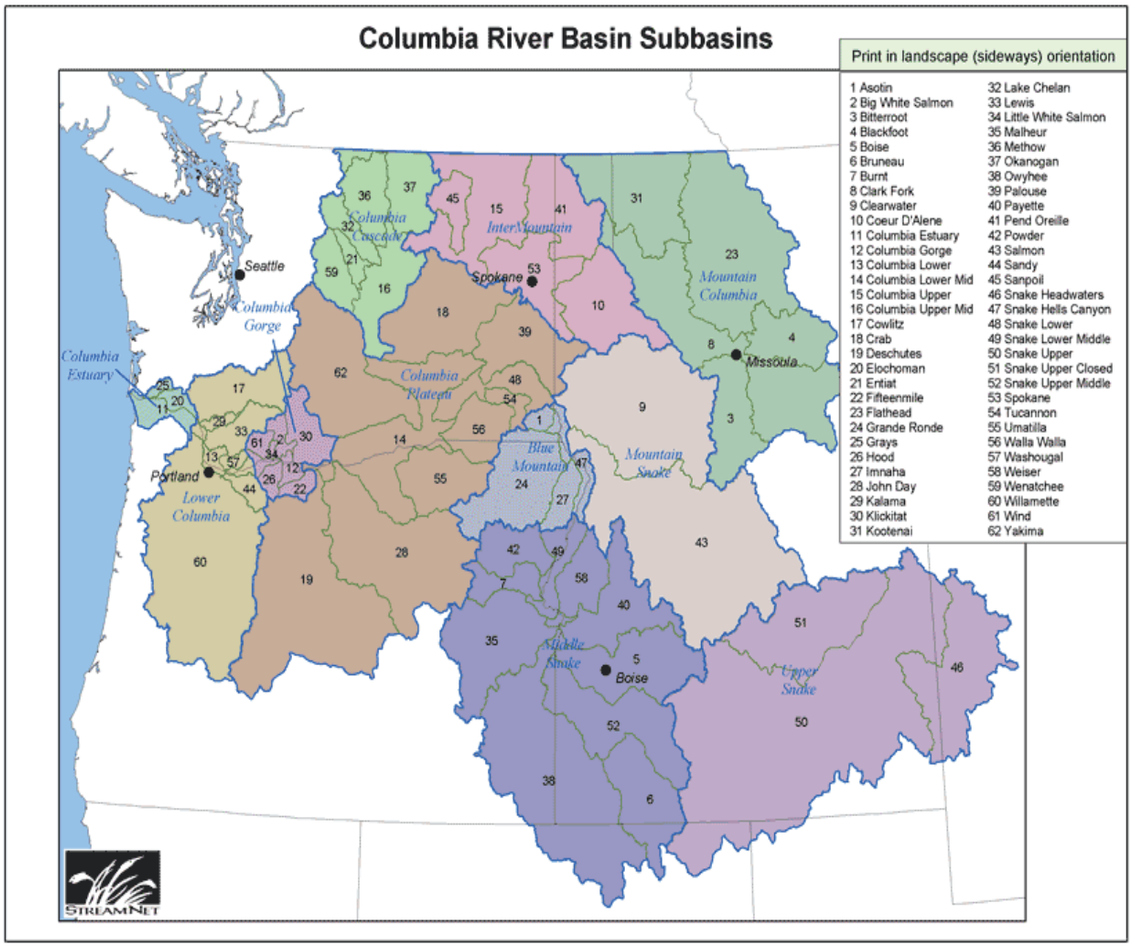
2002??

COLUMBIA BASIN FISH AND WILDLIFE AUTHORITY

Northwest Power and Conservation Council

BONNEVILLE POWER ADMINISTRATION

Status of Fish and Wildlife Resources in the Columbia River Basin



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An online version of this report is available at *www.cbfwa.org/sotr*.

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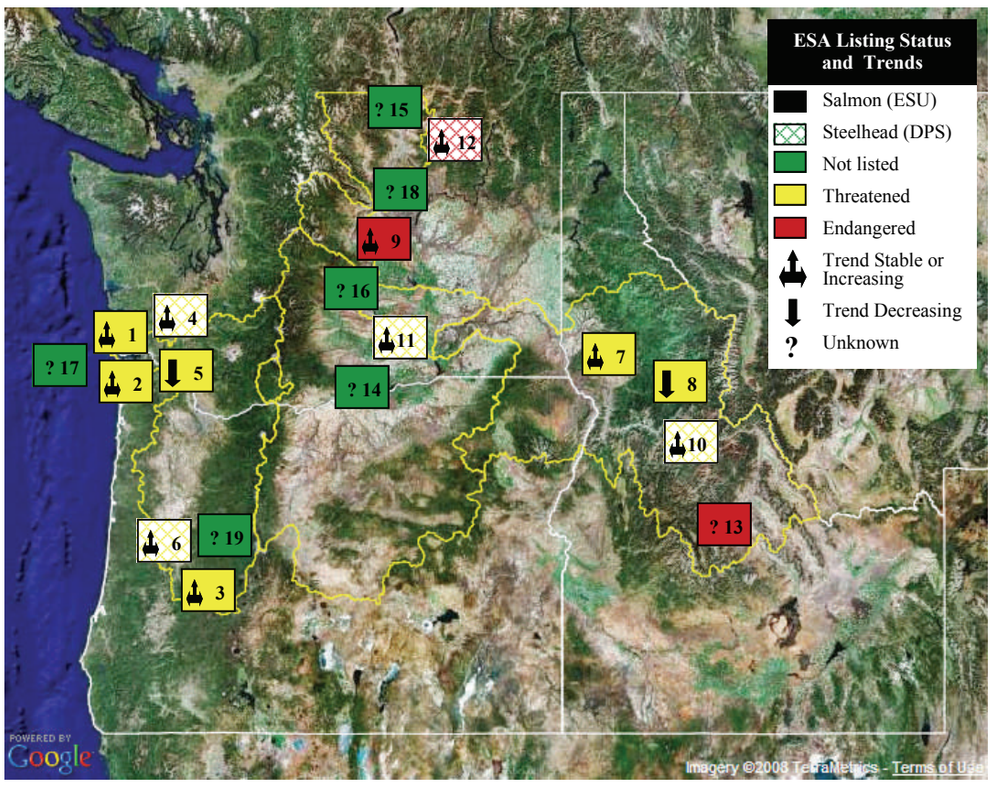
Table of Contents

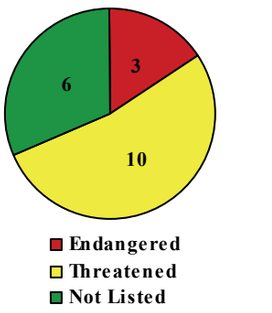
Columbia River Basin

Status and Trends of Salmon and Steelhead in the Columbia River Basin[1]

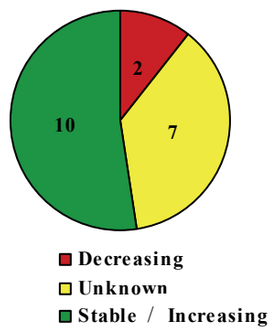


Numbers correspond to the parenthetical numbers in the ESU/DPS column of the table.

Endangered Species Act Salmon and Steelhead ESU/DPS Listing Status



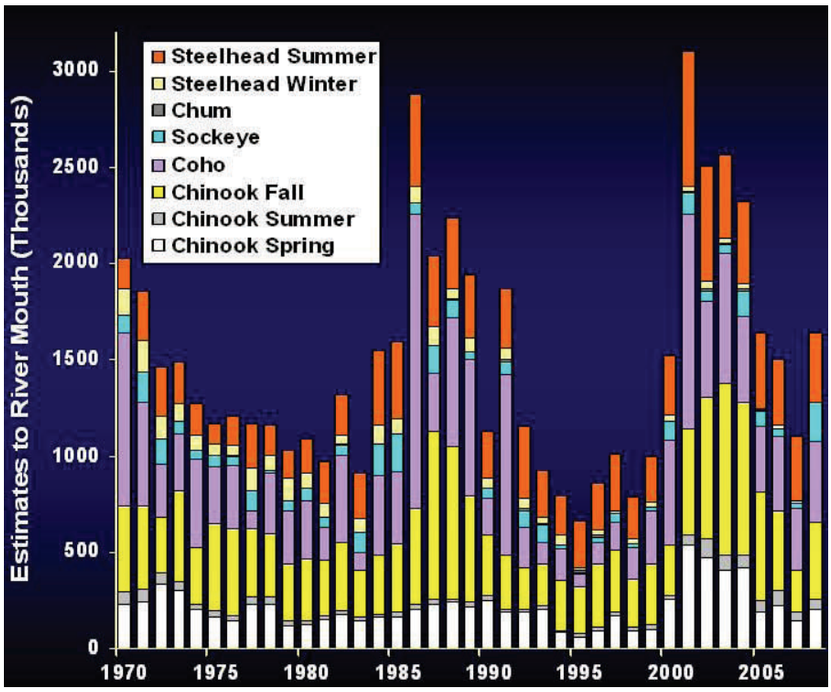
Recent Trends of Salmon Steelhead ESU/DPS[1]



Recovery Domain	Species	ESU/DPS Name (location on map)	Number of Extant Populations	Current ESA Listing Status (Year Listed)
Willamette/Lower Columbia	Chum Salmon	Columbia River Chum (1)	16	Threatened (1999)
	Chinook Salmon	Lower Columbia River Chinook (2)	32	Threatened (1999)
	Chinook Salmon	Upper Willamette River Chinook (3)	7	Threatened (1999)
	Steelhead	Lower Columbia River Steelhead (4)	23	Threatened (1999)
	Coho Salmon	Lower Columbia River Coho (5)	24	Threatened (2005)
	Steelhead	Upper Willamette River Steelhead (6)	5	Threatened (1999)
Interior Columbia	Chinook Salmon	Snake River Fall Chinook (7)	1	Threatened (1992)
(Excludes Clearwater)	Chinook Salmon	Snake River Spring/Summer Chinook (8)	31	Threatened (1992)
	Chinook Salmon	Upper Columbia River Spring Chinook (9)	3	Endangered (1999)
	Steelhead	Snake River Basin Steelhead (10)	24	Threatened (1997)
	Steelhead	Middle Columbia River Steelhead (11)	18	Threatened (1999)
	Steelhead	Upper Columbia River Steelhead (12)	5	Endangered (1997)
	Sockeye Salmon	Snake River Sockeye (13)	1	Endangered (1991)
No Recovery Domain	Chinook Salmon	Middle Columbia Spring Chinook (14)	4	Not Warranted
	Sockeye Salmon	Okanogan River Sockeye (15)	1	Not Warranted
	Sockeye Salmon	Lake Wenatchee Sockeye (16)	1	Not Warranted
	Steelhead	Southwest Washington Steelhead (17)	7	Not Warranted
	Chinook Salmon	Upper Columbia River Summer/Fall Chinook (18)	3	Not Warranted
	Chinook Salmon	Deschutes River Summer/Fall Chinook (19)	1	Not Warranted

Anadromous Fish

Estimates of Adult Salmon and Steelhead Counts at the Columbia River Mouth (1938-2008)[2, 3]

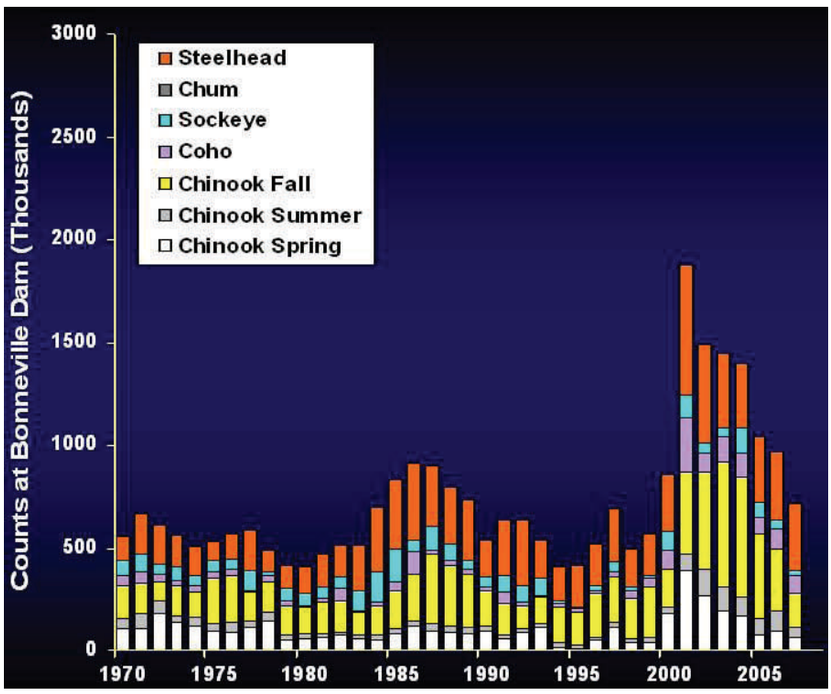


Adult Salmon and Steelhead Counts at the Columbia River Mouth

Estimates of the number of salmon and steelhead returning to the Columbia River Basin are generally made by summing (1) harvest in the Columbia River downstream from Bonneville Dam, (2) runs into tributaries downstream from Bonneville Dam, and (3) counts at Bonneville Dam. Because fish entering tributaries downstream from Bonneville Dam may not be completely counted, some estimates are considered "minimum".

Numbers of fish entering the Columbia River reached a relative high in 2001, and then generally declined until an upturn in 2008. The upturn was partially a result of the sockeye salmon return being the highest in over 40 years. The return of Coho salmon also increased for the first time in five years, but was still below numbers seen from 2000-03. An estimate for winter steelhead is not yet available for 2008, but they comprise a small percentage of the overall run.

Counts of Adult Salmon and Steelhead at Bonneville Dam (1970-2007)[4]



Adult Salmon and Steelhead Counts at Bonneville Dam

Because it is the lowermost dam on the Columbia River, counts of salmon and steelhead at Bonneville Dam provide information important to the management of upriver stocks. Fish are counted at windows in fish ladders, either directly or by viewing video tape.

Similar to estimates of fish entering the Columbia River, counts at Bonneville Dam declined from 2001 through 2007. Counts for each species and race are not yet available for 2008.

