Recovery Plan

For The

EASTERN TIMBER WOLF

U.S. Fish and Wildlife Service

Twin Cities, Minnesota

RECOVERY PLAN
FOR THE

EASTERN TIMBER WOLF

Revised 1992

Original Recovery Plan Approved June 5, 1978

Prepared by the Eastern Timber Wolf Recovery Team

for

Region 3, U.S. Fish and Wildlife Service

Twin Cities, Minnesota

Approved: James C. Pitman

Regional Director, U.S. Fish and Wildlife Service

Date: JAN 31 1992

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SUMMARY

Current Status: The eastern timber wolf is a subspecies of the gray wolf and is listed as threatened in Minnesota and endangered throughout the remainder of its historic range in the eastern United States. A stable and growing population estimated at 1550 to 1750 wolves currently exists in Minnesota. Approximately 45 to 60 wolves comprise a second population in northern Wisconsin and the Upper Peninsula of Michigan. An additional thirteen or fourteen wolves are located in Isle Royale National Park, Michigan.

Habitat Requirements and Limiting Factors: This subspecies cannot survive over the long term without (1) large tracts of wild land with low human densities and minimal accessibility by humans, and (2) the availability of adequate wild prey, largely ungulates and beaver. Currently, it is believed that there exists sufficient suitable habitat in Minnesota, Wisconsin, and Michigan to achieve the recovery criteria.

Recovery Objective: Delisting.

Recovery Criteria: At least two viable populations within the 48 United States satisfying the following conditions must exist: (1) the Minnesota population must be stable or growing, and its continued survival be assured, and (2) a second population outside of Minnesota and Isle Royale must be re-established, having at least 100 wolves in late winter if located within 100 miles of the Minnesota wolf population, or having at least 200 wolves if located beyond that distance. These population levels must be maintained for five consecutive years before delisting can occur. A Wisconsin-Michigan population of 100 wolves is considered to be a viable second population, because continued immigration of Minnesota wolves will supplement it demographically and genetically for the foreseeable future.

Reclassification Criterion: The Wisconsin wolf population should be reclassified to threatened status when the late-winter Wisconsin population is maintained at 80 wolves for three consecutive years. Reclassifying Michigan wolves also may be considered at that time.

Summary of Major Changes in this Revision:

1. The Plan describes the characteristics of a "viable population" of wolves at two levels of geographic isolation from the Minnesota population. (These characteristics were absent from the original 1978 Plan, but were added to it in 1981.) The Plan also specifies that populations must exhibit these characteristics for at least five consecutive years to be considered viable.
2. A Wisconsin wolf population of 80 or more for three successive years will allow reclassification to "threatened" in Wisconsin, and possible reclassification in Michigan.
3. The importance of minimizing roads open to the public within wolf habitat is described and quantified in a "road density statement."
4. The Plan recommends changes to the wolf depredation control program in Minnesota to allow non-lethal control of depredating wolves in Zone 1, and more timely action at sites of repeated depredations in Zones 4 and 5.
5. Several changes to the Minnesota Wolf Management Zone boundaries are recommended to improve the original delineations. These recommendations stem from better information on habitat conditions and wolf numbers in portions of Zones 3, 4, and 5, and from the previous unwarranted inclusion of several communities and built-up areas within Zone 1.
6. Areas in the southern and central Appalachian Mountains are no longer being considered for future eastern timber wolf reintroduction.
7. The list of factors that are critical threats to the long-term survival of the eastern timber wolf has been expanded to include diseases and parasites.

Summary of Major Actions Needed:

1. Increase public education programs on wolf restoration.
2. Monitor wolf populations, habitat conditions, and prey base.
3. Maintain suitable habitat conditions and prey populations throughout recovery areas.
4. Provide concerted law enforcement activities.
5. Minimize losses of domestic animals due to wolf predation.
6. Evaluate need and feasibility of restoring wolves to Maine-New Hampshire and/or New York.

