RECLAMATION
Managing Water in the West

Environmental Assessment

Klamath Tributary Coho Rearing Habitat Enhancement Project
Klamath Basin Restoration Program Grant
R10AP20080 Salmon River Restoration Council

Klamath Project
Mid-Pacific Region

EA No.: KBAO-EA-12-002

U.S. Department of the Interior
Bureau of Reclamation

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Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitment to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water related resources in an environmentally and economically sound manner in the interest of the American public.

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Chapter 1 Introduction and Background Information

1.1 Introduction

The Bureau of Reclamation (Reclamation) proposes to provide Klamath Basin Restoration Program (KBRP) grant funding to the Salmon River Restoration Council (SRRC) to enhance summer and winter rearing habitats for coho salmon (*Oncorhynchus kisutch)* at various locations within the Salmon River subbasin, California (see Table 1 and Appendix A.) This Environmental Assessment (EA) has been prepared to examine the potential direct, indirect, and cumulative impacts to the affected environment associated with the proposed action.

This Environmental Assessment (EA) includes discussion of the purpose and need for the proposed project actions, alternatives, environmental consequences of the alternatives, and a listing of agencies and persons consulted (40 CFR 1508.9). The EA was prepared to satisfy the procedural requirements of the National Environmental Policy Act (NEPA) (P.L. 91-190, as amended) and to determine if an Environmental Impact Statement or Finding of No Significant Impact should be prepared.

1.2 Background

As reported by the Committee on Endangered and Threatened Fishes in the Klamath River Basin, National Research Council (NRC) (2003), the Salmon River is the smallest of the four tributaries to the Klamath River watershed supporting a coldwater resident and anadromous fishery including coho salmon which are part of the Southern Oregon/Northern California Coasts Evolutionary Significant Unit listed as threatened under the under the Endangered Species Act (ESA) (16 USC. 1521 et seq.). Coho and other anadromous fish habitats are distributed among tributaries of the Salmon River including the Main Stem, Wooley Creek, North Fork, and South Fork which provide an estimated 376 miles of coldwater fish habitat (Elder, et al. 2002; SRRC 2004).

Over the last several decades the Salmon River subbasin has experienced a variety of factors that are likely to limit the production of coho and other salmonids. Those factors include: migration barriers (e.g. low-flow blockage and thermal barriers), poor water quality (e.g. high temperatures and suspended solids), geomorphology (e.g. loss of spawning gravel and fine sediment deposition), and land use constraints (e.g. timber management practices and management of fuels (SNR 2012[2]). Additional factors include mining, road construction, water diversions, dredging, natural events, etc. which together, cause sediment and riverine blockages and shifts in local hydrology, resulting in lower base flows impacting fish migration and survival during peak stress conditions.

Identified as a key watershed by the Northwest Forest Plan (1994) and Klamath River Basin Assessment (1997), considerable information has been compiled through "administrative studies, watershed analyses, late-successional reserve assessments, and research investigations pertaining to the need for development of restoration within the Salmon River subbasin" (Elder, et al. 2002). With the North Fork, South Fork, and Main stem reaches of the Salmon River subbasin requiring heavily shaded pools, root wads, undercut banks or logs, other woody debris, in order to provide forage and refuge for fish from excessive water velocities, thermal solar exposure, and

or poor water quality, “Given proper funding and agency participation, these efforts (like those proposed by SRRC) may be sufficient to improve conditions for Coho and other salmon and steelhead in the watershed” and contribute to improved coho instream life cycles (NRC 2003).

1.3 Purpose and Need

The purpose of the project to provide KBRP grant funding to SRRC in order to install brush bundles and woody debris at specific off-channel habitat locations within the Salmon River subbasin. The project is needed for two primary reasons: (1) to enhance 50 percent or more in-stream cover to aid in increasing riparian shade, vegetation health and overall winter and summer rearing habitats for coho salmon within the Salmon River subbasin; and (2) to asses and analyze habitat conditions and fish response, both pre and post installation of materials, for the purpose of influencing and prioritizing future site specific treatments.

Chapter 2 Proposed Action and Alternatives

2.1 No Action Alternative

Under the No Action Alternative, Reclamation would not provide funding to the SRRC for installation of brush bundles and woody material or for the pre and post monitoring and assessment of such enhancement activities. Taking “no action” however, would not meet the purpose and need for the proposed project.

2.2 Proposed Action

Reclamation proposes to provide KBRP grant funding to SRRC in order to install brush bundles and woody debris (<20” diameter at breast height (dbh)) at site specific off-channel habitat locations within the Salmon River subbasin (Table 1. Appendix A). In addition, SRRC proposes to conduct site assessments and analyses, both prior and subsequently after placement of brush bundles and woody debris in order to monitor the fish response to these habitat improvements. The specific proposed habitat improvement activities SRRC proposes to implement area as follows and are outlined in the *California Salmonid Stream Habitat Restoration Manual* (Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, M., and Collins, C. 1998).

- Harvesting of brush bundles and other woody debris (20”dbh) by hand with pruning saws and shears from upland areas that are near, but not adjacent to or that may be shading any stream.

- Bundling of brush and other woody debris (e.g. sand bar willow and alder) with biodegradable ¼ inch sisal rope (three year expected guarantee), and attaching to existing riparian vegetation or sprigs using sisals rope, or by being keyed into existing vegetation.

- Placing bundles and woody materials (e.g. root wads) in low/no flow areas (i.e. off-channel pools, in-stream pools and alcoves in accordance to the Coho Habitat Utilization Model developed by the Karuk Tribe Fisheries Program and partners, and by methods per the California Salmonids Stream habitat Restoration Manual 199, sec 7-VII24).

- Bundles and other woody material (e.g. root wads) would be added to riparian habitats so that each site would have an increase of no less 50 percent of the total existing cover.

- Assessment of site habitat conditions would occur both before and after the implementation of bundles and woody material in the riparian areas. This includes monitoring fish presence (quantity, age, and species), habitat size and use, amount of current in-stream cover, and water temperatures at specifically identified reaches of the Salmon River and its tributaries.

- Monitoring would consist of setting up photo points where the life of the project, before, during, and after implementation could be captured.

- Snorkel surveys would be conducted before and after implementation of brush bundles and woody debris and would involve subtly sliding one's head into the pools with a snorkel and mask, so as not to disturb the fish.

- GPS points would be taken at each proposed project site, with all sites mapped to aid in reporting and prioritization of future site treatments.

- Landowner outreach and education will assist in the maintenance and monitoring of the sites post implementation where enhancement sites exist on/or adjacent to private property.

- All materials will be transported by hand.

- No material would be added directly above culverts.

- No heavy equipment would be used.

In addition, Figures 1 through 5 indicate visual displays of the proposed activities and the following analysis and assessment, implementation, and monitoring narratives provide further detail necessary to fully implement the proposed action.

Analysis and Assessment – Initial assessment would consist of activities as described above and would include surveys that would focus on off-channel sites in the Salmon River, particularly between Sawyers Bar and Kelly's Gulch, and between Methodist Creek and Negro Creek. Photos would capture conditions both before and after implementation.

Implementation –Implementation would include enhancing cover complexity with on-site brush bundles and woody debris as described in Section 2.2. Bundles and other wood would be added to habitats in specific areas based on the Coho habitat utilization model developed by the Karuk Tribe Fisheries Program and partners. This model takes into account temperature, velocity, depth and cover. All cover would be placed in low/no flow areas, i.e. off-channel pools, in-stream pools and alcoves. No material would be added directly above culverts. No sedimentation or streambed alteration would occur as a result of this work.

Monitoring – Photo points would be established to capture the life of the project – before, during and after treatment.
GPS points would be taken for each project site and all sites would be mapped for reporting and prioritization of future site treatments. Landowner outreach and education would assist in the

maintenance and monitoring of this project where restoration sites exist on/or adjacent to private property.

Table 1. Proposed Salmon River off-channel project enhancement locations.

Township, Range, and Section, Salmon River Off-Channel Habitat Sites (1-18)

Site #	USGS Quad Map	Site Name	Township	Range	Section
1	Cecilville	St. Claire Creek	38N	12W	25
2	Cecilville	Plummer Creek	38N	12W	22
3	Forks of Salmon	Nordheimer Creek	11N	7E	34
4	Forks of Salmon	Dead Mule Gulch	10N	7E	13
5	Forks of Salmon	Horn Creek	10N	7E	13
6	Forks of Salmon	Picayune Gulch	40N	12W	32
7	Orleans Mountain	Butler Creek	11N	7E	20
8	Sawyers Bar	Heiney Gulch	40N	12W	32
9	Sawyers Bar	Jones Gulch	40N	12W	28
10	Sawyers Bar	Cronan Gulch	40N	12W	23
11	Sawyers Bar	Kelly Gulch	40N	12W	24
12	Sawyers Bar	Glasgow Gulch	40N	12W	25
13	Somes Bar	Merrill Creek	11N	6E	3
14	Somes Bar	Oak Bottom	11N	6E	2
15	Somes Bar	Wooley Creek	11N	7E	6
16	Tanners Peak	North Russian Creek	40N	10W	19
17	Youngs Peak	Hotelling Gulch	10N	8E	20
18	Youngs Peak	Knownothing Creek	10N	8E	29

Figures 1-4. Illustration of brush gathering and installation of brush bundles and woody debris similar to those proposed on reaches in the Salmon River subbasin identified in Table 1.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

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Figure 5. Photograph of installed brush bundles at Aikens Creek and which are proposed at site specific locations within the Salmon River subbasin.

Chapter 3 Affected Environment and Environmental Consequences

3.1 Resources Considered

The Proposed Action has been evaluated and the following resources could be affected by the project:

- Surface Water Resources
- Biological Resources
- Cultural Resources
- Indian Trust Assets
- Climate Change
- Environmental Justice

3.2 Resources Not Analyzed in Detail

Evaluation of the Proposed Action indicates that there would be little to no indirect, direct, or cumulative effects on several resource areas. The resources include:

- Groundwater Resources
- Air Quality
- Geology and Soils
- Hazards and Hazardous Materials
- Mineral Resources
- Recreation
- Land Use
- Public Services
- Utilities and Infrastructure
- Socioeconomics
- Noise

As a result, these resource areas are not discussed further in this EA.

3.3 Surface Water Resources

3.3.1 Affected Environment

Located in remote northwestern California, the Salmon River is a 751 square mile riverine system within the Cascadia for-acre region on the Sierra Nevada block within the Klamath National Forest (NRC 2003). Elder, et al. (2002) report that the Salmon River headwaters flow predominantly from the Marble Mountain, the Trinity Alps, and the Russian Wilderness areas and that the Salmon River watershed is subdivided into four major watersheds, North Fork (130,468 acres), South Fork (185,608 acres), Wooley Creek (95,188 acres) and Main Stem (69,362 acres). Within these sub-watersheds, there are approximately 1,414 miles of stream

(sixty-three stream drains ranging in size from 3,300 to 14,500 acres) that provide drainage for each sub-watershed. Smaller than the other major tributaries to the Klamath River, the Salmon River watershed consists of numerous "step-pool, cascade reaches, narrow riparian corridors, and lacks large alluvial valleys which prohibits some land use activities that have disrupted anadromous fish habitats in found in other watersheds (e.g. Scott and Shasta) Elder, et al. (2002).

The "Salmon River from Cecilville Bridge to the river mouth near Somesbar; the North Fork of the Salmon River from the intersection of the river with the south boundary of the Marble Mountain Wilderness Area to the river mouth; and Wooley Creek from the western boundary of the Marble Mountain Wilderness Area to its confluence with the Salmon River…are designated as components of the Wild and Scenic System" (California Wild and Scenic River System and Management Agencies 2007). Due to the high rates of uplift in the watershed, and unstable rock types, high erosion rates and sediment yields are experienced (SRRC 2012[2]). The Salmon River watershed exhibits strong seasonal variations in flow, including large winter floods and low-flow conditions in the summer, (particularly during drought, and due to scarcity of cold springs) contributing to high summer water temperatures and stress on salmonid production within the basin (NRC 2003).

3.3.2 Environmental Consequences

No Action

Under the No Action Alternative, there would be no change to existing surface water resource conditions and or current trends of the affected environment.

Proposed Action

Under the Proposed Action, Reclamation would release grant funding to the SRRC for the purpose of implementing habitat enhancement activities, analysis and assessment, and subsequent monitoring/reporting of coho rearing habitat use at various locations within the Salmon River subbasin.

The Proposed Action includes activities that would occur within the surface water resource of Salmon River tributaries including the placement of brush bundles which would be attached to existing riparian vegetation or sprigs and placed in low/no flow areas, i.e. off-channel pools, in-stream pools, and alcoves. No material would be added directly above culverts. No sedimentation or streambed alteration would occur as a result of this work. Potential water quality affects could occur such as increases in turbidity, but would be temporary in nature persisting only during installation of brush bundles along the stream banks and potentially during snorkeling monitoring activities. As the brush bundles have the potential to provide a barrier between solar thermal energy and surface water resources, lower water temperatures may be experienced, thereby improving instream habitat and rearing conditions for coho salmon and other salmonids.

Any required State of California clean water and/or instream permits or authorizations shall be obtained by the grantee prior to implementation of project activities.

Overall, the Proposed Action is not expected to have an effect on the Salmon River subbasin's water resources quantity and is expected to have no significant effects on water resource quality as all work within the waters is short-term and temporary in nature.

Cumulative Impacts

Implementation of the Proposed Action would not affect the long term quantity or quality of the surface water resources. Therefore, the Proposed Action would have no significant cumulative impacts on surface water resources.

3.4 Biological Resources

3.4.1 Affected Environment

Vegetation of the Salmon River watershed consists of approximately 90 percent forest cover. Roughly 81 percent of the forested land is coniferous forest with 9 percent in hardwood forests. The coniferous forests can be divided into the mixed conifer, Douglas fir, and true fir types. There is also a small amount of knob cone pine forest type (> 1%) (Elder et al. 2002).

