

PRELIMINARY

MISSOURI NATIONAL RECREATIONAL RIVER

FLORA AND FAUNA

A BIBLIOGRAPHY WITH ABSTRACTS OR PARTIAL SUMMARIES

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INTRODUCTION

The Missouri River from Gavins Point Dam to Ponca State Park, Nebraska was designated, on 10 November 1978, a National Recreational River. The purpose of the designation is to preserve and protect the river reach and to make its resources available for public use.

The Secretary of the Interior has been mandated to administer the river. Acting through the Assistant Secretary for Fish, Wildlife, and Parks, the Secretary of the Interior has entered into a written cooperative agreement with the Secretary of the Army (acting through the Chief of Engineers) to provide for construction and maintenance of erosion control work and appropriate recreational development.

Prior to construction of the erosion control works and recreation facilities, the Army Corps of Engineers will prepare an Implementation Plan. This Plan will identify the outstandingly remarkable values for which the river is designated and prioritize these values on the basis of need to protect, enhance, and/or preserve. This bibliography was compiled to assist biologists in their participation in the development of the Implementation Plan.

feasibility of replacing the apparent lack of natural reproduction in Lake Francis Case. Paddlefish population dynamics must be studied in each of the reservoirs to attain sufficient information to formulate management plans.

Friberg, D. V. 1972. Investigation of paddlefish populations in South Dakota and development of management plans, 1973. S.D. Dept. Game, Fish and Parks. D-J Proj. F-14-R-8: 11 pp.

ABSTRACT: The status of paddlefish is relatively unknown in the four Missouri River mainstem reservoirs in South Dakota, although, a substantial snagging fishery has developed in each of the tailwaters. Angler pressure and paddlefish harvest from the Big Bend Dam and Gavins Point Dam tailwaters were determined. Population estimates are offered for Lake Francis Case, based on mark and recapture data, and paddlefish were marked and released in the Missouri River below Gavins Point Dam. Artificial propagation of paddlefish was attempted and was successful through the hatching stages. All attempts to rear paddlefish failed.

Gould, Glen R. 1975. Macroinvertebrate aufwuchs communities on natural substrates in the unchannelized Missouri River, South Dakota. M.A. Thesis, Univ. S. D., Vermillion. 127 pp.

PARTIAL SUMMARY: The macroinvertebrate aufwuchs community of the unchannelized Missouri River near Vermillion, South Dakota, was studied during the summer and fall of 1973 using substrates fashioned from cottonwood (populus deltoides) which are an abundant natural substrate in the unchannelized Missouri River. A total of 168 samplers were established during the course of the study at selected slow-water and fast-water sites to estimate production of the aufwuchs community at different current velocities; establish colonization rates; determine seasonal differences in the aufwuchs community, and compare differences in taxonomic composition between the natural cottonwood samplers and the artificial multiple-plate samplers as reported by Nord (1971).

Gould, Glen and James Schmulbach. 1973. Relative abundance and distribution of fishes in the Missouri River, Gavins Point Dam to Rulo, Nebraska. Final Report Missouri River Environmental Inventory, U.S. Army Corps of Engineers, Omaha District, Omaha, Nebraska. 60 pp.

PARTIAL SUMMARY: Fish communities in unchannelized and channelized portions of a 312 mile section of the middle Missouri River (Gavins Point Dam to Rulo, Nebraska) were sampled from July 1, 1972 to August 31, 1973. The objective of the study was to identify fish communities in existing habitats and then estimate their relative abundance. Fifty species of fish were collected. Approximately the same species were collected in both sections of the river but the relative abundance of the species varied between sections and between habitats. Four species; carp, goldeye, river carpsucker, and gizzard shad,

channelized river. The fishery supported 412,660 angler hours (98,252 angling days) valued at \$720,047. Anglers averaged 0.47 and 0.33 fish/h for annual catch and harvest rates, respectively. Catch rate includes fish not kept.

