

Biological Assessment - Fish

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Abstract: The Illinois River watershed has a flashy stream system that supports several species of native and non-native fish. The population sizes of native salmonids are below historic and desired levels. The streams are managed to protect native salmonids, while the lakes are managed to provide a harvest of stocked trout and warmwater fish. High summer water temperatures and degraded habitat are thought to limit salmonid populations. Increasing summer stream flows would lower summer water temperatures; thus, would improve the habitat for the native salmonids. Increasing the complexity of stream channels, restoring riparian vegetation, and improving the water retention capacity of the watershed would also be beneficial.

Introduction

Much of the Illinois River watershed is characterized by mountainous terrain with steep, rocky slopes. The soils tend to be porous, and do not store water well. Most of the precipitation comes in the winter in the form of rain. The summers are typically hot and dry. Consequently, the streams in the Illinois basin tend to be extremely flashy. The streams often experience very high flows during the winter that scour the channel. This results in a lot of bedload movement, and tends to flush woody material out of the larger streams. During the summer, the stream flows drop to very low levels, and the water temperatures get quite high.

These conditions have a significant effect on the ability of the streams in the Illinois basin to support populations of both native and non-native species of fish. Land use practices within the basin have tended to increase these seasonal extremes in water flows and temperatures; thus, have farther influenced the ability of the streams to provide habitat for fish.

Summary of Concerns

1. Low stream flows and high water temperatures limit the production of salmonids during the summer.
2. Simplified stream channels and degraded riparian areas limit the carrying capacity of the streams for salmonids.
3. Land use practices have increased the flashiness of the stream flows.
4. Irrigation diversions and road crossings hinder the migration of salmonids.
5. There are no good inventories being done to access the population levels of the native salmonids in the basin.

Species of Fish in the Illinois Watershed

The streams and lakes in the Illinois Watershed support a wide variety of native and non-native species of fish (Table 1 below). In recent years, a lot of attention has focused on the native salmonids. Those found in the Illinois basin include fall Chinook salmon (Appendix A, Maps 13 & 13-c), coho salmon (Appendix A, Maps 13 & 13-d), winter steelhead (Appendix A, Maps 13 & 13-b), summer steelhead (Appendix A, Maps 13 & 13-b), rainbow trout (Appendix A, Maps 13 & 13-a), and cutthroat trout (Appendix A, Maps 13 & 13-a). Their life-history patterns are similar to those of populations in other coastal watersheds. The winter steelhead in the Illinois basin have a longer average stream and ocean residency than those in the rest of the Rogue basin, and they do not exhibit the half-pounder life history. The Illinois basin does not support a spawning population of summer steelhead; however, summer steelhead do occasionally enter the lower Illinois River as they migrate up the Rogue River. This was particularly true prior to the construction of Lost Creek Reservoir, when the Illinois River provided a thermal refuge (Rivers, 1963).

Resident populations of rainbow trout are found in some headwater areas. Rainbow trout in the lower-gradient streams are generally residualized steelhead. The Oregon Department of Fish and Wildlife stocks rainbow in some lakes within the watershed. Brook trout are also stocked in several of the high lakes. Naturally reproducing populations of brook trout are also found in several high lakes and headwater streams.

Table 1. Species of fish present in the Illinois watershed and their natural history.

Common Name	Scientific Name	Indigenous (Yes/No)	Life History	Distribution
Fall Chinook salmon	<i>Oncorhynchus tshawytscha</i>	Yes	Anadromous	Larger streams
Coho salmon	<i>Oncorhynchus kisutch</i>	Yes	Anadromous	Low-gradient streams
Winter steelhead	<i>Oncorhynchus mykiss</i>	Yes	Anadromous	Low to moderate-gradient streams
Summer steelhead	<i>Oncorhynchus mykiss</i>	Yes	Anadromous	Lower river only
Cutthroat trout	<i>Oncorhynchus clarki</i>	Yes	Anadromous	Very low in the basin only
			Fluvial	Low to moderate-gradient streams
			Resident	Headwater streams
White sturgeon	<i>Acipenser transmontanus</i>	Yes	Anadromous	Lower river only
Pacific lamprey	<i>Lampetra tridentata</i>	Yes	Anadromous	Low to moderate-gradient streams
Rainbow trout	<i>Oncorhynchus mykiss</i>	Yes	Resident	Scattered in streams, lakes, and ponds
Sculpins	<i>Cottus</i> sp.	Yes	Resident	Widespread in streams

