Yakima-Klickitat Fisheries Project

Supplement Analysis

DOE/EIS-0169-SA-01

Prepared for Bonneville Power Administration

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1. Introduction

The Bonneville Power Administration (BPA) is funding ongoing studies, research, and artificial production of several salmonid species in the Yakima and Klickitat river basins. BPA analyzed environmental impacts of research and supplementation projects in the Yakima basin in an Environmental Impact Statement (EIS) completed in 1996 (USDOE/-BPA 1996). The purpose of this Supplement Analysis is to determine if a supplemental EIS is needed to analyze additional research activities proposed as part of that project over the next 2-3 years. BPA will, however, soon begin work on a supplemental EIS on the proposed expansion of the fall chinook and coho programs to full production levels.

2. NEPA Analysis to Date

The Yakima Fisheries Project Final EIS (YFP EIS) (USDOE/BPA 1996) analyzed impacts of undertaking fishery research and mitigation in the Yakima River Basin. The EIS focused on the impacts of construction, operation and maintenance of anadromous fish production facilities in order to conduct research. Because spring chinook were the priority species at the time, most of the analysis focused on impacts related to that species. A monitoring program was proposed but impacts were not evaluated in detail. A limited coho research program also was proposed; the potential for impacts of more widespread coho releases was recognized, but not systematically evaluated. The EIS recognized that in future years, other species, including fall chinook, could become the focus of research and supplementation activities, but the impacts of activities related to those species were not evaluated in detail.

3. Description of the Proposed Action

In the Yakima River basin, the proposed project would collect broodstock; incubate eggs and rear fry in hatcheries; acclimate and release smolts; and study the natural production, ecological interactions, long-term fitness, and culturing/genetics of spring and fall chinook and coho salmon. In the Klickitat basin, salmonid life history and physical habitat data would be collected. Since the EIS was prepared, the project has developed the detailed spring chinook monitoring program and the research programs for fall chinook and coho. The project is co-managed by the Yakama Indian Nation (YIN) and the Washington Department of Fish and Wildlife (WDFW).

Several documents outline the project study designs: for spring chinook, the Project Status Report (PSR) (YIN 1995); for fall chinook, the draft Fall Chinook PSR (YIN 1998b); for coho, the Mid-Columbia Coho Salmon Study Plan (YIN, 1998c) and the draft Coho PSR (YIN 1998a); for the Klickitat program, Draft Klickitat Hatchery Facility Management Plan (Oshie and Ferguson 1998). Figures 1 and 2 show project locations. Tables 1 and 2 summarize the project activities.

Table 1: Activities Required for YKFP Project (Yakima Basin)

Activity	Spring chinook	Fall chinook	Coho
Volitional smolt releases	Building up to 810,000 between 1999-2004 (Mar 15–May 30)	- Mainstem stock - Up to 330,000 (Apr 25 & May 25) - Marion Drain stock – Up to 75,000 (Apr 25 & May 25)	1,000,000 (May 7 and 31)
Fry releases	None	880,000 in 3 groups up to RM 83 (Granger) Apr 14–17, 2000-2002	None
Acclimation sites	- Jack Creek (on North Fork Teanaway [RM 5]) - Easton (on upper Yakima [RM 203]) - Clark Flat (on upper Yakima)	- Prosser Hatchery for mainstem stock - Marion Drain Hatchery for Marion Drain stock	- Naches – Lost Creek pond (RM 39) and Stiles pond (RM 9) - Upper Yakima – Cle Elum hatchery (RM 183) and: • 1999 – Jack Creek and Easton spring chinook sites • 2000 and beyond – existing side channel or pond site to be determined on Yakima River (RM 180-205)
Broodstock collection	Up to 400 returning adults per year at the Roza Dam facility Apr 15–Sep 15	- Mainstem stock – Up to 124 adults/year at the Chandler canal and Prosser Dam, Sep 7–Nov 21 - Marion Drain stock – Up to 32 in Marion Drain at weir, fish wheel, or seine, Sep 7–Nov 21	- 1999-2000 – Approx. 600 adults/year at Prosser Dam Sep 1–Dec 7 - 2001-beyond – Preferably at Roza and Cowiche Dams, same dates, same numbers
Spawning surveys	- Naches basin: American, Little Naches, Bumping, Rattlesnake, Naches, late Jul-late Sep - Upper Yakima basin: Teanaway, Cle Elum, and Yakima, late Aug–early Oct	Marion Drain, Sep 15–early Nov	- Ahtanum, Cowiche, Wide Hollow, Satus, Naches, Yakima - Upper Yakima and Naches near acclimation sites starting fall 2000 Sep 15–Nov 30
Juvenile collection/ screw trapping	- Roza Dam juvenile trap and two downstream screw traps, Apr 1–May 1 - CJMF, Nov 15–Jul 15	- Two screw traps near West Richland (RM 8.4), Apr 1–early Jul - CJMF, Nov 15–Jul 15	- Two screw traps at RM 194, May 7–Jun 15 - Roza Dam juvenile trap and two downstream screw traps, Apr 1–May 1 - CJMF, Nov 15–Jul 15
Beach seining	None	Yakima, RM 0–90 on cobble/gravel bar locations, Apr 1–Jul 1	None
Electrofishing	- Yakima River (5 sites, RM 0-103) boat surveys for predator fish, Apr 1–Jul 1 - Yakima River (RM 112-158), boat surveys for rainbow, spring chinook, cutthroat, Sep & Oct - Upper Yakima tributaries (33 200-m reaches), backpack surveys for rainbow, spring chinook, cutthroat, dace, sculpin, Jul or Aug - Upper Yakima basin, collect 180 spring chinook for stomach analyses, Jul & Oct	None	None

Table 1: Activities Required for YKFP Project (Yakima Basin) (continued)