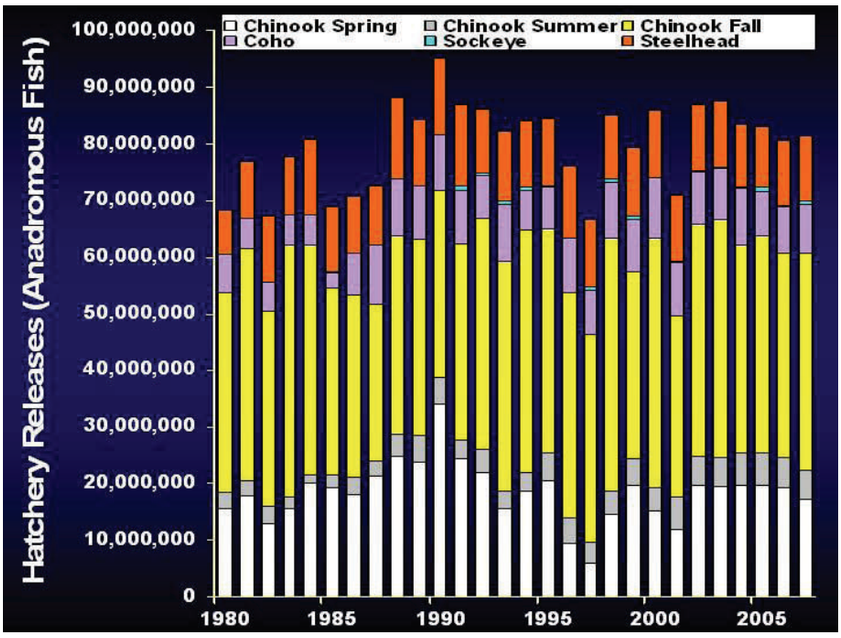
Counts at Bonneville Dam generally follow the same trend as estimates at the Columbia River mouth; however, this relationship is affected to varying degrees by individual species or races. For example, large numbers of Coho salmon entering the Columbia River do not often result in high counts at Bonneville Dam because most Coho salmon spawn or are harvested in the lower river.

Columbia River Basin

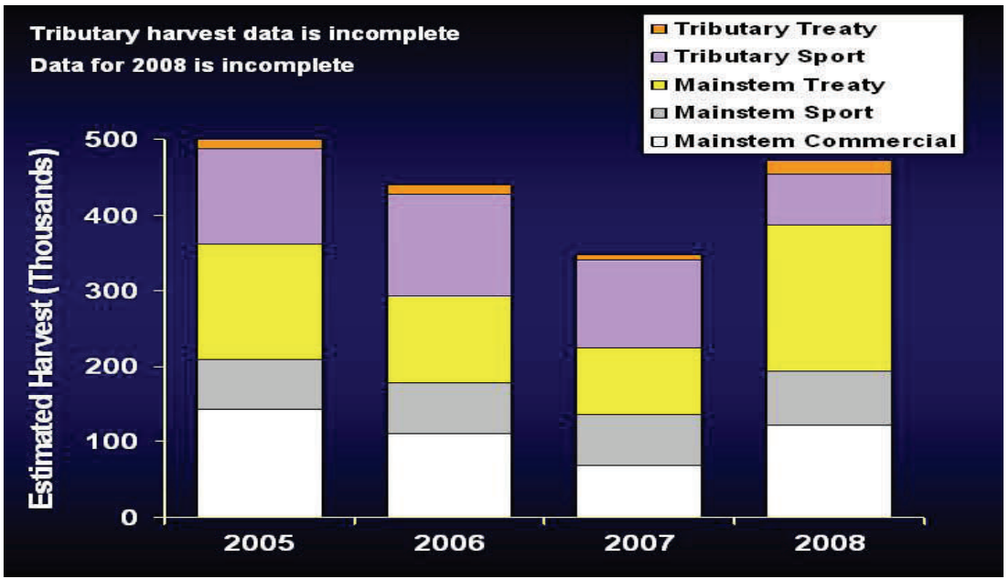
Hatchery Production

In 2007, more than 80 million salmon and steelhead were released in the Columbia River Basin. Hatchery programs are categorized, based on their genetic broodstock management strategy, as either integrated (i.e., composite population of natural and hatchery origin fish) or segregated (i.e., distinct population reproductively isolated from natural populations). The purpose of these programs are either to provide harvest opportunities, serve as a conservation measure, or both.

Hatchery Production of Salmon and Steelhead in the Columbia River Basin[4]



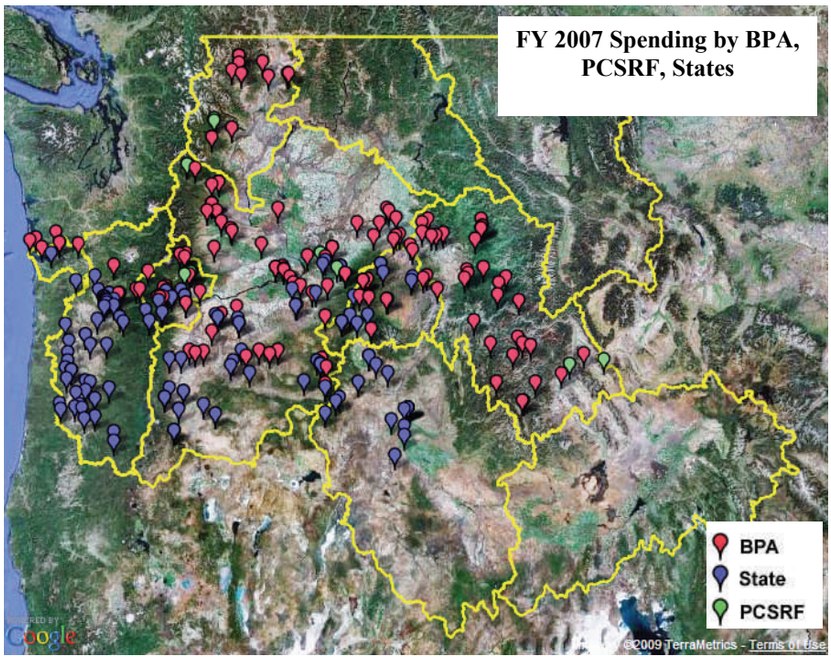
Columbia River Basin Salmon and Steelhead Harvest[5,6,7]



Species/Race	Mainstem Harvest—2007			Tributary Harvest— 2007	
	Commercial	Sport	Treaty	Sport	Treaty
Spring Chinook	10,298	7,129	6,144	15,509	5,700
Summer Chinook	1,122	2,429	5,375	0	0
Fall Chinook	16,750	13,330	45,356	3,680	510
Coho	40,709	9,237	8,035	5,634	Unknown
Sockeye	0	0	1,414	0	Unknown
Chum	38	0	0	0	0
Winter Steelhead	0	1,876	558	6,207	0
Summer Steelhead	0	33,151	20,819	86,339	Unknown

Anadromous Fish

Location of Anadromous Fish Habitat Projects (FY 2008)



Anadromous Fish Habitat Projects

During FY 2008, BPA funded 104 projects in the Columbia River Basin to improve wetland, instream, riparian, and riparian-upland habitats zones that are important for the conservation and restoration of anadromous fish. General descriptions of the project-types and the habitat zones that are addressed through the implementation of the associated actions are listed below. A more thorough description of the actions are included in Appendix A**.**

The accomplishments of a given habitat projects can be measured several different ways. For example, a project for which the focus is to increase instream habitat complexity may have the following objectives: 1.) install a specific number of structures and 2.) treat a specified number of stream miles. Similarly, the installation of wells, piplines, sprinkler, etc. can provide multiple benefits (e.g., primary stream miles improved, total stream miles improved, cfs of water conserved, and acre-feet of water conserved).

BPA—Funded Anadromous Fish Habitat Project Accomplishments (FY 2008)[8]

Habitat Zone	Project-type	Planned Value	FY 2008 Accomplishment (Actual Value)
Wetland	Realign, connect, and/or create channel	176.2 acres	44.2 acres affected
Instream	Increase instream habitat complexity	77.53 stream miles	67.67 stream miles treated
	Increase instream habitat complexity	1,522 structures	962 structures installed
	Removal/install diversion, remove/breach dam, install fish passage structure	684.8 miles	337.1 habitat miles accessed
	Install well, install pipeline, install sprinkler, acquire water instream	449.8 miles primary stream	278.4 miles of primary stream reach improved
	Install well, install pipeline, install sprinkler, acquire water instream	929.7 miles total stream	711.3 miles of total stream reach improvement
	Install well, install pipeline, install sprinkler, acquire water instream	54.5 cfs conserved	22.9 cfs conserved
	Install well, install pipeline, install sprinkler, acquire water instream	19,733.9 acre-feet conserved	11,137.9 acre-feet conserved
	Realign connect and/or create channel	15.9 miles	5.9 stream miles after treatment
	Remove/install diversion	10 screens	6 screens addressed
	Install fish screen	144.9 cfs	210.2 cfs diversion flow
	Install fish screen	7,259.2 acre-feet	1,938.9 acre-feet screened
	Acquire water instream	379 acre-feet	342 acre-feet water protected
	Acquire water instream	33,241.1 acre-feet protected	19,208.6 acre-feet protected
Riparian	Plant vegetation	520.76 miles	408.1 miles planted
	Purchase land, lease land	201.34 miles	189.59 miles protected
Riparian-Upland	Land purchase, land lease	112,868.7 acres	110,663.8 acres protected
	Conduct controlled burn, plant vegetation, practice no-till and conservation tillage, remove vegetation, upland erosion and sedimentation control, enhance floodplain, create, restore, and enhance wetland	47,840.5 acres	27,822.1 acres treated
	Install fence	1,131.02 miles	1,112.06 miles of fence installed
	Decommision roads, relocate roads, improve roads	323.92 miles	286.33 miles road treated

Columbia River Basin

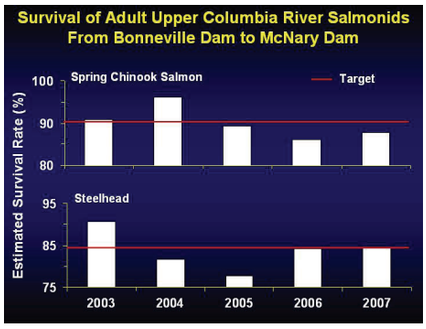
Hydrology and Salmon Survival

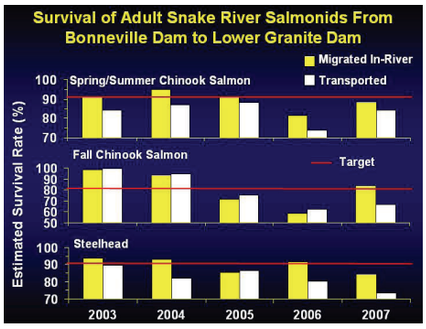
Salmon and steelhead survival depends in part on the hydrology of the Columbia River Basin in conjunction with operation of the hydrosystem. Juveniles in particular rely on flow to aid downstream migration, but annual discharge rate can fluctuate greatly. Flow is further regulated by the hydropower system. Dams have altered the seasonal flow of the basin to meet electricity, irrigation, flood control, navigation, recreation, and water supply demands. What was once a free-flowing river with a broad complex of habitats has been converted to a series of reservoirs.

Survival of juvenile salmonids may be directly affected by passage at dams, by the increased time and energy needed for migration to the ocean, or by other factors related to the changed river such as predation, disease, or thermal stress. Adult migration may be delayed or blocked by dams, and may also affected by predation.

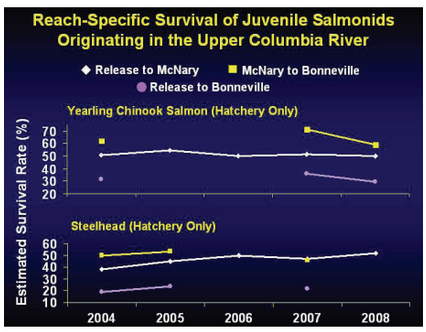
Actions intended to increase the survival of migrating juvenile salmonids include flow enhancement at critical times, increased spill at dams, placement of structures to increase passage efficiency, transportation past dams and reservoirs, and predation control measures. Actions to increase survival of migrating adults have been largely completed, and focused on increasing passage efficiency at dams. Predation control is an additional measure.

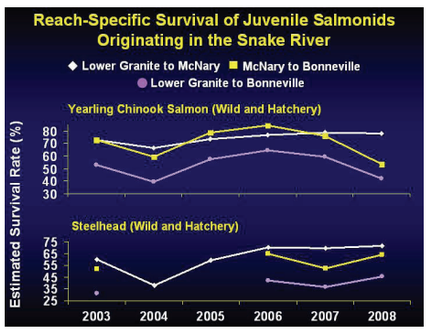
Survival of Adult Salmonids Through the Hydropower System[500]



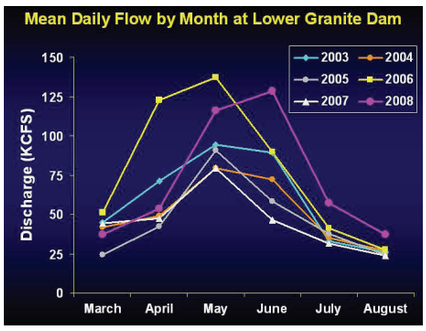


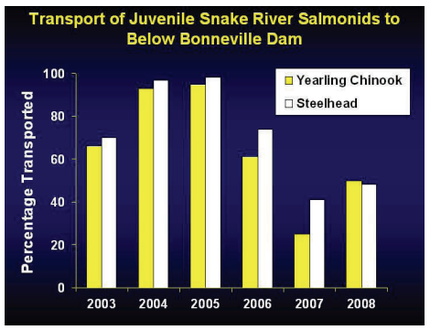
Survival of Juvenile Salmonids through the Hydropower System[501]





Snake River Flow and Transportation of Snake River Juvenile Salmonids





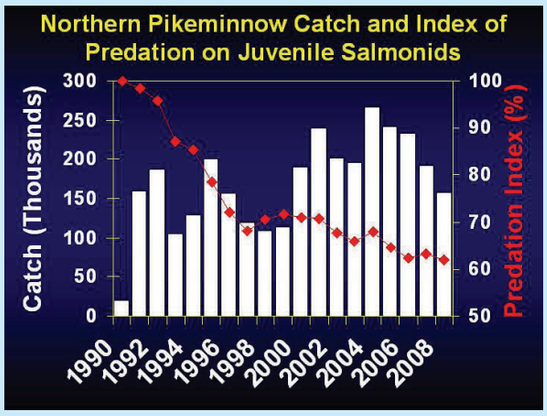
Survival Estimates for Juvenile Salmonids at Specific Dams in Recent Year Evaluated[502]
(Survival from upstream face of the dam to reference point in the tailrace)

Dam, Year	Yearling Chinook			Subyearling Chinook			Steelhead		
	Spillway	Turbine	Bypass	Spillway	Turbine	Bypass	Spillway	Turbine	Bypass
Lower Granite (2006)	98.2%	90.9%	97.6%	89.4%	84.6%	87.5%	97.5%	90.9%	97.6%
Little Goose (2007)	99.9%	89.1%	99.9%	91.8%	87.7%	87.4%	98.2%	92.1%	99.3%
Lower Monumental (2007)	95.9%	90.9%	94.1%	—	—	—	93.9%	92.3%	98.6%
Ice Harbor (2005)	96.5%	—	99.7%	98.3%	—	—	99.0%	—	100%
McNary (2007)	99.0%	89.0%	96.5%	—	—	—	100%	87.0%	100%
John Day (2003)	93.5%	79.0%	100%	95.5%	72.2%	92.1%	—	—	—
The Dalles (2005)	93.8%	83.8%	100%	94.0%	80.0%	94.7%	—	—	—
Bonneville (2007)	95.9%	—	—	93.0%	—	—	—	—	—

Predation on Salmonids

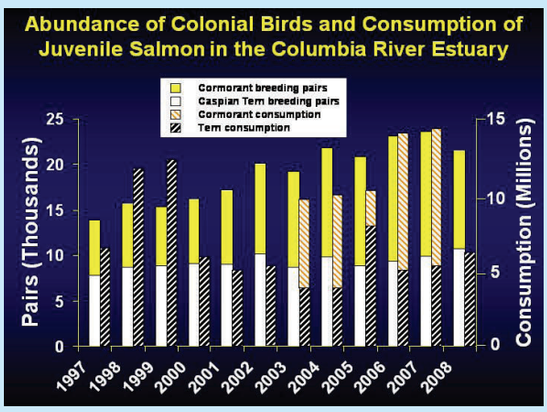
Predation research and management in the Columbia River to date has historically focused on losses of juvenile salmonids to predacious fish (primarily northern pikeminnow) and birds (primarily Caspian terns and cormorants). Predation by non-native fish such as smallmouth bass, walleye, and channel catfish has also become a concern. Initial steps have been taken to evaluate and manage predation by these non-natives. In recent years, predation on adult salmonids and white sturgeon by sea lions below Bonneville Dam has become an additional concern. Actions to reduce this predation have recently been implemented.