Klamath small-scale sucker	Catostomus rimiculus	Yes	Resident	Lakes and low-gradient streams
Speckled dace	Rhinichthys osculus	Yes	Resident	Low-gradient streams
Brook trout	Salvelinus fontinalis	No	Resident	High lakes and headwater streams
Largemouth bass	Micropterus salmoides	No	Resident	Widespread in lakes and ponds
Black crappie	Pomoxis nigromaculatus	No	Resident	Widespread in lakes and ponds
Bluegill	Lepomis macrochirus	No	Resident	Widespread in lakes and ponds
Pumpkinseed sunfish	Lepomis gibbosus	No	Resident	Lakes and ponds
Green sunfish	Lepomis cyanellus	No	Resident	Lakes and ponds
Brown bullhead	Ictalurus nebulosus	No	Resident	Widespread in lakes and ponds
Carp	Cyprinus carpio	No	Resident	Lakes and low-gradient streams
Red-sided shiner	Richardsonius balteatus	No	Resident	Low-gradient streams
Golden shiner	Notemigonus crysoleucas	No	Resident	Lake Selmac
Umpqua squawfish	Ptychocheilus umpquae	No	Resident	Low-gradient streams

Several species of warmwater gamefish have been introduced into the watershed, and have established self-sustaining populations in many of the lakes and ponds. Largemouth bass, black crappie, bluegill, and brown bullhead are widely distributed and abundant in the Illinois Valley. Lake Selmac supports a popular warmwater fishery.

Several species of minnows have also been introduced into the Illinois watershed. Carp and red-sided shiners have long been established in ponds and low-gradient streams. Golden shiners were illegally introduced into Lake Selmac. Umpqua squawfish were illegally introduced into the Rogue basin in 1978 and rapidly spread into the Illinois River and increased in abundance during the 1980's.

Population Status and Trends

There is concern about the health of many of the populations of native fish in the Illinois watershed. It is believed that the abundance of all the native salmonids are significantly below historic levels. The population data that is available supports this belief; however, there is little good population data. The only long-term data available is from the salmon/steelhead punch cards (Table 2). This gives estimates of the total number of each run of salmon and steelhead that were harvested each year by anglers from 1953 through 1991. Since 1992, the angling regulations require that all salmon and steelhead caught in the Illinois River be released; therefore, angler harvest is no longer available as a population index. While the angler harvest does indicate general trends in fish population

abundance, it is not an absolute measure of changes in abundance since other factors besides fish population abundance affect the angler harvest rate.

Table 2. Estimated angler harvest of salmon and steelhead from the Illinois River during 1953 through 1991.

Run Year	Summer Steelhead	Winter Steelhead	Total Steelhead	Spring Chinook	Fall Chinook	Coho	Total Salmon
1953			2824				145
1954			2231				123
1955			N/A				N/A
1956			2089				154
1957			1905				171
1958			1862				122
1959			3374				209
1960			2010				270
1961			842				63
1962			1052				N/A
1963			1188				89
1964			936				85
1965			1088				61
1966			1472				101
1967			966				112
1968			1935				123
1969	38	2395	2433				89
1970	189	3444	3633				170
1971	69	2699	2768		84		145
1972	41	1893	1934		211		345
1973	62	2491	2553		135		524
1974	150	2815	2965		295		323
1975	120	1772	1892		182		182
1976	97	641	738		56		56
1977	149	1597	1746	111	183		294
1978	25	638	663	0	88	0	88
1979	0	534	534	3	195	3	201
1980	0	1261	1261	0	41	3	44
1981	0	797	797	0	12	0	12
1982	22	384	406	6	0	0	6
1983	0	526	526	0	60	0	60
1984	0	1150	1150	0	3	6	9
1985	0	606	606	0	8	0	8
1986	0	995	995	0	4	11	15
1987	0	403	403	0	67	0	67
1988	0	550	550	47	98	0	145
1989	0	233	233	4	232	4	240
1990	0	171	171	0	41	6	47
1991	0			23	17	0	40

Note: Steelhead data for years prior to 1969 is for calendar year.

