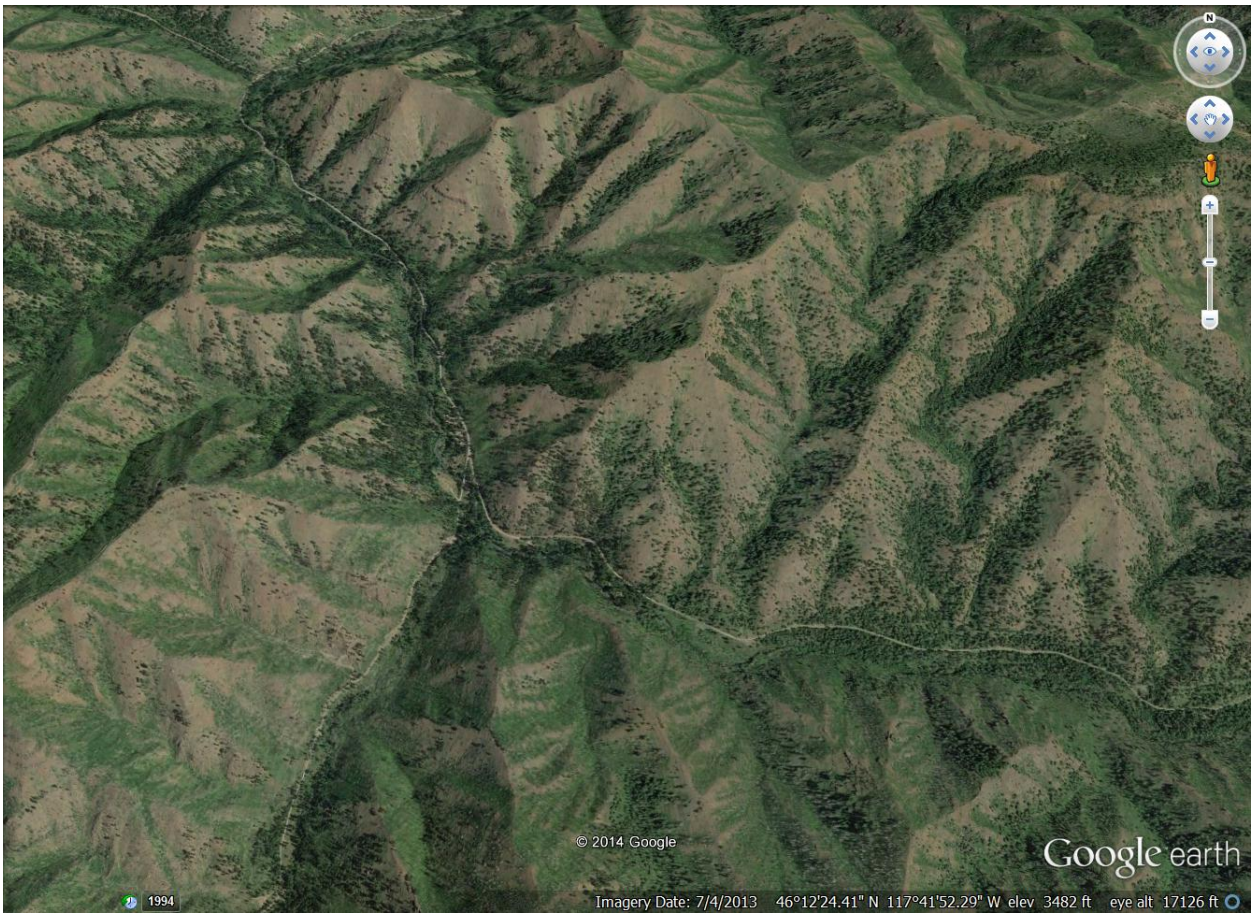
Tucannon River – Reach 1 Columbia and Garfield Counties

Reach Description: Reach 1 of the Tucannon River begins at the center of T8N_R42E_S17 in Garfield County and ends at Rainbow Lake (SE ¼ T10N_R41E_S27) in Columbia County.

Shoreline Jurisdiction: 805 acres, 15.2 miles



Source: Google Earth

Subreaches (SR); see Map F-1

SR 1a: Begins at approximately Bear Creek in Garfield County (center of T8N_R42E_S17) and ends at Tucannon Campground (NW ¼ of T9N_R41E_S15); 596 acres, 11.2 miles

SR 1b: Begins at Tucannon Campground (NW ¼ of T9N_R41E_S15) and ends at Rainbow Lake (SE corner of T10N_R41E_S27); 210 acres, 4.0 miles

CHARACTERISTICS

Ownership:

This reach is almost entirely publically owned, with ownership evenly split between the U.S. Forest Service (USFS) and the Washington State Department of Fish & Wildlife (WDFW).

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Land Use/Current Shoreline Master Program (SMP):

Current land use designation:

- Land use has not been designated. The current land uses are recreation and open space.

Current zoning designation:

- SR 1a: The entire portion of SR 1a within both Garfield and Columbia counties is within Umatilla National Forest.
- SR 1b: The majority of this subreach is within Umatilla National Forest. A small portion of the end of the reach (adjacent to SR 2a) is managed by WDFW and is zoned R-1 Recreational Zone.

Current SMP environment designation:

- The current designation is Conservancy.

Existing Land Cover/Development:

Exising land cover includes forest, rangeland, wetlands, and riparian areas. Development includes recreation-related development, including campgrounds, parking areas, roads and other improvements.

Geomorphic Character:

Description: The Tucannon River flows within a wide alluvial valley bounded by valley walls that mostly comprise loess deposits and Grande Ronde Basalt. The river mostly has a single-thread channel, but multiple flowpaths may be present in wider, unconfined areas. The low lying channel areas consist mostly of alluvium. Infrastructure is present throughout the valley limiting the channel migration potential throughout the valley. Localized bank armoring is present throughout the reach.

