Local and regional data document the continued presence and effects of persistent chemical compounds in North American Peregrines. Many studies have documented the relationship between concentrations of DDE (a metabolite of DDT) and eggshell thinning (Morse 1994, Steidl et al. 1991, Court et al. 1990, Hickey and Anderson 1968). Studies in Alaska show that mercury may be at levels that affect peregrine reproduction and that these mercury levels are actually increasing over time (Ambrose et al. 2000). While the U.S. has implemented regulations on the use of DDT and other pesticides, peregrines that winter in other countries still using those chemicals may be at risk of accumulating contaminants from their avian prey (Banasch et al. 1992; Johnstone et al. 1996), some of which return to nest in the north and are a potential source of contaminants for both migratory and non-migratory peregrines (Fyfe et al. 1990). The 1997 North American Regional Action Plan, which recommends that the U.S., Canada, and Mexico cooperate in a phased reduction in the use and distribution of DDT across the continent, has been very successful in reducing DDT use in Mexico.
Although peregrines are still accumulating contaminants from their prey, the levels are currently low enough to allow for successful reproduction and expansion of the population. Nonetheless, the continual introduction of anthropogenic chemicals to the environment far outpaces research on their effects on wildlife.
Objective

The peregrine monitoring plan is primarily designed to detect declines in territory occupancy, nest success, and productivity is six regions across the United States.

2.3 Out-of-Subbasin Effects[15]

From a holistic “big picture” perspective, three “out-of-subbasin” effects have had a major impact on the Owyhee River ecosystem:

(1) Effects on Terrestrial Focal Species;
(2) Dam and reservoir construction to support a an agrarian culture; and,
(3) Climatic Changes and Catastrophic events.

2.3.1 Effects on Terrestrial Focal Species

A number of the terrestrial focal species spend a portion of their life cycle outside the Brueau River subbasin’s designated boundaries. Although most are nongame avian species, at least one upland game species and several big game species potentially migrate between State jurisdictions. Depending on the extent, location, and timing of seasonal movements, out of subbasin effects may range from limited to potentially substantial. Potentially limiting factors encountered outside the subbasin including hunting, environmental toxins, and habitat degradation may influence species occurrence,

[15] This section id dervved in part from Vigg et al. (2002).

annyal survival, reproductive success, and ultimately population growth within the subbasin..

Several of the Owyhee subbasin focal bird species display varying degrees of seasonal movements. Yellow warbler and white faced ibis, are primarily long-distant migrants; wintering south from Mexico to South America (Ryder and Manry 1994, Hughes 1999, Lowther et al. 1999, Sedgwick 2000). In contrast, sage grouse and beaver populations may move relatively short distances or remain resident (Squires and Reynolds 1997, Connelly et al. 2000): although seasonal movement likely includes locations outside the subbasin boundaries. Migration is considered energetically expensive, loss of habitat due to pesticides, herbicides, fragmentation, and decline in extent has been suggested as a potential cause of declining population of North American bird species (Ryder and Manry 1994, Hughes 1999, Connelly et al 2000, Sedqwick 2000). In general, insectivorous birds, birds in western North America, and birds migrating to Mexico and Central and South America are still contaminated with relatively high levels of organochlorines (primarily DDE; DeWeese et al. 1986). Seasonal movements, however, may not be limited to winter, as big game and sage grouse may move outside the subbasin during alternative seasons (Connelly 2000). However, independent of the timing of seasonal movements, the condition of habitats sought likely influences within subbasin population dynamics. For example, reduced sagebrush cover due to herbicide application, fire, and mechanical removal has been shown to be an important predictor of sage grouse occurrence and recruitment (Connely et al 2000). Isolating the causes of population declines requires a full understanding of species ecology in combination with long-term population monitoring data.

Terrestrial focal species identified for the Owyhee subbasin are managed by Oregon, Idaho and Nevada as game animals. Depending on seasonal movements exhibited by populations, State agencies may be managing the same animals from opposite sides of the fence. Proghorn antelope, mule deer, and sage grouse occurring in the subbasin can be hunted in Oregon, Idaho and Nevada, although hunting seasons, limits, and pressure are variable among years and locations. Although seasons primarily overlap, in all three instances there is the potential for individual from populations moving across State boundaries to be exposed to a longer hunting season. Coordination between the State agencies, including an understanding of the migratory ecology of potentially shared populations, is essential for proper management (Connelly et al. 2000)

2.3.1 Dam Construction and Elimination of Anadromous Salmonids

When the Pacific Northwest salmon resource was first exploited by European settlers in the late 1800's, the Columbia River Basin was the greatest producer of chinook salmon in the world (Craig and Hacker 1940). Anadromous fish runs in the Columbia River at that time were estimated to range from 10 to 16 million fish annually (NPPC 1996). In contrast, the estimated current average annual run size is about 2.5 million fish (Dauble et al. 2003). Hydroelectric dam construction began in basin the early 1900’s and continued through the mid-1980's. Although the exact amount of fish lost as a result of hydropower development is unknown, the development of the hydropower system clearly had a significant impact on anadromous fish abundance in the Columbia River (Dauble et al. 2003). Currently the Hells Canyon Complex (completed in 1967) and the Owyhee dam (completed in 1932) block fish passage The loss of anadromy into the Owyhee subbasin has likely had profound effects on at least one of the extant aquatic species. Although their influence on redband populations is unknown, it is probable that the elimination of steelhead from the Owyhee subbasin represented an impact to redband population connectively, genetic diversity, and/or refounding capacity (Vigg and Company 2000). Similarly, the loss of anadromous carcasses and juvenile fish has likely affected current nutrient cycling and prey availability (respectively) for extant aquatic species, most notably for redband trout.

The following five anadromous salmonid species (pictured below) inhabited the Snake River Basin within the past 50 years, and probably historically occurred in the Owyhee River system. In addition to the salmon and char species, the white sturgeon (originally anadromous) and the pacific lamprey (catadromous) may have inhabited the Owyhee as well.

During Owyhee Subbasin Planning meetings, chinook salmon was discussed at length as a focal species for river habitat, however, consensus could not be reached to include it . The following issue section provides background information regarding the ecological importance of anadromous salmonids in the Owyhee Subbasin.

Anadromous Salmonids in the Owyhee Subbasin

Anadromous fish were of particular value to native peoples since they had many uses. For instance, they might be used at the time of catch, processed for the future, or used as a trade commodity. In this discussion of anadromous fish, it should be noted that "**salmon**" was a term used for several species of anadromous fish including chinook and steelhead. Historical evidence indicates that Tribal fishing for anadromous salmonids occurred in the Owyhee River basin. Early diaries, oral histories and newspapers suggest that native people used the upper Owyhee River basin for fishing. Such sources also suggest that this fishing occurred in the headwaters over an extended period each year, and that salmon and steelhead were among the primary species sought.

It is documented that Indian fishing weirs were used in the mainstem Snake River. Certainly Native peoples could have fished the mainstem Owyhee River, as it would have been at least as fishable as the mainstem Snake River. There is a great deal of evidence that fishing the Snake River was a major activity of many tribes. The multi-tribe/band events in the Snake River area between the mouth of the Owyhee River and the mouth of the Weiser River were well known and well attended. This event typically occurred during late summer to late fall, and fishing was a primary activity. At least some of the Duck Valley people, such as the people of the White Knife Band, attended this event. The records confirming the Snake River resource use are more common than other records, as the Snake River plain had many of the major travel routes, and therefore the fisheries there often were observed in this narrow corridor.

It is uncertain how far downstream in the mainstem Owyhee that fishing occurred. Weirs were also identified by early explorers as landmarks in the Owyhee River basin. While locations are hard to pinpoint, Ogden mentions the "Indian Fish Weare" in the "Sandwich Island River," identified by historians as the Owyhee River; there are at least two such entries in his 1820s journals. In one of the diaries, it appears to be in the headwaters of the Owyhee; in another year's diary it appears to be near the mouth. In each instance, he uses the weir as a landmark.

There is no indication that low water periods inhibited Owyhee salmon runs or fisheries in the early days. To the contrary, the Robert McQuivey Collection (1998) shows that summer and fall fishing for salmon in the upper basin was common. "Columbia salmon" and "red salmon" are mentioned.

In the Owyhee basin, we find that native people fished for salmon and steelhead in many places in the watershed, depending upon the season. The following discussion provides several examples.

<u>Spring Season.</u> The spring fishing was likely done in the Owyhee headwaters. Steelhead bones were collected at the Pole Creek site of the upper basin. March, April and May newspaper articles from the 1860s-1880s (Robert McQuivey Collection, 1998) indicate that it was fairly easy to capture large migratory fish during spring in the upper South Fork Owyhee by "raking fish off the shoals" in the large valley areas of the upper basin. Clubs, spears, arrows and other methods were used. Oral histories and similar information published by the Elko County Historical Society indicate the native people typically used Jack Creek in the upper South Fork Owyhee and other locations in the upper basin to fish.

During periods of high discharge, the smaller streams of the headwaters would be more easily fished than lower reaches of the river. It is not surprising that in the spring, the Owyhee River near Duck Valley, the South Fork Owyhee River in the Independence Valley, and many tributaries to this part of the upper basin were known as fishing locations for native people and later for the miners (Robert McQuivey Collection, 1998). Oral histories indicate: " The salmon used to come up the Owyhee River in the spring and up into the smaller streams to spawn. They came up Jerrett Creek, … I remember the people coming out from town to spear salmon. It was great sport and easier to get them in the smaller streams" (Smith 1983). Streams such as Jarrett Creek, Jack Creek, Indian Creek near White Rock, Bull Run Creek, and Taylor Creek supplied anadromous fish in the spring (Smith 1983, Robert McQuivey Collection, 1998). One band of Indians had a camp each year on Jack Creek, where the fish were plentiful (Weinberg 1998). Spring harvest of fish right in Tuscarora occurred in the early days, with stories such as using a pitchfork to collect a 30-pound fish. Oral histories of the area say, "The Indians used to get them, too. They would work the country near the reservation and bring them to Tuscarora in wagon loads" (Gruell 1998).

Summer Season. Summer fisheries were also known in the upper basin. In early July of 1828, Mr. McKay, working at the time for Mr. Ogden of the Hudson's Bay Company, went to meet Sylvaille in the Owyhee River basin, and found him at the "Indian Fish Pen." It is unclear if this is in the upper or lower part of the watershed. In 1859, Scholl comments in late July: " The stream runs here through very high precipices; it abounds in large salmon" (Wallen 1860). While it is difficult to identify the precise location in the Owyhee River watershed where Scholl makes his observations, it is somewhere in the eastern part of the basin, some distance upstream from the Jordan Creek confluence (Wallen 1860). Salmon were present at Three Forks in late July of 1876 (Robert McQuivey Collection 1998). Later in the 1800s, there is evidence that salmon or steelhead were available all summer in the upper watershed (Robert McQuivey Collection 1998). In the fall, the Juniper Mountain region was a major rendezvous location for native people (Drew 1865). This is not far from several sites where there is evidence of the use of anadromous fish by native people. Steelhead remains have been identified in the Pole Creek/Deep Creek watershed, tributary to the upper mainstem of the Owyhee (sometimes referred to as the East Fork Owyhee River), indicating very early use of anadromous fish by native people (Plew 1980, 1986). Other evidence of salmon and the use of salmon by native people in the area come from the records of stockmen. The Juniper Mountain region, the North Fork Owyhee, and the lower East Fork were known as the ION country (Hanley 1988). This ION area was known as a place where Indians came to many small streams to process salmon (Hanley 1988).

Fall Season. Fall fisheries in the South Fork Owyhee River basin are noted in the newspapers of the mining community. For instance, in September, the salmon in the Independence River are described as follows:
"… the kingly salmon…, forced its passage over every obstacle through the Columbia and its tributary Lewis R Snake R to spawn in the cool, limpid waters of the Owyhee. Myriads of them annually fail to return to the ocean, but are incorporated into Indians and now-a-days do and henceforward may help make up prospectors and miners. Splendid fish, three feet long and estimated to exceed the weight of twenty pounds, were seen dashing through water scarcely ankle deep." (Robert McQuivey Collection 1998).
Late spring, summer and fall salmon must have been fairly easy to collect in the upper basin, as miners, who were new to the area, used techniques similar to those of native people. In the 1800s, miners, when "not having nets, tied willows together and using them as a seine, rake out upon the shore salmon weighing fifteen to twenty pounds" (The Robert McQuivey Collection, 1998). Pitchforks, clubs and crude rakes were also commonly used fishing devices. The upper meadows were an easy place to catch fish. In 1876, newspapers report the situation as follows: "Where the waters cover the meadows the fish leave the main stream and swim out among the grass and reeds, rendering their capture an easy manner."

Idaho Power Company (Chandler editor, 2001) estimates that during the pre-development era (pre-1860), the area above Hells Canyon Dam produced between 1 and 1.7 million adult Pacific salmon (Oncorhynchus spp.) and steelhead (Oncoryhynchus mykiss). This estimate includes:

- 0.76 to 1.19 million spring/summer chinook salmon;
- 135,000 to 214,000 fall chinook salmon;
- 117,000 to 225,700 steelhead; and,
- 14,400 to 57,400 sockeye salmon (O. nerka).

The Chandler (2001) study did not account for coho salmon (Oncoryhynchus kisutch) that were known to exist in the lower Snake River and believed to historically migrate up to production areas as far as the Clearwater River. Coho salmon from the Snake River system made up about one-third of the total upriver coho run (compared to the upper-Columbia mainstem) during 1962-79;and the number of adult coho salmon counted over Ice Harbor Dam averaged about 1,300 fish during 1967-79 (Horner and Bjornn 1981). By the early 1980's, when Ted Bjornn and his colleagues documented upriver salmon status for proposed ESA-listings, most of the native origin Snake River coho salmon were produced in the Wallowa River -- tributary to the Grand Ronde River. Endemic Snake River coho salmon populations are now functionally extinct.

The distribution and abundance of Pacific lamprey (Lampetra tridentata) in the Owyhee River basin is unknown, although the species was documented in the mainstem Snake River at Swan Falls Dam (Stanford 1942). Over a period of approximately 70 years, anadromous fish above the present-day Hells Canyon Dam on the Snake River were gradually extirpated from their historical distribution by the construction of federal and private dams and by habitats degraded by multiple land uses.

Mid-Snake Province – History of Anthropomorphic Impacts

Human development has had significant impacts on the middle Snake River – as it has throughout the Columbia Basin. Mining altered the landscape by moving tons of rock. Habitat losses began primarily with placer mining, which was distributed throughout the entire basin and literally turned over stream valleys, created water diversions, and input tons of sediment into stream channels. When the extraction of the ore included chemical processes, fuel was needed, and the wood in the area was harvested and burned by the smelters.

As mining activity increased, so did industries that could serve a growing population base. The Snake River basin was soon developed for agricultural production, timber harvest, and livestock production. Some of the most profound changes to aquatic habitats began with the development of irrigation systems and the grazing of livestock. In the mid 1800s, grazing began to modify the productivity of the landscape, an impact recorded by the stockmen. At first, livestock grazed on open range year round, though they were moved between summer and winter range locations. Later, raising stock required more expensive techniques. After a period of drought combined with overgrazing in the late 1880s, and a severe winter, the stockmen reduced the number in their herds/bands and began mowing wild hay for winter. Irrigation of wild grass also began as a technique to increase hay resources. Later, the practice of cultivating alfalfa to feed stock began.

Irrigation systems had the following impacts:

- decreased instream flows,
- increased instream temperatures,
- increased fine sediment inputs into aquatic habitats, and
- creation of partial or complete migration barriers.

Livestock grazing impacted riparian corridors by decreasing stream shading and increasing stream temperatures. These effects were especially pronounced in high-elevation desert basins such as the Malheur, Burnt, and Owyhee rivers. As irrigation systems expanded, construction of large storage reservoirs began to eliminate production of anadromous fish from specific river basins.

Bruneau Subbasin

The Bruneau River was the first basin eliminated when a dam was constructed in the lower 1.5 miles (mi). Constructed in 1890, the dam was originally built for placer mining but was soon used for irrigation purposes. It was a complete barrier to anadromous fish.

Swan Falls Dam - mainstem Snake River

In 1901, the Trade Dollar Mining Company of Silver City constructed the Swan Falls Dam. This dam was not constructed for irrigation, but to generate electricity for mines in the Owyhee Mountains. It became the upstream terminus for salmon in the Snake River, and, to a large extent, the dam was a barrier to steelhead.

Swan Falls Dam blocked approximately 157 mi (253 kilometers km) of mainstem Snake River, or approximately 25% of the entire anadromous section of the mainstem Snake River. In addition, the dam blocked fish access to Salmon Falls and Rock creeks, which were the uppermost basins to support spring/summer chinook in the Snake River basin. Also, many smaller tributaries were blocked with construction of Swan Falls Dam. Although a fish ladder was installed at Swan Falls Dam during the initial construction, it was not functional for salmon and was probably not functional for steelhead.

In 1922, after IPC had taken ownership of Swan Falls Dam, the ladder was reconstructed. Unfortunately, the ladder was still ineffective for passing salmon around the dam. But some steelhead were probably able to pass. There are reports that a small run of steelhead ascended the river to C.J. Strike Dam (constructed in 1952), which was a complete barrier. Pacific lamprey could apparently use the fish ladder to pass Swan Falls Dam: Stanford (1942)[16] reported that "Pacific lamprey…was taken in the spring as it made its way with apparent ease, over the fishway or attempted to climb the lower face of the dam."

Boise and Payette Subbasins

Following construction of Swan Falls Dam, large irrigation dams continued to be constructed. Dams on the Boise and Payette rivers eliminated production of anadromous

[16] Stanford, L.M. 1942. Preliminary studies in the biology of the Snake River. Ph.D. dissertation. University of Washington, Seattle. 120 p.

fish in those basins. Black Canyon Dam, constructed in 1924 in the lower Payette River, eliminated the only sockeye salmon production area above Hells Canyon Dam.

Owyhee Subbasin

Affects of Mining on Riparian Habitats

Abrupt changes in aquatic habitats were noted shortly after mining and associated activities began. As early as 1870 there were complaints about the destruction of the salmon fishery near Mountain City (The Robert McQuivey Collection 1998). In May of 1887, the news reports that the absence of salmon "is attributable to tailings in the river extending down as far as Duck Valley, driving the fish into Indian Creek, where a great many are caught by White Rock people" (The Robert McQuivey Collection, 1998).