Activity	Spring chinook	Fall chinook	Coho
Gill nets/angling	- Yakima River (I-182 bridge to mouth), drifting gill net surveys, Apr & May - Angling at hotspots (e.g., Roza, Sunnyside, Prosser dams), Apr 1-May 15	None	None
Radio-telemetry	None	None	Tag up to 200 adults and track from jet boats and autos and at fixed dam sites (Sunnyside, Roza, Cowiche, and Wapatox), mid-Sep through Nov
Snorkeling	- Spot checks near release areas spring through fall - Upper Yakima basin, spring chinook habitat, competition, and precocial surveys, Jul-Sep - North Fork Teanaway (RM 10-16), bull trout surveys, Aug & Sep	None	Spot checks near release areas spring through fall
Bird studies	Predatory bird census and collection at hotspots	None	None
Hatchery broodstock development/-egg banking	Cle Elum Hatchery on upper Yakima River	Prosser Hatchery for mainstem stock, Marion Drain Hatchery for Marion Drain stock	Prosser Hatchery, lower Columbia River hatcheries

Table 2: Activities Required for YKFP Project (Klickitat Basin)

Task	Method/Activity
Screw Traps (3)	- Mainstem near Lyle (RM 6): operated year-round. - Immediately above the Klickitat hatchery (RM 42.8): operated year-round. - Immediately above Castile Falls (RM 68): operated Jun-Nov.
Spawner Surveys - spring chinook	Foot and raft surveys Aug and Sep, Leidl Bridge to McCormick Meadows (RM 32-83), early Aug – late Sep.
Spawner Surveys - fall chinook	Foot and raft surveys, Lyle Falls to Klickitat Hatchery (RM 2-42), early Oct – mid-Dec.
Spawner Surveys - coho	Foot and raft surveys, mainstem below Klickitat Hatchery and associated tributaries (lower portions only) Nov - mid-Jan.
Spawner Surveys - steelhead	Foot and raft surveys, McCormick Meadows to Lyle Falls Hatchery and associated tributaries, Mar-May.
Electrofishing, snorkeling	Presence-absence surveys for all species in selected tributaries consisting of 300-ft. survey reaches that coincide with the habitat inventory surveys.
Habitat Inventory Surveys	Use the TWF protocols to survey 1500-ft. reaches in

	selected tributaries.

4. New Activities and Circumstances Since Earlier NEPA Documents

The YFP EIS recognized that additional environmental analysis could be needed if other project facilities and activities were proposed. The following lists those activities not evaluated in the YFP EIS. No new facilities are proposed in conjunction with these research activities.

- Spring chinook monitoring activities have been increased and refined. Impacts of potential monitoring activities were not specifically evaluated in the EIS.
- The coho research program, including broodstock collection, acclimation, releases, and monitoring, has been developed in detail. It includes release sites and numbers different from those suggested most likely in the EIS. Effects of coho acclimation and releases were evaluated in general terms in the EIS, but the document specifically stated that the EIS was not evaluating impacts of the coho acclimation and release program (USDOE/BPA 1996, section 2.4.1.2). Effects of other coho monitoring activities were not evaluated.
- A fall chinook research program, including broodstock collection, acclimation, releases, and monitoring, has been developed. Effects of fall chinook acclimation and releases and other research activities were not evaluated in the EIS.
- Monitoring activities in the Klickitat basin have been increased. Effects of monitoring activities in the Klickitat basin were not evaluated in the EIS.

The YFP EIS also recognized that additional environmental analysis could be needed if environmental circumstances changed—for example, if additional species were listed under the Endangered Species Act (ESA). Additional fish species in the two basins have been listed as threatened under the ESA, including bull trout and Middle Columbia steelhead. Additional fish species outside the two basins also have been listed under ESA.

5. Effects of Project Activities Not Previously Evaluated

Because no new facilities are proposed, effects of the additional research now proposed would be limited to effects on other fish. Proposed new activities would not affect or diminish water rights currently held in the basin.

5.1 Effects of the Spring Chinook Program in the Yakima Basin

The effects of the Yakima spring chinook program were evaluated in the YFP EIS in detail. The differences from that analysis and the current environment are primarily that monitoring activities have been explicitly defined, and that bull trout and Middle Columbia steelhead have been listed as threatened under ESA.

