Pallid Sturgeon and Shovelnose Sturgeon in the Missouri River from Fort Peck Dam to Lake Sakakawea and in the Yellowstone From Intake to its Mouth

Fort Peck Pallid Sturgeon Study

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FINAL REPORT

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ABSTRACT

Pallid and shovelnose sturgeon were observed throughout the study area by netting, radio telemetry, SCUBA and angler contacts. From 1989 - 1993, 55 different pallid sturgeon and over 1000 shovelnose sturgeon were captured by the Montana Department of Fish Wildlife and Parks during netting and SCUBA diving. A character index, based on morphological measurements, differentiated pallid from shovelnose sturgeon. Based on this index and field observation, no suspected pallid/shovelnose hybrids were captured during the study. Pallids ranged in fork length from 1090 - 1566 mm, while shovelnose ranged from 190 - 943 mm. Drift netting effort was concentrated in known pallid habitat and resulted in average catch rates during 123 hours of netting (1012 drifts) of 0.4 pallids/hour and 8.0 shovelnose/hour. All pallids caught with drift netting were captured on the Yellowstone near its mouth or below the confluence of the Yellowstone and Missouri Rivers. Seven pallids and three shovelnose were recaptured during drift netting. Radio and/or sonic transmitters were placed on 29 pallid and 30 shovelnose sturgeon. All pallids in the confluence/Yellowstone area generally resided below the confluence from August - April and moved up into the Yellowstone in April and May. Most shovelnose in this area remained in the Yellowstone year long, but some were found downstream of the confluence from August - October. Sturgeon telemetered in the Fort Peck tailrace exhibited different behavior patterns. Pallids tended to move downstream in April and return to the tailrace by the winter months, while shovelnose stayed in the tailrace area year long. Pallid sturgeon movement from the tailrace to below the confluence (300 km) was documented. Standardized sampling done in 1993, constituted 22.8 hours and 249 drifting efforts of 90 total km and resulted in capture of 184 shovelnose and 0 pallid sturgeon. During standardized sampling shovelnose were captured most frequently in upstream stations in both the Yellowstone and Missouri over gravelly substrate. Gill nets (2.5 and 5 cm mesh) were found to be better than trammel nets (25.4 cm outer, 5 cm inner mesh) at capturing sturgeon less than 651 mm. Four candidate endangered species were captured during the study, including sicklefin chub, sturgeon chub, blue sucker and paddlefish.

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DISCLAIMER

Mention of commercial products in this report does not imply endorsement by the Montana Department of Fish, Wildlife, and Parks.

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INTRODUCTION

In response to sightings of pallid sturgeon (*Scaphirhynchus albus*) in the Fort Peck tailrace and potential listing of this candidate endangered species, the U. S. Army Corps of Engineers (USACOE) began funding pallid sturgeon research downstream of Fort Peck Dam in April 1989. The USACOE continued to fund this study through 1993. In 1993, the Montana Department of Fish, Wildlife and Parks (MDFWP) and U.S. Fish and Wildlife Service (USFWS) Section 6 dollars provided additional funds. This report summarizes research completed from 1989 - 1993. Much of this information has been previously reported (Tews and Clancey 1993; Clancey 1992, 1991, 1990). The pallid sturgeon was listed as endangered in October, 1990 and a pallid sturgeon recovery plan was signed on November 8, 1993. The draft recovery plan (USFWS 1993a) lists the study area as a priority reach for pallid sturgeon recovery efforts. North Dakota does not allow harvest of pallid or shovelnose sturgeon *(S. platorynchus)*, and Montana regulations prohibit harvest of pallid sturgeon and harvest of shovelnose greater than 16 pounds.

From 1989 - 1992 research focused on finding pallid sturgeon with drift netting and SCUBA surveys, perfecting telemetry in the deep, high conductivity water of the 480 kilometers (km) study area, and obtaining habitat measurements from telemetered fish. In 1993, the USACOE changed the focus of the study to a standardized sampling scheme. Shovelnose sturgeon are closely related to pallid sturgeon (Phelps and Allendorf, 1983) and have been studied throughout this project.

