Appendix A – Fisheries Biological Assessment/Evaluation and Magnuson-Stevens Act Assessment

BIOLOGICAL ASSESSMENT

Project Name: McKenzie River Boat Launches Project

NEPA Document Name: McKenzie River Boat Launches Project, Willamette National Forest, 2006

Watershed Analysis: Upper McKenzie Watershed Analysis (1995); Quartz Creek and Minor Tributaries Watershed Analysis (1998).

Other ESA Consultation: None required

Administrative Unit: Willamette National Forest , McKenzie River Ranger District

Prepared By: Ramon Rivera, Supervisory Fisheries Biologist, McKenzie River Ranger District and Dave Kretzing, Supervisory Hydrologist, McKenzie River Ranger District

Reviewed By: Wade Sims, ESA Consultation Biologist (Fisheries), Willamette N.F.

Date of Final Version: December 13, 2006

Table 1. ESA Unit, Critical Habitat, and EFH Addressed in this BA:

ESA Listed Species or Habitat	ESA Status	ESA EFH Determination
Upper Willamette River Chinook Salmon	Threatened	May Affect, Likely to Adversely Affect
Critical Habitat - UWR Chinook Salmon	Designated	May Affect, Likely to Adversely Affect
Columbia River Basin Bull Trout	Threatened	May Affect, Likely to Adversely Affect
Critical Habitat - Columbia River Basin Bull Trout	Exempt	No Effect
Essential Fish Habitat – Spring Chinook Salmon	N/A	May Adversely Affect

Table 2. Project Location (See Figure 1 for map of 5th and 6th field HUCs)

USGS Hydrologic Unit Code (HUC)	HUC Scale	HUC Name	NW Forest Plan Key Watershed?
17090004	4th Field	McKenzie River	No
1709000401	5th Field	Upper McKenzie River	Yes
170900040106	6th Field	Boulder Creek / Frissell Creek	Yes
170900040109	6th Field	McKenzie Bridge	No
1709000405	5th Field	McKenzie River / Quartz Creek	No
170900040502	6th Field	McKenzie River / Elk Creek	No

INTRODUCTION

The McKenzie River is a popular boating river and is used by people from the Willamette Valley as well as Central Oregon. This project involves reconstructing or relocating existing boat launches in the upper McKenzie River. The three sites assessed in this document are Frissell, Paradise, and Bruckart.

Project design criteria were developed by an Interdisciplinary Team (IDT) that included engineering, recreation, fisheries, hydrology, wildlife, botany, and Special Uses Administrators. The intent is to minimize disturbance at all locations, and this is especially true for in-river work. For example, equipment will work from the bank as much as possible, but some in-river time will be required at Paradise Boat Launch to relocate some small boulders. As another example, designs will incorporate existing roads where possible at all sites and new roads will be carefully located to minimize the number of trees that will need to be cut.

Frissell boat launch is the most upstream of the three launches and lies within the Upper McKenzie Wild and Scenic River, and Oregon State Scenic Waterway. Paradise boat launch is located within the Paradise campground and day use complex. It lies within the Oregon State Scenic Waterway corridor, but is not in the Federal Wild and Scenic River corridor. Bruckart boat launch is the furthest downstream of the three locations and is located approximately one quarter mile upstream of Bruckart Bridge (Forest Road 19). Bruckart is neither a State Scenic Waterway or a Federal Wild and Scenic River.

DESCRIPTION OF THE PROPOSED ACTION

Purpose and Need:

The purpose and need for action is to improve public safety and relieve recreation user congestion at Frissell, Paradise, and Bruckart developed boat launch facilities.

There is also a need to provide developed recreation opportunities in the upper McKenzie River that are compatible with individual management area objectives and sensitive to public demand and use, as directed by the 1990 Willamette National Forest Land and Resource Management Plan, as amended. Alternative designs should consider current demand for boat launch facilities on the upper McKenzie River from the recreating public, for both private river trips and with permitted, special-use river guides.

The boat launch ramps at all three sites are constructed with mostly compacted gravel and have slopes in excess of 15%, creating unstable conditions for pedestrians and vehicles attempting to launch or land boats and inflatable rafts. Depending on the flow regime in a given year, fluctuations in river level and flow velocity remove gravel at all the ramps. All boat ramps, but especially Frissell and Bruckart, typically require semi-annual maintenance to replace gravel. There is a need to implement improvements at each boat launch due to deterioration, to reduce the safety hazards associated with accessing the launch sites, and to improve launching and landing conditions at the sites.

There is also a need to increase the staging areas at Frissell, Paradise, and Bruckart boat launch facilities to relieve periods of congestion when two or more boating parties are assembling, and/or launching boats or inflatable rafts.

Legal description of the project: T.16S., R.6E., Sec. 1, Willamette Meridian; Lane County, Oregon (Frissell Launch), and T.16S., R.6E., Sec. 9, Willamette Meridian; Lane County, Oregon (Paradise Launch), and T.16S., R.6E., Sec. 18, Willamette Meridian; Lane County, Oregon (Bruckart Launch).

See Figure 2 for a map showing the general vicinity of all boat launch locations analyzed in this BA.

Proposed Action:

The District Ranger of the McKenzie River Ranger District proposes to relocate boat launches at Frissell and Bruckart sites, and reconstruct the existing boat launch at Paradise in order to double its capacity.

The following actions are proposed at **Frissell Boat Launch** (Figure 3):

- Construct a new launch site by placing a pre-fabricated concrete ramp in a new location across the McKenzie River and downstream from the Frissell-Carpenter Bridge (river right looking downstream). The new ramp site would be approximately 16 feet wide by 40 feet long (640 square feet). The ramp would extend into the river approximately 10 to 15 feet from bankfull width (up to 240 square feet of concrete pad in river channel). See Figure 4.
- Construct a paved access road, loop road, staging area, and a concrete toilet pad for a "porta-pottie" at the new boat launch location. Design will utilize as much existing road as possible at this site in order to minimize disturbance. The total approximate area of disturbance for these actions is 10,936 square feet. See Figure 4.
- Improve two pull outs along Forest Road 2650 to provide parking for vehicles and trailers. Improvement is defined as blading the existing shoulders to ensure proper drainage and safety, conducting some brushing, and adding aggregate. These pullouts are disturbed ground and no new fill will be required to improve them. These existing pull outs are approximately 50 feet in length and 90 feet in length, and they are 10 feet wide (total area of 1,593 square feet – this figure includes "tapers" on the pullouts). Since no new ground would be disturbed to improve these pull outs (i.e. they are already disturbed ground) the square footage of "improvement" is not included in the total area of disturbance. See Figure 4.
- Decommission the existing boat launch on river left and restore the river bank and a portion of the terrace. The existing buttress logs and cable would be removed from the site. A portion of the existing pull-out access would remain along State Highway 126 for motor vehicles. See Figure 5.
- Rehabilitate the decommissioned boat ramp location and a portion of the highway pullout. This will be accomplished by grass seeding the old ramp site with native

grasses and red alder, planting vine maple trees, big leaf maple, and conifers (Douglas-fir or Western red cedar depending on what is available). The vegetation will be monitored thru the seasons (for up to 2 years) and if the site requires additional seeding or tree planting due to mortality or for any other reason, it will take place during the appropriate planting season. The large pull out will be rehabilitated by importing topsoil and shaping it into hummocks. These hummocks will be seeded with native grass and will serve as a barrier between the highway and the river by acting as a soil filter and as a berm that diverts water into existing vegetation. Vegetated hummocks are desired since this is a Federal Scenic Byway, and they will keep vehicles from driving onto the area. See Figure 5.

- The total approximate area of decommissioning for these actions is 2,670 square feet.

The following actions are proposed at **Paradise Boat Launch** (Figure 6):

- Place a pre-fabricated concrete ramp at the existing site that is wide enough to serve as two ramps that would have a decreased gradient relative to the existing ramp. The ramp would be 40 feet by 32 feet (1,280 square feet). The approach road is currently paved so the only new paving expected at the ramp will be the apron in order to connect the loop road to the concrete ramp (approximately 710 square feet of new pavement). The ramp would extend into the river approximately 10 to 15 feet from bankfull width (up to 480 square feet of concrete pad in river channel). The total area at the ramp site that would be concrete and asphalt is approximately 1,990 square feet. See Figure 7.
- Relocate approximately 20 small boulders (16 inches to 24 inches in diameter) that block use of the extended ramp width during low flow months. This will be accomplished by utilizing an excavator to place these small boulders further into the channel where the river can mobilize and relocate them. The excavator would have to wade approximately 25 feet into the river to accomplish this task. The river is approximately 145 feet wide in this location. See Figure 7.
- Provide additional road side parking in the day-use area. These sites are approximately 125 to 150 from the river and currently serve as defacto parking spaces that are not paved. This “additional” road side parking would formalize the areas by paving the bare sites. Some small trees less than 6 inches in diameter (big leaf maple, Western hemlock, and vine maple) would need to be cut. The additional areas would be 50 feet by 10 feet, and 80 feet by 10 feet which will increase the impervious area in the Paradise day use area by 1,449 square feet (this figure includes “tapers” on the pullouts). See Figure 7.
- Designate an additional staging area close to the launch area. This will be accomplished by signing an area that is currently not vegetated (it is a former historic camp site established by the CCC). No aggregate would be placed on this staging area, and no real “on the ground” changes will occur except for signing to designate it as a staging area. See Figure 7.

- Improve an existing user trail that is within bankfull width by placing spawning size gravels (1 to 3 inch), relocating large woody material, and trimming riparian vegetation. This user trail is approximately 20 feet away from the river during base flow conditions. The rationale for placing spawning size gravel on the trail is due to its location within bankfull width. If/when floods mobilize gravel on the user trail, it will at least be appropriate for spawning in whatever location the river places it. The piece of wood that needs to be relocated is 22 feet in length by 19.5 inches in diameter. It will be moved upstream onto the cobble bar and will remain within the bankfull channel. The riparian vegetation that needs to be trimmed is along the user trail and is comprised of alders and vine maple.

The following actions are proposed at **Bruckart Boat Launch** (Figure 8):

- Relocate the ramp to a new site downstream from Bruckart Bridge on the same side of the river (river right). The ramp would be made of prefabricated concrete and would be 16 feet wide by 40 feet in length (640 square feet). The ramp would extend into the river approximately 10 to 15 feet from bankfull width (up to 240 square feet of concrete pad in river channel). See Figure 9.
- Construct and pave an access road, loop road, turnout, parking stalls, staging area, and concrete toilet pad at the new site. The area will be designed to minimize the number of large trees that would need to be felled and moved. The total approximate area of disturbance for these actions is 19,840 square feet. See Figure 9.
- Provide additional parking along Forest Road 19 by widening the shoulders. This will require bringing in fill material in order to widen the shoulders and pave them. One parking area would be 90 feet long by 10 feet wide (900 square feet), and the other would be 150 long by 10 feet wide (1,500 square feet) on the opposite side of Road 19 (2,400 square feet in total). See Figure 9.
- Decommission the existing boat launch site. This will be accomplished by grass seeding the old ramp site with native grasses and red alder, planting vine maple, big leaf maple, and conifers (Douglas-fir or Western red cedar depending on what is available). The vegetation will be monitored thru the seasons (for up to 2 years) and if the site requires additional seeding or tree planting due to mortality or for any other reason, it will take place during the appropriate planting season. See Figure 10.
- Decommission an existing loop road that connects Bruckart landing to Forest Road 19. This road is composed of native surface and is compacted. Decommissioning will be accomplished by scarifying the surface layer 2 to 4 inches in depth. The underlying subsoil is comprised of glacial-fluvial deposits that are very permeable and porous so no surface runoff is expected after scarification. Native grass seed will be applied to the scarified surface to prevent soil erosion and will be monitored for 2 years. If for any reason further seeding is required, it will take place during the appropriate planting season. The length of existing loop road that would be decommissioned is approximately 861 feet. See Figure 10.

- The total approximate area that would be decommissioned is 10,000 square feet.

Table 3. Summary of Project Area Impacts Described Above[a]

Site	Total Impact in Square Feet	Total Decommissioned in Square Feet	Total Concrete Ramp in Bankfull Width in Square Feet[b]
Frissell	10,936	2,670	240
Paradise	3,439	0	480
Bruckart	19,900	10,000	240

[a] These figures are approximate as designs are conceptual, and they represent a "worst case scenario." That is, the total area impacted will likely be less and the total area restored will likely be greater. All of the area summarized is within the Riparian Reserve.

[b] This figure is included in the "total impact" column and represents the amount of ramp that would be "in the water" during bankfull flows.

General Project Design Features

In addition to site specific measures identified in this document, this project will comply with all applicable Oregon State Water Quality statutes through compliance with Forest Plan Standards and Guidelines and General Water Quality Best Management Practices (USDA Forest Service, November 1988) as per the following document signed by both parties on May 10, 2002.

> NFS 02-MU-11060000 MEMORANDUM OF UNDERSTANDING between USDA FOREST SERVICE and OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY TO MEET STATE AND FEDERAL WATER QUALITY RULES AND REGULATIONS.

The General Water Quality Best Management Practices (USDA Forest Service, November 1988) requires an Erosion Control Plan. Prior to starting work the Contractor submits a plan which sets forth erosion control measures to be used. Operations cannot begin until the Forest Service has given written approval the plan. The plan recognizes mitigation measures required in the contract. All contracts specify that operations be scheduled and conducted to minimize erosion.

Approval of the erosion control measures plan will be conducted using an interdisciplinary approach. The measures approved by the interdisciplinary team will be reflected in the contracts specifications and provisions. Monitoring and enforcement of the erosion control plan will be the responsibility of the Contracting Officer's Representative (COR). Watershed and fisheries specialists will be on the work site during in-river work.

In the case of a hazardous spill, the Willamette National Forest has a Hazardous Spill Control and Emergency Response Plan (signed by Forest Supervisor Dallas Emch on February 17, 2004). The plan contains specific information and requirements on the following:

- Emergency Notification
- Quick Response Checklist
- Hazardous Spill Coordinators & Key District Personnel
- Federal Emergency Response – U.S. Coast Guard & EPA
- Forest Service - Scope & Purpose
- Elements of the Emergency Response Plan
- Pre-emergency Planning and Coordination with Outside Parties
- Personnel Roles, Lines of Authority, Communication and Training
- Emergency Recognition and Prevention
- Safe Distances and Places of Refuge
- Site Security and Control
- Evacuation Routes and Procedures
- Decontamination
- Termination, Critique of Response and Follow Up

The contractor shall have two SPILL RESPONSE KITS on the project whenever equipment is operating. One spill kit shall be sufficient to absorb 34 gallons of oil, designed to float on the surface, while absorbing oil and repelling water.

Equipment shall be furnished on a fully operational basis, of modern design and in good operating condition with no fuel or oil leaks. All equipment shall be power washed to remove all foreign or noxious seeds/weeds prior to entering Forest Service lands.

Specific Project Design Features

- During construction activities, silt barriers will be placed as needed to prevent movement of sediment from the worksite to the river. Fisheries or watershed personnel will be consulted on the need for, and the specific locations for placement of these barriers. These measures will be requirements in the contract.
- Upon completion of construction activities areas of exposed soil will be seeded or planted with native species. Areas will be mulched with weed free straw to prevent erosion and potential sediment transport. These measures will be requirements in the contract.

- All equipment that will be used for instream work in the McKenzie River will be cleaned of grease, oil, and other solvents prior to use, and will be equipped with drip pans or diapers and water friendly fluid systems (i.e. non-petroleum based fluids). These measures will be requirements in the contract.
- Fuel storage will not be permitted within Riparian Reserves (within 320 feet of fish bearing streams). Fueling sites will be designated by the COR and will not be within 150 feet of water. These measures will be requirements in the contract.
- New and roads, staging areas, and parking areas will be designed to shed water into vegetation. The areas where new construction would take place are composed of glacial/fluvial material and soils are very porous and permeable. Due to these conditions no surface runoff to the river is expected. The exception to this is the ramp itself where rain water would like shed to the river before entering the soil.
- Any trees that need to be removed for the project would be spread in the Riparian Reserve in a fashion that does not cause too much disturbance; trees that are suitable for fish habitat projects will be staged for use at a future time.
- The project will be designed to minimize the need to cut big trees.
- Work in the McKenzie River will take place during the instream work period (July 1 – August 15).

Project Elements:

This project has been separated into 2 project elements which are described below.

New boat launch construction on the river terrace, river bank, and river bed.

- Placement of pre-fabricated concrete ramp in the floodplain and river channel.
- Construction of loop roads, staging sites, and parking sites.
- Manipulation of boulders in river channel, and relocation of one piece of woody material at Paradise.

Decommissioning of old boat launch sites at Frissell and Bruckart.

- Removing any structural elements.
- Shallow ripping compacted areas and re-vegetating, and/or bringing in topsoil and placing it in hummocks and vegetating.

Element 1: New boat launch construction on the river bed, river bank, and river terrace.

Frissell Boat Launch

The **Action Area (Figure 11)** for this element and location is defined as approximately one quarter of the terrace area on river right downstream of the Frissell-Carpenter Bridge

(approximately 250,000 square feet or about 5.7 acres); the 2650 road including improved shoulder parking and length to the designated fueling area which is 800 feet away from any surface water (this is an established waste area and any waste will be placed here outside of the floodplain); an area of the floodplain approximately 40 feet long by 16 feet wide (640 square feet) where the ramp will be placed; an area from the new ramp location out into the river 65 feet (the bankfull width of the river is approximately 130 feet at this location) to a downstream point 300 feet from the new ramp location (19,500 square feet of the rivers surface area), and including the average depth of the river at this location which is 5 feet (300'x65'x5' = 97,500 cubic feet).

Placement of pre-fabricated concrete ramp in the floodplain and river channel

- Construction of the new launch site will be accomplished by placing a pre-fabricated concrete ramp in a new location across the McKenzie River from the existing ramp and downstream from the Frissell-Carpenter Bridge (river right looking downstream). This action will require the removal of 12 to 20 red alder which will be spread out in the floodplain and/or Riparian Reserve. Removal and relocation of the alders should take no more than one working day. Placement of the concrete ramp in the floodplain and river bed should take no more than one working day. In-water work would occur during the in-water work period (July 1 to August 15) unless otherwise required and authorized by NMFS, USFWS, and ODFW.

Construction of loop road, staging site, and parking sites

- Work activities on the terrace could take up to 2 months and will take place during the summer (likely between July and September). The terrace where the new boat launch site will be located is used by dispersed campers and there is a web of native surface roads in the area. Construction of the access road, loop road, staging area, and toilet pad will be designed to shed surface runoff into existing vegetation on the terrace. Given the flat nature of the terrace (See Figure 11) and the permeable soils, no surface runoff directly into the river is expected from these sites. The obvious exception to this being the ramp itself which will likely shed surface water toward the river.
- Some large conifers (20 to 50 inches in diameter) may need to be felled and moved in order to construct the new site, but our intent is to use as much currently disturbed area as possible to minimize the need to cut trees. It is unknown at this time how many trees will need to be cut, but those trees that are suitable for fish habitat work will be staged for future projects. Those trees not suitable for fish habitat work will be placed within the Riparian Reserve in appropriate areas. That is, where they will not interfere with the boat launch site or dispersed camp sites, and where it is practical to place them without too much additional disturbance by the equipment.
- Parking will be provided along the 2650 road by improving existing pull outs along the road. Improvement is defined as blading the existing shoulders to ensure proper drainage and safety, conducting any needed brushing, and placing

aggregate. These pullouts are on previously disturbed ground and no new fill will be required to improve them.

Paradise Boat Launch

The **Action Area (Figure 12)** for this element and location is defined as the Paradise day use area including all existing loop roads, parking sites, and picnic areas; two sites in the day use area that are adjacent to the existing loop road and parking area (50 feet by 10 feet, and 80 feet by 10 feet); an area of the floodplain approximately 40 feet long by 32 feet wide (1,280 square feet) where the ramp will be placed; an area from the new ramp location out into the river 65 feet (the bankfull width of the river is approximately 144 feet at this location) to a downstream point 300 feet from the new ramp location (19,500 square feet of the rivers surface area), and including the average depth of the river at this location which is 7 feet (300'x65'x7' = 136,500 cubic feet).

Placement of pre-fabricated concrete ramp in the floodplain and river channel

- Construction of the new launch site will be accomplished by placing a pre-fabricated concrete ramp in the existing location that would be wide enough to serve as two ramps. The new ramp would be approximately 32 feet wide by 40 feet long. The approach road is currently paved so the only new paving expected at the ramp will be the apron in order to connect the loop road to the concrete ramp. The apron is located approximately 20 to 25 feet away from the McKenzie River at base flow conditions. The ramp would extend into the river approximately 10 to 15 feet from bankfull width (up to 480 square feet of concrete pad in river channel). No trees will need to be removed in order to place the new ramp, but a stump will be removed. In-water work would occur during the in-water work period (July 1 to August 15). In-water work to place the concrete ramp should take no more than one work day.

Construction of additional parking sites

- The construction of additional parking sites is within 150 feet of the river but there is vegetative buffer between the two, and no overland flow of sediment or sheeting over pavement is expected to directly reach the river. Work could take 3 to 4 weeks to complete in the day use area.

Relocation of small boulders and woody material

- Relocation of approximately 20 small boulders (16 inches to 24 inches in diameter) that block use of the extended ramp width during low flow months will be accomplished by have an excavator place these small boulders further into the channel where the river can mobilize and relocate them. The excavator would have to wade approximately 25 feet into the river to accomplish this task. The river is approximately 145 feet wide in this location. The piece of wood that needs to be relocated is 22 feet in length by 19.5 inches in diameter. It will be moved upstream onto the cobble bar and will remain within the bankfull channel.

All of this work should take no longer than half of a work day, and will likely take place before the concrete ramp is placed.

Bruckart Boat Launch

The **Action Area (Figure 13)** for this element and location is defined as the portion of the river terrace downstream and upstream of Bruckart Bridge (Forest Road 19) on river right that is National Forest System lands (approximately 1000 feet by 500 feet = 500,000 square feet or 11.5 acres); the portion of Forest Road 19 from its junction with Highway 126 to its junction with Road 1900-410 (approximately 1.0 mile); Forest Road 1900-410 from its junction with Road 19 approximately 2 miles to Strube Flat (an established waste area outside of the floodplain); an area from the new ramp location out into the river 65 feet (the bankfull width of the river here is approximately 160 feet) to a downstream point 300 feet from the new ramp location (19,500 square feet of river surface area), and including the average depth of the river which is estimated to be 7 feet at this location (300'x65'x7' = 136,500 cubic feet).

Placement of pre-fabricated concrete ramp in the floodplain and river channel

- Construction of the new launch site will be accomplished by placing a pre-fabricated concrete ramp in a new location on the same side of the river, but downstream of Bruckart Bridge (river right looking downstream). The new ramp would be approximately 16 feet wide by 40 feet long. The ramp would extend into the river approximately 10 to 15 feet from bankfull width (up to 240 square feet of concrete pad in river channel). This action will require the removal of 12 to 20 red alder and about 6 small conifers (less than 6 inches in diameter) which will be spread out in the floodplain and/or Riparian Reserve. Removal and relocation of the trees should take no more than one working day. Placement of the concrete ramp in the floodplain and river bed should take no more than one working day. In-water work would occur during the in-water work period (July 1 to August 15).
- Construction of loop road, staging site, and parking sites
- Work activities on the terrace could take up to 2 months and will take place during the summer (likely between July and September). Construction of the access road, loop road, parking stalls, turnout, staging area, and toilet pad will be designed to shed surface runoff into existing vegetation on the terrace. Given the flat nature of the terrace and the permeable soils, no surface runoff directly into the river is expected from these sites. The obvious exception to this being the ramp itself which will likely shed surface water toward the river.
- Some large conifers (20 to 50 inches in diameter) may need to be felled and moved in order to construct the new site, but our intent is to design the loop road in a fashion that minimizes the need to cut large trees. It is unknown at this time how many trees will need to be cut, but those trees that are suitable for fish habitat work will be staged for future projects. Those trees not suitable for fish habitat work will be placed within the Riparian Reserve in appropriate areas. That is,

where they will not interfere with the boat launch site, and where it is practical to place them without too much additional disturbance by the equipment.

Element 2: Decommissioning of old boat launch sites at Frissell and Bruckart.

No decommissioning activities are proposed at the Paradise boat launch or day use area.

Frissell Boat Launch

The **Action Area (Figure 11)** for this element and location is defined as all portions of the existing Frissell boat ramp and Highway pullout; the 2650 road length to the designated fueling area which is 800 feet away from any surface water (this is an established waste area and any waste will be placed here outside of the floodplain); an area from the old ramp location out into the river 65 feet (the bankfull width of the river is approximately 130 feet at this location) to a downstream point 300 feet from the new ramp location (19,500 square feet of the rivers surface area), and including the average depth of the river at this location which is 5 feet (300'x65'x5' = 97,500 cubic feet).

Removing structural elements

- Decommission the existing boat launch on river left and restore the river bank and a portion of the terrace. The existing buttress logs and cable would be removed from the site. This should take less than one working day.

Shallow ripping compacted areas and re-vegetating, and/or bringing in topsoil and placing it in hummocks and re-vegetating

- Rehabilitate the decommissioned boat ramp location and a portion of the highway pullout. The ramp site will not be scarified with heavy equipment because it already has loose soils due to use. Some of this soil may be removed if we determine it will likely enter the river. If any scarification is needed of the ramp site, it would be accomplished with a hand rake in order to minimize disturbance while still providing a seed bed for grass and red alder. In addition to grass seeding the old ramp site with native grasses and red alder, we would spread straw mulch, plant vine maple, big leaf maple, and conifers (Douglas-fir or Western red cedar depending on what is available). The vegetation will be monitored thru the seasons (for up to 2 years) and if the site requires additional seeding or tree planting due to mortality or for any other reason, it will take place during the appropriate planting season.
- A portion of the large pull out, located on a relatively flat terrace separating the highway from the McKenzie River, will be rehabilitated by scarifying the compacted layer no greater than 4 inches in depth and importing topsoil that will be shaped into hummocks and a soil windrow. These structures will be seeded with native grass and will serve as a barrier between the highway and the river by acting as a soil filter and as a berm that diverts water into existing vegetation.

Vegetated hummocks are desired since this is a Federal Scenic Byway and they will keep vehicles from driving onto the area. This technique has been used on other sections of Highway 126 and has been successful at preventing surface runoff from directly reaching the river.

- Decommissioning activities and rehabilitation work is estimated to take up to 5 working days and will take place during the summer (likely between July and September).

Bruckart Boat Launch

The **Action Area (Figure 13)** for this element and location is defined as all portions of the existing Bruckart boat ramp and parking area; the loop road between the parking area and Forest Road 19; an area from the old ramp location out into the river 65 feet (the bankfull width of the river here is approximately 160 feet) to a downstream point 300 feet from the new ramp location (19,500 square feet of river surface area), and including the average depth of the river which is estimated to be 7 feet at this location (300'x65'x7' = 136,500 cubic feet).

Removing structural elements

The existing ramp and a portion of the parking area are comprised of concrete, asphalt, and aggregate. All concrete and asphalt will be removed. This activity is estimated to take up to 2 working days.

Shallow ripping compacted areas and re-vegetating, and/or bringing in topsoil and placing it in hummocks and re-vegetating

- The techniques used at Frissell would also be used on the old Bruckart ramp site. That is, we will remove any loose material that could enter the river, scarify with hand rakes, straw mulch, seed with native grasses and red alder, plant vine maple, big leaf maple, and conifers (Douglas-fir or Western red cedar depending on what is available). The vegetation will be monitored thru the seasons (for up to 2 years) and if the site requires additional seeding or tree planting due to mortality or for any other reason, it will take place during the appropriate planting season. A windrow made of topsoil will be used to ensure that any potential surface runoff is diverted away from the old ramp slope and into existing vegetation.
- Decommissioning an existing loop road that connects Bruckart landing to Forest Road 19 will be accomplished by placing hummocks at the junctions of the road and grass seeding. The remainder of the road would be scarified to a depth of 2 to 4 inches and grass seeded. The road is located on a flat terrace approximately 10 to 50 feet from the McKenzie River. The underlying subsoil is glacial-fluvial deposits that are very permeable and porous so no surface runoff is expected. Native grass seed will be applied to the scarified surface to prevent soil erosion and will be monitored for 2 years. If for any reason further seeding is required, it will take place during the appropriate planting season.

Evaluation of Baseline Condition for McKenzie River Boat Launches Project Upon Bull Trout and Spring Chinook Salmon in the Upper McKenzie River 5th Field Watershed.

Upper McKenzie River 1709000401 (5th field HUC)

Boulder Creek/Frissell Creek 170900040106 (6th field HUC)

McKenzie Bridge 170900040109 (6th field HUC)

Note: Discussion of population characteristics in the Baseline Condition evaluation also includes information from the Kink Creek 6th field sub-watershed (170900040103), The Smith River 6th field sub-watershed (170900040104) and the Deer Creek 6th field sub-watershed (170900040105). These sub-watersheds are not in the project area for the boat launches project, but important information on bull trout and spring Chinook salmon has been collected in these sub-watersheds so it is presented as background information within the context of the 5th field watershed.

POPULATION CHARACTERISTICS (Bull Trout)

Population Size and Distribution:

Buchanan and others (1997) documented three isolated bull trout populations in the McKenzie River and they are: (1) the Mainstem population, (2) the South Fork Population, and (3) the Trail Bridge population. Both the Mainstem and Trail Bridge populations can be found within the Upper McKenzie River 5th field watershed. The South Fork is a separate 5th field watershed, but redd numbers are provided.

Table 4. Bull trout redd counts from spawning surveys by ODFW, Stillwater Sciences and Forest Service; 1989-2005.

Year	McKenzie River Population									Trail Bridge Population			S.Fk McKenzie Pop.	
	Anderson Creek				Olallie Creek			McKenzie River below Trail Bridge Dam	Total McKenzie Population					
	Below Culvert	USFS Index Reach	Above Culvert	Total Stream	Below Culvert	Above Culvert	Total Stream			McKenzie R. above Trail Bridge Dam	Sweetwater Creek	Total Trail Bridge Population	Roaring River	Total S.Fk McKenzie Pop.
1989	-	7	-	**7**	-	-	-	-	**7**	-	-	-		-
1990	-	9	-	**9**	-	-	-	-	**9**	-	-	-		-
1991	0	8	8	**8**	-	-	-	-	**8**	-	-	-		-
1992	4	13	9	**13**	-	-	-	-	**13**	-	-	-		-
1993	4	15	11	**15**	-	-	-	-	**15**	-	-	-		**1**
1994	7	22	23	**30**	3	-	**3**	-	**33**	0	0	**0**		**1**
1995	3	30	70	**73**	1	9	**10**	-	**83**	7	0	**7**		**2**
1996	1	26	81	**82**	0	7	**7**	-	**89**	7	0	**7**		**0**
1997	7	18	78	**85**	0	9	**9**	-	**94**	3	0	**3**		**0**
1998	4	29	75	**79**	0	7	**7**	-	**86**	2	0	**2**		**6**
1999	13	47	64	**77**	0	6	**6**	-	**83**	0	0	**0**		**13**
2000	15	44	68	**83**	0	9	**9**	-	**92**	0	2	**2**		**25**
2001	6	23	66	**72**	2	4	**6**	-	**78**	1	2	**3**		**34**
2002	9	31	51	**60**	5	5	**10**	-	**70**	3	1	**4**		**25**
2003	6	23	50	**56**	7	10	**17**	0	**73**	9	4	**13**		**27**
2004	6	24	43	**49**	7	5	**12**	1	**62**	15	9	**24**[a]		**32**
2005	7	24	40	**47**	7	5	**12**	2	**61**	10	9	**19**		**35**

[a] The high redd count in 2004 for the Trail Bridge population can be attributed to an increased effort in survey.