Figure 1
Yakima River Subbasin

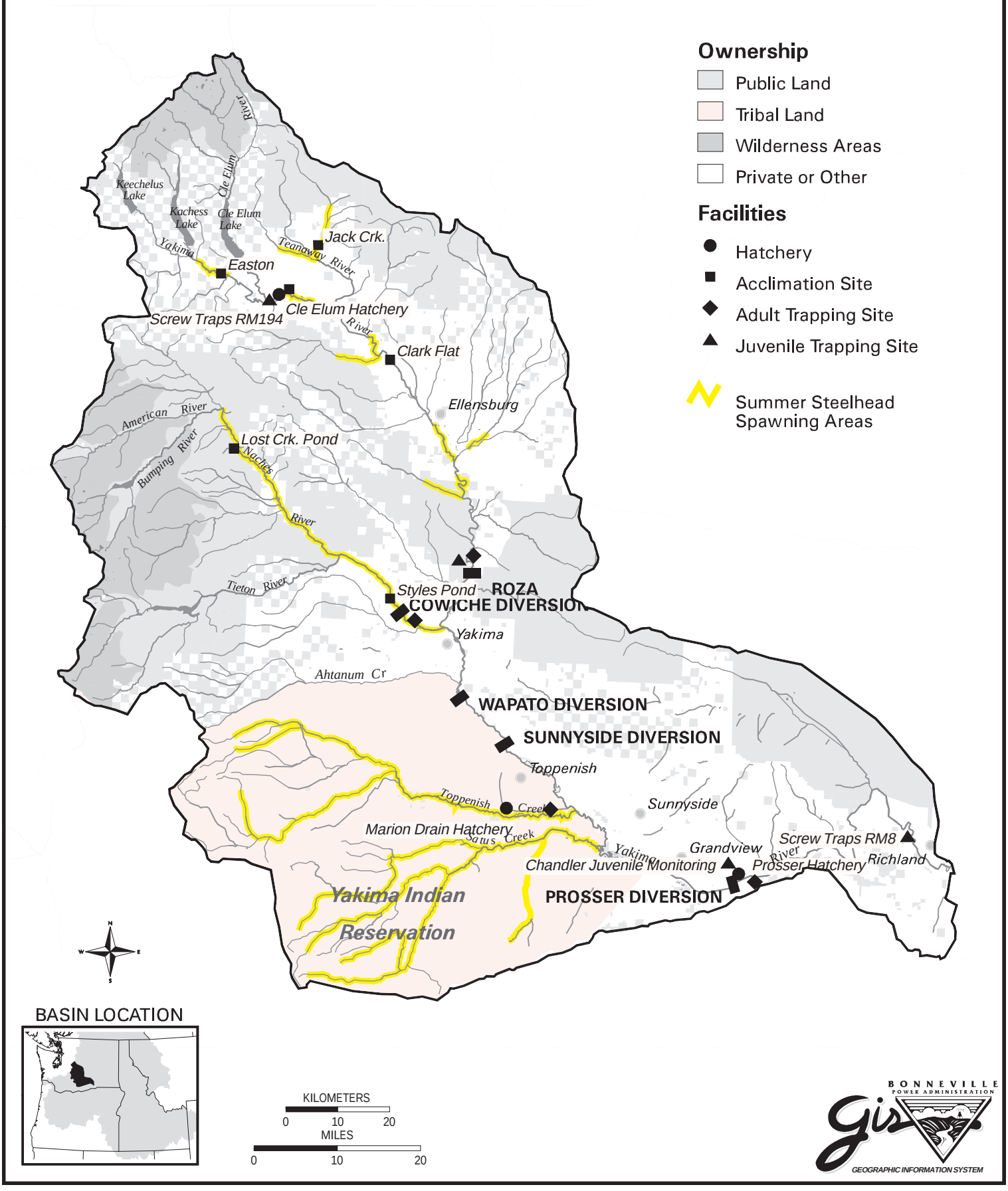
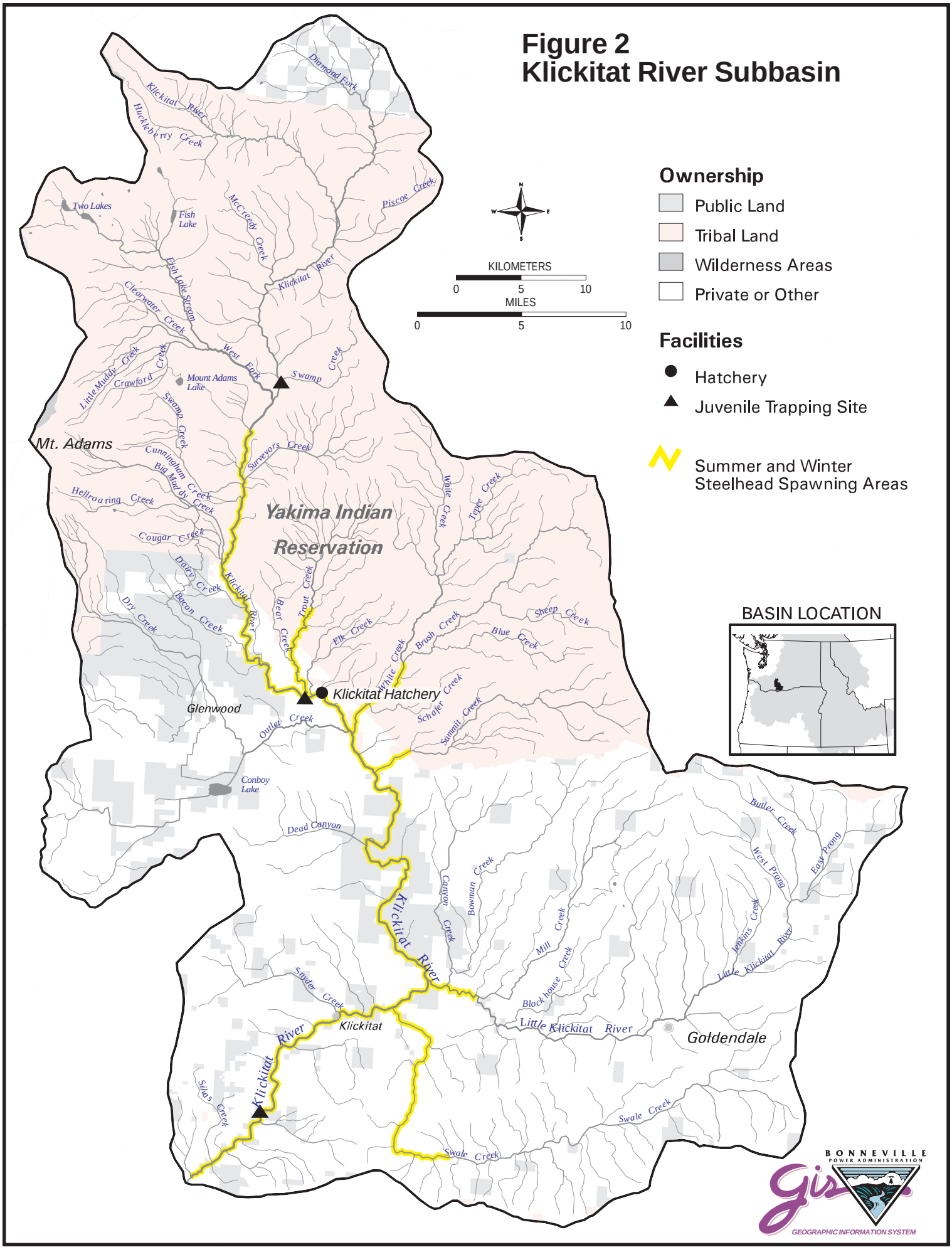


Figure 2
Klickitat River Subbasin



5.1.1 Effects of Acclimation, Releases, and Broodstock Collection

Effects of these activities were analyzed in the YFP EIS. Effects on other salmonids, including bull trout and steelhead, were evaluated in the EIS, and then subsequently in two separate biological assessments after bull trout and steelhead were listed (BPA et al. 1999a; BPA et al. 1999b). The conclusions in each of those assessments were that spring chinook releases may affect but would not adversely affect steelhead and bull trout; and that spring chinook broodstock collection may adversely affect steelhead because adults likely would be trapped, but that broodstock collection had only a very slight chance of trapping bull trout. Because any non-target species would be immediately released from broodstock collection traps, the potential effect on steelhead is not considered significant.

5.1.2 Effects of Monitoring Activities

As shown in Table 1, monitoring activities in connection with spring chinook research include spawning surveys, snorkeling, and bird censuses; and fish collection methods that include gill nets, angling, screw trapping, and electrofishing.

