Fish/Riparian S&G Implementation 62a ☺

Introduction: The Forest Plan outlines specific standards and guidelines to ensure protection of fish and riparian resources. The emphasis of this monitoring item is to determine whether fish and riparian standards and guidelines are applied through project planning and implementation. This monitoring item is evaluated at the project-level. Specific questions addressed are:

- What riparian mitigation was planned for the project?
- Was planned mitigation consistent with standards and guidelines?
- Was the project contract written to include provisions to meet standards and guidelines?
- Was the project implemented in compliance with standards and guidelines?

A variety of project types (i.e., timber sale, road construction, recreation development, watershed restoration, etc.) may be evaluated under this monitoring item. Timber sales and a developed recreation site were the focus for 2002 and 2003 monitoring effort. The Forest's three ranger districts selected three timber sales (Whip, Gage, Cispus Hazard Tree, and Hazard Tree Removal in Administrative/Recreation Sites and along Forest Roads). Six harvest units and a developed recreation site was evaluated. Project implementation dates ranged from 1999-2003 and all projects were planned under the 1994 *Northwest Forest Plan*.

Ranger District and Year	Project Name	Timber Sale Unit/Area
Mt. Adams 2002	Whip Timber Sale	12, 15
Cowlitz Valley 2002	Cispus Hazard Tree	1, 2
Mt. Adams 2003	Hazard Tree Removal in Administrative/Recreation sites and along Forest Roads	Wicky Creek Rec Site
Mt. St. Helens 2002	Gage	21, 22

Results:

Riparian Mitigation Planned

All of the projects employed mitigation measures to protect riparian resources. Riparian mitigations for the timber sales were developed during the project planning process as part of required environmental analysis. Mitigations included:

- Establishment of riparian buffers along streams and wet areas.

All of the projects employed mitigation measures to protect riparian resources.

- Designation of streams on sale area maps
- Directional tree felling away from riparian reserves
- Felled trees should be yarded away from streams
- No landings or temporary roads located within riparian reserves
- Stream crossings (road reconstruction) would follow management guidelines in the Washington Department of Fish and Wildlife Hydraulic Permit.

Whip Timber Sale

Whip timber sale Unit 12 had two wetland areas and a Class IV stream. Unit 15 had a spring source wetland area and a Class IV stream. Wetland areas on both units that were >1 acre in size, and had a 158 foot buffer (one site-tree buffer). Unit 12 had a smaller wetland, <1 acre, receiving a 50 foot buffer. The Class IV streams on both units received a 158 foot buffer.

Cispus Hazard Tree Removal

The Cispus Hazard Tree Removal project is similar to a thinning project. The Lower Cispus East Watershed Analysis, which was completed in April 1996, found that restoring riparian function and late-successional forest connectivity in parts of the watershed were needed to attain Aquatic Conservation Strategy objectives outlined in the Northwest Forest Plan. The analysis recommended thinning within riparian reserves when harvest activities are specifically designed to improve the aquatic conditions and/or develop late structural corridors (WA, page 7-16). Therefore, several areas within Riparian Reserves are included in the Cispus Hazard Tree Removal project.

In the harvest units, perennial and intermittent streams are protected by designating Riparian Reserves within one site-potential tree height (for Covel Creek and an un-named intermittent stream), or two site-potential tree heights (for Yellowjacket Creek) measured from the edge of the active stream channel on either side of the stream. In the case of the Cispus River, Riparian Reserves adjacent to the project area are the outer edges of the 100-year floodplain, since this distance is more than two site-potential tree heights from the active channel. The following measures would be applied to activities within the Riparian Reserves.

Covel Creek No commercial timber harvest should occur within 50 feet of the channel. The primary purpose for this no-harvest area is the supply of coarse wood. This is especially true since no wood is present in Covel Creek below Road 76. Fifty feet will retain approximately 75 percent of the potentially recruitable debris given the mild slopes adjacent to Covel Creek. With an estimated residual canopy closure of 70 percent (beyond 50 feet), virtually all recruitable debris will be maintained.

Within the first 50 feet, dead hazard trees may be felled towards the creek to reduce risk to people and property (standard RA-2). Due to the gentle slopes adjacent to Covel Creek, natural woody debris accumulations would be determined by bank erosion and random piece by piece input from the nearby forest. To mimic this input process, the trees will be felled as individual "pieces" not as debris jams. Where dead hazard trees are available, 15 trees/1000 feet of stream below Road 76 and 10 trees/1000 feet of stream above Road 76 will be felled toward and/or into the stream. Inputting more than this at one time would likely result in adverse channel adjustments such as bank erosion and channel widening. These trees would be identified by the district aquatic specialist to ensure proper spacing, orientation, and size. Felled, merchantable hazard trees in excess of Covel Creek's needs may be removed from the riparian reserve (standard RA-2). This input of coarse woody debris would result in an improvement at the reach scale. This no-harvest width is also adequate to maintain sediment filtration, shade, and bank strength.

Cispus River No commercial harvest should take place on the floodplain between the Cispus River and the un-named intermittent tributary. This un-named stream begins near the Cispus River/Yellowjacket Creek confluence and continues to near Covel Creek forming an "island" between itself and the Cispus River. While the floodplain extends beyond the tributary, that portion of the Riparian Reserve is addressed under the next item. To reduce risk to people and property, dead hazard trees may be felled within this "island" area. These trees should remain on site to provide high flow refugia in the numerous old channels on this floodplain (standard RA-2). Together with the intermittent stream, the no-harvest area will be between 1.5 and 2 tree heights in width.

Hazard Tree Removal in Administrative/Recreational Sites

Trees cut in riparian areas within the Wicky Creek developed recreation site should be felled so as to minimize damage to other trees, should not be felled into the stream, and cut trees should be left on the ground (not for sale or fire wood cutting). Streams associated with the project area are tributaries to Morrison Creek.

Gage Timber Sale

Within the Gage timber sale, two Class IV streams are located along Unit 21. One stream is located along the southern perimeter and the other along the southeasterly edge. One Class IV stream and small pond is located outside of Unit #22 on its northeasterly side. Gage Timber Sale Environmental Assessment planned for 134 to 150 foot Riparian Reserve buffers. Unit #21 Riparian Reserve widths were 134 to 150 feet and away from the Class IV stream adjacent to the southern and southeastern edge of the unit. The Riparian Reserve buffer width for Unit 22 is 300 feet, which protects the Class IV stream and pond located outside of the unit on the northeasterly side.

Was Planned Mitigation Consistent with Standards and Guidelines?

In all cases, planned riparian mitigation measures were consistent with Forest Plan Standards and Guidelines. For the Cispus Hazard Tree Removal project, new information about the use of Covel Creek as fish habitat, particularly by coho salmon, may have changed the recommendations to a larger no-cut buffer for Covel Creek's riparian reserves.

Were Contracts Written to Include Necessary Provisions?

The units monitored were in compliance with fish and riparian standards and guidelines.

