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HUBBEL POND WILDLIFE MANAGEMENT AREA MASTER PLAN, 1980-1989

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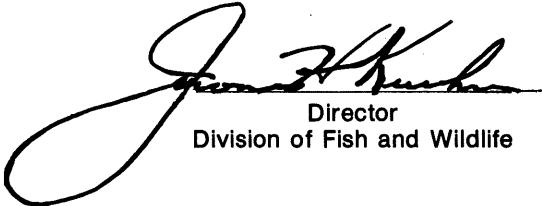
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**HUBBEL POND WILDLIFE MANAGEMENT AREA
MASTER PLAN 1980-89**

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STATE OF MINNESOTA

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Minnesota Department of Natural Resources
Division of Fish and Wildlife
St. Paul, Minnesota
October, 1980

Approved:


Director
Division of Fish and Wildlife


Commissioner of
Natural Resources

PREFACE

Concurrent with our population growth, our natural resources have been increasingly exploited through demands for raw materials and outdoor recreational opportunities. Recognizing Minnesota's existing and potential recreation and natural resource use problems, the 1969 legislature requested a "Study of the Total Environment" called Project 80. The study, to guide the legislature in reviewing appropriation requests for the acquisition, development, and maintenance of state-owned lands used for outdoor recreation, was conducted by the State Planning Agency and the Department of Natural Resources.

Project 80 recommendations led to the Outdoor Recreation Act of 1975. The act established an outdoor recreation system to preserve and properly use Minnesota's natural, cultural, and historical resources. The system is composed of 11 different classes of state-owned lands administered by the Department of Natural Resources, the Minnesota Historical Society, and the Department of Transportation (Appendix A). Each class within the system has an unique purpose and use. In this way, the system provides a variety of recreational opportunities with minimal use conflicts.

The Department of Natural Resources is preparing comprehensive management plans for the nine wildlife management areas in the state having resident managers. The plans include present and projected regional perspectives, resource inventories, and demand and use analyses, as well as acquisition and development plans, cost estimates, and resource management programs. These are 10-year management plans, and will be revised as new management practices develop, new resource philosophies evolve, and new problems are encountered.

Under a cooperative agreement with the State Planning Agency, the Department of Natural Resources completed plans for the Whitewater, Carlos Avery, Mille Lacs, Talcot Lake, and Lac qui Parle Wildlife Management Areas during the 1976-77 biennium. Plans for the Roseau River, Red Lake, Hubbel Pond, and Thief Lake Wildlife Management Areas will be completed during the 1980-81 biennium.

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INTRODUCTION

Minnesota has an abundance of natural resources. To many people, Minnesota's wildlife management areas and their associated wildlife and plant communities are among the state's most precious resources. In accord with the Outdoor Recreation Act of 1975, this master plan outlines the management of the Hubbel Pond Wildlife Management Area (WMA) through 1989. The plan was developed by defining area goals, examining existing conditions and resources, identifying management considerations, and then developing appropriate management programs.

DESCRIPTION

The Hubbel Pond WMA is a 3,450-acre unit in central Becker County, 200 highway miles northwest of the Twin Cities and 11 miles northeast of Detroit Lakes (Figure 1). Access is provided from State Highway 34 and by Becker County Road 29, which forms the western unit boundary. The 43,000-acre Tamarac National Wildlife Refuge borders the area to the north.

The management area, located between Height of Land and Cotton Lakes, is characterized by gently rolling uplands surrounding a large central marsh. The Otter Tail River flows through the management area from the northeast to the southwest.

The Hubbel Pond WMA was established to preserve, restore, and manage wildlife habitat and to provide public hunting and trapping. The area is managed principally for waterfowl with secondary emphasis on white-tailed deer, ruffed grouse, and squirrels. Hunting and trapping are the principal recreational uses. Other public uses include fishing, nature observation, environmental education, hiking, and canoeing.

LEGAL PURPOSE

Minnesota's wildlife management areas are lands and waters with a high potential for wildlife production. They are managed and developed by the Commissioner of the Minnesota Department of Natural Resources (DNR) to perpetuate and, if necessary,

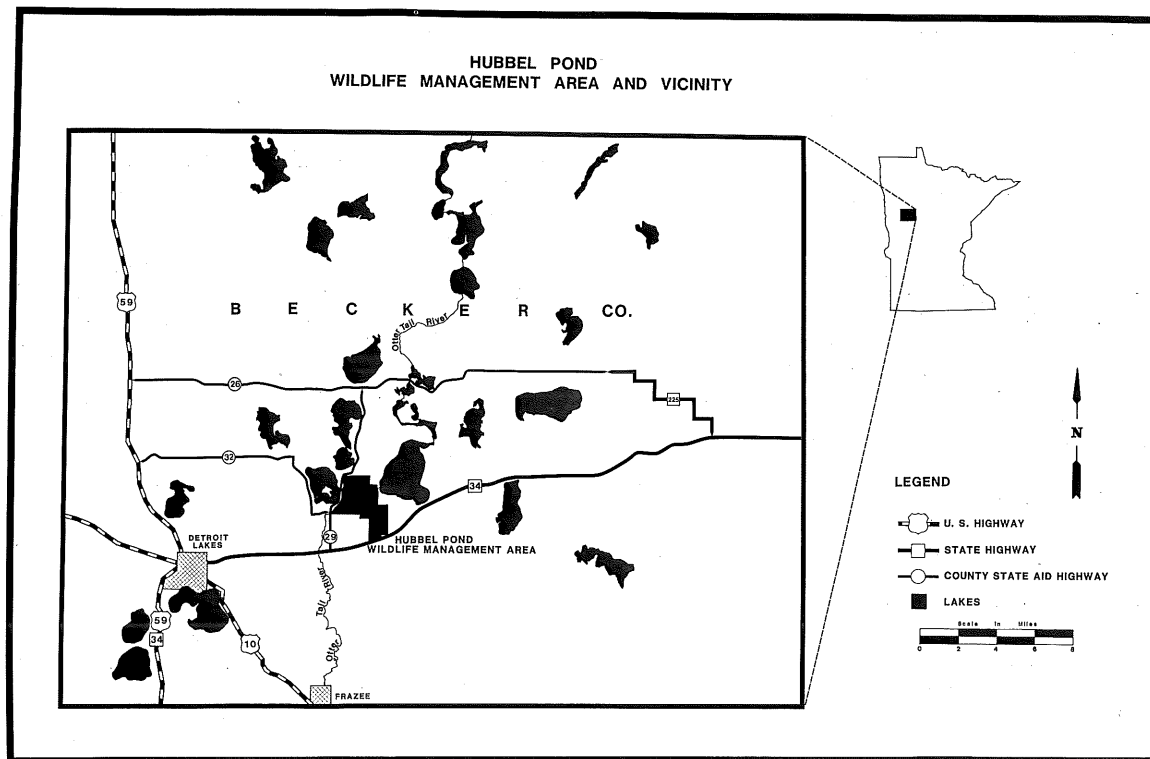


Figure 1

reestablish habitats for the maximum production of a variety of wildlife and to provide hunting, fishing, trapping and other compatible outdoor recreational uses. Public use must be consistent with the units' resource limitations, and developments must minimize intrusion on the natural environment (Minnesota Statutes, Sec. 86A.05, Subd. 8, 1978).

Public lands have a limited potential for multiple recreational use. Minnesota has never actively encouraged the multiple recreational use of wildlife lands. The Commissioner of Natural Resources recognized those public uses associated with the observation, interpretation, and understanding of fish and wildlife populations and habitats as recreational uses compatible with Minnesota's wildlife management areas. Similarly, the U.S. Fish and Wildlife Service has recently realized that national wildlife refuge goals are endangered by conflicts between the demand for recreation and the ability of the resource to accommodate the use (Pulliam 1974).

Since the development, management, and administration of state wildlife lands are financed primarily through revenues derived from the sale of hunting, trapping, and fishing licenses, recreational uses of these lands are limited to activities directly

oriented towards wildlife and fish. In addition, wildlife lands purchased with federal matching funds derived from the Pittman-Robertson Act were acquired with the understanding that they would be managed for the benefit of wildlife populations and/or for the public use and understanding of those resources.

The greatest contribution from our country's wildlife lands is the fostering of public uses directly associated with fish and wildlife and their habitats. To achieve these goals, the Minnesota DNR will continue to restrict public uses that are not related to fish and wildlife.

LONG-RANGE GOALS

In accordance with the legal purposes of wildlife management areas, the two primary long-range goals of the Hubbel Pond WMA are: 1) to develop and maintain diverse habitats which are highly productive and attractive to wildlife; and 2) to provide quality hunting, trapping, fishing, and other forms of outdoor recreation compatible with wildlife management and use. Accomplishment of these goals will perpetuate wildlife and native plant communities for public utilization, enjoyment, and education.

HISTORICAL AND ARCHAEOLOGICAL ASPECTS

Historical knowledge is valuable to natural resource management. Many of the land use problems and attitudes toward natural resource use arose with settlement of the region. An understanding of the historical use of an area's natural resources, the strong points and shortcomings of these practices, and the policies regarding natural resource use is necessary to develop a comprehensive management plan.

LOCAL HISTORY

Fur traders were the first non-Indians to enter the Becker County area. From 1830 to 1867, furs obtained from the Chippewa Indians were shipped to St. Paul and Winnipeg (Teague 1971). In 1855, the Chippewa ceded all interest to lands in northcentral Minnesota, opening the way for settlement by white immigrants. In 1867, the White Earth Indian Reservation was established in Mahanomen, Clearwater, and northern Becker Counties (Dana et al. 1960).

The logging of the pine and hardwood forests began after Indian claims were settled. Logs were floated down the Otter Tail River to mills in Detroit Lakes, Frazee, Fergus Falls, and Breckenridge. To facilitate the transport of logs, a series of dams were constructed along the Otter Tail River. In the spring, water was released and the increased flow carried logs downstream to the next dam.

Economic activity and population increased in the vicinity after 1869, when a railroad was completed to Detroit Lakes. Becker County was formally organized in 1871. Logging continued to be a major industry until

the turn of the century. Once the trees were removed, the land was sold to settlers for farming. Wheat soon became an important agricultural product (Teague 1971).

WILDLIFE MANAGEMENT AREA HISTORY

The Hubbel Pond WMA was named after Orson Hubbel, who settled near the present management area headquarters in 1877. The marsh between Height of Land and Cotton Lakes made an ideal location for a reservoir, and Hubbel built a dam on the Otter Tail River to store water for spring log drives. Logs were floated from Height of Land Lake to the Hubbel dam down a diversion ditch constructed south of the old river channel. Water was then released from the Hubbel reservoir and the logs were floated downstream to the next dam. Once the logging era ended, the Hubbel dam deteriorated. Portions of the management area were farmed, but the sandy and rocky upland soils and the poorly drained lowland areas were not suited for agriculture. Much of the land eventually became tax-forfeited.

The Becker County Sportsmen's Club first proposed establishment of the management area in 1947, and the Becker County Commissioners granted approval for land purchases in 1952. Land acquisition began in 1954 with the initial purchase of 1,076 acres, including almost 1,000 acres of tax-forfeited and Trust Fund land. A resident manager was hired in 1955 and the Hubbel Pond dam was rebuilt in 1957, impounding a 500-acre marsh.

ARCHAEOLOGICAL ASPECTS

One prehistoric Indian site is located in the extreme northeast corner of the management area (Johnson 1977). Another site is located adjacent to the western boundary of the unit. Both sites contain burial mounds and evidence of village habitation, but neither has been excavated or tested. According to Johnson (1977), both sites "...have potential and should receive an intensive field survey to determine their present status and their eligibility for the National Registry of Historic Places."

The entire region surrounding the Hubbel Pond WMA has a high density of prehistoric sites. A late

prehistoric wild rice harvesting and processing site is located at the inlet of the Otter Tail River into Height of Land Lake. Several burial mounds exist north of the management area on the Tamarac National Wildlife Refuge.

HISTORICAL SITES

The Becker County Historical Society and the Minnesota State Historical Society were asked to identify historical sites on the Hubbel Pond WMA. No sites in need of special consideration or preservation were identified.

RESOURCE INVENTORY

An inventory of the resources and conditions in the area is essential to developing comprehensive management programs. The resources can be divided into two classes: abiotic and biotic. While each category influences the other, the abiotic conditions generally determine the diversity, distribution, and density of the biotic resource. Examination of the existing resources in conjunction with the habitat requirements, population dynamics, and behavior of resident and migratory wildlife is needed to develop programs for the sustained production and use of these populations.

ABIOTIC RESOURCES

Climate. The Hubbel Pond WMA vicinity has warm summers and long, cold winters. The average temperature for July is 68.2° F and for January 4.7° F (Table 1). Approximately 60 days per year can be expected to have minimum temperatures below 0° F. The growing season is approximately 120 days long. The first killing frost is expected in early September and the last normally no later than late May. Average annual precipitation is 23.94 inches, ranging from 0.56 inches in February to 4.34 inches in June. About 17 inches, or 71 percent of the annual precipitation, falls

Table 1. Average temperature, precipitation, snowfall, and snow depth for the Hubbel Pond WMA vicinity.

Month	Average Temperature ¹ (F°)	Average Precipitation ¹ (inches)	Average Snowfall ¹ (inches)	Average Snow Depth ² (inches)
January	4.7	0.63	8.81	11.85
February	8.8	0.56	5.04	13.24
March	22.1	0.89	7.47	10.68
April	40.4	2.17	4.36	1.68
May	52.7	2.70	0	0
June	62.8	4.34	0	0
July	68.2	3.69	0	0
August	66.7	3.87	0	0
September	55.8	2.33	0	0
October	45.7	1.25	1.37	0.14
November	27.6	0.76	4.54	2.03
December	12.1	0.75	8.60	7.14
TOTAL	—	23.94	40.19	—

¹ Data from weather reporting station at Detroit Lakes, Minnesota 1941-1970.

² Data from weather reporting stations at Detroit Lakes and Fosston, Minnesota 1941-1976.

Sources: U.S. Department of Commerce 1973.

State Climatology Office, University of Minnesota, St. Paul.

during May through September. Annual snowfall averages 40.19 inches. Greatest snow depths generally occur in January and February, averaging 11.85 and 13.24 inches (Table 1). Prevailing winds are from the northwest during winter, changing to the south and southwest during spring and summer.

Geology. Precambrian bedrock formations underlie the management area. Granites, schists, greenstones, and other crystalline rocks predominate (Winter et al. 1969).

Pleistocene glacial activity was responsible for the present soils and topographic features of the management area. Glaciers covered the area several times during the Pleistocene epoch, but present landforms and surface deposits are the result of the most recent (Wisconsin) glaciation approximately 50,000 to 10,000 years ago. From 400 to 500 feet of glacial till and sand and gravel were deposited over the bedrock surface. Glaciation created a rolling topography of morainal hills and outwash plains containing numerous lakes and depressions (Minnesota Conservation Department 1959a).

Knowledge of the bedrock geology on the management area is limited, and assessment of the mineral potential is difficult. Based on available bedrock information, however, the mineral potential for the management area is rated as fair. Zinc, copper, lead, gold, and silver may occur on the unit, but not necessarily in deposits making commercial mining feasible or economical (David Meineke, DNR, Division of Minerals, personal communication).

Soils. Soil development in the Hubbel Pond vicinity has been influenced by parent materials, topography, climate, and vegetation. Underlying parent materials consist of unconsolidated glacial till and sand and gravel outwash deposits.

Mineral soils on the management area belong to the Nebish-Marquette-Menaghá Soil Association (U.S. Department of Agriculture 1976). These soils were generally formed under mixed coniferous-deciduous forests and have a typical podzolic profile. The soil surface is characterized by a covering of leaf litter, mold, and humus underlain by an organic-mineral horizon of black to gray loams or sandy loams. Subsoil layers typically consist of brown sands, clay loams, or sandy loams. Agricultural potential for these soils is low due to their slope and droughty conditions (U.S. Department of Agriculture 1976). Peat soils have accumulated over mineral subsoils on low-lying, poorly

drained sites. A detailed soil survey of the management area has not been completed.

Underground Hydrology. The groundwater availability is related to the glacial history of the management area. Impermeable bedrock forms the base of the groundwater reservoir. Except for possible deposits in bedrock fractures or joints, the primary source of groundwater is from porous sand and gravel outwash deposits buried in glacial till (Winter et al. 1969). In the management area vicinity, groundwater moves generally southeasterly through glacial till toward the Otter Tail River and its tributaries.

The many lakes in the area reflect a nearly full groundwater reservoir (Winter et al. 1969). This large reservoir is sufficient to sustain lakes even during dry cycles.

The management area is primarily a recharge area for underground water in the Otter Tail River and Buffalo River watersheds. Most recharge occurs in the permeable glacial deposits. Annual groundwater recharge is primarily from precipitation and snowmelt. Approximately 92 percent (22.4 inches) of the annual precipitation is dissipated through evapotranspiration. The remainder (2.0 inches) either runs off as streamflow or enters the groundwater reservoir (Winter et al. 1969).

Well depths and water-yielding capabilities vary considerably depending on the type, capacity, and depth of the groundwater source. Most wells in the area are between 70 and 250 feet deep and yield from 10 to more than 500 gallons per minute. (Winter et al. 1969). Yields are adequate for most domestic, livestock, and small industrial needs. Three wells in Detroit Lakes, between 232 and 245 feet deep, yield over 500 gallons per minute.

Groundwater quality in the area varies, depending on the distance of movement, physical and chemical characteristics of the water-bearing materials, and the contact time with these materials. Most groundwater in the management area vicinity is, in general, high in iron, very hard, and high in water-soluble materials (total dissolved solids). It is still suitable for domestic and livestock use in most places. Hardness is due mainly to the high concentration of calcium and magnesium ions (Winter et al. 1969). Chemical concentrations in groundwater samples taken near the management area were within Minnesota Pollution Control Agency (1972) limits for domestic consumption (Table 2). Total hardness did, however, exceed the

Table 2. Chemistry of groundwater sampled from glacial drift near the Hubbel Pond WMA.

Parameters ¹	Location		Consumption Limits ²
	WMA Headquarters Area	Detroit Lakes	
Iron	—	0.2	0.3
Calcium	8.0	—	
Magnesium	4.0	—	
Sodium & Potassium	0.4	—	
Chloride	1.4	—	
Sulfate	0.7	—	250
Dissolved solids	—	378	500
Total hardness	—	302	

1. Measurements in parts per million.

2. Recommended domestic consumption limits (Minnesota Pollution Control Agency 1972).

Source: Winter et al. 1969.

200 parts per million limit recommended by the U.S. Public Health Service.

Surface Hydrology. Two watersheds drain the Hubbel Pond WMA. Approximately 95 percent of the management area is within the 1,920 square mile Otter Tail River watershed, and the northern 5 percent is in the 1,690 square mile Buffalo River watershed.

The Otter Tail River originates in southwestern Clearwater County and flows southward through a series of lakes until it reaches Otter Tail Lake. There it turns westerly until its junction with the Red River of the North. Its principal tributaries and their drainage areas are the Pelican (518 square miles), Dead (148 square miles), and Toad Rivers (122 square miles) (Minnesota Conservation Department 1959a). Drainage on the management area is generally towards the Otter Tail River.

Stream gradients on the Otter Tail River vary widely. The greatest slope, 12 feet per mile, occurs over a reach of five miles below Height of Land Lake and includes that portion of the river flowing through the management area.

Annual base flows for rivers and streams is variable, depending on precipitation, rapidity of snowmelt, runoff conditions, and the amount of groundwater discharge. Between 1938 and 1965, base flow for the Otter Tail River two miles south of the management area averaged 56.2 cubic feet per second, with a maximum discharge recorded at 371 cubic feet per second.

Surface waters are derived primarily from runoff and groundwater discharge to stream channels. The large groundwater reservoir and the many lakes and marshes in the area are very effective in reducing peak stream flows. Maximum stream levels have mostly been caused by ice jams (Winter et al. 1969).

Lakes in this area are generally quite deep and are underlain by sand and gravel. Productivity is typically high.

The Otter Tail River flows southwest from Height of Land Lake through the management area. The Hubbel Pond impoundment is located in a shallow basin of the old river channel. Hubbel Pond originally covered about 600 acres, but lumbering operations and the

diversion of water to Cotton Lake reduced the water area to less than 100 acres (Minnesota Conservation Department 1959b). The new dam increased the water area to its present size of approximately 520 acres. The main channel of the Otter Tail River currently flows through a diversion ditch south of the impoundment before rejoining Hubbel Pond approximately one-half mile north of the headquarters control dam. The Hubbel Pond impoundment has a maximum and median water depth of 7.8 and 3.5 feet, respectively. The impoundment has approximately 11.8 miles of shoreline. The bottom consists primarily of soft muck and matted roots (Minnesota Conservation Department 1966).

Other permanent water areas of significant size on the WMA include Hanson and Alvin Lakes and two type IV marshes. Hanson Lake covers 37 acres with a maximum depth of 25 feet. Its water temperature and quality are suited for rainbow trout. Alvin Lake covers about 26 acres. Each of the two larger type IV marshes on the area contain approximately 13 to 18 acres of open water. Other smaller potholes and impoundments also occur on the area. Beaver dams impound waters on streams and ditches throughout the area. Impounded acreages fluctuate, depending on precipitation levels and beaver numbers and activity.

Water samples taken from the Otter Tail River, Hubbel Pond, and Hanson Lake in July and October, 1978, were analyzed at the DNR, Section of Ecological Services' laboratory at the Carlos Avery WMA. Water quality measurements for these samples are presented in Table 3. Nutrient levels were similar for the four areas sampled. Total Kjeldahl nitrogen (1.28 to 2.62 ppm) was high, suggesting high fertility. Water in all areas was hard, which often indicates high productivity. Sulfate and chloride concentrations were within normal ranges for Minnesota lakes and streams (Howe and Carlson 1969).

BIOTIC RESOURCES

Vegetation. Vegetation is continuously changing with short-term disturbance, such as fires or storms, and long-term events, such as climatic changes or soil development. The process of change from one vegeta-

Table 3. Chemistry of surface water samples from the Hubbel Pond WMA.