5.1.2.1 Spawning surveys, snorkeling, and bird studies

Spawning surveys and snorkeling/residualism surveys involve walking, boating, or swimming in fish habitat. At most they would create minor, temporary disturbances to fish in the area. Researchers would not capture, touch, or harass fish. Censuses and collection of predatory birds would not target fish and so would not affect them. Birds targeted for collection to study their stomach contents would be common, abundant species, and may not have to be sacrificed in order to conduct the studies.

5.1.2.2 Juvenile collection at traps

Traps are used to collect juvenile spring chinook for marking, counting, weighing, measuring and other assessments. Traps for spring chinook are in two locations: Roza Dam and the Chandler Juvenile Monitoring Facility (CJMF). At Roza, there is a juvenile fish trap at the dam and two screw traps located in the tailwater immediately below the dam; they are operated from April 1 to May 1 annually, 24 hours a day, 7 days a week. The traps will be checked at least twice a day or more often as dictated by the number of emigrating fish. Once collected, the spring chinook will be PIT tagged and released directly back into the river. All other species collected in the juvenile fish trap and screw traps will be released back into the river as soon as they are encountered.

Anadromous smolt production in the Yakima River basin, including spring and fall chinook, coho, and steelhead, is monitored primarily at the Chandler Juvenile Monitoring Facility (CJMF). The CJMF is located on Chandler Canal, an irrigation/hydropower diversion on the left bank of Prosser Dam (river mile [RM] 47). The CJMF is operated from November 15 through July 15 annually, 24 hours a day, 7 days a week.

Smolts enter the Chandler Canal and travel 0.7 miles from the headgates to a number of rotary drum screens. Fish are then directed into a pipe and conveyed 0.1 miles to the juvenile collection facility. Inside the facility, the fish first cross a separator, which removes larger fish. Smolts and other small fish are directed through the primary PIT-tag detector and into a flume. The flume bifurcates just below the primary detector, with one branch leading into a live box and the other to a 0.1-mile fish bypass pipe that returns fish to the river. A timed gate at the flume bifurcation allows sub-sampling at a rate of 33%,

which allows 66% of the fish to be returned directly to the river. Sub-sampled smolts are placed in a holding tank and worked up every 24 hours. They are removed from the holding tank, anesthetized, counted, and passed through a secondary PIT-tag detector and into an anesthetic recovery tank. The work-up consists of species enumeration, random sample for lengths, weights and scales for age information. Fish are released from the recovery tank into the bypass pipe and returned to the river. Recovery tank releases are made at night to lessen avian predation. Non-target fish species are passed directly back to the river with a minimum amount of handling, to reduce stress.

Traps used to collect juvenile spring chinook likely also will trap steelhead/rainbow trout and possibly coho, but would have a very slight chance of trapping bull trout. On a basin-wide level, the risk to steelhead populations of entrainment of steelhead smolts at Roza Dam is low given only about 6% of the steelhead population spawns and rears above the dam. No bull trout have been captured at the Roza juvenile fish trap in three years of operation. Coho could be captured, but the natural population has been extirpated, so any juveniles captured would be research fish. Capture data on the Roza screw traps do not exist because this will be the first year using traps there. However, in 1996, the juvenile trap was operated from January through June, and a total of 101 rainbow/steelhead trout were captured. Of these fish, 72 were classified as steelhead smolts based on a combination of fork length and coloration. Based on the relatively low estimated capture efficiency (4-10%) between the screw traps and juvenile fish trap, and the careful handling procedures used, it is unlikely that the operation at Roza Dam will adversely impact non-target fish populations.

Bull trout/Dolly Varden have been extremely rare in the lower Yakima River for many years (WDFW 1998). No bull trout have ever been encountered at the CJMF since operations began in 1983, and none are expected to be captured in the future. Because the CJMF is the primary juvenile salmonid monitoring facility in the basin for the YKFP, other anadromous fish species would be captured. For example, the average steelhead smolt outmigration handled at the CJMF annually has ranged from 6% to 52%, and has averaged 23.5% since 1988. The 1997 juvenile steelhead estimated passage at Prosser Dam was 40,526. The proportion of smolts entrained at the facility largely depends upon the river discharge: the greater the river discharge, the lower the smolt entrainment rate into the facility. Smolts from the facility are released at night to minimize avian predation at the fallout area.

The CJMF is an essential monitoring component to calculate smolt-to-smolt and smolt-to-adult survival rates for all species, and for various hatchery smolt experimental groups. The information generated is key to the long-term monitoring and evaluation for the salmonid stocks in the basin for both the YKFP and for basin managers. Therefore, though there is a potential for a small adverse impact to steelhead and other salmonid smolts, it is considered acceptable for the long-term management of fish populations in the basin. The facility has been specifically designed to minimize impacts to fish from handling and other research activities.

5.1.2.3 Electrofishing

Lower Yakima predator surveys: Electrofishing surveys to target warm water predator fishes in the lower Yakima River could encounter steelhead smolts. However, records from 1997 indicate that only 44 steelhead smolts were encountered with this work. This

number is low compared to the estimated 1997 Yakima steelhead counts at Prosser Dam (40,526 smolts; Yakama Indian Nation, unpublished data, Toppenish, Washington). During 1998 surveys, 2 wild adult steelhead and 83 wild steelhead smolts were caught in 5 of 12 surveys conducted by WDFW. During 1998 surveys conducted by YIN, no adult steelhead and 29 wild steelhead smolts were caught in 6 of 21 surveys. No mortalities were observed in either the WDFW or YIN 1998 surveys.

Although a single bull trout was observed during electrofishing in 1997, this was the only bull trout observed in the lower Yakima in decades. Since this single encounter, hundreds of hours of electrofishing effort have been expended in the lower Yakima River and no bull trout were found until four were found this year. It is impossible at this point to determine whether the four encounters this year mean that bull trout populations are increasing, or whether their incidence is related to unusual environmental conditions. It is likely, however, that few, if any, bull trout will be encountered during these surveys during future work.

Other juvenile salmonids, including spring and fall chinook and coho, could be encountered during this period (Apr 1 – Jul 1). Because coho are research fish and there is no natural population, any encounters and/or mortalities would not be considered significant. Electrofishing activities in the lower Yakima River may have encountered approximately 0.5% of the spring chinook and 0.4% of the fall chinook. The relative proportion of the total number of fish encountered is small and therefore the overall impact to these stocks of chinook is expected to be low.

