30. Illinois River Population

- Interior Rogue Stratum
- Core, Functionally Independent Population
- High Extinction Risk
- 11,800 Spawners Required for ESU Viability
- 400 mi^2
- 590 IP km (367 mi) (47% High)
- Dominant Land Uses are Agriculture and Urban/Residential/Commercial Development
- Principal Stresses are ‘Altered Hydrologic Function’ and ‘Degraded Riparian Forest Conditions’
- Principal Threats are ‘Roads’ and ‘Dams/Diversions’

30.1 History of Habitat and Land Use

From 1780 to 1840, trappers swept Oregon coastal rivers, including the Rogue River basin, reducing the robust beaver population to remnant levels (Oregon Department of Fish and Wildlife (ODFW) 2005b). Beaver ponds provide excellent rearing habitat for coho salmon, and thus beaver trapping was likely the first negative effect of European settlers on coho salmon. Gold mining in the Illinois Valley began in the 1850s (U.S. Bureau of Land Management (BLM) 2003). Flood terraces were turned over, which disrupted riparian areas and in some cases unleashed large quantities of sediment (U.S. Forest Service (USFS) 1999a).

The first agricultural development arose to support the community of miners. After the gold rush, agriculture continued to expand in the fertile lowlands surrounding the river. Meadows and valley bottom forests were converted to pasture where thousands of cows grazed, and more than 100,000 sheep occupied upland meadows of the Illinois subbasin and other watersheds in Siskiyou Mountains (USFS 1999a).

Logging on a large scale began in the Illinois Valley after World War II (USFS 1997a, USFS and BLM 2000), when there were few restrictions on harvesting near streams or using stream beds to skid logs. Channel damage from the 1964 flood was widespread and exacerbated by timber harvest and road building activities. Affected areas included the East Fork Illinois River and its tributaries Chicago and Dunn creeks (USFS and BLM 2000), and Sucker Creek and its tributaries Grayback, Cave, Tannen creeks (USFS 1997a).

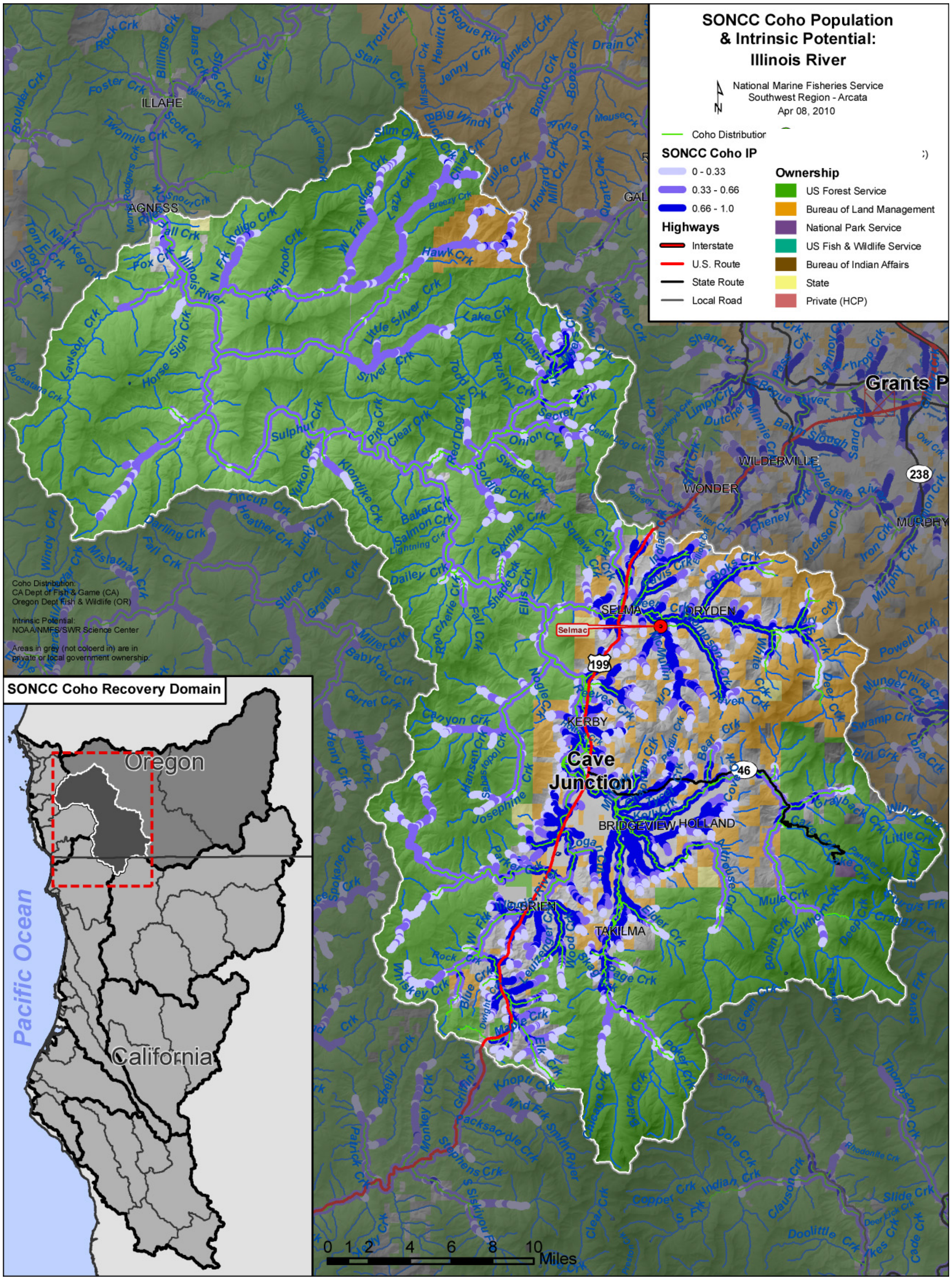

Figure 30-1. The geographic boundaries of the Illinois River coho salmon population. Figure shows modeled Intrinsic Potential habitat (Williams et al. 2006), land ownership, coho salmon distribution (ODFW 2010a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Interior Rogue diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

Less ground-disturbing methods of logging were used by the USFS and U.S. Bureau of Land Management (BLM) in the 1970s and 1980s, but many landslides still occurred as a result from failures on steep harvested slopes (USFS 2000b) and extensive road networks (BLM 1997, USFS 1998c). This triggered another sediment pulse that compounded adverse effects to habitat.

Alluvial valley reaches near the mouth of the Illinois River that strongly overlap with extensive high IP (>0.66) coho salmon habitat (Williams et al. 2006) were formerly winding channels with complex wetlands and likely numerous beaver ponds (BLM 2005). These reaches would have had substantial groundwater and surface water connections (Oregon Department of Environmental Quality (ODEQ) 2008) as well as slow water habitats suitable for both summer and winter rearing of coho salmon juveniles. These mainstem summer and winter refugia for coho salmon juveniles have been largely lost.

Although federal ownership covers 81 percent of the Illinois River population, the vast majority of stream reaches on USFS and BLM lands are too steep or otherwise unsuitable for coho salmon. Both the USFS and BLM have adopted new timber harvest practices which are less detrimental to salmonid habitat. Forests are now being thinned to meet conservation and recreation objectives (USFS 2007), rather than cleared for timber sale. Aquatic habitat on federal lands in the Illinois River subbasin is recovering in response to these land use changes.

Rural residential growth in the watershed has followed a pattern similar to other areas of Josephine and Curry counties, with related increased demand on surface and groundwater (Southwest Oregon Resource Conservation and Development Council (SO RC&D) 2003).

30.2 Historic Fish Distribution and Abundance

Historically, coho salmon were widely distributed in the Illinois River watershed; however most of the high intrinsic potential (IP >0.66) coho salmon habitat (Williams et al. 2008) is in low gradient tributaries in the upper portion of the subbasin (Figure 30-1). Coho salmon production potential is limited in other areas. Tributaries of the lower Illinois River subbasin, such as Silver, Lawson, and Indigo creeks, are too steep and confined for coho salmon to flourish. High IP coho salmon habitat occurs on a bench in the upper North Fork of Silver Creek (Figure 30-1) but coho salmon access to that reach is blocked (BLM 2004a) by a series of culverts; natural falls downstream are additional potential impediments to passage. Briggs Creek Valley near the headwaters of Briggs Creek contains high IP habitat (Figure 30-1) and is accessible to coho salmon, but NMFS is not aware of any record of coho presence in upper Briggs Creek since 1983 (USFS undated). A substantial portion of the western Illinois River subbasin has serpentine soils that naturally support sparse riparian conditions (USFS 2000b) that likely result in warm stream temperatures. Therefore, streams that flow from this terrain, such as Rough and Ready and Josephine creeks, are unsuitable for coho salmon. This profile focuses on the upper Illinois River subbasin where tributaries with high IP coho salmon habitat exist: the mainstem Illinois River, East Fork Illinois River, West Fork Illinois River, Althouse Creek, Sucker Creek, Briggs Creek, and Deer Creek.

A cannery operated at the mouth of the Rogue River beginning in 1876. Records from that cannery were used to estimate an annual run size of approximately 114,000 adult coho salmon in the late 1800s (Meengs and Lackey 2005). There is no way to know how many of these fish were returning to the Illinois River subbasin, rather than elsewhere in the 5,600 square mile Rogue River basin. The Illinois River subbasin contains 25 percent of the basin-wide IP kilometers of habitat (Williams et al. 2008), suggesting possible returns of 28,500 fish during the time of cannery operation if fish were distributed in proportion to IP kilometers.

Table 30-1. Tributaries with instances of modeled high IP reaches (IP > 0.66) in the Illinois River subbasin (Williams et al. 2006).

