Chapter 3: Affected Environment and Environmental Consequences

3.1 Introduction

This chapter is organized into the following sections describing specific resource areas or environmental elements:

- Fish
- Wildlife
- Plants and Wetlands
- Geology, Geology Hazards and Soils
- Hydrology, Floodplains and Water Quality
- Wild and Scenic Rivers
- Cultural Resources
- Aesthetics (Visual Quality)
- Land Use, Recreation and Transportation
- Socioeconomics
- Air Quality
- Noise
- Public Health and Safety

Each of the above sections first describes the affected environment and then analyzes the environmental consequences of alternatives, including the Proposed Action and No Action Alternative.

For this EIS, the affected environment includes the Grande Ronde and Imnaha subbasins of the larger Snake River drainage basin. Within the Grande Ronde subbasin, the affected environment includes Lookingglass Creek and the Lostine River. Within the Imnaha subbasin, the affected environment description focuses on the Imnaha River. The Proposed Action sites, along with landscape features such as main roads, rivers, and mountain ranges, are depicted in Figure 1-1.

For each resource or environmental element in this chapter, the analysis of environmental consequences considers the direct, indirect and cumulative effects of alternatives. For purposes of determining effects, each section contains evaluation criteria and assesses potential impacts based on their context and intensity. The term "context" refers to the general affected environment in which the Proposed Action would take place. The term "intensity" refers to the severity or degree of impact that the Proposed Action would have on the affected environment. Features of project design, and any reasonable mitigation measures, which help avoid, minimize or compensate for potential adverse effects are identified. Cumulative effects analysis considered the activities shown in Table 1-1 as well as other reasonably foreseeable actions relevant to each environmental element below. As a baseline condition for cumulative effects, larger-scale land management activities on nearby National Forest (consisting primarily of recreation, grazing and some logging use) and private lands (primarily agriculture, grazing and residential use) are expected to remain constant. No substantial changes in these activities in the subbasins is anticipated.

This chapter concludes with sections that address short-term uses of the environment; maintenance and enhancement of long-term productivity; irreversible and irretrievable resource commitments; and adverse effects that cannot be avoided.

3.2 Fish

3.2.1 Affected Environment

The geographic locations of the affected environment for fish are confined to the Grande Ronde and Imnaha subbasins. Within the Grande Ronde subbasin, the water bodies of interest are Lookingglass Creek and the Lostine River. Within the Imnaha subbasin, the water body of interest is the Imnaha River.

Both the Grande Ronde and Imnaha subbasins continue to support fisheries that were an important part of the regional economy and regional tribal cultures (James 1984; Wallowa County and NPT 1999; Ashe et al. 2000). The Draft Biological Assessment (in process) presents more detailed information on fish species in the subbasins, including historic and present distribution and abundance. The sections that follow present an overview of existing conditions in the subbasins and analyze potential project impacts.

3.2.1.1 Grande Ronde Subbasin

Historically, an estimated 43 fish species, including 24 native and 19 introduced species, are known to have occurred in the Grande Ronde subbasin (Ashe et al. 2000). Thompson and Haas (1960) report that coho salmon historically were abundant in the subbasin, but were **extirpated** from the subbasin in the 1980s. Historic abundance of sockeye salmon in the Wallowa River system (including the tributary Lostine River) is unknown, but it is assumed to have been high given the presence of sockeye canneries at Wallowa Lake in the 1890s (ODFW et al. 1990). Although anadromous sockeye salmon were extirpated from the area by 1905, their genetic component may still be present in wild kokanee in Wallowa Lake (Nowak and Eddy 2001). Table 3.2-1 lists both native and introduced species currently present in the Grande Ronde subbasin.

Table 3.2-1. Fish Species Currently Occurring within Grande Ronde Subbasin.

Common name	Scientific name	Native
Spring/summer chinook salmon	*Oncorhynchus tshawytscha*	X
Fall chinook salmon	*Oncorhynchus tshawytscha*	X
Summer steelhead	*Oncorhynchus mykiss*	X
Sockeye salmon/kokanee	*Oncorhynchus nerka*	X
Rainbow trout	*Oncorhynchus mykiss*	X
Redband trout	*Oncorhynchus mykiss*	X
Cutthroat trout	*Oncorhynchus clarki*	X
Bull trout	*Salvelinus confluentus*	X
Mountain whitefish	*Prosopium williamsoni*	X
Pacific lamprey	*Lampetra tridentata*	X
White sturgeon	*Acispenser transmontanus*	X
Mountain sucker	*Catostomus platyrhynchus*	X
Largescale sucker	*Catostomus macrocheilus*	X
Bridgelip sucker	*Catostomus columbianus*	X
Chiselmouth	*Acrocheilus alutaceus*	X
Longnose dace	*Rhinichthys cataractae*	X
Torrent sculpin	*Cottus rhotheus*	X
Leopard dace	*Rhinichthys falcatus*	X
Mottled sculpin	*Cottus bairdi*	X
Northern pikeminnow	*Ptychocheilus oregonensis*	X
Peamouth	*Mylocheilus caurinus*	X

Redside shiner	*Richardsonius balteatus*	X
Paiute sculpin	*Cottus bildingi*	X
Shorthead sculpin	*Cottus confusus*	X
Lampreys	*Lampetra spp.*	X
Speckled dace	*Rhinichthys osculus*	X
Largemouth bass	*Micropterus salmoides*	
Yellow perch	*Perca flavescens*	
Sunfish	*Lepomis spp*	
Brown bullhead	*Ictalurus nebulosus*	
Common carp	*Cyprinus carpio*	
Channel catfish	*Ictalurus punctatus*	
Smallmouth bass	*Micropterus dolomieu*	
White crappie	*Pomoxis annularis*	
Brook trout	*Salvelinus fontinalis*	
Black bullhead	*Ameiurus melas*	
Black crappie	*Pomoxis nigromaculatus*	
Bluegill	*Lepomis macrochirus*	
Flathead catfish	*Pylodictis olivaris*	
Golden trout	*Oncorhynchus aguabonita*	
Lake trout	*Salvelinus namaycush*	
Pumpkinseed	*Lepomis gibbosus*	
American shad	*Alosa sapidissima*	
Tadpole madtom	*Noturus gyrinus*	
Yellow bullhead	*Ameiurus natalis*	

Source: Adapted from Coby Menton, NRCS, as referenced in the Master Plan (Ashe et al. 2000).

Currently, spring/summer and fall chinook, steelhead, and bull trout returning to the Grande Ronde River and its tributaries are listed as threatened under the ESA. Discussion of each species (and stocks) follows.

Chinook Salmon — Chinook salmon are an anadromous fish species. Anadromous fish migrate up rivers from the sea to breed in freshwater. Due to the chinook salmon's relatively large size, they usually spawn in streams that are larger and deeper than those used by other salmon. Chinook salmon **fry** and smolts usually stay in fresh water from 1 to 18 months before travelling downstream to estuaries, where they remain up to 200 days. Chinook salmon spend one to six years at sea before returning to their natal streams to spawn (Sankovich 2002, personal communication). Spawning occurs from summer to late fall, depending on the stock, *i.e.* fall or spring/summer chinook (ODFW 2001).

In-subbasin and out-of-subbasin habitat changes and out-of-subbasin salmon harvest have reduced all salmon populations and extirpated or nearly eliminated certain segments of chinook salmon populations (Mobrand and Lestelle 1997). Declining adult returns from the early 1980s and early 1990s resulted in the 1992 federal ESA listing of the Snake River **evolutionarily significant unit** (**ESU**) as threatened. The Grande Ronde River stock is a part of that ESU. Recent redd counts, however, show a significant increase in adult **escapement** (Table 3.2-2). Chinook salmon that once may have spawned from late-September through October probably have been extirpated, and chinook populations that spawn in November have been reduced to a remnant population.

Spring/Summer Chinook
Escapement levels and trends in the early to mid 1990s indicate that Grande Ronde spring/summer chinook salmon were in immediate danger of extirpation (Sims 1994). **Smolt-to-adult return ratios (SARs)** were below 1.0 for the eight brood years in the 1990s (Carmichael et al. 1998a). Recent (2000 – 2002) **redd** counts, however, indicate an increase in spawners within the Grande Ronde basin, as shown in Table 3.2-2.

Table 3.2-2. Number of Spring Chinook Salmon Redds Observed in the Grande Ronde River and Tributaries, 1998-2002.

	Year														
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Redds Observed	969	227	296	198	558	688	149	80	306	298	253	180	502	868	884

Sources: Nowak and Eddy (2001); Kinery 2003, personal communication.

Grande Ronde spring/summer chinook enter the Columbia River in March through June (Neeley et al. 1994) and they pass through the lower Snake River primarily during April through mid-July (Thompson et al. 1960; Bjornn et al. 1992). High water temperatures greatly restrict summer use of the Grande Ronde subbasin. In most recent years, high mainstem temperatures blocked upstream migration of adult fish during much of the summer, and probably prevented juveniles from rearing from mid-July through August. Spawning usually occurs in August and September with fry emergence between March and May. Juveniles that remain in the subbasin for one year generally begin their outmigration in June through October. **Smoltification** occurs the following spring. Adults usually remain at sea for one to four years and return to spawn between ages three and six (ODFW 2001).

Within Lookingglass Creek, spring/summer chinook enter the creek in the later part of May and generally spawn from mid-August to September. Fry emerge from March to May and juveniles tend to remain for rearing in areas relatively close to where they hatched. Catherine Creek, from which Lookingglass Hatchery collects a portion of its broodstock, differs slightly in spawn timing as some individuals have been observed spawning in late July (Zollman 2002a, personal communication).

Lostine River spring/summer chinook returning adults generally enter the river beginning in the first week of June and generally spawn in mid-August to late September. Earlier spawning may occur as spawned-out carcasses have been observed as early as mid-July (Zollman 2002b, personal communication). Fry emerge from March to May, depending on water temperature. Variability of river water temperature occurs in association with springs creating thermal infusion areas. Generally, fry tend to remain near emergence sites, but may move downriver in June or July depending upon river conditions.

Fall Chinook
Although fall chinook salmon are indigenous to the Grande Ronde subbasin, including all of the lower portion of the river system, only remnant populations occur in the lower Grande Ronde River from the mouth to just above the Wenaha River, primarily in Washington. These populations occur downstream of the proposed project sites. Grande Ronde fall chinook salmon are part of the Snake River ESU and were federally listed as threatened under the ESA in 1992.

Although life history information for Grande Ronde River fall chinook is extremely limited, life histories for Snake River fall chinook may be comparable. Generally, fish from the Snake River populations spawn in

mid-November. Fry emerge in early to late May and leave the Snake River in late June to early July (ODFW 2001).

Currently, there is no "direct" artificial production of fall chinook within the Grande Ronde subbasin. However, wild fall chinook may be impacted by the adult returns to the mainstem Snake River programs where smolts are acclimated at locations like Captain Johns Rapids and Pittsburg Landing. The adults that return from those programs find locations and spawn naturally, occasionally within the Grande Ronde River.

Steelhead — From 1988 to 2000 steelhead redd counts showed a steady decline in summer steelhead spawning in all reaches of the Grande Ronde River. Due to this decline, the Grande Ronde River stock of summer steelhead, included in the Snake River ESU, was federally listed as threatened under the ESA in 1997.

Presently, summer steelhead are distributed throughout the accessible portions of the Grande Ronde subbasin. Summer steelhead are known to occupy 238 streams in the subbasin. They use about 33 percent of the total stream length available for spawning and rearing. On average, summer steelhead grow for two years in the Grande Ronde River system before migrating to the ocean. Most smolt migration occurs from April through June (Smith 1975). A smaller smolt migration occurs in the fall, when juveniles are thought to migrate to lower stream reaches to avoid freezing conditions in the upper tributaries. Upstream areas may be repopulated the following spring. Juveniles may also move upstream to find cool water sanctuaries during the summer (ODFW 1993).

Within Lookingglass Creek, steelhead adults migrate upstream during late winter/early spring when flows increase due to spring runoff. Juveniles are supported throughout the river, as evidenced by ODFW trap data, and emigrate in spring (Sankovich 2002, personal communication).

Lostine River steelhead spawners begin to ascend upstream in early spring (March – April). In late April or early May, adults begin to move up tributaries to spawn (Zollman 2002b, personal communication). Rearing juveniles may move upstream and downstream within tributaries for up to 2 years. Smolt emigration occurs after 2 years of rearing throughout the Lostine, usually in late March through May, once again coinciding with increased flow due to spring runoff (Sankovich 2002, personal communication).

In the Grande Ronde subbasin, summer steelhead artificial production takes place at the Wallowa Hatchery, Irrigon Hatchery and the Big Canyon **acclimation site** in Oregon, and at the Lyons Ferry Hatchery and Cottonwood acclimation facility in Washington. The Wenaha and Minam Rivers and Joseph Creek are wild fish management areas for summer steelhead in the subbasin and, thus, receive no hatchery supplementation (Nowak and Eddy 2001). Grande Ronde steelhead broodstock was founded from fish collected at one of the Snake River dams and probably included fish from throughout the Snake River basin (ODFW 1995).

Bull Trout — Although there is limited historical distribution information, bull trout presently occur throughout the Grande Ronde subbasin in areas where water quality and habitat are suitable to the species. Populations within the Wenaha River are considered healthy, however, most Grande Ronde bull trout populations are considered at “moderate risk of extinction” (Buchanan et al. 1997). Populations within Wallowa Lake and Wenatchee Creek, a tributary to the lower Grande Ronde, have been extirpated (ODFW 2001). Due to population declines, Grande Ronde bull trout were listed as threatened under the ESA in 1998, as part of the larger Columbia River Basin Distinct Population Segment (DPS).

The status of Lookingglass Creek bull trout populations was considered “of special concern” by some researchers (Ratliff and Howell 1992), but has been downgraded to a “moderate risk of extinction” (Buchanan et al. 1997). Although no population estimates have been made in the Lookingglass Creek drainage, presence/absence surveys and spawning ground surveys indicate that bull trout abundance is low (Buchanan

et al. 1997). High water temperatures occur at the Lookingglass Hatchery location during low flow periods within the diversion reach; these may limit bull trout usage during those periods (Lund 2002, personal communication). Although bull trout have been caught throughout the year, there are definite peaks in catch rates in the spring and fall with a low in July (ODFW 1995). Bull trout that occur in the portions of Lookingglass Creek near the hatchery may experience temporary delays in migration due to instream barriers (Sankovich 2002, personal communication). However, total dewatering does not take place and when necessary, during the late summer, flow into the hatchery is reduced to provide sufficient flow in the river to provide for bull trout passage, while still providing a healthy environment for fish in the hatchery (Zakel 2003, personal communication).