If salmonids are encountered during electrofishing, the boat and personnel maneuver to reduce contact with them. Additionally, the electro-shocker will be turned off to allow a non-target fish to escape and recover on its own. Personnel operating the electrofishing boat will be trained in the proper operation of the field equipment.

It seems unlikely, therefore, that electrofishing surveys which target predatory fish in the lower Yakima will adversely impact Yakima River salmonid populations due to the low encounter levels (capture efficiency), and to the efforts described to avoid contacts with non-target species during electrofishing activities.

Yakima River mainstem (RM 112-158) surveys: Adult wild steelhead sometimes are caught during mainstem mark-recapture electrofishing surveys. Four adults were caught in 1991 and one in 1992. None were caught in 1990 or from 1993-1998. Electric current is shut off immediately whenever large salmonids are encountered.

Small steelhead may make up a small proportion (roughly 1%) of the fish identified as rainbow trout. Electrofishing gear is not effective at sampling small fish (<80 mm) and is unlikely to injure fish smaller than 250 mm, which would include almost all steelhead prior to smolting. This sampling averages 4 mortalities per year of the rainbow trout of a size that might be confused with steelhead, or approximately 0.04 potential steelhead mortality per year.

It is unlikely that bull trout or other species of concern would be encountered in these areas.

Yakima River tributary backpack surveys: No adult steelhead have been caught in tributary electrofishing surveys from 1990-1998. Some young steelhead could be

mistaken for rainbow trout during these surveys. Of the rainbow trout that are small enough to be confused with steelhead, an average of 24 per year have died, which computes to 0.24 steelhead mortality per year.

It is unlikely that bull trout would be encountered in these areas; however, cutthroat trout may be encountered. Because all electrofishing work will be done in accordance with NMFS Electrofishing Guidelines (NMFS 1998), impacts to other species would not be significant.

5.1.2.4 Gill Nets and Angling

In 1998, no steelhead were caught in drifting gill net surveys for channel catfish, or in angling surveys for channel catfish and smallmouth bass. During angling surveys of Northern pikeminnow, no steelhead were caught at Sunnyside and Prosser dams, and only one adult steelhead was caught at Roza dam. Because future surveys of this kind are expected to be done in the same or nearby areas, and because low numbers have been encountered there, the threat to steelhead is expected to be low.

The likelihood is low of catching a bull trout or other non-target species, either resident or anadromous, at any of these locations.

5.2 Effects of the Fall Chinook Research Program in the Yakima Basin

The effects of a fall chinook program were not evaluated in the YFP EIS. The current activities, as shown in Table 1, are proposed in an effort to gather essential life history information for the fall chinook and to help determine if a comprehensive supplementation program has the potential to enhance the basin's low fall chinook population.

5.2.1 Effects of Acclimation, Releases, and Broodstock Collection

Because bull trout are rarely found in the lower Yakima River, where the fall chinook program is focused, and because river conditions and the man-made Marion Drain do not support bull trout, fall chinook releases, broodstock collection, and other activities are extremely unlikely to adversely affect bull trout.

5.2.1.1 Releases

Genetics effects: Marshall et al. (1995) assign the two existing fall chinook populations in the Yakima—one in the Yakima mainstem and one in Marion Drain—to different genetic diversity units.

YIN proposes to supplement each population separately, by managing broodstock collection activities. Broodstock for the supplementation of the Marion Drain population will be collected only in Marion Drain, and broodstock for the mainstem population will be collected at Prosser Dam right bank Denil facility and at Chandler Canal (see section 5.2.1.2). The relatively low number of Marion Drain fish compared to mainstem fish will minimize the numbers of Marion Drain fish collected during collection for the mainstem supplementation program. These efforts will help ensure that mixing between the two populations is minimized and will reduce gene flow.

Fish straying to other basins will be minimized by acclimating fall chinook smolts prior to release, to ensure that smolts properly imprint on their natal waters. Based on CWT recoveries from both the mainstem and Marion Drain, gene flow of hatchery tagged fish between the two populations seems low (C. Busack, personal communication). A portion of mainstem hatchery fall chinook will continue to be marked to monitor straying.

Interaction effects: Release of hatchery fall chinook smolts (half on April 25, half on May 25) would overlap to some degree with wild steelhead smolt emigration. Steelhead smolts emigrate in April and May. During the period 1983-1997, approximately 91% of all emigrating Yakima River steelhead had passed Prosser Dam before May 25 (YIN unpublished data). The potential ecological risk from interactions between fall chinook and steelhead is very low due to the fact that Yakima steelhead are much larger at this stage (150-170 mm) than age-0 fall chinook smolts (65-75 mm) and prefer different micro-habitats.

The proposed year 2000-02 fry releases also could overlap temporally with steelhead smolts in the lower Yakima River, though the likelihood for competition with steelhead smolts that are much larger is considered to be non-existent, because of their differing habitat preferences.

Fall chinook releases would be far downstream of spring chinook release areas. By the time spring chinook reach the lower Yakima River where fall chinook are found, they are actively migrating; they use the channel thalwag (main channel where water moves most swiftly) for migration and slow backwater areas for resting. On the other hand, fall chinook are very much bank-oriented, even during migration. As a result, competition between the two species would be negligible. In addition, fall chinook are much smaller than spring chinook at this stage, thus precluding fall chinook from preying on spring chinook.

5.2.1.2 Broodstock collection

Yakima Mainstem stock: Most broodstock for the fall chinook program are collected when the Bureau of Reclamation drains Chandler Canal for maintenance on the rotating screens and removes all salmonids in the canal. This event would occur regardless of broodstock collection activities. Therefore, project broodstock collection activities in Chandler Canal do not adversely affect other fish populations. Salmonids that are not collected for broodstock are transported upstream via truck and released into the Yakima River.

Fall chinook and coho broodstock collection activities at the Prosser Dam Denil facility occur concurrently. During fall chinook/coho broodstock collection at Prosser Dam in 1997 and 1998, approximately 20% and 2% respectively of the returning adult steelhead run was intercepted. We observed no steelhead mortalities during this procedure. Few spring chinook are expected to be encountered because the majority of adults have already migrated upriver by the time coho broodstock collection takes place. Bull trout in the lower Yakima River are rare and have been captured only in the spring, so fall chinook broodstock collection is extremely unlikely to encounter them. No other species of concern would be encountered or adversely affected.

