Draft

Flathead River Subbasin Summary

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Northwest Power Planning Council

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Subbasin Description

General Description

Subbasin Location

The Flathead Subbasin, located in northwestern Montana and the southeastern corner of British Columbia, constitutes the northeastern-most drainage of the Columbia River. Tributaries originate in Glacier National Park, the Bob Marshall Wilderness, and Canada. The mouth of the river is located at Paradise, Montana. East to west, the subbasin stretches 141 km (88 miles), north to south, 281 km (175 miles) (Figure 1).

Drainage Area

The Flathead River Subbasin encompasses almost six million acres. The upper mainstem of the Flathead River begins where the North, Middle, and South Forks merge near the town of Columbia Falls (elevation 3,100 feet). The Whitefish and Stillwater Rivers, which drain the northwest part of the basin, join the upper Flathead River below Kalispell. Near Holt, the river empties into Flathead Lake. At the town of Big Fork, the Swan River flows into Flathead Lake. The lower Flathead River leaves Flathead Lake at the lake's southwest corner and flows 116 km (72 miles) south and west to its confluence with the Clark Fork of the Columbia River (elevation 2,500 feet). The lower Flathead River's primary tributaries are the Little Bitterroot and Jocko Rivers and Crow, Mission, and Camas Creeks.

Climate

The climate of the Flathead River Subbasin is strongly influenced by pacific maritime airmasses. In winter, moist air dominates, often shrouding the basin with low-lying, gray clouds and bringing mild temperatures. Kalispell, for example, has a mean January temperature of 20°F. Occasionally, continental airmasses composed of arctic or polar air spill over the Continental Divide, bringing clear skies and frigid temperatures (-20°F or colder) (Zackheim 1983; Cunningham 1982).

Pacific airmasses usually dominate during the spring and early summer as well. They bring partly cloudy conditions, punctuated by rain and occasional warm, dry periods. In July, a high-pressure system often moves over the subbasin. Skies clear and temperatures range from the 70s to the high 90s with occasional, short, hotter periods. Afternoon thunderstorms are common throughout the summer. Fall repeats the unsettled weather pattern of spring; clear skies alternate with periodic cloudy weather (Zackheim 1983).

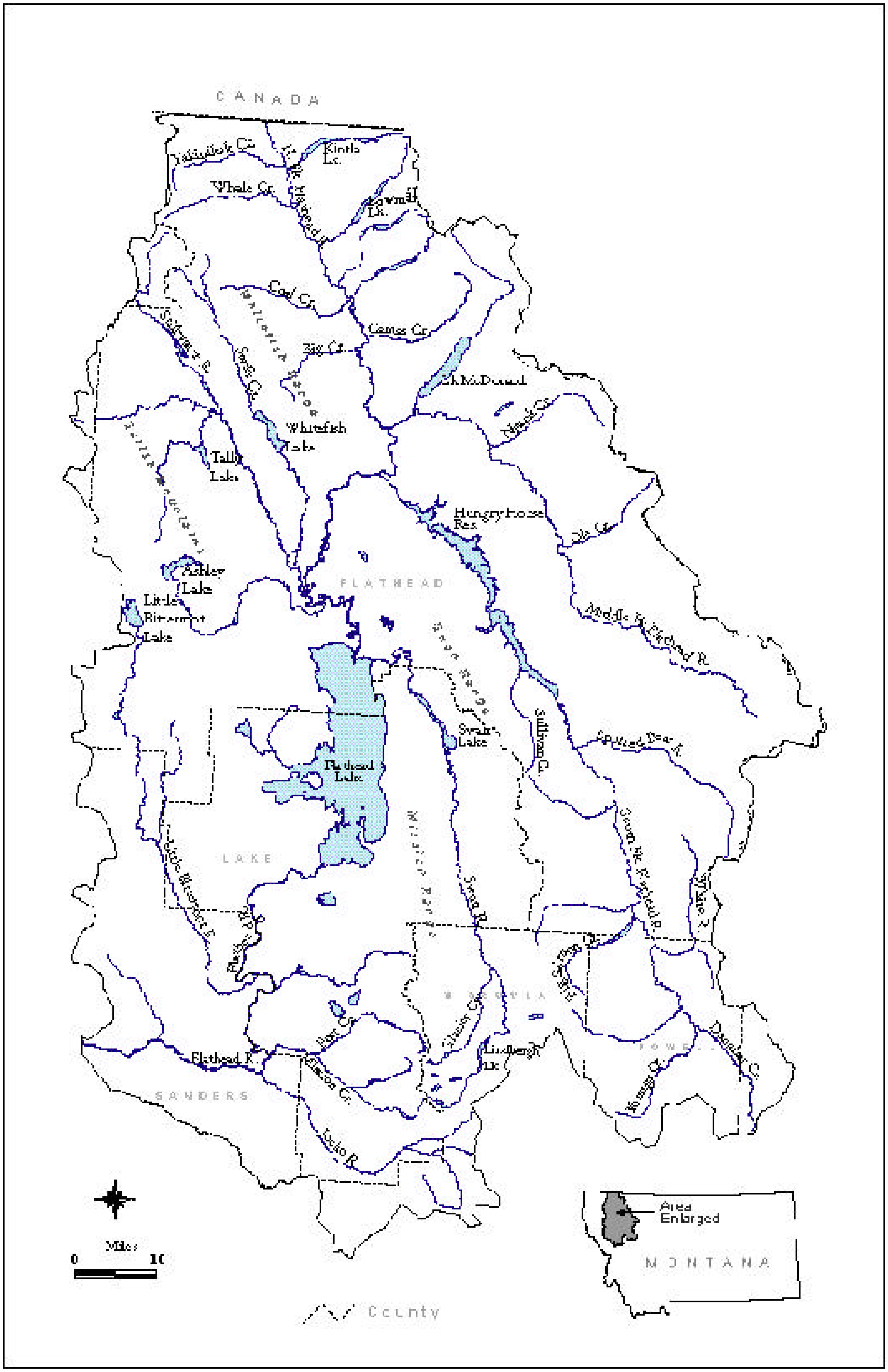

Figure 1. U.S. portion of the Flathead River Subbasin

The varying topography of the Flathead River basin results in extreme local fluctuations in precipitation. The mountains receive between 80 and 120 inches of precipitation annually, mostly in the form of snow (Finklin 1986). Mountain ridges have snowpacks of up to 20 feet or more. Valleys annually receive an average of between 15 and 20 inches of precipitation. The rainiest months occur in May and June (Finklin 1986). Winter snowfalls seldom exceed six inches at a time in the valleys; frequent winter thaws usually keep total valley snow cover at under a foot.

Topography

The east half of the subbasin, which is bordered by the Continental Divide, is broken by a series of rugged mountain ranges, chief among them the Whitefish, Swan, Mission, Livingstone, and Flathead Ranges. Their ridges generally trend northwest to southeast; their highest peaks reach 8,000 to 10,000 feet. The west half of the subbasin is quite different topographically. It is basically a 160-km-long oval depression interspersed with groups of rolling hills. The north half of this depression is dominated by the upper Flathead River Valley, the south half by the Mission, Jocko, Little Bitterroot, Camas Prairie, and Lower Flathead valleys. Flathead Lake, with a surface area of 126,000 acres, lies at the depression's center.

Geology

The Flathead River Subbasin is situated along the west limb of the Rocky Mountains. Precambrian rocks of the Belt Supergroup form the bedrock under virtually the entire subbasin. Belt rocks are exposed in the mountain ranges, as well as in many of the lower hills of the valleys. The major rock types include argillite, siltite, quartzite, and limestone. Almost all of the forested acres are underlain by these Precambrian rocks, which are fine grained, moderately metamorphosed sediments deposited over one billion years ago. Belt sediments are highly stable (they have low erosion potential), and they account for the generally high stability of the subbasin's watersheds. Igneous rocks also occur but only in a few areas. Over the last 100,000 years, advances and recessions of glaciers have extensively modified landscapes. The most recent glacial advance receded about 10,000 years ago and left unconsolidated surface sediments in many watersheds that include glacial tills, glacial stream deposits, and fine grained sediments deposited in Glacial Lake Missoula. (CSKT 2000).

Hydrology

In terms of volume, the Flathead River is Montana's fourth largest river (Zackheim 1983). The mean annual discharge of the river system is nine million acre-feet (Figure 2, Zackheim 1983). The flow rate for the lower Flathead River averages over 12,000 cubic feet per second (cfs). The three forks of the Flathead together supply about 80 percent of the water carried within the system. Flows on the North Fork average about 3,000 cfs near Columbia Falls, approximately the same as the flows on the Middle Fork. On both, peak spring runoff often exceeds 10 times the average flow (Zackheim 1983). The North and Middle forks experience an average elevation drop of 26 and 15 feet per mile, respectively. On the South Fork, the average annual discharge into Hungry Horse Reservoir is 2,300 cfs (Deleray 1999).

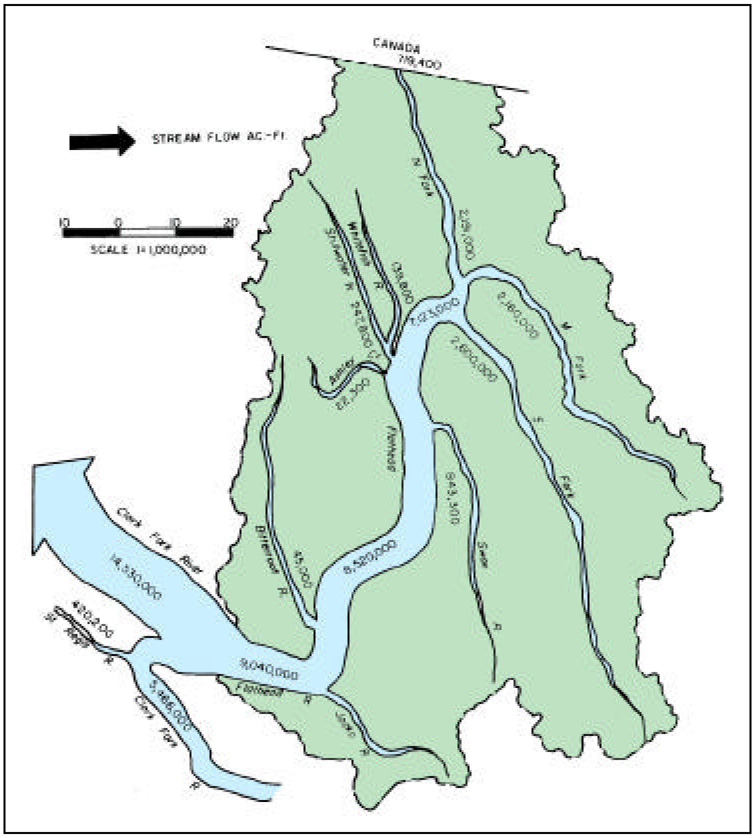

Figure 2. Annual Discharge of the Flathead River Subbasin in acre-feet

The Whitefish and Stillwater rivers merge just southeast of Kalispell and contribute about five percent of the flow of the upper Flathead. The Swan River provides about one tenth of the water flowing into Flathead Lake. The largest tributary of the lower Flathead is the Jocko River, but it contributes less than four percent of the total flow volume (Zackheim 1983).

Flathead Lake has a surface area of roughly 197 square miles, a mean depth of 164 feet, and a maximum depth of 370 feet. It is the largest natural freshwater lake in the western U.S. The lake is classified as oligomesotrophic (Zackheim 1983).

The lower Flathead River is a low-gradient river (3.4 ft/mile) draining a 954,313-acre watershed. With the exception of the first 11.26 km of the river, which flow through a steep canyon, the lower Flathead River is a comparatively smooth-flowing, shallow river in which riffle and pool areas blend. Approximately 94 percent of the river's 116-km length fall within the Flathead Indian Reservation.

The basin is nearly completely underlain with Precambrian sedimentary rock, which is characteristically deficient of nutrients. As a result, the water is likewise nutrient poor and flows distinctly clear.

Soils

Soils formed from residual and colluvial materials eroded from Belt rocks or in materials deposited by glaciers, lakes, streams, and wind. Wind deposits include volcanic ash from Cascade Range volcanoes in Washington and Oregon.

Since glacial recession, geologic conditions have been relatively stable. This is suggested by the widespread distribution of 6,700-year-old Mt. Mazama volcanic ash in forested drainages, well developed soil profiles on many glacial features, stable stream channels, and stable slopes in forested watersheds. The volcanic ashes produce soils with very high soil-moisture holding capacity, high fertility, low strength, and high erodability.

In many areas, soils formed in glacial till and are generally loamy, with moderate to high quantities of boulders, cobbles, and gravels. Although soils within the mountainous regions vary widely in character, most mountain and foothill soils are on steep slopes and are well drained with large amounts of broken rock. Rock outcrops are common.

Soils deposited by glaciers or flowing water cover about 40 percent of the national forest lands. These are, for the most part, deep, well-drained, and productive soils. About 15 percent of the national forest lands have soils that developed in place through weathering of bedrock. Most of forest soils in the subbasin are somewhat resistant to erosion by water. In most of the valleys, soils are deep, relatively productive, and gently sloping (CSKT 2000; Zackheim 1983).

Land Uses

Within the subbasin, the upper Flathead River Valley and the Mission Valley are the areas that have been the most extensively developed for agricultural and urban uses. Additional important agricultural areas include the Jocko and Little Bitterroot valleys. The low-elevation treeless slopes in the southwestern corner of the basin provide significant rangeland, while forests dominate the mountainous terrain, which composes the vast majority of the basin area. Major land uses are summarized in Figure 3 (Zackheim 1983). Table 1 summarizes population trends in the three major counties. Figure 4 shows land ownership in the U.S. portion of the subbasin.

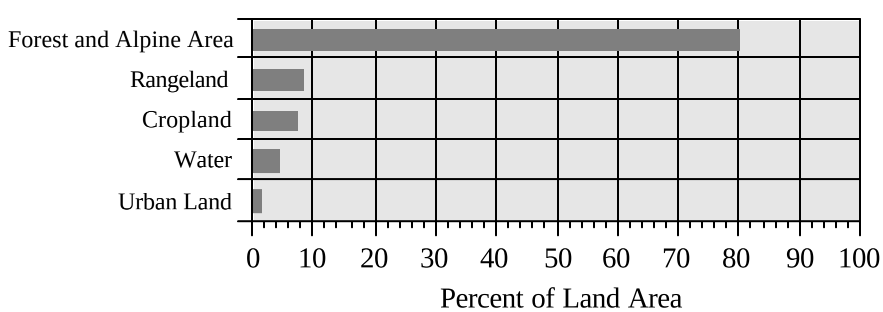

Figure 3. Land Uses in the Flathead River Subbasin

Table 1. Population of major Flathead Subbasin Counties, 1980-1997

County	1980 Population	1997 Population	Area (sq. mi.)	People/sq. mi.
Flathead	**51,966**	**71,707**	**5,099**	**14.1**
Lake	**19,056**	**25,341**	**1,494**	**17**
Sanders	**8,675**	**10,253**	**2,762**	**3.7**
Totals	**79,697**	**107,301**	**9,355**	**13.5 (Ave.)**

Impoundments and Irrigation Projects

Hungry Horse Dam, completed in 1952, is located 8.4 km upstream from the confluence of the South Fork and the mainstem of the Flathead River. Hungry Horse Reservoir is 56 km long and covers 23,782 acres at full pool. The dam, operated by the Bureau of Reclamation (BOR), provides flood control, electrical power production, and water storage capability for the Columbia River system. Annual operations for power and flood control result in a reservoir draft toward minimum pool by mid-April and refill toward full pool (elevation 3,560 feet) during July. The maximum reservoir drawdown on record was 188 feet. Hungry Horse Dam has a peak capacity of 320,000 kilowatts. Kerr Dam, located 6.9 km downstream of the natural lake outlet, was built in 1938 and is currently operated by Pennsylvania Power and Light Montana (PPLM). The dam regulates the top three meters of water and is operated to provide flood control and power production. Its peak capacity is 180,000 kilowatts. The dam is now operated as a base-load facility. Presently, flood control and recreation require the lake level to be dropped to the low pool elevation of 2,883 feet by April 15, refilled to 2,890 feet by May 30, raised to full pool elevation of 2,893 feet by June 15, and held at full pool through Labor Day (Deleray et al. 1999). Bigfork Dam is a small hydroelectric facility with a 4,000-kilowatt peak capacity. It is located on the Swan River less than 2 km from Flathead Lake.

On the Flathead Indian Reservation, the Flathead Agency Irrigation District (FAID) consists of an intricate network of natural channels, irrigation canals, and storage reservoirs that retain spring runoff and distribute the water to cultivated lands. Approximately 1,930 km of irrigation canals and 17 reservoirs exist under FAID. The larger FAID reservoirs include Pablo, Ninepipe, Crow, Kicking Horse, and Hubbard. Several natural lakes on the Flathead Indian Reservation have been adapted for controlled irrigation releases. An unquantified number of secretarial water rights also exist throughout the basin.

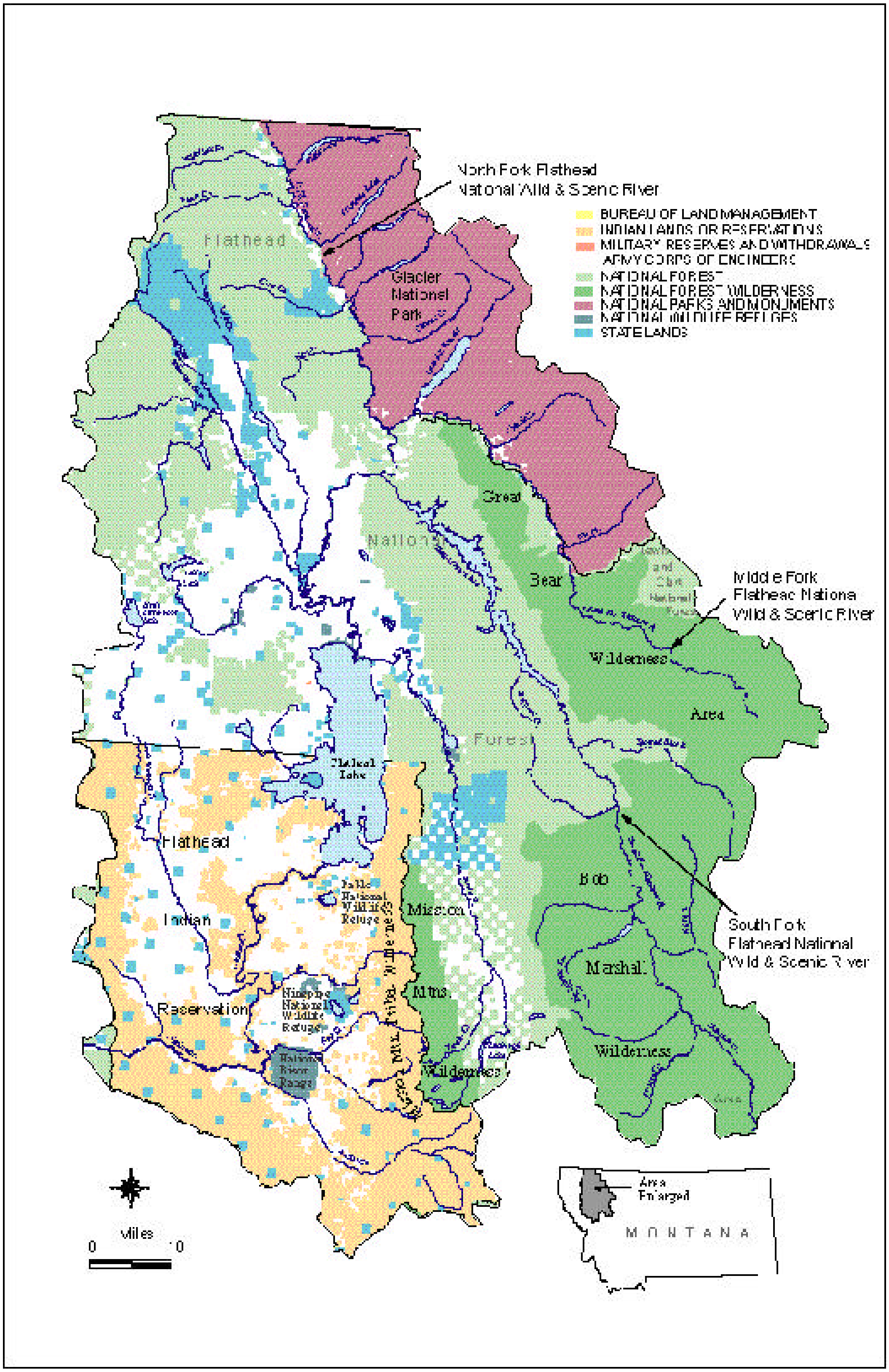

Figure 4. Landownership in the U.S. portion of the Flathead River Subbasin

Protected Areas

In the U.S. part of the subbasin, approximately 1.9 million acres have significant protective status and 338 km of river are classified as wild, scenic or recreational (Table 2, Zackheim 1983). In Canada, Akamina-Kishinna Provincial Park is located adjacent to the northern edge of Glacier Park.