Watershed	Stream Name	Watershed	Stream Name
West Fork Illinois	Brushy Creek	**Mainstem and East Fork Illinois**	Althouse Creek
	Dwight Creek		Althouse Slough
	Elk Creek		Bear Creek
	Gilligan Creek		Briggs Creek
	Logan Creek		Chapman Creek
	Mendenhall Creek		Democrat Gulch
	Trapper Gulch		Elder Creek
	West Fork Illinois River		Free and Easy Creek
	Whiskey Creek		George Creek
	Woodcock Creek		Grayback Creek
			Holton Creek
			Horse Creek
			Kelly Creek
Deer Creek	Anderson Creek		Khoeery Creek
	Clear Creek		Little Elder Creek
	Crooks Creek		Long Gulch
	Davis Creek		Mill Creek
	Deer Creek		Myers Creek
	Draper Creek		North Fork Silver Creek
	Haven Creek		Page Creek
	McMullin Creek		Poker Creek
	North Fork Deer Creek		Reeves Creek
	Potter Gulch		Senior Gulch
	Salt Gulch		Scotch Gulch
	South Fork Deer Creek		Skagg Creek
	Thompson Creek		Sucker Creek
	Whites Creek		Tycer Creek

30.3 Current Status of Coho Salmon in the Illinois River

Spatial Structure and Diversity

ODFW (2005a) surveys from 1998 to 2004 confirmed that coho salmon still migrate to Illinois River tributaries in an extensive area, but rearing is concentrated in small patches in upper reaches of Illinois Valley streams, just below federal land. Comparatively high densities of juvenile coho salmon have been found in Deer, Sucker, and Althouse creeks as well as the East and West Forks of the Illinois River (Figure 30-2). During the 2004 to 2009 run years, on average about 70 percent of sites were occupied by wild adult coho salmon with an estimated average of 25 spawners per mile (hatchery or wild origin unstated) (Lewis et al. 2009). In most cases, coho salmon are naturally absent from steep lower Illinois River tributaries and those that drain the serpentine bedrock area of the western part of the subbasin (e.g., Rough and Ready and Josephine creeks).

Population Size and Productivity

ODFW (2011b) estimated the abundance of wild adult coho salmon from 2002 to 2008 in the Illinois River. Wild adult coho salmon spawner abundance for the Illinois population was estimated to be 2,117 in 2007 and 745 in 2008 (Figure 30-3). Data were not collected in 2005, 2008, and 2010 which complicated efforts to track the strength of year classes. The lowest three-year running average of the number of spawners was 1431. Therefore, the Illinois River population of coho salmon is at moderate risk of extinction with regard to the spawner density criteria, because the spawner density is above the depensation threshold of 590 but below the low risk threshold of 11,800 adults.

Huntley Park seine mark-recapture seine estimates occur in the lower Rogue River (river mile 8) and are the most robust and precise estimates of adult coho salmon abundance in the Rogue River (ODFW 2011a). It is impossible to determine, with existing information, how many of the estimated coho salmon at Huntley Park were returning to the Illinois River, but if the trend in abundance is assumed to reflect trends in the Illinois River the data can inform whether the population is at high risk of extinction due to the population decline criterion (Williams et al. 2008). The three year running average of the number of spawners at Huntley Park has declined at an annual rate of 12 percent over the last 12 years (Figure 10-2), greater than the 10% decline associated with a high risk of extinction (Williams et al. 2008). Therefore, the population is at high risk of extinction due to its sharply declining productivity.

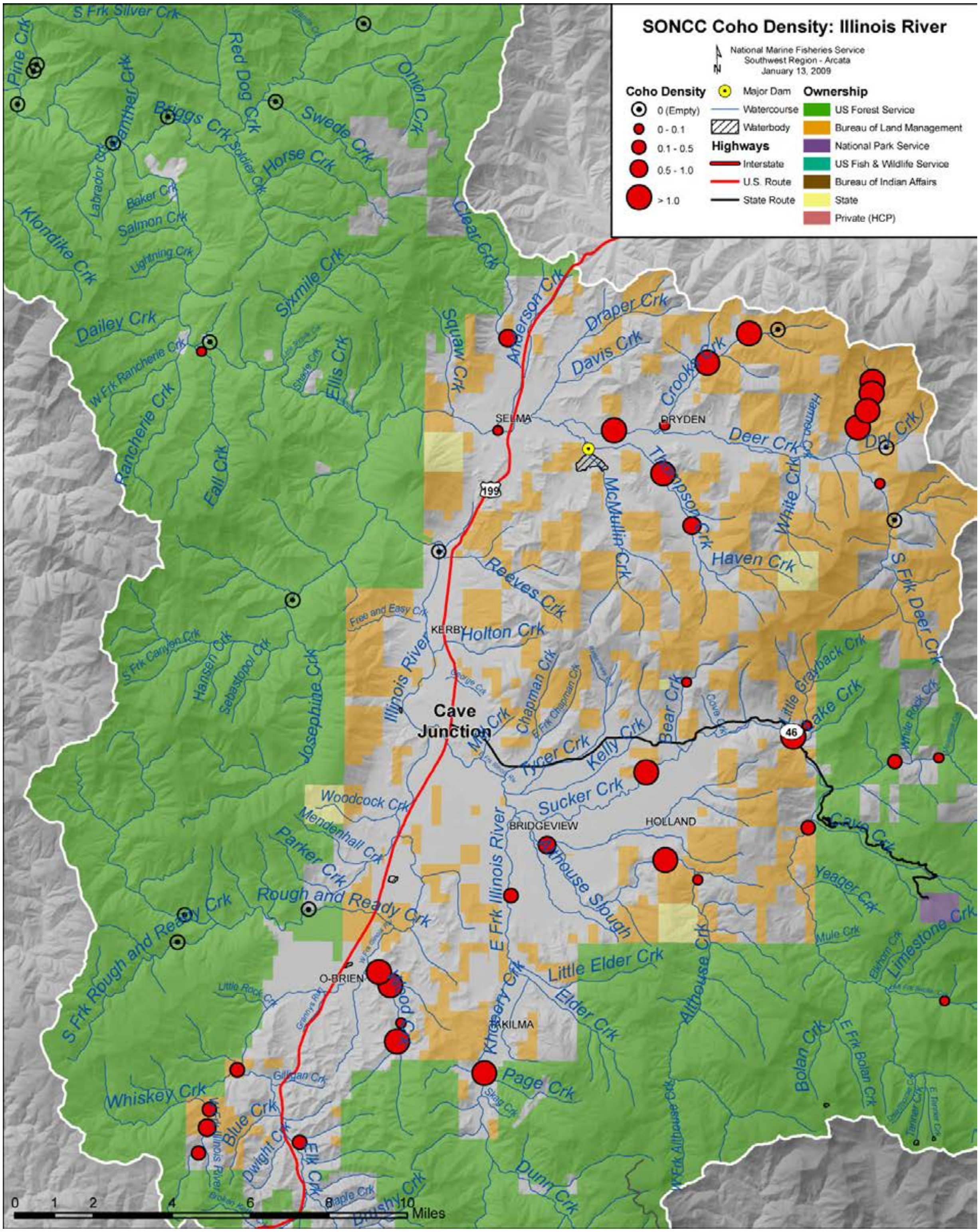

Figure 30-2. Upper Illinois River juvenile coho salmon survey results. Data are from 1998 to 2004 and show presence, absence and density of fish per square meter. (ODFW 2005a).

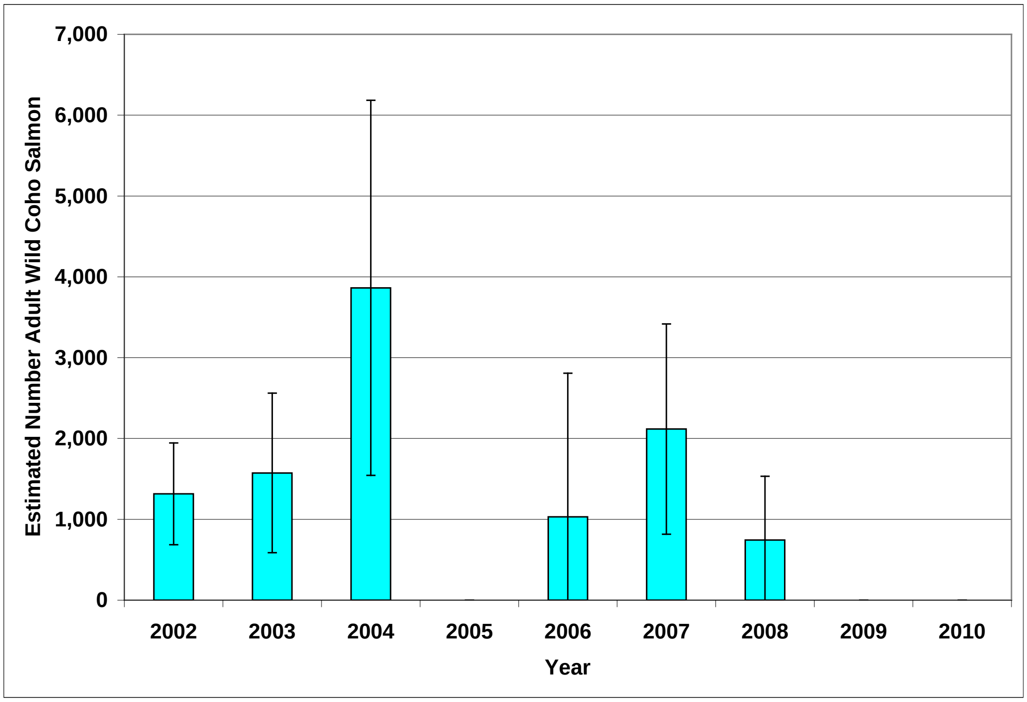

Figure 30-3. Estimated number of adult coho salmon in the Illinois River, from 2004 through 2010. No sampling occurred in 2005, 2009, or 2010 (ODFW 2011b).

