9.0 UPPER COLUMBIA RIVER STEELHEAD ESU

9.1 POPULATIONS

9.1.1 Okanogan

9.1.1.1 Background

Historical abundance of UCR steelhead is not known, although it is has been speculated that steelhead were never as abundant in the Okanogan as in other Upper Columbia subbasins. For this exercise, the base period to which present populations have been compared is the 1950s and 1960s. The most profound changes to habitat occurred long before this base period. The construction of numerous dams in British Columbia and on Salmon Creek in the U.S. in the early 1900s blocked access to many miles of historically productive habitat. It is unclear whether steelhead ascended the Similkameen River above a falls near the Enloe Dam in the U.S. before the dam was constructed circa 1920. However, while aboriginal legend holds that salmon never ascended this falls, Native American testimony cites that Tribal members harvested large trout in the river above the falls before the dam was constructed.

Regardless of what the historical abundance of steelhead might have been, it is estimated that, by 1955, the total population in the Okanogan was about 100 adults. Presently, it is generally believed that the basin supports fewer than 50 naturally produced adults. When considered next to this base period, the capacity to increase the population is considered low (see Table 9-1). However, if much of the habitat lost in this system could be restored, the potential to increase the population could be considered high.

In addition to the previously discussed passage barriers, most of the habitat in the Okanogan system is in poor condition. The mainstem is too warm during the late spring and summer to support steelhead rearing, except near areas of isolated upwelling. The temperature problem in the mainstem is partially rooted in natural conditions but is substantially exacerbated by the many top-discharge impoundments in the system and by the withdrawal of several hundred cfs for irrigated agriculture on both side of the border. Water quality in the mainstem is also compromised by very high sedimentation rates resulting from bank erosion and poor land management practices. Irrigation water withdrawals dewater most tributaries before they join the mainstem. Farming and grazing activities have further reduced habitat quality. The mainstem also supports robust populations of smallmouth bass and northern pikeminnow, so predation rates are likely high. Under present conditions, viable steelhead habitat is limited to a few patches in the mainstem Okanogan and lower Similkameen rivers, Omak Creek, and a few lesser tributaries. The potential to improve the productivity of existing habitat is low; however, the benefits of restoring or providing passage into suitable habitat is high, if not in absolute productivity gains, then in relative gains for this small population.

The anthropogenic limiting factors are warm water resulting from impoundment and water withdrawal, access barriers to suitable habitats, tributary dewatering, and high sedimentation rates.

Table 9-1. Upper Columbia River Steelhead (yearlings) Ecological Improvement Potential

4 Populations		① Range of System Survival Rates GAP [D*]	② Index of Potential to Increase Population: H/M/L (base period abundance/productivity estimate; recent abundance/ productivity estimate or % Interim Target)	C S T N	③ Qualitative Assessment (CHART, NWFSC approach and other info) of Potential to Improve/Increase Habitat (H/M/L)	C S T N	④ Primary Candidate Anthropogenic Limiting Factors: **F**low, **C**hannel **M**orphology (bed, banks, sediment, LWD, sinuos., connectiv.), **T**emperature, **W**ater **Q**uality	C S T N	⑤ Ecological Improve-ment Potential	⑥ Improvement Potential Adjusted Based on Practical Constraints	⑦ Proposal to Fill Gap and Performance Measures/ Standards/ M&E
1 UCWEN-s	Wenatchee River		M - H		M - H		barriers, CM (LWD, connectiv) F		M	M	
2 UCENT-s	Entiat River		L - M		M		CM (all), F		M	L - M	
3 UCMET-s	Methow River		H		M		CM (irrig, sed, barriers, LWD, rip veg), F		M	M	
4 UCOKA-s	Okanogan River		H		H		Temperature, barriers, Flow, sediment		H	L	

Data Sources

*D = Delayed mortality due to transportation

C S T N = Council, States, TRTs, NWC

9.1.1.2 Suggested Mitigation Measures and Constraints

It is technically possible to pass fish over Enloe (Similkameen), McIntyre (mainstem Okanogan in B.C.) dams, the OID diversion and Conconully dam on Salmon Creek. Passage to the upper portions of Omak Creek could also be provided by further modifying Mission Falls. It is also possible to restore streamflows in some of the lesser tributaries, although the biological gains in these smaller tributaries would likely be small. Conventional soil stabilization techniques would probably be effective and, if implemented broadly, could substantially reduce sedimentation. Most of the sediment in the system originates in the upper Similkameen, the mainstem Okanogan within the U.S., and Bonaparte and Omak creeks. Providing passage, particularly at Enloe and McIntyre, would yield a high relative increase in productivity.