In all cases, the contracts were written to reflect the planned riparian mitigation. They included erosion control requirements, directional felling, and specific yarding requirements.

Were projects implemented in compliance with Standards and Guidelines?

Yes. Buffer widths on all riparian features averaged or exceeded the required buffer strip.

Evaluation: The units were in compliance with fish and riparian standards and guidelines. Appropriate mitigation measures were identified in the planning process; the measures were subsequently tracked through the contracting process and appropriately implemented on the ground. Tracking mitigation measures is largely the responsibility of the Sale Administrator and Forest Service Contract Officer Representative.

Effects of the proposed mitigation measures were all positive. All mitigation measures were reported to have met their desired objectives. No observable impacts to fish and riparian resources were documented by fish biologist, hydrologist, and soil scientist staff conducting these evaluations.

The 2002 and 2003 monitoring effort indicates the Forest has made a transition to the 1994 Forest Plan standards and guidelines. Because all projects evaluated were planned under the 1994 Northwest Forest Plan, there seemed to be far less confusion than previous years when projects were planned under the 1990 Forest Plan and monitored against the 1994 Northwest Forest Plan. However, the quality of information related monitoring results has decreased making it difficult to discern adequate interpretation of data results.

Recommended Actions to be Taken: Successful planning and implementation is attributed to several factors including the following:

Continue to have fish biologist, hydrologist, and soil scientist personnel participate in locating and classifying streams and wet areas prior to completion of the timber sale contract (preferably during preparation of the environmental analysis) and when hazard trees have been identified within administrative/recreation sites, and along Forest roads.

Specify riparian mitigations in environmental assessments and contracts for streams and wet areas.

Continue to provide necessary training for timber sale layout and marking personnel to ensure that all streams and wet areas are properly identified and treated in accordance with specified mitigations.

Extend thorough ground surveys outside the immediate planning area boundary a distance of two site-potential tree-heights. This precautionary measure helps ensure that all adjacent streams and wet areas are treated appropriately.

Projects implemented with a rental agreement contract should be actively administered by a contracting officer's representative (COR) to ensure the successful implementation of planned mitigation.

Reconsider the felling of hazard trees within riparian areas into streams if project fish biologist and hydrologist agree.

Review monitoring results for adequate data interpretation and provide maps of unit showing Riparian Reserve buffers (suggest mapping on ortho quads).

Effectiveness of Riparian Standards and Guidelines 62b ☺

Introduction: The intent of this monitoring item is to determine if planned mitigations are effectively meeting Forest Plan management objectives for protection of riparian, fish, and water resources. Layout Creek project, which is not investigated under *Fish/Riparian S&G Implementation* is included in this section because it monitors specific channel conditions that effect immediate riparian function. Three specific questions shall be answered for all projects monitored for *Effectiveness of Riparian Standards and Guidelines*:

- Is channel stability maintained?
- Is stream shading maintained?
- Do sediments originating from management activities reach the stream course?

Layout Creek The 2002 monitoring survey for Layout Creek consisted of a linear bank erosion survey, a cross section survey to determine width-to-depth ratios, and a structure durability survey. To determine bank erosion, Layout Creek was walked downstream from the uppermost structure. Lengths and heights were then recorded using a 300-foot tape. For accuracy some bank areas were triangulated and both sides of the creek were included in the calculations as done in the 1998 Layout Creek report completed by Powers. Width-to-depth ratios were taken at four selected sites that were established in 1995. Bankfull was determined at the pool tail crest, the maximum pool depth, and the pool head. A tape was strung from bankfull to bankfull and an elevation was taken at two foot intervals between the banks using a LB-1 laser beacon. The depth from bankfull was then averaged and divided by the total length between bankfull marks. Structure durability was surveyed using Monitoring Item #62d as a reference.

Results:

Maintenance of Channel Stability

Channel stability was maintained or improved for all projects evaluated.

Channel stability was maintained or improved for all projects evaluated. The minimum planned riparian treatment was achieved on the ground in all cases. Whip timber sale's riparian buffers maintained channel stability within the units monitored because no riparian areas were affected from harvesting. No evidence was found of channel instability related to the Cispus Hazard Tree project. Perhaps because there was no harvest of trees along the banks of any of the channels. Hazard trees felled within the Wicky Creek developed recreation site were further than 300 feet from a riparian area.

For Layout Creek project, the average width-to-depth ratios have not changed significantly since the restoration efforts of 1996. The average width-to-depth ratios for 1998 and 2002 were 40 and 41 respectively.

Stream shading was adequately maintained along all streams examined

Maintenance of Stream Shading

Stream shading was adequately maintained along all streams examined. Whip Timber Sale's riparian buffers maintained stream shade within the units monitored because no perennial streams were located within or bordering the units. Hazard trees felled within the Wicky Creek developed recreation site were outside any riparian area. Stream shade objectives are not expected to be met until riparian stands fully mature (approximately 100 years). No water temperature data were provided for any of the projects evaluated.

For Layout Creek project, stream shade is not expected to change from the existing condition within the near future. In 1992 and 1994, at least 43,000 conifers were planted in the riparian areas and the stream shade objective is expected to be met around 2080.

Sediment Transport to Affected Stream Course

Sediment originating at the project was not observed reaching any of the associated stream channels.

Sediment originating at the project was not observed reaching any of the associated stream channels or wet areas for the four projects monitored. For the Cispus Hazard Tree Removal project, there were a few potential sources of sediment observed within the unit, but there was no evidence the sediment had or would be able to reach nearby streams. Surface compation woted on the surface of major skid trails and a few roads (see Soils Report). A few water bars with no drainage openings were observed. Because the area was practically flat where the potential sediment sources were observed, no current or future contribution of sediment to nearby streams was observed, or is anticipated.

For Layout Creek project, stream banks appears to have stabilized. Bank erosion was reduced from 40 percent to 11 percent on 1.85 river miles following the addition of approximately 1200 pieces of wood in 1996 (Powers, 1998). In 2002, bank erosion was again evaluated using the same methods applied in the 1998 report. The results of the 2002 evaluation for the same 1.85 river miles again equaled 11 percent.

Evaluation: Riparian standards and guidelines were effective in meeting Forest Plan management objectives for the protection of riparian, fish, and water

resources. In all cases prescribed mitigations were followed as specified, and appear effective. The Cispus Hazard Tree project team found no roads or skid trails across stream channels. In addition, the team was unable to measure decreases in stream shading because no pre-activity readings were taken. There may have been a slight decrease in shading along Covel Creek. However, the decrease was probably less than 5 percent within the sale unit, and Covel Creek remained adequately shaded. For Wicky Creek developed recreation site, Hazard trees felled were at least 300 feet outside any riparian area.