The angler harvest data indicates a downward trend for steelhead since the mid-1970's. Up through 1975, the average annual harvest was 1,998 steelhead; however, after 1975, the harvest averaged only 719 steelhead per year. Currently the steelhead in southern Oregon and northern California are a candidate species for listing under the Endangered Species Act. Most of the steelhead that use the Illinois basin are of the winter race. Summer steelhead do not spawn in the Illinois basin, and their use of the lower Illinois River as a thermal refuge dropped off significantly after 1978 when water releases from Lost Creek Reservoir reduced temperatures in the Rogue River.

The fall Chinook salmon population in the Illinois basin is thought to be depressed. The punch card data indicates a downward trend, but there is too little information to be conclusive. Chinook salmon in southern Oregon and northern California have been proposed for listing under the Endangered Species Act. Like summer steelhead, spring Chinook salmon do not spawn in the Illinois basin, and their use of the lower Illinois River as a thermal refuge dropped off significantly after the completion of Lost Creek Reservoir.

Coho salmon are listed as a threatened species under the Endangered Species Act in southern Oregon and northern California. While the population is depressed, the Illinois basin is thought to support a high proportion of the wild coho salmon that use the Rogue River system. There is, however, little good information available about the size of the population in the Illinois basin.

Pacific lamprey and anadromous cutthroat trout are experiencing declines in their population levels over a large portion of their range. Although there is little information available for these species in the Illinois basin, it is likely these populations are declining here also.

The Illinois Falls, which is located on the mainstem of the Illinois River at river mile 39.5, has been modified to improve the conditions for the upstream migration of salmon and steelhead. The falls were blasted several times between 1910 and 1935 (Busby et. al., 1993). A fish ladder was constructed in 1956 and 1957. Currently salmon and steelhead are able to pass over the falls at most flows. There has recently been some debate over the ability of these fish to pass over the falls, thus use the upper part of the basin, prior to these modifications. Cole Rivers (1963) stated that the falls were a partial barrier to the upstream migration of anadromous fish, especially Chinook and coho salmon, prior to the modifications. The falls is, however, completely inundated during high winter flows, so it would have allowed some passage, especially for steelhead, which migrate during the high-flow period.

Management Practices

Activities undertaken to manage the fisheries resources in the Illinois watershed are intended to 1) conserve native fish populations and 2) provide recreational fishing opportunities. Because of the presence of several species of native salmonids that are

experiencing some level of decline in abundance, most of the management efforts have been directed toward the conservation of these populations. The Illinois basin does, however, provide some important recreational fishing opportunities: The Illinois River provides a quality experience for winter steelhead anglers looking for solitude and beautiful scenery. Lake Selmac is a popular destination for warmwater anglers and for families looking for the opportunity to easily catch fish. Many of the high lakes and remote ponds are used heavily by trout anglers. Consequently, managing these fisheries is also important.

Hatchery Practices

The Oregon Department of Fish and Wildlife currently manages the Illinois River system for wildlife fish only. This means that no fish are stocked in the flowing waters within the basin. There has, however, been some stocking of trout and steelhead in past (Cramer, 1992). Rainbow trout, probably legal-sized, were stocked into the river and several of the larger streams in 1928, from 1942 through 1947, and from 1954 through 1977. Surplus adult steelhead were planted in the basin from 1978 through 1980. The Salmon and Trout Enhancement Program (STEP) released winter steelhead fry from hatchboxes from 1985 through 1989.

The Oregon Department of Fish and Wildlife stocks legal-sized rainbow in Lake Selmac and Spalding Pond several times during the spring and early summer each year. They also stock Tannen, East Tannen, Bolan, and Babyfoot Lakes with brook trout fingerlings biannually.

Harvest

Because of concerns for the health of several of the populations of native fish in the Illinois basin and the emphasis for managing the streams for wild fish, the angling regulations for the streams in the basin are designed to protect wild fish. In 1992, the angling regulations were modified to require catch and release angling only and the use of artificial flies and lures only in the Illinois River. Then in 1993, all of the tributaries were closed to all angling to protect juvenile salmon and steelhead. This left only the mainstem of the Illinois River below Pomeroy Dam open to angling. Lakes and ponds within the watershed are open to angling under the general regulations, with the exception of Lake Selmac where harvest of largemouth bass is restricted to promote a trophy fishery.