Social and political constraints limit the options for restoring habitat in the Okanogan subbasin. The majority of the most suitable steelhead habitat in the basin is in B.C., and, to date, the provincial government has opposed passage projects in Canada and at Enloe Dam that would allow fish passage into Canada. There is both local support and local opposition to restoring passage into Salmon Creek, depending on the method by which passage is restored. However, it is likely that passage could be provided here, at a cost of several million dollars. USBR owns the dams on Salmon Creek and should consider options for providing passage. It has been estimated that passage into Salmon Creek could double current steelhead production in the Okanogan. The Confederated Tribes of the Coville Indian Reservation have actively pursued improved passage and other habitat improvements on Omak Creek, a large tributary entirely on the Reservation. It is doubtful that the mainstem could be significantly cooled, as doing so would require substantial changes in water management and irrigation system configuration in Canada. Improving conditions in Salmon and Omak creeks, and other lesser tributaries within the U.S., would not

provide a large absolute increase in steelhead productivity, but might provide more than a 100-percent increase over present production.

9.1.2 Methow

9.1.2.1 Background

From 1977 through 2003, an average of 58 percent of the steelhead that passed Rock Island Dam also passed Wells Dam. Applying this average to the 1960-through-1970 base period during which Wells Dam was constructed (in 1967) yields an estimate of approximately 4,600 wild steelhead passing by the present location of Wells Dam. This is probably a conservative estimate, because Wells Dam likely reduced survival. The vast majority of these fish would have returned to the Methow. From 1993 through 2003, assuming that 20 percent of the total counts for 1993-1997 were wild fish, an average of 2,304 wild steelhead passed over Wells. The larger population in the 1960s was likely to have been substantially smaller than historical populations, because significant habitat alteration had occurred in the interim, including the construction of many of the mainstem dams. Given the greater number of steelhead in the 1960s compared to the 1990s, and given the likelihood that the historical population size was probably even larger than the 1960s population size, the Methow is believed to be capable of supporting a large increase in population.

The Methow still supports of number of pristine to nearly pristine habitats, mostly within designated wilderness areas. A number of important production areas, however, have been and continue to be adversely affected by human activity. Irrigation water withdrawals substantially reduce habitat quality and quantity during base flow periods in the mainstem Methow, lower Chewuck, and lower Twisp rivers. Irrigation diversions reduce habitat quality and quantity and impede adult steelhead passage in Gold, Libby, and Beaver creeks. A number of lesser tributaries are completely dewatered by irrigation withdrawals. Some, which do not support steelhead spawning, are occupied by juvenile steelhead in the late spring and winter. Some of the diversions on the mainstem and large tributaries are gravel “push-up” dams that can impede passage during low flows and create locally unstable habitat conditions. Furthermore, maintaining these structures, accomplished by dozing additional alluvium from the riverbed, can destroy redds. Most of the irrigation withdrawals are screened to modern standards, but a few large diversions downstream of important production areas are inadequately screened. Several reaches of the mainstem and tributaries are listed under Section 303(d) of the Clean Water Act as impaired for various parameters, including temperature and instream flow. Most stream reaches downstream from wilderness areas lack sufficient instream flow. Large wood has historically been removed from stream channels following larger floods. Revetments have further limited channel complexity and off-channel habitat in the lower Lost, Chewuck, and Twisp rivers and at various locations on the mainstem. Riparian conditions have also been adversely affected as a result of agricultural, silvicultural, residential, and recreational activities. Despite the significant amount of wilderness in the subbasin, it appears that the potential to increase habitat capacity is medium.

The anthropogenic limiting factors are irrigation-related substantial reductions to base flow, particularly in drier years; loss of off-channel habitat; lack of large wood; passage barriers or

impediments at irrigation diversions; inadequate screening at some irrigation diversions; and loss of riparian vegetation. Sedimentation may also be a problem in the lower Chewuck. The nearly annual dewatering of small streams that support rearing may also be a significant limiting factor if these fish are unable to exit these systems before they dry up.