Total Estimated Cost of Recovery: $13,500,000

Estimated Date of Recovery: 2005

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INTRODUCTION

The eastern timber wolf (*Canis lupus lycaon*) of eastern North America is one of 32 subspecies or geographic races of the gray wolf, 24 of which originally inhabited North America (Mech 1970). An increasing number of taxonomists believe that too many subspecies of North American wolves are recognized, and that the present number should be reduced (Rausch 1953, Jolicoeur 1959, Kelsall 1968, Mech 1974a, Nowak 1983). Nevertheless, the latest published taxonomic revisions still recognize the eastern timber wolf as a separate subspecies.

Originally, the eastern timber wolf occurred throughout most of the eastern United States and southeastern Canada (Appendix 1). At present, the United States population remains only in Minnesota, Michigan and Wisconsin, comprising about three percent of its original range. The subspecies is still relatively common throughout most of its original Canadian range. In 1967 the eastern timber wolf was listed by the U.S. Secretary of the Interior as "endangered" in the United States. The Superior National Forest of Minnesota was closed to the taking of wolves in 1970, and in August 1974 the subspecies was legally protected by the Federal Endangered Species Act of 1973 (Public Law 93-205). Wolves had been protected by State law in Michigan since 1965 and in Wisconsin since 1957. Minnesota outlawed taking in 1974. In April 1978 the U.S. Fish and Wildlife Service (FWS) reclassified the eastern timber wolf in Minnesota as "threatened," and in 1985 the U.S. Court of Appeals upheld a lower court's decision outlawing the public harvest of wolves in Minnesota and reaffirming the FWS's responsibility for managing the subspecies.

Wolf Biology and Life History

The following information about the eastern timber wolf was largely condensed from Mech (1970, 1974a), Rothman and Mech (1979), Fritts and Mech (1981), and Fuller (1989).

Eastern timber wolves generally weigh 50 to 100 pounds (23 to 46 kg.) as adults, with males generally heavier than females. They are usually a mixed gray, but a small percentage are black or white (Mech and Frenzel 1971). Most wolves live in family groups or packs consisting of two to eight members, although packs of up to 21 have been reported.

Each pack inhabits an area of 20 to 214 square miles (51 to 555 km^2) or more and tends to be territorial. There is a dominance hierarchy within each pack, and generally only the top ranking male and female breed, although there are exceptions (Packard et al. 1983). Pups are produced from early April through early May, and under good conditions litter sizes average four to seven (Mech 1970, Fuller 1989). Some offspring

remain with the pack, and others leave the territory as they mature. These independent animals become lone wolves and either live nomadically over areas of 1,000 square miles (2,500 km^2) or more, or disperse out of the area, sometimesmoving more than 500 miles (800 km) (Fritts 1983). If they find a member of the opposite sex and suitable range that is not occupied by other wolves, they may settle into a territory, mate, and begin their own pack.

Generally the prey of eastern timber wolves consists of white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*),and beaver (*Castor canadensis*), but wolves will also take domestic animals including dogs, sheep and cattle (Appendix II). Several studies indicate that generally the old, sick, weak, or disabled prey are most vulnerable to wolf predation. Generally, wolves are not instrumental in causing prey declines. However, in a portion of Minnesota the wolf has been implicated in accentuating a deer decline that apparently began as a result of deteriorating habitat and a series of hard winters (Mech 1977a, Mech and Karns 1977). By 1989, however, this deer herd was well on the way to recovery (Nelson and Mech 1986, and Mech, unpublished data).

Some humans resent the wolf's predation on livestock and big game and persecute wolves because of it, despite State and Federal protective laws (Weise et al. 1975). However, most citizens of Michigan (Hook and Robinson 1982, Kellert 1990) and Minnesota (Kellert 1985, 1986) —including hunters, trappers, and farmers—hold a positive attitude toward wolves and consider them a valuable asset. Nevertheless, according to Kellert's (1986) survey conducted in 1984, more than 30% of Minnesota farmers, hunters and trappers, and 26% of northern county respondents indicated they might shoot a wolf even though it would be illegal.

