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Northcentral Montana Warm and Coolwater Reservoir and Lake Ecosystems

2001 & 2002 Annual Report
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By

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ABSTRACT

Windmills were used to aerate Bynum Reservoir during the winters of 2000-01 and 2001-02 because of low water conditions. Subsequent sampling indicated Bynum's fishery overwintered both years, although marked declines were evident in the walleye *Sander vitreum* population in 2002. Routine standardized sampling could not be completed on Bynum during 2001 because of low water conditions, but netting in 2002 indicated the walleye population was about one-tenth of historic levels. Seine catches indicated excellent yellow perch *Perca flavescens* production occurred in Bynum during 2002; CPUE averaged 66.4 age-0 yellow perch per seine haul. Standardized sampling efforts were reduced on Lake Frances during 2001 because of low water, but an intense June storm quickly filled the reservoir in 2002. During 2001, seine catches of age-0 yellow perch was the lowest observed in the last 10 years, but excellent production was evident in 2002. CPUE of walleye and northern pike *Esox lucius* in standardized fall netting surveys were similar to historic trends during 2001, but catches of yellow perch were reduced. Net catches of walleye and yellow perch increased sharply during 2002. Mean W_r of Lake Frances' walleye, yellow perch, and northern pike populations exceeded 100 in 2002. Spring trap net catches of walleye and northern pike were higher at Devon than in the Willow Creek Arm on Tiber Reservoir during 2001. Spottail shiner *Notropis hudsonius* was the most common forage fish sampled in seine hauls in Tiber, but mean CPUE was much reduced in 2001 relative to 2002 and historic trends. Common carp *Cyprinus carpio* production was excellent in Tiber during 2002. Catches of northern pike and walleye in standardized netting surveys during 2001 and 2002 on Tiber Reservoir remained consistent with recent trends. Cisco *Coregonus artedi* dominated standardized net catches in 2001 and 2002, averaging 11.5 and 9.2 per net, respectively. Mean W_r of walleye in Tiber remained poor in 2001, averaging 82.5, but increased to 91.6 in 2002. Northern pike exhibited excellent body condition with a mean W_r of 96.1 in 2001 and 103.2 in 2002. Hydroacoustic surveys completed on Tiber Reservoir during 2001 indicated significant cisco reproduction and a corresponding size shift in the population. These findings were not corroborated by vertical gill net catches, which indicated the population was still dominated by large, adult cisco. Vertical gill net catches indicated the production of a very large strong cisco year class in 2002. This is the first significant cisco natural reproduction to occur in Tiber and caused an immediate shift in the size structure of the population. Hydroacoustic survey estimates of Tiber's cisco population were synonymous with vertical gill net catches during 2002. Fish dominated the diet biomass of Tiber's northern pike and walleye populations in 2001 and 2002. Common carp was the dominant prey fish consumed by both walleye and northern pike during 2002, reflecting their unusually high abundance in seine catches. For the first time since their introduction into Tiber in 1997 and 1998, cisco were identified in walleye stomachs in 2002. Aquatic invertebrates were a seasonally important prey item for walleye during both 2001 and 2002. In the Lewistown area, East Fork Reservoir, Petrolia Reservoir, the Judith River, Dog Creek, Flat Creek and six small reservoirs were sampled during 2001 – 2002. Drought has reduced water levels and impacted fisheries in all of these waters except East Fork Reservoir. Dry Blood Reservoir winterkilled in 2001 and, due to low water levels, has not been restocked. Northern pike in East Fork Reservoir appear to

have become smaller and more numerous since 1998. Small yellow perch were at record low numbers in seine hauls, but larger yellow perch appear to be doing well in East Fork Reservoir. Crayfish numbers continue to increase. Petrolia Reservoir had record high numbers of age-0 carp in 2001 and walleye gill net catch was higher in both 2001 and 2002 than observed since 1996. A 9.5-pound walleye was captured in Petrolia. In Drag Reservoir, the 34 bluegills *Lepomis macrochirus* stocked in 1996 have reproduced and their population has expanded. Largemouth bass *Micropterus salmoides* stocked into Drag Reservoir are also doing well. In contrast, the black crappie *Pomoxis nigromaculatus* stocked in Whisker Reservoir appear to be present at only low levels. A total of 19 different species were sampled in two electrofishing sections of the Judith River. Rainbow trout *Oncorhynchus mykiss* and longnose suckers *Catostomus catostomus* were the most common species near the Beckman Wildlife Management Area and flathead chubs *Platygobio gracilis* and shorthead redhorse *Moxostoma macrolepidotum* were the most common near the river mouth. Fourteen different species of fish were sampled in Wadsworth Pond in gill nets and frame trap nets set periodically from 1993-2002. White sucker *Catostomus commersoni* was the dominant species sampled in both gear types and were estimated at 5,231 (95% CI: 4,807 – 5,747) individuals in 1996. Trap net CPUE for yellow perch in Wadsworth Pond has declined from 8 per net night in 1996 to 1.5 per net night in 2002. Walleye and largemouth bass have subsequently been stocked into Wadsworth Pond to control abundant populations of white sucker, yellow perch, and black bullheads *Ameiurus melas*. Electrofishing was not effective for sampling fish in Wadsworth Pond because of the high conductivity of the water. Small largemouth bass and pumpkinseed sunfish *Lepomis gibbosus* were readily sampled in seine hauls. Mean CPUE of largemouth bass and pumpkinseed sunfish were 4.4 and 24.2 per seine haul, respectively, during 2002. Gill net sampling completed in Pelican Point Pond #1 during 2001 captured largemouth bass and illegally introduced walleye and northern pike. There is evidence walleye might be established and reproducing. Sampling in Pelican Point Pond #2 in 2001 indicated pumpkinseed were illegally introduced. Five illegal introductions of fish have occurred into these two ponds located at the Pelican Point Fishing Access Site.

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OBJECTIVES

The purpose of this project is to implement the Fisheries Program on coldwater lake ecosystems in the Missouri River drainage in northcentral Montana. Major watersheds include the Missouri, Sun, Teton, Smith, Marias, Judith and Musselshell drainages.

The mission of the Fisheries Division of Montana Fish, Wildlife and Parks (MFWP) is to preserve and enhance aquatic species and their ecosystems to meet public demand for recreational opportunities while assuring stewardship of aquatic life. The Fisheries Program is divided into four major elements, with objectives and outcomes as follows:

The **Fisheries Management** element of the fisheries program has 21 objectives and the following desired outcomes:

1. A healthy aquatic resource, including native-species fisheries and sport fisheries.
2. Public satisfaction with available angling opportunities.
3. Public support for ongoing efforts to restore, maintain, and protect the state's aquatic resources.

The **Habitat** element of the fisheries program has 15 objectives and the following desired outcomes:

1. Diverse, high-quality aquatic ecosystems that support healthy fish populations and provide fishing opportunities.
2. Public participation in efforts of MFWP as well as other state and federal agencies to conserve and improve fish habitat through formation of watershed protection groups and partnerships for the protection and restoration of habitat.

The **Fishing Access** element of the fisheries program has 16 objectives and the following desired outcomes:

1. Provide a diversity of fishing opportunities throughout the state that might otherwise be unavailable.
2. Provide the public with a variety of incidental, non-angling recreational activities by maintaining access to Montana's waters through the fishing access site program.

The **Aquatic Education** element of the fisheries program has 11 objectives and the following desired outcomes:

1. Opportunities for the public, youth and adults, to learn about the state's aquatic ecosystems and their importance.
2. Fishing and water safety skills for program participants.
3. Enhanced public understanding of Montana's natural and cultural resources.
4. An educated public able to make informed decisions about using and preserving Montana's aquatic resources.

PROCEDURES

Choteau Management Area

Reservoir sampling was completed using standard sinking style 125- x 6-foot experimental mesh multi-filament nylon gill nets with 25-foot length panels of 0.75-, 1.0-, 1.25-, 1.5- and 2.0-inch square mesh. Standardized netting was completed during specific time periods at established locations and depths. Frame trap nets (4- x 6-foot frame with 1.0-inch square mesh) were used to sample Bynum and Tiber reservoirs. Forage fish monitoring was completed using a 100- x 10-foot beach seine with 0.25-inch mesh. Tiber Reservoir's cisco population was monitored periodically during 2001 and monthly in 2002 with vertical gill nets. Six 100- x 10-feet vertical gill nets with differing mesh (0.5-, 0.75-, 1.0-, 1.25-, and 2.0-inch square mesh) were set overnight at an established station in the Marias Arm of the reservoir towards North Bootlegger. All fish captured in sampling efforts were identified, measured to the nearest 0.1 inch in total length (TL), and weighed to the nearest 0.01 pound, or counted. Relative weight (W_r) of several species was determined using equations from Anderson and Neuman (1996) and Bister et al. (2000). Stomach samples were collected from predator species in Tiber Reservoir from gill net catches and creel survey. Stomach contents were preserved in 10% formalin and later identified and weighed (0.01g). Vertical plankton tows were completed in Tiber Reservoir using a 30-cm conical plankton net (0.153-mm mesh) with a 15-cm radius. Water temperature (F), dissolved oxygen (ppm), and specific conductivity (µS/cm) profiles were monitored in Tiber Reservoir using a Hydrolab Surveyor 4a fitted with a MiniSonde 4a multiprobe.

Hydroacoustic surveys were completed on Tiber Reservoir using a Hydroacoustics Technology Inc. (HTI) split beam digital echo sounder (200 kHz; 15^0 circular transducer). Data was collected in digital format with an onboard computer using HTI Digital Echo Processor software. HTI EchoView software was used to track acoustic targets. Forebay elevations were used to determine reservoir volume from approximately one meter below the surface to one meter above the reservoir bottom by five-meter intervals. Fish were weighted according to where they fell in the acoustic beam followed by volumetric expansion of fish densities across all transects to the entire reservoir. Minimum target thresholds have consistently been set at –55dB (1.2 inches). The HTI system cannot detect fish smaller than –55dB unless they are directly on axis. Fish larger than –50dB (2.2 inches) can be detected throughout the esonified beam. During post-processing of raw acoustic data, targets can be filtered such that estimates are based on size range of verified (with vertical gill net catches) targets. Cisco population estimates in 2001 and 2002 were based on acoustic targets larger than –45 dB (4 inches) and smaller than –34.5dB (14 inches). The relationship between fish size in the dorsal/ventral aspect to their length was developed by Love (1971). In an attempt to more accurately estimate the Tiber cisco population, analysis has removed all targets less than four inches from previous years estimates. Furthermore, estimates of pelagic (>21 meters) abundance have been corrected for proportion of cisco in gill nets and fish greater than four inches. This report includes population parameters from previous years acoustic

estimates that are markedly different from previous years reports. The reason for this is that estimates since 1996 (pre-cisco introduction) to 2000 included targets of all sizes. In many cases, targets less than four inches comprised the majority. Based on gill net, beach seine and trawling data, these small targets are not cisco. Targets from 1.2- to 4 inches are difficult to identify. However, it is common in acoustic surveys to encounter large numbers of small targets and in many cases they are treated simply as "forage". Cisco estimates stated in this report deal only with targets greater than –45dB (four inches).

Lewistown Management Area

Fish populations were sampled with standard sinking and floating style 125- x 6-foot experimental mesh multi-filament nylon gill nets with 25-foot length panels of 0.75-, 1.0-1.25-, 1.5- and 2.0-inch square mesh; with 50-x 4-foot beach seine (0.12-inch square); with 100- x 12-foot seine (0.25-inch square mesh); and with 4- x 6-foot frame traps (1-inch square mesh). Equations from Anderson and Neuman (1996) and Bister et al. (2000) were used to calculate W_r. Fish were measured to the nearest 0.1 inch and weighed to the nearest 0.01 pounds. Northern pike growth in East Fork Reservoir was estimated from tagged fish recaptured during fisheries surveys. The Judith River was surveyed using a fiberglass driftboat equipped with a mobile electrode and a Coffelt VVP-15 to rectify AC to DC. Power was obtained from a 240-volt generator.

Great Falls Management Area

Wadsworth Pond was sampled periodically between 1993 and 2002 using standard sinking style 125- x 6-foot experimental mesh multi-filament nylon gill nets with 25-foot length panels of 0.75-, 1.0-, 1.25-, 1.5- and 2.0-inch square mesh. Frame trap nets (4- x 6-foot frame with 1.0- and 0.37-inch square mesh) were also used to sample Wadsworth during the same time period. Both gear types were fished overnight. Additional sampling was completed in 2002 using a 100- x 10-foot beach seine with 0.25-inch mesh. On 29 May 2002, an attempt was made to sample Wadsworth Pond with a boat-mounted electrofishing system.

RESULTS & DISCUSSION

Choteau Management Area 2001

Bynum Reservoir

Winter Aeration Efforts – Low water conditions threatened survival of Bynum's fishery during the winter of 2000-01. The reservoir had a maximum depth of about 8.5 feet, and was approximately 500 surface acres between two separate but connected pools. Four

windmills (manufactured by Koenders Windmills, Englefeld, Saskatchewan, Canada) were installed at two locations in Bynum during fall 2000 to promote overwinter survival of the fishery. The reservoir was closed to fishing on 02 October 2000 for safety concerns and to protect the remaining adult walleye and yellow perch populations (Hill et al. 2001).

Population Monitoring – Two 1.0-inch mesh trap nets were fished overnight on 3 May 2001 to evaluate overwinter survival of Bynum's walleye and yellow perch populations. Walleye and white suckers dominated trap catches at 44.0 and 167.5 per trap net night, respectively, but catch-per-unit-effort (CPUE) of these species were much less relative to 2000 trap net catches (Table 1; Hill et al. 2001). Few yellow perch were sampled, but CPUE was similar to previous years. Captured walleye averaged 19.0 inches total length (TL), but their condition was poor. Mean W_r of walleye sampled in traps was 82.0, which is the lowest observed in Bynum since walleye were first introduced into the reservoir in 1985 (Hill et al. 2000).

Because of ongoing drought conditions, Bynum Reservoir did not receive a significant influx of irrigation water during 2001. The reservoir was too low to conduct annual standardized gill netting and beach seine sampling. However, one 1.0-inch mesh and two 0.25-inch mesh trap nets were deployed overnight on 24 August to sample the fishery. Similar to the spring sampling, walleye and white suckers dominated the net catches in the larger mesh trap. Walleye averaged 14.9 inches TL (range: 8.6-21.5) but remained in relatively poor condition as indicated by their mean W_r of 83.6 (Table 1). Spottails shiners, white suckers, and yellow perch were abundant in the 0.25-inch mesh traps, indicating an adequate forage base.

Lake Frances

Population Monitoring – Trap net sampling was not conducted on Lake Frances during spring 2001, and beach seine and standardized gill netting efforts were reduced because of receding water levels.

Twelve beach seine hauls were completed on 22 August 2001 to monitor Lake Frances' forage base. The CPUE (mean catch per seine haul) of age-0 yellow perch was the lowest observed in the last 10 years, likely a result of poor production attributable to reduced reservoir elevations (Figure 1). Abundance of spottails shiners was comparable to historic seining data; mean catch of spottails was 127.3 per seine haul. Only a single age-0 white sucker was sampled in the 12 seine hauls.

Five experimental-mesh sinking gill nets were set on 18 September 2001. Typically, 10 nets are deployed in this standardized netting series, but efforts were reduced because of low water conditions. Walleye, yellow perch, and northern pike were equally abundant in these nets, averaging from 5.0 to 6.4 individuals per net (Table 1). CPUE of walleye and northern pike were similar to historic trends, but the number of yellow perch sampled was the lowest since 1993 (Figure 2). The low abundance of adult perch does not

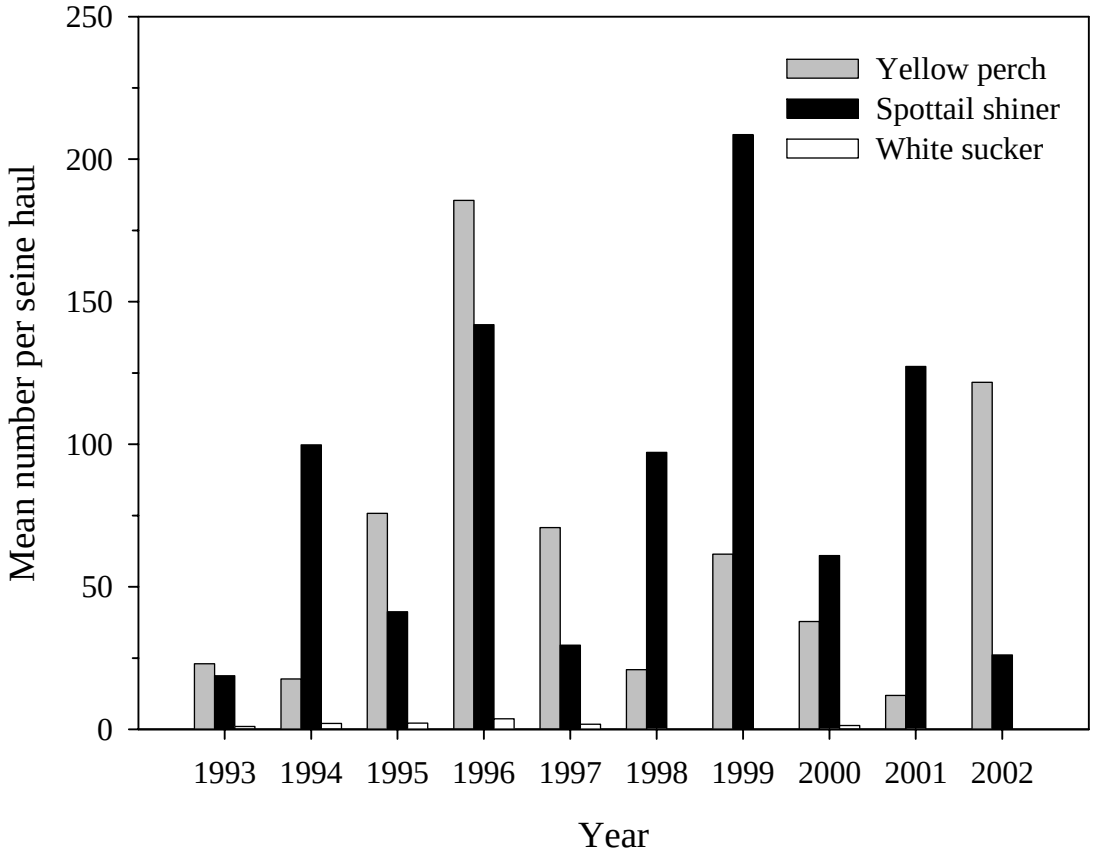


Figure 1. Mean number of forage fish sampled in beach seine hauls in Lake Frances, Montana, 1993 - 2002.

correlate with the good production years of perch observed in beach seine hauls in 1996 and 1999 (Hill et al. 2001). However, predation pressure may have cropped these year classes.

Body condition of walleye and northern pike sampled in fall nets was similar to historic trends. The mean W_r of walleye sampled was 86.7, which is within the range (86-92) observed for Frances' walleye from 1991 through 1999 (Hill et al. 2001). The northern pike population exhibited higher W_r than walleye, averaging 93.1. Historically, northern pike have exhibited slightly higher W_r trends than walleye in Lake Frances (Figure 2).

Creel Census – A weekend creel census was completed on Lake Frances from Labor Day through Memorial Day. Results from this census will be summarized in a future report (Yerk, in preparation).

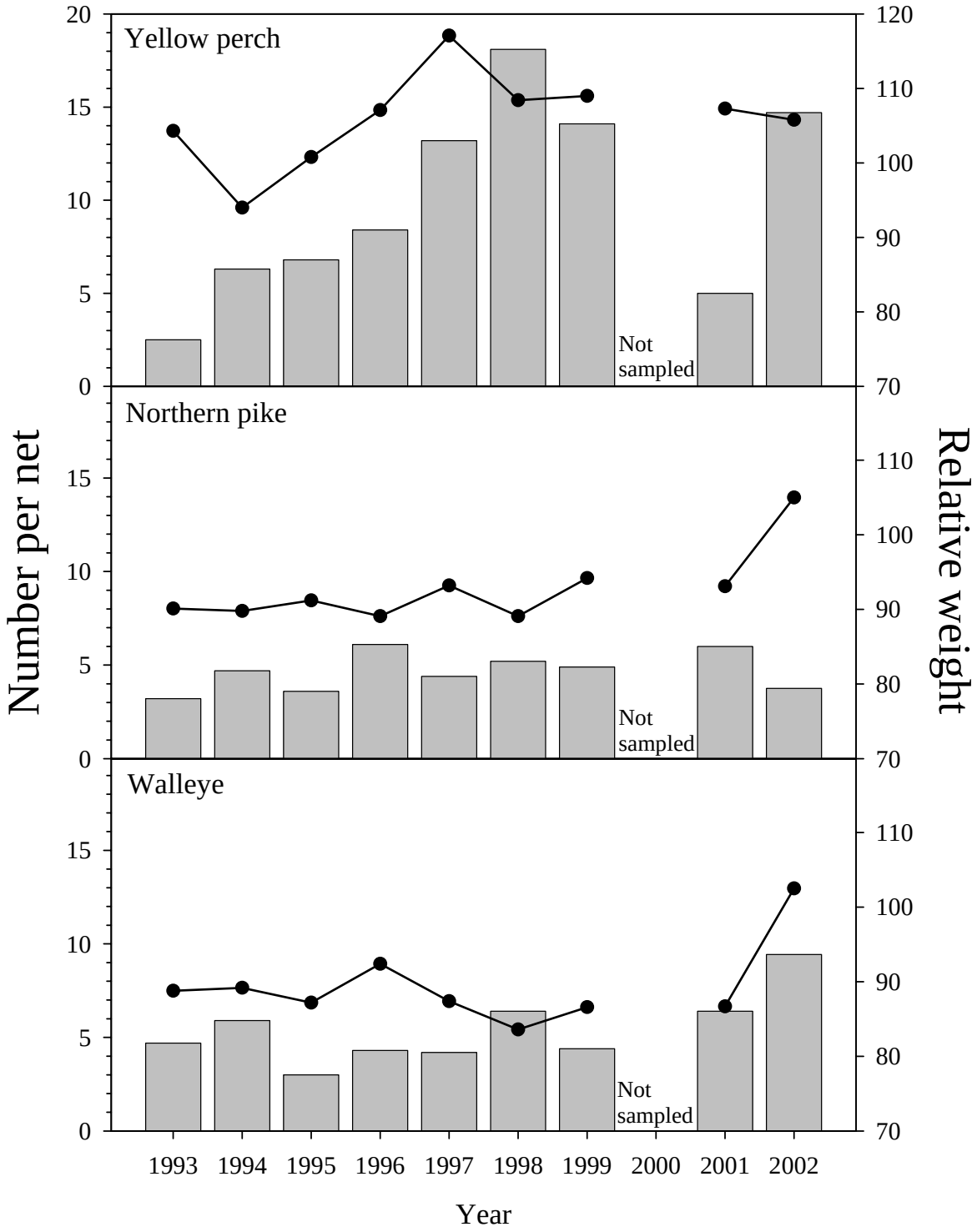


Figure 2. Relative abundance (bar) and relative weight (line) trends of walleye, northern pike, and yellow perch sampled in standardized netting series in Lake Frances, Montana, 1993 - 2002.

Pishkun Reservoir

Population Monitoring – Abundances of forage fishes were not surveyed in Pishkun during 2001. This standardized beach seine sampling was last completed in 1999. Fall gill netting was completed on 18 September to monitor Pishkun's fisheries. Two sinking and three floating style gill nets were deployed overnight at standardized sites. Results from this netting are presented in Tews et al. (2003).

Tiber Reservoir

Population Monitoring – Trap net sampling was completed in upper Tiber Reservoir (near Devon) and in the Willow Creek Arm on 24 April 2001. Five 1-inch mesh traps were fished overnight at each site. This was a reduction in effort relative to previous years sampling (Hill et al. 2000), thus results are not comparable. Catches of walleye and northern pike were considerably higher at Devon than in the Willow Creek Arm, averaging 10.8 and 7.0 individuals per trap net night, respectively (Table 1). Mean size and body condition (as indicated by W_r) of walleye and northern pike were similar between the two areas. W_r of walleye was relatively poor (averaged less than 83) at both locations, while mean W_r of northern pike exceeded 100 at both Devon and the Willow Creek Arm. However, caution must be exercised when interpreting this data because many of these fish were in spawning or post-spawn condition. One large (24 lbs.) northern pike was sampled in the Willow Creek Arm. Other species sampled in trap nets included rainbow trout, yellow perch, white sucker, longnose sucker, and common carp (Table 1).

Forage fish surveys were completed in Tiber Reservoir on 28-31 August 2001. Fifty-four seine hauls were completed at standardized sites located throughout the reservoir. Water temperature ranged from 68- to 73 F. Spottail shiner was the most common species sampled, and was captured in numbers similar to recent years sampling. However, their relative abundance was about one-third the number sampled during the 1994-1998 period (Figure 3). Reduced reservoir elevations resulting from ongoing drought may be limiting production of spottail shiners and other forage fishes. The number of age-0 yellow perch sampled was similar to 2000, but much reduced from historic trends. Relatively few common carp, emerald shiners *Notropis atherinoides*, and white suckers were sampled, but in numbers similar to previous years (Figure 3). Other species sampled included walleye, northern pike, lake chub *Couesius plumbeus*, flathead chub, longnose dace *Rhinichthys cataractae*, rainbow trout, mottled sculpin *Cottus bairdi*, and cisco.

Standardized fall gill netting was completed in Tiber on 10-12 September 2001. This netting series has been set annually since 1973 and is used to monitor the reservoir's fisheries. Twenty-nine sinking gill nets were set at standardized locations throughout the reservoir and fished overnight. CPUE of walleye and northern pike were similar to recent years trends, averaging 2.0 and 0.6 per net, respectively (Figure 4). Just four years since being introduced into the reservoir in 1997, cisco dominated the net catches. A total of 323 cisco were sampled, averaging 11.1 per net. Yellow perch was the second

most common species sampled, but catches remained low, averaging 2.3 per net. The relative abundance of yellow perch in Tiber has remained low since 1998 (Figure 4). Mean size and body condition of Tiber's walleye remained poor; walleye captured in nets averaged 12.6 inches TL and had a mean W_r of 82.5 (Table 1). Most cisco were too large to be consumed by the relatively small walleye in Tiber. Similar to 2000 fall netting results, the average cisco (12.9 inches TL) sampled during 2001 was larger than the average walleye caught in the nets. Northern pike exhibited excellent body condition with a mean W_r of 97.1. It appears larger pike in Tiber are utilizing the abundant cisco population as forage. A single, large (38.5 inches TL) shovelnose sturgeon *Scaphirhynchus platorynchus* was sampled in the nets, a likely relict from the Marias River prior to its impoundment in 1955.