Table 5. Total Bull Trout Redd Tally for Upper McKenzie River 5th Field Watershed

Year	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Redds	33	90	96	97	88	83	94	81	74	86	86	80

Additional estimates of the population size for bull trout were made for the Trail Bridge population as part of a hydropower licensing effort. Stillwater Sciences is the consultant to the Eugene Water & Electric Board (EWEB) and the following table displays their estimates.

Table 6. Population estimates for Trail Bridge bull trout. Confidence intervals in parentheses when available. Based on Stillwater Sciences (2006c and 2006f)

Life-stage	Year	Method	Estimated population size +/- 95% C.I.
Adults	2004	Two adults for every confirmed bull trout redd, and half the "unknown" redds (11). Assumes annual spawning.	70[a]
	2004	Petersen estimator applied to redd counts and PIT tag recaptures of adults	141 +/- 41
Adults/subadults combined	2005	Program MARK	105 (30-280)
	2004	Program MARK	111 (29-307)
	2004	Baited Video Station estimate for bull trout > 200 mm (7.9 in) FL	254 (128-538)[b]
Juveniles	2004	Total number observed in snorkel survey of all habitat units	14 in Sweetwater Creek
		Extrapolated snorkel survey results	377 (168 minimum) in Carmen Bypass Reach
	2005	Modified Petersen estimator	351 +/- 253 in Trail Bridge Reservoir
		Program MARK	264 (121 – 725) in Trail Bridge Reservoir
Fry outmigrating from Carmen Bypass Reach	2004	Petersen estimate	802
	2005	Petersen estimate	841

[a] This estimate is conservative, if a proportion of the population spawns bi-annually. Stillwater Sciences (2006c) cite Baxter and Baxter (2002) as evidence that some populations spawn every other year.
[b] This estimate is higher than other estimates partly because it includes large juveniles in the calculation.

Baseline Condition: Based upon redd surveys and abundance estimates for the Trail Bridge population it is likely that the number of adult bull trout in the Upper McKenzie River 5th field HUC is between 50 and 500. Population size is estimated at 194 adult fish in calendar year 2004 with 70 fish from Trail Bridge, and 124 fish from the Mainstem (2 fish per redd). This estimate would be conservative since some bull trout may spawn bi-annually, and it is typical to see a small "satellite" male with a larger spawning pair so some redds have 3 fish. This indicator is considered to be FUNCTIONING AT RISK.

Growth and Survival:

Information on the Trail Bridge population has recently been collected by Stillwater Sciences (2006c) on growth, age structure, and survival. However, there is some information that was collected on PIT tagged fish that were located downstream of Trail Bridge dam. They become de facto Mainstem bull trout when they are entrained at Trail Bridge. The following is a summary of their findings.

Age determinations based on scale analysis were precise to +/- 1-year. A sub-sample of scales was evaluated on separate occasions to estimate the precision of age determinations. Agreement was reached between the final age determinations for 37% of the samples (n = 63), with 78% of the disagreements being 1 year apart, and 22% at 2 years apart (n = 40).

Growth rate of bull trout in Stillwater Science's Study Area did not appear dependent on initial size (see Table 7 below). Size-at-age data from scale analysis indicated that bull trout in the Study Area are typically age 3 or older when they become subadults, and are generally older than age 4 when they become adults. Based on size, the range in spawning age is between ages 4 and 7. Reservoir trapping captures indicated that a variety of ages/sizes of bull trout are currently residing in Trail Bridge Reservoir. No bull trout older than age 7 were observed. The data suggest that a portion of the bull trout population remains in Carmen Bypass Reach until at least age 4, while only reaching 200 mm FL.

Table 7. Annual growth rates of bull trout in the Study Area (from Stillwater Sciences 2006c).

Life stage (sample size)	**Initial size FL**			**Individual growth rates cm/yr (in/yr)**		
	Min cm (in)	**Max cm (in)**	**Avg cm (in)**	**Min cm/yr (in/yr)**	**Max cm/yr (in/yr)**	**Avg cm/yr (in/yr)**
Subadult and adult (n = 11)	33.5 (13.2)	58.4 (23.0)	44.7 (17.6)	2.9 (1.1)	10.6 (4.2)	5.9 (2.3)
Juvenile (n = 5)	14.2 (5.6)	23.0 (9.1)	18.1 (7.1)	3.6 (1.4)	12.8 (5.0)	6.7 (2.6)

Stillwater Sciences (2006c) assessed bull trout survival using PIT tag recapture data to estimate minimum annual survival, and minimum over-winter survival (see Table below). All 2003 tags detected or recaptured in 2005 had been previously detected or recaptured in 2004. Annual survival rates were also estimated using Program MARK (see Table below). Low recaptures of subadults in 2005 prevented an estimate of survival of subadults tagged in 2004. Recapture periods of juveniles were too varied to estimate confidence intervals, and these estimates should be considered less precise than those for subadult and adults.

Table 8. Bull trout survival estimates, 2003-2005.

Life stage	Year tagged	Annual survival estimate (%) +/- 95% C.I.	Method
Adult	2003	53	Minimum estimate based on PIT tag recaptures
		75 (52-89)	Program MARK
Subadult		38	Minimum estimate based on PIT tag recaptures
		66 (46-89)	Program MARK
Adult	2004	20	Minimum estimate based on PIT tag recaptures
		84 (66-94)	Program MARK
Subadult		17	Minimum estimate based on PIT tag recaptures
Juvenile		6	Minimum estimate based on PIT tag recaptures
		40	Program MARK

The only information on the resilience of bull trout populations is for the Trail Bridge population. This information was developed by Stillwater Sciences (2006f) using a population dynamics model.

The bull trout population upstream of Trail Bridge Dam exhibited a high resiliency in recovering from a modeled catastrophic fish kill of all life-stages of bull trout in lower Carmen Bypass Reach (the McKenzie River between the head of Trail Bridge Reservoir and Tamolitch Falls) and Sweetwater Creek. In the years following the fish kill, the adult population in Trail Bridge Reservoir would be maintained by the abundance of age 2+ juveniles and subadults rearing there. However, once the current population of age 2+ juveniles became subadults, the lack of recruitment of age 2+ juveniles from Carmen Bypass Reach and Sweetwater Creek would limit recruitment to the subadult life-stage; for the next two years, the adult population would decrease based on the estimated annual adult mortality of 20%. Three years following the disturbance, age 2+ recruits from Carmen Bypass Reach and Sweetwater Creek would again become available to recruit to the subadult life-stage in Trail Bridge Reservoir, and 4 years following the disturbance, the subadults would be available to recruit to the adult population. The age structure of the adult populations would be biased toward older fish (> age 5) individuals until subadult to adult recruitment resumed.

The bull trout population upstream of Trail Bridge Dam also showed a high resiliency in recovering from a modeled catastrophic fish kill of all life-stages of bull trout in Trail Bridge Reservoir. During the year of the fish kill, the subadult/adult population would be extirpated. By the first year following the disturbance, age 2+ juveniles would seed the reservoir from production in the lower Carmen Bypass Reach and Sweetwater Creek, and

by the second year these juveniles would recruit to the subadult life-stage, and to the adult life-stage within three years following the disturbance. The age structure of the adult population would be biased towards younger (all age 4 fish) individuals in the third year following the disturbance, and the proportion of older adults would increase each year thereafter.

Overall, short-term alterations in the amount or quality of habitat (e.g. physical habitat, food availability) at crucial life-stages are not likely to cause long-term effects on the bull trout population. The bull trout population is highly resilient to disturbance based on:

- Age structure of adult population from age 4+ to 7+ (Stillwater Sciences 2006c),
- High production of juveniles relative to the adult population,
- Spawning habitat in both the Carmen Bypass Reach and Sweetwater Creek, and
- Habitat supporting rearing to age 2+ juveniles in both the Carmen Bypass Reach and Sweetwater Creek.

Baseline Condition: The findings by Stillwater Sciences (2006f) suggest that the Trail Bridge population is resilient to single pulse catastrophic disturbance. Based on redd surveys, the Trail Bridge population appears to be on the increase and the Mainstem population appears to be decreasing. This steady reduction in the number of redds for the Mainstem population is troubling and of concern, but it does not appear to be based on habitat factors or water quality. Due to this steady reduction in redd numbers in Anderson Creek this indicator is considered FUNCTIONING AT RISK.

Life History Diversity and Isolation:

The migratory form is present in the Trail Bridge and Mainstem bull trout populations. Habitat is considered good to excellent. However, Trail Bridge Dam does not have upstream passage facilities. Downstream passage (entrainment) occurs through the turbines and via the spillway (Stillwater Sciences 2006b). If a bull trout survives entrainment, they are lost to the Trail Bridge population and become part of the Mainstem population. It is unknown if these entrained fish spawn in Anderson or Olallie Creek.

Two culverts under Highway 126 have been replaced with baffled pipes (Olallie Creek and Sweetwater Creek) and are effective in passing adult bull trout. The culvert at Anderson Creek has not been barrier.

Baseline Condition: Due to the lack of connectivity between the Mainstem and Trail Bridge populations because of the dam, this indicator is considered to be FUNCTIONING AT RISK.

Persistence and Genetic Integrity:

As stated above, Trail Bridge Dam does not have passage and this restricts connectivity. In addition, Stillwater Sciences (2006a) and Spruell (2006) found that bull trout /brook

trout hybrids are present above Trail Bridge Dam. They also noted that the potential effects of brook trout on bull trout may be changing. The bull trout population above Trail Bridge Dam appears to be increasing, and trap sampling suggests that brook trout abundance has decreased in Trail Bridge Reservoir over the last 10-15 years. However, bull trout and brook trout hybridization continues even with shifts in relative abundance.

Baseline Condition: Given these conditions this indicator is considered to be FUNCTIONING AT RISK.

Water Quality:

Temperature:

The following table provides the seven day average maximum for various streams within the Upper McKenzie River 5th field HUC. This data was collected by the Forest Service.

Table 9. 7-day average maximum for various streams within the Upper McKenzie River 5th field HUC

Stream Name	Geographic Description of Sensor Location	Geologic Province	7-Day Average Maximum in Degrees Celsius	Date of Maximum Temperature
Anderson Creek (Boulder Cr / Frissell Cr 6th)	At Highway 126	New High Cascades	**6.6**	September 14
Boulder Creek (Boulder Cr / Frissell Cr 6th)	Near Mouth	Old High[a] Cascades	**13.1**	August 8
McKenzie River (Boulder Cr / Frissell Cr 6th)	Below Trail Bridge Dam	Primarily High Cascades at this point, but influenced by Smith River watershed and Trail Bridge Reservoir upstream	**10.6**	August 4
McKenzie River (McKenzie Bridge 6th)	Near Ranger Station	McKenzie[b] River Glacial Valley	**12.2**	August 9
Olallie Creek (Boulder Cr / Frissell Cr 6th)	At Highway 126	New High Cascades	**5.5**	July 10
Scott Creek (Boulder Cr / Frissell Cr 6th)	Near Mouth	Old High Cascades	**12.2**	August 10

[a] The term Old High Cascades is used only to describe how Scott Creek and Boulder Creek cut through Pleistocene glacial deposits and "New" High Cascade lavas in their headwater areas, but further downstream incise underlying older High Cascades lava that have been subjected to fluvial processes for a longer period of time and McKenzie River glacial deposits.

[b] The term "McKenzie River Glacial Valley" is used at this site since because the river is in a glacial valley confined by two east-west trending ridges, but is not a recognized province name.

Bull trout spawning does not take place near any of the boat launch locations. The closest known spawning is in Olallie Creek which is 6 miles upstream of Frissell launch (the most upstream site).

Based on snorkel surveys conducted by ODFW and bank observations along the McKenzie River by the Forest Service, it appears that bull trout fry rearing is primarily taking place in the tributaries where spawning takes place. Forest Service monitoring and inventories have only documented fry in streams where the 7-day average maximum does not exceed 7.5^{o} C. Buchanan and Gregory (1997) indicate that optimal "early" fry rearing takes place at temperatures 4-4.5^{o} C and "late" fry rearing at temperatures from 4-10^{o} C. Spence (1996) also indicated that these temperatures were optimal. Temperatures downstream of Deer Creek are just over 10^{o} C. Due to river temperature conditions, and since Forest Service and ODFW inventories have not documented bull trout fry downstream of Deer Creek, it is highly unlikely that bull trout fry will be affected by boat launch activities.

Bull trout juveniles rear in the same areas where spawning takes place and temperatures are below 12 ^{o} C in these areas, but older juveniles have been seen in the mainstem river as far downstream as Frissell Creek (Stillwater Sciences 2006c) where temperatures are around 10 degrees Celsius. Suitable temperatures in the river exist as far downstream as Lost Creek (9.3 ^{o} C in Lost Cr.).

Adult and sub-adult bull trout use these areas as well, and temperatures are below 15^{o} C. These life history stages have also been documented in Deer Creek (19^{o} C near mouth, and 16.7^{o} C above the powerline). It is presumed that sub-adult and adult bull trout are entering these systems to forage on prey species because conditions are not suitable for spawning or rearing.

Deer Creek is a Western Cascade stream and as such it is typically warmer, produces more sediment, and has a flashier hydrograph than High Cascade Streams USDA Forest Service 1995). Deer Creek has been impacted by human activities (hydropower transmission lines, timber harvest, and road construction) and these activities have likely affected stream temperatures.

Although Deer Creek is relatively warm (19^{o} C at mouth), as it enters the mainstem McKenzie River these warm temperatures are overwhelmed by flows from the mainstem and Olallie Creek. Water from the McKenzie River and Olallie Creek comes from cold water springs with steady flows. The following table shows 7-day monthly maximum temperatures in years 2004 and 2005 for sites above and below the Deer Creek confluence with the McKenzie River.

Table 10. Monthly Maximum 7-Day Average Temperatures in McKenzie River in Degrees Celsius (Fahrenheit) (Stillwater Sciences 2006h)

Location	Year	7-Day Monthly Maximum	Month
Upstream of Deer Creek Confluence	2004	9.3 (48.7)	July and August
Downstream of Deer Creek Confluence	2004	10.3 (50.5)	July
Upstream of Deer Creek Confluence	2005	9.3 (48.7)	July and August
Downstream of Deer Creek Confluence	2005	10.1 (50.2)	July and August

Note: all sites are within the Boulder Creek / Frissell Creek 6th field sub-watershed.

In September 1999, a project was implemented to collect stream temperatures in the McKenzie River using Forward Looking Infrared (FLIR) technology (Torgersen, et. al.) which documented similar effects. That is, Deer Creek water was warm, but when it entered the McKenzie River it was overwhelmed by Ollalie Creek's cold water influence.

Baseline Condition for bull trout: Although Deer Creek is above 15 degrees Celsius for periods of the year, the overwhelming influence of spring fed water maintains cold water temperatures in areas where bull trout adults and sub-adults migrate (i.e. there are no thermal barriers to migration from adult rearing areas to spawning areas). Temperatures are well within tolerance limits for juvenile rearing in the 5th field. Temperatures are good for bull trout spawning in known spawning areas. Incubation is above the 5 degree threshold during some part of the year in every stream except Olallie Creek. This is typically during spawning, and temperatures drop during the winter. The temperature sensor in this 5th field that is in the most downstream location, and is in the mainstem river (McKenzie River near Ranger Station), has a 7-day average maximum of 12.2 degrees Celsius in August. Despite the warm water temperatures that come from Western Cascade streams this indicator is considered to be PROPERLY FUNCTIONING for bull trout due to the overwhelming influence of spring fed water in the 5th field.

Baseline Condition for spring Chinook salmon: In areas of known spring Chinook spawning and rearing, temperatures are within the thresholds. They range from 10.6 to 12.2 degrees Celsius in this 5th field watershed. The warmer temperatures of Deer Creek do not present a thermal barrier to Chinook spawning and migrating in the upper McKenzie River. This indicator is considered PROPERLY FUNCTIONING.

Suspended Sediment – Intergravel DO/Turbidity:

Intergravel Dissolved Oxygen measurements have been collected and reported by Stillwater Sciences (2006h). The measurements were taken as part of hydropower licensing and are limited to the Carmen Smith Project area.

Table 11. Average Dissolved Oxygen Measurements McKenzie River (Stillwater Sciences 2006h)

Date	Site Description	Average Temperature (degrees C)	Average DO mg/L	Average % saturation
August 2004	McKenzie River downstream of Trail Bridge Dam at upper spawning channel bar-rack	**9.9**	**12.0**	**116.1**
August 2004	McKenzie River downstream of Trail Bridge Dam at lower spawning channel weir-box	**9.9**	**11.8**	**113.7**

Bjornn and Reiser (1991) report that minimum DO recommended for spawning fish (at least 80% of saturation, and not even temporarily less than 5.0 mg/L) should provide the minimum needs of migrating salmonids. For incubation requirements they recommended that concentrations should be at or near saturation, and that temporary reductions drop no lower than 5.0 mg/L for anadromous salmonids. For juvenile rearing requirements they found that salmonids may be able to survive when DO conditions are relatively low (<5 mg/L), but growth, food conversion efficiency, and swimming performance will be adversely affected.

Turbidity measurements have been collected and reported by Stillwater Sciences (2006h). The measurements were taken as part of hydropower licensing and are limited to the Carmen Smith Project area.

Table 12. Water clarity measurements during 2004 sampling events (Stillwater Sciences 2006h)

Site Description	Turbidity (NTU)			
	May	Aug	Oct	Dec
McKenzie River downstream of Trail Bridge Dam	0.80	0.24	0.19	0.28
McKenzie River downstream of Olallie Creek	0.00	0.00	0.15	0.00
McKenzie River upstream of Deer Creek confluence	0.50	0.18	0.22	0.34
McKenzie River downstream of McKenzie Bridge	0.70	0.25	0.24	2.20

Bjornn and Reiser (1991) cite a study that found adult salmonids did not migrate in streams where suspended sediment concentrations exceeded 4000 mg/L. They also found that larger juvenile and adult salmon and trout appear little effected by ephemerally high concentrations of suspended sediments that occur during most storms and episodes of snow melt. They cite studies that found coho juveniles could be affected by turbidities that ranged from 60 to 70 NTU.

Baseline Condition: Measurements taken by Stillwater Sciences show DO and NTU conditions in the McKenzie River are well above these minimum requirements. This indicator is considered to be PROPERLY FUNCTIONING.

Chemical Contamination/Nutrients:

The McKenzie River is not listed as 303d for chemicals. Water quality is excellent in this 5th field. There are no agricultural, industrial, or other sources of chemical contamination. It is likely that hydrocarbons on Highway 126 get washed into the river during rain events.

Baseline Condition: Since there is no indication of chemical contamination in this 6th field, this indicator is PROPERLY FUNCTIONING.

Habitat Access:

Physical Barriers:

There is one human-made barrier in the Boulder Creek/Frissell Creek 6th field subwatershed. This barrier is the Trail Bridge Dam tailrace barrier and it is intended to force fish into the Carmen Smith Spawning Channel. In 1961 EWEB constructed a spawning channel below Trail Bridge Dam to mitigate for the lack of passage to upstream habitats. The spawning channel has two 250 foot riffles for spawning, and has recently been augmented with fresh gravels. It successfully produces tens of thousands of salmon fry, but does not provide good rearing habitat. Salmon fry must enter the river proper to seek better rearing conditions.

Baseline Condition: Since this barrier is intended to serve as a barrier, and it is the only human caused barrier in the 6th field subwatershed, this Indicator is considered to be PROPERLY FUNCTIONING.

Habitat Elements:

Substrate Character and Embeddedness (in areas of the gravels and subsurface areas):

The upper McKenzie River 5th field watershed is large and has two very different geologic provinces that produce different levels of sediment.

Stillwater Sciences (2006d) conducted intensive surveys in various reaches within the Upper McKenzie River 5th field watershed. The following information is a summary of their findings on the composition of channel substrate at those intensive sites within the Boulder Creek / Frissell Creek 6th field, and the McKenzie Bridge 6th field.

The McKenzie River at Trail Bridge gage site is strongly confined, with steep hillslopes directly joining the channel. In the upper portion of the site, narrow terraces of glacial

deposits occupy the eastern channel bank; in the lower portion of the reach, narrow terraces occupy the western channel bank. No alluvial bars were found in this study site. Channel banks within the study site are stable, and bank erosion was associated with root throw pits when trees were uprooted due to windthrow or mortality (Stillwater Sciences 2006d).

The McKenzie River downstream of Frissell Creek site is located in a straight, relatively uniform reach that is confined by hillslope, with no floodplain areas. The effects of lower slope and stream power and high sediment inputs from Deer and Frissell creeks are evidenced by cobble and gravel deposits along lower velocity zones, but sediment deposits remain submerged at low flows and do not support riparian vegetation. Bank conditions were stable throughout the site and no evidence of channel aggradation or degradation was visible (Stillwater Sciences 2006d). This survey site is the closest to Frissell boat launch and is located approximately 1.5 miles upstream.

The gage site on the McKenzie River at McKenzie Bridge is downstream of the point where the valley morphology transitions to a broader, glaciofluvial valley with a higher degree of floodplain connectivity and complexity. The change in valley morphology leads to noticeably different site characteristics than at the other McKenzie River sites: (1) decreased slope and channel confinement, (2) stable, forested islands that are composed of alluvial material delivered during outsized paleofloods that are no longer part of the current climate setting, (3) alluvial bars that are attached to the upstream ends of the islands, (4) increased frequency of perennial side channels that flow around the islands, and (5) higher large woody debris loading due to side channels and islands that collect fluvially transported wood. The site is bordered by terraces of glacial valley fill on both sides of the channel (Stillwater Sciences 2006d). This survey site is the closest to Paradise boat launch and is approximately 1.5 miles downstream.

Table 13. Percent area of dominant channel facies at intensive study sites. Stillwater Sciences (2006d)

Substrate type	**McKenzie River at USGS Trail Bridge gage[a]**	**McKenzie River downstream of Frissell Creek[a]**	**McKenzie River at USGS McKenzie Bridge gage (main channel)[b]**	**McKenzie River at USGS McKenzie Bridge gage (side channel)[b]**
Percent area of dominant channel facies				
Sand	0	0	0	0
Gravel	1	8	1	12
Cobble	21	73	55	88
Boulder	78	20	44	0
Estimated reach-average particle size weighted by facies area (mm)				
D_{50}	260	140	220	125
D_{84}	480	260	680	250

[a] Within the Boulder Creek / Frissell Creek 6th field sub-watershed
[b] Within the McKenzie Bridge 6th field sub-watershed

Table 14. Frequency of particle embeddedness classes at intensive study sites. Stillwater Sciences (2006d)

Particle embeddedness class (%)	McKenzie River at USGS Trail Bridge gage[a]	McKenzie River downstream of Frissell Creek[a]	McKenzie River at USGS McKenzie Bridge gage[b]
Frequency of particle embeddedness classes (%)			
0-10	36	34	23
10-20	20	9	18
20-30	8	18	13
30-40	4	7	12
40-50	4	9	12
50-60	16	2	7
60-70	4	9	7
70-80	8	5	8
80-90	0	7	0
90-100	0	0	0

[a] Within the Boulder Creek / Frissell Creek 6th field sub-watershed
[b] Within the McKenzie Bridge 6th field sub-watershed

Baseline Condition: The Upper McKenzie River 5th field watershed displays substrate and embeddedness characteristics indicative of the varied geology. Streams in the Western Cascades contribute significant quantities of sediment to the McKenzie River, and in those areas where streams flow through the High Cascades little sediment is yielded (Stillwater Sciences 2006g; USDA Forest Service 1995).

The reach of river between Trail Bridge Dam and Deer Creek is significantly sediment supply limited in those particle sizes that are suitable as spawning material. Stillwater Sciences (2006g) estimated that 3,350 metric tons of coarse sediment (>2 mm) is annually captured by Smith and Trail Bridge reservoirs.

The extensive road network in Western Cascades Geology in this 6th field watershed and the ongoing sediment depravation in the reach of river between Trail Bridge Dam and Deer Creek caused by reservoir trapping provide the rationale to make the determination of FUNCTIONING AT RISK.

Large Woody Debris:

Inventories by Stillwater Sciences (2006e) found that pieces of large woody material downstream of Trail Bridge Dam ranged from 6 pieces to 65 pieces depending on the reach. In general, in the upper river wood is in single pieces but as you move further down the river to the lower portions of this 5th field watershed pieces tend to be in jams.

The following table provides large woody debris frequencies from selected sub-reaches in the McKenzie River (Stillwater Sciences 2006e). Total wood includes all pieces 25 feet in length and 24 inches in diameter. Large wood includes only pieces 50 feet in length and 36 inches in diameter.

Table 15. Large woody debris frequencies from selected sub-reaches in the McKenzie River (Stillwater Sciences 2006e)

Reach	Total wood frequency (pieces/mile)	Large wood frequency (pieces/mile)
1[a]	253	43
2[b]	222	36
3[c]	21	6

[a] McKenzie Bridge 6th field. This reach is downstream of Paradise boat launch.

[b] McKenzie Bridge 6th field This reach is upstream of Paradise boat launch.

[c] Frissell Creek / Boulder Creek 6th field. This reach is immediately upstream of the Frissell boat launch.

It is unlikely that the reach of McKenzie River from Trail Bridge Dam to Lost Creek could maintain 80 pieces of large woody material per mile due to high LWD transport capacity of the reach and limited geomorphic surfaces to induce LWD deposition. Downstream of Lost Creek there is a higher frequency of depositional surfaces (e.g. stable islands, alluvial bars, and side channels).

Minear (1994) found that there was reduction in pool forming elements (i.e. large wood) and noted a 19% decrease over the study area.

Baseline Condition: Since the criteria of 80 pieces per mile has not been met, given the findings of Minear (1994), and due to the presence of Highway 126 in sections of the river that were once riparian area, this element is FUNCTIONING AT RISK. However, in the critical spawning and rearing areas for bull trout (lower Carmen Bypass Reach, Sweetwater Creek, Anderson Creek, and Olallie Creek) woody material frequency is more than adequate and considered Properly Functioning.

Pool Frequency and Quality / Large Pools:

This type of data has not been systematically collected in the mainstem river by the Forest Service.

Baseline Condition: In general pools are rare in the upper McKenzie River which is a steep headwater system. Those pools that do exist are deep and large. If the channel was not constrained by Highway 126, and if woody material recruitment was higher, it is expected that there would be a greater number of pools in the upper river. Minear (1994) found that there was a decrease in large pools in the reach from Trail Bridge Dam to Belknap Springs from 10 to 8 between calendar years 1937 and 1991. Due to these conditions (constrained channel and reduced wood recruitment due to Highway 126) this element is considered to be FUNCTIONING AT RISK.

Off-channel Habitat:

The criteria in the "Table of Population and Habitat Indicators" do not seem appropriate for the upper McKenzie River. That is, "watershed has many ponds, oxbows, backwaters, and other off-channel and low energy areas." These criteria would be appropriate for a valley river system, but not a headwater river.

Minear (1994) found that channel straightening occurred due to constraint from Highway 126, and her study documented a decrease in off-channel length. In the reach from Trail Bridge Dam to Belknap Springs Minear (1994) documented a decrease in side channel length from 1,039 meters in the 1949 aerial photos, to 669 meters in the 1986 photos.

Baseline Condition: The presence of Highway 126 constrains the river, and given Minear's (1994) findings that straightening has occurred and that there has been a loss in side channel length in the upper McKenzie River, this indicator is considered to be FUNCTIONING AT RISK.

Refugia:

The upper McKenzie River has habitats capable of supporting strong and significant populations. However, many human activities take place in the upper watershed. There is a hiking trail, a state highway, a hydroelectric facility, recreation on the river (fishing and floating), and forest management.

Baseline Condition: Given all these human activities in the watershed this element is considered NOT PROPERLY FUNCTIONING.

Channel Condition & Dynamics:

Average Wetted Width/Maximum Depth Ratio in scour pools in a reach:

In tributaries where inventories are conducted the type of data collected is: bankfull width to depth ratios at riffles. This type of data has not been collected in the mainstem McKenzie River below Trail Bridge Dam due to safety considerations. However, Stillwater Sciences (2006d) used a boat to collect bankfull width to depth ratios.

Table 16. Width to depth ratios collected by Stillwater Sciences (2006d)

Site description	Cross section	Bankfull width	Bankfull depth	Bankfull width/depth
McKenzie River at USGS Trail Bridge Dam gage[a]	1	118	5.2	23
McKenzie River downstream of Frissell Creek[a]	1	121	5.3	23
	2	138	4.3	33
	3	131	5.5	24
McKenzie River at USGS McKenzie Bridge gage[b]	1	144	7.2	20

[a] Frissell Creek / Boulder Creek 6th field

[b] McKenzie Bridge 6th field

Baseline Condition: All of the sites where measurements could be taken exceed criteria in the habitat indicators table. Therefore this indicator is NOT PROPERLY FUNCTIONING.

Streambank Condition:

In general, the McKenzie River in the 6th field subwatersheds where this project occurs have stable banks. This is due to the dominance of spring-fed water in the upper watershed. However due to Highway 126, rip-rap can be found on some banks and rip-rap has been placed adjacent to Paradise Campground.

Baseline Condition: Given the presence of rip-rap associated with the highway and campground, and since inventories have not measured this specific element in the mainstem river, this element is considered to be FUNCTIONING AT RISK.

Floodplain Connectivity:

The term "flood" is one that is rarely used in the High Cascades geologic portion of the upper McKenzie River watershed. In the reach between Trail Bridge Dam and Deer Creek it is very rare that water would reach the floodplain. Due to the stable flow regime in this reach side channels are rare and the channel is entrenched.

In other river segments in the 6th field subwatersheds the presence of Highway 126 has constrained the river, and rip-rap is present along some sections of the highway and along Paradise Campground.

Baseline Condition: Due to the presence of Highway 126 and the rip-rap along the river segment near Paradise Campground, this indicator is FUNCTIONING AT RISK.