Wolves kill livestock in Minnesota each year, primarily in Zones 4 and 5 (Appendix III). Although these depredations may bring hardships to a few individual ranchers, on the average such losses are low. Approximately five cattle are claimed lost per 10,000, and approximately twelve sheep per 10,000, in wolf range per year (Fritts 1982). From 1979 through 1991, the total number of farmers that sustained verified wolf depredations on livestock has varied from 9 to 55 per year which is an average of 27 farms per year. The Minnesota Department of Agriculture has paid compensation for livestock killed by wolves averaging $26,762 per year (Appendix II). The FWS conducted a highly directed wolf control program from 1979 to 1985, and in 1986, the program was transferred to the United States Department of Agriculture's Animal and Plant Health Inspection Service, Animal Damage Control Program (ADC). Some 6 to 42 wolves were killed in the control program during the period from 1979 through 1985, with an average of 26 wolves killed per year. Since that period the numbers of depredation complaints, verified complaints, and wolves killed have increased significantly. The number of wolves killed has increased annually, from 31 in 1986 to 91 in 1990, followed by a decrease to 54 in 1991. This is an average of 60 during this period. In these same six years the number of farms experiencing verified livestock losses to wolves has varied from 25 to 55, and averaged 38 per year. An average of two dogs were verified as having been killed by wolves annually from 1986 through 1988;

the average decreased to ten dogs for the years 1989 through 1991 (Paul 1992, in Appendix II).

It is interesting to note that since 1974, after total legal protection (except for wolves taken illegally and those killed for livestock-depredation control), wolf depredations on livestock only began significantly increasing about 1988 (Fritts et al. in press). Generally, year-to-year depredations seemto be primarily a function of winter weather conditions. The milder a winter, the greater the amount of wolf depredations on livestock the following summer. This may indicate that wolves take livestock as secondary prey when deer fawns, their primary summer prey, are less vulnerable due to better prenatal nutrition (Mech et al. 1986b, Fritts et al. in press).

According to Goldman (1944), the reduction of the eastern timber wolf population in the United States was caused by: (1) intensive human settlement of the land, (2) direct conflict with domestic livestock, (3) a lack of understanding about the animal's ecology and habits, (4) fears and superstitions about the animal, and (5) overzealous control programs designed to exterminate it, and (6) perceived competition for deer and moose.

Now that the wolf's range has been reduced, parasites and diseases may become more significant mortality factors. This is especially true of heartworm (*Dirofilaria immitis*), canine parvovirus (CPV), and Lyme disease, which are new to the eastern timber wolf. Heartworm has gradually spread northward, probably via southern dogs brought to northern dog trials, and has been found in three Minnesota wolves (Mech and Fritts 1987, and Mech, unpublished). CPV is a new disease infecting Minnesota and Wisconsin wolves and can be fatal (Mech et al. 1986, Goyal et al. 1986). In addition, serological evidence of Lyme disease has been found in Minnesota wolves (Thieking et al. 1991) and Isle Royale wolves (Peterson unpublished data). At present, not enough is known about any of these conditions to predict their effects on wolf populations, but conceivably they could become important. Recent evidence from Minnesota indicates that over half of the variation in annual pup production and a third of the variation in wolf population change in the Superior National Forest is attributable to CPV (Mech and Goyal, in prep.). These findings imply that CPV could be important in limiting isolated or disjunct wolf populations such as those in Wisconsin and Michigan.

Hybridization

Genetic analyses of 86 wolves from Minnesota indicate that more than half of the population have mitochondrial DNA (mtDNA) derived from coyotes (Lehman et al. 1991). Because mtDNA is inherited only matrilineally, this situation could only have resulted from male wolves having crossed with female coyotes an unknown number of years ago and the matrilineal offspring having survived to the present. The data also indicate that the sample of Minnesota specimens resulted from at least two hybridizations.