Table 2. Flathead River Subbasin National Wild and Scenic Rivers

River	KM
North Fork of the Flathead River	
US/Canada Border to Camas Bridge (Scenic)	65.5
Camas Bridge to Middle Fork (Recreational)	28.3
Middle Fork Flathead River	
Headwaters to Bear Creek (Wild)	74.9
Bear Creek to South Fork (Recreational)	87.0
South Fork Flathead River	
Headwaters to Spotted Bear River (Wild)	82.5
Spotted Bear River to Hungry Horse Res. (Recreational)	14.1

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

Westslope Cutthroat Trout

Westslope cutthroat trout were petitioned for listing under the Endangered Species Act (ESA), U.S. Fish and Wildlife Service (USFWS 1998). The USFWS determined that listing is not warranted at this time. In Montana, the species has been designated a Species of Special Concern. Westslope cutthroat trout populations above Hungry Horse Dam form one of the strongest, most secure metapopulations of westslope cutthroat trout in existence (Marotz, MDFW&P, pers. com. 2000). Below the dam, cutthroat numbers have declined due to loss of habitat and negative interactions with non-native fish species (e.g. hybridization with rainbow trout and predation by lake trout).

Bull Trout

Bull trout were listed in 1998 as a threatened species under the ESA. The population in Hungry Horse Reservoir and its headwaters is arguably the second strongest metapopulation in existence (Marotz, MDFW&P, pers. com. 2000). Hungry Horse Dam isolated bull trout populations above and below the dam. Populations in the reservoir have stabilized at sustainable numbers, and Montana Fish, Wildlife & Parks (MFWP) established a comprehensive monitoring program to alert managers to any change in population status. MDFW&P and the Confederated Salish and Kootenai Tribes (CSKT) also carefully monitor the bull trout population in the Flathead system below Hungry Horse Dam. At least 20 disjunct populations have been identified (MBTSG

1995). Results have documented an alarming reduction in bull trout spawning redds since the early 1990s. The population declined to the lowest point in the 20-year record during the period from 1992 to 1996. During 1997 and 1998, redd counts rebounded somewhat but remain at 50 percent of the long-term average.

Six distinct populations of bull trout occur within the Flathead Reservation (Hansen and DosSantos 1997). These populations occur in the lower Flathead River and the Jocko River and Mission Creek watersheds.

Native Trout and Char Life Histories in the Subbasin

The native trout and char—westslope cutthroat trout and bull trout—have evolved varied life histories to be successful in the Flathead drainage. There are three life history forms: (1) adfluvial stocks, which spawn and rear in river tributaries and move downstream to mature and reside in Flathead Lake; (2) fluvial stocks, which spawn and rear in river tributaries then move downstream to mature and reside in the Flathead River, and; (3) tributary or "resident" stocks, which spawn, rear, and reside for their entire life cycle in a tributary stream (Shepard et al. 1984, Fraley and Shepard 1989, Liknes and Graham 1988). Westslope cutthroat trout employ all three of these strategies in the Flathead system. Bull trout are primarily adfluvial, although recent radio telemetry results have documented a fluvial component (Muhlfeld et al. 2000), and individual fish may combine the two strategies. Juveniles reside in tributaries for one to three years before migrating downstream into river or lake habitats (Shepard et al. 1984). Adfluvial fish take advantage of improved forage and growth rates during lake residence and thus reach larger sizes than either fluvial or tributary residents. Tributary fish mature at relatively smaller sizes (~200 mm) and don't grow as large (>400 mm) as fish using the other strategies (Shepard et al. 1984, Liknes and Graham 1988).

These three life history forms inhabit three general types of habitat: tributary streams, mainstem river and forks, and lake. In order for fish populations in the basin to be successful, all habitats must present adequate conditions for fish survival at related life history stages. Degraded conditions in one of these habitat types may limit the population.

Geographical Summary

The relative abundance of bull trout and the genetic purity of westslope cutthroat trout in the upper part of the subbasin are shown on Plates 1 through 10 in Appendix B.

Three Forks of the Flathead

Westslope cutthroat trout, bull trout, and mountain whitefish are the native gamefish species found in the South, Middle, and North forks of the Flathead River and their tributaries. Adfluvial cutthroat trout generally occur in the lower South Fork of the Flathead up to Meadow Creek Gorge and in the Middle and North forks of the Flathead River. Fluvial westslope cutthroat trout are found primarily in the mainstem of the South Fork above Meadow Creek Gorge, and portions of the Middle Fork. The resident form of westslope cutthroat trout completes its entire life cycle solely in headwater tributaries to all three Flathead River forks (Deleray 1999).

Bull trout appear to be primarily adfluvial in the three forks of the Flathead River. At this time, MFWP biologists have not observed evidence of fish residence in tributaries for complete life cycles. They have observed all age classes during summer river surveys, which may be evidence of a fluvial component.

North Fork of the Flathead River

Results from three years of population estimates for the Ford section of the North Fork are summarized in Table 3 (Deleray 1999). From 1990 to 1996, overall cutthroat trout numbers dropped dramatically from 282 to 96 per kilometer. The majority of the decline occurred in the small cutthroat trout with mid- and large-size fish maintaining low numbers in all three years. It is probably that all three life history forms (resident, fluvial, and adfluvial) of cutthroat trout exist in the North Fork and its tributaries.

Table 3. North Fork Flathead Snorkel/Petersen population estimates (95 percent confluence interval) by section for westslope cutthroat trout

	Number of Fish Per Kilometer			
Date	<254 mm (10")	254-305 mm (10-12")	>305 mm (12")	All Fish Combined
8/3/90	411 (+/-79)	16 (+/-17)	0	428 (+/-82)
8/18/93	232 (+/-44)	15 (+/-9)	1 (+/-1)	249 (+/-46)
8/30/96*	133 (+/-30)	10 (+/-5)	3 (+/-2)	146 (+/-31)

*Approximately half of previous marking effort.

Bull trout core areas in the North Fork Flathead River drainage are Big, Coal, Whale, Trail, Red Meadow, Howell, and Cabin Creek drainages. The North Fork itself is a nodal habitat (nodal habitats are those that provide a migratory corridor, overwintering area, or are otherwise critical to the population at some stage of its life cycle (MBTSG 1995a)).

Middle Fork of the Flathead River

Estimates conducted in the Middle Fork Flathead River are summarized in Table 4. In the uppermost (Gooseberry) section, there has been an increasing trend in total cutthroat trout abundance when comparing 1988, 1991, and 1994. Cutthroat trout in the upper reaches are primarily resident fish, spending their entire life in or near the survey section (Deleray 1999). Two estimates were conducted in the Schafer Section (1988 and 1994). The estimated number of small cutthroat trout increased dramatically from 37 per kilometer in 1988 to 148 per kilometer in 1994. (Deleray 1999). Estimates have been conducted for two years (1997 and 1998) in the Spruce Park section. A higher proportion of larger fish was present in this section than in upstream sections (Deleray 1999). Estimates in the Paola Section were conducted annually from 1995 through 1997 to establish a baseline data set. Abundance of small cutthroat trout in the Paola section appeared to increase steadily over the three years (Deleray 1999).

Cutthroat trout below the Schafer section appear more migratory in nature than those in above sections, suggesting the presence of all three life history forms within the Middle Fork. Lake McDonald appears to be utilized by some Middle Fork cutthroat trout. Graham (1980) documented cutthroat trout migrating upstream from Flathead Lake into the Middle Fork as well (Deleray 1999).

Table 4. Middle Fork Flathead River Snorkel/Petersen population estimates (95 percent confidence interval) by section for westslope cutthroat trout

Section (Length)	Date	Number of Fish Per Kilometer <254 mm (10")	254-305 mm (10-12")	>305 mm (12")	All Fish Combined
Gooseberry (3 km)	7/20/88	72 (+/-20)	4 (+/-3)	1 (+/-0)	77 (+/-20)
	7/29/91	98 (+/-27)	4 (+/-1)	1 (+/-0)	102 (+/-23)
	7/18/94	125 (+/-54)	1 (+/-1)	1 (+/-0)	127 (+/-50)
Schafer (3 km)	7/20/88	37 (+/-3)	0	0	37 (+/-3)
	8/9/94*	148	3	1	152
Spruce Park (3.6 km)	8/13/97	150 (+/-29)	56 (+/-17)	14 (+/-5)	219 (+/-33)
	8/12/98	59 (+/-12)	21 (+/-8)	14 (+/-5)	94 (+/-16)
Paola (3.2 km)	8/31/95	16 (+/-8)	14 (+/-5)	8 (+/-4)	38 (+/-10)
	8/21/96	54 (+/-16)	12 (+/-5)	4 (+/-2)	70 (+/-16)
	8/20/97	73 (+/-40)	14 (+/-5)	5 (+/-4)	92 (+/-31)

Bull trout core areas in the Middle Fork Flathead River are Nyack, Park, Ole, Bear, Long, Granite, Morrison, Schafer, Clack, Strawberry, and Bowl Creek drainages. The Middle Fork Flathead River is a nodal habitat for bull trout.

South Fork of the Flathead River

Beginning in the uppermost (Gordon) section of the South Fork, MFWP conducted estimates in 1984 and 1987 (Table 5). Estimates combining all fish were quite similar between the two years. Large cutthroat trout tend to reside in this portion of the South Fork at least until fall and then seek preferred habitat for overwintering. Mean lengths and catch rates were consistently the highest in the Youngs and Danaher Creeks confluence area and in the Gordon section when compared to other South Fork sections and streams (Table 6).

The Black Bear Section consistently contained the highest estimated number of cutthroat trout per kilometer of the South Fork sections (Deleray 1999). Estimated cutthroat trout numbers in the Harrison Section were generally lower than in the Black Bear Section (Table 5). Research suggests that cutthroat trout above Meadow Creek Gorge are generally a separate population with a fluvial life history, while cutthroat trout below the Gorge are both fluvial and adfluvial fish, some utilizing Hungry Horse Reservoir (Deleray 1999).

Table 5. South Fork Flathead River Snorkel/Petersen population estimates (95 percent confidence intervals) by section for westslope cutthroat trout

Section (Length)	Date	Number of Fish Per Kilometer <254 mm (10")	254-305 mm (10-12")	>305 mm (12")	All Fish Combined
Gordon	1984*	No Estimate	No Estimate	No Estimate	206 (+/-62)
(2.2 km)	8/13/87	85	98 (>254 only)	No Estimate	183 (+/-37)
Black Bear	8/28/83	494 (+/-190)	105 (+/-85)	42 (+/-34)	641 (+/-220)
(4.4 km)	8/7/85	419 (+/-177)	56 (+/-27)	39 (+/-31)	514 (+/-164)
	7/21/89	309 (+/-79)	42 (+/-20)	31 (+/-11)	381 (+/-74)
	7/2/92	325 (+/-82)	151 (+/-42)	51 (+/-12)	527 (+/-78)
	7/28/95	339 (+/-75)	60 (+/-29)	32 (+/-14)	431 (+/-81)
	7/23/98	232 (+/-40)	81 (+/-22)	33 (+/-9)	346 (+/-46)
Harrison	8/9/84	267 (+/-100)	15 (+/-11)	4 (+/-4)	285 (+/-102)
(2.2 km)	8/23/85	186 (+/-48)	26 (+/-11)	No Estimate	213 (+/-47)
	7/30/90	207 (+/-37)	34 (+/-22)	16 (+/-7)	257 (+/-42)
	8/20/93	189 (+/-57)	62 (+/-18)	17 (+/-8)	268 (+/-53)
	8/15/96	443 (+/-87)	19 (+/-9)	13 (+/-6)	475 (+/-82)

Table 6. Catch data for westslope cutthroat trout collected by MFWP personnel in sections of the South Fork Flathead River

Section	Area	Year	N	Mean Length (mm)	Range (mm)	Percent >254 mm (10")	Percent >305 mm (12")	Catch Rate (Fish/Hr.)
Gordon	Murphy Flats	1960	80	228	90-406	34	11	N/A
	L. Salmon Cr.	1981	151	230	110-350	26	8	3.7
	B. Salmon Cr.	1984	92	240	170-370	46	18	N/A
	B. Salmon Cr.	1985	296	258	150-400	59	24	7.0
	Youngs/Danaher	1985	111	255	120-340	42	23	7.7
	Independence Pk.	1986	586	274	120-427	61	31	8.7
	Youngs/Danaher	1986	142	268	190-425	42	24	8.8
	Gordon	1987	15	272	218-378	60	20	1.3
	Youngs/Danaher	1987	137	264	165-400	56	20	7.7
	Youngs/Danaher	1988	106	243	179-452	28	12	6.0
	Youngs/Danaher	1989	145	244	160-443	38	11	9.7
	Youngs/Danaher	1990	133	263	140-446	53	20	9.2
	Youngs/Danaher	1991	100	266	155-442	53	23	8.5
	Youngs/Danaher	1992	132	272	180-442	59	23	11.0
	Youngs/Danaher	1993	101	277	200-440	61	24	7.8
	Youngs/Danaher	1994	104	289	170-445	63	40	8.3
	Youngs/Danaher	1995	90	274	170-431	57	28	5.1
	Youngs/Danaher	1996	48	265	165-470	31	27	4.6
Black Bear	Mid Cr.	1983	112	213	160-378	8	2	N/A
	Black Bear	1985	595	228	117-401	28	8	6.3
	Black Bear	1986	54	231	101-421	26	13	N/A
	Black Bear	1987	38	274	203-381	61	26	1.7
	Black Bear	1989	428	215	120-430	24	11	4.1
	Black Bear	1992	477	239	109-440	38	13	5.2
	Black Bear	1995	329	219	112-404	19	8	4.1
	Black Bear	1998	432	220	112-401	32	10	4.6

Section	Area	Year	N	Mean Length (mm)	Range (mm)	Percent >254 mm (10")	Percent >305 mm (12")	Catch Rate (Fish/Hr.)
Harrison	Harrison	1984	153	197	112-238	10	2	1.7
	Harrison	1985	142	212	152-343	13	0	2.4
	Harrison	1987	31	241	157-358	25	16	3.8
	Harrison	1989	90	198	123-396	10	6	3.8
	Harrison	1990	208	216	135-390	14	7	5.7
	Harrison	1993	151	230	136-352	34	7	2.2
	Harrison	1996	287	188	124-420	8	3	4.9

Over the initial four years of redd counts, field crews observed an average of 280 bull trout redds in our annual monitoring sections. The 1997 total of 269 is 4 percent below this average figure (Deleray 1999). Data are summarized in Table 7.

Table 7. Summary of South Fork Flathead bull trout spawning site inventories from 1993-1998 in the annual index sections

Reservoir Tributaries							**Upper River Tributaries**					
	1993	1994	1995	1996	1997	1998		1993	1994	1995	1996	1997
Wounded Buck	22	29	34	41	14	5	Youngs	40	24	34	74	43
Wheeler	12	10	1	3	1	4	Gordon	35	44	46	58	30
Sullivan	25	8	--	52	50	54	White River	39	60	45	86	31
Quintonkin	5	3	7	4	0	11	Little Salmon	56	47	43	134	100
Totals	64	50	42	100	65	74	Totals	170	175	168	353	204

Mainstem of the Flathead River upstream of Flathead Lake

Salmonids using the mainstem of the Flathead River have diverse life history strategies, which makes it difficult to assess the status of populations. Mountain whitefish, westslope cutthroat trout, and bull trout have both fluvial and adfluvial life histories, while rainbow trout appear to be primarily fluvial. Within a species, individual fish of one life history are generally not visually distinguishable from those of another life history. Determining population status for these species is difficult due to the timing of seasonal migrations and overlapping habitat use by the different life histories.

Adfluvial westslope cutthroat trout use the mainstem river and North and Middle Forks as a migratory corridor. Adults migrate to and from spawning tributaries from early winter through summer, while juveniles migrate from rearing streams toward the lake from early summer through winter (Shepard et al. 1984, Liknes and Graham 1988). Similarly, juvenile bull trout emigrate from tributaries to the Flathead River and Lake system from early summer through winter. In early summer (April to July), adult adfluvial bull trout migrate from the lake into the river and move toward staging areas. They then move into spawning tributaries generally in August, and following spawning in September, move rapidly back downstream to Flathead Lake (Shepard et al. 1984). Adult mountain whitefish also make spawning migrations as the fall spawning period approaches, and rainbow trout adults move in response to spring spawning. Thus, at any time of the year, different salmonids, life histories, and age groups are migrating throughout the river system.

A recent investigation found the mountain whitefish to be the most numerous species (hundreds per night) in both river sections (Deleray et al. 1999). Investigators also observed but did not enumerate largescale suckers. They captured rainbow trout, westslope cutthroat trout, bull trout, lake trout, brook trout, and lake whitefish. Rainbow, westslope cutthroat trout, and bull trout dominated the trout and char catch. Future surveys are needed to assess trends in population abundances and to relate variation in catch to river discharge, water temperature, or other factors.

Hybridization between rainbow and westslope cutthroat trout is prevalent in the upper Flathead River. The concentration of hybrid trout appears higher in the Columbia Falls section than in the Kalispell section.

Table 8. Mean catch per unit effort (CPUE) for rainbow, westslope cutthroat, and bull trout, night electrofishing on Flathead River in February and March, 1997 and 1998

Kalispell Section		Rainbow			Westslope Cutthroat			Bull Trout		
Year	CPUE	All Sizes	>300 mm	<300 mm	All Sizes	>300 mm	<300 mm	All Sizes	>400 mm	<400 mm
1997	#/hr	3.1	2.2	1.0	2.7	2.0	0.6	1.5	0.4	1.1
1998	#/hr	6.1	1.8	4.3	18.9	8.8	10.1	3.5	0.3	3.2
1981	#/km/hr	0.5	---	---	4.2	2.1	---	---	---	0.4
1997	#/km/hr	1.1	0.7	0.3	0.9	0.7	0.2	0.5	0.1	0.4
1998	#/km/hr	2.1	0.6	1.4	6.4	3.0	3.4	1.2	0.1	1.1
Columbia Falls Section										
1997	#/hr	17.9	7.2	10.8	4.5	2.6	1.9	2.2	0.6	1.6
1998	#/hr	21.3	7.6	13.7	3.0	0.8	2.2	2.7	0.9	1.8
1981	#/km/hr	2.5	---	---	3.0	2.8	---	---	---	---
1997	#/km/hr	9.0	3.6	5.4	2.3	1.3	1.0	1.1	0.3	0.8
1998	#/km/hr	10.7	3.8	6.9	1.5	0.4	1.1	1.4	0.5	0.9

Flathead Lake

From a fish community perspective, Flathead Lake has supported three very different species assemblages. Prior to settlement by Europeans, the fish community was solely comprised of native species, which colonized the waters following the last glacial period, roughly 10,000 years ago. Bull trout, westslope cutthroat trout, and mountain and pygmy whitefish were the only salmonids. Bull trout and northern pikeminnow were the dominant piscivorous fishes. Most likely, the minnows (n. pikeminnow and peamouth) dominated in fish abundance and biomass (Elrod, et al. 1929). Accurate depiction of relative species abundance is difficult due to a lack of recorded and quantified surveys or fishery encounters.

Europeans arrived in the mid-1880s, and beginning in the early 1900s introduced a number of other fish species (Table 9, Hanzel 1969, Alvord 1991) (Hanzel 1969; Alvord 1991). By the 1920s, a new fish community had established itself with abundant kokanee, lake trout, lake whitefish, and yellow perch in addition to the native species. Kokanee and yellow perch dominated the recreational fishery. Angler creel surveys in 1962, 1981, and 1985 show kokanee provided the majority of the sport fishery—from 77 to 97 percent of harvested fish numbers (Evarts 1998). This new community was relatively stable until the mid-1980s.

Table 9. List of native and non-native fish species in Flathead Lake

Native	Non-Native	Date Introduced
Bull Trout	Lake Trout	1905
Westslope Cutthroat Trout	Lake Whitefish	1890
Mountain Whitefish	Kokanee	1916
Pygmy Whitefish	Yellow Perch	1910
Longnose Sucker	Northern Pike	1960's (Illegally)
Largescale Sucker	Rainbow	1914
Northern Pikeminnow	Brook Trout	1913
Peamouth Chub	Largemouth Bass	1898
Redside Shiner	Pumpkinseed Sunfish	1910
Sculpins	Black Bullhead	1910

Beginning in 1968, MFWP introduced opossum shrimp (*Mysis)* into Ashley, Swan, Tally, and Whitefish lakes in the Flathead Lake drainage. Mysis moved out of these lakes and downstream into Flathead Lake, where they were first collected in 1981. By the mid-1980s, mysis established an abundant population and caused the third shift in the fish assemblage in Flathead Lake.

Following their first collection in Flathead Lake in 1981, the mysis population increased exponentially from under three mysis/m^2 in 1984 to a peak of 130 mysis/m^2 in 1986 (Beattie and Clancey 1991, Spencer et al. 1991). Mysis density then dropped below 60/m^2 by 1988 and has since varied between 16 and 68/m^2 (Spencer et al. 1991, Beattie and Clancey 1991, Flathead Basin Commission 1993, Stanford et al. 1997). This created unforeseen and far-reaching changes in the Flathead Lake system due to unique feeding behavior of mysis. Mysis became a competitor with fish species dependent on the zooplankton forage base. It also provided an abundant food source for benthic fishes, such as lake trout and lake whitefish, and substantially increased survival, recruitment, and abundance of these species.

Table 10 shows how the fish population has changed since the introduction of mysis. Percent species composition has changed dramatically. For gillnet surveys, sample years 1981 and 1983 describe the pre-mysis fish community and provide baseline fishery information for comparison to current populations. In the sinking nets, there was a shift in species composition from numerical dominance by peamouth (pre-mysis) to lake whitefish (post-mysis). In 1981 and 1983, peamouth comprised about 40 percent of catch composition, while lake whitefish comprised only about 15 percent. In recent catches, lake whitefish comprised roughly 75 percent of the catch. One of the more dramatic transformations has been in the relative abundance of bull trout and lake trout. In 1981 and 1983, bull trout numbers comprised 10 and 13 percent of fish caught in sinking nets, while lake trout numbers comprised only 0.2 and 0.9 percent, respectively. Since 1996, bull trout comprised roughly one percent, while lake trout comprised six to 14 percent of gillnet catch. Similar declines have been observed in mountain whitefish in sinking net catch. Mountain whitefish comprised roughly four percent of catch composition in the early 1980s and now have a very low incidence (<1 percent).