Habitat Enhancement

A number of Federal, State, local, and private agencies are working to restore and enhance the habitat for the native fish populations within the Illinois Watershed. One of the most urgent projects is the restoration of instream flows during the summer. The Oregon Department of Fish and Wildlife has received instream water rights on most of the streams in the basin; however, these rights are junior to most of the out-of-stream rights. The Oregon Water Trust, a private, nonprofit organization, made the acquisition of water rights in the Illinois basin a top priority. They have negotiated the purchase and lease of water rights from the holders and transferred them to instream rights. Some of

these rights have early priority dates and are extremely valuable in providing increased flows for fish.

A lot of effort is also being placed on improving fish passage. A multi-agency task force is working to replace the push-up dams traditionally used by irrigators in the basin with other types of diversion structures that allow unrestricted passage of adult and juvenile fish, as well as reduce the annual disturbance to the stream channels. More emphasis is being placed on making road crossing more conducive to upstream migration of both adult and juvenile fish. Bridges are being used instead of culverts in more situations, and old crossings that do not provide adequate passage are being modified or replaced. Considerable effort is also being expended on screening irrigation withdrawals. Several incentive programs are in place to encourage irrigators to screen their diversions and to help defray their expenses.

The United States Forest Service, Bureau of Land Management, Oregon Department of Fish and Wildlife, and others have placed logs and boulders in streams and created alcoves and side channels in an attempt to improve the quality of fish habitat in the Illinois basin. The Siskiyou National Forest has done a lot of instream habitat enhancement work in the upper reaches of the streams used by salmon and steelhead in an attempt to increase the carrying capacity in these reaches, thereby encouraging more fish to remain in these areas with better water quality during the summer.

In recent years, much more emphasis is being placed on looking more at the watershed as a whole, rather than just focusing on the streams. This approach facilitates the restoration of ecosystem function rather than just trying to correct the symptoms of an unhealthy system. This is a significant improvement in the way we try to manage the habitat for fish and other aquatic organisms.

Inventory

The Oregon Department of Fish and Wildlife conducts a variety of surveys in an effort to monitor the distribution and abundance of the various fish populations in the Illinois basin. As stated previously, angler harvest records were used in the past to monitor population levels of most of the anadromous species; however, since requiring catch and release angling in 1992, that source of information is no longer available. The Department currently conducts spawning ground surveys for coho salmon. While these surveys do give us some idea of the relative abundance of coho in the basin, they have not been going long enough to provide information about long-term trends in population health. The Department also does periodic surveys of the fall Chinook salmon spawning grounds; however, limits in the availability of personnel make these surveys so sporadic that the data is of little value for evaluating the status of the population.

Several other techniques have been tried to monitor trends in population abundance, but have not proved successful: Using hydro-acoustics to count adults as they migrate upstream was cost prohibitive and was not practical in the Illinois River because of the significant fluctuations in flow. Using downstream migrant traps to monitor smolt out-

migration was tried for several years, but was also not practical due to the frequent high-flow events that occur during the migration period. Spawning ground surveys for winter steelhead provided little information due to the large geographic area and time period over which winter steelhead spawn. Snorkeling surveys to count juvenile salmon and steelhead were also tried, but were of little value in assessing changes in population abundance due to variations in fish distribution.

The Oregon Department of Fish and Wildlife and the United States Forest Service also conduct surveys to determine the presence or absence of various fish species within the basin. These surveys are used to classify streams as to their importance for fish, which is used in making land use decisions and for determining the range of various species within the basin.

The Oregon Department of Fish and Wildlife sets gillnets in the lakes within the watershed on a regular basis to assess the health of the fish populations in those lakes, evaluate stocking levels, and monitor the spread of illegally introduced exotic fish.

Habitat and Management Problems

There are several problems that effect the native fish populations in the Illinois Watershed, as well as the management of those fish. The most serious is summer water temperatures. The Illinois River and all of the major tributaries have water temperatures high enough to limit salmonid production (Appendix A, Map 16). (Also see Water Temperature Analysis section.) Most of the fish-bearing streams in the watershed are listed as water quality limited by the Department of Environmental Quality because of high water temperature (see Water Quality Assessment section).