Lostine River bull trout are mostly fluvial (migrating between tributaries and larger river systems) and may overwinter throughout the Lostine, although studies have suggested severe mortality of those fish that overwinter there (Sankovich 2002, personal communication). Spawning survey information is limited, but current populations are thought to be healthy (Zollman 2002a, personal communication; Sausen 2002, personal communication). Stream surveys conducted in 1992 indicated a low abundance of adult bull trout in the Lostine (ODFW 1995). They migrate up the river from June through August, and are in upstream tributaries in late August when temperatures exceed their tolerable limit. Generally, bull trout are upstream of river mile (**RM**) 10 during the warm months of the summer. Subadults will be higher upstream, seeking cooler temperatures in the summer (Sankovich 2002, personal communication). Adults may migrate downstream in late fall or early winter, before icing occurs in the upper portion of the river (Zollman 2002b, personal communication).

Lamprey — Pacific lamprey historically inhabited a large portion of the Grande Ronde River subbasin. Remnant populations may persist in the subbasin but their distribution and abundance are unknown (ODFW 1996). According to Jackson et al. (1996), the Pacific lamprey population in the Grande Ronde subbasin and tributaries are likely near extinction and no individuals have been captured in Lookingglass Creek during trapping operations. However, reintroduction efforts are currently proposed by several entities including BPA and the CTUIR.

Western brook lamprey are also native to the subbasin. A dead individual of this species was observed in the Wenaha River in the early 1990s (ODFW 2001). This observation suggests at least a few individuals may persist in the subbasin, although their distribution and abundance are unknown.

Redband Trout — Isolated populations of rainbow trout in the Grande Ronde subbasin have been identified as inland "redband" type trout. Within the Grande Ronde, Behnke (1979) suggests that redband trout represent the wild component of resident steelhead, while rainbow trout represent a hatchery lineage. As of April 20, 2000, redband trout were listed as a **sensitive species** in Oregon and managed similarly to steelhead when occurring in waters frequented by anadromous fish. Wild trout distribution surveys conducted in the Grande Ronde drainages in 1991 indicated that redband trout were widespread and abundant in all streams surveyed. According to ODFW (1995), there are six known populations of resident redband trout located in the upper East and West Forks of the Wallowa River, Hurricane Creek, Little Creek, Jarboe Creek and in Limberjim Creek.

Rainbow Trout — Since 1925, hatchery rainbow trout have been used to enhance fishery opportunities and harvest in the Grande Ronde River subbasin. This stocking effort supported popular trout fisheries on many subbasin streams, especially Catherine Creek and the Grande Ronde, Lostine and Wallowa Rivers. Historically, releases have consisted of fry, fingerling, and legal-size (six- to ten-inch) fish. Some streams were stocked only once and many others were stocked annually until the mid-1950s. Stocking of catchable rainbow trout has been discontinued in the Wallowa and Lostine Rivers (Buchanan et al. 1997).

In 1992, when spring/summer chinook salmon were listed as threatened under the ESA, ODFW restricted the location of rainbow trout stocking, and reduced the number of fish stocked, to avoid primary chinook salmon spawning and rearing areas. In 1997, when steelhead were listed as threatened, ODFW ceased stocking rainbow trout in all anadromous streams in the Grande Ronde subbasin (ODFW 2001).

Kokanee — Kokanee do not currently occur in the Grande Ronde River or its tributaries. Within the Grande Ronde subbasin, Wallowa Lake historically supported a large anadromous sockeye salmon population and continues to provide habitat for a naturally reproducing population of resident kokanee. From about 1955 to 1970, kokanee from Montana, Washington and British Columbia were planted in Wallowa Lake to supplement the existing population (ODFW 2001).

Brook Trout — High lakes of the Wallowa Mountains were historically stocked with brook trout. Stocked brook trout from the Eagle Cap Lake population have trickled down into some of the Grande Ronde subbasin systems, including the Lostine. Introduced brook trout pose a serious threat to bull trout populations due to resource competition and the potential for hybridization that results in sterile offspring (Leary et al. 1991). A number of stream systems within the Grande Ronde subbasin contain established populations of brook trout that have successfully hybridized with bull trout. Although competition and hybridization occur, it appears that bull trout in the Lostine are currently maintaining themselves as a genetically distinct population (Smith 2002, personal communication). There is no evidence of brook trout presence in Lookingglass Creek (ODFW 2001).

3.2.1.2 Grande Ronde Subbasin Project Sites

Lookingglass Hatchery — Lookingglass Hatchery was opened in 1982 as part of the LSRCP program to produce spring/summer chinook salmon juveniles for release in the Imnaha and Grande Ronde Rivers. Currently, the hatchery rears stock from Grande Ronde River, Catherine Creek, the Lostine River and the Imnaha River.

Upstream passage of steelhead, bull trout and spring/summer chinook is impeded by water withdrawal and instream structures at Lookingglass Hatchery. The existing intake passage system does not allow for adequate passage of adult bull trout and steelhead. The existing fish ladder system does not provide effective guidance during low flow conditions as some fish are stranded at these times. These instream passage issues are currently being discussed by LSRCP and ODFW personnel for correction as an action separate from this Proposed Action.

Lostine Adult Collection Facility and Lostine River Hatchery — The majority of spring/summer chinook spawning in the Lostine River occurs between RM 10 and RM 13, which is in the general vicinity of the proposed Lostine River Hatchery (near RM 12). Chinook salmon have also been observed holding and spawning in the lower reaches of the Lostine River (below RM 1.5) where spawning habitat is available (Harbeck 1998). There is spawning habitat upstream of the proposed intake structure, however, there is reduced spawner use of habitat upstream of the proposed facility location due to the presence of cobble and steep gradient (Zollman 2002b, personal communication). Late-run spring/summer chinook historically have spawned in this area (Thompson and Haas, 1960).

Natural escapement declines of the Lostine River spawning aggregate of spring/summer chinook have paralleled those of other Grande Ronde River tributaries. Redd count totals for the Lostine River have dropped substantially since the mid-1950s as shown in Table 3.2-3. However, recent (2001-2002) redd counts have shown an increase in spawners. This increase may be attributed to a variety of factors including ocean rearing conditions, juvenile outmigration freshwater conditions, harvest management, and supplementation associated with existing programs.

Table 3.2-3. Lostine Spring/Summer Chinook Redd Counts from Various Survey Years.

	Year									
	1957	1994	1995	1996	1997	1998	1999	2000	2001	2002
Redds Observed	893	16	11	27	49	35	57	64	131	209

Sources: ODFW (2001); Keniry (2003, personal communication).

From the data of the 1990s, co-managers determined that the Lostine River spawning aggregate of Grande Ronde River spring/summer chinook was at short-term risk of extirpation, and sought to implement the conservation and recovery program.

3.2.1.3 Imnaha Subbasin Overview

There are 20 native and 9 introduced fish species in the Imnaha River (Table 3.2-4; Ashe et al. 2000). Introduced species are found predominantly in the lower reaches of the Imnaha River. Currently, spring/summer and fall chinook, steelhead, and bull trout returning to the Imnaha River are listed as threatened under the ESA.

Chinook Salmon — In-subbasin and out-of-subbasin habitat changes and out-of-subbasin salmon harvest have reduced all Imnaha River salmon populations and extirpated or nearly eliminated certain segments of chinook salmon populations. However, as shown in Table 3.2-5, returns have significantly increased in recent years. Chinook that may have once spawned from late-September through October have probably been extirpated, and chinook populations that spawn in November have been reduced to a remnant population. Many genetic and heritable traits have likely been lost as a result. A highly variable environment challenges remaining traits, as do genetic consequences associated with small breeding populations (Bryson et al. 2001).

Spring/Summer Chinook
The Imnaha River subbasin once supported healthy runs of spring/summer chinook salmon as an estimated 6,700 adults returned to the subbasin annually (USACE 1975). Returns to the Imnaha River subbasin have declined dramatically during the past three decades. Peak escapement of spring chinook salmon to the Imnaha River was estimated at 3,459 adults in 1957; returns of natural origin fish have declined to levels below 150 individuals (ODFW 1998b). ODFW performed population modeling on the stock, based on return data from the early 1990s, and determined that without a supplementation program the natural population would continue to decline and would become extinct between 2030 and 2050 (ODFW 1998b). Recent redd counts have shown a significant increase in spawners, although the percentages of these that are wild spawners was not reported in the data (Table 3.2-5).

Members of the Grande Ronde Model Watershed Program (1994) conducted surveys along the mainstem Imnaha River to determine the cause and type of fish habitat problems within the Imnaha. The group determined that the natural dynamics of the river may preclude substantial use of the area by spring/summer chinook. A general lack of woody debris and related pool habitat partially may be due to the high hydraulic forces along the river. These conditions persist and continue to limit the amount of habitat available for spring chinook in the basin (Zollman 2002b, personal communication). Additionally, high summer water

temperatures below Freezeout Creek may restrict the upstream migration period and prevent extended summer use of the lower 30 miles of the river by juvenile chinook (Schwartzberg et al. 2001).

Table 3.2-4. Fish Species Currently Occurring in the Imnaha River Subbasin.

Common name	Scientific name	Native
Spring/summer chinook salmon	*Oncorhynchus tshawytscha*	X
Fall chinook salmon	*Oncorhynchus tshawytscha*	X
Summer steelhead	*Oncorhynchus mykiss*	X
Bridgelip sucker	*Catostomus columbianus*	X
Chiselmouth	*Acrocheilus alutaceus*	X
Longnose dace	*Rhinichthys cataractae*	X
White sturgeon	*Acispenser transmontanus*	X
Torrent sculpin	*Cottus rhotheus*	X
Leopard dace	*Rhinichthys falcatus*	X
Mottled sculpin	*Cottus bairdi*	X
Mountain whitefish	*Prosopium williamsoni*	X
Northern pikeminnow	*Ptychocheilus oregonensis*	X
Pacific lamprey	*Lampetra tridentata*	X
Rainbow trout	*Oncorhynchus mykiss*	X
Redband trout	*Oncorhynchus mykiss*	X
Peamouth	*Mylocheilus caurinus*	X
Redside shiner	*Richardsonius balteatus*	X
Paiute sculpin	*Cottus bildingi*	X
Shorthead sculpin	*Cottus confusus*	X
Bull trout	*Salvelinus confluentus*	X
Lampreys	*Lampetra* spp.	X
Largescale sucker	*Catostomus macrocheilus*	X
Speckled dace	*Rhinichthys osculus*	X
Smallmouth bass	*Micropterus dolomieu*	
Largemouth bass	*Micropterus salmoides*	
Yellow perch	*Perca flavescens*	
Sunfish	*Lepomis* spp	
Brown bullhead	*Ictalurus nebulosus*	
Common carp	*Cyprinus carpio*	
Channel catfish	*Ictalurus punctatus*	
White crappie	*Pomoxis annularis*	
American shad	*Alosa sapidissima*	

Source: Adapted from Mundy and Witty 1998.

Table 3.2-5. Estimate of Total Spring Chinook Salmon Redds in the Imnaha River Subbasin, 1964 -1995[1]; 1996-2002[2].

Year	Redd Count	Year	Redd Count	Year	Redd Count
1964	496	1977	241	1990	54
1965	391	1978	715	1991	99
1966	561	1979	85	1992	118
1967	447	1980	66	1993	384
1968	507	1981	162	1994	36
1969	556	1982	225	1995	32
1970	474	1983	178	1996	125
1971	738	1984	506	1997	216
1972	626	1985	245	1998	146
1973	909	1986	207	1999	119
1974	464	1987	156	2000	261
1975	281	1988	208	2001	635
1976	280	1989	74	2002	1111

[1]Source: Williams et al. 1998.
[2]Source: Keniry (2003, personal communication)

Fall Chinook
Although fall chinook salmon are present in the Imnaha subbasin, their abundance is much less than historic levels. Anecdotal accounts suggest that fall chinook may have used the lower 19.5 miles of the Imnaha mainstem for spawning, and generally did not occur above the town of Imnaha (Chapman 1940 as referenced in Bryson et al. 2001). Others contend that fall chinook spawning occurred as far upstream as the confluence of Freezeout Creek (Mundy and Witty 1998 as referenced in Bryson et al. 2001).

Documented occurrence of fall chinook spawners within the lower Imnaha have been shown through redd surveys since 1964. No occurrence of fall chinook spawning above Fence Creek has been observed in recent decades (Bryson et al. 2001). Due to the low escapement, the contribution of natural spawning to annual recruitment has not been demonstrated (Chapman and Witty 1993).

There is no fall chinook artificial production in the Imnaha River basin.

Steelhead — Steelhead population distribution in the Imnaha subbasin is generally similar to historic conditions. Although actual historic escapement data does not exist, it is estimated that prior to the construction of the four lower Snake River dams, up to 4,000 summer steelhead returned to the Imnaha subbasin annually (USACE 1975). In the absence of historic distribution data, it is difficult to determine which streams were inhabited by summer steelhead. However, the lack of residual rainbow trout above Imnaha Falls (RM 73) suggests that steelhead were likely restricted to all accessible areas downstream from this probable migration barrier (Mundy and Witty 1998, as referenced in Bryson et al. 2001).

Annual steelhead spawning surveys in the Imnaha are limited (U.S. Forest Service 1998a; 1998b). Current escapement estimates are based on data collected in Camp Creek, a tributary to Big Sheep Creek. Annual escapement of wild/naturally spawning fish has declined over the past three decades with recent estimates ranging from 300 to 1,000 adults (Bryson et al. 2001).

Currently, Imnaha steelhead maintain widespread distribution throughout most of the subbasin, and generally occur in all tributaries that do not have vertical falls near their mouths (Mundy and Witty 1998 as referenced in Bryson et al. 2001). About 397 river miles of summer steelhead spawning and rearing habitat have been identified in the Imnaha subbasin (U.S. Forest Service 1998a; 1998b).

Imnaha steelhead overwinter in the Snake River and move up the Imnaha during spring runoff conditions (March – April), when flows are at their peak. Juvenile out migrations are also driven by increased flows in spring, but juveniles may move up and down tributaries of the Imnaha at any time of the year, with pulses occurring in late summer. There is not a significant number of steelhead that overwinter in the Imnaha (Sankovich 2002, personal communication).

Bull Trout — In 1998, the USFWS listed the Klamath and Columbia River DPS of bull trout as threatened. Bull trout are currently listed as a species of critical concern in Oregon. Historical information regarding Imnaha River bull trout populations is limited. Unlike other salmonids, it is doubtful that bull trout occupied all accessible streams at any one time (U.S. Forest Service 2000), due to their current patchy distribution in even pristine, "stronghold" habitat types (Rieman and McIntyre 1995).

Both resident and fluvial forms of bull trout occur in the Imnaha subbasin. As with Grande Ronde bull trout, waterfall barriers usually isolate resident forms. Generally, most individuals that occur above Imnaha Falls are considered residents, while those occurring below the falls are considered fluvial (U.S. Forest Service 2000).

