



Aquatic Biota

WHAT IS THE RELATIVE IMPORTANCE TO FISHERIES PRODUCTION?

The Illinois River is a tributary to Rogue River. The Rogue River produces more anadromous fish than any other coastal river in Oregon. This productivity depends upon the available fish habitat, riparian conditions, and diversity of aquatic fauna found on small and large tributaries to Rogue River, such as the Middle Illinois River. Adult fish counts within the Rogue River basin are made at Gold Rey Dam, located in Gold Hill, OR. Average adult fish counts over Gold Rey Dam from 1942-1995 for all salmonids ranged from 2,388 for coho to 31,801 for spring chinook (Table 1). Additional information on numbers are available by calling Army Corps of Engineers at 1-800-472-2434.

Table 1. Adult fish	Spring Chinook	Fall Chinook	Coho	Summer Steelhead	Winter Steelhead
Average	31,801	3,512	2,388	6,256	9,331

Anadromous fish stocks present in the middle Illinois River basin are fall chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), winter steelhead (*O. mykiss*), searun cutthroat trout (*O. clarki*), resident cutthroat trout and rainbow trout. These anadromous species are important fish stocks regarded as *ESU s (Evolutionarily Significant Unit). Non-anadromous and introduced fish species are white sturgeon, eastern brook trout, large mouth bass, black crappie, bluegill, brown bullhead, green sunfish, pumpkinseed, umpqua squawfish, red-side shiners, longnose dace, speckled dace, three-spine stickleback, carp, Cottidae sp., lower Klamath sucker, bridgelip sucker, and pacific lamprey. Brook trout and large mouth bass were introduced fish species in the headwaters of the Illinois river. Black croppie, blue-gill, brown bullhead, and green sunfish are fish species used to stock Lake Selmac and other ponds on private land. These fish eventually made it to the middle Illinois river as a result of wash outs from ponds and lakes during high flows. Most warm-water fish are now able to maintain reproducing populations within the Illinois drainage. Umpqua squawfish are now present within the lower reaches of Sucker Creek, a tributary to the Illinois River.

WHAT IS THE KNOWN FISH DISTRIBUTION?

Southern OR and California Coastal Chinook

Status: USDA FS Sensitive, Candidate species for listing



The Southern OR and California Coastal Chinook was proposed for listing as a threatened species on March 9, 1998. A final listing determination is being deferred until September 1999. The ESU includes all naturally spawned populations of chinook salmon from rivers and streams between Cape Blanco, Oregon (excluding the Elk River), and San Francisco Bay, California, excluding populations in the Klamath River Basin upstream from the confluence of the Klamath and Trinity Rivers.

Critical habitat is proposed to include all river reaches and estuarine areas accessible to chinook salmon in the drainages of San Francisco and San Pablo Bays, westward to the Golden Gate Bridge, and includes all estuarine and river reaches accessible to proposed chinook salmon on the California and southern Oregon coasts south of Cape Blanco (inclusive). Excluded are the Klamath and Trinity Rivers upstream of their confluence. Also excluded are areas above specific dams or above longstanding naturally impassable barriers. More detailed critical habitat information for this ESU can be found in the March 9, 1998 *Federal Register* notice.

Lost Creek Dam (Rkm 253) eliminated one-third of the spawning habitat of spring-run chinook salmon in the Rogue River. Additionally, changes in river flow and temperature have allowed fall-run chinook salmon to spawn in more upstream locations and increased the opportunities for interbreeding between fall and spring runs (ODFW 1990). Fall-run chinook are present throughout the mainstem of the Illinois River, usually through at least June (ODFW 1988). Their distribution includes 1.9 mi in Fall Ck, 4.4 mi in Josephine Ck, 1.4 mi in Fiddler Gulch, and 2.0 mi in Canyon Ck (Table 2). No stronghold areas have been identified for chinook within the middle Illinois River basin.