Channel Migration Zone Characterization: The mainstem Tucannon River flows within bedrock and alluvium throughout its extent. The channel varies from an incised, single-thread channel to a meandering channel with multiple flowpaths. In areas where the channel is incised in bedrock, the potential for channel migration is minimal. In areas where the river flows through alluvium, and along segments not protected by stable levees, the potential for migration exists. Along its alignment, migration can occur as an ongoing slow process or as a rapid channel movement (such as a channel avulsion).

Hardened Banks: Approximately 4,400 linear feet of artificial hardened banks exists along the Tucannon River in this reach.

Flooding and Geological Hazards:

Flooding: Federal Emergency Management Agency (FEMA) floodplains are mapped only for the lower portion of SR 1b. Floodplain widths are relatively wide compared to other waterbodies within the planning area.

Geological Hazards: No moderately or severely erodible soils can be found in Reach 1. Most of Reach 1 has moderate to high liquefaction susceptibility. Landslide hazards exist in SR 1a and 1b where slopes are steeper than 15% over underlying alluvial deposits.

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Existing Public Access:

SR 1a: Shoreline and public access is managed by USFS:

- The following USFS roads access the river along this reach: NF-160, NF-165, NF-180, and NF-4620.
- NF-4713 crosses the Tucannon River via a bridge at the mouth of Panjab Creek.
- There is an informal parking lot near T8N_R42E_S17 in Garfield County.
- There is a primitive (non-named) campsite approximately 0.25 mile upstream from the informal parking lot.
- An informal campground is located at the intersection of NF-4713 and Tucannon Road.
- An informal campground and pull-off are located 2.5 miles downstream of Tucannon Campground.
- Tucannon Road crosses the Tucannon River 1.47 miles downstream of Tucannon Campground; there is an informal campground slightly upstream from the bridge.

SR 1b:

- Tucannon Road runs the length of SR 1b.
- A primitive parking area is located 0.5 mile upstream of Tucannon Campground.
- The USFS (Pomeroy Ranger District) maintains the Tucannon Campground, which is a fee campground and includes 18 campsites, restrooms, potable water, and water access.
- Curl Lake is a WDFW-owned pond that is stocked with trout. The lake has a parking lot, vault toilets, and a fishing pier. Curl Lake is 1.5 miles upstream from the Tucannon Campground.
- Big Four Lake is located 0.57 mile upstream from Curl Lake and has a parking lot and vault toilet.
- Beaver Lake is a WDFW-owned and stocked lake 1.65 miles upstream from Big Four Lake. Beaver Lake is adjacent to Watson Lake. These lakes are accessed via a bridge that crosses the Tucannon from Tucannon Road. There is a parking lot and vault toilet.
- A two-track dirt road runs from Beaver Lake, north to Rainbow Lake on the eastern shore of the Tucannon River.
- Deer Lake is located 1.37 miles upstream from Beaver Lake and Watson Lake. This lake is stocked with trout for fishing and has a vault toilet.
- Rainbow Lake is located 0.70 mile upstream from Deer Lake. There is a trail around the lake, vault toilets, and a fishing pier. It can be accessed via the two-track road that runs along the eastern shore of the Tucannon River.

Identified Public Access Improvements: Several options are being considered by WDFW for this reach and are outlined in the W.T.Wooten Floodplain Management Plan (dated November 8, 2012). The report provides information on relocating some of the campsites and providing additional campsites along the river, along with modified access to and around some of the lakes, as part of proposed lake reconfigurations and deepening.

Public Access Opportunities: Past work has included relocating campgrounds outside the floodplain; however, there are remaining campgrounds still within the floodplain that will be relocated to restore the historical floodplain.

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ECOLOGICAL CONDITIONS

Water Quantity and Sediment:

Tributaries entering this reach include Panjab Creek and Little Tucannon River in SR 1a. The nearest USGS gage (Gage No. 13344500) is located in Reach 2, and has a mean annual flow of 171 cubic feet per second (cfs) and a maximum discharge of 7,980 cfs.

Sediment inputs are typically from colluvial erosion and debris flows, as well as some channel migration, road erosion, and timber harvesting. Sediment typically is efficiently moved throughout this reach due to relatively high gradients. SR 1b temporarily stores sediment in many areas during moderate events.

Water Quality:

This reach has a total maximum daily load (TMDL) in place for temperature in SR 1a and 1b.

Habitat Characteristics and Priority Habitat Species (PHS) Presence:

The Tucannon River may provide habitat for elk, mule deer, and white tailed deer, as identified on PHS maps and Table 28 of the Inventory, Analysis, and Characterization (IAC) Report. The Tucannon River in this reach supports Endangered Species Act (ESA)-listed bull trout and Tucannon River steelhead and spring/summer Chinook salmon, as well as a natural population of Snake River fall-run Chinook salmon. The Tucannon River also supports hatchery steelhead, redband trout, and mountain whitefish. Bull trout of all life stages may use the Tucannon River and its tributaries.

Riparian habitat conditions in this reach of the Tucannon River are affected by low quantities of large woody debris (LWD). Historical logging and flood-control operations may have caused some stream and riparian damage because logs were often moved downhill in stream channels and floodplains (SRSRB 2011).

The habitat factors limiting the viability of the Tucannon River steelhead and spring/summer Chinook salmon populations include a lack of key habitat (primarily pools), with minor impacts attributable to channel stability and habitat diversity (SRSRB 2011). Agriculture has had a minimal effect on this area, particularly because cattle grazing has been excluded from upper reaches of the Tucannon River since the early 1990s (SRSRB 2011). Recreational access and associated activities, including camping, hunting, and use of recreational vehicles, has impacted stream habitat in this area.