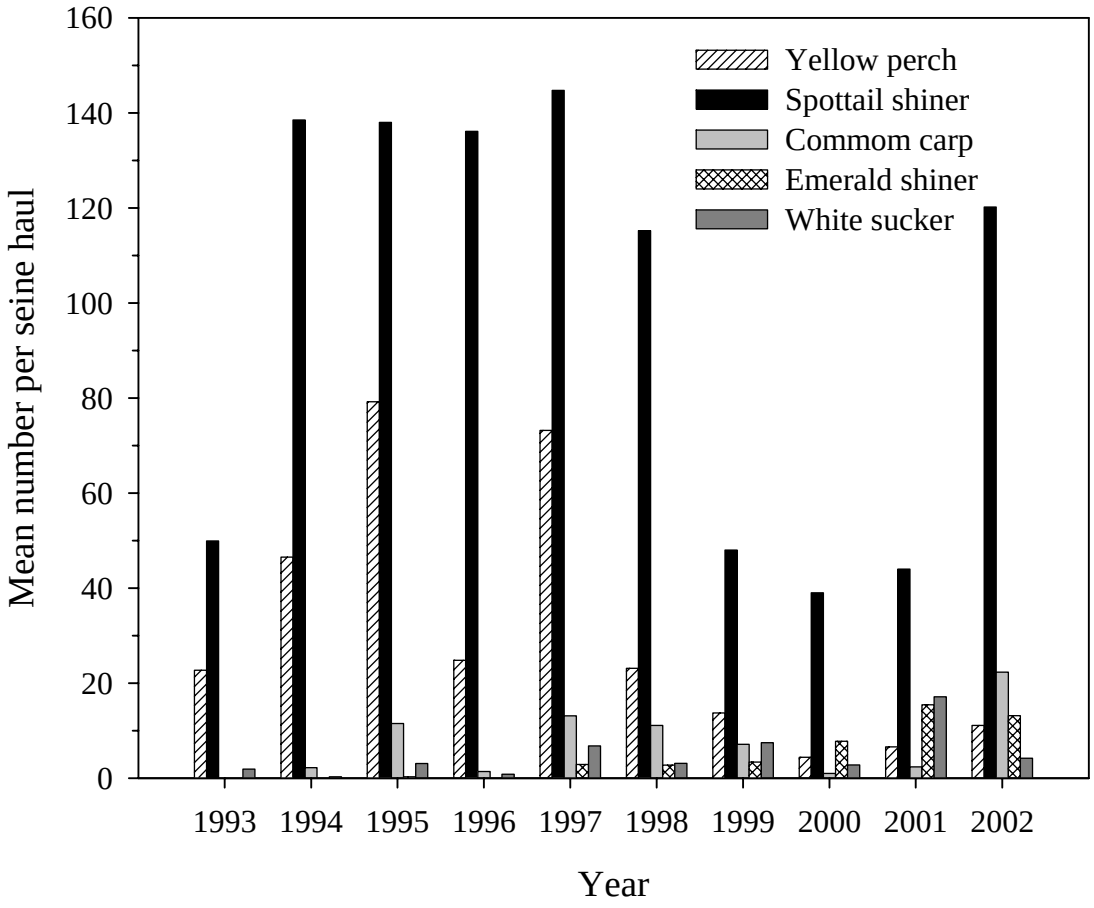


Figure 3. Mean number of forage fish sampled in beach seine hauls in Tiber Reservoir, Montana, 1993 - 2002.

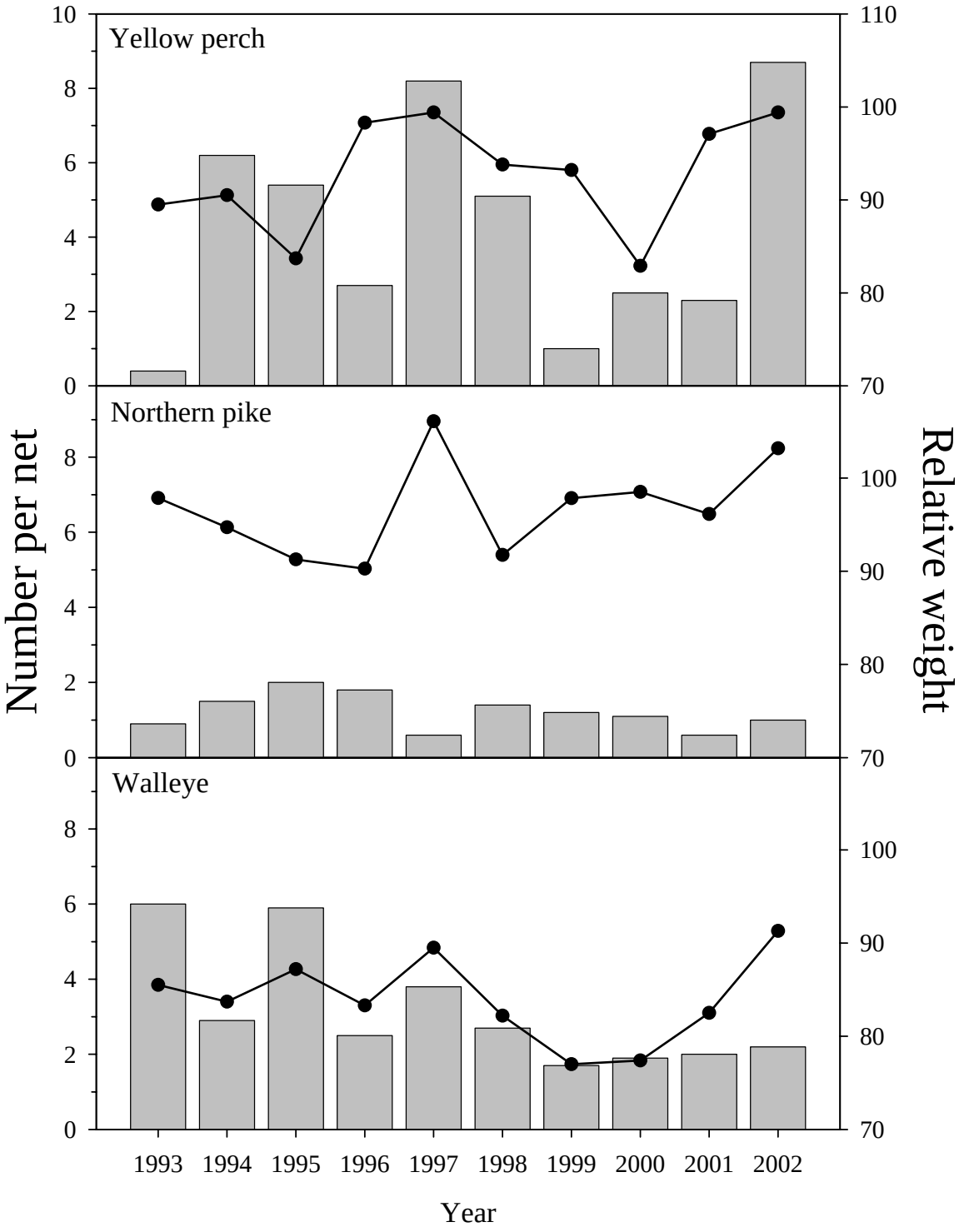


Figure 4. Relative abundance (bar) and relative weight (line) trends of walleye, northern pike, and yellow perch sampled in standardized netting series in Tiber Reservoir, 1993 - 2002.

Table 1. Trap net and gill net results for warm and coolwater reservoirs sampled in the Choteau area during 2001. 'NA' denotes data not available.

			Catch Statistics			*Fish Statistics*					
Water body	Net type	Water				Total length (in)		Weight (lbs)		Wr (%)	
(date)	(*n* of sets)	temp (F)	Species	*n*	*n*/net	mean	(range)	mean	(range)	mean	(range)
Bynum Res.	Trap (1.0 in)	46	Walleye	88	44.0	19.0	(13.6-23.2)	2.22	(0.86-4.80)	82.0	(59.2-96.2)
(3 May)	(2)		Yellow perch	3	1.5	9.6	(7.5-10.7)	0.60	(0.26-0.88)	119.3	(100.1-133.5)
			White sucker	335	167.5	NA		NA		NA	
			Mountain whitefish	1	0.5	14.3		1.26		NA	
Bynum Res.	Trap (1.0 in)	68	Walleye	73	73.0	14.9	(8.6-21.5)	1.12	(0.23-3.34)	83.6	(68.5-119.5)
(24 Aug.)	(1)		Yellow perch	7	7.0	10.3	(7.8-12.2)	0.59	(0.25-0.97)	96.1	(84.1-105.3)
			White sucker	578	578.0	NA		NA		NA	
	Trap (0.25 in)	68	Walleye	13	6.5	NA		NA		NA	
	(2)		Yellow perch	130	65.0	NA		NA		NA	
			White sucker	205	102.5	NA		NA		NA	
			Spottail shiner	440	220.0	NA		NA		NA	
Lake Frances	Sinking gill	63	Walleye	32	6.4	16.2	(7.5-20.9)	1.51	(0.12-3.18)	86.7	(73.1-121.3)
(18 Sept.)	(5)		Yellow perch	25	5.0	8.6	(5.7-11.8)	0.41	(0.09-0.96)	107.3	(93.2-123.9)
			Northern pike	30	6.0	17.6	(12.6-25.5)	1.34	(0.40-3.68)	93.1	(81.8-106.2)
			White sucker	2	0.4	20.0	(19.4-20.5)	3.78	(3.55-4.00)	108.9	(106.5-111.2)

Table 1. Continued.

Water body (date)	Net type (*n* of sets)	Water temp (F)	*Catch Statistics* Species	*n*	*n*/net	*Fish Statistics* Total length (in) mean	(range)	Weight (lbs) mean	(range)	Wr (%) mean	(range)
Tiber Res.	Trap (1.0 in)	46	Walleye	54	10.8	15.0	(11.3-27.1)	1.29	(0.42-7.70)	82.8	(69.7-103.8)
Devon (24 April)	(5)		Northern pike	35	7.0	26.5	(17.6-32.5)	6.03	(1.32-11.20)	119.1	(88.2-155.9)
			Rainbow trout	2	0.4	18.8	(18.8-18.8)	2.16	(2.12-2.19)	75.5	(74.2-76.7)
			White sucker	10	2.0	18.6	(15.3-20.6)	3.30	(1.54-4.20)	115.2	(96.9-135.6)
			Longnose* sucker	2	0.4	15.4	(13.9-16.9)	1.18	(0.40-1.95)		
			Common carp	1	0.2	26.8		10.00		105.6	
Tiber Res.	Trap (1.0 in)	48	Walleye	7	1.4	14.2	(12.3-19.6)	0.90	(0.53-2.12)	80.7	(72.3-94.1)
Willow Creek Arm (24 April)	(5)		Yellow perch	15	3.0	9.1	(7.6-11.2)	0.45	(0.20-0.84)	108.3	(87.7-123.0)
			Northern pike[1]	5	1.0	27.8	(22.2-33.2)	6.78	(2.52-10.60)	113.1	(95.1-144.0)
			White sucker	13	2.6	16.9	(15.7-19.3)	2.47	(1.77-3.78)	113.0	(97.7-127.4)
			Common carp	1	0.2	25.4		9.90		122.3	

Table 1. Continued.

Water body (date)	Net type (*n* of sets)	Water temp (F)	*Catch Statistics* Species	*n*	*n*/net	*Fish Statistics* Total length (in) mean	(range)	Weight (lbs) mean	(range)	Wr (%) mean	(range)
Tiber Res. (10-12 Sept.)	Sinking gill (29)	NA	Walleye	59	2.0	12.6	(7.6-17.2)	0.62	(0.10-1.42)	82.5	(67.7-98.2)
			Yellow perch	66	2.3	7.3	(5.2-10.4)	0.22	(0.06-0.60)	97.1	(72.7-117.4)
			Northern pike	16	0.6	22.4	(13.6-36.0)	3.84	(0.54-14.50)	96.1	(65.0-130.9)
			White sucker	61	2.1	15.8	(7.2-19.8)	1.89	(0.16-3.36)	101.0	(86.1-116.4)
			Longnose* sucker	15	0.5	16.1	(12.4-19.4)	1.71	(0.69-2.80)		
			Channel catfish	1	<0.1	22.9		4.60		102.9	
			Cisco*	323	11.1	12.9	(5.5-15.5)	0.86	(0.06-1.45)		
			Common carp	3	0.1	21.0	(4.3-30.6)	9.22	(0.05-14.00)	111.8	(97.6-127.5)
			Burbot	1	<0.1	18.0		0.90		58.9	
			Shovelnose* sturgeon	1	<0.1	38.5		9.10			

* W_r equations not available for these species.

[1] Note one NP weighed at 24 lbs in trap at WCA but not measured.

Creel Census – A weekend creel census was completed on Tiber Reservoir from Labor Day through Memorial Day during 2001. Results from this census will be summarized in a future report (Yerk, in preparation).

Cisco Population Monitoring – Vertical gill nets were set at the Bootlegger Sampling Station during May, June, August, and September to monitor Tiber's cisco population. Total catch of cisco was relatively low during May and June, but increased later in August and September once the reservoir stratified and a thermocline developed (Appendix D). Adult cisco dominated net catches during all months (Figure 5). Yearling cisco resulting from the limited reproduction that occurred in 2000 (Hill et al. 2001) were captured in June, August, and September. Age-0 cisco first appeared in nets in August and September, but in low numbers relative to the number of adults sampled (Figure 5). However, this is the most significant cisco production observed in Tiber since their introduction into the reservoir in 1997. Age-0 cisco averaged 4.3 inches TL (SD = 0.12) and 5.0-inches TL (SD = 0.24) in August and September, respectively.

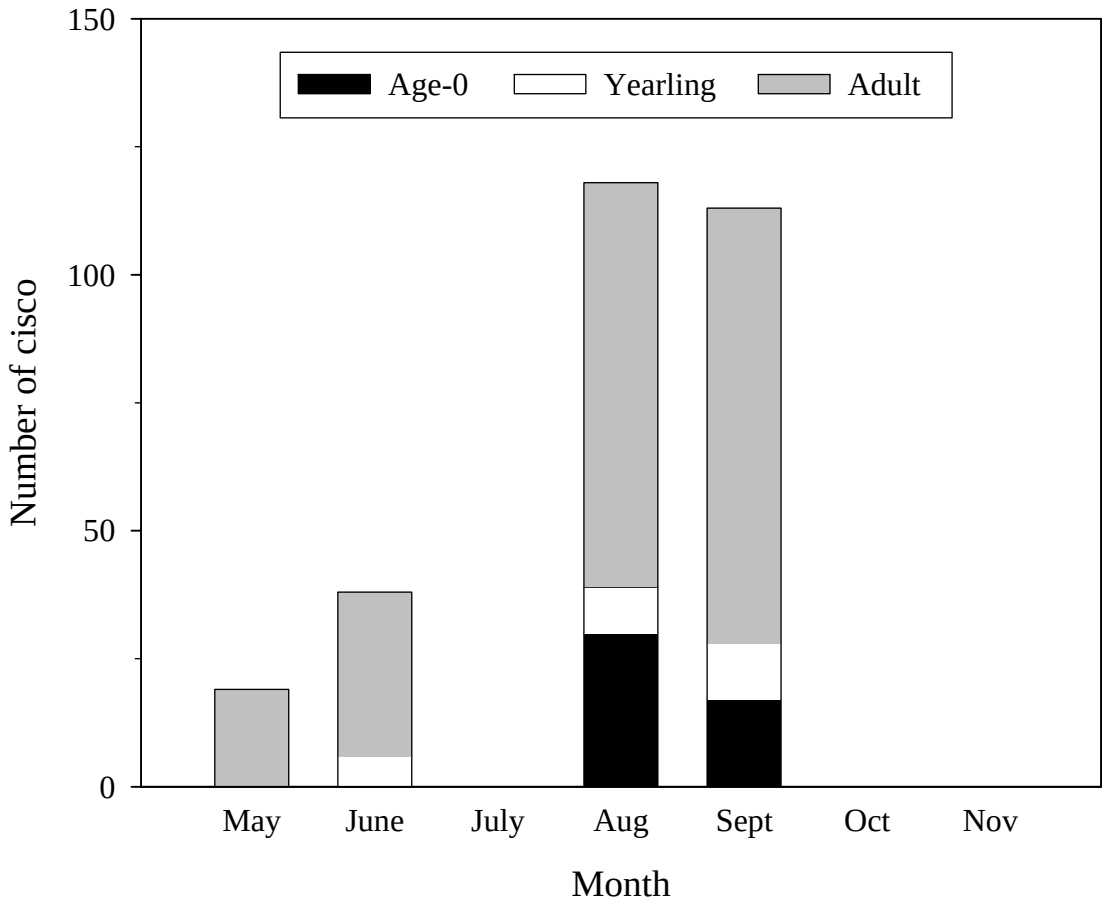


Figure 5. Classification of cisco sampled in vertical gill nets at Bootlegger Sampling Station in Tiber Reservoir, Montana, during 2001.

In addition to the vertical net sampling completed at the Bootlegger Station, sets were also completed during September near the mouth of the Willow Creek Arm and Tiber Dam to complement hydroacoustic surveys (Figure 8). This more comprehensive netting effort provides an index for monitoring Tiber's cisco population. Combined catches of cisco from all three stations indicated that although limited cisco production occurred in 2000 and 2001, the population was still dominated (92% of total catch) by larger adults originating from the first introduction of this new species in 1997 (Figure 6). Adult cisco averaged 12.5-inches TL (SD = 0.47) in the September nets. Average TL of age-0 and yearling cisco have not changed since monitoring began in 1997, indicating growth rates have not changed. The mean TL of adult (age 2 and older) cisco sampled during September increased 1.3 inches from 1999 to 2001 (Figure 7). This is attributable to the continued growth of the exceptional 1997 year class.

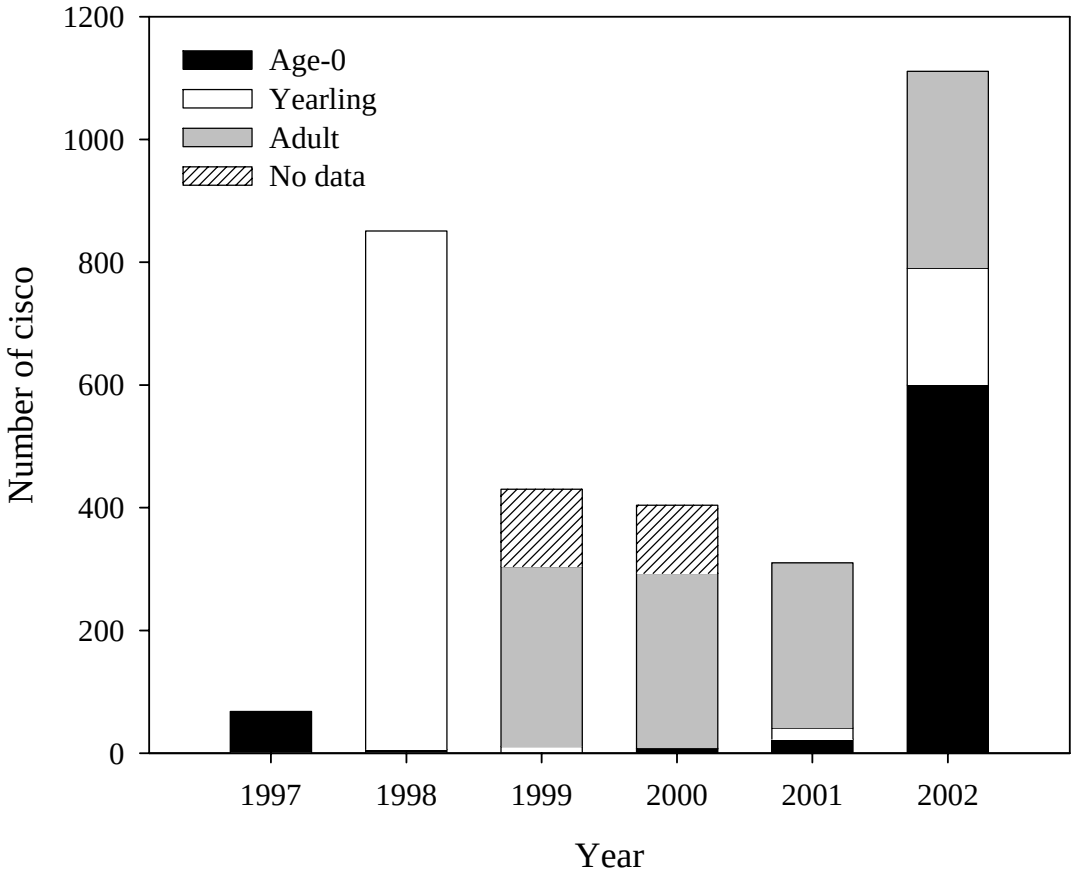


Figure 6. Classification trends of cisco captured in composite vertical gill nets set in three areas of Tiber Reservoir, Montana, during September, 1997-2002.

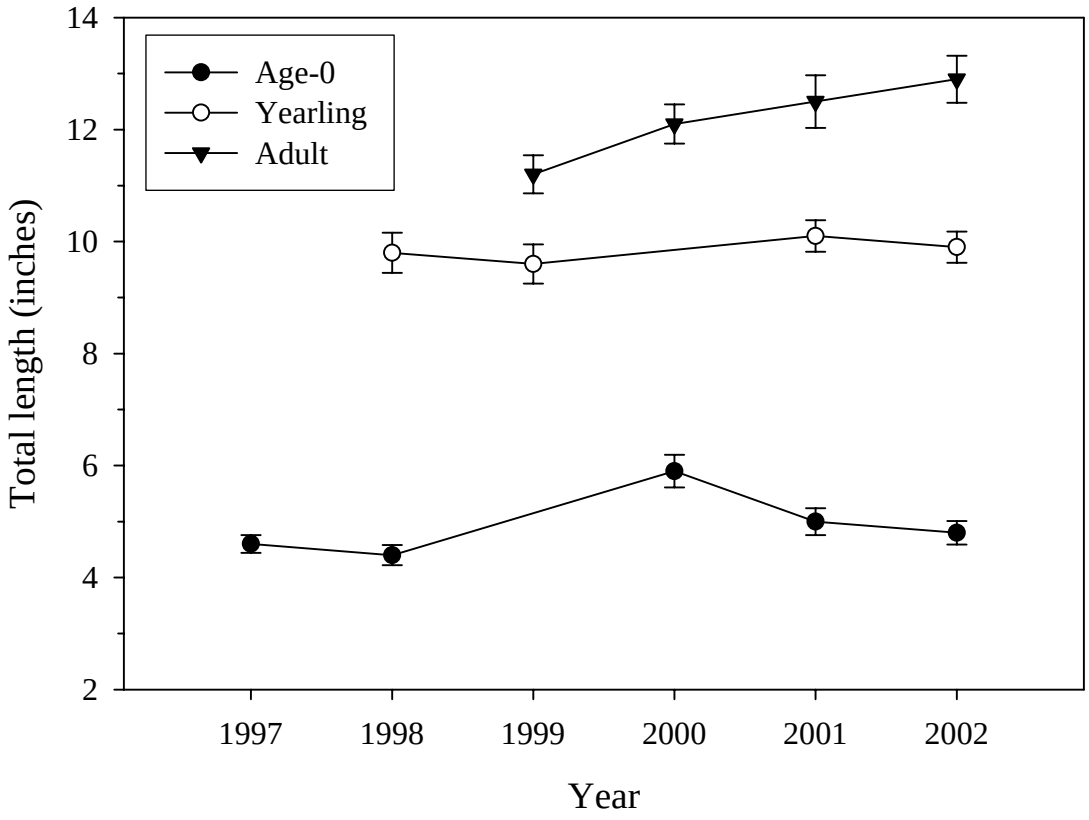


Figure 7. Mean total length (±1 SD) of cisco sampled in vertical gill nets during September in Tiber Reservoir, Montana, 1997 - 2002.

Hydroacoustic surveys — Hydroacoustic surveys in 2001 were conducted between 2029 hours on 11 September and 0208 hours on 12 September. Tiber Reservoir forebay elevation during the survey was 2980.1 feet mean sea level (msl). Fish densities were collected along 18 equally spaced transects suggested by Gunderson (1993) and the same transects used since 1996 (Figure 8; Hill and Teuscher 1997).

The 2001 Tiber cisco estimate was 1.48 million (Table 2). This estimate includes only acoustic targets between 4- and 14 inches and is corrected for proportion of cisco in vertical gillnets (3.4 million fish * 44% greater than 4 inches * 98.7% cisco in verticals). In 2001, abundance of age-0 cisco (4-7 inches) was 968,000 while the adult cisco (7-14 inches) estimate was 489,000. This estimate includes ages 2, 3 and 4 cisco as these age groups were clustered around 10-13 inches in length. Estimates of adult cisco declined by one-half from 2000 levels (1.14 million). The highest estimate of adult cisco was measured in 1998 at 1.61 million. This coincides with the excellent survival of the initial 1997 cisco introduction. Length frequency of targets between 4 and 14 inches revealed a mean of 6.4 inches in 2001 (Figure 9).

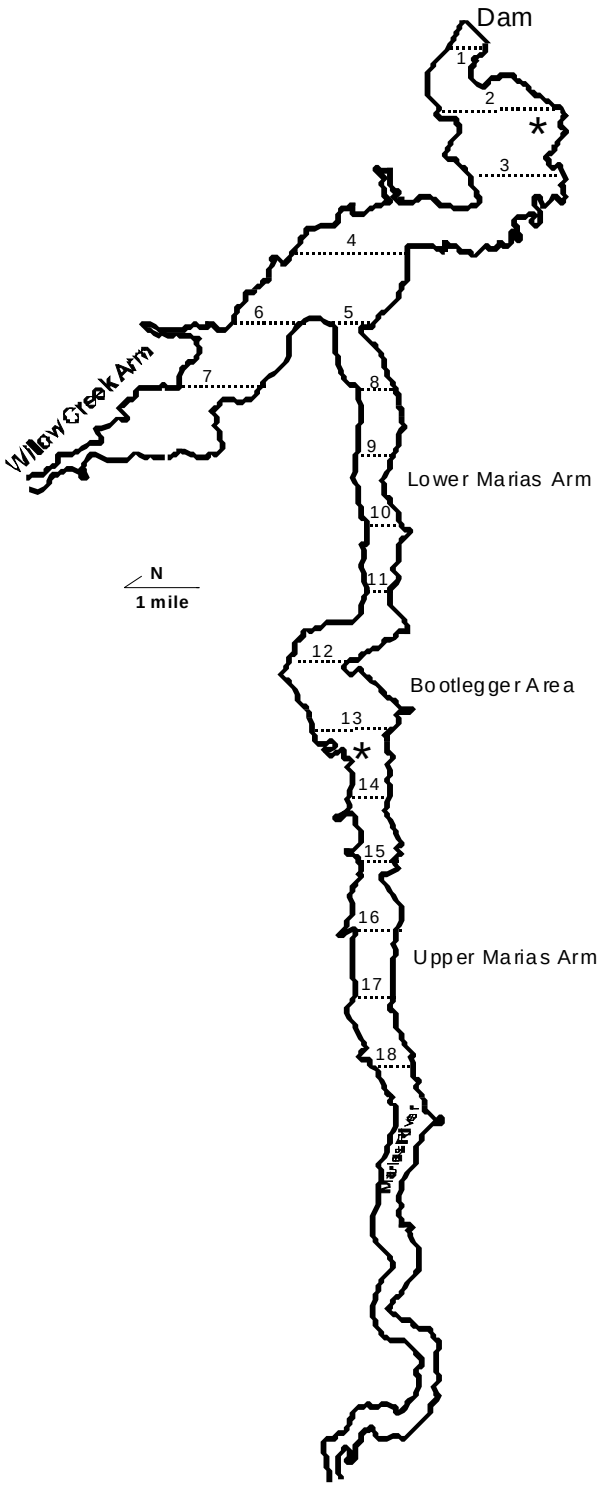


Figure 8. Hydroacoustic transects and vertical gill net locations on Tiber Reservoir. Vertical gill net locations are indicated with *.

Table 2. Summary of population parameters derived from acoustic monitoring on Tiber Reservoir (1996 through 2002). *Approximately 5 million age-0 cisco were introduced in 1997 and again in 1998.

	1996	1997	1998	1999	2000	2001	2002
Total targets-million	2.0	1.2	3.2	2.7	4.3	3.4	9.3
% Cisco in vertical gillnets	0	72	99.2	98.8	99.3	98.7	99.5
% Fish > 4 inches	N/A	14	73	28	38	44	29
Cisco population estimate (>4 inches)	N/A	166,000	2.31 mil	743,000	1.6 mil	1.48 mil	2.67 mil
Age 0 cisco estimate (4-7 inches)	N/A	115,000*	713,000*	164,000	463,000	968,000	1.98 mil
Adult cisco estimate (>7 inches)	N/A	N/A	1.6 mil	586,000	1.1 mil	489,000	690,000
Pelagic[1] Estimate (cisco > 4 inches)	N/A	35,000	535,000	138,000	101,000	542,000	1.10 mil

[1] Pelagic Estimate = fish counted between 21 and 46 meters of depth.