Parameters ¹	Otter Tail River				Hubbel Pond		Hanson Lake	
	Height of Land Dam		Hubbel Pond Dam		7/78	10/78	7/78	10/78
	7/78	10/78	7/78	10/78				
Sulfate	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total								
Phosphorus	< 0.050	< 0.050	< 0.050	< 0.050	0.220	0.055	< 0.050	< 0.050
Soluble								
Phosphorous	< 0.010	0.014	< 0.010	< 0.010	0.142	0.014	< 0.010	< 0.010
Chloride	4.3	3.9	2.7	3.3	1.8	1.4	4.2	2.4
Nitrogen								
Ammonia	0.026	0.060	< 0.025	0.027	< 0.025	0.026	< 0.025	< 0.025
Nitrite	< 0.001	< 0.001	< 0.001	< 0.001	0.004	< 0.001	< 0.001	< 0.001
Nitrate	< 0.050	0.074	< 0.050	0.055	0.057	0.067	0.070	0.065
Total								
Kjeldahl	1.28	2.12	1.90	1.59	2.62	1.88	1.45	1.65
Total								
Alkalinity ²	140.0	140.0	162.0	155.0	188.0	168.0	120.0	130.0
pH	8.75	8.70	7.45	7.85	7.10	7.10	8.95	8.30
Conductivity ³	250.0	235.0	290.0	245.0	350.0	270.0	210.0	210.0

1. Measurements in parts per million (ppm) except pH and conductivity.

2. Expressed as ppm of calcium carbonate (CaCO₃).

3. In micro-mhos

tion type to another is succession.

The presettlement vegetation of the Hubbel Pond WMA and vicinity was transitional between the prairie to the west and the northern forest types to the east and northeast. Marschner (1930) used original land surveyors' field notes to identify four presettlement vegetation types in the WMA vicinity. The Brush-Prairie type consisted of an interspersed of shrub thickets, patches of small trees, and prairie grasslands. Periodic wildfires maintained the species composition and structure of this type. The Big Woods was a mesic, upland, deciduous forest dominated by oak, elm, maple, basswood, aspen, and birch. The Aspen-Birch-Conifer Forest, which included white and red pines, balsam fir, spruce, and white cedar, and the White and Red Pine Forest were the other two presettlement types occurring in the management area vicinity.

Logging and settlement altered the presettlement vegetation. Most of the mature pine had been harvested by the 1900's. Settlers began clearing the land for farming. Fires, originating from logging and land clearing operations, were prevalent. By 1930, stricter fire prevention laws ended indiscriminate burning and favored the growth of the forested types.

Plant communities on the Hubbel Pond WMA were mapped from black-and-white, aerial, infrared photographs taken in 1965. Vegetation types were classified according to the dominant species. In cases where more than one species predominates, the major species are listed. For example, O/A designates a stand dominated by oak with aspen as a subdominant. Wetlands were classified using criteria modified from Steward and Kantrud (1971) and Cowardin and Johnson (1973). Species composition and dominance in the various communities were determined from previous vegetation studies and by ground-checking. The smallest mapping unit was about three acres. Ten upland, three lowland, and three wetland vegetational types were mapped (Figure 2). Descriptions of succession generally follow Curtis (1959). Names of plants follow Gleason and Cronquist (1963). A complete list of plant species mentioned in the text is found in Appendix B. The acreage and percentage occurrence of each community are listed in Appendix C.

NORTHERN HARDWOOD. The most abundant upland vegetation type found on the management area is the northern hardwood type, which occupies about 640 acres. Red oak, sugar maple, and basswood are the dominant overstory species, but bur oak, aspen, elm, and paper birch are also common. Prominent shrubs include beaked hazel, hop-hornbeam, chokecherry, junberry, and round-leaved dogwood. Sugar maple, basswood, elm, and red oak seedlings and saplings are also common. Bur oak and aspen regeneration, however, is restricted to forest edges or under large openings in the overstory canopy. Ground cover is dominated by hog peanut, posion ivy, bracken fern, sarsaparilla, dogbane, large-leaved aster, bush honeysuckle, and early meadow rue.

Without disturbance, succession will replace the shade-intolerant, short-lived species with shade-tolerant, longer-lived species. For example, oak, aspen, and birch will gradually be replaced by species such as sugar maple and basswood. Major disturbances such as fires or logging will set back succession and favor species such as aspen, birch, and bur oak (Curtis 1959).

ASPEN. This type has more than 50 percent of the canopy in aspen and covers 291 acres on the area. Aspen stands occupy a wide range of soils and forest sites. Stand distribution generally reflects past disturbances such as fire, logging, or wind damage (Hanson et al. 1974). Red oak, bur oak, and paper birch are common associates. Understory and

ground-layer species composition is similar to the northern hardwood type.

Aspen is a short-lived, pioneer species which reproduces vigorously by root suckering following disturbances. Aspen, however, cannot reproduce successfully under shade, and, if undisturbed, aspen stands will begin to deteriorate after 60 to 80 years. On most sites on the WMA, aspen will be replaced by northern hardwood such as hop-hornbeam, red oak, and, eventually sugar maple and basswood.

OAK. This type, totaling 614 acres, is dominated by oaks. Red oak is the primary species, but bur oak also occurs. Aspen, paper birch, and sugar maple are common associates. Understory and ground-layer species composition is similar to the northern hardwood type.

Without disturbance, oaks will gradually be replaced by more shade-tolerant species such as sugar maple and basswood. Major disturbances such as fires or logging will set back succession and favor early successional species such as aspen and paper birch (Curtis 1959).

BOTTOMLAND HARDWOOD. The bottomland hardwood type occurs on poorly drained and periodically flooded mineral soils and covers about 53 acres. This type is found along portions of the Otter Tail River as well as adjacent to wetlands. American elm, green ash, black ash, and basswood are dominant. Common understory vegetation includes chokecherry, junberry, prickly ash, beaked hazel, round-leaved dogwood, and panicled dogwood. Ground cover plants include poison ivy, white snakeroot, bracken fern, large-leaved aster, wild ginger, early meadow rue, and sarsaparilla.

The major dominants of this type are capable of self-regeneration and form a relatively stable community (Curtis 1959). Changes resulting in dryer soil conditions would favor the invasion of more mesic species such as sugar maple, oaks, and paper birch.

UPLAND CONIFER. This type is a mixture of jack pine, trembling aspen, and oaks and occupies 13 acres of the unit. Stand composition varies from nearly pure jack pine to mixed stands where the frequency of aspen and oaks may approach or even exceed jack pine. Shrub and groundlayer species are similar to the northern hardwoods type.

Without disturbance, longer-lived species such as red oak, sugar maple, or possibly red pine, will gradually replace jack pine (Curtis 1959). Periodic fires with intervals allowing seedlings to mature will perpetuate the jack pine type.

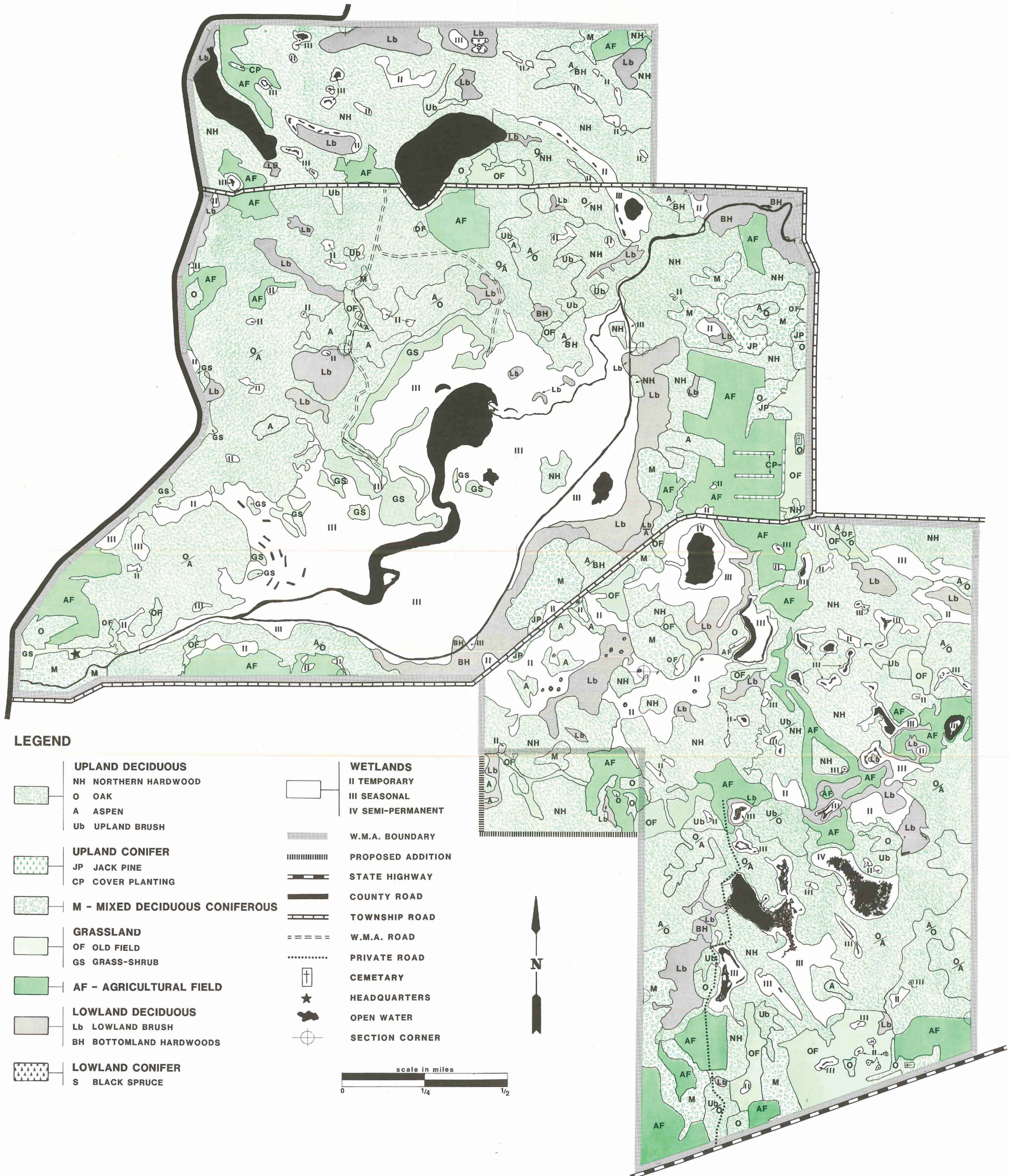


Northern hardwoods, composed of red oak, sugar maple, basswood, elm, aspen, and paper birch, are the most common forest type on the Hubbel Pond WMA.

FIGURE 2. VEGETATION

HUBBEL POND WILDLIFE MANAGEMENT AREA

VEGETATION



LOWLAND CONIFER. This lowland forest type occupies one acre of the unit on poorly drained peat soils. The overstory is dominated by black spruce and tamarack, but aspen, paper birch, or black ash may occur. Common understory vegetation includes willows, round-leaved dogwood, raspberry, and bog birch. Ground cover is dominated by grasses and sedges.

Successional development in this type is extremely slow. Both tamarack and black spruce are susceptible to disease, fires, and insect attack but reproduce readily under most conditions. Changes leading to drier soil conditions would favor an increase in deciduous trees such as black ash, American elm, or aspen.

MIXED DECIDUOUS/CONIFEROUS. This upland type, covering 152 acres, is a mixture of trembling aspen, paper birch, red oak, black ash, white spruce, balsam fir, and white pine. Aspen is generally the most abundant overstory species, but in certain stands the frequency of spruce and balsam fir may approach or exceed aspen. Understory shrub and ground cover species composition is similar to the northern hardwood type.

Without disturbance, succession will favor the replacement of the shade-intolerant, short-lived species such as aspen and birch by shade-tolerant species such as white spruce and balsam fir. On wetter sites, black ash or black spruce will eventually dominate.

UPLAND BRUSH. This type, totaling 90 acres, includes logged or burned sites still in the early stages of regeneration. These sites include a dense cover of beaked hazel, willow, chokecherry, aspen, red oak, and paper birch. If undisturbed, these areas will develop into aspen stands.

LOWLAND BRUSH. The lowland brush type, covering 210 acres, occurs on waterlogged peat areas having standing water during part of the growing season. Alders and willows are the dominant shrub species, forming a dense thicket from 6 to 15 feet high. Ground cover is dominated by several kinds of sedges and grasses.

In the absence of major disturbances, this type may persist for long periods. Black spruce and tamarack invade these sites very slowly because of the dense shrub cover. Repeated, severe fires could cause the reversion to a grass and sedge community.

OLD FIELDS. Old fields include abandoned cropland and remnant openings created by settlement. These areas, totaling 120 acres, are generally dominated by grasses, goldenrod, milkweed, white sweet clover, and common mullein. They will eventually be invaded by woody species such as aspen, willow, and raspberry, unless they are periodically mowed, burned, or cultivated.

AGRICULTURAL FIELDS. This type includes active cropland, fallow legume fields, and hayfields. In 1979, 16 acres of cropland were planted to corn and small grains. Haying permits were issued for 80 additional acres.

GRASS/SHRUB. This type, totaling 62 acres, is characterized by a grass-sedge cover with scattered willow, red-osier dogwood, high-bush cranberry, and resprouting green ash, bur oak, and basswood.

Without disturbance, these sites will eventually be dominated by woody species. Periodic burning will reduce woody cover and maintain an open grass-sedge community.

COVER PLANTINGS. In 1978, 1,000 red pine and white spruce were planted in two old field sites to serve as winter cover for wildlife. The trees were planted in strips approximately six rows wide.

TEMPORARY WETLAND (TYPE II). There are 143 acres of type II wetlands on the unit. Surface water remains in these wetlands for only a few weeks after spring snowmelt. Soils generally remain waterlogged within a few inches of the surface during the entire growing season. Common species include sedges, bluejoint, blue flag, and sweet flag.

In the absence of fires and other disturbances, alder, willow, and red-osier dogwood will invade these wetlands, creating a dense shrub thicket.

SEASONAL WETLAND (TYPE III). This type has variable water depths of up to 30 inches. Water

remains in the basin from spring through early summer. Type III wetlands occupy 593 acres on the unit. Vegetation composition in this type is influenced by both water depth and water chemistry; however, cattail, bulrushes, spikerushes, and sedges are usually present. Also occurring on some areas are wild rice, common cane, marsh marigold, water hemlock, and arrowheads. Emergents are more common in wetlands containing water for the majority of the growing season, while sedges are found in drier areas.

With the slow accumulation of peat and mineral sediments in these wetland basins, water depth will begin to decrease. As sediments accumulate over hundreds of years, sedges will replace emergents, and gradually a hydric shrub stage of willow, alder, and red-osier dogwood will become dominant. Fires retard the buildup of organic sediments and set back plant succession.

SEMI-PERMANENT WETLAND (TYPE IV). This type, covering 33 acres, is a deep marsh with water up to five feet deep which remains through the entire growing season. Species composition is influenced by water depth, seasonal water level fluctuation, and water chemistry. Emergents found in type III wetlands are also common to type IV wetlands, as are such submergent aquatics as bladderwort, coontail, water milfoil, and pondweeds (Cowardin and Johnson 1973).

Successional trends of type IV wetlands follow a pattern similar to type III wetlands. Through the accumulation of dead organic matter and peat, the marsh basin will gradually fill, and the species composition will change from emergent aquatics to sedges and finally a shrub thicket (Curtis 1959).

Birds. A list of bird species likely to occur on the Hubbel Pond WMA was compiled by comparing lists from Robert Janssen of the Minnesota Ornithologists' Union, the Tamarac National Wildlife Refuge, and DNR personnel, with species lists and accounts available in the literature. Many species, especially migrants, may be uncommon or rare because the amount, quality, or distribution of preferred habitat on the area may be deficient or because the unit lies near the normal limit of a species' range.

Of the 247 species that may occur on the management area (Table 4), 159 are permanent or summer residents and commonly nest on the area. Fall and spring migrants account for 73 species, and 15 occur only in winter.

Thirty-three bird species are protected under Minnesota Statutes, Sec. 100.27 (1978) and may be taken only during authorized hunting seasons. All other species, except house sparrows, starlings, and rock doves, are protected by state or federal laws and have no open season in Minnesota. Among the game birds found on the management area are 24 waterfowl species. Mallard, blue-winged teal, wood duck, and ring-necked duck are the most common migrant and breeding waterfowl. Other waterfowl species occur during the spring and fall migration but in lesser numbers. Other resident game birds associated with wetlands include the American coot, sora, Virginia rail, and the common snipe.

Two species of upland game birds occur on the management area. Ruffed grouse are permanent residents, while woodcock are summer residents. The ruffed grouse is the most heavily hunted game bird. Each spring, ruffed grouse drumming is recorded along two established routes to provide an index of population levels (Table 5). The Island Lake route runs through the management area, while the Tamarac route runs north of the WMA through the Tamarac National Wildlife Refuge. Grouse numbers on the management area vicinity have generally been above the central Minnesota average. No index to woodcock abundance is available for the management area. Gray

Table 4. Bird species and their relative abundance in the Hubbel Pond WMA vicinity.

Common Name	Permanent Resident	Summer Migrant	Winter Resident	Common Name	Permanent Resident	Summer Migrant	Winter Resident
Common loon		C	C	Dunlin		U	
Red-necked grebe		U	U	Semipalmated sandpiper		C	
Horned grebe		U	U	Western sandpiper		U	
Eared grebe		U	U				
Western grebe		U/R	U/R	Sanderling		U	
Pied-billed grebe		C	C	Short-billed dowitcher		U	
White pelican		U/R	U/R	Long-billed dowitcher		U	
Double-crested cormorant		U/R	U/R	Stilt sandpiper		U	
Great blue heron		C	C	Buff-breasted sandpiper		R	
Green heron		R	R	Marbled godwit		C	C
Great egret		R	R	Hudsonian godwit		U	
Black-crowned night heron		U	U	American avocet		U	U
Least bittern		R	R	Wilson's phalarope		C	C
American bittern		U	U	Northern phalarope		U	
Whistling swan		U					
*Canada goose		C	C	Herring gull		C	
*White-fronted goose		R		Ring-billed gull		C	
*Snow goose		U	U	Franklin's gull		C	
*Mallard		A	A	Bonaparte's gull		U	
*Black duck		U/R		Forster's tern		C	C
				Common tern		U	U
*Gadwall		C/U	C/U	Caspian tern		U	
*Pintail		C/U	C/U	Black tern		A/C	A/C
*Green-winged teal		U/C	U/C	Rock dove	A		
*Blue-winged teal		A/C	A/C	Mourning dove		A/C	A/C
*American wigeon		U	U				
				Yellow-billed cuckoo		R	
*Northern shoveler		C/U	C/U	Black-billed cuckoo		U	U
*Wood duck		C	C	Screech owl		U	U
*Redhead		C/U	C/U	Great-horned owl	C/U	U/R	
*Ring-necked duck		C	C	Snowy owl			U/R
*Canvasback		U/R	U/R		U		
				Barred Owl			
*Greater scaup		U/R	U/R	Great gray owl		R	
*Lesser scaup		A/C	A/C	Long-eared owl		U	
*Common goldeneye		C	C	Short-eared owl		R	R
*Bufflehead		U	U	Boreal owl		R	R
*White-winged scoter		U					
				Saw-whet owl		R	R
*Ruddy duck		U	U	Whip-poor-will		R	R
*Hooded merganser		U	U	Common nighthawk		C/U	C/U
*Red-breasted merganser		U/R	U/R	Chimney swift		C/U	C/U
*Common merganser		C/U	C/U	Ruby-throated hummingbird		C/U	C/U
Turkey vulture		C/U	C/U				
				Belted kingfisher		C	C
Goshawk		U/R		Common flicker		C	C
Sharp-shinned hawk		C/U	C/U	Pileated woodpecker	U/R		
Cooper's hawk		U	U	Red-headed woodpecker		U/R	U/R
Red-tailed hawk		C/U	C/U	Yellow-bellied sapsucker		C	C
Red-shouldered hawk		R	R				
				Hairy woodpecker	C		
Broad-winged hawk		C/U	C/U	Downy woodpecker	C		
Swainson's hawk		R	R	Black-backed 3-toed woodpecker		R	
Rough-legged hawk		C/U	C/U	Eastern kingbird		C/U	C/U
Golden eagle		U/R		Western kingbird		C/U	C/U
Bald eagle		U	U				
Marsh hawk		C/U	C/U	Great crested flycatcher		U	U
Osprey		U	U	Eastern phoebe		U	U
Peregrine falcon		VR		Yellow-bellied flycatcher		U/R	U/R
Merlin		VR		Alder flycatcher		U	U
American kestrel		C	C	Least flycatcher		C	C
*Ruffed grouse	C			Eastern wood pewee		C/U	C/U
Greater prairie chicken	C			Olive-sided flycatcher		U	U
*Sharp-tailed grouse	R			Horned lark		A/C	A/C
*Ring-necked pheasant	C			Tree swallow		A/C	A/C
*Gray partridge	C/U			Bank swallow		C/U	C/U
Sandhill crane		U		Rough-winged swallow		U	U
King rail		R	R	Barn swallow		A/C	A/C
*Virginia rail		U		Cliff swallow		C	C
*Sora		C/U	C/U	Purple martin		C	C
*American coot		A/C	A/C	Gray jay		R	
Semipalmated plover		U	C	Blue jay	C		
Killdeer		C	C	Black-billed magpie		U	
American golden plover		U		Common raven	U		
Black-bellied plover		U		Common crow	A		
Ruddy turnstone		U		Black-capped chickadee	C		
*American woodcock		U	U	White-breasted nuthatch	C		
*Common snipe		C	C	Red-breasted nuthatch		U	
Upland sandpiper		C	C	Brown creeper	C/U		
Spotted sandpiper		C/U	C/U	House wren		C/U	C/U
Solitary sandpiper		U		Winter wren		U	
Greater yellowlegs		U/R		Long-billed marsh wren		C/U	C/U
Lesser yellowlegs		U		Short-billed marsh wren		C	C
Red knot		R		Gray catbird		C	C
Pectoral sandpiper		C		Brown thrasher		C/U	C/U
White-rumped sandpiper		C		American robin	A		A
Baird's sandpiper		U		Wood thrush		U	U
Least sandpiper		C		Hermit thrush		U	
				Swainson's thrush		U	
				Gray-cheeked thrush		U	
				Veery		C	C

TABLE 4 (Continued)

Common Name	Permanent Resident	Summer Migrant	Winter Resident	Common Name	Permanent Resident	Summer Migrant	Winter Resident
Eastern bluebird		U	U	Eastern meadowlark		U	U
Golden-crowned kinglet		C/U		Western meadowlark		C	C
Ruby-crowned kinglet		C/U		Yellow-headed blackbird		C	C
Water pipit		U		Red-winged blackbird		A	A
Bohemian waxwing		R		Northern oriole		C/U	C/U
Cedar waxwing		C/U	C/U	Rusty blackbird		C/U	
Northern shrike		U	U	Brewer's blackbird		C/U	C/U
Loggerhead shrike		U	U	Common grackle		A/C	A/C
Starling		A/C	A/C	Brown-headed cowbird		A/C	A/C
Yellow-throated vireo		U		Scarlet tanager		U	U
Solitary vireo		U		Rose-breasted grosbeak		U	U
Red-eyed vireo		C	C	Indigo bunting		U	U
Philadelphia vireo		R		Evening grosbeak		C/U	C/U
Warbling vireo		U	U	Purple finch		C	C
Black-and-white warbler		C/U		Pine grosbeak		C/U	C/U
Golden-winged warbler		U/R	U/R	Hoary redpoll		U	U
Tennessee warbler		C		Common redpoll		C	C
Orange-crowned warbler		C		Pine siskin		U	
Nashville warbler		C/U	C/U	American goldfinch		C	C
Northern parula		U	U	Red crossbill	V		
Yellow warbler		C	C	White-winged crossbill	V		
Magnolia warbler		U		Rufous-sided towhee		U/R	
Cape May warbler		U		Savannah sparrow		C	C
Black-throated blue warbler		R		Grasshopper sparrow		C/U	C/U
Yellow-rumped warbler		A/C		LeConte's sparrow		U	U
Black-throated green warbler		U		Vesper sparrow		C	C
Blackburnian warbler		U	U	Lark sparrow		U/R	U/R
Chestnut-sided warbler		U	U	Dark-eyed junco	A/C		
Bay-breasted warbler		U		Tree sparrow		A/C	A/c
Blackpoll warbler		C/U		Chipping sparrow		C	C
Pine warbler		U		Clay-colored sparrow		U	U
Palm warbler		C/U		Harris' sparrow		U	
Ovenbird		C	C	White-crowned sparrow		C/U	
Northern waterthrush		U		White-throated sparrow		C	
Connecticut warbler		U		Fox sparrow		C/U	
Mourning warbler		U	U	Lincoln's sparrow		U	
Common yellowthroat		C/U	C/U	Swamp sparrow		C/U	C/U
Wilson's warbler		U		Song sparrow		C	C
Canada warbler		U		Lapland longspur		C	
American redstart		C/U	C/U	Snow bunting		C	C
House sparrow	A						
Bobolink		C	C				

* Species with Minnesota hunting seasons.