Placer mining, like the massive placer workings of the Owyhee River near Mountain City was just one of the early impacts on aquatic habitats. Mining used water, and the first diversions were for washing gold and serving mining communities with domestic water. Lode mining brought the use of chemical slurries; often these slurries were an in-stream activity.

The mining also brought the need to feed the miners the foods they were used to. Agricultural activities began as dry-land farming, and the impact was localized to cultivated grounds. Livestock were also brought to the area in large numbers, and grazing took place over large tracts see Upland Habitats. Until the beginning of irrigation and documentation of accelerated erosion due to livestock, impacts of agriculture on aquatic habitats were not well documented. Some intermittency was noted in the late 1800s, but how much of this was natural and how much was exacerbated by mining, irrigation, and other land uses remains unclear.

Affects of Mining, Grazing and Irrigation on Upland Habitats

Mining altered the landscape by moving tons of rock. When the extraction of the ore included chemical processes, fuel was needed, and the wood in the area was harvested and burned by the smelters. Near Tuscarora, Chinese crews made their living grubbing sagebrush and selling it as fuel to other miners. We did not find discussions about the impact of this rapid timber and sagebrush removal.
The impact of livestock included the removal of seeds that would typically be harvested by the Shoshone as a staple food. This occurred in several areas, not just the Owyhee, and was best documented by Madsen (1986) in connection with stock along the Oregon Trail.

Later in the 1800s, grazing modified the productivity of the landscape, an impact recorded by the stockmen. At first, livestock grazed on open range year round, though they were moved between summer and winter range locations. Later, raising stock required more expensive techniques. After a period of drought combined with overgrazing in the late 1880s, and a severe winter, the stockmen reduced the number in their herds/bands and began mowing wild hay for winter feeding (Gold Creek example described by Tremewan 1964). Irrigation of wild grass also began as a technique to increase hay resources. Later, the practice of cultivating alfalfa to feed stock began. Keen competition for feed and water continued into the early 1900s, at which time the Federal Forest Reserves and their associated regulations began, in part at the request of the stockmen. There had been complaints about the deteriorating condition of the range on the East Fork, South Fork and North Fork of the Owyhee River. Sheep mines were in use. Sheep mines were lands claimed as placer ground to obtain the right to the water so stockmen could water their animals. The stockmen who controlled the water controlled the range. Stockmen were in favor of the regulations as they paid less for grazing fees on the federal reserve lands than they paid for the bogus placer mining leases (Tremewan 1964). The condition of the range was no small problem. Tremewan (1964) provides this paraphrased description: The conditions in the Independence Mountains had gotten so bad that steers taken off the range in the fall had to be fed for several weeks before they could be driven to the railroad. These conditions existed from a combination of their feed, and the practice of stockmen running the herd back and forth trying to beat each other to the best camps. The Forest reserves eliminated a lot of this tramping back and forth by establishing trails and allotments.

Irrigation began early in the Duck Valley area, and white peoples' use of water upstream from the reservation encroached on the water (McKinney 1983). By the 1909-1928 period, the encroachments on the upper Blue Creek had so limited the water available to the Duck Valley people that in 1928 the tribes abandoned their developments on reservation land along that tributary (McKinney 1983).

Effects of Dams and Cumulative Impacts on Anadromous Fish

Patterson et al. (1969) says that until dams were built on the lower reaches of the South Fork Owyhee, all the streams flowing into the Owyhee were spawning grounds for salmon. They go on to say that from Tuscarora, from Mountain City and from the ranches, people gathered along the streams to spear salmon for winter menus. Although there was always trout to catch, in spring, salmon spearing was the favorite sport" (Patterson et al. 1969).

Chapman (1940) observed "The construction of the Owyhee Dam, some 21 miles from the mouth of the river, by the Bureau of Reclamation in 1933 completely and, as far as I can see, irrevocably eliminated it as a producer of anadromous fishes." … He further notes that even if anadromous fish used the lower 20-25 miles of the Owyhee River, "The Owyhee Canal, about 16 miles downstream from the dam where the river leaves the canyon, dries up the river except for two or three weeks in the spring. It would be expected that nearly all downstream migrants resulting from anadromous fish would be killed in this diversion."

Nonetheless, some anadromous fish were reported for several years after the construction of Owyhee Dam. "In spite of the handicaps river being dried up a fairly good run of steelhead still enters the river in the spring and at that time the steelhead fishing is good below the dam for a few miles" (Chapman 1940). Large rainbow trout were caught in irrigation canals and the siphon on the Owyhee Ditch into the late 1940s (Lockwood 1950).

By the mid-1950s, Oregon state agencies observed that there was no spawning steelhead or chinook in the Owyhee basin. The last known observation of chinook were some very small fish within the Owyhee River, but within the first mile upstream of the Snake River during 1954 (Fortune and Thompson 1959; Weinburg 1969).

Malheur, Burnt, and Powder Subbasins

The Malheur, Burnt, and Powder rivers all had large production areas eliminated by dams. In addition, land uses in the Malheur, Burnt, and Powder rivers had left even accessible areas of the basin unable to support anadromous fish.

The Hells Canyon Complex (HCC)

The Hells Canyon Complex (HCC), owned and operated by the Idaho Power Company, consists of the following mainstem Snake River Dams (year closed):

- Brownlee Dam (1958)
- Oxbow Dam (1961)
- Hells Canyon Dam (1967)

The HCC inundated approximately 93 mi (150 km) of mainstem Snake River habitat and blocked access to approximately 118 mi (190 km) of free-flowing Snake River up to Swan Falls Dam. A total of 211 mi (340 km), or 34%, of mainstem Snake River habitat was lost. This loss plus the loss above Swan Falls Dam accounted for approximately 59% of Snake River mainstem habitat.

Anadromous Fish Populations Still Existing in 1958

Brownlee -- finished in 1958 -- was the first dam of the Hells Canyon complex . At the time Brownlee Dam was constructed, relatively few tributary basins were still producing spring/summer chinook salmon and steelhead. Idaho Power Company estimates that by 1958:

- Approximately 75% of the anadromous production area above Hells Canyon Dam had been eliminated;
- Fall chinook salmon were limited to below Swan Falls Dam;
- Spring/summer chinook and steelhead production areas were primarily limited to the Weiser River, Eagle Creek (tributary to the lower Powder River), Wildhorse River, Pine Creek, and Indian Creek; and
- restricted steelhead production was occurring in smaller tributaries to the Burnt, Powder, and Snake rivers.

Idaho Power Company (Chandler, editor 2001) estimates that adult returns to the area above Hells Canyon Dam immediately before the dam's construction consisted of approximately:

- 16,400 fall chinook salmon,
- 1,900 spring chinook salmon, and
- 7,500 steelhead.

Sockeye salmon had been eliminated from the system by that time. Pacific lamprey were known to be present, however, their distribution and abundance at the time of closure by the dam is unknown. The construction of the HCC followed a long and confrontational competition between public and private power interests. In question was whether power would be privately or publicly produced, not whether or not dams would be built.

Mitigation for the HCC

Once the Federal Power Commission (now the Federal Energy Regulatory Commission) issued a permit for construction of the HCC, everything associated with fish passage went on a fast-track schedule. From issuance of permit (August 1955) to closure of Brownlee Dam (May 1958), only about 33 months were available to decide on mitigation techniques and to build the various passage facilities once passage was chosen. In August 1954, IPC was asking whether fish ladders or elevators should be constructed to permit adult fish passage and whether runs should be relocated in other streams.
The Federal Power Commission license (Article 34) required the licensee to carry out detailed studies of the project area's fishery resource and to devise means and measures for mitigating losses to that resource. In accord with that requirement, state and federal fishery agencies investigated or considered all known methods for mitigating losses to the anadromous runs. These methods included:

- juvenile and adult fish passage,
- adult salmon spawner translocation,
- artificial and semi-artificial propagation, and
- natural redistribution of fish in streams below the projects.

<u>Fish Passage</u>

Of the methods, fish passage appeared most promising for protecting the resource. It retained the possibility of restoring runs in the historic spawning and rearing areas and focused mitigation on natural production. The main emphasis by the agencies and by IPC was on successfully passing adult and juvenile salmon and steelhead at the HCC, not on operating fish hatcheries or translocating stocks. Adults were passed successfully above the projects using a trap-and-haul program. The adult migration at Brownlee Dam succeeded. From 1956 to 1964, adult chinook and steelhead were hauled successfully to a point 1.5 mi upstream of the dam. From there, the fish migrated through Brownlee Reservoir to the spawning grounds. However, passage of downstream migrating juveniles was much less certain. As early as fall 1953, a barrier net and gulper system was visualized as a means of passing juvenile fish. But how to pass juvenile salmon successfully through a deep reservoir, such as Brownlee Reservoir, was not known.
IPC developed the engineering concept for a mesh-barrier system to collect juveniles before they reached the dam. Fish were to be collected and transported by truck below

the dam. Fish management agencies expressed concern about the untried nature of the barrier-net system, but given both the fast-moving construction schedule and the understanding at that time that additional dams would be constructed downstream of the HCC, agencies felt forced to accept the approach. By 1962, it had become apparent that the barrier-net system would not work. Other factors causing mortality of out-migrating juvenile salmon and steelhead included: water temperature, dissolved oxygen (DO) levels, and inability of fish to find their way through the reservoir were more important factors.

Hatchery Mitigation Program

In December 1963, the Federal Power Commission ordered IPC to abandon the downstream collection efforts prior to the outmigration of 1964. The order also led to developing a hatchery mitigation program. With completion of Oxbow Dam (1962) and Hells Canyon Dam (1968), production areas for spring chinook and steelhead were lost in the Wildhorse River and Pine Creek. Indian Creek was primarily a steelhead production area, but may have supported low numbers of spring chinook.

Feasibility Study for Reintroduction of Anadromous Fish Above Hells Canyon Dam

The extinction of all anadromous fish above Brownlee Dam is mute testimony to the failure of salmon mitigation efforts. Consequently, the feasibility of reintroducing anadromous fish above Hells Canyon Dam has been discussed in numerous forums over the years. In the late 1980s a workshop initiated by Senator James McClure. The workshop participants concluded that reintroduction was possible if three prerequisites could be met:

- smolt passage problems at existing lower Snake and Columbia river dams were solved;
- flows in the lower Snake River reservoirs were improved to enable successful smolt passage; and
- a reintroduction program were not developed at the expense of existing fisheries programs in the Snake and Columbia rivers.

In the final recommendations to the National Marine Fisheries Service, the Snake River Salmon Recovery Team (Bevan et al. 1992) recommended that the issue of reintroduction for fall chinook salmon (Oncorhynchus tschawytscha) be examined again in the future, especially if smolt collectors that were harmless to the fish could be developed. The issue of the feasibility of reintroducing anadromous fish was also identified by regional interests represented in the Aquatic Resources Work Group as part of the relicensing process of the Hells Canyon Complex (HCC). In addition, the issues of anadromous fish passage and habitat availability continually arise in discussions relating to other Idaho Power Company (IPC) projects along the mainstem Snake River above the HCC that are also involved in the process of relicensing. benefit, risks, and likelihood of success of a reintroduction program.

The Idaho Power Company commissioned a study of the "*Feasibility of Reintroduction of Anadromous Fish Above or Within the Hells Canyon Complex*" (James A. Chandler, editor 2001). This study was intended to be the first phase toward addressing the question of feasibility; it was also intended to highlight the many uncertainties of reintroduction and to identify areas within the historical distribution that have the greatest potential for successful reintroduction. A second phase would require more research targeted to examine key uncertainties of the reintroduction alternatives showing the greatest promise.

Reintroducing anadromous fish above Hells Canyon Dam involves many considerations (Chandler, editor 2001):

- the historical perspective;
- present-day habitat quality;
- multiple land uses and their effects on habitat and passage;
- limitations of passage technology at tributary and mainstem dams;
- risks of deleterious pathogen introductions;
- limitations of smolt-to-adult returns below Hells Canyon Dam; and
- potential impacts to existing federally protected stocks.

2.3.3 Climatic Changes and catastrophic Events

Climate Changes at he the Turn of the Century

Dramatic climatic changes have occurred in the Owyhee Mountains in the last one hundred to one hundred and fifty years. The date of this climatic transition varies slightly depending on the source, but scientists generally agree that it occurred around the 1860s (Great Basin Riparian Ecosystems 2004). The area began to slowly change over time from a high precipitation tall grass area to a low precipitation desert plant community. When the first settlers began to move into the Owyhee Mountains in the 1860s and 1870s, they recorded grasses to their horse's shoulders. Other settlers' journals recorded looking over a sea of tall grass as far as the eye could see, taller than their wagon wheels.

As you review settlers' accounts around 1900, they began telling of drier and drier conditions occurring in the Owyhee Mountains. Heavy snow years did not happen every year, but only one year out of five. The annual precipitation was diminishing and the tall grasses had all but disappeared. The early settlers used the Owyhees to raise horses and sheep. They sold replacement horses to the Army and raised small bands of sheep for wool and meat. Sheep and horses were the primary livestock raised in the Owyhee until the early 1940s.

According to the Black's family journal and Paul Black born in 1908, the Indian bands would use the Antelope Trail and Desert Trail out of the high country of the Owyhee Mountains and the Lonesome Trail between Shoo Fly Creek and Little Jacks Creek in late spring and early summer each year to make their way to the annual encampment at the mouth of the Bruneau River. They would go to the Bruneau encampment to catch and dry their winter supply of salmon. The Indian Trails were used so heavily for so many years that they were beat deep into the earth and can still be seen to this day. There was an abundance of trout in the streams in the Upper Owyhee during the late 1800s.

According to the Black family, the earthquake of 1916 changed the Upper Owyhee country forever. For months after the earthquake, the springs and streams ran murky water and the stream and spring flows dropped off sharply. Many springs dried up, and water had to be hauled in for livestock in areas that always had water previously. As stream and spring flows continued to decrease in the 1920s, many homesteads had to be abandoned. Meadows in Camas Creek, Battle Creek, Big Springs, and Rock Creek no longer produced enough hay for the winter feeding of horses and the settlers were forced to move. Where there were large trout populations, they disappeared. Paul Black remembered how they would catch gunny sacks full of trout in Battle Creek; and Paul Black attributes that to the loss of water flow after the 1916 earthquake. Today, there are only limited populations of trout caught in short sections of streams that have enough water year around in the Owyhee Subbasin. A lawsuit was filed over water rights after the earthquake as the water supply dwindled (Burkhardt vs. Black-1981).

Current Climate

The climate of the Great Basin is semiarid, characterized by an mean annual temperature of 9°C (48.2°F) and between 100 and 200 mm (3.94-7.88 in.) of precipitation annually (Smith et al. 1997). The majority of this precipitation comes during the winter and spring. The current climatic conditions of Rome, OR on the Owyhee River at 3400 feet (1036 m) of elevation best reflect recent climatic conditions of the Owyhee uplands. Average annual precipitation over the last 50 years is 8.21 inches (20.85 cm). The average daily maximum temperature in the hottest month, which is July, is 92.0°F (33.3°C). The average daily minimum temperature for January, the coldest month of the year, is 18.1°F (-7.7°C). Data from further to the south at weather station McDermitt 26N (located 26 miles to the North of the Oregon/Nevada border along US 95) reflects similar conditions at 4500 feet (1371 m) of elevation. Average annual precipitation is 9.43 inches (23.95 cm). The temperature ranges from an average daily maximum of 91.1°F (32.8°C) in the month of July and the average daily minimum for Jan of 18.9°F (-7.3°C). The averages for this station are for the last 45 years (Western Regional Climate Center).

The environment of the Owyhee uplands is comparable to that of the Great Basin (interior drainage). The main difference between the two is hydrological. While the Owyhee uplands have drainage into the Pacific Ocean by way of streams and rivers, the Great Basin has internal drainage. The plant communities which can be found in the two regions are similar in the Owyhee Subbasin and Great Basin (Murphy and Murphy 1986:285). In turn animal communities are similar with the notable exception of different varieties of fish that inhabit the Owyhee River in comparison to inland lakes.

High winds come up in the morning and evening across the plateau regions of the Owyhee uplands. These winds, anabatic and katabatic, are driven by gravity and the heating and cooling associated with morning and evening, respectively (Christopherson

1997). In the evening as layers of the surface cool, the cold surface air is denser and sinks, moving down slope across the mesa. The downward movement is called a katabatic wind. The reverse happens in the morning as the air at lower elevations warms and rises, pushing air the opposite direction across the mesa as an anabatic wind.

2.4 Environment/Population Relationships

2.4.1 Aquatic

2.4.1.1 Redband Trout Distribution

The distribution of redband trout in the Owyhee Subbasin is fragmented (Figure 2.22). Most streams supporting redband trout occur on the east side of the subbasin, primarily in Idaho. Within the Idaho portion of the Owyhee Subbasin, redband trout presently occur in 4,362 miles of streams. They were found in 1,623 miles of streams in the Nevada portion of the subbasin and in only 157 miles of streams in the Oregon portion. The wider distribution of redband trout in the Idaho portion of the subbasin may reflect the true distribution of the trout, or it may be related to sampling intensity. Sampling in the Idaho portion of the subbasin may be more intensive and extensive than in other regions of the subbasin. Nevertheless, redband trout currently exist in mostly isolated patches within the subbasin. There appears to be little connection between headwater demes and those in mainstream reaches.