Flow/Hydrology:

Change in Peak/Base Flows:

Tributary hydrologic inputs to the McKenzie River downstream of Trail Bridge Dam currently include Anderson Creek, Ollallie Creek, and Lost Creek (sourced predominantly in High Cascades terrain east of the McKenzie River); Twisty Creek, Boulder Creek, and Scott Creek (sourced predominantly in glacial terrain); and Deer Creek and Frissell Creek (sourced predominantly in Western Cascades terrain). Natural inflow to the Carmen-Smith Hydroelectric Project from the McKenzie and Smith rivers closely matches outflow at the Trail Bridge Powerhouse tailrace on a daily flow basis, and effects on the annual volume of water delivered downstream of Trail Bridge Dam are small. Pre- and post-Project records for the USGS McKenzie Bridge gage indicate no Project impacts on typical flow statistics such as mean annual and mean monthly flows; the 1-, 3-, or 7-day minimum or maximum flows; or the timing of the 1-day minimum and maximum flows (Stillwater Sciences 2006a). Pre-Project (1911–1962) exceedance probabilities of mean annual flow, and post-Project (1963–1994) exceedance probabilities were very similar. Comparison of pre- and post-Project annual peak flows indicates that post-Project flows are greater at recurrence intervals less than 1.5 years, but are less at recurrence intervals greater than 1.5 to 10 years.

It is likely that forest management activities (timber harvest and road building) in the Western Cascades portion of this 6th field subwatersheds have affected peak and base flows, but the extent has not been evaluated for this project.

Baseline Condition: Given this uncertainty, the determination for this Indicator is FUNCTIONING AT RISK.

Increasing in Drainage Network:

There has most likely been an increase in the drainage network in the two 6th field subwatersheds in question. The effects of an increase in drainage network are more of an issue in the Western Cascades Geologic Province. Increases in the drainage network due to roads appear to be of limited or no consequence in the High Cascades Province where bull trout streams occur. The differences between the geologic provinces provide for stark contrasts in topography and drainage development and reflect the underlying geology, geomorphology, and hydrology in the upper McKenzie watershed (Stillwater Sciences 2006g).

Western Cascades volcanic landscapes comprised of older, deeply weathered, and uplifted basalt flows and volcaniclastic rocks have evolved through debris sliding, debris flows, and deep-seated mass wasting. Steep slopes with shallow, rapid subsurface flow are dissected by a dense network of steep, incised channels that efficiently convey surface runoff and sediment. Stream channels in the Western Cascades exhibit dynamic morphology in response to peaked storm runoff, high sediment yield, and periodic debris

flows (Stillwater Sciences 2006g). Given the geologic context in these areas, it is likely that road building has had the effect of increasing the drainage network.

High Cascade landscapes, in contrast, are composed of broad areas of hydrologically disconnected surface runoff due to low gradient topography, disorganized drainage patterns, and subsurface flow though relatively unweathered and rapidly permeable Quaternary volcanic flows. Stream discharge remains relatively constant throughout the year regardless of winter rainfall or rain-on-snow events. This characteristic surface and subsurface hydrology, in combination with predominantly low gradient hillslopes with low drainage density, results in very low sediment yield in the High Cascades. Channel morphology is relatively static, as evidenced by mature and upland riparian vegetation growing near a stable base flow water surface elevation, and moss-covered bed particles and large wood in active channels (Stillwater Sciences 2006g). Given the geologic context in these areas, it is likely that road building has had minimal effect on increasing the drainage network.

Baseline Condition: The amount of roads in the Boulder Creek/Frissell Creek and McKenzie Bridge 6th field subwatersheds are "greater than moderate" so this indicator would be considered to be Not Properly Functioning. However, since the effects of an increase in drainage network are realized for that portion of the watershed in the Western Cascades, and not the High Cascades, it seems more appropriate to consider this indicator FUNCTIONING AT RISK.

Watershed Conditions:

Road Density and Location: The Upper McKenzie River 5th field watershed has a road density of 1.9 miles per square mile (see Figure 14). This ratio is considered Functioning at Risk for bull trout, and Properly Functioning for Chinook salmon. However, in this watershed road location has a greater impact on habitat characteristics and poses a greater risk to McKenzie River water quality.

Highway 126 is adjacent to the McKenzie River for a great proportion of its length, and has the greatest impact on the river (see Figure 2). Where it is directly adjacent to the river it constrains the channel, has rip-rap along the bank, and has eliminated a source of large woody material to the river. The highway's location poses the greatest risk to aquatic habitats and water quality due to the risk of chemical spill from truck-tankers.

Baseline Condition: Given the road densities in the 5th field watershed, and due to Highway 126 and the existence of other valley bottom roads within the 5th field watershed, this element is considered FUNCTIONING AT RISK.

Disturbance History:

The measure of ECA is not meaningful in the upper McKenzie River 5th field watershed due to the behavior of the High Cascades Geology. It is meaningful for the Western Cascades Geology.

Baseline Condition: Approximately 19.5% of the entire watershed is in a managed condition, but this does not mean that all 19.5% has been clearcut. However, give the matrix criteria of 15% this Indicator is FUNCTIONING AT RISK.

Riparian Reserves:

There are approximately 39,215 acres of Riparian Reserve in the Upper McKenzie 5th field watershed (see Figure 15). In general, the Riparian Reserve of the mainstem river is in good condition with mature vegetation and a long-term supply of woody material. However, there is also development along the mainstem river in the form of a hydroelectric facility, Highway 126, Belknap Hot Springs Resort, developed campgrounds and dispersed camping, a hiking trail, summer recreation residences, private residences, and the existence of the town of McKenzie Bridge, Oregon.

Baseline Condition: Many of the Riparian Reserves in the 5th field are in good to excellent condition, but due to the amount of development in the mainstem river Riparian Reserve, and due to the presence of Highway 126 this element is considered to be FUNTIONING AT RISK.

Disturbance Regime:

The disturbance regime has been impacted in this 5th field watershed, especially in the Western Cascades portion of the watershed. There is a legacy of intensive forest management (timber harvest and road network) in the Deer Creek watershed. This has likely increased the sediment yield from that watershed compared to reference conditions (Stillwater Sciences 2006; Upper McKenzie Watershed Analysis 1995). There is also a large, deep-seated earthflow in the Deer Creek watershed and this naturally occurring feature provided Deer Creek with a historically high sediment load.

Baseline Condition: Forest management and Highway 126 have impacted the disturbance regime in the upper McKenzie River 5th field. However, the High Cascades provide an aquatic resiliency to disturbance in the overall 5th field. This indicator is FUNCTIONING AT RISK.

INTEGRATION OF SPECIES AND HABITAT CONDITIONS (Bull Trout Only)

Habitat for bull trout in the upper McKenzie River 5th field watershed is most likely the best that can be found in Western Oregon. However, the presence of Trail Bridge dam, and Highway 126 have significant impacts on connectivity and long-term habitat maintenance. The bull trout population is not large enough to be considered “secure.” The relatively lower number of redds in current inventories compared to the highs of 1996 and 1997 in Anderson Creek are a continuing concern. Finally, ongoing hybridization between brook trout and bull trout continues in the Trail Bridge population.

Baseline Condition: Due to the presence of Highway 126, Trail Bridge dam, all the human activities that take place in the upper watershed, and brook trout x bull trout hybridization, this element is considered to be FUNCTIONING AT RISK.

Evaluation of Baseline Condition for McKenzie River Boat Launches Project Upon Bull Trout and Spring Chinook Salmon in the McKenzie River/Elk Creek 6th Field Watershed.

McKenzie River/Elk Creek 170900040502 (6th field HUC)

Note: Quartz Creek is a tributary to the mainstem river and that portion of the 5th field watershed is downstream of the project area and action area.

SUBPOPULATION CHARACTERISTICS (Bull Trout Only)

Population Size and Distribution:

Bull trout do not spawn in this 6th field sub-watershed. The McKenzie River in this location would provide rearing habitat for subadult and adult bull trout. Bull trout in this river segment are part of the Mainstem population, and any bull trout that were entrained at Trail Bridge Dam (Trail Bridge population) or Cougar Dam (Army Corps of Engineers dam on South Fork McKenzie River – South Fork population).

In calendar year 2005, sixty-one (61) bull trout redds were tallied in Mainstem population spawning sites (note: these spawning sites are in different 5th and 6th field HUCs). With two fish per redd it is estimated that the population that uses this 6th field sub-watershed is 122 adult bull trout. This is a conservative estimate since some bull trout may spawn biannually, and it is likely that bull trout from the South Fork population and the Trail Bridge population are also found in this 6th field.

Baseline Condition: Adults in this population are less than 500 but greater than 50. This indicator is FUNCTIONING AT RISK.

Growth and Survival:

Bull trout do not spawn in the mainstem McKenzie River in this 6th field sub-watershed. This portion of the river is not suitable since the stream temperatures are not in the preferred range for spawning, incubation, or early rearing. The only known suitable spawning areas for bull trout in the Mainstem subpopulation are two spring fed streams (Olallie and Anderson Creeks) which are approximately 20 miles upstream of the Bruckart project site.

The Mainstem population has not been analyzed for resiliency in a similar manner to the Trail Bridge population. The best information available for analysis is redd survey results in Anderson and Olallie Creek. The recent numbers in Olallie Creek, relative to

the 1990's, show an increase. However, Anderson Creek continues to show lower redd tallies.

Baseline Condition: The steady reduction in the number of redds for the Mainstem population is troubling and of concern, but it does not appear to be based on habitat factors or water quality. Due to this steady reduction in redd numbers in Anderson Creek this indicator is considered FUNCTIONING AT RISK.

Life History, Diversity, and Isolation:

Fluvial bull trout use the McKenzie River as foraging, adult rearing, and migratory habitat. The only known spawning habitat that the Mainstem population successfully utilizes, are Anderson and Olallie creeks which are tributaries to the upper McKenzie River. Trail Bridge and Cougar dams have blocked upstream migration to the Upper McKenzie and the South Fork McKenzie, respectively. This has forced isolation of the three sub-populations (South Fork, Mainstem, and Trail Bridge).

Baseline Condition: The Mainstem population is fluvial, and the Trail Bridge and South Fork populations have been forced into a fluvial/adfluvial life history. They appear to be rearing well in the reservoir, but unsafe downstream entrainment at dams is still a problem.

Within this 6th field sub-watershed there are no human caused barriers to bull trout. However the bull trout that utilize this 6th field come from the Mainstem, South Fork, and Trail Bridge populations, and those populations are disconnected from spawning areas due to dams without upstream passage and safe downstream passage. Therefore this indicator is FUNCTIONING AT RISK.

Persistence and Genetic Integrity:

At the 5th field watershed level, and the 6th field sub-watershed level there are no connectivity barriers for bull trout. Barriers that do exist (Trail Bridge and Cougar Dams) occur in different 5th field watersheds.

Within the McKenzie River/Elk Creek 6th field sub-watershed no brook trout have been reported by anglers. The only area where brook trout x bull trout hybridization has been documented is in the Trail Bridge population.

Baseline Condition: There are no indications of hybridization for the bull trout that utilize the McKenzie River/Elk Creek 6th field sub-watershed. However the existence of Trail Bridge and Cougar Dams, although in different 5th field watersheds, requires that this indicator be rated as FUNTIONING AT RISK.

Water Quality:

Temperature:

In September 1999, a project was implemented to collect stream temperatures in the McKenzie River using Forward Looking Infrared (FLIR) technology (Torgersen, et. al.). This project documented temperatures at the confluence of the mainstem McKenzie and South Fork McKenzie River as 10.5 degrees Celsius and 11.3 degrees Celsius, respectively.

The following table provides maximum 7-day averages for tributaries in the McKenzie River/Elk Creek 6th field sub-watershed, and Quartz Creek which is a separate 6th field that has its confluence with the McKenzie River over 6 river miles downstream of Bruckart Boat Launch. Data collected by Forest Service in 2005.

Table 17. 7-day average maximum temperature (degrees C) data collected by the Forest Service in 2005

Stream Name	Geographic Description of Sensor Location	7-Day Average Maximum in Degrees Celsius	Date of Maximum Temperature
Cone Creek	Above private land	16.6	September 10
Mill Creek	Above private land	14.2	September 10
Mill Creek	Below private land	20.0	September 10
Unnamed McKenzie Trib	Mid-slope location near Thor's Hammer. No surface connection to McKenzie River in the summer.	17.4	July 23
Quartz Creek	Above private land	15.5	September 10

Information was reviewed for the USGS gauge that is located immediately adjacent to Bruckart Boat Ramp. The USGS name for this gage location is:

- McKenzie River above South Fork near Rainbow, Oregon.
- USGS ID: 14159110

Table 18. Data from USGS Gage near Bruckart Boat Ramp in 2005

Date of 7-Day Average Maximum	Temperature in Degrees Celsius
July 20	13.7
August 8, 9, 10, and 11	13.5
September 1	12.2
September 30[a]	9.8

[a] The 7-day avg max for the month of September was on the 1st. The September 30 7-day avg max is provided to show the decreasing trend in temperature during the month of September.

Baseline Condition: Tributaries that have a surface connection to the mainstem McKenzie River in this 6th field sub-watershed are warm. However, the mainstem remains relatively cold due to the influence of ground water from the upper watershed.

Bull trout use this 6th field to rear as subadults and adults, and as a migratory corridor to upstream spawning areas. The USGS gage shows that the 7-day average maximum in the mainstem did not exceed 15 degrees Celsius.

This is not an area of "high concentration" for chinook spawning (personal communication with Mark Wade of ODFW). The Oregon Department of Fish and Wildlife has conducted aerial redd surveys along the McKenzie River. They found that the highest concentrations occurred from Trail Bridge dam downstream to the McKenzie River Trailhead. From the trailhead down to the confluence with Horse Creek spawning concentrations were considered "light." And finally, from Horse Creek downstream to Finn Rock bridge (this reach encompasses almost the entire 6th field discussed here) spawning was "moderate." Spawning begins around mid-August and continues thru early October with a peak in early October . During that time period temperatures were below14 degrees Celsius (57 degrees Fahrenheit) providing suitable spawning conditions.

Given the temperatures recorded and the life history phases using this 6th field sub-watershed, this indicator is PROPERLY FUNCTIONING.

Suspended Sediment – Intergravel DO/Turbidity:

No intergravel DO information is available, however turbidity information is available from the USGS gage near Bruckart Boat Ramp.

During the winter of calendar year 2005 there was a high water event that peaked on December 30 and 31. A second event occurred in 2006 on January 10 and 11. The following table displays peak turbidity measurements during the high water at two gages on the McKenzie River that are 14.9 miles apart. The gage near Vida, OR is an indicator of the influence of private land management, especially in Quartz Creek. During the high water events field investigations showed a stark difference in turbidity upstream and downstream of Quartz Creek. The gage above the South Fork near Rainbow, OR has private land influence, but since the land base upstream of this gage is predominantly National Forest System it is a reasonable indicator of conditions upstream.

Table 19. Turbidity measurements from USGS gages on the McKenzie River

Location of Gage	Date	Turbidity in FNU[a]	Discharge in cfs
McKenzie River above South Fork Near Rainbow, OR (River Mile 62.3)	12/30/2005	139.0	18,662
	12/31/2005	139.0	18,706
	01/10/2006	139.0	18,313
	01/11/2006	139.0	18,313
	02/01/2006	4.2	6,727
McKenzie River near Vida, OR (River Mile 47.4)	12/30/2005	332.0	21,769
	12/31/2005	236.0	21,809
	01/10/2006	169.0	20,745
	01/11/2006	332.0	21,373
	02/01/2006	329.0	12,204

[a] An FNU is a Formazin Nephelometric Unit. It is a measure of turbidity commonly used in Europe and is similar to Nephelometric Turbidity Unit (NTU). The difference is based on the wavelength used to make

the measurement. NTUs are measured with a white light, while FNUs are measured with an infrared light. Due to the fact that suspended particles scatter light of different wavelengths with varying efficiency, FNU data often are not directly comparable to NTU data.

These turbidity events were relatively high for the McKenzie River hydrologic regime. The readings at the two gages show high turbidity that occurred during a storm, but the high turbidity on February 1 was from a slide on private land in the Quartz Creek watershed downstream of National Forest System lands. This information is only used for comparison to turbidity conditions on the same day at the upstream gage that is a reasonable indicator for conditions in the McKenzie River/Elk Creek 6th field sub-watershed.

Baseline Condition: Relative to measurements downstream of National Forest System lands, turbidity in the McKenzie River/Elk Creek 6th field sub-watershed is considered "moderate." On the high water event on 12/30/2005 the upper gage was 193 FNUs lower than the lower gage that is approximately 9 river miles downstream of National Forest System lands. The FNU graphs show that the high water events caused a spike in turbidity, but they also show that during the spawning and incubation season in the McKenzie River/Elk Creek 6th field turbidity conditions were low to moderate. This indicator is FUNCTIONING AT RISK.

Chemical contamination/Nutrients:

The McKenzie River is not listed as 303d for chemicals. There are no agricultural, industrial, or other sources of chemical contamination. It is likely that hydrocarbons on Highway 126 get washed into the river during rain events. This 6th field does however have a number of private residences, and mixed ownerships. It is unknown if, or at what level, chemicals from private residences, the town of Blue River, and private timberlands are entering the McKenzie River in this 6th field sub-watershed.

Baseline Condition: Since there is no indication of chemical contamination in this 6th field, this indicator is PROPERLY FUNCTIONING.

HABITAT ACCESS

Physical Barriers:

There are no physical barriers to either upstream or downstream migration in the 6th field sub-watershed. Major streams entering the mainstem McKenzie River in this sub-watershed either have bridges or culverts that do not prevent passage.

Baseline Condition: Given the absence of human caused barriers to bull trout and spring Chinook salmon in this 6th field sub-watershed, this indicator is PROPERLY FUNCTIONING.

HABITAT ELEMENT

Substrate Character and Embeddedness:

Development along the terraces and flood plains of the McKenzie River, especially early road construction and road maintenance activities, has locally resulted in increased bank erosion and the introduction of sediment into the river system. Volumetrically, it is unlikely that this amount of sediment has had a serious, long-term negative impact on channel processes (Quartz Creek and Minor Tributaries Watershed Analysis 1998).

The two major river systems that enter into the McKenzie River/Elk Creek 6th field sub-watershed are Blue River and South Fork McKenzie River. They are each independent 5th field watersheds, and both have Army Corps of Engineers flood control dams (Blue River dam at about river mile 1.5; and Cougar Dam at about river 4.5). Each of these dams traps tens of thousands of cubic yards of sediment.

Baseline Condition: The specific measurement has not been taken throughout the mainstem river in this 6th field sub-watershed. Visually it appears that cobble and gravel dominate the channel in this 6th field, and bedload material is well sorted. FUNCTIONING AT RISK.

Large Woody Material:

In this 6th field watershed, two inventories have been conducted to count wood in the McKenzie River. One was done in 1997 to evaluate large wood associated with the "Mile Post 44 Logjam" and the other was done in 1999 (Bennett) that covered areas in the 6th field not evaluated by the 1997 effort.

The 1997 evaluation looked at wood in the river from the confluence with the South Fork McKenzie River upstream to Belknap Bridge (upstream of Dearborn Island). This evaluation reach is approximately 4 river miles in length. The following table provides counts of woody material in the reach.

Table 20. Woody Material in the area of the MP 44 Logjam

Location	Pieces of large woody material (>10' long, 12" diameter)	Key Pieces of large woody material (>30' long, 20" diameter)
Associated With Mile Post 44 Logjam	151[a]	66
River Meander Near Mile Post 44 Logjam	57	24
Remainder of Study Reach	26	14
Total	**234[a]**	**104**

[a] Count of woody material associated with the Mile Post 44 jam was a significant underestimate due to an abundance of pieces deep within the jam which could not be enumerated.

In addition to the wood counted in the Mile Post 44 Logjam study (1997), the following wood was counted in 1999 by a contractor (Bennett) in areas of the 6th field that were not covered in the 1997 inventory.

Table 21. Woody material inventory conducted by Bennett (1999)

Size of Woody Material	Pieces
Small (25' x 12")	59
Medium (50' x 24")	10
Large (50' x 36")	0

Twenty-six pieces of woody material in the jam area were measured to be over 100' long and six were more than 150' long. The largest piece of woody material in the study area was 182' long with bark and root wad still attached. Since the time of the study in 1997, at least 5 more pieces had entered the MP 44 Log Jam area. However, during the high water events of December 2005 and January 2006 dynamic changes took place at the log jam. Woody material was transported downstream and much of it can be found at the heads of islands in this 6th field. Large trees with partial crowns and with root wads attached were also deposited in the log jam area. Channel shifts took place and gravels and cobbles were mobilized, transported, and deposited into new areas. This specific segment of the McKenzie River where the log jam occurs is the most dynamic and complex of the "upper river" (upstream of Vida, OR).

An updated inventory has not been accomplished since the changes, the jam area and the 6th field remains rich with woody material. The deposits at the heads of islands will provide for long-term maintenance of off channel habitats, and provide cover during future high water events. The log jam area remains a complex network of rearing, spawning and migratory channels for spring Chinook salmon.

Baseline Condition: Given the amount of woody material inventoried, this indicator is PROPERLY FUNCTIONING.

Pool Frequency and Quality:

The McKenzie River varies in width in the 6th field sub-watershed. It is over 40 feet throughout the sub-watershed and over 65 feet in other portions. In the "South Fork to Finn Rock" reach there are approximately 2.5 large pool per mile in a segment where the river is over 65 feet wide.

The following table is from Minear (1994) and shows changes in large pools in two reaches of her study. Minear (1994) looked at changes between 1938 and 1991 using aerial photos. A large pool was defined as a pool with a minimum depth of 2 meters and an area of at least 40 square meters.

Table 22. Changes in Large Pools

Reach	1938 Number of Pools	1991 Number of Pools	Percent Change
Rainbow to South Fork Junction	22	6	-73%
South Fork to Finn Rock	21	13	-38%

The McKenzie River/Elk Creek 6th field sub-watershed has had private land development, the town of Blue River is partially in the 6th field, and Highway 126 or McKenzie River Drive are adjacent to the river almost along the entire length in this 6th field. The presence of these paved roads prevents full riparian development on the north side of the river, and constrains the river. These conditions are not conducive to the promotion of large pools in a river channel.

Baseline Condition: There have been dynamic changes to the river since the1991 aerial photograph series (e.g. the 1996 floods, and smaller events). However, a similar exercise to inventory pools with aerial photos has not taken place, nor has a ground inventory of pools. Given the reductions in large pool habitat found by Minear (1994), the low number of large pools that are found in the 6th field, and the chronic effect of paved roads adjacent to the river throughout much of the 6th field sub-watershed, this indicator is NOT PROPERLY FUNCTIONING.

Off Channel Habitat:

The following table displays the changes in side channel numbers and length found by Minear (1994) using aerial photos in the 6th field subwatershed.

Table 23. Changes in side channel numbers and length found by Minear (1994) using aerial photos

Reach	Number of Side Channels 1945/49	Number of Side Channels 1986	Side Channel Length (m) 1945/49	Side Channel Length (m) 1986
Rainbow to South Fork Junction	21	7	6,027	973
South Fork to Finn Rock	7	9	5,957	3,077

The Mile Post 44 Log Jam is located at the lower end of the “Rainbow to South Fork Junction” reach and has undergone dynamic changes since the 1986 photo time series, as has the “South Fork to Finn Rock” reach. The large woody material deposits at the heads of islands will provide for long-term maintenance of off channel habitats, and provide cover during future high water events. The log jam area remains a complex network of rearing, spawning and migratory channels for spring Chinook salmon.

Baseline Condition: Channel complexity is high in this section of the "upper river" (i.e. upstream of Vida, OR). This can be attributed to geomorphic conditions and geographic location. The lower boundary of this 6th field sub-watershed is near the lower terminus of Pleistocene glacial advance (Upper McKenzie River Watershed Analysis 1995). Downstream of this 6th field the McKenzie River channel is influenced by the Western Cascade geology and naturally becomes more constrained relative to the glacial-valley segment of the McKenzie River/Elk Creek 6th field sub-watershed. The reach of river from the South Fork to Finn Rock is geomorphically set up to have high channel complexity. However, due to the presence of Highway 126 and McKenzie River Drive the channel is constrained on the north side and inhibits lateral scour. This indicator is FUNCTIONING AT RISK.

Refugia:

The McKenzie River has habitats capable of supporting strong and significant populations. However, many human activities take place in the upper watershed and that is especially true in the McKenzie River/Elk Creek 6th field sub-watershed. The presence of Highway 126 and McKenzie River Drive (both paved roads) adjacent to the river, mixed ownership, numerous private residences within the river valley and some directly adjacent to the river, and recreational boating. This 6th field does not function as a "refugia" and is therefore NOT PROPERLY FUNCTIONING.

CHANNEL CONDITIONS AND DYNAMICS

Width to Depth Ratio:

Width to depth ratios have not been physically collected in the main stem McKenzie River. The following is an estimate of bankfull width (using a range finder), and a visual estimate of bankfull depth. The McKenzie River/Elk Creek 6th field sub-watershed is in a segment of the McKenzie River where two large flood control dams impact the sediment and flow regime.

Table 24. Estimated width to depth ratio at Bruckart boat launch

Site description	Bankfull width	Bankfull depth	Bankfull width/depth
Current Bruckart boat launch site	160	7	22

Baseline Condition: An estimate of the bankfull width to depth ratio is greater than both criteria in the matrix of indicators (20 for bull trout; 12 for spring Chinook salmon). This indicator is NOT PROPERLY FUNCTIONING.

Streambank Conditions:

Streambank conditions in the 6th field in general are good. However, some of the banks along the McKenzie River in the 6th field have been reinforced with rip-rap (e.g. at the

head of Dearborn Island). Development along the terraces and flood plains of the McKenzie River, especially early road construction and road maintenance activities, has locally resulted in increased bank erosion and the introduction of sediment into the river system. Volumetrically, it is unlikely that this amount of sediment has had a serious, long-term negative impact on channel processes (Quartz Creek and Minor Tributaries Watershed Analysis 1998).

Baseline Condition: Streambank conditions in the 6th field in general are good. However, due to the presence of paved roads that have required rip-rap in places, and the presence of some private residences along the river that have placed rip-rap along the bank, this indicator is FUNCTIONING AT RISK.

Floodplain Connectivity:

Floodplain connectivity is a concern in this 6th field sub-watershed due to the presence of flood control dams (Cougar and Blue River) in tributary 5th field watersheds. These dams do not allow peak flows to inundate the floodplains in a similar spatial and temporal frequency as compared to historic conditions. In addition there are areas of rip-rap along the river bank that do not allow lateral scour to occur.

Baseline Condition: Given the presence of flood control dams in tributary 5th field watersheds and changes to natural bank conditions, this indicator is NOT PROPERLY FUNCTIONING.

FLOW/HYDROLOGY

Changes in Peak/Base Flows:

Upstream of the McKenzie River/Elk Creek 6th field sub-watershed the flow regime is not impacted by flood control dams, so the hydrologic regime that flows into this 6th field is "natural" for the most part. However, there are two tributary 5th field watersheds (South Fork and Blue River) that enter this 6th field that have significantly affected the hydrograph as compared to historic conditions.

Baseline Condition: Due to the presence of two flood control dams, the peak and base flows in this 6th field sub-watershed are not characteristic of historic conditions. Therefore, this Indicator is NOT PROPERLY FUNCTIONING.

Increases in Drainage Network:

There is significant mixed ownership in this 6th field. There is a State highway (Hwy 126), there are municipal roads (town of Blue River), private timber company roads, other private land holder roads, and Forest Service roads.

Many roads in the 6th field are paved roads administered by the State of Oregon or the Forest Service and are in good shape. However, Highway 126 and McKenzie River Drive have a significant impact on the river due to their location.

Baseline Condition: NOT PROPERLY FUNCTIONING

WATERSHED CONDITION

Road Density and Location (Figure 16):

There is significant mixed ownership in this 6th field. There is a State highway (Hwy 126), there are municipal roads (town of Blue River), private timber company roads, other private land holder roads, and Forest Service roads.

Many roads in the 6th field are paved roads administered by the State of Oregon or the Forest Service and are in good shape. However, Highway 126 and McKenzie River Drive have a significant impact on the river due to their location.

The following table displays existing road densities for all roads in the 5th field watershed (McKenzie River/Quartz Creek). These figures represent data on National Forest System lands (i.e. private land is not in the road density calculation).

Table 25. Existing Road Densities in the McKenzie River / Quartz Creek 5th field HUC

Location	Density Forest Service
McKenzie River/ Quartz Creek 5th Field Watershed	2.8

Baseline Condition: The density ratio of 2.8 is considered Not Properly Functioning for bull trout and Functioning at Risk for Chinook salmon. However, the data used in this analysis only include Forest Service roads and lands. Private timber lands in Quartz Creek do not have the rigorous requirements of the Northwest Forest Plan, and harvest activities are substantial. When taking into account the watershed impacts caused by private timber harvest, this indicator is considered NOT PROPERLY FUNCTIONING at the 5th field watershed level.

Disturbance History:

This 5th field watershed (McKenzie River/Quartz Creek - 1709000405) has a history of significant human caused disturbance.

Timber harvest by private companies has been extensive in the past and continues to the present. The Forest Service has acquired lands along the river terraces that was clear cut using ground based yarding methods. These lands were cut 50 to 60 years ago and many of the old roads are in disrepair. The Forest Service has also extensively managed portions of the river terraces in the past (Mill Creek area). Those stands are currently 30

to 50 years old and densely stocked. In the Quartz Creek portion of the 5th field watershed extensive clear cutting continues by a private timber company.

Oregon State Highway 126 and other roads have had adverse impacts on the watershed by constraining the river, permanently removing riparian areas, and providing an avenue for chemical spills.

Baseline Condition: Given the human caused disturbance that has occurred in the past, and continues in the present, this indicator is NOT PROPERLY FUNCTIONING.

Riparian Reserves:

There are approximately 4,561 acres of Riparian Reserve on National Forest System lands in the 5th field watershed (see Figure 17). Development along the terraces and flood plains of the McKenzie River, especially early road construction and road maintenance activities, has locally resulted in increased bank erosion and the introduction of sediment into the river system. Volumetrically, it is unlikely that this amount of sediment has had a serious, long-term negative impact on channel processes (Quartz Creek and Minor Tributaries Watershed Analysis 1998).

Many of the Riparian Reserves in the 5th field either have had some form of timber harvest, or there is a residence, or a road (paved or gravel). The Riparian Reserve on the north side of the river is a paved highway, but there are some small pockets of mature/old growth forest. The south side, in general, has a more mature forest. The Elk Creek/Cone Creek system has had relatively little disturbance and is part of a Late Successional Reserve.

Baseline Condition: Due to the presence of Highway 126, McKenzie River Drive, and the amount of residential development along the river in the McKenzie River/Elk Creek 6th field sub-watershed, and the substantial amount of timber harvest in the Quartz Creek 6th field sub-watershed, this indicator is NOT PROPERLY FUNCTIONING.