9.1.2.2 Suggested Mitigation Measures and Constraints

Techniques for redressing most of the limiting factors are tested and available. Improving irrigation water conveyance efficiencies, replacing archaic push-up dams, shifting irrigation points of diversion from smaller streams to the larger mainstem, late-season water leases, and replacing obsolete irrigation screens are all viable techniques for minimizing the effects of agriculture on fish habitat, with benefits that would accrue almost immediately. Reconnecting off-channel habitats would also provide benefits in the short and long terms. Riparian conditions can be improved through planting, livestock fencing, and other proven techniques, although the benefits would not be fully realized until the trees mature. Selectively adding large wood could improve habitat productivity in some areas in the short and mid-terms, perhaps as a bridging technique until degraded riparian areas can be restored.

Social and political constraints limit the available options for restoring habitats in the Methow. The county government is opposed to further converting private lands to public ownership and is not inclined to further regulate private land use. Accordingly, riparian restoration or protection strategies on private lands will likely be limited to conservation easements or programs such as CREP that keep lands in private ownership and on the tax rolls. Similarly, water purchases that decrease the agricultural base will meet local resistance. However, late-season water leases and on-farm efficiency projects are generally-supported strategies for improving streamflow. Lining canals to improve conveyance efficiency is opposed in some portions of the subbasin, either for fear that doing so will reduce groundwater recharge to the point that domestic wells are affected, or over concerns about the loss of the aesthetic qualities of the existing canals. This technique is supported at least in the Chewuck and Beaver Creek watersheds. There is broad local support for replacing screens and improving fish passage at irrigation dams, and USBR is currently designing passage improvement projects in Libby, Gold, and Beaver creeks. Adding large wood will only be accepted in areas where possible channel migration would not result in loss of capital structures. The reconnection and restoration of off-channel habitats would likely be supported within National Forest boundaries and at a few other sites where capital structures would not have to be relocated.

9.1.3 Entiat

9.1.3.1 Background

Dam counts are the only data available to estimate escapements to this system, because spawner surveys have not been routinely conducted. Assuming that all steelhead counted at Rocky Reach Dam and not counted at Wells Dam spawned in the Entiat, and assuming that 20 percent of the steelhead that passed Rocky Reach Dam from 1993 through 1998 were wild steelhead, the adult return to the Entiat averaged 831 from 1993 through 2003. Estimates for the base period 1960 through 1970 were generated by assuming that the percentage of steelhead that passed both

Priest Rapids Dam and the current location of Rocky Reach Dam (for which dam counts are only available back to 1977) but did not pass Wells Dam was 9 percent, the same percentage calculated for the period 1993 through 2003. This technique produces an estimate of 827 returning adults. This is obviously a very crude method of estimating run size, but it does suggest that population size during the base period was not remarkably different than the current population. Average run size during both periods was probably greater than 250 and probably less than 1,000. The population in the 1960s was likely to have been substantially smaller than historical populations, since significant habitat alteration had occurred in the interim, including the construction of many of the mainstem dams. The potential to increase the population of the Entiat for steelhead is likely low to medium.

Steelhead spawning presently occurs in portions of the mainstem Entiat, the Mad River, and Roaring Creek. The channelization of the lower 14 miles of the river has reduced steelhead spawning habitat suitability in that reach. This channelization and associated loss of off-channel habitats and riparian function are the most significant habitat alterations in the watershed. The Entiat is less severely affected by water withdrawals, most of which are downstream of the spawning areas, but water withdrawals do limit habitat quality and quantity, particularly in drier years. It is believed that all of the irrigation diversions in the subbasin are screened to modern standards. Sedimentation from forest lands is also a significant factor. Steep terrain, highly erodible soils, forest road locations, and fire frequency combine to make sedimentation a much more significant problem in the Entiat than in the other subbasins occupied by UCR steelhead. The Entiat Valley is also growing in popularity as a retirement and vacation destination. Some of the most desirable building locations are along the productive floodplain reaches. The potential to increase habitat productivity is medium.