Table 2. Miles of distribution for salmonids within the Middle Illinois River Watershed (USFS/BLM/ODFW data). *Rmi*=River mile

	Southern OR/ Northern CA Coho	Southern OR/CA Coasts Chinook	Southern OR/CA Coasts Cutthroat	Klamath Mtns Province Steelhead
Mainstem of Illinois River	<i>Fish present throughout mainstem, total Rmi = 23.6</i>			
Daily Ck	0	0	2.3	1.3
Rancherie Ck West Fork	0.6	0	4.0	3.0
Fall Ck	1.9	1.9	6.7	2.6
McGuire Gulch	0	0	1.0	0
Store Gulch	0	0	2.0	0
Sixmile Ck	1.2	0	3.5	2.5
Days Gulch	0	0	1.6	1.7
Fiddlers Gulch	0	1.4	2.9	2.9
Canyon Ck	0	2.0	9.7	6.2
Josephine Ck	0	4.4	13.6	9.7

Southern OR/Northern California Coho

Status: Federal Threatened

(FederalRegister/Vol. 62, No. 87/ Tuesday, May 6, 1997)

The Southern OR/Northern California Coho was listed as a threatened species on May 6, 1997. The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California.

Critical habitat for the Southern OR/Northern California coho encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive. Critical habitat includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). Adjacent riparian zones have been redefined and are now based on a functional (rather than quantitative) description. Critical habitat includes riparian areas that provide the following functions: shade, sediment, nutrient or chemical regulations, streambank stability, and input of large woody debris or organic matter. It is important to note that habitat quality is intrinsically related to the quality of riparian and upland areas and of inaccessible headwater or intermittent streams which provide key habitat elements crucial for coho in downstream reaches. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the May 5, 1999 *Federal Register* notice.

_____ Coho in the Middle Illinois watershed extend from the north to south boundary of the watershed, up 1.9 mi in Fall Ck and 1.2 mi in Sixmile Ck. No stronghold areas for coho have been identified within the middle Illinois River basin.

South Coast/Lower Rogue River Steelhead

Status: USDA FS Sensitive, Candidate species for listing

South coast winter steelhead populations in the small coastal streams from Cape Blanco to the Oregon/California border appear to have a stable trend over the last few decades, but are currently at lower than 1970s levels, as indicated from punchcard information. The populations appear to vary in size following cycles probably associated with ocean productivity, but show no long-term trend. Land management activities, including logging and road building, have impacted critical steelhead habitat along the southern Oregon coast where watersheds are particularly unstable.

The winter steelhead population in the Illinois River has declined based on catch records. Sports harvest declined from 2,500 fish in the 1970s to less than 200 fish in 1992. Irrigation withdrawals have been a major impact to steelhead production in the Illinois basin, and the impacts were particularly severe during the recent drought. Other land management activities, such as logging and mining, have also reduced productive steelhead habitat in the basin.

There is only one steelhead hatchery program in this group. The program releases 50,000 smolts in the Chetco River using a locally developed broodstock. Between 1969 and 1977 the hatchery program released Asea stock. Straying of immature upper Rogue River hatchery summer steelhead half-pounders has been documented in several of these populations. However, since these strays are subadults, interbreeding with hatchery fish has not been a problem. Less than 5% hatchery fish released stray into the Illinois River basin.

Harvest regulations allow taking wild fish in this group except in the Illinois River, where no trout, salmon or steelhead can be kept.

Most resident rainbow trout populations in this group are isolated above natural or artificial barriers. Only populations in the lower Rogue River, including the Illinois River and in the Chetco River, are sympatric with winter steelhead. Headwater populations in the Smith, Chetco, Pistol, and Elk rivers are all located on National Forest lands. The populations are not monitored, but their abundance is likely limited by habitat constraints. The Illinois River trout population appears to be much smaller than that observed in the 1950s (Rivers 1991).

No hatchery trout are released into these coastal streams. Legal-sized rainbow trout were planted in Illinois tributaries until 1977. Headwater lakes in the Illinois Basin are still planted.

Southern OR/CA Coast Cutthroat Trout (*Salmo clarki*)

Status: USDA FS Sensitive, Candidate species for listing

The Southern OR/CA Coast Cutthroat Trout ESU is one of six proposed ESU s described in a NMFS status review and proposed rule (*Federal Register*/Vol. 64, No. 64, 5 April 1999). Cutthroat was designated sensitive by the Regional Forester, Robert Williams, on 20 August 1997 (FC 2670-1920).

Cutthroat are distributed along the mainstem of the Illinois River, up 1.2 mi in Daily Ck, 1.0 mi in McGuire Gulch, 3.9 mi in West Fork Rancherie Ck, 3.2 mi in Rancherie, 6.7 mi in Fall Ck, 1.2 mi in Sixmile Ck, 13.6 mi in Josephine, 1.6 mi in Days Gulch, 2.9 mi in Fiddler Gulch, and 9.7 mi in Canyon. No stronghold areas have been identified for cutthroat within the middle Illinois River basin.