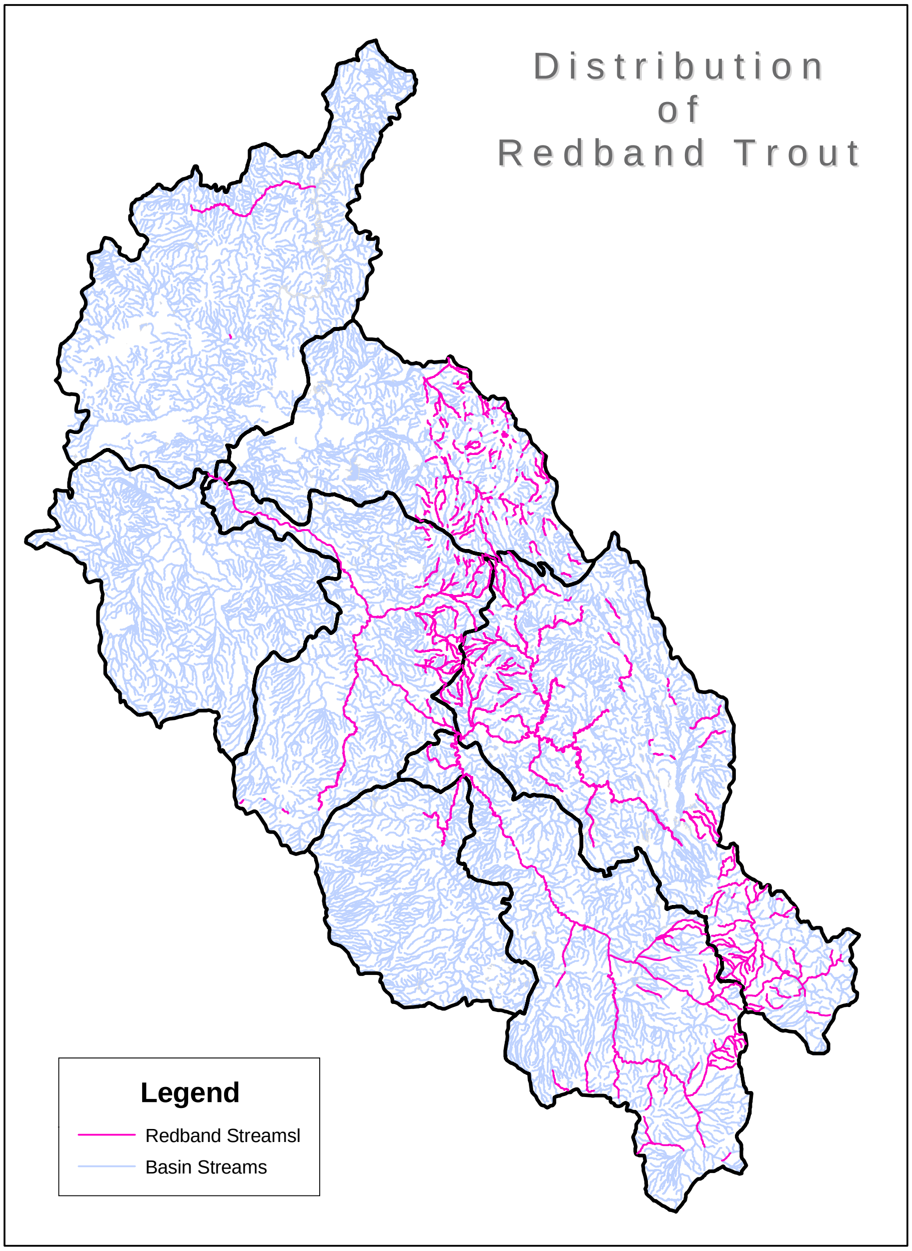

Figure 2.21. Current distribution of redband trout in the Owyhee Subbasin.

2.4.1.2 Redband Trout Habitat – Proper Functioning Condition

About 46% of the streams surveyed in the Owyhee Subbasin for Proper Functioning Condition (PFC) are rated as "Proper Functioning" (Table 2.20; Figure 2.22). That is, 54% of the streams surveyed in Oregon, Idaho, and Nevada (combined) are either non-functioning (10%) or are functioning at risk (44%).

Table 2.20. Miles of stream within the Owyhee Subbasin within different categories of Proper Functioning Condition (total miles of stream equals 1,065.7).

Portion of subbasin	Miles of streams				
	Functioning at risk downstream	Functioning at risk upstream	Functioning at risk (no trend)	Non-functioning	Proper functioning
Idaho	8.7	23.2	329.0	78.6	231.4
Oregon	6.2	1.7	65.8	2.8	251.6
Nevada	27.9	7.6	2.8	22.3	6.1
Total	42.8	32.5	397.6	103.7	489.1

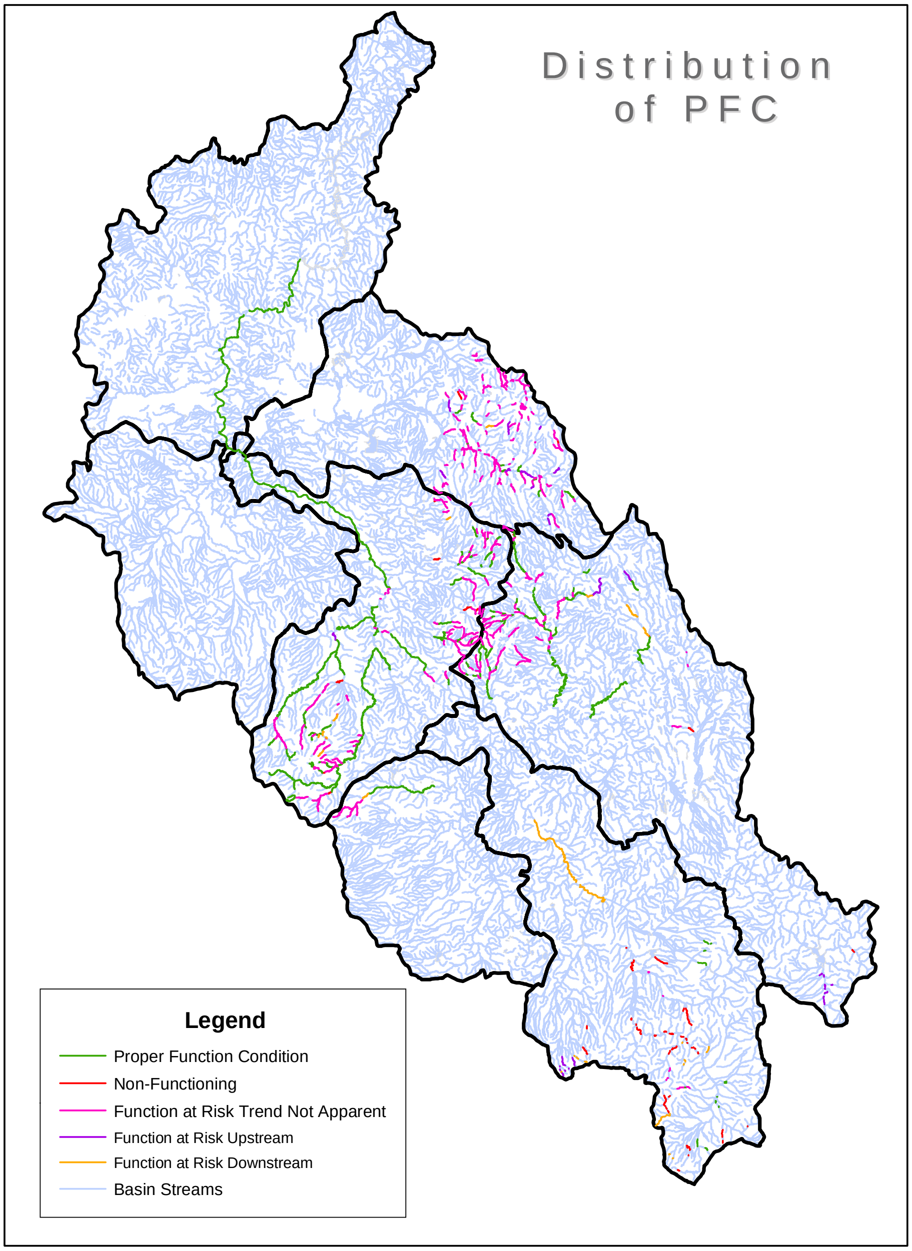

Figure 2.22. Distribution of Proper Functioning Conditions on streams in the Owyhee Subbasin.

2.4.1.3 Qualitative Habitat Assessment (QHA) for Redband Trout in the Owyhee Subbasin

The Qualitative Habitat Assessment tool (QHA) facilitates a structured ranking of stream reaches and attributes for subbasin planners. QHA relies on the expert knowledge of subbasin planners to describe physical conditions in the target stream and to create an hypothesis about how the habitat would be used by a focal species. The hypothesis is the "lens" through which physical conditions in the stream are viewed. The hypothesis consists of weights that are assigned to life stages and attributes, as well as a description of how reaches are used by different life stages. These result in a composite weight that is applied to a physical habitat score in each reach. This score is the difference between a rating of physical habitat in a reach under the current condition and the condition of the reach for the attribute in a reference condition. The result is that the current constraints on physical habitat in a stream are weighted and ranked according to how a focal species might use that habitat.

Description of Qualitative Habitat Assessment (QHA)

Qualitative Habitat Analysis (QHA) is a tool developed to assess habitat as part of subbasin planning for those fish species and subbasins where EDT rules have not been developed or there is insufficient time, resources, and/or data to use the Ecosystem Diagnosis and Treatment (EDT) tool17. QHA is primarily for use on resident salmonids in stream habitats on a watershed scale. QHA requires the user to rate 11 attributes: riparian condition, channel stability, habitat diversity, fine sediment, high and low flow, oxygen, high and low temperature, pollutants, and obstructions. These attributes are rated in both the current and reference conditions in each stream reach being rated. The user must then develop a hypothesis relating the importance of these attributes to a focal species on a reach-by-reach basis for each of four life stages (spawning/incubation, summer rearing, winter rearing, migration). QHA produces a series of tables that describe the physical habitat and identify where restoration and/or protection activities may be the most productive.

The Qualitative Habitat Assessment (QHA) technique was developed as a means to characterize the relationship between a fish population and its aquatic habitat. It was developed principally for resident salmonids, though it could potentially be adapted for use with other species. The QHA is intended for use in stream environments at a watershed or subbasin scale. QHA would not be particularly useful for an assessment covering only a few stream reaches or small watersheds. The minimum number of reaches or small watershed where QHA results would be meaningful is, perhaps, 20-30. The current version of QHA will only support up to 300 reaches. For subbasins with

[17] Chip McConnaha, of Mobrand Biometrics, Inc. was the principal creator of the QHA technique. Lars Mobrand, Bruce Watson, Phil Roger, and Drew Parkin contributed to the development of concepts and reviewed draft products. Bruce Marcot and Tom O'Neil provided advice on structuring ranking schemes. Several subbasin planners were kind enough to review the draft product. Chip McConnaha, Drew Parkin and Jeff Fryer authored the user's guide.

more reaches, we encourage dividing up the subbasin into different portions as we believe that it is going to be very difficult to interpret results from QHA analysis of large numbers of reaches.
While it is possible to integrate lake or reservoir assessment findings with QHA, as currently constructed this technique would be of limited use for areas where a lake or reservoir is the dominant fish habitat. QHA could, however, be used to support a lake assessment by characterizing fish/habitat relationships in lake tributaries.

QHA would be particularly useful in subbasins where there is local knowledge of habitat conditions but where systematic field research may be limited. It would also be useful in situations where time and financial resources may be limited.

The following explanation provides background on using "qualitative" biological assessment. Professional judgment (i.e., expert opinion) may be criticized for being subjective and lacking consistency. On the other hand, it is well recognized that a strictly quantitative approach may not always be possible, or even preferred. For example, using a quantitative approach may not make sense in areas where data are limited, when there is not enough time allotted to conduct a rigorous quantitative assessment, or where appropriate tools or expertise are not available. In these situations a more qualitative approach is indicated. The 2000 Template for Subbasin Assessment, for example, referenced the use of "opinions of local fish managers" as an analytical tool.

The QHA was designed to minimize problems associated with unstructured qualitative assessments. QHA is what we call a "structured qualitative assessment." In other words, it is a systematic and objective assessment of species habitat relationships that relies principally on existing local professional knowledge and judgment. QHA "structures" the process by:
(1) following a logical and replicable sequence,
(2) using the best available quantitative data as the basis for decisions,
(3) generating a product that is similar in form to products resulting from other more quantifiable approaches, and
(4) documenting the decision process.

QHA produces a series of tables that describe the physical habitat, identify where restoration and/or protection activities may be the most productive, and a series of summary tables. Taken as a whole, these tables offer a means to track and document the decision process.

Owyhee QHA Workshops

We conducted a series of QHA Workshops for each portion of the Owyhee Subbasin – Oregon, Idaho and Nevada. The first workshop was on November 6th 2003 in Vale, Oregon. The participants were: Jeff Fryer (TOAST), Tim Dykstra (Shoshone-Paiute Tribes), Jack Wenderoth (BLM hydrologist) and Steve Vigg (Consultant/Owyhee Subbasin Plan Coordinator). During this meeting we set up the initial version of the river reach system for the Oregon Portion of the Owyhee. On November 25th 2003, we conducted the second QHA workshop at the Vale BLM office. Participants were Cynthia Tait (BLM biologist), Brent Grasty (BLM GIS support), Jack Wenderoth, Ray Perkins (ODFW biologist), Jennifer Martin (OWC), Carl Hill (OWC), Tim Dykstra, Tom Dayley (NPCC) and Steve Vigg. During this meeting we finalized the river reach system for the Oregon portion of the Owyhee, and completed the redband trout habitat ratings.

The Idaho QHA workshops were initiated on January 14th-15th 2004 in Boise. The participants of the first meetings were Pam Druliner (BLM Biologist), Bonnie Hunt (BLM Resource Specialist), Tim Dykstra, Brad Nishitani (GIS consultant), and Steve Vigg. During these meetings we developed the initial version of the river reach system for the Idaho Portion of the Owyhee. Bruce Zoellick (BLM Biologist) provided additional input on the Owyhee-Idaho river reach system after the initial meeting.

The participation at the January 29th, 2004 QHA Workshop in Boise included the following technical and planning members:

- Bonnie Hunt BLM-Owyhee
- Pat Ryan BLM-Owyhee
- Jim Desmond Owyhee County, Natural Resources Committee
- Steven Vigg Steven Vigg & Co.
- Eric Leitzinger IDFG
- Jerry Hoagland Owyhee Watershed Council
- Jennifer Martin Owyhee Watershed Council
- Leonard Beitz Ash Grove
- Carl Hill Owyhee Watershed Council
- Pam Druliner BLM-Owyhee
- Bruce Zoellick BLM-Bruneau
- Randy Wiest DSL
- Guy Dodson Sr. Shoshone-Paiute Tribe
- Tim Dykstra Shoshone-Paiute Tribe
- David F. Ferguson Idaho Soil Conservation Service
- Duane LaFayette IACSD
- Bradley Nishitani BioAnalysts, Inc.
- Tracy Hillman BioAnalysts, Inc.
- Tom Dayley NPCC

During this workshop, redband trout habitat ratings were discussed and scoring was initiated for the Idaho Portion of the Owyhee Subbasin. Since the ratings were not completed for the entire river reach system, a third QHA Workshop was convened on February 5th 2004 in Boise. The participants at this workshop included the following fish & wildlife biologists and managers: Eric Leitzinger, Pam Druliner, Bonnie Hunt, Tim Dykstra, Guy Dodson, and Steve Vigg. Tom Dayley (NPPC Coordinator) also attended to provide Council guidance. During this third Idaho workshop, redband trout QHA ratings were completed for the Idaho Portion of the Owyhee Subbasin.

During March 9th and March 10th 2004, a QHA Workshop was conducted for the Nevada portion of the Owyhee Subbasin in Elko, Nevada. The participants were: Patrick Coffin (Fishery Biologist, NV-BLM), Robert Orr (Natural Resource Specialist, NV-BLM), Gary Johnson (Fish & Wildlife Biologist, NDOW), Tim Dykstra, Guy Dodson, and Steve Vigg. During the first day, we set-up the QHA river reach system for Nevada Portion of Owyhee and rated specific stream reaches for redband trout habitat "current" conditions versus "reference" conditions. On the second day of the workshop, we finished the habitat ratings and scored species range worksheet "current" vs. "reference". Ray Lister (Supervisory Biologist, NV-BLM) briefly attended the workshop, and later met with Steve Vigg regarding BLM documents that were relevant to the Owyhee Subbasin Planning process. We obtained both electronic and hardcopy documents from Ray Lister, BLM.

Results of Owyhee QHA

Species Hypothesis Worksheet

The “species hypothesis” worksheet provides subbasin planners with the opportunity to apply their understanding of biological systems to make decisions regarding the relative importance of each life stage of the focal species to fish productivity and sustainability. The first step is to rate the life stages according to overall importance in the subbasin (Table 2.20). While there are several ways to delineate life stages, the QHA model opted for the most simple case – spawning, summer rearing, winter rearing and migration. Note that “migration includes both juveniles and adults. Fish life stages are rated using a 4 to 1 scale, with 4 being most important. One may rate all life stages differently (1, 2, 3, 4) or give some or all life stages the same value. The difference in the weight assigned to given life stages — for example, 1 for “migration” and 4 for “summer rearing” — shows that summer rearing is much more important to redband trout production in the Owyhee system than is migration. In contrast, there is less difference in relative importance between “summer rearing” and “spawning/incubation” (rated 3). The reason for rating the life stages is to quantify how each phase of the redband trout’s life cycle will be used to evaluate the importance of the various habitat factors.

Table 2.21. Rank importance of life cycle stages to the focal species – redband trout in the Owyhee Subbasin

	Spawning/incubation	Summer Rearing	Winter Rearing	Migration
Life Stage Rank (1-4)	3.0	4.0	2.0	1.0
Redband Trout Sensitivity	2nd Most	Most Sensitive	3rd Most	Least

Thus, the Life Stage rank (Table 2.21) indicates a prioritization of habitat condition for use by a life stage of the focal species. Since a rank of 4= highest sensitivity and a rank of 1= lowest sensitivity (McConnaha et al. 2003) – the scores above indicate that redband trout populations in the Owyhee Subbasin are most sensitive summer rearing habitat conditions, second-most sensitive to spawning/incubation habitat conditions, third-most sensitive to winter rearing habitat, and least sensitive to migratory habitat conditions.

We also assigned a weight to each attribute relative to its importance to the specific life stage of redband trout (Table 2.22). The attribute scale (0-2) ranks the importance ascribed to each habitat attribute in regards to the life stage of the focal species; where "zero" is not important, "one" is moderately important, and "two" is very important.

Table 2.22. Weight assigned to each attribute relative to its importance to the specific life stage of redband trout.

	Spawning/incubation	Summer Rearing	Winter Rearing	Migration
Riparian Condition	2.0	2.0	1.0	0.5
Channel stability	2.0	2.0	1.0	1.0
Habitat Diversity	1.0	2.0	2.0	1.0
Fine sediment	2.0	1.5	1.0	0.5
High Flow	1.0	1.0	1.0	2.0
Low Flow	1.0	2.0	1.0	2.0
Oxygen	1.0	2.0	0.0	1.0
Low Temp	0.5	0.0	1.0	0.5
High Temp	1.0	2.0	0.0	1.0
Pollutants	0.5	0.5	0.5	0.5
Obstructions	0.5	0.5	0.5	2.0

Current and Reference Worksheets

The “reference” and “current” tables are the heart of the assessment. Using these tables subbasin planners characterize the physical condition of the subbasin. This is accomplished by supplying information concerning a range of habitat characteristics, with information arrayed by reach or small watershed.