The optimum water temperature for the native salmonids in the Illinois watershed is 55 degrees Fahrenheit. At temperatures above 68 degrees Fahrenheit, their condition and survival declines significantly. As water temperatures increase, oxygen levels in the water decrease, the virulence of many pathogens increase, and the metabolism rate of the fish increases. In many of the streams in the Illinois basin, the metabolism rate of the fish is high enough during the summer that they cannot obtain enough food to meet the metabolic requirement and the fish lose weight.

Many of the streams in the Illinois River system naturally have high water temperatures during the summer; however, human-caused alterations to the watershed have resulted in lower summer stream flows and increased solar radiation; thus, have made this situation worse. Extensive water withdrawals in the Illinois Valley are a significant contributor to the lack of adequate stream flows; thus, the high water temperatures during the summer.

Stream channels have been simplified by activities such as gold mining, gravel removal, stream channelization, and the removal of woody material and riparian vegetation. Some of the stream reaches most affected by these activities include the section of Sucker Creek above Grayback Creek where extensive gold mining has occurred and sections of the forks and mainstem of the Illinois River where extensive gravel removal has

occurred. These simplified stream reaches lack many of the components needed to provide suitable habitat for salmonids, such as woody material for cover and pools and backwater areas for over-wintering habitat.

Land use practices have increased the rate of runoff and reduced the water storage capability of the watershed. This has resulted in increased flows during high-water events and reduced flows during the summer and fall. The increased flows during high-water events cause increased channel erosion, reduced channel stability and the transport of woody material from the larger streams. These reduce the complexity of the streams; thus, the quantity and quality of habitat available to the fish. The increased flows also increase the amount of bedload movement, which causes increased damage to redds. The reduced flows during the summer and fall are a significant contributor to the temperature problems in many of the streams. The Deer Creek system, where extensive timber harvest has occurred, is a good example of this situation. Other land use practices that contribute to this problem include road building, residential and commercial development, land clearing and wetland alteration.

The removal of riparian vegetation has also negatively impacted the fish populations in the watershed. The riparian vegetation is an important part of the stream ecosystem. It helps stabilize the banks and prevent erosion, which is important for providing stable habitat for fish and especially for the survival of eggs in the redds. It provides a source of woody material, which is important for providing cover for fish and for developing channel complexity in smaller streams. It provides shade to the streams, which reduces solar radiation; thus, reduces increases in water temperature. It provides a thermal barrier between the streams and the upland areas that helps to maintain a cooler microclimate around the streams. It provides a source of food and nutrients to stream ecosystem. A sufficient riparian zone helps to filter out turbidity and pollutants from runoff water as it enters the stream. It also helps to moderate stream flows by absorbing water during high flow periods and releasing water during low flow periods.

Artificial barriers to fish migration have been a problem. Gravel dams pushed up to divert irrigation water were often left in after the irrigation season ended. These were serious barriers to upstream migration until high flows washed them out. This usually did not happen until after the Chinook and coho salmon had migrated; therefore, they limited the areas these fish could access. Unscreened water diversions carried downstream migrating salmon and steelhead out of the streams, usually resulting in mortality. Poorly designed road crossings also limited fish passage. A lot of work has been done in recent years to address these passage problems. Consequently, the situation has improved greatly.

Non-native fish also pose a problem to native fish populations through competition for food and living space and by preying on juveniles. Umpqua squawfish have rapidly expanded their range and increased in numbers in the Illinois basin in recent years. They have a competitive advantage over the native salmonids in the warm, slow-moving water that is prevalent during low-flow periods.

Many of the above habitat problems are caused by the activities of people who are unaware of the impacts. There are, however, a lot of problems caused by individuals who are aware of the impacts, but either do not care or feel that the benefits they derive from the harmful activities outweigh the damage they cause. In most situations, adequate programs and laws do exist to protect the resources from these harmful activities; however, many of the agencies charged with administering these programs and laws have been quite lax in doing so.

In addition to the habitat problems, management of the fish populations in the Illinois watershed is complicated by the lack of good population information. As discussed in the "Inventory" section above, several techniques have been tried; however, none have yielded acceptable result.