There are no known spawning surveys for salmonids within the middle Illinois River watershed. Population estimates were made by ODFW using angling punch cards before angling restrictions

were applied to the Illinois River. In 1976, Mick Jennings from ODFW used gravel indexes (gravel potential) to estimate the number of adult fish that could spawn in the basin (Table 3). The use of these numbers should be used only for information and not considered to be actual spawning numbers.

Table 3. Estimated number of adult fish that may have been able to spawn in Josephine Creek in 1976 based on gravel indexes (Chuck Fustish, ODFW, pers. comm.).

Salmonid Species	Number	Survey Length (from mouth of Josephine Ck upstream)
Fall Chinook	700	to mouth of Canyon Ck, rmi 6
Coho	300	to 1 mi above mouth of Canyon Ck, rmi 8
Winter Steelhead	500	to 1 mi above mouth of Canyon Ck + 1 mi of Canyon Ck, rmi 9
Resident cutthroat	6-50/100 ft	up 1.75 mi on Fiddler Gulch, rmi 10

Historical Forest Service records show primary habitat as opposed to potential or available habitat for salmonids within the middle Illinois River watershed. Primary habitat is interpreted to indicate areas where fish were certain to spawn and rear during the time that the map was developed, which may have been in the early 1980's (Table 4).

Table 4. Principle spawning and rearing areas for anadromous salmonids according to USFS historical records.

Salmonid Species	Upmost extension along mainstem Illinois River within Forest Service boundary
Chinook, Coho, Steelhead, & Cutthroat	Mainstem of Illinois up to confluence of Rancherie Ck
Chinook, Coho, & Steelhead	Throughout mainstem of Illinois, up Josephine Ck to Madison Gulch
primarily Steelhead	Up 1.5 mi on Rancherie Ck, 1.5 mi on SixMile Ck, from confluence of Madison Ck to forks on Josephin Ck, 1.75 mi on Canyon Ck

Stream surveys conducted within the middle Illinois river are limited. In 1980, one mile long surveys were conducted on Fall Creek, Josephine Creek, Rancherie Creek, and Six Mile Creek by Forest Service personnel. In 1992, surveys were conducted but no report completed on Canyon Creek, Fall Creek, Rancherie Creek, and Six Mile Creek by Forest Service personnel. In 1994, ODFW conducted stream surveys in Reeves Ck. In 1998, stream surveys and reports were completed by Forest Service contract work on Canyon Creek, South Fork Canyon Creek, Days Gulch, Fiddler Gulch, and Josephine Creek. Forest Service stream survey methods differed in 1980 from those in 1992 and 1998. The following are brief summaries of the 1980 surveys conducted by Forest Service:

Fall Creek. A tributary to the Illinois River entering at 1/4 mile south of the mouth of Rancheries Ck. The creek enters the Illinois at a steep gradient, about a 15' drop over 30'. Fall Ck passes through bedrock canyon with steep sides and drains approximately 7 mi² of land. Dominant substrate is large boulder over cobble. Immediate runoff from steep canyon walls and serpentine soils creates high winter stream velocities and high bedload movement. There are areas of good juvenile rearing habitat about 0.50 mi where the stream gradient flattens out. However, deeper pools required for older juveniles are lacking. The first 0.50 mi of the stream shading is approximately 60%, mostly from canyon live oak, willow, alder, and ash. From 0.50 to 1.00 mi, shade decreases to about 20%. A number of slides exist between 0.75 to 1.00 mi, possibly a result of the 64 flood and historical hydraulic mining. Pool habitat for salmonids and shade decreases as the stream gradient in this section increases and stream width decreases. Log debris is increased in this section as well.

Near 0.50 mi, there is a 5' falls that may be difficult for steelhead passage. Spawning gravel increases at 0.75 mi but is moderately available. Temperature of Fall Ck was much cooler than that of the Illinois River (65 degrees compared to 74 degrees).

Rancherie Creek. Rancherie Ck and its fork enter the Illinois River below the mouth of Fall Ck on private land. The mouth of Rancherie Ck is described to drop into the Illinois over 6" - 10" gravel in two braids, with much of the flow permeating the creekbed. Temperature of the Illinois at this point was measured at 75 degrees whereas the mouth of Rancheris was 64 degrees at the mouth and 62 degrees upstream. The West Fork is commonly considered Rancherie Ck.