The Salmon River supports populations of coldwater resident and anadromous fish which include: Coho salmon (*O*ncorhynchus *kisutch*), spring and fall run Chinook salmon (*Oncorhynchus tshawytscha*), summer and winter run steelhead (*Oncorhynchus mykiss*), sea run Pacific lamprey (*Lampetra tridentata*), and green sturgeon (*Acipenser medirostris*). Non-anadromous species include Klamath speckled dace (*Rhinichthys osculus Klamathensis*), Klamath small scale sucker (*Catostomus rimiculus*), and marbled sculpins (*Cottus klamathensis*). Introduced fish stocks include American shad (*Elosa sapidissima*), brown trout (*Salmon trutta*), and brook trout (*Salvalinus fontinalis).* Within the Salmon River subbasin, Coho salmon are listed as *Threatened* and steelhead are listed as a *Candidate* species under the Endangered Species Act (ESA) (Elder et al. 2002). Overall, the Salmon River subbasins are recognized as supplying highly productive habitat for Pacific salmon species (Kier Associates 1991).

A species list was downloaded from the United States Fish and Wildlife Service, Arcata Office website on May 1, 2012 pursuant to section 7(c) of the Endangered Species Act of 1973 (Appendix B). The lists are dated May 1, 2011 and are the current listings of species that may occur within the Cecilville, Fork Salmon, Somes bar, and Sawyers bar 7.5 minute USGS Quad Maps. Table 2 identifies the species that may occur within the project location.

Table 2. Species that may occur near the proposed Salmon River subbasin project sites as identified in Table 1.

Listed/Proposed Threatened and Endangered Species that may occur near the proposed project locations.

Type Habitat	Scientific Name	Common Name	Category	Critical
Fish	*Acipenser medirostris*	green sturgeon	T	Y
	Oncorhynchus kisutch	S. OR/N. CA coho salmon	T	Y
Birds	*Brachyramphus marmoratus*	marbled murrelet	T	Y
	Coccyzus americanus	Western yellow-billed cuckoo	C	N
	Strix occidentalis caurina	northern spotted owl	T	Y
Mammals				
	Martes pennanti	fisher, West Coast DPS	C	N

KEY:
(PE) Proposed Endangered Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened Proposed as likely to become endangered within the foreseeable future.
(E) Endangered Listed in the Federal Register as being in danger of extinction.
(T) Threatened Listed as likely to become endangered within the foreseeable future.
(C) Candidate which may become a proposed species.

Critical Habitat Y = Designated, P = Proposed, N = None Designated

**Table is a compilation of species presented in Appendix B which was downloaded from the United States Fish and Wildlife Service, Arcata Office website on May 1, 2012.

3.4.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no change to existing biological resource conditions and or current trends of the affected environment as a result of Reclamation grant funding.

Proposed Action Alternative

Under the Proposed Action, Reclamation would release grant funding to the SRRC for the purpose of conducting initial enhancement activities, analysis and assessment, implementation, and monitoring/reporting of coho salmon habitats within the Salmon River subbasin. Potential impacts associated with the Proposed Action would be very limited and are not expected to have a significant effect on upland habitats.

Fish Resources and ESA listed Fish Species

The proposed activities that have the potential to impact fish resources include cutting and placement of small brush bundles in microhabitats along the stream banks. This activity would be performed using hand tools and in water work would be limited to human presence only. Likewise, proposed activities consisting of snorkeling are required for pre and post project monitoring for juvenile coho salmon. In electronic mail correspondence dated September 27, 2011, between National Marine Fisheries Service (NMFS) and Bureau of Reclamation staff (National Marine Fisheries Service 2011, Appendix D) indicated that any potential impacts to fish from snorkeling activities are not a concern and suggested that snorkel training is sufficient to reduce any potential impacts to fish before field activities are conducted.

The SRRC shall ensure that training would take place where snorkelers are properly educated to subtly slide one's heads into pools so as to minimize or eliminate any potential impacts to fish. Therefore, the proposed project would not be expected to have a significant impact to ESA listed fish species. Overall, the proposed project is being performed in an effort to benefit coho salmon in the long term by enhancing key habitat conditions.

Upland and Wildlife Species Impacts

Upland species are not expected to be impacted as the proposed project activities are occurring in microhabitat areas adjacent to streams. Impacts to upland vegetation along streams would be low and only hand tools would be used for cutting and placing small brush bundles along the stream banks.

To ensure compliance with the Migratory Bird Treaty Act (MBTA) (16 USC § 703 ET SEQ.), between the dates of March 15 and August 31 all vegetation and surrounding areas scheduled to be disturbed shall be inspected for the presence of bird nests immediately prior to being disturbed. If an active nest is discovered vegetation clearing activities would not be allowed to proceed in the vicinity of the nest(s). No activities shall occur within an appropriate buffered distance from active nests until after the young birds have fledged from the nest. As such, the

Proposed Action is not expected to result in negative effects on migratory birds protected under the MBTA.

The Proposed Action is not expected to have an effect on Bald or Golden Eagles because the proposed activities would be performed using non-mechanical, human and hand tools only for cutting and placing small brush bundles in microhabitats along the stream banks.. As such, the proposed activities are not activities that would result in impacts to species protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d).

Based on the information included and analyzed in this EA, no significant impacts to biological resources are expected as a result of the Proposed Action.

Cumulative Impacts

The Proposed Action would not result in significant impacts to biological resources. Further, the proposed project is being performed to ultimately benefit the species. Urbanization, water withdrawal, agriculture, forestry, chemical use, hatcheries, angling, and streamside restoration are all currently occurring and are expected to continue to occur in the action area. Therefore, the Proposed Action would represent a negligible amount of contribution when considering all cumulative impacts to biological resources.

3.5 Cultural Resources

Cultural resources is a broad term that includes prehistoric, historic, architectural, and traditional cultural properties. The National Historic Preservation Act (NHPA) of 1966, as amended, is the primary Federal legislation that outlines the Federal Government's responsibility to cultural resources. Section 106 of the NHPA requires the Federal Government to take into consideration the effects of an undertaking on cultural resources included in, or eligible for inclusion in, the National Register of Historic Places (National Register). Those resources that are in, or eligible for inclusion in, the National Register are referred to as historic properties.

3.5.1 Affected Environment

The proposed project area is part of the ancestral territory of the Karuk Tribe of California occupying approximately 65% of the subbasin with the Main stem of the Salmon River being the most culturally significant to the Shasta and Karuk people (NRC 2003). The Salmon River subbasin's landscape features and elements are also important to ceremonial activities that the Karuk and Shasta Tribe carry out today (Elder, et al. 2002). The confluence of the Salmon and Klamath Rivers, what the Karuk Tribe call the 'Katamin,' meaning 'Center of the World,' is the location of the tribe's World Renewal ceremonies continue to be held. The salmon, or "Ama" in the Karuk language, found in the larger Klamath Basin and Salmon River Subbasin, are still a major source of food for the Karuk Shasta people (SRRC, 2012[1&2]).

Elder, et al. (2002), report that since the 1800s the area's economy was driven by "explorer-fur traders and gold-seeking adventurers." By 1850 there was an influx of Europeans, Chinese, and Euro-Americans who moved in to the area driven by the discovery of gold but after the turn of the century, agriculture and timber became the primary source of income. By the 1920s human use of watershed included traditional use areas of mining, ranching, and recreation. There are

still several thousand acres of public lands reserved as mining claims in accord with the 1872 Mining Law that entitles the claimant to mineral rights. Currently, these rights are employed on a small scale.

Currently, there are only about 250 residents in the Salmon River watershed's 751 square miles (SRRC, 2012[2]).

3.5.2 Environmental Consequences

No Action Alternative

Under the No Action alternative, Reclamation would not release grant funding to the SRRC for the purpose of conducting initial enhancement activities, analysis and assessment (pre-implementation), implementation, and subsequent (post-implementation) monitoring and reporting of winter and summer Coho rearing habitat at various locations within the Salmon River subbasin. Without the use of Federal funds from Reclamation, there would be no undertaking as defined by Section 301(7) of the NHPA. If Reclamation initiates the No Action alternative, there would be no impact to cultural resources.

Proposed Action Alternative

Under the Proposed Action, Reclamation would release grant funding to the SRRC and such use of federal funds would constitute an undertaking as defined by Section 301(7) of the NHPA.

Reclamation's Mid-Pacific Region's Archeologist transmitted an electronic mail memo on August 11, 2011 (Appendix C) to the Klamath Basin Area Office staff conveying the conclusion of the Section 106 process for the proposed undertaking. It was concluded that Reclamation's Proposed Action to fund SRRC Salmon River enhancement activities has no potential to cause effects to historic properties pursuant to 36 CFR Part 800.3(a)(1).

In the event of an inadvertent discovery Reclamation may have additional Section 106 obligations pursuant to the Post Review Discovery portion of the regulations at §800.13. If cultural resources are identified during implementation of this action, the project shall be halted immediately and the Reclamation Mid-Pacific Regional Archaeologist shall be contacted immediately to discuss any such discovery and determine how to proceed.

Cumulative Impacts

The Proposed Action would not result in impacts to cultural resources, and therefore, would not contribute to cumulative impacts to cultural resources.

3.6 Indian Trust Assets

3.6.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property or rights held in trust by the United States for Indian Tribes or individuals. Trust status originates from rights imparted by treaties, statutes, or executive orders. These rights are reserved for, or granted to, tribes.

Reclamation's policy is to protect ITAs from adverse impacts resulting from Reclamation programs and activities whenever possible. Types of actions that could affect ITAs include an interference with the exercise of a reserved water right, degradation of water quality (where there is a water right), or where noise near a land asset may adversely affects uses of the reserved land.

3.6.2 Environmental Consequences

No Action Alternative

Under the No Action alternative, Reclamation would not release grant funding to the SRRC. As a result, habitat enhancement activities on Salmon River tributaries and within its subbasins would not occur for the benefit of coho salmon. The current land use practices would continue at the proposed project locations resulting in no adverse impacts to ITAs.

Proposed Action Alternative

Under the Proposed Action, Reclamation would release grant funding to the SRRC. Reclamation concluded (Appendix D) through electronic mail correspondence dated August 11, 2011 (Appendix D), with Patricia Rivera, Reclamation Indian Trust Assets Coordinator, that the proposed action does not have the potential to affect Indian Trust Assets. The nearest ITA is a Public Doman Allotment approximately 1 mile WSW of the project location." Therefore, ITAs would not be impacted from implementation of the Proposed Action Alternative.

Cumulative Impacts

The Proposed Action would not result in adverse impacts to ITAs and, therefore, would not contribute to cumulative impacts to ITAs.

3.7 Climate Change

3.7.1 Affected Environment

The United Nations Intergovernmental Panel on Climate Change predicts that changes in the Earth's climate would continue through the 21st century and that the rate of change may increase significantly in the future because of human activity. Climate change may be changing faster than had been anticipated as little as three years ago (GCCIG 2008).

The California Environmental Protection Agency Climate Action Team (CEPACAT) detects that in California and throughout western North America, climate change is already evident. Observations are revealing trends toward warmer winter and spring temperatures, a smaller fraction of precipitation falling as snow instead of rain, a decrease in the amount of spring snow accumulation in lower and middle elevation mountain zones, and advance in snowmelt of 5 to 30

days earlier in the spring. These reductions in snow accumulation and earlier snowmelt would have massive affects on water supplies and natural ecosystems. Changes in temperature and precipitation and would shift the distribution of species, and elevate the risk of climate-related disturbance such as wildfires, disease, and drought. The ecosystems most susceptible to temperature rise in California are the alpine and sub-alpine forest cover (CEPACAT 2006).

3.7.2 Environmental Consequences

No Action Alternative

Under the No Action alternative, Reclamation would not release grant funding to the SRRC. As a result, habitat enhancement activities on Salmon River tributaries and within its subbasins for the benefit of coho salmon would not occur, and therefore would cause no effect to climate change.

Proposed Action Alternative

Under the Proposed Action, Reclamation would release grant funding to the SRRC. The Proposed Action is limited in scope and duration. Therefore, any potential to contribution to climate change would be negligible. As a result, the Proposed Action would not cause any significant changes in atmospheric conditions and therefore would result in no effect on climate change.

Cumulative Impacts

The Proposed Action would not result in adverse impacts to climate change and, therefore, would not contribute to cumulative impacts to climate change.

3.8 Environmental Justice

3.8.1 Affected Environment

Pursuant to Executive Order 12898 (dated February 11, 1994), Reclamation is required to consider any potential effects to minority or low-income populations resulting from its actions.

3.8.2 Environmental Consequences

No Action Alternative

Reclamation would not release grant funding to the SRRC. Habitat enhancement activities on Salmon River tributaries and within its subbasins for the benefit of Coho salmon would not occur. As a result, the No Action alternative would not result in disproportionate effects upon those populations.

Proposed Action Alternative

Reclamation would release grant funding to the SRRC. The proposed action would not result in a disproportionately impact economically disadvantaged or minority populations.

Cumulative Impacts

The Proposed Action would not result in adverse impacts to economically disadvantage or minority populations and, therefore, would not contribute to cumulative impacts to those groups.

3.9 Summary of Environmental Effects

The environmental effects of the Proposed Action Alternative are summarized in the Table below:

Table 3. Summary of Environmental Effects– Enhancement of Winter and Summer Habitats in the Salmon River.

Resource/Issue	Potential Effects
Surface Water Resources	No significant effect. Temporary and limited in nature.
Biological Resources	No significant effect. Beneficial effect.
Climate Change	No effect.
Cultural Resources	No effect.
Indian Trust Assets	No effect.
Environmental Justice	No effect.

Chapter 4 Consultation and Coordination

4.1 Federal Laws

The following federal laws were considered during the preparation of this EA and the evaluations of the potential impacts from the Proposed Action were described in Chapter 3.