Recommended Solutions

Increasing summer flows and reducing summer water temperatures should be the highest priority for restoring the Illinois watershed and increasing its ability to support populations of native salmon, steelhead and trout. Doing so would significantly increase the amount of habitat available to these fish during the summer. It would increase the growth rate, improve the condition and increase the survival rate of these fish. It would also shift habitat conditions to be more favorable for the native salmonids and less favorable for the introduced Umpqua squawfish.

Improving channel conditions should also be a high priority. This would benefit the native salmonids by providing additional habitat, especially during the winter when the demand for complex cover is the highest; thereby, increasing the carrying capacity of the streams. It would also benefit streamside property owners, by improving the stability of the channel.

There are a number of actions that can be undertaken to help achieve the above objectives. Focusing additional effort toward maintaining and enhancing instream flows could make rapid improvements to the summer flow and temperature problems. Reducing the amount of illegal water withdrawals, both by controlling withdrawals by people without water rights and controlling excessive withdrawals by people with water rights, would leave more water to satisfy legal water rights, including those for in-stream flows. Improving the efficiency of existing irrigation systems would also make more water available. Converting out-of-stream water rights to in-stream water rights, especially those with an early priority date, is a very effective way to provide additional water for fish. Leasing out a water right can also be an effective way for a water right holder to preserve their right during a period when they do not need to use the water. Oregon Water Trust can be very helpful in working out purchase and lease agreements that are beneficial to both the water right holder and the fish.

The development of water storage facilities that would be used to augment summer flow has been proposed by a number of sources. Such facilities could be used to improve flow

and temperature conditions in some small tributaries. Because of the dichotomous branching of the Illinois watershed, one large facility would not be effective. Creating enough storage capacity to improve conditions over a significant portion of the basin would require a tremendous investment. There would also be significant impacts to existing resources that would have to be addressed.

Protecting and enhancing stream channels and riparian areas are important components of a watershed restoration effort. Healthy stream channels provide a variety of habitat types for fish and other aquatic organisms, tend to be more stable and are better able to transport bedload. Woody material is an important component of the stream channels. It provides cover for fish, reduces water velocities, and helps to create channel features such as pools. Healthy riparian areas help to stabilize the stream channels, protect water quality, control water temperature, and contribute woody material and nutrients to the streams. Adding structure to stream channels and planting riparian vegetation can speed the recovery of some degraded areas; however, protecting stream channels and riparian areas from artificial disturbance is the most beneficial thing that can be done to insure the health of these areas.

Protecting and enhancing the functions of the watershed are also important. A healthy watershed delivers good-quality water to the streams. It moderates the stream flows throughout the year by absorbing water during wet periods and releasing it during dry periods. There are a number of activities that can be done to improve the ability of the watershed to store and clean water. Decommissioning and revegetating unnecessary roads and ditches is one of the best ways to reduce the rapid run-off of water. These structures intercept water and rapidly transport it down slope to the streams, often with pollutants. Eliminating them allows the water to slowly move down slope or soak into the ground. Revegetating and reforesting disturbed areas also slows run-off and allows more water to soak into the ground, as well as reduces the amount of sediment that washes into the streams.

In addition to the above activities intended to restore the natural functioning of the watershed and stream ecosystems, educating the residents and landowners about the importance of protection and restoration activities is important to the success of the watershed restoration program. Informing appropriate people about programs to assist with installing fish screens, improving fish passage, or converting water rights not only benefits the resources, but also benefits those people. Increasing awareness of and compliance with environmental laws also would be beneficial to both the citizens and the resources within the watershed.

Being able to accurately estimate abundance and monitor changes in the populations of fish that inhabit the Illinois watershed is necessary in order to evaluate their health and the effectiveness of the watershed restoration efforts. It is, therefore, important to have good population inventories for each of the major species of fish. To meet this objective, the spawning-ground surveys for coho salmon should be continued and those for fall Chinook salmon should be resumed. Presence/absence surveys to establish the

distribution of the various species should also be continued. Developing a technique to accurately inventory each of the populations of anadromous salmonids in the Illinois basin annually would be extremely useful. Several techniques have been tried to either count adults as they migrate upstream or smolts as they migrate downstream. Due to the extreme fluctuations of flow in the Illinois River, none of these techniques proved to be successful. Efforts should, however, continue to develop a technique that would be effective.

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