¹Protected in Minnesota but hunted in other states.

A = abundant, C = common, U = uncommon, R = rare, VR = very rare, V = variable, may be locally common some years and absent in others.

partridge, ring-necked pheasant, sharp-tailed grouse, and prairie chicken may occur in the vicinity but are associated with habitats not found on the WMA.

The diverse habitats on the management area attract a variety of nongame birds. Migrating and resident shorebirds are commonly observed in the wetlands. Abandoned fields are suitable habitat for such prairie and old field species as the bobolink, horned lark, western meadowlark, song sparrow, and savannah sparrow. Wood warblers, flycatchers, vireos, woodpeckers, and thrushes occur in the forests. Twenty-four species of migrant and resident raptors may occur on the area. The red-tailed hawk, broad-winged hawk, rough-legged hawk, American kestrel, and great horned owl are the most common resident raptors. Bald eagles are occasionally seen, but they probably do not nest on the unit. Ospreys did nest on the area, but the nest site has been unused for a number of years. Nongame birds are most abundant during the fall and spring migrations.



Ruffed grouse, common upland game birds found on the unit, are often observed feeding on aspen buds during winter.

Table 5. Average number of ruffed grouse drums per stop for the Hubbel Pond WMA and vicinity, central Minnesota, and northcentral Minnesota, 1968-1979.

Year	Hubbel Pond WMA Routes		Central Minnesota ¹	Northcentral Minnesota
	Tamarac	Island Lake		
1968	2.0	2.7	1.0	2.6
1969	2.5	2.6	1.4	2.8
1970	2.3	3.4	1.6	3.1
1971	1.9	2.0	1.6	3.3
1972	2.8	3.1	0.9	3.4
1973	1.2	1.4	0.9	1.3
1974	0.4	0.5	0.7	1.1
1975	1.1	1.1	0.8	1.4
1976	0.9	1.0	0.9	1.5
1977	0.4	0.6	0.9	1.6
1978	0.9	1.2	1.4	2.4
1979	1.0	2.2	1.2	2.2

¹ Includes the Hubbel Pond WMA.

Source: Minnesota DNR, Section of Wildlife.

Mammals. Most of the species of mammals found in the vicinity at the time of settlement occur there today. However, some larger mammals such as the bison, elk, mountain lion, and gray wolf have been eliminated from the area. The historical distribution of small, inconspicuous species is unknown, and, even today, the occurrence of some species has not been verified by observations on or near the unit.

Mammal species present on the management area have been determined from published records, information from Bemidji State University, as well as Minnesota DNR, Section of Wildlife records and personnel (Table 6). Thirty-seven mammal species occur on or near the management area. An additional 17 species possibly occur, but no positive evidence is available. Mule deer have been seen occasionally in Becker County.

Seventeen of these 55 mammal species are protected under Minnesota Statutes, Sec. 100.27 (1978) and may be taken only during authorized hunting or trapping seasons. The remaining species are unprotected by Minnesota law. White-tailed deer and squirrels are commonly hunted on the management area. Beaver, red fox, muskrat, mink, and raccoons are commonly trapped on the unit.

The white-tailed deer is the most important and popular game mammal on the area. Spring pellet-group counts indicate densities in the Hubbel Pond WMA vicinity of approximately 7.4 and 11.0 deer per square mile for the winters of 1977-78 and 1978-79, respectively (Table 7).

Although generally inconspicuous, small mammals representative of forested and grassland communities occur on the management area. Several species of voles, mice, shrews, bats, and squirrels are common.

Fish. Other than Hanson Lake, water bodies on the management area are managed primarily for waterfowl and other wetland wildlife and not for fish production. Most wetlands on the unit are too shallow to support game fish over winter. That portion of the Otter Tail River flowing through the management area is generally unsuitable for game fish because of periodic

Table 6. Mammals occurring in the Hubbel Pond WMA vicinity¹.

Virginia opossum	*Beaver
Masked shrew	Deer mouse
Water shrew ²	White-footed mouse
Arctic shrew ²	Southern red-backed vole
Pygmy shrew ²	Meadow vole
Short-tailed shrew	Prairie vole ²
Star-nosed mole	*Muskrat
Little brown myotis	Southern bog lemming ²
Keen's myotis ²	Norway rat
Silver-haired bat	House mouse
Big brown bat	Meadow jumping mouse
Red bat ²	Woodland jumping mouse ²
Hoary bat ²	Porcupine
*Eastern cottontail	Coyote
*Snowshoe hare	*Red fox
*White-tailed jack rabbit ²	*Gray fox ²
Eastern chipmunk	*Raccoon
Least chipmunk ²	Ermine (short-tailed weasel)
Woodchuck	Least weasel ²
Thirteen-lined ground squirrel	Long-tailed weasel
Franklin's ground squirrel	*Mink
*Gray squirrel	*Badger
*Fox squirrel	*Striped skunk
Red Squirrel	*River otter ²
Northern flying squirrel	*Lynx ²
Plains pocket gopher	*Bobcat ²
Plains pocket mouse ²	*Mule deer ²
	*White-tailed deer

* Game species-may be taken only under DNR regulations.

¹Names and sequence of mammal species follow Jones et al. 1975.

²Possible occurrence.

³Rare or transient occurrence.

Table 7. Estimates of deer per square mile based on spring pellet-group surveys for the Mille Lacs I Deer Management Unit, 1973-1980¹.

	YEAR							
	1973	1974	1975	1976	1977	1978	1979	1980
Mean number of deer/square mile \pm 2 standard errors	16.2 \pm 2.7	14.8 \pm 4.1	10.6 \pm 2.5	10.4 \pm 2.7	13.3 \pm 3.7	7.4 \pm 2.3	11.0 \pm 2.8	12.4 \pm 3.3

¹ Includes portions of Becker, Mahanomen, Hubbard, Cass, Clearwater, and Beltrami Counties and the Hubbel Pond WMA.
Source: Minnesota DNR, Section of Wildlife.

low stream flows and dense submergent vegetation. Hanson Lake, located on the north end of the unit, is a state-designated trout lake. In 1962, the lake was poisoned to remove rough fish and 1,030 yearling rainbow trout were stocked. Since 1963, over 100,000 fingerling and yearling rainbow trout have been

stocked in Hanson Lake.

Eleven game fish and 33 nongame fish species are known to occur in the Otter Tail River or lakes in the management area vicinity (Table 8). Cotton and Height of Land Lakes are classified as walleye-bass-panfish lakes.

Table 8. Fish species occurring in the Otter Tail River and lakes surrounding the Hubbel Pond WMA.

Bowfin	Blackchin shiner	*Green sunfish
Mooneye	Bigmouth shiner	*Pumpkinseed
*Rainbow trout	Blacknose shiner	*Bluegill
Cisco	Pugnose shiner	*Rock bass
Bigmouth buffalo	Brassy minnow	*Black crappie
Quillback	Bluntnose minnow	*Walleye
River carpsucker	Stoneroller	*Yellow Perch
Golden redbreast	Brown bullhead	Logperch
Silver redbreast	Black bullhead	Johnny darter
Shorthead redbreast	Yellow bullhead	Iowa darter
Northern hog sucker	*Northern pike	Rainbow darter
White sucker	Banded killifish	Least darter
Emerald shiner	*White bass	Mottled sculpin
Rosy face shiner	*Largemouth bass	Brook stickleback
Common shiner	*Smallmouth bass	

*Game species — may be taken only under DNR regulations.

¹Names and sequence of fish species follow American Fisheries Society 1970.

OPERATIONS

The operation of the Hubbel Pond WMA depends on capital improvements, staff, equipment, and funding. These factors are provided through the DNR administration system which receives funds and guidelines from the Minnesota Legislature and various federal programs. Knowledge of the present operation is necessary to formulate a comprehensive plan that will utilize existing development and equipment and that can be developed and implemented under anticipated budgetary and administrative constraints.

ADMINISTRATION AND FISCAL

The Hubbel Pond WMA is one of 925 state wildlife

management areas and is administered through the Region I office in Bemidji. Region I consists of 21 counties and includes 323 wildlife areas. Ten area managers manage 319 of the wildlife areas, while four resident managers direct four additional units. The regional wildlife manager supervises management of all wildlife areas in Region I. The regional manager is under the direction of the Chief of the DNR's Section of Wildlife, who supervises the statewide wildlife management program.

Wildlife and fish administration and management in Minnesota is financed primarily through appropriations from the Game and Fish Fund. Receipts from

hunting, trapping, and fishing license sales, cash receipts from wildlife management areas, and federal-aid matching funds are deposited into the Game and Fish Fund. These monies are dedicated for state-wide fish and wildlife management and are appropriated to the Minnesota DNR by the Minnesota Legislature.

Federal matching funds are derived from the Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act) and the Federal Aid in Sport Fish Restoration Act (Dingell-Johnson Act). These acts impose excise taxes on sporting arms, ammunition, archery equipment, and fishing equipment. Funds from these taxes may be used to match state funds on a 3:1 ratio for federally approved wildlife and fish management.

Expenditures for salaries, taxes, equipment, and other operating expenses on the Hubbel Pond WMA, estimated from the regional wildlife manager's records, totaled \$39,149 in fiscal year (FY) 1979 (Table 9). For the same year, income from agricultural leases and fuelwood permits totaled \$534.

Equipment purchases, major equipment repairs, and most capital improvements are budgeted in the DNR, Bureau of Field Services. Equipment needs and major capital improvements, such as buildings, dikes, and control structures, are funded on a region-wide priority basis. Supplemental legislative appropriations such as Betterment of Wildlife Management Areas and the Waterfowl Habitat Improvement Program provided funding for some improvement projects.

Payments in lieu of taxes are made to counties for all state lands acquired for public hunting grounds and game refuges, except state Trust Fund lands. Payments are disbursed from the Game and Fish Fund at a rate of \$0.50 per acre or 35 percent of gross receipts, whichever is greater (Minnesota Statutes, Sec. 97.49, Subd. 3, 1978). A third alternative method of determining in lieu of tax payments will become effective July 1, 1981 (Minnesota Laws, Ch. 301, 1979). This method would tax qualifying lands at the rate of 3/4 of 1 percent of the appraised market value. Payments of \$0.50 per acre to Becker County for the Hubbel Pond WMA totaled \$668 in 1979.

Effective July 1, 1979, additional in lieu of tax payments are made to counties in which certain natural resource lands are located. Payments are disbursed from general funds at the rate of: (1) \$3 per acre for state natural resource lands which were previously privately owned and were acquired by purchase, condemnation, or gift; (2) 75 cents per acre for state tax-forfeited lands administered by the county, and (3) 37.5 cents per acre for other state lands administered by the DNR, including tax-forfeited, Trust Fund, and Consolidated Conservation Area lands (Minnesota Laws, Ch. 303, 1979). Any payments to counties during the preceding year from the DNR under Minnesota Statutes Secs. 84A.51, 89.036, and 97.49 are deducted from the amounts levied under this provision. Payments to Becker County for the Hubbel Pond WMA lands under this provision total about \$3,694.

In addition, Minnesota Statute, Sec. 272.011 (1978) requires the state to pay county real estate taxes on all state-owned residences occupied by state employees. These taxes are paid from the Minnesota DNR Field Services budget, 27 percent of which is derived from the Game and Fish Fund. In FY 1979, real estate taxes for the manager's residence on the Hubbel Pond WMA totaled \$440 (Table 9).

CAPITAL IMPROVEMENTS

Capital improvements are permanent developments necessary for the management and public use of the area. While improved habitat and food plots may be forms of capital improvements, only constructed facilities are considered below.

Seven buildings, constructed between 1957 and 1967, are located at the Hubbel Pond WMA headquarters (Table 10). All buildings are in fair to good condition and include a manager's residence and garage, an office/shop building, a utility building, a machine storage building, an oil shed, and a granary.

Excluding county and township roads, six miles of access roads have been constructed or rebuilt on the area (Figure 3), and are maintained by the Division of Fish and Wildlife. Two parking areas overlooking Hubbel Pond, a public access on Hanson Lake, and four miles of nature trails are also maintained.

Table 9. Expenditures and income on the Hubbel Pond WMA for fiscal years (FY) 1978 and 1979.

	FY 1978	FY 1979
Regional Expenditures		
Salaries and Benefits		
Permanent	\$18,720	\$21,421
Seasonal and hourly	12,626	11,365
Contract Services and Retail Purchases	4,425	5,255
Equipment Purchases	0	0
Land Bureau and Administrative Service Expenditures		
Payments in Lieu of Taxes	688	688
Real Estate Taxes	383	440
Total Expenditures	\$36,842	\$39,169
Income		
Agricultural Leases	\$ 460	\$ 484
Firewood Permits	50	50
Maple Tap Permit	10	10
Total Income	\$ 520	\$ 544

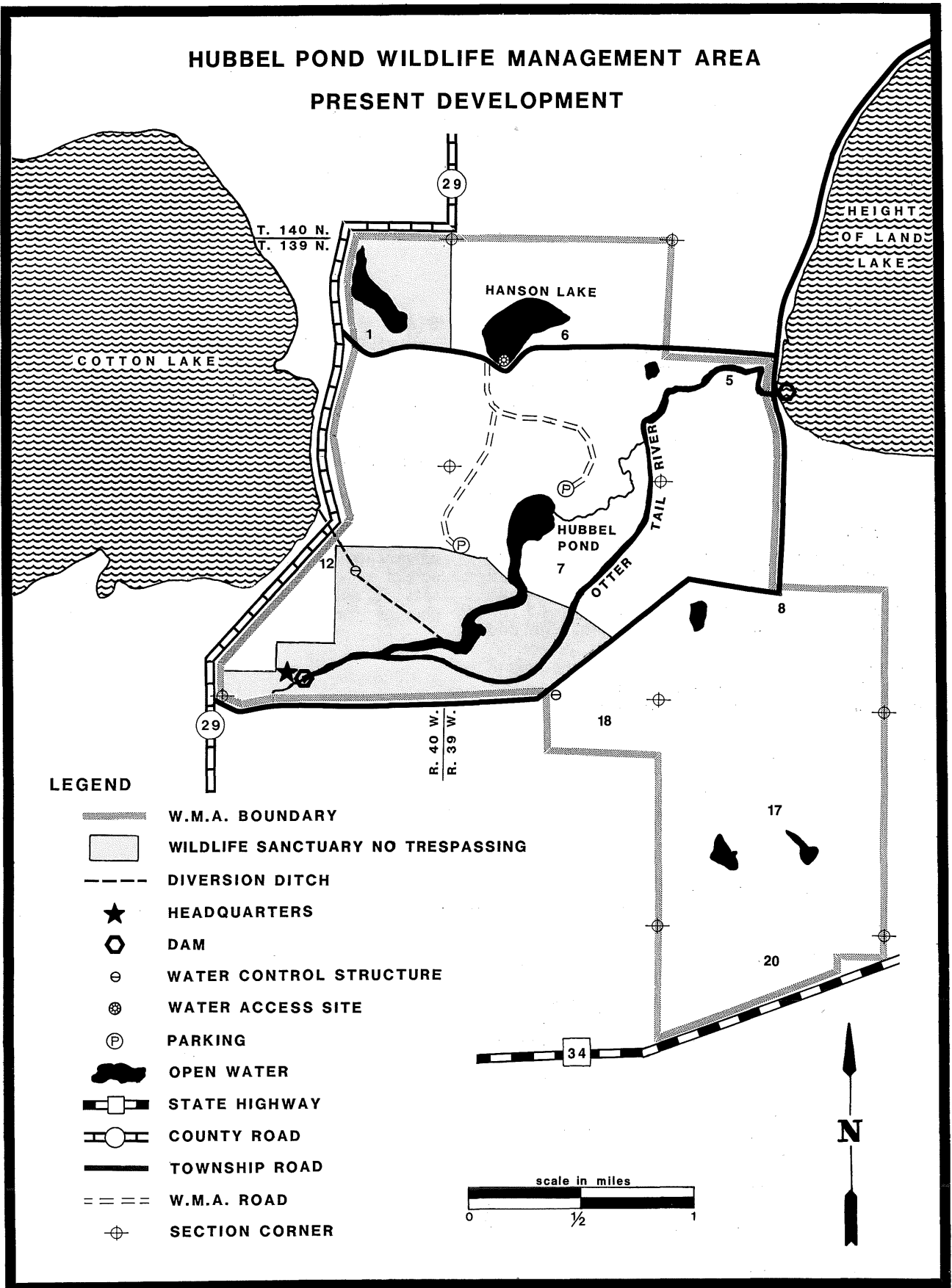


Figure 3

Table 10. Buildings maintained on the Hubbel Pond WMA headquarters.

Building	Dimensions (feet)	Construction Date	Condition
Residence, 2-story	24 x 28	1900	Fair
Garage	18 x 40	Moved to area	Fair
Office/shop	28 x 64	1963	Good
Utility building	20 x 60	1960	Good
Machine stall	20 x 48	1967	Good
Oil shed	12 x 12	1965	Good
Granary	14 x 16	1957	Fair

Two earthen dams regulate water levels on Hubbel Pond. The main dam, on the Otter Tail River at the WMA headquarters, has a drop inlet water control structure of steel-reinforced concrete. Water flow on the other dam, located on the diversion ditch into Cotton Lake, is regulated by a slide gate control over a steel culvert. Six dikes, one of which has a water control structure, were built as part of access roads and trails.

EQUIPMENT

Sixteen items of major equipment are maintained on the area (Table 11). Heavy equipment is also utilized on other Region I wildlife projects when needed. Agricultural equipment is used for planting food and cover plots and for vegetation management. Light and heavy duty trucks are used to transport personnel, equipment, and material. Heavy machinery is used to construct and maintain roads, parking lots, and water control structures and to clear vegetation.

STAFF

The Hubbel Pond WMA employs a full-time resident manager, a 9-month seasonal laborer (April through December), and a 3-month hourly laborer (generally May through August). Temporary hourly laborers may be employed as needed if funds are available. Additional personnel were employed in the past through various federal and state programs for youth and the unemployed.

The staff's time is divided between management of the Hubbel Pond unit and other wildlife management projects in the vicinity. The resident manager coordinates and supervises work conducted by WMA personnel on other wildlife areas. During 1978, the seasonal and hourly laborers spent approximately 40 percent of their time working on other wildlife units.

Table 11. Equipment based on the Hubbel Pond WMA.

Equipment	Make/Model	Model Year	Condition
Truck, pickup	Dodge/½ ton	1970	Good
Truck, pickup	Dodge/½ ton	1975	Good
Truck, dump	International/2½ ton	1975	Good
Truck, 6x6 stake ¹	Reo/3 ton, U.S. Army	1955	Good
Crawler tractor	Case/1000	1962	Good
Crawler loader	International/706	1964	Good
Tractor, farm	International/340 Farm-All	1960	Good
Mower, tractor	International/110	1961	Good
Disc, harrow	Taylorway/brush harrow	1965	Good
Disc, harrow	Unknown	1965	Poor
Corn planter	International/2 row	1968	Good
Field cultivator	International/10 ft.	1968	Good
Row crop cultivator	International/corn cultivator	1968	Good
Grain drill	International/10 ft.	1968	Good
Sprayer, boom	Pesticide sprayer	1954	Poor

¹ Transferred from the U.S. Fish and Wildlife Service.

LAND OWNERSHIP

Land ownership and land acquisition policies bear strongly on natural resource management. Management goals and acquisition status are affected by the project's acquisition history, present land ownership patterns, and the sources and amounts of acquisition funds.

ACQUISITION OF WILDLIFE LANDS

The Commissioner of Natural Resources is authorized to acquire lands for wildlife management purposes (Minnesota Statutes, Secs. 97.48 and 97.481, 1978). However, before acquisition begins, the Section of Wildlife prepares project proposals which delineate areas desirable for wildlife land acquisition. The Director of the Division of Fish and Wildlife has the authority to approve project proposals for the Commissioner of Natural Resources. After a project is approved, the Section of Wildlife may attempt to acquire lands within the project boundary from willing sellers. The board of commissioners of the county involved must give approval before any purchase is completed.

Methods of acquiring public land within a project proposal vary. Consolidated Conservation Area lands may be classified for wildlife management and dedicated to the WMA by DNR Commissioner's Order. As required by law, Trust Fund lands may be purchased only through a condemnation procedure. County administered, tax-forfeited lands may be acquired from the county through a county board resolution defining the terms of sale.