4.1.1 Endangered Species Act (16 USC. 1521 et seq.)

Section 7 of the Endangered Species Act (ESA) requires Federal agencies to ensure that all federally associated activities within the United States do not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of the critical habitat of these species. When a proposed action is likely to impact listed species, action agencies must consult with the U.S. Fish and Wildlife Service, which maintains current lists of species that have been designated as threatened or endangered, to determine the potential impacts a project may have on protected species.

4.1.2 Migratory Bird Treaty Act (16 USC § 703 ET SEQ.)

The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Unless permitted by regulations, the Act provides that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Subject to limitations in the Act, the Secretary of the Interior (Secretary) may adopt regulations determining the extent to which, if at all, hunting, taking, capturing, killing, possessing, selling, purchasing, shipping, transporting or exporting of any migratory bird, part, nest or egg would be allowed, having regard for temperature zones, distribution, abundance, economic value, breeding habits and migratory flight patterns.

4.2 Interdisciplinary Team

Throughout the preparation of the EA, an interdisciplinary team was employed. The team consisted of Natural Resource Specialists, Biologists, Archaeologists, and the grantee. The team participated in various aspects of the document preparation, including but not limited to information gathering, data analysis, resource section review and preparation.

4.3 Public Involvement

The Final EA and FONSI were posted on the Reclamation website advising the public of the decision.

Chapter 5 List of Preparers and Reviewers

Tara Jane Campbell Miranda, Natural Resource Specialist Student Trainee, Klamath Basin Area Office – Preparation of EA
Kristen Hiatt, Natural Resource Specialist, Klamath Basin Area Office – Review of EA
Jennie Land, Chief, Resource Management Division, Klamath Basin Area Office – Review of EA
Chuck Korson, Fish Passage Coordinator, Klamath Basin Area Office – Resource Information
Donald Flickinger, National Marine Fisheries Service – Resource Information

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[2]Salmon River Restoration Council. 2012. Native American History. Accessed in April 2012 at http://www.srrc.org/watershed/humanhistory.php.

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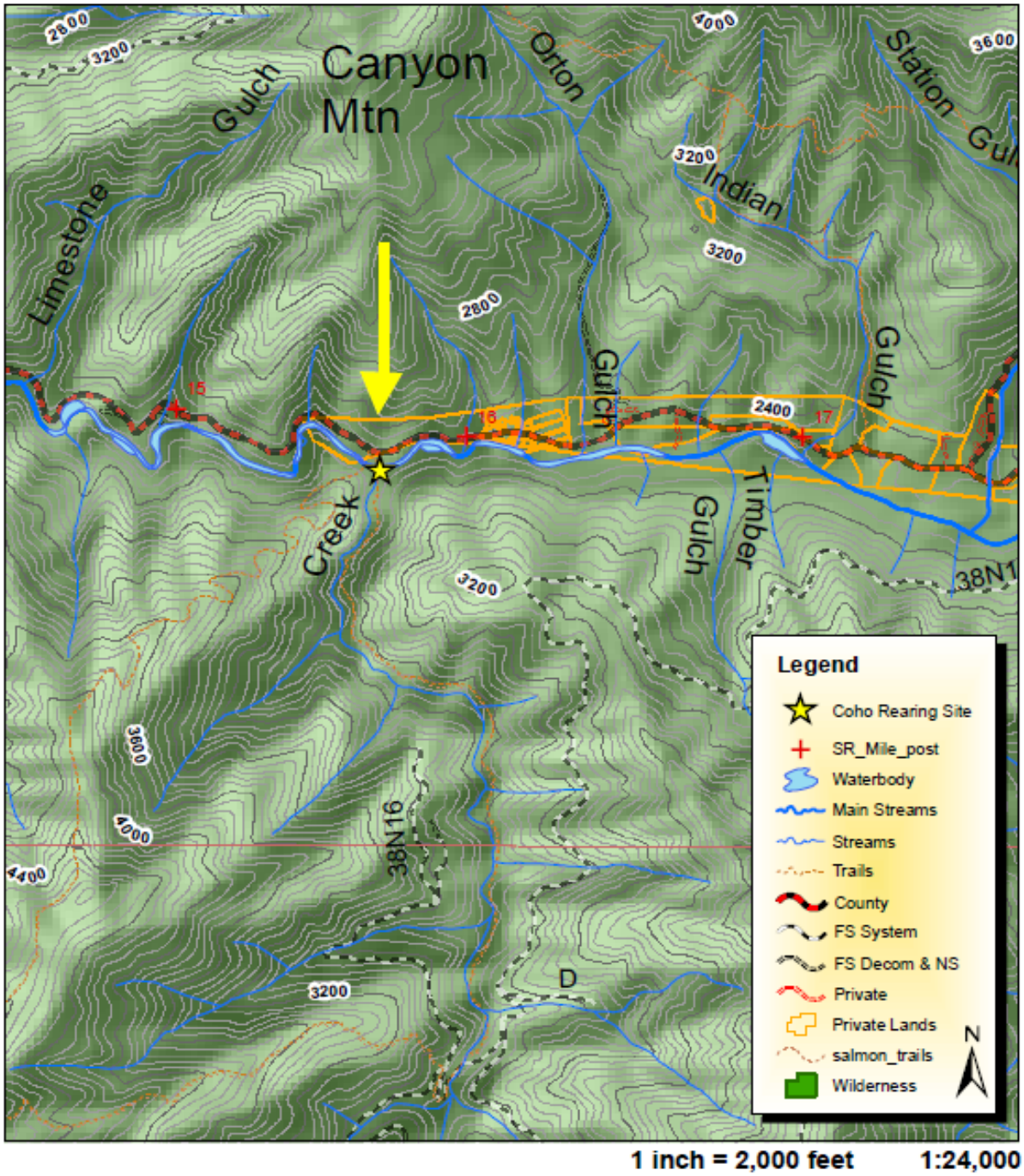
Appendix A. Proposed Project Site Location Maps (1-18, excluding site 7)

Site 1: St. Claire Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

St, ClaireCreek
T38N R12W S25



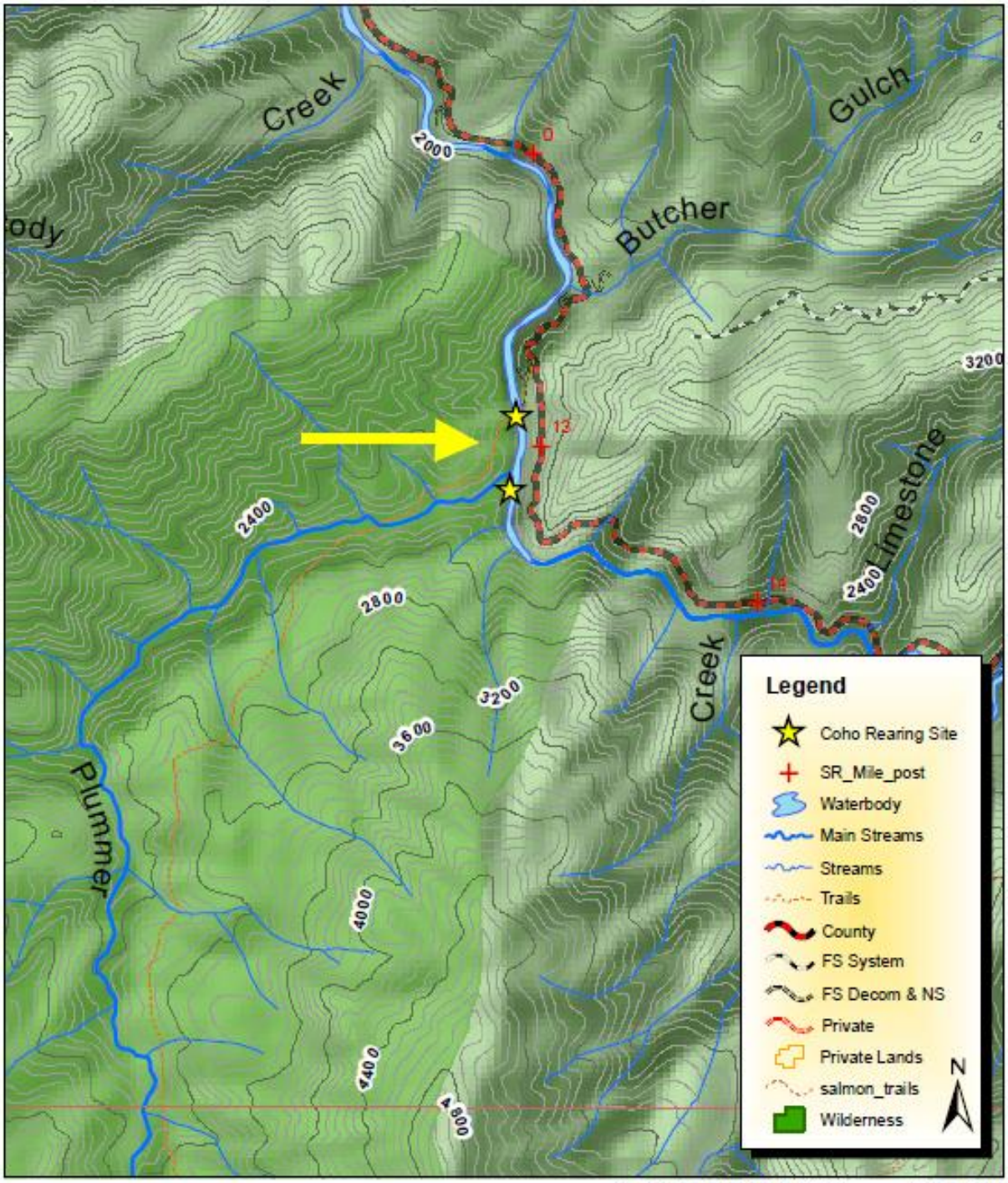
1 inch = 2,000 feet **1:24,000**

Site 2: Plummer Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Plummer Creek
T38N R12W S22



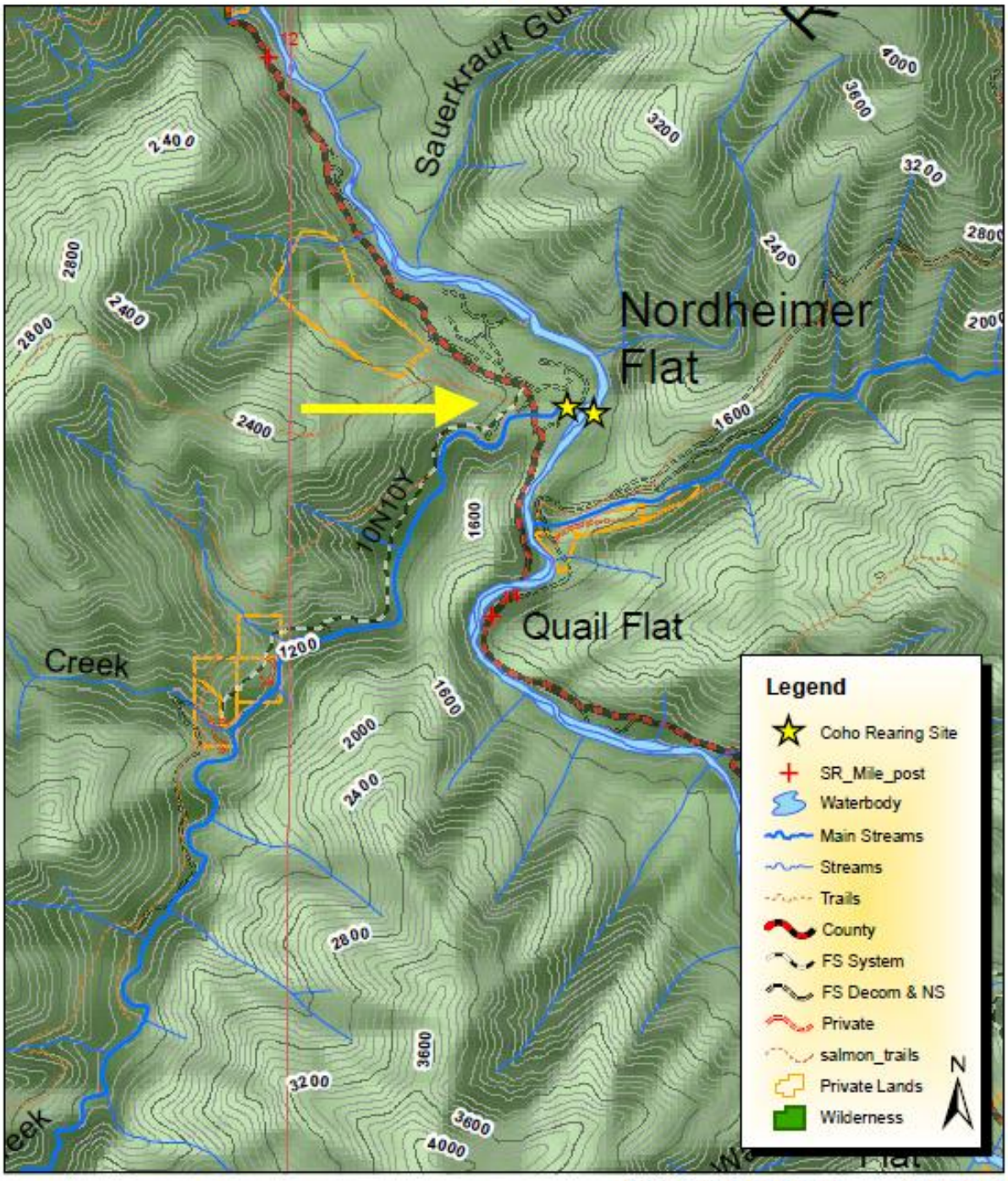
1 inch = 2,000 feet **1:24,000**

Site 3: Nordheimer Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Nordheimer Creek
T11N R7E S34