Westslope cutthroat trout showed the greatest declines in floating net catches. In the early 1980s, westslope cutthroat trout made up 20 to 40 percent of the catch, while in recent years they composed less than 20 percent. With the exception of lake trout and northern pikeminnow, the other species have not shown obvious changes in percent composition.

Table 10. Percent species composition of fish caught in gill nets in Flathead Lake, annual spring monitoring series, 1981-1998

			Percent Species Composition										
Year	# of Nets	Total # of Fish	WCT	BT	LT	LWF	MWF	KOK	NSQ	PM	LNSU	CSU	YP
Sinking Nets													
1981	23	450	0.4	13.3	0.2	16.2	4.4	2.2	15.6	41.1	3.8	0.9	1.8
1983	30	459	0.2	10.7	0.9	13.7	4.1	1.1	11.1	39.0	8.1	2.2	8.7
1992	18	369	0.0	2.4	8.4	55.8	0.3	0.0	12.7	15.7	1.9	1.1	1.6
1993	18	299	0.7	0.7	8.7	46.2	0.3	0.0	24.1	10.4	4.7	3.3	0.7
1994	18	555	0.0	0.7	10.1	49.9	0.0	0.0	9.5	26.5	2.5	0.2	0.5
1995	24	304	0.0	0.3	9.2	54.9	0.0	0.0	15.5	13.5	2.6	2.0	2.0
1996	30	286	0.0	0.7	13.6	74.8	0.0	0.0	6.6	2.1	1.7	0.3	0.0
1997	30	524	0.0	1.4	10.3	74.7	0.0	0.0	11.1	0.4	1.4	0.6	0.0
1998	30	633	0.2	0.6	6.3	74.9	0.2	0.0	12.8	2.1	2.1	0.0	0.9
Floating Nets													
1981	30	232	43.5	10.9	0.0	1.7	8.7	2.6	14.8	17.8	0.0	0.0	0.0
1983	30	268	22.8	7.1	0.0	2.6	2.6	4.9	11.9	46.3	0.7	1.1	0.0
1992	28	149	38.9	3.4	10.1	8.7	6.0	0.0	8.1	22.1	0.7	0.0	0.7
1993	28	102	9.8	0.0	6.9	19.6	1.0	0.0	37.3	20.6	0.0	3.9	0.0
1994	30	116	16.4	4.3	8.6	7.8	0.9	0.0	23.3	37.9	0.0	0.0	0.9
1995	24	51	13.7	2.0	7.8	21.6	0.0	0.0	31.4	17.6	2.0	3.9	0.0
1996	30	41	17.1	17.1	12.2	2.4	4.9	0.0	19.5	26.8	0.0	0.0	0.0
1997	30	134	11.2	8.2	4.5	2.2	3.0	0.0	37.3	23.9	0.7	8.2	0.0
1998	30	608	4.3	2.1	1.5	4.1	0.5	0.2	37.7	46.7	0.0	1.2	0.3

Key: WCT = Westslope Cutthroat, BT = Bull Trout, LT = Lake Trout, LWF = Lake Whitefish, MWF = Mountain Whitefish, KOK = Kokanee, NSQ = Northern Pikeminnow, PM = Peamouth, LNSU = Longnose Sucker, CSU = Largescale Sucker, YP = Yellow Perch

In summarizing the information available on Flathead Lake bull trout, it appears that between 1980 and 1991 total estimated bull trout spawner escapement fluctuated between 2,000 and 4,000 fish. Limited information from the early 1950s suggests similar numbers of spawners at that time. A significant decline in redd numbers occurred during the early 1990s due to alteration of the trophic dynamics in Flathead Lake. From 1992 to 1997, the number of bull trout redds remained relatively stable, but this level was approximately 70 percent below the average during the preceding 12-year period (1980-1991). Our 1998 count showed an encouraging increase over the previous six years, but it was still 50 percent below its pre-mysis levels. The mechanisms causing the decline are not completely clear and there remains considerable uncertainty about bull trout ecology and trophic interactions in Flathead Lake.

Separate bull trout populations occupy the Swan and South Fork Flathead drainages. Those populations are presently stable or increasing.

Lower Flathead River and Main Tributaries

The results of 1998 spring and fall electrofishing surveys on the lower Flathead River are summarized in Table 11 and Table 12.

Table 11. Flathead River, May 1998 electrofishing summary

Species/Lengths	Mean	Median	SE	SD	Range	Min	Max	Count	Percentage
Bull Trout	374	na	na	na	na	na	na	1	0.5%
Westslope Cutthroat	326	309	26.1	63.8	171	272	443	6	2.8%
Rainbow-Cut Hybrid	345	na	na	na	na	na	na	1	0.5%
Rainbow Trout	345	356	17.5	85.7	281	187	468	24	11.3%
Brown Trout	404	416	9.9	88.6	385	185	570	80	38.0%
Mountain Whitefish	142	130	7.5	32.6	145	120	265	19	8.9%
Northern Pike	566	525	24.9	119.3	429	356	785	23	10.8%
Yellow Perch	152	152	71.0	100.4	142	81	223	2	0.9%
Northern Squaw	337	355	24.8	82.4	320	105	425	11	5.2%
Longnose Sucker	484	485	5.6	31.2	125	425	550	31	14.6%
Peamouth	333	333	27.5	38.9	55	305	360	2	0.9%
Largemouth Bass	409	409	84.0	118.8	168	325	493	2	0.9%
Smallmouth Bass	252	284	23.5	62.2	169	140	309	7	3.3%
Pumpkinseed	144	144	10.0	14.1	20	134	154	2	0.9%

Table 12. Flathead River, October 1998 electrofishing summary

Species/Lengths	Mean	Median	SE	SD	Range	Min	Max	Count	Percentage
Bull Trout	484	484	34.5	48.8	69	449	518	2	0.2%
Westslope Cutthroat	310	301	20.4	45.6	105	265	370	5	0.4%
Rainbow-Cut Hybrid	405	414	19.9	52.5	138	349	487	7	0.6%
Rainbow Trout	358	378	17.6	82.7	237	228	465	22	1.7%
Brown Trout	372	381	11.5	96.3	351	210	561	70	5.5%
Mountain Whitefish	284	300	2.1	68.7	460	0	460	1059	83.8%
Northern Pike	587	605	14.8	129.3	558	279	837	76	6.0%
Perch	192	186	17.4	55.2	172	113	285	10	0.8%
Largemouth	173	163	13.0	34.5	97	142	239	7	0.6%
Smallmouth	252	220	34.4	76.8	184	175	359	5	0.4%

The results of electrofishing surveys on tributaries to the lower Flathead River are summarized in Table 13 and Table 14. The Jocko River and its tributaries have the most significant native trout populations on the reservation. Genetic samples taken above the Jocko

Upper “S” canal diversion have confirmed that the irrigation structure functions as a fish barrier keeping the Middle and South forks of the Jocko River free of rainbow trout. Thus, the area remains a stronghold for pure-strain westslope cutthroat trout. In all, a total of nine separate pure-strain westslope cutthroat trout populations persist above fish barriers in the watershed. Bull trout have been documented in the North, Middle, and South forks of the Jocko as well as the mainstem. Introduced trout species are also well distributed within the river. Brook trout occur throughout the drainage, but are less prevalent in the lower reaches. Below Arlee, rainbow trout and brown trout dominate the river. Studies in the 1980s documented an exchange of both westslope cutthroat and bull trout between the Jocko and the Flathead rivers (DosSantos et al. 1988).

The Jocko River is the only designated “core area” and has the most significant potential for recovery (MBTSG 1996). Core areas provide significant spawning and rearing areas and are considered important in the overall recovery of the species within Montana (CSKT 2000a). However, the Jocko population is currently classified as "functioning at unacceptable risk" (Evarts, CSKT, pers. com. 2000) due to habitat degradation.

Table 13. Jocko River 1998 electrofishing summary

Species/Lengths	Mean	Median	SE	SD	Range	Min	Max	Count	Percentage
Jocko River, Dixon Reach, October 1998 Electrofishing									
Brown Trout	264	254	6	82.7	419	101	520	164	44.7%
Rainbow Trout	287	302	9	113.8	408	74	482	168	45.8%
Rainbow-Cut Hybrid	337	331	13	71.2	260	207	467	30	8.2%
Westslope Cutthroat	294	309	23	51.7	113	234	347	5	1.4%
Jocko River, N. Valley Reach, September 1998 Electrofishing									
Brown Trout	222	198	6	99.0	422	88	510	260	59.5%
Rainbow Trout	198	195	12	111.1	367	69	436	84	19.2%
Rainbow-Cut Hybrid	317	304	31	74.8	163	242	405	84	19.2%
Bull Trout	149	149	0	na	0	149	149	1	0.2%
Eastern Brook Trout	248	248	19	26.2	37	229	266	6	1.4%
Mountain Whitefish	275	282	4	82.6	350	95	445	2	0.5%
Jocko River, Spring Creek Reach, Sept. 1998 Electrofishing									
Brown Trout	242	212	12	122.0	427	89	516	105	43.8%
Rainbow Trout	246	266	24	135.1	486	74	560	33	13.8%
Rainbow-Cut Hybrid	436	436	33	46.7	66	403	469	2	0.8%
Eastern Brook Trout	150	150	0	na	0	150	150	1	0.4%
Mountain Whitefish	261	278	9	91.8	343	96	439	99	41.3%

Table 14. Crow Creek 1998 electrofishing summary

Species/Lengths	Mean	Median	SE	SD	Range	Min	Max	Count	Percentage
Reach 2 November 1998									
Brown Trout	172	143	6	72.9	327	105	432	127	22.3%
Rainbow Trout	134	116.5	7	64.5	335	71	406	78	13.7%
Rainbow-Cut Hybrid	152	125	4	72.7	322	85	407	263	46.2%

Largemouth Bass	135	135	7	35.8	107	85	192	24	4.2%
Mountain Whitefish	155	152	3	17.5	109	133	242	47	8.3%
Yellow Perch	145	140	3	19.0	95	115	210	30	5.3%
Reach 3 November 1998									
Brown Trout	163	147	4	57.5	309	105	414	186	34.4%
Rainbow Trout	169	150	4	66.3	486	99	585	312	57.7%
Rainbow-Cut Hybrid	347	348	12	49.1	152	273	425	17	3.1%
Largemouth Bass	152	153	3	12.8	47	129	176	19	3.5%
Mountain Whitefish	168	175	5	12.2	30	150	180	7	1.3%

Wildlife

The Flathead River Subbasin encompasses a wide diversity of habitats from its source to its mouth. These habitats, in turn, provide niches for a diverse array of birds, mammals, amphibians, and reptiles. Approximately 308 species of birds, 69 species of mammals, eight species of amphibians, nine species of reptiles, and 23 species of fish occur in the watershed (Ratti 1990; CSKT 2000).

Target Species

Mammals

Table 15 lists the abundance and status of target mammal species in the subbasin.

Table 15. Flathead Subbasin target mammal species

Species	Abundance	Description of Status
Elk	Abundant	Elk populations in the South, Middle and North Fork drainages experienced long-term declines over the last 40 years; however, populations have remained relatively stable over the last 10 years (Vore and Schmidt 1997). Populations in the remainder of the basin have also been relatively stable over the last 10 years.
Mule deer	Abundant	Mule deer populations throughout the subbasin have been declining over the last 15 years.
Moose	Uncommon	Moose populations increased from the mid-1980's through 1995 and have subsequently experienced sharp declines.
Black bear	Common	Populations have remained relatively stable, although they fluctuate depending on natural food production.
Grizzly bear	Rare	Populations are increasing in undeveloped Canadian portions of the Flathead subbasin (Hovey and McLelland 1996). However, they are declining to stable in the Swan Mountain Range, which is heavily impacted by surrounding human developments and activities (Mace and Waller 1998).
Lynx	Uncommon	Lynx have historically existed at very low-densities. Current populations are relatively high compared to long-term averages, in response to high snowshoe hare populations.
Fisher	Uncommon	Fisher populations were supplemented with transplants during the 1950's and 1960's. They continue to persist in the subbasin at low-densities, as they have historically.
Wolverine	Uncommon	Wolverine populations exist at very low densities in the higher elevations of the sub-basin. Populations have probably increased since poison baits were banned in the early 1970's.

River Otter	Uncommon

Birds

Montana Partners-In-Flight (PIF) Bird Conservation Plan (Casey 2000) classified breeding bird species in Montana based on their priority for conservation action within the state. Table 16 lists the highest priority breeding bird species that are found in the Flathead River subbasin along with their habitats and abundance. All neotropical migrant birds are also considered target species, as are wood ducks, common goldeneye, and sandhill cranes.

Table 16. Bird species in the subbasin considered a high priority for conservation

Species	Priority	Habitat	Abundance
Common Loon	I	wetland	uncommon
Horned Grebe	II	wetland	uncommon
Trumpeter Swan	I	wetland	rare
Harlequin Duck	I	riparian	uncommon
Barrow's Goldeneye	II	wetland; riparian	uncommon
Hooded Merganser	II	wetland; riparian	common
Bald Eagle	II	wetland; riparian	common
Northern Goshawk	II	forest	uncommon
Peregrine Falcon	II	wetland; riparian; unique	rare
Ruffed Grouse	II	riparian	common
Columbian Sharp-tailed Grouse	II	grassland; riparian	extirpated
Long-billed Curlew	I	grassland	uncommon
Flammulated Owl	I	forest	rare
Black Swift	II	riparian; unique	rare
Vaux's Swift	II	riparian; forest	common
Calliope Hummingbird	II	riparian; forest; shrubland	abundant
Lewis's Woodpecker	II	riparian; forest	rare
Red-naped Sapsucker	II	riparian; forest	abundant
Williamson's Sapsucker	II	forest	uncommon
Three-toed Woodpecker	II	forest	common
Black-backed Woodpecker	I	forest	uncommon
Pileated Woodpecker	II	forest	common
Olive-sided Flycatcher	II	forest	common
Willow Flycatcher	II	riparian	common
Hammond's Flycatcher	II	riparian; forest	abundant
Cordilleran Flycatcher	II	riparian	uncommon
Brown Creeper	I	forest	uncommon
Winter Wren	II	forest	common
Veery	II	riparian	uncommon
Red-eyed Vireo	II	riparian	common
Lazuli Bunting	II	riparian; shrubland	common
Brewer's Sparrow	II	shrubland	rare
Grasshopper Sparrow	II	grassland	rare

Priority Levels from Montana Bird Conservation Plan: Level I species exhibit declining populations and require conservation plans; Level II species are under fewer threats; may be declining or stable but still must be monitored.

Amphibians and Reptiles

Amphibians are present in many of the wetter parts of the subbasin, especially wetland and riparian habitats. A 1993 survey of the Flathead Reservation found the long-toed salamander, chorus frog, spotted frog, and boreal toad occur throughout the lower Flathead drainage area, although populations of the boreal toad and spotted frog appear diminished (Werner et al. 1995). The tailed frog occurs but is significantly more restricted in its distribution. The leopard frog, historically common in some areas, was not found during the survey. The survey also found that two species of garter snakes (the common and western terrestrial) and painted turtle are common in valley and foothill habitats. The prairie rattlesnake, bull snake, racer, and rubber boa also occur. Western skinks are thought to be present as well, and northern alligator lizards have been documented at lower elevations in the Mission Mountains (Tribal Wildlife Management Program Unpubl. Data).

Target amphibian species include the northern leopard frog, the spotted frog, and the boreal toad.

Threatened, Endangered, and Sensitive Species

Four federally listed wildlife species occur in the subbasin. The northern gray wolf is listed as endangered the grizzly bear and Canadian lynx as threatened. The peregrine falcon was recently removed from the ESA list due to recovery, and the bald eagle is proposed for removal, but is currently listed as threatened.

Grizzly Bear

Grizzly bears are found mainly in Glacier National Park and adjacent areas, and in and around the Scapegoat, Bob Marshall, Great Bear, and Mission Mountains Wilderness areas and the South Fork of the Jocko Primitive Area. The Flathead Subbasin is located within the Northern Continental Divide Ecosystem, which is thought to contain one of the most productive populations in the lower United States. The Canadian and U.S. portions of the North Fork of the Flathead River Drainage support the highest density of inland grizzlies in North America. Grizzly bear management is primarily focused on reducing human/bear conflicts, minimizing bear mortality, and providing secure high quality habitat for bears. Human/bear conflicts are currently the leading cause of bear mortality.

Northern Gray Wolf

Wolves occupy several areas of the upper subbasin including parts of Glacier National Park and the North Fork of the Flathead Valley, the Bob Marshall Wilderness, and an area to the east of Kalispell. Wolves have also been documented on the Flathead Indian Reservation. They occasionally pass through the reservation, and they have denned near the southern, northern, and western boundaries. They may eventually repopulate some areas of the reservation.

Wolves are habitat generalists and are dependent on healthy prey populations. Big game habitat that wolves utilize include calving and fawning areas, winter range, and summer range. Maintaining healthy prey populations by protecting these important habitats will help to ensure the long-term survival of the wolf within the subbasin. More direct management, such as the protection of denning and rendezvous sites, will also be needed.

Canada Lynx

The Canadian lynx is listed as a threatened species. The status of the lynx in the subbasin is unknown at this time, although it is known lynx habitat exists and persistent populations exist. Winter track surveys and remote-sensing camera surveys have detected the presence of lynx on the Flathead Indian Reservation in potentially low densities (Tribal Wildlife Management Program unpubl. data). Track surveys throughout the remainder of the subbasin are detecting an increasing distribution of lynx. Studies of their status in the upper Swan drainage and the Middle Fork of the Flathead River are underway.

Bald Eagle

North of the Flathead Indian Reservation, bald eagle occupy habitats on the three forks and mainstem of the Flathead River, on some of the sloughs adjacent to the river, on the north shore of Flathead Lake, and numerous rivers and lakes throughout the remainder of the subbasin. Twenty bald eagle breeding territories occur within the Flathead Indian Reservation. Most of these are along the lower Flathead River, on islands or the shoreline of Flathead Lake, or along tributaries and irrigation reservoirs. Migrant and overwintering bald eagles may number as high as 70 birds during peak periods. Bald eagles are also present along Flathead Lake. There are 28 occupied territories in the remainder of the Flathead subbasin. The northern portion of the subbasin (except for Glacier National Park) supports a productive bald eagle population. Most nests fledge one, and often two, young per nest. One new territory has been established in each of the last two years.

Peregrine Falcon

This species was undoubtedly once more common, but habitat destruction and the widespread use of DDT and other pesticides have dramatically reduced the numbers. Since banning DDT in the U.S., and with a captive breeding program in place, peregrine falcons have increased steadily in many parts of their former range. North of the Flathead Indian Reservation, most peregrine observations have been of migratory birds. Recently, some residents have been observed in isolated locations such as Lower Stillwater Lake. However, no surveys have been completed. On the Flathead Indian Reservation, the species probably inhabited portions of the Mission Mountains and possibly the lower Flathead River. Prior to the early 1990s, peregrines were observed as occasional migrants during fall and spring, and were seen during the summer as recently as 1990. In the early 1990s two reintroduction sites were established on the reservation. Reintroduction has been successful at both of these sites, and two additional nesting territories may be productive during 2001.

Sensitive Species

The tribes and state classify 39 terrestrial, vertebrate wildlife species in the subbasin as sensitive (Table 17). All are considered sensitive due to low populations, threats to their habitats, or highly restricted distributions. These species do not necessarily have legal protection but are considered sensitive to human activities and attention to their habitat and population needs may be warranted during the planning of resource management activities. The status of many of these species is not known because there have been few population or habitat studies.

Table 17. Sensitive species

Amphibians	
Boreal toad	Tailed frog
Birds	
Common loon	Common tern
American white pelican	Forster’s tern
Black-crowned night-heron	Black tern
White-faced ibis	Yellow-billed cuckoo
Trumpeter swan	Flammulated owl
Harlequin duck	Burrowing owl
Bald eagle	Great gray owl
Northern goshawk	Boreal owl
Ferruginous hawk	Black swift
Peregrine falcon	Black-backed woodpecker
Columbian sharp-tailed grouse	Loggerhead shrike
Black-necked stilt	Baird’s sparrow
Franklin’s gull	Le conte’s sparrow
Caspian tern	
Mammals	
Townsend’s big-eared bat	Woodland caribou
Northern bog lemming	Wolverine
Gray wolf	Fisher
Grizzly bear	River Otter
Lynx	

Habitat Areas and Quality

Although fish and wildlife are separated in the discussion that follows, the quality of habitat in riparian and wetland areas as well as upland areas affect both fish and wildlife. Upland areas that have been heavily roaded or overgrazed affect big game populations, but they also can contribute sediment to waterways impacting fish and other aquatic organisms. Similarly, when wetlands and riparian areas are lost or degraded, both fish and terrestrial wildlife species suffer. Conversely, habitat improvements in upland areas that are designed to benefit wildlife usually have beneficial effects on fish, just as measures designed to rehabilitate riparian and wetland areas for fish almost certainly benefit wildlife.