Acquisition of wildlife lands has been financed primarily through appropriations from the Game and Fish Fund and with federal matching funds derived from the Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act). Pittman-Robertson funds are used to match state funds on a 3:1 ratio for federally approved acquisition projects. In recent years, special appropriations for wildlife land acquisition have also been made from general revenue funds by the Minnesota Legislature.

Federal law requires federal aid project lands to be managed for approved project purposes only. Other uses of these lands could be considered a diversion of funds (Code of Federal Regulations, Title 50, Chap. 1,

Sec. 80.5) which could cause the federal government to suspend all federal aid to fish and wildlife in the state, about \$2,400,000 per year. A diversion of funds created by non-approved activities can be rectified by: a) replacing the affected property with a property of equal current market value with commensurate values to fish and wildlife; or b) ceasing the uses which interfere with the accomplishment of approved project goals. Generally the approved project activities for the Hubbel Pond WMA are the operation of a game refuge and public hunting grounds and the improvement of wildlife habitats.

ACQUISITION OF THE PRESENT WMA

The approved project boundary for the Hubbel Pond WMA encompasses 3,450 acres. To date, 2,283.5 acres have been acquired. Land acquisition on the unit began in 1954 with the initial purchase of 848 acres of tax-forfeited lands, 100 acres of Trust Fund lands, and 128 acres of private lands. Since 1954, an additional 1,297.5 acres of private lands have been acquired (Table 12).

Expenditures for land purchases total \$68,757 to date. Ninety-eight percent of the unit was purchased through Federal Aid in Wildlife Restoration projects (Table 13). State matching funds for federal aid projects were taken mainly from the Game and Fish Fund. The Minnesota Resources Council (now Legislative Commission on Minnesota Resources) provided matching funds for the purchase of about 5 percent of the unit. A small part of the unit was purchased directly with Game and Fish Funds by the DNR, Section of Game (now Section of Wildlife).

UNACQUIRED LAND IN THE WMA PROJECT

Areas totaling 1,116 acres remain unacquired within the approved Hubbel Pond WMA project boundary (Table 14, Figure 4). All of these lands are privately owned.

One addition to the present WMA project, totaling 80 acres, is proposed. Proposed deletions from the approved project include 51 acres of private land (Figure 4). The proposed net addition to the WMA project totals 29 acres.

Table 12. Previous land ownership in the Hubbel Pond WMA.

Previous Ownership	Acres
Private	1,335.5
Tax-forfeit	848.16
Trust Fund	100.00
Total	2,283.66

Table 13. Acquisition methods, sources and amounts of funds, and acreage purchased in the Hubbel Pond WMA.

Acquisition Method	Sources and Amounts of Funds			Acres
	Federal Aid in Wildlife Restoration	Minnesota Game and Fish Fund	Minnesota Resources Commission	
Federal Aid Projects	\$44,517.75 5,437.50	\$14,839.25	\$1,812.50	2,121.76 108.4
Section of Wildlife Purchase		\$ 2,150.00		53.5
TOTALS	\$49,955.25	\$16,948.25	\$1,812.50	2,283.66

Table 14. Acreage and acquisition priority of land to be acquired in the Hubbel Pond WMA.

Owner	Section	Township (north)	Range (west)	Description	Acreage	Priority ¹
O. J. Bunn	1	139	40	SE $\frac{1}{4}$ SE $\frac{1}{4}$	40	C
O. J. Bunn	1	139	40	SW $\frac{1}{4}$ SE $\frac{1}{4}$	40	D
I. Puttbrese	12	139	40	Lot 2 less platted tracts, N. 19.55 acres of Lot 3	41.51	E
C. Nedberge	12	139	40	Tracts of Lot 2	5.77	Proposed Deletion
D. Stearns	12	139	40	Tract in Lot 2	.23	Proposed Deletion
R. Puttbrese	12	139	40	Tract in Lot 2	.27	Proposed Deletion
M. Green	12	139	40	Tract in Lot 2	1.14	Proposed Deletion
E. Stearns	12	139	40	E $\frac{1}{4}$ of Lot 4	20	E
E. Stearns	12	139	40	W $\frac{1}{2}$ of Lot 4 less platted tracts, Lot 5 SE of Co. Hwy. 29 less W 400' and 2.01 acres	32.77	Proposed Deletion
R. Williams	12	139	40	Tract in the SE corner of Lot 5 S of Co. Hwy. 29	7	Proposed Deletion
S. Eastman	12	139	40	Tract in the SE corner of Lot 5 S of Co. Hwy. 29	2.01	Proposed Deletion
F. DeCock	12	139	40	N $\frac{1}{2}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ less 4.71 acres	15.29	E
A. Kragh	12	139	40	Tract in the N $\frac{1}{2}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$	1.96	Proposed Deletion
F. Perrine	5	139	39	Lot 5, SW $\frac{1}{4}$ SW $\frac{1}{4}$ less 5.5 acres	72.5	D
I. Perrine	5	139	39	Lot 4 less 10.55 acres	19.45	C
M. D. Arouni	6	139	39	Lot 4 less N 13.53 acres, Lot 5	49.47	C ²
A. Elijah	8	139	39	Part of the NE $\frac{1}{4}$ SW $\frac{1}{4}$	14.56	D
D. Carr	8	139	39	Part of the NE $\frac{1}{4}$ SW $\frac{1}{4}$	8	D
L. Knutson	8	139	39	Part of NE $\frac{1}{4}$ SW $\frac{1}{4}$	2.44	D
A. Dow	8	139	39	E $\frac{1}{2}$ SE $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$	120	D
H. J. Wendt	17	139	39	NE $\frac{1}{4}$ NE $\frac{1}{4}$	40	D
H. Sperling	17	139	39	SE $\frac{1}{4}$ SE $\frac{1}{4}$, Lots 2,3,4,5, SE $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$ SW $\frac{1}{4}$	362.65	D ²
I. Sperling	17	139	39	Lot 1, SW $\frac{1}{4}$ NW $\frac{1}{4}$	73.65	D ²
I. Sperling	20	139	39	N $\frac{1}{2}$ NW $\frac{1}{4}$ N of State Hwy 30	75	D ²
A. D. Kohler	20	139	39	W $\frac{1}{2}$ NE $\frac{1}{4}$ and E $\frac{1}{2}$ NW $\frac{1}{4}$ N of State Hwy. 30	105	E
H. MacKenthun	20	139	39	N $\frac{1}{2}$ NE $\frac{1}{2}$ NE $\frac{1}{4}$ less 4.46 acres	15.54	E
E. Schultz	18	139	39	S $\frac{1}{2}$ SE $\frac{1}{4}$	80	Proposed ² Addition

¹ C=critical, D=desirable, E=eventual.

² County board has approved for acquisition.

HUBBEL POND WILDLIFE MANAGEMENT AREA LAND OWNERSHIP AND ACQUISITION PRIORITIES

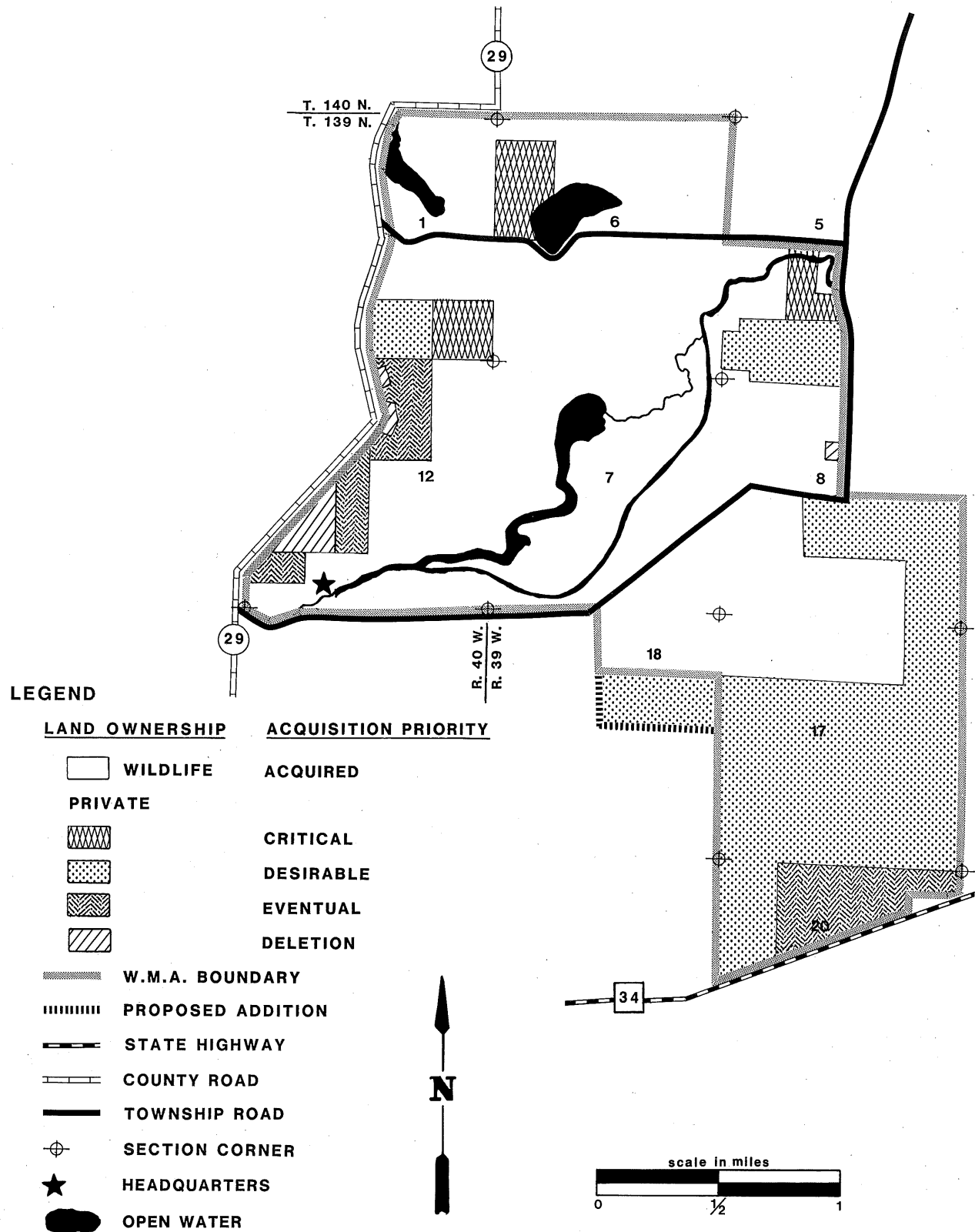


Figure 4

PUBLIC USE

Wildlife management areas in Minnesota are available for a variety of public uses. Outdoor recreation accounts for most of the public use on the Hubbel Pond WMA, but the area is also utilized for non-recreational activities such as cooperative farming and environmental education. Knowledge of present use levels is necessary to predict the future demand for outdoor recreation and to develop management programs.

Use estimates were obtained from car counts, hunter bag-checks, and periodic interviews and informal observations by the resident manager. A public use survey was also conducted on the management area from June to December, 1978 as part of the wildlife planning process. During 29 survey routes, a total of 37 questionnaires were distributed to area users; 10 (27 percent) were returned. Public use of the management area was light, as indicated by the limited number of users encountered during sampling. Because of the small sample size and low response rate, the data could not be accurately expanded to estimate seasonal use levels. The survey did, however, provide information on the types of recreational uses and the attitudes and demographic characteristics of area users. The units of public use reported in this section are use-days. A use-day is one person using the area for one activity on one day.

HUNTING

Hunting is the dominant outdoor recreation on the Hubbel Pond WMA. Actual numbers of hunters using the area are difficult to determine. Hunters are not required to register at the headquarters, and the area can be entered at many points along the boundary. The resident manager estimated hunter use-levels for the 1979 season from car counts and bag-checks (Table 15). An estimated 1,000 hunter use-days occurred on the management area during 1979. Ruffed grouse hunting was most common with an estimated 450 use-days.

The resident manager estimated hunting pressure on deer, ruffed grouse, waterfowl, squirrel, and rabbit for different periods throughout their respective 1979 seasons (Table 15). Approximately 35 percent of the deer hunting on the management area occurred on opening weekend. Hunting pressure for ruffed grouse, waterfowl, squirrels, and rabbits was moderate on opening weekend. Hunting pressure on all game species for the remainder of the season was fairly uniform, but somewhat higher on weekends.

Hunting pressure was not uniformly distributed over the management area because of habitat distribution, hunter preferences and habits, and accessibility. The unit was divided into four compartments to examine

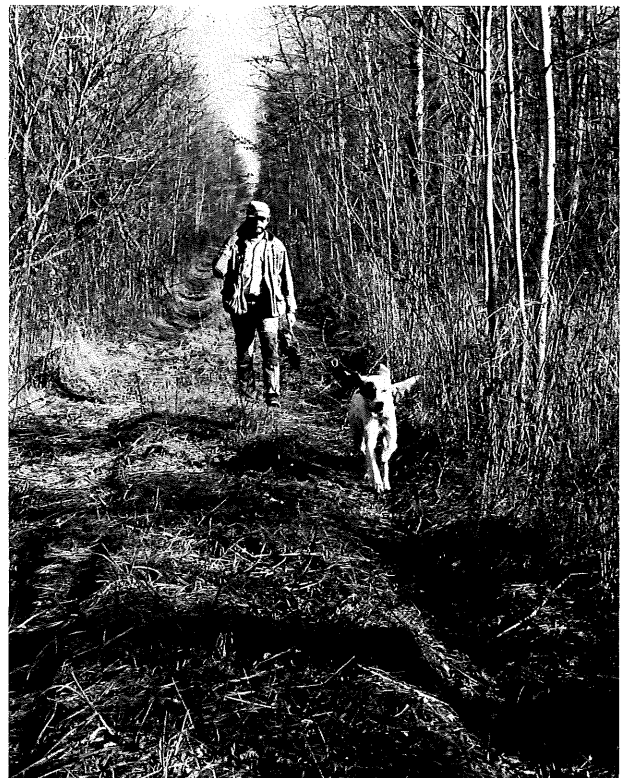
hunter distribution (Figure 5). Most hunting occurred in Compartment 1, which includes the Hubbel Pond impoundment. The remainder of the unit received lower but fairly uniform hunting pressure (Table 15).

TRAPPING

All trappers must obtain a permit from the resident manager, and each permit holder is assigned to a specific area on the unit. Trappers are required to report the number and species of animals harvested to the resident manager at the end of the season.

The number of permits issued depends on annual fluctuations in furbearer numbers observed by the resident manager. If more trappers apply than the number of available permits, applicants are randomly selected to determine permittees. In both 1978 and 1979, there were four applicants for four permits.

Muskrat, mink, and raccoon make up most of the harvest (Table 16). Red fox and raccoon are important because of their high pelt value.



Ruffed grouse hunting is the most popular public use of the Hubbel Pond WMA.

Table 15. Estimated temporal and spatial distribution of hunters on the Hubbel Pond WMA in 1979.

	Firearms Deer ¹	Ruffed Grouse	Waterfowl	Squirrel and Rabbit
Temporal Distribution				
Hunter-use days	273	450	222	54
Opening Day	Sat. Nov. 3	Sat. Sept. 15	Sat. 29	Sat. Sept. 15
% Use	20	9	11	11
Opening Weekend	Nov. 3 & 4	Sept. 15 & 16	Sept. 29 & 30	Sept. 15 & 16
% Use	35	15	19	22
First Week	7 Days	7 Days	7 Days	7 Days
% Use	45	6	13	5
Remaining Weekdays	0 Days	71 Days	30 Days	71 Days
% Use	—	23	23	17
Remaining Weekends	2 Days	30 Days	13 Days	30 Days
% Use	20	56	45	56
Spatial Distribution				
% use in Compartment 1 (.96 square miles)	40	40	60	40
% Use in Compartment 2 (.656 square miles)	15	15	30	10
% Use in Compartment 3 (.69 square miles)	25	25	7	25
% Use in Compartment 4 (.398 square miles)	20	20	3	25

¹ Legal bucks November 3 - 11 and antlerless deer by permit on November 10-11.

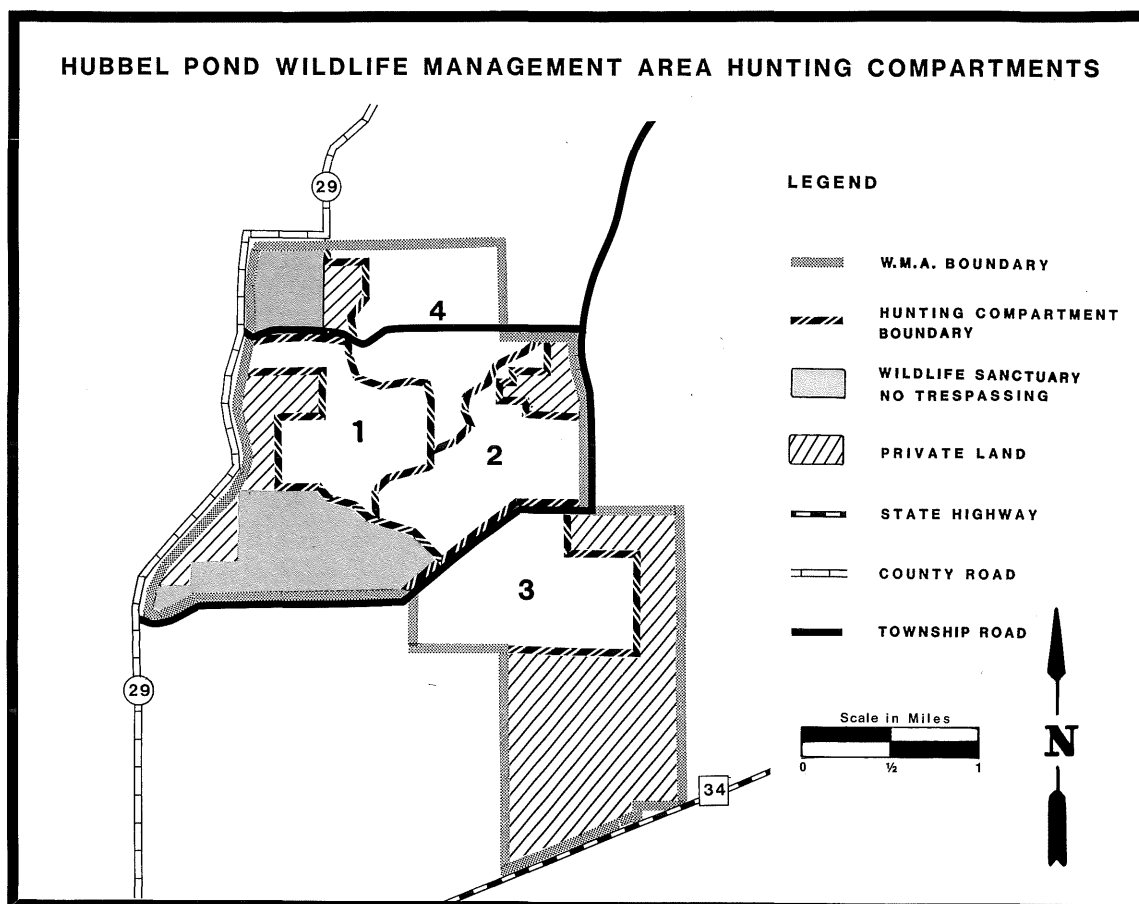


Figure 5

Table 16. Fur harvest reported on the Hubbel Pond WMA, 1974- 1979.

Year	Number of Permits	Red Fox	Coyote	Raccoon	Mink	Muskrat	Weasel	Skunk	Beaver	Otter
1974	5	0	0	4	11	176	1	1	0	0
1975	5	1	0	11	12	458	5	0	19	2
1976	10	4	1	11	9	114	1	5	0	0
1977	4	2	0	0	4	3	0	0	0	0
1978 ¹	4	2	0	4	7	0	0	0	0	0
1979 ²	4	1	0	7	2	22	0	0	0	0
Average		1.7	0.2	6.2	7.5	128.8	1.2	1.0	3.2	0.3

¹ Only 1 of 4 trappers reporting

² Only 3 of 4 trappers reporting

FISHING.

Most wetlands on the unit do not support substantial game fish populations. However, rainbow trout fishing occurs on Hanson Lake, and local residents occasionally fish on the Otter Tail River. No estimates of fishing use are available.

AGRICULTURAL LEASES.

Agricultural land is leased to cooperating farmers on an annual cash-rent basis. In 1978 and 1979, 80 and 100 acres were leased for tame and wild hay and grazing (Table 17). Income from leases was \$460 in 1978 and \$483 in 1979.

OTHER ACTIVITIES.

The Hubbel Pond WMA is used for a variety of other activities. Because of manpower and funding constraints and because many of these activities occur at such low levels, use estimates are not available.

Camping is allowed on the management area only by permit from the resident manager. No facilities or improved sites are provided for camping. Snowmobiles may be driven on the township road crossing the management area, but are prohibited elsewhere on the unit. All-terrain vehicles and horseback riding are prohibited.

Other outdoor recreational activities include nature observation, hiking, canoeing, and environmental education. Nature observation consists mostly of casual driving or hiking around the management area. During spring and early summer, people often canoe through the area on the Otter Tail River. Floating in inner tubes (tubing) on the Otter Tail River has become popular and during summer numerous people start off below the Hubbel Pond dam. The resident manager

also conducts tours for school and civic groups. A one-mile environmental trail has been developed at the headquarters area. The unit's resources, management, and development are explained to the groups.

Permits to harvest timber for firewood are issued by the resident manager. In most years, 5 to 10 permits are sold. In 1977, the resident manager also issued a permit to tap sugar maples for syrup-making.

VISITOR CHARACTERISTICS.

Visitor characteristics and activities were described from only 10 questionnaires returned during the 1978 public use survey. This small sample may not present an accurate picture of visitors to the unit, but these results are useful for comparison with the resident manager's observations and for any new information obtained.

Visitors to the unit averaged 29 years of age. Eighty-three percent were younger than 40 years. Eighty-seven percent were males. Of the 10 reporting parties, seven, with 18 total members, hunted; three parties, totaling 12 people, did not hunt. Reported use-days for each activity give some indication of their relative importance on the WMA. Use-days were calculated by adding the number of party members reporting each activity. Activities reported and calculated use-days were as follows: duck hunting-8, deer hunting-7, observing nature-7, photography-5, bird watching-5, river-floating (tubing)-5, canoeing-4, hiking-4, ruffed grouse hunting-3, berry picking-3.

Over half of the respondents, 62 percent, were local residents and traveled less than 50 miles to the management area (Table 18). About 29 percent were from the Twin Cities area. About 88 percent of the respondents had visited the unit at least once previously within the last year, averaging four trips.