The southern fork is not well known because of its steep gradient. It has a 30' waterfall that blocks anadromous fish within the first 0.25 mile. The main fork of Rancherie Ck passes through a steep canyon. High bedload movement throughout this system may be a result of winter runoff in the sparsely vegetated serpentine mountains. Chinook-sized gravel is lacking with minimal amounts of steelhead-sized gravel throughout the creek. Most of the available gravel is located within the first half mile. Stream cover improves further upstream beginning with 40% from At approximately 0.55 mi, a 5' falls is impassable for anadromous fish in most flows. Additional migration limitations is the continuation of falls and 10' to 20' long bedrock chutes.

Data for 1992 stream surveys and reports for 1998 surveys are available from the Forest Service. Stream surveys conducted in 1994 on Reeves Ck sub-basin are available from ODFW. All streams surveyed in 1998 are tributaries to Josephine Creek. Primary land use activities of Josephine Creek watershed is mining. Historical land use activities include hydraulic mining and timber logging. See archeology report for discussions of historical land use within the middle Illinois River watershed. Any physical habitat surveys completed within the Illinois River by ODFW are available from their Portland office.

Riparian conditions, natural or human influenced, has an effect on the amount of large wood within the system. Based on the results of all stream surveys, the geology of the

watershed, and riparian seral stages, the amount of large wood within Josephine Creek is found in the headwaters of Days Gulch, Fiddler Gulch, and Canyon Creek. Those sub-basins found in non-ultramaphic soil and have late successional riparian conditions should be providing an adequate supply of large wood.

The Reeves Ck survey conducted by ODFW begins at the Highway 199 bridge (located approximately 400 meters upstream from the confluence with the Illinois River) and extends 6.1 kilometers. A total of 5 reaches were surveyed from October 16-19, 1994. Results showed a dry stream segment from reaches 1-3 and partly dry in reaches 4-5. Extensive road building and timber harvest activity was noted in the sub-basin, including roads crossing the channel with no culverts or directly in the Reeves Ck channel. A large proportion of the stream units measured have actively eroding streambanks and silt is a dominant substrate type.

[Table 5](#), gives a summary of attributes measured during the 1998 stream survey for Canyon Ck, South Fork Canyon Ck, Days Gulch, Fiddler Gulch, and Josephine Ck.

Table 5. 1998 Stream Survey Summary.

Stream Name 1998 Survey	Re- ach No.	Reach Gradie- nt (%)	Reach Len- gth (mi)	Average Bank- full Width (ft)	Average Bankfull Width:Dep- th	Ent- r. Ra- tio	Pool- s/Mi- le	% Poo- ls	Average Residual Pool Depth (ft)	Large Wood/- Mile	Salmonid Density (#fish/- yd2)
Canyon Creek	1	2.6	1.01	22	15.26	1.63	31.6	43.7	3.4	0	0.07
	2	2.7	2.13	25	19.92	1.40	22	30.4	2.7	0	0.12
	3	7.5	1.77	17.7	18.0	1.32	22.6	15.1	2.8	9.1	0.17
South Fork Canyon Creek	1	4.8	1.82	16	18.7	1.45	34.1	18.1	2.1	4.7	0.23
Days Gulch	1	7	2.6	15.4	12	1.4	19.9	15.6	2.8	0.4	Pool=0.- 03 Riffle=- 0.02
	2	15	0.5	12.0	8	1.5	16.5	8.6	2.1	0	Pool=0 Riffle=0
Fiddler Gulch	1	6	1.6	16.3	10	1.5	26.9	29.7	3.2	0	Pool=0.- 04 Riffle=- 0.02
	2	12	1.2	20.7	13	1.4	25.6	18.9	3.97	2.6	Pool=0.- 01 Riffle=0
Josephine Creek	1	1	2.2	61	20						