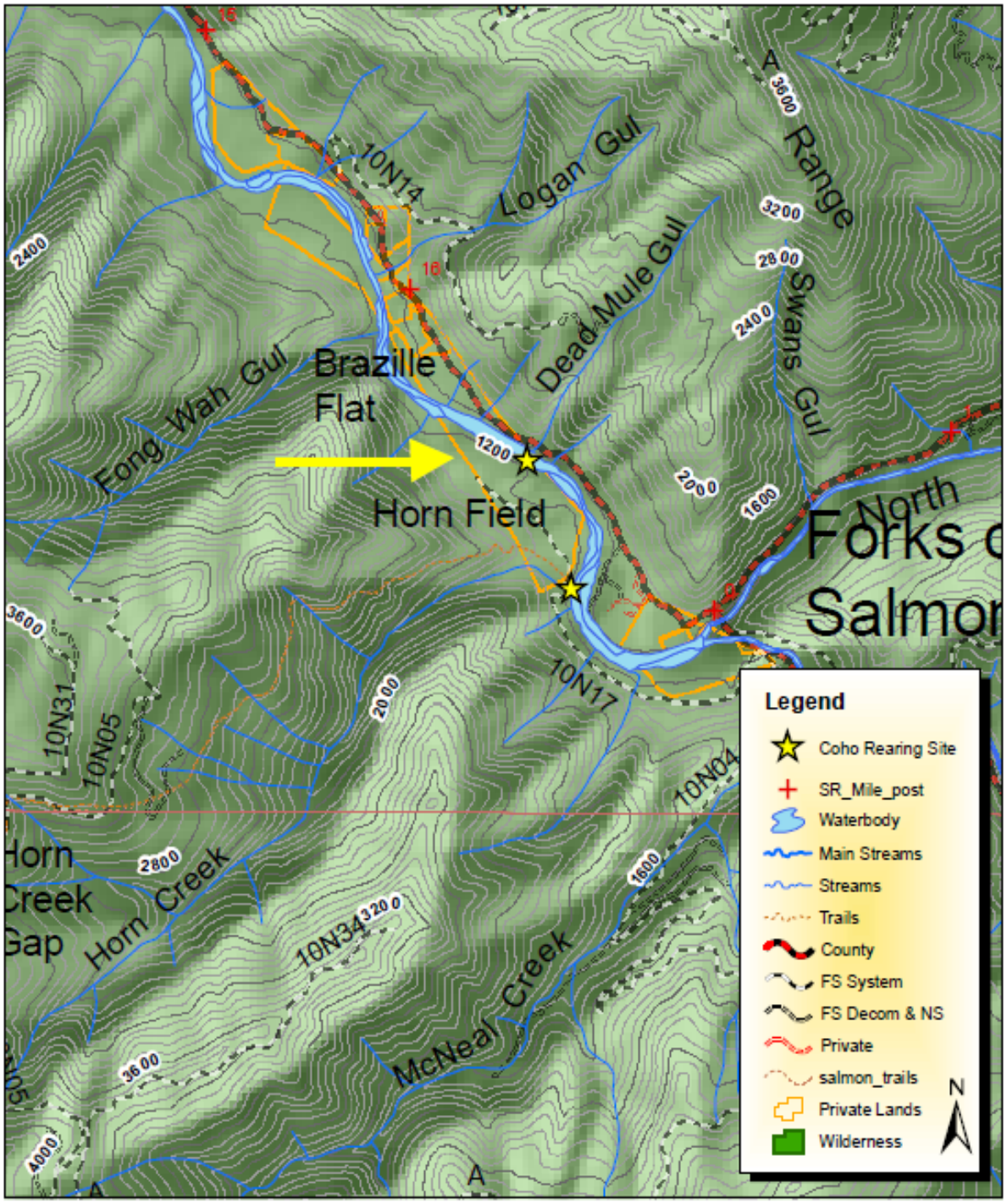
1 inch = 2,000 feet 1:24,000

Site 4: Dead Mule Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Dead Mule Gulch
T10N R7E S13

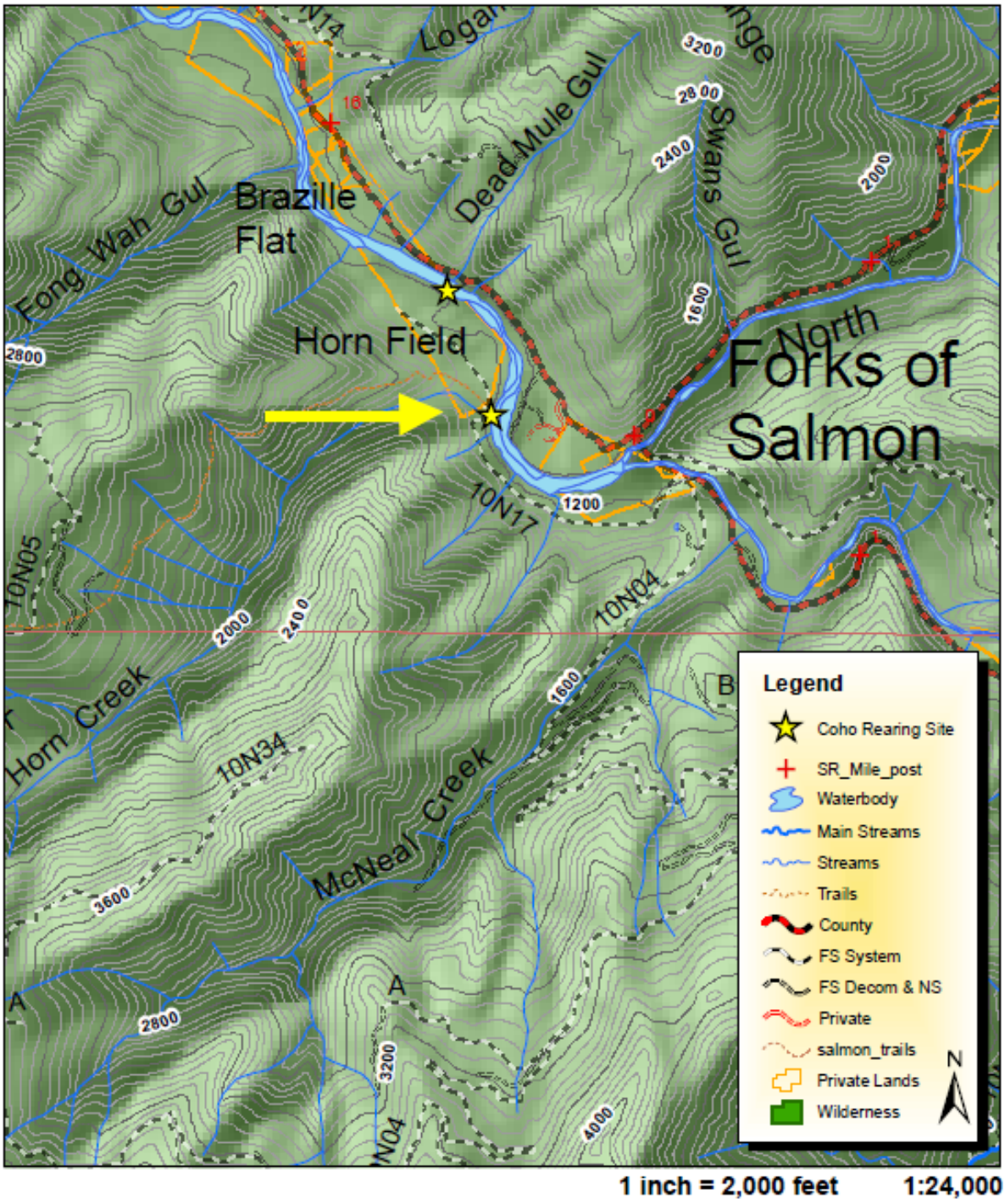


Site 5: Horn Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Horn Creek
T10N R7E S13

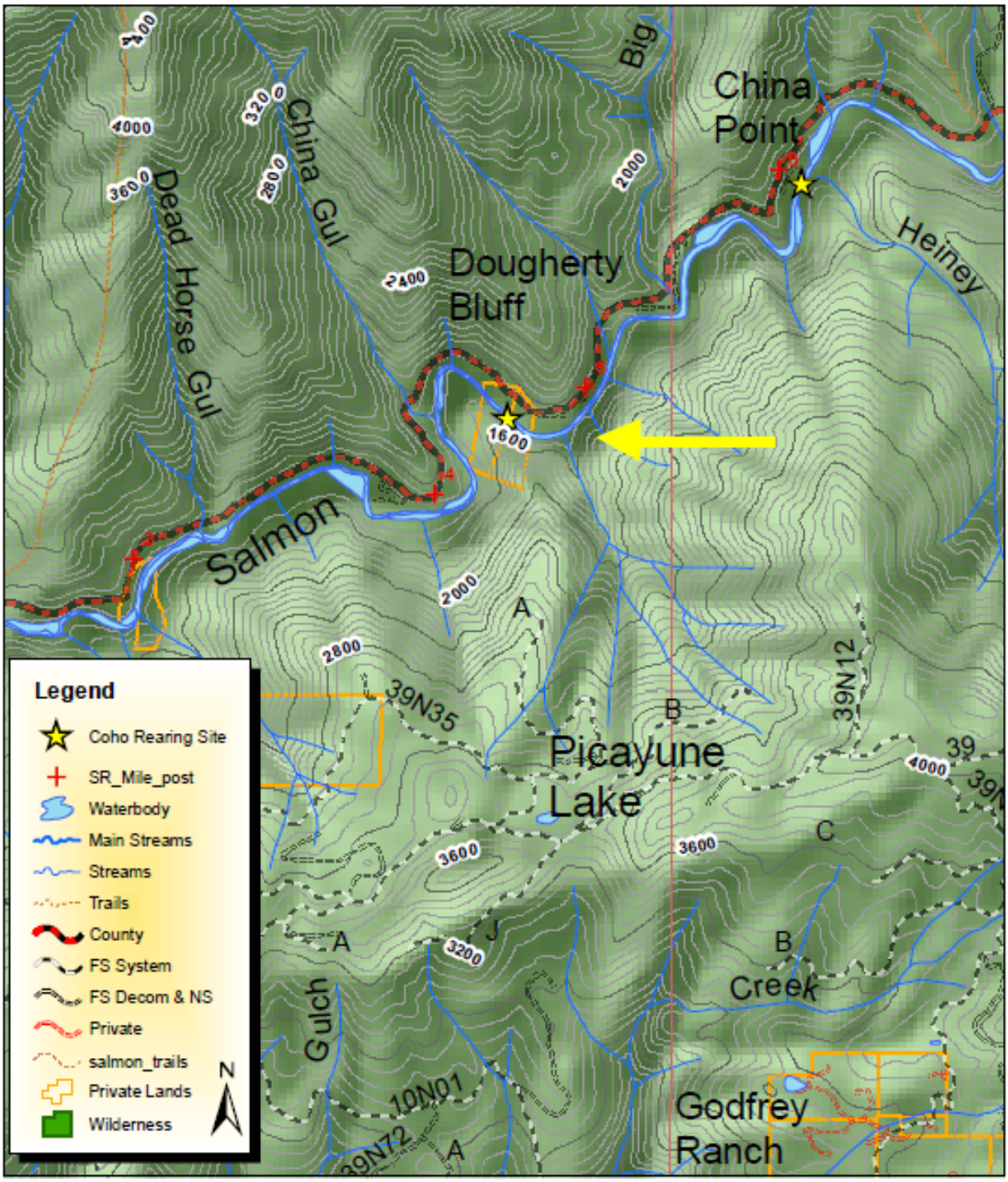


Site 6: Picayune Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Picayune Gulch
T40N R12W S32

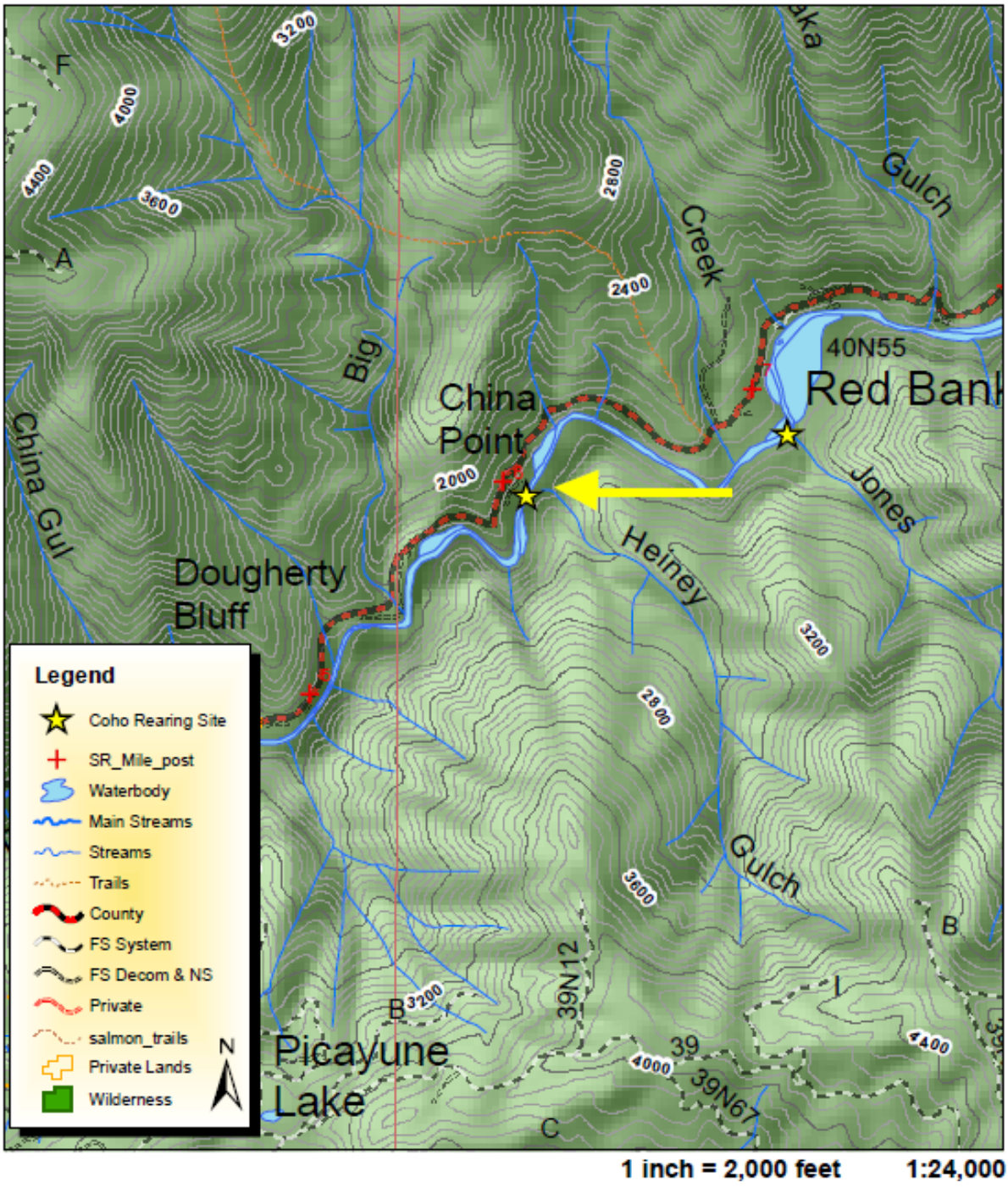


Site 7: No site map available
Site 8: Heiney Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Heiney Gulch
T40N R12W S32