In the Imnaha River, bull trout populations are considered at "low risk" (Buchanan et al. 1997). Fluvial bull trout migrate upstream in June through August to escape summer warm waters and head to cooler spawning grounds. By September, most bull trout are upstream of the Imnaha Satellite Facility at unknown spawning sites where they often hold at the mouth of tributaries and wait for temperatures to drop to 7-9°C (Hanson 2002, personal communication). They out-migrate from their spawning areas in late September through November and head downstream, most likely overwintering in portions of the Imnaha, Grande Ronde and Snake rivers. Subadults, about two-three years of age, move out of the areas where they were spawned and move to overwintering sites, possibly within the Snake River (Sankovich 2002, personal communication).

Lamprey — Although lamprey abundance has dramatically declined in recent decades, not all Lampetra species have been extirpated from the subbasin. A population of non-anadromous brook lamprey occurs in portions of the Imnaha subbasin (Sankovich 2002, personal communication).

Numerous ODFW biologists have stated that, prior to the 1970s, Pacific lampreys existed in large numbers within the Imnaha subbasin (Jackson et al. 1996). Pacific lamprey populations went through a rapid decline after 1970, primarily due to human induced habitat degradation, over-fishing and the installation and operation of the hydroelectric dams that may have impacted adult migration and juvenile outmigration. Currently, Pacific lamprey is federally listed as a species of concern, but is considered extinct in the Imnaha subbasin (NPT 2001).

Redband and Rainbow Trout — It is likely that endemic populations have been steadily declining for decades due to habitat degradation from improper livestock grazing practices, stream channel manipulation and timber harvest (all of which tend to increase erosion, sedimentation and stream temperature as well as decrease the amount of large woody debris, stream bottom complexity and riparian vegetation). Additionally, **introgression** with hatchery rainbow trout and competition from introduced fish threaten the continued viability of redband trout in the Imnaha (Behnke 1992). As in the Grande Ronde subbasin, rainbow trout stocking in the Imnaha region has been reduced over the years due to concerns for competition with spring/summer chinook and concerns over potential redband introgression and subsequent genetic loss.

Mountain Whitefish — Information regarding mountain whitefish within the Imnaha subbasin is limited, but populations are likely doing well (Bryson et al. 2001). Mountain whitefish are members of the Salmonidae family and are closely related to salmon and trout. Indigenous to eastern Oregon, Mountain Whitefish are still found in their original distribution pattern, except where areas were chemically treated (ODFW 1996).

These fish have been an important food fish for humans and provide a variety of angling opportunities (ODFW 1996).

White Sturgeon — White sturgeon, a federally listed species of concern (Columbia Basin Fish and Wildlife Authority [**CBFWA**] 1999), occasionally use lower portions of the mainstem Imnaha (Wallowa County and NPT 1993) but do not likely inhabit the river for extended periods (Bryson et al. 2001).

Smallmouth Bass — The introduction of smallmouth bass into the Hells Canyon Hydroelectric Complex was accompanied by a subsequent expansion of the fishery into free flowing reaches of the Snake and Imnaha Rivers (U. S. Forest Service 1999). The development of the smallmouth population in free flowing environments warrants concern due to the fish eating and competitive behavior smallmouth exhibit toward salmonid species, particularly bull trout (Bryson et al. 2001).

3.2.1.4 Imnaha Subbasin Project Sites

Imnaha Final Rearing Facility and Imnaha Satellite Facility — Currently, most spring/summer chinook within the Imnaha subbasin spawn in the mainstem Imnaha from the Blue Hole to Crazyman Creek. These sites are upstream and downstream, respectively, of the existing Imnaha Satellite Facility. Some individuals have been observed spawning as far upstream as the lower reaches of the South Fork and as far downstream as Freezeout Creek (Witty 1964-1990).

A few spring/summer chinook salmon are known to spawn in Big Sheep and Lick Creeks. Most spawning in Big Sheep Creek occurs from RM 29.4 to RM 33.4. The majority of spawning in Lick Creek occurs in the lower 2.3 miles (Bryson et al. 2001; Smith 2003, personal communication).

3.2.2 Impacts Evaluation Summary

Impacts caused by specific activities are summarized and defined as either short-term or long term. Criteria used to define these impacts are:

- Short term impacts – those activities/operations that will disturb habitat, individuals and populations over a short temporal scale.
- Long-term impacts – those activities/operations that are anticipated to have effects to habitat, individuals and populations over a long-term temporal scale, potentially extending through the length of the project.

Where appropriate, impacts are evaluated over a spatial scale.

Since the spring/summer chinook life cycle spans across different ecosystems and subsequently, different locations over time, impacts were evaluated within different geographical and temporal scales. Some impacts, such as those related to construction of the facilities, are limited to the facility sites. Other impacts would be distributed over larger geographic areas. The impacts were evaluated for the following fish categories:

- Targeted chinook – those hatchery chinook produced by the NEOH program and the wild populations from which they are drawn or introduced.
- Non-targeted chinook – non-NEOH chinook originating within and outside the Grande Ronde and Imnaha subbasins encountered during out migration, in the ocean, or on the return to freshwater.

- Other salmonids and trout – steelhead, bull trout, cutthroat trout, and brook trout in the river systems occupied by the NEOH spring/summer chinook.
- Non-salmonids – all other fish species in the river systems occupied by the NEOH spring/summer chinook.

3.2.3 Consequences of the Proposed Action

3.2.3.1 Grande Ronde Subbasin

Table 3.2-6 summarizes the impacts on targeted chinook, non-targeted chinook, other salmonids and non-salmonids for construction, operations and ecological interactions as a result of implementing proposed projects in the Grande Ronde subbasin.

Table 3.2-6. Summary Results of Impacts for NEOH Program Proposed Action Components within the Grande Ronde Subbasin, including Lookingglass Hatchery, the Lostine Adult Collection Facility, and the Lostine River Hatchery.

Construction/ Operational Component	Fish Category			
	Targeted spring/ summer chinook	**Non-Targeted chinook**	**Other salmonids**	**Non-salmonids**
Siting and Construction of Facilities				
Site Disturbances	Impacts due to upland and in-water site disturbances from construction would have similar impacts to all fish species that may be present. Construction site disturbances are not anticipated to negatively affect population viability on a watershed scale. However, impacts to individuals may occur as a result of construction activities. • Sedimentation due to construction may impact water quality. Impacts would be temporary and short-term. • Increased impervious surface area may result in increased runoff. Impacts would be long-term but limited in spatial scale to the immediate receiving waters. • Construction noise may disturb individuals, causing them to disperse from the site. Impacts would be temporary and short-term. • Removal of **riparian habitat** may result in decreased shading habitat, which may displace individuals. Impacts would be long-term but limited in spatial extent.			
Channel Alterations	Impacts due to instream construction activities would have similar impacts to all fish species that may be present. Placement of permanent instream structures would result in a permanent loss of small amounts of instream and riparian habitat. • Cofferdams would alter stream flow upstream and downstream of the structure. Alterations may affect utilization of the immediate area by fish species, including migrating salmonids. Cofferdam placement would directly reduce instream habitat available in the immediate vicinity of the construction site. Impacts would be short-term and limited in spatial scale to the site and construction impact area. • Increased human presence and activity may disturb fish species and cause them to disperse from the immediate construction area. Impacts would be short-term and limited in spatial scale to the site and construction area. • Placement of intake, outfall, weirs, ladders and riprap structures would alter or remove instream habitat, causing individuals to seek other available rearing, holding, or migratory habitat. Impacts would be long-term, but limited in spatial scale and are not anticipated to affect population viability.			

Construction/ Operational Component	Fish Category			
	Targeted spring/ summer chinook	**Non-Targeted chinook**	**Other salmonids**	**Non-salmonids**
Siting and Construction of Facilities				
Water Gains and Losses	• Although water diversions would be non-consumptive, all species may be affected by withdrawals. Withdrawals would reduce instream habitat availability and may result in decreased utilization within the diversion reach during peak diversions and instream low-flow conditions. To protect in-stream habitat, minimum or acceptable flow, or pump-return, strategies have been developed for the facilities. • These impacts would be long-term but limited to the immediate diversion reaches. Withdrawals may affect individuals but are not anticipated to affect the population viability on a watershed scale.			
Water Quality	• Discharged organic waste materials or chemical therapeutants would meet applicable state or federal standards. The potential for long-term impacts due to these discharges is therefore low. • Water temperature of discharge water would be at ambient temperature. No impact to individuals or populations is anticipated to occur.			
Fish Traps, Ladders, and Weirs	Individuals and the populations would benefit in the long-term from improved passage and collection facilities. Individuals may be delayed in upstream and downstream migration by the new ladder at the Lostine Hatchery intake site. Individuals and populations are anticipated to benefit from improved passage to the Adult Collection site versus the no action – existing condition alternative. Effects would be long-term.	• Individuals would be impacted by installation of weirs, ladders and traps within the Lostine River. Although species would likely pass upstream or downstream through the ladders with little difficulty, some delay is anticipated, and handling, when it occurs, may stress individuals. • Improved upstream passage is anticipated to occur at the Adult Collection site. Downstream passage would improve as compared to existing conditions during extreme low flow conditions as water would be consolidated and routed through the ladder maintaining deeper flowing water. • Effects at the Adult Collection site would be long-term over a limited spatial scale of the Lostine River. Individuals and populations are anticipated to benefit from the proposed action over the no action – existing condition alternative.		
Broodstock Collection and Maintenance	Spring chinook would benefit in the long-term from improved broodstock collection and holding facilities, resulting in less stress and pre-spawning mortality than obtainable with existing facilities.	• Non-target individuals may be affected over the long-term by additional handling associated with broodstock collection handling and sorting. • Negative impacts to population viability over the long-term are not anticipated.		

Construction/ Operational Component	Fish Category			
	Targeted spring/ summer chinook	**Non-Targeted chinook**	**Other salmonids**	**Non-salmonids**
Siting and Construction of Facilities				
Incubation and Rearing Practices	Decreased rearing densities and reduced hauling trips/time would be beneficial for NEOH spring chinook over the long-term. It is anticipated that increases in survival and improved **homing** to natal streams would occur. Population viability is anticipated to increase in the long-term.	No impact	No impact	No impact
Fish Health Maintenance	• Intensive fish health monitoring strategies would benefit all salmonids over the long-term and result in less potential for the spread of disease. • Decreased rearing densities would benefit individuals over the long-term by reducing the potential for the spread of disease within the hatchery population and, in turn, wild salmonid populations.			No impact

Lookingglass Hatchery — Currently, Lookingglass Hatchery (shown in Figures 2-2 and 3.9-1) rears stock from the Grande Ronde River, Catherine Creek, the Lostine River and the Imnaha River. Under the proposed program, production would remain the same for Catherine Creek and Grande Ronde stocks, but the Lostine stock would no longer be transferred to Lookingglass for spawning. Some portion of the Imnaha stock may continue to be reared at Lookingglass under the "spread the risk" approach to offset a facility-wide disease or system failure, should it occur, but the majority would be reared elsewhere.

With the implementation of the Proposed Action, the number of smolts reared at Lookingglass Hatchery would decrease, providing more rearing space and better rearing densities, and ability to meet NATURES criteria. Overall impacts of the proposed improvements at Lookingglass Hatchery are beneficial to spring/summer chinook with no impact to low impact to water quality, quantity and other species.

Site Disturbances
Modifications to existing facilities at Lookingglass Hatchery (building improvements and construction, upgrades to power supply, and new raceways) would involve upland work that would take place where ground has previously been disturbed within the existing site boundary. Construction of three raceways against the toe of a banked hill east of the existing raceways would entail excavation, which would result in the removal of some herbaceous vegetation. The removed soil would be used elsewhere on-site.

These modifications would disturb the ground and increase the amount of impervious surface area at the site. Silt erosion control devices would be used during construction of the bay pole building. Construction

activities would occur away from the creek bank and any increase in sediment due to upland site disturbance would be minimal and temporary and is not expected to exceed the creek's sediment load capacity.

An additional power line would be installed on existing poles along the access road adjacent to the creek, and may result in temporary disturbance to the normal activity of salmonid and resident fish individuals within the creek, both adjacent to and downstream from the site. This activity is not likely to impact population viability.

Upland construction at the facility would be scheduled around facility operations to minimize hatchery fish disturbance.

Channel Alterations
No instream construction is proposed.

Hatchery Operations and Management
Water Gains and Losses: Lookingglass Hatchery has an existing water right for diversion of up to 42 cfs from the creek. Currently, peak use does not exceed 35 cfs (Lund 2003, personal communication). Water management practices and fish production changes with the proposed program could potentially reduce the surface water demand from Lookingglass Creek. Therefore, there would be no additional impact to the existing water balance at Lookingglass Hatchery.

Water Quality: Modifications to Lookingglass Hatchery would not alter existing water quality conditions. The amount of effluent could potentially decrease if fewer fish are reared at the facility, resulting in less discharge of wastewater from the facility. Facility discharges would continue to satisfy existing NPDES permit requirements.

Fish Traps, Ladders and Weirs: No modifications to existing fish ladders or weirs are proposed. Existing passage issues for salmonid species would be addressed under a separate project. Trapping, handling and tagging fish may result in mortalities, but these are not expected to exceed current mortality rates at the hatchery.

Broodstock Collection and Maintenance, Adult Holding and Spawning, Incubation and Rearing, Fish Health Management and Methods and Magnitude of Release: The Lookingglass Hatchery is an existing facility that has been in operation since 1982. Methods of broodstock collection, adult holding and spawning, incubation and rearing practices, and release methods are described in the HGMP for Grande Ronde Basin Spring/summer Chinook Program (ODFW 2002). Modifications to the existing facility would not result in additional impacts to spring/summer chinook populations. The modifications would generally benefit the target species by allowing the implementation of practices that are reflective of NATURES criteria.

To more accurately describe the NATURES criteria incorporation, items proposed for implementation include:

- Provide for low-density rearing.
- Design lighting system to mimic photoperiods in the early rearing building. This would be accomplished by using a combination of special lighting and windows.
- Use a dark color for the early rearing troughs.
- Provide automatic feeders.
- Limit human contact.

- Incorporate natural diet training such as live food introduction to the rearing vessel.
- Provide structure in the raceways to support introduction of natural cover such as Christmas trees or tree branches.
- Provide baffling to create varying flow patterns and backwater conditions.
- Incorporate system to allow varying degree of sunlight penetration to the water surface.
- Provide coloring of the final rearing raceways concrete to mimic the natural riverbed colors to the degree feasible.
- Provide volitional release from each final rearing raceway.

As the design process proceeds, the hatchery managers (tribal and agency project sponsors) would continue to monitor other facilities, which have implemented NATURES criteria and take advantage of the experience and findings at these proposed facilities.

Lostine Adult Collection Facility — Modifications to existing facilities and construction of new structures at the Lostine Adult Collection Facility (Figures 2-3 and 3.9-2) would involve mostly instream and riverbank work that would have physical impacts related to channel alterations to improve the fish ladder passage system.

Site Disturbances
Site disturbances would result in the removal or disturbance of about 300 feet of riparian vegetation on the west bank of the Lostine Adult Collection Facility site and placement of fill and riprap to construct a levee. Existing side channels that occur west of the proposed levee site would be routed under the levee (with french drains) for continued discharge into the Lostine River. A temporary access road to the levee site may also be required.