Disturbance Regime:

There has been significant human disturbance in this 5th field in the form of road building, timber harvest, private land development, and flood control dams in tributary 5th field watersheds that significantly impact the disturbance regime of the McKenzie River/Elk Creek 6th field sub-watershed.

Baseline Condition: The extent of human induced disturbance, and interruption of disturbance (i.e. flood control dams) have created conditions in the 5th field watershed that are NOT PROPERLY FUNCTIONING.

INTEGRATION OF SPECIES AND HABITAT CONDITIONS (Bull Trout Only)

Bull trout use this 6th field as a foraging area for sub-adults and adults. Adult bull trout also use this 6th field as a migratory corridor upstream to the spawning tributaries of Olallie and Anderson Creeks.

Despite the high amount of human influence in the McKenzie River/Elk Creek 6th field sub-watershed, the river still provides good water temperatures and complex habitat for bull trout. This section of the McKenzie River contains the most complex habitat in the upper river due to the presence of the Mile Post 44 logjam. However, it can only be considered to be functioning at risk due to the human impacts.

Flood control dams have significantly altered the disturbance regime; river banks and terraces have had significant development; and Highway 126 and McKenzie River Drive directly impact the river throughout much of the 6th field. These are chronic cumulative effects that will continue to impact the river into the foreseeable future.

Baseline Condition: FUNCTIONING AT RISK

Bull Trout Critical Habitat

Federally managed land covered by the Northwest Forest Plan are exempted from Critical Habitat designation for bull trout (Federal Register – Final Rule 6 October 2004). This project and the downstream effects due to implementation will only affect Federally managed lands, therefore there will be no effect to bull trout critical habitat.

Table 26. Distance to closest bull trout critical habitat downstream of launch sites

Boat launch site	Closest designated bull trout critical habitat downstream of launch sites
Frissell	Approximately 1 river mile downstream to Belknap Springs property boundary.
Paradise	Approximately 1 river mile downstream to private timber lands boundary.
Bruckart	Approximately 1500 feet downstream from existing Bruckart boat launch, and approximately 500 feet downstream from new site.

Since bull trout critical habitat will not be affected, Primary Constituent Elements for bull trout critical habitat are not evaluated for this project.

Critical Habitat spring Chinook salmon

Environmental Baseline Condition, Critical Habitat PCEs

Critical Habitat has been designated for Upper Willamette River Chinook salmon. This designation for chinook salmon includes the reach of the McKenzie River flowing though the Action Areas. NMFS has determined that there are six primary constituent elements (PCEs) essential for the conservation of chinook salmon. These are sites and habitat components that support one or more life stages, including:

1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
2) Freshwater rearing sites with:
   (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
   (ii) Water quality and forage supporting juvenile development; and
   (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;
4) Estuarine areas free of obstruction and excessive predation with:
   (i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater;
   (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and
   (iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
5) Nearshore marine areas free of obstruction and excessive predation with:
   (i) Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and
   (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Only PCEs 1-3 are found within the 6th field subwatersheds. The baseline condition of these PCEs is described below:

Freshwater Spawning Sites: Baseline Condition

The McKenzie River in the project area provides favorable spawning sites for spring Chinook salmon. The Oregon Department of Fish and Wildlife has conducted aerial redd surveys along the McKenzie River. They found that the highest concentrations occurred from Trail Bridge dam downstream to the McKenzie River Trailhead. From the trailhead down to the confluence with Horse Creek spawning concentrations were considered "light." And finally, from Horse Creek downstream to Finn Rock bridge spawning was "moderate."

The river reach between Trail Bridge Dam and Deer Creek is sediment supply limited, with a coarse armored bed. Very little suitable size spawning gravel can be found in this reach. This is a natural condition given the geology, but Trail Bridge and Smith Dams upstream of this reach capture all the sediment from the upper watershed. For example, before the dams were constructed it is estimated that the reach immediately below Trail Bridge Dam had a sediment yield of 1,230 t y^{-1} (metric tons per year). Under current conditions it is estimated that this reach has a sediment yield of 40 t y^{-1} (Stillwater Sciences 2006d and 2006g). Consequently this reach has very little available spawning habitat. The Eugene Water & Electric Board did build the Carmen Smith Spawning Channel in 1961 and this spawning channel provides the best "gravel patch" in the reach between Trail Bridge Dam and Deer Creek. In 2004, 70 spring Chinook redds were constructed in the spawning channel, and the number of Chinook salmon produced was estimated at 98,400 (Stillwater Sciences 2006c).

Downstream of Deer Creek suitable spawning gravels begin to make up more of the particle facies in substrate samples due to the influence of tributary Western Cascade (geology) streams.

Temperatures in the project area are favorable for spring Chinook spawning. In some streams dominated by Western Cascades Geology (Deer Creek, Frissell Creek) stream temperatures are warm. In High Cascades areas (the mainstem river from Trail Bridge Dam to Lost Creek) stream temperatures are cold. In areas of high Chinook spawning concentrations stream temperatures are excellent for spawning, and incubation/larval development (see Tables 27 and 28 below).

Freshwater Rearing Sites: Baseline Condition

Cover in the upper river in the form of interstitial spaces in the substrate, undercut banks, and overhanging vegetation are abundant. Large pools are rare which is a natural condition in High Cascades Geology, however the presence of Highway 126 provides further constraint on the channel and has permanently removed sources of large woody material.

Downstream of Belknap Springs as the river makes its bend westward, it becomes less constrained as it flows through a glacial valley. More physical features in the channel (i.e. islands) can be found with an associated increase in channel complexity and log jams. This reach provides abundant rearing habitat for juvenile spring Chinook salmon.

Minear (1994) found a significant reduction in the number of pools between Horse Creek and Finn Rock (near Quartz Creek) by comparing changes in aerial photos thru a number or time series. Adjacent to this segment of river are McKenzie River Drive and Oregon State Highway 126. In some sections these paved roads are directly adjacent to the McKenzie River and this has impacted important source areas of large wood. This segment of the river still provides important rearing areas due to the number of side channels.

The Mile Post 44 Log Jam is located in the McKenzie River/Elk Creek 6th field sub-watershed. The log jam area is a complex network of rearing, spawning and migratory channels for spring Chinook salmon. The large woody material deposits at the heads of islands in this 6th field sub-watershed will provide for long-term maintenance of off channel habitats, and provide cover during future high water events.

Temperatures are favorable for rearing in the McKenzie River. The following table provides the seven day average maximum for various streams within the Upper McKenzie River 5th field HUC. This data was collected by the Forest Service.

Table 27. 7-day average maximum for various streams within the Upper McKenzie River 5th field HUC

Stream Name	Geographic Description of Sensor Location	Geologic Province	7-Day Average Maximum in Degrees Celsius	Date of Maximum Temperature
Anderson Creek (Boulder Cr / Frissell Cr 6th)	At Highway 126	New High Cascades	**6.6**	September 14
Boulder Creek (Boulder Cr / Frissell Cr 6th)	Near Mouth	Old High[a] Cascades	**13.1**	August 8
McKenzie River (Boulder Cr / Frissell Cr 6th)	Below Trail Bridge Dam	Primarily High Cascades at this point, but influenced by Smith River watershed and Trail Bridge Reservoir upstream	**10.6**	August 4
McKenzie River (McKenzie Bridge 6th)	Near Ranger Station	McKenzie[b] River Glacial Valley	**12.2**	August 9
Olallie Creek (Boulder Cr / Frissell Cr 6th)	At Highway 126	New High Cascades	**5.5**	July 10
Scott Creek (Boulder Cr / Frissell Cr 6th)	Near Mouth	Old High Cascades	**12.2**	August 10

[a] The term Old High Cascades is used only to describe how Scott Creek and Boulder Creek cut through Pleistocene glacial deposits and "New" High Cascade lavas in their headwater areas, but further

downstream incise underlying older High Cascades lava that have been subjected to fluvial processes for a longer period of time and McKenzie River glacial deposits.
[b] The term "McKenzie River Glacial Valley" is used at this site since because the river is in a glacial valley confined by two east-west trending ridges, but is not a recognized province name.

Table 28. Data from USGS Gage near Bruckart Boat Ramp in 2005

Date of 7-Day Average Maximum	Temperature in Degrees Celsius
July 20	13.7
August 8, 9, 10, and 11	13.5
September 1	12.2
September 30[a]	9.8

[a] The 7-day avg max for the month of September was on the 1st. The September 30 7-day avg max is provided to show the decreasing trend in temperature during the month of September.

Stillwater Sciences (2006h) conducted benthic macroinvertebrate surveys as part of a hydropower licensing project for the Eugene Water & Electric Board. The samples discussed for the boat launch project are the only samples that occurred within a project sub-watershed (Frissell Creek/Boulder Creek 6th field).

To provide an integrated assessment of the combined effects of potential stressors on the aquatic ecosystem, multi-metric scores were calculated based on invertebrate assemblage metrics. Both the ODEQ Level III metric and Karr's Benthic Index of Biotic Integrity (BIBI) were developed with a wider geographic coverage and an emphasis on human-related impacts (e.g., sediment loading, organic enrichment, temperature, DO, etc.). In addition to the ODEQ and BIBI scores discussed above, the ABA Assessment Score was calculated based on an assessment developed by Aquatic Biology Associates, Inc. The ABA Assessment Score was developed to encompass a larger number of taxa and metrics than the ODEQ or BIBI metrics and includes taxa specific to the mountain streams of western Oregon and Washington (Stillwater Sciences 2006h).

The values for the ABA Assessment Score ranged more widely than the ODEQ or BIBI metrics, but also corresponded to moderate to high biotic integrity. Although the multi-metrics are not statistically independent because they are calculated from a single collection of organisms, they provide an integrative approach for measuring ecological conditions and are less susceptible to the variability frequently associated with individual metrics. That is, if multiple metrics from a given sample indicate a similar level of habitat integrity or water quality, the conclusions can be considered more reliable than if the metrics indicate inconsistent results.

The following table shows multi-metric scores calculated for the McKenzie River samples collected in 2004 (Stillwater Sciences 2006h). The second table shows multi-metric scores with respect to biotic integrity categories (Stillwater Sciences 2006h).

Table 29. Multi-metric scores for samples collected in 2004 (Stillwater Sciences 2006h)

Site description	ODEQ Level III Assessment score	Karr's BIBI score	ABA Assessment score
McKenzie River downstream of Trail Bridge Reservoir	48	42	69.4
McKenzie River downstream Olallie Creek	48	42	76.6
McKenzie River upstream of the confluence with Deer Creek	46	42	71.8

Table 30. Multi-metric scores and biotic integrity categories (Stillwater Sciences 2006h)

Biotic habitat integrity	ODEQ Level III score	Karr's BIBI score	ABA Assessment score
Very High	> 39	> 40	90-100
High			80-89
Moderate	30-39	25-39	60-79
Low	20-29	0-24	40-59
Severe habitat and/or water quality limitations	< 20		< 40

Samples collected for this study scored within a relatively narrow and high range that indicates biological conditions are among the highest found within the region. Overall, site scores indicate little or no impairment at sites within the Study Area. Although not truly independent measures, all three multi-metrics were similar and suggest relatively high biological condition for all sites surveyed within Frissell Creek/Boulder Creek 6th field sub-watershed (Stillwater Sciences 2006h).

Freshwater Migration Corridors: Baseline Condition

Within the project area there are no barriers to spring Chinook migration. However, Trail Bridge Dam upstream of Frissell Boat Launch is a complete barrier to further upstream migration. The McKenzie River in the project area provides suitable stream temperatures for both adult and juvenile migration. Stream flows in Western Cascades are flashy and have low base flows in the late summer and early fall (spawning season). However, the spring fed streams from the High Cascades provide a relatively high discharge in the summer and buffers the effects of the Western Cascades low base flows.

EFFECTS OF THE PROPOSED ACTION

A. Introduction

The effects to baseline habitat indicators were assessed for both of the project elements:

1) New boat launch construction on the river bed, river bank, and river terrace,
2) Decommissioning of old boat launch sites at Frissell and Bruckart.

The potential effects (negative, positive, or neutral) that the implementation of each project element may have on each indicator or group of indicators was assessed, where applicable, using the AP factors as defined below:

Proximity ~ The geographic relationship between the project element or action and the species/designated critical habitat.

Probability ~ The likelihood that the species or habitat will be exposed to the biotic or abiotic effects of the project element or action to the indicator.

Magnitude ~ The severity and intensity of the effect.

Distribution ~ The geographic area in which the disturbance would occur (may be several small effects or one large effect).

Frequency ~ How often the effect would occur.

Duration ~ How long the effect would last. Potential categories include (a) short-term event whose effects subside immediately (pulse effect); (b) sustained, long-term effect, or chronic effect whose effects persist (press effect); and (c) permanent event that sets a new threshold for a species' environment (threshold effect).

Timing ~ When the effect would occur in relation to the species' life-history patterns.

Nature ~ Effects of the action on elements of a species' life cycle, population size or variability, or distribution; or on the primary constituent elements of critical habitat, including direct and indirect effects.

As the AP directs, the Proximity, Probability, and Magnitude factors are to be considered first. If either of the following conclusions are made, no further analysis of the PE for that indicator is needed:

1) There is no probability or there is a discountable (extremely unlikely to occur) probability of the impact occurring; and/or
2) The magnitude of the effect is insignificant (not able to be meaningfully measured, detected, or evaluated) or non-existent.

Project Effects to Habitat Indicators

The potential effects that the implementation of this project may have on each indicator (or group of indicators) is described in the following narrative. This discussion is conducted for each project element (or group of elements) and then a summary of the effects is provided for the indicator.

The following Indicator will not be discussed or carried through the factor analysis of Project Elements because: (1) they cannot affect an Indicator because there is no causal mechanism; or (2) they are duplicative or are better described under a different Indicator.

- **Physical Barriers:** This project has no causal mechanism to affect this indicator. New instream structures will not be barriers to ESA-listed fish. New road construction would not cross any streams.

TEMPERATURE	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	PF	PF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

Proximity: The boat launch project would have activities immediately adjacent to, and directly in, aquatic habitats that are occupied by ESA-listed fish species.

Probability: It is likely that ESA-listed fish species and their habitat will be affected by new boat launch construction. At the site scale, individual trees will need to be removed (relocated within the Riparian Reserve or used for fish habitat projects) to construct the new loop roads and launches. At Frissell Creek about 12 to 20 red alder would need to be removed from the bank to place the new ramp. At Paradise, no trees need to be removed at the launch site and the trees at the day use area are small hardwoods and Western hemlocks (4 to 6 inches in diameter). At Paradise a vegetative buffer (approximately 100 to 150 feet in width) of old growth will remain between the parking sites and the river. At Bruckart, none of the trees that would need to be removed are shade trees since the launch sites are on the north bank of the river.

Magnitude:

Frissell Boat Launch – The activities will take place on the southwestern terrace in a river bend. Individual trees removed at this site on the terrace will include Douglas-fir and western red cedar, and about a dozen red alder will need to be removed from the bank (approximately a 12-16 foot wide area where the ramp will be placed). Some of the

upland trees and all the red alder provide shade to the river. However, the removal of these trees is not expected to have an effect on stream temperatures for the following reasons. The majority of crowns on the large conifers will be maintained as the project will be designed to avoid as many big trees as possible. Spring-fed flows from ground water sources overwhelmingly dominate the river flow at this site in the summer and the removal of individual trees (approximately 12 to 20 red alder) will not be of the magnitude that the impacts could be measured at the site scale or the sub-watershed scale. Evidence for this rationale can be found in the temperature monitoring results for the McKenzie River upstream and downstream of the Deer Creek confluence. Deer Creek is contributing water that is 19.0^{o} C to the McKenzie River (7-day average maximum in 2005). Monthly maximum 7-day average temperatures in the river above and below the Deer Creek confluence were 9.3^{o} and 10.3^{o} in 2004 (Stillwater Sciences 2006h). In 2005, temperature monitoring above and below recorded 9.3^{o} and 10.1^{o} (Stillwater Sciences 2006h). If a stream system the size of Deer Creek (23 mi^{2} watershed) contributes warm 19.0^{o} C water to the river, and can only have a 1^{o} C impact on temperatures, it seems extremely unlikely that the removal of a dozen or so red alder and individual upland trees in a spring-fed dominated location could be measurable.

Paradise Boat Launch – The activities at Paradise will take place on the south river bank. The parking lot work in the day use area is far enough away from the river that trees removed will not impact shade conditions. At the ramp location and staging location no trees need to be removed.

Bruckart Boat Launch – The activities at Bruckart will take place on the north river bank. Therefore, no trees removed are shade trees and there would be no impact on stream temperatures at the site scale.

Element Summary: Due to the dominant influence of groundwater sources in the upper McKenzie River, and due to the limited amount of disturbance to shade trees, the effect of this project element on stream temperatures is **NEGATIVE**, but of **insignificant** magnitude and impossible to measure given the limited scope of the project.

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Since no decommissioning activities will take place at Paradise Boat Launch it is not discussed in "element 2" factor analysis.

Proximity: The boat launch project would have activities immediately adjacent to aquatic habitats that are occupied by ESA-listed fish species.

Probability: The probability that stream temperatures will be affected by decommissioning and rehabilitation activities at Frissell and Bruckart boat launches is highly unlikely. The rationale for this finding is as follows: the old launch sites at both Frissell and Bruckart are on the north bank of the river and any trees planted at these sites

to stabilize soils will not serve as shade trees. Therefore the potential effects to this indicator from rehabilitation activities, and in turn to listed fish and their habitat, is entirely discountable.

Element Summary: Decommissioning and rehabilitation activities at old boat launch sites will have a **NEUTRAL** effect on this Indicator. The rationale for this finding is as follows: the old launch sites at both Frissell and Bruckart are on the north bank of the river and any trees planted at these sites to stabilize soils will not serve as shade trees. This element does not have a causal mechanism to affect stream temperature, and the effect is neutral.

Indicator Summary

Project elements will have a **NEGATIVE** effect on this indicator due to the removal of shade trees at Frissell launch. However, the potential effects to stream temperatures and in turn to listed fish are of **insignificant** magnitude and impossible to measure given the limited scope of the project and the influence of spring-fed flows..

The only launch site that could have a direct impact on shade trees is Frissell. Impacts to trees at Paradise launch are far enough away from the river that shade will not be affected, and at Bruckart activities take place on the north bank of the river so none of the trees serve as shade trees.

The removal of shade trees at Frissell is expected to have **insignificant** effects on stream temperatures for the following reasons. The majority of crowns on the large conifers will be maintained as the project will be designed to avoid as many big trees as possible. Spring-fed flows from ground water sources overwhelmingly dominate the river flow at this site in the summer and the removal of individual trees (approximately 12 to 20 red alder) will not be of the magnitude that the impacts could be measured at the site scale or the sub-watershed scale. Evidence for this rationale can be found in the temperature monitoring results for the McKenzie River upstream and downstream of the Deer Creek confluence. Deer Creek is contributing water that is 19.0 ^{o} C to the McKenzie River (7-day average maximum in 2005). Monthly maximum 7-day average temperatures in the river above and below the Deer Creek confluence were 9.3^{o} and 10.3^{o} in 2004 (Stillwater Sciences 2006h). In 2005, temperature monitoring above and below recorded 9.3^{o} and 10.1^{o} (Stillwater Sciences 2006h). If a stream system the size of Deer Creek (23 mi^{2} watershed) contributes warm 19.0^{o} C water to the river, and can only have a 1^{o} C impact on temperatures, it is extremely unlikely that the removal of a dozen or so red alder and individual upland trees in a spring-fed dominated location could be measurable.

SUSPENDED SEDIMENT – INTERGRAVEL DO/TURBIDITY	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
SUBSTRATE CHARACTER AND EMBEDDEDNESS	PF	FAR
	FAR	FAR

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

Proximity: The boat launch project would have activities immediately adjacent to, and directly in, aquatic habitats that are occupied by ESA-listed fish species.

Probability: It is likely that adult and juvenile spring Chinook salmon; and adult, sub-adult, and juvenile bull trout will be exposed to short turbidity pulses during instream work. Therefore the potential effects of turbidity are not discountable.

It is impossible for any mobilized sediment from this project to reach bull trout spawning sites since all bull trout spawn well upstream from the boat launches. It is unlikely that these turbidity pulses will reach areas where spring Chinook spawn as all sites are well over 300 feet downstream of launch sites. All sediment mobilized would be sediment already existing in the river channel (i.e. no additional sources of sediment would be created with this project). Therefore the potential effects to substrate character and embeddedness to areas where listed fish spawn are expected to be insignificant. However, in the three locations where ramps would be placed the substrate character will change from a natural streambed (cobble and gravel) to a concrete substrate.

Magnitude: Ground disturbing construction on the terraces is not expected to deliver sediment to the river channel. Due to the flat nature of the terraces (see figures 11, 12, and 13), sediment delivery prevention measures (silt fencing, mulching and seeding exposed areas, etc.) are expected to be successful at trapping any mobilized soil. The subsoil of these terrace areas are comprised of glacial fluvial material and are very permeable and porous. Any over land flow directed at undisturbed sites will infiltrate the soil quickly. Therefore, no turbidity or sediment delivery effects are expected from new launch sites.

The following table summarizes the area potentially changed from natural river bottom to concrete.

Table 31. Area potentially changed from natural river bottom to concrete.

6th Field Subwatershed	Site Name	Total Concrete Ramp in Bankfull Width in Square Feet[b]
Boulder Cr / Frissell Cr	Frissell	240
McKenzie Bridge	Paradise	480
McKenzie River / Elk Creek	Bruckart	240

At the Frissell launch site an annual average sediment yield of 26,200 t y^{-1} (Stillwater Sciences 2006g) exists under current conditions and the project could potentially impact a site of 240 square feet. The amount of sediment that could be mobilized at the site level when viewed in the context of the annual average sediment yield appears to be insignificant from a habitat standpoint and this logic is true at all boat launch sites. Since spawning areas for spring Chinook salmon are greater than 300 feet downstream, there should be no change to substrate character or embeddedness values at those sites due to project implementation.

However, there will be a **measurable negative** effect to the substrate character at the site scale of each ramp. The substrate will be changed from a natural riverbed with gravel and cobbles to a concrete ramp. This change will reduce cover for spring Chinook salmon fry by the values shown in the table above. This would adversely affect both Critical Habitat and Essential Fish Habitat for spring Chinook salmon.

Pulses of turbidity could harass fish by displacing them for a short period of time to the opposite side of the river where no turbidity is expected. This would harass the fish and is considered "take."

Distribution: These turbidity pulses would take place in three different 6th field subwatersheds across two 5th field watersheds. It is expected that visible turbidity will be detectable up to 100 feet downstream of the work site, but for the purposes of this biological assessment, it is determined that this turbidity plume may extend as far as 300 feet downstream from each instream work site in order to ensure incidental "take" is covered. In addition, the plume may extend approximately 65 feet out into the river (width).

Frequency: It is expected that the ground disturbing activities on the river terraces, banks, and bed will only take place once. The turbidity pulse from instream work would only occur while preparing the bank and bed for the boat ramp, and during placement. Once the ramp was keyed-in, the potential for turbidity would end. It is unlikely that all three ramps would be worked on during the same season due to funding considerations. Therefore, it is possible that one ramp per year could be could be worked on distributing the effects over three years at the site scale.

Duration: This would be a short term turbidity event whose effects would subside almost immediately (pulse effect). If there is a discernable increase in turbidity 100 feet downstream in excess of 30 minutes the contractor must cease operations and modify control measures. Given the size and discharge of the river it will be very difficult to isolate the ramp sites, and to do so would cause a significant and longer impact on the

river. The best approach would be to complete in-water work with all due diligence to minimize the turbidity effects. The Contractor will have to provide a plan to minimize turbidity impacts that the Forest Service approves. Fisheries and/or hydrology specialists will be at the work sites during in-water work to assist the Contracting Officer's Representative (COR) with enforcement of the measures approved in the plan.

The change from a natural river bed to a concrete ramp would be "permanent" at each of the three launch sites.

Timing: In-water and other work would occur during the required work periods for these sites (July 1 to August 15). Work on the terrace would occur during the summer (July to September).

Bull Trout: The closest suitable bull trout spawning habitat is in Olallie Creek which is approximately 6 river miles upstream of Frissell launch (the most upstream project site). Therefore, bull trout spawning habitat will not be affected by this project.

Bull trout spawning in the upper McKenzie River starts in mid-September and continues till the end of October. Upstream or downstream migrating adults, and rearing subadults, could be influenced by activities at the boat launch sites. The primary affect expected is displacement of fish to the unaffected side of the river due to the increased turbidity. The displacement is expected to last "hours" not "days." The only launch site that has the potential to affect juvenile bull trout is Frissell. Juveniles have been observed in the mainstem river as far downstream as Lost Creek (approximately 3 river miles downstream of Frissell launch, and approximately 1.5 miles upstream of Paradise launch).

Chinook Salmon: Based on spawning surveys in the Carmen Smith Spawning Channel, the peak of spawning activity is during the first half of October.

At Frissell, the closest known salmon spawning area is Blue Pool which is approximately ½ mile downstream and no effects are expected to reach this area. It is likely that adults will be migrating to holding pools during the instream work period. The river at Frissell is a rapid that salmon would have to move through quickly. By late September the majority of juvenile chinook should have migrated well downstream of Frissell.

At Paradise, the channel downstream of the ramp on river left is a rapid and is bordered by rip-rap along Paradise campground. This does not provide good spawning conditions for spring Chinook salmon. However, shallow margin habitat on river right (the inside of the river bend) could provide spawning sites, and side channels further downstream (about 1 river mile) are areas of known salmon spawning. Juvenile Chinook could be rearing in pocket pool habitat and in the same side channels where spawning takes place.

At Bruckart, the closest known salmon spawning habitat is about 1000 feet downstream of new ramp site. Juvenile chinook could also be rearing in pocket pool habitat in the channel.

Nature: Due to the "pulse effect" nature of activities on the terrace, bank, and bed, activities are not expected to have a long term effect on this Indicator. The turbidity pulses will be short lived, and should only affect one side of the river channel. At all

three launch sites the deeper (thalweg) side of the river is across from boat ramp activities. If fish are displaced due to turbidity effects, they would move to deeper water away from the work sites. This displacement could subject fish to predation since fish may have to leave good cover during daylight hours to find a different site to take cover.

Element Summary: Boat launch construction activities in the river bed and on the bank are expected to have a **measurable NEGATIVE** impact on this Indicator, primarily due to a change from a natural riverbed to a concrete substrate at the specific ramp locations. This would reduce cover for spring Chinook salmon fry that use the river margin for rearing habitat. In addition, short term increase in suspended sediment/turbidity would occur with this project and may displace migrating adult fish and juveniles. These effects will be of short duration (measured in hours, not days).

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: Decommissioning activities at the boat ramps will take place on areas directly adjacent to Highway 126 and the McKenzie River. These areas are compacted, lack vegetation, and the ramp approaches provide an avenue for direct surface runoff.

Probability: There is potential for juvenile spring Chinook salmon; and adult, sub-adult, and juvenile bull trout to be exposed to short turbidity pulses during the first winter after rehabilitation activities. It is unlikely that this will occur, but it is not entirely discountable. The source of this potential turbidity is the decommissioned ramp sites at Frissell and Bruckart (i.e. not from the terrace areas that are rehabilitated).

It is impossible for any mobilized sediment from this project to reach bull trout spawning sites since all bull trout spawn well upstream from the boat launches. It is unlikely that these turbidity pulses will reach areas where spring Chinook spawn as all sites are well over 300 feet downstream of launch sites. Therefore the potential effects to **substrate character and embeddedness** to areas where listed fish spawn **are insignificant**.

Since substrate character would improve at the rehabilitated boat launch sites due to the cessation of maintenance activities, and re-vegetation efforts. Due to the small site scale this action would produce an **insignificant positive** effect to this indicator.

Magnitude:

Frissell – An area of 2,670 feet is expected to be rehabilitated at the Frissell launch. The existing ramp is approximately 16 feet wide by 30 long. The existing buttress logs will be removed, and any loose soil we feel might enter the river will be removed and placed on the terrace where it can't reach the river. Some of this material may stay on the slope to provide for a seed bed. If any compacted areas on the slope need to be scarified, this would be accomplished with a hand rake just deep enough to provide for a seed bed. Re-vegetation of the slope will be accomplished by grass seeding the old ramp site with native grasses and red alder, planting vine maple trees, big leaf maple, and conifers (Douglas-fir or Western red cedar depending on what is available). The vegetation will

be monitored thru the seasons (for up to 2 years) and if the site requires additional seeding or tree planting due to mortality or for any other reason, it will take place during the appropriate planting season. Straw mulch will be placed on exposed surfaces to minimize soil erosion.

Surface runoff from the highway and terrace will be filtered through existing vegetation and directed away from the former ramp slope by the placement of a series of hummocks. The large pull out will be rehabilitated by importing topsoil and shaping it into hummocks. These hummocks will be seeded with native grass and will serve as a barrier between the highway and the river by acting as a soil filter and as a berm that diverts water into existing vegetation.

Bruckart – Similar rehabilitation techniques will take place at Bruckart. An estimated area of 10,000 square feet will be rehabilitated at Bruckart including a loop road that connects the launch site to Forest Road 19.

This will be accomplished by grass seeding the old ramp site with native grasses and red alder, planting vine maple, big leaf maple, and conifers (Douglas-fir or Western red cedar depending on what is available). The vegetation will be monitored thru the seasons (for up to 2 years) and if the site requires additional seeding or tree planting due to mortality or for any other reason, it will take place during the appropriate planting season. Straw mulch will be placed on exposed surfaces to minimize soil erosion. A windrow of soil (or a berm) would be located on the elevated terrace above the old ramp slope. This windrow would be grass seeded and would serve to ensure any surface runoff was directed to existing vegetation before reaching the river.

- Decommission an existing loop road that connects Bruckart landing to Forest Road 19 will be accomplished by scarifying the surface layer 2 to 4 inches in depth. The underlying subsoil is comprised of glacial-fluvial deposits that are very permeable and porous so no surface runoff is expected after scarification. Native grass seed will be applied to the scarified surface to prevent soil erosion and will be monitored for 2 years. If for any reason further seeding is required, it will take place during the appropriate planting season. The length of existing loop road that would be decommissioned is approximately 861 feet.
- Decommissioning and rehabilitation of existing sites that currently deliver sediment and surface runoff from Highway 126, will minimize these effects into the future from Frissell and Bruckart boat launches.

When viewed in the context of the underlying sediment regime in the McKenzie River, the magnitude of effects due to rehabilitating these two boat launch sites are **positive but insignificant.**

Element Summary: There is the potential for a short term **NEGATIVE** effect to this indicator due to decommissioning and rehabilitation activities, but this effect is considered **insignificant**. The potential for an effect would be possible during the first winter after rehabilitation as vegetation would be young, or still seed. Minimization measures (i.e. placing straw mulch on exposed sites, directing surface flow away from the

former ramp, scarification of compacted soils, seeding, and planting) will reduce short term potential effects that are considered negative.

