Minnesota River

Resource Analysis

Minnesota Department of Natural Resources
Wild and Scenic Rivers Program

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This resource analysis of the Minnesota River was prepared by the Rivers Section and the Bureau of Engineering.

RIVERS SECTION

Paul Swenson, supervisor
Jim Weseloh, rivers project leader
Ellen Herman, rivers project coordinator
Linda Watson, editor
Kathy Brandl, assistant editor
James Sogaard, researcher
SherryLee Nunnelee, word processor technician

BUREAU OF ENGINEERING

Roger Liska, graphics supervisor
Tim Latourelle, draftsman

PHOTO CREDITS

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study conclusions

The DNR, after study and evaluation, has concluded that the Minnesota River from Franklin to Le Sueur possesses outstanding scenic, natural, scientific, historical and recreational characteristics.

Scenic

The Minnesota River valley, carved by the might of Glacial River Warren, slices through the southern half of Minnesota. Many millenia ago the River Warren, draining the glacial meltwaters of Lake Agassiz, surged through Minnesota, leaving a depression far greater than necessary for its successor, the Minnesota River.

The Minnesota snakes through its oversized valley, now and then approaching the valley walls, but most often shying away, as its current carries it through the heart of the valley floor.

Throughout its crooked course to the Mississippi, the Minnesota flows past stark granite outcrops and gentle hills, cultivated fields and lush river bottom forest--an arresting array of contrasting colors and contours.

Gnarled, knotted bur oaks top hills and bluffs with sunny, southern exposure. Shady, north-facing slopes support forests of sugar maple, elm and basswood. Steep, rocky areas shelter small pockets of prairie plants. Glades of red cedar embrace hillsides of shallow glacial drift, absorbing the warmth of the sun and exhaling a pungent evergreen scent.

The shallow waters of oxbow lakes and marshes are cropped with cattail, sedge, smartweed, bulrush and scouring rush. Willows and cottonwood weather the frequent flooding of sandbars and the margins of oxbow lakes. Uncultivated floodplain areas support a lush bottomland forest of silver maple, willow, cottonwood, green ash, butternut and black walnut. The forest's dense thicket of summer green, the coiling virginia creeper and wild grape vines, suggest a jungle-like atmosphere.

Natural and Scientific

The Minnesota River valley is a major geologic study area. The valley owes its presence to the ravaging meltwaters of Glacial Lake Agassiz. During the close of the Ice Age, Lake Agassiz drained southward for perhaps thousands of years, cutting the deep valley of the River Warren. The onrush of meltwater removed surface deposits and thin layers of underlying rock, exposing the granite below. Above New Ulm the granite outcrops have been dated at more than three billion years old, some of the oldest rock in North America. Downstream of New Ulm the river flows through a valley of younger sedimentary rocks, mostly limestones. Exposures of metamorphic rocks, clay deposits, shale and sandstone also contribute to the valley's geologic importance.

The river valley was witness to many cultures before our own. The valley shrouds relics and ruins of inhabitants who lived as long ago as 5000 B.C. The earliest known prehistoric peoples roamed from site to site in search of food and shelter. Later tribes built permanent villages and elaborate burial grounds and cultivated crops.

Further study could reveal more valuable information about these ancient cultures. But countless burial mounds and village sites, once common along ridgetops and high river terraces, have already been lost to modern cultivation and construction.

The Minnesota valley's unusual natural vegetation and its diverse and plentiful wildlife are also important. The uncommon cedar glades are typified by an unlikely mixture of red cedar and prickly pear cacti. Other unusual plants found in the valley include the fameflower, small lady's slipper, arrowgrass and fringed gentian. Because of the intensive agricultural use of much of southern Minnesota, the river corridor is one of the few large wildlife habitats remaining in this part of the state.

Many colleges, universities, and other educational institutions study the Minnesota's unique archaeological, geological, botanical and other natural features.

Historical

The Minnesota River and its valley were viewed as an El Dorado by many a covetous eye. Some, stung by greed, eagerly mined and moiled the earth on the banks of the Blue Earth River, tributary to the Minnesota, in search of copper ore. Some believed the river to be the hoped-for and sought-after water route to the Pacific and prosperous trade with the Orient. But to the great disappointment of the soldiers of fortune, the Minnesota River was not the promising passage to the Orient's golden gates and the blue-green clay of the Blue Earth was, after all, only blue-green clay. Those who engaged in the fur trade were more successful, until they unwisely exhausted what had been an abundant supply of fur-bearing wildlife.

The Indian nations who made their home here consistently lost--to the traders, to the unfair treaties that brought an onrush of immigrants hungry for land.

The first settlers and their descendants, willing to work the land and able to withstand droughts, grasshopper plagues and economic depressions, have cultivated and developed the Minnesota River valley into part of southern Minnesota's rich agricultural domain.

Recreational

The Minnesota River valley not only provides a livelihood for its population, but also is a source of recreational opportunity.

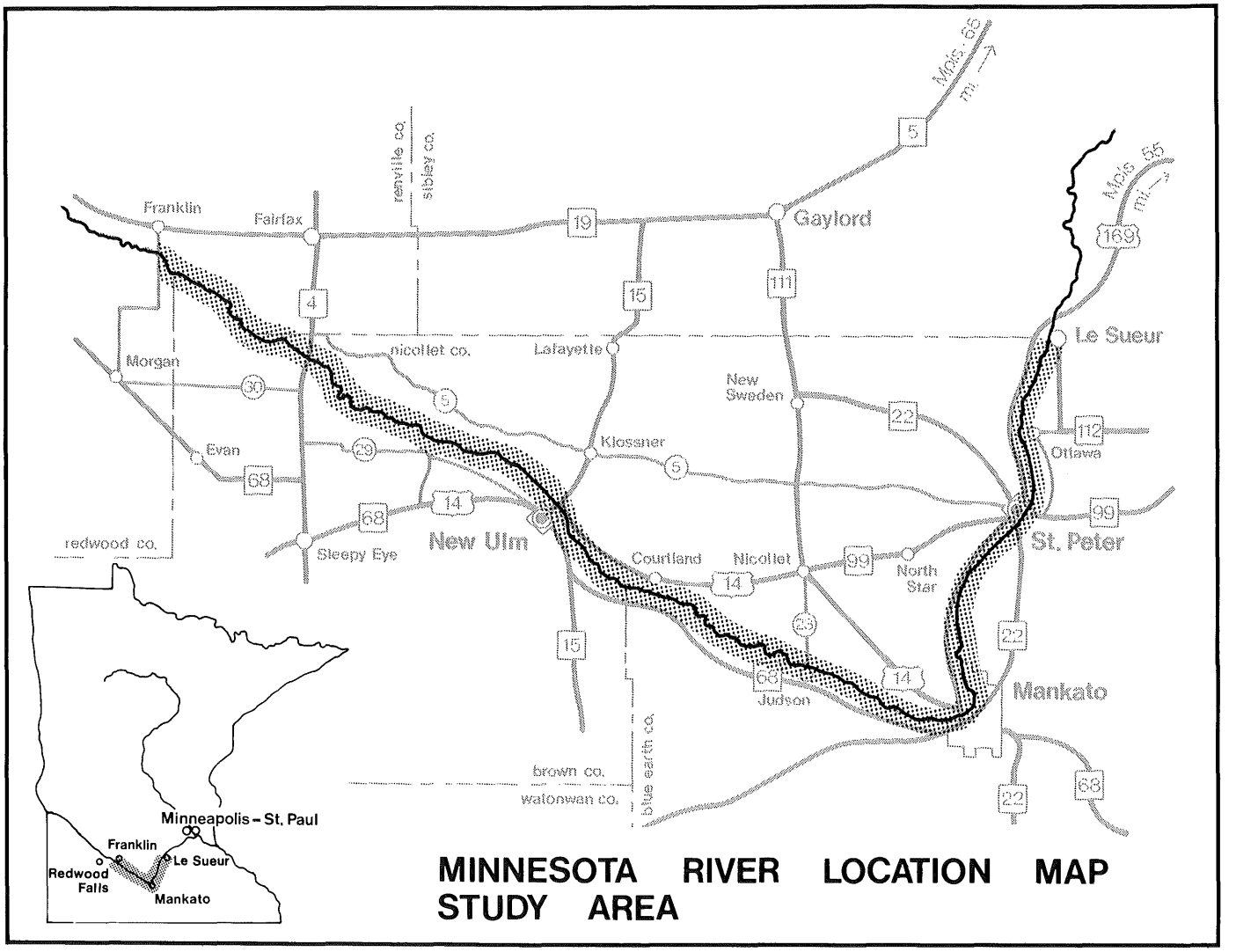
Eager hunters will find many game species living on or near the river, including white-tailed deer, red and gray fox, pheasant, mallard, wood duck, gray partridge and Canada goose. Patient anglers might catch walleye, sauger or channel catfish. The DNR regularly stocks the river with catfish and smallmouth bass fingerlings.

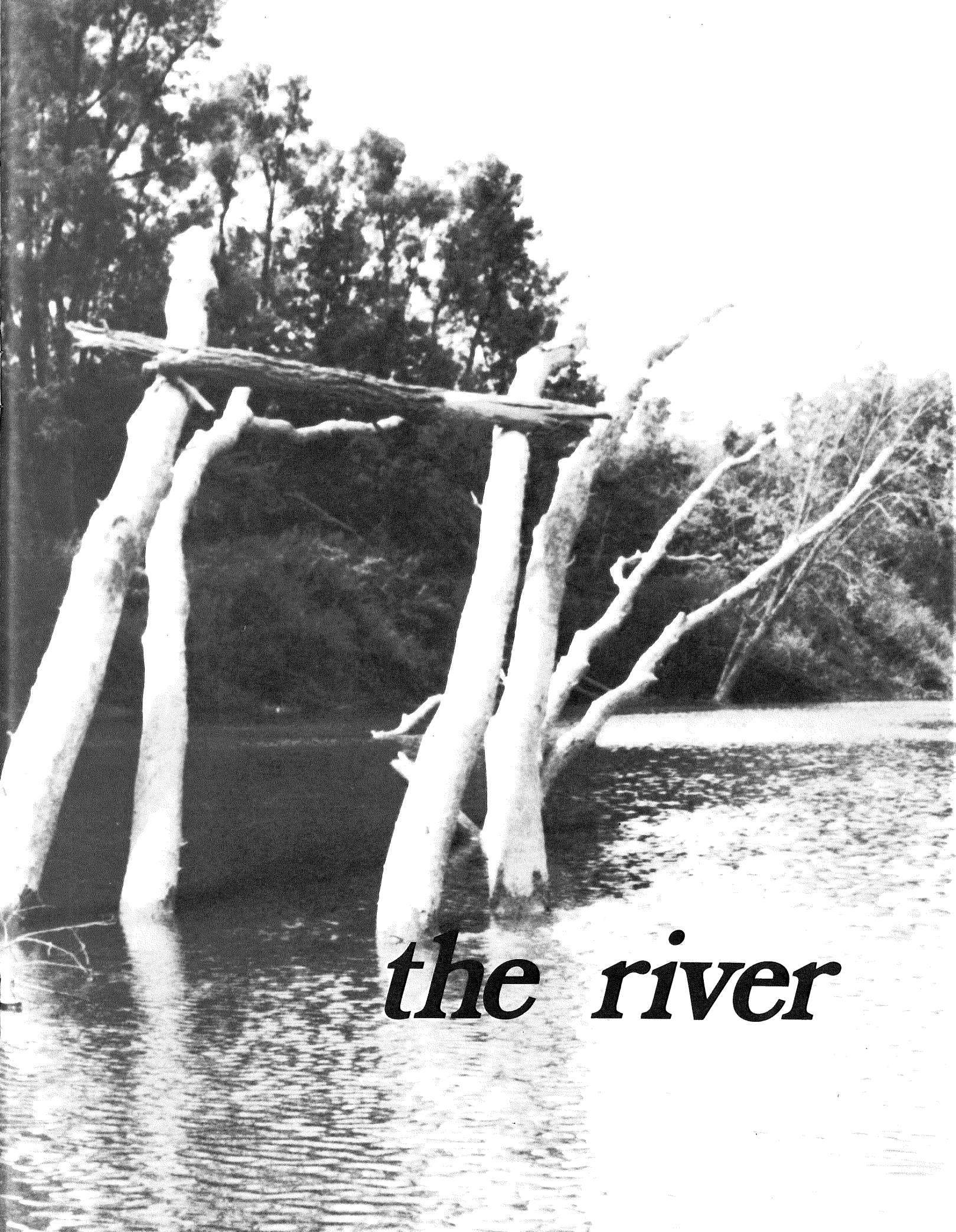
Photographers, hikers and nature observers are also attracted to the river. The valley, with its varying land formations, diverse plant communities and abundant wildlife, offers the creative eye a spectrum of colors and shapes.

The Minnesota has many parks on its banks, including three state parks, two county parks and two state wildlife management areas.

A gentle river interrupted by few rapids, the Minnesota is one of the few canoeable rivers in this region. A number of campsites, rest areas and river accesses are located in parks along the river. Other recreational facilities are maintained by the state canoe and boating route program.

To ease the harm caused by excessive cultivation, development and overuse of this important river and its valley, and to preserve it for the centuries to come, proper land use management is necessary.





the river

geology

During the close of the Ice Age, 12,000 to 13,000 years ago, the last advance of glacial ice had melted back to a position just north of Ortonville. Here the edge held stationary for a time, depositing a broad ridge several miles wide, composed of small hills and depressions. This is now called Big Stone Moraine.

Further east, the melting glacier deposited plains of outwashed sand and gravel. Such areas are found at Carver, Belle Plaine, Le Sueur, Ottawa, St. Peter, Mankato, Courtland and New Ulm.

As glacial melting increased, meltwater accumulated behind Big Stone Moraine, beginning the huge Glacial Lake Agassiz. As the lake level rose, it overflowed the moraine near Brown's Valley, Minnesota. Lake Agassiz drained southward for perhaps thousands of years, cutting the deep valley of Glacial River Warren, the Minnesota River's predecessor.

The volume of water that flowed in Glacial River Warren was tremendous. It quickly removed the loose surface glacial deposits and the underlying thin layers of sedimentary rock (shale, sandstone and conglomerates), exposing the more durable granitic rocks below. Numerous exposures of granitic rock exist along the river valley between Brown's Valley and New Ulm. Downstream from New Ulm, the river flows through a valley of younger sedimentary rocks, mostly limestones.

As the glacier continued to retreat northward, Glacial Lake Agassiz eventually found lower outlets to the northeast and finally drained into Hudson Bay. With the large supply of water from Glacial Lake Agassiz eliminated, Glacial River Warren subsided to become the Minnesota.

As the river's size and velocity decreased, it no longer had the energy to carry the large quantities of sediment supplied by its tributaries. Deposits of sand, gravel and mud accumulated in the riverbed and the stream began to meander across the valley floor. Sometimes whole stretches of the river were abandoned. If they were deep enough to retain water they became lakes or ponds; otherwise, they became dried-up meander scars. Periodic flooding covered the valley floor with rich deposits of silt and clay, giving trees and shrubs a firm foothold. As the climate continued to become drier, the river diminished until it reached its present size.

Between Fort Snelling and Mankato the Minnesota valley is cut deeply into Cambrian (600 million-year-

Mineral production and related land use in the Minnesota River basin

Annual production (thousand short tons)

	1960	1970	1980	2000	2020	1960-2020 (cumulative)
Sand, gravel	5731	8996	13,065	23,857	35,493	1,152,741
Crushed stone	578	676	903	1,592	2,278	77,297
Dimension stone	61	97	131	250	407	12,310

Annual land use (acres)

Sand, gravel	209	328	476	869	1,293	42,006
Crushed stone	4	5	6	12	17	557
Dimension stone	1	3	4	7	12	356
						42,919

Source: Upper Mississippi River Comprehensive Basin Study, Vol. III, UMRCBS Coordinating Committee, 1970.

old) and Ordovician (500 million-year-old) sedimentary rocks. From New Ulm upstream, igneous and metamorphic rock outcrops appear. Broad, conspicuous terraces indicate exposed bedrock shelves and remnant alluvial plains.

Between St. Peter and Mankato outcrops in the west bluff reveal the contact zone between Cambrian and Ordovician layers. Many of these exposed beds show disturbances produced by the collapse of caverns in the Oneota dolomite, a limestone containing a large amount of magnesium. Between Kasota and Mankato is the Kasota Prairie, a terrace of Oneota dolomite 1.5 miles wide and eight miles long, shallowly covered with glacial outwash.

About 25 miles upstream of Mankato, near Courtland, Precambrian quartzites, sandstones and conglomerates lie exposed in a series of terraces along the north wall of the valley. This is the top of a quartzite hill buried under glacial till. The highest exposures reach 175 feet above the river. Sharp glacial scratches show that ice moved southeasterly at this point. Potholes and narrow grooves indicate wear by running water.

The most southerly exposures of granite bedrock in Minnesota crop out about a mile upstream of New Ulm, in a few small, red knobs. These outcrops are 900 feet above sea level. Only 20 miles away, at Mankato, this sharply tilted granite bed is 348 feet below sea level.

About 15 miles upstream of New Ulm the level valley floor is broken by knobs of Precambrian granites, gneisses and related rocks. One of these is Cedar Mountain, near Franklin. It stands 125 feet above the lowest part of the valley. Potholes up to 10 feet deep and numerous scour channels are evidence of wear by the torrential Glacial River Warren. Granite gneiss found near Morton has been dated at more than three billion years of age, the oldest dated rock known.

The various outwash and till deposits and rock outcrops in the Minnesota valley are the basis for a relatively small mining industry. However, the industry is very significant in terms of its impact on the river corridor because of its close association with the river bluffs.

The accompanying table provides an index to the continued presence of mining along the river.

watershed

The Minnesota River originates in northeastern Marshall County in South Dakota and flows approximately 410 miles to its confluence with the Mississippi River at Fort Snelling. It drains an area of 16,920 square miles. The study area is bordered by the Hawk Creek, Cottonwood and Blue Earth watershed units.