Mitochondrial DNA is believed to only affect the function of mitochondria, and unlike genes in the nucleus, apparently has no effect on the morphology or behavior of individuals. Mitochondrial DNA gene flow can occur in the near absence of nuclear gene flow, and preliminary analyses of nuclear DNA from the wolves with coyote mtDNA indicate no substantial difference between wolves with coyote mtDNA and those with wolf mtDNA (R. K. Wayne, pers. comm.). However, the presence of coyote-derived mtDNA in wolves does show that hybridization between the two species did take place. Furthermore, skull characteristics of canids found in eastern Ontario in the early 1970's indicated such hybridization, presumably to a much greater degree, has taken place there, as well (Kolenosky and Standfield, 1975).

Due to changes in habitat, human habitation patterns and development, populations of wolves may become increasingly disjunct. This tendency may increase chances for wolf-coyote contact and thus hybridization. Although there appears to be no such problem in Minnesota, Wisconsin, or Michigan at present, authorities must be alert to detect any hybridization that may take place, and to evaluate its significance to wolf recovery efforts. While hybridization does pose some threat to the integrity of wolf populations, research to date indicates that it has not been a common occurrence within the United States and is not a significant problem at this time.

Present Range and Population

At present, the eastern timber wolf in the United States is restricted to the northwestern corner of its original range, an area contiguous to the Canadian population and one of short growing season, rocky outcrops, muskeg, infertile soil, and low human density. The value of much of the wolf's present range for livestock production varies from zero to moderately good. Within this region, the approximate number of wolves remaining in specific areas correlates well with the low density of humans in those areas (Weise et al. 1975).

In the Upper Peninsula of Michigan Hendrickson et al. (1975) estimated the presence of at least six wolves during the early 1970's and postulated that the existence of wolves was due to sporadic breeding and immigration of wolves from Minnesota and Ontario. A total of 16 wolves were recovered in the Upper Peninsula between 1960 and 1986 (Thiel and Hammel 1988). All of the nine wolf carcasses recovered in Upper Michigan between 1967 and 1980 were found in counties adjacent to Ontario or Wisconsin, and seven of the nine were males (Thiel, unpublished data). During 1990 there were an estimated six wolves in Michigan's Upper Peninsula. In Isle Royale National Park, Lake Superior, 12-50 wolves have inhabited about 210 square miles since 1949, with the population estimated at 14 wolves in 1991 (R.O. Peterson, pers. comm.).

In Wisconsin four to six breeding packs of wolves are located in the northwest along the Minnesota border, and six to eight breeding packs exist in the north-central part of

the State. Additionally, small numbers of lone wolves inhabit northeastern Wisconsin adjacent to Michigan. Known wolf numbers in Wisconsin have fluctuated between 15 and 40 in recent years and in 1991 were estimated at a minimum of 40 wolves in 12 packs (Wydeven 1991).

Northern Minnesota, being contiguous with the Canadian population, harbors the most wolves, but the wolf distribution there is complex. When the eastern timber wolf was placed on the Federal endangered species list, little was known about the status of the animal in Minnesota. In 1955 the wolf's range in Minnesota included 12,000 square miles (30,720 km^2), andthere were an estimated 300 to 400 wolves on 7,000 square miles (17,900 km^2) of the major wolf range (Stenlund 1955). Cahalane (1964) estimated that 350 to 700 individuals inhabited Minnesota in 1964, and their numbers were considered to be stable or decreasing. Since that time intensive research has been conducted on the wolf in that State, and a clearer picture of the animal's status and ecology there has emerged (Mech and Frenzel 1971; Mech 1972, 1973, 1974b, 1975, 1986; Van Ballenberghe and Mech 1975; Van Ballenberghe et al. 1975; Seal et al. 1975; Fritts and Mech 1981; Berg and Kuehn 1982; Fuller 1989).

