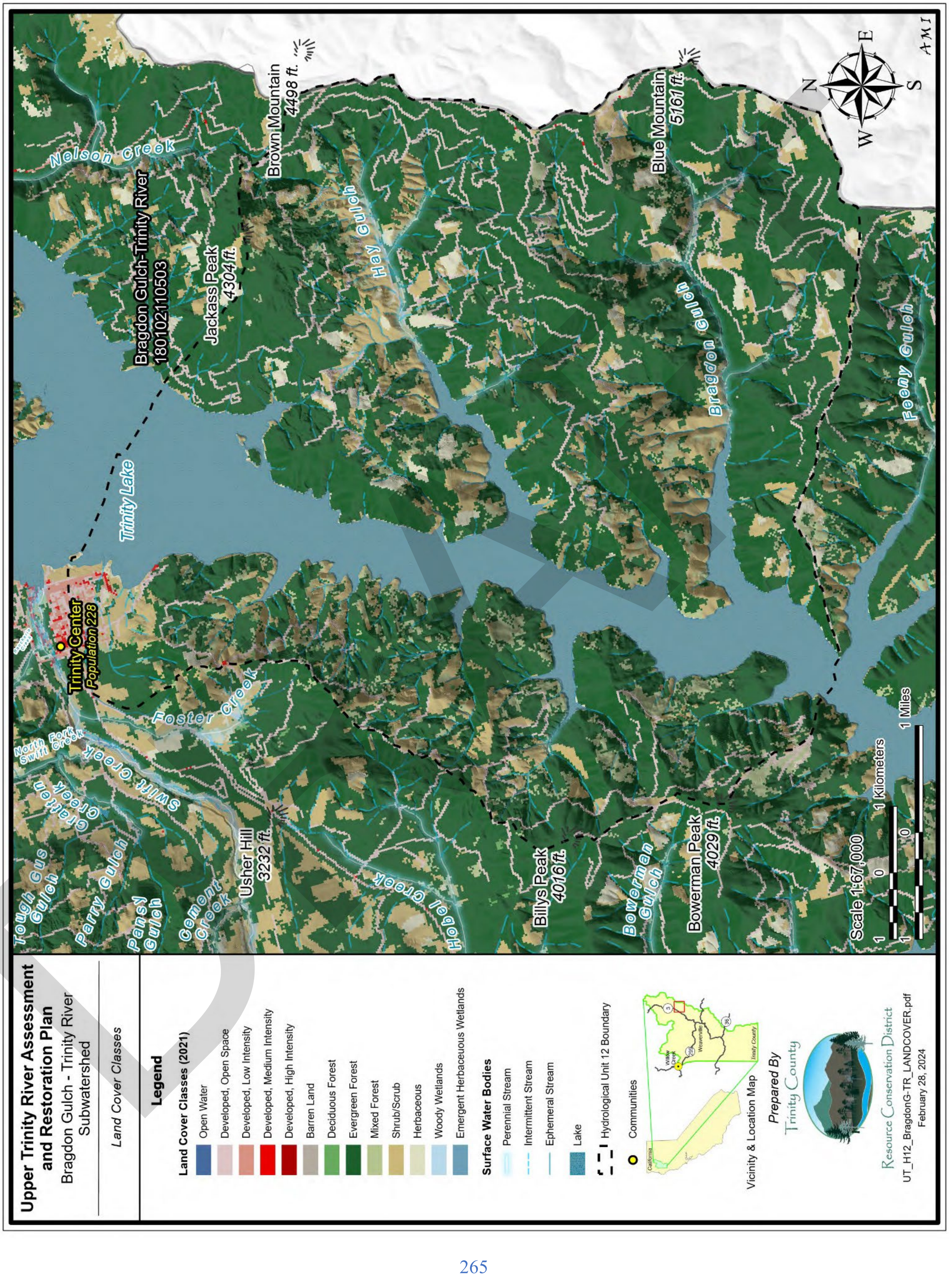

Upper Trinity River Assessment and Restoration Plan
Buckeye Creek - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BuckeyeC-TR_AERIAL.pdf
December 30, 2023
Buckeye Creek-Trinity River
180102110502
Coffee Creek
Population 228
Trinity Center
Population 228
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Trinity Lake
Lake Eleanor
Cedar Creek
Menzel Creek
Squirrel Creek
Squirrel Gulch
Copper Creek
Snow Gulch
Spring Gulch
Carr Gulch
Usher Gulch
Enright Gulch
Flume Creek
Brush Creek
Hatchet Creek
Rancheria Creek
Morrison Gulch
North Fork Swift Creek
Swift Creek
Gratton Creek
Buckeye Creek
Deadhorse Creek
West Branch North Fork Swift Creek
Steer Creek
Tough Gus Gulch
Little Boulder Creek
Lick Creek
N E S W
Scale 1:64,000
1 Kilometers
1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
Buckeye Creek - Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BuckeyeC-TR_LANDCOVER.pdf
December 30, 2023
Coffee Creek
Population 228
Buckeye Creek-Trinity River
180102110502
Trinity Center
Population 228
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Trinity Lake
Trinity River
Coffee Creek
Spring Gulch
Morrison Gulch
Little Boulder Creek
Copper Creek
Cedar Creek
Squirrel Gulch
Squirrel Creek
Menzel Creek
Snow Gulch
Carr Gulch
Usher Gulch
Enright Gulch
Buckeye Creek
Deadhorse Creek
Hatchet Creek
Brush Creek
Flume Creek
Rancheria Creek
North Fork Swift Creek
West Branch North Fork Swift Creek
Star Creek
Lick Creek
Lake Eleanor
Tough Gus Gulch
Swift Creek
Gratton Creek
Parks Gulch
Scale 1:64,000
1 0 1 Kilometers
1 0 1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Buckeye Creek - Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Wilderness Area