Eleven percent of the Layout Creek project area was eroding in 2002. Of the four cross section sites surveyed, only data from 1998 will be compared to data from 2002, as the earlier data was extrapolated from total station contour maps. On average, the width-to-depth ratios have stayed static, at about 40, since the restoration efforts of 1996. The static width-to-depth values and the unchanged percentage of bank erosion suggest that Layout Creek is at equilibrium with its environment for the meantime. The long-term width-to-depth goal set for Layout Creek was 25 before the 1996 restoration. Through this monitoring process, it appears if that goal is to be met, more large wood would be needed to achieve that standard for this given stream type (Rosgen, 1996).

All structures placed within Layout Creek had some function, even if their intended function wasn't fully met. The data shows that the addition of wood to Layout Creek has stabilized the recruitment of in-stream sediments and created fish habitat.

Recommended Action to be Taken:

- Continue monitoring until objectives are met.
- Revise format to incorporate non-traditional projects (e.g. restoration projects, recreation sites)
- Define some quantifiable numerical standards for restoration monitoring.
- Examine alternative sources of standards (e.g. PIG, NOAA Fish environmental baseline matrix, or Forestwide health assessment) for evaluating restoration project effectiveness.
- Establish a provincial source of standards that better represent potential conditions on the Forest, rather than a general standard such as those in the NMFS environmental baseline matrix.
- Similar projects to Cispus Hazard Tree Removal project need to pay close attention to the decompaction of roads, skid trails, and waterbar construction.
- The primary recommendation for Layout Creek to fully meet restoration goals set in 1996 is to make the system more complex by adding additional wood, while allowing for sediment transport and the inundation of its floodplain during peak flows.

Proposed, Endangered, Threatened, and Sensitive (PETS) Fish Species 62c

Introduction: The list of PETS fish species occurring on Gifford Pinchot National Forest (GPNF) includes seven threatened, sensitive, and candidate fish species, and one proposed critical habitat. These species are shown in Table 12.

Table 12. - PETS Fish Species on the Gifford Pinchot National Forest

Status	Evolutionary Significant Unit (ESU) or Distinct Population Segment (DPS)
Threatened	Columbia River bull trout (*Salvelinus confluentus*)
Threatened	Lower Columbia River and Middle Columbia River steelhead trout (*Oncorhynchus mykiss*)
Threatened	Lower Columbia River and Puget Sound Chinook (*Oncorhynchus tshawytscha*)
Proposed	Critical Habitat for Bull Trout
Candidate	Lower Columbia River/Southwest Washington Coho (*Oncorhynchus kisutch*)
Sensitive	Southwestern Washington/Columbia River coastal cutthroat (*Oncorhynchus clarki*)
Sensitive	Interior Red Band Trout
Sensitive	Pygmy Whitefish

Forest Service sensitive species policy requires that species with viability concerns be given special management emphasis.

The Forest Service sensitive species policy requires that species, populations, Evolutionarily Significant Unit (ESU), or Distinct Population Segments (DPS) with viability concerns or tending toward Federal listing be given special management emphasis to ensure their continued existence. Part of this special emphasis is the development of careful monitoring plans through partnerships to assess and document local fish population and habitat conditions following the implementation of ongoing and proposed activities on national forest land. The following is a discussion of different monitoring tools used to assess fish and habitat conditions for two listed species on the Forest.

The majority of the monitoring program in the Forest's fisheries program is accomplished through the development of outside partners, such as Washington Dept. Fish and Wildlife (WDFW). Adult population data for steelhead and bull trout is based on surveys organized by WDFW.

Steelhead (*Oncorhynchus mykiss*)

The Lower Columbia River Steelhead ESU is federally listed as Threatened by the National Marine Fisheries Service under the Endangered Species Act. The steelhead is an anadromous form of rainbow trout that inhabits several rivers and streams throughout GPNF. Adult steelhead spawn in rivers and streams by laying their eggs in depressions in the gravel called "redds". Fry emerge from the gravel and rear for one to three years in freshwater before migrating to the ocean as smolts where they grow to adults. The number of fish present may serve as an indicator of stream health. However, many factors other than habitat quality influence the population size and structure of anadromous fish such as angling, hydroelectric facilities, ocean conditions, avian and marine mammal predation, and hatchery introductions.

This year's monitoring efforts continue to emphasize adult steelhead counts for the Wind and East Fork Lewis Rivers. In addition, smolt population estimates continue to be an important part of the fisheries program at the Wind River Forest Service Work Station. While data provided here are insufficient to determine population viability, these data do provide useful information on population trends.

Results:

Wind River Steelhead Snorkel Survey - Objectives for the Wind River steelhead snorkel survey were to obtain a count of steelhead for trend comparison with the past 15 years' results, and to provide mark/observation data for estimating the actual number of steelhead in Wind River. The snorkel survey covered 22 miles of mainstem Wind River and 6 miles of Panther Creek. This data provides resource managers with another outstanding piece of information on adult steelhead. The total wild steelhead count in 2002 was 233. This count is the highest since 1994 and is 4.3 times greater than the recent five year (1996-2001) average of 62. It is also 2.7 times larger than the 10-year average for this index. It is the highest return since 1988, which had a count of 252. (Rawding, WDFW pers. Communication). In 1999 WDFW issued an emergency sport angling closure for steelhead.

The total wild steelhead count in 2002 was 233.

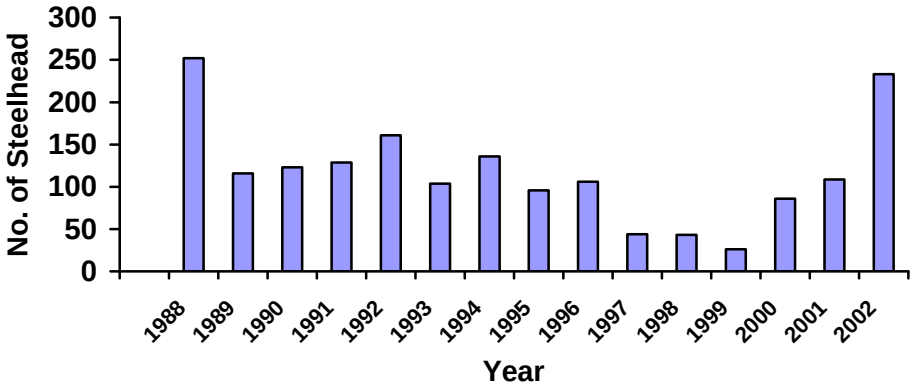

Figure 22. - Wind River adult steelhead snorkel survey counts.

Although there was an increase in the Wind River steelhead population this year, biologists are very concerned about the long-term viability of this population. The current population is less than one-quarter of state escapement goals (1000 adults). The snorkeling results help the WDFW biologists make critical fishing regulation changes each year and serve as a monitoring tool for restoration efforts.