Fish

Barriers to trout movement in the upper part of the subbasin are shown in Plate 11 of Appendix B. Plates 12 through 16 show the general quality of habitat for westslope cutthroat trout and bull trout in the upper part of the subbasin.

North, Middle, and South Forks of the Flathead River

In the headwaters of the Flathead Subbasin, fish habitat quality is high. Headwater reaches are largely undeveloped in Glacier National Park, the Bob Marshall and Great Bear Wilderness, Jewel Basin, and other national forest lands. They retain a high percentage of the original wild attributes and native species complexes. Protection of these remaining pristine areas and reconnection of fragmented habitats in the subbasin are high priorities.

The remainder of the upper subbasin ranges from extremely degraded to nearly pristine. Many stream reaches have been blocked to fish passage by man made or natural barriers. Outside of the South Fork of the Flathead drainage, approximately one-third of the spawning areas in the upper half of the subbasin have been degraded by excessive sediment inputs, which have decreased egg-to-fry survival to <30 percent (Weaver and Fraley 1991; 1993). An additional one-third of the remaining spawning reaches are inhabited by introduced fish species that can compete or hybridize with genetically "pure" native stocks.

Hungry Horse Dam Impacts on Fish Habitat

Hungry Horse Dam impounds the 4,403-km^2 South Fork drainage basin. Completion of Hungry Horse Dam in 1952 on the South Fork of the Flathead River inundated 124 km of high-quality spawning and rearing streams. Fish passage structures were never installed in the dam, which became operational in 1953.

Complete replacement of this inundated stream habitat is not possible. However, mitigation efforts are underway to protect, re-open, or reconstruct the remaining tributary habitat to offset the loss.

Reservoir drawdowns have ranged as deep as 188 feet, exposing over 70 percent of the reservoir area to desiccation and erosion. Drawdown affects all biological trophic levels and influences the probability of subsequent refill during spring runoff. Refill failures are especially harmful to biological production during the productive warm months. Annual drawdowns impede revegetation of the reservoir varial zone, resulting in a littoral zone of nondescript cobble/mud/sand bottom with limited habitat structure.

Power operations cause rapid fluctuations in dam discharges (as great as 400 percent change in daily discharge), which are inconsistent with the normative river concept. Flow fluctuations widen the riverine varial zone, which becomes biologically unproductive. Implementing watershed-based dam operations to recover all native species (Marotz et al. 1999) can mitigate this effect.

Hungry Horse Dam operation reversed the Flathead River hydrograph for power and flood control and altered the annual temperature regime, causing impacts typical of dam tailwaters. As part of Hungry Horse mitigation, a selective withdrawal, temperature control structure was installed on Hungry Horse Dam. The device restored naturalized water temperatures to 71 river kilometers of the mainstem Flathead River. Model estimates predict a two to three-fold increase in growth potential for the fish that remain in the affected reach due to temperature control. Sampling is ongoing to document the influence on target species and their prey.

Fish passage problems in tributaries to Hungry Horse Reservoir were documented following the reconstruction of roads to accommodate higher water levels (Morton 1955; MT

Fish and Game Commission 1963). Sixteen percent of the existing westslope cutthroat trout and bull trout spawning and rearing habitat above full-pool elevation was blocked by poorly placed culverts (MDFW&P and CSKT 1991). Natural barriers include beaver dams and sections of stream channels that intermittently become dry due to subsurface water flow.

An unforeseen benefit of Hungry Horse Dam is that it has prevented introduced fish species in the lower Flathead system from accessing Hungry Horse Reservoir and its tributaries.

Kerr Dam Impacts on Fish Habitat

The Kerr Dam project is located on the lower Flathead River approximately 7.2 km downstream from the natural outlet of Flathead Lake. The project includes a 200 foot-high, 381 foot-long dam, a 126,000-acre reservoir, three penstocks, and a powerhouse containing three generating units, each rated at 60 megawatts. Annual operations of the Kerr Project affect the first 35-km of the upper Flathead River, the entire Flathead Lake shoreline, and the entire 116 km of the lower Flathead River below Kerr Dam.

Seasonal lake-level fluctuations associated with Kerr Dam operations are considered responsible for causing adverse impacts to shoreline and near-shoreline fisheries habitats. Under the current Federal Energy Regulatory Commission (FERC) license, continued manipulation of the Flathead Lake hydrograph will result in shoreline habitats (those located within the varial zone, which lies between lake-level elevations 2,893 feet and 2,883 feet) being inundated from June through late fall of every year. Lake levels are then gradually reduced to low pool level (2,883 feet) by April 15, after which the lake-filling cycle begins again. This artificial hydrograph differs from Flathead Lake's natural hydrograph. Under natural conditions, the lake typically filled to approximately 2,893 feet during the annual June snowmelt period. It then dropped fairly rapidly until it reached approximately 2,883 feet in late summer. The adverse habitat effects of these continued operations include: (1) winter dewatering of preferred shoreline spawning areas for salmonids; (2) degradation of deep spawning habitat (below elevation 2,883 feet) by distribution of fine sediments (a consequence of shoreline erosion during the extended full-pool period); (3) and degradation of varial zone and deeper spawning and rearing habitats for non-salmonid fishes and invertebrates resulting from a reduction in the time of beneficial wave cleaning action due to extended deep-water periods over these habitats. These direct habitat impacts, which limit shoreline invertebrate and juvenile fish production, result in indirect negative impacts to the foraging habitats of other fish species, including native bull and cutthroat trout (FERC 1996, MPC 1990).

Flathead Indian Reservation (Lower Flathead River Drainage)

General Description

The fisheries resources of the Flathead Indian Reservation have been affected by a variety of human activities. The initial and probably greatest influence has been the construction and operation of the Flathead Indian Irrigation Project. Historic impacts from irrigation include stream dewatering, the blockage of migration routes by diversion structures, and the loss of large numbers of fish as water is diverted into the canal system. Another major influence on the reservation fisheries has been the introduction of exotic species. These introductions have produced some thriving fisheries, but have reduced native populations through competition and hybridization. Agriculture and grazing have influenced fisheries by degrading water quality and modifying stream bank vegetation. The primary influence from past forestry practices has been extensive road construction in watersheds, which has resulted in increases in sediment and encroachment on channels. The current goal for reservation forests is to achieve a *total* road density of less than 6.5 miles of road per square mile by removing 15 percent of road spurs in currently roaded areas.

Between 1994 and 1997 the tribes collected samples from 15 streambeds using the McNeil coring method (McNeil and Ahnell 1964). The samples were from sites in both the commercial and noncommercial forest. For each stream the samples contained an average content of particles less than 4.75 mm in diameter ranging from nine to 40 percent.

Between 1993 and 1997 the University of Montana Riparian and Wetland Research Program evaluated 102 reaches of stream on the reservation. The average score for all reaches was 74, which is described as a functional riparian condition, but considered at risk if remedial management actions are not taken. Of the 102 inventoried reaches, 15 rated as nonfunctional, 46 were functional-but-at-risk, and 41 were in proper functioning condition.

Lower Flathead River

The lower Flathead River is unique in its geology and temperature regime. The river cuts through highly erosive lacustrine and alluvial sediments deposited during the life span of glacial Lake Missoula. Cottonwood habitat types and a mixed deciduous/coniferous overstory has been forced toward a conifer-dominated overstory due to the abatement of periodic flooding activity and constrained flows under recent peaking operations (DosSantos et al. 1988). Kerr dam operations historically had significant impacts to the riparian community due to load-following and power-peaking practices. Many of these impacts were addressed in 1997 when the facility was changed to a "baseload" operation under the new license agreement. Current monitoring under mitigation programs centers around assessing the benefits to the biotic community. The river channel itself is largely unaltered by development. The railroad cut off several meander bends or side channels between the town of Dixon and its confluence with the Clark Fork River, but the channel is considered relatively stable. Current impacts to fish habitat quality include bank trampling and vegetation disturbances from grazing and elevated fine sediment input and temperatures from its major tributaries and irrigation return flows. However, due to its size relative to these impacts, fish habitat quality in the mainstem river remains largely unaltered from historic conditions.

Naturally high water temperatures occur in the river, primarily due to the configuration of Flathead Lake. A large shallow bay near the outlet of the lake results in high water temperatures that decrease habitat quality for native salmonids in the lower Flathead River, at least seasonally (Hansen, CSKT, pers. com. 2000). During the summer, lower Flathead River water temperatures are 3 to 4° C higher than those recorded in the upper Flathead River above Flathead Lake due to the natural warming of the lake. Summer water temperatures in the main river are near 20° C, as much as 10° C warmer than any lower river tributary inflow. Winter temperatures reach 0.0° C. The average annual water temperature is 9° C (DosSantos et al. 1988).

Tributaries

The overall health of fish habitat in the upper Jocko River is good to fair. In the lower reaches where water courses have been channelized, water quality degraded, and flows altered, it is poor (CSKT 2000a). Adding to these impacts are problematic irrigation diversions. Important trout spawning areas have been degraded by sedimentation (DosSantos et al. 1988); the sediment originating from irrigation returns and poor riparian management.

The habitat quality of all the tributaries to the lower Flathead has suffered significant adverse impacts due to the construction and operation of the Flathead Indian Irrigation Project and general agricultural practices. In general, impacts include the trapping of fish in unscreened irrigation diversions, frequent, erratic changes in streamflow below irrigation diversions, return flows laden with silt, reduced gravel recruitment in streams, and blocking of access to spawning and rearing habitat.

Cutthroat Trout and Bull Trout Habitat on the Reservation

Populations of cutthroat and bull trout on the Flathead Reservation have been greatly reduced from pre-European levels, and because many of today's populations are not secure, the decline is continuing. Reasons for the decline include impacts from irrigation practices, the introduction of exotic species, and habitat degradation. Artificial migration barriers have isolated many populations. The barriers have hastened the demise of some populations but protected others by preventing exotic species from invading. Habitat condition will likely stabilize or improve if road densities decrease and road standards improve.

Six populations of bull trout survive within the Flathead Indian Reservation. Prior to the construction of dams, adults from these populations may all have shared habitats within the Flathead River and Flathead Lake. Today, three populations are isolated behind dams at the base of the Mission Mountains. They spawn in streams within noncommercial forest lands and are most vulnerable to changes in dam operations and to hybridization with non-native brook trout. There is no timber harvest or roading planned within the ranges of these three populations. The population of bull trout that resides in Flathead Lake spawns off the reservation and is only minimally influenced by forestry activities on the reservation. The populations that reside in the Jocko and Flathead rivers are the most subject to influence by forestry activities. Much of its range is in the forks of the Jocko River, in areas that are noncommercial forest lands. The Jocko population is currently classified as "functioning at unacceptable risk" (Evarts, CSKT, pers. com. 2000). Primary causes for this ranking are identified as habitat fragmentation from irrigation diversions within the Jocko drainage and mainstem Clark Fork River dams. Other impacts include irrigation dewatering, riparian degradation, channelization, and competition from exotic species.

By 1999, the Tribal Fisheries Program had identified 21 separate populations of pure-strain westslope cutthroat trout. Most of these are isolated behind barriers and are widely distributed across the forested landscape. Perpetuation of these populations will require protecting habitat, reducing fragmentation, and separating them from introduced brook and rainbow trout.

Subbasin-wide Bull Trout Habitat Risk Factors

The Montana Bull Trout Study Group identified and rated various habitat risk factors in the subbasin. The major habitat risk factors for the species include: (1) rural residential development especially around Flathead Lake, the North and South forks of the Flathead, and the Swan River; (2) dam operations in the areas affected by Kerr and Hungry Horse Dam operations; (3) forestry practices throughout the subbasin; and (4) agriculture and grazing in the lower Flathead River drainage. These activities have lowered habitat quality for bull trout and threaten to continue to do so in the future.

Wildlife

Priority Habitats

Wildlife habitats that are considered management priorities within Flathead River Subbasin include the following:

Riparian Deciduous Forest (Cottonwood/Aspen), Mixed Forest (Deciduous/Conifer), and Riparian Shrublands

The habitat integrity and availability of riparian deciduous forest and riparian shrublands have been compromised in many parts of the subbasin, and there are continued threats to these habitats. Generally, degradation has resulted either through interruption or alteration of natural flood processes, or through direct removal of vegetation through grazing, clearing, or logging. Changes in flow regimes can have a profound effect on the mix of seral stages present along river reaches, as cottonwoods require flooding and silt deposition for germination. In many cases where the seasonal pattern of high flows has been removed or stabilized, there is a threat of inadequate recruitment to replace older trees as they die. In the most extreme examples of flow alteration—dewatering on the one hand and inundation through damming on the other—all riparian habitat values can be lost.

Mixed forest riparian habitat exhibits co-dominants of cottonwood and ponderosa pine. These are habitat types in successional transition, generally with the coniferous type in some stage of achieving dominance over the cottonwood type. These types provide a large number of niches for a wide variety of wildlife species, but it is likely that in the future they will offer less diverse habitat due to succession toward a dominant conifer type.

Specific activities, which have the most direct effects on riparian habitats, include:

- Flood control and channelization through rip-rapping and other means;
- Dam construction and operation;
- Logging, particularly of older cottonwoods for lumber or pulp;
- Water diversion for irrigation;
- Clearing for agriculture (crops, hay, pasture);
- Grazing;
- Residential development; and
- Recreational use.

Riparian Coniferous Forest

Many upper elevation reaches are in good to excellent condition because of their inaccessibility. Fire suppression has altered species composition in some areas by favoring western red cedar, western hemlock, and grand fir over seral species such as western larch, sub-alpine fir, and lodgepole pine. Lower and mid-elevation reaches are more susceptible to the pressures of overgrazing, flood and erosion control efforts, irrigation withdrawals, road building, logging, and firewood cutting. Long-term grazing impacts in low elevation stands have reduced shrub, forb, and grass cover and created open understory conditions. Grazing has also destabilized stream banks and increased erosion.

Prairie Wetlands

Prairie wetland habitats occur in the Mission Valley, and significant conversion of these habitats has occurred there. Pothole habitats have also been impacted by the loss of surrounding uplands from conversion to croplands, degradation of uplands due to overgrazing, subdivision, contaminated runoff from agriculture, selenium contamination (from leaching due to irrigation or saline seeps), invasion by exotic plants (purple loosestrife), road building and filling. Wildlife values of many wetlands have also been dramatically reduced due to fragmentation, isolation, and high disturbance levels from subdivision and resultant high homesite densities.

Intermountain Valley Wetlands

Unquantified but substantial wetland losses in the subbasin have resulted mostly from filling or draining for subdivisions and agriculture. Intermountain wetlands have also been impacted by development of surrounding uplands (especially cabins and rural subdivisions along shorelines), contaminants, invasion of non-native plants (purple loosestrife), introduction of non-native fish, and disturbance from increasing recreational use.

Intermountain Grasslands

The most immediate threat comes from conversion of existing native grasslands to other types. Conversion primarily occurs in three ways—urban sprawl, establishing tame pastures, and conversion to cropland. Another major concern is the introduction and spread of noxious weeds, particularly knapweed. Other management issues include: 1) grazing regimes, 2) replacement of fire regimes, 3) fragmentation of existing grasslands, and 4) shrub and tree encroachment.

Dry Forest (Ponderosa Pine/Douglas-fir)

The major change common to most dry forest types (especially ponderosa pine) in Montana and elsewhere in the American West is a profound alteration in age-class structure, physical structure, tree density, and tree species composition as a result of logging and fire suppression. Stands that were largely dominated by mature and old growth ponderosa pine trees in an open-parkland setting have been changed to abnormally dense stands dominated by younger Douglas-fir trees.

Moist Douglas-Fir/Grand Fir

The combination of logging and fire suppression has produced a more homogeneous landscape dominated by mid-seral forests, as opposed to historical conditions where more young and old growth forest existed.

Whitebark Pine

Whitebark pine is associated with the federally listed grizzly bear, which relies on whitebark pine nuts. An assessment of the interior Columbia River Basin found that the amount of area in whitebark pine cover type has declined by 45 percent since the turn of the century. This decline, which has been due to a combination of factors (the most prominent of which are mountain pine beetle and whitepine blister rust), has had strong negative consequences for grizzly bears. Most of the loss occurred in the more productive, seral whitebark pine types, of which 98 percent has been lost.

Aspen

Aspen trees are in poor condition in many areas of the subbasin. Most of the aspen remaining are in the older age classes and are in critical need of regeneration. Older stands are usually less vigorous and the least likely to regenerate successfully. Competing conifers are currently crowding out many of these stands. Aspen will eventually be lost from these sites. In addition, pure and mixed stands in the older age classes are of low vigor and are often heavily infested with pathogens. Effective fire suppression over the past 50 years has permitted competition and disease to reduce clone vigor to levels lower than would be expected under natural conditions. Compounding the situation, fire suppression has drastically reduced fire-induced regeneration resulting in few younger-aged stands. Many stands have also been converted to pasturelands or can be classed as a grazing disclimax with little or no regeneration because of heavy grazing pressure.

Upper Flathead Subbasin habitat areas of special concern

Key areas within the Flathead Subbasin critical to native species restoration are experiencing a rapidly progressing change in land ownership and management patterns. Subdivision and residential development of agricultural and timberlands adjacent to waterways in the drainage poses one of the greatest threats to sensitive riparian wildlife. Plum Creek Timber Company, a major landholder in the Flathead drainage, is currently divesting itself of large tracts of its lakeshore and streamside holdings basin-wide. Growth of small tract development throughout the area and its tributaries is occurring at a record rate.

Flathead Indian Reservation (Lower Flathead River Drainage) habitat areas of special concern

Plate 17 in Appendix B shows habitat areas of special concern for wildlife on the Flathead Indian Reservation. This map is not inclusive, however. Wetlands, stream corridors, and riparian areas are important for wildlife but could not be effectively mapped at this scale. In addition, there are many other unmapped dispersed or local sites on forested and open lands that are valuable wildlife habitat. Zone 1 habitat for grizzly bears constitutes critical habitat and recovery areas.

Zone 2 habitat is the area immediately adjacent, is occupied by grizzly bears, and that has the potential to be reclassified to Zone 1.

In many parts of the Flathead Indian Reservation human activities continue to diminish wildlife habitats. Perhaps the most noticeable changes are reductions in the ranges of larger carnivores such as the northern gray wolf and grizzly bear. Another significant change is loss of big game winter range due to high road densities, housing developments, and competition with livestock. In addition, the habitats of other species have been altered by fire suppression, logging, grazing, various forms of development, and the introduction of exotic plant and animal species. Fire suppression alone has had major consequences. For example, at low elevations, open stands of old ponderosa pine, which provided important habitat for many wildlife species, have been converted to dense thickets of Douglas-fir. At higher elevations, fire exclusion policies have meant fewer natural openings, which also provide important habitat. Although there is still great ecological diversity on the Flathead Reservation, humans have altered many of the natural ecological processes that influence wildlife habitats. Arresting the degradation and managing wildlife for the long-term benefit of tribal members is one of the tribes' highest priorities.

Flathead Lake

The wildlife habitat along the edge of Flathead Lake has changed greatly since the beginning of operations at Kerr Dam due to changes in the natural hydrograph coupled with seasonal flooding of an additional ten vertical feet of lake shoreline habitats. The desiccation and flooding regime existing under past and current operations of Kerr Dam have adversely impacted 1,792 acres of wetland and riparian habitat along the shoreline of the lake. These habitat changes will not be repaired under the current and future operations. Under past operations, shallow bays, which were emergent marshes during much of the year, became either dry mudflats or inundated shallow areas, depending upon the time of year. Other areas that supported riparian vegetation were affected by higher and longer water levels and were converted to areas of bare ground due to inundation (Mackey et al. 1987, Mack et al. 1990). The altered hydrograph has created a more stable annual hydrograph, which has allowed for homesite development on most of the lake shoreline, with an attendant level of wildlife habitat loss or degradation.

Lower Flathead River

The annual hydrograph for the lower Flathead River shows a reduction in peak flows and an increase in winter flows from the pre-impoundment hydrograph. These changes in flows cause the normally vegetated varial zone to become abnormally inundated. Similar to the lake, this does not allow riparian vegetation to exist where it normally would. This is especially true in the lower half of the river's course. The area between the high and low water levels of these two reaches has become a largely unvegetated zone dominated by mud and rock. Deciduous and mixed deciduous/coniferous vegetation has moved toward a conifer-dominated vegetative community due to the curtailment of periodic flooding activity and constrained flows under recent peaking operations. Studies have also shown that constant fluctuation in water levels and flows have not allowed a stable enough situation for vegetation to become established (Mackey et al. 1987, Mack et al. 1990, Hansen and Suchomel 1990). Other habitat impacts associated with Kerr Dam include: dewatering of the floodplain, which has resulted in the direct loss of approximately 6,731 acres of riparian area and accelerated the conversion of riparian areas to agricultural lands and livestock grazing; a reduction in the recruitment of early successional riparian species such as cottonwood and sandbar willow; and wetland losses (2,352 acres) within the zone of fluctuating water levels (CSKT 2000b).

Other Habitats

The Mission Valley contains a (unique), high density of prairie pothole wetlands. Tributary streams trend from low sinuosity, gravel-bedded streams near the mountain front, to more sinuous or winding silt and gravel-bedded streams near the valley floor. Several small valley-floor tributaries or segments of tributaries (in addition to Ronan Spring Creek) are sustained by ground-water discharge. Many reservation streams contain excellent wetland and wet meadow habitats. Adjacent uplands are largely used for agriculture, primarily pasture and hay and grain production. The lower part of many of the drainages encompass scattered shrub-dominated and grassland sites bordered mainly by irrigated agricultural lands used for pasture and hay production.