Definition of Reference. In the “reference” conditions we consider what this subbasin would be like if the system were restored to the fullest extent possible short of disrupting infrastructure that is vital to modern society and that is likely to remain in place for the foreseeable future. In a subbasin with little cultural modification this reference condition might equate to "historic" conditions, that is, the conditions that were in place prior to European settlement – this is the case for the Owyhee Subbasin. By contrast, in a largely urbanized subbasin (for example, within the Portland metropolitan area) this might mean accepting the urban fabric but taking aggressive action to restore habitat within the confines of this urban fabric.

Definition of Current. In the "current" conditions (Table 2.24-2.26) we rate the condition of the aquatic environment as it is today. One caveat is a situation where significant habitat enhancement is currently underway that would significantly change habitat quality. In these cases the guidance is to characterize current conditions as if these enhancements were complete.

Defining River Reaches. A river reach (or segment) is a linear stretch of stream that is defined by hydrological or ecological characteristics. Reaches are be hydrologically defined, as is the case in the USGS/EPA river reach system where a reach is defined as the area between confluences. The optimum number of reaches is about 60 for the smallest subbasin and 300 for the largest. We attempted to define each hydrological reach based on ecological character, we reviewed the streams in the subbasin and divide them into meaningful ecologically-consistent segments.

Confidence Levels. Below the list of habitat characteristics is a row entitled "attribute confidence." In this row we rated the level of confidence for each stream reach, based on the following scale:

0 = speculative
1 = expert opinion
2 = well documented

Habitat Characteristics. In both the reference and current condition tables we look at 11 habitat characteristics, or attributes. These eleven are:

1. Riparian condition
2. Channel form
3. Habitat diversity
4. Fine sediment
5. High flow
6. Low flow
7. Oxygen
8. High temperature
9. Low temperature
10. Pollutants
11. Obstructions

These are the habitat characteristics that are generally thought to be the main "drivers" of fish production and sustainability. These habitat attributes are defined in Table 2.23.

Table 2.23. Key for QHA habitat attributes.

#	Attribute	Description
1.	Riparian Condition	Condition of the stream-side vegetation, land form and subsurface water flow.
2.	Channel stability	The condition of the channel in regard to bed scour and artificial confinement. Measures how the channel can move laterally and vertically and to form a "normal" sequence of stream unit types.
3.	Habitat Diversity	Diversity and complexity of the channel including amount of large woody debris (LWD) and multiple channels.
4.	Fine sediment load	Amount of fine sediment within the stream, especially in spawning riffles.
5.	High Flow	Frequency and amount of high flow events.
6.	Low Flow	Frequency and amount of low flow events.
7.	Oxygen	Dissolved oxygen in water column and stream substrate.
8.	Low Temperature	Duration and amount of low winter water temperatures that can be limiting to fish survival.
9.	High Temperature	Duration and amount of high summer water temperature that can be limiting to fish survival.
10.	Pollutants	Introduction of toxic (acute and chronic) substances into the stream.
11.	Obstructions	Dam, irrigation diversion, or natural geologic feature that blocks fish movement.
12.	Reach Confidence	Confidence Rating (0-1-2 scale), where: 0 = Speculative; 1 = Expert Opinion; and 2 = Well Documented.

QHA is basically intended to be rated using an ordinal scale because we should not imply high resolution scores to a method that is inherently imprecise. But 1/2 increments (0.5) are permissible, e.g., when the field biologist thinks more resolution is realistic or as a compromise between two expert opinions.

Table 2.24. Key for scoring habitat attributes in "Current" QHA tables below.

Score	Attribute Rating	Normative (definition)
0	0% of normative	Ideal conditions for similar stream in this ecological province. Note that this is more from a geomorphic perspective than a biological perspective.
1	25% of normative	
2	50% of normative	
3	75% of normative	
4	100% of normative	

Current Worksheets Scores – Oregon

The following river reach system and habitat ratings for redband trout were developed at two workshops in November, 2003 -- with input from BLM and State of Oregon fishery biologists, possessing extensive field experience in the specific stream reaches in the Owyhee Subbasin. The following scores summarized in Table 2.24 were determined during the November 25th workshop-- with primary input from Ray Perkins (ODFW) and Cynthia Tate (BLM).

Table 2.24. QHA scores for the Oregon portion of the Owyhee.

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Owyhee R-1	Mouth to Owyhee Ditch Co Dam (RM14)	3.5	2.5	2.5	1.0	1.0	1.0	0.5	2.0	1.5	3.0	3.0	1
Owyhee R-2	DC Dam to RM28	3.0	3.0	3.5	3.5	2.0	2.0	3.5	2.5	1.0	3.5	4.0	2
Owyhee R-3	Dam to Upstream High Water (RM80)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Dry Creek	Dry Creek upstream to Crowley Road	2.5	3.0	3.0	3.0	2.5	2.5	3.0	3.5	2.0	4.0	3.5	2
Owyhee R-4	High Water upstream to Jordan Cr	3.5	3.5	3.5	3.0	3.5	3.5	3.5	4.0	3.0	3.0	4.0	2
Rinehart Creek	Mouth to falls	3.5	3.5	3.5	3.0	3.5	3.5	3.5	4.0	4.0	4.0	3.5	1
Jordan Creek	Mouth to State Line	2.0	2.5	2.0	2.0	2.5	1.0	1.5	3.0	1.0	3.0	2.5	1
Cow Creek	Mouth to State Line	1.0	2.5	2.0	2.0	3.5	1.0	1.5	3.0	1.0	4.0	2.5	0.5
Owyhee R-5	Confl. Jordan Creek upstream to Sline	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	3.0	4.0	4.0	2
NF Owyhee	Mouth to Sline	3.0	3.5	3.5	3.5	3.5	3.5	3.5	4.0	3.0	4.0	4.0	2
Middle Fork	Idaho Segment (?)	1.5	3.5	3.5	2.0	3.0	3.5	3.0	4.0	3.0	4.0	4.0	0
Antelope Creek R-1	Mouth upstream to corrals (~8 mi)	4.0	4.0	4.0	3.0	3.5	3.5	3.5	4.0	3.5	4.0	4.0	2
Antelope Creek R-2	Corrals upstream to Star Valley Road (dry segment)	3.5	3.5	3.5	3.0	3.5	3.5	3.5	4.0	4.0	4.0	4.0	2
Antelope Creek R-3	SV Road upstream to Headwaters	2.5	3.0	2.5	3.0	3.5	3.5	2.5	3.5	2.5	4.0	4.0	2
WLO R-1	Mouth	3.5	3.5	3.5	3.0	3.5	3.5	3.5	4.0	3.0	4.0	4.0	2

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	upstream to Anderson Crossing												
WLO R-2	Anderson Crossing to headwaters	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.0	3.0	4.0	4.0	2

Current Worksheets Scores – Idaho

The following river reach system and habitat ratings for redband trout have been developed via a series of workshops (January-February 2004) -- with input from BLM and State of Idaho fishery biologists -- with extensive field experience in the specific stream reaches in the Owyhee Subbasin. The following scores were determined at the January 29th and February 5th workshops (Table 2.25).

Table 2.26. QHA scores for the Idaho portion of the Owyhee.

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
HUC 17050108													
Jordan Cr.-1	Jordan Cr. From OR Boundary to BLM boundary section	1.0	1.0	1.0	2.0	3.0	1.0	1.0	1.0	1.0	1.0	4.0	0.5
Jordan Cr.-2	From end of #2 to Rail Creek	1.5	2.0	1.0	2.0	2.5	2.0	2.5	2.0	2.0	1.0	4.0	1.5
Jordan Cr.-3	Rail Cr. Confluence to BLM boundary	2.0	2.0	2.0	3.0	3.0	1.0	2.5	2.0	2.0	1.0	4.0	0.5
Jordan Cr.-4	BLM boundary near Buck Cr. to BLM boundary	1.5	2.0	1.0	2.0	2.5	2.0	2.5	2.0	2.0	1.0	4.0	0.5
Jordan Cr.-5	BLM boundary section line to BLM boundary upstream of Louse Cr.	2.0	2.0	2.0	3.0	3.0	2.0	2.0	2.0	2.0	1.0	4.0	0.5
Jordan Cr.-6	BLM boundary upstream of Louse Cr. To BLM boudary section	3.0	3.0	2.5	3.0	2.5	2.0	2.5	2.0	2.0	1.0	4.0	0.5
Jordan Cr.-7	BLM Boundary to state land section boundary	2.0	2.0	2.0	3.0	3.0	3.0	2.5	2.0	2.0	1.0	4.0	0.5
Jordan Cr.-8	State linelands boundary to headwaters of Jordan Cr.	2.5	2.5	2.5	2.0	3.0	2.5	2.5	2.5	2.5	1.0	4.0	0.5
Williams Cr.	BLM segments	2.5	2.0	2.0	2.5	2.5	2.0	2.5	2.0	2.0	2.5	4.0	1.5
Williams Cr.	Including Pole Bridge Cr. And	2.5	2.5	2.0	3.0	4.0	3.0	2.5	2.0	2.0	2.5	4.0	0.5

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	West Cr.												
Duck Cr.	All	1.5	1.5	2.0	1.5	2.5	2.0	2.0	2.0	2.0	2.0	4.0	1.5
Old Man Cr.	All	1.0	2.0	1.0	2.0	3.0	0.0	2.0	2.0	2.0	2.0	1.0	0.5
South Mountain Creek	Lower BLM upper put state includes Howl Cr. Cyote Cr.	1.5	1.5	1.0	1.5	2.5	2.0	2.0	2.0	2.5	2.0	4.0	0.5
Rail Cr.	All	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.0	2.0	4.0	1
Washington Gulch	All	2.0	2.0	2.0	2.5	2.5	2.5	2.5	2.5	2.0	2.5	4.0	1
Flint Cr.1	Lower	2.8	2.5	3.0	1.5	2.5	2.5	3.0	3.0	2.0	1.5	4.0	0.5
Flint Cr.2	Upper Includes East Cr.	2.8	2.5	3.0	1.5	2.5	2.5	3.0	3.0	2.0	1.5	4.0	2
South Boulder Cr.	From confluence with North Boulder Cr. To confluence with Mill Cr.	2.5	3.0	2.5	2.3	3.0	2.8	2.5	2.5	1.5	2.0	4.0	1.5
Upper South Boulder Creek	Mill Creek confluence to headwaters	2.0	2.0	2.0	2.0	2.0	2.5	2.5	2.5	1.5	2.0	3.5	0.5
Indian Cr.	Bogus Cr. (Lower) - confluence with South Fork Boulder to Section 10	1.0	2.0	1.0	2.0	3.0	0.0	2.0	2.0	2.0	2.0	4.0	0.5
Bogus Cr.	Upper above section 10 and above	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	2.5	3.0	4.0	1
Combination Cr.	Lower reach of stream	1.5	2.0	2.0	2.5	3.0	2.5	1.5	2.5	2.5	2.5	4.0	1
Rose Cr.	Up to state section.	2.8	3.0	2.5	3.0	3.0	2.5	2.0	3.0	2.5	3.0	4.0	1.5
Josephine	includes Wickiup and Long Valley and Headwater Josephine	2.8	3.0	2.5	3.0	1.5	2.0	3.0	3.0	2.0	2.5	4.0	1.5

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Louisa Cr.	From confluence with Rock Cr.	1.5	1.5	2.0	1.5	1.0	1.0	2.5	1.5	1.5	1.5	0.0	1.5
Lower Rock Cr.-1	From confluence of North Boulder to Meadow Creek.	3.0	3.0	3.0	2.5	1.5	1.5	2.5	3.0	2.0	3.0	4.0	1.5
Rock Cr.-2	From Meadow Creek to BLM	1.0	1.0	1.0	2.0	3.0	1.0	1.0	1.0	1.0	2.0	4.0	0.5
Rock Cr.-3	BLM portion in Section 26	3.0	3.0	2.5	2.5	1.5	1.5	2.0	3.0	2.0	2.0	4.0	0.5
Rock Cr.-4	From BLM/PVT boundary in Sec. 26 to above Triangle Reservoir.	1.0	1.0	1.0	2.0	3.0	1.0	1.0	1.0	1.0	2.0	4.0	0.5
Rock Cr. 5	BLM reach above Triangle Reservoir to Sheep Creek/private boundary	3.0	3.0	2.5	2.5	3.0	2.0	2.5	3.0	2.0	2.0	4.0	1.5
Rock Cr. 6	From Sheep Creek/private boundary to headwaters	2.0	2.0	2.0	3.0	4.0	3.0	3.0	3.0	2.0	2.0	4.0	0.5
Meadow Cr.	Headwaters to confluence with Rock Cr.	1.5	1.5	1.0	2.0	3.0	1.5	2.5	3.0	1.5	3.0	4.0	0.5
Deer Cr.	Confluence with Big Boulder to state section 36	2.8	2.8	2.5	2.0	2.5	2.5	2.5	3.0	2.5	3.0	2.0	1.5
Owl Cr.	Includes Minear Cr. (Confluence of Lone Tree to headwaters)	2.5	2.5	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	1
North Boulder-1	From confluence with Big	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	4.0	1.5

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	Boulder; BLM reach to Private												
North Boulder-2	From confluence with Mamouth Cr. To headwaters	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	4.0	1.5
Louse Cr.	Includes Cottonwood Cr. From confluence of Jordan Cr. To headwaters	1.5	2.0	1.0	2.0	3.0	1.0	2.0	2.0	2.5	2.0	4.0	1
Upper Trout Cr.	From Split Rock Canyon to headwaters, including Nichols, Wood Canyon creeks	2.0	2.0	1.8	2.0	3.0	1.5	2.0	2.5	2.5	2.0	3.0	1
Split Rock Canyon	Confluence with Trout Creek to headwaters.	2.5	2.0	2.0	2.0	3.0	2.5	2.5	2.5	3.0	2.5	4.0	1.5
Cow Cr.-2	From confluence with Wildcat Canyon Cr. To headwaters	2.0	2.0	2.0	2.0	3.0	2.5	3.0	3.0	2.0	2.0	4.0	1.5
Soda Cr.	From confluence of Cow Cr. To headwaters	2.5	2.5	2.0	2.0	3.0	3.0	2.0	3.0	2.0	2.0	4.0	1.5
HUC 17050107													
NF Owyhee 1	Lower; From the Oregon State line to the confluence of Juniper Cr.	3.0	3.0	3.0	2.5	3.5	2.0	3.0	3.0	2.0	3.0	4.0	1.5
NF Owyhee 2	Upper; Headwaters of North Fork , Lower Noon	3.0	3.0	3.0	3.0	3.5	2.5	3.0	3.0	2.5	3.0	4.0	1.5

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	Cr. And Lower Pleasant Valley Cr.												
Upper Pleasant Valley Cr.	From the top of Sec. 7 to headwaters	2.0	1.0	1.5	1.5	3.5	1.5	3.0	3.0	2.0	2.0	3.0	1.5
Cabin Cr.	From the confluence with Juniper Cr. To the headwaters	2.0	2.0	2.5	2.0	3.0	2.5	3.0	3.0	2.0	2.0	4.0	1.5
Juniper Cr. 1	From the confluence with the North Fork Owyhee to lower private boundary	2.8	3.0	3.0	2.5	3.0	2.5	3.0	3.0	2.0	2.0	4.0	1.5
Juniper Cr. 2	From the start of the private up to the headwaters	2.0	3.0	2.0	2.0	3.0	1.0	3.0	3.0	2.0	2.0	4.0	0.5
Lone Tree Cr.	From Oregon State line to headwaters	2.0	2.0	1.5	2.0	3.0	2.5	3.0	3.0	2.0	2.0	4.0	0.5
Cottonwood Cr.	From the upper private boundary (section 18) to headwaters	2.0	2.0	2.0	2.0	3.0	1.5	3.0	3.0	2.0	3.0	3.0	1.5
Squaw Cr. 1	From Oregon State line to lower private boundary (section 13)	3.0	3.0	3.0	2.5	3.5	2.5	3.0	3.0	2.0	3.0	3.0	1.5
Squaw Cr. 2	From the start of private in section 14 to the BLM in the northwest corner of section 31	3.0	4.0	3.0	3.0	4.0	2.0	3.0	3.0	2.0	3.0	4.0	0.5
Squaw Cr. 3	From private to headwaters	2.0	2.0	2.0	2.0	3.5	2.0	3.0	3.0	2.0	2.5	4.0	0.5

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Pole Cr.	Oregon State line to headwaters	3.0	3.0	3.0	2.5	3.5	3.0	3.0	3.0	3.0	3.0	4.0	2
Middle Fork Owyhee	Oregon State line to headwaters	0.5	1.5	1.5	2.0	3.5	1.5	2.0	1.5	1.0	2.0	4.0	2
HUC 17050106													
Little Owyhee	From the Nevada State line to the confluence with South Fork Owyhee	2.0	2.3	1.0	2.0	3.0	1.5	1.0	1.0	1.0	1.0	4.0	1
HUC 17050105													
South Fork Owyhee	From Nevada State line to the confluence with Owyhee River	2.8	3.0	2.5	2.0	2.5	1.5	2.5	3.0	1.5	3.0	3.0	1.5
HUC 17050104													
Blue Cr.-3	Blue Cr. Reservoir to headwaters	1.5	2.0	3.0	3.0	2.0	1.0	3.0	2.0	2.0	3.0	2.0	1.5
Shoofly Cr.-1	Confluence to BLM boundary	1.0	2.0	1.0	2.0	2.0	1.0	3.0	2.0	2.0	3.0	4.0	1.5
Shoofly Cr.-2	Private/BLM boundary to Bybee reservoir	2.0	3.0	2.0	3.0	1.0	1.0	3.0	3.0	2.0	3.0	1.0	1.5
Shoofly Cr.-3	Bybee reservoir to headwaters	2.0	3.0	2.0	3.0	3.5	2.5	3.0	3.0	2.0	3.0	3.0	0
Owyhee River	DV reservoir border to confluence	3.0	3.0	3.0	3.0	3.0	3.5	3.0	3.5	2.0	4.0	4.0	1.5
Owyhee River DVIR portion	Mouth of canyon to NV state line	1.0	1.0	1.0	2.0	3.0	1.0	2.0	2.0	1.0	3.0	4.0	1
Battle Cr.-1	Confluence to private in sec. 10 (cottonwood draw)	3.0	3.0	2.0	3.0	3.0	3.0	2.5	3.0	1.0	3.0	4.0	2