Fish Barriers

There are several natural migration barriers and one man-made barrier within the middle Illinois River. Pomeroy Dam, located on the Illinois River about 0.5 miles downstream from the confluence of East and West Forks of the Illinois, is a potential man-made barrier to some fish during certain portions of the year. During drought years, water diversion can have a significant effect on river flow. In the summer of 1992, approximately 50% of the river flow was being diverted (BLM, Kerby WA). Although the concrete dam is thought not to significantly delay upstream migration of adult salmon and steelhead, juvenile migration may be significantly effected. A series of stop logs in the diversion canal wall (west side of the river) and at mid-river are pulled the first week of November and reinstalled between April and June, not allowing juvenile migration during those months. Adult fall chinook utilize the slot in the canal wall for migration purposes. Higher streamflow later in the year allows coho and steelhead to pass over the center section of the dam. However, during extreme low flows fish passage may be limiting. A fish screen was installed in the diversion canal in 1946. The dam diverts approximately 27 cfs (water right: 1898, supplemented in 1953) to the Q Bar X Ranch and numerous smaller land parcels.

In 1960-61, the Oregon State Commission funded construction of a vertical slot fish ladder around Illinois River falls, located near private property called McCaleb Ranch. Fall chinook and coho salmon historically may not have been as abundant above Illinois River Falls during low flow years (see [Hydrology](#)), therefore, its function as a natural fish barrier was dependent on flows. During high flow conditions, it is estimated that as many as 70% of Illinois River adult winter steelhead were successful at migrating past the falls (BLM, Kerby WA).

Stream surveys conducted for Forest Service personnel have identified several natural fish barriers located in tributaries to the middle Illinois River watershed. Rancherie Creek contains a 30 foot falls blocking all upstream migration approximately 0.25 miles past the confluence of West Fork Rancherie Creek, and a series of impassable falls and chutes at approximately 1.00 miles on West Fork Rancherie Creek. On Six Mile Creek, a series of stair-step falls exists that may limit fall chinook migration. These surveys were conducted in 1980 and another survey should be completed to review the extent of natural fish barriers to anadromous fish within the lower tributaries of the middle Illinois River watershed. Stream surveys in 1998 by contract work have identified an unscreened diversion pipe (mining related) at stream mile 1.2 on Days Gulch. A majority of the flow is concentrated within this pipe and may be limiting upstream migration of resident salmonids. An 11 foot high falls at stream mile 1.9 marks the upper limit of fish on Fiddler Gulch. These are barriers recognized as a result of stream survey work. Natural barriers will vary from year to year depending on flow.

WHAT ARE THE MAJOR CREEKS WITHIN THE WATERSHED?

Major creeks within the middle Illinois River basin in relation to fisheries is dependent on the creek's ability to provide a properly functioning physical environment that supports the different stages of the fish's life cycle. The Aquatic Conservation Strategy (ACS) strives to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats.

Riparian reserves are lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use. They include those portions of a watershed directly coupled to streams and rivers, that is, the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing waterbodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats.

Riparian conditions for the middle Illinois watershed vary by sub-basin (Table 6 & 7). The majority of the riparian area is comprised of medium and seed/sapling/pole seral or successional stages (28.25 and 27.31 %, respectively) with Oak Flats sub-basin holding 36.76% of the medium seral stage. Josephine Creek is dominated by younger seral stages within the middle Illinois watershed; 49.68% of the total seed/sap/pole and 45.74% of total water/rock/grass/shrub seral stages.

Table 6. Acres and % of Riparian Vegetation Seral Stages for sub-basins in the Middle Illinois River Watershed (PMR data 1988).

Riparian Vegetation Seral Stage	Oak Flats	Six Mile	Josephine Creek	Kerby	*TOTAL
Water/Rock/Grass/Shrub	485 (10.33)	433 (11.24)	774 (13.94)		1692 (12.0)
Seed/Sapling/Pole	1161 (24.74)	777 (20.16)	1913 (34.45)		3851 (27.31)
Pole/Small	947 (20.18)	727 (18.86)	1213 (21.84)		2887 (20.48)
Medium	1464 (31.2)	1253 (32.51)	1266 (22.80)		3983 (28.25)
Large/Giant	636 (13.55)	664 (17.23)	387 (7.0)		1687 (11.96)
	4693 (100)	3854 (100)	5553 (100)		14100 (100)

*Total excludes info from Kerby Sub-basin.

Table 7. Acres and % of Riparian Vegetation Seral Stages for the Middle Illinois River Watershed (PMR data 1988).

