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PADDLEFISH AND PALLID STURGEON SPAWNING HABITAT STUDY IN THE AREA OF THE ALTAMONT GAS TRANSMISSION COMPANY'S PROPOSED PIPELINE CROSSING OF THE WILD AND SCENIC MISSOURI RIVER.

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January 1991

INTRODUCTION

The Missouri River in north-central Montana has been the focus of several Montana Department of Fish, Wildlife, and Parks (MDFWP) studies in the past 10-12 years (Berg 1981, Gardner and Berg 1982, Drewes and Gilge 1986). This section of the river is classified by the United States Congress as a Wild and Scenic River, and as such, requires special concern regarding potential impacts caused by man's activities. MDFWP has categorized the Missouri River from Morony Dam to Fort Peck as a Class I water, identifying it as having a high value fishery resource. The present study was conducted by MDFWP for the Montana Department of Natural Resources and Conservation and the Altamont Gas Transmission Company (Altamont), in the vicinity of the Altamont natural gas pipeline as it is proposed to cross the Missouri River between the town of Virgelle and the Coal Banks Landing. Two potential inhabitants of the area are of prime concern. The pallid sturgeon was listed as an Endangered Species by the American Fisheries Society (AFS) in 1979, and by the U.S. Fish and Wildlife Service (USFWS) in September, 1990. Paddlefish have been listed as a Species of Special Concern by AFS since 1979, and are presently being reviewed for designation as a Threatened species by USFWS. The paddlefish population that uses the Wild and Scenic Missouri River for spawning is one of only five self sustaining populations in the United States.

STUDY AREA

The study area was defined as that segment of the Missouri River from Sixmile Coulee, near Stranahan, to Alkali Coulee, a distance of approximately 12.5 river miles (Figure 1). The study area is periodically referred to in this report as the Coal Banks area. The Terms of Reference suggests a four mile study area, however, we felt a larger area was appropriate because of the extensive use of this river section by paddlefish (Berg 1981). This section contains two of the nine paddlefish spawning areas described by Berg (1981) and confirmed by Gardner (pers. comm.). The potential exists for the effects of construction to impact paddlefish areas that are not within the proposed four mile study area.

The river-bottom throughout the section is composed mostly of gravel, though some areas of silt are present. Several dams regulate the river upstream of the study area, the closest being Morony Dam, 74 miles above Coal Banks Landing. A more complete description of the area can be found in Drewes and Gilge (1986) and Gardner and Berg (1982).