The river winds sluggishly through a valley that varies from one to five miles wide and from 75 to 200 feet deep. Its average overall gradient is only 0.8 feet per mile.

The Minnesota meanders through alluvial deposits of silt, sand and gravel, frequently changing its course. The riverbed is very unstable. During high water pool bottoms are hard, consisting of clay or gravel. During low water, however, silt settles out, giving the pools a soft bottom. Straight stretches of the river fill with the shifting sand and silt, and many gravel bars are present.

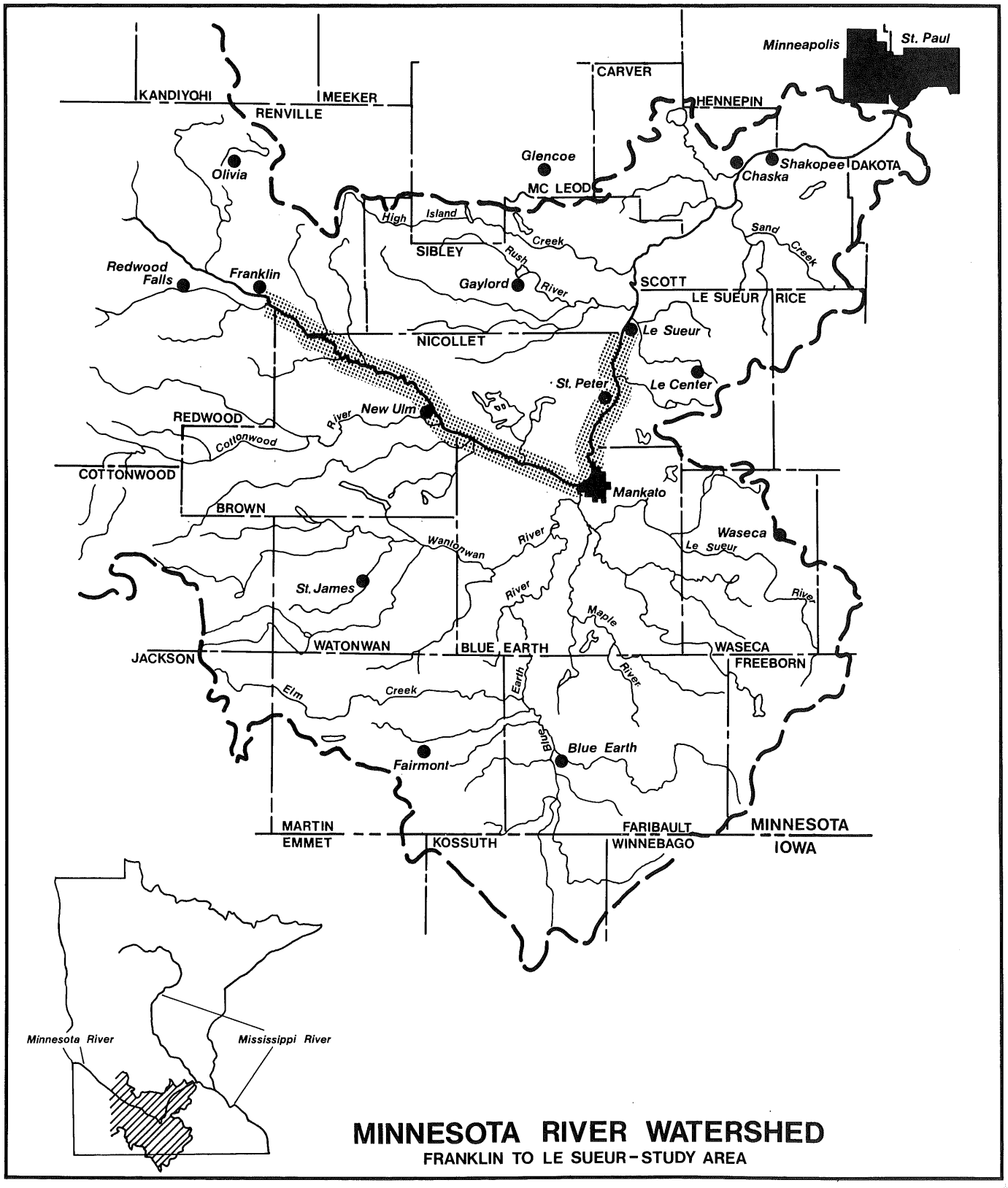
All of the Minnesota's principal tributaries enter above Mankato. They include the Blue Earth, Cottonwood, Redwood, Yellow Medicine and Chippewa rivers, and Hawk Creek. There are numerous smaller tributaries and spring flows.

The tributary streams descend rapidly from much higher elevations. Because they have little natural storage capacity, the rapid flushing of these small tributaries contributes to flooding of the sluggish river bottoms. The smaller tributaries often go dry in summer and fall.

The Minnesota's depth and flow vary greatly. Fluctuations in flow are generally greater in the river's upper reaches. High flows generally occur during spring because of snow melt and spring rains. Short periods of flooding may also occur after summer storms. Daily flow is usually most uniform just before spring ice breakup and least uniform in summer. During periods of low flow water comes largely from groundwater sources.

Flow extremes may affect recreational use of the river.

The accompanying table illustrates the Minnesota's wide fluctuation in stream flow.



MINNESOTA RIVER WATERSHED

FRANKLIN TO LE SUEUR - STUDY AREA

Seasonal flow characteristics of the Minnesota River at New Ulm

Measurements indicate mean daily discharge (in cubic feet per second) during the month.

	October	November	December	January	February	March
1969	2,251	1,230	458	266	402	600
	April	May	June	July	August	September
1969	24,680	7,703	3,395	2,366	615	196

	October	November	December	January	February	March
1972	372	1,535	1,004	608	441	3,314
	April	May	June	July	August	September
1972	6,351	7,217	8,562	2,888	2,455	1,229

Source: The Development of the Recreational and Environmental Resources of the Upper Minnesota River Valley.

landform and soils

The Minnesota River valley contains alluvial bottomlands, nearly level glacial outwash terraces, outwash-mantled bedrock benches, and unterraced glacial outwash plains. The bottomland alluvium is undifferentiated material (silt, sand and gravel) deposited by the river. The deposits pose restrictions to building because of their poor drainage and flood hazard. Corn is grown on about 60 percent of the bottomland; the rest is pasture or woodland.

The more elevated outwash terraces, outwash plains, and bedrock benches, found mostly below New Ulm, are occupied by four basic soil types:

— loamy over rock, poorly drained, dark colored (pasture)

— loamy over rock, well drained, dark colored (woodland pasture)

-- loamy over sandy, well drained, dark colored

-- sandy over sandy, well drained, dark colored

The first soil type presents severe restrictions to building because of high water tables and shallow soil. The second type presents moderate restrictions on 6-percent to 12-percent slopes and severe restrictions where underlying shale causes very low permeability, or on slopes greater than 12 percent. Sandy over sandy soils present similar slope restrictions. Loamy over sandy soils pose only slight limitations to building.

The terraces and outwash plains are heavily mined for gravel. These areas, variably suited for farming, are cropped in corn, soy beans, oats, rye and alfalfa–brome hay. Areas with loamy outwash over bedrock benches are widely used as pastures or pastured woodland.

The surrounding uplands are composed of 100 to 400 feet of unsorted glacial till. The till is composed of silty and clayey calcareous material mixed with boulders, cobblestones, gravel and sand in various proportions. There are many small depressions, swales, marshes and nearly level, low areas.

The loamy over loamy, dark-colored upland soils formed under tall-grass, bluestem prairie are of two primary types - poorly drained and well drained. The poorly drained soils present severe restrictions to building because of high water tables and slow permeability. On the well-drained soils that dominate the uplands closest to the valley, buildings should be constructed only on slopes of less than 6 percent.

Years of cultivation have reduced the organic content of the upland soils. This has made them less water-retentive, and contributes to heavier runoff. For this reason special care is required to prevent erosion.

water quality

The Minnesota River between Granite Falls and Carver Rapids, which includes the study area, has been classified a 2B, 3B river by the Minnesota Pollution Control Agency (PCA).

The PCA defines a 2B river as suitable for the "propagation and maintenance of cool– or warm–water sport or commercial fishing. . .and suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable."

A 3B river is one whose water quality is such as "to permit their use for general industrial purposes, except for food processing, with only a moderate degree of treatment."

The PCA has set water quality standards for each of these classifications. For a 2B river, with which this study is primarily concerned, limitations have been set on the measurements of such things as dissolved oxygen, temperature, turbidity, pH, ammonia, copper, chromium, fecal coliforms, cyanides, oils, phenols and radioactive substances. For the most part, 3B river standards measure different substances. However, in case of overlap the most restrictive standards apply.

These standards are goals toward which the PCA is working. They often are not met on the lower Minnesota River. However, because water quality monitoring stations are generally located in problem areas below larger municipalities, water quality for a stretch of river may be somewhat better than samples indicate.

All of the streams in the Minnesota River basin have periodic low flows that substantially limit their capacities to assimilate wastes. Therefore, serious water quality violations occur below major municipalities or industries that discharge continuously.

Water samples are taken monthly at PCA stations in Henderson, St. Peter, Courtland and Morton.

Frequent violations are recorded for fecal coliforms, turbidity, ammonia, hardness and copper. Less frequent violations occur for pH and dissolved oxygen. Between 1957 and 1974 the standards for fecal coliforms were exceeded in about half the samples at Morton, and in 98 percent of samples at Courtland.

Fecal coliforms are a class of bacteria that live in the intestines of warm–blooded animals. Their presence in water indicates fecal contamination and the danger of encountering organisms capable of causing skin and intestinal diseases. There is a high background level of fecal coliforms throughout the lower Minnesota, probably because of feedlot and pasture runoff.

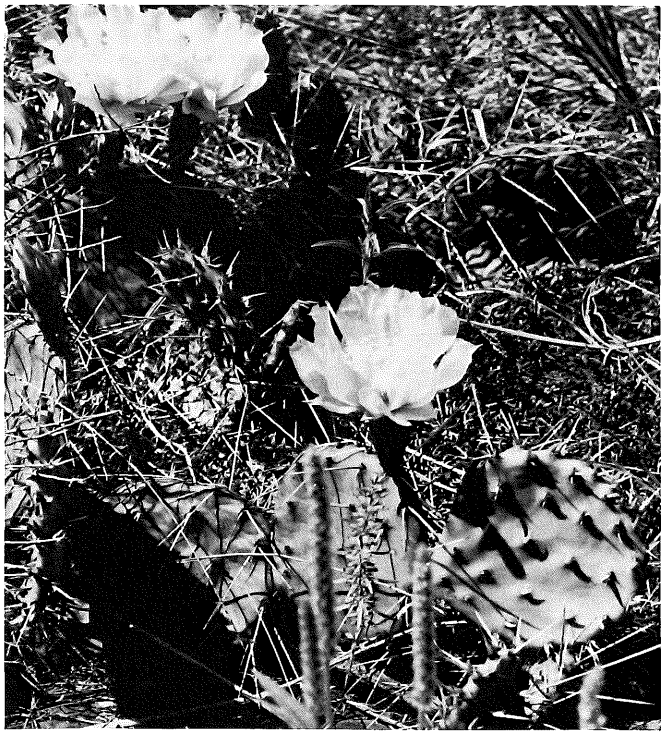
Turbidity was in violation of standards in about one–third of the samples at each station. The Minnesota had a relatively high background turbidity level even before white settlement because of the area's highly erodable soils. When the uplands were cleared for agriculture, erosion, severe flooding and turbidity increased. Amounts of total solids in the water vary greatly, depending on season, location and runoff.

Nitrate levels are moderate at Courtland and Morton, but extremely high at St. Peter and Henderson. Phosphorous levels are moderately high at all stations. These excess nutrients result from agricultural runoff of fertilizers and organic materials and from municipal sewage. They can result in abnormal algal growths which deplete dissolved oxygen and produce unpleasant odors.

Thirty–seven municipal water treatment plants, 141 municipal dischargers and 54 industrial dischargers contribute to point source pollution in the Minnesota drainage basin. Food processing is the major industry.

The level of non–point source pollution is high because of the intensive agricultural use of the watershed. There is heavy application of chemical fertilizers and other agricultural chemicals and a moderate contribution to runoff by livestock operations. Much of the land in the basin has major erosional problems or is in clay soils whose lower permeability results in greater runoff.

Excessive amounts of nitrogen, phosphorus, sediments and fecal coliforms are the most significant elements of non–point source pollutants.



vegetation

Before white settlement the vegetation along the Minnesota River from Franklin to Le Sueur was dominated by two major plant communities: the river bottom forest found along the river corridor, and the tall-grass prairie located on the uplands. Patches of the hardwood forest known as the "Big Woods" were also found on the uplands; wet prairies and marshes were scattered throughout the river valley.

None of these original plant communities has entirely escaped the logging, grazing and cultivation that came with settlement of the river corridor. However, some relatively inaccessible areas--bluffs and ravines, for example—are in good condition, with many of the original species still thriving. Sugar maples, elms and basswoods dominate the north- and northeast-facing bluffs and ravines. The drier south- and southwest-facing bluffs are populated primarily by bur oaks.

River bottom forest species found on sandbars and the margins of oxbow lakes include sandbar willows, peach-leaved willows, pussy willows and cottonwoods. Because these sites are frequently disrupted by flooding, complex plant communities do not occur here.

On slightly higher ground, the dominant plants of the bottomland forest are silver maple, American elm, ash, box elder, cottonwood, basswood, willow, aspen, hackberry, butternut and black walnut. These trees are well adapted to their river environment. They can withstand both submergence during flooding and drought during low water, and are resistant to damage caused by spring ice flow. They are also ground-fire resistant, a factor important in maintaining forests that border prairies.

Prickly ash, currants, red-osier dogwood, gooseberry and red raspberry prevail in the bottomland forest understory. Vines such as virginia creeper and wild grape are also common.

Typical species observed in bottomland marshes and oxbows are cattails, sedges, smartweeds, scouring rushes and bulrushes.

The upland tall-grass prairie region once supported a wide variety of grasses and herbs such as big and little

bluestem, Indian grass, prairieclover, pasqueflower, asters and goldenrods. A few small shrubs and trees, such as wild rose species and wolfberry, also grew here. Because the prairies were large and relatively flat, with rich soils, they were nearly eliminated by cultivation and grazing. However, remnants do remain, in cemeteries, along railroad beds and along bluffs and stone outcrops that are unsuitable for cultivation or heavy grazing.

The Nature Conservancy has protected two tracts of prairie land in the study area. Ottawa Bluffs, 62 acres of west- and southwest-facing bluffs, is eight miles south of Le Sueur. Both prairie and mixed hardwood forest are represented in this preserve. Kasota Prairie consists of 32 acres of tall-grass prairie on a bluff overlooking the river, about eight miles south of Kasota. The rattlesnake-master (Eryngium yuccifolium), a plant rare in Minnesota, is found here. This may be the northernmost location of this species.

Wet prairies were found in transitional zones between tall-grass prairies and marshlands. Indicator species of this prairie type included bluejoint grass, New England aster, hairy stargrass, cowbane, Virginia mountain-mint, large goldenrod, slough-grass, purple meadowrue, Culver's root and golden Alexander. Most wet prairies have been drained and cultivated.

The Big Woods, patches of which were found along the Minnesota River, was a dense hardwood forest that at one time stretched over much of central and eastern Minnesota. Predominating tree species were sugar maple, basswood, red elm, American elm and green ash. Other less abundant trees included red oak, bur oak, hackberry, silver maple, box elder, bitternut hickory, black cherry, butternut, black walnut and quaking aspen. The forest was lost to the land-clearing, cultivation and grazing that accompanied settlement.

Uncommon plant communities known as cedar glades are found on hillsides of thin till over quartzite bedrock or gravelly glacial moraine. The glades are typified by an abundance of red cedar, and include species of cacti such as prickly pears (Opuntia spp.). These glades are often found where there is fire protection in the river valley. While some have been lost, the river valley today retains many examples of this unusual vegetative type.

There are a number of areas along the river that are noteworthy for their rare Minnesota plants. In an area near New Ulm the mousetail buttercup (Myosurus minimus), fameflower (Talinum spp.) and fragile prickly pear cactus (Opuntia fragilis) can be found. Another spot near the river bottom in the vicinity of St. Peter abounds with small white lady's slippers (Cypripedium candidum), arrow-grass (Triglochin maritima), and fringed gentians (Gentiana crinita).