Best management practices to reduce sedimentation from construction activities are incorporated into the Proposed Action. However, construction activities may still result in a temporary increase in sediment and runoff to the Lostine River. According to Waters (1995), most such construction projects, done essentially at a point on a stream, will have temporary effects. If subsequent flows within these river systems are high enough to scour away light deposits, as is the case in the Lostine, invertebrates and fish will generally repopulate quickly (Waters 1995). The anticipated amount of sedimentation would not alter the channel configuration or exceed the river's ability to carry sediment. A river's ability to carry sediment depends on two things: competence and capacity. Competance is the ability of a stream to move large particles and depends on velocity. Capacity is how much load a stream can carry and depends on discharge of stream.

In each case of facility construction, the subject rivers are likely capable of carrying the estimated sedimentation from construction activities downstream through flow predicted during the proposed construction windows (this prediction is simply based on recorded Mean Monthly Flows). If sedimentation exceeds the stream's ability to carry and disperse it downstream, it will settle out and may cause increased impacts until the next high flow event. Excess sediments will be washed downstream following the first storm event.

Channel Alterations
Instream work to remove portions of an existing fish ladder; install a hydraulic velocity barrier and fish ladder, trap and hopper; place large rocks for channel protection; and replace the existing bridge and abutments would result in alterations to the existing channel. All instream work would take place in one construction season during ODFW's instream work window of July 1 – July 31.

Installation of the new fish ladder and trap would require the placement of a cofferdam, and associated dewatering structures to isolate the construction area. Portable pumps would maintain a dry work area and pump discharge would be routed through an upland sediment-settling basin prior to discharge into the Lostine, downstream of the construction site. Installation of the new ladder would occur on the west bank of the Lostine, behind an existing riprap bank. Excavation of a portion of the west riverbank would be necessary to install the new fish ladder.

Removal of both the most upstream and downstream existing concrete sills would be accomplished with a backhoe mounted jackhammer, followed by removal with an excavator. Jackhammer use would produce noise and inwater vibration that may disrupt fish behavior or displace species both upstream and downstream of the area. The remaining sills would be kept in place and allowed to fill naturally with river bedload gravel over time would create a more natural **substrate** for fish species.

During construction of the velocity barrier, most of the river water would be routed through the new fish ladder (during operation, the ladder would pass most water during low flow periods in August and September; water would flow instream during higher flows). Installation of the flow velocity barrier would require the construction of concrete walls and removal of about 20 feet of the bank, including a small amount of existing riparian vegetation. The impact of riparian vegetation removal on shading habitat is expected to be minimal because the majority of canopy trees would remain in place and much of the area to be disturbed has been previously riprapped. Installation of the velocity barrier and levee would have minimal impact on river hydraulics, both upstream and downstream from the site. The proposed levee and velocity barrier would not affect the overall river hydrograph.

The proposed levee, composed of fill and riprap, would be constructed on the west bank of the river to protect the bank and site from damage during high flows and to minimize erosion. Construction of the levee would isolate small side channels returning to the Lostine in this area. French drains would convey river and on-site spring water to the Lostine River, but habitat for juvenile chinook (and potentially bull trout) would be lost. The amount of habitat loss would not impact the populations of listed species within the watershed.

Cofferdam placement and use of the new fish ladder for passage would result in a temporary reduction in available habitat for fish that reside within the river or that are migrating upstream or downstream during the construction period. Diverted flow is not expected to affect water temperatures. Adult steelhead overwinter in the Snake and lower Grande Ronde and migrate up the Lostine in March and April, while juveniles emigrate in late spring (Sankovich 2002, personal communication). While most adult steelhead would therefore not be impacted, potential **kelt** downstream migrants may be affected by construction activities. Rearing juvenile steelhead move up and down the Lostine at all times of the year, with pulses occurring in spring, outside of the construction window. Both adult and juvenile chinook use the Lostine during summer months when instream work would occur. Adult bull trout are known to migrate up the Lostine in June through August, during the proposed instream work window. Smolt emigration occurs in late fall, and would not be impacted by instream construction. Delays to chinook and bull trout passage may occur both upstream and downstream of the site due to the presence of the cofferdam and rerouting of river flow. Daily monitoring during construction activities would determine if salmonid passage, both upstream and downstream of the cofferdam, is impacted by activities. If adverse impacts to passage are observed, fish biologists would consult with federal and state fisheries managers to determine an appropriate action to assist in the passage of individuals. This may include manual transfer of fish to areas upstream or downstream of the construction area. Impacts would be temporary and would be limited to one instream work window.

Hatchery Operations and Management

Water Gains and Losses: During operation of the collection facility, no Lostine River water would be permanently diverted. Water losses and gains would remain the same as existing conditions after installation of the new fish ladder, levee and flow velocity barrier. However, during periods of low flow (September,

near the end of operation), most river water would be diverted through the fish ladder. This could potentially impact species use at the reach as usable habitat would be altered for a short river segment, extending approximately 150 feet from the centerline of the entrance to the centerline of the release channel. The release channel is extended upstream of the velocity barrier crest to ensure that the release point is far enough upstream to prevent fallback over the barrier.

Water Quality: Because the proposed adult collection facility's function is to collect fish and not to hold and rear, no discharges of organic or chemical pollutants are anticipated. Sediment from the fish ladders would be removed and disposed of at appropriate upland locations.

Fish Traps, Ladders and Weirs: The fish ladder, trap and hopper would be equipped so that managers may collect returning hatchery adults on an as-needed basis. The take rate within the Lostine River is on a sliding scale, based on the number of returning adults in that season. The Lostine Collection Facility would be in operation from early April through September and the trap would be checked daily. The exit from the ladder would be far enough upstream to prevent the majority of adults from dropping back over the velocity barrier, requiring them to pass through the collection system/ladder again. Non-targeted salmonids such as steelhead and native trout would be released from the traps and allowed to continue upstream within 24 hours of trapping. Trapping, holding, weighing, measuring and tagging trapped fish could result in some mortality, but occurrences are isolated and not expected to impact spring/summer chinook populations within the river. At the end of adult collection, the trapping equipment would be removed and the structure would function only as a ladder for fish passage.

During periods of critical low flow, all Lostine River water would be diverted through the ladder, which may impact fish use and behavior. Juveniles may be present for rearing upstream or downstream of the facility and may be impacted during low flow periods. During periods of critical low flow most river water would be diverted through the collection ladder. This could alter the way in which fish use this section of the river. Behavior may be altered as some fish may be delayed in seeking the ladder entrance, however, attraction flow should minimize disruption of upstream movement by allowing fish sufficient flow and depth for migration. Passage of adults would be improved using the new ladder system as opposed to the existing system that operates ineffectively in periods of low flow. Juveniles, if they are present at this time, would seek the main flow of the river and would pass downstream through the ladder. Some temporary delay may occur as fish encounter the ladder structure but it is anticipated that flows would sweep them through the ladder for continued migration.

A potential risk of the velocity barrier is to change the habitat use of spawning salmonids. The velocity barrier and trap facilities have the potential to impede or delay spawning migrations of bull trout and chinook and potentially cause fish to spawn below weir sites. There is limited available spawning habitat downstream of the weir site, with most of the prime spawning habitat located upstream. However, the velocity barrier is anticipated to enhance fish passage for all species over a wider range of river flow conditions. To minimize outmigrant effects, the flow velocity barrier would maintain a pool depth of about three feet and river flow would pass through the ladder. To ensure protection of fish species, the Proposed Action includes daily monitoring of the barrier, when in operation. Additionally, cleaning of weirs and checking downstream areas for remnant spawners is included in the Proposed Action. Close monitoring of spawning distribution above and below the weirs would be part of the NPT's on-going annual spawning surveys. Adjustments to adult collection strategies would occur if adult distribution becomes a problem (BIA 1998). Strategies to improve distribution of spawners may include decreasing the number of spawners collected, which would in turn affect that season's production.

Broodstock Collection: Fish that are trapped for broodstock would be hauled by a tanker truck upstream to the proposed Lostine River Hatchery for spawning. Since this facility would function only as a collection

site, no other production operations apply. Collected spawners would be transferred about four miles upstream to the proposed Lostine River Hatchery.

Lostine River Hatchery — The proposed Lostine River Hatchery (Figures 2-4 and 3.9-3) would fully support the Lostine River spring/summer chinook program by holding 250,000 Lostine River smolts from spawning through final rearing and release. Additionally, the hatchery would be designed to hold 100 percent of the Imnaha River spring/summer chinook program (490,000) from incubation to early stages of final rearing in September. For the initial years of the program, a portion of the Imnaha stock may be reared at Lookingglass. The facility would be designed so that the Imnaha stock would be reared at the Lostine River Hatchery once the facility has been successfully operational. See Table 3.2-7 for timing details for the proposed program. One benefit of the use of a hatchery on the Lostine is decreased hauling time for fish transported from Lookingglass. Under the current program, fish are transported four times with an estimated transport time of 14 hours. The fish are moved at critical life stages such as adults and as unfertilized eggs where higher rates of mortality have been observed. With the proposed program and the new facilities, the fish would be transported three times with an estimated transport time of five hours. The adults would be trapped, held, and spawned at the Imnaha Satellite Facility. Incubation to **eyed egg** stage prior to transport to the Lostine Hatchery would also occur. The length of transport time is significantly reduced since the fish are not moved outside Wallowa County.

Table 3.2-7. Lostine River Hatchery Conventional Broodstock Program for Lostine and Imnaha River Stocks (Operated Year-Round).

Lostine Stock		Imnaha Stock	
Life Stage	**Time Period**	**Life Stage**	**Time Period**
Fish collected at Lostine Adult Collection Facility	High flow collection from May – August 1 Low flow collection 15 July – October 1	Fish collected, held and spawned at Imnaha Satellite Facility	June - September
Lostine adults transferred, held and spawned at Lostine River Hatchery	May – October 1	Transport of Imnaha Satellite eyed eggs to Lostine River Hatchery	October - November
Incubation of Lostine stock eggs	August - February	Incubation and early rearing at Lostine River Hatchery	November - April
Final rearing of Lostine stock	April (year 1) – April (year 2)	Intermediate rearing	April – September (year 2)
Acclimation and release of Lostine stock	April (year 2)	Transfer of smolts to Imnaha Final Rearing Facility for final rearing prior to release from Imnaha Satellite	September (year 2)

Site Disturbances

Construction of the Lostine River Hatchery would have physical impacts that relate to site disturbances, channel alterations, and the placement of water intake, conveyance and discharge structures on previously undeveloped land. Construction activities would disturb the ground and add about three acres of impervious surfaces to the site, which may lead to increased or rerouted runoff and sediment carried into the river.

Increased runoff is expected to be short-lived and is not anticipated to exceed the river's ability to carry sediment or to change the river's substrate. Erosion at the hatchery site is expected to be minimal due to the relatively flat topography. Most upland construction activity would occur away from the river channel and would be managed by the use of erosion control devices, removal of the least amount of vegetation possible and revegetation of the site immediately following construction. Site disturbances may temporarily affect fish behavior and individual distribution during the construction phase. These affects are anticipated to be minimal and short-lived.

Channel Alterations/Water Intake and Discharge Structures
The Lostine River channel would be affected by the installation and placement of a surface water supply intake weir diversion structure and a fish ladder and outfall structure and riprap as described in Section 2.1.1. Construction and installation of in-water structures would take place over two seasons during ODFW's instream work window of July 1 – July 31. During the first season, the intake structure, fish ladder and associated pipeline would be installed. In the second instream work season, the weir would be constructed.

Installation of the intake would require construction of a cofferdam and the use of a dewatering system. The river would be diverted to allow for fish passage. About 100 feet of the riverbank would be removed for the placement of the intake, screens, fish ladder and pipeline. Riprap would be placed instream to stabilize the river channel around the intake and to minimize sedimentation. Upon completion of the intake and ladder, the cofferdam would be removed. Limited removal of overhead shading vegetation would occur during this process.

The weir would be installed during the project's second year instream work window. This structure would operate to pool water upstream of the intake to provide adequate water depth for the intake screens. To install the weir, a temporary cofferdam would be placed in the river to direct water into the previously constructed fish ladder. Large riprap and bolted anchors would be placed on the river bottom to help stabilize the substrate and the weir.

Construction of the outfall structure would require the excavation of about 150 cubic yards of bank material. About 35 cubic yards of basin cobbles would be placed around the outfall to stabilize the structure and prevent erosion and sedimentation. Operational scouring is not expected to be significant since the maximum outfall would not exceed 15 cfs, which is well within the channel's capacity (McMillen 2002, personal communication). River rocks occur under a thin layer of sediment and would provide a naturally occurring non-erosive substrate at the outfall. The outfall would be equipped with one-inch bar racks to prevent returning adults, which may cue into the hatchery discharge, from entering the outfall pipe. The velocity of the discharge would be too high for juveniles to enter the outfall pipe (McMillen 2002, personal communication).

Fill and riprap would be placed upstream and downstream within an existing meander side channel to protect the hatchery from flooding events that may cause bank erosion. The riprap would be placed stream-side of existing vegetation. In-channel habitat would be slightly altered, but original meanders would be maintained and riprap placement is not expected to affect instream flow or habitat use.

About 100 to 150 feet upstream and downstream of the river bank adjacent to the most northern well would be riprapped for flood protection and erosion control. This portion of the bank is prone to erosion and riprap would stabilize the channel at that section. Riprap would be placed on top of weedy herbaceous vegetation that does not currently function as shading habitat.

During construction, fish that inhabit the immediate area, including juvenile salmonids, may be displaced, and some mortality may occur, but it is unlikely. Juvenile bull trout would likely be farther upstream in July to avoid warm river temperatures, although both adult and juvenile bull trout are known to use this stretch of the

Lostine in the summer. As discussed in the Lostine Adult Collection Facility construction section, passage of migrating bull trout and chinook may be impacted temporarily during the July instream work window. Locally spawning chinook generally do not enter the area until later in the summer, but juvenile chinook are known to use this stretch of the Lostine in the summer. Summer steelhead complete spawning by July, and downstream moving kelts may be impacted.

Alterations to the river's hydrology due to placement of instream structures may occur, but would affect minimal amounts of habitat and are not anticipated to affect flow within the river. Rerouted water flow during construction is not anticipated to affect ambient water temperatures. Long-term impacts may include behavioral modifications and changes in the distribution of individual fish due to changes in upstream and downstream hydrology.

The amount of riparian vegetation to be removed at the intake, outfall and side-channel is not significant in relation to the amount of riparian habitat available upstream and downstream of the proposed facility site. Riparian vegetation at the side channel improvement location is limited to low-growing shrubs and herbaceous vegetation, which do not provide significant shading benefits. A limited number of trees may be removed from the outfall location. Fish would likely relocate to areas adjacent to the project site that have suitable riparian vegetation cover.