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Battle Cr.-2	Section 10 to above state section 36	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	0
Battle Cr.-3	State section 36 to headwaters	1.5	2.0	1.0	2.0	3.5	1.0	3.0	2.0	2.0	2.0	3.0	1.5
Dry Cr.-1	confluence to reservoir	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0
Dry Cr.-2	Reservoir to headwaters	1.0	1.0	1.0	2.0	4.0	1.0	3.0	2.0	1.0	3.0	1.0	1.5
Big Springs Cr.-1	confluence to reservoir	1.5	2.0	2.0	2.0	4.0	2.0	3.0	2.0	1.0	3.0	3.0	1.5
Big Springs Cr.-3	BLM boundary to private	1.0	2.0	2.0	2.0	4.0	2.0	3.0	2.0	1.0	2.0	4.0	1.5
Deep Cr.-1	Confluence to private	3.0	2.5	2.5	1.0	3.5	2.0	1.0	3.0	1.0	4.0	4.0	2
Deep Cr.-2	Private to mid section 10	2.0	1.5	1.5	1.0	3.5	2.0	1.0	3.0	1.0	4.0	4.0	2
Deep Cr.-3	section 10 to Stoneman Cr. Confluence	3.0	1.5	1.5	1.0	3.5	2.0	2.0	3.0	2.0	4.0	4.0	2
Deep Cr.-4	headwaters including:	1.0	1.0	1.5	1.0	3.5	2.0	2.0	3.0	2.0	3.0	4.0	2
Stoneman Cr.	Confluence to headwaters	2.0	1.0	2.0	2.0	3.0	1.0	3.0	3.0	2.0	3.0	3.0	2
Current Cr.	Confluence to headwaters	2.0	1.0	2.0	2.0	3.0	1.0	3.0	2.0	2.0	3.0	3.0	2
Nickel Cr.	Confluence to headwaters including:	2.0	3.0	3.0	1.0	3.5	2.0	3.0	3.0	2.5	3.0	4.0	2
Smith Cr.	Confluence to headwaters including:	2.0	2.0	2.0	1.0	3.5	2.0	3.0	3.0	2.0	3.0	4.0	2
Castle Cr.	Confluence to headwaters including:	1.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0	1.0	3.0	1.0	2
Beaver Cr.	Confluence to headwaters including:	2.0	3.0	3.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	4.0	2

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Red Canyon Cr.	Confluence to headwaters including:	1.5	2.0	2.0	2.0	3.5	2.0	3.0	3.0	1.0	3.0	4.0	2
Petes Cr.	Confluence to headwaters including:	1.5	1.5	1.5	1.5	3.5	2.0	3.0	3.0	1.0	2.0	4.0	2
Dickshooter Cr.	Confluence to headwaters	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.5	3.0	3.0	4.0	1.5
Pole Cr.-1	Confluence to Camas Cr. Confluence including Camel Cr.	2.5	3.0	3.0	2.0	3.0	2.0	3.0	3.0	1.0	3.0	4.0	1.5
Pole Cr.-2	Camas confluence to headwaters	2.0	2.5	2.5	2.0	3.5	1.0	3.0	3.0	1.0	3.0	3.0	1.5
Camas Cr.	Confluence to headwaters	3.0	3.0	2.5	2.0	3.5	2.0	3.0	3.0	2.0	3.0	4.0	1.5

Current Worksheets Scores – Nevada

The following river reach system and habitat ratings for redband trout have been developed via workshops (March 9th-10th in Elko, Nevada) with input from Nevada fishery biologists – Pat Coffin (BLM) and Gary Johnson (NDOW) – with extensive field experience in the specific stream reaches in the Owyhee Subbasin. The following scores were derived from the Nevada QHA workshops (Table 2.26).

Table 2.26. QHA scores for the Nevada portion of the Owyhee.

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
HUC 17050104													
E.F. Owyhee ID-NV state line to Paradise Point Diversion	Irrigated hay fields, No RBT habitat	2.5	1.0	2.0	1.5	1.5	1.0	2.0	2.5	2.5	1.0	1.0	1
Boyle Cr	Starts in NV and enters Owyhee in ID	1.5	2.0	2.0	2.0	3.5	3.5	3.0	2.5	2.5	3.0	3.5	0.5
S.F of Boyle Cr		1.5	2.0	2.0	2.0	3.5	3.5	3.0	2.5	2.5	3.0	3.5	0.5
E.F. Owyhee Paradise Point to Duck Valley Indian Res border	DVIR	2.0	0.5	0.5	1.5	3.0	2.5	2.0	2.5	2.5	1.0	4.0	1
Skull Cr		1.5	2.0	2.0	2.0	3.5	3.5	3.0	3.0	2.5	3.0	3.5	0.5
N.F. of Skull Cr		1.5	2.0	2.0	2.0	3.5	3.5	4.0	3.0	2.5	3.0	3.5	0.5
E.F. of Skull Cr		1.5	2.0	2.0	2.0	3.5	3.5	4.0	3.0	2.5	3.0	3.5	0.5
Reed Cr		1.5	2.0	2.0	2.0	3.5	3.5	3.0	2.5	2.5	3.0	3.5	0.5
Summit Cr		1.5	2.0	2.0	2.0	3.5	3.5	3.0	2.5	2.5	3.0	3.5	0.5
Fawn Cr	USFS RBT occupied for sure 4.8miles	2.5	3.0	3.0	3.0	4.0	4.0	4.0	3.0	2.5	3.0	4.0	1.5
Jones Cr		1.5	2.0	2.0	2.0	3.5	3.5	3.0	2.5	2.5	3.0	3.5	0.5
Granite	probably fishless	1.5	2.0	2.0	2.0	3.5	3.5	3.0	2.5	2.5	3.0	3.5	0.5
E.F. Owyhee Duck Valley Indian Res border to Patsville (Mill Cr)	U.S.F.S.	2.0	2.0	1.0	2.0	3.0	2.5	2.5	2.5	2.5	0.5	4.0	1.5
Slaughter House Cr	Occupied RBT 2 miles	3.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
Brown's Gulch (Slaughter house Trib	2.4 miles RBT occupied	3.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
Miller Cr.	3 mile occupied RBT	2.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
West Fr. (of Slaughterhouse Cr)	1.5 miles occupied RBT	3.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
California Cr	Min. occupied RBT by headwater of Cr.	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
North Fr (trib of	No RBT, lack of	2.0	2.0	2.0	2.0	3.0	3.0	3.5	3.0	1.5	4.0	3.0	2

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
California Cr)	flow(Drought yr)												
Dip Cr	1 mile RBT occupied	3.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
Big Springs Cr	Unoccupied (insufficient flow)	3.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
South Fr.	2 mile RBT occupied	2.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
Pixley	1 mile RBT occupied	3.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0	2
E.F. Owyhee Mill Cr.to Badger Cr	U.S.F.S.	2.5	1.5	1.0	2.0	3.0	2.5	3.0	2.5	3.0	3.0	2.5	1. 5
Lower Mill Cr to S.F Owyhee River	Unoccupied, pollution, mine tailings	0.5	2.0	0.5	2.0	3.0	3.0	2.0	2.0	2.0	0.5	4.0	2
Upper Mill Cr to Rio tinto Mine	occupied RBT whole distance in none drought years	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
McCall Cr.	5.5 miles occupied RBT	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Allegheny	Native Dace only	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
Cold Spring (trib to Allegheny)	Native Dace only	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
Trail Cr	8.2 occupied RBT, Brook Trout(MGT concern)	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	2.0	2
Van Duzer Cr. (Trib to Trail Cr)	5 mile occupied, Brook Trout (MGR concen)	3.0	2.5	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	2.0	2
Lime Cr (trib to Van Duzer)	.3 occupied by RBT, Brook Trout prsnt	3.0	2.5	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Cobb Cr (trib to Van Duzer)	4.5 RBT occupied	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Deer Cr (trib to Trail Cr.)	min. occupied RBT in a single pool	2.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0	2
Springs Cr.	0.1 mile RBT occupied, Brook trout	2.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0	2
Wood Gulch	Mine prsnt, 2 mile RBT occupied	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
Hutch Cr	1mile RBT occupied, Brook Trout	2.5	2.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0	2
Timber Gulch	0.35 RBT occupied, Brook Trouth	2.5	2.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0	2
Sheep cr	2 mile RBT	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
	occupied, Brook Trout												
Road Canyon	1.2 RBT occupied	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
Gravel Cr	Lower 0.1 RBT occupied (spawning ground)	2.5	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2
E.F. Owyhee Badger Cr. To Wildhorse Res.	U.S.F.S.	3.5	3.0	3.0	3.0	2.5	2.0	2.5	2.0	3.0	3.0	1.0	2
Badger Cr.	7 miles RBT occupied, some livestock concerns, fair condition, 1600 fish	2.5	2.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Beaver Cr.	All occupied by RBT	2.5	2.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Wildhorse Res		3.0	3.0	3.0	3.0	3.0	1.0	2.0	3.0	2.0	2.0	1.0	2
Hendricks Cr	RBT appearing (questionalble genetics,rainbow ?)	2.5	2.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Warm Cr (Trib of Hendricks)	not RBT occupied, warm water temp, soil type/erosion, agriculture	2.5	2.5	4.0	4.0	4.0	2.5	3.0	3.0	3.0	4.0	3.5	2
Penrod	RBT occupied entire way	2.5	2.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Hay meadow Cr	only native dace present	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
Thompson Cr (hay meadow trib)	no fish present in drough yrs	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
Martin Cr. (trib to Penrod)	4.5 RBT occupied, Brook Trout	3.0	2.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	2
Gold Cr. (trib to Martin Cr)	1.8 RBT occupied	2.5	2.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2
Sweet Cr	0.5 RBT occupied	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
Rosebud Cr	Native Dace only	2.0	2.0	2.0	2.0	3.0	1.0	3.5	3.0	1.5	4.0	3.0	2
Deep Cr trib to Wildhorse (E.F. Owyhee)	1.5 miles occupied RBT, some on prvt land?	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	3.0	2
Clear Cr trib to (Deep Cr)	no fish present in drough yrs	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	4.0	2
Riffe Cr (Deep Cr)	3 mile occupied RBT, beaver ponds	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	4.0	2

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
N.F. of Deep Cr	No RBT, lack of flow(Drought yr)	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	4.0	2
Middle Fork of Deep Cr	2 mile occupied RBT	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	4.0	2
S.F of Deep Cr	3 miles RBT occupied	3.0	3.0	3.0	3.0	4.0	2.0	4.0	4.0	3.0	3.0	4.0	2
E. F. Owyhee Above Wildhorse Res to head waters	Spotted Frog habitat	2.5	2.5	3.0	1.0	3.0	1.5	2.0	3.0	2.0	3.0	3.0	2
Clear Cr trib to Upper E.F Owyhee	Historic potential habitat, poisioning in 1988 to remove chub, killed Trout	3.0	3.0	3.0	3.0	4.0	3.0	4.0	4.0	3.0	3.0	3.0	2
Hanks Cr trib to Upper E.F Owyhee	Dace prsnt, habitat concerns (livestocke) no RBT	1.5	2.0	2.0	2.0	3.0	3.0	4.0	3.0	2.0	2.0	4.0	2
HUC 17050105													
State line to Petan ranch	Red Band prsnt seasonally(Spring) during good water yrs when sutiable water temps	2.5	4.0	2.5	3.0	2.0	4.0	4.0	2.5	3.0	3.5	2	2.5
Lower boundry of Petan Ranch to Red Cow Cr.	Red Band prsnt seasonally(Spring) during good water yrs when sutiable water temps	2.0	2.0	2.5	3.0	2.0	4.0	4.0	2.5	3.0	3.5	2	2.5
From Red Cow to Hot cr.	RBT Occupied yr round, low density	2.5	3.0	2.5	3.0	2.0	4.0	4.0	2.5	3.0	4.0	2	2.5
hot creek to McCann	Prvt Land, Brook Trout prsnt in Spring Heads, RBT are seasonal, White Fish yr round	2.5	2.0	2.5	3.0	2.0	4.0	4.0	3.0	3.0	3.0	1	2.5
Four mile cr from S.F. to Chimney Res.	RBT Down migration during good water yrs, dry 10months of yr, flow controlled by Chimney	2.0	1.5	3.0	2.0	1.0	3.0	3.0	2.0	4.0	2.0	1	2.0
Chimney Cr. Res to T41N R49E sec4	RBT Down migration during good water yrs, dry 10months of yr, flow controlled by	1.5	1.5	2.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	2	1.0

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
	Chimney												
T41N R49E sec4 to Head Waters	Occupied by RBT year round, 3miles of reach occupied	2.5	2.0	2.5	4.0	4.0	4.0	4.0	2.0	4.0	4.0	2	2.0
Chimney Cr Res. To Winters Cr.	Int/Dry 10mnths/yr, no RBT	1.5	1.5	2.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	1	1.0
Winters Cr.	Recently occupied, but not currently, historic habitat (no record), stocked in 1972 with RBT, ceased in 2000due to fire/livestock grazing	2.5	2.0	2.5	4.0	4.0	4.0	4.0	2.0	4.0	2.5	2	2.0
Sheep Creek-S.F. Owyhee to Sheep Cr. Res		1.5	1.5	2.0	4.0	4.0	4.0	4.0	2.0	4.0	1.0	0.5	1.0
Sheep Cr. Res to T46n R51E sec 11	Int/Dry, no RBT, spring down migration	1.5	1.5	2.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	0.5	1.0
T46n R51e sec 11 to head waters		1.5	1.5	2.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	0.5	1.5
Indian Cr. (Trib to S.F. Owyhee)	Occupied RBT through National Forest	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	1.0	1.5	3.0
Winters Cr. Trib to Indian Cr	2 miles occupied RBT through National Forest	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	1.5	3.0
Mitchell Cr. Trib to Indian Cr	2 miles occupied RBT through National Forest	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	1.5	3.0
Wall Cr. Trib to Indian Cr	1 Mile occupied RBT through National Forest	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	4.0	1.5	3.0
Silver Cr. (Trib to S.F. Owyhee)	2 miles occupied RBT through National Forest	2.0	3.0	2.5	3.0	2.5	4.0	4.0	3.0	4.0	3.0	1.5	3.0
White Rock Cr.	Unoccupied, probably historic, mining influence	3.0	3.0	3.0	3.0	2.5	4.0	4.0	3.0	4.0	3.0	1.5	3.0
Cottonwood Canyon Cr.	Unoccupied, probably historic, mining influence	3.0	3.0	3.0	3.0	2.5	4.0	4.0	3.0	4.0	3.0	1.5	3.0
Breakneck Cr	2 miles occupied RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	1.5	3.0
Bull Run Cr.-S.F. Owyhee to Bull Run Canyon	Diverted for Agriculture use	2.0	3.0	2.5	3.0	2.5	4.0	4.0	3.0	4.0	3.0	0.5	3.0

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
Mouth of Bull Run Canyon to Cap Winn Cr.	probably recruitment from upstream tribs	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	2.0	1.5	3.0
Frost Cr.	Low number of RBT	2.5	2.0	2.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0	2	1.0
Cap Winn Cr	Occupied RBT,	3.0	2.0	2.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0	2	1.5
Doby George	Occupied RBT,	3.0	2.0	2.0	4.0	4.0	4.0	3.0	3.0	4.0	4.0	2	2.0
Columbia Cr	Occupied RBT, Low number (200's), Brook Trout abundant	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Blue Jacket Cr	Occupied RBT (700), Brook Trout	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	2	3.0
Deep Cr. Trib to S.F. Owyhee		2.0	2.0	1.5	2.5	2.0	4.0	3.0	3.0	4.0	2.0	2	1.5
S.F Owyhee to Head Waters	Unoccupied, RBT probably present historically												
Red Cow Cr.	Occupied 1mile by RBT	2.0	1.0	3.0	3.0	2.0	4.0	3.0	3.0	4.0	4.0	2	1.5
Amazon	Ephemeral, no record of RBT, probably historic	2.0	1.0	3.0	3.0	2.0	4.0	3.0	3.0	4.0	4.0	1	1.5
Big Cottonwood Trib	1mile occupied by RBT	2.0	1.0	3.0	3.0	2.0	4.0	3.0	3.0	4.0	4.0	2	1.5
Harrington Cr	Unsurveyed, Prvt Land, Probable RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	1	3.0
Marsh Cr.	Occupied RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Boyd Cr	Occupied RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Scoonover Cr.	Occupied RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Dorsey	Occupied RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Coffin Cr.	Occupied RBT	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Jack Cr	Occupied RBT, no brook trout surveyed in last 2yrs(used to be abundant)	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Chicken Cr	Occupied RBT,	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0
Mill Cr	Occupied RBT, Brook trout, included 3 forks	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3.0

4th Field HUC/ Reach Name	Description	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12
Niagra Cr	No Surveyed Data	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	0.5	3. 0
Snow Canyon Cr	Occupied RBT, 5 mi occupied	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3. 0
Jarritt Canyon	Int/Dry, Unoccupied, Historic Salmon	2.5	2.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	1.5	2. 5
Burns Cr.(Trib to Jarritt Canyon0	1.5 mile occupied on National Forest, Trout Prsnt	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3. 0
Schmidtt Cr.	4 miles occupied	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.5	2	3. 0
McCann Cr	5 mile occupied RBT, low density RBT	2.5	2.0	2.5	3.0	2.0	4.0	3.0	3.0	4.0	3.0	2	2. 0
Taylor Canyon Cr (trib to S.F. Owyhee)	2 miles occupied RBT, BT common	3.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2	4. 0
Water Pipe Canyon (trib to Taylor Canyon)	2.5 mile occupied RBT	2.5	3.0	3.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	2	2. 0

Owyhee Subbasin QHA Limiting Factors Analysis

The Qualitative Habitat Assessment (QHA) provided a ranking of habitat attributes with respect to redband trout productivity. The factor with the lowest habitat score for the current habitat condition was considered to be the limiting factor for a given reach.

In cases of tie scores, the rank list below was used to determine singular Limiting Factor. For example, if three QHA Attribute scores were the same for a given stream reach (e.g., high temp, low flow, and riparian all had scores of 1.5 – which was the minimum score for the reach); then the following list would be used to determine that low flow was the limiting factor.