Many other plants uncommon in Minnesota inhabit the river valley. The species listed here were compiled from records at the University of Minnesota herbarium. Some may be common locally. Species protected by Minnesota law, including the lady's slippers and gentians, are also listed.

common plants

sugar maple — Acer saccharum
silver maple — A. saccharinum
box elder — A. negundo
American elm — Ulmus americana
red elm — U. rubra
basswood — Tilia americana
red oak — Quercus borealis
bur oak — Q. macrocarpa
white oak — Q. alba
willows — Salix spp.
cottonwood — Populus deltoides
Kentucky coffeetree — Gymnocladus dioica
quaking aspen — Populus tremuloides
hackberry — Celtis occidentalis
butternut — Juglans cinerea
black walnut — J. nigra
green ash — Fraxinus pennsylvanica
prickly ash — Xanthoxylum americanum
currants — Ribes spp.
red-osier dogwood — Cornus stolonifera
big bluestem — Andropogon Gerardi
little bluestem — A. scoparius
Indian grass — Sorghastrum nutans
goldenrods — Solidago spp.
asters — Aster spp.
prairie-clover — Petalostemum spp.
pasque-flower — Anemone patens
roses — Rosa spp.
wolfberry — Symphoricarpos occidentalis
bitternut hickory — Carya cordiformis
black cherry — Prunus serotina
red cedar — Juniperus virginiana
sedges — Carex spp.
cattails — Typha spp.
smartweed — Polygonum Hydropiper
scouring rushes — Equisetum spp.
bulrushes — Scirpus spp.

uncommon or protected plants

Lophotocarpus calycinus
head sedge — Carex cephaloidea
fescue sedge — C. festucacea
tapering galingale — Cyperus acuminatus
blue-eyed grass — Sisyrinchium campestre forma albiflorum
short-fruited rush — Juncus brachycarpus
wood-lily — Lilium philadelphicum
channelled Solomon's seal — Polygonatum canaliculatum
drooping trillium — Trillium flexipes
snow-trillium — T. nivale
alkali grass — Zigadenus elegans
white carnass — Z. glaucus
ginseng — Panax quinquefolius
Adam-and-Eve — Aplectrum hyemale
Cypripedium x Andrewsii
small yellow lady's slipper — C. calceolus var. parviflorum
large yellow lady's slipper — C. calceolus var. pubescens
small white lady's slipper — C. candidum
northern green orchis — Habenaria hyperborea
bracted green orchis — H. viridis var. bracteata
yellow twayblade — Liparis Loeselii
showy orchis — Orchis spectabilis
Sullivant's milkweed — Asclepias Sullivantii
fragile prickly pear — Opuntia fragilis
prickly pear — O. humifusa
diverse-leaved water chickweed — Callitriche heterophylla
nodding mouse-ear chickweed — Cerastium nutans var. brachypodum
povertyweed — Monolepis Nuttalliana
coreopsis — Coreopsis tinctoria
divergent fleabane — Erigeron divaricatus
three-lobed coneflower — Rudbeckia triloba
showy clotbur — Xanthium speciosum
buffalo-berry — Shepherdia argentea
waterwort — Elatine triandra forma terrestris
toothed spurge — Euphorbia dentata
fringed gentian — Gentiana crinita
yellow gentian — G. flavida
closed gentian — G. Andrewsii var. Andrewsii
downy gentian — G. puberula
scurf-pea — Psoralea floribunda
Ammannia coccinea
Hornemann's willow-herb — Epilobium Hornemanni
water-dock — Rumex verticillatus
mousetail buttercup — Myosurus minimus
Nicollet's cinquefoil — Potentilla Nicolletii
cottony-headed willow — Salix eriocephala
eared gerardia — Gerardia auriculata
Gattinger's gerardia — G. Gattingeri
ground-cherry — Physalis macrophysa
black snakeroot — Sanicula canadensis
meadow-parsnip — Thaspium barbinodi
arrow-grass — Triglochin maritima
rattlesnake-master — Eryngium yuccifolium
fameflower — Talinum spp.
Goldie's fern — Dryopteris Goldiana
fir club-moss — Lycopodium Selago var. patens

fish and mollusks

There are about 60 species of fish that are known to inhabit the Minnesota River and its tributaries. In 1965 a fish survey that identified 22 species was done by the then Minnesota Conservation Department. The survey covered the stretch of river from Lac qui Parle to Mankato. Since there are no barriers to fish movement between Mankato and Le Sueur, the species taken in the survey should also be found in this area.

The fish identified reflect only electrofishing catches. Other methods, such as trapping and seining, were not used in the sampling.

Electrofishing is a technique used to temporarily immobilize fish within a small area by introducing an electric field into the water. Fish then can be netted, identified, weighed, measured and returned to the water unharmed. The deep pools of the Minnesota River reduce the effectiveness of electrofishing as a survey technique. The river was also swift and turbid

during the sampling period. Consequently, only broad conclusions can be drawn from the survey data. It is evident, however, that the Minnesota harbors a substantial carp population.

The list of additional species inhabiting the river and its tributaries was compiled with the help of James Underhill, professor of ichthyology at the University of Minnesota.

Little is known about fish spawning in the Minnesota. The river's heavy siltation and water level fluctuations probably adversely affect reproduction, feeding and the general health of most game fish. Many of the game fish caught in the river are probably emigrants from lakes in the watershed that are regularly stocked. Fish also enter the river from tributary streams, some of which have areas suitable for natural reproduction.

Catfishing is the most popular type of angling on the river. Good walleye catches have been reported from some areas, according to local fishermen and DNR regional fisheries personnel. The Minnesota is regularly stocked with catfish and smallmouth bass fingerlings. The DNR regional fisheries office is hopeful that a viable smallmouth bass population can be established in the river.

Mollusks

When the Minnesota was surveyed for mollusks in 1947, 35 species were found to inhabit the river's drainage system. One of these, the Higgin's Eye mussel (Lampsilis higginsii), has been on the endangered species list since 1976.

This large mussel was at one time common in the Mississippi and other large midwestern rivers. Now threatened with extinction, it is believed to be restricted to limited areas of the Mississippi. Its reduction in numbers is the result of pollution, dam building, dredging and quarry washing operations.

A 1978 survey of the Minnesota River did not reveal the presence of the Higgin's Eye mussel. Only 20 other mussel species were found in the river.

fish species

walleye — Stizostedion vitreum vitreum
sauger — S. canadense
northern pike — Esox lucius
silver redhorse — Moxostoma anisurum
golden redhorse — M. erythrurum
northern redhorse — M. macrolepidotum
bigmouth buffalo — Ictiobus cyprinellus
smallmouth buffalo — I. bubalus
quillback — Carpiodes cyprinus
mooneye — Hiodon tergisus
goldeye — H. alosoides
yellow bullhead — Ictalurus natalis
black bullhead — I. melas
American eel — Anguilla rostrata
northern longnose gar — Lepisosteus osseus
shortnose gar — L. platostomus
gizzard shad — Dorsoma cepedianum
river carpsucker — Carpiodes carpio
white sucker — Catostomus commersoni
northern hogsucker — Hypentelium nigricans
carp — Cyprinus carpio
golden shiner — Notemigonus crysoleucas
creek chub — Semotilus atromaculatus
pearl dace — S. margarita
blacknose dace — Rhinichthys atratulus
northern redbelly dace — Chrosomus eos
southern redbelly dace — C. erythrogaster
hornyhead chub — Hybopsis biguttata
speckled chub — H. aestivalis
silver chub — H. storeriana
brassy minnow — Hybognathus hankinsoni
common shiner — Notropis cornutus
emerald shiner — N. atherinoides
bigmouth shiner — N. dorsalis
sand shiner — N. stramineus
spotfin shiner — N. spilopterus
mimic shiner — N. volucellus
river shiner — N. blennius
central weed shiner — N. roseus
rosey face shiner — N. rubellus
fathead minnow — Pimephales promelas
bluntnose minnow — P. notatus
stoneroller — Campostoma anomalum
channel catfish — Ictaluras punctatus
stone cat — Noturus flavus
yellow perch — Perca flavescens
slenderhead darter — Percina phoxocephala
blackside darter — Percina maculata
johnny darter — Etheostoma nigrum
banded darter — E. zonale
fantail darter — E. flabellare
rainbow darter — E. caeruleum
Iowa darter — E. exile
sheepshead — Aplodinotus grunniens
white bass — Roccus chrysops
largemouth bass — Micropterus salmoides
smallmouth bass — M. dolomieu
green sunfish — Lepomis cyanellus
orange spot sunfish — L. humilis
white crappie — Pomoxis annularis
brook stickleback — Eucalia inconstans
shovelnose sturgeon — Scaphirhynchus platorynchus

wildlife

With its broad floodplain forests and wetlands, oak-clad bluffs, remnant prairies and moist, forested ravines, the Minnesota River valley provides one of the last remaining major wildlife habitats in the southwestern part of the state. With much of the surrounding uplands under cultivation, wildlife species depend on the forests and wetlands along the river for food and cover.

The Farmland Wildlife Research Unit in Madelia, Minnesota, reports that well over 60 percent of the area's deer population lives in the river valley year round, and at least 75 percent of the herd is dependent on the valley at some time during the year.

The river valley also provides the core nesting, breeding and feeding grounds for the area's important fur bearers, including the raccoon, fox, beaver, muskrat and mink. It is not uncommon to find 100 to 150 raccoons or two to four foxes in an average square mile of land in the river valley.

The river's mature hardwoods and numerous oxbows are essential to wood duck populations; its marshes sustain the area's pheasants. The riparian woodland habitat also maintains diverse song bird communities.

About 130 species of birds probably breed in or along the river valley. Though there are no known colonies of herons in the river valley, two heronries containing black-crowned night herons, great blue herons and great egrets occupy lakes nearby. Forster's terns, black terns, eared grebes, red-necked grebes, western grebes and least bitterns nest in large marshes near the river and may also nest in river bottom wetlands. The river valley is probably the only place remaining in southwestern Minnesota where one might catch a glimpse of the rare and beautiful pileated woodpecker.

In addition to pheasants and wood ducks, game birds nesting in the valley incude mallards, blue-winged teal, bobwhites and gray partridges. Migrating waterfowl make heavy use of the river bottoms for feeding and resting.

Because the Madelia research unit considers the Minnesota River valley the most important wildlife area in southwestern Minnesota, it may soon attempt to establish a wild turkey population in the valley. If this attempt is successful, it will add a new dimension to recreation in the river valley for both hunters and nature observers.

About 30 species of amphibians and reptiles inhabit the valley between Franklin and Le Sueur. These include a recorded sighting of Blanding's turtle, a species of very limited distribution in Minnesota. The rare blue-tailed skink has been recorded just upstream of the study area and may be seen near granite outcrops in the bottomlands. Other species that might be quite rare on this stretch of the river are the blue racer, red-backed salamander, plains toad, spring peeper, common tree frog, green frog and wood frog. Most of these species appear to be near the southwestern edges of their ranges here.

About 45 species of mammals occur in this stretch of the Minnesota River valley. These include the oppossum, North America's only marsupial. Game mammals living in the river valley include the white-tailed deer, red and gray foxes, mink, raccoon, muskrat, beaver, gray and fox squirrels and cottontail rabbit.

The American bison once thrived on the prairies and prairie edge country along the Minnesota River. However, by the turn of the century, the combined effects of settlement and slaughter had reduced their numbers to a handful of captive buffalo. The last free buffalo reported in the state was seen in 1880.

The otter and bobcat, formerly common in this part of Minnesota, have been greatly reduced, but a few remain. A few coyotes are also present. A far-ranging moose was sighted in Le Sueur County in September 1977.

Other animals that have disappeared from the Minnesota River valley include the timber wolf, cougar, elk, swallow-tailed kite, trumpeter swan, passenger pigeon, burrowing owl, bald eagle, sandhill crane and whooping crane.

Preservation of the remaining river valley habitat and its wildlife yields not only ecological but economic

benefits as well. For example, for each deer taken in the valley between Franklin and Le Sueur, hunters spend $200 to $400, much of it locally. With 1,250 deer taken annually in the area, that adds up to between one-quarter and one-half million dollars each year.

Fur bearers are also economically important to the valley. Raccoons and foxes alone contribute more than $300,000 annually to the state's economy.

There are other, less tangible benefits provided by wildlife. A deer bounding through the woods or a blue heron taking flight is a thrilling sight. The Minnesota valley now provides this precious experience; it is important to ensure that it always will.

Species considered rare or irregular in the Minnesota River valley are indicated by an asterisk (*).

mammals

opossum — Didelphis virginiana
common mole — Scalopus aquaticus
cinereous shrew — Sorex cinereus
pigmy shrew — Microsorex hoyi
short-tailed shrew — Blarina brevicauda
little brown bat — Myotis lucifugus
Keen's little brown bat — M. keenii
big brown bat — Eptesicus fuscus
*pipistrelle — Pipistrellus subflavus
*silver-haired bat — Lasionycterus noctivagans
red bat — Lasiurus borealis
hoary bat — L. cinereus
white-tailed jack rabbit — Lepus townsendii
cottontail rabbit — Sylvilagus floridanus
woodchuck — Marmota monax
striped ground squirrel — Citellus tridecemlineatus
Franklin's ground squirrel — C. Franklinii
eastern chipmunk — Tamias striatus
red squirrel — Tamiasciurus hudsonicus
gray squirrel — Sciurus carolinensis
fox squirrel — S. niger
southern flying squirrel — Glaucomys volans
pocket gopher — Geomys bursarius
pocket mouse — Perognathus flavescens
beaver — Castor canadensis
*harvest mouse — Reithrodontomys megalotis
prairie deer mouse — Peromyscus maniculatus bairdii
northern deer mouse — P. leucopus noveboracensis
red-backed mouse — Clethrionomys gapperi
common meadow mouse — Microtus pennsylvanicus
prairie vole — M. ochrogaster
muskrat — Ondatra zibethica
meadow jumping mouse — Zapus hudsonicus
raccoon — Procyon lotor
ermine — Mustela erminea
long-tailed weasel — M. frenata
mink — M. vison
*otter — Lutra canadensis
spotted skunk — Spilogale interrupta
striped skunk — Mephitis mephitis
badger — Taxidea taxus
red fox — Vulpes vulpes
gray fox — Urocyon cinereoargenteus
coyote — Canis latrans
white-tailed deer — Odocoileus virginianus
*bobcat — Lynx rufus

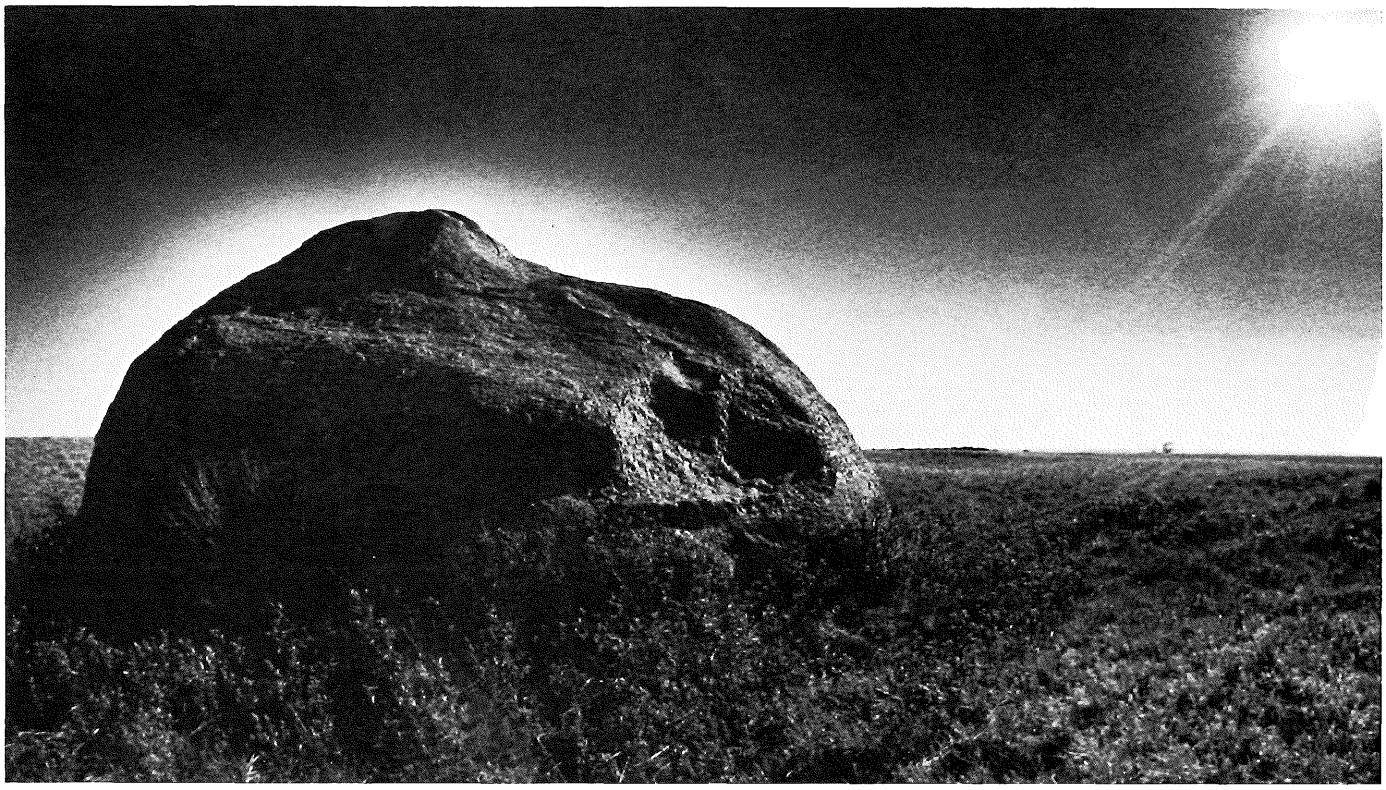
amphibians and reptiles

common newt — Notophthalmus viridescens
mud puppy — Necturus maculosus
tiger salamander — Ambystoma tigrinum
swamp tree frog — Pseudacris nigrita
leopard frog — Rana pipiens
* blue-tailed skink — Eumeces fasciatus
black-banded skink — E. septentrionalis
western hog-nosed snake — Heterodon nasicus
smooth green snake — Opheodrys vernalis
* blue racer — Coluber constrictor
fox snake — Elaphe vulpina
bull snake — Pituophis melanoleucus
milk snake — Lampropeltis triangulum
common water snake — Natrix sipedon
brown snake — Storeria dekayi
red-bellied snake — S. occipitomaculata
plains garter snake — Thamnophis radix
red-sided garter snake — T. sirtalis parietalis
common garter snake — T. sirtalis sirtalis
snapping turtle — Chelydra serpentina
painted turtle — Chrysemys picta
spiny soft-shelled turtle — Trionyx spinifera
* red-backed salamander — Plethodon cinereus
American toad — Bufo americanus
*plains toad — B. cognatus
* spring peeper — Hyla crucifer
* common tree frog — H. versicolor
* green frog — Rana clamitans
* wood frog — R. sylvatica

Bird species that are irregular or rare in distribution are indicated with an asterisk (*).

bird species

black tern
rock dove
mourning dove
yellow-billed cuckoo
black-billed cuckoo
screech owl
great horned owl
barred owl
*long-eared owl
*short-eared owl
*barn owl
common nighthawk
chimney swift
ruby-throated hummingbird
belted kingfisher
common flicker
pileated woodpecker
red-bellied woodpecker
red-headed woodpecker
yellow-bellied sapsucker
hairy woodpecker
downy woodpecker
eastern kingbird
western kingbird
great crested flycatcher
eastern phoebe
willow flycatcher
least flycatcher
eastern wood peewee
horned lark
tree swallow
bank swallow
rough-winged swallow
barn swallow
cliff swallow
purple martin
blue jay
common crow
black-capped chickadee
white-breasted nuthatch
house wren
long-billed marsh wren
short-billed marsh wren
* mockingbird
gray catbird
brown thrasher
American robin
wood thrush
* veery
eastern bluebird
* blue-gray gnatcatcher
* cedar waxwing
loggerhead shrike
starling
* yellow-throated vireo
* red-necked grebe
* eared grebe
* western grebe
pied-billed grebe
* great blue heron
green heron
* great egret
* black-crowned night heron
least bittern
American bittern
mallard
* gadwall
* pintail
* green-winged teal
blue-winged teal
northern shoveler
wood duck
* redhead
* ring-necked duck
* canvasback
ruddy duck
* hooded merganser
* turkey vulture
* Cooper's hawk
red-tailed hawk
* red-shouldered hawk
* Swainson's hawk
* marsh hawk
American kestrel
* bobwhite
ring-necked pheasant
gray partridge
* king rail
Virginia rail
sora
* common gallinule
American coot
killdeer
common snipe
spotted sandpiper
* Wilson's phalarope
*Forster's tern
red-eyed vireo
warbling vireo
yellow warbler
* cerulean warbler
* ovenbird
common yellowthroat
* American redstart
house sparrow
bobolink
eastern meadowlark
western meadowlark
yellow-headed blackbird
red-winged blackbird
orchard oriole
northern oriole
* Brewer's blackbird
common grackle
brown-headed cowbird
scarlet tanager
cardinal
rose-breasted grosbeak
indigo bunting
dickcissel
American goldfinch
* rufous-sided towhee
* lark bunting
savannah sparrow
grasshopper sparrow
vesper sparrow
lark sparrow
chipping sparrow
* clay-colored sparrow
field sparrow
* swamp sparrow
song sparrow



Buffalo rubbing stones are reminders of the herds of bison that once roamed the southwestern Minnesota prairie. The buffalo used the stones to scrape off shaggy winter coats, eventually wearing smooth parts of the rock surface.

recreation

The resources of the Minnesota River valley afford recreational opportunities for valley residents and visitors.