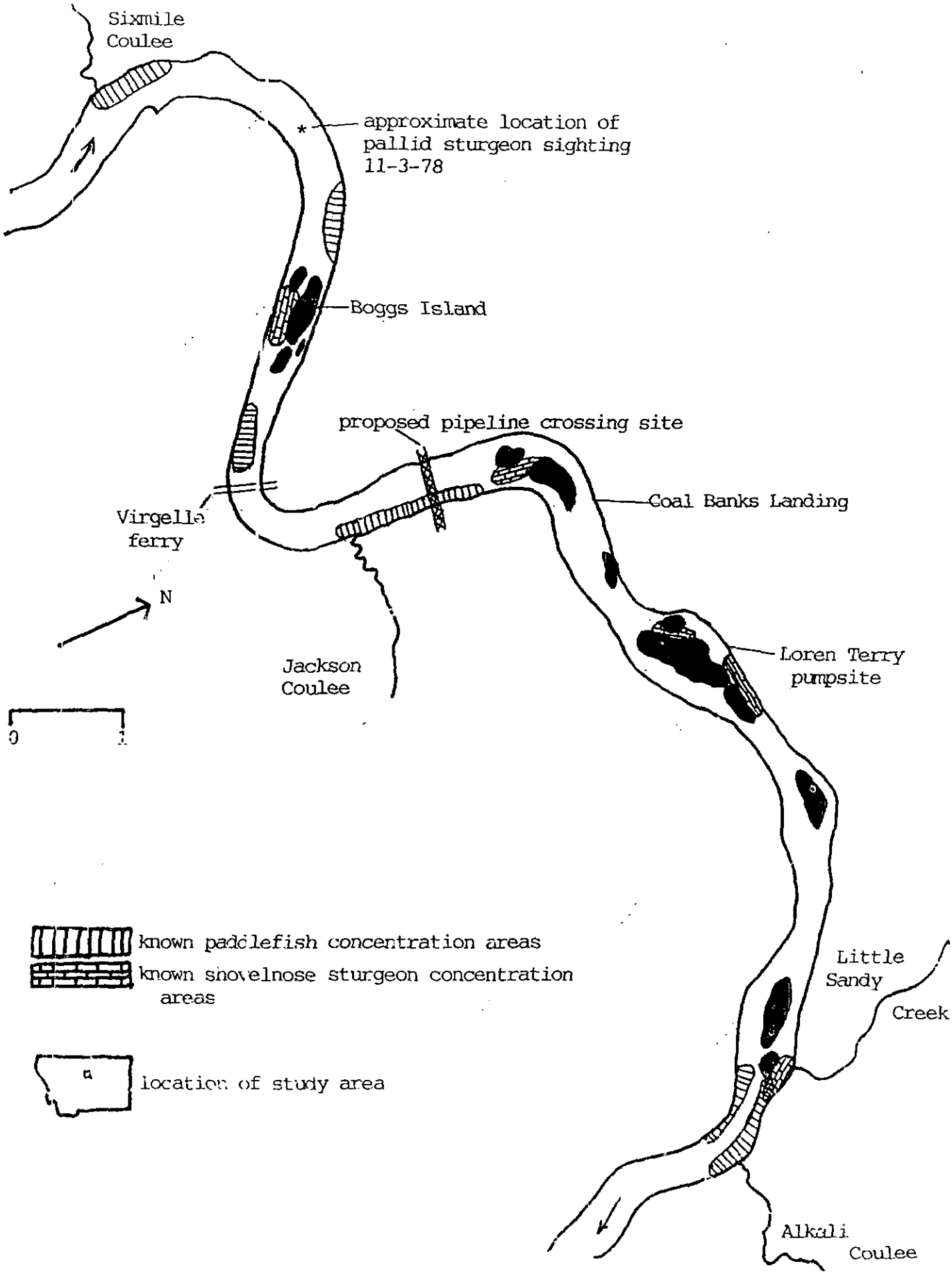

Figure 1. Map of the study section (adapted from Drewes and Gilge 1986). Pallid sturgeon and paddlefish locations from Gardner (pers. comm.) and shovelnose locations from Drewes and Gilge (1986).

METHODS

A 20 foot aluminum Wooldridge jetboat was used during field operations. This boat is equipped for boom mounted electrofishing, and was also used for setting and drifting gillnets, larval fish sampling, deploying set lines, and surveying the study section with an electronic fish finder.

During June, we electrofished for adult paddlefish. Effort was uniform throughout the study area. We used a Coffelt VVP-15 powered by a Honda 5000 watt generator. We set the power output similar to that described by Berg (1981)- 120 volts DC pulsed at 120-160 pulses/second, pulse width of 40-50 percent, 6-8 amps.

Two types of gillnets were used during the study- 125' experimental nets, composed of 25' panels of 3/4", 1", 1-1/4", 1-1/2", and 2" mesh netting, and 100' nets of 3" bar mesh. Nets were either set overnight or were drifted perpendicular to the current with one end tied to the front of the boat. Primary target species were paddlefish and pallid sturgeon. The entire study area was surveyed, but the section between the Virgelle ferry and the islands by Coal Banks Landing were most intensively surveyed.