Hatchery Operations and Management

Water Gains and Losses: The Lostine River Hatchery would be in operation year-round. Surface water requirements for the facility are shown in Table 3.2-8. Diversion of surface water from the intake to the outfall structure would take place over a linear distance of 2,800 feet. For an average year, there appears to be adequate flow in the Lostine to accommodate hatchery demands, while leaving no less than 75 percent of the flow in the river. However, during dry and/or cold years, water demand of the hatchery may be 50 to 60 percent of the total flow in the river. Instream Flow Incremental Methodology (**IFIM**) studies have indicated that at low flow, summer conditions (September), the minimum hatchery flow requirement is 11.5 cfs, which represents about 22 percent of the average flow in September and 50 percent of the September low flow (Mongomery Watson Harza 2001a). This amount of diversion is necessary to support the hatchery during low flow periods and could potentially result in a decrease in the amount of instream habitat available.

Rearing juvenile anadromous salmonids, particularly steelhead and chinook, and resident species may use the reach during low flow periods and may therefore be affected by withdrawals. It is not likely that anadromous adults would be migrating upstream or downstream during September (Sankovich 2002, personal communication). Although prime chinook spawning habitat occurs just downstream of the proposed hatchery, where intake water would be returned to the river, local spawning habitat extends into the diversion reach (Zollman 2002b, personal communication; McMillen 2002, personal communication). Therefore, spawning chinook and their redds could potentially be affected by low flow. Juvenile bull trout and rapid turnaround spawners may out-migrate in September, but would likely remain higher upstream until Lostine River temperatures drop. Adult steelhead would be in the Snake River or arriving in the lower Grande Ronde during September (for overwintering) and would not likely be in the Lostine during that low flow period.

Low flows in the winter months are also a concern, since freezing temperatures and a lack of runoff can drop the river stage to 25 cfs or less. During these periods, water consumption at the hatchery can be reduced because fish activity and growth is near zero due to the cold water temperatures. To meet instream flow requirements for the bypass reach, the minimum water budget shown in Table 3.2-8 would be implemented in low flow years and/or hatchery effluent would be pumped back to the hatchery intake to supplement instream flows in the Lostine River. Freezing at this section of the Lostine River is an existing limiting factor for salmonid use during winter months.

Table 3.2-8. Surface Water Minimum Flow Strategy, Acceptable and Preferred Flow Index, and Mean Monthly Streamflow (cfs) for the Lostine River Hatchery.

	Jan	Feb	Mar	Apr	May	Jun	Mid Jul	Jul	Aug	Mid Sep	Sep	Oct	Nov	Dec
Minimum[1] flow strategy	2.5	2.7	2.7	3.1	0.9	2.4	3.7	7.0	11.2	11.5	3.9	2.6	2.2	2.0
Acceptable[2] flow index	6.2	6.7	6.7	8.2	0.9	4.6	7.0	14.4	14.3	15.3	7.5	6.2	6.2	6.2
Preferred [3] flow index	10.7	10.7	10.7	13.6	2.2	8.2	10.5	15.2	14.4	15.5	10.1	9.4	9.4	9.4
Mean Monthly Streamflows [4]	49.7	47.6	55.4	162	514	787	NA	384	86.4	NA	50.3	56.6	64.4	58.9

[1]Minimum flow strategy: minimum water required to maintain fish during low river stages.
[2]Acceptable Flow Index: provides an adequate rearing/holding environment based on NATURES technical memorandum
[3]Preferred Flow Index: provides an improved rearing/holding environment through higher turnover rates.
[4] Source: USGS 2003. USGS Gauge No. 13330000 on the Lostine River near Lostine, Oregon, water years 1912 - 2001.

In order to minimize instream impacts during low flow conditions within the bypassed river reach, a pump station would be installed to pump the hatchery effluent back, along with supplemental well water, to the intake. The pumped flow would be introduced at the bottom of the fish ladder to return river water near the point of diversion. The pump station has been sized so that, when low flow management strategies are implemented, it could transport the entire diverted flow back to the intake location. Therefore, flow alterations would not likely affect the viability of any fish population currently present, near or downstream of the Lostine River Hatchery at any time.

If the upstream intake structure cannot supply enough water for hatchery operations due to low flow or icing conditions, an emergency intake pump would be used near the north well location. The Lostine River does not regularly freeze in the vicinity of the north well (Zollman 2002b, personal communication) and surface water could be available for diversion year-round.

Operation of the prime production well may impact a nearby pond, a discharge stream channel and a side channel during low flows, but this channel is not used as spawning habitat. A seven-day test of the prime production well has shown no drawdown from the Lostine River (McMillen 2002, personal communication).

Water Quality: Discharges would meet applicable federal and state standards, and would satisfy NPDES permit requirements for aquaculture facilities though they would constitute a new source of water quality impact. Important physical properties and chemical constituents in hatchery effluent would be routinely monitored to assure compliance with water quality standards. Chemicals used to prevent or treat fish diseases would be handled, applied, and disposed of in accordance with applicable state and federal regulations.

Effluent pumped back to the base of the fish ladder via a return pipeline would have levels of solids below current NPDES permit requirements, due to low density rearing. Effluent during cleaning operations would be routed to a cleaning waste basin, where solids would settle and be collected and then disposed of in a local landfill or other permitted disposal site.

Water discharged from the Lostine River Hatchery could be cooler than the receiving river water if chillers are used to maintain incubation and early rearing temperatures in the hatchery below-ambient temperatures. Water released would mix rapidly with the river water downstream of the facility. Temperature changes would therefore be minor and are not expected to impact fish species.

Effluent discharge from the Lostine River Hatchery may disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the site, but the overall impact is not anticipated to affect populations on a watershed scale.

Fish Traps, Ladders and Weirs: Upstream and downstream passage at the intake would be accommodated by a fish ladder. This type of ladder provides for good attraction flow. Juveniles and adults would move through the ladder in periods of low flow, as most flow would be directed through the ladder during those periods. The return effluent pipe (used to return intake water to the bottom of the fish ladder during periods of low river flow) would be fitted with a diffuser screen that would reduce the discharge velocity to less than one foot per second, to prevent fish from being falsely attracted to the discharge (Bell 1991).

During spring runoff, the weir would be submerged or level with the water surface, allowing fish to pass directly upstream or downstream over the weir. During periods of extreme low flow, the weir may block or delay passage of migrating fish. As previously discussed, summer low flow occurs in September, when most migrating salmonids have passed the Lostine River Hatchery site. Winter low flow periods, occurring primarily in February, may delay adult steelhead migration if low flow continues into March and April. However, steelhead begin to move upstream in response to higher flows, and would not likely be impacted by winter low flows. Downstream migrants, such as steelhead kelts, rapid-turnaround bull trout spawners and bull trout sub-adults, may collect at the weir as they search for passage. Spring/summer chinook yearlings generally move downstream in early summer, and passage is not likely to be affected. Monitoring of the weir would be conducted in low flow periods to observe passage conditions. Corrective measures to encourage the survival of naturally reproducing adults would be applied should passage problems occur with the weir. Corrective measures could include reducing the amount of water diverted into the intake (*i.e.* minimum, acceptable strategies as opposed to the preferred strategy), which is part of the Proposed Action. Other measures, not specifically identified as part of the proposed action may include physical movement of migrants passed the weir.

Although lamprey are considered to be extirpated from the Lostine, reintroduction efforts may eventually be successful in returning them to the system. The pool and weir fish ladder would be designed to accommodate lamprey passage. Such designs could incorporate rounded corners within the structure to allow for safe passage of the species.

Broodstock Collection and Maintenance: Adult spring/summer chinook salmon to be reared at the Lostine River Hatchery would be trapped at the Lostine Adult Collection Facility, approximately four miles downstream, and at the existing seasonal picket weir in the lower Lostine. Care would be taken to collect individuals from throughout the spawning run to represent a full genetic complement of individuals within the run. This would preclude a potentially large contribution to subsequent generations from a small segment of the parent population.

Risks associated with salmon supplementation through the use of hatchery-produced juveniles have been identified by Cuenco et al. (1993) and Waples et al. (1991), among others. Potential negative effects to wild populations from hatchery-reared individuals may occur if interbreeding between hatchery and wild fish occurs. Negative effects may include outbreeding depression, which may result in reduced fitness of offspring and therefore reduced reproductive potential. To minimize these risks, local broodstock, which are adapted to local environmental conditions and may contain gene complexes reflecting such adaptation, would be used annually. A distinct “hatchery” population would not be created. Genetic divergence between the hatchery and wild run components is not intended.

Genetic risks resulting from potential interbreeding of hatchery and wild fish have been identified and taken into account in program planning and are far outweighed by the demographic risk of extirpation associated with the current low abundance in the wild spawner populations of recent brood years in the 1990s to present.

Adult Holding and Spawning: Spawning fish in a hatchery entails risks that may affect natural populations. Typical pre-spawning mortality under the current program is almost 20 percent (Ashe et al. 2000). Under the current program, adults collected at the Lostine River are transported to the Lookingglass Hatchery, which is more than five times the distance of the proposed Lostine River Hatchery. Holding and spawning of collected adults at the Lostine River Hatchery would likely result in less stress on transported fish. Therefore, the proposed Lostine River Hatchery would likely benefit fish that are currently trapped at the Lostine River. Although individual mortalities may occur, overall abundance of spring/summer chinook is expected to increase by the supplementation program.

Incubation and Rearing Practices: Rearing conditions can strongly influence the physiological, **morphological** and behavioral characteristics of hatchery fish, which, in turn affect the magnitude and types of interactions between hatchery and wild fish. **Pathogen** free, silt free well water would be used for incubation to ensure maximum survival and minimize potential loss from disease and early rearing. To mimic the various characteristics of their wild counterparts during incubation, darkness (simulates shading) and substrate are planned for use as outlined in the NATURES criteria. Improvements in post-release survival of hatchery-reared chinook (results are limited to the conditions and populations at specific research sites) have been documented using NATURES techniques, such as colored substrate and shading (Maynard et al. 1996, Maynard and Flagg 2001; Maynard et al. 2001; Berejikian et al. 2000).

Fish Health Management: Co-managers have developed fish health monitoring protocols for the Grande Ronde and Imnaha broodstock program (ODFW 1996). The goals of the activities occurring under this program are to: 1) provide healthy and robust hatchery smolts whose survival will not be impaired by health constraints; and 2) conduct the fish health program such that it integrates concerns for both natural and hatchery populations to minimize infectious disease interactions between both populations.

Fish health monitoring objectives for the NEOH project, as presented in Ashe et al. (2000), include the following practices:

- Monitor adult mortalities and spawned adults for presence of viral, bacterial, fungal, and parasitic agents.
- Conduct monthly monitoring of hatchery-reared juveniles to assess presence of viral, bacterial, fungal and parasitic agents.
- Monitor preliberation of hatchery-reared smolts annually.
- Conduct examinations at all life stages when unusual loss or anomalies occur to determine cause of loss and recommend preventative and therapeutic treatment.

Fish health procedures used for disease prevention and treatment can be found in the Master Plan (Ashe et al. 2000).

Fish rearing practices, waste removal and treatment of disease outbreaks within the hatchery would help maintain acceptable fish health and reduce risk of pathogen amplification.

Methods and Magnitude of Release: The magnitude and methods of release of hatchery fish affect the frequency and kinds of interactions between hatchery and wild fish. The timing of hatchery releases would

consider the availability of local resources so as to avoid overwhelming the available rearing habitat and resources. Spring/summer chinook fry releases would be scheduled for times when food and temperature conditions favor rapid growth and emigration. Spring/summer chinook presmolts would also be released near the end of the growing season to minimize competition with wild fish.

The Lostine River Hatchery would use the volitional release strategy where fish would be released directly from their rearing containers into the Lostine River. The use of the volitional release strategy assumes that fish would exit the rearing units over an extended period of time, thus spreading their impact on natural biota over time. To minimize competition between wild and hatchery stocks, smolts from the Lostine River Hatchery may also be transported upstream of the facility and scatter-point released directly into the river. This method would minimize competition within the immediate area of the hatchery by reducing the density and loading of the system in the immediate vicinity of the hatchery. Less fish means less competition for resources, including space, food and cover. Also, release of smolting fish reduces in-river residency time, as these fish are cued into actively migrating.

The impact on the spring/summer chinook populations is likely to be beneficial as this recovery project intends to increase the population status and trends over time. Impacts to other species of fish, including other salmonids, may occur through natural competition if the supplementation program returns enough spring/summer chinook to allow them to once again become the most prevalent inhabitant of the river system.

3.2.3.2 Imnaha Subbasin

Table 3.2-9 summarizes impacts to fish species in the Imnaha River subbasin.

Table 3.2-9. Summary Results of Impacts for NEOH Program Proposed Action Components within the Imnaha Subbasin, including the Imnaha Final Rearing Facility and the Imnaha Satellite Facility.

Construction/ Operational Component	Fish Category			
	Targeted spring/ summer chinook	**Non-Targeted chinook**	**Other salmonids**	**Non-salmonids**
Siting and Construction of Facilities				
Site Disturbances	Impacts due to upland and in-water site disturbances from construction would have similar impacts to all fish species that may be present. Construction site disturbances are not anticipated to negatively affect population viability on a watershed scale. However, impacts to individuals may occur as a result of construction activities. • Sedimentation due to construction may impact water quality. Impacts would be temporary and short-term. • Increased impervious surface area may result in increased runoff. Impacts would be long-term but limited in spatial scale to the immediate receiving waters. • Construction noise may disturb individuals, causing them to disperse from the site. Impacts would be temporary and short-term. • Removal of riparian habitat may result in decreased shading habitat, which may displace individuals. Impacts would be long-term but limited in spatial scale.			

Channel Alterations	Impacts due to instream construction activities would have similar impacts to all fish species that may be present. Placement of permanent instream structures would result in a permanent loss of small amounts of instream and riparian habitat. • Cofferdams would alter stream flow upstream and downstream of the structure. Alterations may affect utilization of the area by fish species, including migrating salmonids. Cofferdam placement would directly reduce instream habitat available in the immediate vicinity of the construction site. Impacts would be short-term and limited in spatial scale to the site and construction areas. • Increased human presence and activity may disturb fish species and cause them to disperse from the immediate construction area. Impacts would be short-term and limited in spatial scale to the site and construction areas. • Placement of intake, outfall, weirs, ladders and riprap structures would alter or remove instream habitat, causing individuals to seek other available rearing, holding or migratory habitat. Impacts would be long-term, but limited in spatial scale and are not anticipated to affect population viability.			
Facility Operations and Management				
Construction/ Operational Component	**Targeted spring/ summer chinook**	**Non-Targeted chinook**	**Other salmonids**	**Non-salmonids**
Water Gains and Losses	• Although water diversions would be non-consumptive, all species may be affected by withdrawals. Withdrawals would reduce instream habitat availability and may result in decreased utilization within the diversion reach during peak diversions and instream low-flow conditions. To protect in-stream habitat, minimum or acceptable flow strategies have been developed for the facilities. • These impacts would be long-term but limited to the immediate diversion reaches. Withdrawals may affect individuals but are not anticipated to affect the population viability on a watershed scale.			
Water Quality	• All discharged organic waste materials or chemical therapeutants would meet applicable state and federal standards. The potential for impacts due to these discharges is therefore low. • Water temperature of discharge water would be at ambient temperature. No impact to individuals or populations is anticipated to occur.			
Fish Traps, Ladders, and Weirs	Individuals and the population would benefit from improved adult attraction and collection facilities at the Imnaha Satellite Facility. Reduction in delay time to enter the fish ladder is anticipated. Fall back and forced spawning below the weir are expected to be reduced. Effects would be long-term.	• Installation of the new Chiwawa weir is expected to benefit non-target species compared with existing conditions (No Action alternative). • Improved upstream and downstream passage during weir operation is anticipated. • Effects would be long-term and limited spatially to the upper Imnaha River.		