Northern Pikeminnow Management Program[9]



The goal of the Northern Pikeminnow Management Program (NPMP) is to reduce predation on juvenile salmonids through sustained harvest of northern pikeminnow. The NPMP is based on research conducted from 1983-93 that indicated (1) loss of juvenile salmonids to resident fish predators was significant, (2) northern pikeminnow were responsible for a majority of the losses, and (3) relatively large reductions in predation could be achieved through relatively low exploitation of northern pikeminnow. Since the NPMP was implemented in 1990, program fisheries have harvested more than 3.2 million northern pikeminnow, with annual harvest rates (for fish $\geq$ 250 mm) averaging approximately 13%. Models indicate that annual losses of juvenile salmonids to northern pikeminnow have decreased approximately 38% from pre-program levels. Empirical evidence supports these results. There is no evidence of compensation in predation, growth, or reproduction by surviving northern pikeminnow, or by other resident fish predators.

Avian Predation on Juvenile Salmonids in the Lower Columbia River[10]



A 1997 study found that Caspian terns nesting on Rice Island, a dredged material disposal island, were a significant predator of juvenile salmonids. Rice Island supported the largest Caspian tern breeding colony in the world (16,000 birds), and these birds consumed more juvenile salmonids than any other prey. Terns were subsequently relocated closer to the ocean on East Sand Island, and by 2000, 94% of all terns in the estuary nested on East Sand Island . Since 2001, all Caspian terns nesting in the Columbia River estuary have used East Sand Island, and this relocation resulted in a sharp drop in consumption of juvenile salmonids. Double-crested cormorants are another common piscivorous waterbird in the Columbia River Estuary. East Sand Island now supports 10-15,000 breeding pairs, compared to about 100 pairs in 1990.

Predation on Adult Salmonids by Sea Lions Near Bonneville Dam[10a]

Predation on adult salmonids by California and Steller sea lions has been generally increasing, with over 3% of the total run from January through May consumed each year since 2006. Predation is primarily on Chinook salmon (93.2% of the catch in 2008), with the remainder on steelhead. This includes predation at Bonneville Dam only. Predation rates in the remainder of the lower river are unknown. Most predation on salmonids (>90%) is by California sea lions, with Steller sea lions consuming mostly white sturgeon (1,139 in 2008). Pacific lamprey are also consumed by California sea lions. Sea lion deterrents utilized have included physical barriers to fishways, acoustic devices, and harassment. Trapping and removal was implemented in 2008.

Estimates of Predation on Adult Salmonids by Sea Lions at Bonneville Dam

Year	Salmonid Count (January 1—May 31)	Observed Salmonid Catch		Expanded Salmonid Catch	
		Catch	% of Run	Catch	% of Run
2002	284,733	448	0.2%	—	—
2003	217,185	1,538	0.7%	—	—
2004	186,804	1,324	0.7%	—	—
2005	82,006	2,659	3.1%	—	—
2006	105,063	2,718	2.5%	3,401	3.1%
2007	88,474	3,569	3.9%	4,355	4.7%
2008	147,543	4,243	2.8%	4,927	3.2%

Columbia River Basin

Pacific Lamprey Background

Like salmon, Pacific lamprey are anadromous; however, their life-cycle is more complex than that of salmon. Juvenile lamprey remain burrowed in the substrate of streams for 4 to 6 years before emerging and migrating to the ocean in late-winter or early-spring. After 2 to 3 years in the ocean, adults return to streams from July to October and spawn the following spring.

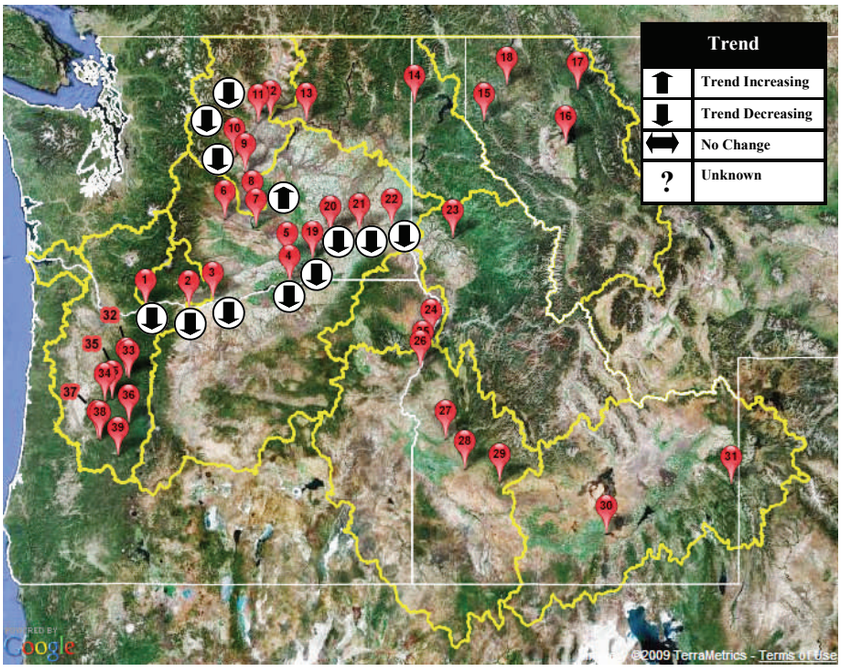
Indigenous peoples from the Pacific Northwest have harvested adult lamprey for subsistence, religious, and medicinal purposes for many generations.[11] Although historical population sizes of lamprey are unknown, adult Pacific lampreys were an important tribal subsistence food.

Pacific lamprey were likely widely distributed throughout the Columbia River Basin, but counts at dams on the Columbia and Snake rivers indicate a severe decline in Pacific lamprey abundance. Annual counts at Bonneville Dam prior to 1970 often exceeded 250,000 fish. Counts at most dams have decreased dramatically in recent years.

Declining trends in abundance suggest that productivity may be limited for all populations. Passage obstructions, degraded habitat, and impaired water quality are all factors that are decreasing the rate of population growth. Predation by exotic predators (e.g., smallmouth bass) may also decrease lamprey productivity.[12]

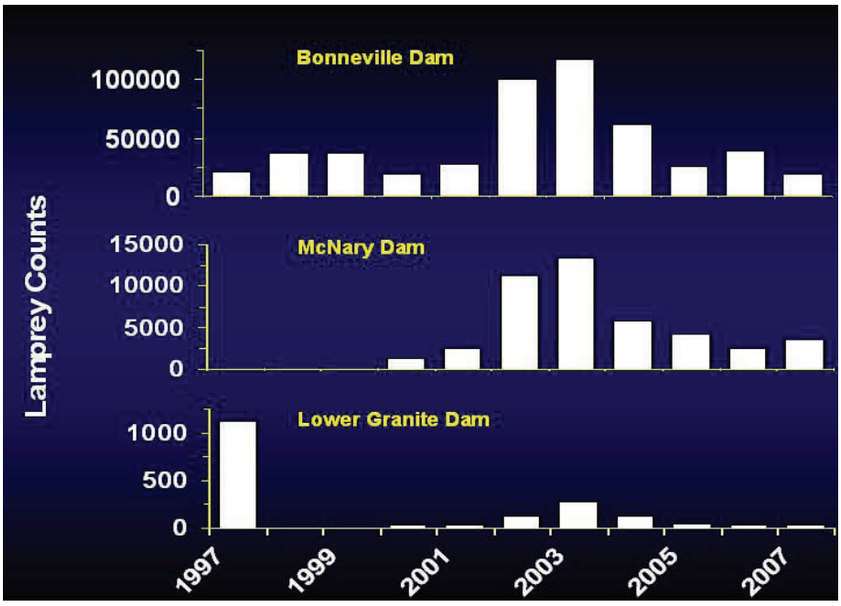
Recent efforts have begun to address some of these limiting factors and threats, especially passage of adults at mainstem dams. Structures designed to improve the collection and passage of lamprey have been installed at Bonneville Dam, with installations at other dams planned for future years. Gratings and screens will be replaced to enhance passage. Sharp corners in and around fish ladders are being rounded to further improve adult passage. Velocity-reducing structures are being evaluated. Adult and juvenile lamprey passage needs will be evaluated at each dam.

Trends of Adult Pacific Lamprey at Columbia River Hydroelectric Facilities (2007)



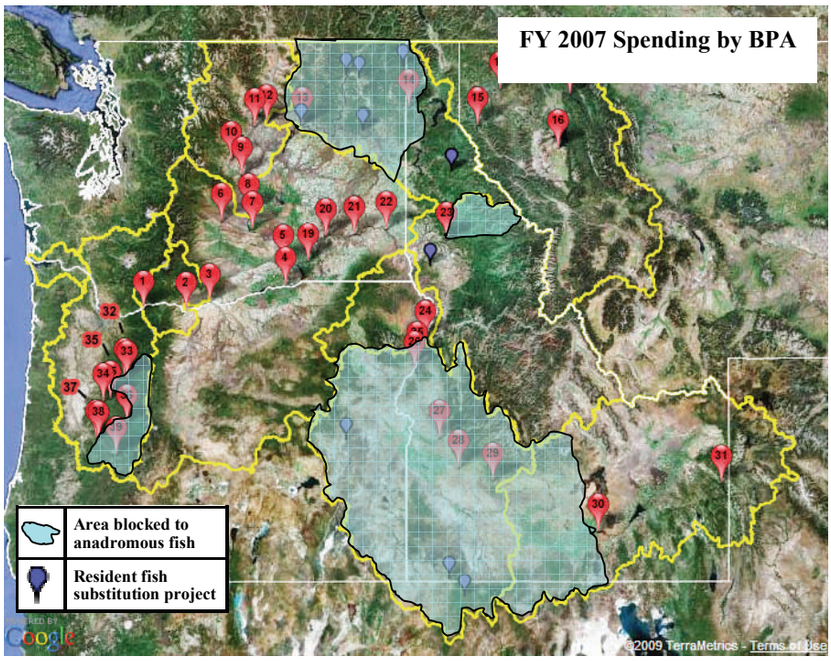
Genetic population structure for Pacific lamprey is currently unknown in the Columbia River Basin, thus, specific populations or management groups cannot be displayed at this time. In addition, little is known about adult returns to specific waters.

Counts of Adult Pacific Lamprey at Bonneville (1), McNary (4), and Lower Granite (22) Dams[4]



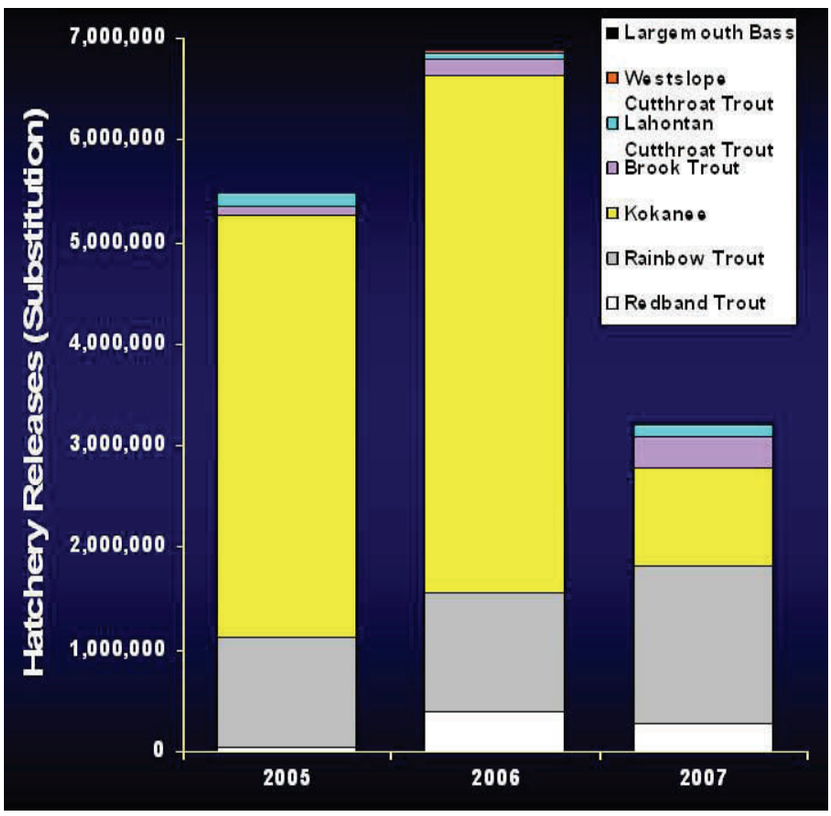
Dam counts are used to index the relative abundance of Pacific lamprey, but these counts are of limited use in estimating actual abundance. Many adult lamprey pass at night when counting is not conducted. In addition, numerous routes are available for lamprey to pass dams without being detected. Research to develop more accurate counting methods is underway.