Trump Rank as Limiting Factor	Attribute
1.	Pollutants
2.	Obstructions
3.	Low Flow
4.	High Temperature
5.	Fine sediment load
6.	Riparian Condition
7.	Oxygen
8.	High Flow

9.	Low Temperature
10.	Channel stability
11.	Habitat Diversity

In other words, the rank listed above was used to determine which potential Limiting Factor would "trump"the others. The rationale is that (for example) if there was a significant problem with pollutants, then alleviating a high temperature or sediment problem would not fix the habitat condition – and pollutants would still be limiting the reach with respect to redband trout production. Thus, a given attribute in the list would "trump" all the attribute scores below it.

The limiting factors by reach are presented in Tables 2.28, 2.29 and 2.30 below. The link between the limiting factors analysis and the "bottom-up" development of Objectives and strategies for redband trout in the Owyhee Subbasin Management Plan are presented in Appendix 4.2.

Table 2.28. Limiting factors analysis based on minimum QHA scores, by specific reach, for the Oregon portion of the Owyhee.

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
Owyhee R-1	Mouth to Owyhee Ditch Co Dam (RM14)	1	1.0: Oxygen
Owyhee R-2	DC Dam to RM28	2	1.0: H. Temp.
Owyhee R-3	Dam to Upstream High Water (RM80)		NA
Dry Creek	Dry Creek upstream to Crowley Road	2	2.0: H. Temp.
Owyhee R-4	High Water upstream to Jordan Cr	2	3.0: F. Sediment H. Temp. Pollutants
Rinehart Creek	Mouth to falls	1	3.0: F. Sediment
Jordan Creek	Mouth to State Line	1	1.0: L. Flow

			H. Temp.
Cow Creek	Mouth to State Line	0.5	1.0: Riparian L. Flow H. Temp.
Owyhee R-5	Confl. Jordan Creek upstream to Sline	2	3.0: H. Temp.
NF Owyhee	Mouth to Sline	2	3.0: Riparian H. Temp.
Middle Fork	Idaho Segment	0	1.5: Riparian
Antelope Creek R-1	Mouth upstream to corrals (~8 mi)	2	3.0: F. Sediment
Antelope Creek R-2	Corrals upstream to Star Valley Road (dry segment)	2	3.0: F. Sediment
Antelope Creek R-3	SV Road upstream to Headwaters	2	2.5: Riparian H. Diversity Oxygen H. Temp.
WLO R-1	Mouth upstream to Anderson Crossing	2	3.0: F. Sediment H. Temp.
WLO R-2	Anderson Crossing to headwaters	2	3.0: H. Temp.

Table 2.29. Limiting factors analysis based on minimum QHA scores, by specific reach, for the Idaho portion of the Owyhee.

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
HUC 17050108			
Jordan Cr.-1	Jordan Cr. From OR Boundary to BLM boundary section	0.5	1.0: Riparian C. Stability H. Diversity L. Flow Oxygen L. Temp. H. Temp. Pollutants
Jordan Cr.-2	From end of #2 to Rail Creek	1.5	1.0: H. Diversity Pollutants
Jordan Cr.-3	Rail Cr. Confluence to BLM boundary	0.5	1.0: L. Flow Pollutants
Jordan Cr.-4	BLM boundary near Buck Cr. to BLM boundary	0.5	1.0: H. Diversity Pollutants
Jordan Cr.-5	BLM boundary section line to BLM boundary upstream of Louse Cr.	0.5	1.0: Pollutants
Jordan Cr.-6	BLM boundary upstream of Louse Cr. To BLM boudary section	0.5	1.0: Pollutants
Jordan Cr.-7	BLM Boundary to state land section boundary	0.5	1.0: Pollutants
Jordan Cr.-8	State linelands boundary to headwaters of Jordan Cr.	0.5	1.0: Pollutants
Williams Cr.	BLM segments	1.5	2.0: C. Stability H. Diversity L. Flow L. Temp. H. Temp.
Williams Cr.	Including Pole Bridge Cr. And West Cr.	0.5	2.0 H. Diversity L. Temp.

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
			H. Temp.
Duck Cr.	All	1.5	1.5: Riparian C. Stability F. Sediment
Old Man Cr.	All	0.5	1.0: L. Flow
South Mountain Creek	Lower BLM upper put state includes Howl Cr. Cyote Cr.	0.5	1.0: H. Diversity
Rail Cr.	All	1	2.0: Riparian C. Stability H. Diversity F. Sediment H. Temp. Pollutants
Washington Gulch	All	1	2.0: Riparian C. Stability H. Diversity H. Temp.
Flint Cr.1	Lower	0.5	1.5: F. Sediment Pollutants
Flint Cr.2	Upper Includes East Cr.	2	1.5: F. Sediment Pollutants
South Boulder Cr.	From confluence with North Boulder Cr. To confluence with Mill Cr.	1.5	1.5: H. Temp.
Upper South Boulder Creek	Mill Creek confluence to headwaters	0.5	1.5: H. Temp.
Indian Cr.	Bogus Cr. (Lower) - confluence with South Fork Boulder to Section 10	0.5	1.0: L. Flow
Bogus Cr.	Upper above section 10 and above	1	2.5: Riparian C. Stability H. Diversity F. Sediment

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
			H. Temp.
Combination Cr.	Lower reach of stream	1	1.5: Riparian Oxygen
Rose Cr.	Up to state section.	1.5	2.0: Oxygen
Josephine	includes Wickiup and Long Valley and Headwater Josephine	1.5	1.5: H. Flow
Louisa Cr.	From confluence with Rock Cr.	1.5	1.0: Obstruction
Lower Rock Cr.-1	From confluence of North Boulder to Meadow Creek.	1.5	1.5: H. Flow L. Flow
Rock Cr.-2	From Meadow Creek to BLM	0.5	1.0: Riparian C. Stability H. Diversity L. Flow Oxygen L. Temp. H. Temp.
Rock Cr.-3	BLM portion in Section 26	0.5	1.5: H. Flow L. Flow
Rock Cr.-4	From BLM/PVT boundary in Sec. 26 to above Triangle Reservoir.	0.5	1.0: Riparian C. Stability H. Diversity L. Flow Oxygen L. Temp. H. Temp.
Rock Cr. 5	BLM reach above Triangle Reservoir to Sheep Creek/private boundary	1.5	2.0: L. Flow H. Temp. Pollutants
Rock Cr. 6	From Sheep Creek/private boundary to headwaters	0.5	2.0: Riparian C. Stability H. Diversity H. Temp. Pollutants

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
Meadow Cr.	Headwaters to confluence with Rock Cr.	0.5	1.0: H. Diversity
Deer Cr.	Confluence with Big Boulder to state section 36	1.5	2.0: F. Sediment Obstruction
Owl Cr.	Includes Minear Cr. (Confluence of Lone Tree to headwaters)	1	2.0: H. Diversity F. Sediment
North Boulder-1	From confluence with Big Boulder; BLM reach to Private	1.5	2.0: H. Temp.
North Boulder-2	From confluence with Mamouth Cr. To headwaters	1.5	2.0: H. Temp.
Louse Cr.	Includes Cottonwood Cr. From confluence of Jordan Cr. To headwaters	1	1.0: H. Diversity L. Flow
Upper Trout Cr.	From Split Rock Canyon to headwaters, including Nichols, Wood Canyon creeks	1	1.5: L. Flow
Split Rock Canyon	Confluence with Trout Creek to headwaters.	1.5	2.0: C. Stability H. Diversity F. Sediment
Cow Cr.-2	From confluence with Wildcat Canyon Cr. To headwaters	1.5	2.0: Riparian C. Stability H. Diversity F. Sediment H. Temp. Pollutants
Soda Cr.	From confluence of Cow Cr. To headwaters	1.5	2.0: H. Diversity F. Sediment Oxygen H. Temp. Pollutants
HUC 17050107			
NF Owyhee 1	Lower; From the Oregon State line to the	1.5	2.0: L. Flow

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
	confluence of Juniper Cr.		H. Temp.
NF Owyhee 2	Upper; Headwaters of North Fork , Lower Noon Cr. And Lower Pleasant Valley Cr.	1.5	2.5: L. Flow H. Temp.
Upper Pleasant Valley Cr.	From the top of Sec. 7 to headwaters	1.5	1.0: C. Stability
Cabin Cr.	From the confluence with Juniper Cr. To the headwaters	1.5	2.0: Riparian C. Stability F. Sediment H. Temp. Pollutants
Juniper Cr. 1	From the confluence with the North Fork Owyhee to lower private boundary	1.5	2.0: H. Temp. Pollutants
Juniper Cr. 2	From the start of the private up to the headwaters	0.5	1.0: L. Flow
Lone Tree Cr.	From Oregon State line to headwaters	0.5	1.5: H. Diversity
Cottonwood Cr.	From the upper private boundary (section 18) to headwaters	1.5	1.5: L. Flow
Squaw Cr. 1	From Oregon State line to lower private boundary (section 13)	1.5	2.0: H. Temp.
Squaw Cr. 2	From the start of private in section 14 to the BLM in the northwest corner of section 31	0.5	2.0: L. Flow H. Temp.
Squaw Cr. 3	From private to headwaters	0.5	2.0: Riparian C. Stability H. Diversity F. Sediment L. Flow H. Temp.
Pole Cr.	Oregon State line to headwaters	2	2.5: F. Sediment

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
Middle Fork Owyhee	Oregon State line to headwaters	2	0.5: Riparian
HUC 17050106			
Little Owyhee	From the Nevada State line to the confluence with South Fork Owyhee	1	1.0: H. Diversity Oxygen L. Temp. H. Temp. Pollutants
HUC 17050105			
South Fork Owyhee	From Nevada State line to the confluence with Owyhee River	1.5	1.5: L. Flow H. Temp.
HUC 17050104			
Blue Cr.-3	Blue Cr. Reservoir to headwaters	1.5	1.0: L. Flow
Shoofly Cr.-1	Confluence to BLM boundary	1.5	1.0: Riparian H. Diversity L. Flow
Shoofly Cr.-2	Private/BLM boundary to Bybee reservoir	1.5	1.0: H. Flow L. Flow Obstruction
Shoofly Cr.-3	Bybee reservoir to headwaters	0	2.0: Riparian H. Diversity H. Temp.
Owyhee River	DV reservoir border to confluence	1.5	2.0: H. Temp.
Owyhee River DVIR portion	Mouth of canyon to NV state line	1	1.0: Riparian C. Stability H. Diversity L. Flow H. Temp.
Battle Cr.-1	Confluence to private in sec. 10 (cottonwood draw)	2	1.0: H. Temp.
Battle Cr.-2	Section 10 to above state section 36	0	1.0: H. Temp.

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
Battle Cr.-3	State section 36 to headwaters	1.5	1.0: H. Diversity L. Flow
Dry Cr.-1	confluence to reservoir	0	2.0: Riparian C. Stability H. Diversity F. Sediment H. Flow L. Flow Oxygen L. Temp. H. Temp. Pollutants
Dry Cr.-2	Reservoir to headwaters	1.5	1.0: Riparian C. Stability H. Diversity L. Flow H. Temp. Obstruction
Big Springs Cr.-1	confluence to reservoir	1.5	1.0: H. Temp.
Big Springs Cr.-3	BLM boundary to private	1.5	1.0: Riparian H. Temp.
Deep Cr.-1	Confluence to private	2	1.0: F. Sediment Oxygen H. Temp.
Deep Cr.-2	Private to mid section 10	2	1.0: F. Sediment Oxygen H. Temp.
Deep Cr.-3	section 10 to Stoneman Cr. Confluence	2	1.0: F. Sediment
Deep Cr.-4	headwaters including:	2	1.0: Riparian C. Stability F. Sediment
Stoneman Cr.	Confluence to headwaters	2	1.0: C. Stability L. Flow

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
Current Cr.	Confluence to headwaters	2	1.0: C. Stability L. Flow
Nickel Cr.	Confluence to headwaters including:	2	1.0: F. Sediment
Smith Cr.	Confluence to headwaters including:	2	1.0: F. Sediment
Castle Cr.	Confluence to headwaters including:	2	1.0: Riparian F. Sediment H. Flow L. Flow H. Temp. Obstruction
Beaver Cr.	Confluence to headwaters including:	2	2.0: Riparian F. Sediment L. Flow
Red Canyon Cr.	Confluence to headwaters including:	2	1.0: H. Temp.
Petes Cr.	Confluence to headwaters including:	2	1.0: H. Temp.
Dickshooter Cr.	Confluence to headwaters	1.5	2.0: F. Sediment
Pole Cr.-1	Confluence to Camas Cr. Confluence including Camel Cr.	1.5	1.0: H. Temp.
Pole Cr.-2	Camas confluence to headwaters	1.5	1.0: L. Flow H. Temp.
Camas Cr.	Confluence to headwaters	1.5	2.0: F. Sediment L. Flow H. Temp.

Table 2.30. Limiting factors analysis based on minimum QHA scores, by specific reach, for the Nevada portion of the Owyhee Subbasin.

4th Field HUC/ Reach Name	Description	Reach Confidence (0-2)	Min. QHA Score ↦ Limiting Factor(s)
HUC 17050104			
E.F. Owyhee ID-NV state line to Paradise Point Diversion	Irrigated hay fields, No RBT habitat	1	1.0: C. Stability L. Flow Pollutants Obstruction
Boyle Cr	Starts in NV and enters Owyhee in ID	0.5	1.5 Riparian
S.F of Boyle Cr		0.5	1.5 Riparian
E.F. Owyhee Paradise Point to Duck Valley Indian Res border	DVIR	1	0.5: C. Stability H. Diversity
Skull Cr		0.5	1.5 Riparian
N.F. of Skull Cr		0.5	1.5 Riparian
E.F. of Skull Cr		0.5	1.5 Riparian
Reed Cr		0.5	1.5 Riparian
Summit Cr		0.5	Riparian
Fawn Cr	USFS RBT occupied for sure 4.8miles	1.5	2.5: Riparian H. Temp.
Jones Cr		0.5	1.5 Riparian
Granite	probably fishless	0.5	1.5 Riparian
E.F. Owyhee Duck Valley Indian Res border to Patsville (Mill Cr)	U.S.F.S.	1.5	0.5: Pollutants
Slaughter House Cr	Occupied RBT 2 miles	2	3.0: C. Stability H. Diversity F. Sediment Obstruction
Brown's Gulch (Slaughter house Trib	2.4 miles RBT occupied	2	3.0:

			C. Stability H. Diversity F. Sediment Obstruction
Miller Cr.	3 mile occupied RBT	2	2.0 C. Stability H. Diversity F. Sediment Obstruction
West Fr. (of Slaughterhouse Cr)	1.5 miles occupied RBT	2	3.0: C. Stability H. Diversity F. Sediment Obstruction
California Cr	Min. occupied RBT by headwater of Cr.	2	1.0: L. Flow
North Fr (trib of California Cr)	No RBT, lack of flow(Drought yr)	2	1.5 H. Temp.
Dip Cr	1 mile RBT occupied	2	3.0: C. Stability H. Diversity F. Sediment Obstruction
Big Springs Cr	Unoccupied (insufficient flow)	2	3.0: C. Stability H. Diversity F. Sediment Obstruction
South Fr.	2 mile RBT occupied	2	2.5: Riparian
Pixley	1 mile RBT occupied	2	1.0: Obstruction
E.F. Owyhee Mill Cr.to Badger Cr	U.S.F.S.	1.5	1.0: H. Diversity
Lower Mill Cr to S.F Owyhee River	Unoccupied, pollution, mine tailings	2	0.5: Riparian H. Diversity Pollutants
Upper Mill Cr to Rio tinto Mine	occupied RBT whole distance in none drought years	2	3.0: Riparian C. Stability H. Diversity F. Sediment
McCall Cr.	5.5 miles occupied RBT	2	3.0: Riparian C. Stability H. Diversity

			F. Sediment
Allegheny	Native Dace only	2	1.0: L. Flow
Cold Spring (trib to Allegheny)	Native Dace only	2	1.0: L. Flow
Trail Cr	8.2 occupied RBT, Brook Trout(MGT concern)	2	2.0 L. Flow Obstruction
Van Duzer Cr. (Trib to Trail Cr)	5 mile occupied, Brook Trout (MGR concen)	2	2.0 L. Flow Obstruction
Lime Cr (trib to Van Duzer)	.3 occupied by RBT, Brook Trout prsnt	2	2.5: C. Stability
Cobb Cr (trib to Van Duzer)	4.5 RBT occupied	2	3.0: Riparian C. Stability H. Diversity F. Sediment
Deer Cr (trib to Trail Cr.)	min. occupied RBT in a single pool	2	1.0: Obstruction
Springs Cr.	0.1 mile RBT occupied, Brook trout	2	1.0: Obstruction
Wood Gulch	Mine prsnt, 2 mile RBT occupied	2	3.0: Riparian C. Stability H. Diversity F. Sediment Obstruction
Hutch Cr	1mile RBT occupied, Brook Trout	2	1.0: Obstruction
Timber Gulch	0.35 RBT occupied, Brook Trouth	2	1.0: Obstruction
Sheep cr	2 mile RBT occupied, Brook Trout	2	3.0: Riparian C. Stability H. Diversity F. Sediment Obstruction
Road Canyon	1.2 RBT occupied	2	3.0: Riparian C. Stability H. Diversity F. Sediment Obstruction
Gravel Cr	Lower 0.1 RBT occupied (spawning ground)	2	2.5: Riparian