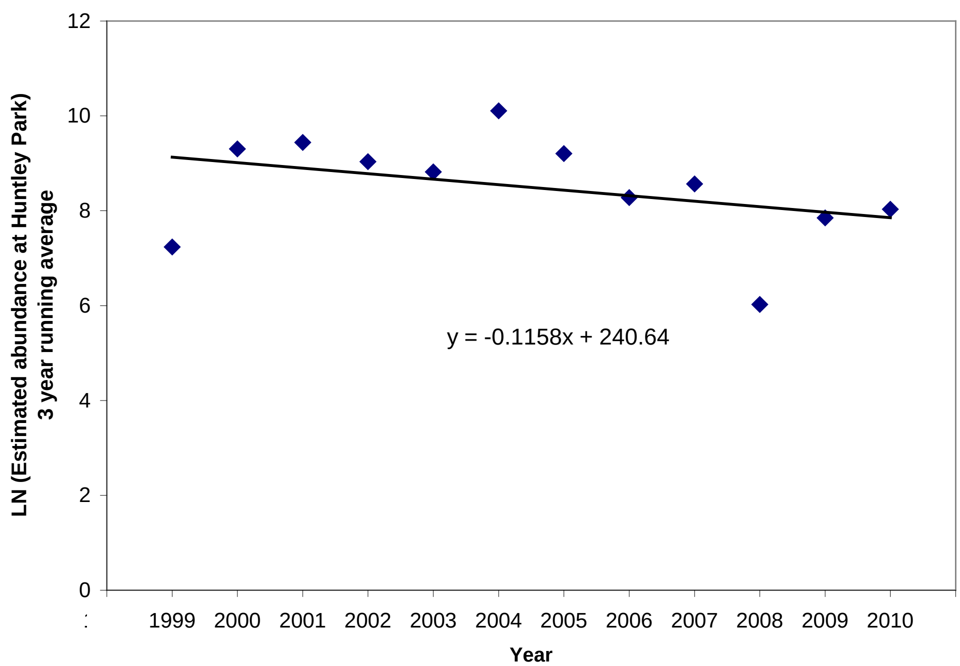

Figure 30-4. Rate of decline of estimated population abundance at Huntley Park, 1999-2010. (Data from ODFW 2011a).

Using seine mark-recapture data from Huntley Park, ODFW (2005c) calculated productivity for wild adult coho salmon in the Illinois, Middle, and Upper Rogue populations aggregated together for each year from 1980 to 2000. Recruits per spawner were less than replacement levels in eight of the years, indicating low productivity during those years (Figure 30-5).

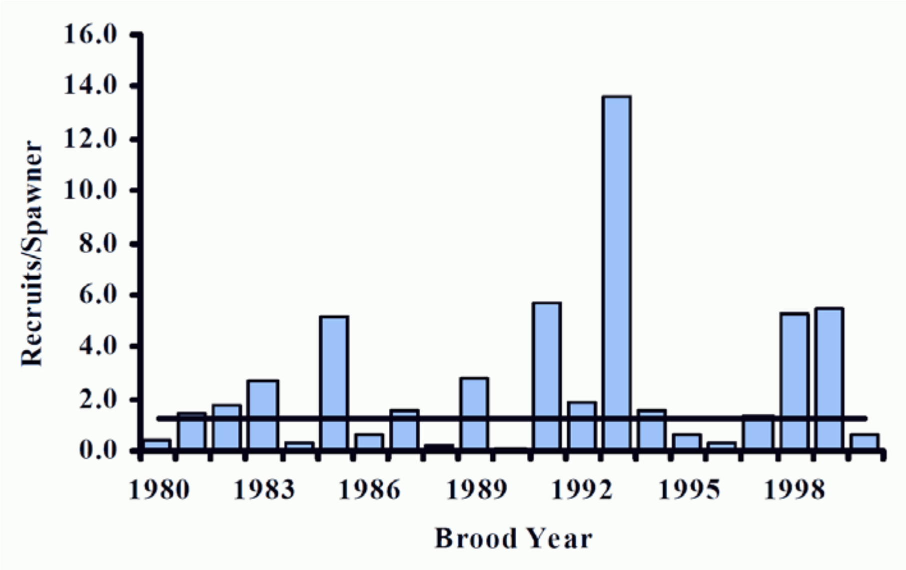

Figure 30-5. Recruit per spawner for brood years 1980 through 2000. Data are for the Rogue River Species Management Unit, which includes the Middle Rogue, Upper Rogue, and Illinois River populations. Figure from ODFW 2005c.

Extinction Risk

The Illinois River coho salmon population is not viable and at high risk of extinction. The estimated number of spawners exceeds the depensation threshold, but the estimated number of spawners at Huntley Park has declined at a rate greater than 10% over the past four generations (Figure 10-2).

Role in SONCC Coho Salmon ESU Viability

The Illinois River coho salmon population is considered functionally independent because of the large amount of modeled IP habitat. When the SONCC coho salmon ESU was healthy, this population would have been large enough to persist over 100 years without immigration from other populations (Williams et al. 2006). The Illinois River population would have been a likely contributor of colonists to other nearby independent and dependent populations, including those in the Rogue River basin. At present, the capacity of this population to supply colonists to adjacent independent populations is limited due to low spawner abundance. Recovery of this population may be enhanced by stray colonists from the nearby Lower Rogue, Middle Rogue/Applegate, and Upper Rogue river populations.

30.4 Plans and Assessments

U.S. Forest Service, Rogue River-Siskiyou National Forest

Sucker Creek Watershed Aquatic Restoration Plan (USFS 2007)

This plan proposes to improve aquatic habitat in the Sucker Creek watershed through placing instream large wood, planting disease resistant Port Orford cedar, riparian thinning, increasing beaver supplementation populations, replacing culverts, and upgrading and decommissioning roads.

Sufficiency Assessment: Forest Service and Bureau of Land Management Programs in Support of SONCC Coho Salmon Recovery (USFS and BLM 2011)

The USFS has adopted a Watershed Condition Framework assessment and planning approach (USFS and BLM 2011). The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands. The WCF provides the Forest Service with an outcome-based performance measure for documenting improvement to watershed condition at forest, regional, and national scales. As part of the WCF, Middle Sucker Creek, Grayback Creek, and Dunn Creek were identified as high priority 6th field subwatersheds in Rogue-Siskiyou National Forest (USFS and BLM 2011). Watershed Restoration Action Plans (WRAPs), which update existing watershed analyses, are part of the WCF and were completed for each priority sub-watershed. USFS and BLM (2011) summarizes these WRAPs and describes, for each subwatershed: the rationale for its priority status, key issues, essential projects, and partnership opportunities.

U.S. Bureau of Land Management (Medford District)

Lower East Fork Illinois Watershed Water Quality Restoration Plan (BLM 2006)

West Fork Illinois Watershed Water Quality Restoration Plan (BLM 2007)

These plans describe base flow, riparian condition, and channel condition in the watersheds and identify goals, objectives, and proposed management measures to improve water quality.

State of Oregon

Expert Panel on Limiting Factors for Oregon's SONCC coho salmon populations

ODFW (2008b) convened a panel of fisheries and watershed science experts as an initial step in their development of a recovery plan for Oregon's SONCC coho salmon populations. Deliberations of the expert panel provided ODFW with initial, strategic guidance on perceived limiting factors and threats to recovery. Based on the input of panel members, ODFW (2008b) summarized the concerns for the Illinois River are as follows:

> Key concerns were related to loss of over-winter tributary habitat complexity and access and over-summer water temperatures and habitat access. Over-winter tributary habitat, especially in the lowlands, has been impacted by past and current agricultural practices and an interruption in the transport and presence of large wood. Access to habitat has been limited by road crossings. Summer habitat is limiting because high water temperatures have resulted from land management actions in the riparian zone and straightening of channels and water management actions for agricultural purposes. Water withdrawals and diversions have also limited the amount of, and access to, summer habitat and thermal refuge.
>
> Secondary concerns spanned a number of life history stages and locations. Unscreened diversions and non-criteria screens at diversions affect fry, summer parr, and out-migrating smolts. Summer juvenile habitat has been impacted by a loss of tributary habitat complexity, especially in the lowlands, caused by past and current agricultural practices and an interruption in the transport and presence of large wood. Access to

summer thermal refuge habitat by juveniles has also been affected by road crossings. Non-native vegetation is a secondary factor contributing to higher water temperatures affecting summer parr by limiting native riparian vegetation. A reduction in floodplain connectivity has affected winter parr. Access to spawning habitat by returning adults is limited by road crossings and diversion structures. Finally, reduced estuarine habitat for smolts due to past and current forestry practices and rural residential development is another impact.

Oregon Plan for Salmon and Watersheds
http://www.oregon.gov/OPSW/about_us.shtml

The state of Oregon developed a conservation and recovery strategy for coho salmon in the SONCC and Oregon Coast ESUs (State of Oregon 1997). The Oregon Plan for coho salmon is comprehensive and includes voluntary actions for all of the threats currently facing coho salmon in these ESUs and involves all relevant state agencies. Reforms to fishery harvest and hatchery programs were implemented by ODFW in the late 1990s. Many habitat restoration projects have occurred across the landscape in headwater habitat, lowlands, and the estuary. The action plans, implementation, and annual reports can be found at the web site.

ODFW Coastal Salmonid Inventory Project

ODFW has monitored coho salmon in the Illinois River as part of their Coastal Salmonid Inventory Project. From 1998 to 2004, ODFW conducted dives to count juvenile coho salmon in the Illinois Valley (ODFW 2005a)(Figure 30-2). ODFW also estimated the abundance of adult coho salmon in the Illinois River from 2002 to 2004 and from 2006 to 2008 (ODFW 2011b).

Southwest Oregon Salmon Restoration Initiative

The Southwest Oregon Salmon Restoration Initiative (Prevost et al. 1997) was created to help fulfill a memorandum of understanding between ODFW and the National Marine Fisheries Service (NMFS) to recover coho salmon. The initiative provides the framework for recovery in southwest Oregon and helped foster formation of watershed councils. The initiative designated Sucker/Grayback Creek, East Fork Illinois, Althouse Creek, Elk Creek/Broken Kettle Creek, and Dunn Creek as “core areas” in the Illinois River watershed that are the highest priority for restoration in the Oregon component of the SONCC coho ESU.

Water Requirements of Rogue River Fish and Wildlife

ODFW fisheries biologists (Thompson and Fortune 1970) conducted widespread surveys of the Rogue River basin to assess water flow and its effect on fish habitat and carrying capacity for salmonids. The study was designed to inform the Oregon Water Resources Board so that a “beneficial water use program” could be developed. Thompson and Fortune (1970) contains comprehensive flow tables for all major coho salmon producing tributaries in the Rogue River basin, including recommended minimum flows. It also provides a summary of the Rogue River basin fish community, including the Illinois River. The report identified flow depletion as a major cause of stress, disease, and predation to Pacific salmonids.