Resident Fish Substitution for Lost Anadromous Fish Opportunities



Please see the inside of the back cover for a complete list of names that correspond with the hydro-facility numbers.

Columbia River Basin Resident Fish Substitution Releases[13-31]



Northwest Power and Conservation Council's Resident Fish Substitution Policy[32]

Resident fish populations throughout the Columbia River Basin have been affected by the construction and operation of the hydropower system. Dams altered natural river flows, inundated spawning and rearing areas, and blocked natural migration patterns. Historically, more than two million salmon and steelhead annually spawned in the upper Columbia River and Snake River basins

Compensation for the annual losses of anadromous fish in these blocked areas is achieved through the release of hatchery-produced fish such as kokanee, rainbow trout, brook trout, Lahontan cutthroat trout, and largemouth bass as well as habitat projects to benefit resident fish populations. These efforts are essential for providing tribal subsistence and public recreation fisheries, opportunities that were lost due the lack of passage for anadromous fish to reach historic spawning areas.

The Northwest Power and Conservation Council "finds that mitigation in areas blocked to salmon and steelhead by the development and operation of the hydropower system is appropriate, and flexibility in the approach utilized for mitigation is necessary. The Northwest Power and Conservation Council's resident fish substitution policy authorizes "restoring native and resident fish species to near historic ranges where habitat can be feasibly restored." The policy also calls for taking actions to reintroduce anadromous fish into areas blocked by dams such as Chief Joseph and Grand Coulee dams, where feasible, and for administering and increasing opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species. This includes intensive fisheries within closed or isolated systems and recreational fisheries such as those in northeastern Washington and northwestern Montana.

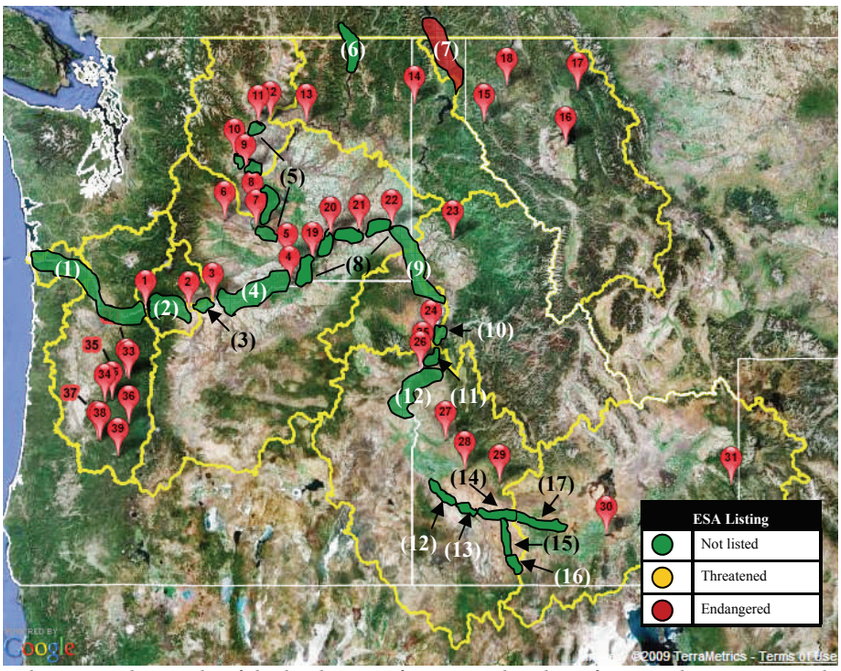
Columbia River Basin

Columbia River Basin White Sturgeon Background

Since 1983, 13 Bonneville Power Administration–funded projects have been implemented throughout the Columbia River Basin to address the research needs. Some conclusions from these efforts included: 1.) dams limit movements of white sturgeon and have functionally isolated populations, 2.) the status and dynamics of each population are unique, (3) productivity in reservoirs is less than in the unimpounded area downstream from Bonneville Dam, 4.) recruitment and subsequent population size are limited by the effects of river discharge on spawning habitat, which is restricted to high-velocity areas immediately downstream from dams, and 5.) reservoirs provide large areas of suitable habitat for juvenile and adult white sturgeon, but compensatory population responses may reduce productivity if carrying capacity is reached.

Current white sturgeon population trends and sizes throughout the Columbia River Basin can be characterized as stable at a relatively high population size in the lower Columbia River, stable or variable at low to moderate population sizes in middle reaches, and declining at extremely low to negligible population sizes in upper reaches of the basin. The Kootenai River white sturgeon population was federally listed as endangered in 1994**.** Although recent research has provided insight into Columbia River Basin white sturgeon ecology and population status, many uncertainties remain that limit the effectiveness of recovery and management efforts.

Status of White Sturgeon in the Columbia River Basin



Please see the inside of the back cover for a complete list of names that correspond with the hydro-facility numbers.

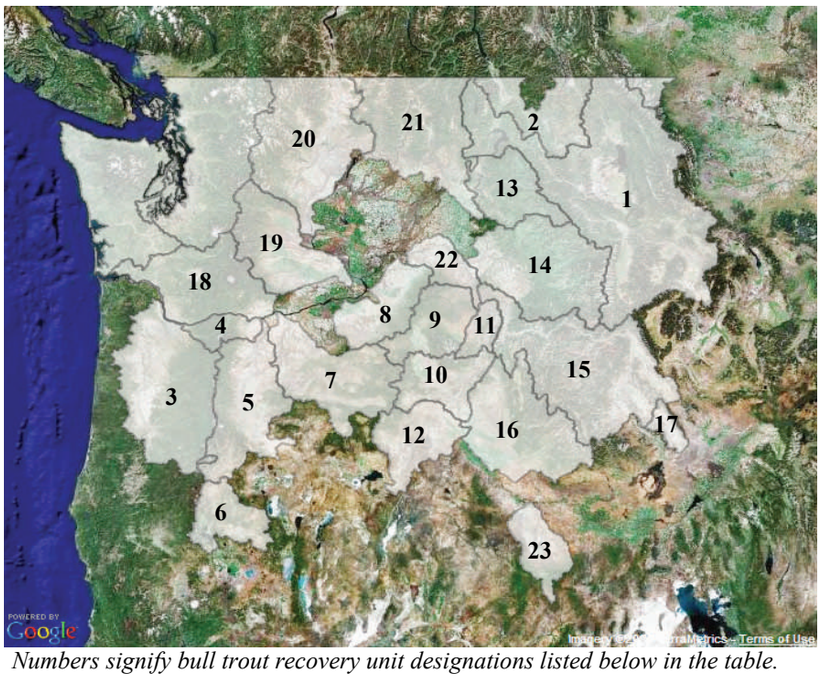
Population/Management Unit	ESA Listing Status	Abundance[33-38]
Lower Columbia (below Bonneville Dam) (1)	None	Unknown
Bonneville (2)	None	243 (adult-fish>72 inches, 2006)
The Dalles (3)	None	831(adult-fish>72 inches, 2008)
John Day (4)	None	841(adult-fish>72 inches, 2007)
Mid-Columbia (includes Priest Rapids, Wanapum, and Rocky Reach reservoirs) (5)	None	Data last collected in 2002
Upper Columbia (Transboundary) (6)	None	2,037 (fish > 27.5 inches in U.S. reach, 2005) 1,151 (fish > 13 inches in B.C. reach, 2004)
Kootenai (7)	Endangered	
Lower Snake (includes McNary/Hanford Reach, Ice Harbor, Lower Monumnetal, and Little Goose reservoirs) (8)	None	Data last collected in 1997
Mid-Snake (9)	None	Unknown
Hells Canyon (10)	None	Data last collected in 2002
Oxbow (11)	None	Data last collected in 1998
Brownlee (12)	None	Data last collected in 1998
Swan Falls (13)	None	Data last collected in 1997
C.J. Strike (14)	None	566 (2007)
Bliss (15)	None	3,100 (2005)
Lower Salmon Falls (16)	None	Data last collected in 1993
Upper Salmon Falls (17)	None	Data last collected in 1981
Shoshone Falls (18)	None	Data last collected in 2001

*Parenthetical numbers correspond to the parenthetical numbers in the above map.

High Increasing (↑)

Resident Fish

Bull Trout Recovery Units in the Columbia River Basin

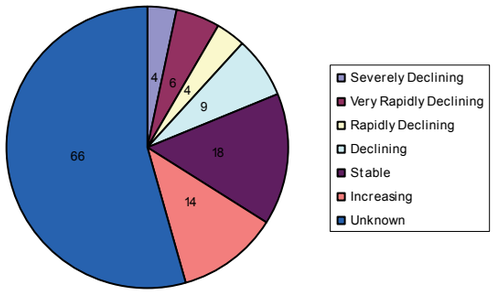


Numbers signify bull trout recovery unit designations listed below in the table.

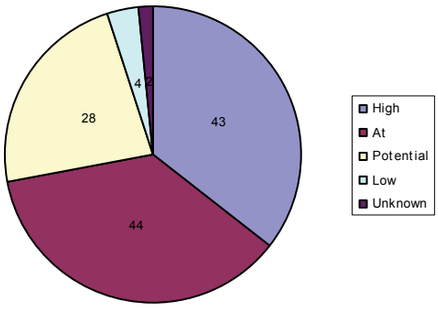
Recovery Unit (Location on Map)	Population Abundance[39]
Clark Fork River (1)	11,251-41,600
Kootenai River (2)	10,501-102,050
Willamette River (3)	50-250
Hood River (4)	25-125
Lower Deschutes River (5)	1,000-2,500
Odell Lake (6)	1-50
John Day River (7)	Unknown (Middle and North Fork), 1-50 (Upper) Mainstem
Umatilla-Walla Walla River (8)	1,100-3,000
Grande Ronde River (9)	300-1,250
Imnaha-Snake River (10)	Unknown (Granite and Sheep), 250-1,000 (Imnaha)
Hells Canyon Complex (11)	500-2,000
Malheur River (12)	50-250
Coeur d'Alene Lake Basin (13)	50-250
Clearwater River (14)	Unknown (Middle-Lower Clearwater and Selway), 1,302-3,850 (Fish Lake, Lochsa, North Fork Clearwater, South Fork Clearwater
Salmon River (15)	Unknown (Middle Fork Salmon, Middle Salmon/Chamberlain, Middle Salmon/Panther, Opal, Pashimeroi, South Fork Salmon, Upper Salmon), 350-1,500 (Lake Creek, Lemhi, Little Lower Salmon)
Southwest Idaho (16)	Unknown (Arrowrock, Middle Fork Payette, Upper South Fork Payette, Weiser), 752-3,100 (Anderson Ranch, Deadwood, Squaw Creek)
Little Lost River (17)	Unknown
Lower Columbia River (18)	Unknown (Klickitat), 1,000-2,500 (Lewis)
Middle Columbia River (19)	250-1,000
Upper Columbia River (20)	350-1,500
Northeast Washington (21)	1-50
Snake River Washington (22)	1,050-2,750
Jarbidge River (23)	50-250

Parenthetical numbers correspond to the numbers in the above map.

Bull Trout Core Area Trends[39]



Bull Trout Core Area Risks[39]



Bull Trout Population Terminology[40]

Despite being widespread throughout their historical range, bull trout have declined in overall distribution and abundance. Population declines can be attributed to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices and the introduction of non-native fish species. In 1998, the USFWS listed Columbia River populations of bull trout as threatened. The USFWS identified 141 subpoplations (i.e., isolated groups thought to lack two-way exchange of individuals) in the Columbia Basin distinct population segment and 1 subpopulation in the Jarbidge River population segment. The following are terms for population units that will be used throughout this document in relation to bull trout:

Local Populations — Populations that are isolated reproductively.

Core Areas — Groups (local populations that are partially isolated, but have some degree of gene flow among them) that function as metapopulations. Within this metapopulation, local populations are expected to function as one demographic unit.

Recovery Unit — Groups that share genetic characteristics and management jurisdictions. Can be one local population or multiple core areas. Most recovery units are consist of multiple core areas.

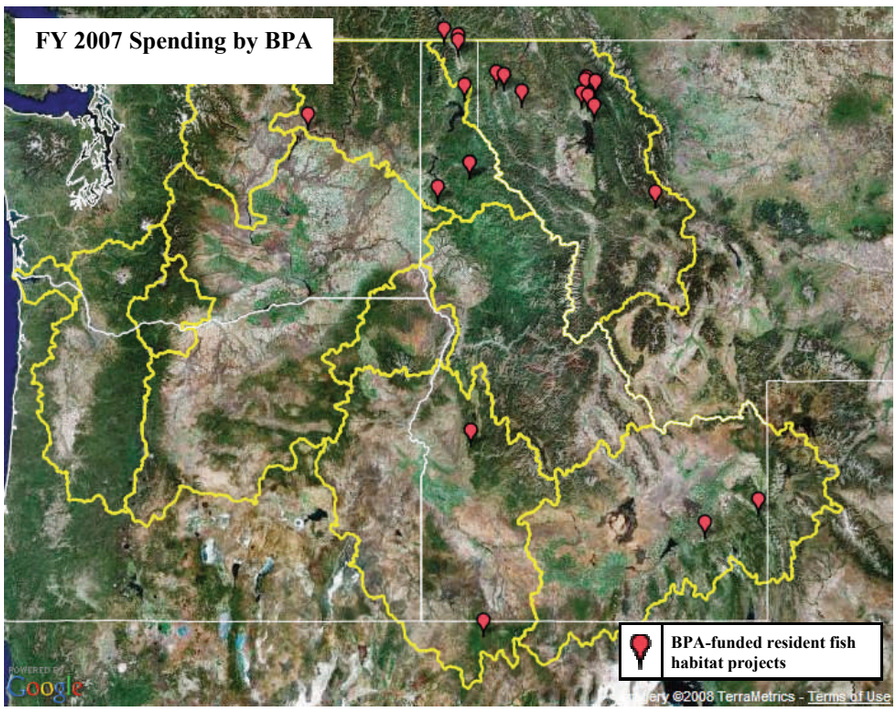
Columbia River Basin

Resident Fish Habitat Project Background

During FY 2008, the **BPA funded** ### projects to improve wetland, in-stream, riparian, and riparian-upland habitats zones that are important for the conservation and restoration of resident fish. General descriptions of the project-types and the habitat zones addressed through the implementation of the associated actions are listed below. A description of the actions are included in Appendix A.

Accomplishments can be measured several ways. A project for which the focus is to increase instream habitat complexity may have the following objectives: 1.) install a specific number of structures and 2.) treat a specified number of stream miles. Similarly, installation of wells, piplines, sprinkler, etc. can provide multiple benefits (e.g., primary stream miles improved, total stream miles improved, cfs of water conserved, and acre-feet of water conserved).