Broodstock Collection and Maintenance	Spring chinook individuals and the population would benefit from improved broodstock collection and holding facilities. A reduction in stress and pre-spawning mortality from that obtainable with the existing operational program and facilities is anticipated. Effects would be long-term.	• Non-target individuals may be affected by broodstock collection via handling, which may cause stress to individuals. This is an existing condition that would be improved with the implementation of the Proposed Action. • Negative impacts to population viability over the long-term are not anticipated.		
Incubation and Rearing Practices	Incubation facilities at the Imnaha Satellite Facility are anticipated to improve egg survival. Decreased rearing densities and reduced hauling trips/time would be beneficial for NEOH spring chinook over the long-term. Increases to survival and homing to natal streams is expected.	No impact	No impact	No impact
Fish Health Maintenance	• Intensive fish health monitoring strategies would benefit all salmonids and result in less potential for the spread of disease. • Decreased rearing densities would benefit individuals by reducing the potential for the spread of disease within the hatchery population and, in turn, wild salmonid populations.			No impact

Imnaha Final Rearing Facility — The proposed Imnaha Final Rearing Facility (Figures 2-6 and 3.9-4) would be constructed to provide early final rearing of 490,000 spring/summer chinook smolts incubated at the Imnaha Satellite Facility and intermediately reared at Lostine River Hatchery or Lookingglass Hatchery. The facility would operate from September through March for final rearing of smolts. See Table 3.2-10 for the proposed program summary. Ground water limitations may preclude incubation and early rearing at the Imnaha Final Rearing Facility. The proposed facility, in combination with the proposed Lostine River Hatchery, would reduce the need for extensive hauling of produced smolts and allow rearing in NATURES densities and natal waters.

Table 3.2-10. Proposed Imnaha Final Rearing Facility Broodstock Program (Operated September - March).

Life Stage	Time Period
Final rearing of Imnaha Satellite smolts	September – March
Transfer back to Imnaha Satellite for acclimation and release near spawning habitat	March

Siting and construction of the Imnaha Final Rearing Facility would necessarily be near the Imnaha River. Construction would have physical impacts that relate to site disturbances, channel alterations, and the placement of water intake, conveyance and discharge structures.

Site Disturbances
The upland infrastructure required to develop the site into a final rearing facility includes a headbox, raceways, water supply well, shop, residence, and ancillary support facilities. Construction of the proposed facilities would occur on undeveloped pastureland that is currently grazed by cattle. Construction would add about three acres of impervious surfaces to the site, which may lead to increased or rerouted runoff and sediment carried into the river. Increased runoff is expected to be temporary and is not anticipated to exceed a stream's ability to carry sediment away from the site. Associated best management practices to reduce sedimentation are part of the Proposed Action.

To protect the site from flooding, approximately three feet of fill would be placed on the upland side of riparian vegetation. Erosion control devices would be used during site raising to minimize sedimentation. The sites would be revegetated with native species, where appropriate, upon completion of construction.

Site disturbances may temporarily alter fish behavior and individual distribution during the construction phase. These affects are anticipated to be minimal and short-lived, and are not anticipated to affect listed populations on a watershed scale.

Channel Alterations/Water Intake and Discharge Structures
Instream work within the Imnaha River channel includes installation of a river intake structure with screens, outfall structure, by-pass pipeline and access bridge improvements. Installation of instream structures would take place within ODFW's instream work window of July 15 – August 15.

The intake structure would be located on the west bank of the river, about 1,200 feet upstream of the proposed outfall site. Installation of the structure would require the excavation of an existing rock abutment and the use of a fill cofferdam and two dewatering pumps. The pumps would discharge water through a sediment pond located within the upland meadow prior to being discharged back to the Imnaha River downstream of the construction area. The cofferdam is proposed for installation from the end of the existing irrigation channel and access road to about 50 feet upstream of the intake location. The river would be diverted to the east bank. Construction equipment would be driven across the pasture from the existing bridge to the cofferdam area via a temporary access road.

The first section (about 50 feet) of the surface water diversion pipeline would be imbedded below the water surface into the west bank via trenching, then mortared with rocks to mimic natural substrate. The remaining sections of the pipeline would be installed within an existing irrigation ditch, requiring the removal of some non-riparian vegetation. Installation of this pipeline could result in temporary increases in sediment, but erosion control devices would be in place to minimize sedimentation and contain it within the cofferdam area.

The intake fish screen would be placed on the upland portion of the site, about 600 feet downstream from the intake. Fish that entered the intake would be returned to the river via a fish bypass pipeline that originates at the screen site. A majority of the fish bypass pipeline construction would take place on the upland portion of the site. The outfall for the bypass line would be located on the west bank as close to the river surface as possible. To aid in returning fish to the river at the bypass outfall, a pool would be excavated at the base of the outfall. Fish may collect within this pool for short periods of time, but would eventually continue their migration.

The cast-in-place concrete outfall structure would be constructed concurrently with the intake. A small cofferdam and dewatering system would be used to install the outfall. The structure would require 200 cubic yards of riprap flood protection on the upstream and downstream sides of the bank.

The existing bridge, which is located about three feet lower than the **100-year flood** elevation, would be relocated upstream to an area above the 100-year floodplain. Concrete abutments would be placed bankside of the normal flow levels to minimize the need for dewatering. Abutments would likely impact a small amount of riparian vegetation and shading. Disturbed areas of the temporary bridge location would be revegetated. The outfall location has good shading habitat and the majority of shading vegetation would remain.

Impacts due to installation of the intake, outfall, by-pass pipeline and bridge abutments include short-term fish displacement and behavioral modifications. Immediate effects of construction may result in the displacement of some resident fish during placement and removal of the cofferdam and dewatering. Fish passage, specifically adult spring/summer chinook migrants, at the construction site would be impacted temporarily and delays may occur due to the presence of the cofferdams. Adult steelhead would not likely be present in the construction area during the instream work and are not likely to be affected by in-water activities. Late season bull trout migrants, both upstream and downstream, could be affected during the instream work window, depending on water temperatures during the construction year. Juvenile salmonids may potentially occur within the Imnaha during construction, although they are more likely to be higher upstream due to high water temperatures in August. Interruption of spring/summer chinook spawning and delays to bull trout may occur due to construction. Vigilant monitoring of the construction area would occur to observe passage conditions. If adverse passage conditions were observed, steps to minimize these impacts would occur. Project staff would consult with state and federal fisheries agencies to determine how to protect fish passage.

The west bank of the Imnaha would be altered by excavation and installation of instream structures. These alterations are minimal and are not expected to affect the flow of the river or instream habitat elements. Sedimentation may occur during construction, but the effects would be short-term and limited. Removal of riparian habitat is expected to be limited to the area of the intake pipeline, outfall and bridge abutments. The amount of riparian habitat affected by this removal is about 1600 square feet, which is negligible and would not affect the total shading habitat available. Riparian zones would be replanted with native vegetation. The land use change from a cattle pasture would encourage the reestablishment of more diverse native riparian vegetation along the riverbank and decrease some sedimentation.

Driving construction equipment on the rocky riverbed is not expected to result in change to the substrate. All construction equipment would be free of petroleum or hydraulic fluid leaks, and would be serviced outside of the riparian zone.

Hatchery Operations and Management

Water Gains and Losses: The Imnaha Final Rearing Facility would operate from September to March. Surface water requirements for the facility are shown in Table 3.2-11. Also shown in Table 3.2-11 are the mean monthly flows at the closest U.S. Geological Survey (**USGS**) gauge, located downstream of the facility

(USGS gauge 13292000). This gauge measures total flow from the Imnaha River, Big Sheep Creek and Little Sheep Creek. According to Ashe et al. (2000), Big Sheep Creek is the largest tributary to the Imnaha River and drains an area of 342 square miles. Based on the drainage area of the Imnaha, Oregon gauge (622 square miles, including the 342 square miles from Big Sheep Creek), flows from Big Sheep and Little Sheep Creeks are about 55 percent of the flow at the gauge, while flows from the Imnaha River are about 45 percent of the total flow. Therefore, the adjusted mean monthly flows shown in Table 3.2-11 represent about 45 percent of the total flow at the downstream gauge, the portion attributable to the Imnaha River alone. Adjusted flows for September and October reflect more than 45 percent of the gauge flow as they are corrected for irrigation withdrawals of 120 cfs water right, which is likely fully used in the summer (R. Zollman, personal communication), for Big Sheep and Little Sheep Creeks. Irrigation withdrawals within the Imnaha River are insignificant (Ashe et al. 2000).

The water budget has been designed to adjust the facilities water requirements based on instream flow from year to year, as shown in Table 3.2-11. The "preferred NATURES" criteria provides an improved rearing/holding environment through the use of higher pond turnover (complete exchange of pond water) rates. The "acceptable NATURES" water strategy, provides an adequate rearing environment, but reduces the amount of water withdrawal and thus reduces turnover rates.

The maximum flow required for rearing at the Imnaha Final Rearing Facility is about 23 cfs, based on the "preferred" NATURES criteria flow scenario. This flow would be required for a short period of time (late February through March) during the transition period of rearing when smolts are on hand. Water use would be non-consumptive; all water withdrawn would be returned to the Imnaha River.

In addition to the water required for rearing, about 10 cfs would be diverted through the intake to operate the fish screening and bypass pipeline. This diversion would take place over the first 600 feet of the total 1,200 feet of diversion from the intake to the outfall. The total diversion at peak usage, therefore, would be about 33 cfs (March) for about 600 feet, and about 23 cfs for the remaining 600 feet to the outfall. During critical low flow years, this water diversion scenario could negatively impact habitat use when the maximum diversion is desired at the facility. Implementation of the "acceptable" rearing criteria surface water withdrawals would then occur.

Table 3.2-11. Surface Water Acceptable and Preferred Rearing Scenario Requirements, Imnaha River Gauge Flows and Adjusted Imnaha River Mean Monthly Streamflow at the Imnaha Final Rearing Facility (cfs).

	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Acceptable[1] NATURES criteria requirements	9.8	10.5	11.4	11.4	11.4	12.3	14.5
Preferred[2] NATURES criteria rearing requirements[3]	14.3	16.3	16.3	18.3	18.3	18.3	22.6
Flows at gauge 13292000[4,]	145	158	185	214	212	243	414
Adjusted Mean monthly streamflows	119[5]	125[5]	83	96	95	109	186

[1]Acceptable criteria: provides an adequate rearing/holding environment based on NATURES technical memorandum
[2] Preferred criteria: provides an improved rearing/holding environment through higher turnover rates.
[3]Does not include the 10 cfs required for operation of the fish bypass line. For each month, an additional 10 cfs would be diverted approximately 600' from the intake to the fish bypass return line. The remaining facility water would then be routed to the facility and then to the outfall. The distance from the bypass to the outfall is an additional 600'. See site plan.
[4] Source: USGS 2003. USGS Gauge No. 13292000 near Imnaha, Oregon, water years 1928 - 2001.
[5]Assuming 100% utilization of the 120 cfs water right on Big Sheep and Little Sheep Creeks in September and October.

Peak water diversion in February and March, and withdrawals during low-flow periods (September – October) may adversely affect fish passage through the diversion reach at the Imnaha Final Rearing Facility. The majority of migrating bull trout would be in cooler, upstream waters in September and would move downstream in the late fall when low flow would not impact outmigration. Rapid turn-around bull trout spawners may encounter low flow conditions, depending on water temperatures during each season. Steelhead do not occupy the mid-Imnaha in the fall and winter, but begin upstream migration in early spring (March – April). Early steelhead migrants may be present during the final stages of operation at the Imnaha Final Rearing Facility, when the maximum amount of surface water is diverted (about 33 cfs from intake to fish bypass; then about 23 cfs from bypass to outfall). Therefore, delays to migrating steelhead may occur if flows are low during this period. Monitoring would be performed to determine the affect on passage of migrating salmonids. If passage problems are observed, program changes would occur. These may include reducing the required amount of water at facilities to allow for more instream flow, or physical passage of species upstream.

The Imnaha Final Rearing Facility would begin operation during spring/summer chinook spawning in September when water levels are low; however, most spawning occurs upstream of the facility. If spawning habitat is negatively impacted due to diversion during periods of low flow, modifications to the water management strategy would be implemented. The "acceptable" water strategy, which reduces the amount of water withdrawal could be used if impacts to spawners, caused by low flows, are observed.

Rearing juvenile chinook and resident fish may be affected by water diversion, but impacts would occur over a brief period of time and are not expected to affect long term population trends or individual distribution.

Icing conditions at this facility are not expected to be an issue. Sheet ice often forms during winter months, but water can still be diverted from beneath the ice. Well water may also be used to aid in de-icing if there is a loss of available surface water during winter months.

Water Quality: Discharges of chemical and organic pollutants would meet applicable federal and state standards, and would satisfy NPDES permit requirements for aquaculture facilities. Important physical properties and chemical constituents in hatchery effluent would be routinely monitored to assure compliance with water quality standards. Chemicals used to prevent or treat fish diseases would be handled, applied, and disposed of in accordance with state and federal regulations. An on-site cleaning waste basin would be used for cleaning wastes from the raceways. Water would flow constantly through the pipelines and the facility, and so would not be subject to heating. The minimal water quality changes resulting from the proposed Imnaha Final Rearing Facility are not anticipated to disrupt the behavior or distribution of individual fish adjacent to and immediately downstream of the site.

Fish Traps, Ladders and Weirs: There would be no fish traps, ladders or weirs associated with the Imnaha Final Rearing Facility. The fish bypass pipeline would serve as the only fish diversion structure. The bypass pipeline would return fish to the river via a plastic (PVC) pipe. This pipe would be maneuverable to accommodate seasonal (erosive) changes in the riverbank.

Broodstock Collection and Maintenance: No broodstock collection activities would occur at Imnaha Final Rearing Facility.

Adult Holding and Spawning: There would be no adult holding and spawning facilities at the Imnaha Final Rearing Facility.

Incubation and Rearing Practices: Incubation would not occur at this facility. Final rearing practices would be similar to those presented for the proposed Lostine River Hatchery.