Fish that ascend the Denil ladder are routed via a flume into the livebox. Any non-target fish that are encountered during broodstock collection will be immediately netted from

the livebox and passed through a window back into the ladder exit area. Therefore, given the previous success of coho/fall chinook broodstock collection at the Prosser Dam Denil facility, and the careful handling protocol, mortality of steelhead and other species of concern as a consequence of fall chinook/coho broodstock collection at this facility is expected to be low.

Marion Drain stock: Broodstock collection methods in Marion Drain may include a fish weir, seining, and/or a fish wheel. Only 2% of steelhead in the Yakima basin spawn in the drain (Hockersmith et al. 1995) so there would be little opportunity to intercept a steelhead during fall chinook broodstock collection. No other species of concern use the drain for spawning. However, any non-target species captured would be immediately released upstream.

5.2.2 Effects of Monitoring Activities

Effects of spawning surveys and juvenile trapping at Roza and Chandler would be the same as those described for the spring chinook program (section 5.1.2.2).

Juvenile trapping will also be done using two screw traps near West Richland (RM 8.4) to estimate marked fall chinook fry survival. The traps will operate from approximately April 1 until early July. Estimated efficiency likely will range between 4-10% for yearling fish. The traps will be checked 2-3 times a day, and all non-target fish captured will be enumerated, visually estimated for fork length, and immediately released downstream to reduce handling stress.

Beach seining will be used to monitor the size, structure, and abundance of non-migrating fall chinook populations in the Yakima River from RM 0 upstream to RM 90 (Toppenish-Zillah Bridge). Seining will be done at numerous cobble/gravel bar locations from April 1 through July 1. This habitat is normally not used by steelhead smolts or juveniles or other species of concern. During this collection procedure, fish are encircled by and then drawn into a large net deployed from the shoreline. All non-target fish species captured will be counted and immediately released. Potential mortality to fish from use of this technique is very low; stress from handling and de-scaling is the primary effect.

5.3 Effects of the Coho Research Program in the Yakima Basin

The YFP EIS acknowledged potential ecological interactions (competition and predation) between coho and other species in the lower Yakima basin, where coho were expected to be acclimated and released (USDOE/BPA 1996, section 4.1.2). Since the EIS was written, the coho program has changed to provide for acclimation and release sites in spring chinook acclimation ponds in 1999 and in other existing upper basin sites in subsequent years; and to increase release numbers from 700,000 to approximately one million smolts annually. The EIS also anticipated a rigorous monitoring program to quantitatively describe species interactions in an attempt to better understand the risks involved and to modify activities if necessary in order to contain those risks. Studies conducted to date as part of this program inform the conclusions discussed below.

5.3.1 Effects of Acclimation, Releases, and Broodstock Collection

5.3.1.1 Acclimation and Releases

Predation: The only species which may be susceptible to predation by coho is spring chinook. All other species emerge in mid-summer when coho will have migrated.

In an effort to determine the ecological risk of re-establishing coho within the Yakima sub-basin, the YIN conducted field studies during the past two years to assess the risks of coho predation on other salmonids. The YIN concluded that the actual impact of coho predation on spring chinook fry within the study reach (approximately RM 202 to RM 194) represented the worst case scenario, and represented a negligible proportion of the spring chinook produced in this study reach in 1998 (Dunnigan and Hubble 1998). This is the general area of the Yakima River where coho would be released in 2000 and beyond. Because the study reach studied in 1998 and 1999 is expected to be worst case scenario, it is expected that impacts at all other locations (Naches) would be less severe. However, the potential for effect would continue to be studied in 1999 at the Easton acclimation site (RM 203 of the upper Yakima River). If a modicum of predation occurs, the coho project would be modified or cancelled to avoid significant impacts.

The risk of coho predation on steelhead juveniles is low, due to the lack of temporal overlap between the period of coho smolt emigration and age-0 steelhead emergence. YIN field work during the past two years indicated that young-of-the-year steelhead emerge from the gravel after the coho have migrated through the Yakima system. Additionally, yearling rainbow/steelhead are too large to be readily consumed by coho smolts. The risk to bull trout is especially low due to the limited spatial overlap between coho smolt emigration corridors and bull trout spawning areas (WDFW 1998).

The risk of predation on other fish species by F_2 generation coho is even lower due to the relatively low expected return rates for coho in the Yakima sub-basin (0.12% smolt-to-adult survival); and to the fact that approximately 50% of all returning adult coho will be collected for development of a localized broodstock, and therefore not given the opportunity to spawn naturally. However, should coho spawn naturally, their progeny are expected to be smaller than hatchery coho and to emigrate at times similar to hatchery coho, thereby further reducing the potential to prey on other native species such as steelhead and spring chinook.

To reduce the risk of predation by coho on other species, coho smolts will be released in relatively low densities, will be sized to more closely resembles sizes of wild coho (which tend to be smaller than hatchery coho), and will be released volitionally so that they are ready to move immediately downstream.

In sum, based on the evidence of potential for impact and on the mitigation measures proposed, the impacts of direct predation by coho hatchery smolts on native salmonids are expected to be minimal.

Competition: Direct competition for food and space between hatchery coho and other species can result in displacement of other fish into less preferred areas, which can potentially affect their growth and survival. For competition to have an adverse effect, the same limited resource must be used by more than one species. However, in some instances, competition for space and food may clearly alter patterns of microhabitat

utilization while having no effect on productivity or viability (Spaulding et al. 1989). Indeed, the small-scale shifts in use for habitat niches may represent a benefit at the community level because environmental resources are used more efficiently (Nilsson 1966).

Juvenile coho salmon are thought to be more aggressive relative to other juvenile salmonids; thus they may compete with other hatchery or naturally produced salmonids under certain conditions. However, Groot and Margolis (1991) suggest that there is little habitat overlap between coho and other salmonids, and that this habitat segregation provides a possible mechanism for reducing ecological interactions between the species. Coho salmon and steelhead are reported to share habitat along the western coast of North America (Fraser 1969; Hartman 1965; Johnston 1967; Burns 1971), with both species residing in freshwater for extended periods (Groot and Margolis 1991). However, the reported impacts of the presence of coho salmon on rainbow/steelhead trout are conflicting. Coho were shown not to affect steelhead growth or habitat use in the Wenatchee River (steelhead occupied different microhabitats than salmon) (Spaulding et al. 1989); and coho affected steelhead habitat use only to a small extent in another Washington stream (Allee 1974; 1981). However Hartman (1965) concluded that strong habitat selection occurred in the spring and summer as a result of aggressive behaviors which were differentially directed by coho against steelhead in pools and by steelhead against coho in riffle habitats.