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BuckeyeC-TR_OWNERSHIP.pdf
December 30, 2023
Buckeye Creek-Trinity River
180102110502
Coffee Creek
Population 228
Trinity Center
Population 228
Plummer Hill
3251 ft.
Manzanita Butte
2621 ft.
Trinity Lake
Trinity Alps Wilderness
Lake Eleanor
Scale 1:64,000
1 Kilometers
1 Miles
Trinity River
Coffee Creek
Spring Gulch
Morrison Gulch
Little Boulder Creek
Buckeye Creek
Deadhorse Creek
Lick Creek
Usher Gulch
Carr Gulch
Enright Gulch
Hatchet Creek
Brush Creek
Flume Creek
Rancheria Creek
North Fork Swift Creek
Swift Creek
Star Creek
Tough Gus Gulch
Par Gulch
Gratten Creek
West Branch North Fork Swift Creek
Cedar Creek
Squirrel Gulch
Squirrel Creek
Menzel Creek
Copper Creek
Snowy Gulch
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Bragdon Gulch - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BragdonG-TR_BDA.pdf
February 28, 2024
Nelson Creek
Brown Mountain 4498 ft.
Blue Mountain 5161 ft.
Bragdon Gulch-Trinity River 18010211050З
Jackass Peak 4304 ft.
Hay Gulch
Bragdon Gulch
Feeny Gulch
Trinity Lake
Trinity Center Population 228
Foster Creek
North Fork Swift Creek
Swift Creek
Gratton Creek
Tough Gus Gulch
Parry Gulch
Pansy Gulch
Cement Creek
Usher Hill 3232 ft.
Hobel Creek
Billys Peak 4016 ft.
Bowerman Gulch
Bowerman Peak 4029 ft.
Scale 1:67,000
1 0 1 Kilometers
1 0 1 Miles
N E S W


Upper Trinity River Assessment and Restoration Plan
Bragdon Gulch - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Decommission
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BragdonG-TR_AERIAL.pdf
February 28, 2024
Bragdon Gulch-Trinity River
180102110503
Trinity Lake
Trinity Center
Population 228
Nelson Creek
Jackass Peak
4304 ft.