Wind River State of the Steelhead: The Wind River "State of the Steelhead" project is a vital, ongoing public and interagency effort between Bonneville Power Administration (BPA), USFWS, WDFW and GPNF that allows resource managers to keep current on local watershed health. All creeks discussed in this section belong to the Wind River basin. The project includes the following surveys:

Redd Surveys: The objectives of redd surveys are to evaluate population trends, identify preferred spawning sites relative to habitat and restoration sites. Biologists from WDFW and GPNF have surveyed established index reaches within the Wind River basin since 1987. The importance of data from 1994 to 1999 is illustrated in the following discussion. For three consecutive years, 1994 to 1996, spawning was not observed in Layout Creek, a major spawning tributary within Trout Creek. In 1996 and 1997, approximately 1,200 trees were placed in Layout Creek to increase bank and channel stability. In 1998 and 1999, eighty and ninety percent of all spawning observed in the Trout Creek watershed was observed in Layout Creek. While this increase in spawner utilization and preference cannot be directly attributed to restoration it does indicate that restoration efforts may be helping.

Surveys were conducted on 24 miles of index spawning reaches on mainstems and tributaries. A total of 20 redds were observed in 2001. No data is available for 2002 and 2003.

Smolt Traps: Smolt trap data is used in conjunction with redd surveys, snorkel surveys and adult trap data to evaluate steelhead smolt production, migration timing, and fresh and marine water survival by sub-watershed. The USFWS, WDFW and USFS have operated rotary screw traps within the basin since 1995

(Figure 23). The resulting data has allowed us to quantify increases in freshwater survival and declines in ocean survival. In addition, the data has allowed us to focus out-year restoration proposals on specific sub-watersheds, such as the upper Wind River. Continued operation of the traps on the Wind River will provide analysis of population trends and additional year's data will provide necessary information to further refine production estimates.

Figure 23. Smolt trap being placed on Wind River, Gifford Pinchot National Forest

Population estimates are based on the total number of steelhead smolts captured at the mouth of the Wind River. The reported 2002 estimates are the midpoint of the 95 percent confidence limits for trap efficiencies. Smolt trap mark and recapture data requires intensive refinement and analysis to produce statistically valid estimates due to the large number of variables influencing the efficiencies of the traps. In the 2002 smolt emigration, an estimated 9,374 smolts exited the Wind River basin (Figure 24).

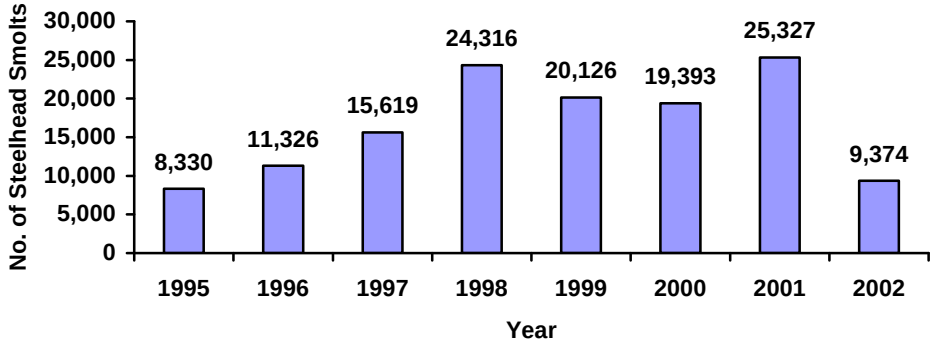

Figure 24. - Wind River smolt population estimates from 1995 to 2002.

East Fork Lewis Steelhead Snorkel Survey. The ninth annual East Fork Lewis River snorkel survey was conducted on July 11 and 12, 2003 in a cooperative effort between the Washington Department of Fish and Wildlife, United States Forest Service, Clark-Skamania Flyfishers, and concerned citizens. Areas surveyed included the mainstem of East Fork Lewis River from Sunset Falls (RM 32.7) to Daybreak Park (RM 10.2). Surveyors were unable to snorkel the river section from Daybreak Park to Mason Creek (RM 5.9) in 2003. To complete the survey, the river was divided into 10 sections ranging from 1.5 miles to over 3.6 miles. Each section was surveyed by 2 to 3 snorkelers.

The objective of the survey was to count adult summer-run steelhead. Steelhead were counted as wild, hatchery, and unknown. Since 1985 all hatchery summer steelhead released into the East Fork Lewis and other Columbia River tributaries are adipose fin clipped. The East Fork Lewis snorkel survey assumes that any steelhead with a missing adipose fin is a hatchery fish and those with intact adipose fins are wild fish. Surveyors are are sometimes unable to detect the presence or absence of an adipose fin; these fish are called unknowns. Other fish often observed include resident trout, juvenile wild steelhead, residual hatchery steelhead smolts, adult spring chinook salmon, juvenile chinook salmon, juvenile coho salmon, whitefish, suckers, lamprey, northern pikeminnow (squawfish), and peamouth. To conduct accurate counts of all species present was beyond the scope of this survey.

The 2003 observations were 151 wild, 123 hatchery, and 89 unknown steelhead. Based on the percentage of wild and hatchery fish observed, the unknown fish are assigned to the wild or hatchery category. The survey's adjusted wild count for steelhead this year is 208, the second highest total since the survey was initiated in 1995. The adjusted hatchery count is 155.

Wild and hatchery steelhead counts for 1995 through 2003 are shown in Figure 25. Higher hatchery counts in 1995-96 are the result of larger hatchery smolt releases. In 2003 wild steelhead accounted for 57 percent of the total steelhead observed.

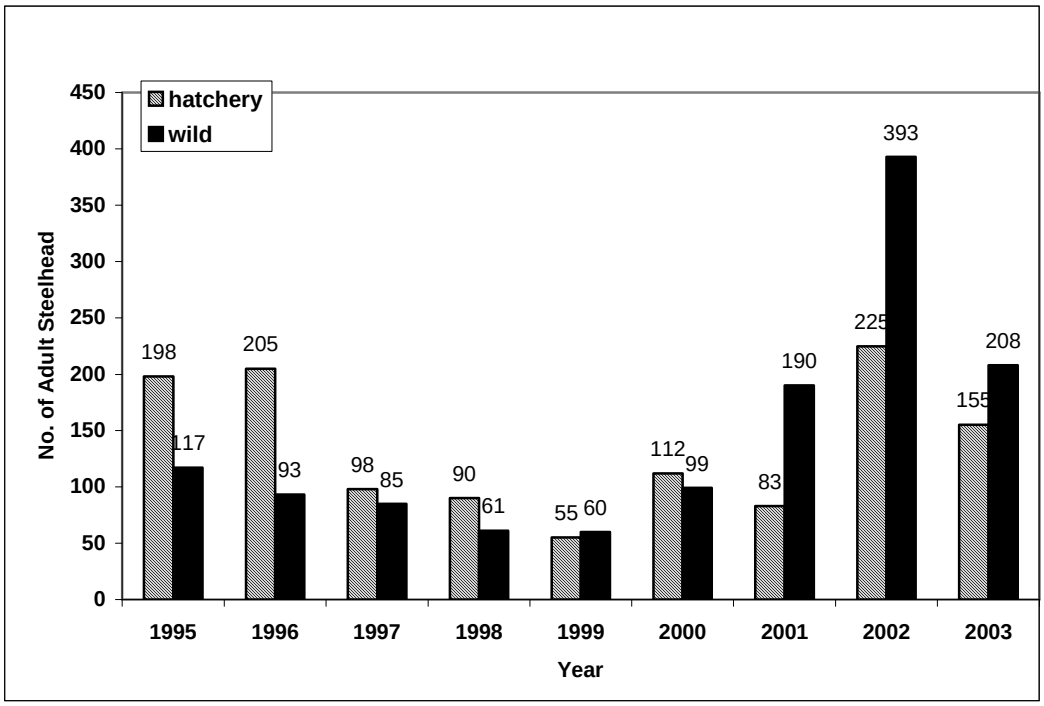

Figure 25. - Total East Fork Lewis River adult steelhead snorkel counts from 1995 to 2003 (courtesy of WDFW).