Coho salmon have been shown to displace cutthroat trout from pool habitat into riffle habitat (Glova 1984; 1986; 1987; Bisson et al. 1988), even though both species preferred pool habitat in the absence of the other species. Tripp and McCart (1983) observed increasing negative impacts on cutthroat trout growth and survival as coho stocking densities increased.

In 1998, the YIN conducted field experiments to address the impacts of coho on the growth, abundance, and broad-scale geographical displacement of cutthroat and rainbow/steelhead trout. Researchers found no evidence that coho salmon influenced the abundance of cutthroat or rainbow trout when they compared the abundance of each species at sites where coho were stocked as well as where coho were not stocked. Coho abundance was largely related to stocking location. In addition, they found no evidence that coho affected the growth of cutthroat or rainbow trout when they compared the condition factor of each species in areas with and without coho (Dunnigan and Hubble 1998).

Although mountain whitefish are ubiquitous in the upper Yakima and Naches systems, they partition themselves quite differently in the habitat than coho. In addition, interactions between the two species would be minimized due to the rapid outmigration of coho smolts.

The results of the more recent studies in the Yakima and nearby basins (Dunnigan and Hubble 1998; Spaulding et al. 1989) suggest that competition between coho and other species may not be significant.

Potential benefits to upper Yakima and Naches fish populations include an increase in nutrients due to the presence of coho salmon carcasses (Bilby et al. 1996), although this

effect would be a longer-term benefit if numbers of naturally spawning coho increase. Juvenile coho might also be prey for bull trout adults.

All hatchery coho smolt releases will be volitional releases to ensure that smolts are ready to actively migrate. Once released, coho smolts tend to move rapidly downstream, thus reducing the potential for competition with other species. In sum, coho competition with other species is expected to be minimal.

5.3.1.2 Broodstock Collection

Coho broodstock collection at Prosser Dam will be done concurrently with fall chinook broodstock collection. Impacts will be the same as for fall chinook (see 5.2.1.2).

Beginning in fall 2001, coho broodstock might be collected at Roza Dam (RM 128 on the Yakima) and Cowiche Dam (RM 3.6 on the Naches). Researchers expect to intercept fewer adult steelhead at Roza and Cowiche dams than at Prosser Dam because a study showed that, from 1989-1992, approximately 59% of steelhead spawned in Satus and Toppenish creeks (Hockersmith et al. 1995), which are downstream of the dams. In addition, most steelhead entering the Yakima sub-basin in the fall overwinter in the Yakima River between RM 50-100 (Hockersmith et al. 1995), below Roza and Cowiche dams. Based on experience of the last 7 years, the number of steelhead that potentially would be handled during coho broodstock collection at Roza ranges from 0-19% of the steelhead run that reaches Roza Dam. During the past 10 years, adult steelhead passage at Roza Dam has ranged from approximately 20-125 adults, with the average escapement during most years not exceeding 50 adults.

The Roza adult trap has captured no bull trout during its two years of operation (1997-98), and none are expected to be captured in the future. Spring chinook upriver migration and adult trapping will largely have ended by the time coho trapping begins.

The trap is constantly staffed when it is in operation. All non-target species encountered at Roza and Cowiche dams will be passed back to the river immediately via a controlled shunt. Minimal handling will reduce stress and potential mortality.

5.3.2 Effects of Monitoring Activities

5.3.2.1 Spawning surveys, snorkeling and radio telemetry

Effects of spawning surveys and snorkeling would be the same as described for the spring chinook program (section 5.1.2.1).

Adult coho for the radio-telemetry study will be collected in conjunction with the coho/fall chinook broodstock collection activities at Prosser Dam. Thus the impacts previously described for broodstock collection activities (section 5.2.1.2) will apply to the radio-telemetry study. Beginning in the year 2000 it is possible, though not yet determined, that adult coho will be captured at Cowiche and/or Roza dams for the radio-telemetry study. Collection at these two sites will be based on the potential run size to each dam, and thus the likelihood of capturing sufficient numbers of coho for the study. Any non-target fish that would be captured at Roza or Cowiche dams would be passed through the facility back to the river in an entirely water-water transfer (see section 5.3.1.2).

5.3.2.2 Juvenile collection at traps

Impacts of juvenile collection at Chandler and Roza would be as described for spring chinook (section 5.1.2.2).

The two screw traps near RM 194 will be operated from May 7 through June 15. Although the traps at this location in 1998 captured numerous yearling rainbow/-steelhead, it is unlikely that a significant portion of those fish were steelhead. This is because less than 6% of all Yakima basin steelhead spawn upstream of Roza Dam (RM 128); and that 6% will have distributed itself throughout tributaries between RM 128 and 194. During the field work YIN conducted over the past two years, they concluded that young-of-the-year steelhead emerge from the gravel after the coho have migrated through the Yakima system, and that yearling steelhead are too large to be readily consumed by coho smolts. Therefore, the risk of predation in the traps is low. Steelhead smolts (>150 mm fork length) will be counted and their fork length visually estimated, then released immediately from the traps. Because it is difficult to distinguish between rainbow and steelhead when they are smaller, those less than 150 mm fork length will be anesthetized with MS 222 and their fork length measured; then they will be weighed, allowed to recover, and released.

The two traps have an existing WDFW Section 10 permit with USFWS for bull trout. However, the trap site is not near any known bull trout spawning locations. The nearest known spawning population is at a minimum 18 miles upstream of the trap. WDFW (1998) concluded that bull trout are infrequently encountered in the mainstem upper Yakima River, and that most bull trout are relatively large fish (typically > 200 mm fork length; Todd Pearsons, WDFW, pers. com. March 1999). WDFW (Todd Pearsons, WDFW pers. com. March 1999) has conducted extensive snorkel surveys in the Yakima River between RM 202.5-180 from summer to early fall in 1994, 1995, 1997 and 1998 and has not observed any bull trout. Furthermore, YIN did not capture any bull trout in the screw traps at this location in 1998. Although bull trout abundance information in the Yakima River above Roza Dam is limited, it is sufficient to conclude that bull trout numbers are very low in this area. Given this information, encountering bull trout in the two screw traps operated at RM 194 is unlikely, and therefore any impact to existing populations of bull trout is extremely unlikely. If a juvenile bull trout is captured in the screw trap the fish will be immediately released to the river with minimal handling to reduce stress. Data on numbers, dates and times of capture, and estimated lengths will be reported to USFWS within one week.