Brown Mountain
4498 ft.
Hay Gulch
Blue Mountain
5161 ft.
Bragdon Gulch
Feeny Gulch
Foster Creek
North Fork Swift Creek
Swift Creek
Gratten Creek
Tough Gus Gulch
Parry Gulch
Pansy Gulch
Cement Creek
Usher Hill
3232 ft.
Hobel Creek
Billys Peak
4016 ft.
Bowerman Gulch
Bowerman Peak
4029 ft.
Scale 1:67,000
1 Kilometers
1 Miles
2022 NAIP Aerial


Upper Trinity River Assessment and Restoration Plan
Bragdon Gulch - Trinity River Subwatershed
Land Cover Classes
Legend
Land Cover Classes (2021)
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Herbaceous
Woody Wetlands
Emergent Herbaceuous Wetlands
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_BragdonG-TR_LANDCOVER.pdf
February 28, 2024
Bragdon Gulch-Trinity River
180102110503
Trinity Lake
Trinity Center
Population 228
Nelson Creek
Brown Mountain
4498 ft.
Jackass Peak
4304 ft.
Hay Gulch
Blue Mountain
5161 ft.
Bragdon Gulch
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Usher Hill
3232 ft.
Hobel Creek
Billys Peak
4016 ft.
Bowerman Gulch
Bowerman Peak
4029 ft.
Scale 1:67,000
1 0 1 Kilometers
1 0 1 Miles
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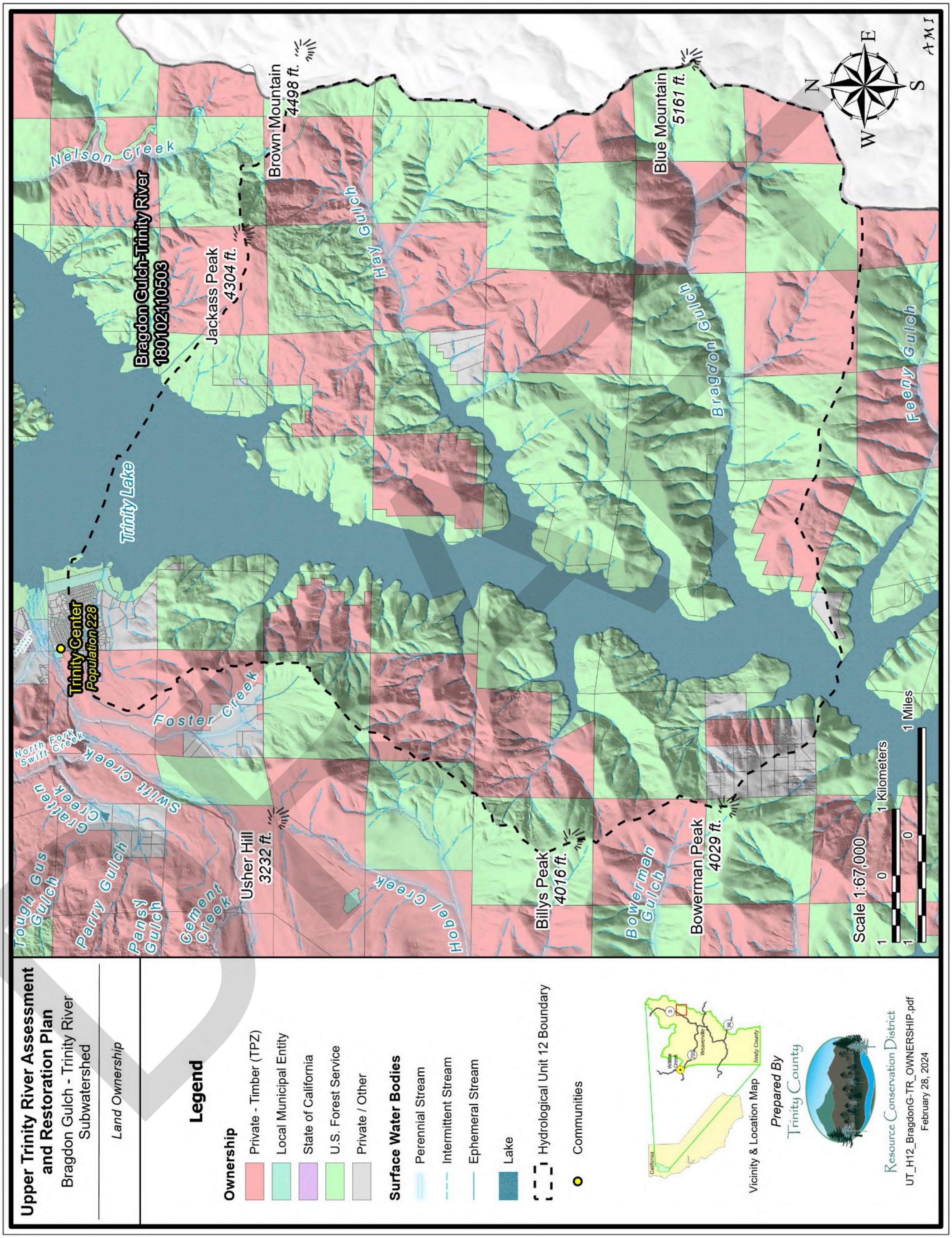
Upper Trinity River Assessment and Restoration Plan
Bragdon Gulch - Trinity River Subwatershed
Land Ownership
Legend
Ownership
Private - Timber (TPZ)
Local Municipal Entity
State of California
U.S. Forest Service
Private / Other
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrological Unit 12 Boundary
Communities
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Resource Conservation District
UT_H12_BragdonG-TR_OWNERSHIP.pdf
February 28, 2024