The objectives of this study were to; 1) identify potential spawning areas, seasonal habitat use and migration patterns of adult shovelnose and pallid sturgeon in the study area by using telemetry and habitat measurements; 2) conduct drift netting surveys for adults, juvenile and YOY sturgeon in efforts to find evidence of reproduction; 3) tag all sturgeon and 4) measure morphometric characteristics to investigate pallid/shovelnose hybridization. Standardized sampling was used to obtain sturgeon distribution and abundance information from a variety of reaches and habitat types. Initiation of standardized sampling in 1993, required the MDFWP to decrease the use of radio telemetry and netting for pallid sturgeon in likely habitats. The void in telemetry research was filled by the Montana Cooperative Fish Research Unit at Montana State University (MSU) when they began a three year pallid sturgeon telemetry project in 1992. That project continues to complement the MDFWP/USACOE study.

MDFWP is conducting two other pallid sturgeon studies, one on the Missouri River between Fort Peck Reservoir and Fort Benton (Gardner 1990, 1991, 1992), and one in cooperation with the Bureau of Reclamation, on the Yellowstone River, between Intake Diversion Dam near Glendive and Cartersville Diversion Dam near

Forsyth (Watson and Stewart 1991; Backes et al. 1992). MDFWP has also been studying the post-hatch drift of larval sturgeon and paddlefish in the Yellowstone and in the Missouri near the confluence since 1991 (Gardner 1992).

In conjunction with these other studies the Fort Peck Pallid Sturgeon Study continues to provide insight into the population status of pallid sturgeon. The study area is unique in that it contains two large rivers with extremely different characteristics; the Missouri, with flow and sediment regimes which have been dramatically altered by man, and the undammed Yellowstone, which even today exhibits qualities similar to those under which the pallid evolved. Presence of relatively high numbers of adult pallid sturgeon along with four candidate endangered fish species including, blue sucker (*Cycleptus elongatus*), sicklefin chub (*Machrybopsis meeki*), sturgeon chub (*M. gelida*) and paddlefish (*Polyodon spatulata*), indicate the biological integrity of this ecosystem and its importance in maintaining native fish species. This area is also home to the endangered least tern (*Sterna antillarum*) and the threatened piping plover (*Charadrius melodus*).

STUDY AREA

The study area is the approximately 370 km of the regulated but unchannelized Missouri River from Fort Peck Dam, Montana downstream to the headwaters of Lake Sakakawea, North Dakota, and the 114 km of the Yellowstone River from its mouth upstream to Intake Diversion Dam (Figure 1). The study area can be divided into four distinctly different reaches; 1) Fort Peck tailrace and dredge cuts; 2) Missouri above the Yellowstone; 3) Missouri below the Yellowstone confluence; 4) Yellowstone River.

The Missouri River has been dramatically altered by seven mainstem dams. Hesse et al. (1989) discuss these changes, which include channelization, changes in temperature regime, hydrographs, turbidity, nutrient cycling and sedimentation patterns. Fort Peck Dam, built in 1936, alters the characteristics of the majority of the study area. Below Fort Peck Dam the Missouri River is regulated and exhibits typical dam caused modifications such as daily peaking flows, a compressed hydrograph with reduced spring run-off, increased winter flows (Figure 2), a decrease in summer water temperatures and increased water clarity. Annual discharge of the Missouri River averages 9713 cubic feet per second (cfs) at Fort Peck Dam and 10670 cfs at Culbertson (Table 1). However, drought from 1988 - 1992 and management of Fort Peck Reservoir in 1993, resulted in below normal flows throughout the study period. Annual discharge varied from 67 - 99% at Fort Peck and from 63 - 95% at Culbertson from 1988 - 1992 (Table 1). By September 1993, discharge was only 55% of the annual average.