The primary limiting factors result from channelization and levee construction and include the loss of channel sinuosity and off-channel habitat, large woody debris, habitat complexity, and channel length. Channelization also significantly increased stream gradient in the lower 14 miles of the mainstem. As mentioned previously, sedimentation and the effects of water withdrawals on late-season base flows are also limiting factors.

9.1.3.2 Suggested Mitigation Measures and Constraints

Improving irrigation water conveyance and application efficiencies may help improve flows in the lower Entiat River and, to some extent, in the Mad River. Water purchases could also be used to improve instream flows during the summer and fall. Reconnecting off-channel habitats and breaching levees would provide the most significant benefits in the short and long terms. Riparian conditions can be improved through breaching and modifying levee structure, although the benefits would not be fully realized until the trees mature. Selectively adding large wood could improve habitat productivity in some areas in the short and mid-terms, perhaps as a bridging technique until degraded riparian areas can be restored. Rock weirs and other rock structures could be used to increase habitat diversity within the channelized section. Stabilizing upland sediment sources would also improve habitat quality over time. The technical feasibility of improving habitat conditions for steelhead is medium.

Social and political constraints limit the available alternatives for restoring habitats in the Entiat. The county government is opposed to further converting private lands to public ownership and is not inclined to further regulate private land use. Accordingly, riparian restoration or protection strategies on private lands will likely be limited to conservation easements or programs such as CREP that keep lands in private ownership and on the tax rolls. However, within the channelized reach, riparian restoration will be significantly more complicated than simply planting and protecting trees. Levees would have to be breached or otherwise modified to support vegetation. This would leave homes and orchards at risk of channel migration and flooding and is unlikely to enjoy broad support. Similarly, water purchases that decrease the agricultural base will meet local resistance. Since most of the water in the basin is destined for perennial orchard crops, late-season water leases are not a viable option here. On-farm and conveyance efficiency projects are generally-supported strategies for improving stream flow, but such efforts are not likely to substantially increase steelhead production. A number of wood and rock habitat structures have been installed in recent years and are accepted by the local community as a desirable alternative to reconnecting the river to its floodplain. There are some opportunities to reconnect side channels in the lower reach. Given the social and political constraints, the potential for increasing habitat productivity is low to medium.

The Action Agencies should aggressively pursue reconnecting side channels wherever technically and socially feasible. To the extent that additional structure placements are planned, existing structures should be closely monitored to determine whether or not they are achieving intended results. Despite county government objections, land purchases in sensitive reaches where the floodplain is still intact should be pursued. The Action Agencies should explore opportunities to mitigate the fiscal impacts of additional public land purchases on local economies. Efforts to reduce sediment loading from upland sources should continue and be expanded as practicable.

9.1.4 Wenatchee

9.1.4.1 Background

Dam counts are the only data available to estimate escapements to this system, because spawner surveys have not been routinely conducted. Assuming that all steelhead counted at Rock Island Dam and not counted at Rocky Reach Dam spawned in the Wenatchee, and assuming that 20 percent of the steelhead that passed Rock Island Dam from 1993 through 1998 were wild steelhead, the adult return to the Wenatchee averaged 1,469 from 1993 through 2003. Estimates for the base period 1960 through 1970 were generated by assuming that the percentage of steelhead that passed both Priest Rapids Dam and Rock Island Dam (where dam counts are only available back to 1977) but did not pass Rocky Reach Dam was 29.8 percent, as it was from 1977 through 2003. This technique produces an estimate of 2,522 returning adults.

This is obviously a very crude method of estimating run size, but it does suggest that population size during the base period was significantly larger than the current population. The larger population in the 1960s was probably substantially smaller than historical populations, because significant habitat alteration had occurred in the interim, including the construction of many of the mainstem dams. Given the greater number of steelhead in the 1960s compared to the 1990s,

and given the likelihood that historical population size was probably even larger than the 1960s population, there is a medium to high likelihood that the steelhead population in the Wenatchee could be increased.