Indicator(s) Summary

The project elements are expected to have **measurable NEGATIVE** effect to these indicators (see Table 31). The indicator for substrate character and embeddedness is not expected to have significant negative effects to areas where listed fish spawn. The indicator for turbidity is expected to have short term negative effects where listed fish rear or migrate.

The effects to turbidity from project element #1 would come in the form of a short term event whose effects would subside almost immediately (pulse effect). If there is a discernable increase in turbidity 100 feet downstream in excess of 30 minutes the contractor must cease operations and modify control measures. Given the size and discharge of the river it will be very difficult to isolate the ramp sites, and to do so would cause a significant and longer impact on the river. The best approach would be to complete in-water work with all due diligence to minimize the duration of turbidity effects. The Contractor will have to provide a plan to minimize turbidity impacts that the Forest Service approves. Fisheries and/or hydrology specialists will be at the work sites during in-water work to assist the Contracting Officer's Representative (COR) with enforcement of the measures approved in the plan.

Due to the "pulse effect" nature of activities on the terrace, bank, and bed, activities are not expected to have a significant effect on this Indicator. The turbidity pulses will be short lived, and should only affect one side of the river channel. At all three launch sites the deeper (thalweg) side of the river is across from boat ramp activities. If fish are displaced due to turbidity effects, they would move to deeper water away from the work sites. This displacement could subject fish to predation since fish may have to leave good cover during daylight hours to find a different site to take cover. The displacement is expected to last "hours" not "days."

CHEMICAL CONTAMINANTS / NUTRIENTS	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	PF	PF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

There is no evidence that the McKenzie River is chemically contaminated, or suffers from eutrophic conditions.

Proximity: These project elements are in immediate proximity to LFH in the McKenzie River.

Probability: Machinery utilized for this project will be operating in close proximity to the McKenzie River. A fuel spill could occur, potentially contaminating the river. Project design measures will be in place to reduce the probability of a spill. These measures include:

- Two spill kits will be required at each work site.
- All equipment that will be used for instream work in the McKenzie River will be cleaned of grease, oil, and other solvents prior to use, and will be equipped with drip pans or diapers and water friendly fluid systems (i.e. non-petroleum based hydraulic fluids).
- Fuel storage will not be permitted within Riparian Reserves (within 320 feet of fish bearing streams). Fueling sites will be designated by the COR and will not be within 150 feet of water.
- At Frissell the designated fueling and storage site is 800 feet away from the river.
- At Paradise there is no good site for storage so it will not be allowed at the campground. However, if the contractor needs a site it would be the McKenzie Airfield (1500 feet away from the river). Fueling will be at the Highway 126 / Forest Road 2600-300 junction (approximately 1300 feet from river).
- At Bruckart the site would be an old road that is approximately 300 to 400 feet away from the river depending on which specific site on the road is selected.

These management practices will be effective at protecting the McKenzie River and preventing spill contamination. Past monitoring of similar instream and near stream projects have shown the rate of contamination to be very infrequent. Therefore, there will be a discountable probability that this project will have a negative effect on this indicator.

Indicator Summary

Project design measures and careful implementation will reduce the probability of this indicator being negatively affected to near zero. The negative effect is **discountable**.

LARGE WOODY DEBRIS	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	PF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

Proximity: Construction activities will occur in direct proximity to listed fish habitat.

Probability: The likelihood that listed fish and their habitat will be affected by the need to remove and relocate woody material for construction activities is high.

Magnitude:

Frissell - Construction of the new ramp site will require the removal of 12 to 20 red alder which will be spread out in the floodplain and/or Riparian Reserve. Removal and relocation of the alders should take no more than one working day.

Some large conifers (20 to 50 inches in diameter) may need to be felled and moved in order to construct launch facilities on the terrace. Our intent is to use as much currently disturbed area as possible given the existing web of native surface roads on the terrace to minimize the need to cut trees. It is unknown at this time how many trees will need to be cut, but those trees that are suitable for fish habitat work will be staged for future projects. Those trees not suitable for fish habitat work will be placed within the Riparian Reserve in appropriate areas. That is, where they will not interfere with the boat launch site or dispersed camp sites, and where it is practical to place them without too much additional disturbance by the equipment.

Paradise – No trees will be removed for the placement of a new boat ramp. Trees that need to be cut for the parking sites in the day use area are in a location where they can not contribute large woody material to the river. This is due to the presence of the parking lot for the day use area that lies in between the "new parking sites" and the river. New parking sites are approximately 150 feet from the river (it varies depending on which

site). In addition, these trees are shrubby hardwoods (e.g. vine maple), and small conifers (Western hemlock and Western red cedar).

A piece of woody material will need to be relocated that is within the bankfull width. It blocks a user access trail and is 22 feet in length by 19.5 inches in diameter. It will be moved upstream onto the cobble bar remaining within the bankfull channel.

Bruckart – Construction of the new boat ramp will require the removal of 12 to 20 red alder and about 6 small conifers (less than 6 inches in diameter) which will be spread out in the floodplain and/or Riparian Reserve.

- Some large conifers (20 to 50 inches in diameter) may need to be felled and moved in order to construct the new launch facilities on the terrace, but our intent is to design the loop road in a fashion that minimizes the need to cut large trees. It is unknown at this time how many trees will need to be cut, but those trees that are suitable for fish habitat work will be staged for future projects. Those trees not suitable for fish habitat work will be placed within the Riparian Reserve in appropriate areas. That is, where they will not interfere with the boat launch site, and where it is practical to place them without too much additional disturbance by the equipment.

The activities required to implement the project will have a NEGATIVE effect on the large wood indicator. However, for the following reasons this effect is considered to be **insignificant:**

- Those trees that are appropriate for fish habitat projects will be staged for use at a later date.
- Those trees that are not appropriate for fish habitat projects will be scattered in the floodplain (alders) or in the Riparian Reserve (conifers).
- The terrace areas where new boat launch construction would take place are on the inside bend of the river. That is, they are not on the erosive outside bend of the river. Due to this spatial location on the inside of the bend it is unlikely that these trees would mobilized and be transported to the bankfull river channel during a flood.

Element Summary: Project element #1 could have a **NEGATIVE** effect on this indicator. These potential effects are considered **insignificant** given the rationale described above.

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: Decommissioning and rehabilitation activities would occur directly adjacent to habitat with listed fish present.

Probability: Rehabilitation activities would plant a small number of hardwoods and conifers. It is probable that these trees planted on the former ramp slope could one day be delivered to the river channel.

Magnitude: The alder seed and hardwoods that would be planted on the ramp slopes may one day become mature trees. However, alders are not as effective as conifers at interacting with river flows and sediment to create fish habitat. This is due to the ability of microbes to readily colonize them and begin the decomposition process. This characteristic does make alders important to river ecosystem as sources of allochthonous material needed to fuel the energy flow processes, but their role as habitat forming features in the channel is limited.

Approximately 5 conifers (Douglas-fir and/or Western red cedar) will be planted on each of the former ramp slopes and monitored for two years to ensure survival. The limited size of these ramps (around 15 wide by 30 feet long) will only provide enough space for one mature conifer (maybe two).

Hardwoods planted will eventually provide allochthonous material to the river ecosystem via their leaves and woody material. Conifers will eventually provide large wood to the river, but likely only 1 tree per 5th field. These beneficial effects would begin within the decade and continue into the future. However given the limited area that would rehabilitated directly next to the river and the limited number of conifers planted, this project element would have an **insignificant POSITIVE** effect on the indicator.

Element Summary: Boat launch decommissioning and rehabilitation activities will have an **insignificant POSITIVE** effect on this indicator due to the limited space available for tree growth.

Indicator Summary

Boat launch construction and decommissioning activities will have an **insignificant NEGATIVE** effect on this indicator. The following rationale is provided for this finding:

- Those trees that are appropriate for fish habitat projects will be staged for use at a later date.
- Those trees that are not appropriate for fish habitat projects will be scattered in the floodplain (alders) or in the Riparian Reserve (conifers).
- The terrace areas where new boat launch construction would take place are on the inside bend of the river. That is, they are not on the erosive outside bend of the river. Due to this spatial location on the inside of the bend it is unlikely that these trees would mobilized and be transported to the bankfull river channel during a flood.
- The limited area that would rehabilitated directly next to the river and the limited number of conifers planted would have an insignificant positive effect on the indicator.

POOL FREQUENCY AND QUALITY LARGE POOLS.	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	NPF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

Proximity: There are no pools in direct proximity to new boat launch construction activities. The closest pool to any of the launch sites is "Blue Pool" which is approximately ½ mile downstream of Frissell. This is well downstream of the proposed action area, and no effects from this project element are expected to effect pool frequency or size.

Probability: It is extremely unlikely that construction activities would have an effect on pools in the McKenzie River. The closest large pool, Blue Pool, was formed due to the interaction of river flows and a bedrock control feature on the right bank (looking downstream). Changes to substrate character and embeddedness in spawning locations was found to be highly unlikely, and impacts to woody material were found to have an insignificant effect.

Element Summary: It is extremely unlikely that any project element effects could affect the bedrock adjacent to Blue Pool (about ½ mile downstream). Therefore, this project element would have a **NEUTRAL** effect on pool frequency and large pools.

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: There are no pools in direct proximity to decommissioning and rehabilitation activities. The closest pool to any of the launch sites is "Blue Pool" which is approximately ½ mile downstream of Frissell. This is well downstream of the proposed action area, and no effects from this project element are expected to effect pool frequency or size.

Probability: It is extremely unlikely that decommissioning and rehabilitation activities would have an effect on pools in the McKenzie River. The closest large pool, Blue Pool, was formed due to the interaction of river flows and a bedrock control feature on the right bank (looking downstream). Changes to substrate character and embeddedness in spawning locations were found to be highly unlikely, and impacts to woody material were found to have an insignificant effect.

Element Summary: It is extremely unlikely that any project element effects could affect the bedrock adjacent to Blue Pool (about ½ mile downstream). Therefore, this project element would have a **NEUTRAL** effect on pool frequency and large pools.

Indicator Summary

Project elements would have a **NEUTRAL** effect on pool frequency, quality, and size. The following rationale is provided for this finding:

- There are no large pools in any of the action areas.
- Changes to substrate character and embeddedness in spawning locations were found to be highly unlikely, and impacts to woody material were found to have an insignificant effect.
- Blue Pool, the largest pool near any of the project sites, was formed by the interaction of river flows, bedload, and a bedrock feature on river right. No project element effects are expected to travel as far downstream as Blue Pool (about ½ mile).
- Activities from both project elements are small in scope relative to the discharge and size of the McKenzie River. It is highly unlikely that any effects will realized in pools in the 6th field subwatersheds.

OFF-CHANNEL HABITAT	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	FAR

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: Off channel habitat exists in all 6th field subwatersheds where project activities would take place. This is especially true for the McKenzie Bridge 6th field, and the McKenzie River / Elk Creek 6th field.

Probability: It is unlikely that project elements will affect off-channel habitat at the scale of the 6th field sub-watershed or the action area. This is due to the distance between project activities and downstream off channel habitat. Project implementation does not require working in off channel habitat, placing parking sites near them, or building access

roads across them. Neither project element, individually or collectively, would result in a loss of off channel habitat.

Element Summary: There is no causal mechanism to effect this indicator, and this project will therefore have a neutral effect on this indicator.

Indicator Summary

There is no causal mechanism to effect this indicator since no project work would occur in off channel habitat, and no facilities will be constructed near off channel habitat. Neither project element, individually or collectively, would result in a loss of off channel habitat. This project will therefore have a **NEUTRAL** effect on this indicator.

REFUGIA	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	NPF	NPF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: There is no refugia in direct proximity to the boat launch project areas. The best refugia in the McKenzie River 4th field sub-basin is Horse Creek. The majority of land in Horse Creek is in Wilderness designation.

Probability: The probability that the boat launch project will affect refugia in Horse Creek is extremely discountable.

Element Summary: It is extremely unlikely that the boat launch project could affect refugia characteristics in Horse Creek (the closest refugia). This is due to the fact that Horse Creek is a separate 5th field watershed and none of the project activities are tributary to Horse Creek. Therefore, the boat launch project will have a **NEUTRAL** effect on this indicator.

Indicator Summary

It is extremely unlikely that the boat launch project could affect refugia characteristics in Horse Creek (the closest refugia). This is due to the fact that Horse Creek is a separate 5th field watershed and none of the project activities are tributary to Horse Creek. Therefore, the boat launch project will have a **NEUTRAL** effect on this indicator.

WIDTH TO DEPTH RATIOS	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	NPF	NPF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: The new concrete ramps will be in direct proximity to the river bed and bank.

Probability: Activities will affect the river banks, however it is highly unlikely that project activities will affect this indicator. The project elements would not cause the river to become shallow, or cause the channel to widen. This finding is based on observations at other boat launches in the upper McKenzie River where no apparent effects to width to depth ratios are discernable.

Indicator Summary

Project elements do not require river bed or banks to be altered in such a manner that width to depth ratios could be caused at the action area or sub-watershed level. There are no causal mechanisms that would affect the width to depth ratios of the McKenzie River channel. Therefore, these project elements would have a **NEUTRAL** effect on this indicator.

STREAMBANK CONDITION	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	FAR

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

Proximity: The new concrete ramps will be in direct proximity to the river bed and bank.

Probability: Activities on the river bank will affect this indicator.

Magnitude: Changes would occur to the river bank due to the placement of a concrete ramp.

Table 32. Change from river band and bed to concrete boat ramp

6th Field Subwatershed	**Site Name**	**Area changed from river bank and bed to concrete boat ramp**
Boulder Cr / Frissell Cr	Frissell	16' x 40' (640 ft^2)
McKenzie Bridge	Paradise	32' x 40' (1,280 ft^2)
McKenzie River / Elk Creek	Bruckart	16' x 40' (640 ft^2)

As described in the baseline condition discussion, in general, the McKenzie River in the 6th field subwatersheds where this project occurs have stable banks. This is due to the dominance of spring-fed water in the upper watershed. However due to Highway 126, rip-rap can be found on some banks and rip-rap has been placed adjacent to Paradise Campground.

Development along the terraces and flood plains of the McKenzie River, especially early road construction and road maintenance activities, has locally resulted in increased bank erosion and the introduction of sediment into the river system. Volumetrically, it is unlikely that this amount of sediment has had a serious, long-term negative impact on channel processes (Quartz Creek and Minor Tributaries Watershed Analysis 1998).

Project activities would move this indicator in the direction of further development on the river bank.

Distribution: See table above.

Frequency: The change from river bank to concrete boat ramp would only take place once.

Duration: Placement of the prefabricated concrete boat ramp would permanently change the condition of the river bank (see table 32 above).

Timing: The ramps would be placed during the instream work period (July 1 to August 15).

Nature: The limited scope of the project (see table 32 above) will limit the impact to listed fish and their habitat. Bull trout and spring Chinook do not spawn in the action areas of the different ramps, but do migrate thru them. The ramps will not impede migration of adults or any other life history stage.

The primary direct effect would be to spring Chinook fry by changing the condition of the habitat. The existing condition is a natural river bank and bed on the inside river bend. This provides lower velocity, shallow margin habitat where Chinook fry can take cover. The banks are stable and river bed substrates are comprised of cobble and small boulders that provide complex habitat small fish can use for cover. Concrete ramp will not significantly affect the flow regime along the river margin, but they will simplify the habitat (see table 32 above for area changed by placement of concrete boat ramps). This will reduce the amount of cover small fish could use in the river.

Element Summary: Although the area is limited in scope and distributed across three 6th field subwatersheds (see table above), the placement of prefabricated concrete boat ramps at the proposed locations will permanently change the river banks in those areas. This will have the direct effect of reducing cover for small fish due to the simplification of habitat. These effects move this indicator in a **measurable NEGATIVE** direction.

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: The decommissioned and rehabilitated river banks that currently serve as boat launches are in direct proximity to listed fish habitat.

Probability: Activities on the river bank will affect this indicator.

Magnitude:

Frissell – An area of river bank approximately 16 feet wide by 30 feet long (480 square feet) would be rehabilitated. This would be accomplished by removing structural elements followed by seeding and tree planting.

Bruckart – An area of river bank approximately 20 feet wide by 30 feet long (600 square feet) would be rehabilitated. This would be accomplished by removing structural elements followed by seeding and tree planting.

The area of river bank rehabilitated would improve the conditions over time. However, the area of rehabilitation relative to the amount of stream bank in the action areas and 6th field subwatersheds is insignificant. Therefore the magnitude of effect on stream banks would be **insignificant**.

Element Summary: The decommissioning and rehabilitation river banks that currently serve as boat launches would move this indicator in a **POSITIVE** direction. However, relative to the amount of stream banks in the 6th field subwatersheds the amount of area rehabilitated is **insignificant.** It would improve cover conditions for small fish, but these current ramps enter into the main river current (the thalweg). This high velocity margin habitat would not be preferred by small fish so improvements to that habitat will be limited.

Indicator Summary

Project Element #1 would have negative effects on this indicator, and Project Element #2 would have positive effects to this indicator. The life history stage of listed fish that will be affected is spring Chinook fry. The habitat that would be affected by element #1 is preferable as cover for small fish, whereas the habitat improved by element #2 is fast moving water where small fish would have difficulty taking cover. The proposed project would have an overall **measurable NEGATIVE** effect on this indicator.

FLOODPLAIN CONNECTIVITY	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	NPF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: FEMA has not developed floodplain maps for the project areas. However, it is obvious that this project is in direct proximity to the floodplain of the McKenzie River. Floodplains in the upper McKenzie River are not extensive given entrenched condition of the River. This is a "natural" condition, but has potentially been influenced by the construction of dams in the river which have trapped substantial amounts of sediment.

Probability: It is likely that project elements will affect floodplains.

Magnitude: The project will not affect a significant portion of the floodplain (see table below)

Table 33. Area floodplain changed from river bank and bed to concrete boat ramp

6th Field Subwatershed	Site Name	Area floodplain changed from river bank and bed to concrete boat ramp
Boulder Cr / Frissell Cr	Frissell	16' x 40' (640 ft^2)
McKenzie Bridge	Paradise	32' x 40' (1,280 ft^2)
McKenzie River / Elk Creek	Bruckart	16' x 40' (640 ft^2)

The area described above includes that portion of the ramp that will be in the river channel, and even with that included the area is still very small relative to all the floodplain area in the McKenzie River.

At Frissell an area 16 feet wide by 30 feet long (480 square feet) would be rehabilitated. At Bruckart an area 20 feet wide by 30 feet long (600 square feet) would be rehabilitated. This is an insignificant amount of area when taken in the context of a 5th field watershed.

Project design of a boat launch or rehabilitation project would not cause a disconnection of the floodplain from the river. A small area relative to the watersheds where the boat launch work would take place would be negatively affected. In terms of effects to listed fish it would be an insignificant effect for the following reasons:

- Listed fish would still be able to access the floodplain during high water events.
-
- Trees that need to be cut in the floodplain to place the new ramps will remain in the floodplain as "down woody material." This woody material will provide cover for fish during high water events. Should these trees become mobilized and transported in the future they would be lost to the action area floodplain, but since they will remain available to the river they will likely end up in the floodplain downstream. In any case these trees will remain part of the aquatic/riparian ecosystem but will be on the ground or in the river rather than standing.

Indicator Summary

Project elements would negatively affect a small area of the floodplain, but would not affect the ability of flood flows to reach the floodplain.

The Upper McKenzie River 5th field watershed is approximately 230,400 acres in size, and the McKenzie River / Quartz Creek 5th field watershed is approximately 47,360 acres in size. The area impacted by project elements in small relative to 5th field watershed area (see table below).

Table 34. Summary of Project Area Impacts[a]

Site	Total Impact in Square Feet	Total Decommissioned in Square Feet	Total Concrete Ramp in Bankfull Width in Square Feet[b]
Frissell	10,936	2,670	240
Paradise	3,439	0	480
Bruckart	19,900	10,000	240

[a] These figures are approximate as designs are conceptual, and they represent a "worst case scenario." That is, the total area impacted will likely be less and the total area restored will likely be greater. All of the area summarized is within the Riparian Reserve.

[b] This figure is included in the "total impact" column and represents the amount of ramp that would be "in the water" during normal flows.

Listed fish would still be able to access the floodplain during high water events, and trees that need to be cut in the floodplain to place the new ramps will remain in the floodplain as "down woody material." This woody material will be available to provide cover for fish during high water events.

Given the small scope of the project relative to watershed size, since the project would not inhibit flood flows from reaching the floodplain, and since woody material cut in the floodplain would remain as "down wood," project elements would have an **insignificant NEGATIVE** effect on this indicator.

CHANGES IN PEAK / BASE FLOWS	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	NPF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And,

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: The project is in direct proximity to listed fish habitat.

Probability: Project element #1 would require cutting down trees and creating impervious surfaces by paving access roads and placing a concrete boat ramp in the floodplain. These activities would also create small openings in the canopy and reduce evapotransporation rates. All these factors have the potential to influence the rate, timing, and magnitude of precipitation runoff to the McKenzie River.

Magnitude: Roads constructed for the project will be paved which will create impervious surfaces. However, based upon field investigations by the District hydrologist and fish biologist our findings are that this would have effects on peak and base flows that cannot be measured. Roads will drain surface water (rain) off the road and towards existing vegetation. The terrace areas where new roads will be constructed are comprised of glacial/fluvial materials and are very porous and permeable. Any surface water will drain off the roads and into this material where it will readily enter the ground water system before it drains to the river. The concrete ramp itself will likely shed rain water directly toward the river before it has an opportunity to enter the soil.

Decommissioning and rehabilitation activities will improve permeability due to scarification of compacted areas and re-vegetation. However given the limited scope of rehabilitation activities relative to watershed size, it is highly unlikely that there will be a measurable effect to peak or base flows.

The Upper McKenzie River 5th field watershed is approximately 230,400 acres in size, and the McKenzie River / Quartz Creek 5th field watershed is approximately 47,360 acres in size. The area potentially affected by project elements relative to watershed size is small (see table below).

Table 35. Summary of Project Area Impacts[a]

Site	Total Impact in Square Feet	Total Decommissioned in Square Feet	Total Concrete Ramp in Bankfull Width in Square Feet[b]
Frissell	10,936	2,670	240
Paradise	3,439	0	480
Bruckart	19,900	10,000	240

a These figures are approximate as designs are conceptual, and they represent a "worst case scenario." That is, the total area impacted will likely be less and the total area restored will likely be greater. All of the area summarized is within the Riparian Reserve.

b This figure is included in the "total impact" column and represents the amount of ramp that would be "in the water" during normal flows.

Given the limited area of effect due to the project elements relative to watershed size, **the potential for negative effects to be significant is low.**

Indicator Summary

The project elements will have an **insignificant NEGATIVE** effect on this indicator. The negative determination is due to the need to cut down trees, the creation of impervious surfaces, and the creation of small openings. The limited scope of the project relative to watershed area, and the highly permeable/porous soils in project areas would limit the significance of effect to this indicator.

INCREASES IN DRAINAGE NETWORK	Baseline Condition	
	Boulder Cr / Frissell Cr and McKenzie Bridge 6th Field Sub-watersheds (040106 and 040109, respectively)	McKenzie River / Elk Creek 6th Field Sub-watershed (040502)
	FAR	NPF

Project Element 1: New boat launch construction on the river bed, river bank, and river terrace

And

Project Element 2: Decommissioning and rehabilitation of old boat launch sites

Proximity: Portions of the project roads would be constructed in direct proximity to listed fish habitat.

Probability: The probability that listed fish and their habitat would be affected by this project element is high.

Magnitude: Roads and their impervious surfaces can cause increases in the drainage network. It is expected that this project element will have an **insignificant negative** effect on this indicator for the following reasons:

- The terrace areas where new roads will be constructed are comprised of glacial/fluvial materials and are very porous and permeable. Therefore, most surface water (rain) will drain off the roads and into this material where it will readily enter the ground water system before it drains to the river.
- The ramp itself will shed water directly to the river before it can enter the soil. This will be limited in scope (240 square feet for Frissell and Bruckart, and 480 square feet for Paradise). Relative to watershed area, these new impacts would be insignificant. In addition, project element #2 would be improving conditions for this indicator.

Indicator Summary

Project elements will have an i**nsignificant NEGATIVE** effect on this indicator that would difficult to measure in listed fish habitat (the McKenzie River). This is due to the limited scope of the project relative to watershed area, and due to the porous and permeable nature of the terrace areas where project activities would take place.

ROAD DENSITY & LOCATION	Baseline Condition	
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	NPF	NPF

The baseline condition determinations were NPF for both 5th field watersheds. The Upper McKenzie watershed (0401) has a road density of 1.934 miles/square mile (Figure 14); and the McKenzie / Quartz Creek watershed (0405) has a road density of 2.832 miles/square mile (Figure 16) (note: these figures are for National Forest System lands, not private lands). The Upper McKenzie River 5th field HUC is a Key Watershed, and since the inception of the NWFP 11.148 miles of road have been decommissioned.

Project Element #1 will increase the road density in the Upper McKenzie River from a road density of 1.934 mi/mi^2 to 1.943; and increase road density in the McKenzie / Quartz Creek watershed (0405) from 2.832 mi/mi^2 to 3.021.

Project Element #2 will decommission roads, but the amount of road decommissioned in the Upper McKenzie River (0401) is insignificant. In fact, it is the pullout of the highway that would be rehabilitated and not a "road" per se. Therefore, this project element would not decrease the road density in this watershed. The McKenzie / Quartz Creek watershed (0405) would have approximately 861 feet of road decommissioned. This would bring the road density down to approximately 2.858 mi/mi^2.

Roads that would be constructed and decommissioned are all within the Riparian Reserve land allocation. These roads are valley bottom roads.

The amount of road work (construction and decommissioning) would be insignificant relative to watershed size and road mileage. Therefore, the project as a whole would have an **insignificant NEGATIVE** effect on this watershed condition indicator.

DISTURBANCE HISTORY	Baseline Condition	
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	FAR	NPF

Project elements would marginally increase the amount of human caused disturbance in both watersheds.

Table 36. Summary of Project Area Impacts[a]

Site	Total Impact in Square Feet	Total Decommissioned in Square Feet	Total Concrete Ramp in Bankfull Width in Square Feet[b]
Frissell	10,936	2,670	240
Paradise	3,439	0	480
Bruckart	19,900	10,000	240

[a] These figures are approximate as designs are conceptual, and they represent a "worst case scenario." That is, the total area impacted will likely be less and the total area restored will likely be greater. All of the area summarized is within the Riparian Reserve.

[b] This figure is included in the "total impact" column and represents the amount of ramp that would be "in the water" during normal flows.

Since Project Element #1 impacts are greater than Project Element #2 benefits, this indicator would continue to have human induced disturbance. Therefore, the project as a whole would have a **measurable NEGATIVE** effect on this watershed condition indicator.

RIPARIAN RESERVES	Baseline Condition	
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	FAR	NPF

Project elements would marginally increase the amount of disturbance in both watersheds. There are approximately 39,215 acres (or 1,708,205,400 ft^2) of Riparian Reserve in the Upper McKenzie River 5th field watershed, and approximately 4,561 acres (or 198,677,160 ft^2) in the McKenzie River / Quartz Creek 5th field (National Forest System lands, only). See Figures 15 and 17.

Table 37. Riparian Reserve area and amount of potential disturbance

5th Field Watershed	Riparian Reserve Area in 5th field (square feet)	Riparian Area Disturbed in 5th field (square feet)
Upper McKenzie 5th Field Watershed (0401)	1,708,205,400 ft^2	17,045 ft^2
McKenzie River / Quartz Cr 5th Field Watershed (0405)	198,677,160 ft^2	29,900 ft^2

Even including the amount of area decommissioned and rehabilitated (a short term disturbance) in the 5th fields, the amount of Riparian Reserve area impacted relative to the acreage of Riparian Reserve in the watersheds, the project would have an **insignificant NEGATIVE** effect on this watershed condition indicator.

DISTURBANCE REGIME	Baseline Condition	
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	NPF	NPF

The disturbance regime has been impacted in the Upper McKenzie River 5th field watershed, especially in the Western Cascades portion of the watershed. There is a legacy of intensive forest management (timber harvest and road network) in the Deer Creek watershed. This has likely increased the sediment yield from that watershed compared to reference conditions (Stillwater Sciences 2006; Upper McKenzie Watershed Analysis 1995). There is also a large, deep-seated earthflow in the Deer Creek watershed and this naturally occurring feature provided Deer Creek with a historically high sediment load.

There is a hydropower development in this 5th field watershed. However, current license requirements are very strict and the hydropower development is essentially a "run-of-the-river" project. That is, inflow must come close to equaling outflow, and therefore this 5th field has a predictable hydrograph.

There has been significant human disturbance in the McKenzie River / Quartz Creek 5th field watershed in the form of road building, timber harvest, private land development, and flood control dams in tributary 5th field watersheds that significantly impact the disturbance regime of the McKenzie River/Elk Creek 6th field sub-watershed. Due to these flood control dams the hydrograph is predictable, but in a negative sense. That is, flood flows are no longer allowed to maintain the river channel and fish habitat in this 5th field watershed.

Project elements will have an **insignificant NEGATIVE** effect on this watershed condition indicator. This is due to the limited area of impact relative to the area of the 5th field watersheds (see Table 37).

Project Effects to Population Indicators

The AP directs the assessment of population indicators when recovery plans are available for listed species. For this project, a draft recovery plan has been developed for Columbia River bull trout, but not for Upper Willamette River spring Chinook salmon. Therefore, the project effects to population indicators will only address bull trout.

	Baseline Condition	Baseline Condition
POPULATION SIZE AND DISTRIBUTION	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	FAR	**FAR**

Effects of the Action: Indicator Summary:
Bull trout distribution ranges throughout the main stem McKenzie River where the action areas occur. A discussion of specific life history stages at each action area follows:

Frissell: The life history stages that could be expected at the Frissell action area are juvenile, subadult, and adult. Fry are not expected to be found this far downstream of Olallie Creek due to stream temperatures (see temperature discussion in Baseline Condition analysis and Table 9).

The project would not create structures that would impact the long term size or distribution of the bull trout population. In the short term a possibility exists that a juvenile bull trout could be harmed if equipment needs to enter the channel. If a small number of juvenile bull trout (e.g. less than 5) were harmed it would not be a number of sufficient size to impact the adult population in the long term. It is expected that larger bull trout could easily move out of the way of equipment, and that by working during the instream work period impacts to bull trout that could affect population size will be substantially minimized.

During in-water work, a short term turbidity plume is expected to occupy an area in the river approximately 65 feet in width by 300 feet in length and last less than one day. This turbidity plume will not occupy the entire river width as the river is approximately 130 feet. Therefore, any potential delay in adult bull trout migration to upstream spawning areas is expected to be minimal (i.e. measured in hours).