Larval drift-nets were used to sample for immature paddlefish, sturgeon, and other species. The pipeline crossing site was the primary site where larval fish samples were taken, and other selected sites were sampled as well. The drift-nets are 3½ meters long with a 3/4 meter diameter circular mouth. The netting itself is 750 micron (.75 mm) Nitex netting. The cod end is affixed to a collecting bucket. The empirical efficiency of the nets is estimated to be 90-95 percent (Jackie Halstead, Research Nets, Inc., Bothell, Washington, personal communication). Generally, one net was attached to a nylon rope off each side of the boat, and the rope was weighted with a section of railroad iron causing the net to fish near the river bottom. Sampling was conducted at sites previously identified as paddlefish and sturgeon locations, in the area proposed for the pipeline crossing, and near the Loren Terry pump site (Drewes and Gilge 1986, Gardner pers.comm.). The nets were fished in the deepest area of the channel at each sampling site. This activity was usually carried out either late at night or early in the morning. Gardner (pers. comm.) has determined that larval paddlefish migrate during the dusk, dark, and dawn hours, in the deepest areas of the channel. The nets were fished for a 5 minute period. A General Oceanics Model 2035-MK III velocity meter was used to measure current velocity necessary to calculate filtering volume of the nets. The current velocity was measured at, or as close as possible to, the mouth of the net.

An Impulse 2800 Plus fish finder was used to survey for large fish such as paddlefish and pallid sturgeon, and to determine the approximate bottom contours of the river for netting purposes. The Impulse emits a 45 degree cone, so provides a more complete picture

of the river bottom than other fish finders which emit a narrower cone.

Setlines were used in an attempt to capture sturgeon throughout the study area. Minnows and suckers captured by electrofishing in the area, as well as purchased nightcrawlers, were used for bait. The lines were 200 feet in length, and were outfitted with 8-11 droppers per line. They were generally set for a minimum of 10 hours overnight, and sometimes for over 24 hours.

Discharge records for the Virgelle station were obtained from the U.S. Geological Survey (USGS) at Fort Peck.

RESULTS AND DISCUSSION

Fisheries Investigations

One paddlefish was observed in 25 hours of electrofishing surveys during this study. It was not captured, but was estimated to be in the 25-30 pound range, so was probably a male. It was sighted in a known paddlefish spawning area immediately upstream of Boggs Island on June 8 (Figure 1). Berg (1981) determined that an instantaneous discharge of 14,000 cubic feet per second (cfs) must occur at the Coal Banks area for 50 consecutive days to sustain large numbers of paddlefish throughout the area during spawning. In 1978, when these flow conditions were met, he reported sighting 41 paddlefish between the mouth of the Marias River and Hole-in-the-Wall, a 42 mile stretch which includes the present study area. However, he also reported sighting 47 paddlefish in the same stretch of river in 1979 when this discharge was attained for only 23 consecutive days. Fewer paddlefish were documented in 1978, a year that met the flow conditions, than in 1979, a year that did not meet the conditions. The difference is that paddlefish occupied the area for nearly a month longer in 1978 than in 1979. Berg theorized that the 1978 run would have been larger than it actually was had it not been for a severe rainstorm that washed excessive debris into the river downstream of the Coal Banks area and literally drove the paddlefish to near exhaustion, forcing them back downstream to Fort Peck Reservoir. An MDFWP biologist observed 1000-1500 paddlefish drifting downstream near the water surface below the Fred Robinson Bridge in late May, 1978.

During 1990, discharge exceeded 14,000 cfs for only 3 days, from June 1-3 (Figure 2). Although only one paddlefish was sighted during this study, Berg's (1981) data for 1979 implies that the Coal Banks area may be used for paddlefish spawning even though discharges reach 14,000 cfs for less than the 50 day threshold. It is highly unlikely that a paddlefish spawning run occurred in the Coal Banks area in 1990. The low runoff throughout May and June was probably insufficient to draw them to the area. Even if