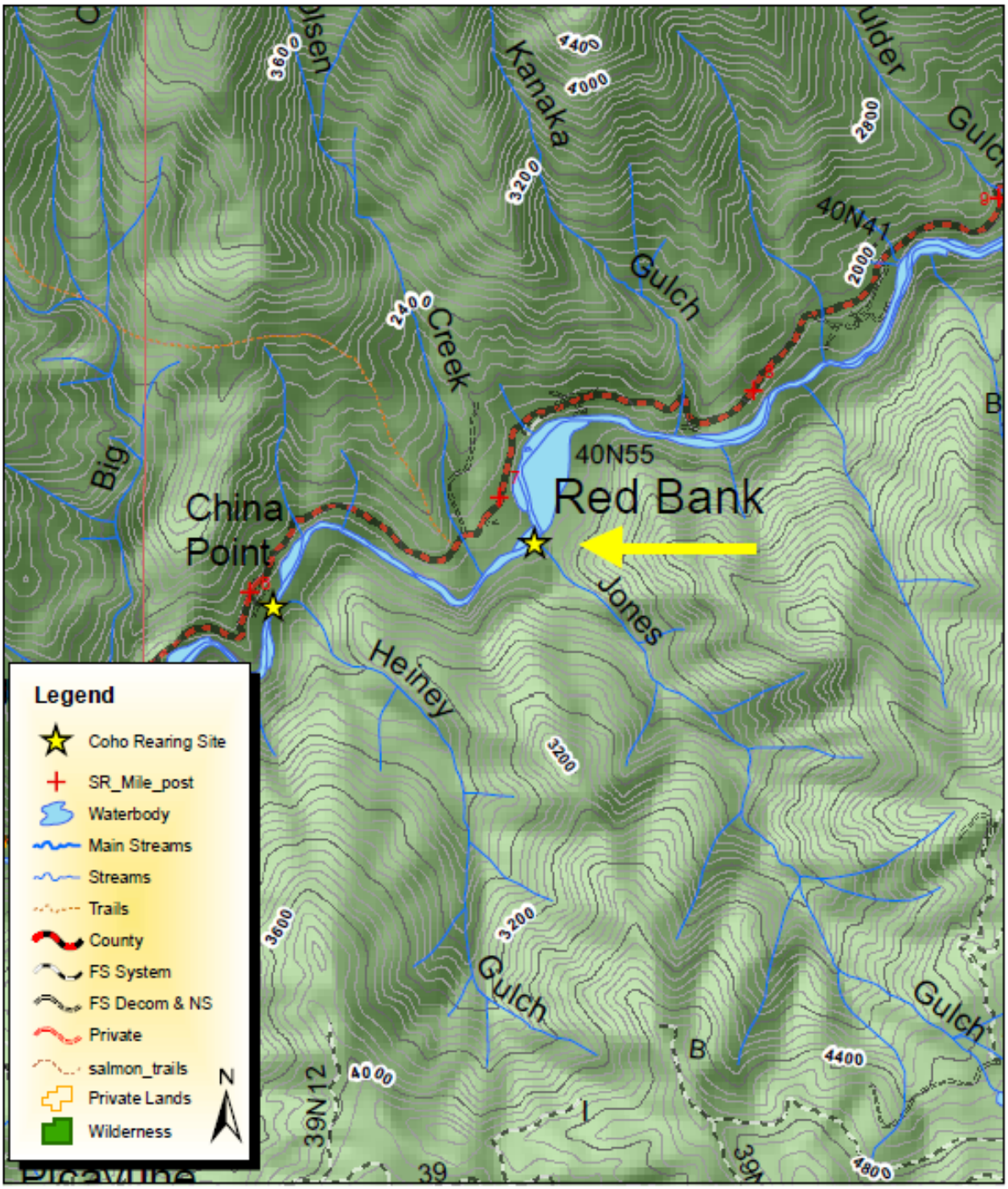


Site 9: Jones Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Jones Gulch
T40N R12W S28

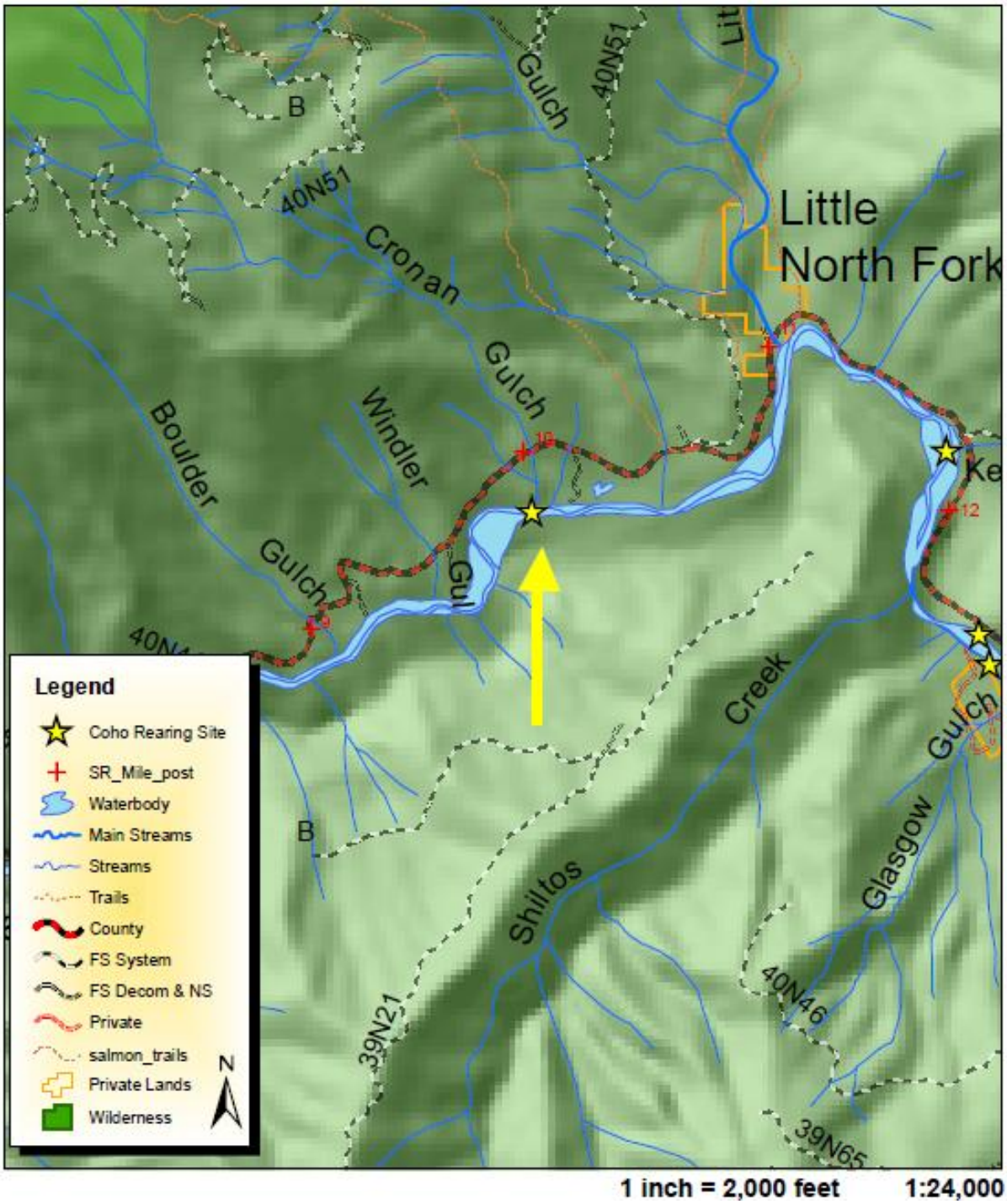


Site 10: Cronan Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Cronan Gulch
T40N R12W S23

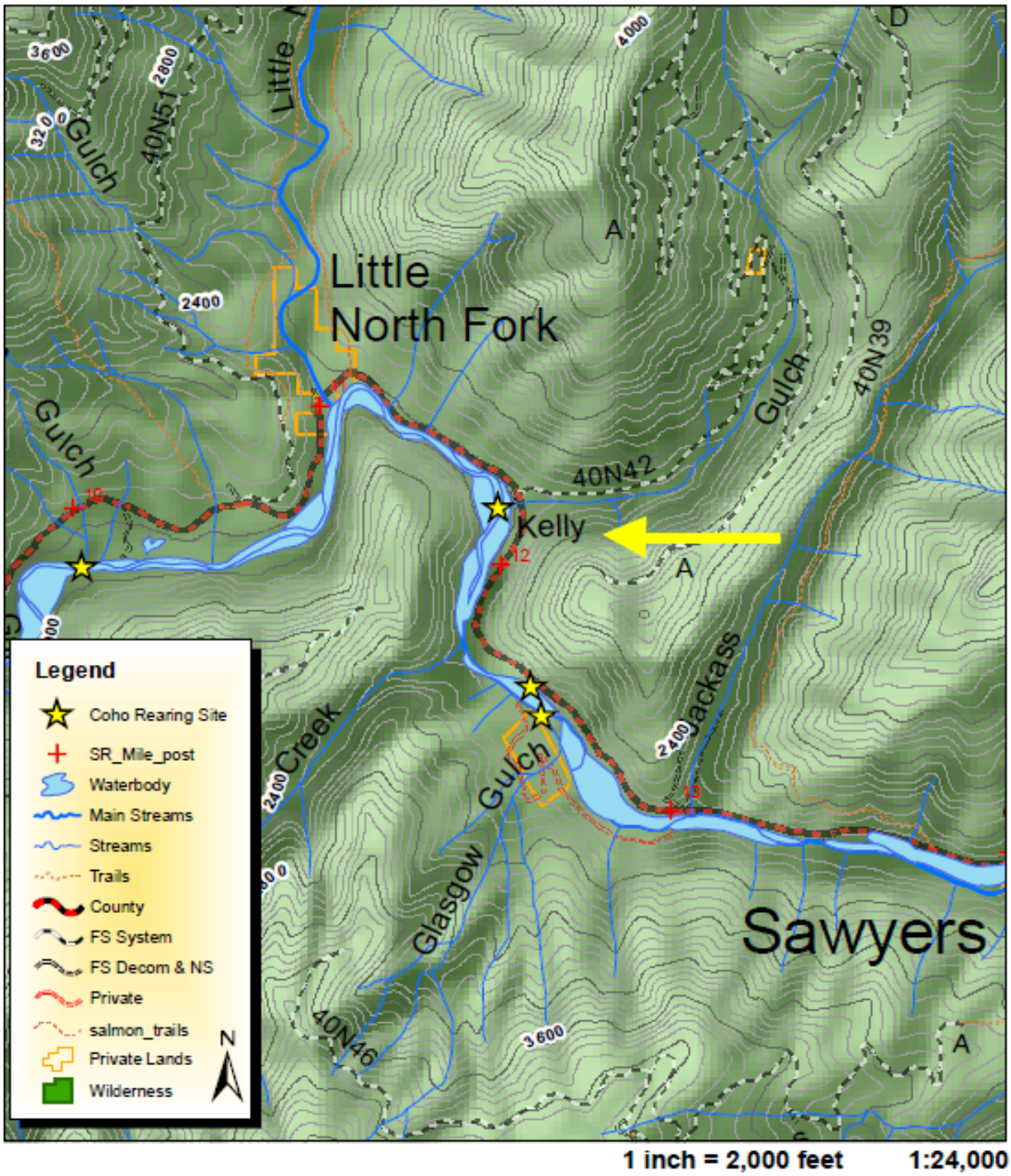


Site 11: Kelly Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Kelley Gulch
T40N R12W S24