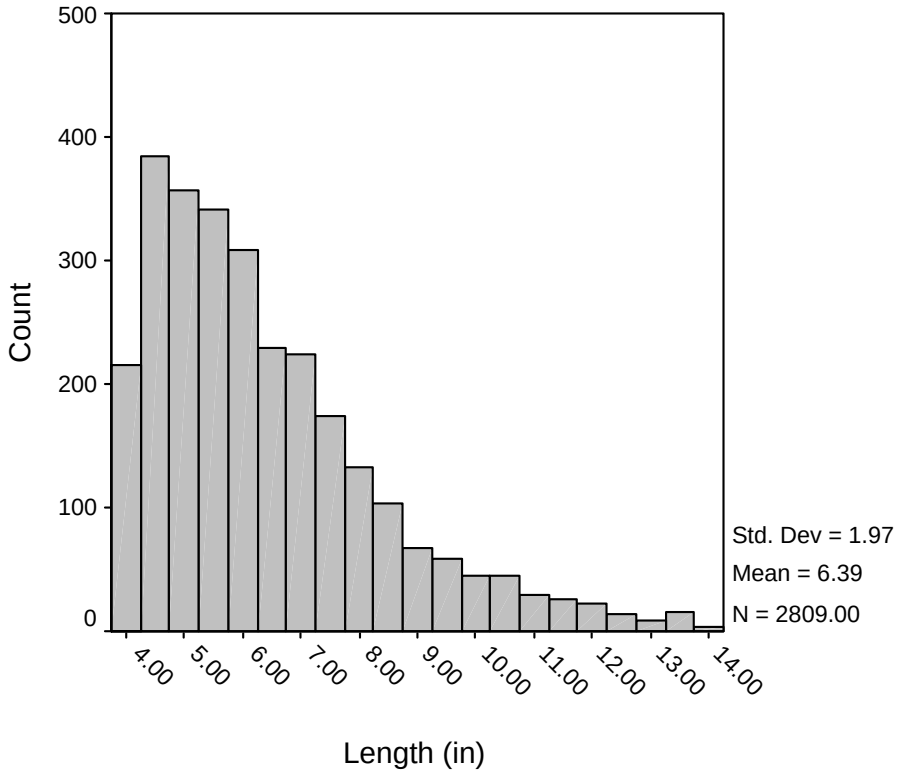


Figure 9. Length frequency of acoustic targets between 4- and 14 inches across all transects in Tiber Reservoir, September 2001.

Since 1998, hydroacoustic estimates of age-0 cisco have been consistently high relative to vertical gill net catches. Hydroacoustic estimates for age-0 and adult cisco during 2001 do not correlate with vertical gill net catches (Figure 6). The validity of these estimates was also called into question in 1998 when an age-0 cisco acoustic estimate of 713,000 was recorded. Vertical gill nets only caught six age-0 cisco in 1998, which indicated survival of the five million cisco stocked that year was low. Potential explanations for these discrepancies are that acoustic sampling has overestimated the abundance of age-0 cisco or vertical gill nets have underestimated their relative abundance. Discrepancies between sampling methods are not uncommon as acoustic and gill nets each possess limitations and bias. Future sampling efforts should attempt to diagnose sampling discrepancies.

In 2001, acoustic targets were vertically distributed with 49% of all targets in the top 69 feet (21 meters) while 49% were counted between 21- and 31 meters (Appendix A). Densities of targets in this depth range have varied through the years with only 22% counted during the 1999 and 2000 estimates, 26% in 1998, 24% in 1997, and only 5.2% in pre-cisco surveys in 1996.

Cisco densities in 2001 were highest in the upper and lower Marias Arm (Figure 10). Transects T6 and T7 in the Willow Creek arm recorded 46 % and 47% age-0 cisco, respectively. Similar proportions of age-0 cisco were observed in transects 15 and 16 in the upper Marias Arm. Adult cisco (>10 inches) densities were highest in the upper Marias area with 55% and 45% recorded in transects T18 and T17, respectively (Figure 10). Density estimates in these upper Marias transects should include the caveat that volume of water esonified is relatively small when compared to near-dam transects.

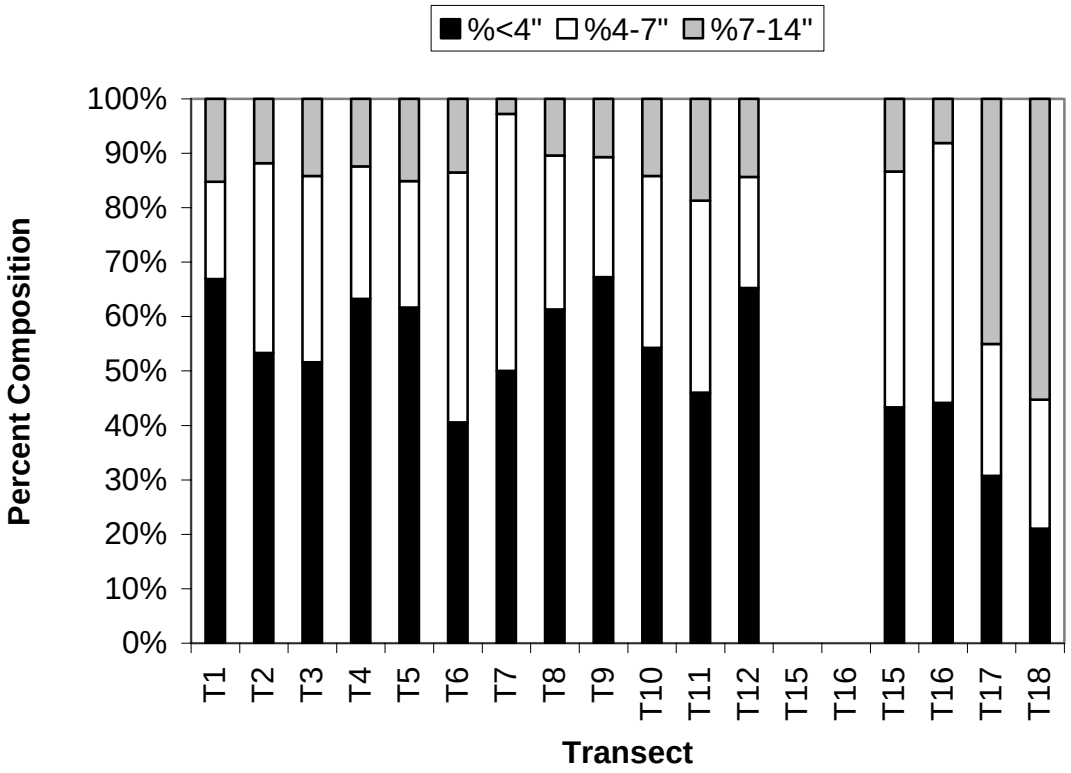


Figure 10. Percent composition by size of acoustic targets across transects in Tiber Reservoir, 2001. Some transects were excluded due to problems with volumetric expansion, tree interference or loss of bottom tracking.

Northern Pike Food Habits – A total of 12 northern pike stomachs collected during the summer creel survey and fall gill net sampling were examined in 2001. Sampled northern pike ranged in size from 13.6- to 36.0 inches TL, and averaged 23.4 inches TL. One-quarter (25%) of the stomachs collected during the summer creel survey were empty, while 40% of the stomachs from northern pike sampled in gill nets were empty.

A single 12-inch TL cisco accounted for 62% of the total biomass examined in northern pike stomachs during 2001. The miscellaneous fish category was represented by one

rainbow trout comprising 24% of the biomass, followed by crayfish at 11% of the biomass. Spottail shiners and yellow perch accounted for 1% and 2% of the total biomass, respectively (Figure 11).

Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence and percent occurrence of all prey items found in northern pike stomachs during 2001 are presented in Appendix B. Crayfish were the most numerous prey items consumed with 16 individuals identified in six stomachs, resulting in a 50% occurrence. Two yellow perch and one spottail shiner were identified in the 2001 samples. Food habits were not compared among months because of small sample sizes.

Walleye Food Habits – Contents of 83 walleye stomachs collected from Tiber Reservoir from May through September 2001 were analyzed. Of the 105 stomachs collected through the creel survey, 59% were empty; 33% of the 57 stomachs sampled from fall gill nets were empty. The walleye collected for diet analysis ranged in length from 9.8- to 19.0 in TL (mean = 13.2 in TL).

Fish comprised 79% of the prey biomass in walleye diets (Figure 11). Yellow perch, spottail shiners, and common carp comprised 26.6%, 21.9%, and 15.6%, respectively, of the total food biomass in walleye stomachs. Crayfish represented 15.2% of the biomass followed by 8.8% for unidentified fish, 6% for aquatic invertebrates and miscellaneous fish at 5.9%. Miscellaneous fish included fathead minnows *Pimephales promelas*, sucker spp., and northern pike.

Monthly summaries of prey items consumed by walleye in Tiber Reservoir during 2001 are presented in Figure 12. Crayfish dominated the May/June samples representing 75% of the biomass, and aquatic insects followed at 23%. In July, aquatic invertebrates increased to 57% of the biomass with Ephemeroptera nymphs representing 44% of this total. Crayfish comprised 43% of the biomass in July, but increased to 68% of the biomass and 58% of occurrence in the August samples. As observed in previous years (Hill et al. 1999; Hill et al. 2000), fish dominated the September sample representing 98% of the biomass. Yellow perch comprised 34% of the September biomass, followed by spottail shiners and common carp with 27% and 20%, respectively.

Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence and percent occurrence of all prey items found in walleye stomachs during 2001 are presented in Appendix C. Dipterans (midge pupae / larvae) were the most numerous prey item (n = 203) followed by Ephemeropterans (mayfly nymphs) at 126 individuals. Mayflies recorded the highest frequency at 33.7% occurrence. Twenty-three spottail shiners were identified in 19 stomachs (22.9% occurrence). Thirty crayfish were consumed by 15 walleye (18% occurrence). No cisco were identified in the 83 walleye stomachs examined during 2001.

Water Quality and Zooplankton Monitoring – Surface water temperature at the Tiber Dam sampling station ranged from a low of 51.7 F on 14 May 2001 to a high of

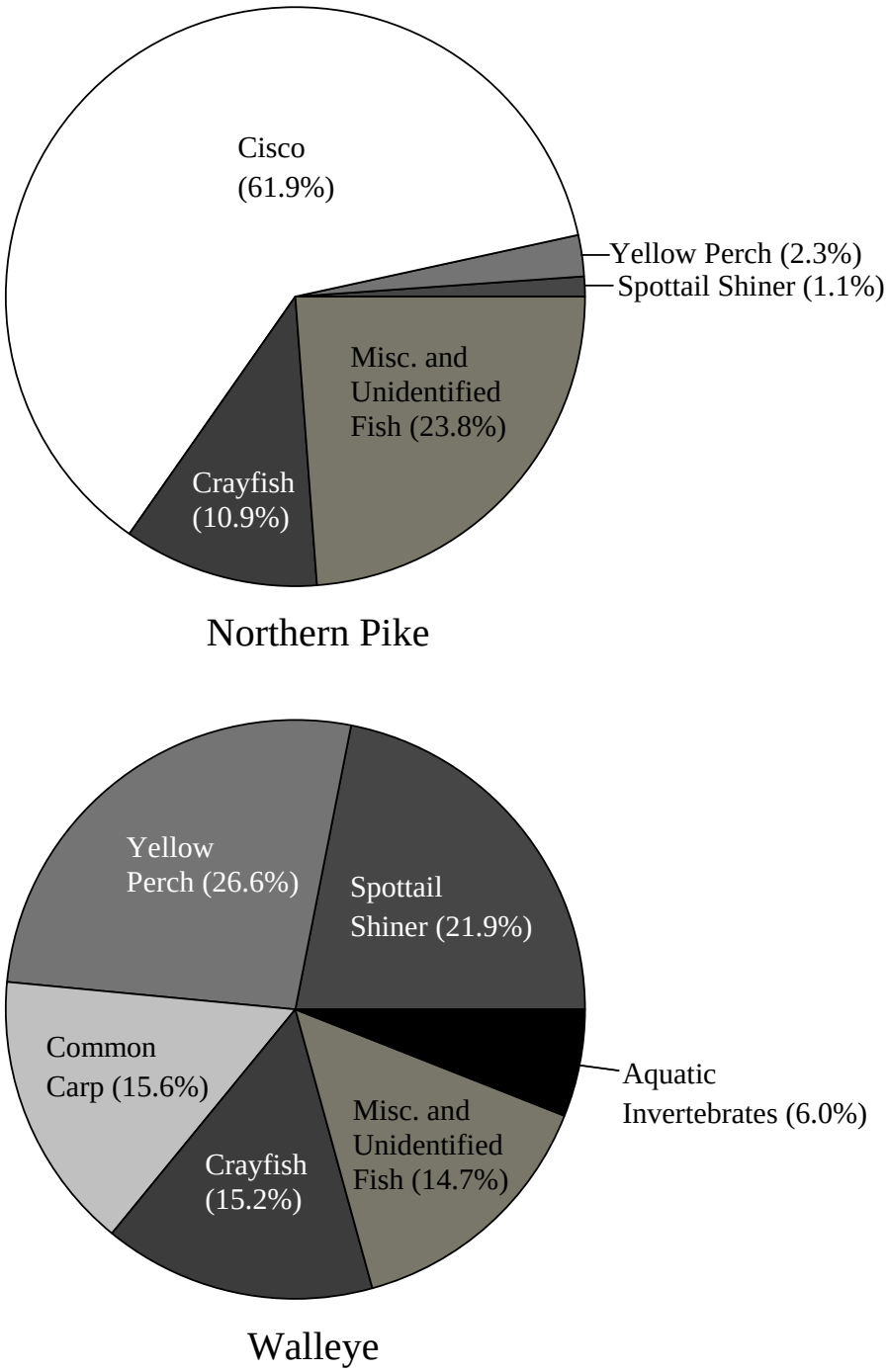


Figure 11. Percent biomass of prey items consumed by northern pike and walleye sampled in Tiber Reservoir, Montana, during 2001.

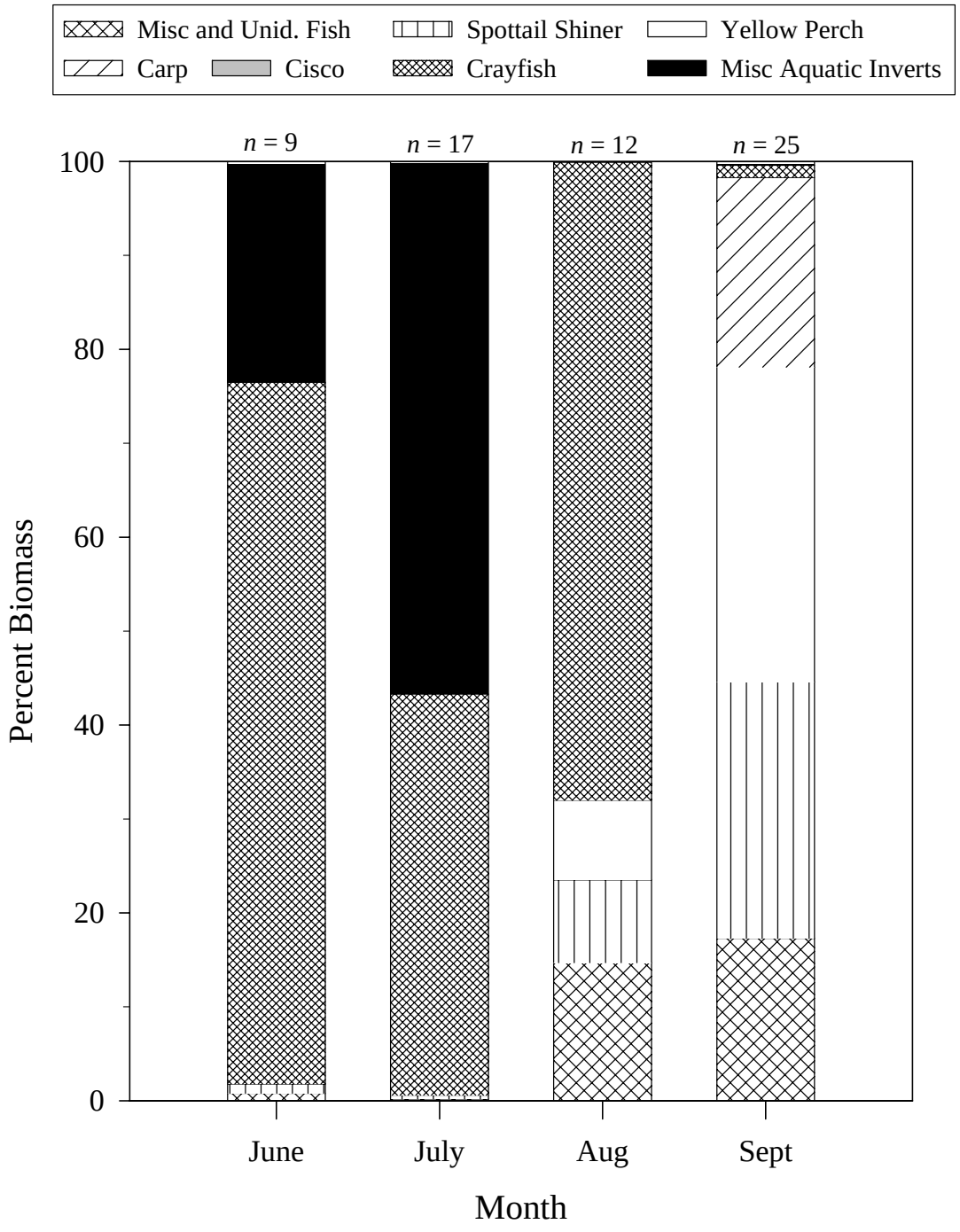


Figure 12. Monthly analysis of prey items (percent biomass) consumed by walleye in Tiber Reservoir, Montana, during 2001. Number of stomachs examined is denoted by "*n*".

73.7 F on 13 August 2001 (Appendix D). Water temperatures recorded at the bottom (approximately 120 feet) of the reservoir never exceeded 53 F. A week thermocline first developed during June 2001 at about 22 m, but became more pronounced during August and September. Dissolved oxygen (DO) levels remained adequate throughout the water column during all months. Surface and bottom DO levels ranged from 5.9- to 9.8 ppm and 5.6- to 11.1 ppm, respectively. Specific conductivity varied little during the year or within the water column, ranging from 533.5- to 561.8 µS/cm (Appendix D). Depth of photic zone penetration was least in spring and greatest in late summer / early fall (Appendix E). The greatest secchi disk depth measured was 19.5 feet on 13 August 2001. Analyses of zooplankton samples will be presented in a future report.

Choteau Management Area 2002

Bynum Reservoir

Winter Aeration Efforts – Low water conditions again threatened survival of Bynum's fishery during the 2001-02 winter. Three windmills were installed on 28 September 2001 near the dam face to provide aeration. Maximum depth of the reservoir was about 6.5 feet. Dissolved oxygen (DO) levels were monitored periodically throughout the winter. DO levels typically exceeded 6 ppm, but dropped briefly to 3 ppm during the second week of March. The highest DO level recorded was 14 ppm on 20 February 2002.

Population Monitoring – Two 1.0-inch mesh trap nets were fish overnight on 4 June 2002 to assess overwinter survival of Bynum's fishery. Only white suckers were sampled in the traps; no walleye or yellow perch were captured. Catch rate of white suckers averaged 202.0 per trap net night, which was similar to CPUE rates observed in trapping efforts in 2001, but much lower than historical data (Hill et al. 2001).

Four experimental-mesh sinking gill nets were fished overnight on 18 June 2002 to further evaluate Bynum's fishery. Gill net catches indicated there was overwinter survival of walleye and yellow perch. However, walleye catch rates were much reduced from historic trends, averaging 1.0 walleye per net. Yellow perch catch rates were higher than recent trends, averaging 14.0 perch per net. CPUE of white suckers was greatly reduced, averaging just 14.3 per net compared to 40 to 60 white suckers captured per net in the late 1990s. Relative body condition of these species was excellent; mean W_r exceeded 100 for all three species (Table 3).

Water elevation was sufficient in Bynum to complete standardized forage fish surveys during 2002. This is the first year seining was completed since 1998. Eleven seine hauls were completed on 19 August 2002. Seine catches indicated excellent yellow perch production occurred in 2002; CPUE averaged 66.4 age-0 yellow perch per seine haul. Catch of spottails shiners averaged 6.7 per seine haul, which is comparable to historic data (Figure 13). Three age-0 walleye were sampled, a result of either natural reproduction or from the 30,000 fingerlings stocked during 2002. This is the first year

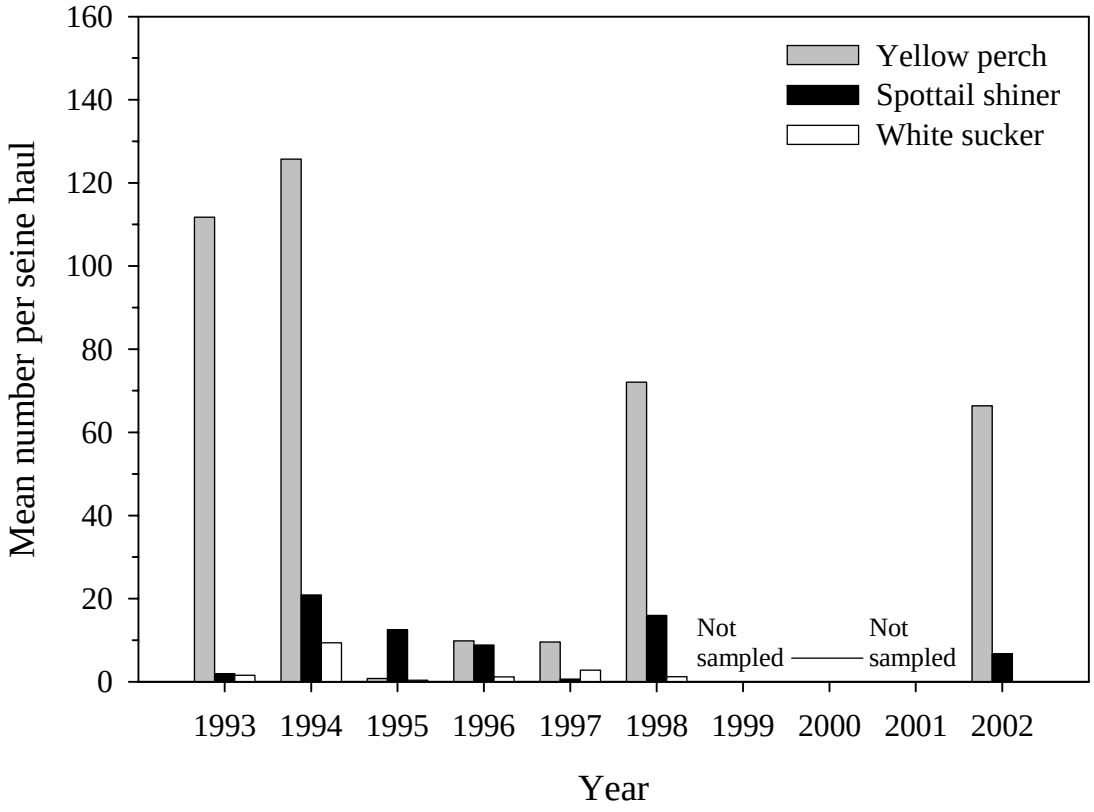


Figure 13. Mean number of forage fish sampled in beach seine hauls in Bynum Reservoir, Montana, 1993 - 2002.

walleye were stocked into Bynum since 1992. No juvenile white suckers were sampled in the seine hauls. Standardized fall gill netting was completed in Bynum on 25 September 2002. This netting was last completed in 1999. CPUE of walleye was about one-tenth historic levels, but similar to the catch rate observed in the June netting. Net catches of yellow perch were similar to historic data but much reduced from what was observed in the June nets. CPUE of white suckers was down considerably from pre-drought levels in the mid to late 1990s. Netting indicated relative abundances of walleye and white suckers are lower than pre-drought levels, but yellow perch numbers are similar. Mean W_r for walleye, yellow perch, and white suckers exceeded 100, indicating these species were in excellent condition (Figure 14).

Lake Frances

Population Monitoring – Trap net sampling was not conducted on Lake Frances during spring 2002. Although it did not appear that Lake Frances would receive substantial

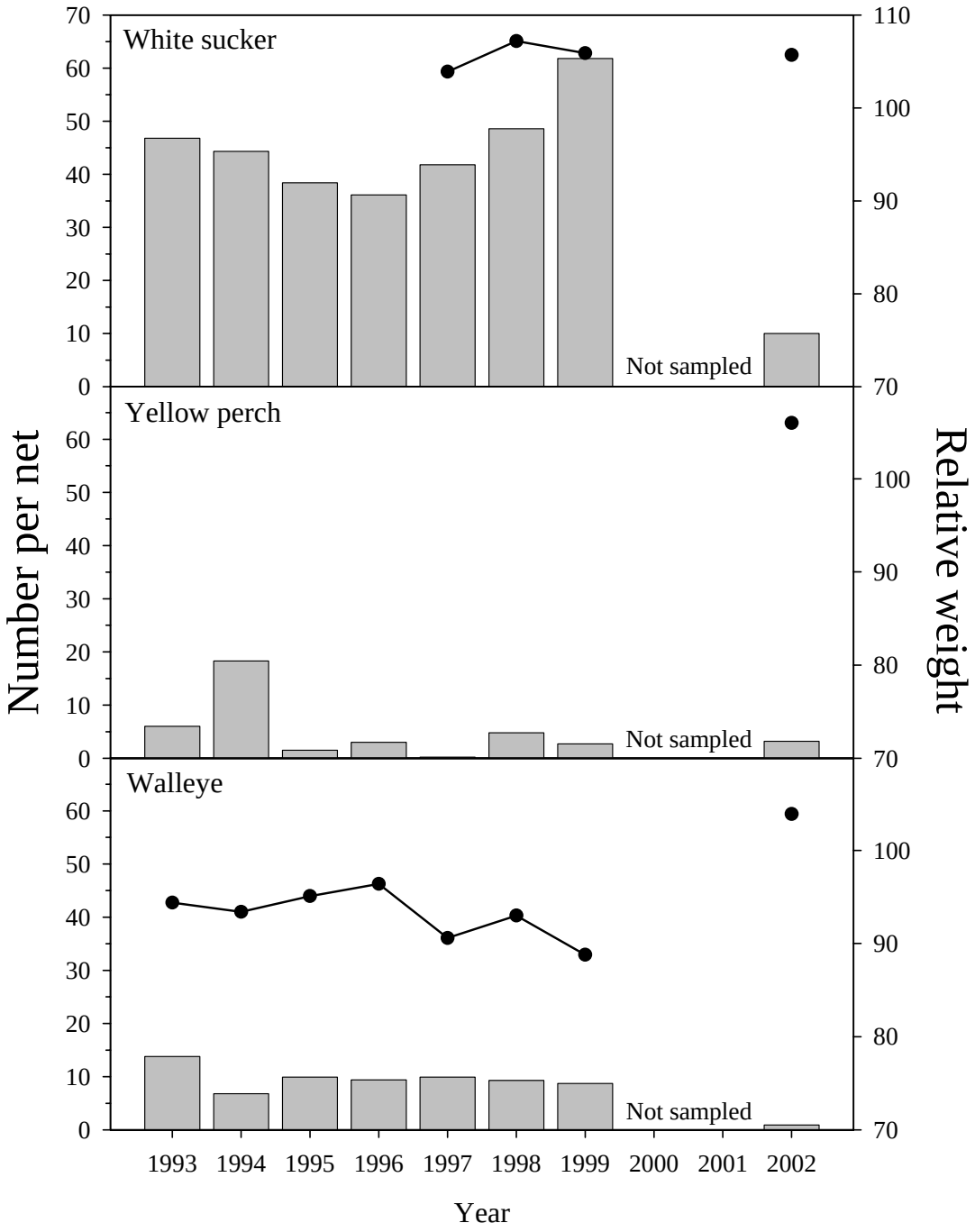


Figure 14. Relative abundance (bar) and relative weight (line) trends of walleye, yellow perch, and white suckers sampled in standardized gill netting series in Bynum Reservoir, Montana, 1993 - 2002.

inflow because of a light snowpack, an intense spring snowstorm in early June resulted in excessive runoff that quickly filled the reservoir to full pool. Standardized forage fish surveys were completed in Lake Frances on 20 August 2002. Yellow perch production was excellent, likely as a result of improved water conditions in the reservoir. Although the reservoir did not fill early enough to flood vegetation for perch to use as spawning substrate, the abundant flooded vegetation available throughout the summer provided optimal rearing and hiding cover for yellow perch, spottail shiners, and other forage fishes. CPUE (mean catch per seine haul) of yellow perch was 121.7 per seine haul, a ten-fold increase over 2001 seine catches (Figure 1). However, spottail shiners were not as abundant, averaging just 26.1 per seine haul. Juvenile walleye, northern pike, and white sucker were also sampled in the seine hauls. The juvenile walleye either resulted from natural reproduction or the stocking of 100,000 fingerlings that occurred in July 2002.