Paradise and Bruckart: The life history stages expected at these sites are subadults and adults. The width of the river at Paradise is approximately 144 feet, and 160 feet at Bruckart. A similar turbidity plume, both is size and duration, is expected at these sites during in-water work. However, since the river is wider the impact to migrating bull trout would be less than at Frissell. In addition, since the fish at these sites would be larger than at Frissell, it is expected that they could easily avoid equipment when it is working in water (i.e. there are no juveniles this far downstream).

Given the conditions at the boat launches, the life history stages potentially affected, and the minimization measures (i.e. working during the instream work period) the project is

expected to have an **INSIGNIFICANT NEGATIVE EFFECT** to the population size and distribution of bull trout.

GROWTH AND SURVIVAL	Baseline Condition	Baseline Condition
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	FAR	**FAR**

The project would have a neutral effect on stream temperatures (see temperature discussion in Baseline Condition analysis). Therefore no effect to bull trout growth and survival is expected due to temperature impacts.

As discussed above, bull trout fry are not expected to be present in any action area. Frissell boat launch could have juveniles present in the action area as well as subadults and adults. At Bruckart, only subadults and adults are expected to be present. All life stages potentially found at the various action areas are expected to be able to avoid equipment during in-water work. Therefore, this project would have an **INSIGNIFICANT NEGATIVE EFFECT** on the growth and survival of the bull trout population in the McKenzie River.

LIFE HISTORY DIVERSITY AND ISOLATION	Baseline Condition	Baseline Condition
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	FAR	**FAR**

This project would not create barriers to migration for any life history stage of bull trout. Nor would it have any effects on the presence or absence of brook trout in the McKenzie River. This project has no causal mechanism to affect the genetics or evolution of bull trout in the McKenzie River. Therefore this project would have a **NEUTRAL EFFECT** on the life history diversity and isolation of bull trout in the McKenzie River sub-basin.

PERSISTENCE AND GENETIC INTEGRITY	Baseline Condition	Baseline Condition
	Upper McKenzie 5th Field Watershed (0401)	McKenzie River / Quartz Cr 5th Field Watershed (0405)
	FAR	**FAR**

This project would not create barriers to migration for any life history stage of bull trout. Nor would it have any effects on the presence or absence of brook trout in the McKenzie River. There is the potential that during implementation (in-water work) there could be a short term turbidity plume (measured in hours) that could delay migrating adults heading to upstream spawning sites. However, given the short term nature of the impact, and since a portion of the river channel should be free of turbidity, it is not expected that the delay could cause any short or long term impact to this indicator. Therefore, this project will have a **NEUTRAL EFFECT** on the persistence and genetic integrity of bull trout in the McKenzie River.

Project Effects to Primary Constituent Elements (PCEs) of Critical Habitat

Only spring Chinook salmon Critical Habitat is located within the Action Areas. Within the Action Areas, only the following three PCEs are applicable:

FRESHWATER SPAWNING SITES

There are no spawning sites within any of the action areas, and no impacts to known spawning sites are expected (see substrate character and embeddedness /suspended sediment – intergravel do/turbidity factor analysis). Therefore, this project would have a **NEUTRAL EFFECT** on this PCE.

FRESHWATER REARING SITES

There is a potential for Chinook fry rearing habitat to be impacted by project element #1. This is due to the change from a natural cobble river bed to a concrete boat ramp. Chinook fry in their early stages will seek out rearing habitat along the river margin where velocities are slower. In these areas they can use the interstitial spaces between cobbles to take cover. Frissell and Bruckart would each change 240 square feet of this natural river margin habitat to concrete ramp and Paradise would change 480 square feet to concrete ramp (project element #1). Project element #2 would rehabilitate approximately 20 feet of river margin at Frissell and about 25 at Bruckart.

The change from cobble habitat to concrete ramp is "permanent." However, these impacts from project elements 1 and 2 (measured in feet), are minor relative to the amount of river margin habitat in the two 5th field watersheds where projects are located (see Figures 1 and 2). In addition, the "old" ramps would be rehabilitated and their poor location would no longer impact the river. This project could have a slight **NEGATIVE EFFECT** on this PCE for Chinook fry. No other life stage of Chinook salmon is expected to have rearing habitat affected due to the distance of that habitat from the ramp sites.

FRESHWATER MIGRATION CORRIDORS

This project would not create permanent barriers to migration for either upstream or downstream migrating spring Chinook salmon. However, during in-water work activities (i.e. ramp placement) there is the potential for a turbidity plume. It is expected that this plume would only last one work day (measured in hours) at each site, and that the plume would not occupy the enter river channel. It is estimated that the plume will hug the side of the river where work is occurring. The estimated width of the plume at each site is 65 feet. The width of the river varies at each site (Frissell = 130'; Bruckart 144'; and Bruckart 160'), but enough room will be available for migrating spring Chinook salmon to swim by the work site during the turbidity plume. If there is a delay, it would be measured in hours not days.

Therefore, this project would have a slight (short term) **NEGATIVE EFFECT** on this PCE.

ESA Effects Determination

The potential effects to bull trout and spring Chinook salmon using a habitat approach was discussed in detail in the previous sections of this BA. The results of this analysis are summarized below.

Summary of effects to Habitat Indicators

		Temperature	Sediment	Chemical	Barriers	Substrate	LWD	Pools	Off Channel	Refugia	Width:Depth	Streambank	Floodplain	Flows	Drainage Network
Baseline	Boulder Frissell HUC6	PF	PF	PF	PF	AR	AR	AR	AR	NF	NF	AR	AR	AR	AR
	McK Bridge HUC6	PF	PF	PF	PF	AR	AR	AR	AR	NF	NF	AR	AR	AR	AR
	McK R Elk Cr HUC6	PF	AR	PF	PF	AR	PF	NF	AR	NF	NF	AR	NF	NF	NF
Element Summary	Element One	-I	-M	D	D	-M	-I	N	N	N	N	-M	-I	-I	-I
	Element Two	N	-I	D	D	+I	+I	N	N	N	N	+I	-I	-I	-I
Indicator Summary		**-I**	**-M**	**D**	**D**	**-M**	**-I**	**N**	**N**	**N**	**N**	**-M**	**-I**	**-I**	**-I**

Notes: Properly Functioning = "PF", Functioning at Risk = "AR", Not Properly Functioning = "NF"; Negative effect = "-", Positive effect -= "+", Neutral effect = "N"; measurable magnitude (Greater than insignificant) = "M", Insignificant magnitude = "I", Discountable probability = "D
"Element 1 = boat launch construction" and "Element 2 = boat launch decommissioning"

Summary of effects to watershed indicators, spring Chinook salmon PCEs, and bull trout population indicators

		Watershed Condition Indicators				Critical Habitat Spring Chinook PCEs			Population Indicators Bull Trout			
		Road Density	Disturbance History	Riparian Reserves	Disturbance Regime	Freshwater Spawning Sites	Freshwater Rearing Sites	Freshwater Migration Corridor	Population Size and Distribution	Growth and Survival	Life History Diversity and Isolation	Persistence and Genetic Integrity
Baseline	Upper McK R HUC 5	NF	AR	AR	NF	N/A	N/A	N/A	AR	AR	AR	AR
	McK R / Quartz Cr HUC 5	NF	NF	NF	NF	N/A	N/A	N/A	AR	AR	AR	AR
Indicator Summary		**-I**	**-M**	**-I**	**-I**	**N**	**-**	**-**	**-I**	**-I**	**N**	**N**

The boat launch project is located in close proximity to habitat used by bull trout and spring Chinook salmon, and therefore, project activities are likely to affect these fish and their habitat. The project was designed to minimize negative effects to listed fish and their habitat, while still meeting the objectives of the project. There is a potential for disturbance/harassment (i.e. take) to both bull trout and spring Chinook salmon due to work on the stream bed and banks.

The implementation of this project would likely result in measurable negative effects to the Sediment/Turbidity indicator. This is due to a predicted turbidity plume that could occur during ramp placement at each of the three sites. Seasonal operating restrictions are expected to minimize adverse affects to listed fish, but the turbidity plumes could temporarily displace fish, cause gill abrasion if fish do not move, or delay upstream migration. The plumes are expected to last hours (not days) at each site and would not occupy the enter river channel width which would allow fish to find refuge in an unaffected portion of the river.

The implementation of this project would likely result in measurable negative effects to the Substrate Character indicator. This is due to change from natural riverbed (cobble and gravel substrate) to a concrete substrate. This change can be measured in square feet and is summarized previous sections of this BA. It would reduce the amount of available river margin habitat that spring Chinook fry use for rearing and cover at the site scale of each ramp.

The project would also permanently change small areas of streambank to a concrete ramp. This change can be measured in square feet and is summarized previous sections

of this BA. In these areas trees will no longer be able to grow and provide LWD and organic matter to the river.

In addition to this negative measurable change to the Streambank indicator and the Substrate indicator, two "old" boat ramps will be rehabilitated which would have an insignificant positive effect on these indicators. Trees planted on the rehabilitated ramps sites would have an insignificant positive effect on the LWD indicator.

PROJECT EFFECTS DETERMINATION KEY FOR SPECIES AND DESIGNATED CRITICAL HABITAT

1) Do any of the indicator summaries have a positive (+) or negative (-) conclusion?
Yes – Go to 2
No – No Effect

YES

2) Are the indicator summary results only positive?
Yes – NLAA
No – Go to 3

NO

3) If any of the indicator summary results are negative, are the effects insignificant or discountable?
Yes – NLAA
No – LAA, fill out Adverse Effects Form

NO

(See Appendix for LAA Effects Forms)

Aggregated Federal Effect

The Analytical Process requires that "action agencies would disclose in each BA the known projects that have not concluded consultation." The AP further states, "There may be situations where two or more LAA land management actions within a 5th field watershed are undergoing consultation concurrently. The effects of each of these actions need to be accounted for in aggregate by the Services in their jeopardy/adverse modification analysis. Coordinate internally within the administrative unit, or with other Federal land management agencies as appropriate, in the preparation and submission of BAs, whether or not the concurrent submissions are combined or separate. Additionally, effects of projects for which consultation has been concluded are not addressed in the aggregate effects section, but are included in the description of environmental baseline."

There are no known (fish) LAA actions occurring in either 5th field watershed that are undergoing consultation concurrently. Effects of projects for which consultation has been concluded have been addressed in the description of environmental baseline. In addition, State and private land actions were considered in the description of the environmental baseline (both actions that have been concluded, and actions that are "foreseeable").

The following is a list of activities occurring within the two 5th field HUCs addressed in this BA. This is not a list of "concurrent consultation" actions by other Federal agencies (e.g. FERC, BLM, ACOE). This list is provided as information that was requested by the Services in order to aid in their jeopardy/adverse modification analysis.

- The Eugene Water & Electric Board operates a hydroelectric project in the Upper McKenzie River 5th field HUC. Trail Bridge dam does not provide passage for bull trout or spring Chinook salmon. The construction of the project isolated/fragmented the McKenzie River bull trout population. It has also affected the sediment regime and large wood routing in the upper McKenzie River. EWEB is currently in the process of filing for a new license to operate the project. A license is expected in late 2008. This project would undergo Section 7 ESA consultation before issuance of a license since FERC provides the federal nexus.

- The Willamette National Forest has a Section 10 (a)(1)(a) "take permit" (TE001822-4 valid from November 10, 2004 to November 9, 2008) in order to conduct bull trout monitoring (snorkel surveys, trapping, marking, redd surveys, and transplanting of fry to the Middle Fork Willamette River). The Willamette works in partnership with the Oregon Department of Fish and Wildlife to transfer fry to the Middle Fork. The permit allows for up to 25% of the estimated total production of Anderson Creek to be transferred; or up to 5000 bull trout fry.

- The Army Corps of Engineers will regulate flow in two 5th field HUCs that are not part of this proposed action, but were considered in the description of baseline due to their impacts on the McKenzie River/Quartz Creek 5th field HUC. Blue River Dam in the Blue River watershed, and Cougar Dam in the South Fork McKenzie River watershed have both significantly affected the flow regime, the sediment regime, large wood routing, and river temperature in the McKenzie River/Quartz Creek 5th field HUC. Cougar Dam caused the isolation and fragmentation of the McKenzie River bull trout population, and blocked spring Chinook salmon from accessing miles of suitable spawning and rearing habitat.

ESA Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the **action area**. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

There are no known State, tribal, local or private actions that are reasonably certain to occur in the **action areas** as defined on pages 8, 10, and 11 of this BA. All action areas lie on National Forest System lands, and by definition there could not be any State, tribal, local, or private actions. Any action proposed by a non-federal entity in the action areas defined in this BA, would be subject to a "federal nexus" since the lands are part of the National Forest System and would therefore require Section 7 consultation.

The following is a list of activities that could be considered "reasonably certain to occur" outside of the action areas (as defined), but within the 5th field watersheds assessed in this BA.

- The public will use the river for boating and fishing. Fishing regulations are the jurisdiction of the State (ODFW).

- The Oregon Department of Transportation will likely continue to maintain State Highways 126 and 242. This can involve brushing, paving, snow removal, anti-freezing chemicals on bridges (e.g. propylene glycol, or ethylene glycol).

- The Oregon Department of Environmental Quality's web site (http://www.statelandsonline.com) was consulted to determine if there were any "fill and removal" permits that would be issued within the 5th field HUCs evaluated in this BA. None were located on the web in the 5th fields, however some were located in the lower river (i.e. downstream of river mile 20). The most downstream ramp, Bruckart, is at river mile 63.3.

- The Oregon Department of Forestry regulates private timberlands. A review of logging operation notifications was not conducted for private lands in the 5th field HUCs assessed in this BA. However, it is likely that timber harvest operations will continue in the private timberlands under the guidelines of the Oregon Forestry Practices Act. See Figures 14-17 for a maps that show non-Forest Service lands in the 5th fields.

Magnuson-Stevens Act – Essential Fish Habitat Assessment

All EFH assessments must include the following information: (1) a description of the proposed action; (2) an analysis of the effects, including cumulative effects, of the proposed action on EFH, the managed species, and associated species, such as major prey species, including affected life-history stages; (3) the Federal agency's views regarding the effects of the action on EFH; and (4) proposed mitigation, if applicable (50 CFR 600.920(g)(2)).

The proposed action and analysis of effects (including cumulative effects) is found in the ESA portion of this BA. The proposed boat launches project would have an **ADVERSE AFFECT** on EFH for spring Chinook salmon fry, and a short term (measured in hours) negative affect on migratory habitat due to a turbidity plume. As described above under the PCE analysis, a small area of river bank and river bed would be changed to a concrete boat ramp (project element #1) and a small area would be restored to river bank (project element #2). Project Element #1 would adversely affect potential rearing habitat for young-of-year, spring Chinook fry.

Literature

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DOCUMENTATION OF EXPECTED ADVERSE EFFECTS TO LISTED FISH SPECIES AND THEIR HABITAT

Name of action: McKenzie River Boat Launches Project

Species of concern: Bull Trout

HUC names and numbers in ESA action area:

USGS Hydrologic Unit Code (HUC)	HUC Scale	HUC Name	NW Forest Plan Key Watershed?
170900040106	6th Field	Boulder Creek / Frissell Creek	Yes
170900040109	6th Field	McKenzie Bridge	No
170900040502	6th Field	McKenzie River / Elk Creek	No

Identify critical habitat area of concern: There is no bull trout critical habitat in the Action Areas.

Element(s) of the action causing the expected adverse effect: Both project elements have the potential to adversely affect bull trout due to short term turbidity plumes. However, project element #1 (boat launch construction) has a higher likelihood of adversely affecting listed fish because equipment must enter the water in order to place the boat ramps, and move small boulders at Paradise launch.

1. The proposed action may result in adverse effects through which of the following mechanisms (underline or circle and describe in a narrative).

Harm: act that actually kills or injures fish (may include habitat modification that significantly impairs behavioral patterns such as breeding, spawning, rearing, migrating, feeding or sheltering).

Harass: significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering.

Other forms of take: pursue, hunt, shoot, wound, trap, capture, kill, collect, or delayed mortality from stress or disease.

Habitat: cause an adverse effect to occupied or accessible habitat of listed/proposed species; proposed/designated critical habitat. For anadromous fish, accessible habitat is considered to be occupied.

The potential adverse affect to listed fish would be in the form of **harassment** due to turbidity. Bull trout could be displaced as they seek the side of the river without any turbidity, and adults could be delayed due to turbidity.

There is a lesser potential that bull trout could be directly harmed due to equipment entering the river for ramp placement, or to move small boulders near the Paradise launch.

Finally, by changing a natural river bed (cobbles) to concrete this has the potential to reduce cover habitat for juvenile bull trout at Frissell.

2. Nature, magnitude and probability

Describe the nature, magnitude and probability of the effects of the action on a species or habitat. Quantify where possible.

Nature: what indicator or habitat feature will be affected.

The indicators that could have a measurable negative affect due to project implementation are: turbidity, substrate character (i.e. the change from cobble to concrete at specific ramp sites), and streambank.

Magnitude: severity and intensity.

Contract specifications will require that water quality be maintained, but a short plume is expected at each ramp site when the river bed is being prepared for ramp placement. If a turbidity plume is noticeable 100 feet downstream of the work site for up to a half hour, the contractor must cease operations and develop a plan that will meet requirements. The turbidity plume is not expected to occupy the enter width of the river channel so fish would be able to leave turbid water. This turbidity plume is expected to last hours not days.

The new ramps will permanently change a portion of the riverbank and river bed. See Table 3 of this BA for areas at each ramps site.

Probability: likelihood of occurrence

It is likely that some bull trout would be affected by the implementation of this project due to the proximity.

3. Which of the following life stages, forms and essential behaviors will be adversely affected (underline or circle and describe as appropriate)?

Life history forms

Fluvial

The bull trout population in the McKenzie River is fluvial.

Life stages and essential behaviors

Juvenile, subadult, and adult bull trout could be adversely affected by this project.

Adult migration to spawning areas

The turbidity plume could delay adult migration for a day at each site. However, since the plume should not occupy the entire width of the river bull trout can still use that corridor of turbidity free river for migration.

4. Temporal Scale (frequency and duration) (underline or circle and describe as appropriate).

a. Frequency: How often will the effect occur?

Once at each new ramp site, and at the decommissioned sites.

b. Duration:

i. Short term or pulse effect: subsides almost immediately.

A short term turbidity pulse is expected at each ramp site during placement. This effect would be measured in hours.

ii. Long term or press effect: chronic.

The new ramps will permanently change a portion of the riverbank and river bed. See Table 3 of this BA for areas at each ramps site.

5. Spatial scale

a. Distribution: Describe the geographic extent of the effect (Note: describe in instructions)

Downstream of each existing ramp, and the two proposed ramps to a distance of 300 feet (length), and 65 feet into the river channel (width). See Action Area descriptions in this BA for detailed descriptions.

b. Proximity:

i. Describe where the effect is in relation to the species and its habitat.

The project is in direct proximity to listed fish habitat. See Table 3 for area in each 6th field HUC, and Figure 1 for a map.

ii. Note relationship to occupied habitat, designated critical habitat, or essential fish habitat

Boat ramps by their very nature are directly in listed fish habitat (see Table 3 for area). All three of the Action Areas have bull trout in proximity.

6. Tracking Adverse Effects:

Catalogue a unit number for this adverse effect and identify the specific location on the GIS water theme as a point, segment, or polygon datum (depending upon the nature of the effect).

7. Include this form and map in the BA.

DOCUMENTATION OF EXPECTED ADVERSE EFFECTS TO LISTED FISH SPECIES AND THEIR HABITAT

Name of action: McKenzie River Boat Launches Project

Species of concern: Spring Chinook Salmon

HUC names and numbers in ESA action area:

USGS Hydrologic Unit Code (HUC)	HUC Scale	HUC Name	NW Forest Plan Key Watershed?
170900040106	6th Field	Boulder Creek / Frissell Creek	Yes
170900040109	6th Field	McKenzie Bridge	No
170900040502	6th Field	McKenzie River / Elk Creek	No

Identify critical habitat area of concern: The river bank and river bed where new ramps would be placed would be permanently changed from "natural habitat" to "a concrete boat ramp."

Element(s) of the action causing the expected adverse effects:

Both project elements have the potential to adversely affect bull trout due to short term turbidity plumes. However, project element #1 (boat launch construction) has a higher likelihood of adversely affecting listed fish because equipment must enter the water in order to place the boat ramps, and move small boulders at Paradise launch.

1. The proposed action may result in adverse effects through which of the following mechanisms (underline or circle and describe in a narrative).

Harm: act that actually kills or injures fish (may include habitat modification that significantly impairs behavioral patterns such as breeding, spawning, rearing, migrating, feeding or sheltering).

Harass: significantly disrupt normal behavior patterns such as breeding, feeding, or sheltering.

Other forms of take: pursue, hunt, shoot, wound, trap, capture, kill, collect, or delayed mortality from stress or disease.

Habitat: cause an adverse effect to occupied or accessible habitat of listed/proposed species; proposed/designated critical habitat. For anadromous fish, accessible habitat is considered to be occupied.

The potential adverse affect to listed fish would be in the form of **harassment** due to turbidity. Spring Chinook could be displaced as they seek the side of the river without any turbidity, and adults could be delayed due to turbidity.

There is a lesser potential that juvenile could be directly harmed due to equipment entering the river for ramp placement, or to move small boulders near the Paradise launch.

Finally, by changing a natural river bed (cobbles) to concrete this has the potential to reduce cover habitat for Spring Chinook fry at Frissell.

2. Nature, magnitude and probability

Describe the nature, magnitude and probability of the effects of the action on a species or habitat. Quantify where possible.

Nature: what indicator or habitat feature will be affected

The indicators that could have a measurable negative affect due to project implementation are: turbidity, substrate character (i.e. the change from cobble to concrete at specific ramp sites), and streambank.

Magnitude: severity and intensity

Contract specifications will require that water quality be maintained, but a short plume is expected at each ramp site when the river bed is being prepared for ramp placement. If a turbidity plume is noticeable 100 feet downstream of the work site for up to a half hour, the contractor must cease operations and develop a plan that will meet requirements. The turbidity plume is not expected to occupy the enter width of the river channel so fish would be able to leave turbid water. This turbidity plume is expected to last hours not days.

The new ramps will permanently change a portion of the riverbank and river bed. See Table 3 of this BA for areas at each ramps site.

Probability: likelihood of occurrence

It is likely that some bull trout would be affected by the implementation of this project due to the proximity.

3. Which of the following life stages, forms and essential behaviors will be adversely affected (underline or circle and describe as appropriate)?

Life history forms

Anadromous

Only the anadromous form of Chinook salmon is present in the McKenzie River.

Life stages and essential behaviors

Spring Chinook fry could be directly affected by the change from riverbed to concrete ramp on the river margin. See Table 3 for area in each 6th field HUC.

Adult migration to spawning areas

The turbidity plume could delay adult migration for a day at each site. However, since the plume should not occupy the entire width of the river bull trout can still use that corridor of turbidity free river for migration.

4. Temporal Scale (frequency and duration) (underline or circle and describe as appropriate).

a. Frequency: How often will the effect occur?

Once at each new ramp site, and at the decommissioned sites.

b. Duration:

i. Short term or pulse effect: subsides almost immediately.

A short term turbidity pulse is expected at each ramp site during placement. This effect would be measured in hours.

ii. Long term or press effect: chronic.

The new ramps will permanently change a portion of the riverbank and river bed. See Table 3 of this BA for areas at each ramps site.

5. Spatial scale

a. Distribution: Describe the geographic extent of the effect (Note: describe in instructions)

Downstream of each existing ramp, and the two proposed ramps to a distance of 300 feet (length), and 65 feet into the river channel (width). See Action Area descriptions in this BA for detailed descriptions.

b. Proximity:

i. Describe where the effect is in relation to the species and its habitat.

The project is in direct proximity to listed fish habitat. See Table 3 for area in each 6th field HUC, and Figure 1 for a map.

ii. Note relationship to occupied habitat, designated critical habitat, or essential fish habitat

Boat ramps by their very nature are directly in listed fish habitat (see Table 3 for area). All three of the Action Areas have bull trout in proximity.

6. Tracking Adverse Effects:

Catalogue a unit number for this adverse effect and identify the specific location on the GIS water theme as a point, segment, or polygon datum (depending upon the nature of the effect).

7. Include this form and map in the BA.

Figure 1.

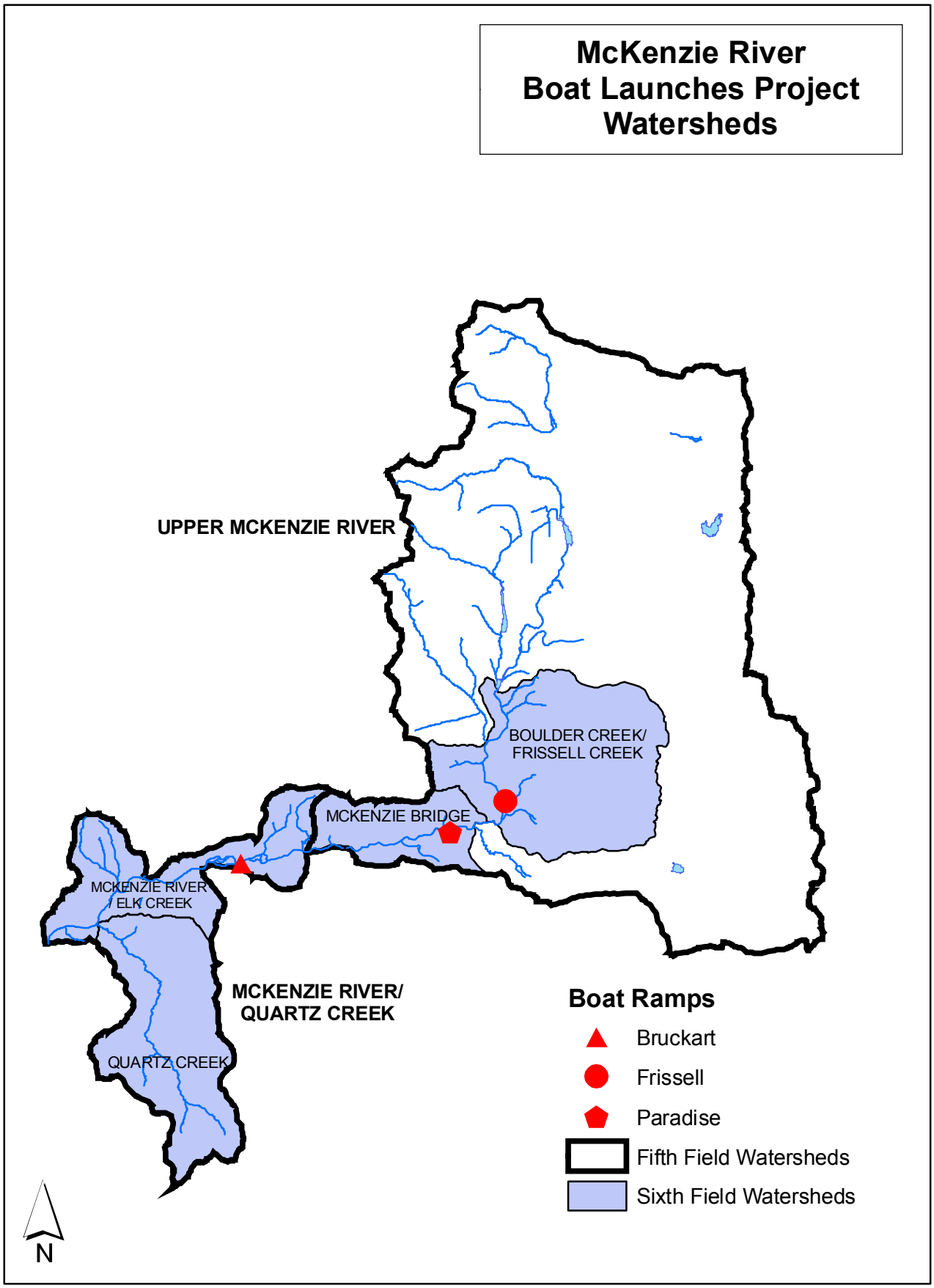

McKenzie River
Boat Launches Project
Watersheds
UPPER MCKENZIE RIVER
BOULDER CREEK/
FRISSELL CREEK
MCKENZIE BRIDGE
MCKENZIE RIVER
/ ELK CREEK
MCKENZIE RIVER/
QUARTZ CREEK
QUARTZ CREEK
N
Boat Ramps
Bruckart
Frissell
Paradise
Fifth Field Watersheds
Sixth Field Watersheds

Figure 2.

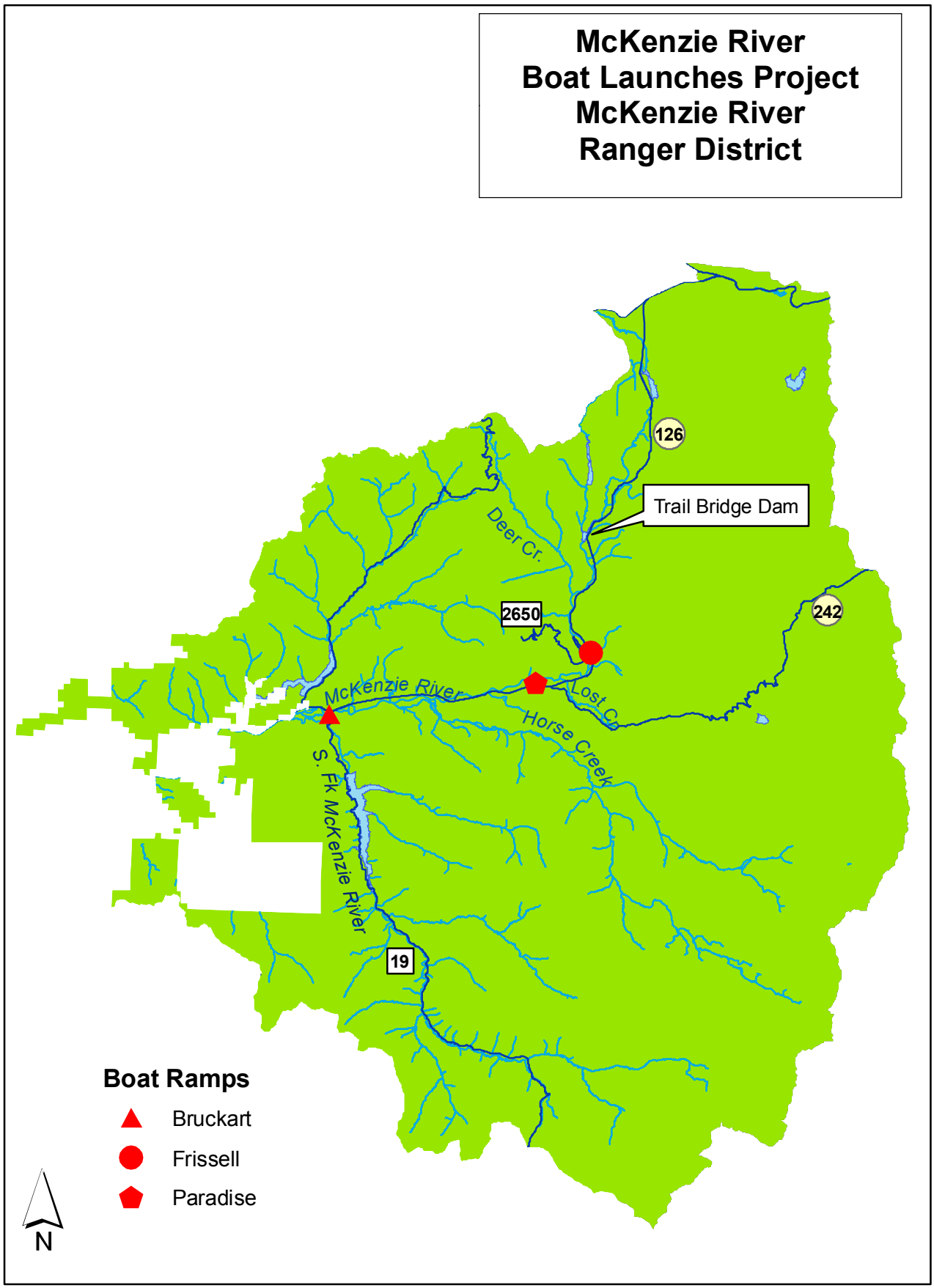

McKenzie River
Boat Launches Project
McKenzie River
Ranger District
126
Trail Bridge Dam
Deer Cr.
2650
242
McKenzie River
Lost Cr.
Horse Creek
S. Fk McKenzie River
19
Boat Ramps
Bruckart
Frissell
Paradise
N

Figure 3.