Riparian Vegetation Seral Stage	Oak Flats TL ac=21,302.95	Six Mile TL ac=17,103.48	Josephine Creek TL ac=27,772.17	Kerby	*TOTAL
Water/Rock/Grass/Shrub	485 (28.66)	433 (25.59)	774 (45.74)		1,692 (100)
Seed/Sapling/Pole	1,161 (30.15)	777 (20.18)	1,913 (49.68)		3,851 (100)
Pole/Small	947 (32.8)	727 (25.18)	1,213 (42.02)		2,887 (100)
Medium	1,464 (36.76)	1,253 (31.46)	1,266 (31.79)		3,983 (100)
Large/Giant	636 (37.7)	664 (39.36)	387 (22.94)		1,687 (100)
	4,693	3,854	5,553		14,100

The greatest potential for large wood recruitment may be found in Six Mile Creek sub-basin, possibly due to its riparian seral stage dominance in large/giant vegetation, least amount of road length within a 300 foot riparian area (14.8 mi) and stream crossing density (1.6 xings/mi²) (Table 8, see Riparian Road Map). Road building within riparian areas decreases the ability of the creek to function to its full potential by removing sources of allochthonous material. Josephine Creek sub-basin has the greatest percent of roads within a riparian zone of 300 feet, whereas Kerby sub-basin with nearly half the road length for the entire middle Illinois River watershed, does not have the greatest percent.

Table 8. Road density within 300 foot stream buffers for all streams within the middle Illinois River watershed (PMR data 1988).

Sub-basin	Rd. Length within 300' riparian area (mi)	% of Riparian Rd length from total miles	Rd. Density within 300' riparian area (mi/mi ²)
Josephine	22.34	37.54	0.52
Kerby	41.06	35.62	1.71
Oak Flats	18.37	33.45	0.56
Six Mile	14.80	34.75	0.55
TOTAL	96.57	35.47	0.75

The headwaters of Canyon Creek, Fiddlers Gulch, and Days Gulch within the Josephine Creek basin contain the majority of mid to late seral stages in riparian areas (see Riparian Seral Stage Map). Oak Flats sub-basin s Daily Creek and parts of West Fork Rancherie Creek is dominated by early seral stages. The majority of Six Mile sub-basin contains mid to late seral stages with the exception of the mainstem of the Illinois river.

The middle Illinois River s riparian and floodplain condition has been impacted by past hydraulic mining, logging, recreation, road building, and human habitation (see Archeology Report). Areas devoid of properly functioning riparian zones are those that have been previously hydraulically mined, have a road system, and/or are currently being highly utilized by local recreationists. Off-road vehicles have the greatest potential to degrade riparian conditions within the entire watershed. There are a number of spur roads that cross riparian areas. Out of a total of 272 road miles, 7.4% are mining related roads (see Transportation Report). Standards for riparian protection under state rules will probably remain far below what is required to allow for recovery of degraded aquatic and riparian habitats. County zoning laws that regulate disturbance to riparian vegetation on private non-forest lands are largely ineffective. Little improvement in riparian protection and road construction standards is expected on private lands over the next decade.

Kerby sub-basin riparian areas were cleared for agricultural and mining purposes until the 1970's (BLM, Kerby WA). Holton and Reeves Creeks within Kerby sub-basin had roads constructed in valley bottom riparian areas. Timber was harvested to the edge of most streams within the sub-basin, removing shade and potential sources of large woody debris. Historical stream cleaning operations were occasionally conducted to prevent perceived fish passage problems. Erosion from tractor skid roads, as well as from poorly constructed and maintained road systems for logging and residential use, have degraded streams throughout Kerby sub-basin on private and public lands.

Nearly 50 % of the middle Illinois river watershed is composed of ultramaphic soil (see Geology). It is not known what the full impacts of roads are to streams given the nature of this type of geology. In addition, the ability of riparian areas on ultramaphic geology will function differently than those found on more productive geology.

WHAT ARE THE BASIC MORPHOLOGICAL CHARACTERISTICS OF STREAM VALLEYS?

See major physical features in Physical Sciences Section, landforms section.

WHAT IS KNOWN ABOUT AQUATIC MACROINVERTEBRATES?