Watershed Assessment

Watershed assessments are an important tool for identifying projects and limiting factors. Past studies and habitat surveys provide extensive assessment-type data.

In 1977, the U.S. Congress funded an "overview environmental impact study" to assess the impacts of population growth and proposed natural resource development in the Flathead River Subbasin. The study, which ran from 1978 to 1985, was funded through the Environmental Protection Agency and included a significant program of basic research on the condition of the subbasin's water, land, air, and socio-cultural resources. The most intensive research effort was directed toward aquatic systems on Flathead Lake and its major tributaries. In all, more than one hundred original research documents were produced during the course of the study. Among the most significant assessments were fish and habitat inventories of streams in the North and Middle Forks drainages of the Flathead River (Read et al. 1982 and Weaver et al. 1983).

In the 1980s and 1990s, Bonneville Power Administration (BPA) funded a series of fish and wildlife studies in the basin as part of the agency's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. Under this funding, MDFW&P conducted studies of kokanee in Flathead Lake (Decker-Hess and Clancey 1984) and the upper Flathead River (Fraley 1984). The agency also examined Hungry Horse-caused fishery losses in the Flathead system (Zubik and Fraley 1987) and studied Canada geese (Casey et al. 1984) in the northern Flathead Valley. The Confederated Salish and Kootenai Tribes studied Canada geese in the southern Flathead valley (Mackey et al. 1985) and the fishery in the lower Flathead system (DosSantos, et al. 1988).

The Forest Plan for the Flathead National Forest, completed in the mid-1980s contains assessment information for those portions of the subbasin managed by the US Forest Service (Brannon, E.B. 1985).

Under contract with the U.S. Bureau of Indian Affairs (BIA), staff of the Flathead Lake Biological Station studied the aquatic insects of the lower Flathead River (Hauer and Potter 1986). Among the other assessment-type reports authored in part or whole by Flathead Lake

Biological Station personnel are: Baseline water quality conditions for the North Fork Flathead River, British Columbia and Montana (Appleman et al. 1990); Hydrologic data for the North Fork Flathead River, British Columbia and Montana (Appleman et al. 1990); *Limnology of Flathead Lake*; and *Water Quality Data and Analyses to Aid in the Development of Revised Water Quality Targets for Flathead Lake, Montana* (Stanford et al. 1997). The station has also issued numerous water quality monitoring reports for the lake and tributaries and conducted many aquatic surveys and research investigations in the subbasin. It maintains an extensive scientific database on a variety of fisheries-related aspects of lake limnology and other related topics.

In 1987, MDFW&P issued a report titled *Effects of Water Level Fluctuations on Aquatic Furbearer Distribution, Abundance and Habitat in the Northern Flathead Valle*y (Bissell and Brown 1987). The project was designed to determine the effects of Kerr Dam on semi-aquatic furbearers in the upper Flathead. Another effort focused on the effects of water level fluctuations on ospreys and bald eagles in the upper Flathead. Both these projects were coordinated with similar efforts conducted for the BIA in the lower Flathead drainage (Mack et al. 1990).

The Montana Riparian and Wetland Association conducted a riparian inventory of the lower Flathead River in 1990. The association also gathered riparian condition data on selected reservation watersheds from 1993 to 1997 (MRWA, unpublished data 1993-97).

The MDFW&P and CSKT issued the *Hungry Horse Dam Fisheries Mitigation* (1991) *and Implementation Plan* (1993) for losses attributed to the construction and operation of Hungry Horse Dam. In 1985, MDFW&P issued the *Wildlife and Wildlife Habitat Mitigation Plan for Construction of Hungry Horse Dam* (Bissell and Yde 1985). The mitigation plans quantify fish and wildlife losses and mitigation actions above and below Hungry Horse Dam, as called for by the Northwest Power Planning Council's (NWPPC) Columbia Basin Fish and Wildlife Program (Program).

In 1992 the CSKT completed a management plan for the lower Flathead River that compiled general assessment information, especially on human use (CSKT 1992). National Wetlands Inventory maps were produced for the Flathead Indian Reservation in 1992 under a cost-share agreement between the tribes and USFWS. In 1995 the CSKT issued a report on the status of amphibian and reptiles on the Flathead Indian Reservation (Werner et al. 1995).

The BIA completed an Environmental Impact Statement (EIS) for the segment of the Yellowstone Pipeline that cuts through the southern part of the Flathead Indian Reservation. The document contains assessment information for watersheds along the pipeline route, most notably, the lower Flathead River west of Dixon.

Bull trout assessments and recovery actions are coordinated with the Montana Bull Trout Scientific Team, USFWS, and BC Environment. In the mid-1990s, the Montana Bull Trout Study Group compiled a series of bull trout status reports. Status reports that include waters within the Flathead Subbasin are (1) Middle Clark Fork River including the lower Flathead River to Kerr Dam; (2) Flathead Lake, including the North and Middle forks of the Flathead River and Stillwater and Whitefish Rivers (3) South Fork of the Flathead River, upstream of Hungry Horse Dam; and (4) Swan Lake/River. These status reports are intended to provide the most current and accurate information available to the Bull Trout Restoration Team and local bull trout watershed groups.

In 1996, Makepeace and Mladenich documented the contribution of nearshore nutrient loads to Flathead Lake.

In 1997 the Flathead Basin Commission issued a report prepared by the Flathead Lake Biological Station titled *Water Quality Data and Analyses to Aid in the Development of Revised Water Quality Targets for Flathead Lake, Montana*. The report examines long-term trends and relationships in Flathead Lake nutrient loading data and in-lake responses from the long-term monitoring program. It also presents the results of synoptic studies done during 1995-6 that was designed to better understand anthropogenic sources of nutrients from within the watershed.

Research and monitoring of the threatened bull trout and the petitioned westslope cutthroat trout is a collaborative effort between MDFW&P and CSKT. The backbone of the existing fisheries knowledge on Flathead Lake comes from data collected over many years by the fisheries co-managers—CSKT and MDFW&P. North of the lake, most of the work is conducted by MDFW&P, south of the lake, by CSKT. Deleray and others (1999) summarize recent survey work done by MDFW&P and CSKT. The work summarized in this report includes: (1) Flathead Lake monitoring (annual relative fish abundance surveys, lake trout otolith analysis, lake trout tagging, lake trout food habits study, Mercury and PCBs in fishes, angler creel surveys, kokanee reintroduction test, bioenergentic modeling; (2) Hungry Horse Reservoir gill net surveys; (3) Flathead River mainstem and South, Middle and North Fork monitoring (water temperature monitoring and assessment of selective withdrawal, westslope cutthroat trout abundance estimates, Flathead River winter trout abundance, and angler cutthroat trout tagging project); and (4) tributary stream monitoring (streambed coring, substrate scoring, stream electrofishing/juvenile salmonid abundance estimates, and bull trout redd counts).

Fisheries assessment data collected by and held at the MDFW&P Kalispell office includes: annual counts of spawning redds in index streams correlated with periodic basin- wide redd surveys; site specific redd counts and migrant trapping to document the strength of spawning runs before and after habitat restoration and /or fish passage improvements; mark/recapture and extinction method population estimates and annual or seasonal gill net surveys to document population trends and community structure; angler creel census (watershed-wide and site specific); photo-point documentation of habitat improvements; quantitative habitat surveys; sediment coring and scoring in spawning areas, correlated with results of fry emergence trapping over the range of sediment types; measures of fish growth, fecundity and condition factor that can be related to environmental factors; water temperature monitoring specifically related to riparian restoration and the selective withdrawal structure on Hungry Horse Dam; and measures of total available habitat and habitat use as related to dam discharge.

In 1998, CSKT and MDFW&P prepared the Dayton Creek Watershed Restoration Progress Report Information pertaining to limiting factors, water quality, fish species present, and riparian function are contained in this report (DuCharme et al. 1998).

CSKT (Makepeace 1998) described stream channel morphology at reference reaches in forested watersheds on the Flathead Reservation.

The Wetlands Conservation Plan for the Flathead Indian Reservation (Price 1999) contains general assessment-type information for wetland and riparian areas on the reservation.

In 2000, the CSKT issued a comprehensive report titled: *Nonpoint Source Assessment for Stream, Rivers, Lakes, and Wetlands of the Flathead Indian Reservation*. It describes watershed analysis areas, places waterbodies within attainability groups, and outlines existing tribal programs and resource management efforts that can address nonpoint source management issues (Makepeace 2000).

The CSKT completed a forest management plan and EIS in 2000 for over half a million acres of forest land on the Flathead Indian Reservation. Both the EIS and the draft and final plan contain general assessment information on forested reservation watersheds within the reservation (Rockwell et al. 2000).

A watershed plan for the Jocko River Watershed on the Flathead Indian Reservation was completed in 2000. This document compiles all existing natural resource information for the Jocko River (CSKT 2000).

The Fish and Wildlife Implementation Strategy and Annual Reports for the Kerr Mitigation Project (CSKT 2000b) contain assessment information for watersheds on the Flathead Reservation.

Other water quality assessment information comes from work currently in progress by the Flathead Basin Commission (FBC), University of Montana Yellow Bay Biological Station, and the Confederated Salish and Kootenai Tribes. This includes water quality monitoring done by the FBC as well as work done in conjunction with MDFW&P through FBC's Volunteer Monitor Program. Yellow Bay Biological Station conducts water quality analyses in their mid-Flathead Lake studies. The Confederated Salish and Kootenai Tribes have a Water Quality Program which tracks water quality within the reservation's boundaries. This program also monitors water supply or streamflow discharge monitoring, fluvial geomorphology, sediment levels, and the presence/absence of aquatic invertebrates to determine lake, stream, and river health.

A great deal of the data that has been collected in various assessments conducted within the subbasin have been digitized and are stored in various Geographic Information System (GIS) databases. The CSKT Natural Resources Department and the Montana State Library (the Montana Natural Resource Information System (NRIS) and the Montana Rivers Information System MRIS keep the databases).

Limiting Factors

At almost six million acres, the Flathead Subbasin is roughly the size of New Hampshire. Because habitats and landuses vary across such a large area, the limiting factors in the subbasin also differ, depending on where you are. The following list groups the subbasin into six zones based upon the major types of waterbodies and landuses and lists the primary limiting factors for each. The list is followed by a brief description of each of the limiting factors.

Headwaters and Associated Uplands (includes all mountain tributaries)

- Fragmentation
- Sedimentation (fish)

- Non-native Species Interactions (fish and wildlife)
- Vegetation Change (fish and wildlife)

Impoundments (includes Hungry Horse Res., Flathead Lk, Swan Lk, and irrig. impoundments)
- Non-native Species Interactions (fish)
- Fragmentation of Habitat (fish and wildlife)
- Cultural Eutrophication — Flathead Lake only (fish)
- Inundation and Water Fluctuations (fish and wildlife)

Regulated Mainstems (includes South Fork, Upper Flathead, Lower Flathead, Jocko River)
- Altered Hydrograph (fish and wildlife)
- Floodplain Alterations – includes bank instability and floodplain restrictions (fish and wildlife)
- Non-native Species Interactions (fish)

Unregulated Mainstems (includes North Fork, Middle Fork, and Swan Rivers)
- Non-native Species Interactions (fish and wildlife)
- Fragmentation of Habitat (wildlife)
- Human/Wildlife Conflicts (fish and wildlife)

Valley Tributaries & Wetlands (includes all valley tribs and the Whitefish and Stillwater Rivers)
- Floodplain Alterations (fish and wildlife)
- Sedimentation (fish)
- Non-native Species Interations (fish and wildlife)
- Temperature Changes (fish)
- Fragmentation of Habitat (fish and wildlife)
- Human/Wildlife Conflicts (fish and wildlife)

Lakes (includes connected and closed-basin lakes)
- Non-native Species Interactions (fish and wildlife)
- Human/Wildlife Conflicts (fish and wildlife)
- Alteration of the Littoral Zone (fish and wildlife)
- Cultural Eutrophication (fish)

Alteration of the Littoral Zone

The Flathead Subbasin has experienced significant growth and development over the past twenty years, much of it near or adjacent to lakes and streams. The result has been the loss of significant riparian and wetland areas, which is some of the most important fish and wildlife habitat in the subbasin. These areas are important because so many species depend on them. For example, of the 256 resident and migratory bird species that occur on the Flathead Indian Reservation, 142 depend on wetlands and riparian areas for one or more of their habitat requirements. These areas are used by many of the subbasin's threatened, endangered, and sensitive species, for example: trumpeter swans, bald eagles, grizzly bears, boreal toads, and leopard frogs.

Wetlands and riparian areas also provide much of the food consumed by a number of fish species. In addition, they serve as nurseries and spawning areas. The loss of riparian areas has resulted in a net loss of security cover, bank stability, and pool formation.

Altered Hydrograph

Hydropower related discharge fluctuations on the South Fork and upper mainstem of the Flathead River have resulted in a wider zone of water fluctuation, or *varial zone,* which has become biologically unproductive. Reduction in natural spring freshets due to flood control has reduced the hydraulic energy needed to maintain the river channel and periodically re-sort river gravels. Collapsing riverbanks caused by intermittent flow fluctuation and lack of flushing flows have resulted in sediment buildup in the river cobbles, which is detrimental to insect production, fish food availability, and security cover. Changes in the annual hydrograph for the lower Flathead River cause the normally vegetated varial zone to become abnormally inundated. This does not allow riparian vegetation to exist where it normally would. The area between the high and low water levels has become a largely unvegetated varial zone dominated by mud and rock. Deciduous and mixed deciduous/coniferous vegetation has moved toward a conifer-dominated vegetative community due to the curtailment of periodic flooding activity and constrained flows under recent peaking operations. Studies have also shown that constant fluctuation in water levels and flows have not allowed a stable enough situation for vegetation to become established (Mackey et al. 1987, Mack et al. 1990, Hansen and Suchomel 1990).

Cultural Eutrophication

Open-water primary production is a main measure of water quality in lakes like the Flathead. This is a very sensitive measure of the ability of a lake to grow algae. Lakes polluted with plant-growth nutrients, particularly nitrogen and phosphorus, typically have high rates of primary production, poor water clarity due to blooms of algae, and bad tastes and odors associated with the decomposition of the blooms. These are symptoms of a process called eutrophication, which in its worst stages can result in floating scums of blue green algae and dense growths of aquatic macrophytes. Over the long-term, primary production has steadily increased in Flathead Lake, although the rate of increase slowed substantially in the mid-1990s. The reduction has been due primarily to substantial improvements in the Flathead Basin's urban sewage treatment plants during the period from 1989 to 1993, which reduced human sources of nutrient pollution by about 15 percent (Stanford 1999). However, in 1997 and 1998, nitrogen concentrations in the Stillwater River and the upper mainstem Flathead River were among the highest levels ever recorded. Anthropogenic sources of nitrogen and phosphorus in those rivers include runoff from hard surfaces (parking lots, city streets) and near-shore housing construction, poorly managed farm and timberlands and groundwater pollution from faulty household drain fields. The long-term record shows that as much as 40 percent of the annual input of phosphorus to Flathead Lake comes from the airshed. The nutrient is contained in particulates from slash and other burning and fugitive dust from rural roads. This so-called "nonpoint nutrient loading" in the Flathead Basin is a very serious pollution problem and it is getting worse.

Floodplain Alterations

Channelization, road fill, bank armoring and other encroachments along stream segments have narrowed channels and limited meander inside floodplains. This has created shorter channels, steeper gradients, higher velocities, loss of storage and recharge capacity, bed armoring, and entrenchment. In impacted stream reaches, even minor flood events have often resulted in significant deterioration. Erosion has increased, and the number of pools and the extent of riparian cover has decreased. The changes have lowered the quality of fish and wildlife habitat.

Fragmentation of Habitat

Fish migrations have been blocked from other man-caused barriers, including road culverts, dewatered stream reaches, irrigation diversions, etc. For wildlife, fragmentation has been caused by a combination of human and natural factors. Human factors include timber harvesting, housing development, power transmission lines, hydroelectric development, and road construction. Fragmentation has had negative effects on many species, but it has especially affected species like lynx, fisher, and pileated woodpecker that require large, contiguous forest patches. Species like elk, mule deer, and sharp-tailed grouse, that need large open patches, have also suffered from human-caused fragmentation.

Human/Wildlife Conflicts

Increasing numbers of humans in sensitive wildlife habitats has led to an increasing number of human/wildlife conflicts. For example, increasing residential development and recreational activities has resulted in an increase in human-caused grizzly bear mortality. It has led to winter recreationists displacing wintering elk; jet skis disturbing nesting loons, and poachers illegally harvesting bull trout. Humans continue to introduce non-native fish species that impact native species restoration efforts.

Inundation and Water Fluctuations

When Hungry Horse Reservoir filled, 124 km of high quality stream habitat was lost. Filling of the reservoir also inundated large areas of low elevation forest, wetland, and riparian habitats, including seasonal habitat for a wide variety of avifauna, spring and fall grizzly bear habitat, and important big game range and calving areas. Excessive reservoir drawdowns now expose vast expanses of reservoir bottom to drying, thus killing aquatic insects, which are the primary spring food supply. Reduced reservoir pool volume impacts all aquatic trophic levels due to the diminished size of the aquatic environment. During summer, reservoir drawdown reduces the availability of terrestrial insects for fish prey because fewer insects are trapped on the diminished surface area. Impoundment by Hungry Horse Dam and the removal of riparian vegetation altered the annual temperature cycle in the river. These changes have affected the food base for the many wildlife species that feed on aquatic organisms.

Seasonal lake level fluctuations associated with Kerr Dam operations are considered responsible for causing adverse impacts to shoreline, near-shoreline fisheries habitats, and the Flathead River upstream of the lake. Under the current FERC license, continued manipulation of the Flathead Lake hydrograph will result in shoreline habitats being inundated from June through late fall of every year. The adverse habitat effects of these continued operations include: (1) winter dewatering of preferred shoreline spawning areas for salmonids; (2) degradation of deep spawning habitat (below elevation 2,883) by distribution of fine sediments (a consequence of shoreline erosion during the extended full-pool period); (3) and degradation of varial zone and deeper spawning and rearing habitats for non-salmonid fishes and invertebrates resulting from a reduction in the time of beneficial wave cleaning action due to extended deep-water periods over these habitats. These direct habitat impacts, which limit shoreline invertebrate and juvenile fish production, result in indirect negative impacts to the foraging habitats of other fish species, including native bull and cutthroat trout (FERC 1996, MPC 1990). Shallow bays, which were emergent marshes during much of the year, are now either dry mudflats or inundated shallow areas, depending upon the time of year. This has eliminated habitat for wildlife. Other areas that supported riparian vegetation, including 35 km of the Flathead River upstream of Flathead Lake, have been affected by higher water levels for longer periods; have been converted to areas of bare ground due to inundation and subsequent dewatering (Mackey et al. 1987, Mack et al. 1990). These changes have affected the food base for the many wildlife species that feed on aquatic organisms.

Non-native Species Interactions

Non-native species now threaten the diversity and abundance of native species and the ecological stability of ecosystems in the subbasin. Illegal and unintentional introductions of non-native fish species have set up negative inter-species competition with native fish. Non-native species have also hybridized with native species. Conversely, impoundment has greatly benefited the native northern pikeminnow and peamouth chub, which now compete with or prey upon species of special concern for food and space. The introduction of opossum shrimp (*Mysis relicta*) into the Flathead system has had serious repercussions on the Flathead Lake kokanee salmon. The introduction of kokanee salmon and lake trout into Flathead Lake may have adverse effects on native bull and westslope cutthroat trout. Bullfrogs on the lower Flathead River have displaced native chorus and spotted frogs. The quality of fish and wildlife habitat has been reduced or eliminated by a host of exotic plants (noxious weeds) able to out-compete native species.

Sedimentation

Logging activities, road building, residential development, and agricultural practices have increased the amount of fine sediments entering streams. Fine sediments accumulating in spawning substrates reduce egg-to-fry survival. In some areas sedimentation has reduced natural reproduction to the point that it is insufficient to fully seed available rearing habitat with juvenile fish. Pools and rearing habitat have become clogged with sediment, reducing the productive capacity of the stream. Sediment has also killed aquatic insects and algae. All of these changes have affected the food base for the many wildlife species that feed on aquatic organisms.

Temperature Changes

The removal of riparian vegetation, especially trees and overhanging shrubs, has changed stream water temperatures, making the water warmer in the summer and colder in the winter. These changes have interfered with fish spawning and generally degraded the quality of stream habitats for native fish and other aquatic life. This has affected the food base for the many wildlife species that feed on aquatic organisms.

Vegetation Changes

Fire exclusion policies and logging have fundamentally transformed the structure and composition of subbasin forests. At lower elevations, dense thickets of Douglas-fir have replaced open park-like stands of ponderosa pine. Mid-elevation forests, which historically formed a complex mosaic composed of many different patch sizes, age structures, and species, have become much more uniform. As a result, there has been a significant loss of habitat diversity, and habitats important to some species, like the grizzly bear, have become much less common. The changes have also altered runoff patterns, which has adversely affected fish and other aquatic organisms.

Artificial Production

A Hatchery Genetics Management Plan (HGMP) for the Creston National Fish Hatchery is included in Appendix A. The bull trout facility at the Creston hatchery allows for experimental culture of bull trout in captivity. Initially, gametes from wild adults were hatched to provide eggs, fry, and fingerlings for an imprint-timing experiment. Developing eggs, fry, and fingerlings were incrementally sacrificed to measure thyroxine hormone levels, a surrogate for determining when the fish imprint on their water source. Remaining juveniles were reared through adult stage and spawned in captivity. Progeny have provided a source for experiments on temperature sensitivity and susceptibility to whirling disease. This benefited the listed population through increased knowledge and by reducing the need to take individuals from wild stocks.