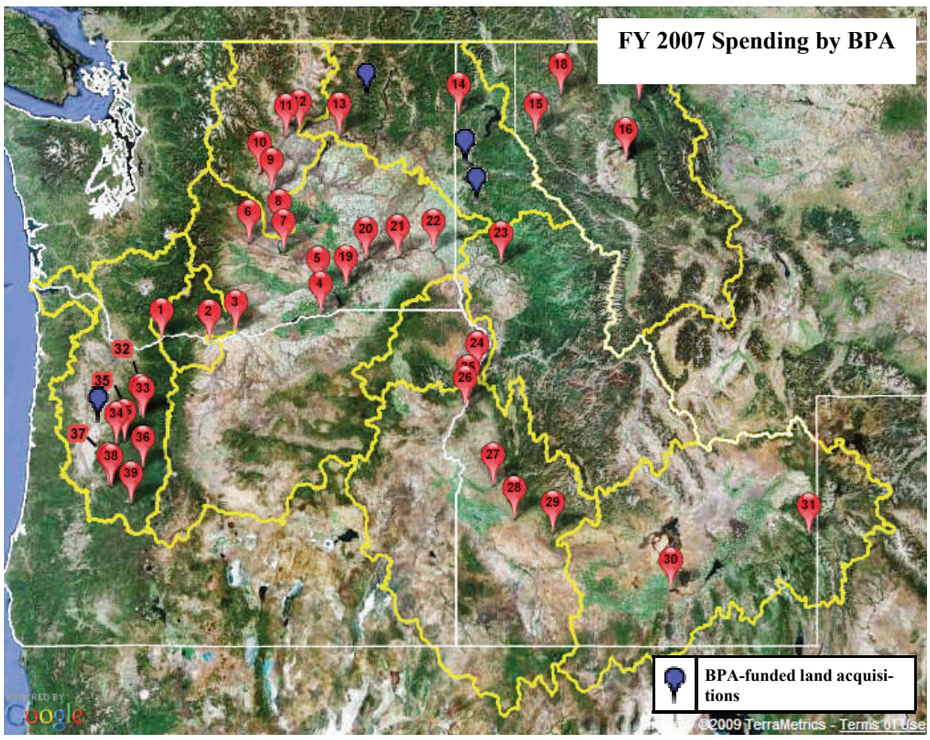
FY 2008 BPA –Funded Resident Fish Habitat Projects



BPA FY 2008 Resident Fish Habitat Project Accomplishments[8]

Habitat Zone	Project-type	Planned Value	FY 2008 Accomplishment (Actual Value)
Wetland	Realign, connect, and/or create channel	15.5 acres	13.5 acres created/treated
Instream	Increase instream habitat complexity	357 structures	326 structures installed
	Removal/install diversion, remove/breach dam, install fish passage structure	45 miles habitat	0 habitat miles accessed
	Install well, install pipeline, install sprinkler, acquire water instream	18 primary miles	4.5 miles of primary stream reach improved
	Install well, install pipeline, install sprinkler, acquire water instream	21 total miles stream	7.4 miles of total stream reach improvement
	Realign connect and/or create channel	2.3 stream miles	2.1 stream miles before treatment
	Realign connect and/or create channel	0.9 stream	0.9 stream miles after treatment
	Install fish screen	100 cfs flow	0 cfs from diversion flow
	Install pipeline	2 cfs of flow	2 cfs flow conserved
	Install pipeline	40 acre-feet water	40 acre-feet water conserved
	Acquire water instream	30.9 cfs of flow	2.3 cfs of flow protected
Riparian	Plant vegetation	199.87 miles	154.79 miles planted
	Purchase land, lease land	3.64 miles	3.14 miles protected
Riparian-Upland	Land purchase, land lease	1,196.3 acres	865 acres protected
	Conduct controlled burn, plant vegetation, practice no-till and conservation tillage, remove vegetation, upland erosion and sedimentation control, enhance floodplain, create, restore, and enhance wetland	10,615.1 acres	9,470 acres treated
	Install fence	538.3 miles	536.84 miles of fence installed
	Decommission roads, relocate roads, improve roads	86.95 miles	48.21 road miles treated

BPA FY 2008 Funded Land Acquisitions



Please see the inside of the back cover for a complete list of names that correspond with the hydro-facility numbers.

Land Acquisition Background

During FY 2008, the BPA funded five acquisitions (includes fee title purchases and conservation easements) throughout the Columbia River Basin. These acquisitions led to the protection of 687 acres. In addition, an estimated (minimum) 651 habitat units, for wildlife crediting purposes, were identified as a result of these purchases.

For a complete list of parcels purchased in previous fiscal years as well as a map showing their location in the Columbia River Basin, please visit www.cbfwa.org.

Wildlife Habitat Losses by Hydroelectric Facilities in the Columbia River Basin[8]

Dam	Habitat Units Lost Due to Construction	Habitat Units Credited in 2008	Total Habitat Units Credited
Bonneville (OR) (1)	6,159	0	590
Bonneville (WA) (1)	6,159	0	871
The Dalles (OR) (2)	1,165	0	0
The Dalles (WA) (2)	1,165	0	329
John Day (OR) (3)	18,280	0	14,057
John Day (WA) (3)	18,280	0	11,019
McNary (OR) (4)	4,710	0	8,406
McNary (WA) (4)	18,834	0	32,810
Chief Joseph (12)	8,833		567
Grand Coulee (13)	111,785		107,842
Albeni Falls (14)	28,658		9,872
Black Canyon (27)	2,170	0	57
Anderson Ranch (29)	9,619	0	1,063
Minidoka (30)	10,503	0	1,744
Palisades (31)	37,070	0	16,093
Big Cliff (32)	413		32
Detroit (33)	11,298		0
Foster (34)	3,544		96
Cougar (36)	11,124		511
Dexter (37)	6,648		196
Lookout Point (38)	25,454		1,296
Hills Creek (39)	19,489		1,565

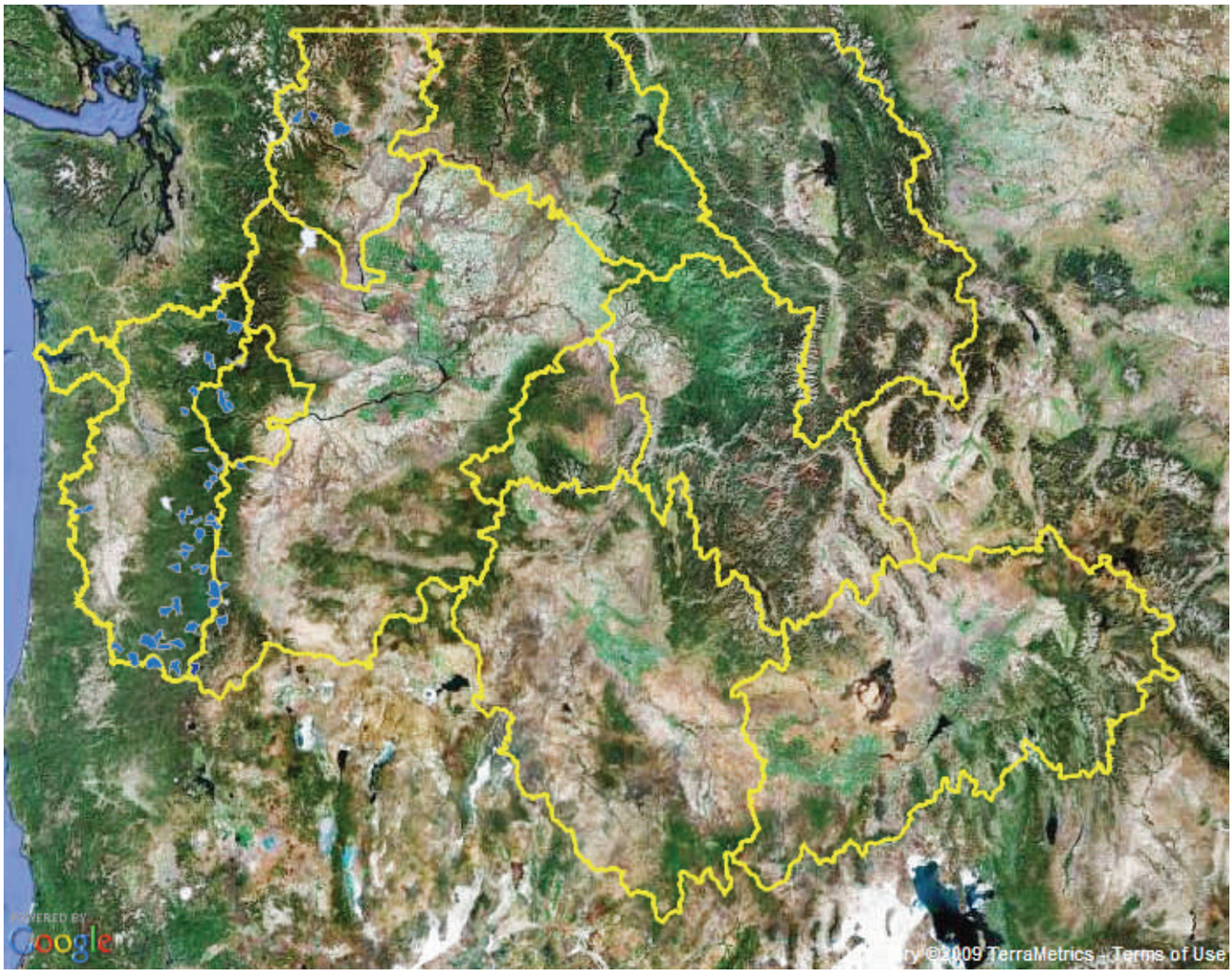
The Bonneville Power Administration (BPA) is responsible for mitigating the impacts to wildlife caused by the development of the dams of the Federal Columbia River Power System. These impacts have been quantified by the Northwest Power and Conservation Council through the completion of "impact assessments" for each dam. Through the Habitat Evaluation Procedure (HEP), impact assessments, which are also referred to as loss assessments, identify the "habitat units" (HU) that were lost due to construction and inundation behind the dams.

Wildlife mitigation activities include land acquisition and management, habitat restoration and improvement, weed control, fencing, and other wildlife conservation efforts. The HUs associated with the mitigation activity are measured or estimated and then counted against the impact assessment for the dam being mitigated. For each wildlife property acquisition, a baseline HEP survey is completed after the acquisition to determine the number of HUs associated with the acquisition.

Dams where BPA's wildlife mitigation obligations have been settled, such as Libby, Hungry Horse, and Dworshak, are not listed in the table.

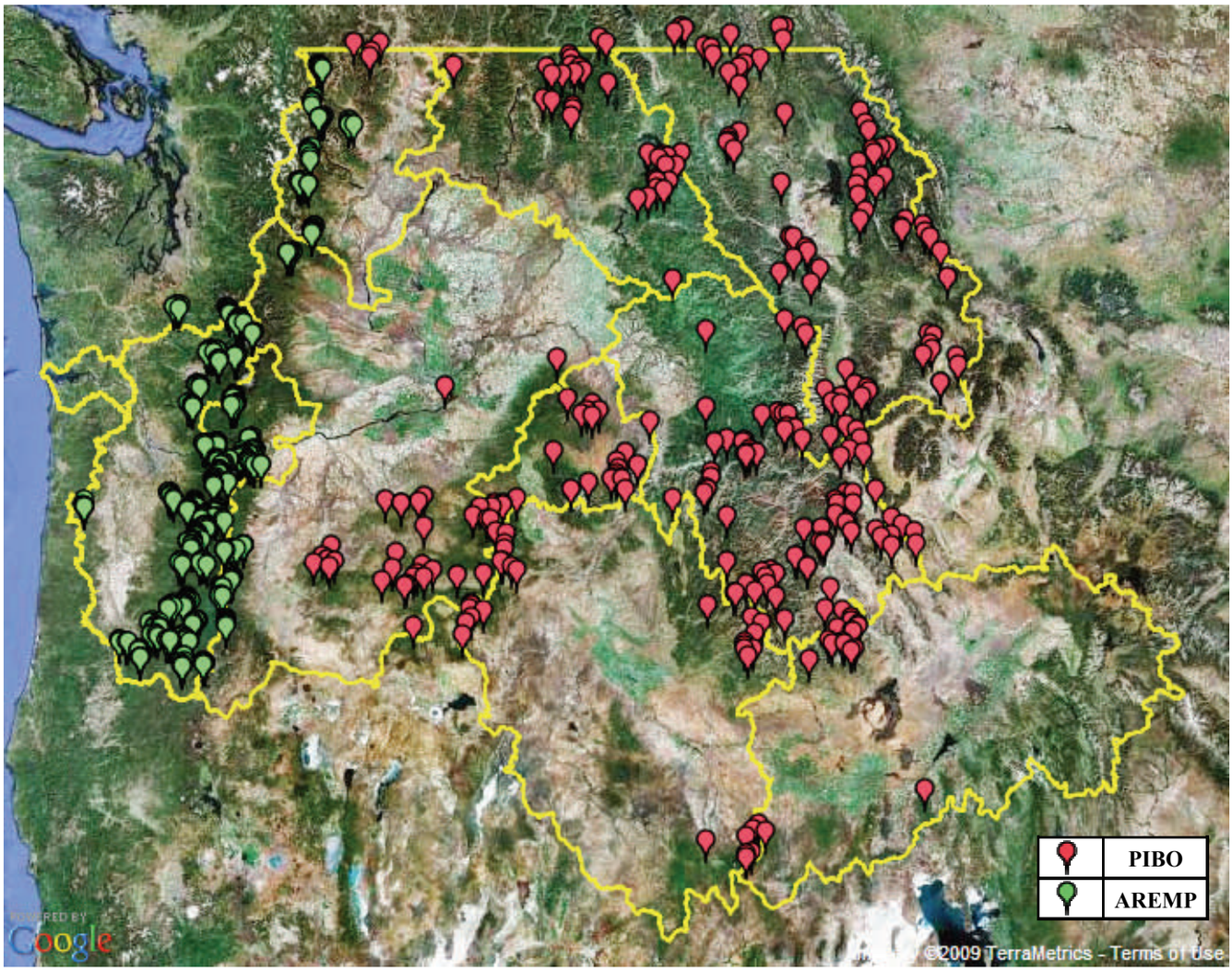
Columbia River Basin

Watershed Conditions for National Forest and Bureau of Land Management Lands in the Columbia River Basin[52]



Watershed condition is based upon work completed by the USDA Forest Service (FS) and USDI Bureau of Land Management (BLM) Aquatic and Riparian Effectiveness Monitoring Program (AREMP). AREMP personnel evaluate the status and trend of watershed condition on FS, BLM, and National Park Service administered lands within the range of the Northern Spotted Owl. Watershed condition scores are determined for all watersheds within National Forest and BLM boundaries that contain a minimum of 25 percent federal ownership. AREMP applies a decision support model to evaluate the premise that watersheds are in good condition. Watersheds are judged to be in good condition where the physical processes, such as wood and sediment delivery, and habitat attributes are adequate to maintain or improve the diversity and abundance of native or desired non-native aquatic species (Gallo et al 2005). A score of 10 indicates full support for the premise that a watershed is in good condition and a score of 0 indicates no support for the premise.