The greatest angling effort and harvest occurred in the tailwaters, but the unchannelized river supported the highest annual catch and harvest rates, 0.72 and 0.50 fish/h. The unchannelized river also exceeded the channelized river in angler-hours/km, number of fish caught/km, weight harvested (kg/km), and average size of creel fish. Sauger, channel catfish, and white bass were the most abundant species creel in the unchannelized river compared to carp, channel catfish, and freshwater drum in the channelized section. The harvest rates indicated that the standing crop of sport fish was considerably greater in the unchannelized than the channelized river. More backwater aquatic habitat and greater habitat diversity in the unchannelized river probably accounted for population abundance differences.

Hansen, Mark D. 1975. The seasonal diversity of microorganisms in channelized and unchannelized portions of the Missouri River. M.A. Thesis, Univ. S.D., Vermillion. 130 pp.

Hansen, Mark D., and Raymond D. Dillon. 1973. Measurements of the species diversity of planktonic and microbenthic organisms. Missouri River Environmental Inventory, Final Report. Department of Biology, University of South Dakota, Vermillion. 120 pp.

PARTIAL SUMMARY: Between July, 1972 and August, 1973, microbenthic and planktonic organisms were collected at monthly intervals, except during the months of December, 1972 and January, 1973 because of the cold weather and adverse sampling conditions, and July, 1973 in which time was spent identifying prepared slides. Sampling stations were randomly chosen among the various types of habitat available in the unchannelized portion of the Missouri River between Yankton, South Dakota and Ponca, Nebraska and in the channelized portion of the river from Ponca, Nebraska to Rulo, Nebraska. Between March, 1973 and August, 1973, these organisms were collected at Snyder Bend Oxbow and DeSoto Bend Oxbow lakes. Water quality parameters were also analyzed during these periods to establish the roles that nutrient availability, temperature, dissolved oxygen concentration, and turbidity played in the abundance and diversification of these planktonic and microbenthic organisms.

Hansen, Mark D., and Raymond D. Dillon. 1974. The diversity of microorganisms in channelized and unchannelized portions of the Missouri River. Proc. S.D. Acad. Sci., 53:254-259.

Heckel, M. C. 1963. An ecological study of a flood plain forest. M.S. Thesis, Univ. S.D., Vermillion. 22 pp.

PARTIAL SUMMARY: Four different seres of the woodland type formation were observed on the Missouri River flood plain. Three of these seres are sub-climax and the fourth constitutes the climax. In studying these different seres, the main objective was to determine the age of each community and rate of succession from one sere to the next.

The sandbar willow sere is the first stage in succession of the Missouri River flood plain. Fifteen years after it has become established the second or cottonwood sere takes over. This is in turn followed in 40 years by the elm-ash sere. The last and final stage of vegetational development is the oak climax sere. The time factor involved in the change from the elm-ash to the oak sere could not be determined.

Johnson, Douthlas H. 1963. The food habits of the goldeye, Hiodon alosoides, of the Missouri River and Lewis and Clark Reservoir, South Dakota. M.A. Thesis, Univ. S.D., Vermillion. 36 pp.

PARTIAL SUMMARY: A food-habits study of the goldeye was conducted on fish from the Missouri River in the vicinity of Gavins Point Dam near Yankton, South Dakota. A total of 295 goldeyes were collected from three different habitats. A backwater area adjacent to the Gavins Point Dam tailwaters yielded 105 goldeyes, taken during April to June of 1963; 154 goldeyes were collected from the tailwaters of Gavins Point Dam in July and August of 1952; and 36 goldeyes were taken from Lewis and Clark Reservoir or its headwaters during the summer of 1962. Both sexes and all age groups up to 8 years, except young-of-the-year, were represented in the sample. Stomachs were examined. Insects, especially terrestrial forms, were found to be the most numerous food items ingested.

Jones, J. K., Jr. 1964. Distribution and taxonomy of mammals of Nebraska. University of Kansas Publications, Museum of Natural History Vol. 16 no. 1, pp. 1-356.

Jonkel, G. M. 1965. South Dakota wintering eagle inventories. South Dakota Bird Notes 17(3):61-62.

Kallemeyn, Larry W. 1974. Investigation of paddlefish populations in South Dakota and development of management plans, 1974. S.D. Dept. Game, Fish and Parks. D-J Proj. F-15-R-9:11 pp.