The river valley is an important state hunting resource. The valley's heavily wooded bluffs, floodplain forests, marshes, oxbow lakes and remnant prairies are home to such sought-after game species as deer, fox, squirrel, pheasant, wood duck, bobwhite and mallard. Within the study area of the valley, about 20,000 person-days are spent annually in the pursuit of deer alone, according to Al Berner of the Farmland Wildlife Research Unit in Madelia.

Fishing is another popular sport on the river. Catfish and bullheads draw anglers from the surrounding area and from neighboring states. Good walleye and northern pike catches reported in some areas also attract fishermen to the river. While there is little data on the extent of river fishing, DNR regional fisheries personnel feel that the Minnesota is an underused angling resource.

Meandering through scenic forests and past picturesque oxbows and sloughs, the Minnesota is popular with canoeists and boaters. According to local county sheriffs' departments, boating use has been increasing on the river, reflecting a statewide trend in river use. The Minnesota is one of the few canoeable streams in the southwestern part of the state. It offers canoeing conditions that are ideal for novice boaters and family outings.

Winter sport in the Minnesota River valley includes snowmobiling and cross country skiing. Many snowmobilers use the river itself, as well as trails in parks such as Fort Ridgely and Traverse des Sioux. Minneopa State Park is open only to cross country skiers. DNR regional staff report that skiing in the valley has been increasing.

Campers, hikers, nature observers, photographers and artists also take advantage of the river valley's scenery, abundant wildlife and interesting plant communities.

archaeology

Archaeological sites in the Minnesota River valley span a range of time from 5000 B.C. to the mid–1700s. There are approximately 30 known sites, mostly villages and burial mounds, near the river between Franklin and Le Sueur. Experts believe that a comprehensive survey of the river valley would reveal many more.

An unknown number of burial mounds and village sites, once common along ridgetops and high river terraces, have been lost to cultivation and construction. But archaeologists excavating sites that escaped destruction have pieced together pictures of the earliest cultures in Minnesota.

The Runck Village site in Brown County has yielded artifacts that show that Indian tribes of the Archaic cultural tradition inhabited the river valley. These Indians lived in Minnesota from 5000 B.C. to 1000 B.C. They were a semi–nomadic people, shifting their camps seasonally to take advantage of changing food supplies. Game, fish and wild vegetables were their primary foods.

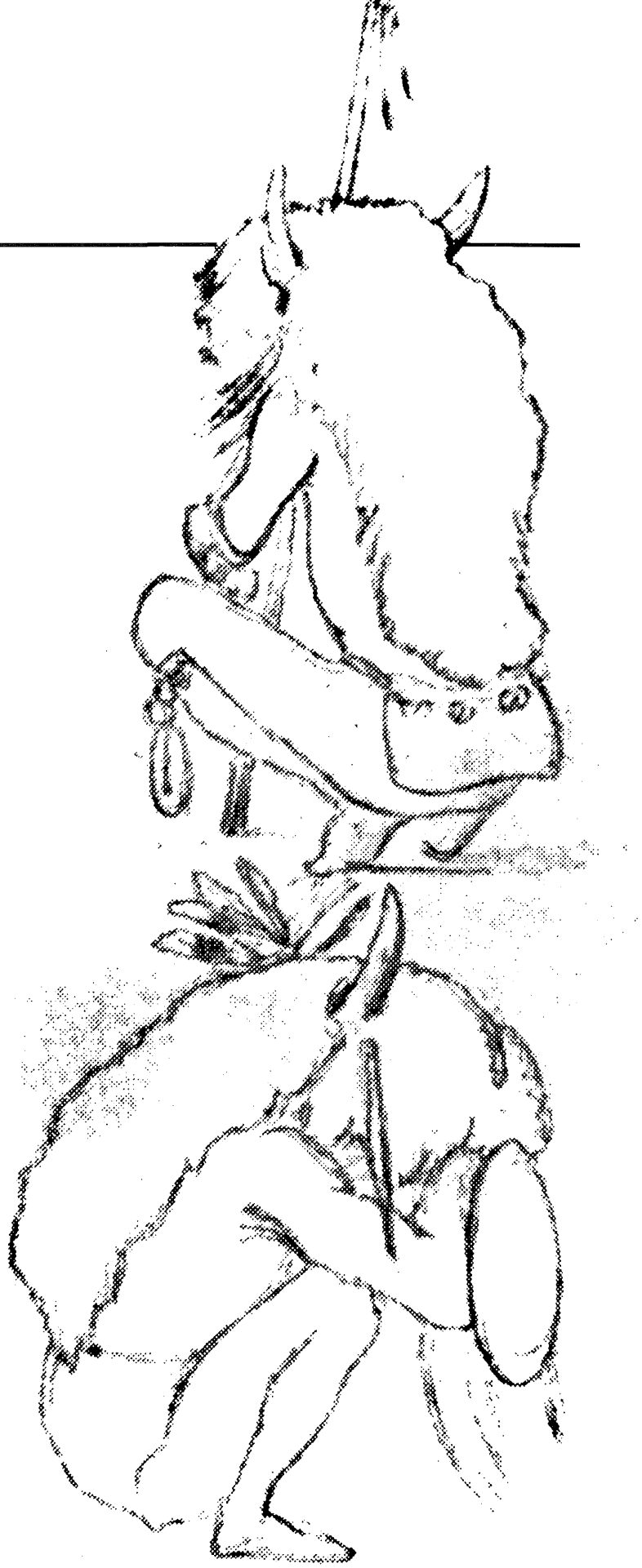
Tribes of the Archaic culture used tools of ground stone. Points, gouges and axes are typical relics. The Archaic people did not build burial mounds or make pottery. They usually buried their dead in shallow graves on high lakeshores, hillsides or glacial knolls.

The "Old Copper" culture, which began about 5000 B.C. and persisted until 1500 B.C., was a part of the Archaic tradition. This culture was unique to the western Great Lakes region and represents the first known use of fabricated metal by man in either North or South America. These tribes hammered pure nuggets of copper, which were found near the upper St. Croix and along the Snake and Kettle rivers, into tools and ornaments and traded them with tribes along the Minnesota River and as far away as Wyoming and the Gulf of Mexico. Archaeologists have found copper artifacts along the Minnesota but have as yet found no evidence that Old Copper tribes lived here. However, because a systematic survey of the entire river valley has never been undertaken, they have not excluded the possibility that these Indians were present.

The Archaic culture was succeeded in the Minnesota River valley by the Woodland culture, which existed here from about 1000 B.C. to 1000 A.D. Woodland tribes built permanent villages and elaborate burial mounds, made pottery, and began harvesting wild rice.

Stone and bone tools, consisting of points, scrapers, knives, punches, drills, and grooved mauls for pounding meat and berries, are usually found at Woodland sites. Pottery, bone dice used for games, pendants, necklaces and shell ornaments are other common artifacts uncovered at Woodland villages and burial mounds.

Two types of burial mounds were used by these people. In the primary mound, the entire body was



interred in a subsoil pit, below the mound. Grave goods were often buried with the body.

The more common secondary mound contained only partial remains of the body. The dead were put on platforms or tied to trees in the open for several years before burial. Grave goods rarely accompanied secondary burials.

The Harbo Hill and Sievert mounds in Blue Earth County are good examples of Woodland burial mounds.

The addition of wild rice to their diet in about 800 A. D. resulted in a major population surge. Grains of superior strains of rice packed in mud balls were traded to tribes for planting in lakes that had no rice or that had inferior grain.

Eventually these tribes began planting and cultivating other foods as well, and gradually became part of the Mississippian cultural tradition. By 1000 A. D. a major Mississippian center was established in the central Minnesota River valley.

Several Mississippian villages and burial sites have been found in the study area. The Cambria village and Lewis mounds in Blue Earth County date from this era.

The Mississippian livelihood was based on the cultivation of corn, beans, squash, sunflowers and tobacco. Timbered areas in the river bottoms were cleared and small garden plots planted. Hunting and fishing were still important; bison remained a staple food.

This Indian culture, related to the great Middle Mississippian center at Cahokia, Illinois, was probably the closest prehistoric Minnesota people came to an urban society. The Mississippian tribes lived in extensive villages housing from 600 to 800 people. At least some residents occupied small, semi-subterranean houses. Sometimes surrounded by a protective wall or palisade, the villages were often located on flat river terraces above the bottomlands. Deep underground storage pits for vegetables were dug throughout the villages.

The village storage pits were used for refuse after they were no longer fit for storing dried vegetable food and are therefore of interest to archaeologists. Broken tools, pottery shards, animal bones, ashes and other artifacts are found in these pits.

Mississippian pottery was tempered with crushed rock and has incised and cord-impressed decorations. It differs from Woodland pottery in shape and in method and type of decoration.

Mississippian burial mounds are usually of the primary type, containing grave goods.

population

Six counties border the Minnesota River between Franklin and Le Sueur. Redwood and Renville counties are projected to lose population; Blue Earth, Brown, Le Sueur and Nicollet counties will show moderate increases.

The area's rural population is declining, while municipalities display mixed trends (see population tables).

With more than two million people living within a two-hour drive of this segment of the Minnesota River, its recreational potential is great.

Population by county

	1970 Census	1976 Estimate	% Change	1980 Projection	2000 Projection
Blue Earth	52,322	51,900	-.7	58,000	69,100
Brown	28,887	30,300	4.7	29,900	31,300
Le Sueur	21,332	22,400	4.9	22,900	25,100
Nicollet	24,518	24,600	.2	26,000	29,000
Redwood	20,024	19,900	-.5	19,400	18,500
Renville	21,139	21,100	-.2	20,700	19,600

Sources: Population Estimates for Minnesota Counties 1976; Population Projections, 1970-2000.

Some municipal population trends

	1970	1976	1978
Redwood Falls	4,774		5,237
New Ulm	13,051		14,936
Mankato	30,895		30,009
North Mankato	7,347		8,327
Le Sueur	3,745		4,038
St. Peter	8,339	7,956	

Sources: U.S. Census Bureau; U.S. Census Bureau Revenue Sharing Estimates; Office of State Demographer Estimates, State Planning Agency.

economy

The economy of the Minnesota River basin is based on agriculture and the manufacture of food and related products. The area's industrial output has been dominated by agriculture since the second half of the 19th century.

Most industries in the basin are related to the manufacture of food products. These include vegetable processing, livestock and poultry packing, grain milling and feed preparation. Other important industries include manufacture of primary and fabricated metals and machinery.

Much of the study area's economic growth and development comes from the sale of agricultural products. Export commodities include corn, soybeans, sugar beets, vegetables, beef, pork and dairy products.

Mining in the basin employs a small number of workers and is confined primarily to the quarrying of rock and limestone that is used locally. One quarry near New Ulm uses 27 million gallons of water per year from the river, for aggregate washing. Some gravel pits are mined near the river.

Forest resources provide recreation, wildlife habitat and grazing. Very little timber is harvested in the valley.

The retail and wholesale businesses are also dominated by agriculture. Besides the usual retailing of groceries, clothing, fuel and recreation, many farm supply stores exist in the basin. The finance, insurance and real estate businesses are also oriented toward farmers' needs.

The following chart indicates the percentage of employed persons (14+ years) by industry as of the 1970 census.

The amount of tourist-generated income for the six-county area is low. All but Nicollet County ranked below the state average in 1974 for tourist-travel expenditures in dollars per county resident (state average: $254.40), and for tourist-travel expenditures as a percentage of gross sales (state average: 3.2 percent).

County	Agriculture, Forestry & Fisheries	Manufacturing	Wholesale & Retail Trade	Professional & Related Services	Other
Redwood	28.2	8.0	22.1	16.3	25.4
Renville	30.1	11.4	20.7	13.8	24.0
Blue Earth	9.0	15.5	25.0	24.1	26.4
Nicollet	13.8	16.6	19.9	26.9	22.8
Brown	16.9	22.3	20.7	15.4	24.7
Le Sueur	15.5	25.4	17.1	16.6	25.4

Source: Minnesota Socio-economic Population Characteristics, Employment, Minnesota State Planning Agency, St. Paul, 1972

history

The Minnesota River, a placid stream meandering through the rich farmland of southwestern Minnesota, was once a vital highway for Indians, explorers, traders and settlers.

The Dakota name for the river means "cloud-tinted water" (Minne, water, and sota, somewhat clouded), owing to its whitishly turbid appearance at flood stage.

French explorers and fur traders called the stream St. Pierre. It is believed that this name commemorates the river valley's first exploration by Pierre Charles Le Sueur in the late 1600s. Le Sueur returned to the river valley in 1700 to mine what he believed to be a vein of copper ore on the banks of the Blue Earth River, near the present site of Mankato. The Blue Earth--called Makata Osa Watapa by the Dakota--was named for the blue-green clays found here and used by the Dakota as a pigment.

Working out of the fort they constructed below the Le Sueur River's confluence with the Blue Earth, Le Sueur's party diligently worked the mine. With two choice tons of ore, Le Sueur left for France. Nothing more was heard of his "copper ore," which was, after all, only bluish shale or clay confused with copper because of its color. In 1702 the inhabitants of the fort were driven from the valley by a warring band of Fox Indians.

With the coming of English dominance after the French and Indian War (1755–1760), the Riviere St. Pierre was anglicized to the St. Peter River. But, soon after the Minnesota Territory was organized in 1849, the territorial legislature received Congress' sanction to reinstate the original name, Minnesota.

The Minnesota for a time was thought to be the Northwest Passage, the hoped-for and sought-after water route to the Pacific and prosperous trade with the Orient. Baron la Hontan's controversial, and apparently fictional, book, New Voyages to North America, purported a 500-mile westward journey on the "Riviere Longue" in 1688–89. Many believed the Minnesota to be this river.

The British Admiralty's offer of a substantial reward for the discovery of the elusive Northwest Passage enticed Jonathan Carver to the mouth of the Minnesota in 1766. His accounts compose the first detailed description of the valley.

"The river St. Pierre, which runs through the territory of the Nadowossies (Dakota)," he wrote, "flows through a most delightful country, abounding with all the necessities of life that grow spontaneously, and with a little cultivation it might be made to produce even the luxuries of life . . . At a little distance from the sides of the river are eminences from which you have views that cannot be exceeded by the most beautiful of those that I have already described."

When spring supplies did not arrive, Carver was forced to retreat.

Another early description of the area was given by fur trader Peter Pond. In the fall of 1773, Pond canoed up the Minnesota River and established a fur trade with the Dakota. The following winter Pond traded with the Yankton, a band of the Dakota Nation, camped about 200 miles upriver. Pond wrote of the land in his colorful phonetic spelling: "On account of the face of the Countrey . . .the Entervales of the River St. Peter is Exsalend. . .and the Soile thin and lite. . .the Woods and Meadowes have an abundans of Annamels, Sum Turkeas; Buffaloes are Verey Plentey, the Common Dear are Plentey, and Larg..."

The early rumor of the Northwest Passage was dispelled by Major Stephen H. Long. In 1823 Long headed an expedition of cartographers, painters and scientists up the Minnesota. Joseph Renville, a French-Indian fur trader who had been a British captain in the War of 1812, furnished information about the Dakota Indians and the country. The expedition proceeded beyond the Minnesota River into the Red River valley and back along a northern route to the Great Lakes.

Renville also guided cartographer Joseph N. Nicollet. In 1838 Nicollet explored the Minnesota as far west as the Cottonwood River and made the first reliable map of the area.