Important spawning areas in the White, Little Wenatchee, and Chiwawa rivers and in Chewaukum Creek remain in healthy, properly functioning condition. Another important spawning area, Nason Creek, has been significantly affected by the highway and railroad construction that severed connectivity to a substantial amount of side channel habitat and truncated the floodplain. Other significant but lesser tributaries, including Peshastin, Chumstick, and Mission creeks, have been substantially altered by road construction, residential development, and water withdrawals. Highway and railroad construction and, to a lesser extent, residential development have also substantially reduced floodplain connectivity, side channel habitat, and riparian quality along much of the mainstem Wenatchee River. While the most important spawning areas are the previously listed tributaries, the mainstem Wenatchee is an important rearing and overwintering area. The lower mainstem Wenatchee is substantially affected by irrigation withdrawals in the late summer and early fall, particularly in drier years. The barrier at the Leavenworth National Fish Hatchery blocks access to nearly 20 miles of highly productive steelhead habitat. Riparian conditions in the major tributaries, except in Nason Creek, are generally excellent. The mainstem Wenatchee downstream from Leavenworth is largely devoid of structural wood. The inherent potential to increase habitat productivity for steelhead in the Wenatchee is medium to high.

The primary limiting factors are the loss of access to the upper Icicle River, and loss of off-channel habitat in the mainstem and Nason Creek, all of which adversely affect late-summer rearing and overwintering conditions and the habitat in other significant tributaries such as Peshastin, Mission, and Chumstick Creeks. Late-season flows in the lower Wenatchee mainstem and the lack of large, in-channel wood are also significant problems.

9.1.4.2 Suggested Mitigation Measures and Constraints

Improving water efficiency, shifting irrigation points of diversion from smaller streams to the larger mainstem, and water right purchases are all viable techniques for minimizing the effects of agriculture on fish habitat, with benefits that would accrue almost immediately. Approximately 50 cfs is diverted from the Wenatchee River at Dryden and delivered to water users on the opposite side of the Columbia River. If this water could be seasonally pumped from the Columbia in drier years, base flows in the lower 13 miles of the mainstem Wenatchee would be substantially improved. Reconnecting off-channel habitat would also provide benefits in the short and long terms, particularly in the lower Wenatchee River and Nason and Peshastin creeks. Chumstick Creek, a fairly large and once-productive tributary, could also be improved by implementing water conservation or purchases, riparian enhancements, and continued passage programs. Riparian conditions can also be improved in the leveed portions of the watershed, although the benefits would not be fully realized until the trees mature. Selectively adding large wood could improve habitat productivity in some areas in the short and mid-terms, perhaps as a bridging technique until degraded riparian areas can be restored. Important fully-functioning habitats, particularly in the White River, lower Nason Creek, and the mainstem Wenatchee between Lake Wenatchee and Tumwater Canyon, are privately owned. As development of these

properties would likely lead to further loss of riparian and floodplain function, acquisition or other forms of protection for these sensitive properties will be an important tool in ensuring the long-term fitness of UCR steelhead. In terms of technical feasibility, the Wenatchee has a medium potential for steelhead habitat productivity improvement.

In the Wenatchee, there is good local support for water conservation, and there may also be support for shifting points of diversion. Late-season leases are likely to be unpopular, because the crops grown in the valley are mostly perennial. There are several compelling opportunities to reconnect side channel habitat, and some of the work has already been implemented. Providing steelhead passage at the Leavenworth National Fish Hatchery is planned as soon as 2005. There is a partly natural waterfall several miles above the hatchery; passage restrictions at this feature have been exacerbated by road construction. It will be important to monitor passage here and to be prepared to modify the falls if necessary to provide passage to the more productive habitat upstream. Improving conditions in Chumstick and Mission Creeks, while technically feasible, may prove too expensive. Fish passage and screening projects are generally supported. Improving riparian conditions on leveed portions of the river may be difficult because of Corps objections to allowing vegetation on them. Considering all of these social, political, and economic factors, the potential for habitat productivity improvement in the Wenatchee is medium.

The Action Agencies should actively pursue all viable side channel projects and all passage projects where upstream habitat conditions are presently suitable. Other passage projects should be delayed until it is reasonably certain the habitat conditions can be suitably improved. The Corps should reconsider its levee vegetation management standards, because they appear to be based on information collected in the Mississippi Valley, where levee composition, vegetation type, and topography differ substantially from conditions in the Upper Columbia. Instream flow improvement in the lower Wenatchee and all irrigation-affected tributaries should also be pursued.

9.2 LITERATURE CITED

To be completed.