Bragdon Gulch-Trinity River
180102110503
Trinity Center
Population 228
Trinity Lake
Nelson Creek
Brown Mountain
4498 ft.
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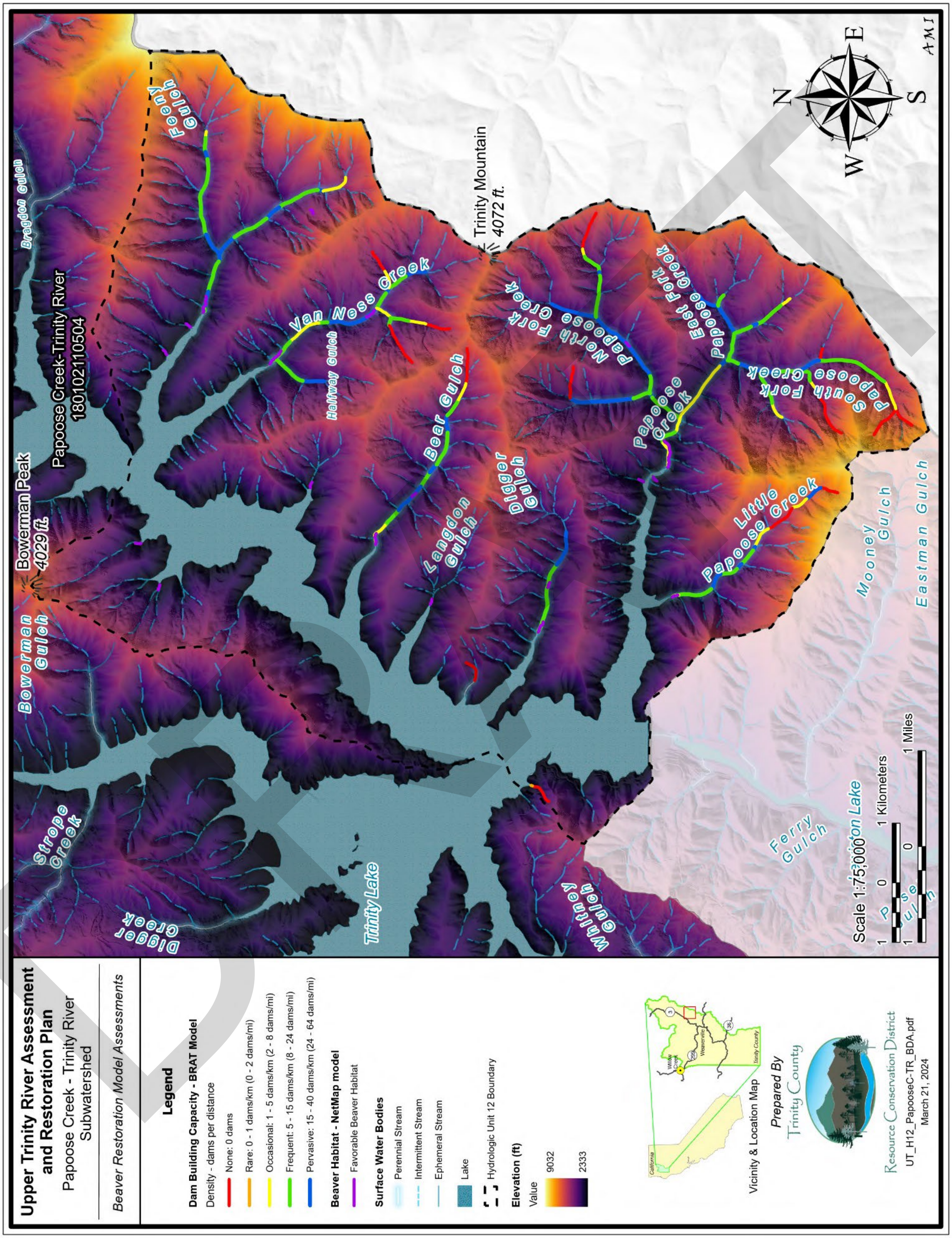
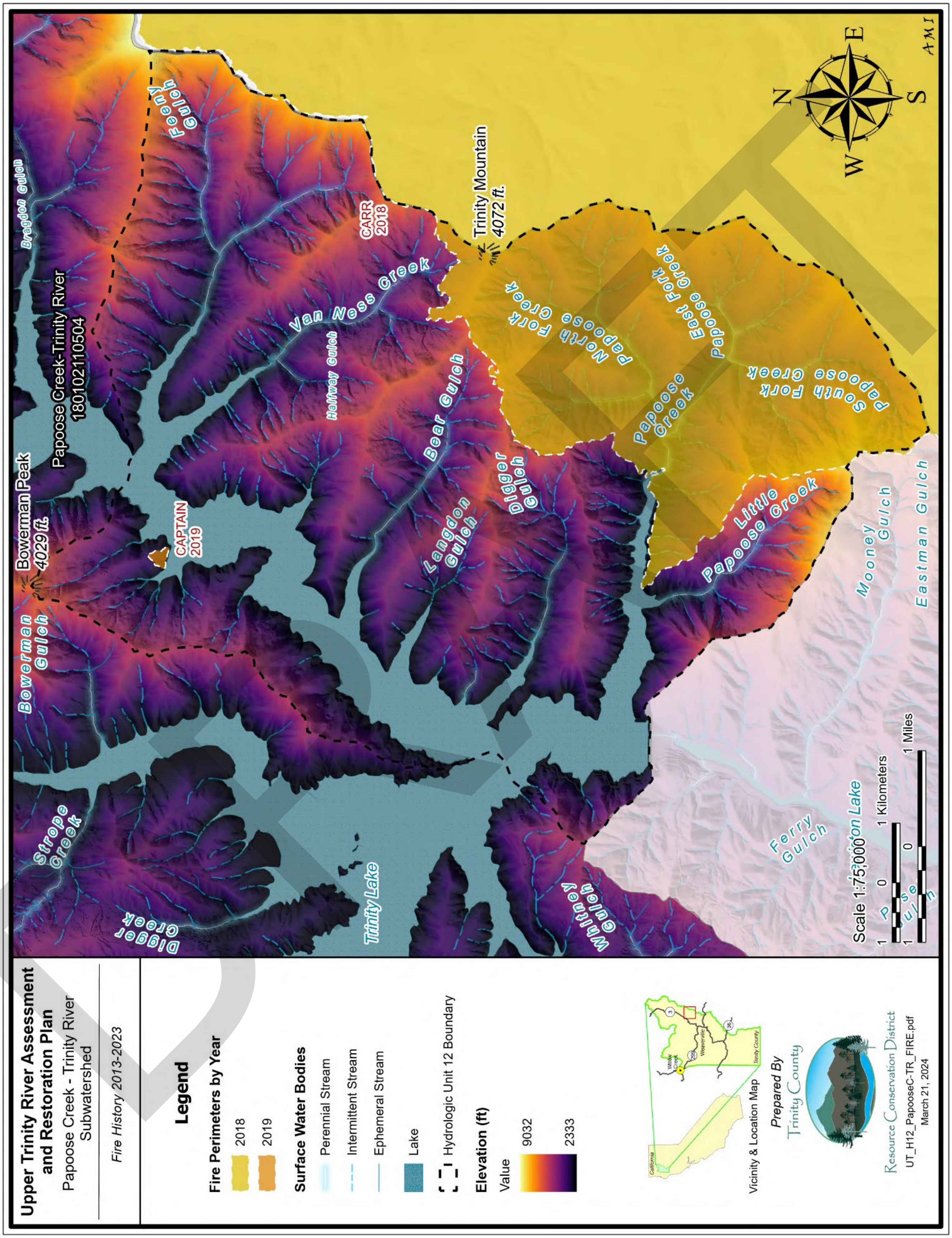

Upper Trinity River Assessment and Restoration Plan
Papoose Creek - Trinity River Subwatershed
Beaver Restoration Model Assessments
Legend
Dam Building Capacity - BRAT Model
Density - dams per distance
None: 0 dams
Rare: 0 - 1 dams/km (0 - 2 dams/mi)
Occasional: 1 - 5 dams/km (2 - 8 dams/mi)
Frequent: 5 - 15 dams/km (8 - 24 dams/mi)
Pervasive: 15 - 40 dams/km (24 - 64 dams/mi)
Beaver Habitat - NetMap model
Favorable Beaver Habitat
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PapooseC-TR_BDA.pdf
March 21, 2024
Papoose Creek-Trinity River
180102110504
Bowerman Peak
4029 ft.
Trinity Mountain
4072 ft.
Bragdon Gulch
Feeny Gulch
Van Ness Creek
Halfway Gulch
Bear Gulch
Langdon Gulch
Digger Gulch
North Fork Papoose Creek
East Fork Papoose Creek
South Fork Papoose Creek
Papoose Creek
Little Papoose Creek
Mooney Gulch
Eastman Gulch
Bowerman Gulch
Strope Creek
Digger Creek
Trinity Lake
Whitney Gulch
Ferry Gulch
Scale 1:75,000
1 Kilometers
1 Miles
N
E
S
W


Upper Trinity River Assessment and Restoration Plan
Papoose Creek - Trinity River Subwatershed
Fire History 2013-2023
Legend
Fire Perimeters by Year
2018
2019
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Elevation (ft)
Value
9032
2333
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PapooseC-TR_FIRE.pdf
March 21, 2024
Papoose Creek-Trinity River
180102110504
Bowerman Peak
4029 ft.
Trinity Mountain
4072 ft.