The only other species of concern would be spring chinook. The purpose of the trapping is to evaluate coho predation on spring chinook; researchers expect that the traps would catch a few (probably 5%) of spring chinook fry in the area.

Based on the relatively low estimated capture efficiency (4-10%), and the careful fish handling procedures, it is unlikely that the operation of these two rotary traps will adversely impact upper Yakima salmonid populations.

5.4 Effects of Monitoring Activities in the Klickitat Basin

5.4.1 Spawning Surveys

Any effects of spawning surveys would be similar to those described for spring chinook spawning surveys (section 5.1.2.1).

5.4.2 Juvenile Collection at Traps

To assess current basin production of all salmonid stocks, the Yakama Indian Nation Fisheries Program (YINFP) operates three rotary screw traps on the mainstem Klickitat River. One is fished at RM 6.0 near the town of Lyle, Washington. This rotary screw traps samples a portion (2-4%) of the salmonid emigrants from the basin. A second trap is fished at RM 42.8. This trap, located immediately upstream of the WDFW Klickitat Hatchery, has an estimated efficiency of 2-3%. This trap samples the natural production and hatchery spring chinook fry releases above the hatchery. A third trap is fished above Castile Falls at RM 68.0. No efficiency estimates have been attempted for this trap to date. This trap collects life history data on natural production and hatchery spring chinook fry released above Castile Falls.

Steelhead juveniles have been collected in both the Lyle and Hatchery screw traps. Since project inception, only two steelhead redds have been observed above Castile Falls, making juvenile steelhead collection at the Upper trap unlikely. Steelhead spawning distribution data show that 90% of mainstem and tributary spawning occurs below the Hatchery trap, indicating that primarily yearling rainbow trout are being enumerated at this facility. Lyle trap is located below the majority of steelhead spawning and collects the bulk of the juvenile steelhead sampled in the basin. In 1998 a total of 447 steelhead smolts were collected at the Lyle trap, during the spring outmigration season. Due to the low daily catch numbers of wild steelhead, efficiency releases were not conducted. Estimated efficiencies using hatchery coho and hatchery spring chinook were between 2% and 4%.

Operational protocols developed by the YINFP call for target salmonids, including steelhead and fall chinook, to be anesthetized, at which point a length and weight measurement is collected and a scale sample taken. This procedure entails netting the fish from the livebox and placing them in a work-up container.

Since project inception no bull trout have been collected in any of the three rotary screw traps currently being fished in the Klickitat mainstem. Operational protocols call for bull trout to immediately be released unharmed back to the river. This would entail netting the fish from the livebox and placing them back into the river. Data on numbers, dates and times of capture, and estimated lengths will be reported to USFWS within one week.

Based on the relatively low estimated capture efficiency (2-4%) and the careful handling procedures, it is unlikely that the operation of these three rotary traps will adversely impact Klickitat salmonid populations.

5.4.3 Electrofishing

Attempts to determine tributary productivity and distribution of stocks in the Klickitat basin include presence/absence surveys for all species on selected tributaries. In conjunction with 1500-foot habitat transect surveys, a 300-foot subsection will be

sampled using a backpack electrofisher. Tributaries surveyed would be distributed throughout the Klickitat River basin.

All fish collected within each 300-foot subsection of the reach are sampled. Life history data are collected on all salmonids, after which the fish are returned to the point of collection. Generally, a two-pass removal methodology is employed. Block nets are placed at the top and bottom of a 300-foot section. Two passes are made to remove as many fish as possible. Data collection takes between .75 to 1.5 hours depending on number of fish encountered. To minimize impacts, one crewmember is dedicated to fish holding. This person visually monitors collected fish, and regularly exchanges water in the collection vessel. NMFS electrofishing guidelines (NMFS 1998) are followed and only trained and experienced personnel are used.

This activity may adversely affect steelhead; during 1997 and 1998 sampling catches ranged from 0 to 100 steelhead. The activity also has the potential for incidental collection of bull trout. However, since project inception no electrofishing surveys have encountered bull trout and such surveys are not conducted in known bull trout habitat. Bull trout are immediately released unharmed back to the river if encountered during electrofishing surveys anywhere within in the basin. Data on numbers, dates and times of capture, and estimated lengths will be reported to USFWS within one week. Encounters with other species such as cutthroat and rainbow trout and other resident species could occur but are expected to be at a low level. Mortalities of all species collected using electrofishing techniques generally are less than 2% of any sample.

5.5 Migration Corridor Impacts

NMFS found, in a biological opinion issued in early 1999 (NMFS 1999) that Yakima basin spring and fall chinook and coho hatchery programs would not adversely affect listed Snake River sockeye, Snake River spring/summer chinook, Snake River fall chinook, Upper Columbia River steelhead, Lower Columbia River steelhead, and Snake River steelhead.

Little research data exist on the potential for adverse ecological interactions between the species and stocks that are subject of YKFP programs and the four stocks in the lower Columbia River listed since that opinion was issued (Lower Columbia chinook, Upper Willamette chinook, Columbia River chum, Upper Willamette steelhead). It is unlikely, however, that the YKFP programs would have a significant impact on the newly listed stocks. First, all the YKFP hatchery smolts are acclimated prior to release, thus increasing adult homing fidelity, so minimal straying is expected. Second, because of the distance between the Yakima basin and the basins below Bonneville Dam where the listed stocks are located, and the time it will take smolts to get there, the density of YKFP hatchery fish as they enter the lower Columbia River and estuary will be low. Therefore, interactions with the above mentioned stocks would be minimal. Finally, the risk of interactions would be minimal because the numbers of research fish will not exceed the level that NMFS determines will not jeopardize listed stocks in the originating basins, where potential for interactions is more likely than in the mainstem Columbia.

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