Two northeast areas of primary wolf range have been delineated in Minnesota, including Zone 1, comprised of 4,462 square miles (11,423 km^2), and Zone 2, comprised of 1,864 square miles (4,772 km^2); one northwest area of primary range, Zone 3 comprising 3,501 square miles (8,963 km^2); and one area of peripheral range, Zone 4 comprising 20,901 square miles (53,507 km^2 (Appendix III). A more precise analysis indicates a total range of 23,398 square miles (59,900 km^2) occupied by breeding packs of wolves (Mech et al. 1988a). In 1978 the Secretary of the Department of Interior designated Zones 1, 2, and 3 as critical habitat under the Endangered Species Act.

The northeast part of the primary wolf range, which includes most of the Superior National Forest (SNF) and its officially designated wilderness, the Boundary Waters Canoe Area Wilderness (BWCAW), appeared to be supporting as many wolves as it could in 1971-72. At that time it contained an estimated 400 wolves, or one wolf per 10 square miles (26 km^2) (Mech 1973). Since then, however, the wolf population in the 800 square-mile (2,000-km^2) intensive sampling area of the Forest declined to about one wolf per 15 square miles (38 km^2) in 1984-85 (Mech 1986), due to a drastic decline in numbers of deer (Mech and Karns 1977), although by 1989 both deer and wolves were increasing again (Mech unpublished data). Indications are that the number of wolves in the rest of the Forest has fluctuated similarly, although not necessarily to the same degree.

In the northwest section of primary range wolf numbers had been low but increased after 1974, probably as a result of the legal protection afforded by the Endangered Species Act of 1973. In spring 1977 there was an estimated one wolf per 13 square miles (33 km^2) in a 1,000 square-mile (2,600 km^2) census area (Fritts and Mech

1981). Prey populations appear to be adequate there to support more wolves, and wolf numbers increased in the late 1970's (S. H. Fritts, unpublished data).

The peripheral range generally lies south of the primary range, includes a much higher density of roads, farms, and other human activities and constructions, and is highly accessible. There are few, if any, areas in the peripheral range that are not within 3 miles (5 km) of developed roads. The mean density of wolves in the peripheral range is lower, and the population is more variable than in the primary range (Berg and Kuehn 1982; Fuller 1988; Berg 1986; Fritts, unpublished data).

Because of the more settled nature of the peripheral range and the potential for wolf-human conflicts there, attempts to maximize wolf numbers should be restricted to the primary range, and wolf populations in theperipheral range should be held to an average of one wolf per 50 square miles (128 km^2).

The variable and dynamic nature of wolf densities throughout various parts of northern Minnesota makes it difficult to arrive at an accurate statewide estimate of wolf numbers. In 1976 Mech (1976) estimated that there were 1,000 to 1,200 wolves in Minnesota, and in 1979 Berg and Kuehn (1982) estimated 1,235. These numbers are greater than the estimate of 500 to 1,000 made by Mech and Rausch (1975), but the new estimates were based on considerably more data than were available to those authors when their estimate was derived in 1973. By 1989 the statewide wolf population had increased to an estimated 1,550 to 1,750 animals (Fuller et al. in press).

Just south and west of the peripheral wolf range is an area of greater accessibility and human density, including a high proportion of intensively farmed areas (Zone 5). Wolves dispersing from either the primary or the peripheral range find their way into this farming country, and many of them are killed. By 1989, wolf populations had begun to colonize this zone (Fuller et al. in press).

Range Restrictions

Apparently the illegal and/or accidental human kill of wolves has minimized their increase in Michigan and Wisconsin (Henrickson et a 1975, Weise et al. 1975, Robinson and Smith 1977, Thiel 1985) and in the agricultural and highly settled regions of Minnesota. Such exploitation, along with government depredation-control, probably also slows saturation of the peripheral range and any increase in Minnesota. Through 1965, when records were available in Minnesota, an average of about 190 wolves per year were bountied there, and for many years an additional 50 to 60 were taken annually by State DNR employees. From 1965 when the bounty was removed,

through August 1974[1], a comparable number of animals are thought to have been taken each year. From 1974 through 1977, wolves were not killed by the state or Federal government, but from 1978 through 1991, 6 to 91 were destroyed annually by the Federal government (Fritts 1982, Fritts et al. in press, Paul 1992).