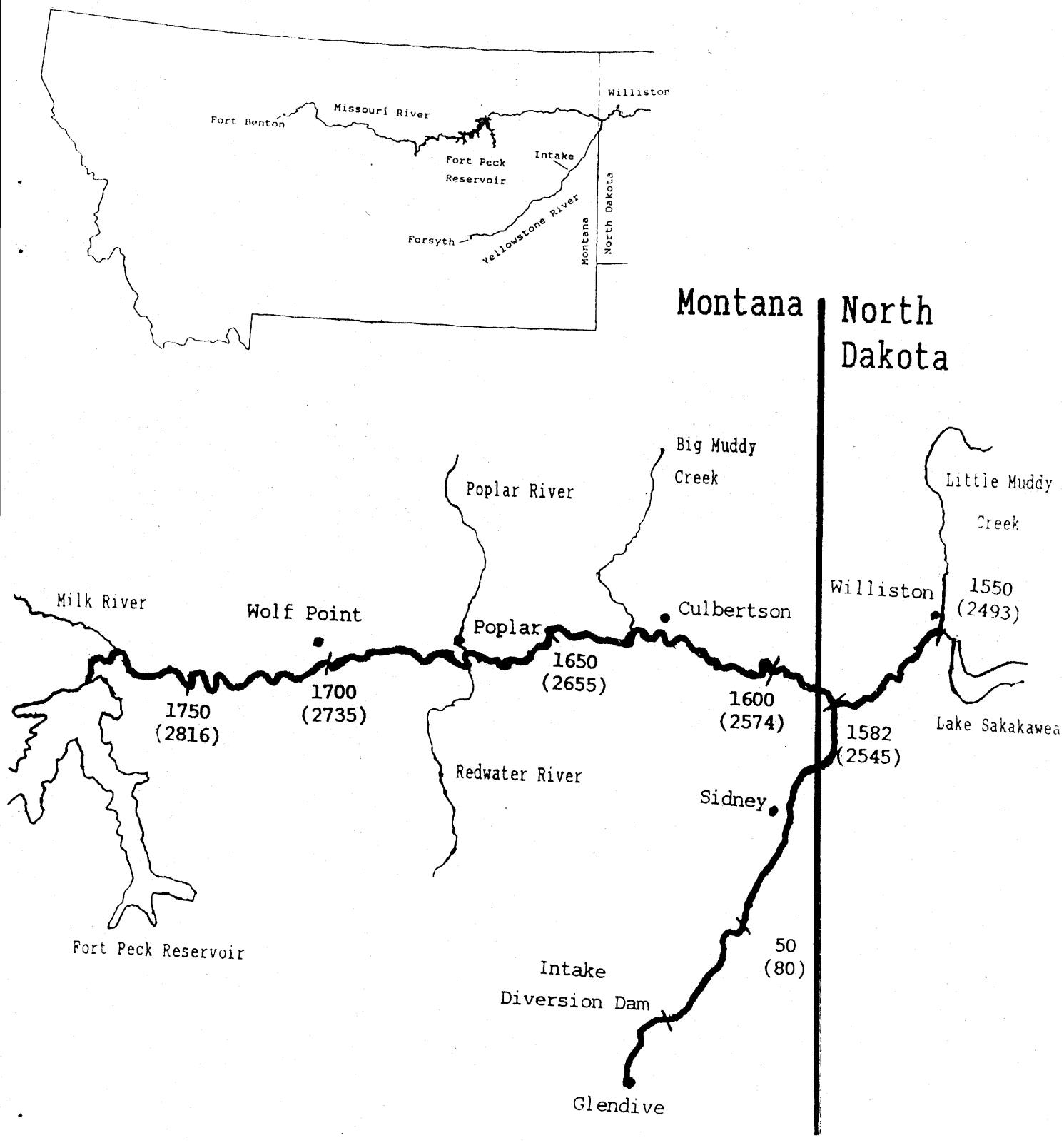

Figure 1. Map of Fort Peck pallid sturgeon study area with river miles (kilometers).