E.F. Owyhee Badger Cr. To Wildhorse Res.	U.S.F.S.	2	1.0: Obstruction
Badger Cr.	7 miles RBT occupied, some livestock concerns, fair condition, 1600 fish	2	2.5: Riparian C. Stability
Beaver Cr.	All occupied by RBT	2	2.5: Riparian C. Stability
Wildhorse Res		2	1.0: L. Flow Obstruction
Hendricks Cr	RBT appearing (questionalble genetics,rainbow?)	2	2.5: Riparian C. Stability
Warm Cr (Trib of Hendricks)	not RBT occupied, warm water temp, soil type/erosion, agriculture	2	2.5: Riparian C. Stability L. Flow
Penrod	RBT occupied entire way	2	2.5: Riparian C. Stability
Hay meadow Cr	only native dace present	2	1.0: L. Flow
Thompson Cr (hay meadow trib)	no fish present in drough yrs	2	1.0: L. Flow
Martin Cr. (trib to Penrod)	4.5 RBT occupied, Brook Trout	2	2.5: C. Stability
Gold Cr. (trib to Martin Cr)	1.8 RBT occupied	2	2.5: Riparian C. Stability
Sweet Cr	0.5 RBT occupied	2	1.0: L. Flow
Rosebud Cr	Native Dace only	2	1.0: L. Flow
Deep Cr trib to Wildhorse (E.F. Owyhee)	1.5 miles occupied RBT, some on prvt land?	2	2.0: L. Flow
Clear Cr trib to (Deep Cr)	no fish present in drough yrs	2	2.0: L. Flow
Riffe Cr (Deep Cr)	3 mile occupied RBT, beaver ponds	2	2.0: L. Flow
N.F. of Deep Cr	No RBT, lack of flow(Drought yr)	2	2.0: L. Flow
Middle Fork of Deep Cr	2 mile occupied RBT	2	2.0: L. Flow
S.F of Deep Cr	3 miles RBT occupied	2	2.0:

			L. Flow
E. F. Owyhee Above Wildhorse Res to head waters	Spotted Frog habitat	2	1.0: F. Sediment
Clear Cr trib to Upper E.F Owyhee	Historic potential habitat, poisioning in 1988 to remove chub, killed Trout	2	3.0: Riparian C. Stability H. Diversity F. Sediment L. Flow H. Temp. Pollutants Obstruction
Hanks Cr trib to Upper E.F Owyhee	Dace prsnt, habitat concerns (livestocke) no RBT	2	1.5 Riparian
HUC 17050105			
State line to Petan ranch	Red Band prsnt seasonally(Spring) during good water yrs when sutiable water temps	2.5	2.0: H. Flow Obstruction
Lower boundry of Petan Ranch to Red Cow Cr.	Red Band prsnt seasonally(Spring) during good water yrs when sutiable water temps	2.5	2.0: Riparian C. Stability H. Flow Obstruction
From Red Cow to Hot cr.	RBT Occupied yr round, low density	2.5	2.0: H. Flow Obstruction
hot creek to McCann	Prvt Land, Brook Trout prsnt in Spring Heads, RBT are seasonal, White Fish yr round	2.5	1.0: Obstruction
Four mile cr from S.F. to Chimney Res.	RBT Down migration during good water yrs, dry 10months of yr, flow controlled by Chimney	2.0	1.0: H. Flow Obstruction
Chimney Cr. Res to T41N R49E sec4	RBT Down migration during good water yrs, dry 10months of yr, flow controlled by Chimney	1.0	1.5 Riparian C. Stability
T41N R49E sec4 to Head Waters	Occupied by RBT year round, 3miles of reach occupied	2.0	2.0: C. Stability Obstruction
Chimney Cr Res. To Winters Cr.	Int/Dry 10mnths/yr, no RBT	1.0	1.0: Obstruction

Winters Cr.	Recently occupied, but not currently, historic habitat (no record), stocked in 1972 with RBT, ceased in 2000due to fire/livestock grazing	2.0	2.0: C. Stability L. Temp. Obstruction
Sheep Creek-S.F. Owyhee to Sheep Cr. Res		1.0	0.5 Obstruction
Sheep Cr. Res to T46n R51E sec 11	Int/Dry, no RBT, spring down migration	1.0	0.5 Obstruction
T46n R51e sec 11 to head waters		1.5	0.5 Obstruction
Indian Cr. (Trib to S.F. Owyhee)	Occupied RBT through National Forest	3.0	1.0: Pollutants
Winters Cr. Trib to Indian Cr	2 miles occupied RBT through National Forest	3.0	1.5 Obstruction
Mitchell Cr. Trib to Indian Cr	2 miles occupied RBT through National Forest	3.0	1.5 Obstruction
Wall Cr. Trib to Indian Cr	1 Mile occupied RBT through National Forest	3.0	1.5 Obstruction
Silver Cr. (Trib to S.F. Owyhee)	2 miles occupied RBT through National Forest	3.0	1.5 Obstruction
White Rock Cr.	Unoccupied, probably historic, mining influence	3.0	1.5 Obstruction
Cottonwood Canyon Cr.	Unoccupied, probably historic, mining influence	3.0	1.5 Obstruction
Breakneck Cr	2 miles occupied RBT	3.0	1.5 Obstruction
Bull Run Cr.-S.F. Owyhee to Bull Run Canyon	Diverted for Agriculture use	3.0	0.5 Obstruction
Mouth of Bull Run Canyon to Cap Winn Cr.	probably recruitment from upstream tribs	3.0	1.5 Obstruction
Frost Cr.	Low number of RBT	1.0	2.0 C. Stability H. Diversity Obstruction
Cap Winn Cr	Occupied RBT,	1.5	2.0: C. Stability H. Diversity Obstruction
Doby George	Occupied RBT,	2.0	2.0: C. Stability H. Diversity Obstruction

Columbia Cr	Occupied RBT, Low number (200's), Brook Trout abundant	3.0	2.0: Obstruction
Blue Jacket Cr	Occupied RBT (700), Brook Trout	3.0	2.0: Obstruction
Deep Cr. Trib to S.F. Owyhee		1.5	1.5 H. Diversity
S.F Owyhee to Head Waters	Unoccupied, RBT probably present historically		
Red Cow Cr.	Occupied 1mile by RBT	1.5	1.0: C. Stability
Amazon	Ephemerial, no record of RBT, probably historic	1.5	1.0: C. Stability Obstruction
Big Cottonwood Trib	1mile occupied by RBT	1.5	1.0: C. Stability
Harrington Cr	Unsurveyed, Prvt Land, Probable RBT	3.0	1.0: Obstruction
Marsh Cr.	Occupied RBT	3.0	2.0: Obstruction
Boyd Cr	Occupied RBT	3.0	2.0: Obstruction
Scoonover Cr.	Occupied RBT	3.0	2.0: Obstruction
Dorsey	Occupied RBT	3.0	2.0: Obstruction
Coffin Cr.	Occupied RBT	3.0	2.0: Obstruction
Jack Cr	Occupied RBT, no brook trout surveyed in last 2yrs(used to be abundant)	3.0	2.0: Obstruction
Chicken Cr	Occupied RBT,	3.0	2.0: Obstruction
Mill Cr	Occupied RBT, Brook trout, included 3 forks	3.0	2.0: Obstruction
Niagra Cr	No Surveyed Data	3.0	0.5 Obstruction
Snow Canyon Cr	Occupied RBT, 5 mi occupied	3.0	2.0: Obstruction
Jarritt Canyon	Int/Dry, Unoccupied, Histeric Salmon	2.5	1.5: Obstruction

Burns Cr.(Trib to Jarritt Canyon0	1.5 mile occupied on National Forest, Trout Prsnt	3.0	2.0: Obstruction
Schmidtt Cr.	4 miles occupied	3.0	2.0: Obstruction
McCann Cr	5 mile occupied RBT, low desnity RBT	2.0	2.0: C. Stability H. Flow Obstruction
Taylor Canyon Cr (trib to S.F. Owyhee)	2 miles occupied RBT, BT common	4.0	2.0: Obstruction
Water Pipe Canyon (trib to Taylor Canyon)	2.5 mile occupied RBT	2.0	2.0: Obstruction

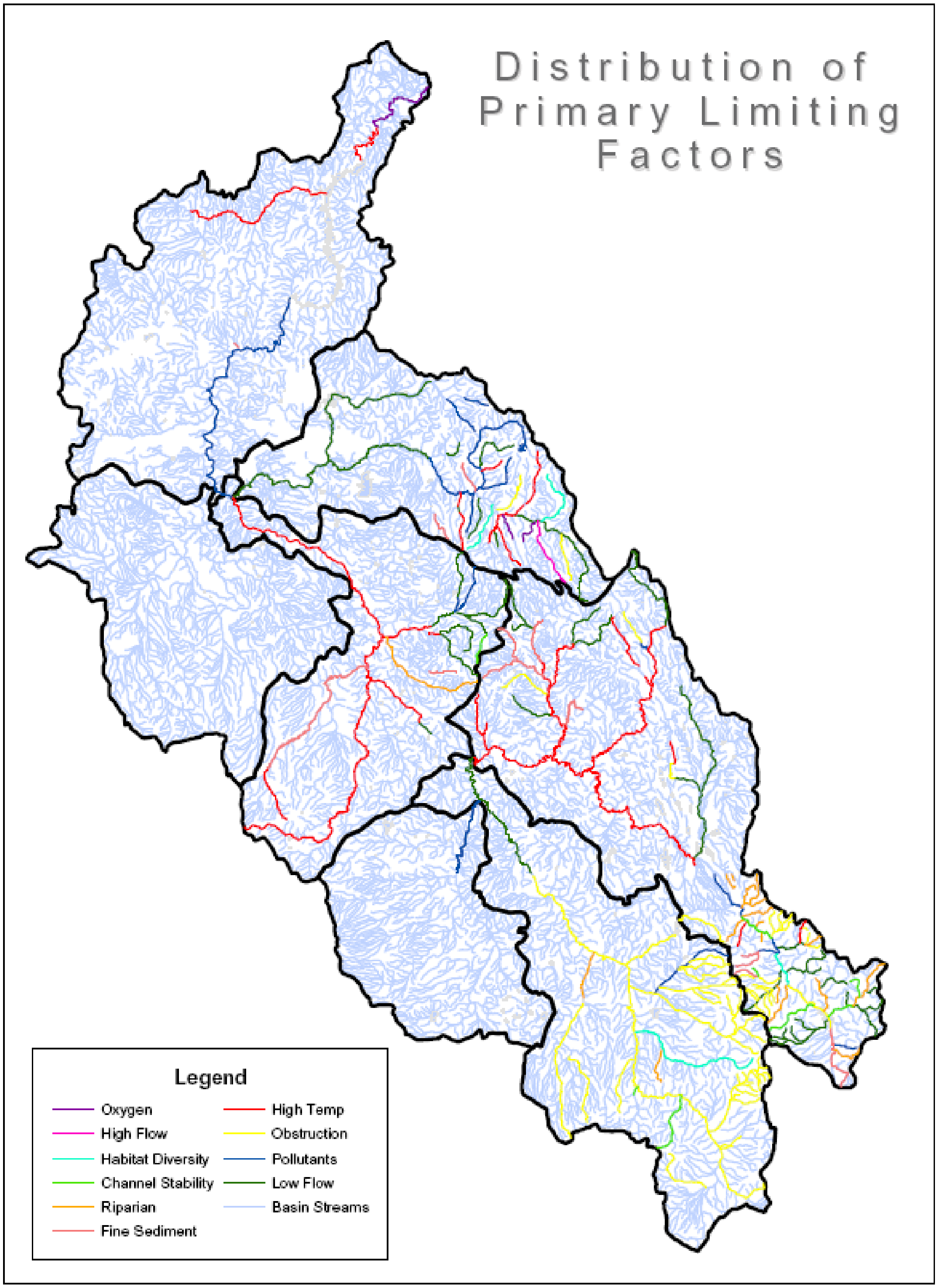

Figure 2.23. Distribution of limiting factors on streams in the Owyhee Subbasin derived from the Qualitative Habitat Analysis.

Cross Reference between the QHA Stream Reach System and HUCs

The cross-references between the QHA stream reach system and 4th, 5th, and 6th field HUCs are presented in Table 2.31 (Oregon), Table 2.32 (Idaho), and Table 2.33 (Nevada) below.

Table 2.31 Cross-reference of specific stream reaches identified in the QHA analysis with 4th, 5th, and 6th field HUC's – for the Oregon Portion of the Owyhee Subbasin.

Reach Name	Description	HUC-5	HUC-6
17050110 – Lower Owyhee			
Owyhee R-1	Mouth to Owyhee Ditch Co Dam (RM14)	1705011001	17050110xxxx
Owyhee R-2	DC Dam to RM28	1705011001	17050110xxxx
Owyhee R-3	Dam to Upstream High Water (RM80)	17050110xx	17050110xxxx
Owyhee R-4[18]	High Water upstream to Jordan Cr	17050110xx	17050110xxxx
Dry Creek	Dry Creek upstream to Crowley Road	17050110xx	17050110xxxx
Rinehart Creek	Mouth to falls	1705011007	17050110070 3
17050108 – Jordan Creek			
Jordan Creek	Mouth to State Line	17050108xx	17050108xxxx
Cow Creek	Mouth to State Line	1705010805	17050108050 6
Owyhee R-5	Confl. Jordan Creek upstream to State line	17050108xx	17050108xxxx
17050107 – Middle Owyhee			
NF Owyhee	Mouth to State line	1705010706	17050107060 1
Middle Fork	Headwaters are in Idaho Segment	1705010708	17050107xxxx
Antelope Creek R-1	Mouth upstream to corrals (~8 mi)	1705010716	17050107160 1
Antelope Creek R-2	Corrals upstream to Star Valley Road (dry segment)	1705010716	17050107xxxx

[18] Most of this Owyhee River reach is in HUC 17050110; however, the upper one mile of this river reach is in HUC 17050107.

Reach Name	Description	HUC-5	HUC-6
Antelope Creek R-3	SV Road upstream to Headwaters	1705010714	17050107xxxx
West Little Owyhee R-1	Mouth upstream to Anderson Crossing	1705010709	17050107090 2
West Little Owyhee R-2	Anderson Crossing to headwaters	1705010712	17050107xxxx

Table 2.32 Cross-reference of specific stream reaches identified in the QHA analysis with 4th, 5th, and 6th field HUC's – for the Idaho Portion of the Owyhee Subbasin.

Reach	Description	HUC 5	HUC 6
4th HUC; 17050108			
Jordan Cr.-1	Jordan Cr. From OR Boundary to BLM boundary section	1705010807	170501080701
Jordan Cr.-2	From end of #2 to Rail Creek	1705010809	170501080904
Jordan Cr.-3	Rail Cr. Confluence to BLM boundary	1705010808	170501080801
Jordan Cr.-4	BLM boundary near Buck Cr. to BLM boundary	1705010808	170501080801
Jordan Cr.-5	BLM boundary section line to BLM boundary upstream of Louse Cr.	1705010808	170501080801
Jordan Cr.-6	BLM boundary upstream of Louse Cr. To BLM boudary section	1705010808	170501080803
Jordan Cr.-7	BLM Boundary to state land section boundary	1705010808	170501080803
Jordan Cr.-8	State linelands boundary to headwaters of Jordan Cr.	1705010808	170501080804
Williams Cr.BLM segments		1705010807	170501080703
Williams Cr.	Including Pole Bridge Cr. And West Cr.	1705010807	170501080703
Duck Cr.	All	1705010808	170501080801
Old Man Cr.	All	1705010809	170501080901

Reach	Description	HUC 5	HUC 6
South Mountain Creek	Lower BLM upper put state includes Howl Cr. Cyote Cr.	1705010809	170501080903
Rail Cr.	All	1705010809	170501080904
Washington Gulch	All	1705010808	170501080801
Flint Cr.1	Lower	1705010808	170501080801
Flint Cr.2	Upper Includes East Cr.	1705010808	170501080801
South Boulder Cr.	From confluence with North Boulder Cr. To confluence with Mill Cr.	1705010812	170501081201
Upper South Boulder Creek	Mill Creek confluence to headwaters	1705010812	170501081201
Indian Cr.	Bogus Cr. (Lower) - confluence with South Fork Boulder to Section 10	1705010812	170501081201
Bogus Cr.	Upper above section 10 and above	1705010812	170501081201
Combination Cr.	Lower reach of stream	1705010810	170501081001
Rose Cr.	Up to state section.	1705010810	170501081001
Josephine	includes Wickiup and Long Valley and Headwater Josephine	1705010811	170501081104
Louisa Cr.	From confluence with Rock Cr.	1705010811	170501081101
Lower Rock Cr.-1	From confluence of North Boulder to Meadow Creek.	1705010810	170501081001
Rock Cr.-2	From Meadow Creek to BLM	1705010811	170501081101
Rock Cr.-3	BLM portion in Section 26	1705010811	170501081103
Rock Cr.-4	From BLM/PVT boundary in Sec. 26 to above Triangle Reservoir.	1705010811	170501081103
Rock Cr. 5	BLM reach above Triangle Reservoir to Sheep Creek/private boundary	1705010811	170501081103
Rock Cr. 6	From Sheep Creek/private boundary to headwaters	1705010811	170501081103
Meadow Cr.	Headwaters to	1705010811	170501081102

Reach	Description	HUC 5	HUC 6
	confluence with Rock Cr.		
Deer Cr.	Confluence with Big Boulder to state section 36	1705010809	170501080902
Owl Cr.	Includes Minear Cr. (Confluence of Lone Tree to headwaters)	1705010807	170501080702
North Boulder-1	From confluence with Big Boulder; BLM reach to Private	1705010810	170501081001
North Boulder-2	From confluence with Mamouth Cr. To headwaters	1705010810	170501081002
Louse Cr.	Includes Cottonwood Cr. From confluence of Jordan Cr. To headwaters	1705010808	170501080802
Upper Trout Cr.	From Split Rock Canyon to headwaters, including Nichols, Wood Canyon creeks	1705010806	170501080601
Split Rock Canyon	Confluence with Trout Creek to headwaters.	1705010806	170501080601
Cow Cr.-2	From confluence with Wildcat Canyon Cr. To headwaters	1705010805	170501080506
Soda Cr.	From confluence of Cow Cr. To headwaters	1705010805	170501080507
Reach	**Description**	**HUC 5**	**HUC 6**
HUC 17050107			
NF Owyhee 1	Lower; From the Oregon State line to the confluence of Juniper Cr.	1705010706	170501070602
NF Owyhee 2	Upper; Headwaters of North Fork , Lower Noon Cr. And Lower Pleasant Valley Cr.	1705010706	170501070605
Upper Pleasant Valley Cr.	From the top of Sec. 7 to headwaters	1705010706	170501070606
Cabin Cr.	From the confluence with Juniper Cr. To the headwaters	1705010706	170501070604
Juniper Cr. 1	From the confluence	1705010706	170501070603