ABSTRACT: The status of paddlefish is relatively unknown in the Missouri River system in South Dakota, although, substantial snagging fisheries exist in the tailwaters of two of the mainstem dams. A creel census was conducted on the Gavins Point Dam tailwaters. Sampling for young-of-the-year paddlefish was conducted on the Missouri River below Fort Randall and Gavins Point Dams and in Lewis and Clark Reservoir. Paddlefish were captured in the Fort Randall Dam tailwaters and tagged and released. Artificial propagation of paddlefish was attempted and limited success was achieved. Fry and fingerline plants were made in Lake Francis Case.

comparative estimates of species composition, relative abundance, population age and growth, instantaneous standing crop, seasonal movement and production. Study results showed that fish populations in the cattails have moderately large standing crops and also exhibit considerable production. The cattail marshes were inhabited at least seasonally by a large number of fish species and this was reflected in the mean diversity index for this habitat. A large number of river-inhabiting fish species utilize the marshes as a nursery site while they are immature. Data from this study also suggests that both adult and immature fish extensively utilize the cattail marsh presumably because of its large number of microhabitats and niches which provide cover, available food organisms, in some cases suitable spawning sites, etc. Loss of this habitat type from the Missouri River would have profound effect on the Missouri River ichthyofauna.

Langemeier, Ralph N. 1965. Effects of channelization on the limnology of the Missouri River, Nebraska, with emphasis on food habits and growth of the flathead catfish. M.S. Thesis, Univ. Missouri, Columbia. 156 pp.

Lawrey, J. D., W. Winner, G. R. Hoffman, and T. VanBruggen. 1973. A basic ecological study of flood plain and upland vegetation along the Missouri River from Yankton, South Dakota to Rulo, Nebraska, with special reference to variations resulting from stabilization of the shoreline. Univ. S.D., Vermillion. 102 pp.

PARTIAL PREFACE: This report characterizes the macrovegetation along the Missouri River between Yankton, South Dakota and Rulo, Nebraska. Field work was done during July and August, 1972, and parts of May, June, and July, 1973. The limited time for field work necessarily makes some of the results and interpretations a bit tentative; however, the report does present a reasonably accurate description of the upland deciduous forest remnants, as well as the basic successional trends one can expect to find on the flood plain. Additionally the report contains some information concerning the effects of riverbank stabilization on flood plain vegetation.

Lynk, J. 1973. Birds, Vertebrate Section. Missouri River Environmental Inventory, Final Report. Univ. S.D., Vermillion. 101 pp.

PARTIAL PREFACE: This report contains a checklist of birds found along the Missouri River from Gavins Point Dam to Rulo, Nebraska with observation records for fall, winter, and spring, migration and egg dates, and site preference for breeding birds.

McMahon, Jean, Jesse Wolf, and Sister Maureen Diggins. 1972. Chironomidae, Ephemeroptera and Trichoptera in the benthos of unchannelized and channelized portions of the Missouri River. Proc. S.D. Acad. Sci., 51:168-181.

Messman, Larry. _____. Commercial Fisheries Industry in Nebraska. Nebraska Game and Parks Commission.

Dakota, between October 1971 and September 1972. The annual diet was dominated by aquatic arthropods, particularly larvae of the insect orders Trichoptera, Diptera, and Ephemeroptera. The annual feeding behavior was separated into three intervals: (1) the fall months, during which the fish extensively utilized the major components of the drift; (2) the winter period, characterized by exploitation of a greater diversity of aquatic and terrestrial invertebrates; and (3) the late spring and summer interval, in which feeding was restricted to benthic foraging. Electivity values indicated opportunistic feeding activity.

Shifts of feeding activity were influenced by timing and rates of discharge from the Lewis and Clark Reservoir located upriver. Changes in the elevation and velocity of the water mass appeared to affect the vulnerability of prey organisms.

Moos, R. E. 1978. Movement and reproduction of shovelnose sturgeon, Scaphirhynchus platyrhynchus (Rafinesque), in the Missouri River, South Dakota. Ph. D. Dissertation. Univ. S.D., Vermillion. 216 pp.