Illinois River Total Maximum Daily Load Reports

Total Maximum Daily Load (TMDL) reports have been completed for lower (ODEQ 2002c) and upper Sucker Creek (ODEQ 1999). In addition, a TMDL for the remainder of the Illinois and Rogue River basin was recently completed (ODEQ 2008).

Illinois Valley Watershed Council

Rogue River Watershed Health Factors Assessment

The Rogue Basin Coordination Council (RBCC) produced the Rogue River Watershed Health Factors Assessment on behalf of the all the watershed councils within the basin (RBCC 2006). The assessment rates aquatic health and watershed conditions, including wildfire risk. Key problems in different Rogue River watersheds are identified and potential solutions are proposed. Recognized problems in the Illinois River subbasin are related to low stream flows and high summer water temperature.

30.5 Stresses

Table 30-2. Severity of stresses affecting each life stage of coho salmon in the Illinois River. Stress rank categories and assessment methods are described in Appendix B, and the data used to assess stresses for the initial threats assessment (described in Appendix B) is presented in Appendix H.

	Stresses (Limiting Factors)	Egg	Fry	Juvenile[1]	Smolt	Adult	Overall Stress Rank
1	Altered Hydrologic Function[1]	Very High	Very High	Very High[1]	Very High	High	Very High
2	Degraded Riparian Forest Conditions[1]	Medium	Very High	Very High[1]	Very High	Very High	Very High
3	Lack of Floodplain and Channel Structure[1]	Medium	High	Very High[1]	High	High	Very High
4	Impaired Water Quality[1]	Low	High	Very High[1]	High	Low	Very High
5	Altered Sediment Supply	High	High	High	Medium	High	High
6	Impaired Estuary/Mainstem Conditions	-	Low	High	High	High	High
7	Barriers[1]	-	Medium	High[1]	High	High	High
8	Adverse Hatchery-Related Effects	Medium	Medium	Medium	Medium	Medium	Medium
9	Increased Disease/Predation/Competition	Low	Medium	Medium	Medium	Low	Medium
10	Adverse Fishery Impacts	-	-	-	-	Low	Low

[1]Key limiting factor(s) and limited life stage(s).

Limiting Stresses, Life Stages, and Habitat

The juvenile life stage is most limited and quality winter rearing habitat, as well as summer rearing habitat, is lacking. Juvenile summer rearing habitat is impaired by deficient floodplain and channel structure, high temperatures resulting from degraded riparian conditions, and altered hydrologic function from water withdrawals. Furthermore, degraded riparian forests inhibit future potential input of large wood and cannot provide bank stability that assists in a stable and complex channel. Finally, barriers throughout the sub-basin limit access to rearing habitat. These findings are consistent with those of the Oregon Expert Panel (ODFW 2008b) (Section 30.4).

Altered Hydrologic Function

Hydrologic function in the Illinois River subbasin is severely altered by water diversion. The USFS (1999a) noted that Reeves Creek, a tributary with high IP habitat, was dry in three of five reaches surveyed in 1994, likely due to diversion. Thompson and Fortune (1970) assessed flows in 1967 and found that sections of the Illinois River system become seriously low and warm, or even dry, during the summer when irrigation diversions were particularly active and runoff was low. The extent to which these conditions persist is unknown.

High road density and widespread clear cutting, especially in rain-on-snow terrain, have somewhat altered peak flows (USFS 1997a, BLM 2004b). Base flows may decrease when dense stands of young trees that consume large amounts of water are established after clear cuts (Murphy 1995).

Lake Selmac, on Deer Creek tributary McMullin Creek, blocks several miles of coho salmon habitat (Figure 30-6). Channelization in portions of Deer and Thompson has resulted in disconnected floodplains in areas known to support juvenile coho salmon. Filling of wetlands and elimination of beaver caused loss of water storage capacity and reduced the areas of contact between surface water and groundwater.

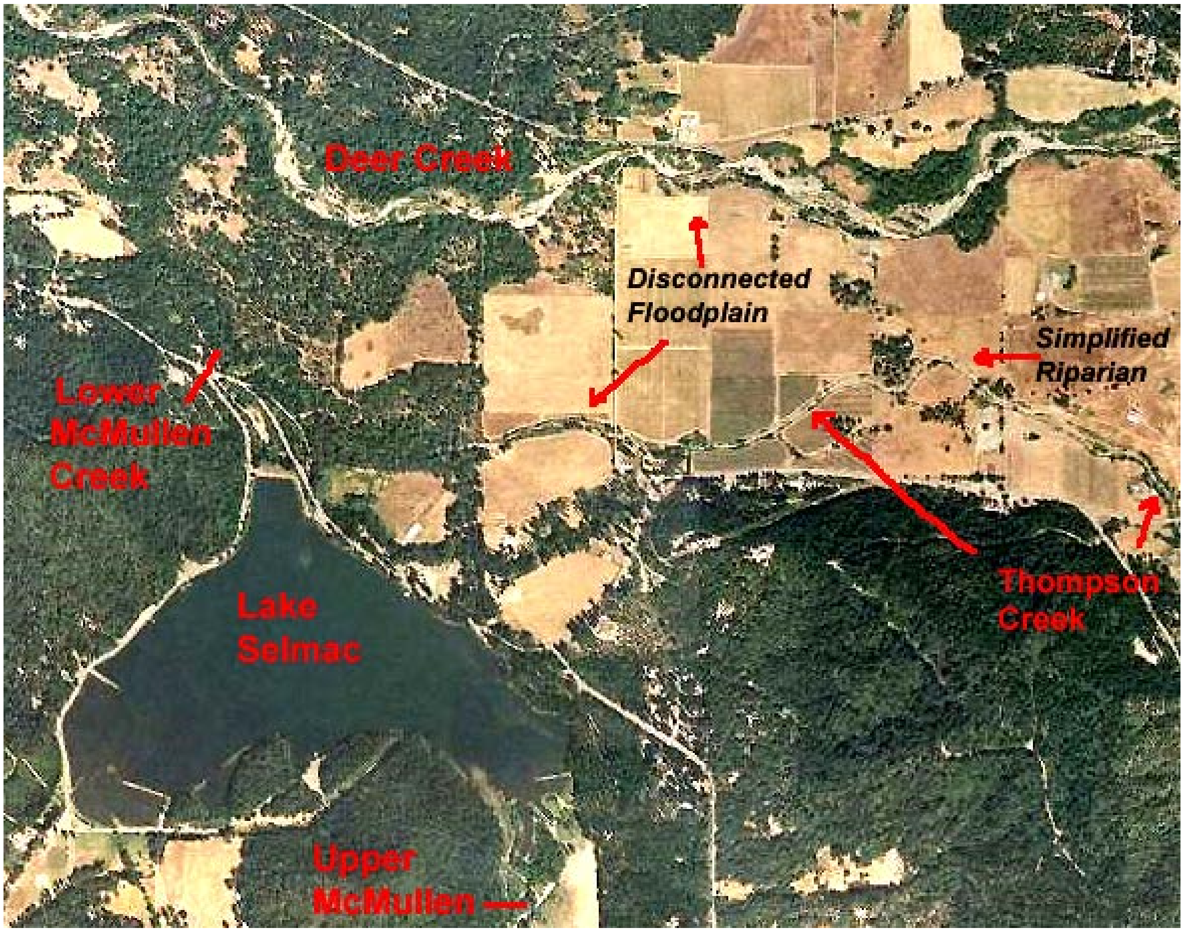

Figure 30-6. Lake Selmac blocks access to high IP coho salmon habitat. The habitat is in upper McMullin Creek. Hydrologic alteration is apparent in Thompson and Deer creeks, which have simplified channels disconnected from floodplains. June 2005.

Riparian Forest Conditions

Degraded riparian forest condition is one of the most significant stresses affecting coho salmon recovery in the Illinois River watershed. Reduction of riparian trees and gallery forests that once covered the alluvial valley floor has led to reduced pool frequency and habitat simplification, has increased bank erosion, and contributed to stream warming by widening the waterways (BLM 1997, 2006, USFS 1997a). ODFW surveyed extensive reaches of coho salmon-bearing Illinois River reaches and tributaries (e.g., EF Illinois, WF Illinois, Deer, Sucker, Althouse, Elk) and found poor conifer density with fewer than 75 trees (>36" dbh) per 1000 feet. Only one upper Sucker Creek reach and the lower North Fork Deer Creek had 75 to 125 trees of this size, which rates as fair riparian conditions. Recent aerial photos show very simplified conditions in both tributary and mainstem Illinois River riparian zones. The riparian zones have been cleared or substantially modified along the mainstem Illinois River and at the mouth of Free and Easy Creek. Overall, there is a very low amount/volume of large wood in channels throughout the Illinois River subbasin (USFS 1997a, BLM 2005).