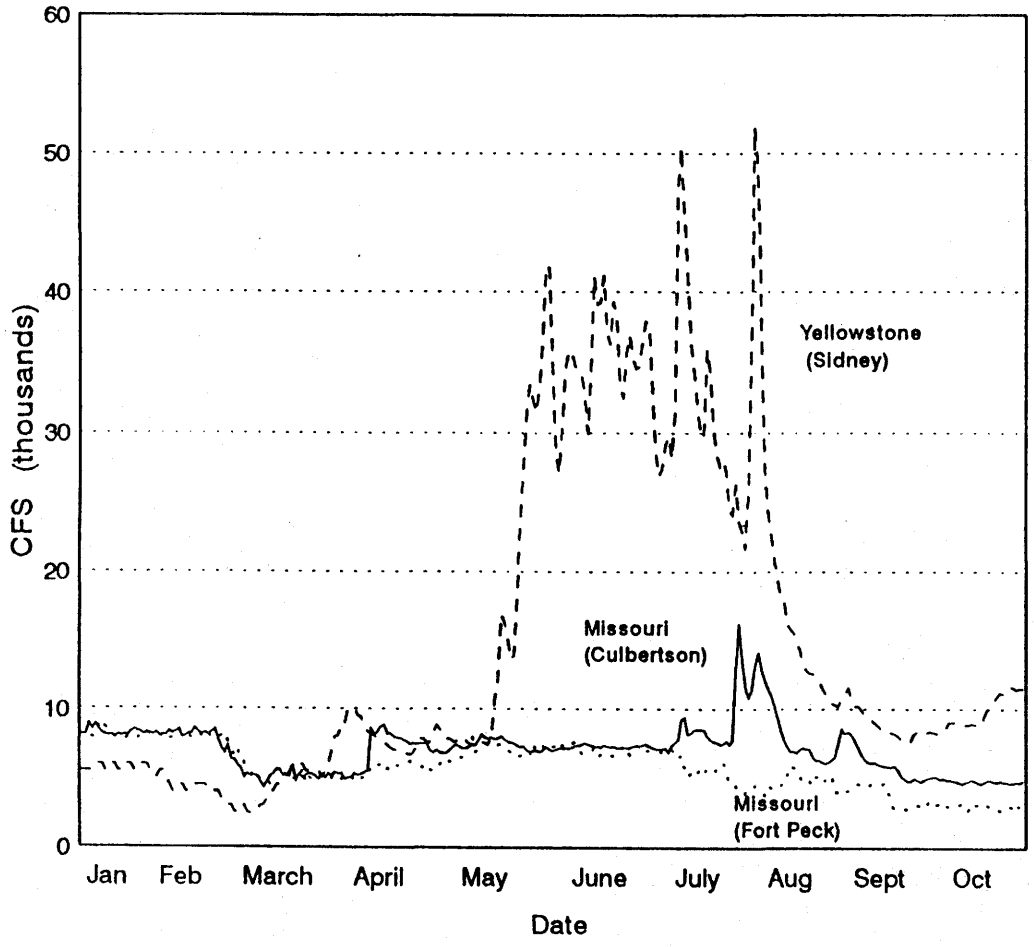

Figure 2. Hydrographs for 1993 of the Missouri River below Fort Peck Dam, the Missouri at Culbertson and the Yellowstone River at Sidney from preliminary USGS data.

Table 1. Average daily mean, maximum and minimum flow at three sites in the study area for 1988 - 1993 calendar year.

Year	Station	Minimum	Maximum	Mean
1988	Fort Peck	4300	12200	7862
	Culbertson	4100	13000	8118
	Sidney	1390	32200	6971
1989	Fort Peck	5000	13400	9623
	Culbertson	5940	13700	10080
	Sidney	800	36700	9096
1990	Fort Peck	3295	13100	8082
	Culbertson	4500	14000	8430
	Sidney	1800	36600	9321
1991	Fort Peck	2995	8190	7234
	Culbertson	3400	16100	7948
	Sidney	3500	62200	13050
1992[1]	Fort Peck	2830	8800	6530
	Culbertson	3210	9200	6700
	Sidney	4310	39300	10253
1993[2]	Fort Peck	2700	8700	5731
	Culbertson	4300	16200	7061
	Sidney	2400	51900	14814
Average[3]				
1944-1992	Fort Peck	16	35400	9713
1958-1992	Culbertson	2000	52000	10670
1967-1992	Sidney	800	111000	12660