By the mid-1800s the Minnesota River valley had been all but trapped out. Both game and fur animals were scarce; the buffalo had been driven to the plains of the upper Missouri and the Red River valley. Spurred by the glowing reports of the fertile valley brought back by traders and explorers, people to the east began clamoring for the Minnesota River region to be opened to white settlement. The U.S. government, in turn, put increasing pressure on the Indians to part with some of their lands.

In 1851 two treaties were negotiated with the Dakota Indians, one with the upper Minnesota bands at Traverse des Sioux, an ancient Indian fording place near the present site of St. Peter, and one with the lower Minnesota bands at Mendota, near the river's mouth. The two treaties were basically the same: the Dakota were persuaded to sell 24 million acres of what is now Minnesota, Iowa and South Dakota. The upper Dakota were allowed a reservation 10 miles wide on either side of the Minnesota from Lake Traverse to the Yellow Medicine River; the lower Dakota a similar strip from the Yellow Medicine to the Little Rock River. A large portion of the payment promised to the Indians was set aside to pay debts claimed by the fur traders.

As soon as word of the 1851 treaties was public, enterprising whites began moving in. They should

legally have waited for the evacuation of the Indian population and for government land surveys to be conducted, but the "Sooners," as these early settlers were called, claimed land and planted crops, relying on public sentiment to protect their interests.

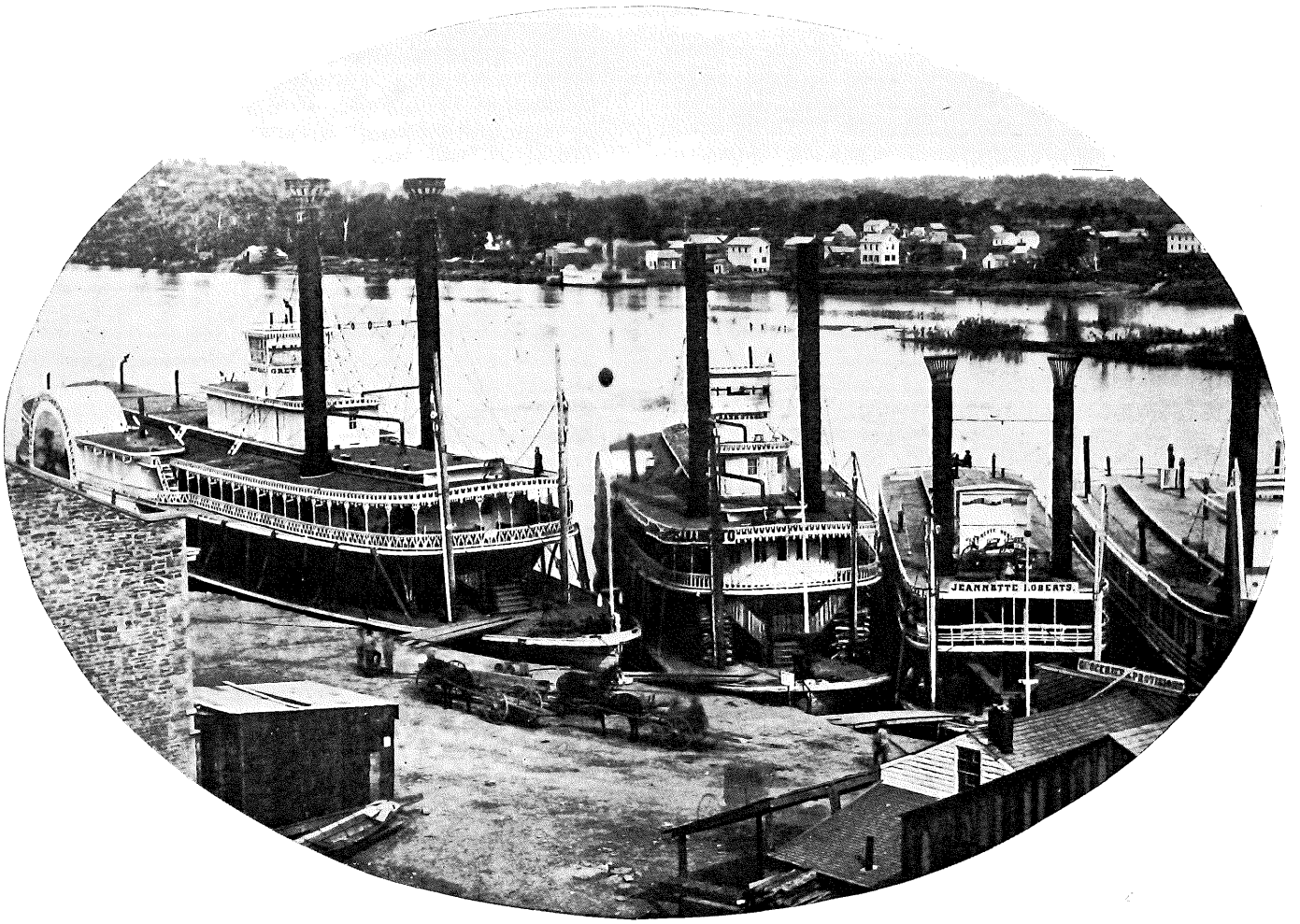
James Goodhue, St. Paul's first newspaper editor, was the valley's most enthusiastic public relations man, proclaiming the rich possibilities and curative climate of the "Suland." Goodhue wrote that along "the whole length of the fertile Minnesota, and upon the waters of the Blue Earth, settlers have not only gone over, but have built houses and stables, and cleared lands, not dozens of settlers, or scores, or hundreds, but thousands of them. . . ."

The Minnesota River was the highway to settlement, bringing passengers and goods to the growing towns and cities. By 1853 there were eight steam paddle-wheelers in regular service on the river. For 20 years steamboats were the primary means of transportation on the Minnesota.

The river always presented navigational problems. Summer's low flows, boulders, snags, and overhanging trees all caused trouble, despite the special low-draft design of the Minnesota steamers.

In 1866 the Army Corps of Engineers examined possibilities for improving the navigability of the river. There were two alternatives: Construction of locks and dams, or the removal of snags, boulders and overhanging trees from the river corridor. The latter plan was implemented.

Proposals made in 1875 again called for more permanent channel improvement as far upstream as South Bend. One proposal was to build a series of locks and dams at Little Rapids, Henderson, Le Sueur, St. Peter and Mankato, at an estimated cost of more than $730,000. Another consideration was to dredge a



canal at double or triple the cost of locks and dams. But the completion of the railroads killed both proposals.

The first train ran in the Minnesota Valley in 1865. By 1878 the Minnesota Valley Railway was completed to Redwood Falls. The Winona and St. Peter Railroad, later a part of the Chicago and Northwestern system, crossed the Minnesota at Kasota in 1871.

The railroads hastened the development and modernization of the valley, but it was the steamboat that brought early riverside settlements. Most early settlements were simply the grouping of families into "companies" for their mutual help and protection. Mankato was settled in 1852 and South Bend City in 1853. New Ulm, a thoroughly planned and progressively designed community named after Ulm, Germany, was settled in 1853-1854. The rival villages of Le Sueur and Le Sueur City sprang up in 1858 and were united nine years later. Fort Ridgely was built in 1853 to keep watch over the Dakota reservation. Rock Bend was settled in 1853 and renamed St. Peter in 1854.

In 1857 St. Peter constructed an imposing building, hoping to lure the state capital from St. Paul. When legislative sanction seemed imminent, legislator Joseph Rolette of Pembina foiled the move by disappearing with the bill until the time set for its passage had expired.

The lumber needs of the young settlements were met by the "Big Woods," an upland hardwood timber belt bordering the lower Minnesota. The Big Woods supplied fence posts, rail ties, barrels, building materials, firewood, fuel for steamboats and lumber for bridges. Tributary streams provided power for saw and grist mills. Freight was distributed from river ports via stage lines.

The speculative optimism of the time was expressed by travelers aboard a steamboat carrying troops and supplies to Fort Ridgely in 1853: "We have returned more than ever convinced that the vast agricultural, and perhaps mineral, resources of this valley have not at all been exaggerated--rather under-rated than otherwise. Rich and desirable farming lands there are in abundance every mile, with all the facilities of timber and water, as well as fine building stone. Iron we are certain will be found in abundance and we are much deceived if immense coal fields should prove a great distance off."

The economic "Panic" of 1857 spurred occasional newspaper editorials predicting an exodus to the newly discovered gold fields of western Canada or the agricultural promise of the western horizon. Crops were small in the Minnesota valley and there was little or no home market. The settlers could not send their farm products to eastern markets because there were no railroads or other means to transport them. Because of this there was little cash, and it was nearly impossible to support a family.

Relief came to the unfortunate settlers from an unexpected quarter. In 1858 several eastern companies began quietly plying a trade in the ginseng plants growing in abundance in the Big Woods.

The Chinese considered ginseng to have general tonic, curative properties, and a lucrative market had been established for the American variety. The earliest Minnesota ventures were hushed in hopes of avoiding competitive interference. Despite the secrecy, the successful harvest of 1858 was soon public knowledge and dozens of buyers entered the field in 1859. The great ginseng rush was on, centered on the Big Woods.

The boom times in St. Peter and Le Sueur were described by the St. Paul Daily Pioneer and Democrat: "Bar rooms are abandoned; eucher and draw poker have lost their fascination: even fishing, ducking, politics, and religion are not now displayed as peculiar fortes; but old and young, the patrician and the plebian, the prudent and the desolate are all agog with — Ginseng."

Though the "boom" phase was short-lived, the supply of ginseng would persist long enough to offer cash relief to the victims of another crisis, the grasshopper plagues of 1873-1877. The grasshoppers appeared in swarms that covered the earth and filled the air. They ate crops (and everything else green), laid their eggs and disappeared in the fall. In the spring the young grasshoppers hatched with healthy appetites. They repeated this pattern until 1877, when they disappeared from the area.

The Dakota Indians suffered a different sort of plague: the white men who swallowed their land and gave them broken promises in return. Even their narrow reservation flanking the Minnesota River would not remain whole for long. In 1858 representatives of the Dakota were led to Washington by Indian agent Joseph R. Brown to sign away the portion of the reserved tract lying north of the Minnesota--close to a million acres.

The new treaties also provided for payment of debts to the traders. This proved a source of resentment when the meager payments promised them were eaten away by the traders' claims against them. Nearly all of the money for the lower Dakota went to traders; the upper Dakota received only little more than half of the funds appropriated for them.

Brown had been appointed agent of the reservation in 1857. He and his successor, Thomas Galbraith, instituted programs to convert the Dakota to white lifestyles. The Indians were encouraged to cut their hair, wear "white" clothing, inhabit "white" houses and farm by "white" methods. The experiment backfired when the small portion of families that complied were so harassed by the "blanket Indians," that military protection was necessary.

In 1862 living conditions and events had strained

relations with the Dakota to a breaking point. That summer government payments were late, food supplies were critically low, and the Indians' crops were failing. In August there were surly confrontations at both the Upper and Lower Sioux agency food storehouses. The Indians were starving. The agency refused to give them food until the government payments arrived, as was customary.

The unfair practices of the traders, the shortcomings of the Indian agency and the bad faith of the United States in making and keeping treaties all led to the "Sioux Uprising."

On August 17, 1862 a small band of Dakota hunters attacked a family farm in Meeker County, killing five white settlers. Early the next morning the Dakota attacked the Lower Sioux Agency, killing 20 people. About 45 whites escaped by way of the Redwood Ferry to Fort Ridgely, the outpost for military control of the river valley. The Dakota made two unsuccessful assaults on the base.

Chief Big Eagle later explained, "We thought the fort was the door to the valley as far as to St. Paul, and that if we got through the door nothing could stop us this side of the Mississippi."

Thwarted, the Dakota turned their hostilities on vulnerable settlements. New Ulm, with a population of about 900, successfully defended itself against 500 Dakota on August 23. The city then evacuated and 153 wagons reached Mankato without incident. The Dakota retreated up the west side of the Minnesota to the Yellow Medicine River.

Two other battles were fought along the Minnesota. The Battle of Wood Lake, on September 23, was the last major battle and was a decisive victory for the whites. On September 26 Colonel Henry Sibley led his troops into the Dakota camp and secured the release of more than 200 prisoners.

On September 28 many Dakota were taken captive. Nearly 1700 Dakota men, women and children were crowded into a prison camp below Fort Snelling. Many froze or starved that winter. More than 300 Indians were sentenced to hang. President Lincoln commuted the sentences of all but 38, who were publicly hanged in Mankato on December 26, 1862. Those remaining at the Fort Snelling camp were transferred to a poorly sited reservation at Crow Creek, South Dakota. After three difficult years they were relocated in Nebraska.

It was several years before white confidence in the river valley was restored. Settlement continued and the Minnesota valley became part of the rich agricultural domain of southern Minnesota.

the appendix

the wild and scenic rivers act

MINNESOTA STATUTES 104.31 to 104.40
(Includes 1977 Amendments)

An act relating to natural resources; preservation and management of wild and scenic rivers; establishing a system of classifications of such rivers as wild, scenic, or recreational; providing policies and standards for administration thereof.

Be it enacted by the Legislature of the State of Minnesota:

104.31 WILD AND SCENIC RIVERS ACT. Sections 104.31 to 104.40 may be cited as the "Minnesota wild and scenic rivers act."

104.32 POLICY. The legislature finds that certain of Minnesota's rivers and their adjacent lands possess outstanding scenic, recreational, natural, historical, scientific and similar values. Because it is in the interest of present and future generations to retain these values, it is hereby declared to be a policy of Minnesota and an authorized public purpose to preserve and protect these rivers.

104.33 SYSTEM; CRITERIA FOR INCLUSION. Subdivision 1. The whole or a segment of any river and its adjacent lands in this state that possesses outstanding scenic, recreational, natural, historical, scientific, or similar values shall be eligible for inclusion within the Minnesota wild and scenic rivers system. "River" means a flowing body of water such as a stream or a segment or tributary thereof, and may include lakes through which the river or stream flows.

Subd. 2. Rivers or segments thereof included within the system shall be classified as wild, scenic, or recreational.

(a) "Wild" rivers are those rivers that exist in a free–flowing state, with excellent water quality, and with adjacent lands that are essentially primitive. "Free–flowing" means existing in natural condition without significant artificial modification such as impoundment, diversion, or straightening. The existence, however, of low dams, diversion works or other minor structures at the time any river is proposed for inclusion shall not automatically bar its inclusion as a wild, scenic, or recreational river.

(b) "Scenic" rivers are those rivers that exist in a free–flowing state and with adjacent lands that are largely undeveloped.

(c) "Recreational" rivers are those rivers that may have undergone some impoundment or diversion in the past and may have adjacent lands that are considerably developed, but that are still capable of being managed so as to further the purposes of sections 104.31 to 104.40.

104.34 COMMISSIONER'S DUTIES. Subdivision 1. The commissioner of natural resources shall be responsible for administering the wild and scenic rivers system and his duties shall include but not be limited to conducting studies, developing criteria for classification and designation of rivers, designating rivers for inclusion within the system, and management of the components of the system, including promulgation of regulations with respect thereto.

Subd. 2. The commissioner shall promulgate, in the manner provided in chapter 15, statewide minimum standards and criteria for the preservation and protection of shorelands within the boundaries of wild, scenic, and recreational rivers. Such standards and criteria (a) may include but need not be limited to the matters covered in the commissioner's standards and criteria for shoreland areas, as set out in section 105.485, except that the distance limitations contained in section 105.485 do not apply to standards and criteria for wild, scenic, and recreational rivers; (b) shall further the purposes of sections 104.31 to 104.40 and of the classifications of rivers established hereunder; and (c) shall apply to the same local governments as are or may hereafter be specified in section 105.485.

104.35 MANAGEMENT PLANS; HEARINGS; ESTABLISHMENT. Subdivision 1. For each river proposed to be included in the wild and scenic rivers system, the commissioner shall prepare a management plan, with no unreasonable restrictions upon compatible, pre–existing, economic uses of particular tracts of land, to preserve and enhance the values that cause the river to be proposed for inclusion in the system. The plan shall give primary emphasis to the area's scenic, recreational, natural, historical, scientific and similar values. The plan shall set forth the proposed classification of the river and segments thereof, and the boundaries of the area along the river to be included within the system. The boundaries shall include not more than 320 acres per mile on both sides of the river. The plan shall include proposed regulations governing the use of public lands and waters within the area, which may differ from any such statewide regulations to the extent necessary to

take account of the particular attributes of the area. The plan may include proposed standards and criteria adopted pursuant to section 104.34 for local land use controls that differ from the statewide standards and criteria to the extent necessary to take account of the particular attributes of the area.

Subd. 2. The commissioner shall make the proposed management plan available to affected local governmental bodies, shoreland owners, conservation and outdoor recreation groups, and the general public. Not less than 60 days after making such information available, the commissioner shall conduct a public hearing on the proposed management plan in the county seat of each county which contains a portion of the designated area, in the manner provided in chapter 15.

Subd. 3. Upon receipt of the hearing examiner's report, the commissioner shall immediately forward the proposed management plan to the state planning agency for review pursuant to section 86A.09, subdivision 3, except that the review by the state planning agency shall be completed or be deemed completed within 30 days after receiving the proposed management plan and the review by the governor shall be completed or be deemed completed within 15 days after receipt. Within 60 days after receipt of the hearing examiner's report, the commissioner shall decide whether to designate by order the river or segment thereof as a wild, scenic, or recreational river and, if so designated, shall adopt a management plan to govern the area. The commissioner shall notify and inform public agencies and private landowners of the plan and its purposes so as to encourage their cooperation in the management and use of their land in a manner consistent with the plan and its purposes.

Subd. 4. The legislature may at any time designate additional rivers to be included within the system, delete rivers previously included in the system, or change the classification of rivers theretofore classified by the commissioner.