Standardized fall gill netting surveys were completed on Lake Frances on 18 and 19 September 2002. Sixteen experimental-mesh sinking gill net sets were deployed during the two-day sampling period. Although Lake Frances had very low water conditions the past two years, the walleye net catch was the highest observed since the late 1980s, averaging 9.4 walleye per net. CPUE of yellow perch increased substantially from 2001 levels to 14.7 perch per net. Northern pike catch rates were stable relative to historic trends (Figure 2).

Relative condition of walleye and northern pike sampled in the fall netting demonstrated a sharp increase in 2002. Mean W_r of walleye increased from 86.7 in 2001 to 104.5 during 2002, an increase of 17.8. Similarly, mean W_r of northern pike increased 13.1 from 93.1 to 106.2 between 2001 and 2002 (Table 3). These increases are likely attributable to Lake Frances' robust yellow perch population, which both walleye and pike readily prey upon. Both juvenile and adult yellow perch were very abundant in 2002 monitoring efforts. Mean W_r of yellow perch also exceeded 100, averaging 105.9. The relatively high CPUE rates observed in the fall gill nets and high W_r values of the different fishes were evidence of the high productivity of Lake Frances.

Creel Census – A summer creel census was not completed on Lake Frances during 2002 because of budgetary constraints.

Pishkun Reservoir

Population Monitoring – Abundances of forage fishes were surveyed in Pishkun on 21 August 2002. This standardized beach seine sampling was last completed in 1999. Relative abundances of yellow perch and white suckers were similar, averaging 12.9 and 11.1 per seine haul, respectively. Few spottail shiners were sampled in seine hauls, which is comparable to historic trends (Figure 15). Fall gill netting was completed at Pishkun on 27 September 2002 to monitor the reservoir's fisheries. Five sinking and

Table 3. Trap net and gill net results for warm and coolwater reservoirs sampled in the Choteau area during 2002. 'NA' denotes data not available.

			Catch Statistics			*Fish Statistics*					
Water body	Net type	Water				Total length (in)		Weight (lbs)		Wr (%)	
(date)	(*n* of sets)	temp (F)	Species	*n*	*n*/net	mean	(range)	mean	(range)	mean	(range)
Bynum Res. (4 June)	Trap (1.0 in) (2)	55	White[a] sucker	404	202.0	15.3	(10.8-17.6)	1.81	(0.60-2.87)	112.5	(84.3-130.3)
Bynum Res. (18 June)	Sinking gill (4)	NA	Walleye	4	1.0	13.9	(11.2-18.4)	1.14	(0.58-2.42)	103.2	(95.9-117.2)
			Yellow perch	56	14.0	5.6	(4.7-11.2)	0.11	(0.03-0.80)	102.7	(44.0-191.5)
			White[a] sucker	105	26.3	14.3	(10.7-18.3)	1.36	(0.53-2.46)	101.7	(82.4-132.3)
Bynum Res. (25 Sept.)	Sinking gill (10)	52	Walleye	9	0.9	17.1	(12.3-20.0)	2.09	(0.66-3.15)	103.9	(99.0-116.0)
			Yellow perch	32	3.2	6.4	(5.0-9.6)	0.14	(0.06-0.44)	106.0	(82.9-141.7)
			White sucker	100	10.0	15.5	(12.7-19.0)	1.77	(1.06-3.21)	105.7	(90.9-132.2)
Lake Frances (18, 19 Sept.)	Sinking gill (16)	62, 58	Walleye	151	9.4	15.0	(6.4-23.0)	1.58	(0.08-5.15)	102.5	(80.3-126.1)
			Yellow perch	235	14.7	6.4	(4.5-11.9)	0.16	(0.03-0.96)	105.8	(49.9-174.3)
			Northern pike	60	3.8	20.0	(13.8-27.8)	2.08	(0.68-5.00)	105.0	(87.5-124.9)
			White sucker	7	0.4	8.6	(6.4-11.5)	0.32	(0.12-0.66)	100.8	(94.1-110.2)

Table 3. Continued.

Water body (date)	Net type (*n* of sets)	Water temp (F)	Species	*Catch Statistics* *n*	*n*/net	*Fish Statistics* Total length (in) mean	(range)	Weight (lbs) mean	(range)	Wr (%) mean	(range)
Tiber Res.	Sinking gill	63-69	Walleye	63	2.2	13.4	(8.0-17.1)	0.84	(0.17-1.69)	91.3	(80.0-109.5)
(4-6 Sept.)	(29)		Yellow perch	251	8.7	6.2	(5.1-11.0)	0.12	(0.05-0.70)	99.4	(65.1-149.6)
			Northern pike	29	1.0	19.1	(10.6-32.5)	2.01	(0.34-8.80)	103.2	(76.2-127.0)
			White sucker	84	2.9	12.9	(6.3-19.0)	1.29	(0.10-2.90)	100.4	(81.6-132.0)
			Longnose* sucker	5	0.2	14.8	(7.4-17.8)	1.56	(0.17-2.35)	NA	
			Common carp	7	0.2	26.6	(25.3-28.2)	8.73	(7.00-11.10)	93.8	(83.6-101.1)
			Rainbow trout	2	0.1	16.3	(13.8-18.7)	1.65	(1.08-2.22)	87.2	(79.0-95.3)
			Flathead* chub	1	<0.1	6.1		0.09		NA	
			Mountain whitefish	1	<0.1	16.2		1.40		89.5	
			Cisco*	267	9.2	12.9	(9.5-15.4)	0.87	(0.34-1.18)	NA	

* W_r equations not available.

[a] Fish statistics represent subsample of total catch.

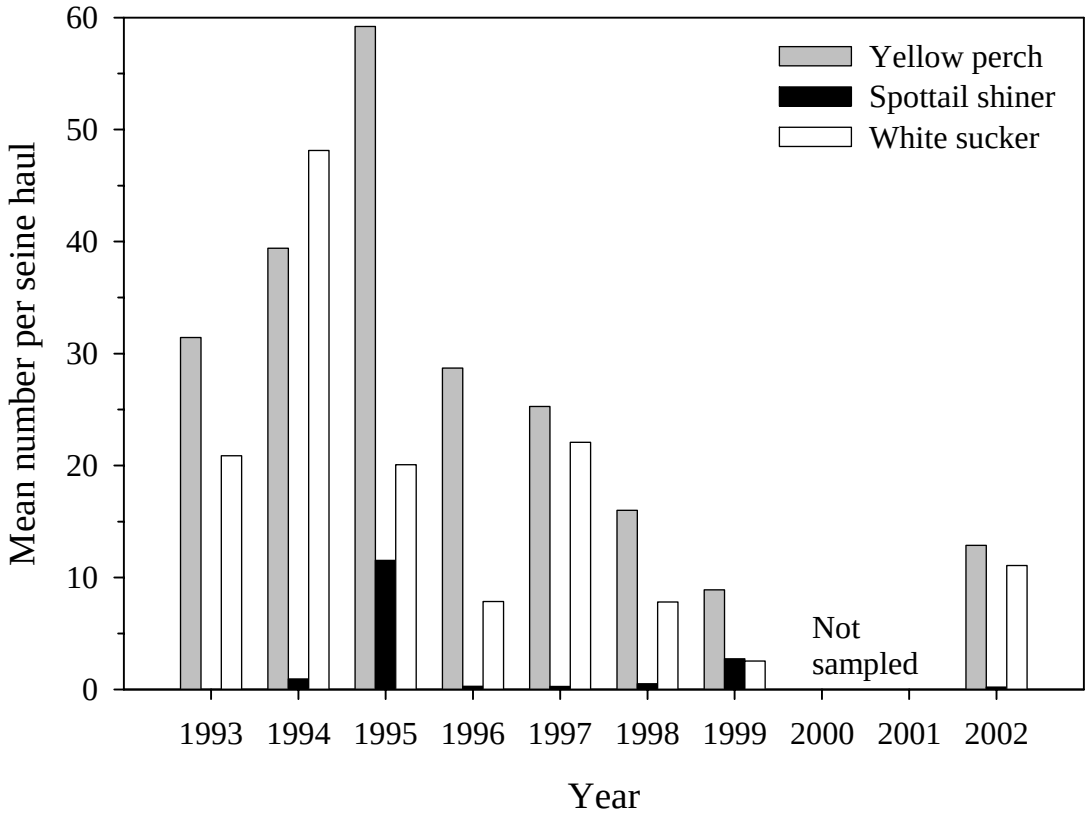


Figure 15. Mean number of forage fish sampled in beach seine hauls in Pishkun Reservoir, Montana, 1993 - 2002.

three floating style gill nets were deployed overnight at standardized sites. Results from this netting are presented in Tews et al. (2003)

Tiber Reservoir

Population Monitoring – Trap net sampling was not completed on Tiber during spring 2002. Standardized forage fish surveys were completed 26-29 August 2002. A total of 70 seine hauls were completed at standardized sites. Production of spottail shiners was excellent during 2002, averaging 120.2 per seine haul. This CPUE was similar to catch rates observed during the 1994-1998 period (Figure 3). Common carp was the second most abundant forage fish sampled in the seine hauls. Seine catches of age-0 carp averaged 22.3 per haul. This is the highest CPUE of carp minnows observed in the past 10 years. Tiber Reservoir, similar to Lake Frances, benefited from an intense spring storm. Very high inflows from the Marias River filled the reservoir quickly in early June. Carp production likely increased because of the availability of flooded vegetation for

spawning during June. This vegetation was not flooded in late April / early May when yellow perch spawn, and subsequently perch production was limited during 2002 (Figure 3). There was an increase in the number of emerald shiners sampled in the seine hauls during 2002, although this may be related to the CPUE observed during 2001 because no distinction is made between adult and juvenile shiners when enumerating seine catches. Similar to historic data, production of white suckers was limited during 2002. Other species sampled in the seine hauls included walleye, northern pike, lake chub, flathead chub, longnose dace, mottled sculpin, cisco, and brook stickleback *Culaea inconstans*.

Fall gill net surveys were completed on Tiber from 4-6 September 2002. Experimental-mesh sinking style gill nets were fished overnight at 29 standardized locations throughout the reservoir. Surface water temperature ranged from 63- to 69 F during the sampling period. Net catch rates of walleye and northern pike remained consistent with recent trends, averaging 2.2 and 1.0 per net, respectively (Table 3; Figure 4). Yellow perch numbers increased substantially in 2002 to 8.7 per net. Similar to 2001, cisco dominated the net catches; 267 cisco were sampled resulting in a CPUE of 9.2 per net. Cisco were most abundant in the upper reservoir near Devon. Mean TL of cisco sampled was unchanged from 2001. Size and condition of Tiber's walleye population improved in 2002. Mean TL increased nearly an inch to 13.4 inches and mean W_r improved from 82.5 in 2001 to 91.3 in 2002 (Figure 4). Similar improvements were measured in the northern pike population; mean W_r increased from 96.1 in 2001 to 103.2 in 2002 (Table 2). These increases in walleye and northern pike W_r were similar to those measured in 1997, the year cisco were first introduced into Tiber. A very strong year class of cisco was produced in Tiber during 2002 (see *Cisco Population Monitoring* section), which likely contributed to the W_r increases seen in Tiber's walleye and northern pike populations. White sucker, longnose sucker, common carp, rainbow trout, flathead chub, and mountain whitefish *Prosopium williamsoni* were also sampled in the fall netting efforts.

Creel Census – A weekend creel census was completed on Tiber Reservoir from Labor Day through Memorial Day during 2002. Results from this census will be summarized in a future report (Yerk, in preparation).

Cisco Population Monitoring – Vertical gill nets were set monthly at the Bootlegger Sampling Station from May through November. Total catches of cisco were relatively low in May and June, but increased in July when yearlings first appeared in the nets. Net catches increased dramatically in August and then September when age-0 cisco were first captured in the 0.75-inch mesh net (Figure 16). Age-0 cisco were fully recruited into the 0.75-inch mesh net during September when they averaged 4.8 inches TL (SD=0.21). Juvenile cisco continued to dominate net catches in October and November (Figure 16). This is the first significant natural cisco reproduction to occur in Tiber since their introduction into the reservoir in 1997 and 1998.

In addition to the Bootlegger Station sampling, vertical gill nets were again set at the Willow Creek Arm and Tiber Dam sampling stations during September to complement hydroacoustic surveys. Combined catches at all three stations indicated the relative

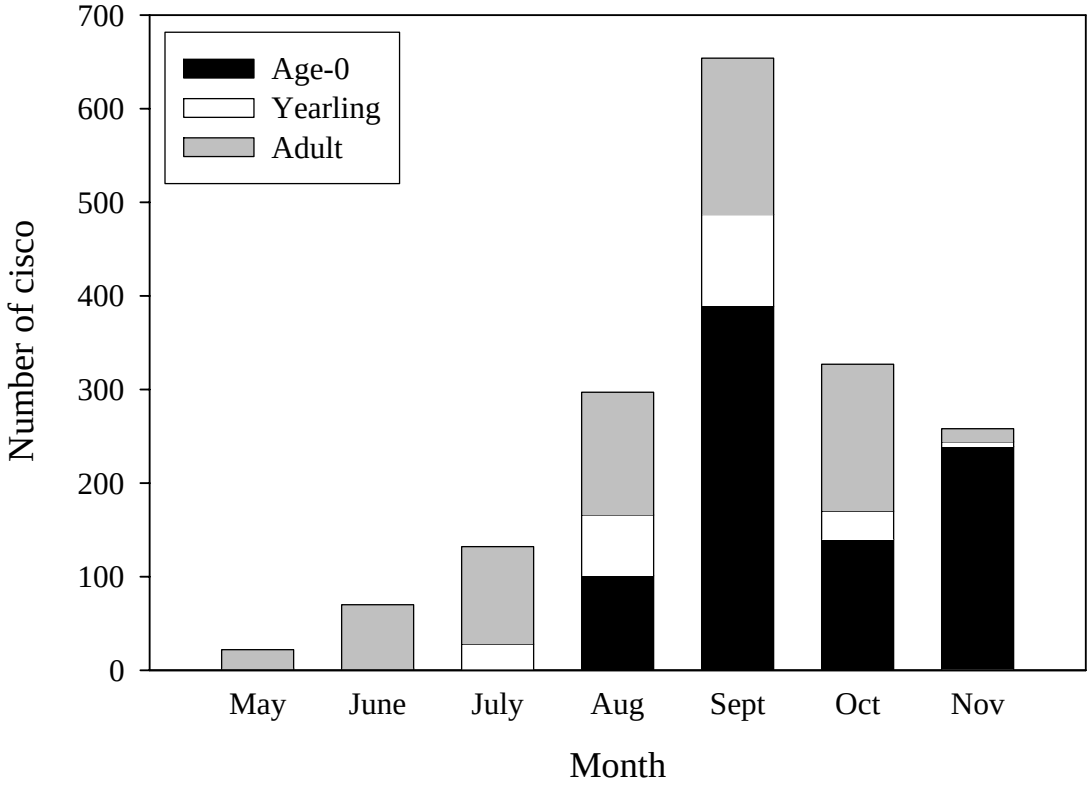


Figure 16. Classification of monthly vertical net catches of cisco at Bootlegger Sampling Station in Tiber Reservoir, Montana, during 2002.

strength of the 2002 cisco year class. In 1997, 68 age-0 cisco were sampled in September vertical nets following the stocking of 4.2 million cisco that year. During 2002, a total of 600 age-0 cisco (54% of total catch) were captured in these same nets, a ten-fold increase relative to 1997 (Figure 6).

The environmental variables that led to the excellent cisco production in 2002 are not easily discerned. Production of strong year classes of cisco in Fort Peck Reservoir, Montana, have been related to early ice-up, which provides protection to deposited eggs from wave action (Mike Ruggles, MT Fish, Wildlife & Parks, personal communication). Ice-up on Tiber Reservoir occurred on 30 December 2001, which was similar to other years since cisco were first introduced in 1997 (Dave Allen, U. S. Bureau of Reclamation, personal communication). Winter drawdown of the reservoir can also negatively affect cisco reproduction by dewatering deposited eggs. Zollweg and Leathe (2000) recommended that Tiber should not be drawn down more than two feet during winter months to maximize cisco production. Reservoir drawdown during the 2001-02 winter was 2.2 feet from 1 December to 1 April, which was the least during 1997 – 2002, and considerably less than the mean drawdown for that time period of 3.6 feet (USBOR 2004). Additionally, it is unclear what affect the intense June storm may have had on

cisco production during 2002. Reservoir inflows from the Marias River peaked at 19,300 cfs on 11 June and the reservoir filled quickly (USGS 2004). This may have caused a productivity "surge" in the reservoir, which possibly also contributed to the cisco production observed in 2002.

Mean TL of the adult component of the cisco population continued to increase during 2002. Adult cisco averaged 12.9 inches TL (SD = 0.42) in the comprehensive vertical gill netting completed during September, an increase of 0.4 inches since 2001. This increase in growth is likely attributable to an aging population and not an increase in growth rates. Mean TL of age-0 and yearling cisco decreased slightly since 2001, averaging 4.8- and 9.9 inches, respectively (Figure 7). Because these two age classes accounted for about 75% of the cisco population (based on September netting trends), this may be evidence of a density dependent decline in growth rates.

Hydroacoustic surveys — The 2002 hydroacoustic survey was conducted between 2034 hours on 09 September and 0322 hours on 10 September over the same transects as during 2001. Tiber Reservoir forebay elevation during the 2002 survey was 2988.8 feet msl. The 2002 Tiber cisco estimate was 2.67 million (9.25 million fish * 29% between 4- and 14 inches * 99.5% cisco in verticals). This compares to previous years estimates of 1.60 million in 2000, 743,000 in 1999, 2.31 million in 1998, and 166,000 in 1997 (Table 2). The 2002 age-0 cisco (4-7 inches) estimate was 1.98 million, which is the highest level measured since acoustic surveys were initiated in 1996. Abundance of yearling and adult cisco (7–14 inches) was estimated at 690,000. The 2002 pelagic (water depths greater than 21 meters) estimate for cisco was 1.1 million (3.8 million pelagic targets * 29% greater than 4 inches* 99.5% cisco in verticals) (Table 2). In 2002, fish densities were highest in the hypolimnion (water deeper than 21 meters; Figure 17). Targets counted from 21- to 41 meters of water represented 61% of the total with the majority of these fish occupying the depth zone from 21- to 36 meters. Proportion of targets in the mesolimnion (16 -21m) represented 25% of targets. Near surface targets (1-6m) accounted for 13% of targets (Figure 17).

Target densities in 2002 were highest in the lower and upper Marias Arm. Transects 5, 8, 11 and 18 recorded the highest densities while the near dam transects 1, 2 and 3 recorded the lowest (Figure 18). Densities of age-0 and adult cisco were similar in most transects. The transect nearest Tiber Dam (T1) had the highest proportion of age-0 and adult cisco, but conversely the smallest proportion of targets less than 4 inches in length (Figure 19).

Length frequency of targets between 4- and 14 inches indicated a mean length of 6.0 inches in 2002 (Figure 20). Interestingly, 44% of these fish were between 4- and 5 inches in length, which would encompass the majority of age-0 cisco measured in vertical net (Figure 7). This is a notable shift from 2000 and 2001 acoustic sampling when the length/age structure appeared to be more diverse. Average length of targets between 4- and 14 inches was 8.5 inches in 2000 and 6.4 inches in 2001.

A total of 9.3 million targets were enumerated in 2002 with 71% (6.6 million) of these being smaller than four inches. These targets have been identified as non-cisco based on

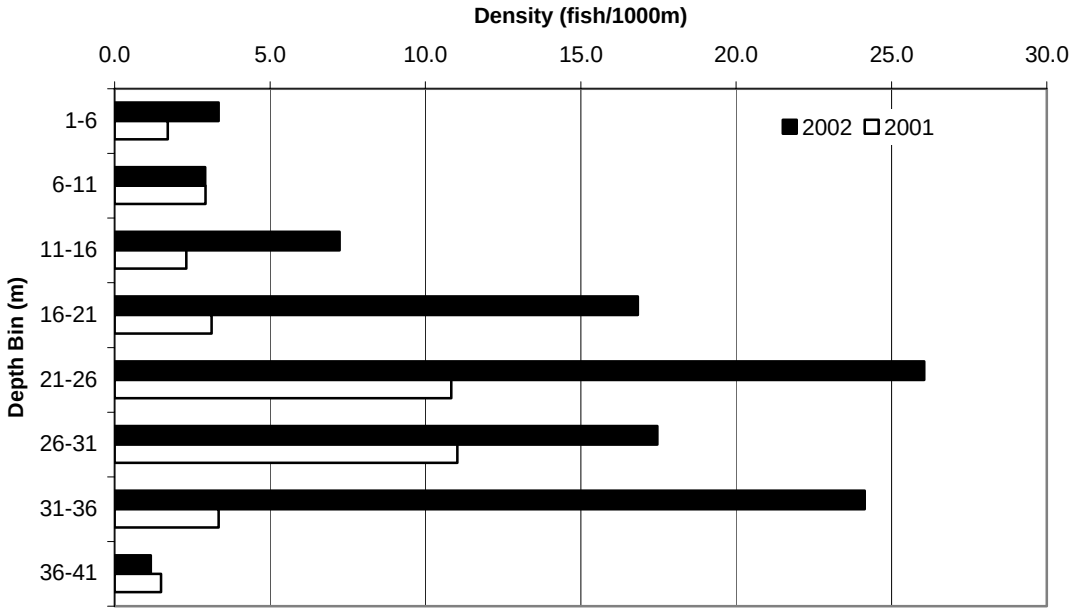


Figure 17. Acoustic target (all targets) densities (fish/1,000m^3) by depth across all transects in Tiber Reservoir - September 2001 and 2002.

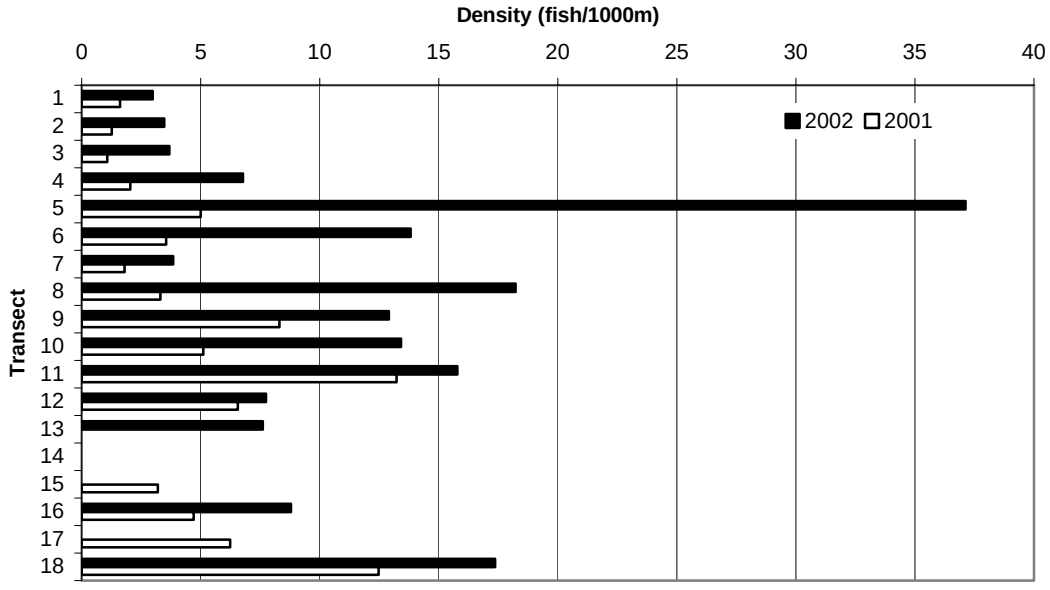


Figure 18. Acoustic target (all targets) density estimates (fish/1000m^3) by transect in Tiber Reservoir – September 2001 and 2002. Some transects were excluded due to problems with volumetric expansion, tree interference or loss of bottom tracking.

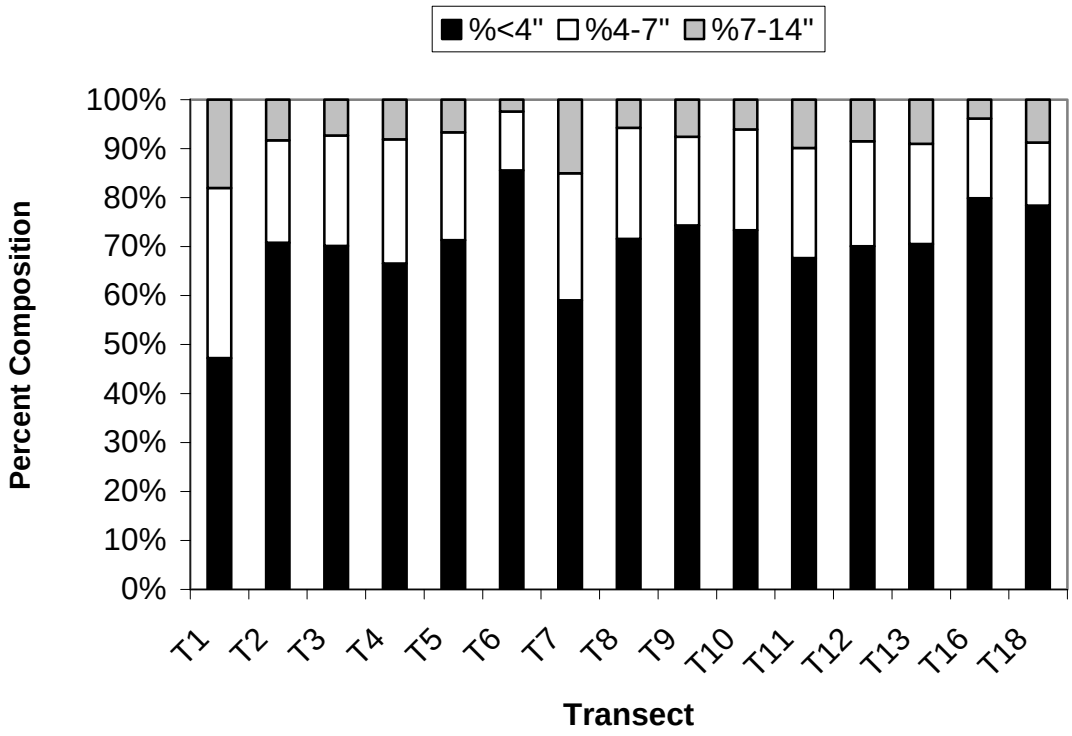


Figure 19. Percent composition by size of acoustic targets across transects in Tiber Reservoir, 2002. Some transects were excluded due to problems with volumetric expansion, tree interference or loss of bottom tracking.