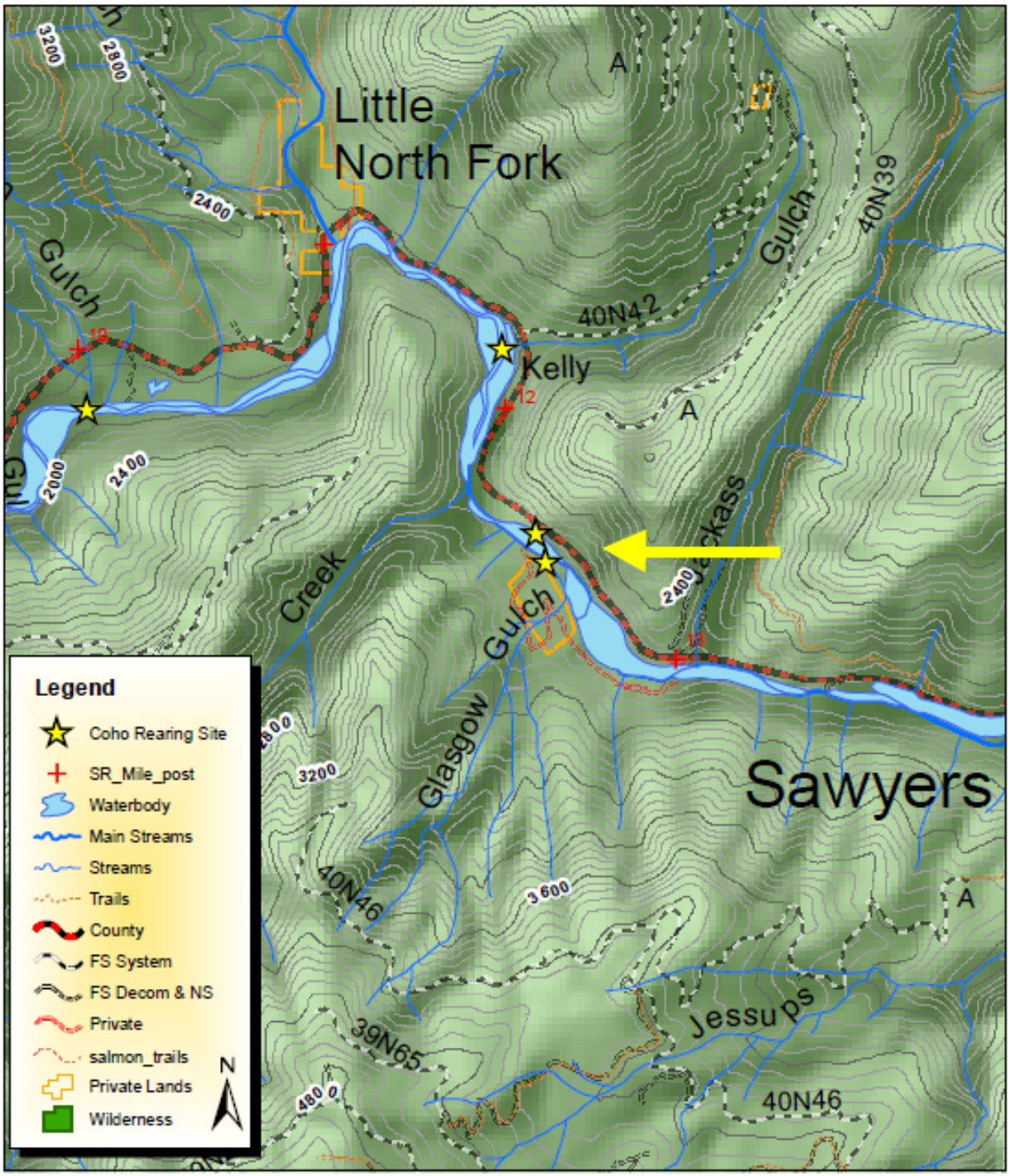
1 inch = 2,000 feet **1:24,000**

Site 12: Glasgow Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Glasgow Gulch
T40N R12W S25



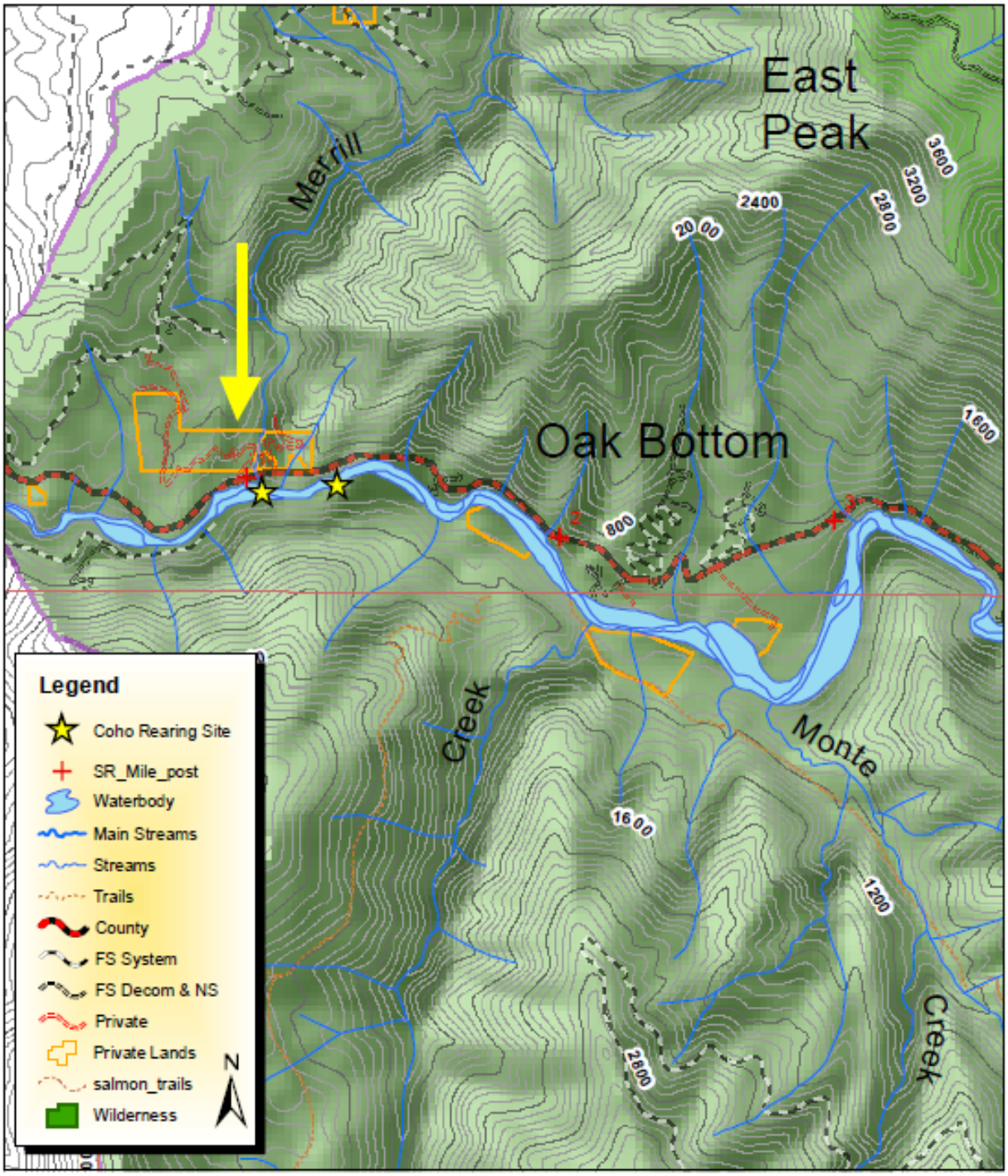
1 inch = 2,000 feet **1:24,000**

Site 13: Merrill Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Merrill Creek
T11N R6E S3



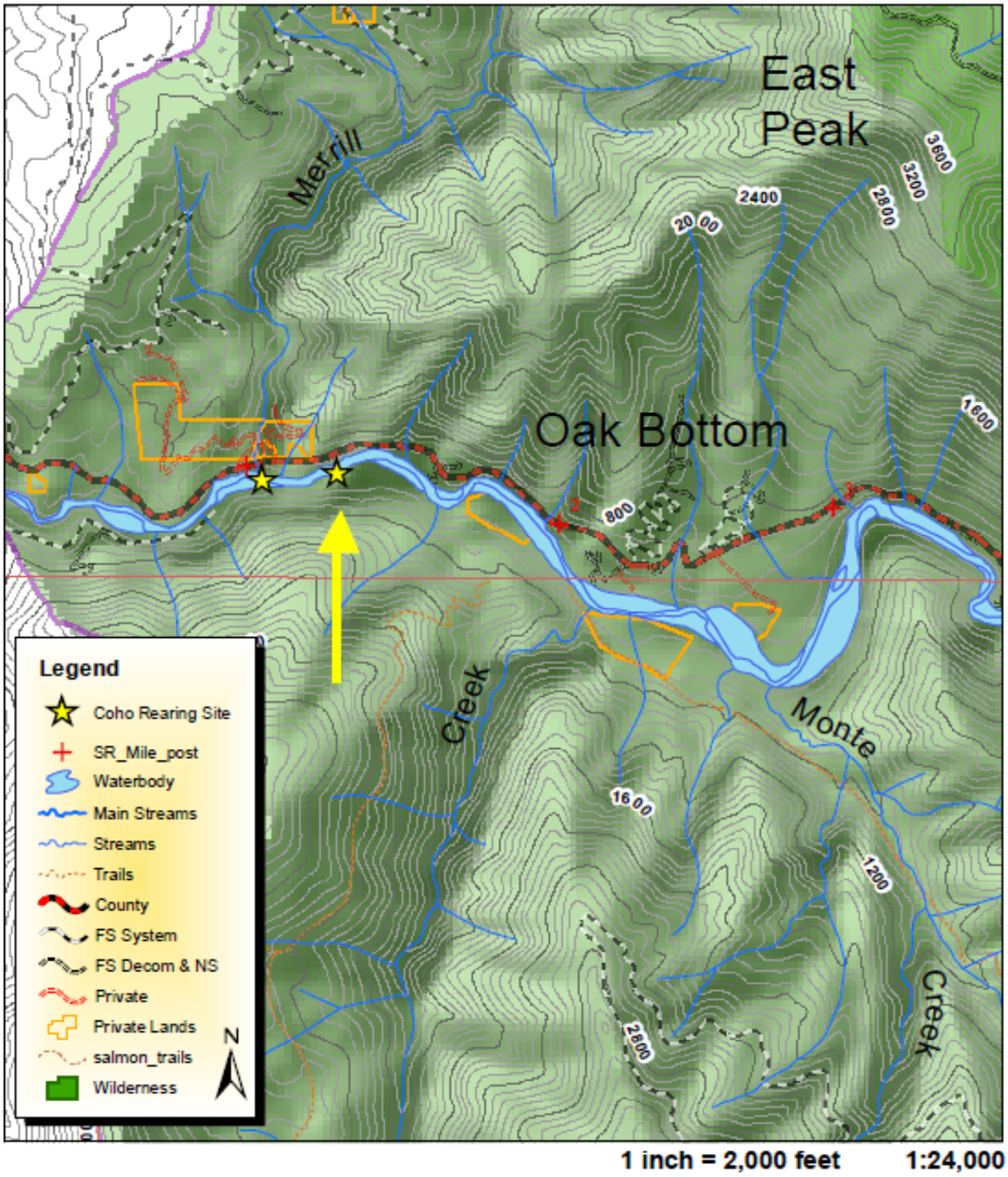
1 inch = 2,000 feet 1:24,000

Site 14: Oak Bottom

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Oak Bottom
T11N R6E S2

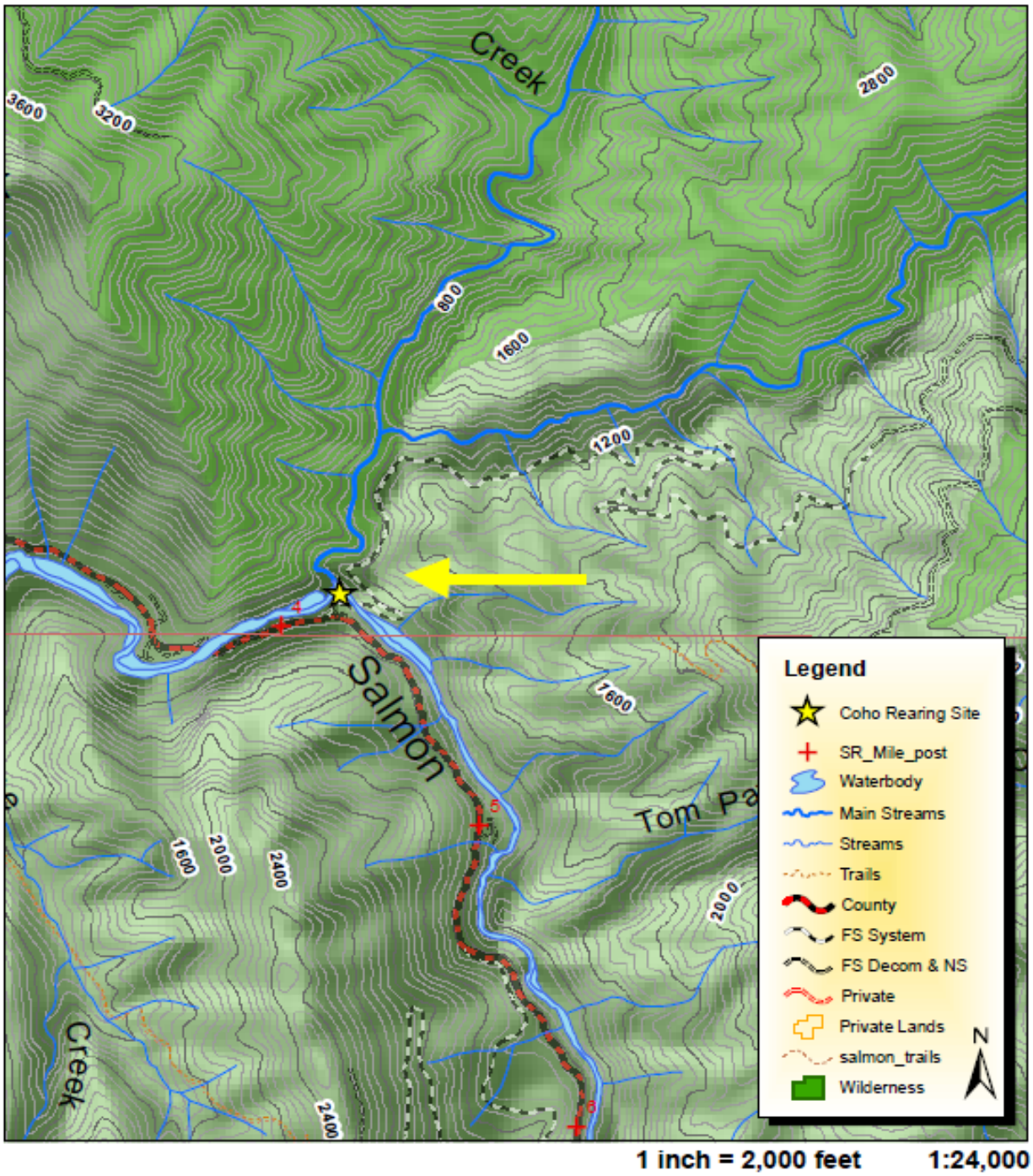


Site 15: Wooley Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Wooley Creek
T11N R7E S6