104.36 LOCAL LAND USE ORDINANCES. Subdivision 1. Within six months after establishment of a wild, scenic, or recreational river area, each local government containing any portion thereof shall adopt or amend its local ordinances and land use district maps to the extent necessary to comply with the standards and criteria of the commissioner and the management plan. If a local government fails to adopt adequate ordinances, maps, or amendments thereto within six months, the commissioner shall adopt such ordinances, maps, or amendments in the manner and with the effect specified in section 105.485, subdivisions 4 and 5.

Subd. 2. The commissioner shall assist local governments in the preparation, implementation and enforcement of the ordinances required herein, within the limits of available appropriations and personnel.

104.37 ACQUISITION OF INTERESTS IN LAND; DEVELOPMENT. Subdivision 1. To further the purposes of sections 104.31 to 104.40, the commissioner of administration, for the commissioner of natural resources, may acquire the title, scenic easements or other interests in land, by purchase, grant, gift, devise, exchange, lease, or other lawful means. "Scenic easement" means an interest in land, less than the fee title, which limits the use of such land for the purpose of protecting the scenic, recreational, or natural characteristics of a wild, scenic or recreational river area. Unless otherwise expressly and specifically provided by the parties, such easement shall be (a) perpetually held for the benefit of the people of Minnesota; (b) specifically enforceable by its holder or any beneficiary; and (c) binding upon the holder of the servient estate, his heirs, successors and assigns. Unless specifically provided by the parties, no such easement shall give the holder or any beneficiary the right to enter on the land except for enforcement of the easement.

Subd. 2. The commissioner of natural resources may designate and develop appropriate areas of public land along wild, scenic, and recreational rivers as water waysides for facilities compatible with the class of river, including, as appropriate, primitive campsites, picnic sites, portages, water access sites, sanitation facilities, and interpretive display.

Subd. 3. The commissioner of natural resources may mark canoe and boating routes along a wild, scenic, or recreational river, consistent with the classification and characteristics of the river, including points of interest, portages, campsites, dams, rapids, waterfalls, whirlpools, and other hazards to navigation. Canoe routes, boating routes, campsites, and portages marked under this subdivision shall not be subject to the provisions of section 160.06.

Subd. 4. The commissioner of natural resources may designate all or a portion of a state wild, scenic, or recreational river that possesses the necessary qualifications as a state trout stream, and make habitat improvement as may be necessary, desirable, and consistent with the classification of the river.

104.38 RESPONSIBILITIES OF OTHER GOVERNMENTAL UNITS. All state, local and special governmental units, councils, commissions, boards, districts, agencies, departments and other authorities shall exercise their powers so as to further the

purposes of sections 104.31 to 104.40 and management plans adopted by the commissioner hereunder. Land owned by the state, its agencies and subdivisions shall be administered in accordance with the management plan, and no land owned by such governmental bodies within the designated boundaries of a wild, scenic or recreational river area shall be transferred to any other person or entity if such transfer would be inconsistent with such plan.

104.39 FEDERAL–STATE RELATIONS. Nothing in sections 104.31 to 104.40 shall preclude a river in the Minnesota wild and scenic rivers system from becoming a part of the federal wild and scenic rivers system as established in the Wild and Scenic Rivers Act, Public Law 90–542; 16 United States Code Section 1271 et seq., as amended. The commissioner is authorized to seek, alone or in conjunction with other governmental authorities, financial and technical assistance from the federal government and to enter into written cooperative agreements for the joint administration of a Minnesota river in the federal wild and scenic rivers system.

104.40 CONFLICT WITH OTHER LAWS. Each river in the wild and scenic rivers system shall be subject to the provisions of sections 104.31 to 104.40, provided that in case of conflict with some other law of this state the more protective provision shall apply.

sample scenic easement contract

The grantee, its successors, assigns, and agents thereof, shall have the right to enter upon the "Scenic Area" for the purposes of inspection and enforcement of the terms and covenants contained herein, together with such right to remove from the "Scenic Area" any unauthorized structure, material, object or thing.

NO RIGHTS HEREIN ARE GRANTED TO THE GENERAL PUBLIC FOR ACCESS TO OR ENTRY UPON THE "SCENIC AREA" FOR ANY PURPOSE.

The grantor_, for _____heirs, executors and administrators, do__ covenant that there shall be:

1. No topographic changes or alteration of the natural landscape within or upon said "Scenic Area" by excavation, drainage, filling, dumping or any other means without a written authorization from the commissioner of natural resources.

2. No building, permanent or mobile, constructed or placed in the "Scenic Area". Buildings in place on the date hereof may be maintained or repaired, but may not be replaced or relocated within the "Scenic Area" or changed in size externally in any manner without a written authorization from the commissioner of natural resources.

3. No other structures or devices, whether permanent or temporary, hereafter constructed or placed in the "Scenic Area" without a written authorization from the commissioner of natural resources. Except that authorization from the commissioner is not required for low fences of the kind normally used to control livestock; for "no trespassing" or "for sale" signs less than 4 square feet in area; and, if the property does not have a dwelling on it, for camping and recreational equipment sufficient for one family which is removed from the area when not in use; or, if the property has a dwelling on it, for the usual items associated with single family residential use.

4. No destruction, cutting, trimming or removing of trees, shrubs, bushes or plants without a written authorization from the commissioner of natural resources. This covenant shall not apply to the cutting of lawns or weeds, or to the harvesting of agricultural crops, or to the removing of trees or shrubs that are dead or are dying from insect infestation or disease.

5. No dumping of ashes, trash, junk, rubbish, sawdust, garbage or offal upon the "Scenic Area".

6. No conveyance of any other easement for any purpose, including but not limited to road or utility, upon or within the "Scenic Area" without a written authorization from the commissioner of natural resources.

7. No use made of the "Scenic Area" in violation of the restrictive covenants herein.

This easement and the covenants contained herein shall run with the land, and shall be binding on all persons and entities who shall come into ownership or possession of the property that comprises the "Scenic Area" or any part thereof as described herein.

NR 78-81

STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

Rules and Regulations

CHAPTER SIX: NR 78-81

STATEWIDE STANDARDS AND CRITERIA FOR THE MINNESOTA WILD AND SCENIC RIVERS SYSTEM

NR 78 General Provisions

(a) STATEMENT OF POLICY

It is in the interest of present and future generations to preserve and protect the outstanding scenic, recreational, natural, historical, and scientific values of certain Minnesota rivers and their adjacent lands. Accordingly, the Commissioner of Natural Resources does hereby provide standards and criteria for the preservation, protection, and management of such rivers, as authorized by Laws of Minnesota 1973, Chapter 271.

(b) SCOPE

The standards and criteria established in NR 78-81 will provide minimum statewide requirements for the selection, classification, management and control of Wild, Scenic and Recreational Rivers and their land use districts.

(c) JURISDICTION

(1) The standards and criteria for Wild, Scenic, and Recreational Rivers hereby established in NR 78-81 shall pertain to public waters and to public and private lands within the land use districts as defined in the management plan.

(2) The extent of the lands so covered is a maximum of 320 acres per each mile of river on both sides (not each side) of those rivers or river segments which the Commissioner of Natural Resources has designated as components of the Minnesota Wild and Scenic Rivers System.

(3) All state, local, and special governmental units, councils, commissions, boards, districts, agencies, departments and other authorities shall exercise their powers so as to further the purpose of the Minnesota Wild and Scenic Rivers Act and management plans adopted thereunder.

(4) Land owned by the state, its agencies and subdivisions shall be administered in accordance with the management plan. No land so owned within the land use district shall be transferred if the Commissioner determines such transfer is inconsistent with the plan.

(5) In case of conflict between a provision of the Minnesota Wild and Scenic Rivers Act of these rules and regulations and some other law of this state or provisions of existing local ordinances, the more protective provision shall apply.

(d) DEFINITIONS

For the purpose of these regulations, certain terms or words used herein shall be interpreted as follows: The word "shall" is mandatory, not per-

missive. All distances unless otherwise specified shall be measured horizontally.

"Agricultural Use" means the management of land for production of farm crops such as vegetables, fruit trees, grain and other crops, and their storage on the area, as well as for the raising thereon of farm poultry, domestic pets, and domestic farm animals.

"Bluffline" means a line along the top of a slope connecting the points at which the slope becomes less than 13%. This applies to those slopes within the land use district which are beyond the setback provision from the normal high water mark.

"Building Line" means that line measured across the width of the lot at the point where the main structure is placed in accordance with setback provisions.

"Campground" means an area accessible by vehicle and containing campsites or camping spurs for tent and trailer camping.

"Clear-cutting" means the removal of an entire stand of vegetation.

"Cluster Development" means a pattern of subdivision development which places housing units into compact groupings while providing a network of commonly owned or dedicated open space.

"Commissioner" means the Commissioner of Natural Resources.

"Conditional Use" means a use of land which is permitted within a zoning district only when allowed by the County Board of Commissioners or their legally designated agent after a public hearing, if certain conditions are met which eliminate or minimize the incompatibility with other permitted uses of the district.

"Essential Services" means underground or overhead gas, electrical, steam or water distribution systems; collection, communication, supply, or disposal systems, including poles, wires, mains, drains, sewers, pipes, conduits, cables, fire alarm boxes, traffic signals, hydrants or other similar equipment and accessories in conjunction therewith; but not including buildings or transmission services.

"Forestry" means the management, including logging, of a forest, woodland, or plantation and related research and educational activities, including the construction, alteration or maintenance of woodroads, skidways, landings, and fences.

"Land Use District" means those lands designated by the Commissioner as the protected land corridor along those rivers or river segments which the Commissioner has designated as components of the Minnesota Wild and Scenic Rivers System. The boundaries of such land use district shall include not more than 320 acres per each mile of river on both sides (not each side) of the river.

"Mining Operation" means the removal from the land of stone, sand and gravel, coal, salt, iron, copper, nickel, granite, petroleum products or other material for commercial, industrial, or governmental purposes.

"Nonconforming Use" means any use of land established before the effective date of a county or local ordinance which does not conform to the

use restrictions of a particular zoning district. This should not be confused with substandard dimensions of a conforming use.

"Normal High Water Mark" means a mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. In areas where the normal high water mark is not evident, setbacks shall be measured from the stream bank.

"Open Space Recreational Uses" means recreation use particularly oriented to and utilizing the outdoor character of an area; including hiking and riding trails, primitive campsites, campgrounds, waysides, parks, and recreation areas.

"Primitive Campsites" means an area that consists of individual remote campsites accessible only by foot or water.

"Scenic Easement" means an interest in land, less than the fee title, which limits the use of the land for the purpose of protecting the scenic, recreational, or natural characteristics of Wild, Scenic or Recreational River areas. Unless otherwise expressly and specifically provided by the parties, such easement shall be (a) perpetually held for the benefit of the people of Minnesota; (b) specifically enforceable by its holder or any beneficiary; and (c) binding on the holder of the servient estate, his heirs, successors and assigns. Unless specifically provided by the parties, no such easement shall give the holder or any beneficiary the right to enter on the land except for enforcement of the easement.

"Selective cutting" means the removal of single scattered trees.

"Setback" means the minimum horizontal distance between a structure and the normal high water mark or between a structure and a road or highway.

"Sewage Disposal System" means any system for the collection, treatment and dispersion of sewage including but not limited to septic tanks, soil absorption systems, and drain fields.

"Single Family Dwelling" means a detached building containing one dwelling unit.

"Structure" means any building, sign, or appurtenance thereto, except aerial or underground utility lines, such as sewer, electric, telephone, telegraph, or gas lines, including towers, poles and other supporting appurtenances.

"Subdivision" means improved or unimproved land or lands which are divided for the purpose of ready sale or lease, or divided successively within a five year period for the purpose of sale or lease, into three or more lots or parcels of less than five acres each, contiguous in area and which are under common ownership or control.

"Substandard Use" means any use of shorelands existing prior to the date of enactment or amendment of a county or local ordinance which is permitted within the applicable land use district but does not meet the minimum lot area, length of water frontage, structure setbacks or other dimensional standards of the ordinance.

"Variance" means a modification or variation of the provisions of the local ordinance where it is determined that, by reason of exceptional

circumstances, the strict enforcement of any provision of the local ordinance would cause unnecessary hardship, or that strict conformity with the provisions of the local ordinance would be unreasonable, impractical or not feasible under the circumstances. This shall be evaluated according to the provisions contained in NR 81.

"Watershed Management or Flood Control Structure" means a dam, floodwall, wingdam, dike, diversion channel, or an artificially deepened or widened stream channel following the same or approximately the same course as the natural channel, or any other structure for altering or regulating the natural flow condition of a river or stream. The term "watershed management or flood control structure" does not include pilings, retaining walls, gabion baskets, rock riprap, or other facilities intended primarily to prevent erosion and which must be authorized by permit from the Commissioner.

"Wetland" means land which is annually subject to periodic or continual inundation by water and commonly referred to as a bog, swamp, or marsh.

(e) SEVERABILITY

The provisions of these regulations shall be severable, and the invalidity of any paragraph, subparagraph or subdivision thereof shall not make void any other paragraph, subparagraph, subdivision or any other part.

(f) RIVERS ELIGIBLE FOR INCLUSION

To be eligible for inclusion in the Minnesota Wild and Scenic Rivers System, a river or segment of a river, and its adjacent lands must possess outstanding scenic, recreational, natural, historical, scientific, or similar values. The river or its segments shall be classified into one or more of the three classes of rivers: Wild, Scenic and Recreational. Each river shall be managed so as to preserve and protect the values which qualify it for designation and classification.

(1) Wild rivers are those that exist in a free-flowing state with excellent water quality and with adjacent lands that are essentially primitive.

(aa) "Free-flowing" means existing in natural condition without significant artificial modification such as impoundment, diversion, or straightening. The existence, however, of low dams, diversion works or other minor structures shall not automatically bar its inclusion as a Wild, Scenic, or Recreational river.

(bb) "Excellent water quality" means that the water quality is in or approaches natural condition with no significant evidence of man's activities.

(cc) "Adjacent lands that are essentially primitive" means that the river's adjacent lands should possess a wilderness or natural-like appearance. These adjacent lands should be substantially free of habitation and other evidence of man's intrusion. However, the existence of a few unobstrusive structures along the river would not bar a river from Wild river classification nor would a limited amount of domestic livestock grazing and pasture land, and cropland developed for the production of hay.

Wild rivers should not be paralleled by conspicuous and well-traveled roads or railroads. Short inconspicuous and well-screened stretches would not bar a river from Wild river classification, nor would a bridge or utility crossings.

(2) Scenic rivers are those rivers that exist in a free-flowing state and with adjacent lands that are largely undeveloped.

(aa) "Free-flowing state" has the same meaning for Scenic rivers as it does for Wild rivers.

(bb) "Adjacent lands that are largely undeveloped" means that the adjacent lands still present an overall natural character, but in places may have been developed for agricultural, residential or other land uses. Small communities that are limited to short reaches of the total area would not bar a river from Scenic river classification.

Although roads and railroads may occasionally bridge certain rivers, this will not bar such rivers from Scenic river classification, nor will short stretches of conspicuous roads and railroads and longer stretches of inconspicuous and well screened roads or railroads paralleling the river.

(3) Recreational rivers are those rivers that may have undergone some impoundment or diversion in the past and that may have adjacent lands which are considerably developed, but that are still capable of being managed so as to further the purposes of this act.

(aa) "May have undergone some impoundment or diversion in the past" means that there may be preexisting water resource development and diversions having an environmental impact greater than that described for wild and scenic rivers.

(bb) "May have adjacent lands that are considerably developed" means that the bordering lands may have already been developed for a full range of agricultural or other land uses. Recreational rivers also may be readily accessible by preexisting roads or railroads.

(g) PROCEDURE FOR INCLUDING A RIVER: MANAGEMENT PLANS

(1) For each river proposed to be included in the Wild and Scenic Rivers System, the Commissioner shall prepare a management plan. The plan shall:

(aa) Give emphasis to the preservation and protection of the area's scenic, recreational, natural, historic, and similar values.

(bb) Place no unreasonable restrictions upon compatible, pre-existing, economic uses of particular tracts of land.

(2) Each Management Plan shall include:

(aa) The proposed classification of the river or appropriate segments.

(bb) The proposed land use district boundaries which shall not exceed 320 acres per each mile of river on both sides (not each side) of the river.

(cc) The proposed methods for preserving the river and its adjacent lands.

(i) Land use controls, applied through local zoning ordinances, will be employed to preserve and protect the values of the river which justified its selection and classification.

(ii) Scenic easements or fee title to land may be acquired when preservation dictates stricter limits on shoreland development than land use controls can impose.

(iii) Fee ownership, or, when sufficient, use easements, may be acquired for campsites, accesses, launch areas, trails, and other public uses of land.

(iv) The Commissioner can acquire fee and lesser interests in land by purchase, grant, gift, devise, exchange or lease.

(dd) The proposed regulations for local land use control. These shall be consistent with the river classification, but may differ from the standards and criteria of NR 78-81 to the extent necessary to take account of the particular attributes of the area.

(ee) The proposed regulations, if any, for water surface use of the river.

(ff) The proposed plan for recreational management within the land use district.

(gg) The proposed plan for administration of the management plan.

NR 79 Land Use Provisions

In order to preserve and protect those rivers and adjacent lands which possess outstanding scenic, recreational, natural, historical, scientific, and similar values, to reduce the effects of over-crowding and poorly planned development of such adjacent lands, to prevent pollution, to provide ample space on lots for sanitary facilities, to preserve natural beauty and quietude, to maintain property values, and to promote the general welfare, land use ordinances and official zoning district maps shall be enacted or amended by the county or municipality to comply with the Management Plan promulgated for lands within the jurisdiction of the local authority.

(a) LAND USE DISTRICTS

(1) The land use controls set forth herein shall apply to the area within the land use district boundaries described in the management plan, and determined in accordance with NR 78 (g) (2) (bb).