Despite an annual kill of perhaps 20 to 30 percent of the estimated number of wolves in Minnesota in earlier years, there was no noticeable decline in the statewide population. This should not be surprising, because it has been demonstrated that annual mortality of 28 percent (Fuller 1989, Keith 1983, Peterson et al. 1984) to 50 percent (Mech 1970:64, Ballard and Stephenson 1982, Ballard et al. 1987) can be sustained by healthy, productive wolf populations. Conversely, the breeding potential of wolf populations with adequate prey is such that without mortality the population could double each year.

On the other hand, total legal protection of the wolf since 1974 has not led to a massive increase in wolves in non-forested areas as some people had feared. From 1974 through about 1978 there has been evidence of a repopulation of semi-wilderness areas adjacent to existing wolf populations, both in Zone 4 of Minnesota and in Wisconsin. In addition, during the last ten years some wolves have repopulated brushy agricultural areas in the north end of Zone 5. While their numbers have been reduced through depredation control activities, livestock depredation problems are still occurring there, indicating that depredation control activities or other wolf population reduction measures may need to be increased and/or initiated in this area.

Conceivably, illegal taking of wolves in accessible areas could be preventing repopulation of such areas. However, it is also possible that dispersing wolves from forested wilderness areas might tend to shun more open, settled areas. Then, if the few that do venture there are killed, this could explain the lack of further repopulation in many such areas despite total protection.

Critical Factors

Five main factors are critical to the long-term survival of the eastern timber wolf: (1) large tracts of wild land with low human densities and minimal accessibility by humans, (2) ecologically sound management, (3) availability of adequate wild prey, (4) adequate understanding of wolf ecology and management, and (5) maintenance of populations that are either free of, or resistant to, parasites and diseases new to wolves or are large enough to successfully contend with their adverse effects.

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[1] Exact figures are not available, but these estimates were developed using the numbers of wolves killed in the Minnesota animal damage control program that replaced the bounty.

Development has multiple effects on wolves: (1) increased human presence increases the chance of direct killing of wolves, (2) although undocumented, unnatural structures, sounds, and smells might deter wolves from inhabiting an area, (3) artificial corridors such as paved roads, powerlines, fences along interstate highways and railroads may prevent or minimize dispersal (Mech, unpublished data; Thiel, unpublished data), (4) increased human presence increases chances of introducing new diseases and parasites to wolves via pets (Mech and Fritts 1987), and (5) reduced prey species abundance and diversity reduce wolf food supply.

Human Density and Accessibility
(Road Density Statement)

No where in the United States is there an area where the eastern timber wolf will not be affected by human activity. Because of the diversity of human attitudes, there will always be differences of opinion about the wolf (Kellert 1986). Wherever people reside in wolf country, they will have domestic livestock and/or pets that may be subject to wolf attack. Thus, the combination of the other four critical factors listed above becomes highly important.

In the long run, public education about the wolf, and the preservation of large tracts of wild land with low human densities and minimal accessibility will best help preserve the wolf.

Human activity and exploitation (legal and illegal) of wildlife increases with accessibility (Holbrook and Vaughan 1985, Van Dyke et al. 1986). This is especially true of wolves, which are strongly affected by roads in the following ways: (1) direct mortality via vehicles, (2) allowing access by hunters and trappers, some of whom deliberately and/or accidentally kill wolves, and (3) in the case of major highways, barriers to dispersal.