The above numbers do not represent the total number of steelhead in East Fork Lewis River. Steelhead will enter the river after the surveys and some fish hiding in whitewater, large woody debris, boulders, and deep pools are not observed during the surveys. The numbers are used as an index to compare trends between years. They represent a minimum count.

<u>Evaluation</u>: Population Viability and Influencing Factors

Many factors in addition to habitat are known to affect anadromous fish populations within Wind River and East Fork Lewis River. Global weather patterns, specifically the drought years from the late 1980s through 1993, have exacerbated the effect of declining habitat conditions. Sport and commercial fishing have also taken their toll. Continued harvest of depressed stocks further contributes to their decline. The Wind River steelhead population continues to show a declining trend over the 10-year record of surveys. Losses of riparian vegetation, altered streamflow and sediment regimes have reduced the ability of the watershed to reach its full potential in supporting aquatic life. Impacts are manifested by increased water temperatures, reduced pool quality and abundance, reduced woody debris in streams, and increased stream width-to-depth ratios (*Wind River Watershed Analysis*, 1996).

Many factors in addition to habitat are known to affect anadromous fish populations.

At this time ocean survival appears to be the major factor influencing steelhead populations within the Wind River basin. Based on smolt trap, snorkel and redd survey data, smolt to adult survival for the past four years has been below 1 percent. Seven to twenty percent was considered good to excellent smolt to adult steelhead survival in Washington rivers such as the Kalama River and Snow

Creek (Rawding, personal communication). In 2002 smolt numbers were unusually low due to only 12 redds counted in 2000. Based on smolt to adult survival estimates approximately 99 percent of all steelhead smolts out-migrating from the Wind River are lost to dams, harvest, disease and predators.

Water temperatures at the baseline monitoring station on the Wind River have exceeded state standards for water temperature on at least 15 of the 22 years of monitoring. Although maximum temperatures do not reach the levels found on Trout Creek, the temperature standard has been exceeded for as many as 50 days in a single year (1992) (Wind River Watershed Analysis, 2001). The abundance of wild summer steelhead population has declined since the late 1980s. The densities and biomass of juvenile steelhead in the late 1990s were less than or similar, but never exceeding those from the mid-1980s. Throughout the watershed there continues to be a need to restore riparian vegetation, reduce sediment delivery to streams, enhance channel complexity and ensure continuous recruitment of large woody debris into the stream. The removal of stream shade and the deterioration of channels have increased maximum water temperatures within the watershed. During warm water years altered maximum water temperatures pose a high risk of negatively affecting all life stages; immigration, spawning/emergence, rearing and emigration (Wind River Watershed Analysis, 2001).

Recommended Action to be Taken:

- Continue watershed restoration partnership efforts aimed at Wind River steelhead recovery.
- Promote the development of a watershed restoration partnership recovery approach for steelhead in the East Fork Lewis River.
- Implement planned watershed and habitat restoration identified in watershed analysis for East Fork Lewis River.
- Monitor and develop a report on restoration results completed in East Fork Lewis River.
- Continue to develop mark recapture estimates for steelhead adults and smolts on the Wind River.
- Develop a biological monitoring plan (e.g. adult escapement and freshwater survival) for East Fork Lewis River.
- Develop active partnerships and actively pursue salmon recovery initiative funding to continue restoration and monitoring efforts in East Fork Lewis River.

Bull Trout (*Salvelinus confluentus*)

Introduction: Bull trout in the Lower Columbia River Distinct Population Segment (DSP) are listed as threatened under the Endangered Species Act by USFWS. Since juvenile bull trout require exceptionally cool, clean water, they are considered a good management indicator of watershed condition and aquatic ecosystem health. A verified population exists in the North Fork Lewis River system above Merwin Dam, with the majority of fish occurring above Swift Dam. The Lewis River population is considered adfluvial. Adults spend the majority of their life cycle in Swift Reservoir, ascending its tributaries each year to spawn. The Forest Service has participated with WDFW and PacifiCorp in the Lewis River Bull trout population monitoring since the early 1990's.

North Fork Lewis River: Early monitoring efforts with WDFW focused on determining population size and viability through collection of catch per unit effort data. Beginning in 1994, population estimates were derived using a mark-visual observation method. Adults are captured in the reservoir in the spring, uniquely marked, and then released. In the late summer and early fall, repeated snorkel surveys are used on a weekly basis to observe the ratio of marked to unmarked adults active on spawning grounds. Using a Joint Hypergeometric Maximum Likelihood Estimator (JHE), a population estimate is calculated with a 95 percent confidence limit.

Two conditions are modeled in deriving the JHE. They include the following: A 10 percent reduction in the number of reservoir marked adults appearing on the spawning grounds (based on prior year radio telemetry studies), and a 10 percent tag loss.

PacifiCorp, Trout Unlimited, WDFW, and USFS personnel conducted snorkel counts in two streams where bull trout spawn to count the number of tagged and untagged bull trout; Pine and Rush Creeks. The resulting data is used to estimate bull trout population size each year.

The objective of this multi-year partnership is to collect information about bull trout migration timing, distribution, habitat use, and habitat preferences so we can develop site-specific recovery plans for the species. Between May 14, 2003 and July 9, 2003 a total of 100 bull trout were captured with short-term gill net sets. Out of the one hundred fish caught, only eighty were previously tagged. Fish were marked with a floy tag (tags that look like a colorful 2" piece of spaghetti) and released back into the reservoir. We also discovered that the 1996 flood changed the spawning time of fish in the North Fork Lewis River – for unknown reasons, spawning now occurs 2 to 3 weeks earlier than before the floods.

Bull Trout Surveys: Since the listing of bull trout, GPNF, WDFW, and USFWS have been discussing the likelihood of the species' presence in several drainages on national forest system land. Discussions revolved around known fish distributions and habitat conditions, such as water temperature, stream surveys, snorkel surveys, creel samples, electro fishing surveys, and anecdotal information. Further review and close examination of various types of historical and current survey records excluded the presence of bull trout in several drainages. In others,

poor quality and lack of data could not verify the absence of bull trout or potential bull trout habitat.