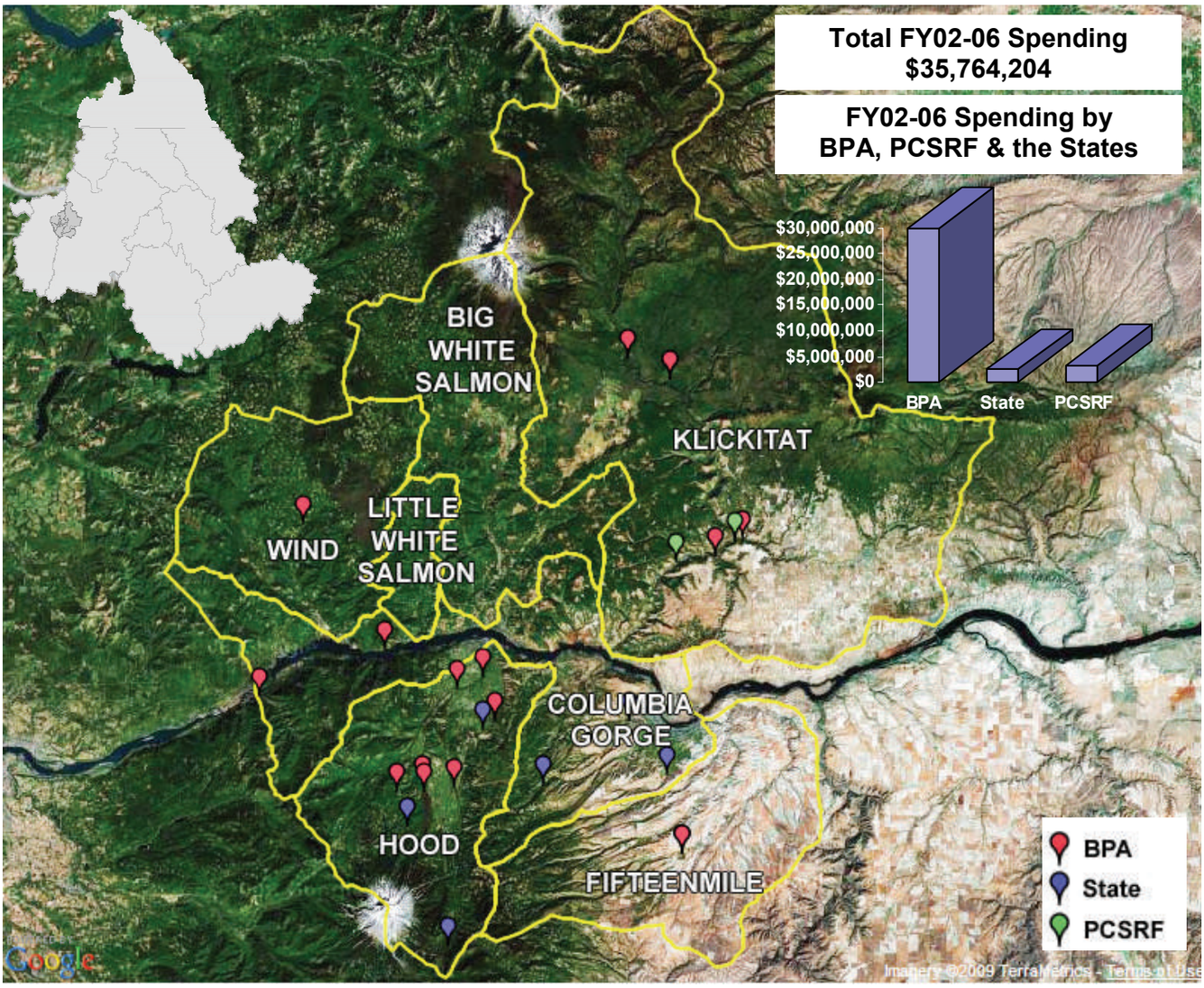
Stream Inventory Sites on National Forest and Bureau of Land Management Lands in the Columbia River Basin[60]



Green Symbol—Indicates locations where stream information is collected by the USDA Forest Service and USDI Bureau and Land Management through the Aquatic and Riparian Effectiveness Monitoring Program (AREMP).

Red Symbol—Indicates locations where stream inventory information is collected by the USDA Forest Service and USDI Bureau and land management through the PacFish/InFish Biological Opinion Monitoring Program (PIBO).

Columbia Gorge



The Columbia Gorge Province is bounded by Bonneville Lock and Dam at river mile 145 and The Dalles Dam at river mile 191 on the Columbia River, and encompasses an area of 3,293 square miles. Subbasins in the Columbia Gorge Province include the Big White Salmon, Columbia Gorge Mainstem (i.e., Bonneville Reservoir), Hood, Fifteenmile, Klickitat, Little White Salmon, and Wind. Chinook (spring and fall), chum, steelhead (summer and winter), and bull trout populations throughout the province are listed under the federal Endangered Species Act. This province is characterized by a complex geologic structure and vegetation pattern. Fed by glaciers in the Oregon and Washington Cascades, the rivers in the province flow from high elevation coniferous forests and transition through fruit orchards and other irrigated agriculture in the lowlands before entering the Columbia River. Forestry, ranching, agriculture, orchards, and tourism are significant factors in the economy of communities in the province.

Land Ownership
Federal……...27%
Private…….56%
Tribal……...17%

BPA FY 2008 Habitat Project Accomplishments in the Columbia Gorge Province[8]			
Habitat Zone	**Project-type**	**Planned Value**	**FY 2008 Performance Indicator (Actual Value)**
Instream	Increase instream habitat complexity	1 stream miles	0 stream miles treated
	Increase instream habitat complexity	64 structures	54 structures installed
	Install well, install pipeline, install sprinkler, acquire water instream	2.3 cfs water	2.3 cfs of water saved
	Install well, install pipeline, install sprinkler, acquire water instream	3.8 cfs water	3.8 cfs of water protected
	Install well, install pipeline, install sprinkler, acquire water instream	1,810 acre-feet	1,810 acre-feet water conserved
	Install well, install pipeline, install sprinkler, acquire water instream	906.1 acre-feet	906.1 acre-feet water protected
	Install well, install pipeline, install sprinkler, acquire water instream	63.3 miles	63.3 miles of primary stream reach improved
	Install well, install pipeline, install sprinkler, acquire water instream	67.6 miles	67.6 miles of total stream reach improvement
	Install fish passage structure	2.2. structures	2.2 structures installed
Riparian	Plant vegetation	2.25 miles	.5 miles planted
	Purchase land, lease land	1 miles	1.35 miles protected
Riparian-Upland	Land purchase, land lease	20 acres	14 acres protected
	Plant/remove vegetation	92.6 acres	65.3 acres treated
	Install fence	1.55 mile	2.15 miles of fence installed

Habitat Improvement Project — Fifteenmile Subbasin[41]

Before

Fifteenmile Creek supports the easternmost run of wild winter steelhead in the Columbia River Basin, a population that was federally-listed as threatened under the Endangered Species Act in 1999. The population, which is part of the Mid-Columbia Ecologically Significant Unit, has never been supplemented with hatchery-produced winter steelhead.

Working collaboratively, the Oregon Department of Fish and Wildlife, Confederated tribes of the warm Springs Reservation of Oregon, and the U.S. Forest Service (Mt Hood National Forest) identified the following six factors as affecting the quantitiy/quality of summer rearing habitat for winter steelhead in the Fifteenmile Creek Basin: 1) passage barriers, 2) lethal summer temperatures, 3) low summer flows, 4) lack of habitat diversity, 5) lack of channel stability, and 6) sediment loading. To address these limiting factors, biologists recommended that 80-90 mile of stream should be treated using: 1) structural improvements for adult and juvenile passage, 2) riparian fencing, 3) structural channel stabilization, and 4) structural rearing habitat improvements.

After

From 1986 — present, implementation of the **Fifteenmile Creek Habitat Restoration Project** has led to completion of 5 fishways, 203 leased and co-op miles of riparian corridor fence resulting in the protection of over 109 miles of stream, 30 off-site water developments, installation of 924 structures producing 20.6 miles with structure, and the addition of 90 irrigation screens.

These photos illustrate results of riparian corridor fencing implemented through the Fifteenmile Creek Habitat Restoration Projected.

Columbia Gorge

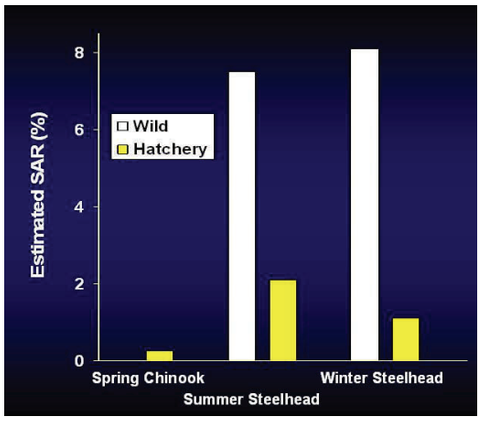
Focal Species[a]

Focal Species	Big White Salmon	Columbia Gorge	Fifteen-mile	Hood	Klickitat	Little White Salmon	Wind
Bull Trout							
Chinook-Spring							
Chinook-Fall							
Chum							
Coastal Cutthroat Trout							
Coho							
Pacific Lamprey							
Rainbow Trout							
Steelhead – Winter							
Steelhead—Summer							
White Sturgeon							

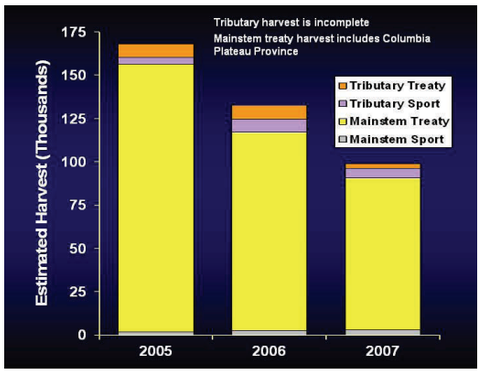
Not a focal species | Not listed | Species of Concern[b] | Threatened[c]

[a]Focal species were identified by subbasin planners during the Northwest Power and Conservation Council's subbasin planning process. Since the completion of subbasin planning, the list of focal species has been amended through the Fish and Wildlife Program Amendment process. This list represents the most current suite of focal species.
[b] USFWS Status
[c] ESA Status

Smolt to Adult Return (SAR) for Salmon and Steelhead Originating from the Columbia Gorge Province (Hood River)[49]



Columbia Gorge Province Salmon and Steelhead Harvest[5,6]



2007 Hatchery Releases and Returns to Hatcheries in the Columbia Gorge Province[42-48]

Species	Release Goal/ Released	Return Goal/Return to Collection Facility
Spring Chinook	3,975,000/	/
Fall Chinook (Upriver River Bright)	8,500,000/	/
Fall Chinook (Tule)	15,100,000/	/
Summer Steelhead	30,000/	/
Winter Steelhead	50,000/	/
TOTAL	27,655,000/	/

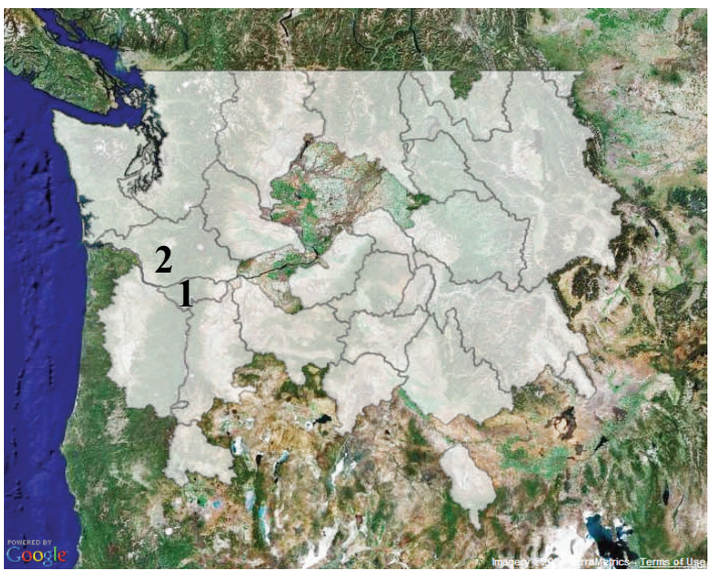
The release goals include values for national fish hatcheries that ensure the U.S. Fish and Wildlife Service meets mandated treaty and trust responsibilities. These release goals reflect values identified in the Columbia River Fish Management Plan developed as a result of the *U.S. v Oregon* agreement.