Table 17. Cropland farmed cooperatively on the Hubbel Pond WMA in 1978 and 1979.

Crop	1978			1979		
	Number of Leases	Acres	Income	Number of Leases	Acres	Income
Tame Hay	4	60	\$350	3	60	\$360
Wild Hay	1	20	110	1	20	100
Grazing	0	0	0	1	20	24

Table 18. Traveling distance by visitors to the Hubbel Pond WMA.

Distance (miles)	Percent
0- 50	62.5
51-100	8.3
101-200 ¹	0
201-300	0
>300	0
Twin City Area ²	29.2
Out of State	0

¹ Does not include the Twin Cities area.

² Includes Ramsey, Hennepin, Washington, Dakota, Scott, Carver, and Anoka Counties.

Most visitors came in groups of two to five; average party size was three. Ninety percent of the visitors stayed less than 12 hours. Visitors spent an average of \$14 per individual per visit in the management area vicinity.

Fifty-five percent of the respondents rated their visit to the management area as good to very good. About 20 percent of the visits were rated as very poor. Responses during the hunting season, however, may more closely reflect hunting success than the overall quality of the visit. Respondents considered area appearance (scenic beauty, habitat diversity) and hunting opportunities as the most important features of the area. Thirty percent of the people felt that the area did not need further improvements. Other respondents, however, wanted to see increased habitat improvement (logging, burning, farming), more maintenance and development of access roads and trails, and better canoe access for the Otter Tail River.

LOCAL PERSPECTIVE

Fish and wildlife management is influenced by factors in the management area vicinity. Land use and ownership, demographic characteristics, and economic conditions must be examined before formulating a comprehensive plan. Development or the potential for development adjacent to the management area may affect future management decisions. Also, the availability of public lands for outdoor recreation in the vicinity will influence the demand for recreation on the Hubbel Pond WMA.

GENERAL

Becker County covers 1,197 square miles in west-central Minnesota. Its population is approximately 28,900 (22.3 persons per square mile). A population increase of 6.6 percent is projected by 1990 (Minnesota State Planning Agency 1979). Detroit Lakes (population 6,555) and Park Rapids (population 2,772), the largest cities in the area, are 10 and 32 highway miles from the Hubbel Pond WMA. Moorhead (population 29,689) is about 55 highway miles west of the unit, and the Twin Cities lie 200 miles to the southeast.

Forestry and agriculture are the principal land uses in Becker County (Table 19). Forests occupy more than 40 percent of the land, generally in the central and

northwestern portions of the county. About 30 percent of the land is cultivated, mostly in the western one-third of the county. In 1973, about 22 percent of the county's population resided on farms. Although the number of farms has decreased about 18 percent in Becker County since 1961, total acres of land in production has remained relatively stable (Minnesota Department of Agriculture 1962, 1978). Livestock and livestock products provided about 70 percent of the farm income in 1976. Livestock include dairy and beef cattle, hogs, sheep, and poultry. Wheat is the principal crop followed by hay, oats, barley, corn, and sunflowers (Minnesota Department of Agriculture 1978).

Retail and wholesale trade and services employed nearly half of the workers and generated over 70 percent of the gross sales in Becker County in 1972 (West Central Regional Development Commission 1976). Although agriculture employed only about 19 percent of the work force, much of the income derived from trade, manufacturing, and services was directly related to the agricultural sector of the economy.

Outdoor recreation is an important source of income for Becker County. Tourist-travel expenditures accounted for about 9.2 percent of the county's gross sales in 1974. Becker County ranks 12th out of Minnesota's 87 counties in the proportion of tourist-travel

Table 19. General land use in Becker County.

Land Use	Acres	Percent
Forested	375,520	40.7
Cultivated	267,760	29.0
Pasture and open	154,720	16.7
Marsh	26,440	2.9
Water	78,960	8.5
Residential	20,000	2.2

Source: Minnesota State Planning Agency 1975.

related sales (Minnesota Department of Economic Development 1975).

A variety of public and privately-owned outdoor public use facilities are available in Becker County (Table 20, Figure 6). In addition to the Hubbel Pond WMA, there are 4,626 acres in 19 other wildlife management areas, two state forests and part of a third, a portion of Itasca State Park, and 42,725 acres in the Tamarac National Wildlife Refuge. There are also 48 federal Waterfowl Production Areas with 9,460 acres owned and open to public hunting. Other recreational facilities include 31 camping areas with 771 campsites, 28 picnic areas, and nearly 300 miles of recreational trails.

Becker County contains ample water resources, providing opportunities for most types of water-based recreation. More than 200 lakes greater than 40 acres in size are located in the county. Water-based facilities include 76 public accesses, 70 swimming beaches, and 72 marinas. Portions of eight DNR-designated

trout streams flow through the county.

Recreational facilities outside Becker County may influence the demand for recreation on the Hubbel Pond WMA. Little Elbow Lake State Park in Mahanomen County, Buffalo River State Park in Clay County, Maplewood State Park in Otter Tail County, and Huntersville State Forest in Wadena County are all within 50 miles of the unit.

DEVELOPMENT

Private land within the western project boundary along Becker County Road 29 has been developed with homes. Although not lakeshore property, these home sites afford a view of Cotton Lake and, as a result, are becoming increasingly popular. Several owners have subdivided land into lots for home sites. Presently, 10 homes are located adjacent to County Road 29 within the management area project boundary.

Table 20. Selected public use facilities in Becker County.

Facility	Name	Size (acres) or Number
State Park (acres)	Itasca ¹	4,740
Wildlife Management Areas (acres)	Hubbel Pond	3,450
	Atlanta	139
	Audubon	29
	Callaway	322
	Coburn	320
	Cuba	88
	Frank	351
	Linbom	280
	Lunde	51
	Melbye	61
	Ogema Springs	515
	Olson	120
	Pednor	243
	Pickerel	960
	Richwood	40
	Riparia	40
	Spring Creek	964
	Teiken-Dalve	62
	White Earth	41
State Forests (acres)	Smokey Hills	14,429
	White Earth ²	7,102
	Two Inlets	13,850
National Wildlife Refuge (acres)	Tamarac	42,725
Federal Waterfowl Production Areas (acres)	48 Areas	9,460
Water Facilities (number)	Swimming beaches	70
	Marinas	72
	Marina capacity (boats)	870
	Public water accesses	76
Trails (miles)	Snowmobile	292
	Hiking	2
	Cross-country skiing	2
Camping Areas (number)	Areas	31
	Campsites	771
Picnic Areas (number)	Areas	28
	Tables	233

¹ Only extreme southern portion of park is in Becker County.

² Only southern portion of state forest in Becker County.

Source: Minnesota Department of Natural Resources 1974, 1978, Detroit Lakes Chamber of Commerce.

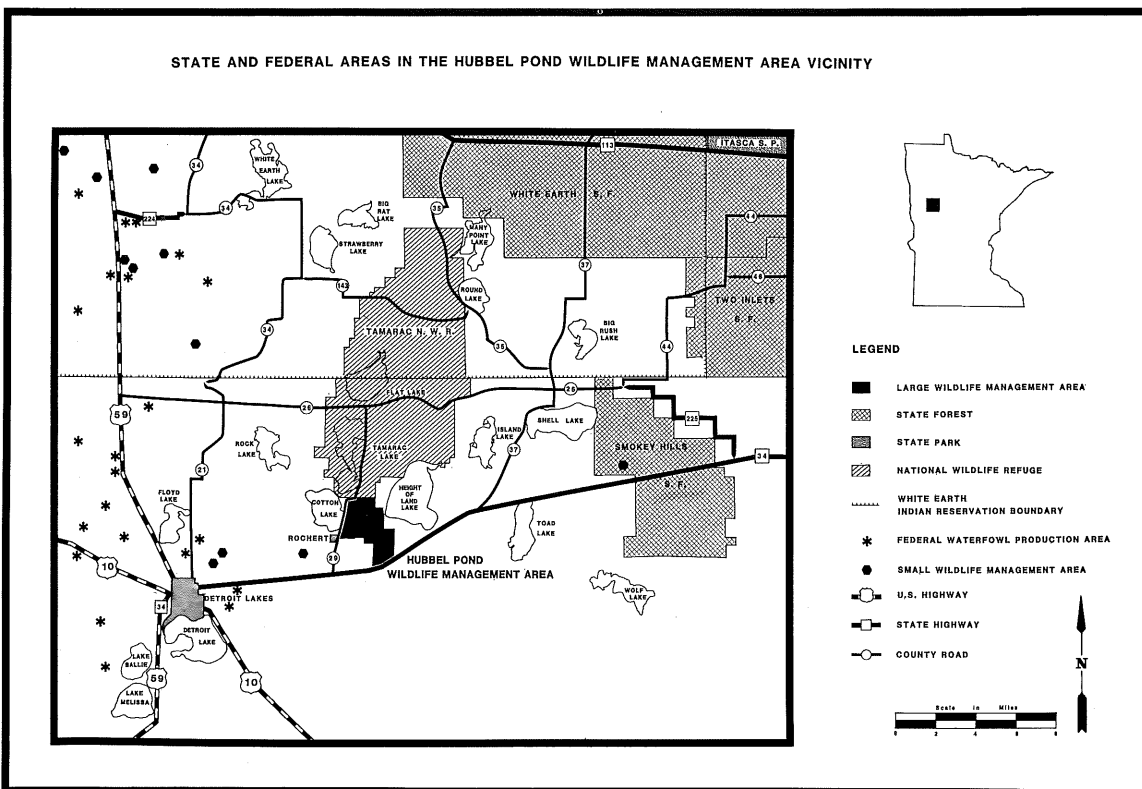


Figure 6

The potential for development also exists within the management area adjacent to Height of Land Lake. One house is currently located within the boundary overlooking the lake. Private property could be subdivided creating lots for more houses.

PINEWOOD CHAPEL CEMETERY

The Pinewood Chapel is located on the township road forming the eastern boundary of the unit. Associated with this church is a 10-acre cemetery located across the road within the project boundary.

SNOWMOBILING

Snowmobiling is a major winter activity in the area. Several hundred miles of snowmobile trails connect the lakes and resorts in the immediate vicinity of the management area.

Snowmobiles are used on the township road crossing the Hubbel Pond WMA. The road is neither groomed for snowmobiles nor plowed during the winter. However, this road connects Height of Land Lake with Cotton Lake and two major snowmobile routes and is used extensively for snowmobiling. Except for a trail along County Road 143, snowmobiling is prohibited on the Tamarac National Wildlife Refuge.

TAMARAC NATIONAL WILDLIFE REFUGE

This 42,725 acre refuge borders the Hubbel Pond WMA to the north. It was established in 1938 for the protection and production of waterfowl and other wildlife. The refuge has 21 lakes within its boundaries, seven adjoining lakes, about 3,000 potholes, and 2,600 acres of marshes and open water. The refuge has ex-

tensive wild rice beds and other aquatic food plants which attract large numbers of ducks each fall.

Public facilities include six picnic areas, 10 gravel boat ramps, 75 miles of groomed cross-country ski trails, six miles of hiking trails, 26 miles of paved and graveled roads, and 60 miles of refuge vehicle trails. No camping or off-road vehicles are allowed. Most of the refuge is open for firearms-deer hunting when deer populations permit. In addition, the southern one-third of the refuge is open to waterfowl and selected small game hunting. The northern one-third of the unit is open only for ruffed grouse and deer hunting. Waterfowl hunting on the refuge is often excellent, attracting many hunters.

WHITE EARTH INDIAN RESERVATION

The White Earth Indian Reservation is located six miles north of the Hubbel Pond WMA. The reservation was established by the treaty of March 19, 1867 with the Chippewa Indians of the Mississippi (Dana et al. 1960). In 1889, four townships in the northeast corner of the reservation were ceded to the federal government. Federal legislation during the early 1900's opened the way for the acquisition of Indian allotments on the reservation by non-Indians. Settlers and lumbering companies purchased large portions of the reservation from the Indians. By 1906, 80 percent of the entire reservation had passed into private hands (Dana et al. 1960). During the 1930's, approximately 28,000 acres within the reservation were purchased by the Federal Resettlement Administration as part of a program to relocate white settlers on more productive lands. Indian lands in the present diminished reservation include about 56,000 acres in Becker, Mahanomen, and Clearwater Counties.

RECREATION DEMAND AND CAPACITY

Anticipating the demand for hunting, trapping, fishing, and other compatible outdoor recreational uses is essential for the development of an effective management plan. By relating future demand to the recreational capacity of the area, programs can be designed to both utilize and protect the area's resources.

DEMAND

Predicting the wildlife and fish-oriented use of the Hubbel Pond WMA is difficult. Future hunting, trapping, and fishing demand can be estimated by examining state-wide population trends, license sales, game abundance and harvest, and availability of private and public lands for these activities. Demand for other types of compatible recreation can be projected from participation surveys if the survey limitations are recognized (Minnesota DNR 1974). This type of demand analysis must be general due to information limitation.

The Minnesota DNR presently administers over 900 wildlife management areas, totaling nearly one million acres. Intensive agricultural practices, forest community succession, and increased posting of private lands has reduced the quality and quantity of land available for wildlife production and public hunting. The increasing proportion of urban hunters often have difficulty obtaining access to private land (Klessig 1970). Wildlife habitat improvement projects are also concentrated on wildlife management areas and other public lands. For these reasons, wildlife management areas are increasingly important to wildlife and sportsmen. As Minnesota's population increases, so will the number of hunters who rely on wildlife management areas. Minnesota sportsmen and wildlife enthusiasts are mobile, so increased recreational pressure will be felt in relatively remote areas even though most of the demand will occur near population centers.

Deer hunting license sales have increased since 1940 at a rate greater than the overall population growth. Sales are expected to fluctuate near current levels of 250,000 to 350,000 with an upward trend through the next 10 years. Archery-deer license sales have followed a similar trend. However, the rate of increase from the low of 12,500 in 1970 to 1978 sales of 32,300 was over twice as great as the firearms license sales increase.

Small game license sales declined from a 1958 high of 379,667 to 221,154 in 1969, probably largely due to the pheasant decline in southern Minnesota. Small game license sales have stabilized at about 280,000 to

300,000 since 1970 and are expected to remain near this level in the near future.

Over one-half of total small game license holders are waterfowl hunters. Federal migratory waterfowl stamp sales, which closely parallel waterfowl hunter numbers, vary with bag limits, season limits, and the price of the stamp. Sales have fluctuated between 122,000 and 180,000 since 1969. The number of waterfowl hunters should remain a relatively constant proportion of the state's population if waterfowl populations and hunting regulations do not change significantly (Minnesota DNR 1974). Future restrictive regulations, increases in price of the federal and state migratory bird stamps, and decrease in waterfowl populations may depress the number of waterfowl hunters in Minnesota. Liberalization of regulations would probably increase waterfowl hunters.

The demand for trapping opportunities will probably be related to the availability of places to trap, fur prices and furbearer populations. Since 1940 the number of trapping licenses sold in Minnesota has varied widely from a high of 53,899 in 1946 to a low of 5,903 in 1971. License sales stabilized at about 11,000 to 14,000 between 1973 and 1978. Due to increasing fur prices and furbearer populations, license sales increased to 18,121 in 1979 and over 30,000 in 1980. Trapper numbers are expected to remain near this level or decrease slightly in the near future.

The proportion of Minnesota residents that fish will probably remain at the present level or increase very slowly. Fishing opportunities on the management area are limited to Hanson Lake. Fishing demand on the unit should about equal overall state increases.

Admittedly, the preceding discussions are only qualitative. These projections suggest that total hunting demand in Minnesota will not increase dramatically in the near future, but intensified use of private lands will increase the importance of management areas to Minnesota's wildlife and sportsmen. The same trend is developing for other wildlife-related recreation. The Hubbel Pond WMA will probably experience an increased demand for deer, waterfowl, and small game hunting, and other wildlife-related recreation equal to the state average. However, if fuel shortages develop or if transportation costs rise too high, a decrease in use will probably occur since the unit is far from the state's population centers.

CAPACITY

In order to insure quality public recreational use while protecting a wildlife management area's resources, the capacity of the area for hunting, trap-

ping, fishing, and other compatible uses must be examined. The capacity of the Hubbel Pond WMA to accommodate hunters, trappers, and fishermen is related to many factors such as fish and wildlife abundance, regulations, topography, vegetation, and access. Excessive user densities result in interference or conflicts between sportsmen. The U.S. Fish and Wildlife Service and U.S. Bureau of Outdoor Recreation (now the Heritage Conservation and Recreation Service) has developed hunter density guidelines for quality hunting which may be a useful guide for wildlife management areas (Table 21). Concentrations of sensitive wildlife populations may require the exclusion of hunting, trapping, fishing, or trespass at specific times from sanctuaries and refuges established within a wildlife management area.

Furthermore, quality experiences depend not only on user densities, fish and wildlife habitats, and fish and game abundance, but also on the sportsmanship and sense of responsibility of hunters and fishermen. Thus, the same set of user density standards cannot

be applied uniformly to all wildlife management areas. The capacity of the Hubbel Pond WMA to accommodate hunters should be defined in terms of hunting experiences which are rewarding to hunters and acceptable to the non-hunting public.

The Division of Fish and Wildlife encourages the use of wildlife management areas for activities which are compatible with wildlife and fish management and use, such as nature observation, photography, hiking, or cross-country skiing. A management area's attractiveness for and capacity to support compatible outdoor recreation depend on factors such as access, the variety and sensitivity of the area's wildlife populations, plant communities, and topography. Some of the resources on the unit are sensitive to overuse. However, when used in a dispersed manner by low densities of people, the management area can accommodate many visitor-days of waterfowl and deer observation and photography, appreciation and study of wetlands, walking for pleasure, and other compatible activities.

Table 21. Hunter density guidelines proposed by the U.S. Fish and Wildlife Service and the U.S. Bureau of Outdoor Recreation.

Game Species	Standard	Length of Stay (hours)
Geese	1 blind per 200 yards per 2 hunters	4
Ducks	1 blind per 10 acres of marsh per 2 hunters or 1 blind per 200 yards	4
Upland game birds	13 hunters per square mile	2
Small game	13 hunters per square mile	4
Pheasants	64 hunters per square mile	3
Deer	13 hunters per square mile	8

Source: U.S. Department of the Interior 1967, 1972.

MANAGEMENT PROGRAMS

Plans for the Hubbel Pond WMA should insure the sustained production and use of a variety of wildlife and fish and the protection of unique, scientific, historic, and aesthetic resources. To develop plans, management objectives were identified, factors influencing management programs were considered, past and present management programs were described, and future programs were then developed from research knowledge and past experience. Current emphasis on the Hubbel Pond WMA is on wetland management for waterfowl, but forest and non-forested upland habitat management as well as public use management will receive high priority in the future.

WETLAND MANAGEMENT

Objectives. Wetlands will be managed primarily for waterfowl and furbearer production and migratory waterfowl use. At the same time, marshes will provide areas for public hunting and trapping.

Considerations. Although wetlands are important habitat for a variety of wildlife species, they are managed primarily for waterfowl due to their popularity with hunters and nonhunters alike. Waterfowl research in Minnesota has concentrated on the prime prairie breeding range. Since the Hubbel Pond WMA is located on the margin of the prairie pothole region of the state, much of this research is applicable.

Wetland conditions which limit waterfowl production



Aerial view of the unit showing the Hubbel Pond impoundment, Otter Tail River, and other wetland developments including level ditches, potholes, and nesting islands.

and use include: 1) fluctuating water levels during the waterfowl nesting season, 2) lack of adequate water in late summer and fall, and 3) dense stands of cattails and other emergent vegetation.

The ability to control water levels is important to properly manage impoundments like those on the management area. Excessively high or fluctuating water levels during spring and early summer can destroy nests of geese, ducks, coots, and other game and nongame birds.

Low late summer and fall water levels limit the use of the marshes by waterfowl and hunters. These conditions also limit muskrat and beaver populations which need adequate water levels for survival over winter. Periodic drying, however, favors soil nutrient release (Kadlec 1962) and the growth of moist soil plants beneficial as waterfowl food and cover (Linde 1969). Reflooding of dry marshes in the fall creates excellent waterfowl feeding conditions.

Dikes help retain water in marshes for longer periods. Dikes should be located where soils are relatively impermeable and where watersheds are adequate to maintain desired water levels. Most of the Hubbel Pond WMA, however, is underlain by glacial sands and gravels with low water holding capacity. Additional materials may be needed in dikes constructed on the unit to prevent excessive seepage. Water control structures are necessary for water level manipulation. Proposed impoundments should be carefully examined to assure that the expected benefits justify the projected costs.

Emergent vegetation can eliminate much of the open water in shallow impoundments. Lack of open water reduces wetlands' attractiveness to waterfowl by restricting the growth of submerged vegetation and limiting movements of waterfowl. A wetland in which the area of open water and vegetation are about equal and well interspersed, generally has the maximum species diversity and production (Weller and Spatcher 1965). An interspersed of water and vegetation is also

desirable for waterfowl hunting. The area of open water in the Hubbel Pond impoundment has decreased over the past several years.

Cattail is one of the dominant emergent plants on the area and is difficult to control. Linde's (1969) list of cattail control methods includes summer mowing or crushing, winter mowing on frozen marshes, herbicide treatment, and burning. These methods vary in effectiveness according to the number and timing of treatments. Cattails are reported to be most vulnerable to control treatments at the early flowering stage in late June (Linde et al. 1976). Weller (1975) recommended water level control as the least expensive and most natural means of cattail management. Field experiments in the northern United States have shown that cutting cattails on the ice in winter to create openings is inexpensive and effective when followed by flooding during the following growing season (Weller 1975). This method is effective for cattails rooted to the bottom, but not for floating mats of cattails.

Weller (1975) also suggested management of muskrat populations as a means of creating openings in cattail stands. Muskrats use cattails for food and lodge building, thus high muskrat populations tend to thin cattail stands. Muskrat houses also provide waterfowl loafing areas and goose nesting sites.

Waterfowl breeding habitat can be created by constructing level ditches and dugouts, blasting potholes, or, in peat areas, by burning (Linde 1969). If natural waterfowl nesting sites are scarce, artificial nest structures and islands or large hay bales in impoundment openings provide suitable nesting sites. When cavities in trees are lacking, wood duck nesting boxes provide substitutes.

Woody vegetation can invade wetland edges or shallow areas. Winter marsh burning may prevent litter accumulation and favor woody plant invasion, while late summer or early fall burns are effective in destroying invading brush. Water level manipulation and mechanical control can also be used (Linde 1969).

Some researchers feel that acid stains from woody plants restrict the growth of desirable submergents, while others feel that brush may provide valuable cover for waterfowl broods (Linde 1969).