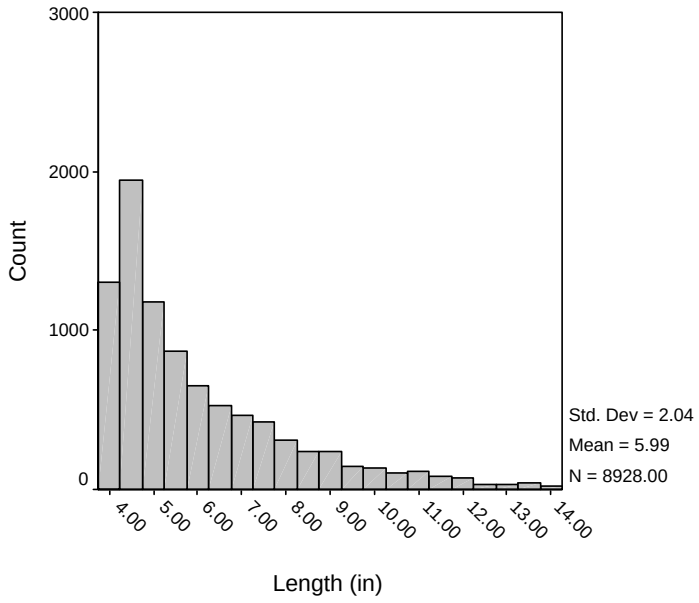


Figure 20. Length frequency of acoustic targets between 4- and 14 inches across all transects in Tiber Reservoir, September 2002.

vertical gill netting results (Figure 7). Sub-four inch targets counted in acoustic estimates since 1997 have ranged from a low of 27% in 1998 to a high of 86% in 1997 (mean=62%). Traditional sampling (vertical and horizontal gill nets and trawling) has yet to identify what these sub-four inch targets are and as a result there is some doubt as to their legitimacy. These targets could be comprised of a mix of the various species in Tiber whether as larval or adults.

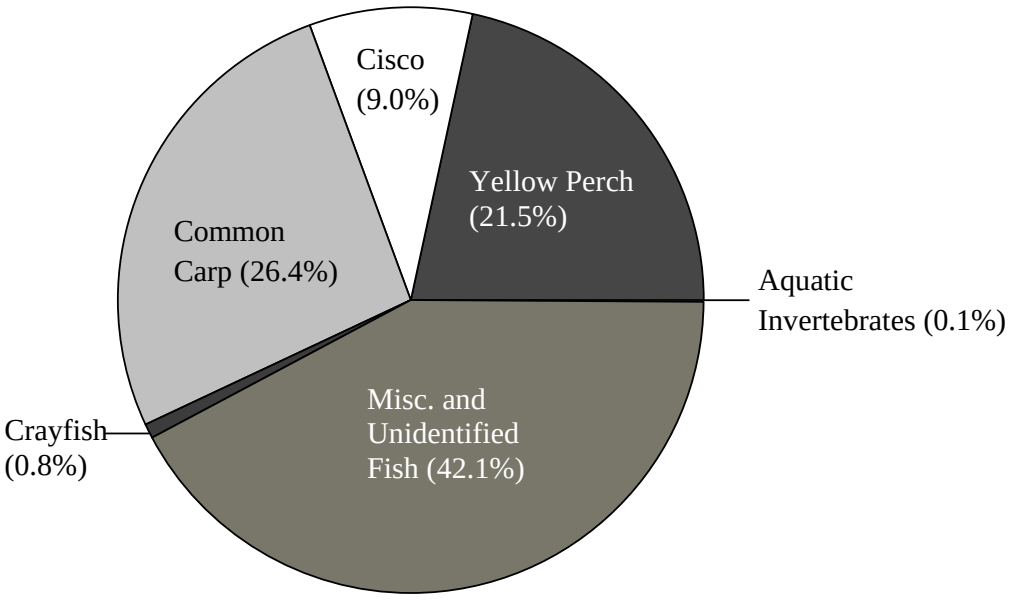
Northern Pike Food Habits – A total of 23 northern pike stomachs were examined in 2002. All of the stomachs except for one were sampled during fall gill net surveys; the other stomach was collected from an angler-caught pike during the summer creel survey. Of the 29 pike collected in the fall gill nets, 22 (76%) had food items in their stomachs. Sampled northern pike ranged in size from 10.6- to 30.7 inches TL, and averaged 18.9 inches TL.

Northern pike fed almost exclusively on other fish (Figure 21). Crayfish and Ephemeroptera nymphs accounted for less than one percent of the total biomass of northern pike prey items. Common carp, yellow perch, cisco, and miscellaneous and unidentified fish accounted for 99% of the biomass found in pike stomachs (Figure 21). The miscellaneous fish category included two walleye and two white suckers. No spottail shiners were identified in pike stomachs during 2002, and the importance of crayfish as a prey item was much reduced relative to 2001.

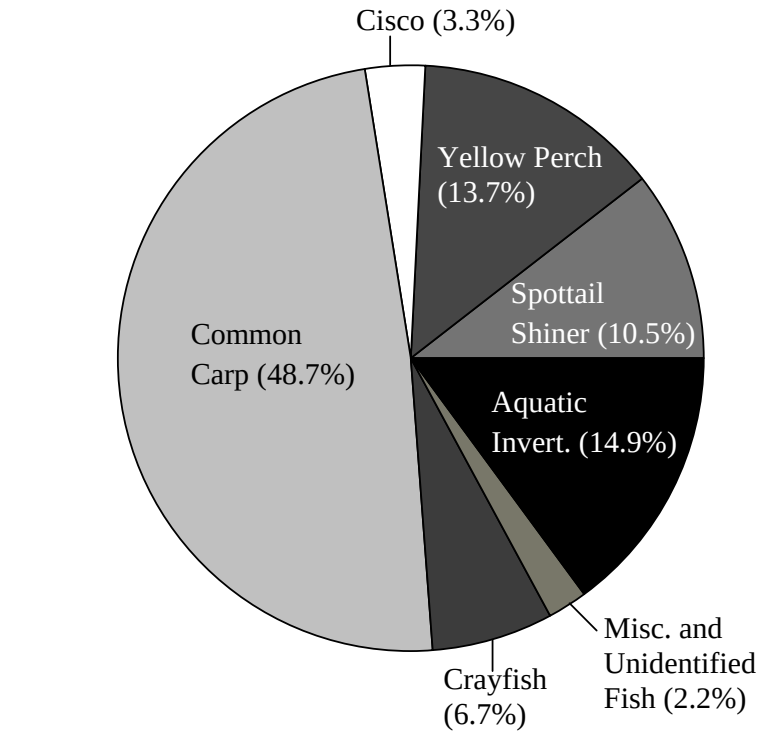
Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence and percent occurrence of all prey items found in northern pike stomachs during 2002 are presented in Appendix F. Common carp minnows were the most numerous prey items consumed with 17 individuals identified in eight stomachs, resulting in a 34.8% occurrence. No carp were identified in pike stomachs during 2001. Three yellow perch and two cisco were identified in the 2002 samples. Food habits were not compared among months because of small sample sizes.

Walleye Food Habits – Contents of 130 walleye stomachs were analyzed in 2002. Angler-caught walleye accounted for 81 (62%) of the stomachs examined; 49 (38%) were collected from walleye captured during fall gill net surveys. Only 12 (20%) of the 61 walleye captured in fall net surveys did not contain food items. Walleye collected for diet analysis ranged in length from 8.0- to 16.9 inches TL (mean = 13.3 inches TL).

Fish comprised 78.4% of the prey biomass in walleye diets during 2002 (Figure 21). This proportion is similar to 2001 data. Common carp was the principle prey species of walleye, accounting for nearly one-half of their total diet biomass. Yellow perch, spottail shiners, and cisco were also evident in walleye stomachs, accounting for 13.7%, 10.5%, and 3.3% of the prey biomass, respectively (Figure 21). This is the first year cisco were found in walleye stomachs since their introduction into Tiber Reservoir in 1997. Aquatic invertebrates continue to provide an important seasonal component to the diet of walleye, contributing



Northern Pike



Walleye

Figure 21. Percent biomass of prey items consumed by northern pike and walleye sampled in Tiber Reservoir, Montana, during 2002.

14.9% of their total diet biomass. Relatively fewer crayfish were consumed by walleye during 2002 compared to 2001. Miscellaneous fish consumed by walleye included three sucker spp. and a single brook stickleback.

Seasonal diet of walleye during 2002 followed a pattern similar to 2001. Aquatic invertebrates were a major component of their diet during June and July (82.6% and 47.6%, respectively), but a sharp transition to fish species occurred during August and September (Figure 22). Diet biomass of fish species increased from 46.5% during July to 90.3% and 94.0% during August and September, respectively. The strong production of common carp in Tiber during 2002 was evidenced by their dominance in walleye stomachs during August and September. Juvenile cisco were only observed in walleye stomachs during September.

Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence and percent occurrence of all prey items found in walleye stomachs during 2002 are presented in Appendix G. Ephemeroptera (*Hexagenia* sp.) nymphs were the most numerous prey item; 509 individual nymphs were identified in 57.7% of walleye stomachs. Dipterans (midge pupae/larvae) were the second most numerous prey item (n = 118), but only occurred in 21.5% of stomachs. Of fish species, common carp was the most abundant prey of walleye; 88 individuals were identified in 28.5% of walleye stomachs. Spottails shiners and yellow perch were also found in several walleye stomachs.

Water Quality and Zooplankton Monitoring – Surface water temperature at the Tiber Dam sampling station ranged from a low of 44.3 F on 8 November 2002 to a high of 74.3 F on 26 June 2002 (Appendix H). This high surface temperature resulted from intense surface heating and did not extend into the water column. Water temperatures recorded at the bottom (115- to 141 feet) of the reservoir never exceeded 51.9 F. A strong thermocline developed by 26 July 2002, but was already weakened by 22 August 2002. Dissolved oxygen (DO) levels remained adequate throughout the water column except an anoxic zone developed near the bottom of the reservoir in October (Appendix H). Surface and bottom DO levels ranged from 8.02- to 11.37 ppm and 3.3- to 11.17 ppm, respectively. Specific conductivity dropped slightly during July and August, probably as a result of high inflows that occurred during June from an intense storm. However, SpC levels varied little during the year or within the water column, ranging from 488.0- to 563.0 µS/cm (Appendix H). Depth of photic zone penetration was least in spring, peaked during summer, and then decreased again in the fall (Appendix E). The greatest secchi disk depth measured was 16.0 feet on 11 September 2002. Analyses of zooplankton samples will be presented in a future report.

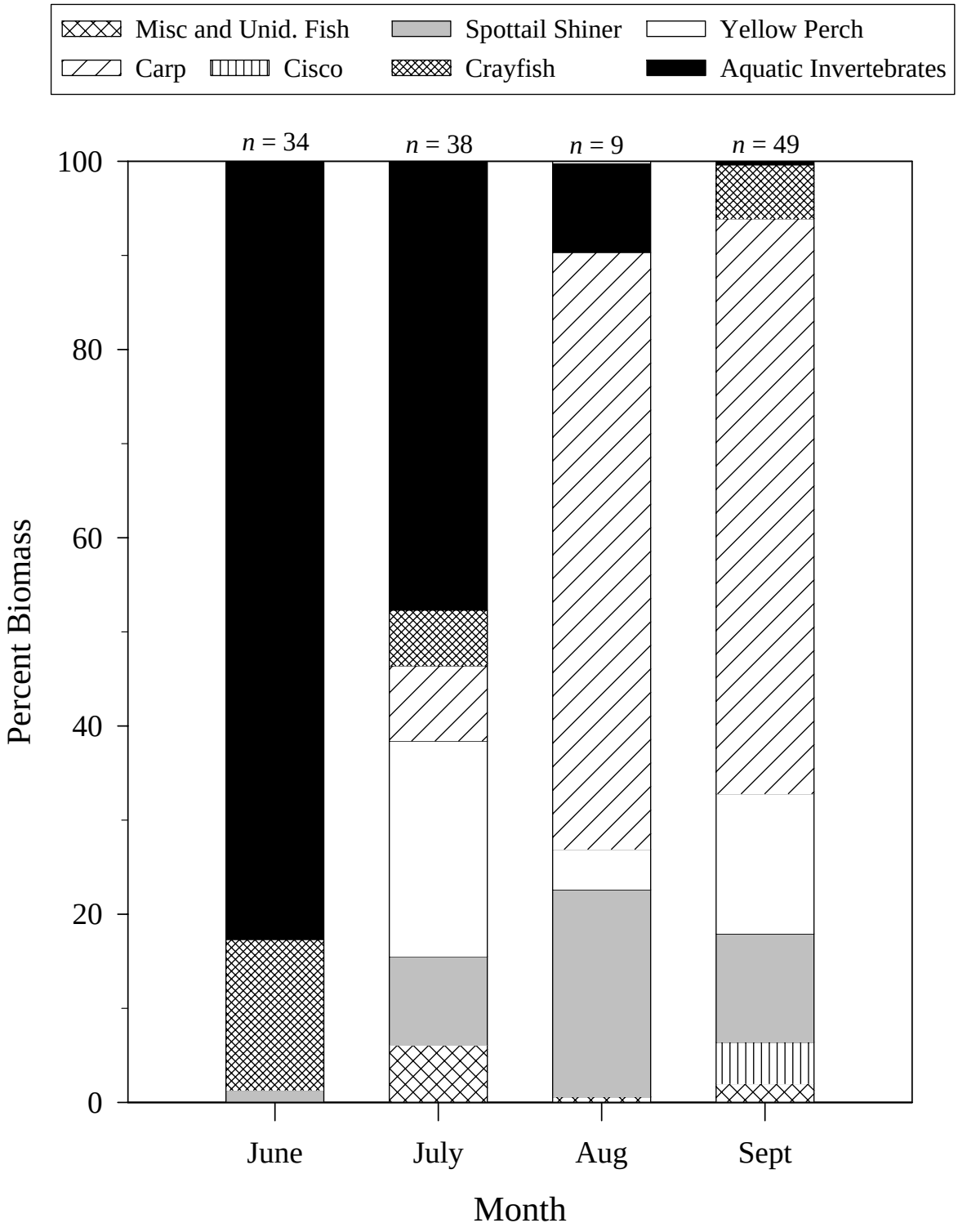


Figure 22. Monthly analysis of prey items (percent biomass) consumed by walleye in Tiber Reservoir, Montana, during 2002. The number of stomachs examined is denoted by "*n*".

Lewistown Management Area 2001

Drought during 2000 - 2001 has caused low water levels and impacted most warmwater fisheries in the Lewistown area. The exception is East Fork Reservoir, which has maintained suitable water levels.

East Fork Reservoir –Traps were set the first week in May, immediately after ice-off. During 20 trap nights, 247 northern pike, 362 white suckers and 61 yellow perch were captured (Table 4). Twenty-two northern pike, 19 white suckers and 2 yellow perch were recaptured. The Schnabel estimate (Van Den Avyle 1993) for northern pike was 1,090 fish with a 95% CI of 723 – 1,739 based on a Poisson distribution (Ricker 1975). The estimate for white suckers was 2,640 with confidence limits of 1,695 – 4,362. In 1998, the estimate for northern pike was 622 (347 – 1,266) and was 4,223 (3,519 – 5,279) for white suckers (Table 5). Fish size structure has changed dramatically in East Fork Reservoir since it was last trapped in 1998 (Hill et al 1999). Average northern pike weight decreased from 3.08 pounds in 1998 to 1.71 pounds in 2001 and white sucker weight increased from 1.28 to 2.04 pounds. Average size of trapped yellow perch increased from 0.33 to 0.56 pounds. Of the 247 northern pike trapped during 2001, one was 17 pounds but only six (2%) were larger than 3 pounds and just 30 (12%) were at least 2 pounds. In 1998, 32 of the 148 (25%) trapped northern pike exceeded 3 pounds and 39% were at least 2 pounds. Average TL of trapped northern pike decreased from 22.0 inches in 1998 to 19.6 inches in 2001 (Figure 23), while average white sucker and yellow perch total length increased by about one and two inches, respectively. Based on limited tag returns, the annual growth of northern pike has declined in recent years. Northern pike trapped in 1995 and recaptured in 1997 and 1998 grew over 3 inches annually compared with 0.7 inches per year for pike tagged in 1998 and recaptured in 2001 (Figure 24).

In gill nets, northern pike up to 2.19 pounds and yellow perch up to 1.37 pounds were captured in 2001 (Table 6). Northern pike numbers continue to remain relatively constant in gill nets, but numbers of white suckers have dropped slightly. Yellow perch numbers were at near record highs (Figure 25). Four gill net sets in a 100-acre reservoir do not appear sufficient to accurately indicate northern pike abundance since catch rates do not follow trapping trends. Fewer northern pike were gill netted in 2001 than in 1998. The 95% confidence intervals for estimates from trapping in 1998 and 2001 overlap, but it is very likely that the differences in point estimates (75% increase of northern pike and 40% decline of white suckers) indicate real changes. Northern pike total lengths have declined both for trapped and gill netted fish since the mid 1990's (Figure 23).

Several warning signs indicate that the northern pike fishery may be declining. Since 1998, average size and condition of northern pike have decreased. Prey fish numbers are down. In East Fork Reservoir, shoreline seining captured record low numbers of small yellow perch in 2001 (Table 7; Figure 26). Crayfish are abundant but W_r and size of northern pike have not responded favorably to their increased numbers in East Fork Reservoir. Crayfish numbers continue to explode when compared with past years (Hill et al. 2001). The number of crayfish per net increased more than 2 fold between 2000 and 2001 and increased from about 10 per gill net in 1998 to over 100 per net in 2001.

Petrolia Reservoir – This reservoir has had extremely low water levels in recent years. Gill netting found the highest numbers of walleye since 1996 (Figure 27). One 27-inch walleye

weighed over 7 pounds. Northern pike and yellow perch were found at the lowest levels since 1993. Northern pike were not sampled in 2001. Relative weight was good for both walleye and perch (Table 6). Gill nets captured the second highest number of carp in more than 10 years and age-0 carp were seined at record high numbers (Figure 28). Seine hauls from August 2001 (Table 7) indicate that the spottail shiners stocked from 1996 – 1998 are still present in Petrolia. Yellow perch numbers were the lowest recorded since seining began in 1994.

Table 4. Statistics from overnight trapping from East Fork Reservoir.

Water Name (Date surveyed)	*n* of trap nights	Species	*n*	Total length (in)			Weight (lb)			W_r
				Min	Max	Mean	Min	Max	Mean	Mean
East Fork Reservoir (5/1/01 – 5/4/01	20	Northern pike	247	11.5	41.0	19.6	0.35	17.1	1.71	87
		White sucker[1]	362	14.0	18.2	16.5	1.31	2.90	2.04	102
		Yellow perch	61	5.7	12.7	10.6	0.03	0.98	0.56	87

[1] subsample of lengths and weights taken.

Table 5. Summary statistics for several years of trapping information from East Fork Reservoir.

		Northern pike			White sucker		
Year	Trap nights	*n*	Estimate (range)[1]	Mean Total length (in)	*n*	Estimate (range)	Mean Total length (in)
1995	4	17	-	23.4	140		11.8
1997	12	81	-	22.1	679		13.8
1998	25	148	622 (347 – 1,266)	22.0	930	4,223 (3,519-5,279)	14.4
2001	20	247	1,090 (723-1,739)	19.6	362	2,640 (1,695-4,362)	15.7
2002	20	367	1,166 (917-1,602)	19.6	394	1,225 (1,123-1,348)	16.8

[1] (95% CI)

Table 6. Overnight gill netting results in the Lewistown area of northcentral MT in 2001.

Reservoir (Date) *n* of Nets	Mean hr/ net	Species	*n*	Total length (in) Min	Max	Mean	Weight (lbs) Min	Max	Mean	W_r Min	Max	Mean
East Fork Res. (9/13/01) 2 sinkers 2 floaters	22.2	Crayfish[1]	500									
		Northern pike	10	13.3	23.7	18.5	0.44	2.19	1.41	67	102	87
		White sucker	53	14.0	18.1	16.6	1.32	2.71	1.91	52	124	95
		Yellow perch	73	4.6	12.9	6.9	0.06	1.37	0.21	73	120	95
Dry Blood Reservoir (5/17/01) 1 sinker	19.0	No Fish										
Drag Reservoir (5/17/01) 1 sinker	19.9	Bluegill	4	4.1	5.6	4.8						
		Largemouth bass	1	10.2	10.2	10.2						
Petrolia Reservoir (9/11/01) 1 sinker 1 floater	24.2	Common carp	20	15.1	26.5	17.8	1.60	7.80	2.88	78	107	92
		Walleye	40	7.0	27.1	11.5	0.10	7.20	0.80	75	121	100
		White sucker	1	16.5	16.5	16.5	1.40	1.40	1.40	71	71	71
		Yellow perch	2	6.5	10.3	8.4	0.15	0.50	0.33	86	114	100

[1] estimate.

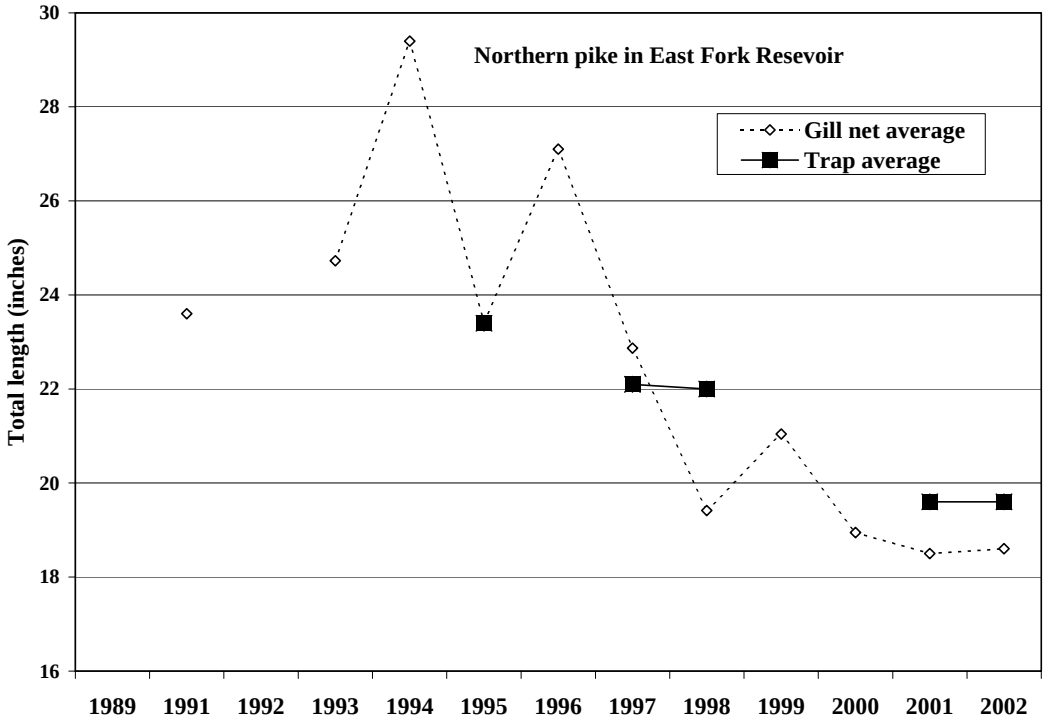


Figure 23. Average total length of northern pike captured by two methods in East Fork Reservoir.

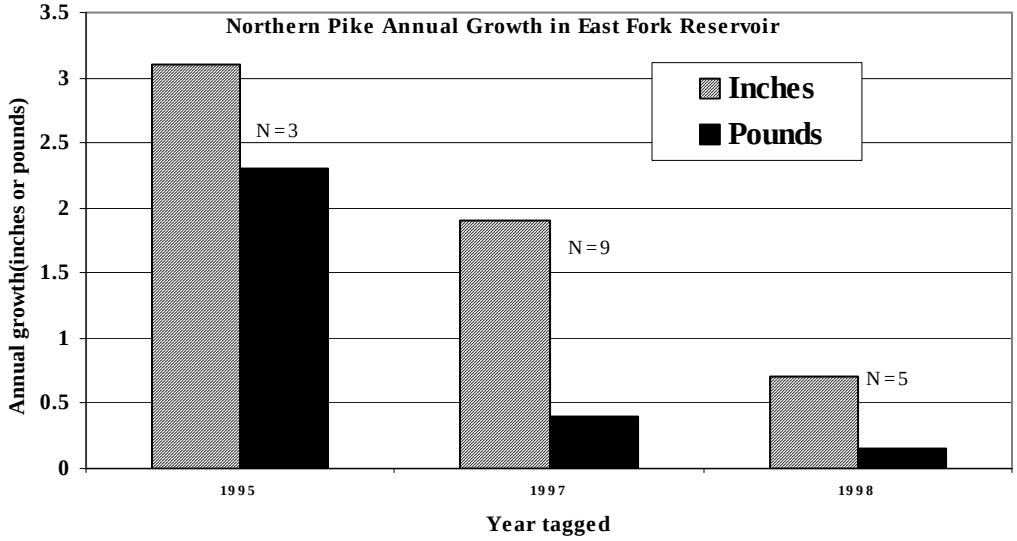


Figure 24. Average annual growth of tagged northern pike recaptured from 1997 – 2001 in East Fork Reservoir from three different tagging years.

Table 7. Seining results from Lewistown area waters in 2001.

Reservoir (Date)	*n* of seine hauls[1]	Legal	Species	*n*	Total length (in) Min	Max	Mean
Dog Creek (5/14/01)	Many	T22N R17E Sec. 6	Lake chub	8			
			Catostomus sp.	1			
			Sandshiner	1			
Drag Reservoir (5/18/01)	3	T19N R28E Sec. 21, 22	Largemouth bass	3	5.6	6.8	6.2
East Fork Reservoir (8/6/01)	11	T14N R19E Sec. 11, 14	Yellow perch (total)	211	2.2	7.9	4.3
			Yellow perch (<4 in)	70			
			Northern pike	7	3.6	12.4	6.1
			Minnow	1	1.1	1.1	1.1
			Crayfish	61			
Jakes Reservoir (5/24/01)	1	T20N R24E Sec. 11	Yellow perch	37	4.6	7.0	6.1
Judith River (8/11/01)	11	T18N R16E Sec. 4, 15 T19N R16E Sec. 34	Common carp	2			
			Goldeye	1			
			Catostomus sp.	12			
			Hybognathus sp.	11			
			Lake chub	4			
			Longnose dace	262			
			Minnow	12			
			Mottled sculpin	1			
			Stonecat	7			
			White sucker	55			
			Shorthead redhorse	4			
Petrolia Reservoir (8/12/01)	8	T14N R27E Sec. 25, 36	Common carp	614[2]	1.7	3.0	2.5
			Yellow perch	4	3.1	3.1	3.1
			Minnow	7			
			Spottail shiner	12	3.1	3.4	3.3
			Walleye	14	4.6	4.8	4.7
Wolf Coulee Reservoir (5/23/01)	5	T20N R26E Sec. 15	Largemouth bass	4	6.2	7.3	6.7

1 – 100 foot seine used on most hauls for East Fork. On other reservoirs used 50-foot seine. 2 – sub-sample of measurements taken.

Small Lewistown Area Reservoirs

Four small warmwater reservoirs were sampled in 2001 (Tables 6, 7). Warm water fish information from Lower Carter Pond and Big Casino Reservoir are summarized in Tews et al. (2002).

Dry Blood Reservoir – Winterkill occurred during 2000/2001. This reservoir had provided excellent largemouth bass fishing for several years. Once water levels reach 10 – 12 feet the reservoir will be restocked with largemouth bass.

Drag Reservoir – The 34 bluegills transferred to Drag in 1999 have reproduced. Anglers reported good fishing for bass and bluegill during the spring of 2001, but numbers caught in gill nets were low (Table 6).

Jakes Reservoir – This reservoir is extremely low, but still has yellow perch.

Wolf Coulee – This reservoir was very low in 2001 but largemouth bass successfully over-wintered.

Lewistown Area Streams

Judith River – As in 2000, the Judith River was extremely low. In 2001, the USGS started maintaining a gauge station about seven miles upstream from the mouth. There was essentially no run-off during 2001. There were several weeks when flows were less than the MFWP instream water reservation of 160 cfs. The Judith was severely dewatered above Big Spring Creek. Several landowners reported that flows were at record low levels and many areas were dry.

Seining done on the Beckman Wildlife management area in 2001 captured similar species to those found in 2000 (Hill et al. 2001). Age-0 stonecats *Noturus flavus* and adult goldeye *Hiodon alosoides* were only captured in 2001 (Table 7), while brook stickleback and channel catfish *Ictalurus punctatus* were only captured in 2000.