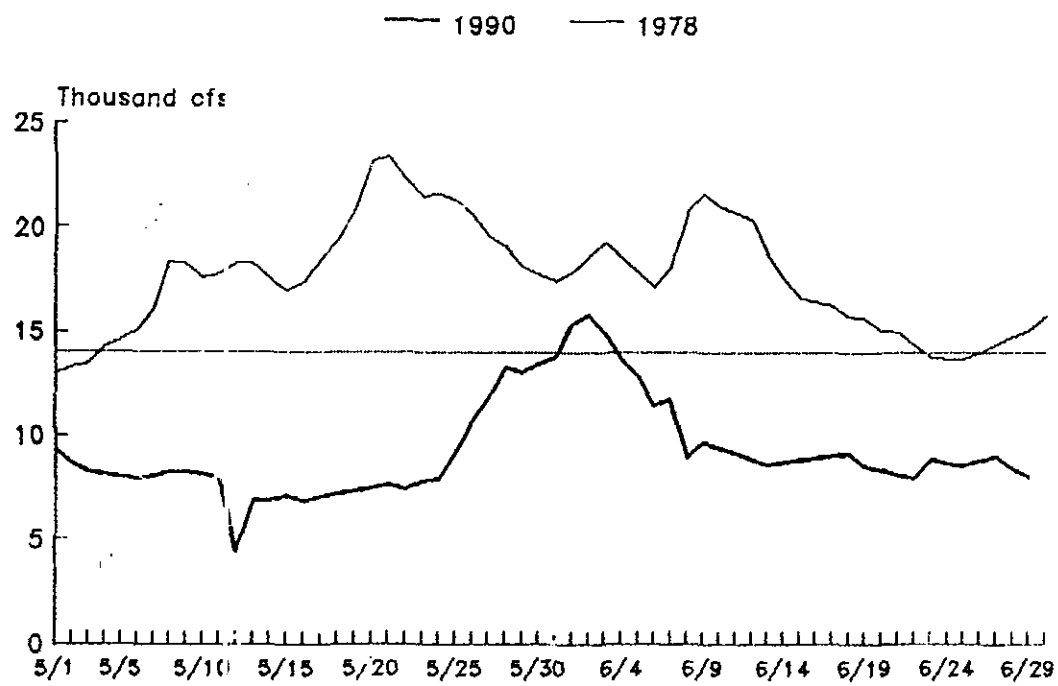

Figure 2. Missouri River discharge at Virgelle in May and June. The straight horizontal line designates 14,000 cfs.

a run did develop, the spawners would have left the area when the discharges dropped below 14,000 cfs in the first week of June. Our first day in the study area was June 8.

Other species sighted during electrofishing surveys included goldeye, river carpsucker, shorthead redhorse, and blue suckers. Blue suckers are designated as a Category 2 species by the USFWS, which indicates that current information possibly warrants listing the species as Threatened or Endangered, but adequate biological information is not on-hand to support an immediate ruling. The blue sucker is considered Threatened within Montana by the Montana Natural Heritage Program.

Drifting of gillnets was an effective means of sampling the local fish assemblage. Shovelnose sturgeon were the most frequently captured species, but the other species mentioned above were also captured. We captured no paddlefish or pallid sturgeon in gillnets. At one point, 14 shovelnose were captured in a single net after less than 1/2 hour of drifting (Table 1). Generally, no more than 5-7 shovelnose were captured in a gillnet, and frequently the nets would snag on submerged trees or their branches. Gillnets set overnight were mostly ineffective in capturing anything except nongame fish. Beginning in July, excessive algae drifting through the study section quickly fouled our gillnets. This severely impaired the efficiency of the nets, whether they were drifted or set overnight.

Sampling for larval fish was carried out on 4 occasions (Table 2). Sampling was initiated one to two weeks past the historical peak of paddlefish spawning in the area. This is because of the late start of the study in general. Numerous organisms were sampled, including many larval suckers and minnows. The only larval fish of interest we caught was a 2-day post-hatch sturgeon. Confirmation was made by personnel of the U.S. Fish and Wildlife Service Larval Fish Laboratory at Colorado State University. The specimen was too young to determine the species-pallid or shovelnose- but the abundance of adult shovelnose sturgeon in the area would suggest it to be of that species. The specimen was captured at the Alkali Coulee sampling site in the July 12 sample. Berg (1981) theorized that shovelnose sturgeon spawn in the Coal Banks area, but verification was nonexistent. The collection of the specimen in this study buttresses his supposition.