For waterfowl production, impoundments should be surrounded by grassy openings for nesting cover and goose grazing. Grain and/or green forage food plots for migratory waterfowl use should also be included. These developments increase the diversity of vegetation on the WMA and also provide important habitat for deer, furbearers, ground nesting birds, and small mammals. These areas also provide excellent sites for hunting, trapping, and wildlife observation and photography.

Past and Present Programs. Two earthen dams were constructed to create the 520-acre Hubbel Pond impoundment. The main dam, on the Otter Tail River at the WMA headquarters, has a drop inlet water control structure. Water flow on the other dam, located on the diversion ditch to Cotton Lake, is regulated by a slide gate control over a steel culvert. Six dikes have been constructed on small watersheds to create several shallow impoundments. Water levels in one of these impoundments are regulated by a culvert with a stop-log control. The other small impoundments have no control structures.

Water levels on the impoundments are managed to provide optimum water depths for waterfowl. Water flow into the management area is regulated by a dam located on the outlet of the Otter Tail River from Height of Land Lake. The Height of Land Lake dam is maintained at a fixed crest level of 1,458 feet. No diversion from the Hubbel Pond impoundment to Cotton Lake is permitted unless the gauge station approximately two miles downstream from the Hubbel Pond dam reads three feet, indicating a river flow of at least 10 cubic feet per second. In addition, no flow into Cotton Lake is permitted if the water level is above 1,442.4 feet.

Nesting islands constructed in the impoundments are periodically cleared of vegetation. Nine goose nesting islands and 50 wood duck nesting boxes are maintained annually. Additional nesting structures are constructed as labor and funds permit.

Bulldozers and draglines are used to create dugouts, level ditches, and nesting islands. Woody vegetation is periodically removed from wetlands by brush discing or prescribed burning.

Future Programs. Current wetland management and maintenance programs will continue. Any changes in the water management programs will be made on an experimental basis only after considering the possible effects of such changes on all species of animals and plants, on the dikes, and on other land and land uses within the watershed. Rainbow trout stocking in Hanson Lake will continue.

When funds are available and conditions permit, heavy equipment will be used to develop open-water habitat for waterfowl (Figure 7). Dugouts will be constructed in wetlands with bulldozers or draglines according to guidelines suggested by Linde (1969) and the Atlantic Waterfowl Council (1972). Level ditches will be constructed with draglines according to recommendations by Hammond and Lacy (1959) and Mathiak and Linde (1956). Woody vegetation in the marshes will be controlled by brush discing and prescribed burning. Additional nesting structures and islands will be constructed as labor and funds permit.

Openings will be made in cattail and other emergent vegetation stands, particularly in the Hubbel Pond impoundment. Experiments done on a small scale will be

used to determine the best method of controlling emergent vegetation. It is anticipated that mowing on the ice in winter will be effective on rooted vegetation. Control of floating mats using an aquatic chopping machine ("cookie cutter") will be evaluated. Should the machine be effective, funds would be sought to purchase one or more of these machines for use in Region I. The openings should be made as suggested by Weller (1975), with small openings connected to larger ones from which diving ducks can gain flight. Within the water management guidelines established by the DNR, water levels will be manipulated in an attempt to improve the interspersed of open water and vegetation on the Hubbel Pond impoundment.

When funding becomes available, additional impoundments will be constructed on small watersheds located in Sections 7, 8, 17, and 18, T.139N., R.29W. (Figure 7). This project will require about 1,500 feet of clay-cored dikes, and three water control structures designed and located to allow for draw-downs. Level ditches will be constructed on the larger impoundments. Acquisition of an 80-acre tract of private land south of these proposed impoundments will be necessary before construction can begin, as this area would be subject to possible flooding. Water control structures will be constructed on existing impoundments to increase water level management capabilities.

FOREST MANAGEMENT

Objectives. Forests will be managed to provide diverse and productive habitats for wildlife by maintaining and creating an interspersed of forest types and age classes. Forest management will be most concerned with game species, such as white-tailed deer, tree squirrels, and ruffed grouse, but a variety of non-game wildlife will also benefit.

Considerations. Current forest types and their distribution have an important effect on the species, density, and distribution of wildlife on the Hubbel Pond



Logging is the most efficient and economical method of managing forest habitats for wildlife.

WMA. Plant communities, however, are not static. Through natural plant succession and human influences, the structure and composition of the plant communities are continuously changing. Wildlife populations respond to these changes in the forest. To achieve the management objectives, forest manipulation will always be required.

Forests can be managed most effectively by controlled commercial logging. Studies in Minnesota have demonstrated that commercial timber harvest as a wildlife management technique can be profitable (Erickson et al. 1961, Rutske 1969, Stenlund 1971). Commercial timber harvest on the Hubbel Pond WMA, however, has been limited. The market for hardwood sawlogs and fuelwood in the area has been good, but the demand for aspen and paper birch has been low. The market demand for aspen is expected to increase in the area, however, as new wood-products plants open in northcentral Minnesota. In addition, the demand for fuelwood permits on the unit will increase as energy costs continue to rise.

While some wildlife species are most clearly associated with climax plant communities, others, such as white-tailed deer and ruffed grouse, depend on plant communities of different successional ages at different times during the year. Studies in Minnesota and Wisconsin have shown that early successional forest types contain the greatest abundance of deer forage (McCaffery and Creed 1969, Rutske 1969, McCaffery et al. 1974, Kohn and Mooty 1971). As the forest matures, there is a reduction in the production of deer forage due to increased shading (Wetzel et al. 1975). Optimum grouse habitat contains a mosaic of forest age classes within the restricted foraging range of grouse (Gullion and Svoboda 1972).

Fire prevention and suppression, forest succession, and limited timber harvest have resulted in an overabundance of mature forest on the Hubbel Pond WMA. Forest manipulation by logging, prescribed burning, and mechanical methods is needed to remove mature trees and to promote resprouting of tree species as well as understory shrubs and herbaceous plants. The result will be an increased yield of available woody browse and other food for wildlife and increased habitat diversity through establishment of a multiple age class forest.

Deer in this region generally concentrate in mixed deciduous-coniferous or pure conifer stands for protection from severe winter weather, often with little regard for the availability of food. White cedar, balsam fir, black spruce, and tamarack provide the most important winter cover (Wetzel et al. 1975). These stands provide a favorable microclimate which reduces body heat loss and reduces travel restrictions caused by deep snow (Ozoga 1968). Dense winter cover is lacking on the management area and deer concentrate on areas adjacent to the unit during winter.

Studies have also shown the close relationship between aspen communities and deer and ruffed grouse populations and have emphasized the importance of proper management of this forest type on these wildlife species (Rutske 1969, McCaffery et al. 1974, Gullion and Svoboda 1972). Aspen and aspen-birch forest types, especially following disturbances, supply the greatest amounts of preferred deer forage. Aspen is the most important component of ruffed grouse habitat throughout their primary range in Minnesota. Aspen alone in the proper age class diversity can supply all the basic habitat requirements of ruffed grouse. Flower buds of mature male aspen trees are also an

important winter food resource for grouse (Gullion 1969).

Clear-cutting is an effective method for increasing habitat diversity and promoting woody browse and other wildlife foods. Small clear-cuts interspersed throughout the forest are more important to wildlife species, such as deer and ruffed grouse, than large, continuous cuts. Research has revealed that clear-cuts as small as one acre may be beneficial to ruffed grouse (Gullion 1976). Studies have also indicated that deer are more attracted to smaller cuts and use them more thoroughly than larger ones (Verme 1972, Drolet 1978). Cuttings larger than 40 acres will not be fully utilized by deer (Graham et al. 1963, Rutske 1969). Irregularly shaped or strip cuts are more beneficial to wildlife as they increase the amount of vegetational variety and density between contrasting vegetative communities ("edge").

The northern hardwoods type can be maintained by selective cutting of mature trees at regular spacings to partially open the crown cover, which will favor the growth of regenerating, tolerant species over intolerant types (Tubbs 1977). Clear-cuts in northern hardwood and bottomland hardwood types will favor the regeneration of shade-intolerant species such as aspen and birch, which are adapted to regeneration following disturbances. Oak, basswood, and maple will resprout after cutting, but will eventually be dominated by intolerant species. A mixture of aspen and northern hardwoods can be maintained by a combination of strip or block clear-cuts and selective cutting (Tubbs 1977).

Many of the forest stands on the area are dominated by oaks, principally red oak. Mature oak trees provide cavities or potential cavities for a variety of hole-nesting wildlife species. Acorns can be an important food resource for a number of wildlife species, including deer, squirrels, ruffed grouse, and wood ducks. Acorn production, however, is often highly variable from year to year. Standing dead trees (snags) are used by woodpeckers and many other species of nongame birds for both nesting and feeding (Hardin and Evans 1977).

Past and Present Programs. Most trees on the unit are cut by issuing fuelwood permits to the public. The resident manager determines the number of permits and the location of each cut; 10 permits were issued in 1979. Permit holders are required to remove all trees within their cutting area and are limited to 10 cords. In 1975, commercial loggers clear-cut jack pine on 10 acres in the southeast corner of Section 7, T.139N., R.29W. DNR personnel occasionally down trees with chain saws or a bulldozer. Detailed annual cutting plans have not been developed for the Hubbel Pond WMA.

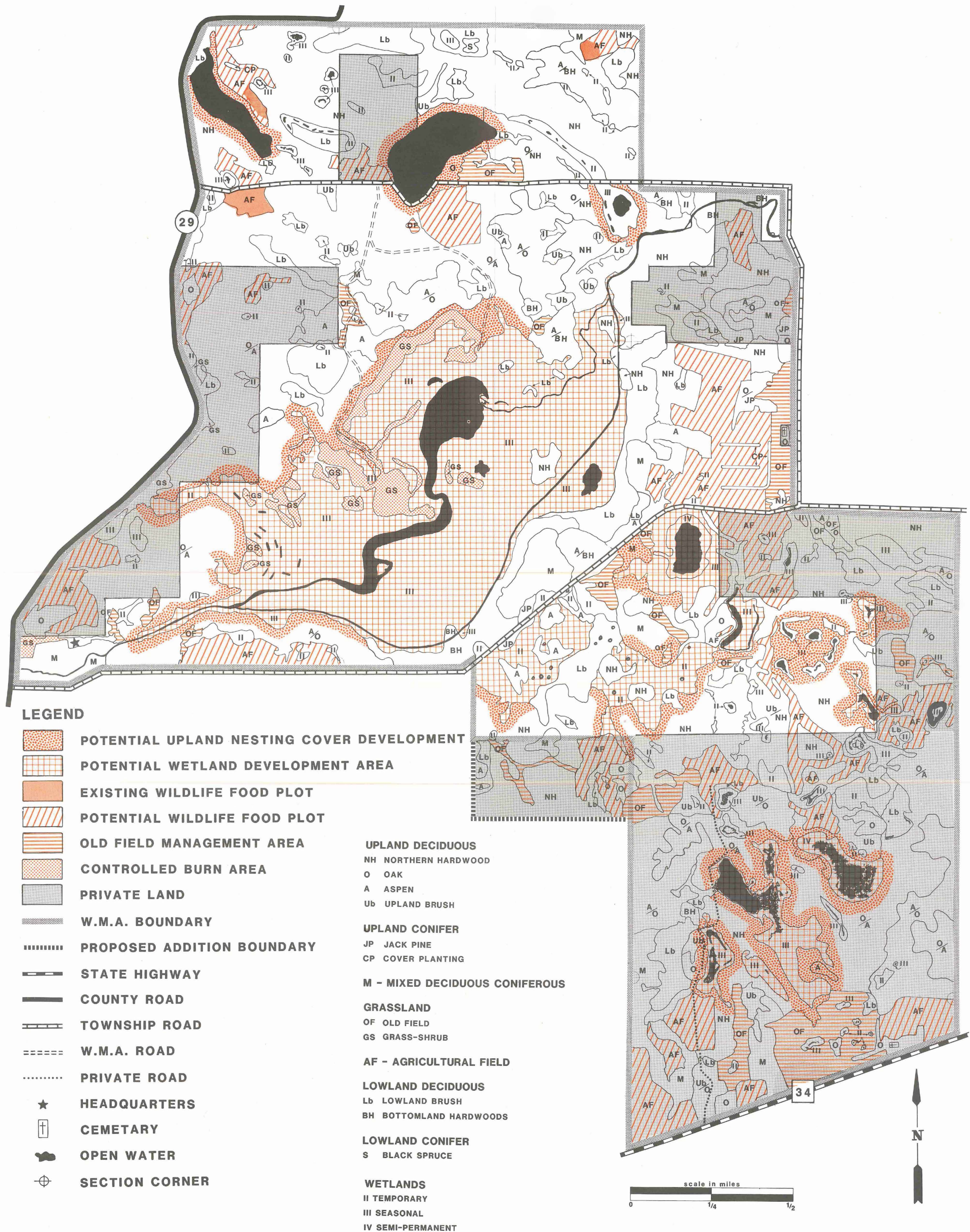
In 1978, 2,000 red pines and white spruce were planted to provide future winter cover. Seedlings were planted in strips, six rows wide, adjacent to food plots on two old field sites. An additional 500 seedlings were planted in 1979 to replace dead trees on the previous two plantings.

Future Programs. Forest management will be directed toward creating and maintaining an optimal distribution of preferred forest types and age classes for deer and ruffed grouse. Optimal habitat includes not less than 25-30 percent of the upland area in the aspen type. Over 60 percent of the upland forest should be of preferred forest types (aspen, openings, conifer cover, upland brush) that are valuable to deer and ruffed grouse. At least 25 percent of the upland

FIGURE 7. PROPOSED MANAGEMENT

HUBBEL POND WILDLIFE MANAGEMENT AREA

PROPOSED MANAGEMENT



area should be in the 1-to 10-year age class, interspersed in a manner most beneficial to wildlife.

The resident manager will rely heavily on fuelwood permits to meet forest management objectives, and will work in conjunction with the district forester in developing annual cutting schemes. The number of fuelwood permits will be increased to obtain the desired level of cutting. A number of permits will be concentrated on specific sites to create ½ to 5-acre clear-cuts to promote the regeneration of aspen. Cuttings will be in irregular shapes or strips to increase the amount of edge and will be placed to provide the maximum age class diversity. In some mixed hardwood stands, selective cutting of sugar maple, basswood, elm, and other species will be used to favor the regeneration of northern hardwood species, especially oaks. Some dead trees will be left to provide cavities for hole-nesting wildlife species. In addition, forested areas adjacent to certain waterfowl impoundments will be cleared and converted to nesting cover. If fuelwood cutting can not meet timber harvest requirements, some commercial logging sales will be necessary. It may be possible to sell permits for the commercial harvest of firewood. Larger clear-cuts (5-20 acres) may be necessary in order to make commercial logging economically feasible.

No additional conifers will be planted on old fields. Small conifer plantings in stands of hardwoods will be evaluated as winter cover for wildlife. Several species of conifers will be planted on these sites to provide a diversity of cover (Rutske 1969).

NON-FORESTED UPLAND MANAGEMENT

Objectives. Non-forested uplands include forest openings, cropland, and upland nesting areas. Croplands will be managed as wildlife food plots. Forest openings will be maintained to provide edge and to increase habitat diversity. Upland nesting cover will be managed primarily to provide secure nesting habitat for waterfowl and nongame birds.

Considerations. Forest openings are an important component of forest wildlife habitat. Studies have documented the importance of openings to white-tailed deer (McCaffery and Creed 1969), ruffed grouse (Berner and Gysel 1969), and woodcock (Hale and Gregg 1976). Openings provide high quality deer forage in early spring and fall when the nutritional requirements of deer are greatest following winter stress and coinciding with rutting activities. Opening edges supply a variety of preferred ruffed grouse forage generally not found in the adjacent forest (McCaffery and Creed 1969).

Smaller, scattered openings are valuable to forest wildlife. Openings less than five acres in size and narrower than 330 feet in width were used more intensively by deer in northern Wisconsin than larger openings (McCaffery and Creed 1969). Openings created by forest cuttings are more important to ruffed grouse than sodded openings (Moulton 1968). Forest openings require periodic maintenance to prevent the encroachment of woody vegetation.

A number of the small forest openings on the management area are remnants of old fields or homesteads. Many of these openings have developed a dense sod cover. New forest openings are created by logging operations, but are less permanent and require more frequent maintenance than sodded openings.

Dense, undisturbed grasslands close to semi-

permanent or permanent marshes are beneficial to upland nesting waterfowl and many nongame birds. These areas are also used by deer and a variety of small mammals. Upland nesting areas require active management to maintain the desired plant species and habitat structure. Prescribed burning improves the density and height of cover, increases the nutritive content of the regenerating forage, and removes ground litter and matted vegetation.

Farming for wildlife is a common practice on many state and federal wildlife areas. Agricultural crops provide supplementary food for deer, migratory waterfowl, and other wildlife species. Small scattered food plots placed near heavy escape or winter cover are most beneficial to wildlife. Areas planted to legumes improve soil conditions and provide important "green-up" areas that are heavily used by deer in early spring and fall. Another important reason for farming on many wildlife areas is to reduce crop damage by wildlife on private lands.

Past and Present Programs. Forest openings are created by fuelwood cuttings by the public and by DNR personnel using bulldozers. In addition, fire breaks are created with bulldozers and maintained by periodic plowing or mowing. Brush mowing, dozing, chemical vegetation control, and prescribed burning are used to prevent encroachment of woody vegetation on forest openings, old fields, and upland nesting areas. The treatment type and frequency depend on the characteristics of each site and seasonal weather conditions for controlled burning as well as available funding. Vegetation along access roads and trails is periodically mowed or sprayed with herbicides to prevent encroachment.

During 1979, brush was cut from one, 1-acre site. Roadside vegetation was mowed and sprayed on 10 sites totaling 10 acres. In addition, 1.2 miles of firebreaks were maintained by plowing. In 1966, a 10 acre strip north of the Hubbel Pond impoundment was cleared of trees and burned to provide upland nesting cover. Since then, this site plus a 20-acre area supporting a variety of prairie plants has been periodically burned.



Food plots located near escape cover are used by deer, waterfowl, squirrels, and other wildlife species.

In 1979, four agricultural fields totaling 16 acres were planted by WMA personnel. Crops include corn, rye, wheat, and alfalfa and are left standing as wildlife food plots. Some areas are seeded to a legume cover crop and left for several years. Two acres of forest openings and one mile of trail were planted in 1979. In addition, four fields, totaling 80 acres, are hayed under cooperative farming leases and a 20-acre field is leased for grazing. To maintain nesting cover until after most duck and grouse broods have hatched, hay may not be mowed until after July 15.

Future Programs. The present management of non-forested uplands will continue. Prescribed burning, dozing, mowing, and chemical control will be used to maintain and improve existing openings and upland nesting areas. New openings and nesting areas will be developed as funds permit. Three to 5 percent of the forest land will be maintained as openings beneficial to deer, ruffed grouse, and other wildlife. Priority will be given to clearing areas adjacent to wetlands for agricultural crops and nesting habitat. Islands and portions of the north shoreline of the Hubbel Pond impoundment will be burned periodically to encourage nesting cover (Figure 7). Herbicide use will follow the guidelines established in DNR Operational Order No. 59, Use of Pesticides in DNR Natural Resource Management Activities.

Wildlife food plots and cooperative haying leases will be continued. As funding permits, additional food plots will be developed in old fields or following timber harvest on upland forest sites as indicated in Figure 7. New food plots will be placed near heavy brush, marsh, or forest cover in relation to the distribution of deer, waterfowl, and other wildlife. Additional agricultural fields may be cropped under cooperative agreements with local farmers. The cooperator will provide all labor, equipment, and supplies in exchange for a share of the crop. The state's share of the crop will be left in the field to provide fall and winter food for wildlife, or a portion will be harvested for use at feeding stations.

PUBLIC USE MANAGEMENT

Objectives. The Hubbel Pond WMA will be managed to provide quality hunting, trapping, fishing, and other compatible recreation. Dispersed, unstructured recreation with a minimum of developed facilities will be provided as part of the state outdoor recreation system.

Considerations. The Hubbel Pond WMA; Itasca, Buffalo River, Little Elbow Lake, and Maplewood State Parks; Smokey Hills, Two Inlets, and White Earth State Forests; the Heartland State Trail; and the Tamarac National Wildlife Refuge are public natural resource lands in west-central Minnesota accommodating a variety of recreation. These units should be managed to maximize the types of recreational opportunities provided, while avoiding unnecessary duplication. To best serve the widest range of Minnesota recreationists, opportunities should include organized activities, such as group camping and naturalist-directed interpretative programs; less structured or intensively developed activities, including the use of marked and developed trails and self-guided interpretative programs; and unstructured activities with low participant densities, such as fishing, hunting, and self-directed hiking and skiing. This approach will provide a variety of opportunities and will fill the needs of most individuals.

Minnesota state parks and state forests provide a variety of outdoor activities. Depending on the classification of each park, the park resources, and theme, state park-oriented recreation will include organized and directed programs as well as less intensively structured use with lower user densities. State forests provide less structured recreation than state parks. These areas accommodate a variety of unstructured activities such as hunting, fishing, and primitive camping, as well as providing picnic and sanitary facilities plus marked, improved trails. More intensively organized activities with higher participant densities, however, may conflict with sportsmen and recreationists seeking more solitude.

State trails provide marked and developed, multiple-use recreational travel routes for snowmobiles and non-motorized forms of recreation including hiking, horseback riding, bicycling, and cross-country skiing. In addition, some state trails provide primitive camping and picnic facilities. Under the provisions of the Outdoor Recreation Act of 1975, state trails cannot be authorized within state wildlife management areas (Minnesota Statutes, Sec. 86A.08, Subd. 1, 1978).

Recreational use of the Tamarac National Wildlife Refuge is permitted when it does not interfere with the management or objectives of the area. The refuge provides a substantial area for unstructured forms of recreation such as hunting, fishing, photography, and nature study, as well as primitive wilderness areas and natural research areas. The refuge also provides more developed and structured facilities, including marked and improved hiking and cross-country skiing trails, scenic drives, and picnic areas.

To round out this system, the Hubbel Pond WMA should provide for public hunting, trapping, and fishing, plus unstructured compatible forms of recreation such as nature observation, hiking, cross-country skiing, and photography at lower user densities. Management of the Hubbel Pond WMA for dispersed, unstructured recreation can provide alternative opportunities for Minnesota recreationists and will minimize use conflicts on all areas. Intensified agricultural practices, increased posting of private lands, and more restrictive trespass laws will increase the importance of state wildlife management areas to wildlife and sportsmen.