SR 1a: The Tucannon River in this subreach begins in Garfield County and crosses into Columbia County. In SR 1a, it is a small creek that runs through a forested valley characterized by coniferous and deciduous trees, shrubs, and riparian species, typical of those identified in the IAC Report. The mountain slopes have continuous forest cover. There is no noticeable development along the river in Garfield County, although several informal recreational access sites exist. In Columbia County, Tucannon Road begins as an informal access road that generally runs adjacent to the channel inside and outside of the 200-foot shoreline boundary until near the confluence with Panjab Creek, where Tucannon road becomes more developed. SR 1a has accumulated significant LWD as a result of downed trees, likely from the 1996 flood, and generally provides high-quality, in-stream fish habitat. Past the confluence with Panjab Creek, SR 1a continues through the valley at a lower elevation, where there is less forest cover on the slopes, and there is an occasional campground, the presence and use of which has some impact on the continuity of the riparian habitat on

Tucannon River – Reach 1 Columbia and Garfield Counties
either bank. **SR 1b:** This subreach is characterized by more open habitat within the broader floodplain, with a riparian area that is more consistently wetland-type vegetation rather than larger trees forming a canopy over the river bed. There are a number of lakes that have formed adjacent to the Creek in SR 1b. There is a diversion dam at the end of SR 1b that provides water supply to one of the recreation lakes.
ECOLOGICAL FUNCTIONS ANALYSIS
Ecological functions within Reach 1 are generally properly functioning (SRSRB 2011). The impact on ecological function of all limiting habitat factors in this reach is minimal. The functions affected include rearing and foraging functions for holding habitat for subyearling steelhead and fry and overwintering spring/summer Chinook salmon, as well as spawning functions. The ecological functions of this reach of the Tucannon River have improved through restoration, including in-stream structures and riparian planting. Major fish-passage obstructions in this watershed have been removed, and remaining forest roads, which are a source of fine sediments, are being modified or removed. Overall, these actions reduce fine sediment loads and streambed embeddedness, which improve functions related to spawning and rearing habitat. **Restoration Actions:** • Implement restoration projects that may include passive (e.g., protected area conservation easements) or active (e.g., riparian plantings) efforts to reduce erosion and increase filtration. • Implement aquatic habitat protection plans, including a list of prioritized projects from the Tucannon Implementation Area of the Water Resource Inventory Area 32 Watershed Plan (Asotin PUD 2007), e.g., riparian buffer replacement/enhancement.
SR 1a: **Level of Existing Function:** Functioning **Stressors:** • Tucannon, NF-160, NF-140, and NF-4713 Road within jurisdiction buffer and two crossings • Campsite development Recreational use and development affects aquatic habitat functions of forage, rearing, and spawning through impacts to water quality via runoff, as well as disturbances to riparian vegetation that lead to aquatic habitat quantity and quality impacts. Recreational access and additional road development also impact continuity of riparian habitats and riparian functions (for terrestrial species) such as migratory corridors. **Potential Restoration Opportunities:** Implement the actions identified above. **Potential Protection Opportunities:** Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers. Retrofit existing USFS roads to meet current stormwater controls; and ensure any new recreational development is consistent with the Eastern Washington Stormwater Manual.

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SR 1b:

Level of Existing Function: Functioning

Stressors:

- Tucannon and private road within jurisdiction buffer and one crossing
- Recreation trails and recreation use (fishing)

Recreational use and development affect aquatic habitat functions of forage, rearing, and spawning through impacts to water quality via runoff, as well as disturbances to riparian vegetation that lead to aquatic habitat quantity and quality impacts. Recreational access and additional road development also impact continuity of riparian habitats and riparian functions (for terrestrial species) such as migratory corridors.

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Limit recreation access to existing trails to protect riparian and shrub-steppe or grassland habitat.

Tucannon River – Reach 2	**Columbia County and Garfield Counties**

Reach Description: Reach 2 of the Tucannon River begins at Rainbow Lake (SE ¼ of T10N_R41E_S27) and ends at the confluence of the Tucannon and Snake Rivers.

Shoreline Jurisdiction: 2,636 acres, 49 miles

Source: https://fortress.wa.gov/ecy/coastalatlas/UICoastalAtlas/Tools/ShorePhotos.aspx

Subreaches (SR); see Maps F-2, F-3, and F-4

SR 2a: Begins at Rainbow Lake (SE ¼ of T10N_R41E_S27) and ends at (NW ¼ of T11N_R41E_S32); 428 acres, 7.6 miles

SR 2b: Begins at (NW ¼ of T11N_R41E_S32) and ends near the community of Marengo (NE ¼ of T11N_R40E_S13); 236 acres, 4.5 miles

SR 2c: Begins near Marengo (NE ¼ of T11N_R40E_S13) and ends at SE ¼ of T11N_R39E_S01; 389 acres, 7.3 miles

SR 2d: Begins at SE ¼ of T11N_R39E_S01 and ends west of the community of Tucannon (NW ¼ of T12N_R39E_S30); 346 acres, 6.4 miles

SR 2e: Begins west of the community of Tucannon (NW ¼ of T12N_R39E_S30) and ends at Smith Hollow

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(SW ¼ of T12N_R38E_S22); 231 acres, 4.2 miles

SR 2f: Begins at Smith Hollow (SW ¼ of T12N_R38E_S22) and ends at east city limits of Starbuck; 201 acres, 3.8 miles

SR 2g: Begins at west city limits of Starbuck and ends at (SW ¼ of T12N_R37E_S03); 268 acres, 3.5 miles

SR 2h: Begins at (SW ¼ of T12N_R41E_S03) and ends at the mouth on the Snake River; 68 acres, 0.08 mile

CHARACTERISTICS

Ownership:

SR 2a: Ownership is WDFW Wooten Wildlife Area.

SR 2b: Ownership is a mix of private (mostly) and public (including Columbia County right-of-way).

SR 2c: Ownership is a mix of private (mostly) and public (including Columbia County right-of-way).

SR 2d: Ownership is a mix of private (mostly) and public (including Columbia County right-of-way).

SR 2e: Ownership is a mix of private (mostly) and public (including Washington State Department of Transportation [WSDOT]).

SR 2f: Ownership is a mix of private (mostly) and public (including WSDOT).

SR 2g: Ownership is a mix of private (mostly) and public (including WSDOT).

SR 2h: Ownership is a mix of private (mostly) and public (including WSDOT).