Species/ Race	Mainstem Harvest 2007		Tributary Harvest 2007	
	Sport	Treaty	Sport	Treaty
Spring Chinook	92	6,144	3,670	2,745
Summer Chinook	0	5,375	0	0
Fall Chinook	659	45,356	390	50
Coho	1,141	8,035	104	Unknown
Winter Steelhead	6	558	499	0
Summer Steelhead	871	1,362	935	Unknown

Status and Recovery Standards for ESA-Listed Salmon and Steelhead in the Columbia Gorge Province[50,51]

ESU or DPS	Major Population Group (MPG)	Populations and Viability			Number of Natural Spawners	
		No. of Populations	No. Meeting Viability Standards	Minimum No. Needed to Meet Standards	Minimum if MPG Viability Standards Met	Minimum if all Populations Meet Standards
Lower Columbia Chinook	Spring Run Gorge	2	0	1	1,729	Unknown
	Fall Run Gorge	4	0	1	2,387	>4,172
Lower Columbia Coho	Gorge	3	0	Unknown	Unknown	9,505
Columbia River Chum	Gorge	2	1	1	>2,000	Unknown
Lower Columbia Steelhead	Gorge Winter	3	0	2	3,059	3,644
	Gorge Summer	2	1	2	2,988	2,988
Mid Columbia Steelhead	Cascade Eastern Slope	6	2	4	4,000-4,500	5,000

Bull Trout Status in the Columbia Gorge Province[39]



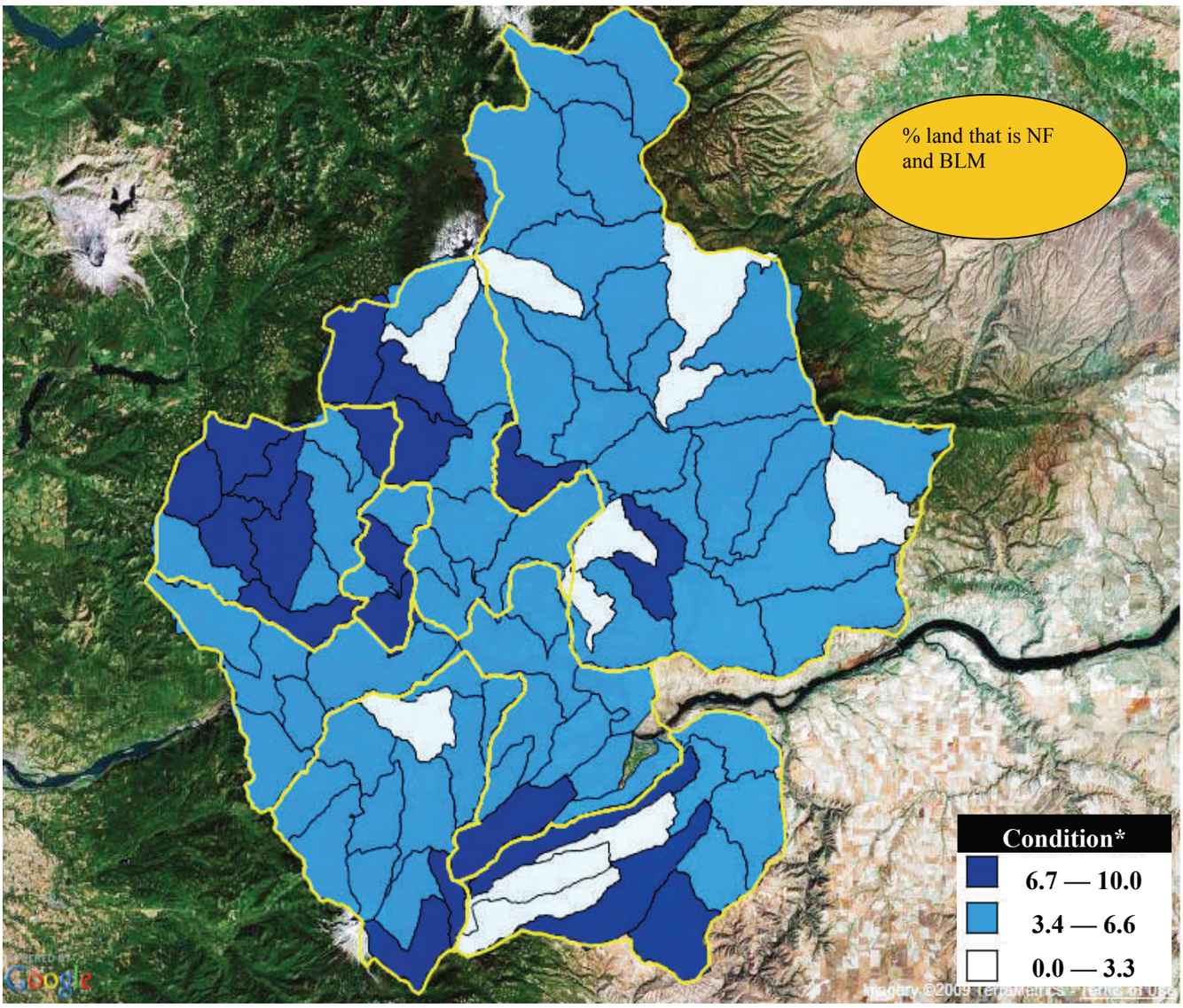
Recovery Unit	Number of cores	Abundance	Trend	Threat	Risk
Hood River (1)	1	50-250	Unknown	Moderate (imminent)	High
Lower Columbia River (2) Klickitat River = Gorge Core	2 (one in Gorge)	Unknown for Gorge core	Unknown for Gorge core	Moderate (imminent) for Gorge Core	At

Wildlife Habitat Losses by Hydroelectric Facility in the Columbia Gorge Province[8]

Dam	HU Lost	HU Credited in 2008	HU Credited (Gained)
Bonneville (OR)	6,159		1,335
Bonneville (WA)	6,159		1,335
The Dalles (OR)	1,165		289
The Dalles (WA)	1,165		289

Columbia Gorge

Watershed Conditions for National Forest and Bureau of Land Management Lands in the Columbia Gorge Province[52]



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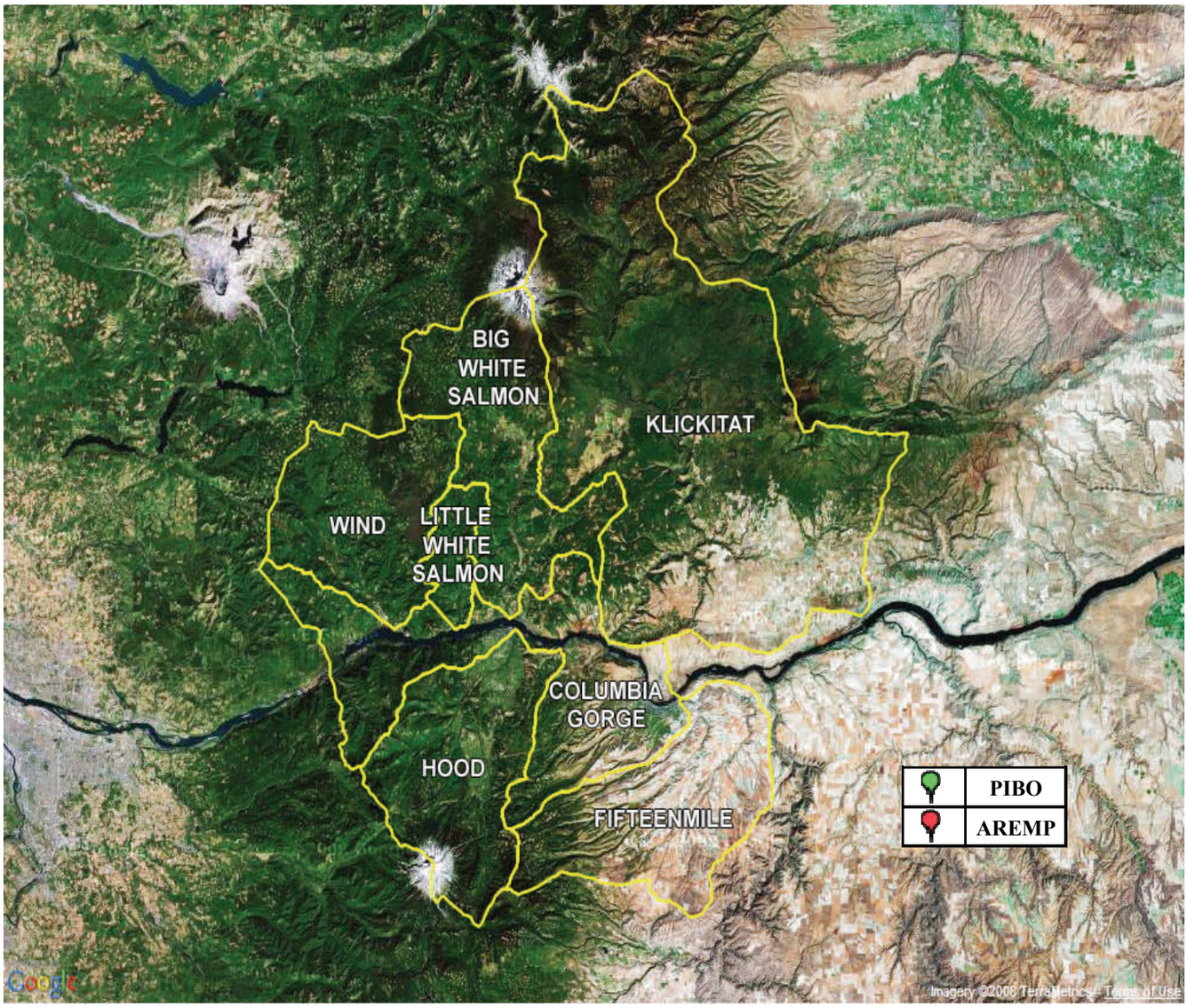
Stream Inventory Sites on National Forest and Bureau of Land Management Lands in the Columbia Gorge Province[53,54]



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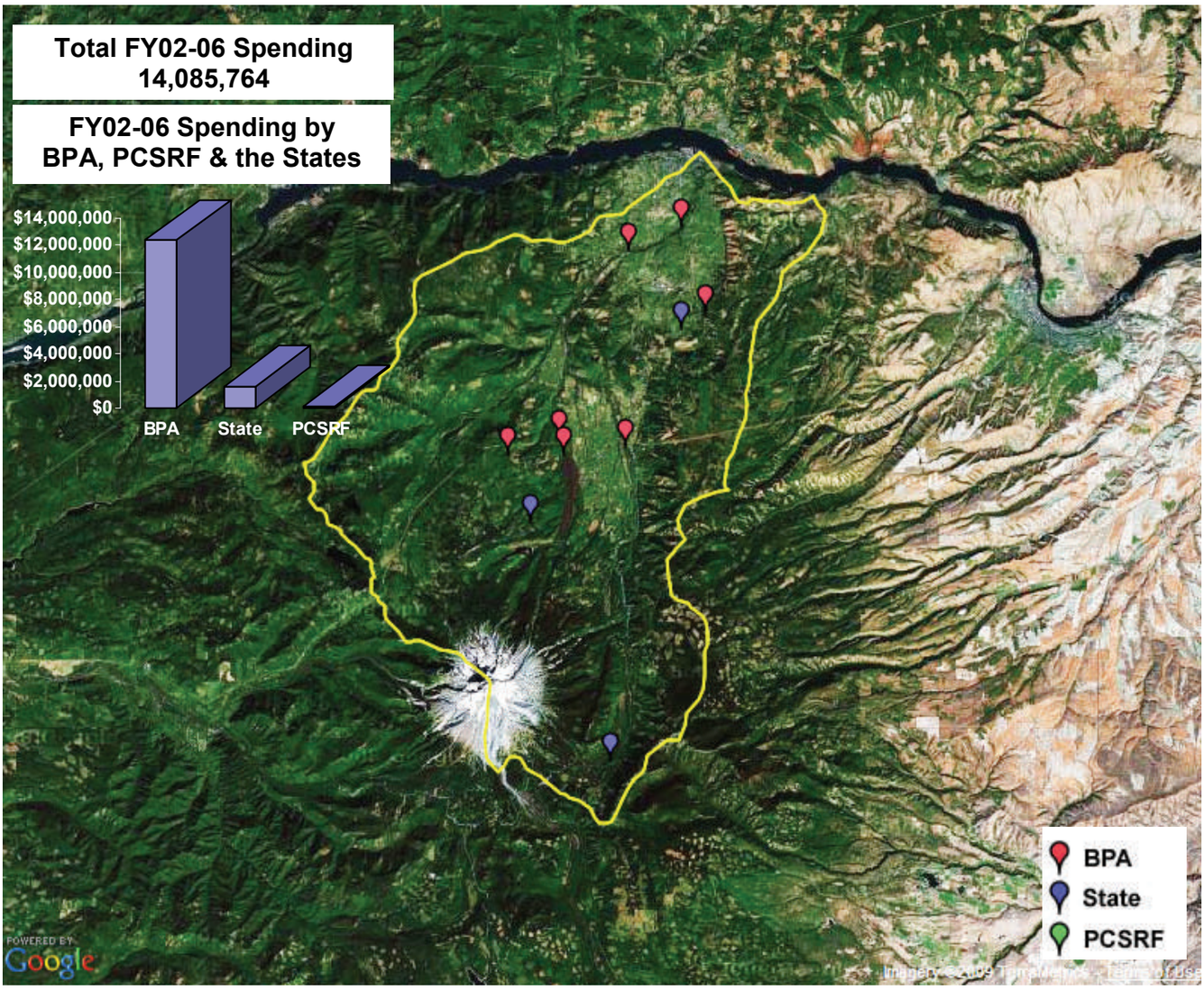
Columbia Gorge



In the Hood River Subbasin, steelhead (both summer and winter runs), Chinook salmon (both spring and fall runs), Pacific lamprey, bull trout, and coastal cutthroat trout (both resident and sea-run forms) have been identified as focal species. Steelhead, Chinook salmon and bull trout are also listed as threatened under the federal Endangered Species Act. Steelhead in the subbasin are part of the Lower Columbia River Distinct Population Segment (DPS), Chinook salmon are part of the Lower Columbia River Evolutionarily Significant Unit (ESU), and bull trout are within the Hood River Recovery Unit. Recovery criteria for a steelhead DPS or a salmon ESU do not necessarily require that all populations achieve viability prior to de-listing; however, the draft recovery plan for Lower Columbia River steelhead and salmon has specified that all Hood River populations must achieve viability. Recovery criteria for bull trout vary among recovery units. Very little is known about the status of Pacific lamprey and cutthroat trout in the subbasin.