Approximately 50,000 rainbow trout and 60,000 cutthroat trout are reared at Creston annually to provide subsistence and recreational fisheries for tribal and non-tribal anglers in closed-basin lakes on the Flathead Indian Reservation. Approximately 20,000 westslope cutthroat trout were propagated at Creston in 1999 and 35,000 in 2000 for release in closed-basin lakes in State-managed waters. Nearly all of the offsite lakes planted under this program do not support natural reproduction. Where natural reproduction is possible, the primary objective is to create genetic reserves for isolated populations of native stocks. In these cases, habitat restoration is performed to enhance fish passage and natural reproduction in the closed system. This hatchery program does not supply fish to waters scheduled for native species restoration. The closed-basin lakes that are planted through this program provide alternative fisheries to meet public demands for harvest and partially offset fishing bans or reduced limits enacted for native species recovery. This program may indirectly benefit native species recovery by redirecting harvest away from sensitive recovery areas in the contiguous Flathead watershed. Rehabilitated lakes remove undesirable species that are a source for additional illegal introductions (e.g. illegally introduced yellow perch, northern pike, sunfish, fathead minnow and in one case, grass carp). Occasionally, illegal introductions occur after lakes have been reclaimed and fisheries established. This negatively impacts the program. An additional chemical treatment may be required within approximately ten years. During the interim, fisheries established by this program remain viable until the undesirable introduced fish become reestablished.

The offsite lakes program is monitored through periodic gill net surveys, angler interviews, and the annual statewide angler creel survey. Stocking rates are established to a large degree by trial and error. Gill netting provides data on species relative to abundance, growth rates, and fish-condition factor. Angler surveys are qualitative indicators of catch rates, angler satisfaction, and rough estimates of harvest. Although rigorous quantitative analyses of CPUE, survival, and total harvest are possible, the number of lakes involved makes this level of monitoring economically impractical. Rigorous sampling is reserved for aspects of the Hungry Horse Mitigation Program directed toward native species restoration.

Qualitative assessments have shown that small, closed-basin lakes yield an efficient hatchery-plant to angler-creel ratio. Project lakes are put, grow, and take fisheries, entirely dependent on artificial production to support the fishery. Many have been chemically rehabilitated to remove illegally introduced species. Gill netting, site visits to interview anglers, and an annual statewide angler creel survey provide managers with qualitative information on species composition, growth, condition factor, and angling success. Periodic spot checks at individual lakes have revealed great success. For instance, angler pressure on Lion Lake grew to the highest small lake in Region One.

Sekokini Springs Natural Rearing Facility and Interpretive Center

Sekokini Springs was a private trout pond that propagated rainbow trout for purchase by private pond owners. Unfortunately the site probably leaked rainbow trout into the Flathead River, where they were a threat to the native westslope cutthroat population. Evidence suggests that rainbow trout escaped for nearly 40 years. The Hungry Horse Mitigation program first leased the site to remove all rainbow trout from the facility. After removing trout from the water source and performing a comprehensive analysis for fish diseases, the State fish health specialist listed the Sekokini Springs water source as safe for experimental culture of westslope cutthroat trout. The program then bought the improvements on the US Forest Service property and secured a no-cost special use permit for use of the site by MDFW&P and CSKT.

With the cooperation of the USFWS Creston National Fish Hatchery, approximately 40,000 fingerling westslope cutthroat (designated pure strain M012 brood source) were reared to assess the water source at Sekokini Springs. The water source follows a natural annual flow and temperature regime that successfully raised westslope cutthroat with an exceptional condition factor. The M012 fish were planted in closed-basin lakes. There are no fish at the site at this time.

Sekokini Springs is in step one of the NWPPC's three-step Artificial Review Process. A genetic management plan is being developed prior to any additional fish being moved to the site. Three spring sources that provide water to the small hatchery building and outdoor rearing streams will be capped to protect the site from fish diseases. Partnerships have been formed with the U.S. Bureau of Reclamation (BOR) and U.S. Forest Service to develop a master plan for the site. Other groups (such as Trout Unlimited and Boy Scouts of America) have shown interest in cooperating on renovating the habitat at the site. BOR has contributed $70,000 for an interpretive pathway featuring water conservation. Future plans for the pathway include two fish viewing areas and exhibits explaining the need for native species restoration. Future plans are to allow for natural reproduction of westslope cutthroat from the Flathead River and experimental outdoor rearing of up to six genetic strains of wild cutthroat trout from the Flathead watershed. The genetic management plan and future uses are being drafted for peer review. Needs for local genetic strains include restoration of wild runs where natives have been extirpated to replace hybridized populations in headwater lakes that are threatening pure westslope cutthroat trout stocks downstream in each drainage.

Periodic spot checks at individual lakes stocked with M012 cutthroat trout from Sekokini Springs have revealed great success. For instance, Rogers Lake now supports a genetic reserve for Red Rocks Lake fluvial grayling (provided by the state of Montana hatchery system) and a major fishery for westslope cutthroat trout (Knotek et al. 1997).

Existing and Past Efforts

Summary of Past Efforts

From 1982 through 1985, MDFW&P and CSKT compiled biological data needed to construct the quantitative reservoir model HRMOD. With aid from Montana State University (MSU), the U.S. Geological Survey (USGS), BOR, Army Corps of Engineers (ACOE) and scientific reviews, Montana completed the model and developed Biological Rule Curves (BRCs) for Hungry Horse Dam (first published in 1989). The BRCs were integrated with power and flood control during the Columbia Basin System Operation Review, and by 1995 the Integrated Rule Curves were completed and adopted by the Northwest Power Planning Council (NWPPC). The IRCs were subsequently superseded by operations dictated by the National Marine Fisheries Service (NMFS) and have not been fully implemented to date.

Habitat restoration efforts outlined in the Mitigation Plan have been completed or are ongoing. Monitoring and evaluation of restoration techniques and fish population responses continues. Cooperative programs and projects have been established with a variety of other entities for ongoing agency management and regulatory activities.

MDFW&P modeled the potential of retrofitting Hungry Horse Dam with a temperature control structure to modify downstream temperatures. This selective withdrawal structure was funded through a congressional appropriation and became functional in 1996. Temperatures have been returned to naturalized conditions in 71 km of the mainstem Flathead River.

Kokanee reintroduction was attempted but unsuccessful in Flathead Lake from 1992 through 1997. That program at the USFWS Creston National Fish Hatchery has now shifted to using standard and experimental hatchery techniques to hatch and rear native species at low densities for restoration stocking and to create fishing opportunities in closed-basin lakes using native, and where appropriate, non-native trout. Public education and new angling opportunities are being used to redirect angling pressure and harvest away from sensitive recovery areas.

In the first 24 months, the CSKT Focus Watershed Program began coordinating and assisting in several local projects including Dayton Creek, the east and south forks of Valley Creek, Marsh Creek, Post Creek, Mission Creek, DuCharme Creek, the Little Bitterroot River, and Jocko River. The watershed coordinator has worked closely with the Flathead Basin Commission, Bull Trout Restoration Team, Lake, Lincoln, Sanders, and Flathead County Conservation Districts, NRCS personnel, tribal personnel, Montana Watercourse, Montana Watershed Inc., and several locally led community interest groups.

Over 10,000 acres of wildlife habitat have been enhanced or conserved through mitigation projects funded in partnership with BPA since the 1970s. This work has resulted in over 4,000 acres of mitigation credit for wildlife habitat losses associated with Hungry Horse Dam. MDFW&P have completed 21 percent of upland forest losses, and 29 percent of riparian/wetland losses. Table 18 summarizes acres of wildlife habitat lost to hydroelectric development, mitigation accomplished through July 2000, and mitigation remaining for each component of the program.

Table 18. Acres of wildlife habitat lost to hydroelectric development, mitigation accomplished through July 2000, and mitigation remaining

Habitat Category	Hungry Horse	Hydropower Losses	Mitigated through 7/00	Mitigation Remaining
Riparian/Wetland	6,876	5,226	1,500	3,726
Upland Forest	16,804	12,771	2,701	10,070
Total	23,680	17,997	4,201	13,796

Kastler (1998) completed a graduate study of elk reproductive success in the South Fork of the Flathead River. In 1996, Bissell completed the Hungry Horse and Libby Riparian/Wetland Habitat Conservation Implementation Plan, which describes the means by which MDFW&P will implement this program from 1996 through 2006 (Bissell 1996). Mace and Waller (1997) provided a compilation of published and unpublished data obtained from radio instrumented grizzly bears in the Swan Mountains. Their report includes information on resource selection, denning ecology, spatial and temporal interactions, and grizzly relationships to the human environment, activity and time budgets, and demography and population trends.

Accomplishments by Year

1992

MDFW&P completed a study examining the enhancement of benthic insect production in Hungry Horse Reservoir. The study concluded that insect production can be enhanced through installation of slash piles, but the practice was not implemented fully because its cost effectiveness was questionable.

MDFW&P completed a chemical rehabilitation of Lion Lake in which illegally introduced perch and pumpkinseed were removed. The lake is located approximately 1.6 km from Hungry Horse Reservoir. The project restored the trout fishery and increased angler use nearly ten-fold. The lake had the highest angler pressure per acre among some 500 lakes in northwestern Montana.

1993

Brook trout were eradicated and spawning and rearing habitat was enhanced in Elliott Creek, a direct tributary to the Flathead River. The project partially met the biological objective in that brook trout eradication was not complete, but cutthroat trout were established. They spawned and offspring were reared in improved habitat.

MDFW&P completed the offsite chemical rehabilitation of Rogers Lake in which perch were removed and cutthroat trout and arctic grayling were reestablished. The lake is now a genetic reserve for the rare Red Rocks Lake strain of arctic grayling.

1994

CSKT completed the 1992-93 Flathead Lake Creel survey.

MDFW&P chemically rehabilitated Devine Lake, successfully eradicating non-native brook trout in order to reduce the hybridization threat to bull trout in Hungry Horse Reservoir, one of the strongest remaining populations.

MDFW&P also completed a bank stabilization and sediment abatement project at a massive landslide in Big Creek, a major bull trout-spawning stream. The slide was directly above a known spawning area. The large bank slump was re-vegetated and stabilized, reducing sediment inputs to bull trout spawning areas downstream.

1995

CSKT reconstructed groundwater seepage on Polson Golf Course into a stream channel flowing into Flathead Lake.

MDFW&P completed sediment-source surveys on road systems associated with six major, connected, bull trout spawning tributaries to Hungry Horse Reservoir.

MDFW&P completed a cooperative culvert-improvement project on Margaret Creek, a direct tributary to Hungry Horse Reservoir. The project opened 3.8 km of high quality habitat. Adfluvial cutthroat redds and juvenile bull trout are now upstream of a former culvert barrier.

MDFW&P also completed thermal modeling and the installation of selective withdrawal structures on Hungry Horse Dam to restore normative river temperatures (Marotz et al. 1994; Christenson et al. 1996). Thermal targets are now being met (1996-98). The response of benthic invertebrates and fluvial fish is being evaluated in the Flathead River.

1996

A fish ladder at Taylor's Outflow was completed to allow access for spawning populations of cutthroat trout in the Flathead River. A trap weir now excludes rainbow trout attempting to enter the stream. Westslope cutthroat trout used the ladder in 1997-98 and gained access to restored spawning and rearing habitat.

MDFW&P completed baseline data collection of bull trout spawning habitat quality and utilization in reservoir and backcountry tributaries of the South Fork Flathead River to monitor population trends and spawning and rearing habitat quality.

MDFW&P completed cooperative fish-passage projects replacing culverts on Murray and Riverside Creeks, tributaries to Hungry Horse Reservoir. The project opened 7 km of quality habitat. Adfluvial cutthroat trout redds and juvenile bull trout are now above the culvert barrier.

MDFW&P completed a fish passage and habitat enhancement project at Hay Creek, a tributary to the North Fork Flathead River. The lower reaches of this stream no longer flow subsurface, a condition that created a passage barrier, during the summer and support native trout.

MDFW&P completed willow-survival experiments in the drawdown zone of Hungry Horse Reservoir and examined methods for re-establishing vegetation in the varial zone. The project identified survival rates for different willow species and the duration of inundation in a drawdown zone.

In 1996 MDFW&P completed an offsite chemical rehabilitation of Bootjack Lake in which introduced pumpkinseed were removed and westslope cutthroat and rainbow trout were introduced. The trout fishery is now recovering. The lake has fish up to 20 inches in length and is fished heavily.

MDFW&P also completed the development of Integrated Rule Curves (IRCs) for Hungry Horse Reservoir (Marotz et al. 1996; updated 1999).

1997

MDFW&P completed cooperative culvert-improvement projects on seven Hungry Horse Reservoir tributaries. The purpose of the project was to eliminate passage barriers for adfluvial cutthroat trout. It resulted in 16 percent more spawning and rearing area in Hungry Horse Reservoir.

MDFW&P completed the offsite chemical rehabilitation of Murray and Dollar lakes. Illegally introduced flathead minnows and redside shiners were removed and trout were re-established. Fishing improved dramatically.

MDFW&P completed a food habits study for lake trout and northern pikeminnow in the Flathead River. Researchers collected and analyzed over 850 stomachs and estimated species-specific losses to predation (Malta et al. 1997; Zollweg 1998). The project quantified the diet composition of the primary predator in the Flathead System, which is believed to be a major limiting factor for native trout.

1998

MDFW&P completed a study quantifying zooplankton entrainment at Hungry Horse Dam under various operational scenarios using selective withdrawal (Cavigli et al. 1998). The results provided dam operators with instructions for using the duel intake ports.

MDFW&P completed offsite chemical rehabilitation of Little McGregor Lake in which illegally introduced perch were removed. Trout were re-established in the lake in 1999.

MDFW&P completed the Griffin Creek fencing project, which excluded cattle from 8 km of stream containing genetically pure westslope cutthroat trout.

MDFW&P completed the construction of the Crossover Wetlands project in which a subsurface diversion structure was installed to expand the wetland in the reservoir varial zone. The wetland has expanded over several acres. Biological monitoring is ongoing.

MDFW&P completed the development of a basin-wide radio-telemetry monitoring system for the upper Flathead River drainage. Seasonal movement studies on lake trout and northern pike were completed, and habitat use and movement studies on bull trout and westslope cutthroat trout were initiated.

MDFW&P completed the channel reconstruction of 2 km of Taylor's Outflow spring creek, which improved habitat complexity and channel stability in the spawning reach.

CSKT completed a channel reconstruction in Skidoo Creek to allow passage of fish through a culvert barrier.

CSKT completed a channel reconstruction in Skidoo Creek to allow passage of fish through a culvert barrier and cost-shared riparian fencing in Valley View with Pheasants Forever to exclude stock from irrigation canal/creek entering Flathead River.

CSKT completed monitoring of the Flathead Lake kokanee experiment.

CSKT completed the Dayton Creek Watershed Restoration Progress Report and the Focus Watershed Project contributed cost-share to a Small-Landowner workshop sponsored by Montana DNRC and to the Flathead Basin Commission for a voluntary monitoring program.

CSKT revised a grazing plan for East Valley Creek and constructed a riparian and headwater fence.

1999

MDFW&P completed a fish passage improvement project on Paola Creek, a major spawning tributary to Hungry Horse Reservoir. A culvert barrier was removed and baffles were installed to allow fish passage.

MDFW&P initiated a contract for stream survey and design work with Land and Water Consulting to reconstruct the lower 1.6 km of Emery Creek, a major spawning tributary to Hungry Horse Reservoir.

CSKT and MDFW&P established livestock management agreements and eliminated point sediment/nutrient sources (e.g. fencing and streambank stabilization) in Dayton Creek.

MDFW&P pursued land acquisition and developed preliminary channel-and-pond-complex designs for Sekokini Springs Natural Rearing Facility. The water source proved to promote impressive growth and condition factor of westslope cutthroat trout.

MDFW&P began a westslope cutthroat trout hybridization risk assessment in the mainstem of the Flathead River in addition to stepping up the commitment to remove compromising genetic material from high-elevation lakes in the North, Middle and South Fork drainages.

MDFW&P completed a riparian fencing project in lower Hay Creek to exclude cattle in conjunction with a USFS grazing allotment modification.

MDFW&P completed project-specific monitoring and evaluation of ongoing and completed projects throughout the Flathead River drainage (i.e. Taylor's Outflow, seven Hungry Horse Reservoir tributaries, Crossover Wetland Area, Hay Creek, Griffin Creek, and area lakes).

MDFW&P completed a site evaluation, feasibility analysis, constant flow rate and water quality tests, and landowner scoping for Rose Creek stream/pond project.

MDFW&P monitored watershed level fish and habitat parameters in cooperation with fish management staff and other agencies. Efforts included population surveys, streambed coring, redd counts, and gillnetting (ongoing since 1991).

MDFW&P initiated an Instream Flow Incremental Methodology study (IFIM) in cooperation with Miller and Associates (Fort Collins, CO) on the Flathead River. The study targets size-classes of native bull trout and westslope cutthroat trout.

CSKT completed the 1998-99 Flathead Lake Creel survey.

CSKT constructed over 7,000 feet of riparian fence and 200 feet of livestock exclusion corral panels in cooperation with landowners and MDFW&P to exclude livestock from the riparian area along the mainstem of Dayton Creek.

CSKT constructed 200 feet of livestock exclusion corral panels in cooperation with a landowner and MDFW&P to exclude livestock from the riparian area; constructed 5.6 km of riparian fence on the Middle and East forks of Dayton Creek in cooperation with Plum Creek; constructed 2.7 km of riparian fencing along Valley Creek; constructed 800 feet of livestock-exclusion fence along DuCharme Creek; completed habitat restoration projects on the Redhorn Range Unit; and wildlife habitat improvements through prescribed burning in the Boulder and Ferry Basin areas.

CSKT made land acquisitions along the Mission Front and constructed fences to deter grizzly bear conflicts.

Ongoing Fisheries Projects

A comprehensive study is being conducted in collaboration with the University of Montana to examine the degree and threat of hybridization between native cutthroat trout and non-native rainbow trout throughout the Flathead River drainage. Construction has begun on the Emery Creek project. A wetted perimeter study is nearing completion in the South Fork downstream of Hungry Horse Dam to calculate a new minimum flow requirement for the reach. Spring caps are being installed at Sekokini Springs. Population electrofishing surveys, bull trout redd counts, whirling disease sampling, spring migrant trapping, and radio-telemetry surveys are being completed for the Flathead River drainage. A winter growth analysis of westslope cutthroat trout in headwater populations will be completed soon.

Ongoing Wildlife Projects

MDFW&P has been conducting a 12-year study of white-tailed deer in coniferous forests of northwestern Montana to develop techniques to determine basic biological and ecological parameters for white-tailed deer and relate those parameters to characteristics of individual habitats and potential limiting factors. Final reports for this project are scheduled for 2002.

MDFW&P have two full-time positions to deal with human/wildlife conflicts in northwestern Montana. With this focus, the Department has developed innovative techniques using aversive conditioning to teach grizzly bears to avoid potential conflict situations. They are also involved in an information and education program to provide public information on how to coexist with wildlife. These people, along with regular wardens and biologists, respond to hundreds of calls resulting from situations where wildlife presence is either undesirable or poses a public safety issue. The workload continues to increase as more people move into previously undeveloped wildlife habitat. Similar activities are undertaken by the CSKT on reservation lands where the activities are conducted by tribal wildlife biologists and conservation officers.

MDFW&P and CSKT are expanding their efforts to educate all hunters. These efforts are intended to decrease game law violations and cases of mistaken identity, foster increased public acceptance of hunters and hunting, and to improve relationships between hunters and landowners. This is being accomplished through development of advanced hunter education classes and other information and education efforts.

Wildlife surveys and inventories are conducted annually on a variety of game, furbearer, and non-game species in the subbasin by state, tribal, and federal agencies. Also, MDFW&P conducts annual hunter harvest surveys to monitor population trends and demographic patterns in harvested wildlife populations.

Tribal, local, state and federal agencies annually spend significant sums of money for the control of various noxious weeds found in the Flathead Subbasin.

Tribal, state and federal natural resource management agencies, as well as some large corporate landowners have been involved in interagency efforts to recover listed species of fish and wildlife. These efforts include active management activities to protect listed species and their habitats, reduce or mitigate adverse impacts of various human developments, protect important habitats, reduce species mortality, and reduce direct human/wildlife conflicts.

From 1993 through 1997, MDFW&P purchased 475 acres of land in the Mission Valley. These lands are the latest additions to their 3,462-acre Ninepipe Wildlife Management Area that is managed to provide food and cover for local wildlife populations. The area includes numerous pothole wetlands that have been created or restored.

The CSKT has a proactive land acquisition program that aims to re-acquire the reservation land base. Much of this land is then subjected to inter-disciplinary planning processes, in which wildlife habitat values are considered. In addition, the CSKT is currently acquiring wetland and riparian habitats and adjacent upland habitats under mitigation planning processes for Kerr Dam and for off-reservation mining impacts. When these tracts are acquired they will be managed for fish and wildlife benefits.

Currently in the upper portion of the Flathead River Subbasin, there are two ongoing habitat enhancement projects being conducted in cooperation with the Flathead National Forest. Both projects are designed to enhance 6,000 acres of important wildlife habitat adjacent to Hungry Horse Reservoir. The Firefighter Mountain Project (900 acres) is nearing completion. The Paint/Emery Project (5,100 acres) will begin in fiscal year 2000. In addition, the goal to conserve or enhance 5,303 acres of riparian and wetland habitats in the Flathead River Subbasin over the next 45 years is considered an ongoing habitat conservation project.