Because of budget constraints, the Forest Service has not been able to complete additional bull trout surveys for potential presence outside of known bull trout population areas.

Results:

Ninety-two bull trout were tagged in Swift Reservoir by WDFW.

North Fork Lewis River. Ninety-two bull trout were tagged in Swift Reservoir by WDFW. A total for four snorkel surveys were completed by WDFW and USFS in Pine Creek and another four in Rush Creek, tributaries to North Fork Lewis River. Population estimates were then computed for each week resulting in a combined population estimate of 911.

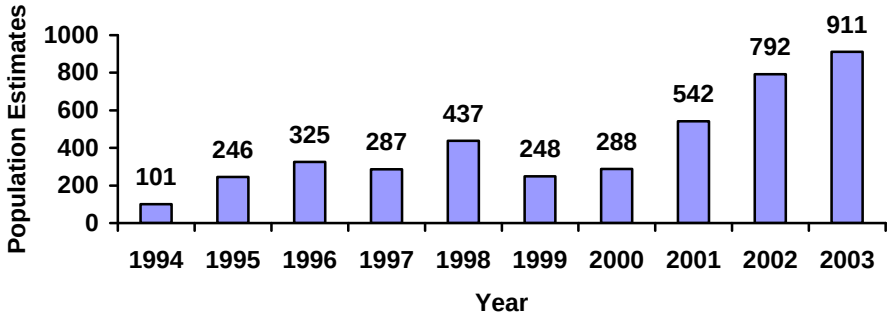

Figure 26 - Bull trout spawning population estimates for Swift Reservoir.

The 2003 estimated population size for spawning bull trout in Swift Reservoir is 911 compared to the 10-year average of 418. Since fish in Swift Reservoir were tagged, we can only estimate the Swift Reservoir spawning population that utilize Pine and Rush Creeks on national forest system land. Swift Reservoir population estimates for Pine and Rush Creek snorkels nearly doubled from the 10-year average. In 2003, 78 percent of the tagged fish were observed in Rush Creek and 22 percent of the tagged fish were observed Pine Creek. Indicating that Rush Creek is the primary stream that bull trout migrate to from Swift Resvoir.

Evaluation:

Certain tributaries to Swift Reservoir, such as the Muddy River, contain sub-optimal habitat for bull trout. Despite restrictive angling regulations on Swift Reservoir and its tributaries, illegal take of bull trout still occurs on occasion. Lack of fish passage facilities at Swift Dam isolate the Swift Reservoir population from mixing and re-establishing with the isolated population of a Yale Lake tributary.

The 2003 estimated population size for spawning bull trout in Swift Reservoir is 911 compared to the 10-year average of 418.

In 2003 bull trout were observed in the lower reaches of the Muddy River watershed up to a series of chutes or waterfalls.

Recommended Actions to be Taken:

- Continue supporting education and law enforcement efforts to curb illegal take of bull trout.
- Where supported by a Roads Analysis, close spur roads to vehicular access that are known to be used for illegal harvesting of bull trout.
- Install adult traps in partnership with Trout Unlimited and WDFW to obtain actual spawner escapement counts.
- Participate in FERC relicensing efforts on the North Fork Lewis River system to address bull trout needs in relationship to existing hydroelectric facilities.
- Continue to conduct surveys for bull trout in conjunction with WDFW in the Lewis River drainage on National Forest lands.
- Assess the distribution of bull trout within the Muddy River system.

In-Channel Habitat Structures 62d ☺

Introduction: Stream habitat restoration activities have been implemented on the Forest since the early 1980s. Activities generally focus on improving habitat availability and quality. The majority of restoration efforts have focused on improving habitat for anadromous species, primarily steelhead. Monitoring provides important feedback for improving in-channel habitat structure designs and applications for future efforts.

Fish biologists surveyed over 100 structure sites.

Structure monitoring in 2003 was conducted on lower Yellowjacket Creek and Trout Creek-Phase IV, in 2002 on East Fork Lewis and Upper Rush Creek. These structures were specifically designed to enhance fish habitat and monitoring focused on structures placed in 1999 and 2000. Fish biologists surveyed over 100 structure sites evaluating the function and performance of individual structural development. Specific data were collected to provide insight on structure success. However, this section will only address the lower Yellowjacket Creek and Trout Creek-Phase IV structures. Information from the East Fork Lewis and Upper Rush Creek projects is insufficient to include in this year's monitoring report.

Method of monitoring for in-channel habitat structures consist of photo points, field observation, and ground measurements.

Lower Yellowjacket Creek (2003)

The objectives of the Lower Yellowjacket Creek project were to provide structure to the floodplain, habitat and cover for young anadromous salmonides, and structure to the stream channel for pool development. A total of 35 sites in the project area were made up of logs that were either trucked in or found laying on the adjacent floodplain. A structure is made up of either a single log (log sill) or multiple logs (log jam) and was placed on the adjacent floodplain or in-channel based on the final design.

Fifty-three structures were installed for this project. Figure 27 shows the position of structures that were installed. Sixteen structures are skeleton logjams designed to catch debris and either raise the grade of the stream, control the alignment of the channel, or protect banks and other habitat features such as gravel bars. The remaining structures are a combination of vanes, log stills, or bank protection/cover logs.

All of the logs in the structures have been tagged with a 1 inch round aluminum tag and each tag has been stamped with a number. Each log is inventoried for a set of parameters which are stored in a database. These tags will help track the movement of logs.