Collections made at and near the proposed crossing site consisted predominatly of aquatic invertebrates and larval minnows and suckers, but two larval catfish were also captured. Berg (1981) sampled two paddlefish larvae within the present study area in 1978, one at Coal Banks Landing, the other near the mouth of Little Sandy Creek. It should be noted that these larval paddlefish and the sturgeon captured in this study could have drifted from upstream spawning locations. Because the river in the study section is generally less than ten feet deep, surveys with

Table 1. Selected examples of gillnet drift time and resultant catches of shovelnose sturgeon. Numerous drifts were disrupted due to the nets snagging on submerged vegetation.

Date	time in	time out	catch
6/9/90	1335	1400	4
	1420	1435	5
	1505	1530	9
	1610	1635	2
6/10/90	0920	1015	11
	1230	1255	14
	1440	1520	6
6/28/90	1015	1030	4
	1040	1115	3
7/12/90[1]	0910	0930	3
	0940	1015	2
	1020	1100	3

[1] Drifting algae fouled the nets, decreasing their efficiency.

Table 2. Dates, locations, and physical parameters of larval fish sampling during this study. Volume filtered assumes 90 percent filtering efficiency.

Date	location	# nets fished	time in	time out	water depth	temp	volume filtered
6/29	Alkali Coulee	1	0922	0927	5.5'	70 F	.8 m^3/sec
	Jackson Coulee	2	1004	1010	5.8'	71	1.5
7/11	Jackson	1	2125	2130	5.6'	76	.8
7/12	Alkali	1	0531	0536	5.1'	72	.3
7/12	Jackson-	excessive algae repeatedly clogged the intake on the jet-drive, causing the engine to overheat, and preventing us from getting to the sample site.					
7/25	Jackson	2[1]	2135	2140	5.0'	73	1.3
	Jackson	2[2]	2208	2213	5.7'	--	1.3
	Terry pumpsite	1	2317	2322	4.0'	--	1.7
7/26	Alkali	2	0054	0059	5.2'	--	1.3
8/21	Alkali	2	2312	2317	6.3'	--	.6
8/22	Jackson	2	0024	0029	5.5'	--	1.5

[1] immediately upstream of the proposed pipeline crossing site.
[2] immediately downstream of the proposed pipeline crossing site.

a fish finder are not an efficient means for finding fish, even with a wide angle cone such as the Impulse has. At a depth of 10 feet, the cone diameter is 8.3 feet (Impulse Technology 1989). To locate a paddlefish in the water column, we would need to be almost directly over the top of it. On two separate occasions, the Impulse did indicate large fish targets of the size range we would expect for paddlefish or pallid sturgeon. The targets were on the river bottom, which is the location we would expect a pallid sturgeon, not paddlefish, to occupy. In each case, intensive netting was unsuccessful in capturing anything large enough to explain the target size indicated by the Impulse.

The Impulse was also used to determine the river depth at the crossing site. A transect was run across the river along the proposed pipeline crossing site as described by Joe Elliott, who was on site. At no point along the transect was the river depth more than 6½-7 feet. The transect was run on June 28, when the average daily discharge was 8,450 cfs.

Setlines were not very effective in capturing fish during this study. A few catfish were captured, but no other gamefish. Algae began accumulating on the setline droppers in July, and rendered them ineffective. A total of 14 setline-nights (8-11 droppers/setline) were employed during the study.

Berg (1981) captured a pallid sturgeon while electrofishing in the Coal Banks area in 1978 (Figure 1). Additional documentation of pallid sturgeon has been compiled by Gardner (1990). He lists 35 known pallid sturgeon sightings, including Berg's, between Fort Benton, Montana and Fort Peck Reservoir since 1876. Another pallid sturgeon sighting occurred within or near the study area in 1964, but there is some question as to the exact date and location of this sighting. It appers this pallid was captured 2 miles upstream from the location of Berg's capture, which would locate it out of the present study area.

Pallid sturgeon studies

In general, information on the pallid sturgeon is sparse due to the rarity of the animal and the difficulty in capturing specimens. Attempts to collect basic information about pallid sturgeon, such as behavior characteristics and habitat requirements, have been based on radio telemetry relocations. However, we have not yet discovered a satisfactory method of attaching transmitters to pallids for more than just a few weeks. Because of this, specific habitat requirements and behavior patterns of pallids remain undefined. Both the State of Montana and the USFWS have formed pallid sturgeon recovery teams which will develop and address further research needs. Field methods to locate and capture pallid sturgeon and to measure their habitat preferences are being developed as part of these efforts.