Land Use/Current SMP:

Current land use designation:

- Land use has not been designated. The current land uses are agriculture, residential, and recreation.

Current zoning designation:

- SR 2a: The current zoning is Umatilla National Forest, except for SE ¼ of T9N_41E_S30, which is zoned A-1 Agricultural.
- SR 2b: The current zoning is Umatilla National Forest.
- SR 2c: The current zoning is 45% R-1 Recreational Zone, 45% A-2 Agricultural, and 10% A-1 Agricultural.
- SR 2d through 2h: The current zoning is A-1 Agricultural.

Current SMP environment designation:

- SR 2a: The upper one-third is designated Conservancy and the remaining is Rural.
- SR 2b through 2h: The current designation is Rural.

Existing Land Cover/Development:

Reach 2 from SR 2a through 2e consists mostly of publicly owned land, and there is less development and mostly open space. From SR 2d through 2h, the land is fairly developed with private residences and farms.

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The development along this reach is predominately campground and recreation facilities with some agriculture.

Geomorphic Character:

Description: The Tucannon River flows within a wide alluvial valley bounded by valley walls that mostly comprise loess deposits and Grande Ronde Basalt. The valley is low gradient and unconfined. The river mostly has a single-thread channel, but multiple flowpaths are present in wider, unconfined areas. The low-lying channel areas consist mostly of alluvium. Infrastructure is present throughout the valley, limiting the channel migration potential throughout the valley. Numerous levees exist along the river through the Town of Starbuck. Localized bank armoring is present throughout the valley and was put in place mostly to support agricultural production on adjacent lands.

Channel Migration Zone Characterization: The mainstem Tucannon River flows within bedrock and alluvium throughout its extent. The channel varies from an incised, single-thread channel to a meandering channel with multiple flowpaths. In areas where the channel is incised in bedrock, the potential for channel migration is minimal. In areas where the river flows through alluvium, and along segments not protected by stable levees, the potential for migration exists. Along its alignment, migration can occur as an ongoing slow process or as a rapid channel movement (such as a channel avulsion).

Hardened Banks: Approximately 73,260 linear feet of artificial hardened banks exist along the Tucannon River.

Flooding and Geological Hazards:

Flooding: FEMA floodplains are mapped for the entire reach. Floodways are delineated in portions of SR 2f and 2g. Floodplains have varying widths but are relatively wide throughout the reach compared to other areas in the planning area. Where floodways are delineated, the floodway does not take up the entire width of the floodplain. In SR 2f, the floodway width is much less than the floodplain width. In SR 2g, the floodway width generally takes up the majority of the floodplain width.

Geological Hazards: Severely erodible soils can be found in SR 2a through 2g, which have moderate to high liquefaction susceptibility, whereas a few areas in SR 2e and SR 2f have low to moderate liquefaction susceptibility. Landslide hazard exists throughout the Reach 2 where slopes are steeper than 15% over underlying Columbia River Basalts, alluvial deposits, and flood deposits

Existing Public Access: Tucannon Road runs the length of the Reach 2.

SR 2a:

- WDFW owns and operates the Tucannon Fish Hatchery 0.37 mile upstream from Rainbow Lake.
- The Tucannon Fish Hatchery is accessed via a bridge that crosses the Tucannon River from Tucannon Road.
- Blue Lake is located 0.5 mile upstream from the Tucannon Fish Hatchery. There is a trail around the lake and multiple water access sites to fish from.
- 0.47 mile upstream from Blue Lake is a camping area that allows primitive camping and vault toilets.

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- 0.51 mile upstream from the Wooten Wildlife Area is Spring Lake. There is a trail around the lake and vault toilets.
- Adjacent to Spring Lake, Tucannon Road crosses the Tucannon River via Tucannon bridge.
- McGovern Lane begins across the river (runs along west shoreline) from the Last Resort and runs upstream for 0.66 mile where Tucannon Road crosses the Tucannon River via a bridge.
- Hartsock Grade Road accesses the area from the west.
- The last portion of SR 2a has limited public access (except for Tucannon Road) because of private ownership.

SR 2b:

- Tucannon Road crosses the Tucannon River at the southern end of SR 2b and again in the middle of the reach.
- There is an informal pull-off at the side of Tucannon Road, just downstream from the junction of Turner Road and Tucannon Road.
- Turner Road crosses the Tucannon River via a bridge right before it intersects with Tucannon Road.
- This subreach has little public access because it is mostly privately owned. The majority of the land adjacent to the Tucannon River is in irrigated agriculture and private residences.

SR 2c:

- Turner Road comes from the west and crosses the Tucannon River via a bridge right before it intersects with Tucannon Road.

SR 2d:

- Tucannon Recreational Vehicle (RV) Park provides access in the middle of this reach.
- Smith Hollow Road crosses the Tucannon River toward the northwestern portion of SR 2b.

Throughout the rest of this reach (SRs 2e through 2h), except for within the Town of Starbuck and Tucker Road crossing in SR 2g, the Tucannon River is bordered to the east by the Tucannon Road, providing visual access. To the west pivot irrigation agricultural fields, pasture, and private residences exist, flanked by steep barren hills and limited public access.

Identified Public Access Improvements:

WDFW floodplain improvements are planned in the Wooten Wildlife Area, including enhancement of fishing, hunting, camping, wildlife viewing, and other recreational activities.

Public Access Opportunities:

In addition to the planned improvements there are several river crossings that have the potential to provide public viewing and access opportunities.

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ECOLOGICAL CONDITIONS

Water Quantity and Sediment:

U.S. Geological Survey (USGS) has had a gage (Gage No. 13344500) that has been active for periods dating back to 1915 and has been presently active since 1995. An active Washington State Department of Ecology (Ecology) gage (Gage No. 35B150) has flow data from 2003 and is located in SR 2c. Major tributaries include Cummings Creek and Tumalum Creek in SR 2a, Willow Creek in SR 2d, Pataha Creek in SR 2e, and Smith Hollow in SR 2f. SR 2h is controlled by backwater from Lower Monumental Dam. The mean annual flow from Gage No. 13344500 for the period of record (1915-1917, 1929-1931, 1959-1990, and 1995-present) is 171 cfs, and the maximum discharge is 7,980 cfs.