Dog Creek – This stream was dry with a few pools in early 2001. Despite the lack of water there were still some fish remaining in the pools in May (Table 7). Later in the year it is likely that the entire creek was dry.

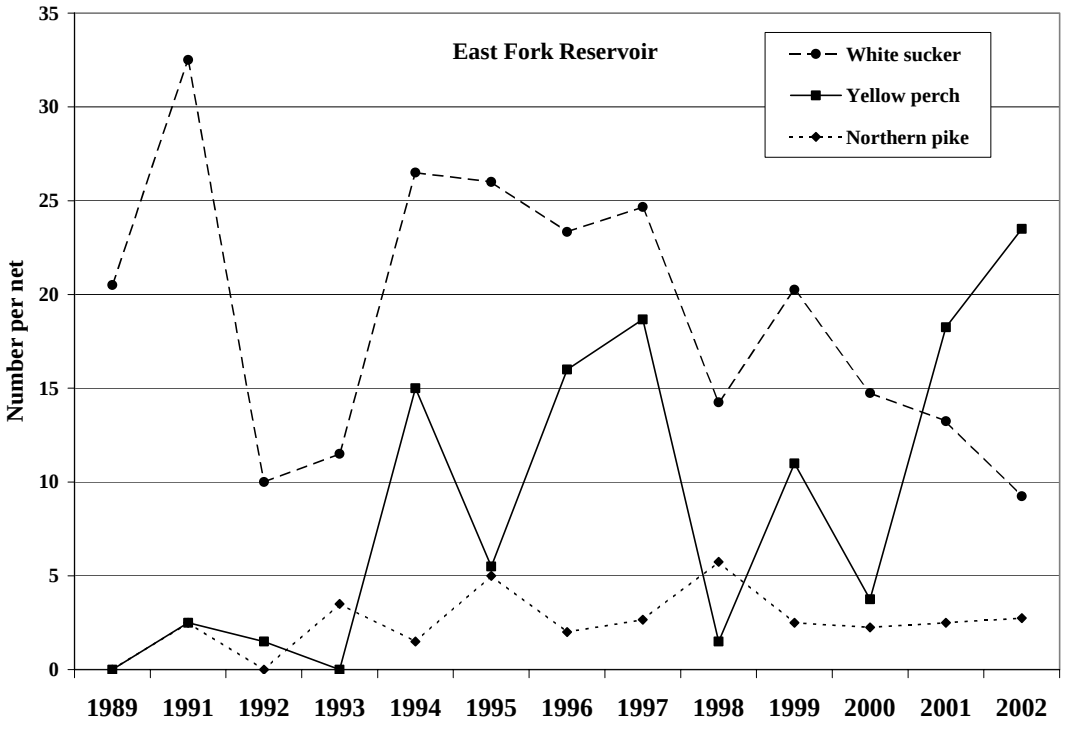


Figure 25. Gill netting trends of common species in East Fork, 1989 – 2002.

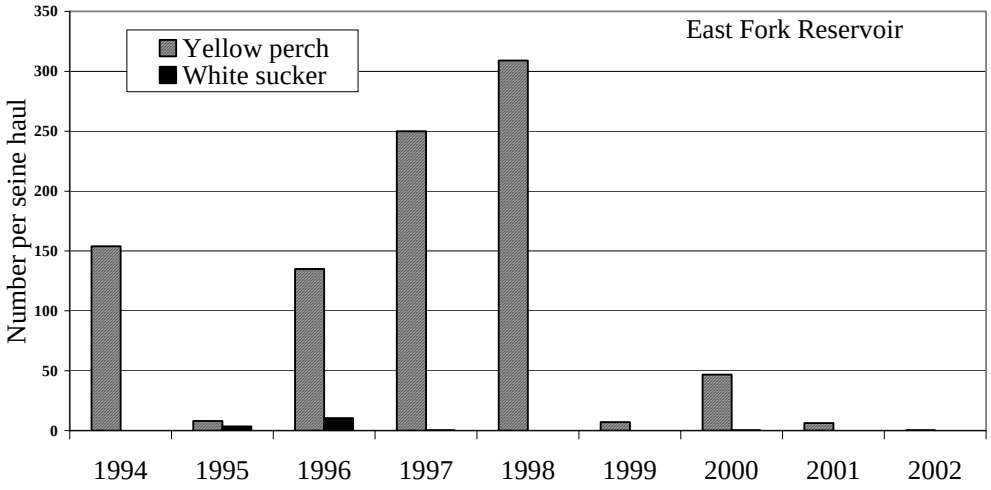


Figure 26. Forage fish numbers from seining in East Fork Reservoir, 1994 – 2002 for fish ≤ 4 inches TL. Previous reports had < 5 inches TL for 1998 (500 yellow perch per haul).

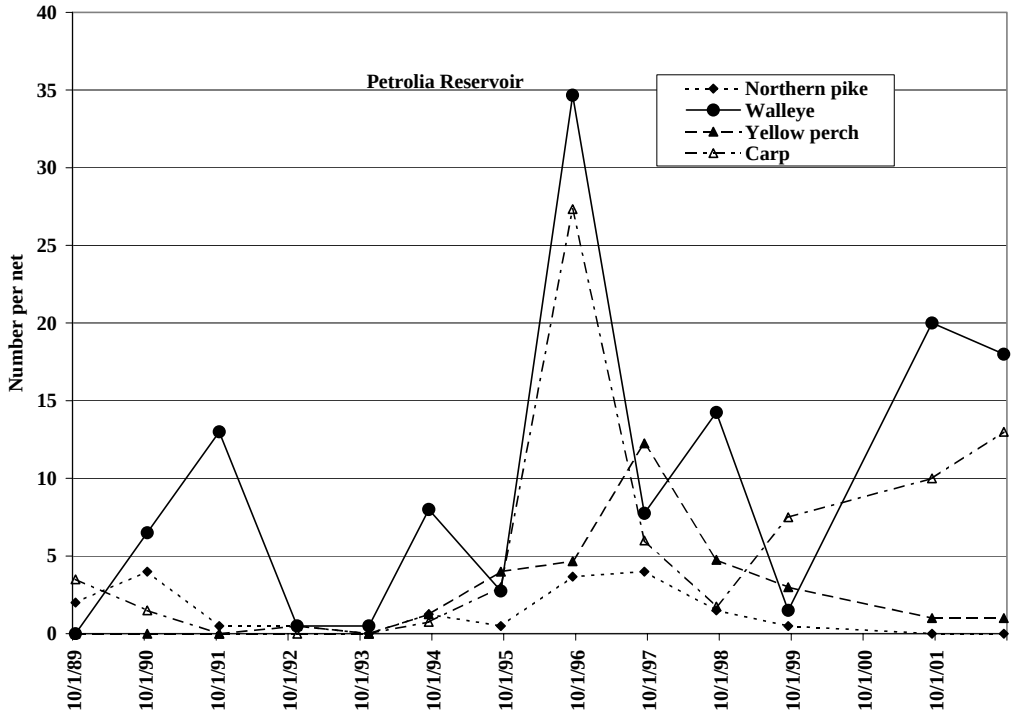


Figure 27. Gill netting trends from Petrolia Reservoir, 1989 – 2002.

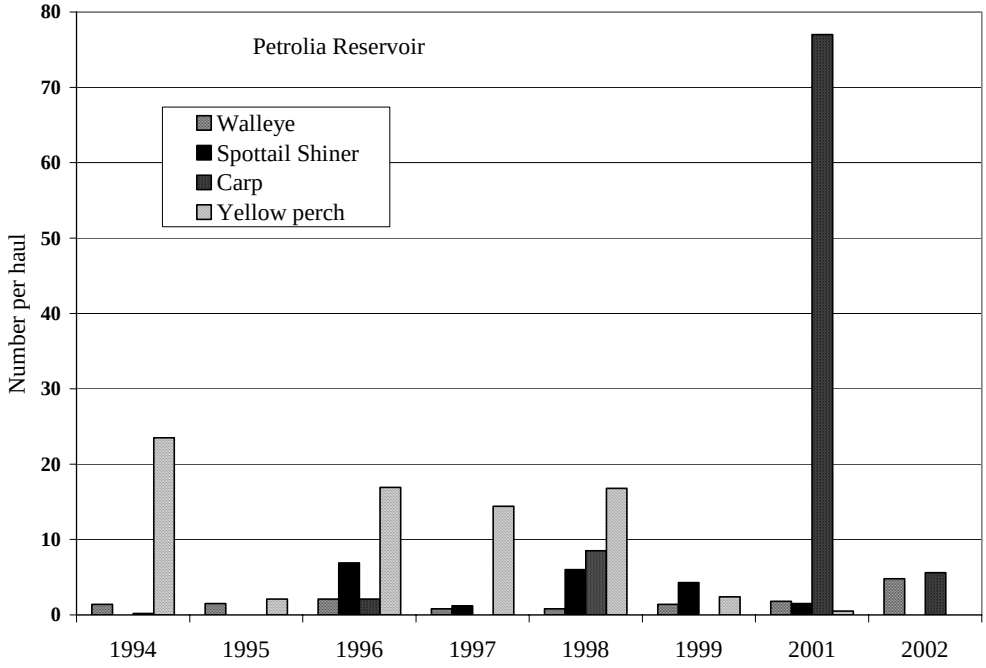


Figure 28. Seining trends in Petrolia Reservoir, 1994 – 2002.

Lewistown Management Area 2002

Drought from 2000 – 2002 resulted in continued low water levels for many fisheries in the Lewistown area. Local storms raised water levels in a few reservoirs.

East Fork Reservoir – This is one of the few reservoirs that has not had drought impacts. Traps were set the last week of April, immediately after ice-off. During 20 trap nights, 367 northern pike, 394 white suckers and 117 yellow perch were captured (Table 8). Fifty-two northern pike, 461 white suckers and 2 yellow perch were recaptured. The Schnabel estimate (Van Den Avyle 1993) for northern pike was 1,166 with a 95% CI of 917 – 1,602. This is likely an underestimate of the northern pike population. Pierce (1997) found Schnabel estimates of spring trapped northern pike underestimated populations by 21 – 51%. In that study, northern pike numbers in a lake smaller than East Fork Reservoir was underestimated by about 30% using Schnabel estimates. White sucker numbers appear to have dropped greatly in the past year. The estimate for white suckers was 1,225 with confidence limits of 1,123 – 1,348. When the white sucker population was first estimated in 1998 there appeared to be over 4,000 in East Fork Reservoir (Table 5). By 2001 that number had dropped to about 2,600. In 2001, only 15 white suckers were recaptured compared to 461 in 2002 (Table 8).

Recapture rates have always been too low to estimate yellow perch numbers. However, the number of yellow perch appears to be increasing. The number of trapped yellow perch increased from 1.5 perch per trap night in 1998 to 3.0 per night in 2001 (Table 4) and 5.8 per night in 2002 (Table 8).

Trapped northern pike W_r increased substantially from 87 in 2001 (Table 6) to 97 (Table 10) in 2002. The mean W_r for pike caught in gill nets was 95, the highest seen since 1998. The pike population is still dominated by small fish (less than 3 pounds), however the percent of 2 to 3 pound pike increased from 12% in 2001 to 30% in 2002. Yellow perch W_r also increased from 87 to 92, while white sucker W_r remained near 102. Northern pike mean length was similar in 2001 and 2002.

Northern pike growth is still slow in East Fork Reservoir. Mean annual growth was less than 1 inch for fish tagged in 2001 (Table 9). This is far less than the growth rate of about 3 inches per year for northern pike tagged in 1995 (Figure 24), but is encouraging since it is slightly more than the 0.5 inch growth seen for fish tagged in 1998. Northern pike tagged in 2001 gained more weight each year than those tagged in 1998 and the more recently tagged fish also had a higher W_r (Table 9).

Gill netting captured record-high numbers of yellow perch and record-low numbers of white suckers (Figure 25). Crayfish numbers continue to increase. Northern pike gill net catch rates have remained similar for the past four years.

Seine hauls captured a record-low number of yellow perch less than 4 inches TL (n=1). Overall, 24.8 yellow perch were captured per haul, which was higher than the 19.2 per haul CPUE observed in 2001 (Tables 7, 11). One northern pike was also caught.

Petrolia Reservoir – Petrolia Reservoir has been dewatered for several years and woody vegetation is growing about 20 vertical feet below the high water mark. Once the reservoir

refills this vegetation should benefit fisheries by providing submerged habitat. In September 2002 the maximum water depth in Petrolia was about 9 feet. Surveys done in 2003 indicate that the reservoir did not winter kill during 2002/2003.

In 2002, walleye catch rate dropped slightly and carp catch rate increased slightly from 2001 (Figure 27). Of note were a 9.5 pound walleye and two shorthead redhorse captured in gillnets. Shorthead redhorse have not been reported from Petrolia since 1986.

Walleye and carp were the most common species captured in seine hauls (Table 11). Walleye were at record high numbers (Figure 28). One sandshiner *Notropis stramineus* and two longnose dace were also captured. This is the first time in recent years that yellow perch have not been captured in seine hauls. This is also the first year that spottail shiners, which were stocked in the reservoir from 1996–1998, were not captured.

Table 8. Size statistics from overnight trapping from East Fork Reservoir.

Water (Date)	*n* of trap nights	Species	New *n*	Recap *n*	Total length (in) Min	Max	Mean	Weight (lb) Min	Max	Mean	W_r Mean
East Fork Reservoir (4/29/02 – 5/3/02)	20	Longnose sucker	2	1	16	17.7	16.8	1.65	2.79	1.97	
		Northern pike	367	52	9.9	36.0	19.6	0.22	13.0	1.83	97
		Female	67	-	15.8	36	21.0	0.94	13.0	2.47	102
		Male	288	-	9.9	23.7	19.3	0.22	3.03	1.67	95
		White sucker[1]	394	461	13.8	19.0	16.8	1.14	3.25	2.16	103
		Yellow perch	117	2	5.5	12.8	8.1	0.05	1.51	0.33	92

[1] subsample of lengths and weights taken.

Table 9. Growth of tagged northern pike in East Fork Reservoir.

Year tagged	*n*	Sex	Mean Total length (in)	Mean change in Total length (in)	Mean weight (lb)	Mean change in weight (lb)	Mean W_r
2001	46	All	20.1	0.8	20.5	0.43	97
	7	Female	21.8	1.2	3.65	1.12	118
	38	Male	19.9	0.8	1.81	0.31	94
1998	4	Male	20.8	2.1 (0.5/year)	1.93	0.35 (.08/year)	86

Table 10. Statistics from fish captured by overnight gill netting in Northcentral MT, 2002.

Reservoir (Date) *n* of Nets	Mean hr/ net	Species	N	Total length (in) Min	Total length (in) Max	Total length (in) Mean	Weight (lb) Min	Weight (lb) Max	Weight (lb) Mean	W_r Min	W_r Max	W_r Mean
Drag Reservoir (5/13/02) 1 Sinker 1 Floater	18.7	Bluegill	51	4.1	6.4	5.1	0.05	0.26	0.13	93	161	127
		Largemouth bass	26	5.8	11.9	9.6	0.01	0.90	0.51	87	128	103
East Fork Reservoir (9/9/02) 2 Sinkers 2 Floaters	16.6	Longnose sucker	1	18.0	18.0	18.0	2.11	2.11	2.11			
		Northern pike	11	15.3	24.5	18.6	0.72	3.48	1.54	81	107	95
		White sucker	37	14.0	18.1	16.5	1.10	2.40	1.87	72	107	93
		Yellow perch	94	5.2	8.8	6.3						
		Crayfish	>1000[1]									
Payola Reservoir (5/28/02) 1 Sinker	22.0	White sucker	1	11.3	11.3	11.3	0.59	0.59	0.59	91	91	91
		Yellow Perch	8	8.0	11.1	10.2	0.26	0.60	0.50	81	101	88
Petrolia Reservoir (9/11/02) 1 Sinker 1 Floater	24.1	Carp	26	4.4	17.8	12.5	0.08	2.78	1.25	80	97	89
		Shorthead redhorse	2	12.7	17.8	15.3	0.72	2.00	1.36	84	86	85
		Walleye	36	7.9	29.5	12.0	0.18	9.50	0.77	70	110	85
		Yellow perch	2	10.2	10.8	10.5	0.38	0.49	0.44	67	72	70
Whisker Reservoir (5/29/02) 1 Sinker 1 Floater	20.0	Black crappie	1	7.0	7.0	7.0	0.19	0.19	0.19	107	107	107
		White sucker	7	13.9	16.2	14.8	1.18	2.12	1.52	94	117	103

[1] estimate

Table 11. Size structure of fish captured during seine hauls in 2002.

Reservoir (Date)	*n* of seine hauls	Legal	Species	Total *n*	Total length (in) Min	Max	Mean
Catfish Reservoir (4/16/02)	1 (50 foot seine)	T20N R26E Sec.25, 26	No fish				
East Fork Reservoir (8/13/02)	5 (100 foot seine)	T14N R19E Sec.11, 14	Northern pike	1	8.9	8.9	8.9
			Yellow perch	124	3.4	9.0	5.6
			(total)	1			3.4
			Yellow perch <4 inch				
Flat Creek (7/1/02)	3 (50 foot seine)	T22N R14E Sec.8, 9	Fathead minnow	6			
			Lake chub	50			
			Longnose sucker	1			
			Plains minnow	30			
			White sucker	1			
Jakes Reservoir (4/16/02)	2 (50 foot seine)	T20N R24E Sec.11	Fathead minnow	22			
			Yellow perch	2	6.2	6.2	6.2
Payola Reservoir (5/29/02)	2 (50 foot seine)	T16N R26E Sec.29, 30	No fish				
Petrolia Reservoir (8/13/02)	10 (50 foot seine)	T14N R27E Sec.25, 26,35,36	Common carp	56	1.6	6.2	3.7
			Longnose dace	2	2.2	2.2	2.2
			Sand shiner	1	-	-	2.2
			Walleye	48	2.8	9.1	3.7

Small Lewistown Area Reservoirs

Five small warmwater reservoirs were sampled in 2002. Gill net results are summarized in Tables 10 and 11. Highlights are discussed below. Warm water fish information from two other reservoirs, Lower Carter Pond and Big Casino Reservoir, are summarized in a companion report by Tews et al. (2003).

Drag Reservoir – Water levels remain high in this reservoir and the bluegills transferred in 1999 are doing well. Over 50 bluegill were captured and had a mean W_r of 127 (Table 10). Largemouth bass up to 11.9 inches and 0.90 pounds were captured in gill nets.

Jakes Reservoir – This reservoir is extremely low, but still held perch in April 2002 (Table 11).

Payola Reservoir – This reservoir has been hard-hit by drought and had a maximum depth of only about 6 feet in May 2002. Yellow perch and white suckers were the only fish sampled (Table 10). It appears that the largemouth bass have winterkilled.

Whisker Reservoir – In 1999, 126 black crappie were transferred to Whisker Reservoir. There are no other records of fish being stocked in this water. One crappie and seven large white suckers were captured during gill net sets (Table 10). Five Axolotl salamanders were also captured. This reservoir was about 8 feet below full pool, but still had about 12 feet of water in May. Since crappie do not appear to have done well, largemouth bass will be stocked in 2003. We are also considering a white crappie *Pomoxis annularis* transfer.

Lewistown Area Streams

Judith River – As in 2000 - 2001, the Judith River was extremely low. Data from the USGS gauging station five miles upstream of the Judith River mouth indicated that there was essentially no run-off during 2002. From mid-July through early August flows were less than the MFWP instream water reservation of 160 cfs (MFWP 1989). Flows were about 70 cfs during early August. Storms resulted in brief increases in flows to over 1000 cfs.

Two reaches of the Judith River were electrofished in 2002 (Table 12). In April, at the Beckman Wildlife Management Area, longnose sucker, rainbow trout and shorthead redhorse were the most common species sampled. Rainbow trout have not previously been sampled in such high numbers. Downstream, shorthead redhorse, flathead chub and goldeye were the most common species. No walleye or sauger *Sander canadense* were captured in the upper reach. Only five sauger and one walleye were captured in the lower section near the mouth of the Judith. Sauger were much more common than walleye when the lower Judith was sampled in 1979 and 1988.

Flat Creek – In conjunction with the U. S. Bureau of Land Management this spring-fed prairie stream was sampled in 2002. The variety of minnow species sampled is common in northcentral Montana streams (Table 11).

Table 12. Statistics of fish captured by electrofishing on the Judith River 2002.

Water Date (length)	Legal	Species	*n*	Total length (in) Min	Max	Mean	Weight (lb) Min	Max	Mean
Judith River	T19N R16E	Brown trout	4	14.1	15.5	15.0	0.92	1.35	1.16
Beckman section	Sec.27, 34	Burbot	3	16.7	19.9	18.3	0.84	1.30	1.09
4/25/02	(Judith)	Common carp	26	19.6	24.2	22.0	3.25	6.50	4.90
(18,691 ft.)		Flathead chub	11	2.5	7.1	4.9			
		Goldeye	1	12.6	12.6	12.6	0.54	0.54	0.54
		Longnose sucker	70	6.9	18.6	15.1	0.69	2.64	1.49
		Mountain sucker	1	5.5	5.5	5.5			
		Mountain whitefish	6	12.4	15.8	13.7	0.90	1.50	1.16
		Northern pike	1	20.6	20.6	20.6	1.87	1.87	1.87
		Rainbow trout	40	4.5	24.5	11.5	0.02	4.92	0.74
		Shorthead redhorse	28	15.0	20.0	17.9	1.45	3.86	2.52
		Smallmouth bass	1	13.8	13.8	13.8	1.44	1.44	1.44
		White sucker	5	3.9	15.0	9.6	0.02	1.50	0.85
Judith River	T22N R16E	Brown trout	2	6.2	6.3	6.3	0.07	0.07	0.07
PN Section	Sec.3, 10, 15,	Burbot	1	11.3	11.3	11.3	0.28	0.28	0.28
5/31/02	22	Common carp	4	19.4	23.4	21.0	3.50	7.80	4.66
(21,120 ft.)	T23N R16E	Channel catfish	8	19.2	33.0	25.3	1.73	13.80	6.81
	Sec.35	Flathead chub	36	2.2	6.2	4.8			
	(Judith)	Freshwater drum	1	13.2	13.2	13.2	0.94	0.94	0.94
		Goldeye	21	10.5	14.0	11.5	0.33	0.75	0.46
		Hybognathus	1	4.0	4.0	4.0			
		Longnose dace	1	3.4	3.4	3.4			
		Longnose sucker	8	6.4	13.5	10.2			
		Rainbow trout	1	5.0	5.0	5.0			
		Sauger	5	12.6	20.1	16.9	0.55	2.15	1.33
		Shorthead redhorse	50	10.1	19.6	16.6	0.42	3.55	1.88
		Walleye	1	16.0	16.0	16.0	1.45	1.45	1.45

Great Falls Management Area 2001

Wadsworth Pond

Wadsworth Pond is located within the boundary of Wadsworth Park and is owned by the City of Great Falls. This pond was created on the western edge of the city during construction of dikes along the Sun River and has a surface area of approximately 45 acres. Although maximum depth was measured at 17-feet deep, a large portion of the pond is seven feet or less in depth. Water levels are managed by a control structure that connects the pond to the Sun River. Access to the park for public fishing was granted in 1995. Initial gill net surveys were conducted in 1988 and reported by Hill et al. 1988. Gill net surveys were again conducted in 1993, 1997 and 1998 (Table 13) along with frame trap net surveys during 1996, 1999 and 2001 (Table 14). Overall, 14 species of fish have been collected in Wadsworth Pond. Largemouth bass and walleye fingerlings have been stocked to control the abundant populations of yellow perch, black bullhead and white sucker and provide a warm/coolwater urban fishery. Largemouth bass were first introduced in 1991 with subsequent stockings in 1997, 1998, 1999 and 2000. Walleye have been stocked annually since 1996. In early June each year since 1999 (prior to kid's fishing day), catchable-size rainbow trout have been stocked into Wadsworth Pond.

In 1996, three frame trap nets (two 1-inch mesh, one 0.37-inch mesh) were fished four consecutive nights during 22-26 April. Biology students from Great Falls High School and Charles M. Russell High School assisted in trap net operation and data collection. Eight species of fish were captured and catch statistics are presented in Table 13. Nets captured 2,910 white suckers, 178 yellow perch, 86 black bullheads, 36 longnose suckers, 7 chub spp., 3 common carp, 3 northern pike and 1 brown trout *Salmo trutta*. A Schnabel population estimate (Van Den Avyle 1993) calculated for white suckers greater than 6.0 inches yielded an estimate of 5,231 individuals with a 95% confidence interval from 4,807 – 5,747. White suckers varied in length from 6.3- to 13.6 inches TL and averaged 9.3 inches TL. One of the three northern pike captured was previously Floy tagged in Lake Frances, a reservoir 85 miles northwest of Great Falls. Natural migration from Lake Frances to Wadsworth Pond is not possible due to dams between the two water bodies. Therefore, an angler likely illegally transported this northern pike.

White sucker was the dominant species captured by both sampling methods during all years (Tables 13, 14). Average size of white suckers has increased since 1993 (8.7 inches TL) to just over 11 inches TL in 2001. Average length of yellow perch collected by trap nets has varied between 3.9- to 4.6 inches TL. Mature male perch less than 3.0 inches TL and mature females less than 4.0 inches TL have been documented. Although less than the 7.5 inches TL average reported by Hill et al. (1988), black bullhead average length has increased slightly in recent years to 6.7 inches TL. A few large northern pike have been captured in Wadsworth Pond with one individual in 2001 weighing 12.8 pounds. Mean W_r of the six northern pike captured during trap netting was over 105, indicating good body condition prior to spawning (Neumann and Willis 1995) and an abundant forage supply (Flickinger and Bulow 1993). No natural reproduction of northern pike has been documented in Wadsworth Pond. Pumpkinseed sunfish were first captured by gill nets in 1998. Trap nets captured 10 pumpkinseed sunfish in 2001, with an average TL of 4.1 inches. Five walleyes from the 1996 and 1997 stocking were first captured in

gill nets in 1998 and averaged 13.5 inches TL. In 2001, the three walleye sampled in trap nets averaged 18.5 inches TL, 2.55 pounds, and had a mean W_r of 103. One 5.7-inch TL largemouth bass was collected in a gill net in 1998. Three largemouth bass were sampled in trap nets in 2001, averaging 9.7 inches TL and 0.50 pounds. Eight rainbow trout were captured in trap nets in 2001, averaging 8.7 inches TL and a mean W_r of 70.

Late spring nighttime electrofishing will be included into the sampling protocol to monitor abundance, size structure, and condition of the largemouth bass population. Planning is underway to dredge a portion of the shallow west side of the pond in 2002-03. Increasing the depth and reducing vegetation will provide better fishing opportunities and may increase prey availability and predator growth. Gill nets, trap nets and electrofishing will be used to evaluate the stocking program, overall population structure and effectiveness of the proposed habitat modification.

Pelican Point Ponds

Pond #1—Surface area was measured at approximately 21 acres on 21 May 2001. Two experimental-mesh sinking gill nets set overnight in May captured nine yellow perch, three walleyes, two largemouth bass and one northern pike (Table 13). Walleyes were first sampled in 1996 from an apparent illegal introduction. These walleyes averaged 21.9 inches TL and 3.8 pounds (Hill et al. 1997). The three walleyes captured in 2001 averaged 17.8 inches TL and 1.82 pounds, and may be the result of natural reproduction from the earlier introduction. Two largemouth bass captured in 2001 averaged 14.3 inches TL long and 1.72 pounds. Furthermore, these are the largest bass sampled to date. One illegally introduced 28.2 inches TL northern pike was collected in 2001. Cursory examination of stomach contents for the walleyes showed all three had consumed yellow perch, one also consumed a pumpkinseed, and one had eaten a largemouth bass. The northern pike had consumed two yellow perch and both largemouth bass had eaten crayfish.