CAPTAIN
2019
CARR
2018
Bragdon Gulch
Feeny Gulch
Van Ness Creek
Halfway Gulch
Bear Gulch
Bowerman Gulch
Strope Creek
Digger Creek
Trinity Lake
Langdon Gulch
Digger Gulch
Whitney Gulch
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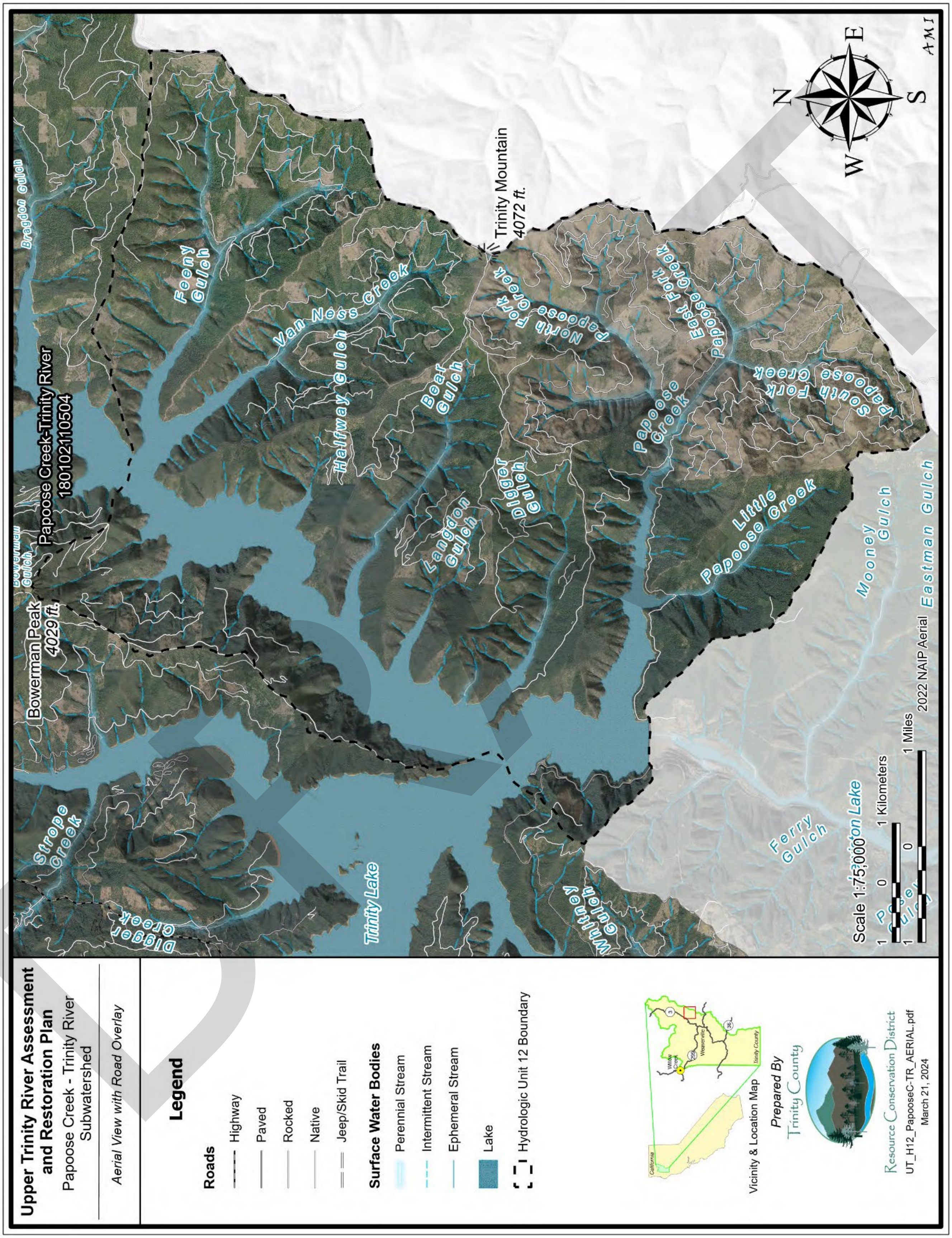
Upper Trinity River Assessment and Restoration Plan
Papoose Creek - Trinity River Subwatershed
Aerial View with Road Overlay
Legend
Roads
Highway