Carlson et al. (1985) identified and documented the hybridization of shovelnose and pallid sturgeon. This indicates that they have similar preferences for spawning. They also found some similarities in the diet of pallid and shovelnose sturgeon, principly that immature aquatic insects comprised the majority of the diet for each species. Trichoptera comprised 34.0 and 37.8 percent of the diet of shovelnose and pallid sturgeon, respectively, and the frequency of occurrence was 74.8 percent in shovelnose and 55.6 percent in pallids. Trichoptera are common in the Coal Banks area (Berg 1981). Fish composed 37.7 percent (by volume) of the diet of pallids compared to 1.6 percent for shovelnose. The frequency of occurrence of fish in the diet, primarily minnows, was higher for pallid sturgeon (55.6%) than for shovelnose (4.3%). Carlson et al. (1985) cited two other studies that report higher incidence of fish in pallid diets and five other studies that report a low incidence of fish in the diet of shovelnose. Gardner and Berg (1982) also found insects comprised nearly the entire diet of shovelnose sturgeon in the Wild and Scenic section of the Missouri River.

Shovelnose sturgeon, paddlefish, and blue suckers occupy the same habitat as pallid sturgeon. All four species have been captured during MDFWP gillnetting operations aimed specifically at pallid sturgeon in the Yellowstone River and in other parts of the Missouri River. All but pallid sturgeon were captured or sighted during this study. Pallid and shovelnose sturgeon have been incidentally caught by anglers snagging for spawning paddlefish at the Intake area on the Yellowstone River, indicating an overlap of their habitats. Pallid and shovelnose sturgeon have been filmed and photographed side-by-side in wintering areas immediately below Fort Peck Dam, where paddlefish and blue suckers also reside during the winter. Pallid and shovelnose have been captured simultaneously in gillnets and on setlines upstream of Fort Peck Reservoir (Gardner, personal communication).

By deduction, the Coal Banks area of the Missouri River is pallid sturgeon habitat. Berg's (1981) documentation of pallid and shovelnose sturgeon, several minnow species, and a variety of aquatic invertebrates, specifically the commonness of Trichoptera, in the area, coupled with shovelnose-pallid hybridization and similarities of diet documented by Carlson et al. (1985), lead to this conclusion. Further evidence comes from research on the pallid sturgeon being conducted by MDFWP in the Missouri River above and below Fort Peck Reservoir (Gardner 1990, Clancey 1990), and from fieldwork performed in past years.

Radio telemetry work below Fort Peck Reservoir has shown pallid sturgeon will generally occupy the deepest portion of the channel, but not in all instances. Relocations of pallid sturgeon mounted with radio transmitters in the Missouri below Fort Peck have shown that they will sometimes reside in water only a few feet deep, despite the availability of nearby areas up to 20-25 feet deep. One radio transmitted pallid sturgeon in the Missouri River below the mouth of the Yellowstone was relocated in 5-6 feet of water on October 4, 1990. It had originally been captured in mid-

September less than 1/2 mile upstream in over 20 feet of water (MDFWP, unpublished data). This may be a result of feeding behavior and local movement patterns.

Two radio transmitted pallid sturgeon were tracked while leaving the Fort Peck tailrace area in 1989. Both of these fish stayed near the north bank of the Missouri River just below the mouth of the Milk River from late March through mid May. Water from the Milk River forms a distinct sediment plume in the Missouri River. Local water quality characteristics are measured at the time of pallid sturgeon relocations. At these relocation sites, Milk River water exhibited turbidities of over 100 JTU's, temperatures ranging from 45-57° F, and current velocities of .35-.40 meters per second (m/s). Similar information for the Missouri River below Fort Peck is not measured by USGS, but is obviously quite different, due to the effects of Fort Peck Dam. In the spring of the year, temperatures are in the 30's and low 40's (due to hypolimnial releases) and water clarity is high.