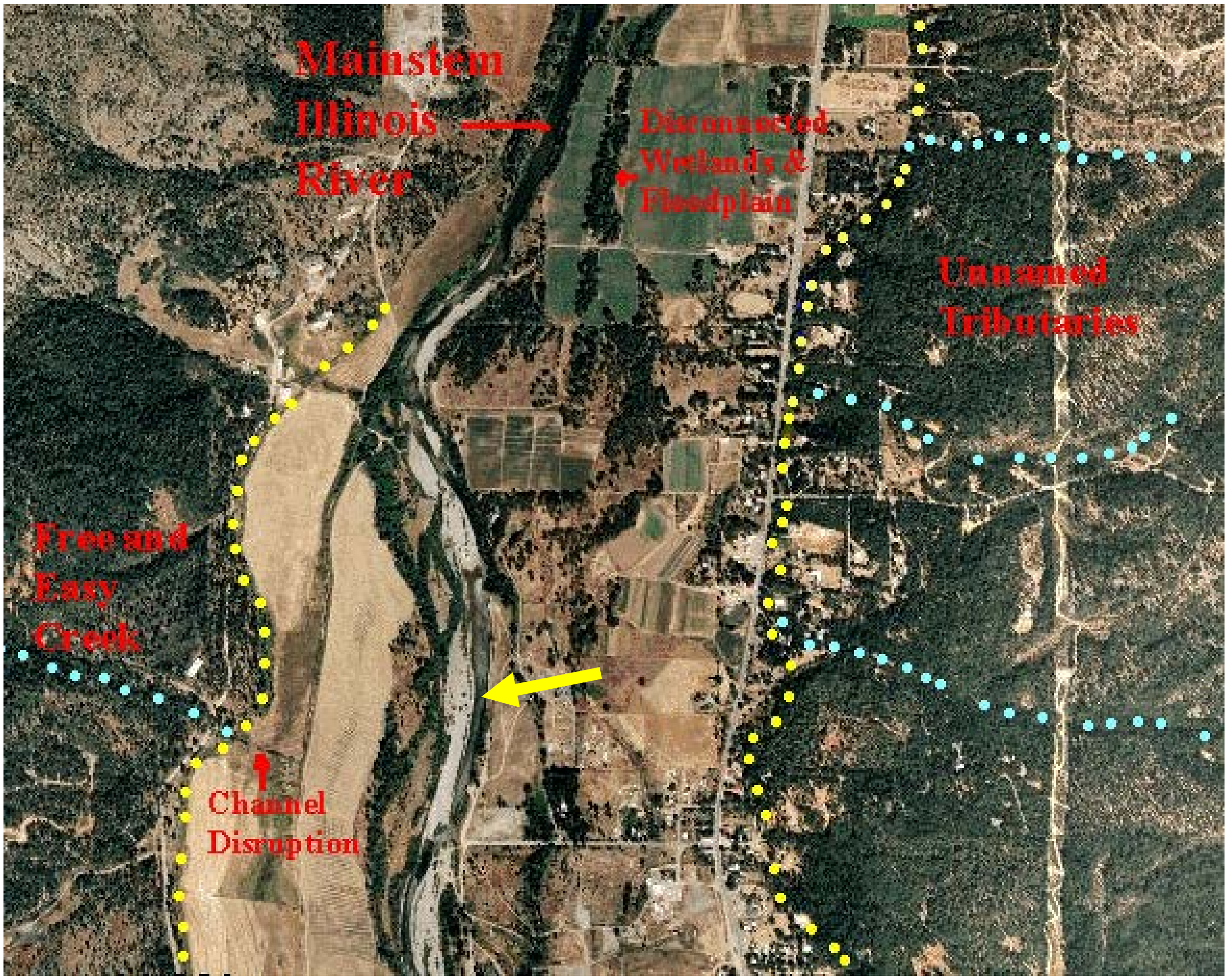

Figure 30-7. Aerial photo of Mainstem Illinois River. Free and Easy Creek (at left) appears to flow subsurface or into a ditch as it crosses the flood terrace. Wetlands and the floodplain of the mainstem are disconnected and there are few riparian trees (shown by large arrow at bottom of photograph). Dots aligned in an east/west configuration are USGS (1984) streams, and dots aligned in a south/north configuration are ditches.

Lack of Floodplain and Channel Structure

The straightening and simplification of streams has reduced the amount of slow, cool edgewater habitats where coho salmon fry and juveniles thrive (ODEQ 2008). Beaver have been greatly reduced along with the pools they create (ODFW 2005b). Although there are patches of functional coho salmon habitat, many Illinois River reaches and tributary channels do not support coho salmon (BLM 1997, USFS 1997a). Channelization of the mainstem Illinois River has disconnected it from much of its floodplain, reducing the physical processes that form coho salmon rearing and spawning habitat. These processes include side channel formation, accumulation of large wood jams, formation of slower water velocities, formation of pools, and lower shear stress. Smaller alluvial valley tributaries that cross the Illinois River floodplain have been channelized, which increases bed shear stress, causes down cutting, and can also trigger upstream gully erosion. A similar situation has occurred in the middle portion of the Illinois River subbasin in the modeled high IP habitat at Briggs Valley, where historically the stream channel meandered across a broad marsh-like floodplain but has now downcut with a straightened channel, resulting in a lowered water table and a dry meadow (USFS undated) that offers a much lower quality of rearing habitat for coho salmon.

ODFW habitat surveys indicate poor wood levels (< 1 key piece per 100 meters) in most surveyed areas of the Illinois River watershed. Exceptions are Sucker Creek below Grayback Creek and headwater stream reaches, mostly on USFS or BLM lands, such as South and North Fork Deer, Bear, Elk, Crooks, Draper and White creeks. USFS large wood surveys found relatively higher wood levels in some lower and middle Illinois River watersheds; however, these reaches lack high IP habitat, with the notable exception of Horse Creek in the upper Briggs Creek watershed. In the upper portion of the Illinois River subbasin, USFS surveys indicate higher levels of wood in much of Grayback, Left Fork Sucker, Sucker, and Bolan creeks, as well as the upper East Fork Illinois and its tributary Poker Creek. While the December 1996 storms washed out some large wood habitat improvement structures, natural large wood recruitment increased (USFS 1998c).

Altered Sediment Supply

Sediment contribution from landslides and erosion occurs naturally in the Illinois River basin; however, roads, timber harvest, and bank erosion following removal of riparian vegetation have elevated fine sediment input. Excess fine sediment directly impact egg viability and can reduce food for fry, juveniles and smolts. Key reaches of the West and East Fork Illinois River, Sucker Creek, Anderson and Draper creeks all have poor scores for fine sediment (<1 mm) in ODFW habitat surveys because spawning gravels have greater than 17 percent fines. Extensive reaches of Deer Creek, Crooks Creek, lower Sucker Creek, and Althouse Creek have very good fine sediment scores (<12 percent fines), indicating suitable coho salmon spawning conditions. Poor pool frequency and depth throughout the Illinois River subbasin are likely due to elevated levels of fine sediment partially filling pools, a lack of scour-forcing obstructions such as large wood, and in some reaches diminished scour due to channel widening.

Water Quality

While the Illinois River has better ambient water quality than many other Rogue River subbasins, it has widespread temperature impairment (ODEQ 1999, 2002c, 2008). Low summer flows contribute to warming as well as stagnation, algae blooms, elevated pH, and depressed dissolved oxygen (Thompson and Fortune 1970, ODEQ 1996). Pesticides and herbicides have the potential to harm coho salmon (NMFS 2008), but data are lacking for the Illinois River subbasin. Poor water quality is a high stress to juvenile coho salmon and a low stress to adults.

Sixty-two percent of 126 stream miles surveyed by ODEQ failed to meet water quality standards (SO RC&D 2003). Headwaters streams in the Illinois River watershed often flow from federal lands where cool water temperatures allow high densities of coho salmon in the summer. ODEQ maximum weekly maximum temperature (MWMT) data shows that when streams cross onto private land they generally become too warm for coho salmon rearing within a short distance and can rise to nearly lethal temperatures as they are progressively dewatered. Variations between locations in streams like lower Sucker Creek show that temperatures are cooler where flows are replenished by springs or tributaries, then warm again as flows are diverted by downstream land owners. This pattern is also apparent in Deer Creek, Althouse Creek and the upper East and

West forks of the Illinois River. Cold groundwater contributions may also be reduced or eliminated by groundwater pumping, but groundwater withdrawals have not been quantified (BLM 2004b). Water temperatures and summer flows are suitable for coho salmon rearing in high IP habitats in Briggs Valley; however, coho are not currently present, likely due to inadequate floodplain connectivity and channel structure.

Impaired Estuary/Mainstem Function

Modification of the Rogue River estuary resulted in a loss of much of its historic function. Some portion of coho salmon fry and juveniles migrate out of their stream of origin in search of viable habitat patches, and these fish opportunistically use estuarine and slough habitats (Miller and Sadro 2003, Koski 2009). The lack of rearing habitat in the estuary limits the potential productivity of the entire Rogue River basin and NMFS ranked *Impaired Estuary/Mainstem Function* as an overall high stress for coho salmon. The Lower Rogue River population profile contains a discussion of the causes of reduced estuarine function.

Barriers

The high level of stress caused by barriers to migration in the Illinois River basin are a result of high numbers of road stream crossings (i.e., as shown in Bredensteiner et al. 2003 maps); small, temporary agricultural dams (Prevost et al. 1997); permanent diversion structures; and large mainstem diversion dams. The Illinois River Watershed Council has worked cooperatively with diverters in the Illinois River subbasin to decrease use of "push-up" gravel dams to divert irrigation water and often block adult and juvenile movement (Prevost et al. 1997). In addition, unscreened diversions and non-criteria screens at diversions affect fry, juveniles, and smolts (ODFW 2008b). Pomeroy Dam, used to divert water just below the convergence of the East and West forks of the Illinois River, was identified as a fish passage barrier at some flow levels (USFS 1999a). Road stream crossings that prevent juvenile and adult access to habitat are also a concern (ODFW 2008b).

Adverse Hatchery-Related Effects

The effects of hatchery fish on all life stages of coho salmon are described in Chapter 3. Cole Rivers Hatchery is located upstream of the Illinois population area in the Upper Rogue River sub-basin, and produces approximately 200,000 coho salmon smolts annually in addition to millions of hatchery spring Chinook, winter steelhead, and summer steelhead (ODFW 2008d). Straying into the Illinois River is thought to be uncommon (Good et al 2005). From 1996 to 1998, none of the adults observed in spawner surveys of the Illinois River were of hatchery origin (Jacobs et al. 2002). Adverse hatchery-related effects pose a medium risk to all life stages, due to the presence of Cole Rivers Hatchery in the Rogue River basin (Appendix B).

Disease/Competition/Predation

Salmonids in the Rogue River basin, including the Illinois River, had higher incidences of the fish diseases *furunculosis* and *columnaris* in reaches that were warm due to flow depletion (Thompson and Fortune 1970). Largemouth bass and other warm water species are stocked in Lake Selmac and private farm ponds (USFS 1999a). These fish can escape and pose the risk of competition with, and predation on, salmonids in the mainstem Illinois River (USFS 1999a).

Umpqua pikeminnow, are present in the lower reaches of Sucker Creek (USFS 1999a) as well as other warm, low-elevation streams of the Illinois River, and prey upon coho salmon. Exotic redside shiners also occur in these streams. Japanese knotweed, an invasive plant, has also been documented in the basin (ODA 2010).