Fish Health Management: A comprehensive fish health monitoring and disease control program has been ongoing for the Imnaha River chinook salmon since 1982. This program is described in Groberg et al. (1999) and would be implemented at the proposed Imnaha Final Rearing Facility. The goals and objectives of this plan are similar to those presented for the Lostine River Hatchery. In addition to the plan, the Imnaha Final Rearing Facility is not expected to have a high disease risk for the following reasons:

- The proposed site is about 25 miles downstream from where most spawning occurs resulting in a greater spatial segregation between spawning area and the hatchery intake than occurs on Lookingglass Creek.
- Problems with carcasses stacking up on the hatchery intake at this site are not expected.
- The quantity of flow in the Imnaha River is much greater than Lookingglass Creek, therefore the dilution factor is greater.
- During the initial site screening process, the disease potential for sites in the vicinity of the Imnaha Final Rearing Facility were evaluated as "low w/temperature and flow control" (Montgomery Watson 1995b; Ashe et al. 2000).
- The available area at the proposed site would allow for spatial segregation and very low rearing densities that would improve the ability to manage fish health.

Methods and Magnitude of Release: Fish reared at the Imnaha Final Rearing Facility would be transferred to the Imnaha Satellite Facility for release. Release strategies are discussed in the Imnaha Satellite Facility section.

Imnaha Satellite Facility — Currently, the Imnaha Satellite Facility (Figures 2-8 and 3.9-5) provides spring/summer chinook adult collection and holding. Table 3.2-12 presents a summary of existing and proposed programs.

Some smolts may continue to be reared at Lookingglass Hatchery according to the Current Production Program (**CPP**). However, the majority of Imnaha stock would be incubated at the Satellite Facility. Eyed-eggs would be transferred to the proposed Lostine River Hatchery for further incubation, early and intermediate rearing. Final rearing would occur at the proposed Imnaha Final Rearing Facility, and upon completion, smolts would be transferred back to the Satellite Facility for acclimation and volitional release.

The proposed modifications to the Imnaha Satellite Facility would result in impacts to the aquatic environment due to site disturbances and channel alterations for modifications or additions of instream structures including a new Chiwawa weir, a new fish ladder and ladder entrance, and an expanded screened intake. The existing intake structure's screen is currently out of compliance with the 1996 NMFS juvenile screening criteria and would be brought into compliance through this project.

Table 3.2-12. Imnaha Satellite Facility, Existing and Proposed Programs for Conventional Broodstock (Operated March – November).

Existing		Proposed	
Life Stage	**Time Period**	**Life Stage**	**Time Period**
Fish collected at Imnaha Satellite	June – September	Adult fish collected at Imnaha Satellite	May – October 1
Adults transported to Lookingglass Hatchery: and then held, spawned, incubated and reared	September – April (year 2)	Adults remain at Satellite for holding and spawning	May – October 1
Returned to Imnaha Satellite for acclimation and release	April (year 2)	Incubation to eyed stage	August - November
		Transfer eyed eggs to Lostine River Hatchery	October - November
		Incubation and early to intermediate rearing at Lostine River Hatchery	November – September (year 2)
		Transport and final rearing at Imnaha Final Rearing Facility	September – March (year 2)
		Return to Imnaha Satellite for acclimation and release	March – mid April (year 2)

Site Disturbances
Upland construction includes expansion of the adult fish trap and holding areas; addition of a new water supply line, pre-settling basin, incubation room, and formalin treatment system; and extension of a new power supply line six miles to the site.

The construction of the new facility structures would take place within the existing site boundary. Construction would remove about seven trees that have been planted on the existing lawn. The 650-foot surface water supply pipeline would be installed under a gravel road that currently covers the existing intake pipeline. The additional power supply would initiate from the Pallete Ranch, located about six miles downstream from the site. The power supply line is proposed to be buried under and along the existing access road Forest Service Road number 3955. These activities would disturb ground and add about one quarter of an acre of impervious surface to the site, which may lead to increased or rerouted erosion and sediment carried into the river. Increased runoff during construction is expected to be short-lived. Also, the Proposed Action includes erosion control devices such as silt fences, hay bales and other typical best management practices for erosion control.

Installation of the power supply line and the additional surface water pipeline would not disturb riparian vegetation. Most construction activities would occur away from the river, and where appropriate, areas would be revegetated upon completion. The removal of about seven ornamental trees would not impact riparian

shading or fish habitat because the trees are not immediately adjacent to the river and do not currently provide shading habitat. Runoff from construction activities would be contained away from the river, and sedimentation would be minor.

Site disturbances may alter the behavior and individual distribution of fish within the area, but these impacts are short-lived and are not expected to affect long-term use, passage, abundance and distribution of fish that occur in the Imnaha. Because riparian vegetation would not be disturbed, no change in the amount or quality of fish habitat would occur.

Channel Alterations/Water Intake and Discharge Structures
Instream disturbances would include the expansion of the exiting water intake structure and upgrade to its screens (to meet NOAA Fisheries criteria); installation of a hydraulically operated fish barrier; and construction of a new fish ladder along side the existing ladder. All instream work would be conducted during ODFW's instream work window of July 15 – August 15.

Expansion of the intake structure and upgrades to the existing screen would require the use of a cofferdam and dewatering pumps. Installation would require disturbance of about 900 square feet of bed and bank upstream of the existing intake. The submersible dewatering pumps would route water through the existing intake pipeline to the existing raceway (that would be used as an on-site sediment basin) and through the outfall pipe that discharges water at the current fish ladder entrance. The construction area would be limited to the riprap portion of the banks and would not disturb riparian vegetation.

About 100 cubic yards of riprap would be placed at and upstream of the intake to stabilize it. Riprap would be placed stream-side of existing vegetation so as not to impact riparian vegetation or shading. This riprap may slightly alter the hydrology of the river in the area, potentially causing very minor, localized modifications to habitat use. Preservation of natural meanders would occur, where possible. Disturbed soils may create minor short-term sedimentation in the river during cofferdam removal.

Construction of instream structures would temporarily delay migrant fish passage. Adult chinook begin entering the Satellite Facility on or around May 23 (Lund 2003, personal communication) and generally spawn immediately adjacent to the construction area beginning in mid-August. Construction activities would, therefore, interrupt migration and spawning of those adult spring/summer chinook that are not needed for broodstock and are passed upstream for natural spawning. Juveniles that may rear in the area could be impacted. Spring/summer chinook are not generally known to spawn in this reach before mid-August (Zollman 2002a, personal communication; Smith, 2002, personal communication), but potential early spawners, however unlikely, could be impacted during construction.

Migrating adult bull trout move up the Imnaha in June through September, with most individuals upstream of the Imnaha Satellite Facility by late August. Bull trout are routinely captured at the Imnaha Satellite Facility between June and September (Buchanan 1997). Therefore, delays to migrating bull trout may occur during the early stages of in-water construction activities if migrants are late to move upstream. Delays to subadult bull trout emigration are not expected because the majority of individuals move downstream during late fall, outside of the instream work window.

Adult steelhead in the Imnaha are early spring spawners and would not be impacted by construction. Kelts emigrate to the ocean soon after spawning and would not be affected. Steelhead juvenile emigrants move out of the Imnaha in spring and are not likely to be affected by instream work. However, younger juveniles may move upstream and downstream within the Imnaha and its tributaries during summer and fall and could use the construction area for rearing.

An electric weir was originally used for adult collection, but caused fish injury and did not effectively direct fish to the existing ladder. Currently, a portable picket-style weir is used to direct fish to the existing ladder, but it also does not direct fish effectively to the ladder. The ladder entrance is too far downstream and fish cannot locate the entrance easily, causing fish to drop back downstream, where they often spawn. Weir installation during high flows is difficult and a portion of the run can be missed when the weir cannot be installed. This can result in broodstock that do not represent the complete run and in less smolt production at the facility than desired.

The proposed action would replace the existing weirs with a Chiwawa weir on the existing concrete sill. Installation would require the addition of concrete abutment walls on both riverbanks. Construction would take place within the area already impacted by the existing weir and concrete sill. Because spring/summer chinook spawners could be present at the time of instream work, a portable picket weir would be installed slightly downstream to direct adults into the fish ladder for collection or upstream passage. Sandbags would be used to dewater the weir construction area, one side of the river at a time. The placement of sandbags and the temporary picket weir has the potential to create minor sedimentation and affect fish habitat if river hydraulics are influenced.

A new fish ladder would be installed alongside the existing ladder coinciding with the weir installation. Riprap would stabilize the ladder at the river entrance, and a minor amount of riparian vegetation would be impacted. The existing ladder would remain to increase water flow and fish attraction to the new ladder.

Construction of the weir and ladder during the current ODFW instream work window may impact the passage of adult spring/summer chinook, potentially stressing individuals. Monitoring by fisheries biologists during construction would take place to observe passage conditions and determine if additional physical passage upstream or downstream of the construction area is necessary. Also, during their monitoring fisheries biologists would consider the need to use any alternate instream work windows to lessen impacts to spring/summer chinook.

Hatchery Operations and Management

Water Gains and Losses: Due to icing on the Imnaha during the winter and worker access difficulties, the Satellite Facility would only operate from March through November. Table 3.2-13 shows the maximum surface water withdrawals for the facility in comparison to the instream flows. Combining existing and proposed surface water withdrawals, a no more than about 21 cfs would be diverted from the river for juvenile acclimation and release (March – April) and adult collection, holding and spawning (May 15 – September 30).

An additional six cfs would be required during adult collection to operate the adult recovery by-pass pipeline system. During adult collection, a second separate intake is operated at a location about 800 feet downstream from the existing surface water intake (about 130 feet upstream from the existing picket fish barrier). This intake feeds a fish return channel with a maximum water right of six cfs and is operated only when adults are migrating. The intake diverts water into a channel with a 21-inch flow return pipe extending from the fish recovery area to a discharge location just upstream from the fish barrier. When adult sorting occurs at the adult trapping and holding facility, those adults and native fish not selected for broodstock are placed in a 12-inch PVC return tube and routed to the fish recovery area. From this area, the fish would hold until recovered, then swim volitionally back to the Imnaha River and on upstream.

During early fall low flow periods, these diversions could potentially impact aquatic resources within the diverted river reaches.

Table 3.2-13. Maximum Surface Water Requirements and Mean Monthly Stream Gauge Flow for the Imnaha Satellite Facility (cfs).

	Mar	Apr 15	May 15	Jun	July	Aug	Sept
Rearing and adult holding requirements	20.3	20.3	26.3	26.3.	26.3	26.3	26.3
Mean monthly streamflows	92.0	341	804	859	453	150	87.1

[1] Source: USGS 2003. USGS gauge located above Gumboot Creek, upstream of facility, water years 1944 - 1953.

Bull trout adults move upstream past the Satellite Facility in June through August. They out-migrate with subadults in the fall when water temperatures in the lower Imnaha drop. The amount of water diverted from the intake to the outfall is not expected to affect bull trout usage because low flows occur later in September when bull trout are upstream of the Satellite Facility. Also, water would be diverted over approximately 1,000 linear feet and is not expected to impact hydrographs at that time of the year.

Adult steelhead migrate up the Imnaha in March through April, and juveniles out-migrate later in the spring. Although the facility would be in operation during steelhead spawning, the acceptable NATURES criteria, instead of preferred criteria, for surface water requirements may be implemented if flows are critically low. Additionally, steelhead spawners would likely hold downstream to migrate upstream until spring river flows increase. Spring chinook that are not collected at the facility may be impacted by low flows since spawning occurs within the diversion reach during late summer months. Water management strategies that divert the least amount of water possible to maintain facility production would be implemented to ensure safe spawning and passage of spring/summer chinook. Water usage at the facility in late August and September can be modified to meet the requirements of the broodfish be held at that time. The amount of attraction water required would also be reduced as the hydrograph begins to decline in these months.

About 100 gallons per minute (gpm) of pathogen-free well water would be required for incubation. An existing on-site well has been shown to produce about 300 gpm during low flow periods with no river draw-down (McMillen 2002, personal communication). Therefore, there would be no impact on river water quantity due to incubation activities at the Imnaha Satellite Facility.

Water Quality: Discharges of chemical and organic pollutants would meet applicable federal and state standards, and would satisfy NPDES permit requirements for aquaculture facilities. Important physical properties and chemical constituents in hatchery effluent would be routinely monitored to assure compliance with water quality standards. Chemicals used to prevent or treat fish diseases would be handled, applied, and disposed of in accordance with state and federal regulations.

Juveniles would be held and acclimated in the ponds for about 30 to 45 days prior to release. No cleaning of the raceways would occur during this period. Under planned operating procedures, following release of fish, the ponds would be cleaned by hand and disinfected prior to use for adults. Therefore, no settled waste material would be released to the Imnaha River.

Cleaning of the proposed pre-settling basin, to be used for sediment removal of intake water, would be accomplished with shovels and a bobcat and disposed of at appropriate upland locations.

Water quality at the Imnaha Satellite Facility is appropriate for fish culture use, however, a chiller may be necessary for incubation due to high river temperatures during July - September. Chilled water would likely be cooler than the receiving river water, but released water would mix rapidly with the river water

downstream of the facility. Temperature changes would be temporary, localize and minor, and are not expected to impact fish species.

Fish Traps, Ladders and Weirs: Operation of the new fish ladder would likely benefit targeted and non-targeted spring/summer chinook through improved attraction to the ladder and less migratory delay. The current ladder entrance does not allow for efficient collection or passage, often resulting in downstream spawning of chinook that would normally spawn further upstream. The new ladder would be equipped with about a 12-inch wide opening to allow for increased attraction flow near the Chiwawa weir. No additional impacts to species that currently use the ladder are anticipated.

When in operation, the Chiwawa weir would provide the flexibility to lower individual panels to allow downstream steelhead kelts and bull trout passage. The existing picket weir does not have these capabilities. When not in operation, the new Chiwawa weir would be designed to lie flat under the water to allow downstream passage. A section on the west abutment would also be placed at a slightly lower elevation to support both upstream and downstream fish passage by providing a deep channel for migration. This type of barrier also operates effectively during high flow events, thus allowing better fish collection and passage than the current weir systems in place at the Satellite Facility.

For targeted spring/summer chinook, the weir would be designed to route fish to the base of the fish ladder, facilitating safer and more efficient adult collection. Vigilant monitoring of fish collection and instream structures would take place, especially during periods of low flow, to ensure that listed species are not negatively impacted by the upgraded structures.

Broodstock Collection and Maintenance: The Imnaha Satellite is an existing facility that has been in operation since 1984. Methods of broodstock collection, adult holding and spawning, incubation and rearing practices, and release methods are described in the HGMP for LSRCP Imnaha Spring/summer Chinook Program (ODFW 2002). The genetic risks associated with use and maintenance of broodstock have been previously discussed in the Lostine River Hatchery section.