We did not detect any unusually deep areas within the study area that pallid sturgeon would be most likely to overwinter in. Circumstantial evidence from pallid sturgeon research downstream of Fort Peck indicates that pallids do not need deep holes for overwintering (Clancey 1990, MDFWP unpublished data). A 33 pound pallid was mounted with a radio transmitter in the Fort Peck Dam tailrace on March 10, 1989. This fish was tracked about 45-50 river miles downstream before we determined that it shed it's transmitter in mid-June. It was recaptured in the Fort Peck tailrace on March 10, 1990, and again on January 19, 1991. This indicates that this fish probably remains in the Missouri River between Fort Peck and the North Dakota border during the spring, summer, and fall. Few holes, if any, in this section of the Missouri approach 20 feet in depth. Numerous SCUBA surveys and recreational dives occurred in the Fort Peck tailrace during the winter of 1990, but this particular pallid was not seen in the area until the day it was recaptured that year. This indicates that the fish remained in shallower water through most of the winter that year.

The suitability of the Coal Banks area for pallid sturgeon will become more evident as pallid sturgeon research progresses and habitat characteristics are defined. Gardner (pers. comm.) has captured 5 pallids in the Missouri River 90-120 miles downstream of the present study area, none of which are included on his 1990 historical sightings list of pallid sturgeon above Fort Peck Reservoir.

Generally, it is believed by researchers that Montana was on the edge of the historic pallid sturgeon range, with the greatest abundance in the Dakotas and Nebraska.

CONCLUSIONS

1) Paddlefish did not make a spawning run into the Coal Banks area in 1990, due to low runoff. However, this study did not begin until after peak discharges in the area began receding, which keys the emigration of paddlefish from the area (Gardner, pers.comm.).

2) The study area is suitable pallid sturgeon habitat. The last known pallid sturgeon sighting in the area was in November, 1978.

3) Blue suckers, which could potentially be designated as a threatened or endangered species by the USFWS, reside in the study area.

4) Shovelnose sturgeon are common in the study area, and probably spawn there.

5) The present proposed pipeline crossing site bisects a known paddlefish concentration area which is probably a spawning site.

RECOMMENDATIONS

1) Given that construction is not scheduled until the fall of 1993, continue monitoring the fisheries of the study area, especially for use by the two primary species of concern. This is especially critical if discharges are at or near 14,000 cfs for more than just a few days in the spring. Retain the objectives of the 1990 Terms of Reference (Appendix A).

2) At some point prior to construction, habitat studies should be undertaken in the river. Habitat measurements need to be undertaken in the known paddlefish concentration areas as well as at other sites within the study area that apparently are not paddlefish concentration areas, to determine preferential use characteristics. This work is outlined in an Appendix B of this report.

3) If a pallid sturgeon is captured within the study area, the fish should be examined to determine spawning condition, sex, and morphological and meristic characteristics, and several habitat measurements consistent with those that are currently measured by researchers should be taken at the capture site.

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Appendix A. Objectives of the Paddlefish/Pallid Sturgeon Spawning Habitat Study, as stated in the Terms of Reference.

1) determine locations of paddlefish and pallid sturgeon staging and spawning sites

2) characterize spawning and rearing areas

3) evaluate the effects of the proposed pipeline crossing installation on the identified spawning sites.

Appendix B. Outline of habitat studies to be undertaken in the Missouri River near Virgelle.

1) If adequate discharges occur, refine Berg's (1981) suspected minimum discharge requirement for keying paddlefish to migrate to upstream spawning areas.

2) Define boundries of paddlefish concentration areas, and locate areas that may not have been previously identified.

3) Undertake microhabitat studies to determine habitat characteristics similar to those described by Hubert et al. (1984). This should be performed in known paddlefish concentration areas, and in areas that apparently are not paddlefish concentration areas.

    a. Determine intergravel flow and/or groundwater discharge in known concentration areas and in nearby areas that are not concentration areas.

    b. Compare volume, temperature, and dissolved oxygen concentration of intergravel water collected in known concentration areas to that collected from nearby areas to determine if any of these serve to attract paddlefish.

    c. Analyze and compare substrate composition in known concentration areas and in nearby areas.

    d. Determine average current velocity in concentration areas and nearby areas.

    e. Determine average water depth of concentration areas and nearby areas.