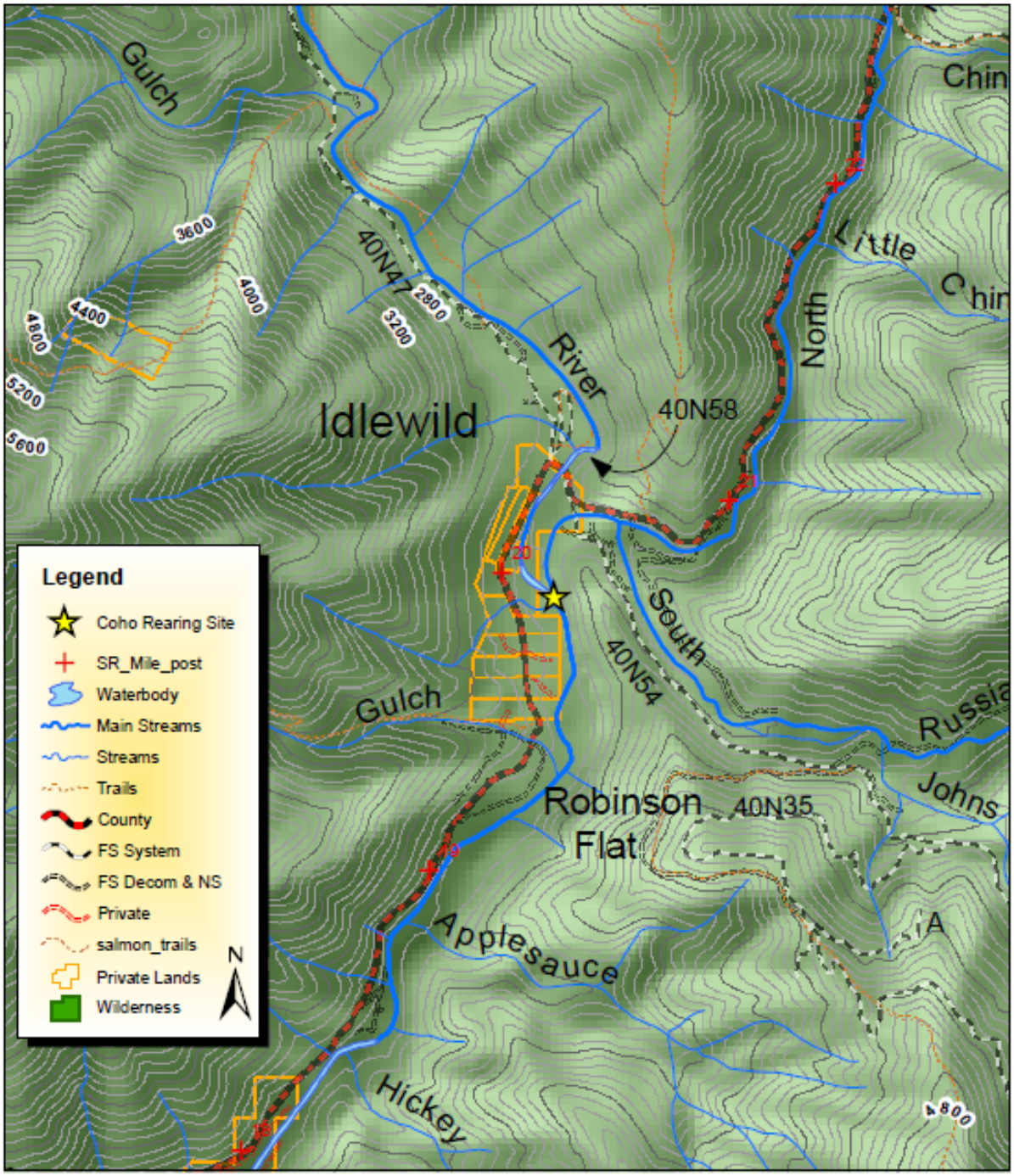


16: North Russian Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

North Russian Creek
T40N R10W S19



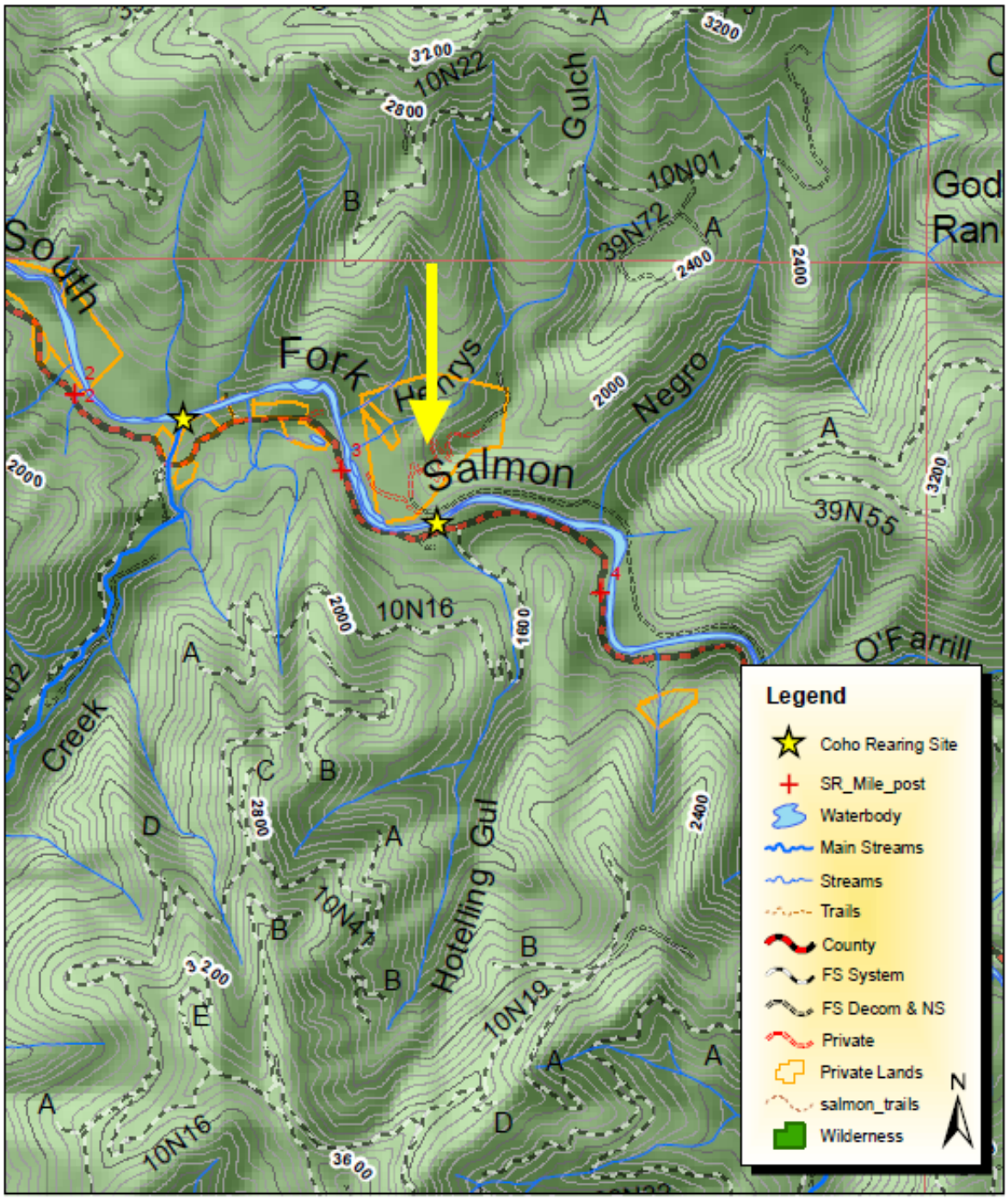
1 inch = 2,000 feet **1:24,000**

Site 17: Hotelling Gulch

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Hotelling Gulch
T10N R8E S20



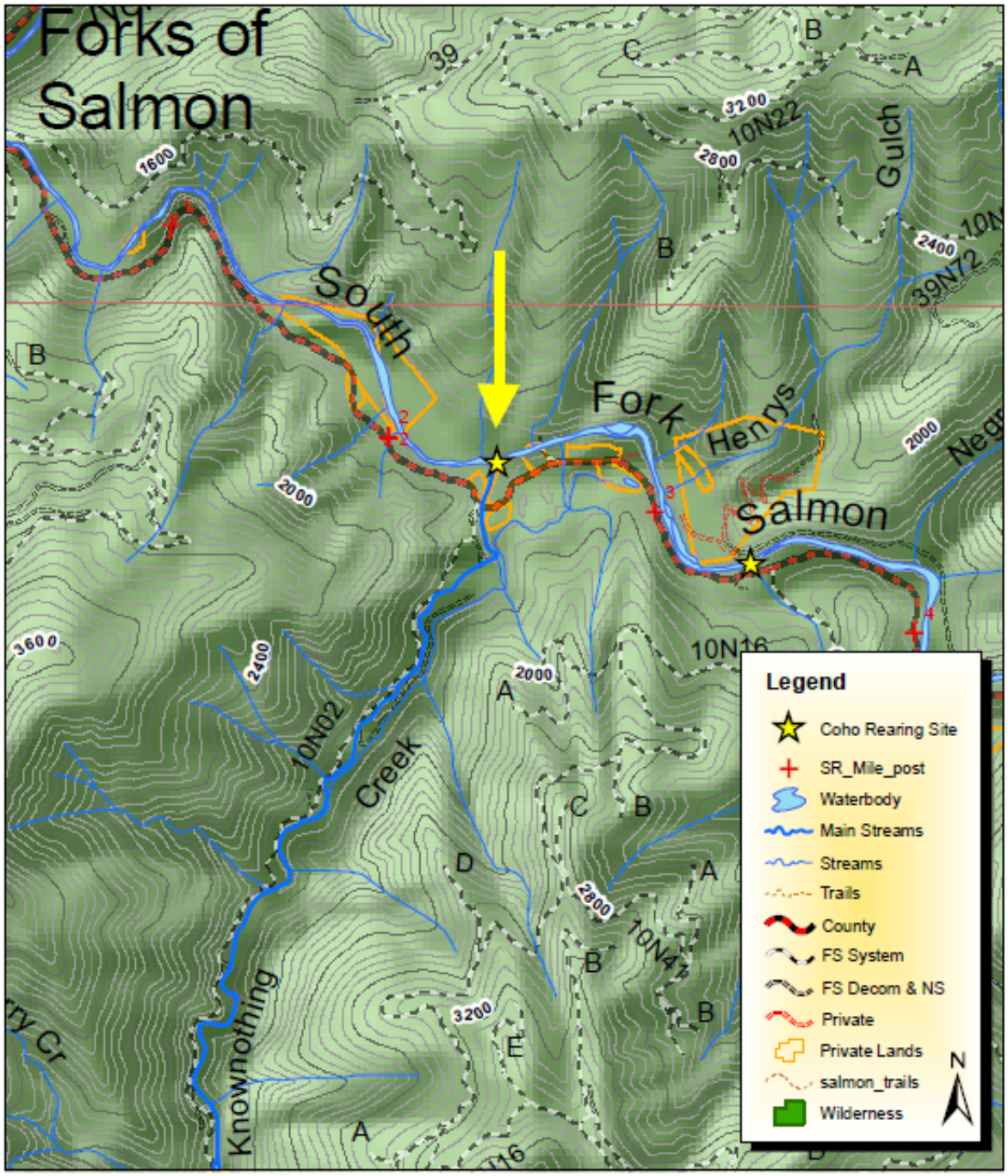
1 inch = 2,000 feet **1:24,000**

Site 18: Knownothing Creek

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement Number R10AP20080

Knownothing Creek
T10N R8E S29



Appendix B. Listed/Proposed Threatened Endangered Species Potentially Occurring in the Proposed Project Locations.