Sediment input is typically due to erosion in SR 2a and 2d, channel migration in SR 2c, and tributary runoff in SR 2e. Sediment typically deposits in SR 2g and 2h due to reduced velocity and backwater from the Lower Monumental Dam. Other areas of the reach, including SR 2a and 2c, store sediment during moderate flow events but transport sediment in more extreme events.

Water Quality:

In this reach, TMDLs are required for pH in SR 2c and 2g and for turbidity in SR 2g. A TMDL is in place for temperature throughout the whole reach.

Habitat Characteristics and PHS Presence:

The Tucannon River may provide habitat for elk, mule deer, and white tailed deer, as identified on PHS maps and Table 28 of the IAC Report. The Tucannon River in this reach supports ESA-listed bull trout and Tucannon River steelhead and spring/summer Chinook salmon, as well as a natural population of Snake River fall-run Chinook Salmon. The Tucannon River also supports hatchery steelhead, redband trout, and mountain whitefish. Bull trout of all life stages may use the Tucannon River and its tributaries.

In this reach, key habitat quantity and sedimentation are believed to be the primary limiting factors for summer steelhead, according to the Tucannon River Subbasin Plan (CCD 2004). Habitat diversity, flow, channel stability, predation, pathogens, and temperature are listed as strong secondary limiting factors. The SRSRB (2011) EDT analysis attributes the largest proportion of the impact to spring/summer Chinook salmon populations to temperature, a lack of key habitat quantity, and sedimentation.

Aquatic habitat function in the Tucannon River is affected by sedimentation linked to agricultural practices, as well as improperly designed roadways and unstable banks within upper watershed and tributaries (e.g., Pataha Creek) (SRSRB 2011). There are several lakes and impoundments, wetlands, and some side channels that provide off-channel habitat for aquatic species within this reach, but these lakes are mostly human-made impoundments with a number of features that affect ecological functions of the floodplain. WDFW is considering a management plan that would include removal of some lakes (WDFW 2012). Riparian functions are degraded as a result of levees, dikes, and road construction; overgrazing; forest and logging practices; removal of floodplain vegetation; and elimination of beaver (SRSRB 2011). Human activities have contributed to elevated water temperatures through riparian degradation and irrigation withdrawals, as well as associated bank erosion and the development of a wider channel, resulting in low summer flows

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(SRSRB 2011).

Habitat restoration projects have been implemented in this reach of the Tucannon River to improve factors limiting salmon habitat quality and salmon/steelhead productivity. All major obstructions have been addressed and many irrigation diversions have been screened. Agricultural improvements and grazing and fencing practices, have reduced fine sediment loads and streambed embeddedness. Elevated stream temperatures have been addressed by planting riparian areas, and as a direct result of such actions, salmonid spawning and rearing has been observed farther downstream than at the time of the species listing (SRSRB 2011). Existing damaged stream banks and low habitat diversity, although improved through restoration actions, will continue to produce fine sediment and elevate stream temperatures until new riparian and floodplain vegetative cover matures.

This reach of the Tucannon River was changed to a priority restoration reach in the Snake River Salmon Recovery Plan beginning in 2010, and a number of restoration actions in the lower river are planned to occur in future years (Anchor QEA 2011).

SR 2a: This subreach begins at the dam above Rainbow Lake, just south of the Tucannon Fish Hatchery. Rainbow Lake is a 10-acre, off-channel impoundment. The lake is supplied directly from the river via an open channel and diverted from the Tucannon River at the Tucannon Fish Hatchery diversion dam (with a recently improved fish ladder). Rainbow Lake provides water (and acts as an ice-free supply in winter) to the hatchery and supports a recreational fishery. The riparian habitat in the upper end of SR 2a is generally forested across the entire width of the floodplain valley. The southwest-facing canyon slopes are less vegetated above the river in this subreach, while northeast facing slopes sustain scattered trees and shrubs farther upslope. Development within the shoreline boundary includes Tucannon Road and other minor roadways on both sides of the valley, as well as the Fish Hatchery, campgrounds, and residential areas, which increase in density near the juncture of Tucannon Road with Blind Grade Road. North of this juncture to the end of SR 2a, agricultural fields exist on both sides of the river, constraining the river channel through dikes that disconnect the floodplain and through removal of native riparian and grassland cover. At the crossing of Tucannon Road near McGovern Lane, the level of agricultural activity diminishes directly adjacent to the river, and the river channel moves toward the toe of the slope of the mountain to the east. The riparian habitat forms a dense forest, up to 150 feet wide to the west, which is more limited on the east due to the slope. Agricultural activities are generally confined to the west and gradually diminish as the river forms a bend around the county line and turns to the west, and the floodplain valley narrows. The habitat along SR 2a is generally in fair condition.

SR 2b: Agricultural activities, including croplands and pasture, occur throughout this subreach adjacent to the river. The crop fields take up much of the width of the valley floodplain, and the river is confined between the slope of the mountain or the agricultural land development. Some small patches of riparian forest have remained, but generally vegetation is confined to narrow bands along both banks. There are two crossings of Tucannon Road in SR 2b.

SR 2c: Habitat conditions in SR 2c are very similar to SR 2b. The reach flows through lower elevations and has drier conditions. South-facing slopes of the bluffs are characterized by shrub-steppe vegetation. This shrub-steppe habitat is generally disconnected from the river by the presence of Tucannon Road and

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agricultural fields. The north-facing slopes maintain more moisture and support trees and shrubs but also transition to more shrub-steppe habitat. More agricultural activities take place on the plateaus above the Tucannon in SR 2c, with the potential for runoff from the fields to be conveyed to the Tucannon through canyons and gullies that discharge to the river, although some sediment settling ponds have been developed that reduce these impacts (Asotin PUD 2007).