Benthic macroinvertebrate biomonitoring is used to assess non-point and point source impacts on aquatic ecosystem integrity. Objectives for collecting samples on Siskiyou National Forest include evaluating cumulative impacts from non-point source human impacts, evaluating recovery of biotic integrity through trend monitoring, and establishing reference conditions through the evaluation of pristine or minimally impacted watersheds. Because macroinvertebrate community structure changes dramatically in response to changes in habitat (temperature, sediment, water chemistry, flow) it is an effective tool in detecting environmental change over time. This is due to their extended residency period in streams. They are relatively immobile and cannot avoid events or pulses of pollutants or other forms of stress often missed by conventional water or habitat quality sampling. Presence or absence of specific taxa can be indicative of specific environmental and habitat factors. Aquatic insects are a direct and definitive measure of biotic integrity. They can be used as a barometer of overall biodiversity in aquatic ecosystems. Most important, aquatic insects are the primary food source for many stream fish, as well as mammals and birds.

Within the middle Illinois River watershed, samples were collected during the fall season from Canyon Creek, Illinois River, Josephine Creek, and Six Mile Creek. The method used followed ABA, Inc. (1995) protocol. Riffle, margin, and course particulate organic matter (CPOM) habitat samples were collected from each stream site (Table 9). Riffle samples are the most diverse habitat type for macroinvertebrates therefore, only results from riffle samples are seen in this document. Additional specific information on functional feeding groups, etc., can be seen in the Galice and IV Benthic Invertebrate Biomonitoring Reports (1990, 1992-93, 1994).

Table 9. Stream, sample location, and year of macroinvertebrate samples within the middle Illinois River watershed.

Stream	Sample Location	Year
Canyon Creek #1	100 ft mile above mouth	1990
Canyon Creek #2	100 ft above Rocky Bar on Canyon Ck	1990
Canyon Creek #3	3/4 mile above mouth	1992
Illinois River	1/4 mile below confluence of Josephine Ck	1990
Josephine Creek	300 ft above confluence of Canyon Ck	1990
Six Mile Creek	100 ft above mouth	1992, 1993, 1994
Six Mile Creek #2	100 ft above last camping spot along stream	1994

Species diversity is measured in a variety of ways. The Shannon-Weiner Diversity (H') was used to measure macroinvertebrate diversity. The index should fall between 1.5 and 3.5 and only rarely surpass 4.5 (Magurran 1988). This index has to estimate the diversity of the unsampled as well as the sampled portion of the community. Stream invertebrae communities in non-impaired, forested, montane streams will typically have values 3. Values above 3.4 are exceptionally high (positive indication). The macroinvertebrate diversity and taxa richness in Canyon Creek is good for the areas sampled (Table 10). The Illinois River is a much larger river system than the other sites sampled and results may not be indicative of the true community. Note the magnitude difference in abundance for the Illinois River. Six Mile Creek for the years sampled indicate a decrease in diversity. However, true community trends may take more than 10 years to adequately interpret the health of the community. The low numbers in abundance and taxa richness for 1994 indicate a possible sampling error or a degraded site. Further collection at this site is needed to compare with previous years sampled. Josephine Creek has moderate taxa richness and a low diversity index.

Table 10. Diversity (H), taxa richness, and total abundance (#/m2) of macroinvertebrate bioassessments from 1990 - 1994 for riffle habitat samples within the middle Illinois River watershed.

Stream	Diversity (H)				Taxa Richness				TL (#/m2)			
	1990	1992	1993	1994	1990	1992	1993	1994	1990	1992	1993	1994
Canyon Ck #1	3.02				55				4,070			
Canyon Ck #2	3.02				55				8,489			
Canyon Ck #3		2.80*				31*				134*		
Illinois River	2.6				48				19,576			
Josephine Ck	2.33				43				1,724			
Six Mile Ck		3.14	2.97	2.48		53	52	28		631	3,384	208
Six Mile Ck #2				2.87				34				244

*Figures based on margin samples, not riffle samples.

Potential total scores for least impacted streams is expected to vary from region to region, and within a region. For example, western Cascade streams may tend to score higher than streams in interior mountain ranges. Or, a north facing watershed may have habitat conditions which more nearly approximate optimal conditions than a nearby south facing watershed. Total scores (% maximum possible score) should be interpreted as being graded on a curve, and not conforming to a 90-100%=A or excellent, 80-89%=B, etc., type of scaling. A low score reflects significant habitat and/or water quality limitations. The low scores in Canyon Creek #3 and Six Mile Creek (1994) is of concern and a riffle sample should be taken again to assess true conditions for the area (Table 11). The recreational use in Six Mile Creek may have an influence on total scores, thus resulting in site-specific conditions. Six Mile Creek should be sampled far enough upstream away from the influences of the camp site to assess overall conditions for the sub-basin. The moderate scores for Six Mile Creek sub-basin indicate that the benthic invertebrate community points to some habitat limitation.