On the Flathead Reservation, the CSKT have developed several habitat restoration and enhancement projects for the benefit of riparian, aspen seep, and wetland habitats. Many of these projects are in the initial stages of development or have recently been completed. Several other projects will be initiated during the next few years.

In an effort to restore viable populations of extirpated species on the Flathead Reservation, the CSKT have successfully re-introduced the peregrine falcon and have restored the species as a breeding bird. Current efforts aimed at the restoration of trumpeter swans are also underway. Planning efforts are underway to restore Columbian sharp-tailed grouse and the northern leopard frog.

The final settlement of the Confederated Salish and Kootenai Tribes' mitigation claims related to the construction and operation of Kerr Dam will be completed during the fall of 2000. This settlement includes provisions for the acquisition of 985 acres of wetland and riparian habitat to replace varial zone habitat lost due to the operations of Kerr Dam on the lower Flathead River.

It also includes provisions for acquisition of 312 acres of riparian habitat. For Flathead Lake impacts, the settlement dictates acquisition of 1,792 acres of wetland habitat to replace lakeshore varial habitat that was lost.

Habitats acquired under the settlement will be restored to provide the optimal wildlife habitat and productivity. In addition, other opportunities for restoration at other sites on the reservation will be pursued. Wildlife monitoring will center on representative habitat tracts and existing and acquired habitats to gauge the degree of change in wildlife status following restoration activities. It will also maintain long-term population monitoring of particular species. Wildlife habitat monitoring will be conducted to determine the success of various restoration and enhancement actions.

The Jocko River Watershed Restoration Program is a large-scale watershed restoration project directed at the restoration of riparian and wetland habitat and enhancement of native bull trout populations. This program will involve acquisition and management of wetland, riparian, and adjacent habitats and management of these tracts to benefit fish and wildlife resources.

Present Subbasin Management

Existing Management

Federal, state, county and tribal governments have management authority within this subbasin. Table 19 (adapted from Zackheim 1983) shows the major administrative authorities in the subbasin and their holdings. The U.S. government controls slightly more than half of the land, most of that is administered by the U.S. Forest Service. The majority of the southwestern part of the subbasin—from the middle of Flathead Lake south—falls within the Flathead Indian Reservation and is administered by the Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation. The Canadian portion of the subbasin includes 274,280 acres administered as British Columbia Crown Lands.

Table 19. Flathead River Subbasin land ownership

Ownership	Acres
Private Lands	
Corporate Timber	274,372
Other Private	1,567,022
Confederated Salish and Kootenai Tribal Lands	
Tribal Lands (total)	669,064
Mission Mountains Tribal Wilderness	92,000
Thompson Peak Tribal Wilderness	4,800
Sleeping Woman Tribal Wilderness	17,600
Tribal Primitive Areas	98,000
State Lands	
Department of State Lands	
Coal Creek State Forest	15,064
Stillwater State Forest	93,815
Swan River State Forest	38,345

Other State forest lands	41,749
Other State lands	1,722
Montana Fish, Wildlife & Parks Lands	3,025
Federal Lands	
Glacier National Park	614,882
Flathead National Forest	
Bob Marshall Wilderness Area	709,356
Great Bear Wilderness Area	286,700
Mission Mountains Wilderness Area	73,877
Jewel Basin Hiking Area	15,000
Other forest lands	1,264,999
US Fish and Wildlife Service	
National Bison Range	18,540
Pablo & Ninepipe National Wildlife Refuges	4,523
Swan River National Wildlife Refuge	1,576
Other federal wildlife lands	4,555

In 1982, the Ninth Circuit Court of Appeals handed down a judgement that the bed and banks of the southern half of Flathead Lake are held by the U.S. in trust for the Salish and Kootenai Tribes. This decision gives the CSKT the authority to regulate the fishery in the southern half of the lake and protect fishing rights given to them by the Hellgate Treaty of 1855 (Vashro, et al. 1989).

The U.S. portion of the subbasin, all of which lies in Montana, includes all of Lake County, most of Flathead County, some of Sanders County, and small portions of Missoula, Lincoln, Powell, and Lewis and Clark counties. The major towns are Whitefish, Columbia Falls, and Kalispell in the north and Polson, Ronan, Hot Springs, St. Ignatius, and Arlee in the south. No significant settlements occur in the Canadian part of the subbasin.

The following is a list of the major entities having regulatory/management authority in the subbasin and a short description of their responsibility areas.

Federal Government

U.S. Forest Service

The U.S. Forest Service (USFS) manages approximately 40 percent (2,349,932 acres) of the subbasin. USFS policies and federal legislation guide management of these lands. Management guidelines are contained in the Flathead National Forest Land and Resource Management Plans and in more site-specific planning and environmental documents.

Bonneville Power Administration

The Bonneville Power Administration (BPA) operates the federal Columbia River hydropower system as if it were a single owner enterprise to maximize power efficiency. BPA schedules Hungry Horse Dam operations for power production and coordinates the power transmission system. BPA also serves as the funding source for projects mitigating the construction and operation of federal dams.

U.S. Bureau of Reclamation

The Bureau of Reclamation (BOR) operates Hungry Horse Dam.

U.S. Army Corp of Engineers

The Army Corp of Engineers (ACOE) is the regulatory entity that controls water levels within federal Columbia River storage projects for flood control. Since the 1960s, the agency's regulatory program's aim has been expanded to consider the full public interest in protecting and using water resources. Section 404 of the Clean Water Act prohibits discharging dredged or fill material into U.S. waters without a permit from the ACOE. Because the definition of "discharge of dredged material" was modified in August 1993, activities that impact waters, including wetlands, will most likely require an ACOE permit.

Federal Energy Regulatory Commission

The Federal Energy Regulatory Commission (FERC) is the regulatory agency that controls the operation of Kerr Dam.

U.S. Fish and Wildlife Service

In addition to administering the National Bison Range and various National Wildlife refuges and wildlife lands, the USFWS administers the Endangered Species Act as it pertains to resident fish and wildlife. USFWS reviews and comments on land-use activities that affect fish and wildlife resources such as timber harvest, stream alteration, dredging and filling in wetlands and hydroelectric projects.

U.S. Environmental Protection Agency

The United States Environmental Protection Agency (EPA) implements federal laws designed to promote public health by protecting the nation's air, water, and soil from harmful pollution. EPA also coordinates and supports research and anti-pollution activities of state and local and tribal governments, private and public groups, individuals, and educational institutions. EPA also monitors the operations of other federal agencies for their impact on the environment. The agency is responsible for implementing the Clean Water Act, including approving Total Maximum Daily Load plans.

Natural Resource Conservation Service

The Natural Resource Conservation Service (NRCS) provides technical support to the Soil and Water Conservation District (SWCD) with distribution of federal cost-share monies associated with reducing soil erosion and increasing agricultural production on privately owned land. They provide engineering and technical support for land and water resource development, protection, and restoration projects.

National Park Service

The USDI National Park Service manages Glacier National Park, which incorporates approximately 615,000 acres of the basin.

Tribes

Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation

The Flathead Indian Reservation encompasses approximately 1.2 million acres of the basin. Within the reservation, the tribes own approximately 662,000 acres. In addition to the administration of their own lands, they review proposed management on public lands within the subbasin and provide comments relative to protection of fish and wildlife resources. Management of tribal lands is guided primarily by the tribes' *Comprehensive Resources Plan* (CSKT 1994), the *Flathead Reservation Forest Management Plan* (CSKT 2000), the *Kerr Project Fish and Wildlife Implementation Strategy* (FWIS) (CSKT 2000a), the *Wetland/Riparian Habitat and Bull Trout Restoration Plan* (CSKT 2000b), and the *Flathead Reservation Wetlands Conservation Plan* (Price 1999). Tribal game wardens regularly patrol the Flathead Reservation to enforce laws and regulations designed to protect fish and wildlife.

Tribes and State

The *Flathead Lake and River Fisheries Co-Management Plan* describes fisheries management strategies and objectives for ten fish species: bull trout, westslope cutthroat trout, lake trout, rainbow trout, kokanee salmon, yellow perch, lake whitefish, mountain whitefish, northern pike, and largemouth bass. While the management plan addresses all sport fish species in Flathead Lake and provides an overview of management, four other fisheries plans specifically address, or will address, three of these species in detail: (1) the *Hungry Horse Fisheries Mitigation Implementation Plan* (DosSantos, et al 1992) addresses dam-caused losses of bull trout, westslope cutthroat trout, and kokanee salmon; (2) the *Montana Bull Trout Restoration Plan* (scheduled for completion in 2000) addresses bull trout; (3) the *Bull Trout Recovery Plan* (USFWS, scheduled for completion in 2001) addresses bull trout; and (4) the FWIS addresses dam-related impacts to the fishery in Flathead Lake. Thus, the *Flathead Lake and River Fisheries Co-Management Plan* serves as an umbrella document encompassing the portions of other plans that affect, or will affect, fish management in Flathead Lake during the 2000 to 2010 time period.

State

Montana Fish, Wildlife & Parks (MDFW&P)

MDFW&P is responsible for protecting and enhancing Montana's fish and wildlife and their habitats for use and enjoyment by present and future generations. Management of the fish and wildlife and their habitats in the subbasin is guided by MDFW&P policies and federal and state legislation. Policies and plans that pertain to the subbasin include the *Montana Elk Management Plan* (Youmans 1992), Management of Black Bears in Montana (FWP 1994), and Management of Mountain Lions in Montana (FWP 1996). State game wardens regularly patrol the Flathead Subbasin to enforce laws and regulations designed to protect fish and wildlife.

Montana Department of Natural Resources and Conservation

The Montana Department of Natural Resources and Conservation (DNRC) is responsible for promoting the stewardship of Montana's water, soil, forest, and rangeland resources and for regulating forest practices and oil and gas exploration and production. The department includes four divisions involved in land management in the subbasin. The Conservation and Resource Development Division coordinates, supervises, and provides financial and technical assistance to Montana's 58 conservation districts. It also provides technical, financial, and administrative assistance to public and private entities to complete projects that put renewable resources to work, increase the efficiency with which natural resources are used, or solve recognized environmental problems. The Forestry Division protects the state's forested and non-forested watershed lands from wildfire, provides aviation services, operates a nursery and provides shelterbelt, windbreak, wildlife habitat improvement, reclamation, and reforestation plantings on state and private lands. The Forestry Division also regulates forest practices and wildfire hazards created by logging or other forest management operations on private lands. The Trust Land Management Division is responsible for managing the surface and mineral resources of forested, grazing, agricultural, and other classified state trust lands to produce revenue for the benefit of Montana's public schools and other endowed institutions. The Water Resources Division is responsible for many programs associated with the uses, development, and protection of Montana's water. Activities include interstate coordination of water issues, centralized water rights record keeping, state water planning, dam safety regulation, floodplain management, and drought planning.

Montana Department of Environmental Quality

The Montana Department of Environmental Quality's mission is to protect, sustain, and improve a clean and healthful environment throughout the state. It oversees implementation and enforcement of the state's environmental protection laws.

Local Government

County Governments

County governments in the subbasin are responsible for planning and land use. They also issue building permits.

Flathead and Lake County Conservation Districts

Conservation districts administer the Natural Streambed and Land Preservation Act, also known as the "310 Law." Any private individual or corporation proposing to undertake a project or construction activity in a perennial stream must first apply for a permit from the local conservation district. Conservation districts are the local contact for the control of non-point source (NPS) pollution. Districts conduct projects that demonstrate NPS pollution control practices, preferring voluntary, educational, and incentive-based approaches to regulatory approaches. Additionally, district boards work with state and federal regulatory agencies (for the most part, the Montana Department of Environmental Quality and the U.S. Environmental Protection Agency) to identify problem areas and prioritize treatment. Recently, the manner in which these problems are addressed has become the development of Total Maximum Daily Loads for impaired streams in Montana. Conservation districts often draw people and resources together to catalyze or assist in the development of watershed planning efforts. Conservation districts sponsor many stream restoration projects, conduct landowner workshops, produce and distribute informational and educational materials, and hold demonstrations and tours of innovative riparian management techniques and projects.

Existing Goals, Objectives, and Strategies

The goal for the Flathead River Subbasin is to restore and protect the abundance, productivity, and diversity of biological communities and habitats, particularly those containing native fish and wildlife populations within the subbasin. The fish and wildlife populations of the subbasin are of economical and cultural significance to the people of the State of Montana, the Northwest, and the Nation and to members of the Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation.

Our objectives are intended to address the primary limiting factors in the subbasin, and so they follow the same grouping used for limiting factors.

Headwaters and Associated Uplands (includes all mountain tributaries)

Objective 1 Reconnect five blocked tributaries over the next three years.

- Strategy 1. Provide passage to migratory fish by removing potential man-caused barriers, i.e. impassable culverts, hydraulic headcuts, water diversion blockages, landslides, and impassable deltas.

Objective 2 Reduce fine sediments in critical spawning areas in five indexed streams over the next three years.

- Strategy 1. Maintain and protect habitat by achieving compliance with existing habitat protection laws, policies, and guidelines.
- Strategy 2. Work with the U.S. Forest Service to lower forest road densities.
- Strategy 3. Implement stream bank stabilization measures where necessary.
- Strategy 4. Implement riparian revegetation/rehabilitation projects.
- Strategy 5. Agitate embedded gravels to remove silts and fine sands.
- Strategy 6. Install artificial spawning structures where necessary.

Objective 3 Restore natural pool frequency to that of undisturbed referenced reaches in five streams over the next three years.

- Strategy 1. Using Rosgen-type rehabilitation techniques, place large rocks and woody debris in the stream to restore the appropriate channel morphometry.

Objective 4 Eradicate or suppress non-native or hybridized populations from five streams over the next three years.

- Strategy 1. Restore habitat to favor native species assemblages.

Strategy 2. Use RSI's to increase native species densities in areas where natural colonization is not possible.

Strategy 3. Protect native populations in headwater areas by installing barriers to upstream invasion by non-native species. Remove barriers where the threat of invasion is corrected.

Strategy 4. Selectively remove non-natives using effective management tools.

Objective 5 Alter 2,008 acres of forest structure and composition in the South Fork of the Flathead over the next three years, consistent with management and mitigation plans.

Strategy 1. Implement wildlife enhancement and protection projects in cooperation with all interested parties in the subbasin as opportunities arise.

Objective 6 Acquire and/or protect key habitat parcels (endangered, threatened, and sensitive species habitats) through purchase, conservation easements, or conservation agreements to assist in maintenance of viable populations.

Impoundments (includes Hungry Horse Reservoir, Flathead Lake, Swan Lake, and irrigation impoundments)

Objective 1 Reduce negative non-native species interactions in Flathead Lake and three irrigation impoundments over the next three years.

Objective 2 Meet the TMDL goal for reduction in phosphorus.

Strategy 1. Support new techniques for bank stabilization as alternatives to the standard riprap material. These new techniques would serve as landowner demonstration models for the reduction of sediment to the mainstem and lake.

Strategy 2. Protect critical wetland and riparian habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms.

Strategy 3. Work with the Focus Watershed Coordination project to identify site-specific wetland/riparian restoration projects and to coordinate with landowners, agencies, and other funding sources.

Objective 3 Reduce the frequency of Hungry Horse refill failure (to within five feet of full pool) as compared to historic operation.

Strategy 1. Operate dams to provide reservoir operations that are consistent with VARQ and IRC concepts by 2002.

Strategy 3. Reduce runoff forecasting error by increasing the number of monitoring sites and improved remote-sensing technology.

Strategy 4. Balance the releases of stored water for flow augmentation with reservoir refill. Specifically, calculate tiered flows using a conservative inflow forecast, assuming the lowest 25th percentile precipitation (rather than average).

Strategy 5. Assess cost effective means for re-vegetating the reservoir varial zone.

Objective 4 Protect, restore, and enhance riparian/wetland habitat in the upper and lower Flathead valleys over the next three years, meeting the annual goals set forth in management and mitigation plans.

Strategy 1. Maintain and protect habitat of native species from degradation by achieving compliance with existing habitat protection laws, policies, and guidelines.

Strategy 2. Maintain minimum flows through the purchasing and leasing of water rights and water conservation agreements.

Strategy 3. Protect critical habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms.

Strategy 4. Reconnect artificially fragmented habitats.

Strategy 5. Work with the Focus Watershed Coordination project to identify site specific restoration projects and to coordinate with landowners, agencies, and other funding sources.

Strategy 6. Implement wildlife enhancement and protection projects in cooperation with all interested parties in the subbasin as opportunities arise.

Regulated Mainstems (includes South Fork, Upper Flathead, Lower Flathead, Jocko River)

Objective 1 Move Hungry Horse operations 50 percent closer to normative compared to current operations over the next three years.

Strategy 1. Implement seasonal flow windows and flow ramping rates.

Objective 2 Protect, restore, and enhance riparian/wetland habitat in the upper and lower Flathead valleys over the next three years, meeting the annual goals set forth in management and mitigation plans.

Strategy 1. Maintain and protect habitat of native species from degradation by achieving compliance with existing habitat protection laws, policies, and guidelines.

Strategy 2. Protect critical wetland, riparian, and associated habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms.

Strategy 3. Work with the Focus Watershed Coordination project to identify site-specific wetland/riparian restoration projects and to coordinate with landowners, agencies, and other funding sources.

Strategy 4. Implement wildlife enhancement and protection projects for wetland and riparian areas in cooperation with all interested parties in the subbasin as opportunities arise.

Objective 4 Complete an operational impact assessment and develop plans to mitigate for any impacts that the operations of Hungry Horse Dam may cause to the development and successional trends of riparian wildlife habitats and their associated aquatic components, in cooperation with ongoing fisheries mitigation activities.

Objective 5 Deal with ongoing recreation-fisheries-water quality conflicts on a daily basis, and educate the public to reduce these conflicts.

Strategy 1. Develop an education program to make boat owners aware of the damage boats can do to banks because of the artificially high summer lake/river levels, controlled by Hungry Horse and Kerr dams.

Unregulated Mainstems (includes North Fork, Middle Fork, and Swan Rivers)

Objective 1 Treat all sites that have occurrences of purple loosestrife or Eurasian watermilfoil.

Objective 2 Protect, restore, and enhance riparian/wetland habitat in the upper and lower Flathead valleys over the next three years, meeting the annual goals set forth in management and mitigation plans.

Strategy 1. Maintain and protect habitat of native species from degradation by achieving compliance with existing habitat protection laws, policies, and guidelines.

Strategy 2. Protect critical wetland and riparian habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms.

Strategy 3. Work with the Focus Watershed Coordination project to identify site-specific wetland/riparian restoration projects and to coordinate with landowners, agencies, and other funding sources.

Strategy 4. Implement wildlife enhancement and protection projects for wetland and riparian areas in cooperation with all interested parties in the subbasin as opportunities arise.

Objective 3 Deal with ongoing human/wildlife conflicts on a daily basis, and educate the public to reduce human/wildlife conflicts.

Strategy 1. Decommission unnecessary roads to reduce harassment of wildlife and encourage more uniform use of available wildlife habitat.

Strategy 2. Continue to develop and implement strategies to educate private landowners on how to coexist with wildlife and preserve or enhance habitat.

Strategy 3. Educate anglers about native fish issues, fishing regulations, and proper identification of native species.

Valley Tributaries & Wetlands (includes all valley tributaries and the Whitefish and Stillwater rivers)

Objective 1 Eliminate three sources of non-native or hybridized fish populations over the next three years.

Strategy 1. Selectively remove populations using effective management tools (i.e. chemical treatment, intensive electrofishing, installation of fish migration barriers etc.).

Objective 2 Protect, restore, and enhance riparian/wetland habitat in the upper and lower Flathead valleys over the next three years, meeting the annual goals set forth in management and mitigation plans.

Strategy 1. Maintain and protect habitat of native species from degradation by achieving compliance with existing habitat protection laws, policies, and guidelines.

Strategy 2. Protect critical wetland and riparian habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms.

Strategy 3. Work with the Focus Watershed Coordination project to identify site-specific wetland/riparian restoration projects and to coordinate with landowners, agencies, and other funding sources.

Strategy 4. Implement wildlife enhancement and protection projects for wetland and riparian areas in cooperation with all interested parties in the subbasin as opportunities arise.

Objective 3 Significantly reduce the level of sedimentation in five impacted spawning areas over the next three years.

Strategy 1. Restore normative surface-water runoff patterns in upland areas using the best management practices and habitat improvement measures (i.e. culvert removal and replacement, sediment source abatement, road obliteration, and re-vegetation).

Strategy 2. Restore natural stream channel function and form using soft methods (i.e. bank stabilization, streambank and riparian re-vegetation, riparian fencing, in-stream channel habitat structures).

Objective 4 Maintain temperatures within the tolerance range of native fish species.

Strategy 1. Deploy continuous recording thermographs in important tributaries to monitor water temperatures in relation to tolerance range of native fish species.

Strategy 2. Improve riparian and in-stream habitat using stream channel and riparian habitat restoration methods (Rosgen 1995).

Objective 5 Deal with ongoing human/wildlife conflicts on a daily basis, and educate the public to reduce human/wildlife conflicts.

Strategy 1. Decommission unnecessary roads to reduce harassment of wildlife and encourage more uniform use of available wildlife habitat.

Strategy 2. Continue to develop and implement strategies to educate private landowners on how to coexist with wildlife and preserve or enhance habitat.