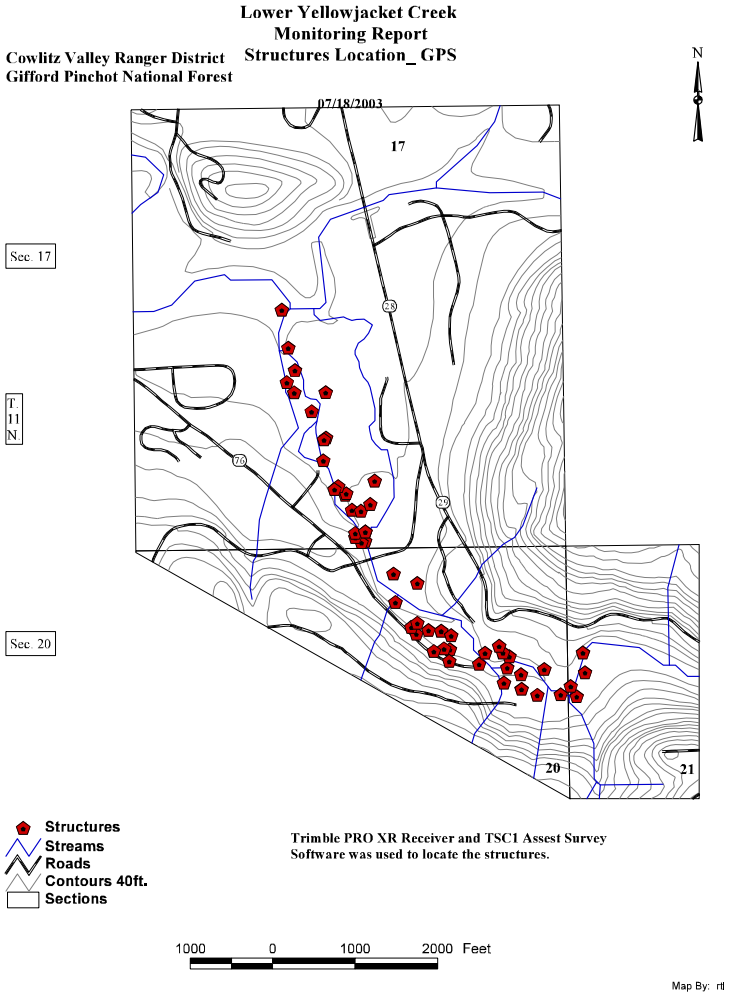

Figure 27. - Location of structures monitored in Lower Yellowjacket Creek

Trout Creek - Phase IV

Trout Creek is a major tributary of the Wind River and is vital for the recovery of wild summer run steelhead within the basin. The Trout Creek watershed has historically supported up to 20 percent of the entire Wind Rivers run of wild steelhead. Trout Creek Flats (river mile 6.5 to 9.0) was tractor logged in 1948. Re-vegetation efforts after logging failed apparently due to compacted soils. In the late 1960's the entire flats area was "ripped" with heavy equipment to de-compact the soils and restore percolation. In the 1970's log jams were thought to be migration barriers to steelhead. Log jams and other wood was removed or "cleaned" from stream channels. The removal of LWD eliminated the natural water velocity modification and sediment storage that the stream needed to function properly. The removal of wood from within the channel initiated serious channel degradation. The cumulative effect of removing streamside vegetation and in-stream LWD produced maximum water temperatures >75° F. Bank full channel width-to-depth ratios exceeded 60 on average, while undisturbed reaches within the basin containing similar morphology possessed width-to-depth ratios of 25 on average. Stream shade was reduced to <27 percent, bank erosion rates were >40 percent and in-stream LWD levels were <40 pieces per river mile while undisturbed channels averaged 120 pieces per river mile within the watershed. Because of the severity of stream conditions linked to the biological requirements of steelhead, Trout Creek-Phase IV was designed to initiate the recovery process (Figure 28).

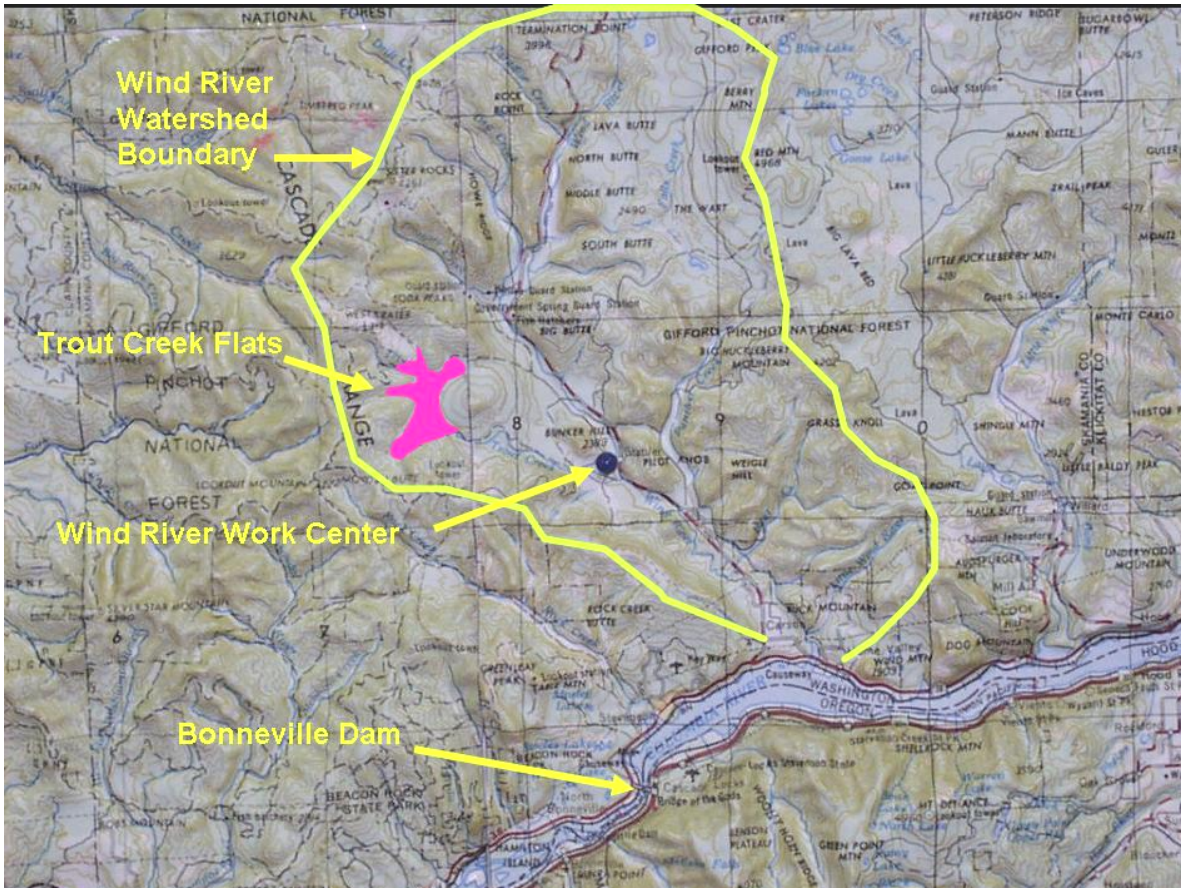

Figure 28. - Trout Creek Flats site map, T.4N., R.6E. Section 13.

U.S. Fish and Wildlife Service, Bonneville Power Administration and the USDA Forest Service have cooperatively funded this project. NEPA was completed in the winter of 1998. Materials were stockpiled in the fall of 1998, implementation began July 20, 1999 and was completed August 20, 1999.

The goals of Trout Creek-Phase IV are to reduce water temperature maximums below lethal salmonid levels, restore riparian conifers, and reestablish bank and channel stability to recover viable populations of wild steelhead. Objectives to meet these goals are:

(1) Reduce the width-to-depth ratios within identified reaches to less than 25 (2 years),
(2) Increase shade to greater than 80 percent (60 years)
(3) Increase bank stability above 80 percent (10 years),
(4) Restore the conifer component along these reaches to eight trees per acre greater than 31" in diameter (200 years),
(5) Increase in-stream large woody debris >100 pieces per river mile (1 year)
(6) Maintain 0.8 river miles of old growth channel and historic flood plains.

One-hundred and twenty blown down logs (half with attached root-wads) were salvaged and stockpiled in Trout Creek Flats. A helicopter was used to fly the material to project areas. A tracked excavator constructed logjams and bank revetments. Site-specific placement of revetments and jams were based on templates derived from empirical data and analysis of undisturbed channels with similar characteristics. The head-gate sediment control structure that was placed to aggrade the channel in 1996 was removed to allow natural channel processes to occur.