Pond #2—On 21 May 2001, one experimental mesh sinking gill net was set in this 1.1-acre pond. Only two yellow perch and two pumpkinseed sunfish were collected (Table 13). Hill et al. (1997) documented the illegal introduction of northern pike in 1996. The capture of two pumpkinseed sunfish in 2001 represents the fifth illegal introduction of fish into the two ponds located on the Pelican Point Fishing Access Site.

Table 13. Overnight gill netting results for Wadsworth Pond and Pelican Point Ponds showing date surveyed (Date), number of nets, mean hours per net set, species, total number of fish sampled (*n*), and minimum (min), maximum (max) and mean values for total length (in), weight (lb) and relative weight (W_r) during 1993, 1997, 1998 and 2001.

Water (Date) *n* of nets[3]	Mean hr/net	Species	*n*	Total length (in) Min	Max	Mean	Weight (lb) Min	Max	Mean	W_r[2] Min	Max	Mean
Wadsworth Pond	17.0	Brown trout	1	20.0	20.0	20.0	3.17	3.17	3.17			
(8/27/93)		Yellow perch	7	6.0	11.6	8.0	0.12	0.78	0.31	64	106	92
2S		Black bullhead	7	4.9	5.6	5.4	0.07	0.11	0.09	81	147	107
		White sucker	23	6.3	15.5	8.7	0.13	1.14	0.36	61	128	100
		Longnose sucker	4	11.6	14.5	13.2	0.56	1.08	0.82			
		Chub spp.	7	7.0	8.9	8.0	0.16	0.25	0.21			
Wadsworth Pond	17.2	Brown trout	1	17.2	17.2	17.2	2.04	2.04	2.04			
(10/21/97)		Black bullhead	1	7.6	7.6	7.6	0.05	0.05	0.05	55	55	55
2S		White sucker	30	9.0	11.5	10.5	0.30	0.56	0.45	76	93	85
		Longnose sucker	1	12.1	12.1	12.1	0.56	0.56	0.56			
Wadsworth Pond	17.5	Black bullhead	5	5.3	6.2	5.7	0.07	0.10	0.08	65	81	74
(9/15/98)		White sucker	61	6.4	14.0	10.5	0.10	1.16	0.49	73	107	90
3S		Longnose sucker	7	11.5	14.1	12.7	0.50	0.98	0.74			
		Common carp	7	8.3	17.1	11.8	0.34	2.78	1.08	89	119	108
		Pumpkinseed	2	3.6	3.7	3.7	0.04	0.04	0.04	113	123	118
		Chub spp.	1	6.9	6.9	6.9	0.12	0.12	0.12			
		Northern pike	1	25.5	25.5	25.5	4.80	4.80	4.80	118	118	118
		Largemouth bass	1	5.7	5.7	5.7	0.10	0.10	0.10	130	130	130
		Walleye 1/	5	11.4	15.3	13.5	0.48	1.06	0.83	92	114	101
Pelican Point Pond #1	20.3	Yellow perch	9	6.0	11.2	7.7	0.06	0.66	0.19	51	86	64
(5/21/01)		Largemouth bass	2	13.8	14.8	14.3	1.52	1.92	1.72	109	110	109
1F,1S		Northern pike	1	28.2	28.2	28.2	5.50	5.50	5.50	99	99	99
		Walleye	3	16.8	18.4	17.8	1.58	2.00	1.82	80	88	84
Pelican Point Pond #2	18.1	Yellow perch	2	6.0	6.3	6.1	0.07	0.09	0.08	69	76	72
(5/21/01)		Pumpkinseed	2	4.0	4.1	4.1	0.05	0.05	0.05	101	109	105
1S												

1: sub-sample taken for length and weight measurements 2: Relative weights (W_r) were determined using formulas and data from Anderson and Neumann 1996, and Bister et al. 2000. 3: S = sinking net, F = floating net.

Table 14. Overnight trap net results for Wadsworth Pond, MT, showing the date surveyed (Date), number of trap net nights (net nights), species, total number of fish sampled (*n*) and minimum (min), maximum (max) and mean values for total length (in), weight (lb) and relative weight (W_r) during 1996, 1999, and 2001.

				Total length (in)			Weight (lb)			W_r [2]		
Date	Net nights	Species	*n*	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
4/23-4/26/96	12	Brown trout	1	9.1	9.1	9.1						
		Yellow perch	178	2.5	13.1	4.4						
		Black bullhead 1/	86	4.9	6.4	5.5						
		White sucker 1/	2,910	6.3	13.6	9.3	0.14	0.66	0.29	54	104	81
		Longnose sucker	36	9.8	15.6	12.7						
		Chub spp.	7	7.8	9.4	8.7						
		Common carp	3	17.0	20.0	18.4						
		Northern pike 1/	3	8.3	23.4	17.0	1.78	3.36	2.57	104	108	106
3/31-4/01/99	8	Yellow perch 1/	21	3.6	7.8	4.6	0.02	0.20	0.04	62	141	99
		Black bullhead	23	5.3	6.5	6.0	0.06	0.10	0.08	49	83	67
		White sucker 1/	158	9.5	12.0	11.0	0.33	0.72	0.50	74	111	84
		Longnose sucker	1	13.6	13.6	13.6	0.76	0.76	0.76			
		Common carp	6	9.1	17.9	11.5	0.40	2.78	0.95	95	109	99
		Northern pike	1	31.5	31.5	31.5	8.30	8.30	8.30	106	106	106
		Burbot	1	14.7	14.7	14.7	0.36	0.36	0.36	42	42	42
		Walleye	1	9.1	9.1	9.1	0.21	0.21	0.21	82	82	82
4/25-4/26/01	8	Rainbow trout	8	8.0	9.6	8.7	0.15	0.30	0.20	59	81	70
		Yellow perch	13	3.5	4.3	3.9	0.02	0.03	0.03	67	119	93
		Black bullhead 1/	8	5.7	10.2	6.7	0.05	0.46	0.17	46	71	60
		White sucker 1/	999	10.2	12.2	11.1	0.35	0.79	0.52	69	106	83
		Longnose sucker	12	12.0	13.6	12.6	0.59	0.80	0.71			
		Common carp	32	6.5	17.8	11.2	0.16	2.48	0.78	85	106	94
		Pumpkinseed 1/	10	3.8	4.8	4.1	0.04	0.05	0.05	61	103	82
		Golden shiner	1	6.2	6.2	6.2	0.08	0.08	0.08			
		Northern pike	2	27.4	35.5	31.5	5.30	12.8	9.10	104	113	109
		Walleye	3	17.8	19.1	18.5	2.13	2.97	2.55	99	110	103
		Largemouth bass	3	7.6	11.2	9.7	0.18	0.72	0.50	88	102	94

1: sub-sample taken for length and weight measurements; 2: Wr were determined using formulas and data from Anderson and Neumann 1996, and Bister et al. 2000.

Great Falls Management Area 2002

Wadsworth Pond

Trap nets sampled eight species of fish between 1996 and 2002 (Table 15). Trap net CPUE for yellow perch in Wadsworth Pond has declined from 8 per net night in 1996 to 1.5 per net night in 2002. Because of the small size of the yellow perch, the 1-inch mesh trap net sets did not catch any yellow perch in 2002. The mean TL of yellow perch sampled in 2002 was 4.5 inches TL, slightly larger than the 2001 sample (3.9 inches TL) and similar to the 1999 (4.6 inches TL) and 1996 samples (4.4 inches TL). The mean CPUE for pumpkinseed sunfish has increased from 1.3 per net night in 2001 to 1.9 per net night in 2002. The mean length of pumpkinseed sunfish in 2002 was 3.9 inches TL, which was similar to the 2001 sample of 4.1 inches TL. CPUE for white suckers and common carp were lower than the 2001 sample. Mean length of suckers remained similar to the 2001 sample, while mean length of common carp decreased from 11.2 inches TL in 2001 to 8.8 inches TL in 2002.

The electrofishing attempt on Wadsworth Pond was not successful due to extremely high conductivity in the pond. Conductivity measurements were over 4,000 µS/cm, which is much higher than the specific conductivity of the fish in the pond.

Nine species of fish were sampled in gill nets (Table 15). Catch rates of fish in gill nets were highly variable when compared to historical gill net catch rates. This is likely due to the wide variety of sampling dates used in the past. Since 1988, gill net sampling dates have varied from 3 July to 20 October. This makes comparisons of catch rates and size of fish difficult due to differences in habitat, water temperature, and life stages. With the exception of common carp and rainbow trout, the size of fish sampled in gill nets was similar to those sampled in trap nets two months earlier. Common carp sampled in July gill nets were three inches longer on average compared to those sampled in May trap nets. In addition, rainbow trout sampled in gill nets were nearly 6 inches shorter in July gill nets compared to May trap nets. The sample of rainbow trout in July likely included many newly stocked (on 30 May 2002) rainbow trout, where as the May sample represented fish that had over wintered in the pond.

Seining was effective for sampling small largemouth bass. The mean CPUE was 4.4 per seine haul (Table 15). The mean size of sampled largemouth bass was 3.7 inches TL (varying from 2.9- to 6.1 inches TL). Overall, eight species of fish were sampled in the seine hauls. The beach seine was also effective for sampling pumpkinseed sunfish (mean CPUE was 24.2 per haul). Length of sampled pumpkinseed sunfish varied from 1.2- to 4.6 inches TL and the mean TL was 3.1 inches. Several newly stocked walleye fry were captured in the seine hauls varying in length from 1.2- to 1.7 inches TL.

Table 15. Number of net sets (Net sets), total number sampled (Total *n*), catch per unit effort (CPUE; number per net night or seine haul), and mean (Mean), minimum (Min), and maximum (Max) total length of fish sampled in various gear types in Wadsworth Pond, Montana, 1996 - 2002.

Species	Year	Dates	Net sets	Total *n*	CPUE	Total length (in) Mean	Min	Max
Trap nets								
Yellow perch	1996	23-26 Apr	12	96	8	4.4	2.5	13.1
	1999	31 Mar – 1 Apr	8	21	2.6	4.6	3.6	7.8
	2001	25-26 Apr	8	13	1.6	3.9	3.5	4.3
	2002	8-9 May	8	12	1.5	4.5	4.0	5.1
Black bullheads	1996	23-26 Apr	12	82	6.8	5.5	4.9	6.4
	1999	31 Mar – 1 Apr	8	23	2.9	6.0	5.3	6.5
	2001	25-26 Apr	8	8	1.0	6.7	5.7	10.2
	2002	8-9 May	8	4	0.5	6.9	6.1	8.1
Walleye[1]	1996	23-26 Apr	12	0				
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	3	0.38	18.5	17.8	19.1
	2002	8-9 May	8	1	0.13	20.5		
Northern pike	1996	23-26 Apr	12	3	0.25	17.0	8.3	23.4
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	2	0.25	31.5	27.4	35.5
	2002	8-9 May	8	0				
Largemouth bass[2]	1996	23-26 Apr	12	0				
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	3	0.38	10.0	7.6	11.2
	2002	8-9 May	8	0				
Pumpkinseed sunfish	1996	23-26 Apr	12	0				
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	10	1.3	4.1	3.8	4.8
	2002	8-9 May	8	15	1.9	3.9	3.1	4.2
Brown trout	1996	23-26 Apr	12	1	0.08	9.1		
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	0				
	2002	8-9 May	8	0				
Rainbow trout[3]	1996	23-26 Apr	12	0				
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	8	1.0	8.7	8.0	9.6
	2002	8-9 May	8	11	1.4	13.4	12.4	14.5

Table 15. Continued.

Species	Year	Dates	Net sets	Total *n*	CPUE	Total length (in) Mean	Min	Max
White sucker	1996	23-26 Apr	12	2,910	242.5	9.3	6.3	13.6
	1999	31 Mar – 1 Apr	8	158	19.8	11.0	9.5	12.0
	2001	25-26 Apr	8	999	124.9	11.1	10.2	12.2
	2002	8-9 May	8	74	9.3	11.9	10.9	13.1
Longnose sucker	1996	23-26 Apr	12	29	2.4	12.7	9.8	15.6
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	12	1.5	12.6	12.0	13.6
	2002	8-9 May	8	1	0.13	12.0		
Common carp	1996	23-26 Apr	12	3	0.5	18.4	17.0	20.0
	1999	31 Mar – 1 Apr	8	6	0.8	11.5	9.1	17.9
	2001	25-26 Apr	8	32	4.0	11.2	6.5	17.8
	2002	8-9 May	8	17	2.13	8.8	6.0	12.6
Lake chub	1996	23-26 Apr	12	7	0.6	8.7	7.8	6.4
	1999	31 Mar – 1 Apr	8	0				
	2001	25-26 Apr	8	0				
	2002	8-9 May	8	0				
Gill nets								
Yellow perch	1988	13 Jul	3	46	15.3	7.2	5.0	11.7
	1993	27 Aug	2	7	3.5	8.0	6.0	11.6
	1997	20 Oct	2	0	0			
	1998	15 Sep	3	0	0			
	2002	3 Jul	4	36	9	5.4	4.8	6.0
Black bullhead	1988	13 Jul	3	41	13.7	7.5	4.8	9.0
	1993	27 Aug	2	0	0			
	1997	20 Oct	2	1	0.5	5.4		
	1998	15 Sep	3	5	1.7	5.7	5.3	6.2
	2002	3 Jul	4	10	2.5	7.0	6.2	8.5
Walleye[1]	1988	13 Jul	3					
	1993	27 Aug	2					
	1997	20 Oct	2					
	1998	15 Sep	3	3	1	135	11.4	15.3
	2002	3 Jul	4	2	0.5	20.9	19.8	21.9
Northern pike	1988	13 Jul	3	0				
	1993	27 Aug	2	0				
	1997	20 Oct	2	0				

Table 15. Continued.

Species	Year	Dates	Net sets	Total *n*	CPUE	Total length (in) Mean	Min	Max
Northern pike	1998	15 Sep	3	1	0.33	25.5		
	2002	3 Jul	4	0				
Largemouth bass[2]	1988	13 Jul	3	0				
	1993	27 Aug	2	0				
	1997	20 Oct	2	0				
	1998	15 Sep	3	1	0.33	5.7		
	2002	3 Jul	4	1	0.25	6.2		
Pumpkinseed sunfish	1988	13 Jul	3	0				
	1993	27 Aug	2	0				
	1997	20 Oct	2	0				
	1998	15 Sep	3	2	0.67	3.7	3.6	3.7
	2002	3 Jul	4	39	9.8	3.8	3.2	4.7
Brown trout	1988	13 Jul	3	1	0.33	25.5		
	1993	27 Aug	2	1	0.5	20.0		
	1997	20 Oct	2	1	0.5	17.2		
	1998	15 Sep	3	0				
	2002	3 Jul	4	0				
Rainbow trout[3]	1988	13 Jul	3	0				
	1993	27 Aug	2	0				
	1997	20 Oct	2	0				
	1998	15 Sep	3	0				
	2002	3 Jul	4	13	3.3	7.5	6.6	9.0
White sucker	1988	13 Jul	3	22	7.3	10.3	6.4	13.8
	1993	27 Aug	2	23	11.5	8.7	6.3	15.5
	1997	20 Oct	2	31	15.5	10.5	9.0	11.5
	1998	15 Sep	3	61	20.3	10.5	6.4	14.0
	2002	3 Jul	4	202	50.5	12.0	9.1	13.7
Longnose sucker	1988	13 Jul	3	23	7.7	11.6	7.5	13.5
	1993	27 Aug	2	4	2	13.2	11.6	14.5
	1997	20 Oct	2	1	0.5	12.1		
	1998	15 Sep	3	7	2.3	12.7	11.5	14.1
	2002	3 Jul	4	4	1	13.5	13.1	14.0
Common carp	1988	13 Jul	3	52	17.3	6.9	4.7	10.0
	1993	27 Aug	2	0	0			
	1997	20 Oct	2	0	0			

Table 15. Continued.

Species	Year	Dates	Net sets	Total *n*	CPUE	Total length (in) Mean	Min	Max
Common carp	1998	15 Sep	3	7	2.3	11.8	8.3	17.1
	2002	3 Jul	4	33	8.3	8.8	6.0	12.6
Lake chub	1988	13 Jul	3	0	0			
	1993	27 Aug	2	7	3.5	8.0	7.0	8.9
	1997	20 Oct	2	0	0			
	1998	15 Sep	3	0	0			
	2002	3 Jul	4	0	0			
Beach seine								
Yellow perch	2002	3 Jul	5	45	9.0	4.7	2.0	5.7
Black bullhead	2002	3 Jul	5	2	0.4	7.3	6.9	7.6
Walleye	2002	3 Jul	5	12	2.4	1.4	1.2	1.7
Northern pike	2002	3 Jul	5	0	0			
Largemouth bass	2002	3 Jul	5	22	4.4	3.7	2.9	6.1
Pumpkinseed sunfish	2002	3 Jul	5	121	24.2	3.1	1.2	4.6
Brown trout	2002	3 Jul	5	0				
Rainbow trout	2002	3 Jul	5	2	0.4	7.6	6.9	8.2
White sucker	2002	3 Jul	5	4	0.8	12.0	11.1	13.0
Longnose sucker	2002	3 Jul	5	0				
Common carp	2002	3 Jul	5	7	1.4	10.7	3.9	15.0
Lake chub	2002	3 Jul	5	0				

[1] First stocked in 1996 (annual thereafter 5,000/year).
[2] Stocked in 1991 then 1997 through 2002 (2,000/year).
[3] Stocked in 1978 then 1999 through present annually

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Principle Fish Species Involved

Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Goldeye	*Hiodon alosoides*
Lake chub	*Couesius plumbeus*
Common carp	*Cyprinus carpio*
Golden shiner	*Notemigonus crysoleucas*
Emerald shiner	*Notropis atherinoides*
Spottail shiner	*Notropis hudsonius*
Sand shiner	*Notropis stramineus*
Fathead minnow	*Pimephales promelas*
Flathead chub	*Platygobio gracilis*
Longnose dace	*Rhinichthys cataractae*
Longnose sucker	*Catostomus catostomus*
White sucker	*Catostomus commersoni*
Mountain sucker	*Catostomus platyrhynchus*
Shorthead redhorse	*Moxostoma macrolepidotum*
Black bullhead	*Ameiurus melas*
Channel catfish	*Ictalurus punctatus*
Stonecat	*Noturus flavus*
Northern pike	*Esox lucius*
Cisco	*Coregonus artedi*
Rainbow trout	*Oncorhynchus mykiss*
Mountain whitefish	*Prosopium williamsoni*
Brown trout	*Salmo trutta*
Burbot	*Lota lota*
Brook stickleback	*Culaea inconstans*
Mottled sculpin	*Cottus bairdi*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Black crappie	*Pomoxis nigromaculatus*
White crappie	*Pomoxis annularis*
Yellow perch	*Perca flavescens*
Sauger	*Sander canadense*
Walleye	*Sander vitreum*
Freshwater drum	*Aplodinotus grunniens*

Code Numbers of Waters Referred to in Report

14-7080	Bynum Reservoir
14-7740	Lake Frances
14-9240	Tiber Reservoir
16-1180	Dog Creek
16-1540	Flat Creek
16-1800	Judith River, Section 1
16-4950	East Fork Spring Creek Reservoir
16-6070	Jakes Reservoir
17-9393	Pelican Point Pond #1
17-9395	Pelican Point Pond #2
18-2475	Whisker Reservoir
18-7395	Catfish Reservoir
18-7560	Drag Creek Reservoir
18-7565	Dry Blood Reservoir
18-8700	Payola Reservoir
18-8720	Petrolia Reservoir
18-9481	Wolf Coulee #2 Reservoir
20-7950	Pishkun Reservoir
20-8470	Wadsworth Pond

Appendix A. Tiber Reservoir hydroacoustic fish population estimates for 1996 through 2002. Estimates include targets of all size.

Year 2002	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	3.34E-03	366,003,934	1,223,826	13.23%
	6-11	2.91E-03	249,823,622	727,075	7.86%
	11-16	7.24E-03	166,093,975	1,203,007	13.00%
	16-21	1.68E-02	134,992,595	2,272,816	24.56%
	21-26	2.61E-02	91,193,879	2,376,188	25.68%
	26-31	1.75E-02	52,379,130	915,097	9.89%
	31-36	2.41E-02	21,933,892	529,413	5.72%
	36-41	1.17E-03	4,618,895	5,391	0.06%
	Total Fish (all sizes)			**9,252,813**	
	Total Fish Below Thermocline (all sizes)			**3,826,088**	
	Fish Per Acre			**544**	

Year 2001	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	1.71E-03	247,581,392	423,231	12.4
	6-11	2.93E-03	189,120,615	553,892	16.3
	11-16	2.30E-03	147,095,456	338,891	10.0
	16-21	3.12E-03	108,812,280	339,993	10.0
	21-26	1.08E-02	83,346,075	903,168	26.5
	26-31	1.10E-02	70,293,535	775,649	22.8
	31-36	3.35E-03	15,416,872	51,625	1.5
	36-41	1.50E-03	12,333,497	18,450	0.5
	41-46	1.71E-03	3,083,374	0	0.0
	Total Fish (all sizes)			**3,404,897**	
	Total Fish Below Thermocline (all sizes)			**1,748,891**	
	Fish Per Acre			**200**	

Appendix A. Continued.

Year 2000	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	4.70E-03	259,103,346	1,216,761	28.6
	6-11	5.58E-03	198,852,978	1,109,977	26.1
	11-16	3.83E-03	152,413,660	583,710	13.7
	16-21	5.29E-03	116,875,921	618,159	14.5
	21-26	3.75E-03	85,710,406	321,445	7.6
	26-31	2.46E-03	34,131,721	83,988	2.0
	31-36	1.75E-03	61,583,619	107,857	2.5
	36-41	2.76E-03	13,651,948	37,620	0.9
	41-46	4.79E-02	3,663,049	175,616	4.1
	Total Fish (all sizes)			**4,255,133**	
	Total Fish Below Thermocline (all sizes)			**726,526**	
	Fish Per Acre			**250**	

Year 1999	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	1.52E-03	366,003,934	555,929	20.7
	6-11	1.85E-03	249,823,622	461,426	17.2
	11-16	2.96E-03	166,093,975	490,847	18.3
	16-21	2.93E-03	134,992,595	395,051	14.7
	21-26	3.80E-03	91,193,879	346,109	12.9
	26-31	4.46E-03	52,379,130	233,730	8.7
	31-36	7.22E-03	21,933,892	158,458	5.9
	36-41	9.12E-03	4,618,895	42,132	1.6
	41-46	2.32E-02	46,867	1,089	0.0
	Total Fish (all sizes)			**2,684,783**	
	Total Fish Below Thermocline (all sizes)			**781,518**	
	Fish Per Acre			**158**	

Appendix A. Continued.

Year 1998	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	2.45E-03	366,003,934	895,858	28.1
	6-11	1.55E-03	249,823,622	386,827	12.1
	11-16	2.25E-03	166,093,975	373,405	11.7
	16-21	4.89E-03	134,992,595	659,829	20.7
	21-26	7.14E-03	91,193,879	651,180	20.4
	26-31	3.54E-03	52,379,129	185,675	5.8
	31-36	1.23E-03	21,933,891	26,979	0.8
	36-41	1.05E-03	4,618,894	4,855	0.2
	41-46				
	Total Fish (all sizes)			**3,184,608**	
	Total Fish Below Thermocline (all sizes)			**868,689**	
	Fish Per Acre			**187**	

Year 1997	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	6.30e-04	308,815,904	195,789	16.1
	6-11	9.60e-04	251,431,202	241,757	19.9
	11-16	1.53e-03	180,916,740	276,937	22.8
	16-21	1.23e-03	148,833,974	182,391	15.0
	21-26	2.00e-03	105,883,370	211,749	17.4
	26-31	1.01e-03	77,226,188	77,878	6.4
	31-36	3.60e-04	56,787,446	20,371	1.7
	36-41	2.60e-04	29,032,318	7,604	0.6
	41-46	6.70e-05	10,709,886	716	0.1
	Total Fish (all sizes)			**1,215,192**	
	Total Fish Below Thermocline (all sizes)			**318,318**	
	Fish Per Acre			**71**	

Appendix A. Continued.

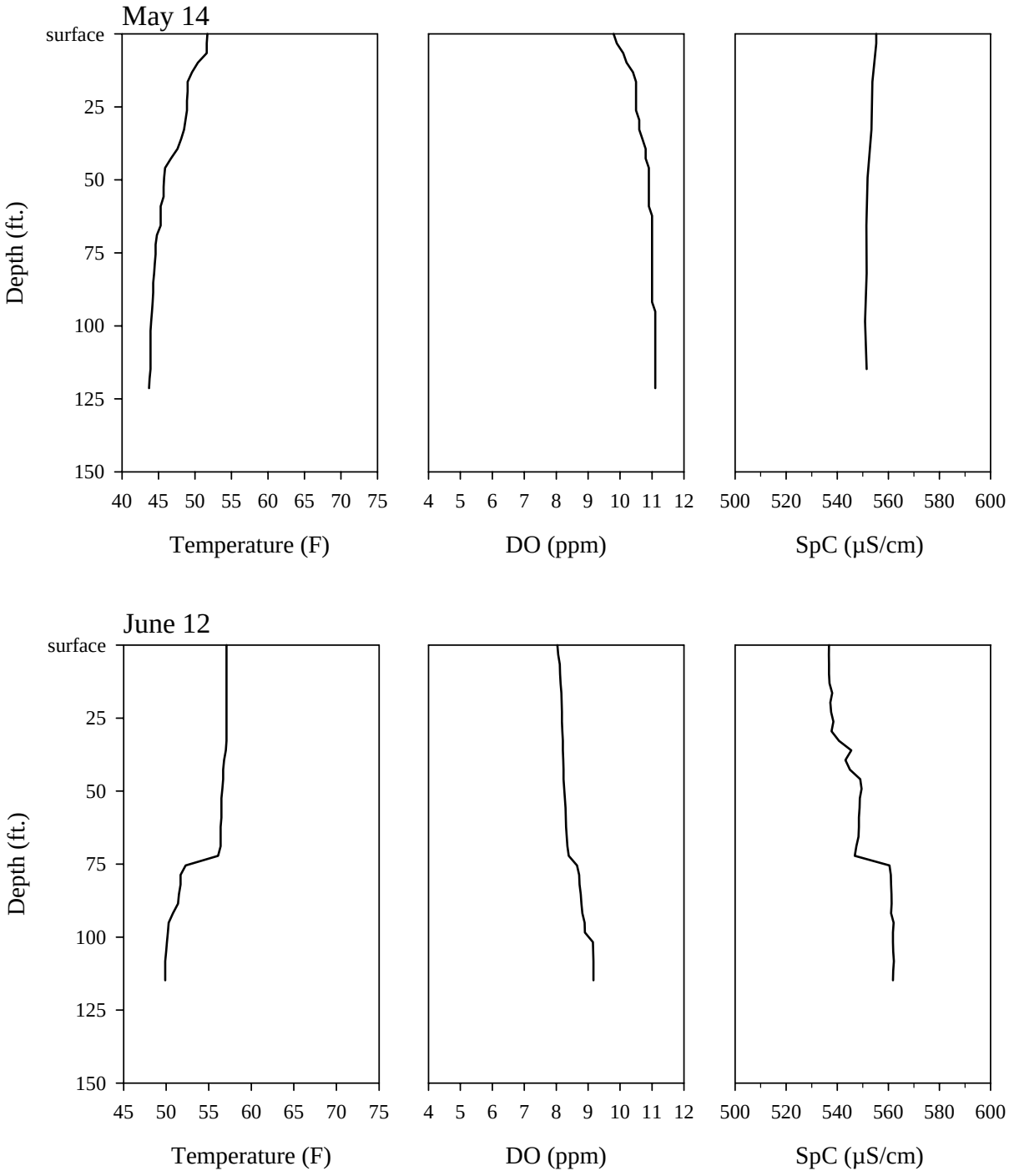
Year 1996	Depth (m)	Mean Density (fish/m^3)	Lake Volume (m^3)	Number of Fish	% Of Total
	1-6	1.96e-03	281,164,432	552,434	37.3
	6-11	1.96e-03	228,196,216	447,005	30.2
	11-16	1.57e-03	164,356,460	258,106	17.4
	16-21	9.70e-04	135,292,058	130,592	8.8
	21-26	5.80e-04	94,347,938	54,980	3.7
	26-31	3.30e-04	68,599,294	22,365	1.5
	31-36	1.80e-04	46,825,364	8,519	0.6
	36-41	2.30e-04	21,079,188	4,788	0.3
	41-46	1.40e-04	6,817,850	970	0.1
	Total Fish (all sizes)			**1,479,846**	
	Total Fish Below Thermocline (all sizes)			**91,710**	
	Fish Per Acre			**105**	

Appendix B. Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence, and percent occurrence of prey items found in northern pike stomachs (n = 12) sampled in Tiber Reservoir, Montana, during June-September, 2001.