Adverse Fishery-Related Effects

NMFS has determined that federally- and state-managed fisheries in Oregon are not likely to jeopardize the continued existence of the SONCC coho salmon ESU (Appendix B).

30.6 Threats

Table 30-3. Severity of threats affecting each life stage of coho salmon in the Illinois River. Threat rank categories and assessment methods are described in Appendix B, and the data used to assess threats for the initial threats assessment (described in Appendix B) is presented in Appendix H.

	Threats	Egg	Fry	Juvenile	Smolt	Adult	Overall Threat Rank
1	Roads	High	Very High	Very High	Very High	Very High	Very High
2	Dams/Diversion	Medium	Very High	Very High	Very High	Very High	Very High
3	Agricultural Practices	Medium	High	High	High	High	High
4	Channelization/Diking	Medium	Medium	High	High	High	High
5	Timber Harvest	High	High	High	Medium	Medium	High
6	Mining/Gravel Extraction	High	High	High	Medium	Medium	High
7	Climate Change	Low	Low	High	High	Medium	High
8	Road-Stream Crossing Barriers	-	Low	High	High	High	High
9	Hatcheries	Medium	Medium	Medium	Medium	Medium	Medium
10	Urban/Residential/Industrial	Low	Medium	Medium	Medium	Medium	Medium
11	High Intensity Fire	Low	Medium	Medium	Medium	Medium	Medium
12	Invasive and Non-Native/Alien Species	Medium	Medium	Medium	Low	Low	Medium
13	Fishing and Collecting	-	-	-	-	Low	Low

Roads

Road density is high in many areas of the Illinois River subbasin. Roads were built to support timber harvest, residential and urban development, and highway systems. An extensive network of small, unpaved roads exists in many areas of the Illinois River watershed (Figure 30-8 and Figure 30-9). Many of these roads run alongside streams, and are known to yield chronic fine sediment and to pose elevated risk of catastrophic failure on steep slopes (USFS 1998c). NMFS (1995) recommended a road density limit of 2 miles of road per square mile of watershed (mi/sq mi) to protect anadromous salmonids in interior Columbia River basins to limit sediment and cumulative watershed effects. Road density in the Illinois River subbasin (Figure 30-10) is typically 2 to 4 mi/sq mi on federal land (Prevost et al. 1997, USFS and BLM 2000, BLM 2005), but may be higher than 8 mi/sq mi on private timberlands and over 10 mi/sq mi in rural residential areas (BLM 1997). Landslides triggered by roads during the November and December 1996 storms resulted in extensive sedimentation in Sucker and Grayback creeks (USFS 1998c). Damage resulted from road crossing failures and diversion of streams onto roadways, which increased fine sediment delivery to levels 2 to 3 times higher than unaffected watersheds (USFS 1998c).

Hydrologic effects of extensive road networks persist even when the roads are no longer used, because roads often continue to contribute fine sediment to streams and alter hydrology by intercepting ground water, channelizing water and transporting sediment down inboard ditches, or both. Erosive geology may require lower road density targets in some watersheds. For example, upper Sucker Creek has decomposed granitic soils that are prone to landsliding as well as chronic gully and surface erosion (USFS 1998c).

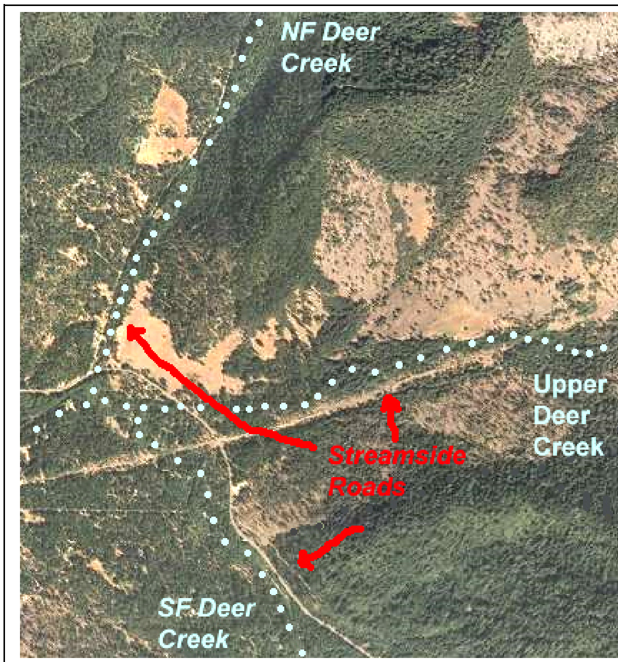

Figure 30-8. Aerial photo showing stream side roads. Roads parallel upper Deer Creek as well as the NF and SF. These roads chronically leach fine sediment into Deer Creek. Dots are USGS (1984) stream courses (1:24 K). Photo from 2005.

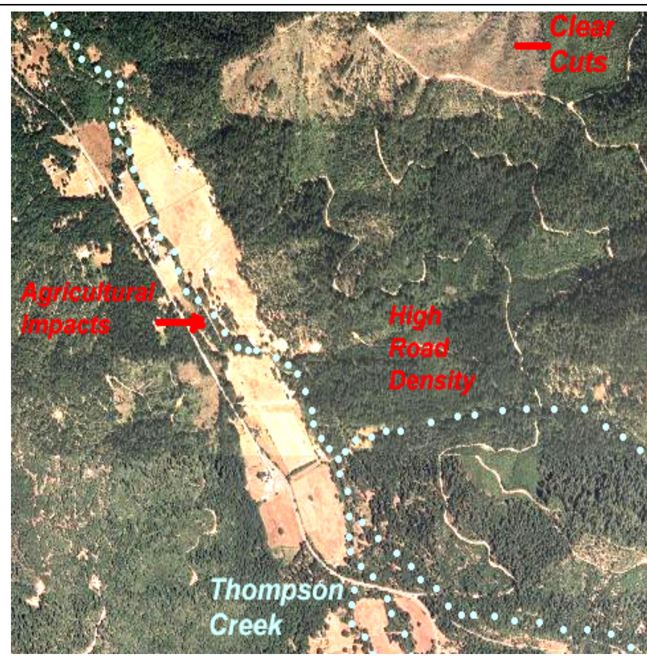

Figure 30-9. Aerial photo showing very high road densities in upper Thompson Creek. All of upper Deer Creek, which includes Thompson Creek, has a road density of 4 mi./sq.mi. Photo from 2005.

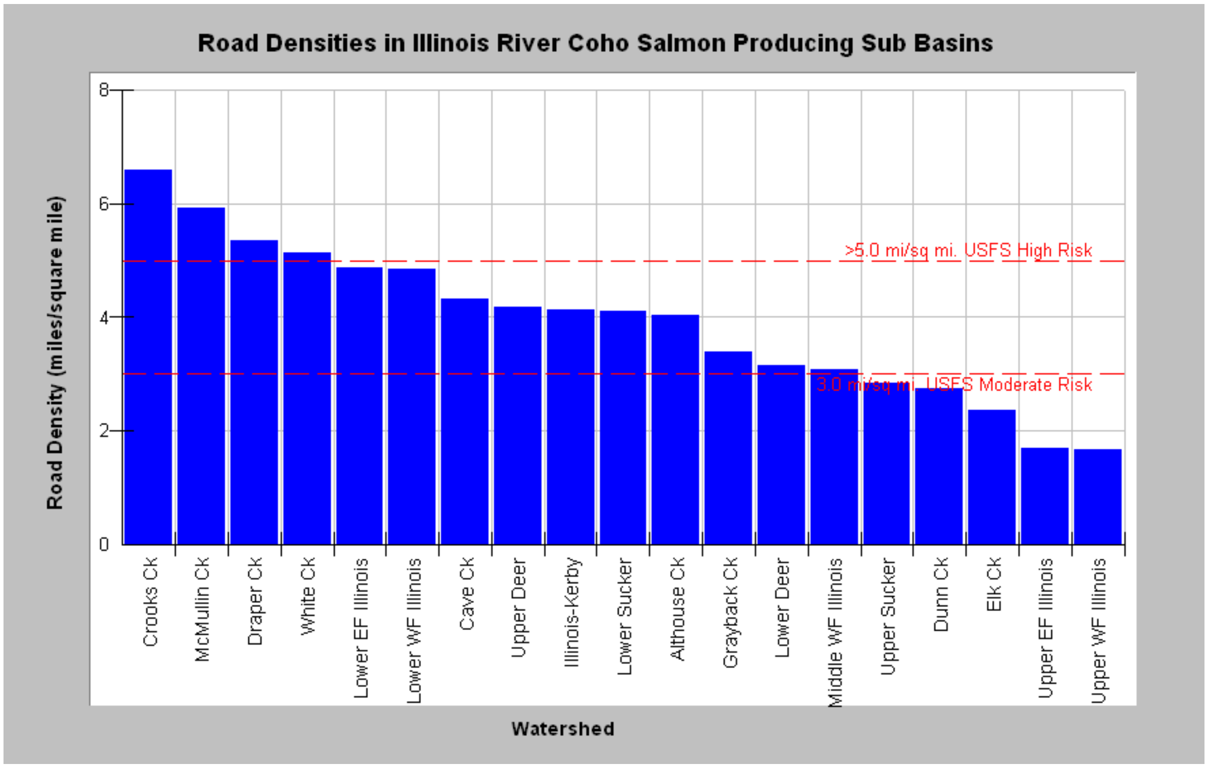

Figure 30-10. Road density in Illinois River coho salmon producing watersheds.

Dams and Diversions

Dams and diversions pose a very high threat to Illinois River coho salmon. Many diverted streams have the potential of drying during low flow periods (Thompson and Fortune 1970). Dry reaches were documented in Illinois River tributaries in late summer and fall 1967 including Deer, Anderson, Thompson, Elder, Little Elder, and Parker creeks. Many stream reaches still go dry annually. Figure 30-11 shows Deer Creek, which falls within high IP coho salmon habitat, running dry as a result of diversion in 2009. Studies of the Illinois River watershed conclude that flows are the most limiting factor for fisheries, coho salmon habitat continues to be dewatered, and water quality impairment continues as a result of flow depletion (Thompson and Fortune 1970; USFS 1997a, 1999a; BLM 2004b, 2005, 2006, 2007).