McKenzie River Boat Launches Project
Frissell Boat Launch

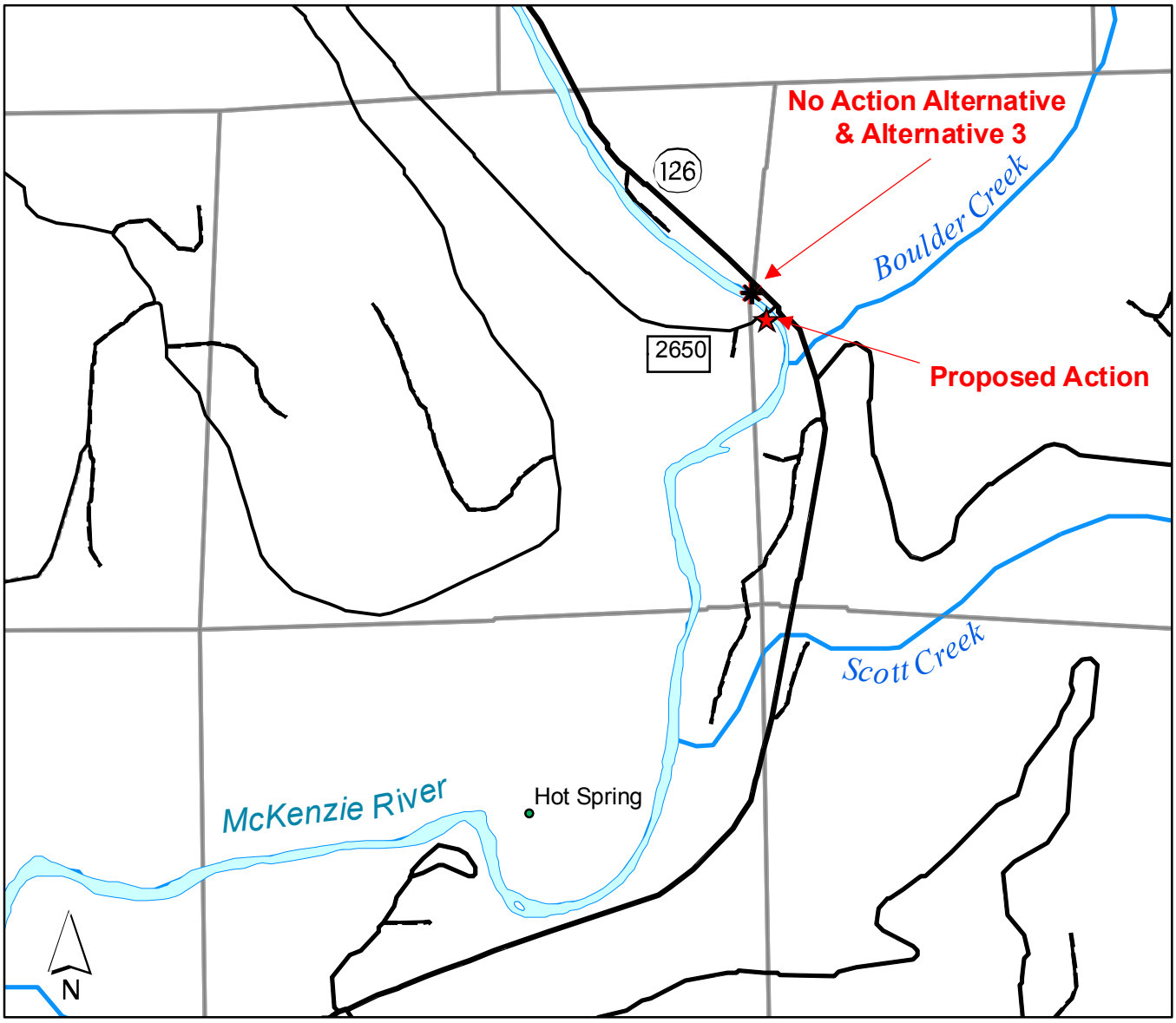


Figure 4.

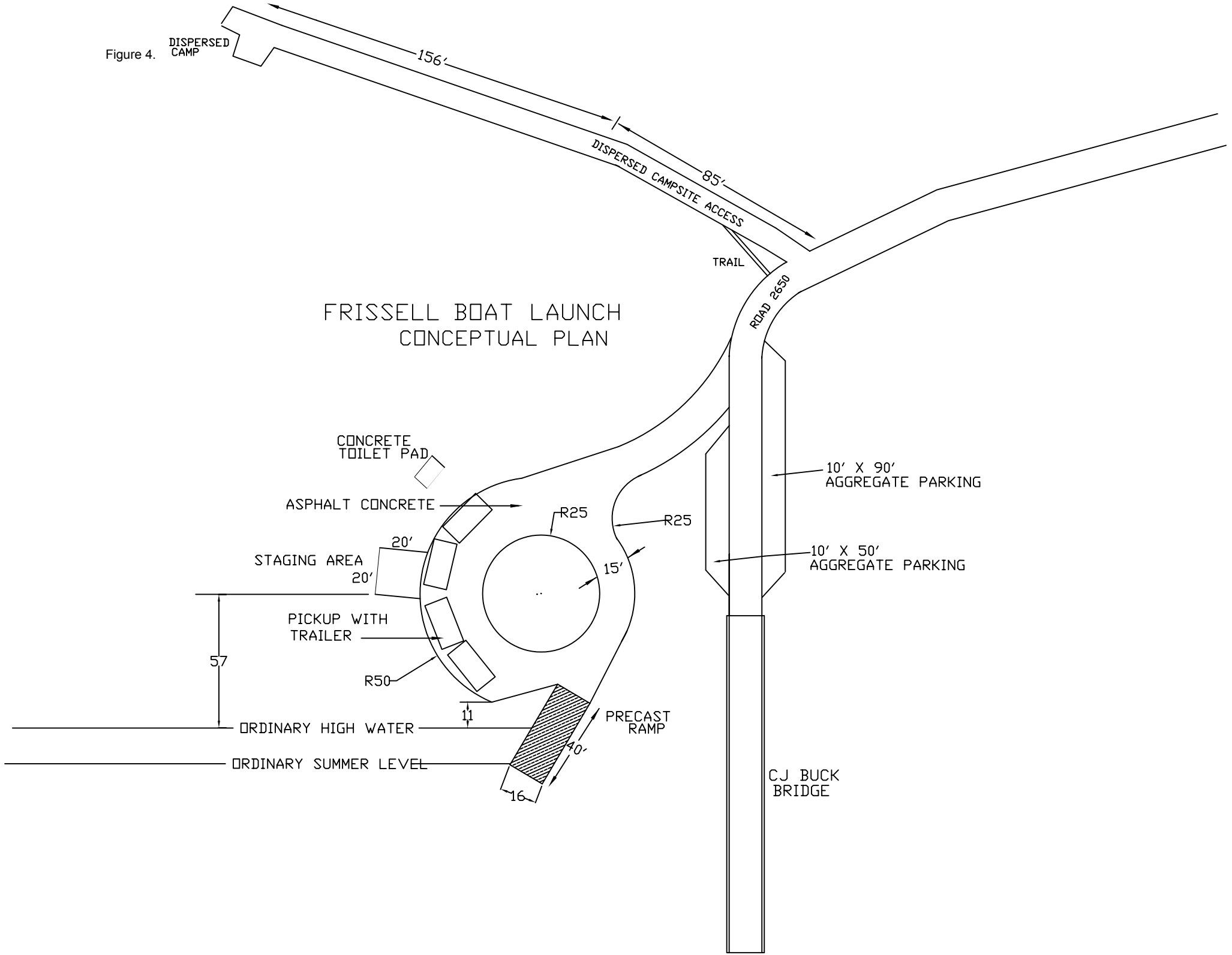

DISPERSED CAMP
156'
85'
DISPERSED CAMPSITE ACCESS
TRAIL
ROAD 2650
FRISSELL BOAT LAUNCH
CONCEPTUAL PLAN
CONCRETE TOILET PAD
ASPHALT CONCRETE
R25
R25
20'
STAGING AREA
20'
15'
10' X 90'
AGGREGATE PARKING
10' X 50'
AGGREGATE PARKING
PICKUP WITH TRAILER
57
R50
11
ORDINARY HIGH WATER
PRECAST RAMP
40'
ORDINARY SUMMER LEVEL
16
CJ BUCK BRIDGE

Figure 5.

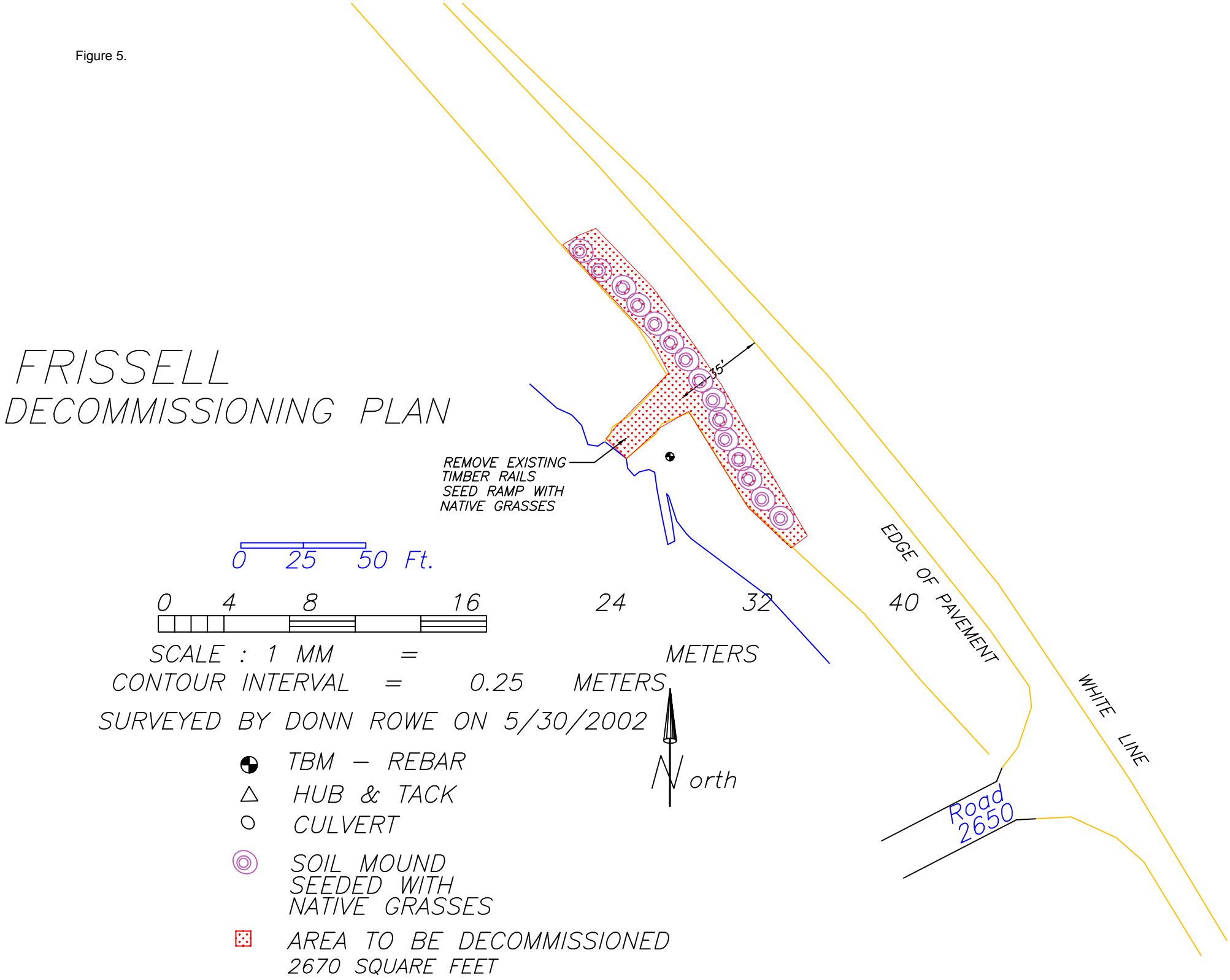

FRISSELL
DECOMMISSIONING PLAN
15'
REMOVE EXISTING
TIMBER RAILS
SEED RAMP WITH
NATIVE GRASSES
EDGE OF PAVEMENT
WHITE LINE
Road
2650
0 25 50 Ft.
0 4 8 16 24 32 40
SCALE : 1 MM = METERS
CONTOUR INTERVAL = 0.25 METERS
SURVEYED BY DONN ROWE ON 5/30/2002
TBM – REBAR
HUB & TACK
CULVERT
SOIL MOUND
SEEDED WITH
NATIVE GRASSES
AREA TO BE DECOMMISSIONED
2670 SQUARE FEET
orth

Figure 6.

McKenzie River Boat Launches Project
Paradise Boat Launch

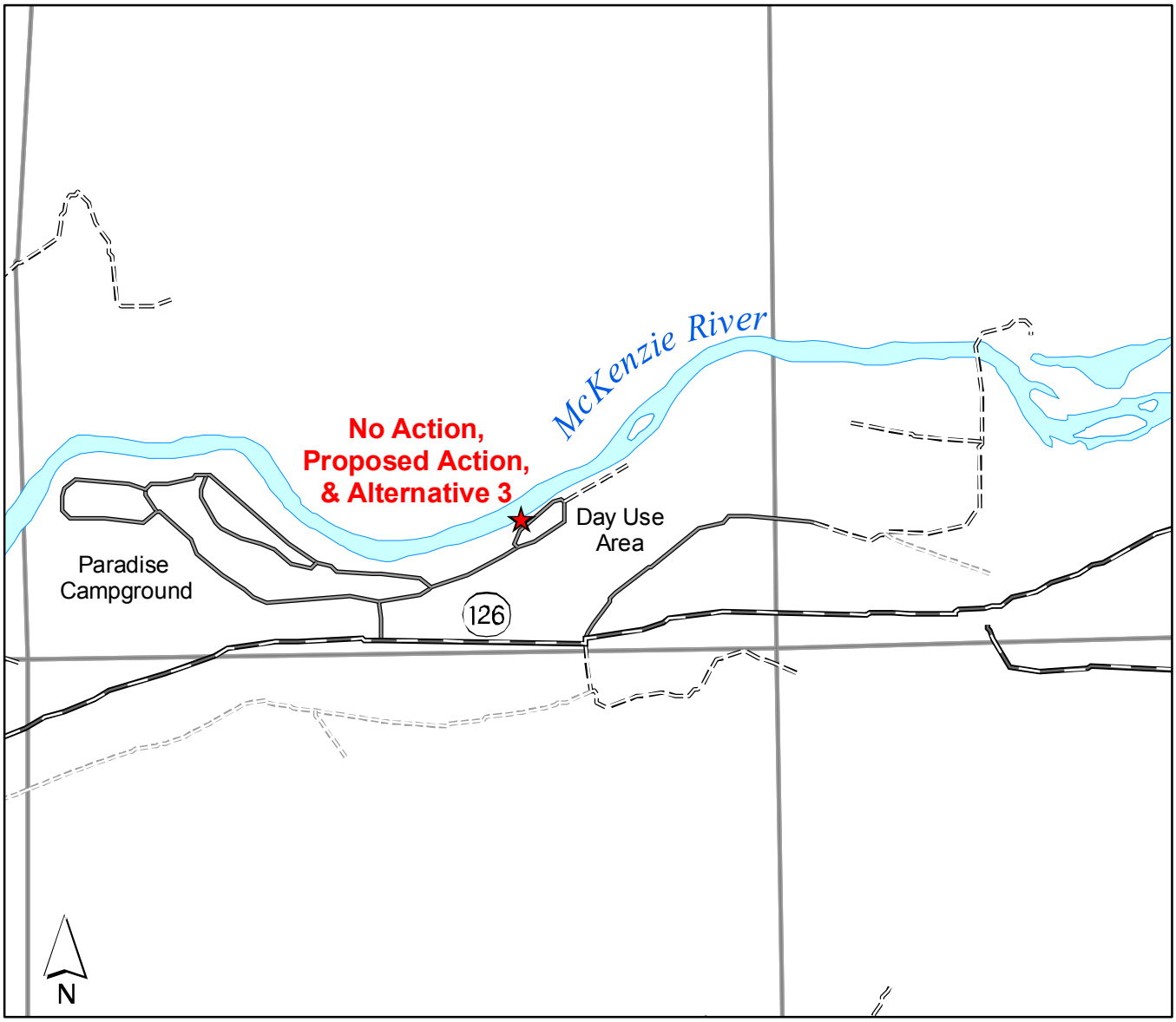


Figure 7.

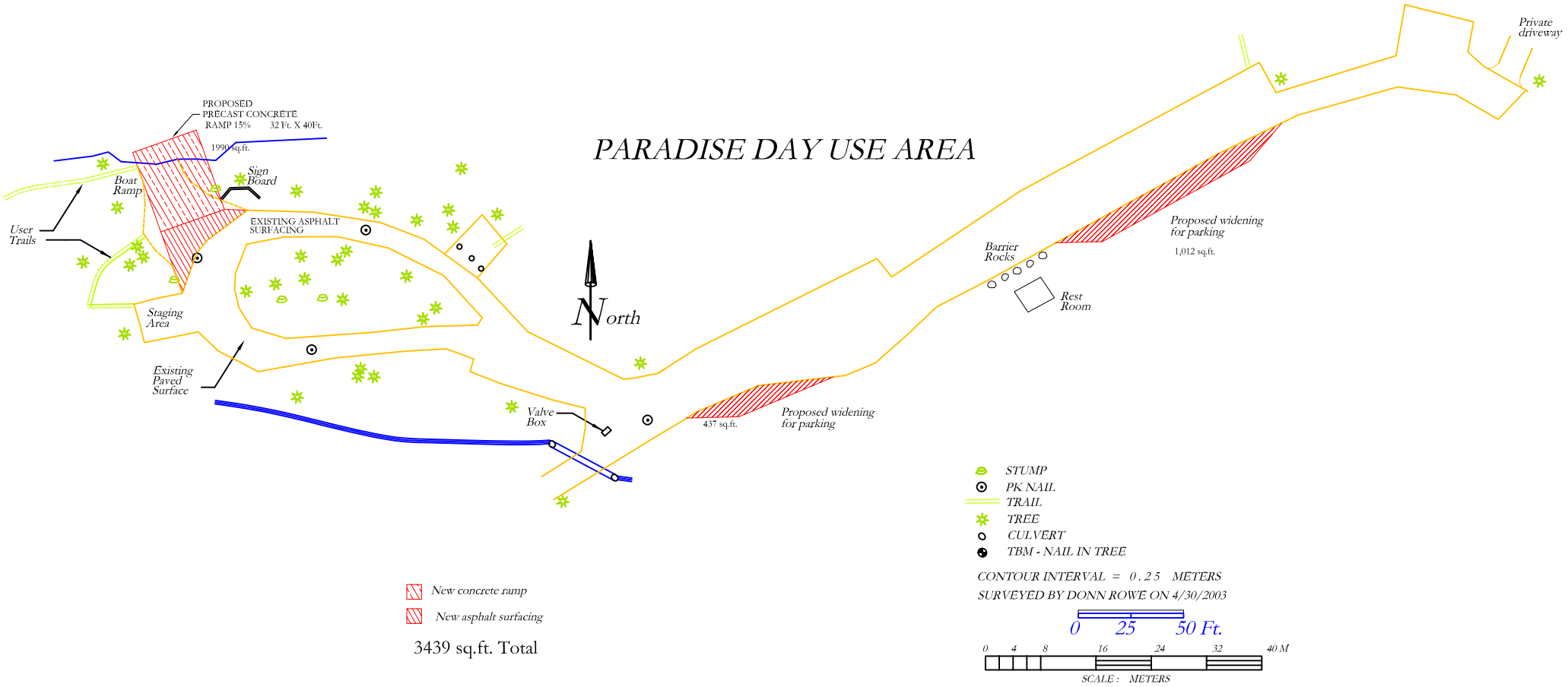

PARADISE DAY USE AREA
PROPOSED
PRECAST CONCRETE
RAMP 15% 32 Ft. X 40Ft.
1990 sq.ft.
Sign
Board
Boat
Ramp
User
Trails
EXISTING ASPHALT
SURFACING
Staging
Area
Existing
Paved
Surface
Valve
Box
North
Barrier
Rocks
Rest
Room
Proposed widening
for parking
1,012 sq.ft.
Private
driveway
437 sq.ft.
Proposed widening
for parking
New concrete ramp
New asphalt surfacing
3439 sq.ft. Total
STUMP
PK NAIL
TRAIL
TREE
CULVERT
TBM - NAIL IN TREE
CONTOUR INTERVAL = 0.25 METERS
SURVEYED BY DONN ROWE ON 4/30/2003
0 25 50 Ft.
0 4 8 16 24 32 40 M
SCALE : METERS

Figure 8.

McKenzie River Boat Launches Project
Bruckart Boat Launch

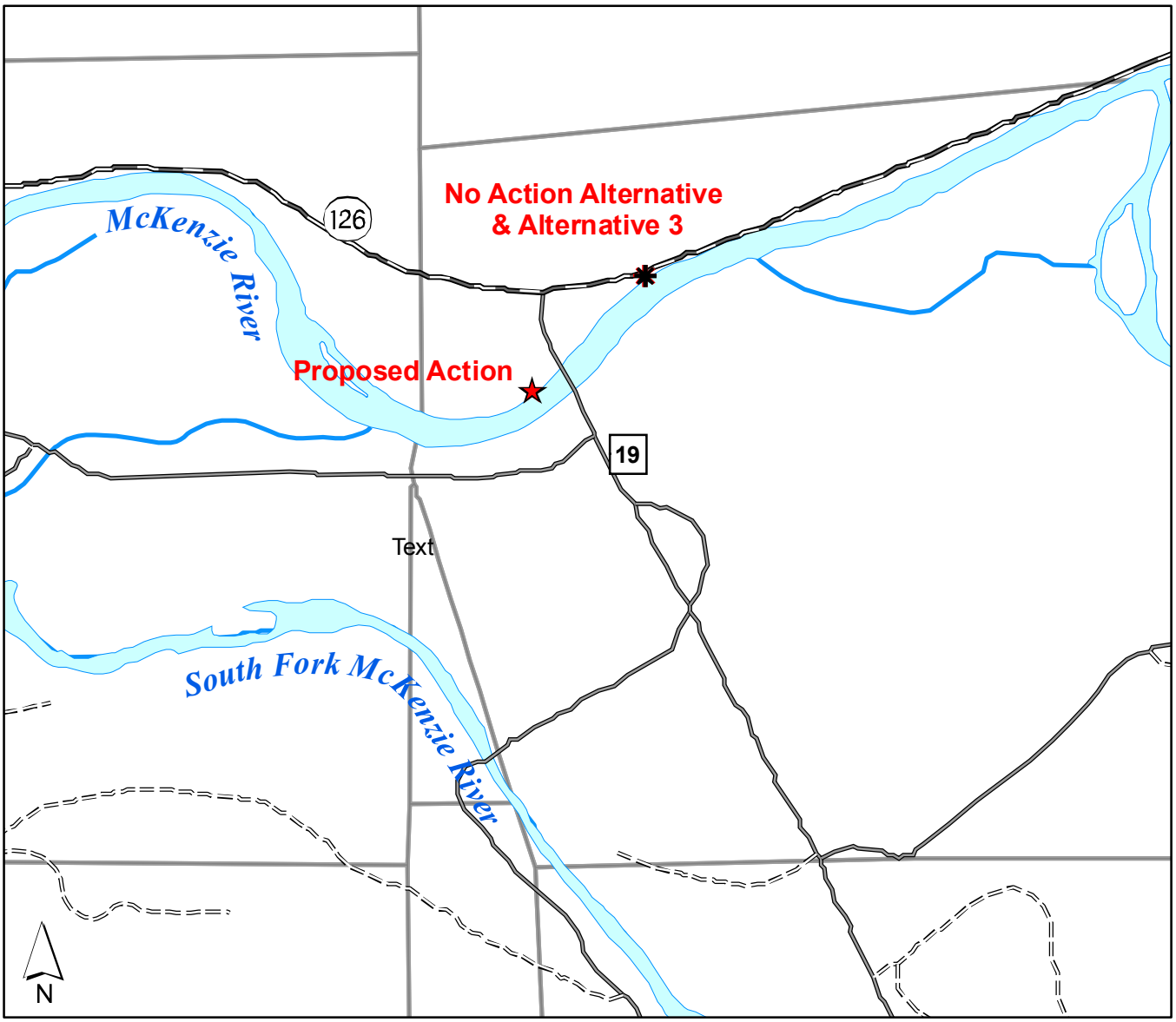


Figure 9.

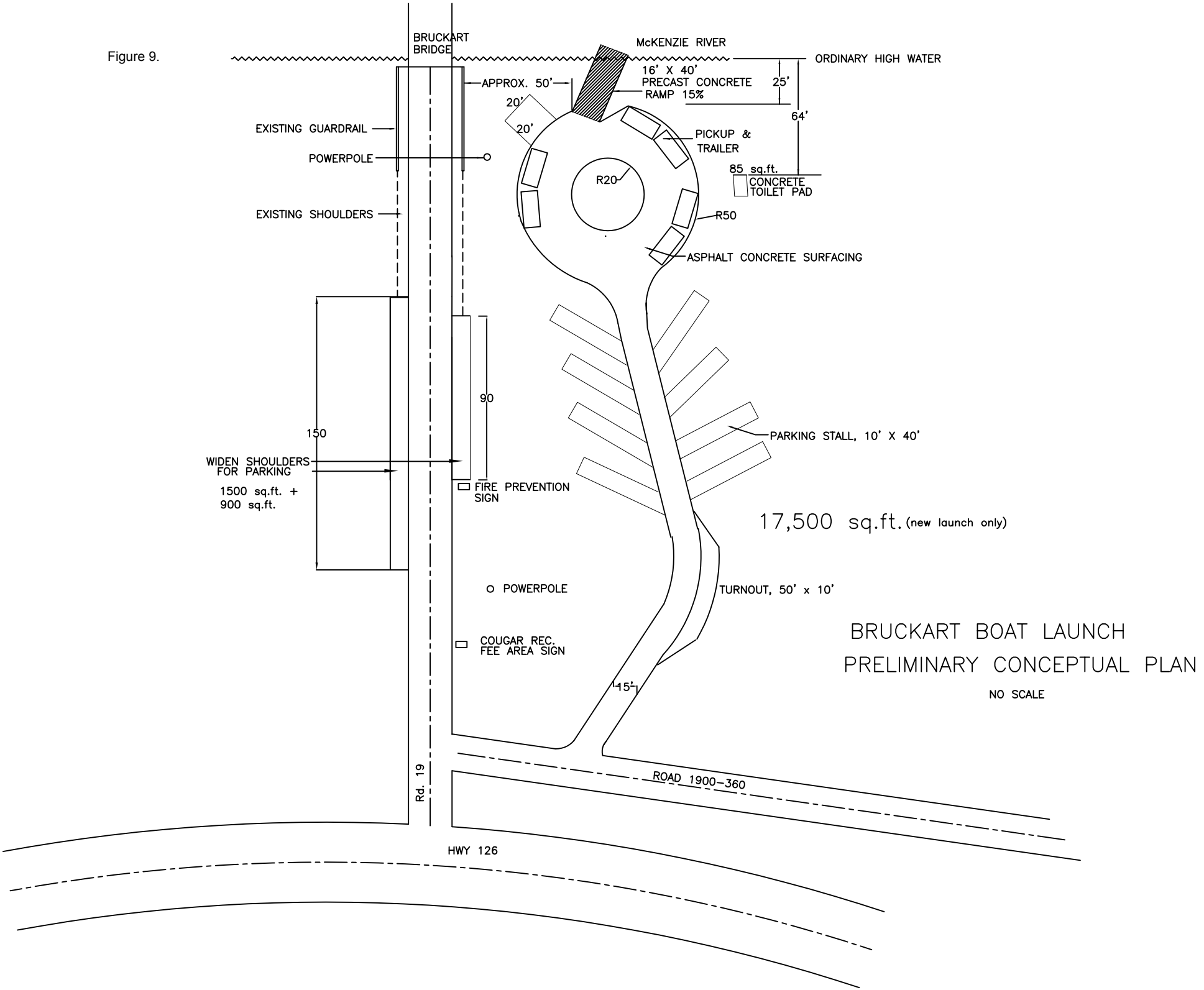
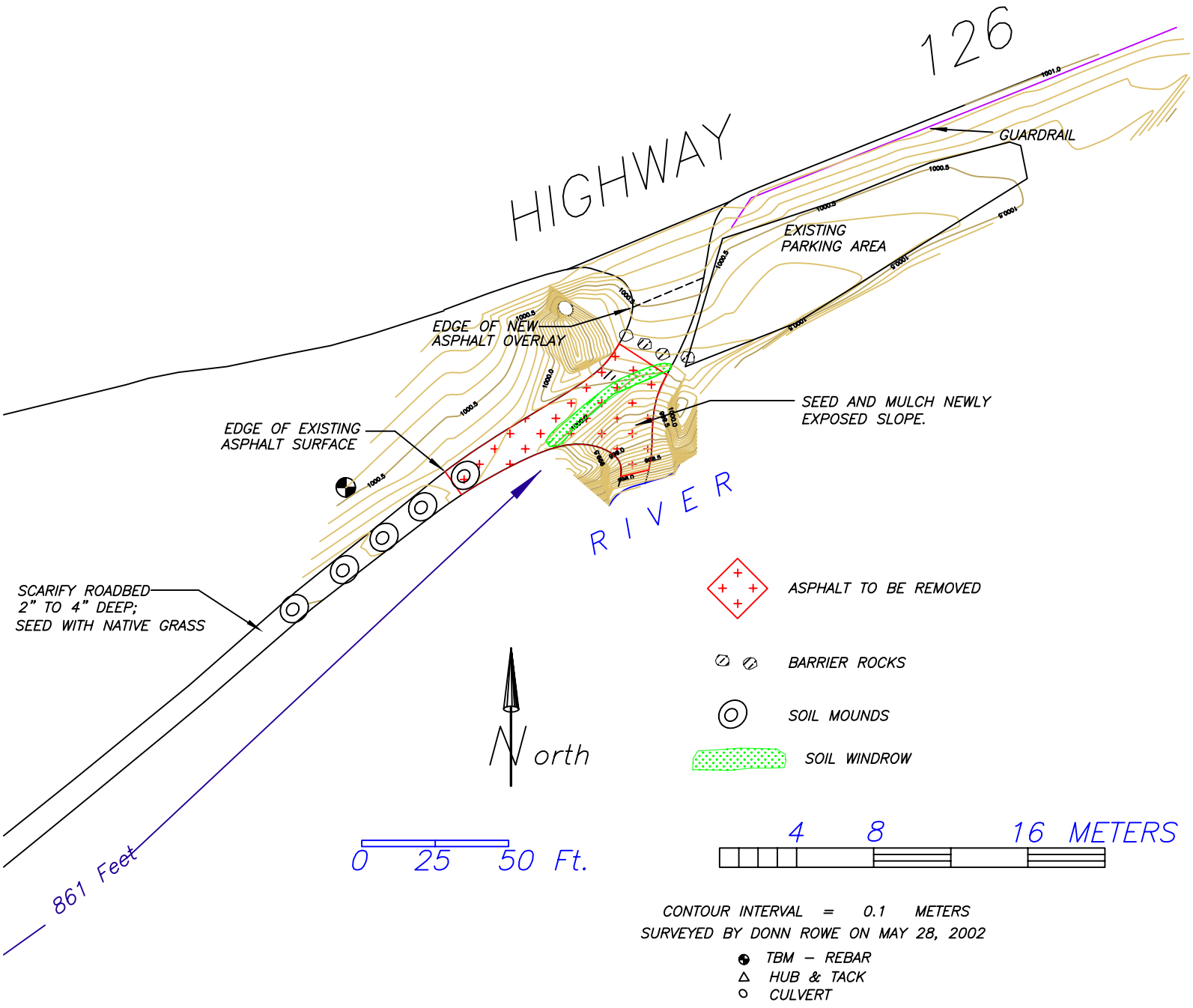

BRUCKART BRIDGE
McKENZIE RIVER
ORDINARY HIGH WATER
16' X 40' PRECAST CONCRETE RAMP 15%
25'
64'
APPROX. 50'
20'
20'
EXISTING GUARDRAIL
POWERPOLE
EXISTING SHOULDERS
PICKUP & TRAILER
85 sq.ft. CONCRETE TOILET PAD
R20
R50
ASPHALT CONCRETE SURFACING
90
150
WIDEN SHOULDERS FOR PARKING
1500 sq.ft. + 900 sq.ft.
FIRE PREVENTION SIGN
PARKING STALL, 10' X 40'
17,500 sq.ft. (new launch only)
POWERPOLE
TURNOUT, 50' x 10'
COUGAR REC. FEE AREA SIGN
15'
BRUCKART BOAT LAUNCH
PRELIMINARY CONCEPTUAL PLAN
NO SCALE
Rd. 19
ROAD 1900-360
HWY 126

Figure 10.