[1] preliminary data
[2] preliminary data from January - October 20
[3] water year (October - September)

The hydrograph has been further compressed for threatened and endangered species management. For instance, during 1993, as flow in the Milk River increased, outflow from Fort Peck dam was decreased to prevent flooding of nesting sites for the piping plover and least tern (USACOE 1993). Future plans call for similar management (Ibid). Such management accentuates the lack of high flows, which are likely needed for sturgeon spawning and rearing (USFWS 1993a) and are the conditions under which birds as well as fish evolved.

Power peaking was curtailed from April 1990 - July 1992 during a Fort Peck powerhouse retrofit. Once modifications were complete, daily fluctuations were usually over 60 cm (2 feet) in the Fort Peck tailrace (Figure 3). Power peaking was also curtailed during extremely low flows (mean releases of 3000 - 4000 cfs) from September - November 1992 and 1993.

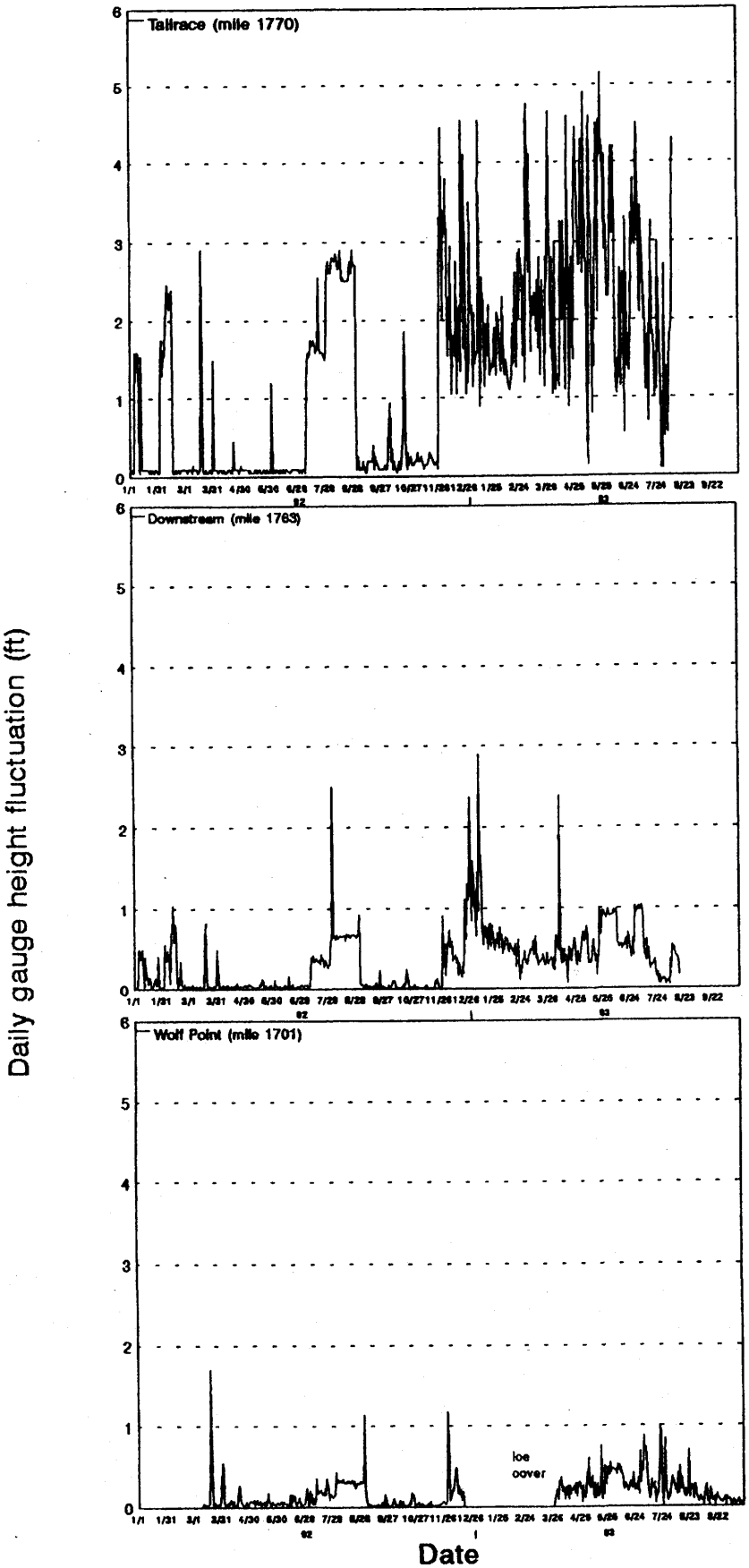

Figure 3. Daily hydrograph of the Missouri at three sites below Fort Peck Dam.

Comparison of gauge height fluctuations from April 1 - July 1 during 1992 and 1993 shows that once power peaking was re-initiated, average daily fluctuations increased from 3 cm (0.10 ft) to 80 cm (2.64 ft) in the Fort Peck tailrace. The 80 cm change was dampened to 18 cm (0.60 ft) 11 km downstream and to 9 cm (0.29 ft) 113 km below Fort Peck dam. This is about 50% of the fluctuation found below Garrison Dam (Elstad et al. 1992).

The 16 km of river from Fort Peck Dam to the Milk River confluence have severe erosion problems and have been physically altered. The lotic habitat has rock and gravel substrate that is typically covered with green-algae mats and is from 0.3 - 1.5 m deep. This area also contains the Fort Peck tailrace and the dredge cuts, lake-like areas that were excavated during dam construction (Gardner and Stewart 1987). These dredge cuts provide a sport fishery and rise and fall with the tailrace, thereby diminishing the downstream effects of power peaking. In this area, much of the "river" is up to 14 m deep and current velocity is extremely slow.