The two large dams in the Illinois River subbasin are at Lake Selmac (Figure 30-6) and the Pomeroy Diversion Dam approximately 0.5 miles below the convergence of the East Fork and West Fork Illinois. Pomeroy Dam is known to hinder salmonid migration in some seasons, particularly for downstream migrating juveniles (USFS 1999a). While passage has been improved, some small diversions still pose the risk of entraining juvenile coho salmon and smolts.

Figure 30-11. A high IP coho salmon reach of Deer Creek, a tributary to the Illinois River. Photo taken September 22, 2009.

Agricultural Practices

The extent of agriculture, while not large, coincides with broad alluvial valleys associated with high IP (>0.66) coho salmon habitat (Williams et al. 2008). Agricultural impacts include water diversion (BLM 1997, USFS 1997a), wetland filling, channelization and diking, riparian removal, channel simplification, and chemical application. It is likely that pesticides known to harm salmonids (NMFS 2008) are used in the region. However, information regarding pesticide and herbicide use in the Illinois River subbasin and the SONCC coho salmon ESU is unavailable (Riley 2009). Herbicide use in the nearby Upper Rogue subbasin has resulted in fish kills that included coho salmon (Ewing 1999).

Channelization/Diking

Channelization and confinement of mainstem and tributary reaches of the Illinois River is widespread. Disconnecting high IP coho salmon streams from their floodplains and constricting their channels into straight, narrow stream courses greatly diminishes their summer and winter habitat carrying capacity (BLM 1997). These activities also tend to reduce surface-groundwater connections that help maintain cool stream temperatures (ODEQ 2008).

Timber Harvest

Timber harvest levels were estimated to be between 10 to 25 percent on USFS and BLM lands in the East Fork Illinois River and Sucker, Grayback and Althouse creeks according to Landsat comparisons between 1972 and 1992 imagery. Many Illinois River tributaries are surrounded by harsh terrestrial conditions, such as decomposed granitic soils in upper Sucker Creek (USFS 1997a), that make re-establishing forests problematic. Logging in these types of locations can lead to very dry soil conditions if duff is removed or burned. Failure to re-establish forest cover can lead to increased fine sediment delivery to streams for decades. In addition, the Independent Multidisciplinary Science Team (IMST 1999) concluded that the Oregon Forest Practice Rules (OFPRs) for riparian protection, large wood management, sedimentation, and fish passage are not adequate to recover depressed stocks of wild salmonids. Approximately 81 percent of the land in the Illinois River population area is managed by the federal government; therefore, the threat from ongoing and future timber harvest will likely decrease.

Mining/Gravel Extraction

Potential impacts of mining on Illinois River salmonids threaten the ecological integrity of the area (Bredensteiner et al. 2003). The majority of the occupied IP in the Illinois River watershed occurs on federal lands (Figure 30-1), where mining access is permitted under the 1872 Mining Law. There are two gold mining claims under consideration on lower gradient federal lands in Sucker Creek, an area with high IP that currently supports juvenile coho salmon (Section 30.3). The location of such mining contributes to the severity of the threat to coho salmon in the Illinois River. Gold mining on federal lands often occurs on those lower gradient stream reaches that are located just upstream of private lands; these reaches are very important to coho salmon and they represent the best low gradient habitat available. Gravel mining has intensified along the lower East Fork Illinois and pits that can capture juvenile coho salmon, coho salmon smolts, and adult coho salmon during high flows events have been excavated in the floodplain. Most of these stranded fish perish if no outlet is available when flows recede.

Climate Change

The current climate is generally warm and modeled regional average air temperature suggests a large increase over the next 50 years (see Appendix D for climate change threat ranking methodology). Average air temperature could increase by over 2 ^{o}C in the summer and by 1 ^{o}C in the winter. Annual precipitation in this area is predicted to stay within the natural range of current variability; however seasonal patterns in precipitation may change (Mote and Salathe 2010). Van Kirk and Naman (2008) documented decreasing snow pack below 6,000 feet over the last 20 years in the Klamath Mountains. If this trend continues, the water supply will be affected in watersheds such as Deer, Grayback and Sucker creeks, and the upper East and West Fork Illinois rivers. Coho salmon juvenile and smolt rearing and migratory habitat are most at risk to climate change. Rising sea level may affect the quality and extent of wetland rearing habitat. Adult Illinois River coho salmon will be negatively affected by ocean acidification and changes in ocean conditions and prey availability (see Independent Science Advisory Board 2007, Portner and Knust 2007, Feely et al. 2008).

Road-Stream Crossing Barriers

Road densities in portions of the Illinois River subbasin are very high and stream-side roads are common. Culverts under road-stream crossings may block upstream migration for adults or passage for juveniles and smolts during low flow periods.

Hatcheries

Hatcheries pose a medium threat to all life stages of coho salmon in the Middle Rogue/Applegate River. The rationale for these ratings is described under the “Adverse Hatchery-Related Effects” stress.

Urban/Residential/Industrial

Rural residential development is expanding and may have a substantial impact on water supply in the Illinois River subbasin. Each landowner may use surface water from nearby streams or drill a well, which may in some cases be connected to, and deplete, surface flows (BLM 2004b). Rural residences can also contribute to pollution due to extensive road networks, leakage from septic systems, and the use of pesticides and herbicides.

High Intensity Fire

The potential for fire is great due to high summer air temperatures and degraded forest conditions. Early seral stage forests, which are common in this population’s range, lead to dry site conditions and increased fire risk (SO RC&D 2003). Recent extensive fires include the 1987 Silver Fire and the 2002 Biscuit Fire, which was the largest fire in Oregon history and burned a great deal of the western part of the watershed (Azuma et al. 2004). Much of the area that burned is serpentine terrain within the Kalmiopsis Wilderness, which has frequent fires due to sparse vegetation and dry site conditions resulting from naturally poor soils (USFS 1999a). However, the shallow soil depth and low topographic relief in this terrain lessen risk of mass wasting and sediment pulses to streams below. Coho salmon are not commonly found in serpentine watersheds, so fires in those watersheds do not directly impact the species.

Invasive Non-Native/Alien Species

Thompson and Fortune (1970) documented widespread presence of introduced warm water game fish in the Rogue River basin. Lake Selmac and private agricultural ponds in the Illinois River subbasin are noted as sources of these fish and ponds may be increasing in number with continued residential development (USFS 1999a). Competition or predation on juvenile coho salmon by most non-native warm water species is likely limited in the winter because warm water species are washed downstream by high winter flows. However, in the summer, warm water conditions created by flow depletion give these introduced species a competitive advantage over salmonids. Umpqua River pikeminnow have been documented in lower Sucker Creek (USFS 1999a). This species is of particular concern because it is adapted to swift rivers and may pose a risk of competition and predation on coho salmon smolts during spring out-migrations. A similar situation occurs in the Eel River basin in California where the introduction of the Sacramento pikeminnow has caused major ecological problems (Brown and Moyle 1990).

Fishing and Collecting

The recreational fishery for hatchery coho salmon in Oregon likely encounters more federally-listed coho salmon than does the Chinook salmon fishery that accounts for much of the bycatch mortality of SONCC coho salmon. This is because coho salmon are the targeted species in the recreational fishery. NMFS (1999) concluded that the exploitation rate associated with this and other freshwater fisheries in Oregon are not likely to jeopardize the continued existence of SONCC coho salmon (Good et al. 2005). The standard applied to make that determination was a jeopardy standard, not a species viability standard, because no recovery objectives to achieve species viability had been established for SONCC coho salmon at that time (NMFS 1999). Regional-scale effects may be enough to impede recovery of the Interior Rogue River diversity stratum, even if they are not severe enough to jeopardize the continued existence of the ESU. Specifically, wild coho salmon in the Rogue River basin likely experience more exploitation effects than those in other areas, because they co-occur with the adult hatchery coho salmon that were produced in the Rogue's Cole Rivers Hatchery, return to the Rogue River to spawn, and are targeted there by recreational fishermen. As of April 2011, NMS has not authorized future collection of coho salmon for research purposes in the Illinois River.

30.7 Recovery Strategy

The most immediate need for habitat restoration and threat reduction in the Illinois River subbasin is in those areas currently occupied by coho salmon in the following watersheds: West Fork Illinois River, Wood Creek, East Fork Illinois River, Althouse Creek, Sucker Creek, and Deer Creek. Unoccupied areas must also be restored to provide sufficient habitat to achieve coho salmon recovery. For example, the upper Briggs Creek watershed currently lacks coho salmon but has suitable water temperature, summer water flow, low stream gradient, and is entirely owned by the USFS; thus, if channel structure and floodplain connectivity were restored it could provide excellent habitat.

The severely degraded condition of habitat in the Illinois River subbasin, combined with the depressed coho salmon population size and distribution, significantly increases the risk of extinction of this inland coho salmon population which is expected play a critical role in recovery of the Interior Rogue River diversity stratum. The most important factor limiting recovery of coho salmon in the Illinois River is a deficiency in the amount of suitable rearing habitat for juveniles. The processes that create and maintain such habitat must be restored by restoring flow, increasing habitat complexity within the channel, restoring off-channel rearing areas, and reducing threats to instream habitat.

Table 30-4 on the following page lists the recovery actions for the Illinois River population.

Table 30-4. Recovery action implementation schedule for the Illinois River population.