Strategy 3. Educate anglers about native fish issues, fishing regulations, and proper identification of native species.

Objective 6 Develop a reintroduction plan for Columbian sharp-tailed grouse in the Flathead Basin.

Strategy 1. Work with private, tribal, state, and federal landowners to identify opportunities to restore Columbian sharp-tailed habitat and populations.

Lakes (includes connected and closed-basin lakes)

Objective 1 Remove the sources of non-native or hybridized trout from two to three connected lakes each year over the next three years.

Strategy 1. Selectively remove non-desirable fish and restock with native desirable fish.

Strategy 2. Establish barriers to non-native fish escapement or spawning.

Objective 2 Deal with ongoing human/wildlife conflicts on a daily basis, and educate the public to reduce human/wildlife conflicts.

Strategy 1. Decommission unnecessary roads to reduce harassment of wildlife and encourage more uniform use of available wildlife habitat.

Strategy 2. Continue to develop and implement strategies to educate private landowners on how to coexist with wildlife and preserve or enhance habitat.

Strategy 3. Educate anglers about native fish issues, fishing regulations, and proper identification of native species.

Objective 3 Protect, restore, and enhance riparian/wetland habitat in the upper and lower Flathead valleys over the next three years, meeting the annual goals set forth in management and mitigation plans.

Strategy 1. Maintain and protect habitat of native species from degradation by achieving compliance with existing habitat protection laws, policies, and guidelines.

Strategy 2. Protect critical wetland and riparian habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms.

Strategy 3. Work with the Focus Watershed Coordination project to identify site-specific wetland/riparian restoration projects and to coordinate with landowners, agencies, and other funding sources.

Strategy 4. Implement wildlife enhancement and protection projects for wetland and riparian areas in cooperation with all interested parties in the subbasin as opportunities arise.

Objective 4 Maintain the trophic status of all classified lakes.

Strategy 1. Restore physical integrity of degraded habitat where logistically and technically feasible.

Strategy 2. Achieve compliance with water quality standards and develop TMDLs for water quality impaired streams (streams listed on the DEQ 303(d) impaired water bodies list) that are priority native species habitat.

Objective 5 Increase the angler opportunities in three closed-basin lakes over the next three years.

Strategy 1. Utilize hatchery production to stock offsite, closed-basin lakes.

Strategy 2. Where appropriate, rehabilitate three closed-basin lakes per year to provide maximum angler opportunity and system productivity.

Strategy 3. Form partnerships with the public through the Focus Watershed Program and other avenues to increase awareness of the role of mitigation in achieving native species and habitat restoration.

Research, Monitoring, and Evaluation Activities

Monitoring and evaluation activities will occur concurrently with on-the-ground BPA-funded projects described in the section titled *Existing and Past Effort*. Monitoring will include project-specific and watershed-level parameters. Specific monitoring strategies, including pre- and post-treatment sampling, has been designed for each completed and ongoing project (generally the strategies involve site-specific measures, photo points, and migrant trapping). These activities are combined with watershed level, long-term, time-series indices for habitat and fish populations to evaluate direct and indirect effects of projects. This extensive monitoring program is maintained through a cooperative effort with other agencies.

Specific ongoing monitoring activities are listed below:

Fisheries

MDFW&P will conduct the following BPA-funded fisheries monitoring activities:

- To develop habitat suitability use curves required by the Instream Flow Incremental Methodology (IFIM) Project (BPA #9502500) on the Flathead River, MDFW&P will collect micro- and macro-habitat parameters (i.e. depth, velocity, substrate, habitat type etc.) for use in developing weighted useable area curves for size-classes of bull trout and westslope cutthroat trout.

- To monitor effects of selective withdrawal at Hungry Horse Dam on the Flathead River ecosystem, MDFW&P will monitor river temperatures at six locations in the Flathead River system; quantify differences in macrozoobenthos diversity and abundance and pre-and post-selective withdrawal; and quantify and compare whitefish growth rates pre and post.

- To assess abundance, distribution, and food habits of predator fish species (lake trout, northern pike) in the mainstem, North, and Middle forks of the Flathead River, MDFW&P will perform creel surveys throughout the Flathead River system; obtain growth information and analyze stomach contents from harvested northern pike and lake trout; and tag and release fish for abundance and distribution analyses.

- To assess distribution and movements of juvenile, sub-adult, and adult bull trout and westslope cutthroat trout in the mainstem, North, and Middle forks of the Flathead River, MDFW&P will use radio-telemetry to collect data on bull trout distribution, movement, and habitat use through weekly ground, boat, and aerial surveys.

- To assess distribution and movements of westslope cutthroat trout, rainbow trout, and WCT x RBT hybrids in the mainstem, North, and Middle forks of the Flathead River, MDFW&P will collect data on westslope cutthroat trout distribution, movement, and habitat use through weekly ground, boat, and aerial surveys.

- To monitor watershed level fish and habitat parameters in cooperation with fish management staff and other BPA projects, MDFW&P will annually: monitor spawning, incubation and habitat quality by McNeil method of streambed coring in 33 tributaries (to assess juvenile bull trout rearing habitat quality) and by substrate scoring in 21 tributaries; conduct annual migratory cutthroat and bull trout redd counts in 45 index tributary reaches to monitor adult runs; conduct annual cutthroat and bull trout juvenile estimates in 31 tributaries to monitor recruitment; conduct river population estimates in mainstem and forks of Flathead River; conduct annual gill net series on Flathead Lake and Hungry Horse Reservoir; and collect disease samples from wild fish populations.

- MDFW&P will evaluate past mitigation projects on Taylor's Spring Creek, Hay Creek, Dayton Creek and monitor fish growth, species composition, and angler use at past lake rehabilitations on Lion, Rogers, Bootjack, Murray, and Dollar lakes plus other offsite fish-plant waters. A specific monitoring strategy, including pre- and post-treatment sampling, is designed for each restoration project. These are combined with watershed level spawning substrate and redd counts, electrofishing, and gillnet monitoring series to assess direct and indirect effects of the program.

- MDFW&P will assess the timing and magnitude of discharge releases (e.g. ramping rates and flow regimes) from Hungry Horse Dam as related to the distribution, habitat use and movements of juvenile and adult bull trout and westslope cutthroat trout.

- MDFW&P will quantify impacts of flow releases from Hungry Horse Dam on the macroinvertebrate community structure and temporal frequency dynamics of trophically important benthic species in the Flathead River downstream of Hungry Horse Dam.

- MDFW&P will conduct research on an as needed basis as specified in the USFWS Biological Opinion on bull trout in the upper Flathead River system.

CSKT will conduct the following BPA-funded fisheries monitoring activities:

- Native species abundance in Flathead Lake will be monitored using spring gillnetting.

- The biology of lake trout in Flathead Lake will be monitored using fall gillnetting.

- The success of offsite fish plants will be monitored through creel surveys and fish sampling.

- Exploitation rates of sport fish in Flathead Lake will be monitored using a year-long creel survey.

- The Watershed Focus Coordinator's effectiveness will be monitored by tracking the number of individuals in the sub-watershed participating in restoration activities.

In addition, CSKT Fisheries and Water Management programs will monitor:

- Native fish populations on a 10-year cycle to evaluate long-term viability based on the BayVam or similar model by measuring abundance, available habitat, and year-class distribution.
- Substrate condition by McNeil coring or substrate embeddedness in all streams on a 15-year cycle.
- Channel complexity in all streams on a 15-year cycle.
- Streams by maintaining and intermittently reporting results for the reservation-wide Stream Assessment and Reference-reach Assessment Monitoring Program.
- Timber sales, which include (for each sale): sediment source surveys, BMPs implementation and road abandonment, cumulative effects, stream and wetlands inventories, and forest-wide stream-reach assessment surveys for 16 reaches.

BPA-funded fisheries research includes the following projects:

- In 1999, Montana initiated a modified Instream Flow Incremental Methodology (IFIM) project on the Flathead River to refine the river component of HRMOD. The project has been approved for two years of funding and the final year, FY2000, is pending NWPPC approval. The IFIM research will calibrate simulations of hydraulic conditions (stage/discharge and velocities etc.), and fish habitat from Hungry Horse Dam to Flathead

Lake at various discharges from Hungry Horse Dam. An optimization program is scheduled for development to allow managers to assess tradeoffs between the requirements of reservoir and riverine biota, when conflicts occur between reservoir operation and river flow limits as per the MDFW&P. MDFW&P and CSKT monitor the effects of dam operation in Hungry Horse Reservoir and the Flathead River and its tributaries.

- Factors controlling mysis abundance in Flathead Lake will be researched by CSKT through biweekly mysis sampling with associated limnological parameters.

Wildlife

BPA-funded wildlife projects have been undertaken by MDFW&P. BPA-funded wildlife project monitoring has provided, and continues to provide, important information to insure that mitigation is being carried out in the most biologically sound and economically efficient way possible. Only limited funding has been available for wildlife projects in the lower portion of the basin.

- A non-game monitoring program by MDFW&P will evaluate the effects of habitat enhancements at Hungry Horse on breeding-bird communities to determine if enhancement prescriptions for big game species effectively restore habitat for bird species as well. Non-game birds are widely recognized as one of the best indicators of habitat quality. They inhabited all the habitats lost in the project area. In addition, there is growing international concern over the status and trend in many western bird populations and their relationships with habitat management practices. In order to optimize benefits to all wildlife, monitoring needs to determine whether activities done to benefit big game animals also benefit other species groups that depend on those habitats. A final summary report of this eight-year effort will be prepared by June 2001. The results will be used to review and develop new habitat enhancement proposals and methods for measuring wildlife benefits.

- Big game monitoring will evaluate the effectiveness of big game habitat enhancements along Hungry Horse Reservoir. Vegetation monitoring is conducted at a representative sample of paired treatment and control areas to document changes that result from each of the various treatments. Key vegetation components such as density, species composition, canopy coverage and vigor of forage plants will be measured. The elk monitoring portion of this project was originally designed to determine the magnitude of elk population increases resulting from habitat enhancements. However, given the results of Stansberry (1996) this goal will be re-evaluated. A final summary report of this 13-year effort will be prepared by June 2001. The results will be used to review and develop new habitat enhancement proposals and methods for measuring wildlife benefits.

- MDFW&P conducts annual population monitoring on big game, furbearer, and non-game populations in the subbasin through a variety of surveys and inventories. MDFW&P conducts annual surveys of elk, mule deer, white-tailed deer, moose, mountain goats, and grizzly bears. MDFW&P also conducts breeding bird surveys on each of their wildlife management areas as well as furbearer track surveys during winter.

- The Montana Bald Eagle Working Group and the Montana Loon Society coordinate annual bald eagle and common loon occupancy and productivity surveys. The National Audubon Society sponsors annual Christmas bird counts. The U.S. Fish and Wildlife Service coordinates annual breeding bird surveys in the Flathead Subbasin as part of the national surveys. There are also MAPS (Monitoring Avian Production and Survivorship) stations conducted each year, an effort coordinated by the Point Reyes Bird Observatory in California.

As part of its management program, the CSKT Wildlife Management Program monitors:

- Wildlife populations on the Flathead Indian Reservation and in adjacent habitats. Big game, waterfowl, upland gamebirds, endangered, threatened and sensitive species, non-game species, furbearers, amphibians, and reptiles are routinely monitored.

- Recovery of endangered and threatened species by continuing to monitor populations in coordination with other state and federal agencies. The tribes have also taken a lead to reintroduce peregrine falcons and trumpeter swans. Other reintroduction plans involve Columbian sharp-tailed grouse and northern leopard frogs.

- Activities prescribed to eliminate or mitigate the impacts of proposed human activities, including forest management, range management, construction, and a wide variety of other projects.

Research includes the following projects:

- Long-term black bear research is being conducted to improve harvest criteria used for management by assessing the vital rates (reproduction and mortality) of a typical black bear population in Swan River Valley. The project is also documenting local population size, trend, and sustainable harvest level estimates. Simultaneously, the project will develop estimates of black bear population size in typical hunting areas throughout western and central Montana to estimate current harvest rates.

- Long-term monitoring and associated research on the Flathead Indian Reservation includes work on bald eagles, small mammal population dynamics and their impacts upon other species, grizzly bears, amphibians, and forest carnivores.

Statement of Fish and Wildlife Needs

The following near-term priority fish and wildlife needs have been identified for the Flathead River Subbasin:

- **Protect habitat of native fish and wildlife populations.**
  There is an extreme need to use land acquisitions and conservation easements to protect significant intact habitats that support rare, unique, or highly productive populations of fish and wildlife or that are important for sustaining annual public harvests. More active management of existing fish and wildlife management areas is also needed to provide increased benefits.

- **Reduce or eliminate hybridization and competition with non-native species.**
  Hybridized fish populations in headwater lakes and connected streams pose a threat to genetically pure westslope cutthroat populations. Illegal introductions of non-native fish species have likewise impacted progress toward fisheries mitigation and native species recovery. Rehabilitation of selected lakes is needed to create genetic reserves for native fish, prevent genetic introgression, improve fisheries, and eliminate source populations for further illegal introductions. Rehabilitation of selected interconnected streams in the upper Flathead River system is needed to prevent genetic introgression, improve fisheries, and suppress or eradicate hybridized or pure rainbow source populations. Public awareness of damages caused by illegal fish introductions must be a priority. Existing laws regulating the transport of live fish must be enforced. There is a need to reduce or eliminate non-native predator fish species—for example lake trout and northern pike— that pose a threat to the persistence of native fish populations in the river/lake system. Various techniques should be implemented to assess the distribution, abundance, and food habits of these non-native predators in the Flathead system upstream of Kerr Dam.

  There is a need to reduce or eliminate non-native species—for example, purple loosestrife, Eurasian watermilfoil, spotted knapweed, leafy spurge, and bull frogs—that pose a threat to wildlife populations and aquatic organisms.

- **Restore locally extirpated fish and wildlife species to a self-sustaining condition.**
  Self-supporting fish populations need to be reestablished in areas where their habitat can be restored. Natural colonization of restored habitats would be encouraged where possible. Where wild stocks have been extirpated, an appropriate source population could be replicated through imprint planting of genetically compatible eyed eggs or fry. Various techniques for reestablishing wild runs need to be evaluated through rigorous comparisons of effectiveness and risk.

Wherever habitat is available or where there is a potential for habitat restoration, there is a need to restore populations (and habitats) of native wildlife species with populations that have been extirpated or drastically reduced (for example trumpeter swans, northern leopard frogs, Columbian sharp-tailed grouse, and burrowing owls).

- **Reconnect fragmented habitats and isolated populations.**
  There is a need to reconnect access to spawning and rearing habitat that has been blocked by human-caused barriers. Improving fish passage into existing habitat is a cost-effective tool to replace habitat lost during the construction and operation of the hydropower system. These efforts will be consistent with the maintenance of genetic integrity in fish species and protection of threatened, endangered, and senstive plant and animal species.

  For wildlife there is a need to reconnect fragmented habitats and protect existing migration corridors and existing connected habitats from additional fragmentation. This can be accomplished by working with local communities to modify activities such as timber harvesting, housing developments, and road construction and by acquiring key parcels of land and establishing conservation easements with landowners. In addition, the need to acquire and manage key habitat parcels is an extremely high priority, especially on the Flathead Indian Reservation.

- **Restore in-channel habitat structure, function, and complexity.**
  Fish require suitable habitats for natural production and survival through all life stages. Sediment sources need to be reduced or eliminated. Fine sediments accumulating in spawning substrate reduce egg to fry survival such that natural reproduction may be of insufficeint quanity to fully seed available rearing habitat with juevenile fish. Pools and rearing habitat clogged with sediment need to be restored to improve the productive capacity of the stream. Land management needs to be consistent with natural stream function. Possible treatments include stream bank stabilization, livestock fencing, sediment source abatement, riparian re-vegetation, upland road improvement or obliteration, surface water drainage improvements, and agitation of embedded gravels to remove silts and fine sands. In some locations the installation of artificial spawning structures may be beneficial. Stream habitats on channelized or impacted streams need to be restored to natural form and function. This can be accomplished passively or by restoring the stream to a stable channel form. Stream rehabitlitation measures may include placing large rocks, woody debris, and bank stabilization structures in the stream to restore the appropriate channel morphometry. Similarly, lake or reservoir habitat needs be improved by re-vegetating areas subject to water fluctuations or by adding wooden cribs, slash structures, or artifical substrates.

- **Restore riparian and wetland habitats and floodplain function**
  Riparian and wetland areas have the greatest influence over the biological health of the watershed. They provide security cover for fish and terrestrial wildlife, habitat and food for insect production, and woody debris that creates channel diversity and pocket water for spawning gravel deposition. The canopy of the riparian zone helps maintain cool water temperatures and traps sediments produced from adjacent land areas. There is a need to identify and protect the best available remaining riparian and wetland habitats through the use of conservation agreements and land acquisitions and a need to modify the activities that are

causing the degradation of impacted areas or that are preventing the ecosystem from recovering. Riparian and wetland vegetation needs to be restored and protected through fencing and re-vegetation projects.

Channelization, road fill, bank armoring, and other encroachments along stream segments have narrowed channels and limited meanders inside floodplains, which has created shorter channels, steeper gradients, higher velocities, a loss of storage and recharge capacity, bed armoring, and entrenchment. Restoration of highly altered stream reaches and protection of intact systems is needed to restore and maintain stream diversity.

- **Restore watershed function and condition**
  In terrestrial habitats, fire exclusion, logging practices and agriculture has created many changes since pre-European times. Forests have expanded onto grasslands, overall diversity has declined, and the species composition has shifted. Forest structures have changed, and there have been increases in the density of forest vegetation. Changes in patch size and edge, shifts in the ages and sizes of trees, and increases in road densities have also occurred. All these trends have resulted in less resilient and less diverse habitats for fish and wildlife. There is a need to reverse these trends by changing forest and agricultural practices so vegetation communities become more diverse and sustainable and less vulnerable to catastrophic fires and epidemic insect and disease outbreaks. There is a need to use mechanical treatments focused not on commodity production but on restoration in combination with prescribed fire to restore and maintain forest and grassland communities and to enhance fish and wildlife habitats. There is also a need to identify and protect the best available remaining habitats through the use of conservation agreements and land acquisitions.

- **Reduce point and non-point sources of pollution**
  There is a need to address all significant point and non-point sources of water pollution in the system. Reductions in water quality can lower the overall resilience of aquatic environment and keep fish and wildlife populations from recovering. Standards for total maximum loading of nutrients (TMDL), thermal pollution, and gas saturation need to be enforced.

- **Restore the quantity, seasonal pattern, and stability of streamflows and reservoir conditions.**
  There is a need to operate dams to restore and maintain normative hydrologic conditions (conditions that mimic natural processes and minimize impacts on fish and wildlife). Dams need to be operated to provide reservoir operations consistent with VARQ and IRC concepts. Specifically, there is a need for a gradual ramp-down approach to Flathead River flows after the spring runoff and a need to maintain stable discharges during the biologically productive summer months in order to benefit native species. There is also a need to address downstream operational impacts of Hungry Horse Dam upon riparian habitat on the Flathead River both upstream and downstream of Flathead Lake.

- **Replace lost tribal hunting, fishing, and gathering areas and cultural and spiritual sites.**

Construction of Hungry Horse Dam inundated 23,750 acres of wildlife habitat in the South Fork of the Flathead River. This habitat was located primarily on federal lands administered by the U. S. Forest Service. As a source of resources for subsistence under the language of the Hellgate Treaty of 1855, these habitats were very important to members of the Salish and Kootenai Tribes. With inundation, all of these lands and the resources that they produced were lost to use forever by the tribes. In 1990, the State of Montana and BPA signed a wildlife settlement agreement to mitigate for inundation losses related to Hungry Horse Dam. The CSKT were not signatory to this agreement and were not included in the negotiations that led to its development. The CSKT have been a participant in the Montana Wildlife Mitigation Advisory Committee, which advises the MDFW&P on proposed mitigation projects. Although some projects have had benefits for wildlife resources that tribal members utilize, most have not served to adequately replace the wildlife and wildlife habitat losses that occurred.

As a result, a substantial deficit in mitigation of inundation losses continues. There is a need to acquire off-site habitat similar to that degraded or destroyed by Hungry Horse construction and a need to enhance or restore acquired habitat to maximize wildlife productivity. Specifically, there is a need to: (1) secure important spring and fall grizzly bear habitats along the Mission Front and Rattlesnake Mountains from further habitat fragmentation and high disturbance levels; (2) secure and enhance big game winter ranges at key areas on the reservation; (3) mitigate for ongoing impacts of Hungry Horse Dam on the habitat quality and quantity of the lower Flathead River; (4) preserve, protect, and restore remaining acres of unprotected wetland habitat and associated grasslands in the Ninepipe-Kicking Horse area; and (5) restore native grassland and woody draw habitats that have been heavily impacted by livestock use and that no longer support the wildlife species that they did historically.

- **Reduce human/wildlife conflicts.**
  There is a need for increased public outreach and education and law enforcement to reduce human/wildlife conflicts resulting from high rates of rural residential growth. Effective educational strategies must be developed to educate homeowners about how to coexist with wildlife. The need for continued law enforcement is integral to fish and wildlife species and habitat protection in the subbasin, as are forest road closures, obliteration, and other road treatments in order to minimize poaching and harassment and to reclaim habitat. There is a need to limit new development of forest habitats to avoid further losses and intensified human/wildlife conflicts. There is also a need to improve winter and year-round fish and wildlife habitat on county, private, and federal forest lands.

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