EST. 10,000 SQUARE FEET
AREA TO BE DECOMMISSIONED

Figure 11.

Frissell Boat Launch
Project Action Area

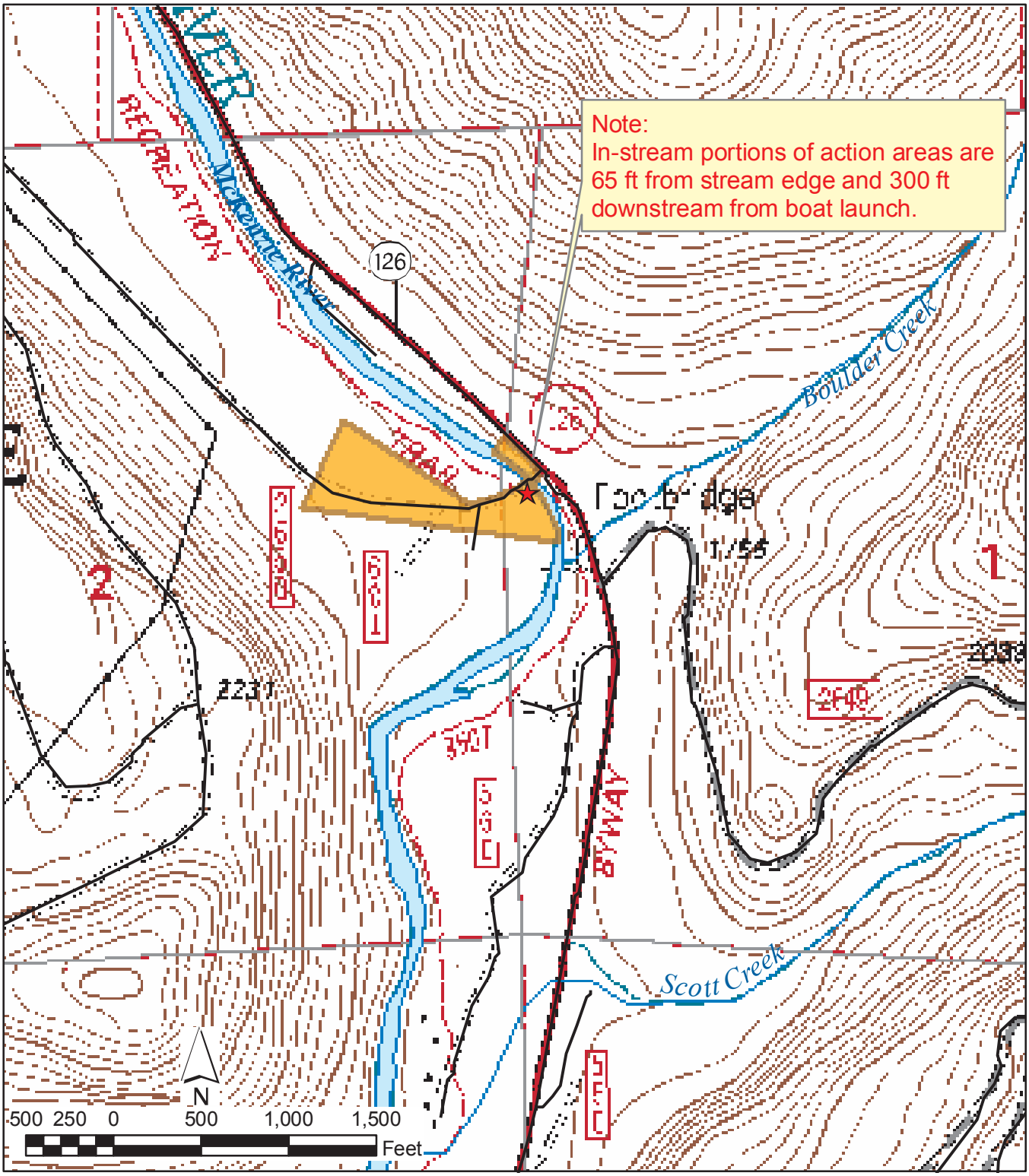


Figure 12.

Paradise Boat Launch
Project Action Area

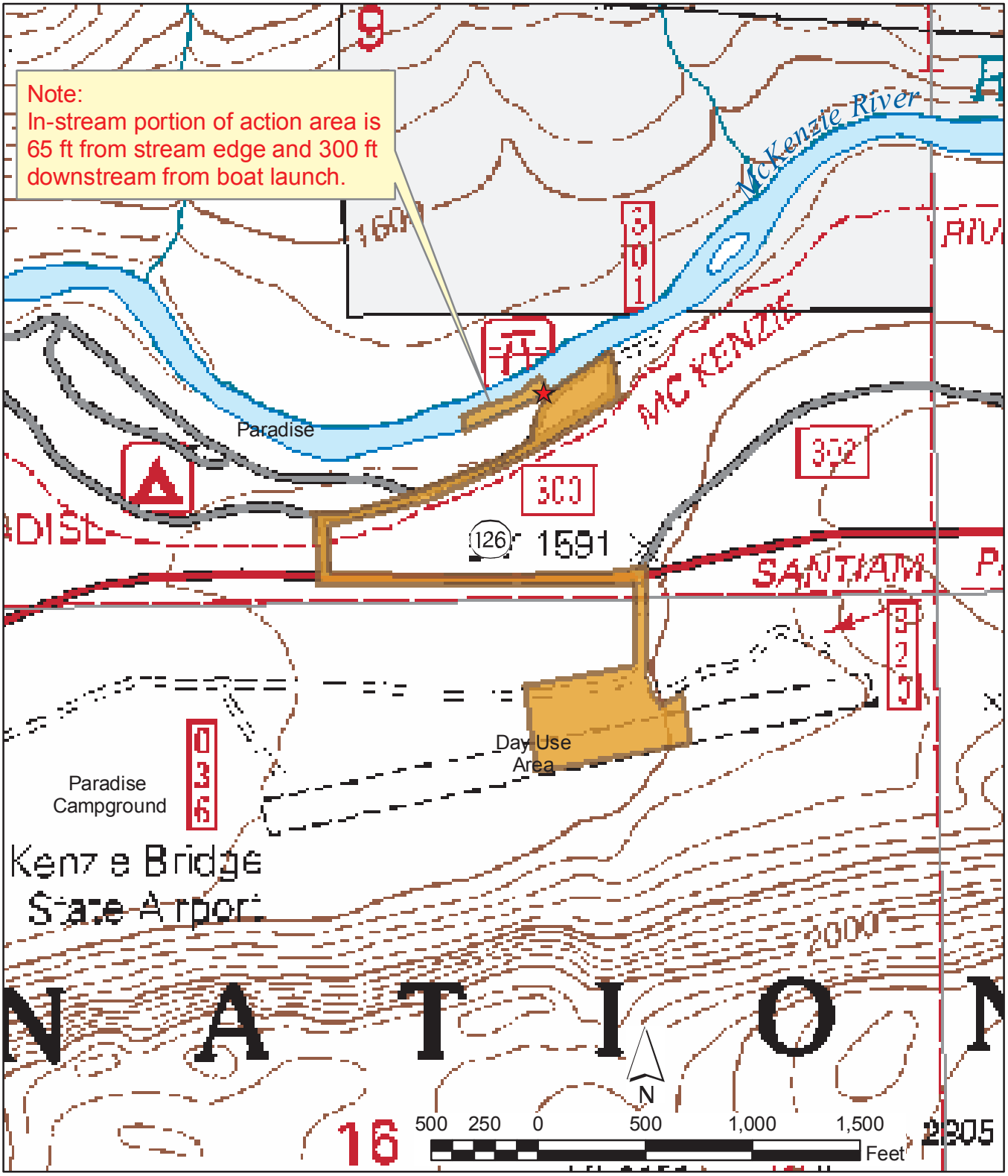


Figure 13.

Bruckart Boat Launch
Project Action Area

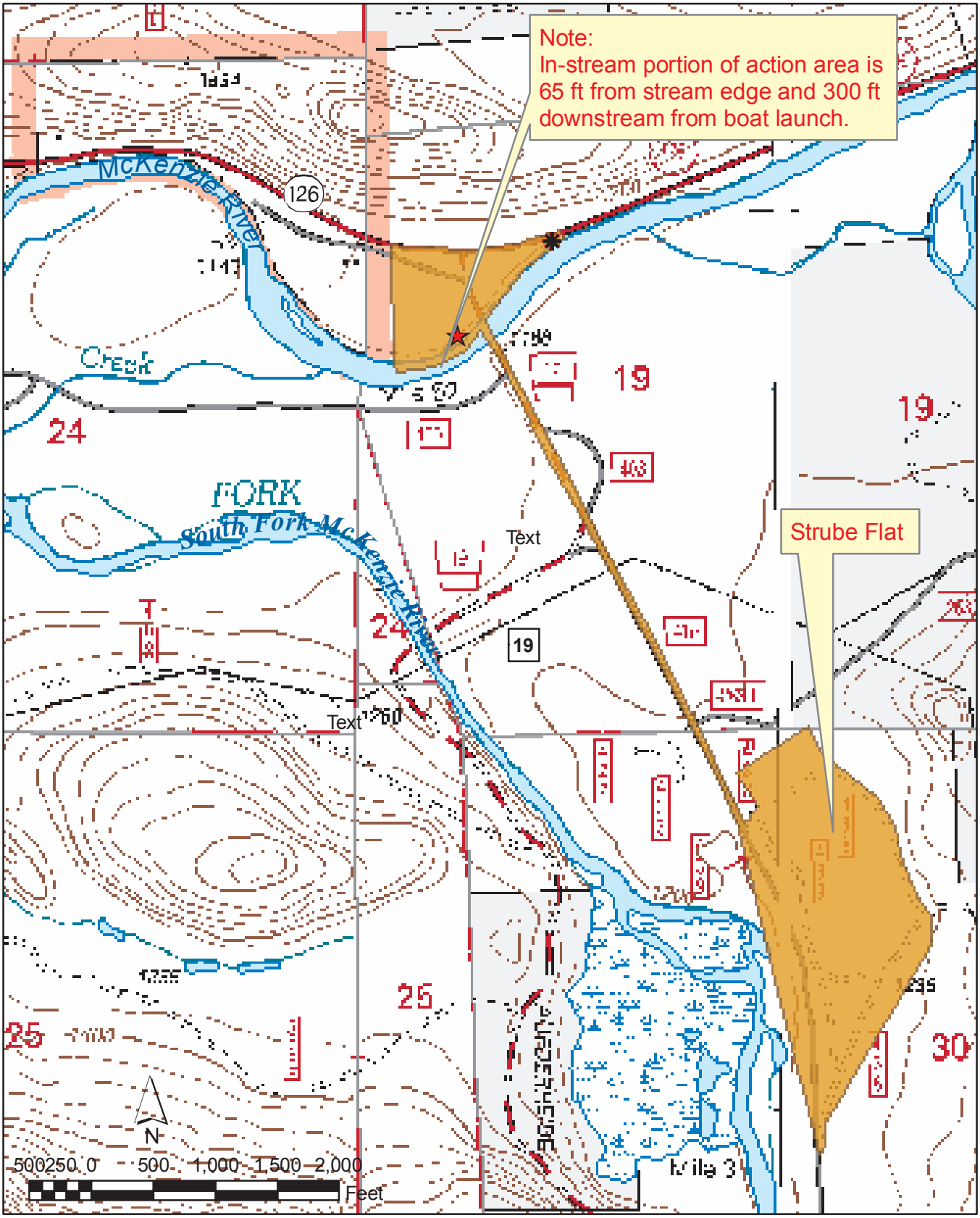
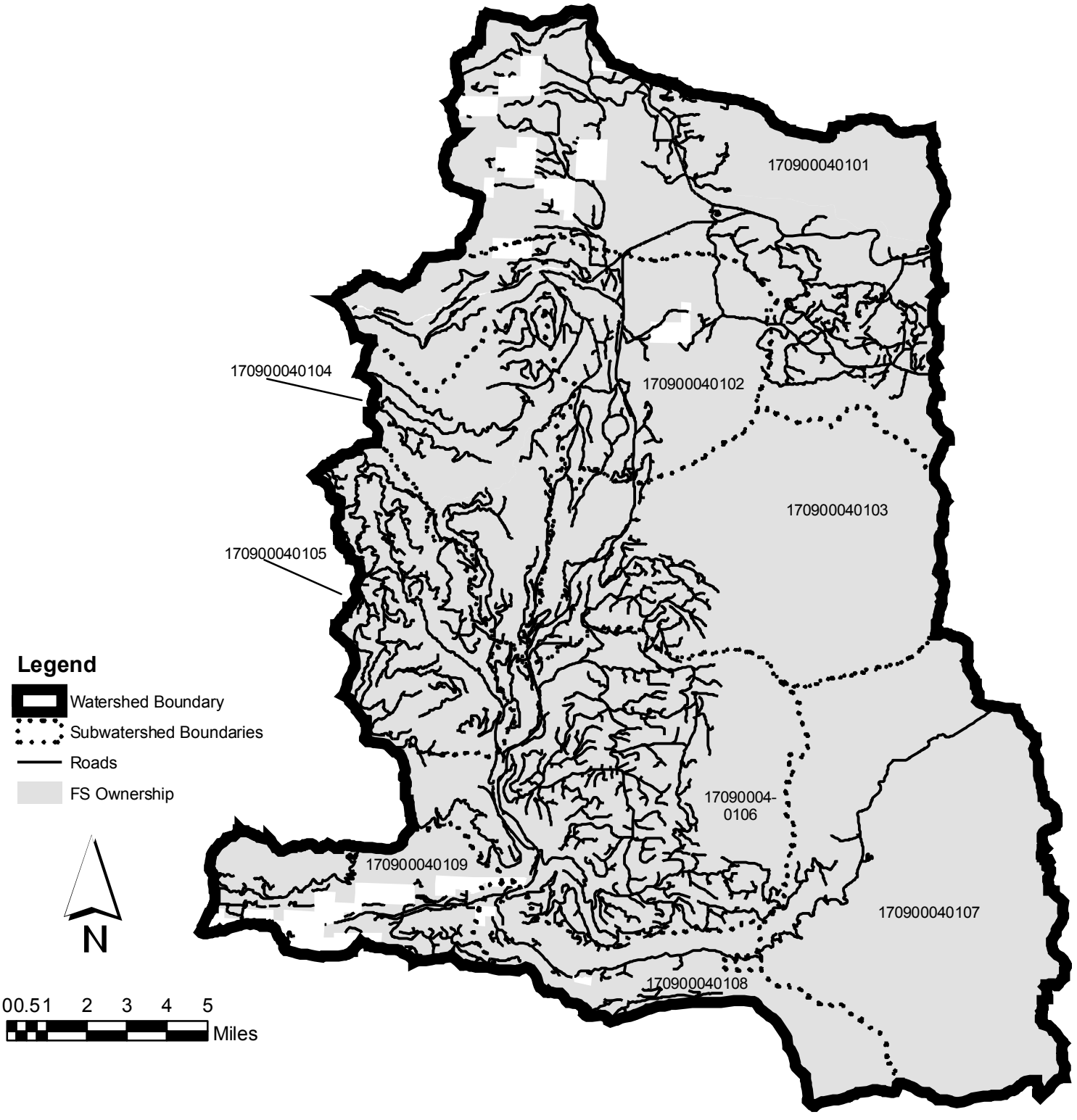


Figure 14.

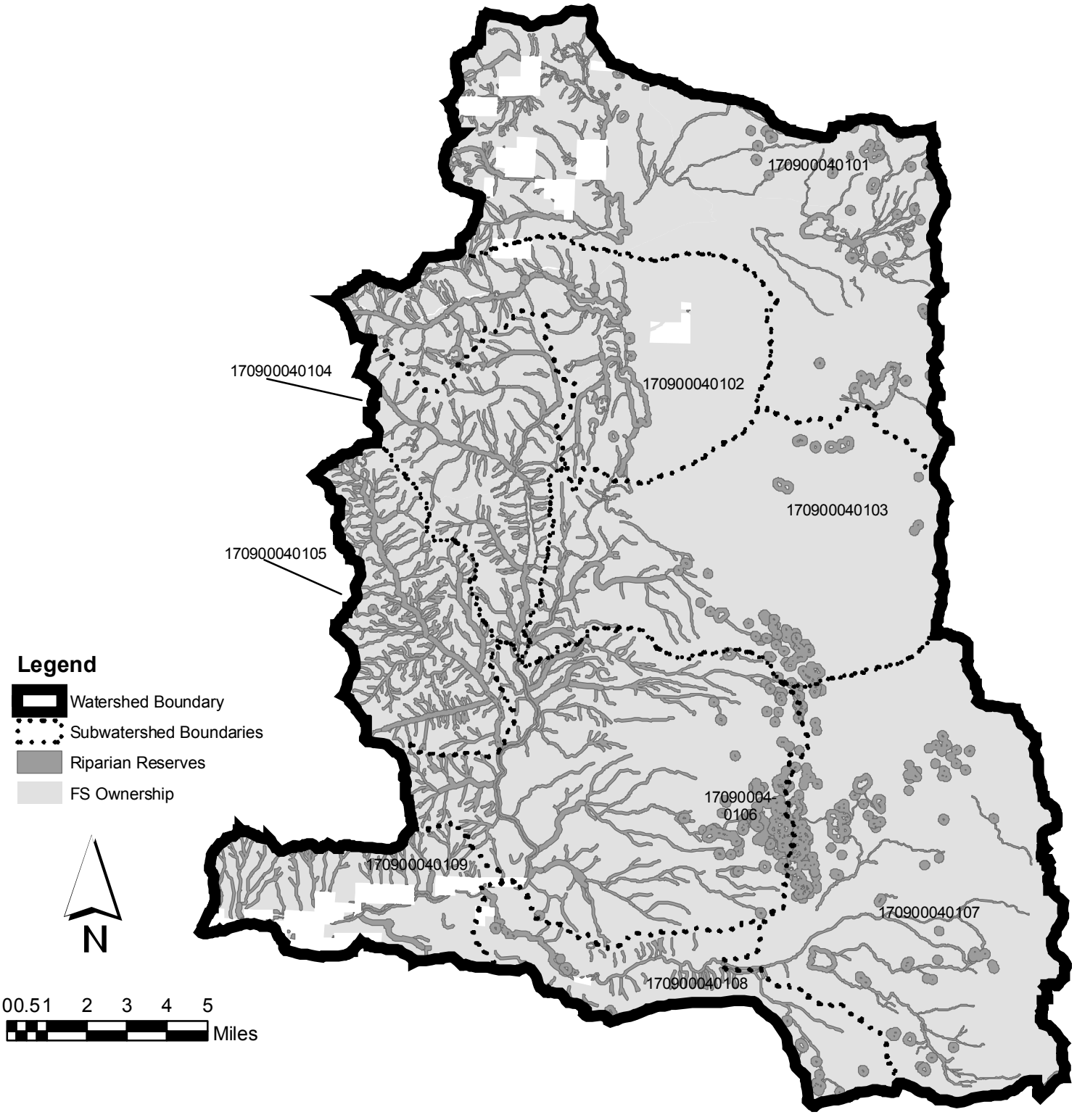
UPPER MCKENZIE RIVER Watershed (1709000401) Roads



2006-09-22 USFS R6 CSA2 #614710840

Figure 15.

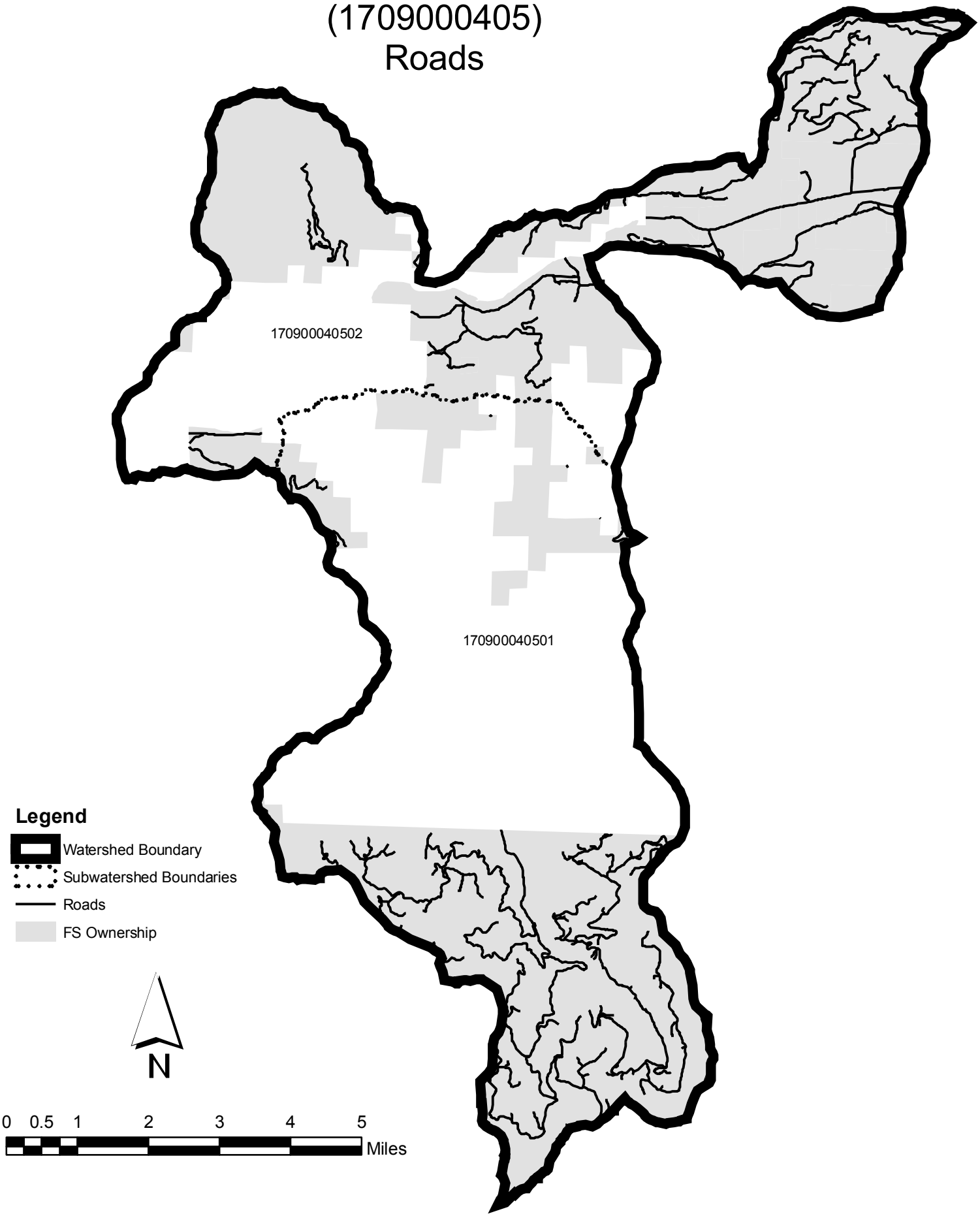
UPPER MCKENZIE RIVER Watershed (1709000401) Riparian Reserves



2006-09-22 USFS R6 CSA2 #614710840

MCKENZIE QUARTZ CREEK Watershed (1709000405) Roads

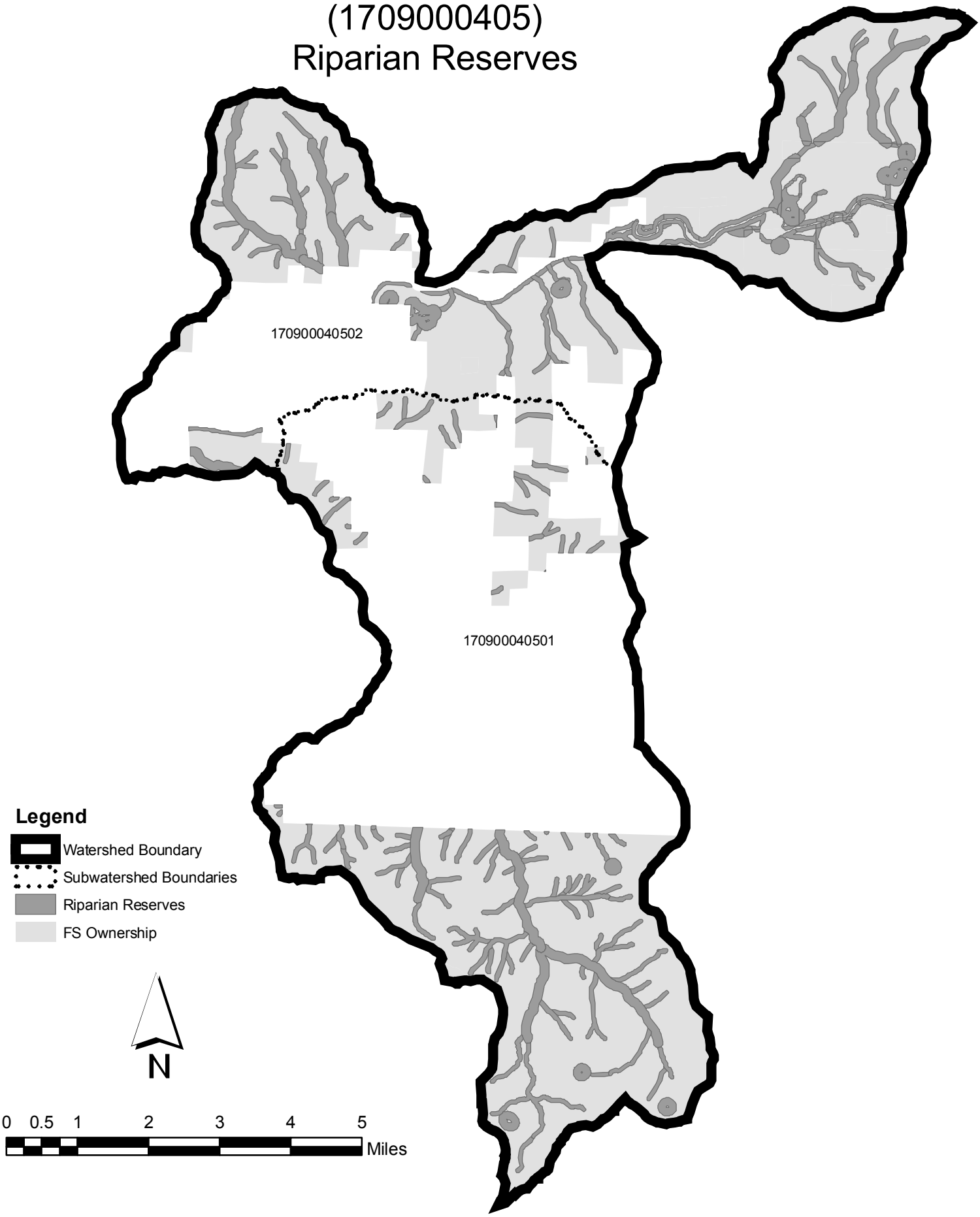
Figure 16.



2006-09-22 USFS R6 CSA2 #614710840

MCKENZIE QUARTZ CREEK Watershed (1709000405) Riparian Reserves

Figure 17.



2006-09-22 USFS R6 CSA2 #614710840