Co-managers need to collect about 320 adults to reach the program production goal of 490,000 smolts (Ashe et al. 2000). Fish would be selected for broodstock or released above the weir to spawn naturally according to a sliding scale or other management tools as agreed to by co-managers. Fish not needed for broodstock or to meet natural spawner goals above the weir may be **outplanted** into other tributaries in the subbasin. The sliding scale tool currently used for broodstock management (Table 3.2-14) is discussed in detail in the Section 10 Permit Application to NMFS (ODFW 1998b). The scale has an underlying premise, that at low population levels the greatest risk to persistence is demographic risk of extinction. In the sliding scale, fewer constraints are placed on the number of hatchery fish spawning naturally and the number of naturally-produced fish spawned in the hatchery when population levels are low. As population levels increase, demographic risks are of less concern and greater constraints are placed on the hatchery program to control the genetic risks associated with hatchery rearing (**domestication selection**).

Table 3.2-14. Sliding Scale Developed for Allocation of Imnaha River Spring/Summer Chinook Salmon Collected at the Imnaha Satellite Facility to Natural Spawning or Hatchery Production.

Estimated total adult escapement to the Imnaha River mouth	Ratio of hatchery to natural adults at the mouth	Maximum % natural adults to retain for broodstock	Maximum % hatchery adults to retain for broodstock	Maximum % adults of hatchery - released fish above the weir	Minimum % of broodstock of natural origin
<50	Any	0	0	a*	Not applicable
51-700	Any	50	≤50	a	a
701-1000	Any	40	a	70	20
1001-1400	Any	40	a	60	25
>1400	Any	30	a	50	30

*a – Percentages determined as a result of implementing other criteria, therefore not a decision factor
Source: ODFW, 1998 (Section 10 permit)

Adult Holding and Spawning: As discussed within the proposed Lostine River Hatchery section, holding and spawning of fish may result in pre-spawning stress and potential mortalities of chinook or other species that enter the facility. Currently, fish collected at the Satellite Facility are transported to Lookingglass for spawning. This transfer causes mortalities and additional stress on fish that are already stressed due to being held. The amount of stress that collected fish encounter would be reduced if fish were held and spawned at the Satellite Facility, as proposed. Although individuals may die, the mortality rate under the proposed program is anticipated to be less than that of the existing holding and transport program, and be within an acceptable level as determined through program permitting.

Incubation and Rearing Practices: Incubation would occur at the Imnaha Satellite Facility, or at another appropriate facility, until eggs are eyed. Spring/summer chinook eyed eggs would then be transferred from incubation units to appropriate rearing facilities. Final rearing would occur at the proposed Imnaha Final Rearing Facility. Because of the use of techniques to maintain wild-type characteristics among hatchery fish, the impact on spring/summer chinook and other fish populations is expected to be minimal.

Fish Health Management: Fish health management issues for the Imnaha Satellite Facility would be similar to those presented for the proposed Lostine River Hatchery.

Methods and Magnitude of Release: As discussed in the Lostine River Hatchery section, the magnitude and methods of release are vital factors that would have the most influence on the status and trend of chinook populations. Volitional release from the Satellite Facility (transferred back to the site after rearing) would begin in late March, after acclimation in an on-site pond. The timing of hatchery releases would consider the availability of local resources to avoid overwhelming the available rearing habitat and resources. Spring/summer chinook releases would be scheduled for times when conditions favor migration. Yearling smolts would probably not interact to any great extent with their wild counterparts because it is anticipated that the hatchery smolts would begin their downstream migration shortly after release.

A portion of the production may be direct stream released in small groups farther upstream of the acclimation facility, or the acclimation facility may acclimate different release groups sequentially. This release method

would take place over a period of several weeks to allow the biological impact of the smolts entering the Imnaha to be spread over time.

The long-term impact on spring/summer chinook populations is likely to be beneficial as this activity is intended to cause an increase in population over time. Impacts to other species of fish, including salmonids, through interaction and competition may occur if the supplementation program returns enough spring/summer chinook to allow them to once again become the most abundant inhabitant of the river system. The abundance of unused habitat and species preference for specific habitat types would limit this impact.

3.2.4 Cumulative Impacts

3.2.4.1 La Grande/Union County

According to the City of La Grande/Union County Building Inspection Department (Botts 2003), six building permits have been requested for projects that are currently underway in the County. They include four building permits for additions to private residences, one for the construction of a private residence and one permit for alteration of a commercial property. However, none of the projects are in the immediate vicinity of the proposed facility upgrades described in this EIS. These actions in conjunction with the Proposed Action cumulatively would not likely affect any fish species in the area.

Several on-going salmon/habitat recovery projects are listed within the Grande Ronde watershed in Union County. These include fish presence surveys, riparian habitat restoration and water quality monitoring studies (Grande Ronde Basin Model Watershed Program 2003). These actions, combined with the on-going projects listed in Table 1-1 and considered cumulatively with the Proposed Action project, would not result in increased negative impacts to the action area, and would ultimately be expected to result in benefits to listed species and their habitats.

3.2.4.2 Wallowa County

According to the Wallowa County Planning Department (Jones 2003), three permits have been requested in the past year for projects located in the same township and range as the proposed Lostine River adult collection facility. These projects are all modifications to existing single-family residences and include two house remodels and one porch addition. One permit was issued for the addition of a pole building in the same section as the proposed Lostine River Hatchery. Because these activities most often would involve re-models of existing facilities, changes in water diversion or effluent discharge are not expected. Therefore, these activities in conjunction with the Proposed Action cumulatively would not likely affect any fish species in the area.

3.2.4.3 Harvest and Poaching

Harvest is authorized and regulated by ODFW with a Section 10(a) consultation. Presently, there is no harvest of spring chinook or bull trout in all tributaries, although catch and release fishing is allowed for bull trout within the Imnaha River. Only adipose fin-clipped steelhead may be taken in the Northeast zone (ODFW 2002). Within both Lookingglass Creek and the Lostine River, angling is restricted to artificial lures and flies for all species. Additionally, all angling opportunities are closed 200 feet downstream from a hatchery water intake. In all tributaries of the Northeast zone, all trout, salmon and steelhead that are released must be unharmed and must not be removed from the water. Also protected within this zone are margined sculpin. These activities in conjunction with the Proposed Action cumulatively would not likely affect these fish species in the region.

In 1998, the NPT and ODFW cooperatively developed a management agreement for Imnaha River broodstock allocation and harvest of adults by setting adult escapement goals (Ashe et al. 2000). This agreement is outlined in Table 3.2-15. During 1992 and 1993, in Lookingglass Creek tribal members harvested 173 and 110 Rapid River (non-native) stock chinook returning to Lookingglass Hatchery. There is little information to describe current tribal harvest in the Lostine River.

Table 3.2-15. NPT and ODFW Harvest Management Guidelines.

Escapement Level	Harvest for Tribal Ceremonial Use	Harvest for Tribal Subsistence	Recreational Harvest
<300 for 2 consecutive years	*	*	No
51-700	Yes	*	No
>700	Yes	Yes	*

* Decision made on case-by-case basis

3.2.4.4 State and Federal Actions

Within Wallowa County, state and federal actions include the proposed Wallowa Lake Dam project. This project proposes to rehabilitate the poorly functioning dam at Wallowa Lake and to exchange irrigation diversions to release lake water seasonally to irrigate lower valley farms. This exchange would result in increased flows, thereby increasing salmonid habitat, in both the Lostine River and Bear Creek. This project, in conjunction with the Proposed Action, would result in cumulatively beneficial effects to listed species.

The Wallowa County/Nez Perce Tribe Salmon Habitat Recovery and Multi-Species Strategy is currently ongoing within unincorporated Wallowa County. The goal of this strategy is to assist in salmon recovery, particularly chinook recovery, by increasing spawning, rearing, and migration habitat within the County to ultimately aid in the recovery of all Snake River salmonids. This strategy has resulted in the development of Coordinated Resource Management Plans (CRMPs) and/or Watershed Action Plans for Bear Creek, Lostine River, Big Sheep Creek, Little Sheep Creek, and Upper Joseph Creek. Participation in WC/NPS&MS implementation includes private landowners, NPT, Forest Service, Soil & Water Conservation District, NRCS, ODFW, Grande Ronde Model Watershed Program, Oregon Department of Forestry, and Oregon State University. On-going research studies related to the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery and Multi-Species Strategy are anticipated to have beneficial impacts for listed species and critical habitats. These activities when considered together with the Proposed Action would have beneficial cumulative impacts for fish species in the region.

3.2.5 Consequences of Taking No Action

Taking no action would continue current rearing practices that do not allow for rearing of juveniles within their natal water source. Rearing in natal streams is believed to increase a juvenile's homing success and may therefore increase adult returns to the area and decrease the potential for straying. Straying could result in less escapement to collection sites and to the appropriate natal streams. Additionally, if a catastrophic event occurred at Lookingglass Hatchery, including a disease outbreak, the No Action Alternative may result in loss of entire stocks of fish. With no action, the "spread the risk" approach could not be satisfied as the majority of the Lostine and Imnaha juveniles are initially reared in one facility, Lookingglass Hatchery.

The proposed changes would allow for collection of a more complete complement of the run across the hydrograph than that which currently occurs at collection sites. Collecting more individuals from throughout the run increases genetic diversity. Proposed collection sites and structures would also allow for more

efficient collection, promoting less stress on spawners as well as less stress on non-target species passing through the ladders and weirs. Safer collection, for both those fish collected and those humans operating the trapping structures, would be accomplished under the proposed alternative. Additionally, the use of NATURES rearing techniques, specifically low density rearing, would not occur under the No Action Alternative. The use of low density rearing is thought to contribute to increased post-release survival of spring chinook (Maynard et al. 1996; 2001).

The following describes the consequences of taking no action at each of the Proposed Action sites.

3.2.5.1 Lookingglass Hatchery

Under the No Action Alternative, no modifications would occur at the Lookingglass Hatchery. Therefore, no change in impacts to aquatic resources would occur. Spring/summer chinook salmon recovery efforts would continue, but recovery of populations within the Grande Ronde subbasin may not occur as quickly. When constructed in 1982, the Lookingglass Hatchery was designed to accommodate two stocks of spring/summer chinook. The CPP, in response to the ESA listings in the late 1990s, expanded the responsibilities of the hatchery beyond its physical capacity to handle more stocks at the desired low densities. Under current conditions, smolt production is below that which was permitted due to sub-optimal rearing densities and an overload of facility resources. If no action were to occur, early and final rearing facilities, as well as incubation, holding and spawning facilities would not be modernized at the hatchery. Chinook salmon would not be reared in facilities that implement acceptable NATURES criteria.

3.2.5.2 Lostine Adult Collection Facility

If no action were taken to modify existing structures, construction impacts would not occur to the aquatic environment. However, if the existing structures were not replaced and the velocity barrier not installed, safe adult collection and trapping at high river stages would continue to be problematic. Fish passage problems at the existing fish ladder during periods of low flow would not be resolved and impacts to listed species would occur from migration delays and/or restricted passage.

3.2.5.3 Lostine River Hatchery

If the proposed Lostine River Hatchery were not constructed, no impacts to the aquatic environment would occur as a result of construction or operation. However, spring/summer chinook production at the existing facilities, including Lookingglass and the Imnaha Satellite Facility, would likely continue to be below levels suggested in the program. Hauling of fish collected at the existing portable weir to Lookingglass would continue, causing stress on fish collected from the Lostine. Additionally, with no action, the Lostine River component would not be reared in natal waters, as desired under NATURES and APRE fish culture designs.

3.2.5.4 Imnaha Final Rearing Facility

Under the no action alternative, the Imnaha Final Rearing Facility would not be constructed and therefore, construction and operation of instream features would not impact existing fish resources. Final rearing of Imnaha stock smolts would not take place in natal waters at the Imnaha Final Rearing Facility and long-distance hauling stress on juveniles would continue. It is expected that Imnaha chinook runs, currently reared at Lookingglass and released at the Imnaha Satellite Facility, would increase, but at a slower rate than if the Imnaha Final Rearing Facility were not used for final rearing, due to the limited space and water available at Lookingglass Hatchery.

3.2.5.5 Imnaha Satellite Facility

Under the No Action Alternative, instream structures that currently cause adverse impacts to migrating and spawning salmonids at the Imnaha Satellite facility would not be improved. Better collection of spawners and an anticipated increase in downstream passage ability past the structures would not be attained. An increased fish ladder attraction, and collection of adults across a larger hydrograph would not take place. The inefficient collection, migrational delay, and forced downstream spawning would continue to occur. Additionally, if no action were taken, the existing intake screen would remain out of compliance with NMFS (1996) juvenile fish screening criteria.

3.3 Wildlife

3.3.1 Affected Environment

3.3.1.1 Grande Ronde Subbasin

General Wildlife Overview — Numerous wildlife species reside or are seasonally present in the Grande Ronde subbasin. These species are found in association with the area's primary habitat types, including riparian areas; wetlands, seeps and springs; shrub and early seral habitats; shrub/deciduous forest types; and conifer forests. Project sites within the subbasins include all of these habitat types, and therefore, wildlife species that occur throughout the subbasin could occur at any of the project sites. The riparian habitats found at each of the proposed project sites most likely provide travel, dispersal, cover, resting and foraging corridors for many of these species.

Twenty-one species of ducks, four species of geese, and two species of swans occur in the Grande Ronde subbasin during migration and nesting seasons (Nowak and Eddy 2001). In addition, a number of wading and shorebirds, including sandhill cranes, are found in the subbasin. Upland birds found in the basin include chukar and Hungarian partridge; blue, ruffed, sage and Columbian sharp-tailed grouse; mountain and California valley quail; wild turkey, and ring-necked pheasant. Chukar, Hungarian partridge, ring-necked pheasant, and wild turkey are not native to the Grande Ronde subbasin (Nowak and Eddy 2001), but are introductions. Many raptor species reside in the subbasin including golden eagle, American kestrel, peregrine falcon and northern goshawk. Bald eagle and Swainson's hawk are seasonal migrants to the subbasin (Nowak and Eddy 2001). The subbasin is also home to many migratory and resident species of songbird, woodpecker, and other non-game bird species.

Game species common in the subbasin include Rocky Mountain bighorn sheep, mountain goats, Rocky Mountain elk, Rocky Mountain mule deer, white-tailed deer, black bear and cougar. Rocky Mountain bighorn sheep disappeared from Oregon in the mid-1940s, but have been reintroduced since 1971. Within the Grande Ronde subbasin, bighorns have been released in the Lostine, Minam and Wenaha drainages (Nowak and Eddy 2001). Mountain goats, once indigenous to northeast Oregon, disappeared before or at the time of European settlement (Nowak and Eddy 2001). Present populations resulted from reintroductions and occur in the Wallow Mountains, Hells Canyon and Elkhorn Mountains. A band of 20 to 25 mountain goats is know to occur in the Lostine subbasin (U.S. Forest Service 2002b), although their presence in the immediate project vicinity is not anticipated.

Furbearing species common in and near the mainstem rivers, tributaries and wetlands of the Grande Ronde River subbasin include beaver, river otter, mink, muskrat, and raccoon. American martens are known to occur in the subbasin, but between 1991 and 1994, surveys conducted by the Forest Service in the Lostine River area detected no martens (U.S. Forest Service 2002b). Surveys conducted by the Forest Service