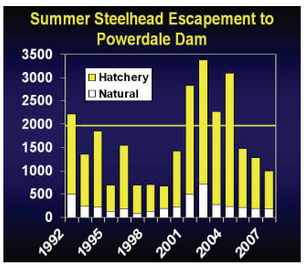
Subbasin: Hood

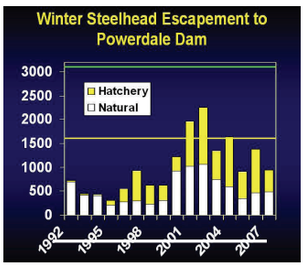
Key Factors Limiting Hood River Subbasin Focal Species[55,56,57]									
Factors for Decline/Limiting Factors/Threats		**Species/Race, and Life-Stage Most Affected**							
		Spring Chinook	**Fall Chinook**	**Coho**	**Summer Steelhead**	**Winter Steelhead**	**Pacific Lamprey**	**Bull Trout**	**Cutthroat Trout**
Habitat	Estuary and Nearshore Marine Habitat Degradation	Fingerling through yearling	Fry through subyearling	Yearling	Fingerling through yearling	Fingerling through yearling			
	Floodplain Connectivity and Function		Fry through subyearling	Yearling	Fry, summer parr, winter parr	Fry, summer parr, winter parr			
	Channel Structure and Complexity		Fry	Yearling	Fry, summer parr, winter parr	Fry, summer parr, winter parr		Juveniles, adults	Juveniles, adults
	Riparian Areas and LWD Recruitment		Fry through subyearling	Yearling	Fry, summer parr, winter parr	Fry, summer parr, winter parr		Juveniles, adults	Juveniles, adults
	Stream Flow	Fingerling through yearling	Fry through subyearling	Yearling	Fry, summer parr, winter parr	Fry, summer parr, winter parr	Juveniles, adults	Juveniles, adults	Juveniles, adults
	Water Quality	Fingerling through yearling	Fry through subyearling	Yearling	Fry, summer parr, winter parr	Fry, summer parr, winter parr	All	All	All
	Fish Passage						Juveniles, adults	Juveniles, adults	Juveniles, adults
Hydro	Mainstem Columbia River Hydropower-related Adverse Effects	Fingerling through yearling	Fry through subyearling	Yearling	Fingerling through yearling	Fingerling through yearling			
Hatchery	Hatchery Fish Interbreeding With Wild Fish	Adult spawners	Adult spawners	Adult spawners					
Harvest	Mortality from Targeted Fishery	Adults	Adults	Adults					

BPA FY 2008 Habitat Project Accomplishments[8]			
Habitat Zone	**Project-type**	**Planned Value**	**FY 2008 Accomplishment (Actual Value)**
Instream	Install well, install pipeline, install sprinkler, acquire water instream	5.0 miles	5.0 miles of primary stream reach improved
	Install well, install pipeline, install sprinkler, acquire water instream	7.0 miles	7.0 miles of total stream reach improvement
	Install well, install pipeline, install sprinkler, acquire water instream	2.3 cfs	2.3 cfs of water conserved
	Install well, install pipeline, install sprinkler, acquire water instream	1,810.0 acre-feet	1,180.0 acre-feet of water conserved
	Increase instream habitat complexity	54 structures	54 structures installed

Columbia Gorge

Steelhead





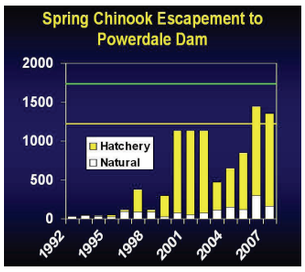
Summer

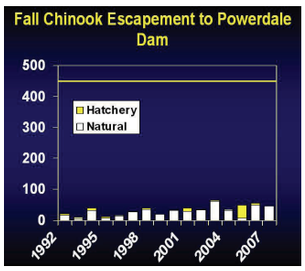
ESA Listing Status: Threatened
ESU: Lower Columbia
MPG: Gorge Summer
Population: Hood River
***Draft Recovery Plan Criteria*:** 1,988 natural adults[51]
Status: 176 natural and 816 hatchery adults (2007)[58]

Winter

ESA Listing Status: Threatened
ESU: Lower Columbia
MPG: Gorge Winter
Population: Hood River
***Draft Recovery Plan Criteria*:** 1,633 natural adults[51]
Draft Broad Sense Recovery Objective: 3,129 natural adults[51]
Status: 476 natural and 473 hatchery adults (2007)[58]

Chinook





Spring

ESA Listing Status: Threatened
ESU: Lower Columbia
MPG: Gorge Spring
Population: Hood River
Draft Recovery Plan Criteria: 1,229 natural adults[1]
Draft Broad Sense Recovery Objective: 1,784 natural adults[51]
Status: 158 natural and 1,200 hatchery adults and jacks (2007)[58]

Fall

ESA Listing Status: Threatened
ESU: Lower Columbia
MPG: Gorge Fall
Population: Hood River
Draft Recovery Plan Criteria: 454 natural adults[51]
Status: 45 natural and 0 hatchery adults and jacks (2007)[58]

Coho

ESA Listing Status: Threatened
ESU: Lower Columbia
MPG: Gorge
Population: Hood/Upper Gorge (OR)
Draft Recovery Plan Criteria: 5,149 natural adults[51]
Status: Unknown

Pacific Lamprey

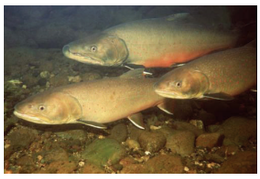
ESA Listing Status: Species of Concern
Biological Objective: None[57]
Status: Unknown

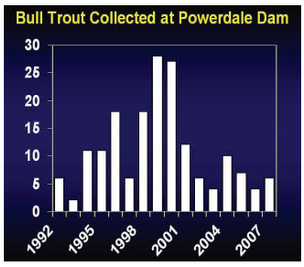
Recovery Status of ESA-Listed Steelhead and Salmon in the Hood River Subbasin[51]

Population	Abundance Threshold	Mean Abundance	Major Spawning Areas Occupied	Growth Rate	Recruits/Spawner	Current Viability
Steelhead						
Hood River Summer	1,988	195 (1993-2005)	Unknown	Unknown	Unknown	Very Low
Hood River Winter	1,633	395 (1992-2004)	Unknown	Unknown	1.30 (1992-2004)	Moderate
Chinook Salmon						
Hood River Spring	1,229	Unknown	Unknown	Unknown	Unknown	Very Low
Hood River Fall	1,240	36 (2000-2004)	Unknown	Unknown	Unknown	Very Low
Coho Salmon						
Hood River	5,149	12 (1992-2004)	Unknown	Unknown	Unknown	Very Low

Subbasin: Hood

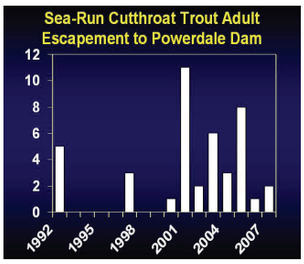
Bull Trout





ESA Listing Status: Threatened
Core Area: Hood River (Within Hood River Recovery Unit)
Local Populations: Clear Branch, Hood River
Draft Recovery Plan Criteria: ≥500 adults, distributed among three or more local populations[56]
Status: 6 adults passed Powerdale Dam (2007)[58]; total abundance estimated at ≤ 300 adults[56]
Threat or Risk Categories:
Distribution = increased risk;
Abundance = risk from genetic drift;
Productivity = intermediate risk;
Connectivity = intermediate risk

Coastal Cutthroat Trout



Resident

ESA Listing Status: Species of Concern
Biological Objective: None[57]
Status: Unknown

Sea-Run

ESA Listing Status: Species of Concern
Biological Objective: None[57]
Status: 2 adults passed Powerdale Dam (2007)[58]

2007 Hatchery Releases and Returns to Hatcheries in the Hood Subbasin[42, 59]

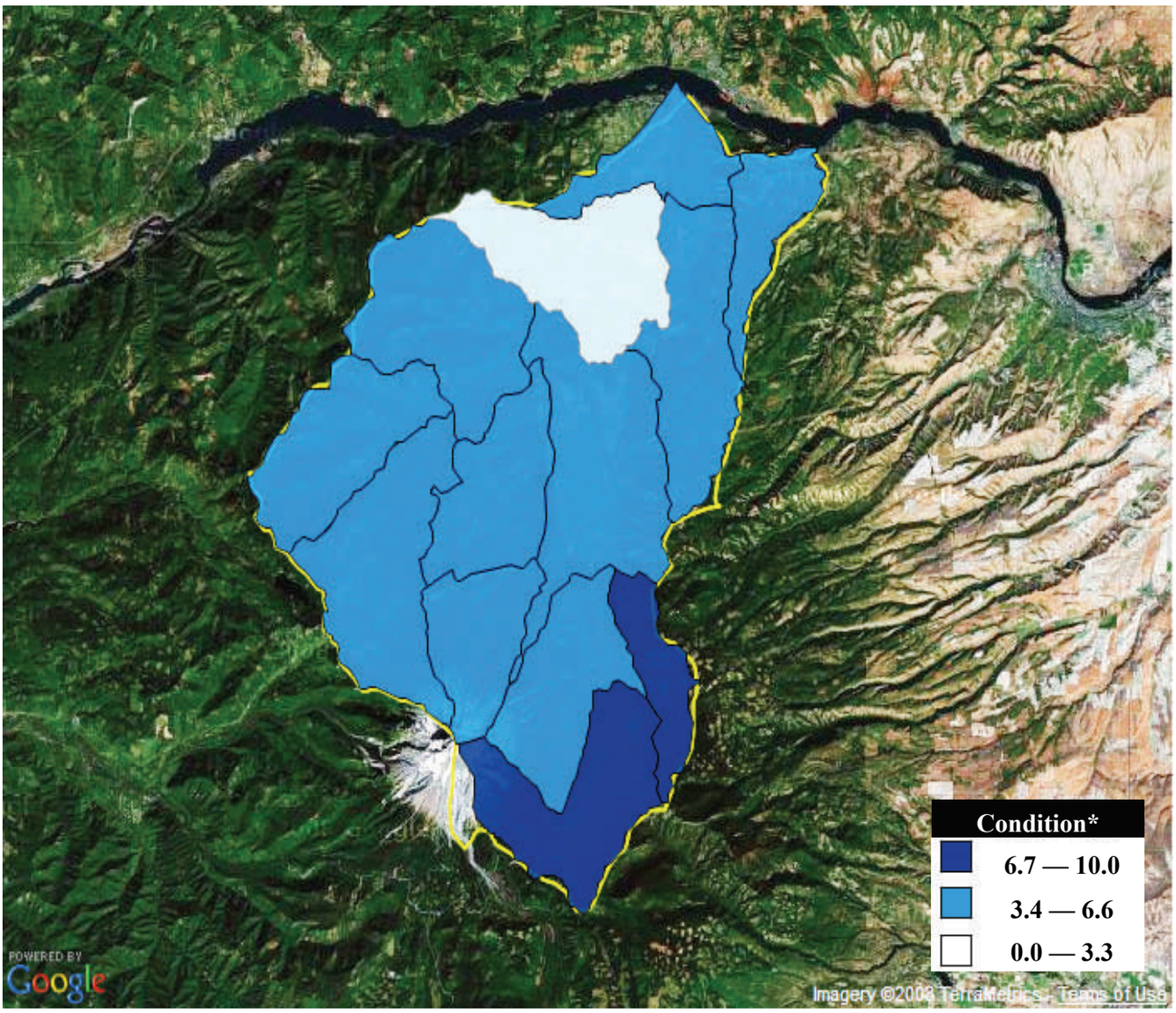
Hatchery	Species	Release Goal/Released (By life stage)	Return Goal to Powerdale Dam/Actual Return	Harvest (Tribal)	PNI
Pelton Ladder and Round Butte	Spring Chinook	125,000/127,829	1,300/302	51	Unknown
	Summer Steelhead	30,000/0			Unknown
Oak Springs	Winter Steelhead	50,000/36,523			Unknown
Total		205,000/164,352			

BPA FY 2008 Habitat Project Accomplishments in the Hood Subbasin[8]

There are no BPA-funded habitat improvement efforts in this subbasin.

Columbia Gorge

Watershed Conditions for National Forest and Bureau of Land Management Lands in the Columbia Gorge Province[52]



Watershed condition is based upon work completed by the USDA Forest Service (FS) and USDI Bureau of Land Management (BLM) Aquatic and Riparian Effectiveness Monitoring Program (AREMP). AREMP personnel evaluate the status and trend of watershed condition on FS, BLM, and National Park Service administered lands within the range of the Northern Spotted Owl. Watershed condition scores are determined for all watersheds within National Forest and BLM boundaries that contain a minimum of 25 percent federal ownership. AREMP applies a decision support model to evaluate the premise that watersheds are in good condition. Watersheds are judged to be in good condition where the physical processes, such as wood and sediment delivery, and habitat attributes are adequate to maintain or improve the diversity and abundance of native or desired non-native aquatic species (Gallo et al 2005). A score of 10 indicates full support for the premise that a watershed is in good condition and a score of 0 indicates no support for the premise.

Subbasin: Hood

Stream Inventory Sites on National Forest and Bureau of Land Management Lands in the Columbia Gorge Province[60]

Stream Data[60]

Year	Location	PoolDp	PoolPCT	PlFn6	LWFreq	LWD>3m	BNKAngle	AMT_16p7	Richness	Abun-dance

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Appendix A

Increase Instream Habitat Complexity — Activities that add natural material instream to create habitat or improve channel morphology. Material include J-hooks, barbs, vortex weirs, large woody debris, and rirap.
Conduct Controlled Burn — Use fire to improve habitat.
Realign, Connect, and /or Create Channel — Projects that add sinuosity, meanders, side channels, off-channel habitats, reconnection of historical channels, excavation of new channels, and/or improving the functionality of existing channels.
Decommission Road/Relocate Road — Activities that make roads or trails unusable including adding berms, pits, boulders or logs, ripping or obliterating the road or trail with heavy equipment that may involve re-contouring the slope, and/or building a or trail in a more appropriate location to replace a decommissioned road or trail.
Improve Road — Projects that eliminate or reduce erosion, sediment and/or toxic run-off from reaching streams, rivers, or wetlands from roads or trails currently in use.
Install Fence — Installation of various types of fence and gates including cattle guards or water gaps for livestock.
Plant Vegetation — Installation of plants or seeds for purposes such as erosion control, roughness recruitment, shading, restoring native habitat, forage enhancement, and road removal.
No-till and Conservation Tillage Systems — Establishment of practices that focus on increased crop residue during subsequent crop seeding, and/or reduction or elimination of traditional tilling practices.
Remove Mine Tailings — Activities that remove or re-contour remnant landscape effects fro old mining operations.
Remove Vegetation — Projects that involve either the mechanical, biological, or chemical removal of one or more plant species or a number of individuals of a plant species. The plants are often non-native, naturalized, undesirable native-plants, all of which have been deemed noxious, invasive or "weeds".
Upland Erosion and Sedimentation Control — Activities include installation of water bars, gully plugs and culvert outlets, grassed waterways, grade stabilization structures, sediment catchment ponds/basins, and removal of drainage pipes and other blockages to specifically prevent sediment slump or landslide
Enhance Floodplain — Projects that remove or breach a dike to restore floodplain function or the enhancement of a floodplain through the addition of large woody debris as well as potentially involving the installation of a tide-gate or water control structure.
Create, Restore, and /or Enhance Wetland — Efforts that include water control structures, tidegates, dike removal or breaching, re-contouring, and excavation to create, restore, or enhance wetlands.
Install Fish Screens — Activities that involve the installation or replacement of screens associated with diversions or pumps.
Remove/Install Diversion — Projects that remove, replace, avoid creating a fish passage barrier associated with a stream diversion including push-up dams. These efforts may be part of a diversion consolidation efforts that reduce the number of diversion sites that includes installation of alternative ways (e.g. infiltration galleries, instream diversion pumps, and lay-flat stanchions) to divert stream flow without creating passage barriers caused by traditional diversion structures.
Remove/Breach Dam — Work that facilitates fish passage over a natural or human-made dam by breaching or removal.
Install Fish Passage Structure — Activities that include the removal or modification of a full or partial instream barrier to improve fish passage and/or flow through the installation of the fish ladders, bridges, culverts, jump pools, and weirs.
Lease Land — Includes riparian, grazing, and multiple-use leases, typically for multiple years.
Install Well — Project that includes installation of a well to enable groundwater to be used as an alternative to instream flow