The maintenance of high quality public hunting on the Hubbel Pond WMA is a major concern. Crowding is often a major problem in maintaining quality hunting during the waterfowl season, particularly early in the season and on weekends. Crowded duck hunting conditions cause interference among hunting parties and destroy traditional values of the sport such as skill in the use of calls and decoys. Waterfowl hunters shooting at birds out of range (skybusting) can also decrease hunting quality for others by flaring approaching birds. Waterfowl hunting conditions may, in the future, become so crowded that steps will need to be taken to regulate the number of hunters using an area. Excessive regulation and regimentation can, however, decrease hunting quality. Except possibly on the opening weekends of the waterfowl and firearms deer season, excessive hunting pressure is currently not a problem on the Hubbel Pond WMA.

The problem of temporal distribution of hunters is considered when hunting regulations are established. However, regulations can only be partially successful in equalizing weekend, weekday, and opening day hunting pressure.

Unequal hunter distribution on the area is the result of hunter preference, access, and game distribution. Compartment 1 (Figure 5), which includes the Hubbel Pond impoundment received the highest hunting pressure. The remainder of the unit received lower but fairly uniform hunting use. The intensity and distribution of hunter use can be influenced by the location and number of access roads and parking lots. Sanctuary boundaries have also been adjusted in the past to affect hunter distribution.

Snowmobiles, 4-wheel drive vehicles, and motorbikes have been shown to be detrimental to wildlife habitats (Newman and Merriam 1972, Wanek 1973). In addition, snowmobiling may be detrimental to wintering deer and other wildlife (Jarvinen and Schmid 1971, Kopischke 1974, Dorrance et al. 1975).

Other activities such as hiking, nature observation, photography, and canoeing are minor uses compared to hunting. However, such activities help to cultivate an appreciation of wildlife and of the management area and should be permitted and encouraged when facilities and manpower permit and when they do not conflict with the main objectives of the area. Environmental education and hunter education could be done during guided tours of the area and through slide talks to local clubs and schools. Hunter orientation programs would be helpful in familiarizing hunters with the regulations, hunting opportunities, access, and other features of the management area.

Past and Present Programs. Use of the management area is presently regulated by the resident manager in accordance with Minnesota DNR Commissioner's Order No. 1961, Regulations Relating to the Public Use of Wildlife Management Areas (Appendix C) and other annual Commissioner's Orders specifying hunting and fishing seasons. Snowmobiles may be driven on the township road crossing the management area, but are prohibited elsewhere on the unit. Motor vehicles may be operated on the unit but only on established roads, and no vehicles may be driven beyond a sign prohibiting vehicular use or beyond any man-made vehicle barrier. Camping on the area is prohibited except by permit from the resident manager. Camping is limited to WMA parking areas.

Roads and trails are maintained for public access and management purposes. Boundary signs are posted and maintained for the management area and two refuges.

The resident manager is authorized to make arrests for violations of fish and game laws (Minnesota DNR Commissioner's Delegation Order No. 253, 1976), but does not have time for intensive enforcement duties. Conservation officers stationed at Detroit Lakes and Osage are also responsible for law enforcement on the area. Hunting is prohibited in two refuge areas within the management area. A permit from the resident manager is required to trap on the unit.

The resident manager conducts tours for school groups and other organizations. A 1-mile environmental education trail has been developed at the headquarters area.

Future Programs. Present regulations will remain in effect. The current trapping system will be continued. If trappers operate outside their assigned permit areas or fail to report their annual harvests to the resident manager, they will not be permitted to trap on the area in subsequent years.

To create more opportunities for hunting on the management area, the sanctuary in the northwest cor-

ner of the unit will be eliminated. If disturbance during the waterfowl nesting season becomes a problem, this area may be closed to entry during this period.

River floating, or tubing, as presently done on the Otter Tail River, is a compatible recreational activity. The DNR will encourage the Village of Rochert to develop suitable off-road parking and litter disposal facilities, on WMA land if necessary. If litter and parking problems cannot be solved, the damsite will be closed to entry. To prevent possible injury to tubers at the Hubbel Pond dam, the dam area will be posted with no trespassing signs and fenced.

NONGAME MANAGEMENT

Objectives. An objective of wildlife management on the Hubbel Pond WMA is an effectively balanced program for all native wildlife species. Nongame wildlife will be considered in managing the forests, wetlands, non-forested openings, and other habitats on the area.

Considerations. The Minnesota DNR has statutory responsibility for the protection, propagation, and wise use of the state's wildlife resources. State and federal wildlife management programs have, in the past, emphasized game species because of the popularity of hunting and because most of the funding for these programs came from hunter license fees and excise taxes on sporting arms, ammunition, and archery equipment. Benefits or losses to nongame species were generally not considered in various management practices. Recently, public interest and concern for nongame wildlife, especially uncommon or endangered species, has increased. Information concerning the effects of land management on nongame wildlife is lacking (Curtis and Ripley 1975). However, most of the land acquisition and habitat management that has been done for game species has also been beneficial to nongame wildlife.

It is not possible to manage all portions of an area for all species at the same time. Some species are associated with climax plant communities, while others are adapted to early successional habitats. A variety of habitats is needed to provide for a variety of wildlife species. In managing habitats for wildlife, especially mobile species such as most birds, a manager should consider which habitats are rare or becoming less common in the general vicinity.

Little is known about the requirements and responses to management of many species of mammals, birds, reptiles, amphibians, and fish. The nongame discussion emphasizes birds because there has been more public interest in this group than in any other and more research has been done on birds. Birds are also the most visible of the management area's nongame wildlife.

Nongame bird management should consider three factors (Zeedyk and Evans 1975). First, maximum diversity of birdlife is found when the horizontal and vertical diversity of the vegetation are maximum. Second, bird species are adapted to nearly every habitat, so management benefiting some species can be detrimental to others. Finally, bird species differ in their ability to adapt to habitat variability since some species have specific requirements, while others are more general in their requirements.

The diversity of bird species often increases with forest maturity due to the greater vertical diversity of layers in mature forests (Odum 1971). Setting back forest succession by cutting or other means produces

edges between contrasting vegetation types which increase horizontal diversity, resulting in a greater diversity and density of birds (Curtis and Ripley 1975). Species of birds that respond to cutting and increased edge include common flicker, catbird, brown thrasher, and yellow warbler. As the forest begins to regenerate, species closely associated with early successional stages, such as the mourning and chestnut-sided warblers, common yellow-throat, and white-throated sparrow, will benefit (Titterton et al. 1979). Access trails and forest openings also provide greater vegetative diversity for birds.

Species attracted to clear-cuts and edges usually have broad ranges of tolerance, high reproductive rates, and good powers of dispersal. Other species with more narrow ranges of tolerance can be adversely affected if management is directed entirely toward creating the maximum habitat diversity (Balda 1975). Species that require mature forests include the goshawk, ovenbird, barred owl, pileated woodpecker, red-headed woodpecker, and wood thrush. Extensive cutting of mature forest areas may be detrimental to these species.

Wetland management for game birds is generally good management for nongame birds as well. An interspersed of open water and structurally diverse emergent vegetation should be attractive to a wide variety of marsh birds (Weller and Spatcher 1965). Maintaining water levels helps to maintain fish populations, which, in turn provides food for birds such as pied-billed grebes, great blue herons, and great egrets.

Croplands on the WMA provide food for wintering songbirds (Burt 1977) as well as game birds. Grain fields and fallow fields are used by mourning doves, which are presently a nongame species in the state. Hay fields and grassy areas provide habitat for songbirds such as the western meadowlark, bobolink, and vesper sparrow, plus small rodents which are fed upon by hawks, owls, and mammalian predators. Small rodents may serve as buffer species, reducing predation on other species including waterfowl (Weller 1979).

The U.S. Fish and Wildlife Service has classified the bald eagle in Minnesota as a "threatened species," or one not considered to be in present danger of elimination but considered likely to become endangered in the foreseeable future. The osprey is considered an "uncertain species," in Minnesota (Minnesota DNR 1975) or one which is presently not endangered or threatened, but which could become threatened in the near future. Both bald eagles and osprey are occasionally observed in the management area vicinity. Osprey did breed on the unit in the past, but the nest site has been unused for a number of years. An active osprey nest has been recently observed adjacent to the unit on Height of Land Lake. Large amounts of open water supporting a sizable fish population are necessary for both species. Large trees are also important for nest sites. Protection of nest sites from human disturbance and prevention of pesticide contamination of fish are two important factors in maintaining a breeding population of both species (Minnesota DNR 1975).

Up to the present, all funding for nongame management has come from hunting, fishing, and trapping license fees. In 1980, however, legislation was passed creating the Minnesota Nongame Wildlife Fund. This is a dedicated funding source for nongame management and research derived from voluntary checkoffs of state

income tax refunds beginning in 1981. In addition, federal nongame funding legislation which would provide excise tax appropriations as matching funds for state nongame projects is under consideration. This legislation may provide substantial support for specific nongame management in the future.

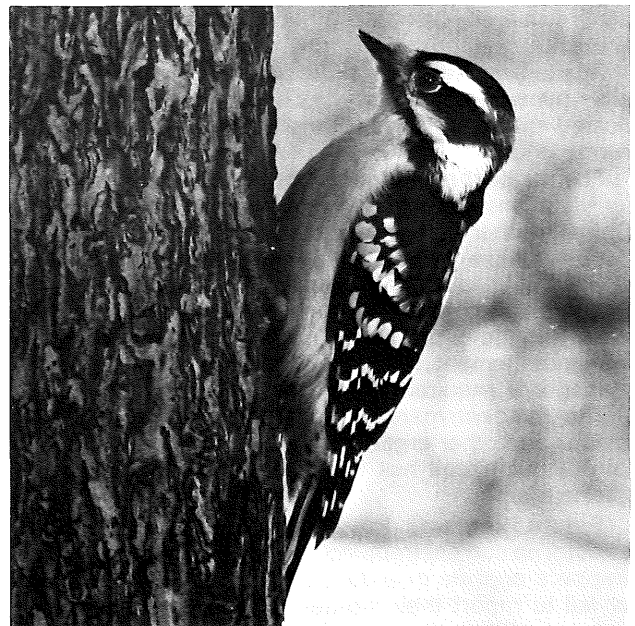
Past and Present Programs. Current management on the WMA benefits nongame wildlife by promoting the maintenance of diverse habitats and preserving naturally occurring communities. Maintaining cover and food supplies and limiting disturbance should help both game and nongame species. Nongame wildlife is considered in management plans, but thus far, lack of funds and information has limited management specifically for nongame species.

A nongame wildlife specialist employed by the Section of Wildlife beginning in 1977 has worked at evaluating the current status of many nongame species, especially uncommon ones, plus making suggestions for management. Breeding records and sightings of uncommon species are reported to and summarized by the nongame specialist.

Future Programs. Although specific proposals for nongame management can not be presented in this plan, management programs on the Hubbel Pond WMA will continue to consider all wildlife species, especially uncommon and threatened species. If funds become available for nongame work, additional surveys and habitat management will be done. Suggestions of the nongame wildlife specialist will be incorporated into the management of the WMA whenever possible.

RESEARCH AND SURVEYS

Objectives. Surveys will be conducted to monitor wildlife abundance and harvest, public use, and the effects of management on the unit's resources. Research to gather information on wildlife and their habitats will be encouraged. Research and survey results will be used to evaluate present management programs and to develop new techniques.



Downy woodpeckers, permanent residents on the Hubbel Pond WMA, benefit from the mature hardwood forests on the area.

Considerations. Information on wildlife abundance and distribution, hunting and trapping harvests, and public use is needed to guide the development and management of the WMA.

Wildlife abundance is difficult to assess. Aerial surveys of deer and waterfowl are useful under certain conditions. In forested regions, deer pellet group surveys in spring provide an index to deer numbers. Annual surveys, such as ruffed grouse drumming counts and woodcock singing counts on established routes, can be used as indexes to small game abundance. All of these techniques, however, require extensive labor and funding. Surveys of deer populations receive the highest priority, since their present management depends heavily on annual changes in harvest regulations based, in part, on these population estimates. Measuring changes in wildlife abundance in response to management on specific areas is complicated by changes in abundance in the surrounding area and by animal movements to and from the managed area.

Wildlife productivity is even more difficult to assess. Deer reproduction can be assessed by examining car-killed does in spring. Waterfowl productivity can be estimated using breeding pair counts, nest searches, or brood counts. Measurement of the reproductive response of waterfowl to habitat manipulation may be complicated by other factors such as weather, predation, the harvest in the preceding year, or the phenology of the nesting season.

Wildlife harvest statistics are used, in part, to estimate wildlife abundance and the success of management programs and regulations. Harvest data is determined by hunter bag checks, game registration, carcass collections, and mail surveys. Harvest records also supply information on physical condition of the animals, population sex and age structures, and, in some cases, food habits.

Public use is difficult to assess because of the limited staff and the number of public entry points. Information on the number of users, temporal and spatial distribution of use, and other statistics on area visitors are used to document public use trends, problems, and needs. Input from individual users by interviews or questionnaires is useful in determining factors which increase or decrease the quality of a visit.

The effects of management on the resources of the area should be examined. Projects designed to benefit specific wildlife species may be detrimental to other animals, plants, soils, or waters. All projects should be examined for their impact on nontarget resources. Federal guidelines require these investigations when federal aid is involved.

Research information helps to develop effective management programs. The area has potential for research in many areas, including waterfowl production, mortality factors, and habitat management; deer populations; responses of furbearers to trapping and wetland management; and the effects of specific wildlife species management on nontarget wildlife. The unit will become more important as a research area as natural areas in the state are fragmented or destroyed by development.

Past and Present Programs. The resident manager uses car counts, bag-checks, and informal observations and interviews to estimate hunting pressure and harvest during the ruffed grouse, waterfowl, and firearms-deer seasons. Data on trapping harvest is incomplete because trappers have often failed to report

their harvest as required under the trapping permit system.

A public use survey involving mailback questionnaires was conducted on the management area in 1978 as part of the wildlife planning process. Survey results were used to determine public use types and the attitudes and demographic characteristics of area users (see Public Use Section, pages 20-22).

Annual wildlife surveys conducted on the WMA include deer pellet group counts and ruffed grouse drumming counts in spring. No surveys are conducted on the unit to determine the abundance of other upland game species, waterfowl, furbearers, and non-game wildlife. WMA personnel also assist the area wildlife managers in conducting wildlife surveys in Becker and surrounding counties. Approximately 25-30 man-days are spent by WMA personnel each year conducting surveys on the management area and vicinity.

Future Programs. Present wildlife surveys will be continued. Management and research personnel of the DNR will cooperate on improving techniques to census wildlife populations. If staff and support funds permit, additional wildlife surveys will be initiated. A survey to determine waterfowl production and response to wetland management will be given highest priority. In addition, surveys to monitor muskrat and beaver population levels and the effects of trapping, water level manipulation, and other factors on their numbers will be conducted.

Car counts and bag-checks to estimate hunting pressure and game harvest will be continued. Interviews with visitors or questionnaires placed on vehicles will be used to obtain visitor opinions and suggestions concerning management of the WMA. Comprehensive public use surveys will be conducted periodically if additional staff and funds become available.

Research by the Minnesota DNR and other competent researchers will be encouraged. Area personnel will cooperate and provide any assistance which their other duties permit. WMA personnel will experiment with various techniques to control emergent vegetation on the unit's wetlands. The effectiveness of control measures and use of openings by waterfowl and other birds will be monitored.

The effects of proposed management projects on the area's resources, including plants, non-target wildlife, and abiotic resources, will be assessed by the area personnel. The Division of Fish and Wildlife will submit significant development plans to the Minnesota Historical Society for review in order to avoid destroying or altering important prehistoric or historical cultural resources.

LAND ACQUISITION AND ADMINISTRATION

Objectives. The long-range acquisition goal for the Hubbel Pond WMA is to acquire all lands within the approved project boundary. The WMA boundaries will be adjusted to protect valuable wildlife habitat and to facilitate the implementation of wildlife management programs. Priority will be given to acquiring desirable tracts of land needed for wildlife management. Within five years, the Hubbel Pond WMA resident manager's position will be reassigned to another location, and management of the WMA will be assigned to the area wildlife manager in Detroit Lakes.

Considerations. Land acquisition is an important issue on the Hubbel Pond WMA. Although the unit has existed since 1954, over 32 percent of the project lands are unacquired. Land acquisition has been complicated by the many individual tracts and different landowners involved, the unfavorable attitudes of private landowners towards state land acquisition, and the lack of acquisition funds.

Land purchases or leases by the state for wildlife purposes must first be approved by the appropriate county board of commissioners (Minnesota Statutes, Sec. 97.481, 1978). Further land acquisition by the state in many areas has often met with opposition from the county boards. County officials state that state land acquisition decreases the county tax base by removing lands from the tax rolls. Recent legislation, however, requires the state to pay \$3.00 per acre for state natural resource lands which were previously privately owned (Minnesota Laws, Ch. 303, 1979). State lands will now often provide more tax revenue than if the same lands were in private ownership.

Except for the Talcot Lake WMA, the other seven WMA's in the state with resident managers are significantly larger (ranging from 22,850 to 284,100 acres) than the Hubbel Pond WMA (3,450 acres). The Talcot Lake WMA is comparable in size (4,000 acres), but receives substantially greater public use. In 1975, an estimated 10,110 hunter use-days occurred on the Talcot Lake WMA, as compared to 1,000 hunter use-days on the Hubbel Pond WMA in 1979. The other seven WMA's also received significantly greater hunter use (5,200 to 27,000 estimated hunter use-days) than the Hubbel Pond WMA. Equipment storage on the Hubbel Pond unit is limited and WMA personnel spend a considerable portion of their time working on wildlife projects in the WMA vicinity.

Compared to other major units, the Hubbel Pond WMA is too small and receives too little public use to justify having a resident manager. The location of the area, 11 miles from the area wildlife office in Detroit Lakes, makes the transfer of management to that office feasible. The present resident manager can effectively divide his time between his present unit duties and assisting in wildlife management in the Detroit Lakes area.

Past and Present Programs. Land acquisition for the Hubbel Pond WMA began in 1954 with the acquisition of 848 acres of tax-forfeited lands, 100 acres of Trust Fund lands, and 128 acres of private lands. Since 1954, 1,207.5 acres of private lands have been acquired, bringing the state-owned total to 2,283.5 acres.

For the purposes of this plan, proposed acquisitions were assigned priority ratings of critical, desirable, or eventual. Critical ratings applied to lands needed as soon as possible to protect or develop important wildlife habitat or solve serious management problems. Lands needed for future management, development, or habitat preservation were designated as desirable. Lands classed as eventual are needed to preserve habitat, consolidate ownership, and increase

the manageability of the unit.

Private lands within the unit were assigned a priority by the resident manager (Figure 4). Three tracts, totaling 109 acres, are rated as critical. Desirable lands include 10 tracts, totaling 809 acres. The remaining five tracts, totaling 197 acres, are rated for eventual acquisition (Table 14, page 18). The 80-acre tract of private land in the proposed addition is rated as desirable.

Future Programs. Further land acquisition on the Hubbel Pond WMA depends on funding, the availability of land, and county board approval. For these reasons, a definite acquisition schedule is not possible. Private lands will be acquired as funds become available and owners are willing to sell. Land exchanges will be negotiated, if possible, when landowners desire.

A proposed addition to the project boundary involves an 80-acre tract in the S½NE¼ of Section 18, T.139N., R.29W. This parcel is needed before wetland development can be undertaken on WMA land bordering to the north. This project expansion has been approved by Region I and the Division of Fish and Wildlife. No formal project proposal will be prepared, since the expansion is less than 10 percent of the current proposal's acreage.

Priority will be given to acquiring those tracts of land rated as critical and desirable. However, because of uncertain availability of land, lower priority parcels may be acquired before higher priority tracts. County board approval has been obtained to acquire 600 acres of land within the project boundary and the 80-acre proposed addition (Table 14, page 18).

The resident manager's position will be reassigned to higher priority management duties by 1984. Management of the unit will be reassigned to the area wildlife manager in Detroit Lakes. The seasonal laborer assigned to the Hubbel Pond WMA will continue to work out of the WMA headquarters for the area wildlife manager as long as equipment is based there. The DNR will attempt to acquire state hospital property at Fergus Falls to serve as a substitute storage depot and management center for southern Region I. Public use of the WMA will not be significantly affected by this action. Wildlife management on the unit will probably be less intensive than at present, but it will be commensurate with management levels on other unmanned units in Region I. The resident manager will continue his duties on the WMA and on other units in Region I until his position is reassigned.

Personnel and facility needs in Region I will be reevaluated in 1984. If needed for management operations, some or all of the headquarters buildings will be maintained. Any surplus buildings will be sold and removed, moved to another DNR facility, or razed. Depending on funding and priorities, additional labor and support may be assigned to the Detroit Lakes area to compensate for the reassignment of the manager's position.

SUMMARY OF MANAGEMENT PROGRAMS

WETLANDS

Wetlands will be managed primarily for waterfowl and public hunting. Impoundment water levels will be managed to provide optimum water depths for waterfowl and hunters. Small islands and artificial structures will be constructed and maintained to provide waterfowl nesting sites. Open-water habitat for waterfowl will be developed using bulldozers and draglines. Emergent vegetation in impoundments and other wetlands will be thinned to benefit waterfowl. Additional impoundments equipped with water control structures may be developed on small watersheds on the management area.

FORESTS

Forests will be managed to maintain or create an interspersed of preferred forest types of age classes beneficial to wildlife. Timber will be harvested primarily by issuing fuelwood permits to the public. A number of permits will be concentrated on specific sites to create ½-to 5-acre clear-cuts to promote aspen regeneration. Selective cutting will be used to favor the regeneration of northern hardwood species such as sugar maple, basswood, and red oak. Forested areas adjacent to certain waterfowl impoundments will be cleared and converted to nesting cover or food plots.

NON-FORESTED UPLANDS

Non-forested uplands include forest openings, cropland, and upland nesting areas. Forest openings will be created and maintained to provide edge and to increase habitat diversity. Croplands will be managed to provide food, cover, and other habitat needs for wildlife. Some cropland on the area will be leased to local farmers. Upland nesting cover will be managed primarily to provide secure nesting habitat for waterfowl and nongame birds. Prescribed burning, logging, dozing, mowing, and chemical control will be used to create and maintain openings and upland nesting areas.