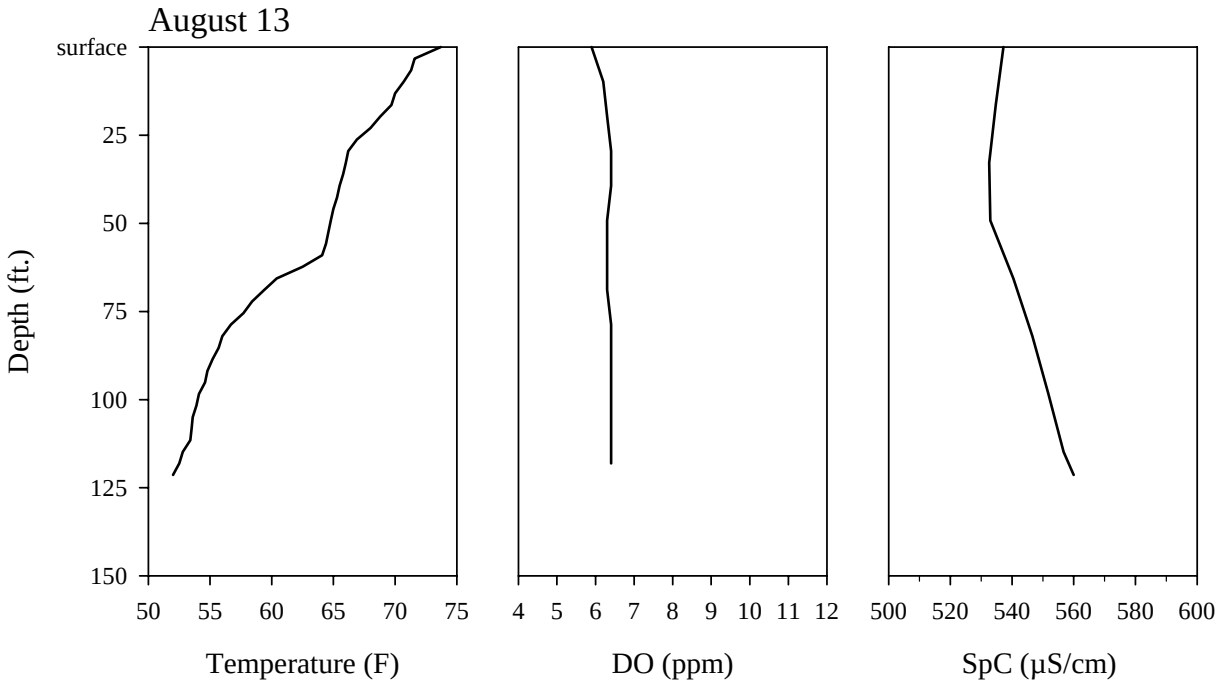
Prey item	Biomass (g)	Biomass (%)	Number	Number (%)	Frequency of occurrence	Percent occurrence
Unidentified fish	6.47	0.1	1	4.5	1	8.3
Spottail shiner	5.52	1.1	1	4.5	1	8.3
Yellow perch	11.76	2.3	2	9.1	2	16.7
Common carp	0	0	0	0	0	0
Cisco	316.50	61.9	1	4.5	1	8.3
Misc. fish	121.37	23.7	1	4.5	1	8.3
Crayfish	55.92	10.9	16	72.7	6	50.0
Ephemeroptera	0	0	0	0	0	0
Diptera	0	0	0	0	0	0
Odonata	0	0	0	0	0	0
Amphipoda	0	0	0	0	0	0
Other aquatic organisms	0	0	0	0	0	0
Total	511.39	100	22	100		

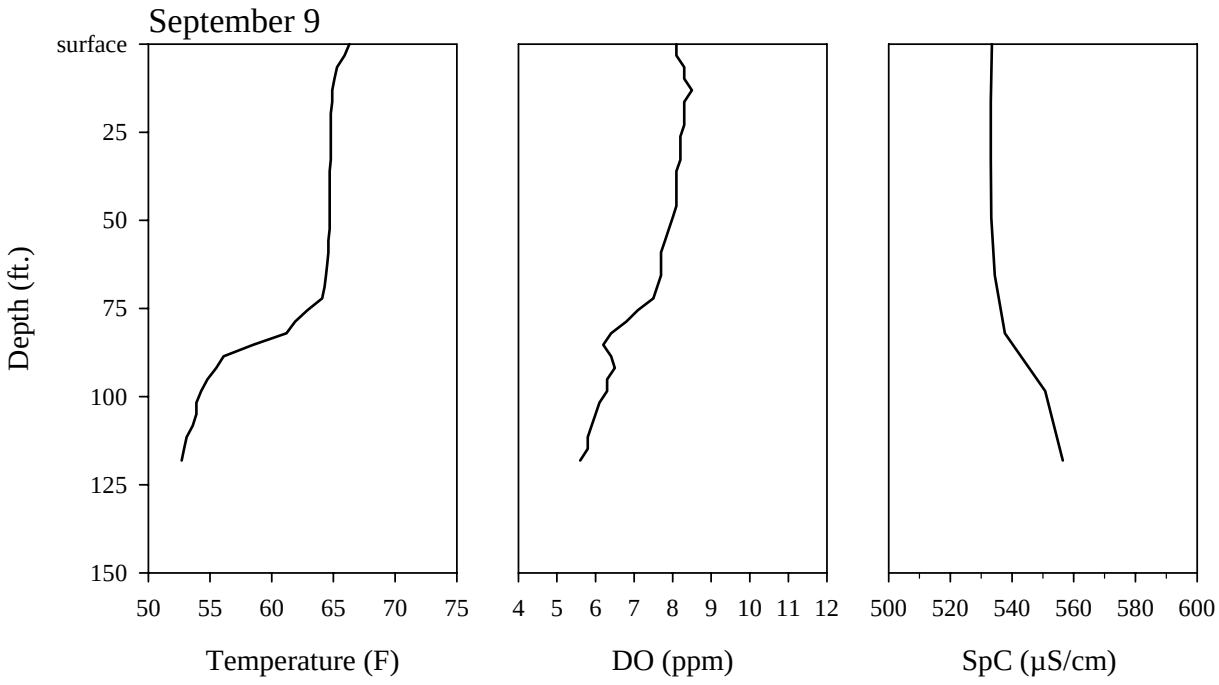
Appendix C. Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence, and percent occurrence of prey items found in walleye stomachs (n = 83) sampled in Tiber Reservoir, Montana, during June-September, 2001.

Prey item	Biomass (g)	Biomass (%)	Number	Number (%)	Frequency of occurrence	Percent occurrence
Unidentified fish	21.16	8.8	24	4.3	19	22.9
Spottail shiner	52.50	21.9	23	4.2	19	22.9
Yellow perch	63.82	26.6	19	3.4	14	16.9
Common carp	37.47	15.6	8	1.4	4	4.8
Cisco	0	0	0	0	0	0
Misc. fish	14.07	5.9	5	0.9	4	4.8
Crayfish	36.63	15.2	30	5.4	15	18.1
Ephemeroptera	12.13	5.0	126	22.8	28	33.7
Diptera	0.59	0.2	203	36.7	16	19.3
Odonata	0.65	0.3	21	3.8	10	12.0
Amphipoda	0.73	0.3	86	15.6	10	12.0
Other aquatic organisms	0.53	0.2	8	1.4	6	7.2
Total	240.28	100	553	100		

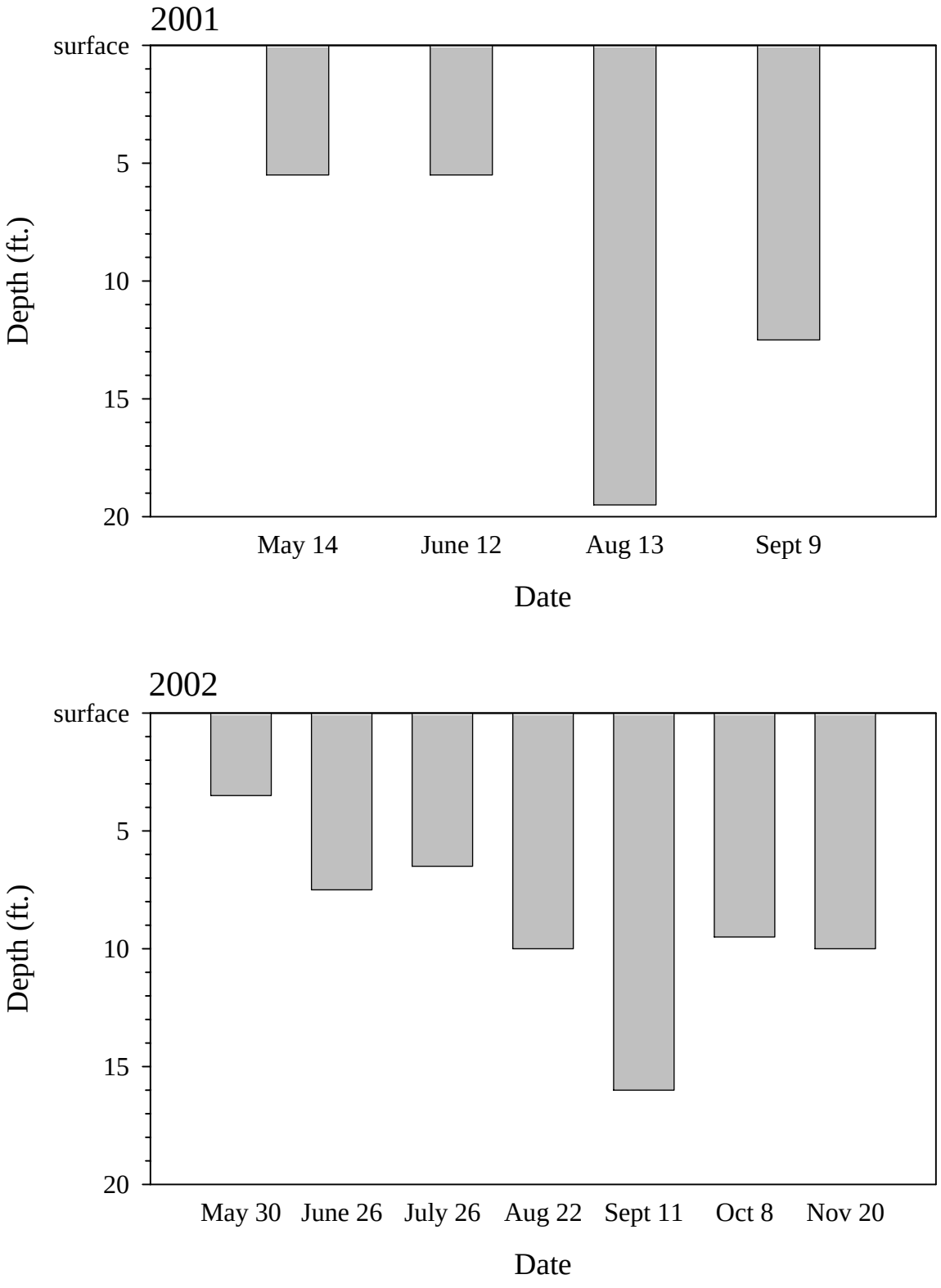


Appendix D. Water temperature, dissolved oxygen (DO), and specific conductivity (SpC) profiles measured at Tiber Dam sampling station on Tiber Reservoir, Montana, during 2001.





Appendix D. Continued.



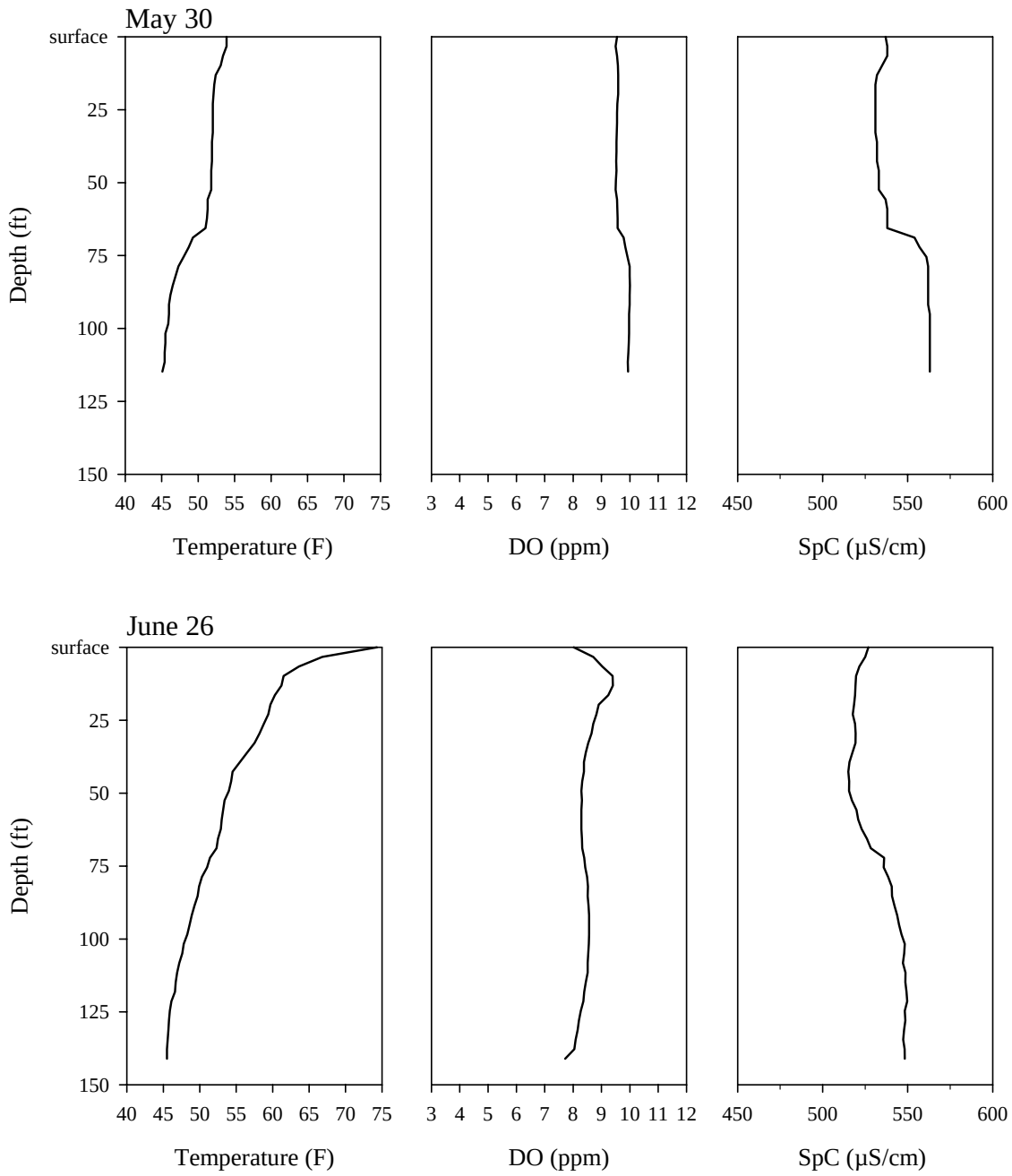
Appendix E. Depth of photic zone (as measured by secchi disk) at Tiber Dam sampling station on Tiber Reservoir, Montana, during 2001 and 2002.

Appendix F. Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence, and percent occurrence of prey items found in northern pike stomachs (n = 23) sampled in Tiber Reservoir, Montana, during June-September, 2002.

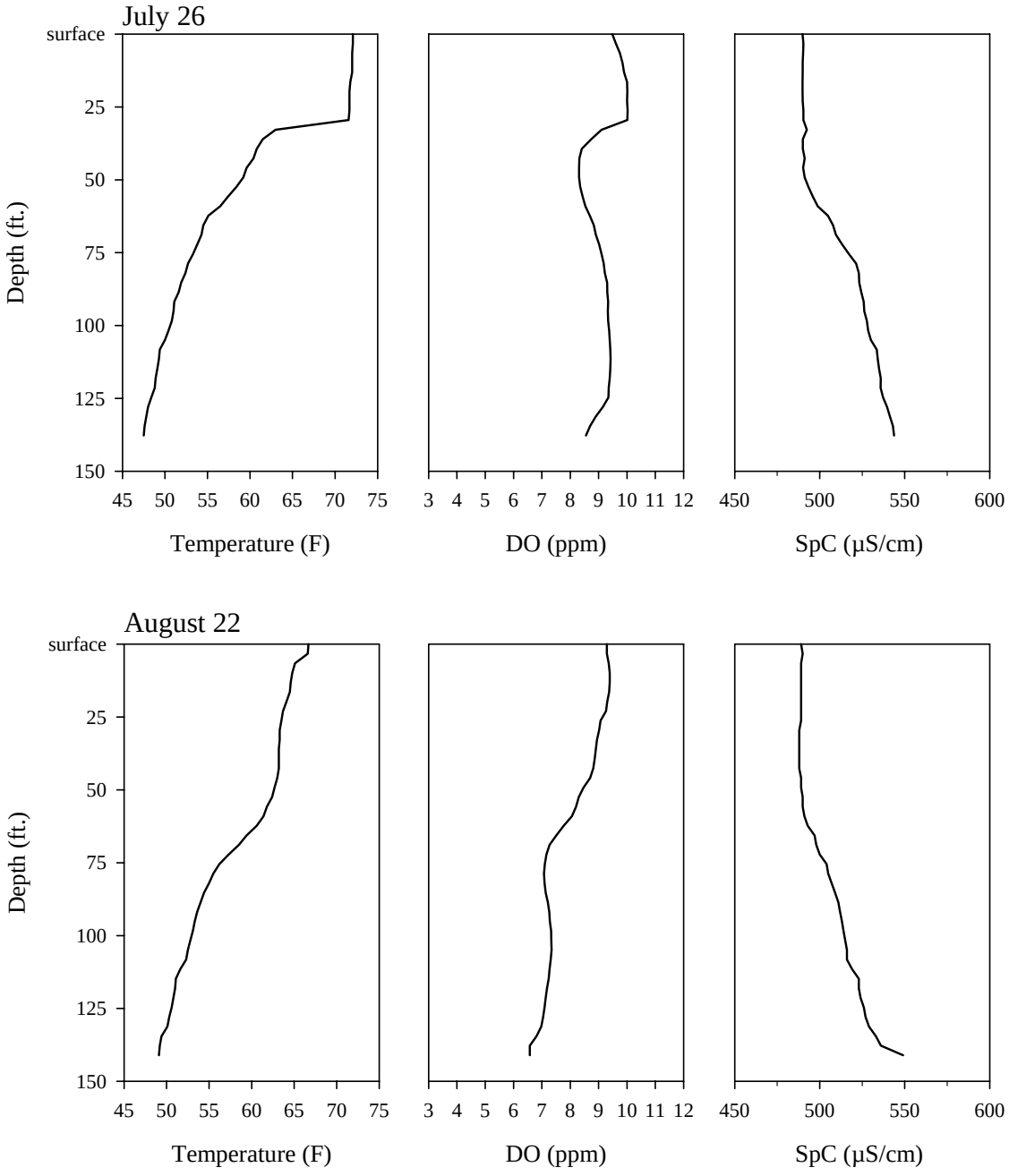
Prey item	Biomass (g)	Biomass (%)	Number	Number (%)	Frequency of occurrence	Percent occurrence
Unidentified fish	17.72	7.1	7	17.5	7	30.4
Spottail shiner	0	0	0	0	0	0
Yellow perch	53.46	21.5	3	7.5	3	13.0
Common carp	65.55	26.4	17	42.5	8	34.8
Cisco	22.22	9.0	2	5.0	2	8.7
Misc. fish	86.81	35.0	5	12.5	5	21.7
Crayfish	2.06	0.8	4	10.0	3	13.0
Ephemeroptera	0.34	0.1	2	5.0	2	8.7
Diptera	0	0	0	0	0	0
Odonata	0	0	0	0	0	0
Amphipoda	0	0	0	0	0	0
Other aquatic organisms	0	0	0	0	0	0
Total	248.16	100	40	100		

Appendix G. Summary of biomass, percent composition of biomass, number, percent composition of number, frequency of occurrence, and percent occurrence of prey items found in walleye stomachs (*n* = 130) sampled in Tiber Reservoir, Montana, during June-September, 2002.

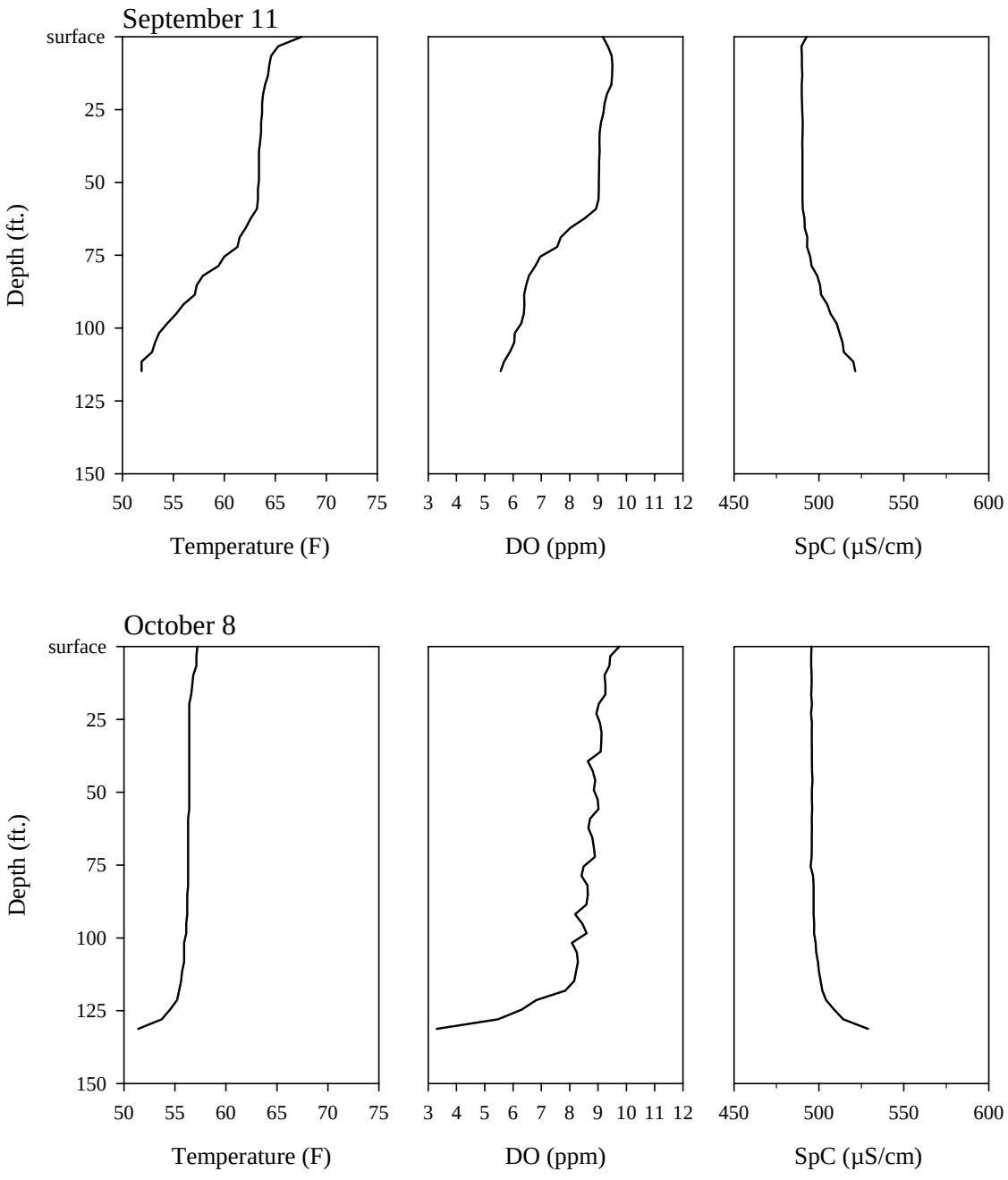
Prey item	Biomass (g)	Biomass (%)	Number	Number (%)	Frequency of occurrence	Percent occurrence
Unidentified fish	6.05	1.3	16	1.8	15	11.5
Spottail shiner	49.28	10.5	30	3.4	24	18.5
Yellow perch	63.85	13.7	19	2.1	10	7.7
Common carp	227.71	48.7	88	9.9	37	28.5
Cisco	15.34	3.3	2	0.2	2	1.5
Misc. fish	4.11	0.9	4	0.4	4	3.1
Crayfish	31.19	6.7	31	3.5	13	10.0
Ephemeroptera	68.14	14.6	509	57.0	75	57.7
Diptera	0.29	0.1	118	13.2	28	21.5
Odonata	1.12	0.2	46	5.2	26	20.0
Amphipoda	0.14	<0.1	22	2.5	15	11.5
Other aquatic organisms	0.07	<0.1	8	0.9	8	6.2
Total	467.29	100	893	100		



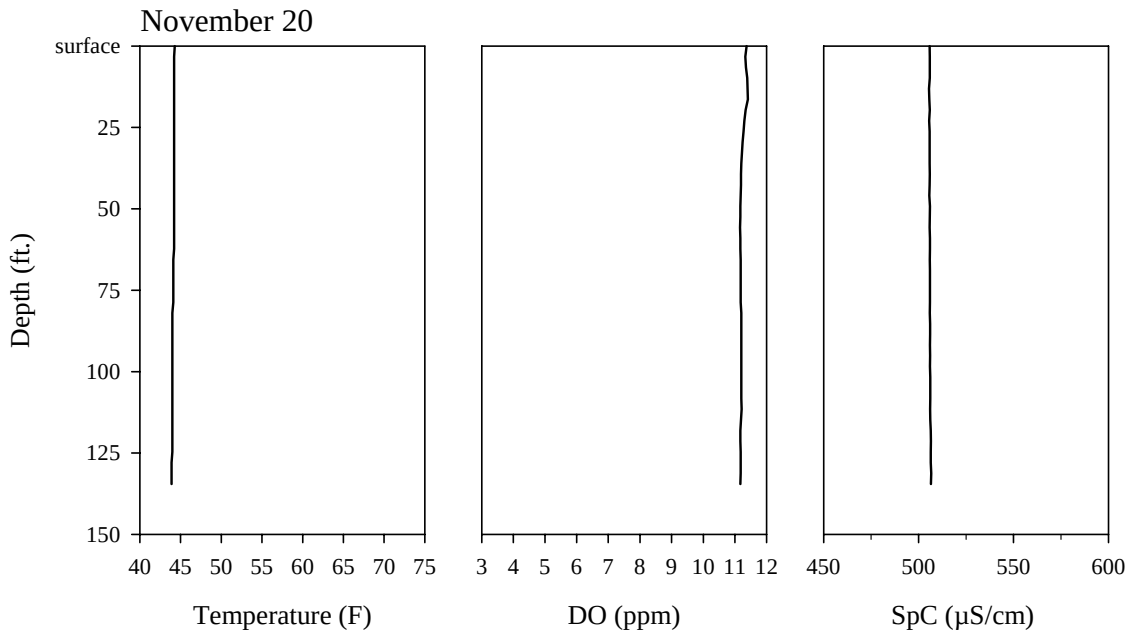
Appendix H. Water temperature, dissolved oxygen (DO), and specific conductivity (SpC) profiles measured at Tiber Dam sampling station on Tiber Reservoir, Montana, during 2002.



Appendix H. Continued.



Appendix H. Continued.



Appendix H. Continued.