Reach	Description	HUC 5	HUC 6
	with the North Fork Owyhee to lower private boundary		
Juniper Cr. 2	From the start of the private up to the headwaters	1705010706	170501070603
Lone Tree Cr.	From Oregon State line to headwaters	17050107xx	17050107xxxx
Cottonwood Cr.	From the upper private boundary (section 18) to headwaters	1705010706	170501070607
Squaw Cr. 1	From Oregon State line to lower private boundary (section 13)	1705010706	170501070607
Squaw Cr. 2	From the start of private in section 14 to the BLM in the northwest corner of section 31	1705010706	170501070607
Squaw Cr. 3	From private to headwaters	1705010706	170501070607
Pole Cr.	Oregon State line to headwaters	1705010707	170501070701
Middle Fork Owyhee	Oregon State line to headwaters	1705010708	170501070801
Reach	**Description**	**HUC 5**	**HUC 6**
HUC 17050106			
Little Owyhee	From the Nevada State line to the confluence with South Fork Owyhee	1705010601	170501060101
Reach	**Description**	**HUC 5**	**HUC 6**
HUC 17050105			
South Fork Owyhee	From Nevada State line to the confluence with Owyhee River	17050105xx	17050105xxxx
Reach	**Description**	**HUC 5**	**HUC 6**
HUC 17050104			
Blue Cr.-3	Blue Cr. Reservoir to headwaters	1705010413	170501041304
Shoofly Cr.-1	Confluence to BLM boundary	1705010413	170501041301
Shoofly Cr.-2	Private/BLM boundary to Bybee reservoir	1705010413	170501041301

Reach	Description	HUC 5	HUC 6
Shoofly Cr.-3	Bybee reservoir to headwaters	1705010413	170501041302
Owyhee River	DV reservoir border to confluence	17050104xx	17050104xxxx
Owyhee River DVIR portion	Mouth of canyon to NV state line	17050104xx	17050104xxxx
Battle Cr.-1	Confluence to private in sec. 10 (cottonwood draw)	1705010404	1705010404XX
Battle Cr.-2	Section 10 to above state section 36	1705010409	170501040903
Battle Cr.-3	State section 36 to headwaters	1705010409	170501040905
Dry Cr.-1	confluence to reservoir	1705010409	170501040904
Dry Cr.-2	Reservoir to headwaters	1705010409	170501040904
Big Springs Cr.-1	confluence to reservoir	1705010409	170501040902
Big Springs Cr.-3	BLM boundary to private	1705010409	170501040902
Deep Cr.-1	Confluence to private	1705010402	170501040203
Deep Cr.-2	Private to mid section 10	17050104xx	17050104xxxx
Deep Cr.-3	section 10 to Stoneman Cr. Confluence	1705010405	170501040501
Deep Cr.-4	headwaters including:	1705010405	170501040501
Stoneman Cr.	Confluence to headwaters	1705010405	170501040503
Current Cr.	Confluence to headwaters	1705010405	170501040503
Nickel Cr.	Confluence to headwaters including:	1705010405	170501040502
Smith Cr.	Confluence to headwaters including:	1705010405	170501040502
Castle Cr.	Confluence to headwaters including:	1705010403	170501040303
Beaver Cr.	Confluence to headwaters including:	1705010403	170501040302
Red Canyon Cr.	Confluence to headwaters including:	1705010401	17050104xxxx
Petes Cr.	Confluence to headwaters including:	1705010401	170501040103
Dickshooter Cr.	Confluence to headwaters	1705010407	170501040701

Reach	Description	HUC 5	HUC 6
Pole Cr.-1	Confluence to Camas Cr. Confluence including Camel Cr.	17050104xx	17050104xxxx
Pole Cr.-2	Camas confluence to headwaters	1705010406	1705010406xx
Camas Cr.	Confluence to headwaters	1705010406	1705010406004

Table 2.33 Cross-reference of specific stream reaches identified in the QHA analysis with 4th, 5th, and 6th field HUC's – for the Nevada Portion of the Owyhee Subbasin.

Reach	Description	HUC 5	HUC 6
4th HUC; 17050105			
State line to Petan Ranch	Red Band prsnt seasonally (Spring) during good water yrs when sutiable water temps	1705010502	17050105xxxx
Lower boundry of Petan Ranch to Red Cow Cr.	Red Band prsnt seasonally(Spring) during good water yrs when sutiable water temps	1705010504	17050105xxxx
From Red Cow to Hot cr.	RBT Occupied yr round, low density	17050105xx	17050105xxxx
hot creek to McCann	Prvt Land, Brook Trout prsnt in Spring Heads, RBT are seasonal, White Fish yr round	17050105xx	17050105xxxx
Four mile cr from S.F. to Chimney Res.	RBT Down migration during good water yrs, dry 10months of yr, flow controlled by Chimney	1705010521	170501052101
Chimney Cr. Res to T41N R49E sec4	RBT Down migration during good water yrs, dry 10months of yr, flow controlled by Chimney	1705010519	170501051901
T41N R49E sec4 to Head Waters	Occupied by RBT year round, 3miles of reach occupied	1705010519	170501051901
Chimney Cr Res. To Winters Cr.	Int/Dry 10mnths/yr, no RBT	1705010519	170501051901
Winters Cr.	Recently occupied, but	1705010518	170501051802

Reach	Description	HUC 5	HUC 6
	not currently, historic habitat (no record), stocked in 1972 with RBT, ceased in 2000due to fire/livestock grazing		
Sheep Creek-S.F. Owyhee to Sheep Cr. Res		1705010506	170501050601
Sheep Cr. Res to T46n R51E sec 11	Int/Dry, no RBT, spring down migration	1705010506	170501050601
T46n R51e sec 11 to head waters		1705010506	170501050601
Indian Cr. (Trib to S.F. Owyhee)	Occupied RBT through National Forest	1705010507	17050105xxxx
Winters Cr. Trib to Indian Cr	2 miles occupied RBT through National Forest	1705010507	170501050703
Mitchell Cr. Trib to Indian Cr	2 miles occupied RBT through National Forest	1705010507	170501050703
Wall Cr. Trib to Indian Cr	1 Mile occupied RBT through National Forest	1705010507	170501050702
Silver Cr. (Trib to S.F. Owyhee)	2 miles occupied RBT through National Forest	1705010507	170501050704
White Rock Cr.	Unoccupied, probably historic, mining influence	1705010507	170501050704
Cottonwood Canyon Cr.	Unoccupied, probably historic, mining influence	1705010507	170501050704
Breakneck Cr	2 miles occupied RBT	1705010507	170501050704
Bull Run Cr.-S.F. Owyhee to Bull Run Canyon	Diverted for Agriculture use	1705010507	170501050701
Mouth of Bull Run Canyon to Cap Winn Cr.	probably recruitment from upstream tribs	1705010509	170501050904
Frost Cr.	Low number of RBT	1705010509	170501050902
Cap Winn Cr	Occupied RBT,	1705010509	170501050904
Doby George	Occupied RBT,	1705010509	170501050904
Columbia Cr	Occupied RBT, Low number (200's), Brook Trout abundant	1705010509	170501050903
Blue Jacket Cr	Occupied RBT (700), Brook Trout	1705010509	170501050903

Reach	Description	HUC 5	HUC 6
Deep Cr. Trib to S.F. Owyhee		17050105xx	17050105xxxx
S.F Owyhee to Head Waters	Unoccupied, RBT probably present historically	17050105xx	17050105xxxx
Red Cow Cr.	Occupied 1mile by RBT	1705010516	170501051601
Amazon	Ephemeral, no record of RBT, probably historic	1705010511	170501051101
Big Cottonwood Trib	1mile occupied by RBT	1705010515	170501051501
Harrington Cr	Unsurveyed, Prvt Land, Probable RBT	1705010512	170501051201
Marsh Cr.	Occupied RBT	1705010512	170501051201
Boyd Cr	Occupied RBT	1705010512	170501051201
Scoonover Cr.	Occupied RBT	1705010512	170501051201
Dorsey	Occupied RBT	1705010512	170501051201
Coffin Cr.	Occupied RBT	1705010512	170501051201
Jack Cr	Occupied RBT, no brook trout surveyed in last 2yrs(used to be abundant)	1705010512	170501051201
Chicken Cr	Occupied RBT,	1705010510	170501051002
Mill Cr	Occupied RBT, Brook trout, included 3 forks	1705010512	170501051201
Niagra Cr	No Surveyed Data	1705010512	170501051201
Snow Canyon Cr	Occupied RBT, 5 mi occupied	1705010512	170501051201
Jarritt Canyon	Int/Dry, Unoccupied, Historic Salmon	1705010512	170501051201
Burns Cr.(Trib to Jarritt Canyon	1.5 mile occupied on National Forest, Trout Present	1705010512	170501051201
Schmidtt Cr.	4 miles occupied	1705010512	170501051201
McCann Cr	5 mile occupied RBT, low density RBT	1705010514	170501051404
Taylor Canyon Cr (trib to S.F. Owyhee)	2 miles occupied RBT, BT common	1705010514	170501051402
Water Pipe Canyon (trib to Taylor Canyon)	2.5 mile occupied RBT	1705010514	170501051402
HUC 17050104			
E.F. Owyhee ID-NV state line to Paridise Point Diversion	Irrigated hay fields, No RBT habitat	1705010412	170501041201

Reach	Description	HUC 5	HUC 6
Boyle Cr	Starts in NV and enters Owyhee in ID	1705010412	170501041201
S.F of Boyle Cr		1705010412	170501041201
E.F. Owyhee Paridise Point to Duck Valley Indian Res border	DVIR	1705010414	17050104xxxx
Skull Cr		1705010414	170501041406
N.F. of Skull Cr		1705010414	170501041406
E.F. of Skull Cr		1705010414	170501041406
Reed Cr		1705010414	170501041405
Summit Cr		1705010414	170501041405
Fawn Cr	USFS RBT occupied for sure 4.8miles	1705010414	170501041404
Jones Cr		1705010414	170501041405
Granite	probably fishless	1705010414	170501041403
E.F. Owyhee Duck Valley Indian Res border to Patsville (Mill Cr)	U.S.F.S.	1705010414	170501041403
Slaughter House Cr	Occupied RBT 2 miles	1705010414	170501041403
Brown's Gulch (Slaughter house Trib	2.4 miles RBT occupied	1705010414	170501041403
Miller Cr.	3 mile occupied RBT	1705010414	170501041403
West Fr. (of Slaughterhouse Cr)	1.5 miles occupied RBT	1705010414	170501041403
California Cr	Min. occupied RBT by headwater of Cr.	1705010414	170501041407
North Fr (trib of California Cr)	No RBT, lack of flow(Drought yr)	1705010414	170501041407
Dip Cr	1 mile RBT occupied	1705010414	170501041407
Big Springs Cr	Unoccupied (insufficient flow)	1705010414	170501041407
South Fr.	2 mile RBT occupied	1705010414	170501041407
Pixley	1 mile RBT occupied	1705010414	170501041407
E.F. Owyhee Mill Cr.to Badger Cr	U.S.F.S.	17050104xx	17050104xxxx
Lower Mill Cr to S.F Owyhee River	Unoccupied, pollution, mine tailings	1705010414	170501041402
Upper Mill Cr to Rio tinto Mine	occupied RBT whole distance in none drought years	1705010414	170501041402
McCall Cr.	5.5 miles occupied RBT	1705010414	170501041402

Reach	Description	HUC 5	HUC 6
Allegheny	Native Dace only	1705010415	170501041504
Cold Spring (trib to Allegheny)	Native Dace only	1705010415	170501041504
Trail Cr	8.2 occupied RBT, Brook Trout(MGT concern)	1705010415	170501041502
Van Duzer Cr. (Trib to Trail Cr)	5 mile occupied, Brook Trout (MGR concen)	1705010415	170501041503
Lime Cr (trib to Van Duzer)	.3 occupied by RBT, Brook Trout prsnt	1705010415	170501041503
Cobb Cr (trib to Van Duzer)	4.5 RBT occupied	1705010415	170501041503
Deer Cr (trib to Trail Cr.)	min. occupied RBT in a single pool	1705010415	170501041502
Springs Cr.	0.1 mile RBT occupied, Brook trout	17050104xx	17050104xxxx
Wood Gulch	Mine prsnt, 2 mile RBT occupied	1705010415	170501041502
Hutch Cr	1mile RBT occupied, Brook Trout	1705010415	170501041502
Timber Gulch	0.35 RBT occupied, Brook Trout	1705010415	170501041502
Sheep cr	2 mile RBT occupied, Brook Trout	1705010415	170501041502
Road Canyon	1.2 RBT occupied	1705010415	170501041502
Gravel Cr	Lower 0.1 RBT occupied (spawning ground)	1705010415	170501041502
E.F. Owyhee Badger Cr. To Wildhorse Res.	U.S.F.S.	1705010415	170501041501
Badger Cr.	7 miles RBT occupied, some livestock concerns, fair condition, 1600 fish	1705010415	170501041501
Beaver Cr.	All occupied by RBT	1705010415	170501041501
Wildhorse Res		1705010416	170501041601
Hendricks Cr	RBT appearing (questionalble genetics,rainbow?)	1705010416	170501041608
Warm Cr (Trib of Hendricks)	not RBT occupied, warm water temp, soil type/erosion, agriculture	1705010416	170501041608
Penrod	RBT occupied entire	1705010416	170501041602

Reach	Description	HUC 5	HUC 6
	way		
Hay meadow Cr	only native dace present	1705010416	170501041604
Thompson Cr (hay meadow trib)	no fish present in drough yrs	1705010416	170501041604
Martin Cr. (trib to Penrod)	4.5 RBT occupied, Brook Trout	1705010416	170501041602
Gold Cr. (trib to Martin Cr)	1.8 RBT occupied	1705010416	170501041603
Sweet Cr	0.5 RBT occupied	1705010416	170501041603
Rosebud Cr	Native Dace only	1705010416	170501041602
Deep Cr trib to Wildhorse (E.F. Owyhee)	1.5 miles occupied RBT, some on prvt land?	1705010416	170501041607
Clear Cr trib to (Deep Cr)	no fish present in drough yrs	1705010416	170501041607
Riffe Cr (Deep Cr)	3 mile occupied RBT, beaver ponds	1705010416	170501041607
N.F. of Deep Cr	No RBT, lack of flow(Drought yr)	1705010416	170501041607
Middle Fork of Deep Cr	2 mile occupied RBT	1705010416	170501041607
S.F of Deep Cr	3 miles RBT occupied	1705010416	170501041607
E. F. Owyhee Above Wildhorse Res to head waters	Spotted Frog habitat	1705010416	170501041605
Clear Cr trib to Upper E.F Owyhee	Historic potential habitat, poisioning in 1988 to remove chub, killed Trout	1705010416	170501041605
Hanks Cr trib to Upper E.F Owyhee	Dace prsnt, habitat concerns (livestock) no RBT	1705010416	170501041606
E.F. Owyhee ID-NV state line to Paradise Point Diversion	Irrigated hay fields, No RBT habitat	1705010412	170501041201

2.4.2 Terrestrial

This section was not completed due to time constraints.

The Owyhee Subbasin Planning/Technical Team did not complete a quantitative assessment of terrestrial focal species and habitats – this is a deficiency that should be corrected in a subsequent iteration of the Owyhee Subbasin Plan. The Technical Team used the Terrestrial Habitat Problem Statements, Objectives, and Strategies from the draft Bruneau Subbasin Plan (Accessed from the Eco-Vista web site, April 2004) as a “strawman” or model due to time constraits and because the landscape and resource management issues are similar to the Owyhee (Tim Dykstra, Shoshone-Paiute Tribes, Personal Communication). Furthermore, the Bruneau Subbasin Planning Team had spent a great deal of time and inter-agency technical effort in the developing their initial draft, and the Owyhee Subbasin Team did not have the resources to duplicate this level of effort.

2.4.3 Interspecies Relationships

This section was not completed due to time constraints.

Key Environmental Correlates (KEC) and Key Ecological Functions (KEF)

Traditionally defined, the term habitat is that set of environmental conditions, usually depicted as food, water, and cover, used and selected for by a given organism. Despite this broad definition, many land management agencies use the term habitat to denote merely the vegetation conditions and/or structural or seral stages used by a particular species. However, many other environmental attributes or features influence and affect the population viability of wildlife species.

The word Key in Key Environmental Correlate refers to the high degree of influence (either positive or negative) the environmental correlates exert on the realized fitness of a given species. A positive associations supports species viability, abundance, fitness and distribution, while a negative influences may be viewed as environmental stressors.

Both key environmental correlates and ecological functions support as well as influence Ecosystem Services, which are the beneficial outcomes that result from ecosystem functions. Some examples of ecosystem services are support of the food chain, fishing and hunting, clean water, better human health, or scenic views. Ecosystem Services help sustain life and are critical to human welfare. Negative influences to Ecosystem Services, like through KECs or KEFs, often result in a loss of biodiversity processes and functions of natural ecosystems.

Definition of Key Environmental Correlates – Environmental elements that are key or critical factors thought to most influence a species distribution, abundance, fitness and viability. These can be thought of as the fine feature elements that a species principally relies on or are influenced by.

Further defining Key Environmental Correlates – site-specific KECs include natural attributes, both biological and physical (e.g., large trees, woody debris, cliffs, and soil characteristics) as well as anthropogenic features and their effects such as roads, buildings, and pollution. Including these fine-scale attributes of an animal's environment when describing the habitat associations for a particular species expands the concept and definition of habitat, a term widely used only to characterize the vegetative community or structural condition occupied by a species. Failing to assess and inventory KECs within these communities and conditions may lead to errors of commission; species may be presumed to occur when in actuality they do not. KECs that influence a species negatively may preclude occupancy or breeding despite adequate floristic or structural conditions.

Definition of Key Ecological Functions - Principal or key roles performed by each species. Or, the main ways organisms use, influence and alter the environments.

Further Defining Key Ecological Functions -- to ensure sustainable wildlife populations, like conserving threatened or endangered species, cannot stop at addressing only individual species habitat needs. In fact, a primary purpose of the Endangered Species Act is .. . . to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved . . . ..(Sec. 2[b]). As well, natural resource organizations, like the U.S. Forest Service, have moved to an ecosystem-based management approach, to conserve and manage ecosystems means understanding their dynamics and processes, including the ecological functions of species.

It has long been recognized that the ecological roles of vertebrate species influence ecosystems. Examples of some ecological functions of vertebrate species include how: browsing or grazing by ungulates can change plant communities; or carnivore predation can influence populations of ungulate prey species; and pollinators can support plant diversity. Ecological functions of organisms support the trophic structure of ecosystems that is, energy flows, food webs, and nutrient cycling. Hence, more biologically diverse systems support wider arrays of ecological functions.

\\schrepel\plans\owyhee\chapter 2 owyhee subbasin technical assessment.doc