Table 11. Bioassessment score, dominant taxa, and % dominance for sites sampled in riffle habitats within the middle Illinois River watershed.

Stream	Bio- asses- sment Score % of *Max Score 1990	1992	1993	1994	Dominant Taxa and % Dominance			
					1990	1992	1993	1994
Canyon Ck #1	N/A				<i>Orthocladius/- Cricotopus</i> 15.43			
Canyon Ck #2	N/A				<i>Dipheter hageni</i> 15.89			
Canyon Ck #3		156.1 LOW				Acari 17.16		
Illinois River	N/A				<i>Orthocladius/- Cricotopus</i> 22.63			
Josephine Ck	N/A				<i>Hydropsyche</i> sp. 40.50			
Six Mile Ck		63.7 MOD	71.8 MOD	46.3 LOW		Chironomidae 14.10	<i>Simulium</i> sp. 24.35	<i>Juga</i> sp. 35.10
Six Mile Ck #2				64.2 MOD				<i>Baetis tricaudatus</i> 14.34

* Scores not applicable for 1990.

!Margin habitat score, riffle sample not taken.

The expected range of a dominant taxa should be less than 15%. Percent dominant taxa is the % contribution of the most numerous taxa present in a sample. It is a simple measure of diversity. Stressed communities often are composed of not only fewer taxa, but also overwhelmed by a few tolerant and/or weed type taxa. High abundance of a single taxon indicates a stressed benthic community, which allows one or a few tolerant taxa to dominate the community. Nearly all sites sampled show some level of stress, with the exception of Six Mile Creek in 1992 and Six Mile Creek #2 in 1994.

Dipheter hageni is most common in large streams and rivers, but has a wide habitat range. They are relatively tolerant. *Orthocladius/Cricotopus* are collector-gatherers, meaning that their feeding strategy is to collect fine organic particles as food. Collector-gatherers are a normal constituent of all aquatic ecosystems, however, high numbers is generally indicative of stressed habitat conditions. Many of the collector-gatherers are weed type, tolerant taxa that can proliferate in streams that have lost many or most of the intolerant forms. Both of these species percentages in Canyon Creek are not significantly above 15%, but are at a threshold. The high percentage of *Orthocladius/Cricotopus* at the Illinois River site is of concern. Another sample should be taken above the confluence of Josephine Creek to assess any possible downstream effects from Josephine Creek on the benthic community at the site sampled on the Illinois River in 1990.

Juga sp., *Simulium* sp., and *Hydropsyche* sp. are well above 15% at the sites sampled. *Juga* sp. is an aquatic mollusc tolerant of fine sediment, warmer water and depressed oxygen tensions. High numbers of these snails typically indicate depressed habitat/water quality. *Simulium* sp. are black flies. They are a normal component of almost all montane streams. High densities of these larvae are usually associated with disturbed or enriched streams. The proximity of the sites sampled to the camp site on Six Mile Creek may be a result of the dominance in these species.

Hydropsyche sp. is common in the Pacific Northwest. This taxa is a collector feeder, indicating a good source of suspended particles for food. Collector feeding organisms use a variety of adaptations to capture fine organic particles suspended in the water column. In mid-order, well shaded streams, the number of filterers is usually low. Numbers increase when shading decreases or when the amount of fine particle organic matter increases. The geology of Josephine Creek limits the shading of the stream, which may explain why this taxa is dominant. However, the level of instream activity within the sub-basin may be an influencing factor as well. Samples should be taken from sub-basins within Josephine Creek to assess dominant characteristics within the basin.

In summary, no trend can be identified as a result of the limiting areas sampled. Existing data can only serve as a baseline information for site specific conditions. Results of bioassessment scores may be nebulous at a watershed scale but beneficial for immediate site conditions. Further sampling throughout the middle Illinois River watershed is needed to develop baseline information for the whole watershed. Site-specific conditions for the areas sampled in Six Mile Creek (camp site) show a stressed benthic community with habitat limitations, in addition to temperature along the mainstem of the Illinois River (See Hydrology).