Inflow from the Milk (km 2831) and Poplar Rivers (km 2701) increase turbidity and temperature in the Missouri River. However, temperature is about 3° C colder at Culbertson (km 2608) than would be found in natural conditions (Gardner and Stewart 1987). In Montana, the Missouri River gradient varies from 0.6 ft/mile near the Milk River to 1.5 ft/mile near the Redwater River. The river becomes depositional near Wolf Point and is characterized by shifting sandbars near Culbertson (Gardner and Stewart 1987). The confluence of the Missouri and the Yellowstone Rivers is 5 km downstream of the Montana border. Below this confluence, the Missouri is up to 11 m deep, has shifting sand bars, moderate to fast current and numerous snags. When Lake Sakakawea is at full pool (564 m) there are only about 24 km of river between the confluence and the headwaters of Lake Sakakawea (Power et al. 1992). However, due to abnormally low pool conditions in Lake Sakakawea, throughout this study there have been about 50 - 80 km of free flowing river downstream of the Yellowstone confluence.

In contrast to the Missouri, the Yellowstone River has no major dams. Run-of-the-river irrigation dams are present and when Yellowtail Dam was built on the Bighorn River in 1966, 30% of Yellowstone's flow (at Sidney) was regulated (Koch et al. 1977). Yellowtail Dam operations do compress seasonal maximum and minimum flow (Ibid), but the Yellowstone still exhibits a near natural hydrograph (Figure 2) and water quality characteristics. Average annual discharge of the Yellowstone is 12,660 cfs. In contrast to the Missouri which had below average flows for all 6 years of the study, the Yellowstone was below average for just 4 years, ranging from 55 - 103% of normal from 1988 - 1992. Based on flows through October 1993, the Yellowstone may exceed 110% of normal in 1993. The Yellowstone River below Intake is