(2) The following land use districts shall be established in accordance with the classification of the river in the management plan:

(aa) Wild River Land Use District

(bb) Scenic River Land Use District

(cc) Recreational River Land Use District

(b) USE WITHIN LAND USE DISTRICTS

(1) Nonconforming Uses and Substandard Uses

(aa) Nonconforming Uses

All uses in existence prior to the effective date of enactment or amendment of the ordinance, which do not conform to the use restrictions of the newly established land use district are nonconforming uses. Under the

authority permitted by law, local authorities may adopt provisions to regulate and control, reduce the number or extent of, or gradually eliminate nonconforming uses. Local authorities shall provide for the gradual elimination of sanitary facilities inconsistent with CONS 72 (b) (2), (b) (3), and (b) (5) over a period of time not to exceed five (5) years from the date of enactment of the local ordinance.

(bb) Substandard Uses

All uses in existence prior to the effective date of enactment or amendment of the ordinance which are permitted uses within the newly established land use district, but do not meet the minimum lot area, setbacks or other dimensional requirements of the ordinance are substandard uses. All substandard uses, except for substandard signs, shall be allowed to continue subject to the following conditions and exceptions:

(i) Any structural alteration or addition to a substandard use which will increase the substandard dimensions shall not be allowed.

(ii) Each local authority shall provide for the gradual ammortization of substandard signs over a period of time not to exceed five (5) years from the enactment or amendment of the ordinance.

(2) Permitted and Conditional Uses
In the following table of uses:

P means Permitted Use

C means Conditional Use

N means Nonpermitted Use

Certain of the following uses are subject to the ZONING DIMENSION PROVISIONS and SANITARY PROVISIONS. See (c) and (d). All of the following uses are subject to the VEGETATIVE CUTTING PROVISIONS and the GRADING AND FILLING PROVISIONS. See (g) and (h).

	LAND USE DISTRICTS		
	Wild River	Scenic River	Rec. River
(aa) Governmental campgrounds, subject to management plan specifications.	N	P	P
(bb) Private campgrounds, subject to management plan specifications.	N	C	C
(cc) Public accesses, road access type with boat launching facilities subject to management plan specifications.	N	P	P
(dd) Public accesses, trail access type, subject to management plan specifications.	P	P	P
(ee) Temporary docks.	C	C	P
(ff) Other governmental open space recreational uses, subject to management plan specifications.	P	P	P

	LAND USE DISTRICTS		
	Wild River	Scenic River	Rec. River
(gg) Other private open space recreational uses, subject to management plan specifications.	C	C	C
(hh) Agricultural uses.	P	P	P
(ii) Single family residential uses.	P	P	P
(jj) Forestry uses.	P	P	P
(kk) Essential services.	P	P	P
(ll) Sewage disposal systems.	P	P	P
(mm) Private roads and minor public streets.	P	P	P
(nn) Signs approved by federal, state, or local government which are necessary for public health and safety and signs indicating areas that are available, or not available, for public use.	P	P	P
(oo) Signs not visible from the river that are not specified in (nn).	P	P	P
(pp) Governmental resource management for improving fish and wildlife habitat; wildlife management areas; nature areas; accessory roads.	P	P	P
(qq) Underground mining that does not involve surface excavation in the land use district.	C	C	C
(rr) Utility transmission power lines and pipelines, subject to the provisions of NR 79 (i).	C	C	C
(ss) Public roads, subject to the provisions in NR 79 (j).	C	C	C

All uses not listed as permitted or conditional uses shall not be allowed within the applicable land use district.

(c) ZONING DIMENSION PROVISIONS

(1) Substandard Lots

(aa) Lots of record in the office of the County Register of Deeds (or Registrar of Titles) on the effective date of enactment or amendment of the local land use ordinance, which do not meet the requirements of NR 79 (c) shall be allowed as building sites provided the proposed use is consistent with the local ordinance and the SANITARY PROVISIONS, NR 79 (d), and the ZONING DIMENSION PROVISIONS, NR 79 (c), are complied with to the greatest extent practicable.

(bb) If in a group of two or more contiguous lots under a single ownership any individual lot does not meet the lot width requirements of the local ordinance, such individual lot cannot be considered as a separate parcel of land for purposes of sale or development, but must be combined

with adjacent lots under the same ownership so that the combination of lots will equal one or more parcels of land each meeting the lot width requirements of the local ordinance, or to the greatest extent practicable.

(2) Lot Size

(aa) For lots platted or created by metes and bounds description, the minimum size shall be:

(i) For Wild Rivers: At least 6 acres in area, and at least 300 feet in width at the building line and at least 300 feet at the water line for lots abutting a wild river.

(ii) For Scenic Rivers: At least 4 acres in area, and at least 250 feet in width at the building line and at least 250 feet at the water line for lots abutting a scenic river.

(iii) For Recreational Rivers: At least 2 acres in area and at least 200 feet in width at the building line and at least 200 feet at the water line for lots abutting a recreational river.

(bb) Smaller lot sizes may be permitted for planned cluster developments. See NR 79 (f).

(3) Structures: Density, Setback, Placement, Height

(aa) Density of Dwelling Units

(i) The density of dwelling units shall not exceed 1 dwelling unit per lot.

(bb) Setback Provisions

Structures, except signs specified in NR 79 (b) (2) (nn), essential services, private roads, and minor public streets, shall be placed so as to satisfy all setback requirements of the following three minimum setback tables.

(i) From the normal high water mark:

Wild River	200 feet
Scenic River	150 feet
Recreational River	100 feet

(ii) From a bluffline:

Wild River	40 feet
Scenic River	30 feet
Recreational River	20 feet

(iii) From tributaries designated in the management plan:

Wild River	100 feet
Scenic River	100 feet
Recreational River	100 feet

(cc) Placement of Structures

(i) Structures shall not be located on slopes greater than 13% unless such structures can be screened and sewage disposal system facilities can be installed so as to comply with the SANITARY PROVISIONS (d).

(ii) Where a floodplain ordinance exists, no structure shall be located in the floodway of a stream as defined in Minnesota Statutes Chapter

104.02 and furthermore shall be placed at an elevation consistent with any such applicable floodplain management ordinances. Where no floodplain ordinances exist, the elevation to which the lowest floor of a structure, including a basement, shall be placed, shall be determined after an evaluation of available flood information and shall be consistent with the statewide Standards and Criteria for Management of Flood Plain Areas of Minnesota.

(dd) Structure height shall not exceed 35 feet.

(d) SANITARY PROVISIONS

(1) The sanitary provision standards set forth in Minn. Regs. Cons. 72 of the Statewide Standards and Criteria for Management of Shoreland Areas of Minnesota shall apply to Wild, Scenic and Recreational river land use districts.

(2) However, the provisions of Cons. 72 (b) (4) are superseded by the following setback provisions for septic tank and soil absorption systems.

	Setback from the normal high water mark
Wild River	150 feet
Scenic River	100 feet
Recreational River	75 feet
Tributaries	75 feet

(e) WATERSHED MANAGEMENT AND FLOOD CONTROL STRUCTURE PROVISIONS

Minnesota Statutes Section 105.42, as amended, requires a permit from the Commissioner of Natural Resources before any change is made in the course, current, or cross section of public waters.

(f) SUBDIVISION REGULATIONS

(1) Land Suitability

No land may be subdivided which is held unsuitable by the local authority, or the Commissioner, for the proposed use because of flooding, inadequate drainage, soil and rock formations with severe limitations for development, severe erosion potential, unfavorable topography, inadequate water supply or sewage disposal capabilities, or any other feature likely to be harmful to the health, safety, or welfare of the future residents of the proposed subdivision or of the community.

(2) Subdivision Standards

The provisions otherwise set forth in NR 79 shall apply to all plats except Planned Cluster Developments.

(3) Planned Cluster Developments

Local ordinances shall contain provisions for allowing planned cluster developments when the proposed clustering provides a means of preserving agricultural land, open space, woods, scenic views and other features of the natural environment. Smaller lot sizes than those permitted in NR 79 (c) (2) may be allowed for planned cluster developments provided:

(aa) Preliminary plans are approved by the Commissioner of Natural Resources prior to their enactment by the local authority.

(bb) Central sewage facilities are installed which at least meet the applicable standards, criteria, rules or regulations of the Minnesota Department of Health and the Pollution Control Agency.

(cc) Open space is preserved. This may be accomplished through the use of restrictive deed covenants, public dedication, granting of scenic easements, or other methods.

(dd) There is not more than one centralized boat launching facility for each cluster.

(g) VEGETATIVE CUTTING PROVISIONS

(1) On lands within 200 feet of the normal high water mark of Wild Rivers, 150 feet of the normal high water mark of Scenic Rivers, 100 feet of the normal high water mark of Recreational Rivers and lands within 100 feet of the normal high water mark of tributaries designated in the management plan and on lands 40 feet landward of the bluffline on Wild Rivers, 30 feet landward of the bluffline on Scenic Rivers, and 20 feet landward of the bluffline on Recreational Rivers, the following standards shall apply:

(aa) Clear cutting, except for any authorized public services such as roads and utilities, shall not pe permitted.

(bb) Selective cutting of trees in excess of 4 inches in diameter at breast height is permitted provided that cutting is spaced in several cutting operations and a continuous tree cover is maintained, uninterrupted by large openings. In cases where the existing tree cover has been interrupted by large openings in the past, selective cutting should be performed so as to maintain a continuous tree cover in the remaining wooded areas.

(cc) The above cutting provisions will not be deemed to prevent:

(i) The removal of diseased or insect infested trees, or of rotten or damaged trees that present safety hazards;

(ii) Pruning understory vegetation, shrubs, plants, bushes, grasses, or from harvesting crops, or cutting suppressed trees or trees less than four inches in diameter at breast height.

(2) Clear cutting anywhere in Wild, Scenic, or Recreational River Land Use Districts is subject to the following standards and criteria:

(aa) Clear cutting shall not be used as a cutting method where soil, slope, or other watershed conditions are fragile and subject to injury.

(bb) Clear cutting shall be conducted only where clear-cut blocks, patches or strips are, in all cases, shaped and blended with the natural terrain.

(cc) The size of clear cut blocks, patches, or strips shall be kept at the minimum necessary.

(dd) Where feasible all clear cuts shall be conducted between September 15 and May 15. If natural regeneration will not result in adequate vegetative cover, areas in which clear cutting is conducted shall be replanted to prevent erosion and to maintain the aesthetic quality of the area. Where feasible, replanting shall be performed in the same spring, or the following spring.

(h) GRADING AND FILLING PROVISIONS

(1) Grading and filling in of the natural topography which is not accessory to a permitted or conditional use shall not be permitted in the land use district.

(2) Grading and filling in of the natural topography which is accessory to a permitted or conditional use shall be performed in a manner which minimizes earthmoving, erosion, tree clearing, and the destruction of natural amenities and shall be controlled by the local ordinance.

(3) Grading and filling in of the natural topography shall also meet the following standards:

(aa) The smallest amount of bare ground is exposed for as short a time as feasible.

(bb) Temporary ground cover, such as mulch, is used and permanent ground cover, such as sod, is planted.

(cc) Methods to prevent erosion and trap sediment are employed, and

(dd) Fill is stabilized to accepted engineering standards.

(4) Excavation of material from, or filling in a Wild, Scenic, or Recreational River, or construction of any permanent structures or navigational obstructions therein is prohibited, unless authorized by a permit from the Commissioner pursuant to Minnesota Statutes, Section 105.42.

(5) No state or local authority shall authorize the drainage or filling in of wetlands within Wild, Scenic, or Recreational River Land Use Districts.

(i) UTILITY COMPANIES, STANDARDS AND CRITERIA FOR UTILITY CROSSINGS

(1) Permits

(aa) All utility crossings (transmission and distribution) of Wild, Scenic, or Recreational Rivers, or of state lands within their land use districts which are under the control of the Commissioner, require a permit from the Commissioner pursuant to Minnesota Statutes, Sections 84.415 or 105.42. In reviewing permit applications for such crossings, primary consideration shall be given to crossings that are proposed to be located with or adjacent to existing public facilities, such as roads and utilities.

(bb) Utility **transmission** crossings of lands within the jurisdiction of the local authority within Wild, Scenic, or Recreational River Land Use Districts, require a conditional use permit from the local authority. **Transmission** means electric power, telephone, and telegraph lines, cables, or conduits which are used to transport large blocks of power between two points — with respect to electric power, generally, 69 kilo-volts or more— or main or pipeline crossings for gas, liquids, or solids in suspension which are used to transport large amounts of gas, liquids, or solids in suspension between two points. A conditional use permit is not required for high voltage (200 kilo-volts or greater) transmission lines under the control of the Environmental Quality Council, pursuant to Minnesota Statutes, Section 116C.61.

Distribution means lines, cables, or conduits or mains or pipelines used to distribute power, water, gas, or other essential services to the utility com-

pany's customers. These are essential services. A conditional use permit is not required for essential services.

(2) Standards and Criteria for utility **transmission** crossings of lands within the jurisdiction of the local authority within Wild, Scenic, or Recreational River Land Use Districts:

(aa) Policy

It is essential to regulate utility transmission crossings of lands within the jurisdiction of the local authority within Wild, Scenic, or Recreational River Land Use Districts in order to provide maximum protection and preservation of the natural environment and to minimize any adverse effects which may result from such utility crossings. These standards and criteria provide a basic framework of environmental considerations concerning such a proposed crossing. The considerations deal with route design, structure design, construction methods, safety considerations, and right-of-way maintenance.

(bb) Standards and Criteria

For each environmental consideration listed in these standards and criteria, the applicant shall indicate how he is satisfying the consideration, where applicable, or if he is not, why not. In dealing with route design considerations the applicant must, where applicable, also supply data on relevant site conditions. The local authority shall issue a conditional use permit if the applicant shows he has satisfied, to the extent feasible, these environmental considerations.

In general, avoid Wild, Scenic and Recreational River Land Use Districts, especially Wild River Land Use Districts, whenever practicable. But if there is no feasible alternative, the following standards and criteria shall apply.

(i) Route Design

With regard to topography:

(aaa) Avoid steep slopes.

(bbb) Avoid scenic intrusions into stream valleys and open exposures of water.

(ccc) Avoid scenic intrusions by avoiding ridge crests and high points.

(ddd) Avoid creating tunnel vistas by, for example, building deflections into the route or using acceptable screening techniques.

With regard to location:

(eee) Avoid entering areas within 200 feet of Wild, Scenic, and Recreational Rivers and avoid entering areas within 100 feet of designated tributaries with Wild, Scenic, or Recreational River Land Use Districts except where the utility has been authorized by the Commissioner to cross Wild, Scenic, or Recreational Rivers or tributaries within their land use districts.

With regard to vegetation:

(fff) Avoid wetlands.

(ggg) Run along fringe of forests rather than through them.

But if it is necessary to route through forests, then utilize open areas in order to minimize destruction of commercial forest resources.

With regard to soil characteristics:

(hhh) Avoid soils whose high susceptibility to erosion would create sedimentation and pollution problems during and after construction.

(iii) Avoid areas of plastic soils which would be subject to extensive slippage.

(jjj) Avoid areas with high water tables, especially if construction requires excavation.

With regard to crossing of public waters:

(kkk) Utility crossings of public waters requires a permit from the Commissioner pursuant to Minnesota Statutes, Section 84.415 or 105.42.

With regard to open space recreation areas:

(lll) Avoid them whenever practicable.

(ii) Structure Design

With regard to locating the utility overhead or underground:

(aaa) Primary considerations must be given to underground placement in order to minimize visual impact. If the proposal is for overhead placement, the applicant shall explain the economic, technological, or land characteristic factors, which make underground placement infeasible. Economic considerations alone shall not be the major determinant.

(bbb) If overhead placement is necessary, the crossing should be hidden from view as much as practicable.

With regard to the appearance of the structures:

(ccc) They shall be made as compatible as practicable with the natural area with regard to: Height and width, materials used, and color.

With regard to the width of the right-of-way:

(ddd) The cleared portion of the right-of-way should be kept to a minimum.

(iii) Construction methods

(aaa) Construct across wetlands in the winter in order to minimize damage to vegetation, and in order to prevent erosion and sedimentation.

(bbb) Construct at times when local fish and wildlife are not spawning or nesting.

(ccc) Effective erosion and sedimentation control programs shall be conducted during all clearing, construction, or reconstruction operations in order to prevent the degradation of the river and adjacent lands.

(iv) Safety Considerations

Applicants must adhere to applicable Federal and State safety regulations, both with regard to prevention (such as safety valves and circuit breakers) and with regard to emergency procedures in the event of failure (fire suppression, oil spill cleanup).

(v) Right-of-Way Maintenance

(aaa) If possible, natural vegetation of value to fish or wildlife, and which does not pose a hazard to or restrict reasonable use of the utility, shall be allowed to grow in the right-of-way.

(bbb) Where vegetation has been removed, new vegetation consisting of native grasses, herbs, shrubs, and trees, should be planted and maintained on the rights-of-way.

(ccc) Chemical control of vegetation is discouraged. But where such methods are justified, chemicals used and the manner of their use must be in accordance with rules, regulations and other requirements of all state and federal agencies with authority over the use.

(ddd) The Management Plan may identify areas suitable for utility corridors.

(j) PUBLIC ROADS, RIVER CROSSINGS

(1) Permits

(aa) A permit as established in Minnesota Statutes, Section 105.42, is required for the construction or reconstruction, removal, or abandonment of any road or railroad crossing, of a public water.

In reviewing permit applications required for road or railroad crossings, primary consideration shall be given to crossings located with or adjacent to existing facilities, such as roads and utilities.

(bb) A conditional use permit from the local authority shall be required for any construction of new public roads, or the reconstruction of any existing public roads within Wild, Scenic, or Recreational River Land Use Districts. **Public roads** include township, county, and municipal roads and highways which serve or are designed to serve flows of traffic between communities or other traffic generating areas. **Public roads** also include public streets and roads which serve as feeders or traffic-ways between minor public streets and major roads. A conditional use permit is not required for minor public streets which are streets intended to serve primarily as an access to abutting properties.

(2) Standards and Criteria for construction of new public roads, or the reconstruction of any existing roads within Wild, Scenic, or Recreational River Land Use Districts.