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-IIIR.2.2.7	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Reconnect floodplains, wetlands, and off channel habitat	Private lands	2
SONCC-IIIR.2.2.7.1	*Assess habitat to determine where potential exists for floodplain reconnection. Prioritize sites and determine best means for reconnection at each site using tools such as hydrologic analysis*					
SONCC-IIIR.2.2.7.2	*Implement restoration projects that improve off channel habitats as guided by assessment results*					
SONCC-IIIR.2.2.8	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Population wide	3
SONCC-IIIR.2.2.8.1	*Develop program to educate and provide incentives for landowners to keep beavers on their lands*					
SONCC-IIIR.2.2.8.2	*Implement beaver program (may include reintroduction)*					
SONCC-IIIR.2.1.9	Floodplain and Channel Structure	Yes	Increase channel complexity	Improve suction dredging practices	Population wide	3
SONCC-IIIR.2.1.9.1	*Develop suction dredging regulations that minimize or prevent impacts to coho salmon. Consider special closed areas, closed seasons, and restrictions on methods and operations*					
SONCC-IIIR.2.1.34	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Population wide	2
SONCC-IIIR.2.1.34.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-IIIR.2.1.34.2	*Place instream structures, guided by assessment results*					
SONCC-IIIR.3.1.4	Hydrology	Yes	Improve flow timing or volume	Improve regulatory mechanisms	Population wide, especially East and West Forks of the Illinois, Deer, Sucker, Elk, and Althouse creeks	2
SONCC-IIIR.3.1.4.1	*Quantify groundwater withdrawal and determine maximum amount available for use without significantly reducing instream flows*					
SONCC-IIIR.3.1.4.2	*Study groundwater withdrawal and prevent development if insufficient supply exists*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-IIIR.3.1.5	Hydrology	Yes	Improve flow timing or volume	Improve regulatory mechanisms	Population wide, especially East and West Forks of the Illinois, Deer, Sucker, Elk, and Althouse creeks	3
SONCC-IIIR.3.1.5.1	*Establish a comprehensive statewide groundwater permit process*					
SONCC-IIIR.3.1.6	Hydrology	Yes	Improve flow timing or volume	Educate stakeholders	Population wide	3
SONCC-IIIR.3.1.6.1	*Develop an educational program about water conservation programs and instream leasing programs*					
SONCC-IIIR.5.1.16	Passage	Yes	Improve access	Remove barriers	Population wide	3
SONCC-IIIR.5.1.16.1	*Assess and prioritize barriers using the ODFW fish passage barrier database*					
SONCC-IIIR.5.1.16.2	*Remove barriers, guided by the assessment*					
SONCC-IIIR.7.1.10	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve long-range planning	Population wide	3
SONCC-IIIR.7.1.10.1	*Review General Plan or City Ordinances to ensure coho salmon habitat needs are accounted for. Revise if necessary*					
SONCC-IIIR.7.1.10.2	*Develop watershed-specific guidance for managing riparian vegetation. Consider larger riparian buffers in coho occupied habitat*					
SONCC-IIIR.7.1.11	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Grayback, Sucker, Elk, Althouse, and Deer creeks	3
SONCC-IIIR.7.1.11.1	*Determine appropriate silvicultural prescription for benefits to coho salmon habitat*					
SONCC-IIIR.7.1.11.2	*Thin, or release conifers, guided by prescription*					
SONCC-IIIR.7.1.11.3	*Plant conifers, guided by prescription*					
SONCC-IIIR.7.1.12	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	Privately held timberlands	2
SONCC-IIIR.7.1.12.1	*Revise Oregon Forest Practice Act Rules in consideration of IMST (1999) and NMFS (1998) recommendations*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-IIIR.7.1.31	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	Private lands	BR
SONCC-IIIR.7.1.31.1	*Develop HCPs or GCPs with interested owners of private timberlands*					
SONCC-IIIR.7.1.33	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	BLM lands	3
SONCC-IIIR.7.1.33.1	*Manage timber harvest (and associated activates) on Federal lands in accordance with the Aquatic Conservation Strategy of the NWFP to achieve riparian and stream channel improvements for coho salmon*					
SONCC-IIIR.10.2.13	Water Quality	Yes	Reduce pollutants	Educate stakeholders	Population wide	3
SONCC-IIIR.10.2.13.1	*Develop an educational program that promotes Salmon Safe methods for agricultural operations and Integrated Pest Management for rural residents*					
SONCC-IIIR.10.1.32	Water Quality	Yes	Reduce water temperature, increase disssolved oxygen	Improve regulatory mechanisms	Population wide	3
SONCC-IIIR.10.1.32.1	*Develop riparian placer mining regulations that minimize or prevent impacts to coho salmon and their habitat. Consider special closed areas, closed seasons, and restrictions on methods and operations*					
SONCC-IIIR.10.1.32.2	*Educate miners regarding the ESA, coho salmon, and effects to habitat from proposed mining activities*					
SONCC-IIIR.14.2.15	Disease/Predation/ Competition	No	Reduce predation and competition	Manage non-native species	Population wide	3
SONCC-IIIR.14.2.15.1	*Assess feasibility and benefits of eradicating non-native fish species*					
SONCC-IIIR.14.2.15.2	*Take measures to manage non-native fish species*					
SONCC-IIIR.1.2.35	Estuary	No	Improve estuarine habitat	Improve estuary condition	Rogue River Estuary	3
SONCC-IIIR.1.2.35.1	*Implement recovery actions to address strategy "Estuary" for Lower Rogue River population*					
SONCC-IIIR.16.1.17	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating salmonid fishery management plans affecting SONCC coho salmon	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3
SONCC-IIIR.16.1.17.1	*Determine impacts of fisheries management on SONCC coho salmon in terms of VSP parameters*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-IIIR.16.1.17.2	*Identify fishing impacts expected to be consistent with recovery*					
SONCC-IIIR.16.1.18	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Limit fishing impacts to levels consistent with recovery	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	2
SONCC-IIIR.16.1.18.1	*Determine actual fishing impacts*					
SONCC-IIIR.16.1.18.2	*If actual fishing impacts exceed levels consistent with recovery, modify management so that levels are consistent with recovery*					
SONCC-IIIR.16.2.19	Fishing/Collecting	No	Manage scientific collection consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating scientific collection authorizations affecting SONCC coho salmon	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3
SONCC-IIIR.16.2.19.1	*Determine impacts of scientific collection on SONCC coho salmon in terms of VSP parameters*					
SONCC-IIIR.16.2.19.2	*Identify scientific collection impacts expected to be consistent with recovery*					
SONCC-IIIR.16.2.20	Fishing/Collecting	No	Manage scientific collection consistent with recovery of SONCC coho salmon	Limit impacts of scientific collection to levels consistent with recovery	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3
SONCC-IIIR.16.2.20.1	*Determine actual impacts of scientific collection*					
SONCC-IIIR.16.2.20.2	*If actual scientific collection impacts exceed levels consistent with recovery, modify collection so that impacts are consistent with recovery*					
SONCC-IIIR.27.1.21	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Estimate abundance	Population wide	3
SONCC-IIIR.27.1.21.1	*Perform annual spawning surveys*					
SONCC-IIIR.27.1.22	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Develop survival estimates	Site to be determined	3
SONCC-IIIR.27.1.22.1	*Install and annually operate a life cycle monitoring (LCM) station*					
SONCC-IIIR.27.1.23	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Track life history diversity	Population wide	3

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-IIIR.27.1.23.1	*Describe annual variation in migration timing, age structure, habitat occupied, and behavior*					
SONCC-IIIR.27.1.24	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Track indicators related to the stress 'Fishing and Collecting'	Population wide	2
SONCC-IIIR.27.1.24.1	*Annually estimate the commercial and recreational fisheries bycatch and mortality rate for wild SONCC coho salmon.*					
SONCC-IIIR.27.2.25	Monitor	No	Track habitat condition	Track habitat indicators related to spawning, rearing, and migration	Population wide	3
SONCC-IIIR.27.2.25.1	*Measure indicators for spawning and rearing habitat. Conduct a comprehensive survey*					
SONCC-IIIR.27.2.25.2	*Measure indicators for spawning and rearing habitat once every 10 years, sub-sampling 10% of the original habitat surveyed*					
SONCC-IIIR.27.2.26	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Lack of Floodplain and Channel Structure'	All IP habitat	3
SONCC-IIIR.27.2.26.1	*Measure the indicators, pool depth, pool frequency, D50, and LWD*					
SONCC-IIIR.27.2.27	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Degraded Riparian Forest Condition'	All IP habitat	3
SONCC-IIIR.27.2.27.1	*Measure the indicators, canopy cover, canopy type, and riparian condition*					
SONCC-IIIR.27.2.28	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Altered Sediment Supply'	All IP habitat	3
SONCC-IIIR.27.2.28.1	*Measure the indicators, % sand, % fines, V Star, silt/sand surface, turbidity, embeddedness*					
SONCC-IIIR.27.2.29	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Impaired Water Quality'	All IP habitat	3
SONCC-IIIR.27.2.29.1	*Measure the indicators, pH, D.O., temperature, and aquatic insects*					
SONCC-IIIR.27.2.30	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Impaired Hydrologic Function'	All IP habitat	3
SONCC-IIIR.27.2.30.1	*Annually measure the hydrograph and identify instream flow needs*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-IIIR.27.1.39	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Refine methods for setting population types and targets	Population wide	3
SONCC-IIIR.27.1.39.1	*Develop supplemental or alternate means to set population types and targets*					
SONCC-IIIR.27.1.39.2	*If appropriate, modify population types and targets using revised methodology*					
SONCC-IIIR.27.1.40	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Measure VSP parameters of coho salmon in remote areas	Population wide	3
SONCC-IIIR.27.1.40.1	*Develop techniques to estimate abundance, productivity, spatial structure, and diversity in remote areas.*					
SONCC-IIIR.5.1.36	Passage	No	Improve access	Remove barriers	BLM lands	3
SONCC-IIIR.5.1.36.1	*Evaluate and prioritize barriers for removal*					
SONCC-IIIR.5.1.36.2	*Remove barriers*					
SONCC-IIIR.8.1.1	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	USFS and BLM lands	3
SONCC-IIIR.8.1.1.1	*Assess and prioritize road-stream connection, and identify appropriate treatment to meet objective*					
SONCC-IIIR.8.1.1.2	*Decommission roads, guided by assessment*					
SONCC-IIIR.8.1.1.3	*Upgrade roads, guided by assessment*					
SONCC-IIIR.8.1.1.4	*Maintain roads, guided by assessment*					
SONCC-IIIR.8.1.2	Sediment	No	Reduce delivery of sediment to streams	Improve regulatory mechanisms	Population wide	3
SONCC-IIIR.8.1.2.1	*Develop grading ordinance for maintenance and building of private roads that minimizes the effects to coho*					