PARTIAL SUMMARY: Between June 1968 and July 1970 over 5,000 shovelnose sturgeon were collected from the unchannelized Missouri River in southeastern South Dakota. About 3,540 shovelnose were tagged and released within a 20 km study area to study movement. Over 560 shovelnose were subsampled from 1968 and 1969 catches for analyses of external morphology and examination of gonads. Length-frequencies, length-weight relationships, and condition factors were calculated for Missouri River shovelnose and compared with the same data for shovelnose sturgeon populations in the Mississippi, Ohio, and Chippewa Rivers. Reproductive cycles for both males and females were determined from microscopic analyses of stained gonad sections and temporal changes in gross morphology of the gonads.

Morris, Larry. 1964. Sauger and Walleye Investigations in the Missouri River (F-4-R-10). Nebraska Game and Parks Commission.

Morris, Larry. 1965. Sauger and Walleye Investigations in the Missouri River (F-4-R). Nebraska Game and Parks Commission.

Morris, Larry A. 1965. Age and growth of the river carpsucker, Carpiodes carpio, in the Missouri River. Am. Midl. Nat. 73:423-429.

Morris, Larry. 1966. Sauger and Walleye Investigations in the Missouri River (F-4-R-12). Nebraska Game and Parks Commission.

Morris, Larry. 1967. Sauger and Walleye Investigations in the Missouri River (F-4-R-13). Nebraska Game and Parks Commission. p. 9.

Morris, Larry. 1967. Flathead Catfish Investigations in the Missouri River (F-4-R-13). Nebraska Game and Parks Commission. p. 27.

- Nelson, Gene L. 1974. A limnological investigation of the periphyton community in the unchannelized Missouri River with emphasis on the diatoms. M.A. Thesis, Univ. S.D., Vermillion. 66 pp.
- Nord, Allen E. 1971. The use of artificial substrate to study the macro-invertebrate aufwuchs community of the Missouri River. M.A. Thesis, Univ. S.D., Vermillion. 56 pp.
- Nord, A. and J. C. Schmulbach. 1973. A comparison of the macroinvertebrate aufwuchs in the unstabilized and stabilized Missouri River. Proc. S.D. Acad. Sci. 52:127-139.
- PARTIAL SUMMARY: Artificial substrate multiple-plate samplers were used to determine the taxonomic composition and standing crops of aufwuchs macro-invertebrates in unchannelized and bank stabilized areas of the Missouri River. Samplers were suspended for 32 days in both fast- and slow-water velocities at five stations, July 27 to September 10, 1970.
- The basic taxonomic composition of the aufwuchs varied only slightly between stations. The caddisflies, Hydropsyche and Neureclipsis dominated the aufwuchs from both a standing crop and numerical basis.
- Osberg, B. L. 1973. A recreational resources utilization study of the Missouri River and adjacent lands extending from Yankton, South Dakota to Rulo, Nebraska. M.A. Thesis, Univ. S.D., Vermillion. 112 pp.
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- Rupp, Lee. 1971-1975. Paddlefish Study and Creel Census, Gavins Point. Nebraska Game and Parks Commission.
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- Schainost, Steve. 1974-1976. Commercial Fisheries Industry of Nebraska. Nebraska Game and Parks Commission.
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Eagles leave the roost at or before dawn for fishing areas, to perch near waterfowl populations, or to survey the fields for food.

The basic modes for capturing fish were either a straight dive from an observational perch or a stooping dive after an aerial survey.

Tunik, D. H. 1977. The swimming performance of fishes endemic to the middle Missouri River. M.A. Thesis, Univ. S.D., Vermillion. 126 pp.

Unkenholz, D. G. 1976. Investigation of paddlefish populations in South Dakota and development of management plans, 1976. S.D. Dept. Game, Fish and Parks. D-J Rept. F-15-R-12. 19 pp.