(aa) Policy

It is essential to regulate the construction of new public roads and reconstruction of existing public roads within Wild, Scenic, and Recreational River Land Use Districts in order to provide maximum protection and preservation of the natural environment and to minimize any adverse effects which may result from such development. These standards and criteria provide a basic framework of environmental considerations concerning such proposed road construction. The considerations deal with route design, construction methods, safety considerations, right-of-way maintenance, and waysides.

(bb) Standards and Criteria

For each environmental consideration listed below, the applicant shall indicate how he is satisfying the consideration, where applicable, or if he is

not, why not. In dealing with route design considerations, the applicant must, where applicable, also supply data on relevant site conditions. The local authority shall issue a conditional use permit if the applicant shows he has satisfied, to the extent feasible, these environmental considerations.

In general, avoid Wild, Scenic, and Recreational River Land Use Districts, especially Wild River Land Use Districts, whenever practicable. But if there is no feasible alternative, the following standards and criteria shall apply.

(i) Route Design

With regard to topography:

(aaa) Avoid steep slopes.

(bbb) Avoid scenic intrusion into stream valleys and open exposures of water.

(ccc) Avoid scenic intrusion by avoiding ridge crests and high points.

With regard to location:

(ddd) Avoid new public road construction within 200 feet of Wild, Scenic, and Recreational Rivers and avoid new public road construction within 100 feet of designated tributaries within Wild, Scenic, or Recreational River Land Use Districts, except where a crossing of a Wild, Scenic, or Recreational River has been authorized by the Commissioner.

With regard to vegetation:

(eee) Avoid wetlands.

(fff) Run along fringes of forests rather than through them. But if it is necessary to route through forests, then utilize open areas in order to minimize destruction of commercial forest.

With regard to soil characteristics:

(ggg) Avoid soils whose high susceptibility to erosion would create sedimentation and pollution problems during and after construction.

(hhh) Avoid areas of plastic soils which would be subject to extensive slippage.

(iii) Avoid areas with high water tables, especially if construction requires excavation.

With regard to crossing of public waters:

(jjj) A permit from the Commissioner is required for a road or railroad crossing, or reconstruction, removal, or abandonment of any existing road or railroad crossing, of a public water.

With regard to open space recreation areas:

(kkk) Avoid them whenever practicable.

(ii) Construction methods

(aaa) Construct new roads so they rest as "lightly on the land" as feasible, avoiding cuts and fills so as to blend into the natural terrain so that it appears to be a part of the natural landscape.

(bbb) Reconstruction of an existing public road or railroad should be performed in a manner that would minimize any adverse effect on the natural beauty and environment of the river.

(ccc) Effective erosion and sedimentation control programs shall be conducted during all clearing, construction, or reconstruction operations in order to prevent the degradation of the river and its adjacent lands.

(ddd) Construct across wetlands in a manner which minimizes damage to vegetation, and in a manner preventing erosion and sedimentation.

(eee) Construct at times when local fish and wildlife are not spawning or nesting.

(iii) Safety Considerations

Applicants must adhere to applicable Federal and State Safety regulations with regard to new road construction or reconstruction of an existing road.

(iv) Right-of-Way Maintenance

(aaa) If possible, natural vegetation of value to fish or wildlife, and which does not pose a safety hazard, shall be allowed to grow in the roadside right-of-way.

(bbb) Where vegetation has been removed, new vegetation consisting of native grasses, herbs, shrubs, and trees should be planted and maintained on the roadside right-of-way.

(ccc) Chemical control of vegetation is discouraged. But where such methods are justified, chemicals used and the manner of their use must be in accordance with rules, regulations and other requirements of all state and federal agencies with authority over their use.

(v) Highway Waysides

Highway waysides shall be designed in such a manner so as to harmonize with the surroundings.

NR 80 Public Use of Waters and Lands within Wild, Scenic, and Recreational River Land Use Districts

(a) POLICY

(1) In order to protect the rights of private landowners, to ensure quietude, to prohibit trespassing, to prevent littering, and to maintain the essential quality of Wild, Scenic and Recreational Rivers and their land use districts, the Commissioner and local governments shall adopt measures to manage the use and enjoyment of the rivers and their land use districts by the public.

(2) The public use and enjoyment of Wild, Scenic, and Recreational Rivers and their land use districts is limited to the public waters and designated publicly owned lands and interests in land within the land use districts. Private lands which may be located within the Land Use District do not become public in any sense. As otherwise provided in NR 78, private landowners may grant scenic easements in their land to the State of Minnesota. However, unless specifically provided by the parties, no such easement shall give the holder or any beneficiary the right to enter on the land except for enforcement of the easement.

(3) The restrictions set forth in NR 80 (b) shall not apply to persons who have been authorized by the Commissioner or by the appropriate local government to possess such items for the sole purpose of removing such items from the area.

(b) RESTRICTIONS

(1) Pursuant to Minnesota Statutes, Section 609.68, whoever unlawfully deposits garbage, rubbish, offal, or the body of a dead animal, or other litter in or upon any public highway, public waters or the ice thereon, public lands, or without the consent of the owner, private lands or water or ice thereon, may be sentenced to imprisonment for not more than 90 days or to payment of a fine of not more than $100.

(2) No person shall discharge a firearm while traveling on or using a Wild, Scenic, or Recreational River, except for the purpose of hunting during those times and in those areas in which hunting for protected animals is allowed.

(3) No person traveling over or using publicly owned lands within Wild, Scenic, or Recreational River Land Use Districts shall use trail bikes, all-terrain vehicles, or vehicles of a similar nature, provided that snowmobiles may be provided for in accordance with the management plan. This provision shall not apply to the lawful use of such vehicles on public roads and public streets.

(4) Overnight camping, fires or campfires shall not be allowed on publicly owned lands within Wild, Scenic, or Recreational River Land Use Districts, except in areas posted or designated by the Commissioner for such purposes.

(5) No person traveling on or using a Wild, Scenic, or Recreational River shall enter upon private lands within the land use district unless he has permission from the landowner, lessee, or occupant.

(6) Anyone violating any of the provisions of NR 80 (b) shall be guilty of a misdemeanor.

(c) WATER SURFACE ZONING

Any regulations which may be necessary to reduce conflicts among users of a particular river, or between users and nearby residents, shall be promulgated as part of the management plan for the river, or as amendments thereto. The boundaries of such areas shall be described with particularity in the management plan.

NR 81 General Administration

(a) IMPLEMENTING THE PROPOSED MANAGEMENT PLAN

(1) Adoption of the management plan, and adoption or amendment of local ordinances to comply with the management plan, shall be carried out pursuant to the procedures described in Laws of Minnesota 1973, Chapter 271, sections 5 and 6.

(2) When the Commissioner deems it necessary to expedite the preservation and protection of the designated river, he may request the local authority to initially implement the land use controls described in the adopted

management plan by passing an interim zoning resolution, providing such a resolution would be otherwise lawful.

(b) CERTIFYING CERTAIN ACTIONS

(1) In order to ensure that the standards herein are not nullified by unjustified exceptions in particular cases, and to promote uniformity in the treatment of applications for such exceptions, a review and certification procedure is hereby established for certain local land use decisions. These certain decisions consist of any decisions which (1) directly affect the use of land within a Wild, Scenic, or Recreational River Land Use District, and (2) are one of the following types of action:

(aa) Adopting or amending an ordinance regulating the use of land, including rezoning of particular tracts of land.

(bb) Granting a variance from a provision of the local land use ordinance which relates to the ZONING DIMENSION PROVISIONS of NR 79 (c) and any other zoning dimension provisions established in the management plan.

(cc) Approving a plat which is inconsistent with the local land use ordinance.

(2) No such action shall be effective unless and until the Commissioner has certified that the action (1) complies with the Minnesota Wild and Scenic Rivers Act, the statewide standards and criteria, and the management plan; and (2) conforms to the following decision guides:

(aa) A land use ordinance or amendment must comply with the Act, the statewide standards and criteria, and the management plan.

(bb) The grant of a variance requires the presence of these conditions:

(i) The strict enforcement of the land use controls will result in unnecessary hardship. "Hardship" as used in connection with the granting of a variance means the property in question cannot be put to a reasonable use under the conditions allowed by the zoning provisions. Economic considerations alone shall not constitute a hardship if any reasonable use for the property exists under the terms of the ordinance.

(ii) Granting of the variance is not contrary to the purpose and intent of the zoning provisions herein established by these standards and criteria, and is consistent with the comprehensive management plan adopted by the Commissioner.

(iii) There are exceptional circumstances unique to the subject property which were not created by the landowner.

(iv) Granting of the variance will not allow any use which is neither a Permitted or Conditional use in the land use district in which the subject property is located.

(v) Granting of the variance will not alter the essential character of the locality as established by the management plan.

(vi) Exception:

Where a setback pattern from the normal high water mark has already been established on both sides of the proposed building site, the setback of

the proposed structure may be allowed to conform to that pattern. (This provision shall apply only to lots which do not meet the minimum lot width restrictions of the ordinance).

(cc) Approval of a plat which is inconsistent with the local land use ordinance is permissible only if the detrimental impact of the inconsistency is more than overcome by other protective characteristics of the proposal.

(3) Procedures for the certification process

(aa) A copy of all notices of any public hearings, or where a public hearing is not required, a copy of the application to consider zoning amendments, variances, or inconsistent plats under the local ordinance shall be received by the Commissioner at least thirty (30) days prior to such hearings or meetings to consider such actions. The notice or application shall include a copy of the proposed ordinance or amendment, or a copy of the proposed inconsistent plat, or a description of the requested variance.

(bb) The local authority shall notify the Commissioner of its final decision on the proposed action, within 10 days of the decision.

(cc) The Commissioner shall, no later than 30 days from the time he receives notice of the final decision, communicate to the local authority either:

(i) Certification of approval, with or without conditions; or

(ii) Notice of non-approval.

(dd) The action becomes effective when and only when either:

(i) The final decision taken by the local authority has previously received certification of approval from the Commissioner; or

(ii) The local authority receives certification of approval after its final decision; or

(iii) Thirty days have elapsed from the day the Commissioner received notice of the final decision, and the local authority has received from the Commissioner neither certification of approval nor notice of non-approval; or

(iv) The Commissioner certifies his approval after conducting a public hearing.

(ee) In the case of notice of non-approval of an ordinance or a variance or an inconsistent plat, either the applicant, or the chief executive officer of the county or municipality, may, within 30 days of said notice, file with the Commissioner a demand for hearing. If the demand for hearing is not made within the 30 days, the notice of non-approval becomes final. Also:

(i) The hearing shall be held in an appropriate local community within 60 days of the demand for it but not before 2 weeks published notice. Notice and the conduct of the hearing and the allocation of costs of the hearing shall be accomplished in the same manner as provided in Minnesota Stats. 105.44, subdivisions 5 and 6 (1971) as amended.

(ii) Within 30 days after the hearing, the Commissioner shall either certify his approval of the proposed action, or deny it. His decision shall be based upon findings of fact made on substantial evidence found in the

hearing record. If the Commissioner concludes that the proposed action satisfies the standards and criteria of NR 81 (b) (2), then he shall certify his approval; otherwise, he shall deny it.

(c) REVIEWING APPLICATIONS FOR CONDITIONAL USE PERMITS

A copy of all notices of any public hearings, or where a public hearing is not required, a copy of the application to consider issuance of a conditional use permit shall be received by the Commissioner at least thirty (30) days prior to such hearings or meetings to consider issuance of a conditional use permit. A copy of the decision shall be forwarded to the Commissioner within ten (10) days of such action.

(d) COPIES OF ALL PLATS SUPPLIED TO THE COMMISSIONER

Copies of all plats within the boundaries of wild, scenic, or recreational river land use districts shall be forwarded to the Commissioner within ten (10) days of approval by the local authority.

bibliography

Geology

Halgren, Lee A. The Development of the Recreational and Environmental Resources of the Upper Minnesota River Valley. Report prepared for the Minnesota Resources Commission by Southwest Minnesota State College, 1975.

Schwartz, George M., and George A. Thiel. Minnesota's Rocks and Waters. Minneapolis: University of Minnesota Press, 1973.

Watershed

Halgren, Lee A. The Development of the Recreational and Environmental Resources of the Upper Minnesota River Valley. Report prepared for the Minnesota Resources Commission by Southwest Minnesota State College, 1975.

Hydrological Atlas of Minnesota. State of Minnesota Bulletin no. 10, April 1959.

Schneider, J.A. The Minnesota River: A Biological Reconnaissance — Lac qui Parle Dam to Mankato. Minnesota Department of Conservation, special publication no. 37, 1966.

Landform and Soils

U.S. Department of Agriculture, Soil Conservation Service, in cooperation with University of Minnesota Agricultural Experiment Station. Soil Survey of Nicollet County, Minnesota, 1958.

University of Minnesota, Department of Soil Science, in cooperation with Minnesota Geological Survey and U.S. Soil Conservation Service. Soil Landscapes and Geomorphic Regions — St. Paul Sheet, 1972.

New Ulm Sheet, 1978.

Minnesota Soil Atlas, St. Paul Sheet, 1978.

Water Quality

Minnesota Pollution Control Agency. Minnesota Water Quality. Report to Congress, Section 305 (b), June 1977.

Minnesota Pollution Control Agency. Routine Water Quality Monitoring Program. Standards Retrieval Data.

Vegetation

Curtis, J.T. The Vegetation of Wisconsin. Madison: University of Wisconsin Press, 1959.

Fernald, M.L. Gray's Manual of Botany. New York: D. Van Nostrand Co., 1970.

Halgren, L.A. The Development of the Recreational and Environmental Resources of the Upper Minnesota River Valley. Report prepared for the Minnesota Resources Commission by Southwest Minnesota State College, 1975.

MacMillan, Conway. Minnesota Plant Life. St. Paul: Pioneer Press, 1899.

Tanner, W.D. Jr. An Ecological Survey of the Flora of Henderson Sites I and II. Northern States Power Co. report, 1972.

Fish and Mollusks

Dawley, Charlotte. "Distribution of Aquatic Mollusks in Minnesota." The American Midland Naturalist, vol. 38, pp. 671–697.

Eddy, S., and J.C. Underhill. Northern Fishes. Minneapolis: University of Minnesota Press, 1976.

Imlay, Marc. "Our Rivers...Death Beds for Endangered Mollusks." The Minnesota Volunteer, vol. 35, no. 201.

Schneider, J.A. The Minnesota River: A Biological Reconnaissance — Lac qui Parle Dam to Mankato. Minnesota Department of Conservation, special publication no. 37, 1966.

Underhill, James. Professor of ecology and behavioral biology, University of Minnesota, May 1978.

Wildlife

Breckenridge, W.J. Reptiles and Amphibians of Minnesota. Minneapolis: University of Minnesota Press, 1944.

Emmerich, John M. Bird Utilization of Woodland Habitat in the Eastern Quarter of South Dakota. South Dakota State University, 1978.

Farmland Wildlife Research Unit. DNR Division of Fish and Wildlife, Madelia, Minn. April 1979.

Green, Janet C., and Robert B. Janssen. Minnesota Birds: Where, When, and How Many. Minneapolis: University of Minnesota Press, 1975.

Gunderson, H.L., and J.R. Beer. The Mammals of Minnesota. Minneapolis: University of Minnesota Press, 1953.

Henderson, Carroll. DNR nongame wildlife specialist. St. Paul, January 1978.

Tanner, Ward. Professor of botany, Gustavus Adolphus College, St. Peter, Minnesota. January 1978.

Recreation

Berner, Al. Farmland Wildlife Research Unit. DNR Division of Fish and Wildlife, Madelia, Minn. May 1979.

DNR Region IV personnel. May 1979.

Sheriffs' departments, Brown, Le Sueur, Nicollet and Renville counties. May 1979.

Archaeology

Johnson, Elden. The Prehistoric Peoples of Minnesota. St. Paul: Minnesota Historical Society, 1969.

Norquist, Carla L. Roster of Prehistoric Sites in Minnesota. St. Paul: Minnesota Historical Society, 1967.

Streiff, Jan. Archaeology Laboratory, University of Minnesota, May 1978.

Population

Minnesota State Planning Agency, Office of the State Demographer. Population Estimates for Minnesota Counties 1976. August 1977.

Minnesota Population Projections: 1970-2000. November 1975. Office

Office of State Demographer estimates. May 1978.

U.S. Census Bureau. Revenue Sharing Estimates, May 1978.

Economy

Minnesota Department of Economic Development. The Economic Distribution of Tourist-Travel Expenditures in Minnesota by Regions and Counties. St. Paul, 1974.

Minnesota State Planning Agency. Minnesota Socio-economic Population Characteristics, Employment. St. Paul, April 1972.

Southern Minnesota River Basin Commission. Minnesota River Basin Report. February 1977.

History

Babcock, W.M. "Minnesota as Seen by Travellers: Up the Minnesota Valley to Fort Ridgely in 1853." Minnesota History, vol. 11, 1930.

Blegen, Theodore C. Minnesota: A History of the State. Minneapolis: University of Minnesota Press, 1963.

Blegen, Theodore C. "With Axe and Saw: A History of Logging in Minnesota." Forest History, vol. 7, no. 3, 1963.

Folwell, William Watts. A History of Minnesota. 4 vols. St. Paul: Minnesota Historical Society, 1926.

Fritsche, T.R. "Some Significant Events on the Upper Minnesota River." Brown County's Heritage, vol. 2, no. 8, 1966.

Jones, Evan. The Minnesota: Forgotten River. New York: Holt, Rinehart and Winston, 1962.

Lass, William E. "Ginseng Rush in Minnesota." Minnesota History, Summer 1969.

Neill, Edward D. History of the Minnesota Valley. Minneapolis: North Star Publishing Co., 1882.

U.S. Chief of Engineers. Annual Report. Washington, D.C.: Government Printing Office, 1890, 1975.

Upham, Warren. Minnesota Geographic Names. St. Paul: Minnesota Historical Society, 1920, 1969.