SR 2d: Conditions in SR 2d are similar to SR 2c, and the transition to drier conditions in the uplands continues. Riparian habitat becomes more constrained, and cover type changes to smaller trees and shrubs. Agricultural land use continues along the Tucannon in SR 2d.

SR 2e: The habitat conditions are similar along the riparian zone to SR 2d, but the level of agricultural land use diminishes, and the riparian zone forms wetland areas where development does not occur. The floodplain valley is narrower, and land use includes more cattle pasture and grazing lands. The river is confined by Highway 261.

SR 2f: The habitat conditions in this subreach are very similar to SR 2d for riparian and upland habitat. There is significant agricultural development and ranching, with potential for riparian degradation due to cattle watering at the river.

SR 2g: This subreach is similar to SR 2e. There is agricultural land use on both sides of the river until the intersection with Tucker Road. The riparian zone in this area is generally only present in patches and is occasionally diminished on one side of the river, possibly where livestock are allowed to access the river for watering. To the west of Tucker Road, there is a minimal amount of development with the exception of Highway 261. The river has good riparian cover in SR 2g on both sides of the river as it approaches the confluence with the Snake River.

SR 2h: This subreach includes the last 0.5 mile of the Tucannon River. The Snake River pool behind Lower Monumental Dam has inundated the mouth of the Tucannon River, forming a large wetland complex. The west bank of the Tucannon is hardened adjacent to Highway 261, and the channel has been modified to increase flow conveyance capacity and protect adjacent properties. There is a small public access area here for launching personal watercraft. The uplands to the east consist of shrub-steppe habitat on the slopes of the bluff, and there are numerous wildlife and recreational trails that may contribute to erosion and disturbance of the shrub-steppe and riparian community.

ECOLOGICAL FUNCTIONS ANALYSIS

Riparian areas of Reach 2 were generally determined to be partially functioning.

The habitat function within this reach is affected by channel stability, reduced habitat diversity, key habitat, and sediment load. Encroachment on the floodplain, particularly in SR 2c, 2d, 2f, 2g, and 2h caused by the construction of single-family dwellings and the activities associated with the encroachment, negatively affects floodplain and riparian function. Reduced stream channel complexity, confinement, and floodplain function caused by past channel straightening, loss of historical riparian forests (SR 2a and 2b) and loss of LWD sources throughout the upper subreaches (SR 2a through 2c in particular) has reduced key habitats such as rearing and wintering habitat. Stream temperature in SR 2g and 2h, approaching the confluence with the Snake River, may also be elevated due to reduced riparian cover, confinement, and poor floodplain and

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channel function.

This reach has benefited from some salmon habitat restoration actions performed in the drainage area, including federal and state programs to improve grazing practices, convert tilled lands to minimum till agriculture, sediment retention basins in problem areas, improved riparian habitat in tributaries, and removal of fish passage barriers elsewhere in the watershed. The results include reductions in fine sediment loads and reduced streambed embeddedness, as well as improvements in riparian habitat and water temperature; however, until floodplain and riparian cover matures and additional restoration actions are completed, the damaged stream banks, low habitat diversity, and disturbed habitat structures will continue to generate fine sediment and elevate stream temperatures (SRSRB 2011).

Restoration Actions:

- Implement restoration projects as identified in the *Tucannon River Geomorphic Assessment and Habitat Restoration Study* (Anchor QEA 2011), and prioritized as in (Anchor QEA 2012), and other associated documents and studies related to the Tucannon River Habitat Program.
- Implement restoration projects that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., riparian plantings) efforts to reduce erosion and increase filtration to reduce the sediment load to this reach.
- Reduce riparian and water quality impacts from livestock through expanded use of best management practices (e.g., exclusionary fencing and rotational grazing) for livestock operations within shoreline jurisdiction.
- Implement strategies to reduce fecal coliform at SR 2h, such as repairs/upgrades to septic systems and regulate point sources.

Protection Actions:

- Protect remaining floodplain habitat from encroachment related to construction of single-family residential units and associated development.

SR 2a:

Level of Existing Function: Partially Functioning

Stressors:

- Hatchery and infrastructure and development
- Agricultural fields with limited vegetated buffer
- Rural residential development
- Tucannon Road within jurisdiction buffer and three crossings

Runoff from upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development and trails may impact continuity of riparian habitats and riparian functions such as migratory corridors. Agricultural use primarily affects aquatic functions of forage and rearing through impacts to water quality and quantity through withdrawals. It may affect water quality due to nutrient inputs from agricultural runoff or livestock wastes.

Tucannon River – Reach 2	Columbia County and Garfield Counties

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.

SR 2b:

Level of Existing Function: Partially Functioning

Stressors:

- Agricultural fields
- Tucannon Road and McGovern Lane within shoreline jurisdiction and four crossings

Runoff from upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development may also impact continuity of riparian habitats and riparian functions such as migratory corridors.

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.

SR 2c:

Level of Existing Function: Partially Functioning

Stressors:

- Agricultural fields
- Tucannon, King Grade, and Marjorie roads within shoreline jurisdiction and one bridge

Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development may also impact continuity of riparian habitats and riparian functions such as migratory corridors.

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.

SR 2d:

Level of Existing Function: Partially Functioning

Stressors:

- Agricultural fields
- Tucannon Road and Highway 20 within shoreline jurisdiction and one bridge
- Rural residential with some outbuildings within shoreline jurisdiction boundary

Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development may also impact continuity of riparian habitats and riparian

Tucannon River – Reach 2	Columbia County and Garfield Counties

functions such as migratory corridors.

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.

SR 2e:

Level of Existing Function: Partially Functioning

Stressors:

- Agricultural fields
- Highways 20 and 261 and River Ranch Lane and Territorial Road within shoreline jurisdiction and two bridges
- Rural residential with some outbuildings within jurisdiction boundary

Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development may also impact continuity of riparian habitats and riparian functions such as migratory corridors.

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.