Paved
Rocked
Native
Jeep/Skid Trail
Surface Water Bodies
Perennial Stream
Intermittent Stream
Ephemeral Stream
Lake
Hydrologic Unit 12 Boundary
Vicinity & Location Map
Prepared By
Trinity County
Resource Conservation District
UT_H12_PapooseC-TR_AERIAL.pdf
March 21, 2024
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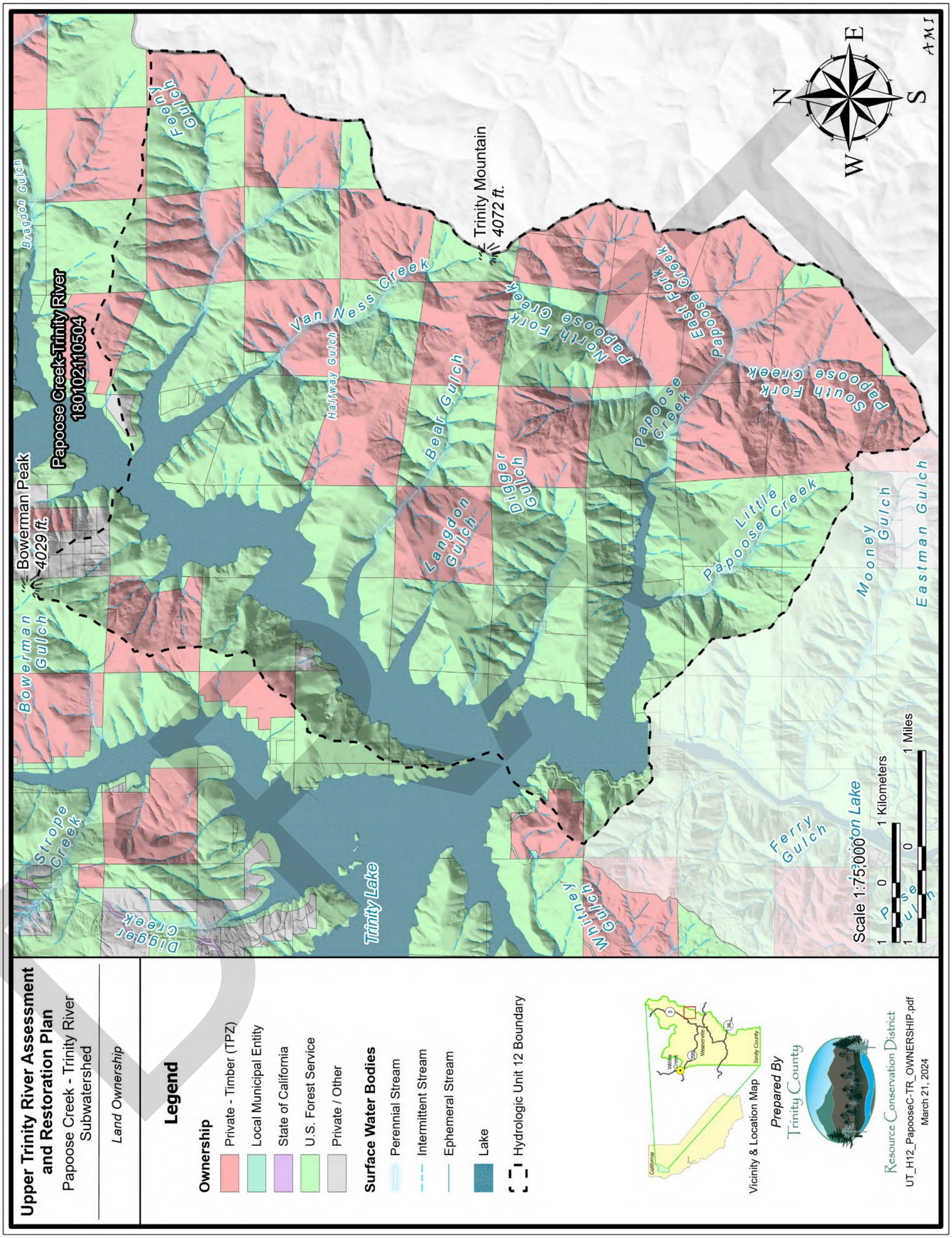
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