Trout Creek Phase IV project is the fourth phase of the in-stream rehabilitation effort that began in 1992. This project treated river mile 6.7 to 8.0 in the Trout Creek Flats area. Approximately 200 pieces of LWD were placed into to 1.3 river miles. One hundred and twenty pieces were flown in by helicopter and another 80 pieces were redistributed within the 100 year flood plain. One thousand-two hundred and twenty-five feet of eroding bank were treated with large woody revetments. Twenty acres of flood plain were reclaimed with large woody aggradation structures (log jams). Seven hundred feet of degraded or down-cut channel was aggraded with log jams to the historic elevation. Seven-tenths of a river mile of old growth channel was reactivated to increase stream shade within the reach from 26 percent to 41 percent.

Results:

Lower Yellowjacket Creek

In the three winter seasons since 2000, when the project was completed, there have been two small flood events, estimated 5 and 10 year events. These events have scattered 8 (15 percent) of the structures. Another 5 structures were moved. These 5 structures are still providing some functionality to the floodplain/channel and therefore were considered to be partially functioning. The remaining forty (75 percent) structures are still in place and are functioning as designed. Three structures (7, 8, and 25) have done very well in collecting more wood, building in

size and becoming an intergraded part of the floodplain. However, as far as what is showing on the surface structures 10, 14, 15, 17 and 29 are a complete loss. There may be parts of structures 14 and 29 buried but without digging them up it is hard to tell.

Maintenance should be performed on ten of the structures. These structures have lost at least 1 log and in some cases more, but the majority of the structures are still in place. Maintenance would consist of adding more logs to the structures. In the case of Structures 11 and 26, the logs are still on site and just need to be reset.

Trout Creek –Phase IV

Three large log jams constructed in 1996-1998 to re-water the Trout Creek Old Growth Channel were monitored for the 2003 Forest Plan Monitoring Report. These three structures have endured two significant flow events since construction; 20 and 4 year discharge return intervals in 1999 and 2003, respectively. Elevation of the up-stream structure has increased approximately five feet due to additional trees and woody debris accumulation. The stream bed up-stream of structures one and two have aggraded three feet on average and all low flows are currently being carried through the old growth reach.

The increase in discharge in the old growth channel has eroded some areas of the stream bank and has allowed the recruitment of additional large wood. Erosion bank pins were monitored and showed that bank erosion within the old growth channel was approximately 15-20 percent, which is within the natural range of undisturbed channels.

Normal winter and flood flows charge the jammed channel and provide high water refuge for juvenile steelhead. Fine sediment is deposited between log jams one and two and has created a medium for noxious weeds. Fisheries biologists have been working with botanists to develop an eradication plan for these areas.

The placement of logjam #1 has allowed the stream channel to divert into an old-growth channel. At this specific site, a logjam that was thought to be a migration barrier was removed in 1981. Removal of the logjam caused the channel to "down-cut" approximately five feet below the original bed elevation. As the channel degraded the connectivity with the flood plain and the last remaining old growth reach in Trout Creek was lost (Figure 29).

Brian Bair Photo

Figure 29. - 1995 Photo of the entrance to the Trout Creek old growth channel

Photo monitoring has allowed the Forest Service to track the effectiveness restoration projects. Figure 30 is a photo of log jam one that was placed where the natural jam was removed in 1981. By placing log jam #1, the stream bed was aggraded over four feet to regain connectivity with flood plain and reactivate 0.8 of a river mile of pristine habitat.

Brian Bair Photo

Figure 30. - 1999 Photo of the entrance to the Trout Creek old growth channel after restoration of logjam.

Figure 31, page 71, is a photo of severe bank erosion on Trout Creek (river mile ~ 7.3) caused by removal of riparian vegetation, in-stream large wood removal, and channel degradation. Figure 32 shows the same site after the addition of large wood for reducing further bank erosion.

Brian Bair Photo

Figure 31. - Photo of severe bank erosion on Trout Creek (river mile ~ 7.3).

Brian Bair Photo

Figure 32. - Photo of large wood revetment at Trout Creek (river mile ~ 7.3).

Large width-to-depth ratios and low stream shade increase maximum water temperature and provide poor quality rearing habitat for steelhead on Trout Creek, approximately river mile 7.1 (Figure 33). Width-to-depth ratios were reduced by constructing gravel bars based on empirical hydraulic and geomorphic template data. Width-to-depth ratios for Trout Creek, river mile 7.1, was reduced from 66 to 17 (Figure 34).

Brian Bair Photo

Figure 33. - Photo of Trout Creek before restoration work (river mile 7.1).

Brian Bair Photo

Figure 34. - Photo of Trout Creek following construction of gravel bars (river mile 7.1).

Evaluation:

The overall project goal was to provide structure to the Lower Yellowjacket Creek floodplain and indirectly improve habitat for salmonid fish species. Because only 5 structures out of 53 that are still in place require minimal maintenance, results from the monitoring are positive.

Width-to-depth ratios for the Trout Creek-Phase IV project up-stream of log jam #1 and in the old growth channel has continued to decrease to below 20, exceeding the objective of 25. This decrease in stream width-to-depth and increase in stream shade appears to be maintaining water temperatures below lethal levels for salmonids. It appears that the stream diversion to the old-growth channel has facilitated the establishment of noxious weeds within the dry stream

bed and riparian area. Care must be taken in future restoration activities within the Wind River to prevent additional noxious weed sites.

Effectiveness monitoring should be conducted during a time period when the structures are functioning as designed. Surveys conducted during low flow make it difficult to recognize all processes influencing the success or failure of individual treatment sites.

Recommended Actions to be Taken: The following actions are recommended:

- Emphasize interdisciplinary involvement during project initiation and design. Assure, at a minimum, the design team has the following mix of skills and expertise:
    - An understanding of fluvial geomorphic processes.
    - An understanding of hydraulic processes and relationships.
    - An understanding of life cycles and ecology of fishes present in project area.
    - Practical experience with heavy machinery and construction of in-stream structures.
- Establish a Forest monitoring protocol, compatible with the Regional protocol, that addresses all types of in-channel habitat improvement designs and applications
    - Conduct fish use surveys during the period when structures are designed to function.
    - Increase sample size of in stream structure monitoring (Note: This was a recommended action to be taken in 2001 when less than 10 structures were sampled; this action was accomplished in 2002 and 2003).
    - Develop a long-term sampling scheme of representative structures and stream types across the Forest.
    - Monitor structures after high stream flow events at the first, and safest, available opportunity.
- Due to budget constraints and data quality, develop a prioritization of funding availability for in-channel structure monitoring. For example, some projects may be monitored every other year.
- Establish clear contract clauses that will help prevent the establishment of noxious weeds within project areas. Monitor for noxious weed establishment at project sites.