SR 2f:

Level of Existing Function: Partially Functioning

Stressors:

- Agricultural fields
- Highway 261, HA Fletcher and Smith Hollow Road within shoreline jurisdiction and two bridges
- Feedlot and rangeland grazing

Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development may also impact continuity of riparian habitats and riparian functions such as migratory corridors. Livestock activity may cause reduced or disturbed shoreline vegetation or allow establishment of invasive species, impacting riparian functions such as erosion control, wildlife habitat, and migratory corridors.

Potential Restoration Opportunities: Implement the actions identified above.

Potential Protection Opportunities: Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.

Tucannon River – Reach 2	Columbia County and Garfield Counties
SR 2g: **Level of Existing Function:** Partially Functioning **Stressors:** • Agricultural fields • Highway 261 and Tucker Road within jurisdiction buffer and two crossings Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development may also impact continuity of riparian habitats and riparian functions such as migratory corridors. **Potential Restoration Opportunities:** Implement the actions identified above. **Potential Protection Opportunities:** Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.	
SR 2h: **Level of Existing Function:** Partially Functioning **Stressors:** • Highway 261 within shoreline jurisdiction Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development also limits width of riparian habitats and riparian functions such as migratory corridors. **Potential Restoration Opportunities:** Implement the actions identified above. **Potential Protection Opportunities:** Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.	

Tucannon River	Town of Starbuck

Reach Description: The Tucannon River starts at the upstream city limits of the Town of Starbuck and ends at the downstream end of the Town of Starbuck city limits.

Shoreline Jurisdiction: 59 acres, 0.7 mile

Source: Google earth

Subreaches (SR); see Map F-5

Starts and ends at city limits; 59 acres, 0.7 mile

CHARACTERISTICS

Ownership:

The ownership is private.

Land Use/Current SMP:

Current land use designation:

- Land use has not been designated. The current land use is residential and griculture.

Current zoning designation:

- The Town of Starbuck is not zoned.

Current SMP environment designation:

- The current designation is Urban (Columbia County SMP).

Tucannon River	Town of Starbuck

Existing Land Cover/Development:

The Town of Starbuck Reach of the Tucannon River is highly developed. The majority of the development is private residences, with agriculture and also a few small businesses. There is little open space along this stretch of the river.

Geomorphic Character:

Description: The river is mostly a confined, single-thread channel through the Town of Starbuck. The channel comprises alluvium with valley walls comprising loess deposits.

Channel Migration Zone: Levees are present throughout the reach, limiting the channel migration potential throughout the valley.

Hardened Banks: Approximately 6,280 feet of artificial hardened banks exist through the Town of Starbuck.

Flooding and Geological Hazards:

Flooding: FEMA floodplains and floodways are delineated for this entire reach. Floodplain widths are relatively wide, and floodways take up a small width of the floodplain area.

Geological Hazards: Severely erodible soils can be found in this reach. The upstream section of this reach has low to moderate liquefaction susceptibility and the rest has moderate to high. Landslide hazards exist throughout this reach where slopes are steeper than 15% over underlying Columbia River Basalts, alluvial deposits, and flood deposits

Existing Public Access:

There is unimproved and informal access along the shoreline in the Starbuck city limits.

Identified Public Access Improvements: None identified.

Public Access Opportunities: There is a crossing of Kellogg Hollow Road over the river, which may provide public access. Additionally, there appears to be either a levee or an unpaved road along the shoreline that may provide public access in concert with other restoration plans for this section of the river.

ECOLOGICAL CONDITIONS

Water Quantity and Sediment:

Kellogg Creek is a major tributary that flows into this reach. Flows for this reach can generally be described by Gage No. 13344500, which has a mean annual flow of 171 cfs and a maximum discharge of 7,980 cfs.

Sediment input likely occurs from Kellogg Creek during increased flow events. Sediment is likely impacted by agricultural use and other land use practices.

Tucannon River	Town of Starbuck

Water Quality:

This reach is listed as a water of concern for temperature on Ecology's 305b list. Water quality may be impacted by residential, roadway, and agricultural runoff.

Habitat Characteristics and PHS Presence:

The Tucannon River may provide habitat for elk, mule deer, and white tailed deer, as identified on PHS maps and Table 28 of the IAC Report. The Tucannon River in this reach supports ESA-listed bull trout and Tucannon River steelhead and spring/summer Chinook salmon, as well as a natural population of Snake River fall-run Chinook Salmon. The Tucannon River also supports hatchery steelhead, redband trout, and mountain whitefish. Bull trout of all life stages may use the Tucannon River and its tributaries.

In this reach, key habitat quantity and sedimentation are believed to be the primary limiting factors for summer steelhead, according to the Tucannon River Subbasin Plan (CCD 2004).

Aquatic habitat function in the Tucannon River is affected by sedimentation linked to agricultural practices, as well as improperly designed roadways and unstable banks within upper watershed and tributaries (e.g., Pataha Creek) (SRSRB 2011). Riparian functions are degraded as a result of levees, dikes, road construction, overgrazing, and removal of floodplain vegetation (SRSRB 2011).

Habitat restoration projects have been implemented in this reach of the Tucannon River to improve factors limiting salmon habitat quality and salmon/steelhead productivity. Starbuck Dam (river mile 5.5) played a major role in the early decline of anadromous salmonids in the Tucannon River. In the summer and fall, the dam dewatered 1 mile or more of the mainstem. Besides blocking adult salmonid passage, both dams represented major smolt entrainment hazards. The obstructions caused by the Starbuck Dam have been addressed, and many irrigation diversions have been screened. Elevated stream temperatures have been addressed by planting riparian areas. However, existing damaged stream banks and low habitat diversity, although improved through restoration actions, will continue to produce fine sediment and elevate stream temperatures until new riparian and floodplain vegetative cover matures.

This reach is included within the priority restoration reach of the Tucannon River in the Snake River Salmon Recovery Plan beginning in 2010, and a number of restoration actions are planned to occur in future years (Anchor QEA 2011).