Listed/Proposed Threatened and Endangered Species for the CECILVILLE Quad (Candidates Included)

May 1, 2012

Document Number: *52164136-162824*

TYPE	SCIENTIFIC NAME	COMMON NAME	CATEGORY	CRITICAL HABITAT
Fish				
*	*Acipenser medirostris*	green sturgeon	T	Y
Birds				
	Brachyramphus marmoratus	marbled murrelet	T	Y
	Coccyzus americanus	Western yellow-billed cuckoo	C	N
	Strix occidentalis caurina	northern spotted owl	T	Y
Mammals				
	Martes pennanti	fisher, West Coast DPS	C	N

KEY:

(PE) Proposed Endangered	Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened	Proposed as likely to become endangered within the foreseeable future
(E) Endangered	Listed in the Federal Register as being in danger of extinction
(T) Threatened	Listed as likely to become endangered within the foreseeable future
(C) Candidate	Candidate which may become a proposed species
Critical Habitat	Y = Designated, P = Proposed, N = None Designated
*	Denotes a species Listed by the National Marine Fisheries Service

Listed/Proposed Threatened and Endangered Species for the FORKS OF SALMON Quad (Candidates Included)

May 1, 2012

Document Number: *56742581-17620*

TYPE	SCIENTIFIC NAME	COMMON NAME	CATEGORY	CRITICAL HABITAT
Fish				
*	*Acipenser medirostris*	green sturgeon	T	Y
*	*Oncorhynchus kisutch*	S. OR/N. CA coho salmon	T	Y
Birds				
	Brachyramphus marmoratus	marbled murrelet	T	Y
	Coccyzus americanus	Western yellow-billed cuckoo	C	N
	Strix occidentalis caurina	northern spotted owl	T	Y
Mammals				
	Martes pennanti	fisher, West Coast DPS	C	N

KEY:

(PE) Proposed Endangered	Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened	Proposed as likely to become endangered within the foreseeable future
(E) Endangered	Listed in the Federal Register as being in danger of extinction
(T) Threatened	Listed as likely to become endangered within the foreseeable future
(C) Candidate	Candidate which may become a proposed species
Critical Habitat	Y = Designated, P = Proposed, N = None Designated
*	Denotes a species Listed by the National Marine Fisheries Service

Listed/Proposed Threatened and Endangered Species for the SAWYERS BAR Quad (Candidates Included)

May 1, 2012

Document Number: *56742581-17713*

TYPE	SCIENTIFIC NAME	COMMON NAME	CATEGORY	CRITICAL HABITAT
Fish				
*	*Oncorhynchus kisutch*	S. OR/N. CA coho salmon	T	Y
Birds				
	Brachyramphus marmoratus	marbled murrelet	T	Y
	Coccyzus americanus	Western yellow-billed cuckoo	C	N
	Strix occidentalis caurina	northern spotted owl	T	Y
Mammals				
	Martes pennanti	fisher, West Coast DPS	C	N

KEY:

(PE) Proposed Endangered	Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened	Proposed as likely to become endangered within the foreseeable future
(E) Endangered	Listed in the Federal Register as being in danger of extinction
(T) Threatened	Listed as likely to become endangered within the foreseeable future
(C) Candidate	Candidate which may become a proposed species
Critical Habitat	Y = Designated, P = Proposed, N = None Designated
*	Denotes a species Listed by the National Marine Fisheries Service

Listed/Proposed Threatened and Endangered Species for the SOMES BAR Quad (Candidates Included)

May 1, 2012

Document Number: *56742581-17746*

TYPE		SCIENTIFIC NAME	COMMON NAME	CATEGORY	CRITICAL HABITAT
Fish					
	*	*Acipenser medirostris*	green sturgeon	T	Y
	*	*Oncorhynchus kisutch*	S. OR/N. CA coho salmon	T	Y
Birds					
		Coccyzus americanus	Western yellow-billed cuckoo	C	N
		Strix occidentalis caurina	northern spotted owl	T	Y
Mammals					
		Martes pennanti	fisher, West Coast DPS	C	N

KEY:

(PE) Proposed Endangered	Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened	Proposed as likely to become endangered within the foreseeable future
(E) Endangered	Listed in the Federal Register as being in danger of extinction
(T) Threatened	Listed as likely to become endangered within the foreseeable future
(C) Candidate	Candidate which may become a proposed species
Critical Habitat	Y = Designated, P = Proposed, N = None Designated
*	Denotes a species Listed by the National Marine Fisheries Service

Appendix C. Reclamation Mid Pacific Regional Cultural Resources Request and Correspondence.

KO-300 (Hiatt)
ENV-3.00

National Historic Preservation Act Compliance Request Form

(This form is to be used for actions that would relate only to the National Historic Preservation Act Section 106 as determined by either the bureau or office.)

****Please send your request to: BOR MPR Cultural Resources Section cc: Jennie M. Land at jland@usbr.gov, Kristen Hiatt at khiatt@usbr.gov, and Jennifer Birri at jbirri@usbr.gov.**

AREA OFFICE CONTROL NO: KBAO- NHPA-2011-024

DATE: 8/5/2011	**PROPOSING AGENCY/APPLICANT:** Salmon River Restoration Council
PROJECT: Coho Habitat Enhancement Project	**REQUESTING OFFICE:** KBAO
LICENSE OR CONTRACT NUMBER:	**ANTICIPATED NEPA DOC TYPE:** CEC

NATURE OF ACTION:

T11N R7E Section 6 and 34
T10N R7E Section 13 and 14
T38N R12W Section 22 and 25
T11N R6E Section 3
T40N R12W Section 28 and 32
T40N R12W Section 23, 24 and 25

PROJECT LOCATION (Township, Range & Section or XY cords)

COST AUTHORITY NO.: A30-0012-4990-001-00-0-0	**COST CENTER:** 2530000

7.5 MINUTE QUAD MAP: 41123 B2 – Cecilville; 41123 C3 – Forks of Salmon; 41123 D4 – Somes Bar; 41123 C2 – Sawyers Bar;

DETAILED PROJECT DESCRIPTION:

See attached proposed action description.

PREPARE'S NAME AND TITLE: Kristen Hiatt, Natural Resources Specialist

CONCUR: _____ Archaeologist **Date:** _____

Klamath Tributary Coho Rearing Habitat Enhancement Project

Agreement # R10AP20079

Proposed Action

The proposed action entails Reclamation funding SRRC to conduct an initial analysis and assessment (pre-implementation) for the project, implementation, and subsequent (post-implementation) monitoring and reporting of each project site.

Analysis and Assessment – Initial assessment will describe fish presence (quantity, age, and species), and habitat use, identifying size of habitat, amount of cover, and water temperatures at known and potential off-channel summer and winter coho rearing habitats along the Salmon River and the lower reaches of Salmon River tributaries. Surveys will focus on off-channel sites in the Salmon River, particularly between Sawyers Bar and Kelly's Gulch, and between Methodist Creek and Negro Creek. Photos will capture conditions both before and after implementation.

Implementation – Implementation of the project will occur between April 15 and October 15 on prioritized sites. Implementation will include enhancing cover complexity with on-site brush bundles and woody debris (<20" dbh). Brush bundles will be harvested with pruning saws and pruning shears from areas not adjacent to, and not providing shade for any stream. Sand bar willow will be the dominant material used. Materials will be transported by hand and when applicable, bundled with biodegradable ¼" sisal rope (three year expected life span). Bundles will be attached to existing riparian vegetation or sprigs using the same biodegradable rope, or keyed into existing vegetation. Bundles and other wood will be added to habitats in specific areas based on the coho habitat utilization model developed by the Karuk Tribe Fisheries Program and partners. This model takes into account temperature, velocity, depth and cover. All cover will be placed in low/no flow areas, i.e. off-channel pools, instream pools and alcoves. No material will be added directly above culverts. No sedimentation or streambed alteration will occur as a result of this work.

Monitoring – Photo points will be established to capture the life of the project – before, during and after treatment. Snorkel surveys to assess fish usage will be conducted before and after implementation at each project site. GPS points will be taken for each project site and all sites will be mapped for reporting and prioritization of future site treatments. Landowner outreach and education will assist in the maintenance and monitoring of this project where restoration sites exist on/or adjacent to private property.

Hiatt, Kristen L

From: Bruce, Brandee E
Sent: Thursday, August 11, 2011 1:58 PM
To: Hiatt, Kristen L
Subject: RE: 2011-NHPA-024.pdf - CR

Per the re-submitted form:

Kristen,

Tracking #: 11-LBAO-232

Project Name: 11-024 Coho Habitat Enhancement Project

Location: Sec. 6, 34, T.11 N. R. 7 E.; Sec. 13-14, T.10 N. R. 7 E.; Sec. 23-25, T. 38 N., R. 12 W.; Sec. 3, T. 11 N., R. 6 E.; Sec. 23-25, 28, 32, in Siskiyou County, California

Reclamation's activity to provide funding to the Salmon River Restoration Council for initial analysis, assessment, implementation, monitoring, and reporting for an enhancement project for Coho habitat along the Salmon River, a tributary of the Klamath River has no potential to cause effects to historic properties pursuant to 36 CFR Part 800.3(a)(1).

This e-mail concludes the Section 106 review process for this action. Please retain a copy of this e-mail with the administrative record for this action. Please note if there are any changes to the project description, additional Section 106 review may be required.

BranDee

From: Hiatt, Kristen L
Sent: Thursday, August 11, 2011 11:18 AM
To: Bruce, Brandee E
Subject: 2011-NHPA-024.pdf - Adobe Acrobat Professional

BranDee,

Please use this as the submittal for cultural resource compliance and the information included to update your concurrence.

Thanks,

Kristen

Appendix D. Reclamation Mid Pacific Regional Indian Trust Assets Request and Coordinator Correspondence

Indian Trust Assets
Request Form

**Please send your request to: Patricia Rivera, privera@usbr.gov - cc to Diane Williams and Ellie Robbins, marywilliams@usbr.gov, and erobbins@usbr.gov

Date:

Requested by	Kristen Hiatt – Natural Resource Specialist
Cost Authority (18 digits + 1)	A30-0012-4990-001-00-0-0
Cost Center (7 digits)	2530000
Region # if other than MP	
Project Name	Coho Habitat Enhancement Project
CEC or EA Number	2011-CEC-020
Project Description	See attached document
***Project Location (Township, Range, Section, e.g., T12 R5E S10, or XY cords)**	T11N R7E Section 6 and 34 T10N R7E Section 13 and 14 T38N R12W Section 22 and 25 T11N R6E Section 3 T40N R12W Section 28 and 32 T40N R12W Section 23, 24 and 25 (see attached maps)

Hiatt, Kristen L

From: Rivera, Patricia L
Sent: Thursday, August 11, 2011 7:42 AM
To: Hiatt, Kristen L
Subject: RE: ITA Request - SRRC Coho Habitat Enhancement Project

Kristen,

I reviewed the proposed action to fund SRRC to conduct an initial analysis and assessment (preimplementation) for the project, implementation, and subsequent (post-implementation) monitoring and reporting of each project site.

Analysis and Assessment – Initial assessment will describe fish presence (quantity, age, and species), and habitat use, identifying size of habitat, amount of cover, and water temperatures at known and potential offchannel summer and winter coho rearing habitats along the Salmon River and the lower reaches of Salmon River tributaries. Surveys will focus on off-channel sites in the Salmon River, particularly between Sawyers Bar and Kelly's Gulch, and between Methodist Creek and Negro Creek. Photos will capture conditions both before and after implementation.
Implementation – Implementation of the project will occur between April 15 and October 15 on prioritized sites. Implementation will include enhancing cover complexity with on-site brush bundles and woody debris (<20" dbh). Brush bundles will be harvested with pruning saws and pruning shears from areas not adjacent to, and not providing shade for any stream. Sand bar willow will be the dominant material used. Materials will be transported by hand and when applicable, bundled with biodegradable ¼" sisal rope (three year expected life span). Bundles will be attached to existing riparian vegetation or sprigs using the same biodegradable rope, or keyed into existing vegetation. Bundles and other wood will be added to habitats in specific areas based on the coho habitat utilization model developed by the Karuk Tribe Fisheries Program and partners. This model takes into account temperature, velocity, depth and cover. All cover will be placed in low/no flow areas, i.e. offchannel pools, instream pools and alcoves. No material will be added directly above culverts. No sedimentation or streambed alteration will occur as a result of this work.

Monitoring – Photo points will be established to capture the life of the project – before, during and after treatment. Snorkel surveys to assess fish usage will be conducted before and after implementation at each project site. GPS points will be taken for each project site and all sites will be mapped for reporting and prioritization of future site treatments. Landowner outreach and education will assist in the maintenance and monitoring of this project where restoration sites exist on/or adjacent to private property.

The proposed action does not have a potential to affect Indian Trust Assets. The nearest ITA is a Public Domain Allotment approximately 1 mile WSW of the project location.

Patricia

Appendix E. Email Correspondence Regarding Snorkeling Impacts to Fish.

From: Korson, Charles S (Chuck)
To: Hiatt, Kristen L
Subject: FW: effects from snorkeling
Date: Tuesday, September 27, 2011 8:00:47 AM
Attachments: ATT00001.gif

FYI and thought – Interesting dialogue among NOAA Fisheries biologists regarding snorkeling impacts to fish. Appears to me that NOAA/NMFS is not concerned at all as long as a training component is included.

From: Don Flickinger [mailto:Donald.Flickinger@noaa.gov]
Sent: Monday, September 26, 2011 4:44 PM
To: Will Harling
Cc: Korson, Charles S (Chuck)
Subject: effects from snorkeling

Hi again,

Chuck's comments helped me think a bit more about what fish do when one passes by while snorkeling, and the extent/duration of these impacts.
The benefit from doing this exercise could be to use the observed fish behavior as a discussion point during dive trainings...with the aim of minimizing impacts on fish when we're in the water. I've done this just before entering the water with crews, but I could/should stress it more. Maybe part of the mitigation measures within a proposed action could be a training component emphasizing the ways impacts to fish can and should be minimized.

Flick

-------- Original Message --------
Subject: Re: Fwd: Re: effects from snorkeling
Date: Mon, 26 Sep 2011 16:31:09 -0700
From: Don Flickinger <donald.flickinger@noaa.gov>
To:chuck glasgow <Chuck.Glasgow@noaa.gov>

Thanks for the reply, Chuck. Impacts from snorkel survey activities depend on the life stage encountered and the time of year...as you suggest. Adult spring Chinook tend to be most affected by snorkel passersby...either moving out of the way in a quick swimming burst, or temporarily relocating either upstream or downstream for a few minutes, or not changing position at all. When water temp is warm(er) and flows are low, fish tend to be lethargic and less likely to respond in any significant way when a snorkeler passes by. Juvenile fish move for cover if there is any available, or stay put if they are already in an optimal position for holding and feeding. Juveniles come out of their cover after several seconds to see if the "big shadow" has passed on by. My guess is that there may be some temporary increase in exposure to predators when such disturbance occurs, but this usually lasts for only a few seconds, or up 1-2 minutes at most (e.g., (re)counting fish clustered in a pool). During trainings, snorkelers are encouraged to minimize their impacts on the fish they are observing. This should be continued during future survey training exercises.

Flick