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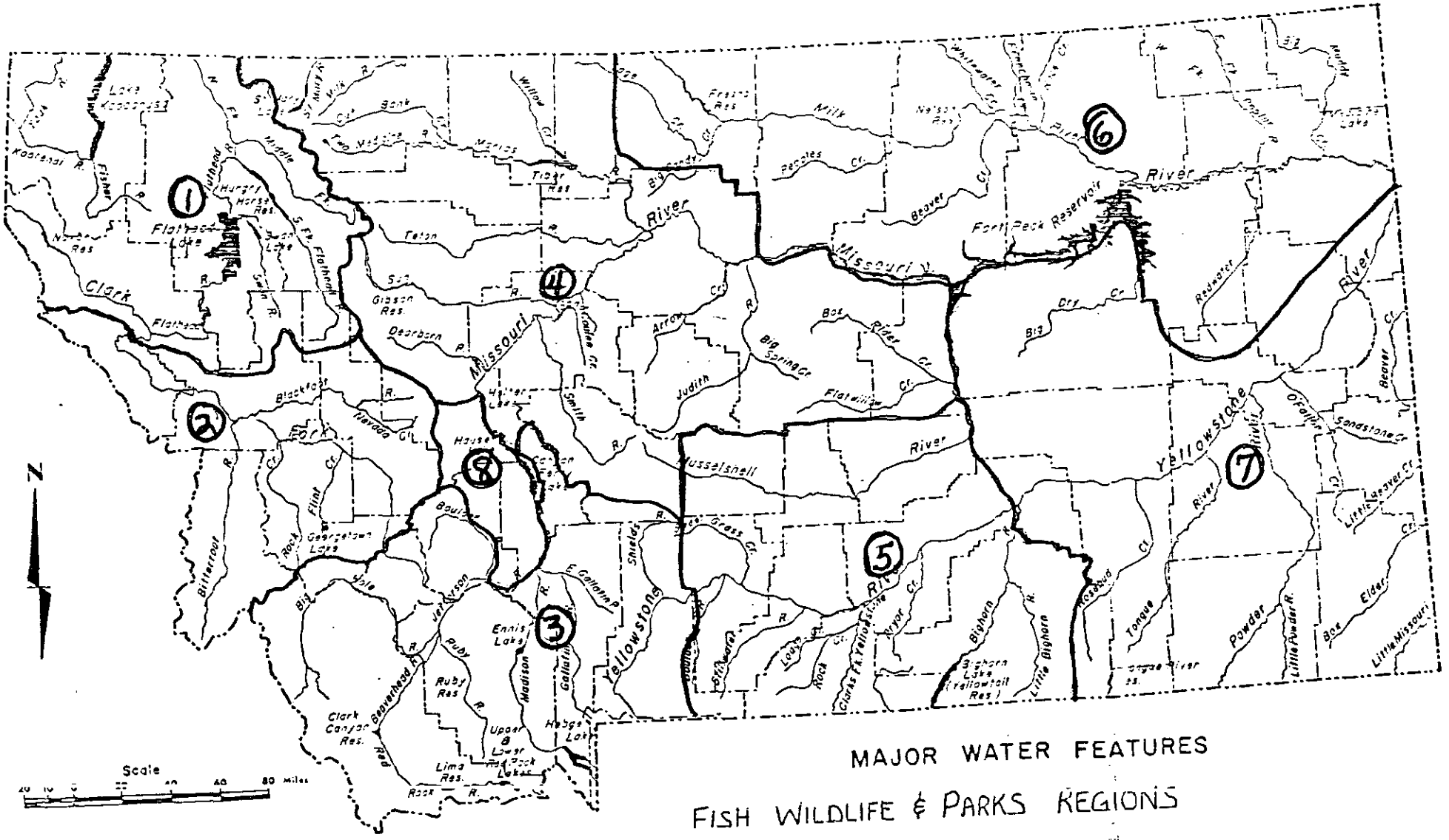

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