There is riparian cover on both sides of the river as this reach enters the Town of Starbuck. In some areas, the riparian zone includes no trees due to disturbances from agricultural and livestock use in the uplands. The river bank in this reach has been stabilized to support the levee on the east bank of the river. There are no trees along the riparian zone along the levee.

ECOLOGICAL FUNCTIONS ANALYSIS

Level of Existing Function: Impaired

Stressors:

- Residential and industrial development
- Kellogg Hollow Road, town street ends and informal dirt road within jurisdiction buffer and one

Tucannon River	Town of Starbuck
crossing • Levee Runoff from agriculture and upland development impacts water quality, which impacts aquatic forage and rearing habitat functions. Upland development and trails may impact continuity of riparian habitats and riparian functions such as migratory corridors. **Potential Restoration Opportunities:** Implement the actions identified above. **Potential Protection Opportunities:** Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual and protect intact riparian buffers.	

Panjab Creek	**Columbia County**

Reach Description: Panjab Creek begins at the NE ¼ of T8N_R41E_S18 and ends at the confluence with the Tucannon River Reach.

Shoreline Jurisdiction: 111 acres, 2.2 miles

Source: Google maps

Subreaches (SR); see Map F-1

There are no subreaches in Panjab Creek.

CHARACTERISTICS

Ownership: This reach is entirely within USFS-owned lands.

Land Use/Current SMP:

Current land use designation:

- Land use has not been designated. The current land use is recreation.

Current zoning designation:

- The current zoning is Umatilla National Forest.

Current SMP environment designation:

- The current designation is Conservancy.

Panjab Creek	Columbia County

Existing Land Cover/Development:

Panjab Creek is owned by USFS and remains in forested open space. The developments on Panjab Creek are USFS roads, fishing access, and campgrounds.

Geomorphic Character:

Description: Panjab Creek occupies a mostly narrow and confined bedrock valley. Valley bottom consists mostly of alluvium with valley boundaries and walls consisting of Grande Ronde Basalt and meta-sedimentary and meta-volcanic rocks. The overall valley width narrows and steepens in the upstream direction.

Channel Migration Zone Characterization: Channel migration is limited by the presence of bedrock throughout the channel and valley.

Hardened Banks: No artificial hardened banks appear to exist along Panjab Creek

Flooding and Geological Hazards:

Flooding: FEMA floodplains are not mapped on Panjab Creek.

Geological Hazards: Landslide hazards exist along Panjab Creek where slopes are greater than 15% and contain overlying alluvium. Moderate to high liquefaction susceptibility exists along the river valley.

Existing Public Access:

Panjab Creek is managed by USFS, providing several trailheads and campgrounds for the area, including equestrian access.

Identified Public Access Improvements: None identified.

Public Access Opportunities: Because this reach is remote, and there are multiple access sites, public access for the area may be adequate. However, according to the U.S. Department of Agriculture website, the Panjab Trail and camping area is subject to medium-heavy use, and there may be future improvements needed at that site.

ECOLOGICAL CONDITIONS

Water Quantity and Sediment:

No major inputs occur within this reach. Water quantity can be estimated using existing gages on the Tucannon River and relating basin drainage areas.

Sediment is likely to move efficiently throughout this reach due to relatively high gradients. Timber harvesting activities may impact sediment inputs.

Water Quality:

This reach is listed as a water of concern for temperature on Ecology's 305b list.

Panjab Creek	Columbia County

Habitat Characteristics and PHS Presence:

The Tucannon River may provide habitat for elk, mule deer, and white tailed deer, as identified on PHS maps and Table 28 of the IAC Report. The Tucannon River in this reach supports ESA-listed bull trout and Tucannon River steelhead and spring/summer Chinook salmon, as well as a natural population of Snake River fall-run Chinook salmon. The Tucannon River also supports hatchery steelhead, redband trout, and mountain whitefish. Bull trout of all life stages may use the Tucannon River and its tributaries.

Panjab Creek is a small creek that runs through a forested valley characterized by deciduous and coniferous trees, shrubs, and other typical riparian species as identified in the IAC Report. The upper slopes of the east-facing bluffs have less contiguous forest and shrub cover due to lack of water. The open areas on these east-facing slopes support grassland communities. The west-facing slopes have more continuous forest cover. NF 4713 within this reach is generally an informal access road that runs the entire length of the reach, both inside and outside of the 200-foot shoreline boundary, and represents the most significant development within this reach. The creek in this reach has accumulated LWD and generally provides very good quality in-stream fish habitat.

Agriculture has had a minimal effect on this area, particularly because cattle grazing has been excluded from upper reaches of the Tucannon since the early 1990s (SRSRB 2011). Recreational access and associated activities, including camping, hunting, and use of recreational vehicles, has impacted stream habitat in this area.

For steelhead and spring/summer Chinook salmon, the dominant limiting factor was a lack of key habitat attributable to a decrease from historical levels in the quantity of pools of various types. Inadequate habitat diversity and channel instability had very minor impacts, as did a minimal increase in peak flows. Fry and incubating eggs were the primary steelhead life stages affected, while spring/summer Chinook salmon fry and holding adults were most affected.

ECOLOGICAL FUNCTIONS ANALYSIS

The impact on ecological function of all limiting factors in Panjab Creek is minimal, affecting primarily subyearling steelhead and fry and overwintering spring/summer Chinook salmon (SRSRB 2011).

Level of Existing Function: Functioning

Stressors:

- NF-4713 Road within jurisdiction buffer

Existing roads may affect aquatic habitat functions of forage and rearing through impacts to water quality via runoff and lead to sedimentation. Roads and trails may impact continuity of riparian habitats or quality of riparian vegetation and riparian functions such as migratory corridors for aquatic and terrestrial species.

Potential Restoration Opportunities: Implement riparian restoration actions consistent with the actions identified for other reaches of the Tucannon River, with a focus on improved filtration to minimize sedimentation from USFS roads.

Potential Protection Opportunities: Protect intact riparian buffers.