PUBLIC USE

The area will provide quality public hunting, trapping, and other activities compatible with its legal purpose and management objectives. To create more opportunities for hunting, the wildlife sanctuary in the northwest corner of the unit will be eliminated. The current trapping permit system will continue. Other

outdoor recreational activities, such as cross country skiing, hiking, wildlife observation, and canoeing, will be permitted on the area, but no trails or facilities will be developed for these activities. Except for the township road crossing the WMA, snowmobiles will be prohibited on the unit. River floating, or tubing, will be permitted on the Otter Tail River below the Hubbel Pond dam, but the DNR will encourage the Village of Rochert to develop suitable off-road parking and litter disposal facilities.

NONGAME WILDLIFE

Nongame wildlife management will be integrated with game habitat management. Special management considerations will be given to rare or unique species such as the bald eagle and osprey. More specific programs for nongame species will be implemented as needs are identified and funds are provided through the state nongame wildlife program.

RESEARCH AND SURVEYS

Wildlife and public use surveys will continue on the area as long as staff and funds are available. Car counts and hunter bag-checks will be used to estimate hunting pressure and game harvest. Annual wildlife surveys include deer pellet group counts and ruffed grouse drumming counts. WMA personnel will assist the area wildlife manager in conducting wildlife surveys in Becker and surrounding counties. Area personnel will cooperate with DNR and university research projects which will aid in statewide or unit management.

LAND ACQUISITION AND ADMINISTRATION

Private lands, totaling 1,195 acres, are proposed for acquisition from willing sellers after county board approval. The resident manager's position will be reassigned by 1984 and management of the Hubbel Pond WMA will be reassigned to the area wildlife manager in Detroit Lakes. Management on the unit will be less intensive than at present, but will be commensurate with management levels on other unmanned units in Region I. The seasonal laborer will continue to work out of the WMA headquarters for the area wildlife manager. If needed for management operations, some or all of the headquarter's buildings and equipment will be maintained.

IMPLEMENTATION AND COST ESTIMATES

Specific programs to manage fish and wildlife and provide quality fish and wildlife-related recreation were developed based on present conditions and future expectations. Implementation of these programs depends on land ownership, land and management costs, and the amount and sources of funding.

LAND COSTS

Land acquisition costs are difficult to estimate for the management area because of the variation in land types and timber values. The estimated acquisition cost for 80 acres of critical and 809 acres of desirable private lands is approximately \$430,000. However, purchase of these lands is dependent upon willing sellers and funding. Funds for land purchases are not part of the management area's operating budget.

Land acquisition is funded by a surcharge on small game hunting licenses. This \$2.00 surcharge, which is authorized through 1984, currently generates about \$600,000 annually for wildlife land acquisition. In addition, the Legislative Commission on Minnesota Resources (LCMR) has made periodic special appropriations for wildlife land acquisition. The LCMR's most recent appropriation was \$250,000 in 1975. In recent years, surcharge and LCMR funds have been supplemented by general revenue funds under a program called Resource 2000. This six-year program has provided \$9.2 million for wildlife land acquisition since 1975. The amount of wildlife lands which can be acquired in future years will depend on the level of funding provided by these three sources.

MANAGEMENT PROGRAMS AND COSTS

The Section of Wildlife, through the Region I office in Bemidji, will implement the wildlife proposals in this plan. The wildlife management proposals involve changes in funding and staffing for the management area.

Allocating funds for specific wildlife habitat projects is difficult because many activities are dependent to a large degree on uncontrollable conditions. Prescribed burning is only effective under exact conditions. The construction of dikes, level ditches, and potholes is dependent on seasonal weather trends. Proposed developments and management programs depend on weather conditions, land acquisition, and equipment and labor availability. The manager must have the flexibility to decide how funds will be spent through the year and to modify programs to suit changing conditions.

Current management programs and estimated implementation costs for the Hubbel Pond WMA are

summarized in Table 22. Present expenditures of about \$35,000 to \$40,000 per year represent current costs for salaries, routine equipment and facility maintenance and operation, and yearly habitat maintenance and development.

Management costs for the Hubbel Pond WMA will be budgeted through the area wildlife manager's office in Detroit Lakes after the resident manager's position is reassigned. Salary and operational costs for the management area will be reduced from current levels. Most management functions on the WMA will be continued but at a lower level.

A replacement schedule for major equipment based at the Hubbel Pond WMA is described in Table 23. Because major equipment replacement is dependent on funding, needs, and priorities within Region I, anticipated replacement is scheduled in 5-year intervals. All or part of this equipment may be transferred to other DNR facilities in Region I if the WMA headquarters is vacated. Replacement costs were based on price estimates for new equipment. In many cases, however, used equipment, especially farm machinery, will be adequate and can be purchased at substantially lower costs.

Fisheries work on the unit can be implemented with current funding. No additional fisheries management programs are planned on the WMA.

MANAGEMENT AREA FUNDING

Although special appropriations are sometimes received, the acquisition, development, and operation of the management area is generally dependent on dedicated funds. Revenue available to the Division of Fish and Wildlife for statewide fish and wildlife management is related to hunting, fishing, and trapping license sales. Besides providing direct income, license sales determine the level of federal-aid matching funds the state is eligible to receive. During 1978, the Section of Wildlife spent approximately \$400,000 of Pittman-Robertson funds for WMA development and \$1.5 million for wildlife land acquisition. For the most part, the Division of Fish and Wildlife operates within a budget that can only be increased through greater license sales or higher license fees. Similarly, should license sales decline, revenue would also decline.

A \$3.00 Minnesota migratory waterfowl stamp was initiated in 1977. Purchase of this stamp by waterfowl hunters and other people interested in conservation will provide increased funds for wetland development. In addition, the 1977 legislature appropriated \$500,000 for statewide wildlife habitat improvement during the 1978-79 biennium as part of the general fund Resource 2000 programs.

Table 22. Current management programs and implementation costs on the Hubbel Pond WMA.

Forest management

1. Small winter cover plantings
2. Prescribed burning
3. Develop and maintain firebreaks
4. Mechanical vegetation manipulation
5. Issue and monitor fuelwood permits

Wetland management

1. Maintain dikes and water control structures
2. Manage impoundment water levels
3. Construct and maintain dugouts
4. Burn shoreline and nesting islands

Public use management

1. Administer cooperative farming agreements
2. Manage public hunting and trapping
3. Maintain access roads, trails, parking areas, and boat ramps
4. Maintain boundary and other regulatory signs

Non-forested upland management

1. Plant food plots
2. Develop and maintain openings and upland nesting cover
3. Plant herbaceous cover on openings and trails

Research and surveys

1. Conduct wildlife surveys
2. Conduct car counts and hunter bag-checks

Annual Spending

1979 baseline	\$39,000
Added labor and support	-0-
Annual total	\$39,000

Immediate capital needs for implementation

Replacement	\$0
Total	\$0

Except for the recent increase in revenue provided by the migratory waterfowl stamp and possible future general fund appropriations, management funds will probably not increase significantly by 1989. Accordingly, most proposals are planned within the present budgetary constraints. Wildlife management finances in Region I are somewhat flexible, and funds can be shifted from item to item. However, the restructuring of spending priorities could be detrimental to some regional wildlife management functions.

Table 23. Equipment replacement schedule for the Hubbel Pond WMA.

Period	Item	Model	Estimated Cost
1981-1984	Truck, pickup	Dodge/½ ton	\$ 5,500
	Crawler tractor	Case/1000	42,000
	Tractor loader	International/706	18,000
	Tractor, farm	International/340 Farm-all	20,700
	Tractor, forklift	Unknown	10,000
	Mower, tractor	International/110	2,300
	Disc, harrow	Taylorway/brush harrow	3,400
	Sprayer, boom	Pesticide sprayer	2,600
	Equipment trailer	Unknown	7,000
1985-1989	Truck, pickup	Dodge/½ ton	5,500
	Truck, dump	International/2½ ton	18,000
	Corn planter	International/2 row	4,000
	Field cultivator	International/10 ft.	2,500
	Rowcrop cultivator	International/corn cultivator	4,800
	Grain drill	International/10 ft.	4,200

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Appendix A. The Minnesota Outdoor Recreation System.

Classification	Purpose	Administration
Natural State Park	A natural state park shall be established to protect and perpetuate extensive areas of the state possessing those resources which illustrate and exemplify Minnesota's natural phenomena and to provide for the use, enjoyment, and understanding of such resources without impairment for the enjoyment and recreation of future generations.	Commissioner of Natural Resources
Recreational State Park	A recreational state park shall be established to provide a broad selection of outdoor recreation opportunities in a natural setting which may be used by large numbers of people.	Commissioner of Natural Resources
State Trail	A state trail shall be established to provide a recreational travel route which connects units of the outdoor recreation system or the national trail system, provides access to or passage through other areas which have significant scenic, historic, scientific, or recreational qualities or reestablishes or permits travel along an historically prominent travel route or which provides commuter transportation.	Commissioners of Transportation and Natural Resources
State Scientific and Natural Area	A scientific and natural area shall be established to protect and perpetuate in an undisturbed natural state those natural features which possess exceptional scientific or educational value.	Commissioner of Natural Resources
State Wilderness Area	A state wilderness area shall be established to preserve, in a natural, wild and undeveloped condition, areas which offer outstanding opportunities for solitude and primitive types of outdoor recreation.	Commissioner of Natural Resources
State Forests and State Forest Sub-Areas	A state forest, as established by Minnesota Statutes, Section 89.021, shall be administered to accomplish the purposes set forth in that section, and a state forest sub-area shall be established to permit development and management of specialized outdoor recreation at locations and in a manner consistent with the primary purpose of the forest.	Commissioner of Natural Resources
State Wildlife Management Area	A state wildlife management area shall be established to protect those lands and waters which have a high potential for wildlife production and to develop and manage these lands and waters for the production of wildlife, for public hunting, fishing, and trapping, and for other compatible outdoor recreational uses.	Commissioner of Natural Resources
State Water Access Site	A state water access site shall be established to provide public access to rivers and lakes which are suitable for outdoor water recreation and where the access is necessary to permit public use.	Commissioner of Natural Resources
State Wild, Scenic, and Recreational Rivers	State wild, scenic, and recreational rivers shall be established to protect and maintain the natural characteristics of all or a portion of a river or stream or its tributaries, or lake through which the river or stream flows which together with adjacent lands possesses outstanding scenic, scientific, historical, or recreational value, as provided by Sections 104.31 to 104.40.	Commissioner of Natural Resources
State Historic Sites	A state historic site shall be established to preserve, restore, and interpret buildings and other structures, locales, sites, antiquities, and related lands which aptly illustrate significant events, personalities, and features of the history and archaeology of the state or nation.	Commissioner of Natural Resources, Minnesota Historical Society, Board of Regents of the University of Minnesota, Governmental subdivisions of the State and County Historical Societies.
State Rest Area	A state rest area shall be established to promote a safe, pleasurable, and informative travel experience along Minnesota highways by providing areas and facilities at reasonable intervals for information, emergencies, or the rest and comfort of travelers.	Commissioner of Transportation

Appendix B. Common and scientific names of plants mentioned in the text.

Family	Common Name	Scientific Name
Aceraceae	Sugar maple	<i>Acer saccharum</i>
Alismataceae	Arrow-head	<i>Sagittaria</i> sp.
Anacardiaceae	Posion-ivy	<i>Rhus radicans</i>
Apocynaceae	Dogbane	<i>Apocynum androsaemifolium</i>
Araceae	Sweet flag	<i>Acorus Calamus</i>
Araliaceae	Wild sarsaparilla	<i>Aralia nudicaulis</i>
Aristolochiaceae	Wild ginger	<i>Asarum canadense</i>
Asclepiadaceae	Milkweed	<i>Asclepias syriaca</i>
Betulaceae	Paper birch	<i>Betula papyrifera</i>
	Beaked hazel	<i>Corylus cornuta</i>
	Hop-hornbeam	<i>Ostrya virginiana</i>
Caprifoliaceae	Bush-honeysuckle	<i>Diervilla lonicera</i>
	High-bush cranberry	<i>Viburnum Opulus</i>
Ceratophyllaceae	Coontail	<i>Ceratophyllum demersum</i>
Compositae	Large-leaved aster	<i>Aster macrophyllus</i>
	White snakeroot	<i>Eupatorium rugosum</i>
	Goldenrod	<i>Solidago</i> sp.
Cornaceae	Round-leaved dogwood	<i>Cornus rugosa</i>
	Panicled dogwood	<i>Cornus racemosa</i>
	Red-osier dogwood	<i>Cornus stolonifera</i>
Cupressaceae	White cedar	<i>Thuja occidentalis</i>
Cyperaceae	Sedge	<i>Carex</i> sp.
	Spike rush	<i>Eleocharis</i> sp.
	Bulrush	<i>Scirpus</i> sp.
Fabaceae	Hog peanut	<i>Amphicarpa bracteata</i>
	White sweet clover	<i>Melilotus alba</i>
Fagaceae	Red oak	<i>Quercus borealis</i>
	Bur oak	<i>Quercus macrocarpa</i>
Gramineae	Bluejoint	<i>Calamagrostis canadensis</i>
	Common reed	<i>Phragmites communis</i>
	Wild rice	<i>Zizania aquatica</i>
Haloragaceae	Water milfoil	<i>Myriophyllum exalbescens</i>
Iridaceae	Blue flag	<i>Iris versicolor</i>
Lentibulariaceae	Bladderwort	<i>Utricularia vulgaris</i>
Najadaceae	Pondweed	<i>Potamogeton</i> sp.
Oleaceae	Black ash	<i>Fraxinus nigra</i>
	Green ash	<i>Fraxinus pennsylvanica</i>
Pinaceae	Balsam fir	<i>Abies balsamea</i>
	Tamarack	<i>Larix laricina</i>
	White spruce	<i>Picea glauca</i>
	Black spruce	<i>Picea mariana</i>
	Jack pine	<i>Pinus banksiana</i>
	Red pine	<i>Pinus resinosa</i>
	White pine	<i>Pinus strobus</i>
Polypodiaceae	Bracken fern	<i>Pteridium aquilinum</i>
Ranunculaceae	Marsh marigold	<i>Caltha palustris</i>
	Meadow rue	<i>Thalictrum dioicum</i>
Rosaceae	Chokecherry	<i>Prunus virginiana</i>
	Red raspberry	<i>Rubus strigosus</i>
	Juneberry	<i>Amelanchier</i> sp.
Rutaceae	Prickly ash	<i>Zanthoxylum americanum</i>
Salicaceae	Trembling aspen	<i>Populus tremuloides</i>
	Willow	<i>Salix</i> sp.
Scrophulariaceae	Common mullein	<i>Verbascum thapsus</i>
Tiliaceae	Basswood	<i>Tilia americana</i>
Typhaceae	Common cattail	<i>Typha latifolia</i>
Ulmaceae	American elm	<i>Ulmus americana</i>
Umbelliferae	Water-hemlock	<i>Cicuta bulbifera</i>

Appendix C. Vegetative composition of the Hubbel Pond WMA and proposed addition¹.

Type	Present WMA		Proposed Addition	
	Acres	Percent	Acres	Percent
Upland Deciduous				
Northern hardwood	640	18.6	46	57.5
Oak	614	17.8	3	3.8
Aspen	291	8.4	2	2.5
Upland brush	90	2.6	0	0
Upland Conifer				
Jack pine	13	0.4	0	0
Cover plantings	4	0.1	0	0
Mixed Deciduous-Coniferous	152	4.4	2	2.5
Grassland				
Old field	120	3.5	7	8.8
Grass-shrub	62	1.8	0	
Agricultural Field	324	9.4	14	18.7
Lowland Deciduous				
Lowland brush	210	6.1	4	5.0
Bottomland hardwoods	53	1.5	0	0
Lowland Conifer				
Spruce	1	T ²	0	0
Wetlands				
II-Temporary	143	4.1	1	1.2
III-Seasonal	593	17.2	0	0
IV-Semi-permanent	33	1.0	0	0
Open Water	107	3.1	0	0
TOTAL	3,450	100.0	80	100.0

¹ Areas calculated from Figure 2 with a Hewlett-Packard Digitizer

² T=trace

Appendix D. Regulations relating to the public use of wildlife management areas, Commissioner's Order No. 1961.

No use shall be made of any state-owned wildlife management area except in accordance with the following regulations:

Section 1. Entry and use.

- (a) Those parts of wildlife management areas posted "STATE GAME REFUGE — NO TRESPASSING" or "WILDLIFE SANCTUARY — NO TRESPASSING" shall not be entered except as authorized by an agent of the Commissioner.
- (b) No part of any wildlife management area may be entered or used during the hours 10:00 P.M. to 5:00 A.M. if so posted at the major access points.

Sec. 2. Hunting and trapping.

- (a) Protected wild animals may be taken on wildlife management areas by hunting or trapping during the established seasons therefore in the zones in which they are located unless the wildlife management area is specifically closed by Commissioner's Order. Upon request by an agent of the Commissioner, all persons shall report animals taken on wildlife management areas and submit them for inspection.
- (b) Unprotected wild animals may be taken on wildlife management areas from September 1 through the last day in February unless the wildlife management area is specifically closed by Commissioner's Order. Nuisance animals may be controlled under permit issued by a wildlife manager.

Sec. 3. Commercial fishing.

The taking of minnows and other live baits for commercial purposes may be allowed only under permit from the wildlife manager and only on wildlife management areas over 2000 acres in size.

Sec. 4. Watercraft.

Use of motorized watercraft is permitted only on the following Wildlife Management Areas except where posted otherwise by agents of the Commissioner:

- (a) In the Gores Wildlife Management Area (Mississippi River Pool 3, Dakota and Goodhue Counties) motorized watercraft may be used without limitation on size.
- (b) In the Lac Qui Parle Wildlife Management Area (Big Stone, Chippewa, Lac qui Parle, and Swift Counties) motorized watercraft may be used without limitation on size.
- (c) In the Mud-Goose Wildlife Management Area (Cass County) motorized watercraft powered by motors of 10 horsepower or less may be used except during the waterfowl season.
- (d) In the Orwell Wildlife Management Area (Ottertail County) motorized watercraft powered by motors of 10 horsepower or less may be used.
- (e) In the Roseau River Wildlife Management Area (Roseau County) motorized watercraft may be used in the main channel of the Roseau River. Motorized watercraft powered by motors of 10 horsepower or less may be used elsewhere on this management area during the waterfowl season only.
- (f) In the Talcot Lake Wildlife Management Area (Cottonwood and Murray Counties) motorized watercraft may be used on Talcot Lake except during the waterfowl season. Such watercraft are not permitted on the river and marshes.
- (g) In the Thief Lake Wildlife Management Area (Marshall County) motorized watercraft powered by motors of 10 horsepower or less may be used.

- (h) In the Walnut Lake Wildlife Management Area (Faribault County) motorized watercraft powered by motors of 10 horsepower or less may be used in that portion of the area known as South Walnut Lake.

Sec. 5. Vehicles

- (a) Regulations in this Section do not pertain to Federal, State or County highways or Township roads.
- (b) No person shall operate an all-terrain vehicle, hang glider, air boat, or hover craft in a wildlife management area. No person shall operate a snowmobile in any wildlife management area without the written permission of the wildlife manager in charge thereof in that part of the state lying south and west of a line described as follows: U.S. Highway No. 2 from East Grand Forks easterly to Bemidji; thence southerly along U.S. Highway No. 71 to Wadena; thence easterly along U.S. Highway No. 10 to Staples and U.S. Highway No. 210 to Carlton; thence east in a straight line to the easterly boundary of the state.
- (c) Motor vehicles may be operated on the following wildlife management areas, but not in excess of 20 mph. They may be operated only on established roads, and no vehicle may be driven beyond a sign prohibiting vehicular use or beyond any man-made vehicle barrier.
 - 1. Carlos Avery Wildlife Management Area (Anoka and Chisago Counties)
 - 2. Hubbel Pond Wildlife Management Area (Becker County)
 - 3. Mille Lacs Wildlife Management Area (Kanabec and Mille Lacs Counties)
 - 4. Red Lake Wildlife Management Area (Beltrami County)
 - 5. Roseau River Wildlife Management Area (Roseau County)
 - 6. Thief Lake Wildlife Management Area (Marshall County)
- (d) Vehicles are prohibited on all other wildlife management areas except they may be operated, not in excess of 20 mph, on those routes designated by signs as being for travel purposes.
- (e) No vehicle shall be parked where it obstructs travel.

Sec. 6. Aircraft.

Unauthorized use of aircraft below 1000 feet AGL (above ground level) over a wildlife management area is prohibited except in emergencies.

Sec. 7. Firearms and target shooting.

Target, trap, skeet, or promiscuous shooting is prohibited.

Sec. 8. Disorderly conduct.

Obnoxious behavior or other disorderly conduct is prohibited.

Sec. 9. Disposal of waste and abandonment of property.

Disposal or abandonment of garbage, trash, spoil, sludge, rocks, vehicles, or other debris or personal property on any wildlife management area is prohibited. Boats, decoys, and other equipment must not be left unattended overnight except traps on those wildlife areas open to trapping.

Sec. 10. Destruction or removal of property.

Signs, posts, fences, buildings, trees, shrubs, vines, plants, or other property may not be destroyed or removed except that marsh vegetation may be used to build blinds on the area, and edible and decorative portions of plants (except wild rice) may be picked for personal use. Wild rice may not be har-

Appendix D (continued)

vested unless the area is specifically opened by commissioner's order.

Sec. 11. Private property or structures.

No person shall construct or maintain any building, dock, fence, billboard, sign, or other structure on any wildlife management area, except that duck blinds may be erected but shall not become private property or be used to preempt hunting rights. It is unlawful to construct, occupy or use any elevated scaffold or other elevated device for the purpose of hunting, watching for or killing big game, except that portable tree stands may be used for this purpose provided they are removed each day at the close of hunting hours and do no permanent damage to trees in which they are placed.

Sec. 12. Private operations.

Soliciting business, agricultural cropping, beekeeping or conducting other commercial enterprises on any wildlife management area is prohibited except by lease agreement.

Sec. 13. Introduction of plants or animals.

Plant and animal life taken elsewhere shall not be released, placed, or transplanted on any wildlife management area except as approved by the wildlife manager.

Sec. 14. Animal trespass.

Livestock, horses, and other domestic animals, except dogs being used for hunting purposes, shall not be permitted on wildlife management areas except under cooperative agreement or permit prepared by the wildlife manager.

Sec. 15. Camping.

No person shall camp on any wildlife management area except by permit or in designated areas during the hunting season.

Sec. 16. Other compatible uses.

Wildlife management areas may be used for hiking, wildlife observation, sport fishing, and other wildlife-related uses provided such uses are not inconsistent with sections 1 through 15 of this order.

Sec. 17. These regulations do not apply to persons engaged in official Department of Natural Resources operations or research projects approved by the Department of Natural Resources.

Sec. 18. Commissioner's Order No. 1948 is hereby superseded.