ABSTRACT: This report represents information collected during the eighth consecutive year of paddlefish research in South Dakota. During artificial propagation experiments, only 80,000 fry hatched from the 773,000 eggs collected. Only 30 of the 36,000 fry stocked in hatchery ponds survived to fingerling size. Approximately 3,000 fry were fed artificial diets in hatchery tanks. Results of this feeding experiment were encouraging and more work is planned on intensive culture. The remaining 41,000 fry were stocked in Lake Francis Case. Young-of-year paddlefish were collected in the Missouri River below Fort Randall Dam and in Lewis and Clark Lake. Young-of-year collections indicated spawning occurred the last week of May and the first two weeks of June. Paddlefish fry were collected in the Missouri River below Gavins Point Dam, the first time paddlefish spawning in this portion of the Missouri River has been documented. Seventy-three adult paddlefish were tagged and released in the Missouri River below Gavins Point Dam.

Unkenholz, D. G. 1977. Investigation of paddlefish populations in South Dakota and development of management plans, 1977. S.D. Dept. Game, Fish and Parks. D-J Rept. F-15-R-13. 34 pp.

ABSTRACT: This report presents information collected during the ninth consecutive year of paddlefish research in South Dakota. During artificial propagation experiments, 58,000 fry hatched from the 302,100 eggs collected. Of 4,550 fingerlings which were pond-reared, 3,550 were stocked in Lake Francis Case.

Cladocerans were the most important food item in stomachs from pond-reared paddlefish early in the rearing period. Insects became a major food item late in the rearing period.

Young-of-the-year paddlefish were caught in the Missouri River below Fort Randall Dam and in Lewis and Clark Lake documenting natural reproduction for the thirteenth consecutive year. Annual angler harvest of paddlefish from the Missouri River below Gavins Point Dam is estimated to be 8 percent based on tag returns.

the results of recent studies of the main stream benthos in the channelized and unchannelized portion of the Missouri River. In addition, an attempt was made to determine the relationship between various environmental factors and the distribution and abundance of the benthos. This investigation also was intended to ascertain the importance of the cattail marshes as areas of secondary production.

Walburg, C. H. 1971. Loss of young fish in reservoir discharge and year-class survival, Lewis and Clark Lake, Missouri River. Pages 441-448. In G. E. Hall (ed.), Reservoir Fisheries and Limnology. Am. Fish. Soc., Spec. Publ. No. 8.

ABSTRACT: Many age 0 fish are lost in the discharge from 11,330-ha Lewis and Clark Lake each summer. Sixteen species were identified from June, July, and August collections in 1969-70 and most fish were less than 25 mm long. Estimated peak 24-hr. losses were 10 million freshwater drum, 800,000 emerald shiner, 700,000 sauger-walleye, and 170,000 channel catfish. Numbers of fish lost were related to summer flushing rates, and most were lost when flushing time was less than 7 days. Summer survival of age 0 freshwater drum in the reservoir was inversely related to the July-August flushing rate. Abundance of age 0 channel catfish, freshwater drum, gizzard shad, and emerald shiner in summer trawl and seine catches was associated with rate of reservoir flushing.

Walburg, C. H., G. L. Kaiser, and P. L. Hudson. 1971. Lewis and Clark Lake tailwater biota and some relations of the tailwater and reservoir fish populations. Pages 449-467. In G. E. Hall (ed.), Reservoir fisheries and limnology. Am. Fish. Soc., Spec. Publ. No. 8.

ABSTRACT: Benthos, drift, plankton, and fish were studied in Lewis and Clark Lake tailwater between February 1968 and April 1969 to determine seasonal occurrence and origin. Abundance of fish was studied in relation to feeding, temperature, and spawning. Organisms found in the tailwater originated from both above and below the dam. Bryozoans and some species of algae, chironomids, and fish were endemic to the tailwater, whereas zooplankton, Hexagenia nymphs, and some species of algae, chironomids, and fish were flushed from the reservoir above.

Our studies illustrated concentration of fish in the tailwater. Seasonal change in fish occurrence was related to food abundance, spawning activity, and water temperature. Recruitment to tailwater fish stocks was partially supplied from the reservoir. Fish growth in the tailwater was superior to that in the reservoir for all species except channel catfish.

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