Studies in Wisconsin, Michigan, Ontario, and Minnesota indicate that wolf populations usually fail to sustain themselves in areas where rural roads open to the public have densities exceeding 0.93 linear miles of road per square mile of land (0.56 km/km^2) (Thiel 1985, Jensen et al. 1986; Mech et al. 1988a). Wolf populations in the upper Great Lakes region are generally restricted to large blocks of land which are below this critical road density threshold (Thiel 1985; Jensen et al. 1986; Mech et al. 1988a). However, where areas of public road densities as high as 1.2 mile per square mile (0.72 km/km^2) or higher occur adjacent to large roadless regions inhabited by wolves, such as in the Superior National Forest and near the Chippewa National Forest of Minnesota, these higher road density areas can support wolves under some conditions (Mech 1989; Fuller, unpublished data). Nevertheless, the desired future state is to manage average public road densities so as not to exceed 1 mile per square mile (0.6 km/km^2) in the designated recovery areas in Michigan and Wisconsin, and in parts of Minnesota where road density is limiting wolf recovery.

To be effective, low densities of roads open to the public must be maintained over sufficiently large areas to allow wolves to meet their biological needs free from adverse human disturbance. Logically, the smallest area to be maintained below threshold would be the amount of land required to sustain the needs of a pack, the basic breeding unit of every wolf population. In Minnesota and Wisconsin wolf pack territories range from 20 to 214 square miles (50 to 555 km^2) (Mech 1973; Fritts and Mech 1981; Berg and Kuehn 1982; Fuller 1989; Thiel, unpublished data). Territories tend to be larger in some colonizing populations (Fritts and Mech 1981).

However, a single pack does not constitute a minimum viable population. Although the concept of minimum viable population is still evolving, clearly it would require far more than one family of wolves to reach any such population. Providing for a genetically healthy, self-sustaining population of wolves will require that much larger areas be maintained at below threshold road density levels. Mech (in Henshaw 1979:430) and Soule (1980:163) estimated that a minimum of 4,000 to 5,000 square miles (10,360 to 12,950 km^2) would be necessary to support a viable population of wolves (See also p. 23). Where below-threshold regions of this magnitude do not exist, management should be directed at maintaining below-threshold conditions in areas of at least 100 square miles (256 km^2) which could contain at least two adjacent wolf packs.

Although the actual public road density threshold for healthy, self-sustaining wolf populations is still unknown and probably varies depending on conditions, two principles for guiding road development can be given. These principles are based on known effects of roads on wolves: (1) themore access provided to wolf range, the more detriment there will be to wolves, (2) the higher grade (i.e. standard) the road is, the more access it will provide.

Based on these guidelines, governmental units seeking to promote wolf conservation should minimize road development and road upgrading. Of greatest importance is the minimizing of new roads. The difference between a new road and any type of existing road is far greater than the difference between one grade of road and another. Significant increases in road quality standards, while not necessarily increasing overall road densities per se, may have a similar affect.

There are many pertinent variables which should be considered in evaluating the existing or proposed road density in a given area as it pertains to wolves. These factors include:

Distribution of roads. Where the roads are located in a given area may affect habitat use by wolf prey. Consideration should also be given to road location in relation to wolf dens and rendezvous sites. The layout of roads in a management unit may also influence wolf movements.

Risk of the expected human use of roads. An open, low-standard woods road may have greater potential human impact on wolves than a national forest highway.

Lightly travelled woods roads could have high risk to wolves if they are travelled primarily by people seeking to trap or shoot coyotes or wolves.

Road design factors influencing human use of roads. The types of vehicle use on the road, whether logging truck, automobile, 3-wheeled vehicles or snowmobile, all constitute a different potential threat by humans to wolves. The risk to wolves differs with each road. The location of the existing road, or of the road to be constructed in relation to habitat types more-or-less utilized by wolves, are factors which may be very relevant in the evaluation of roads and their impact on wolves.

Road management. The maintenance of an open road and the seasonal closure are important considerations in increasing or decreasing human access into an area. Road management may differ from road to road or area to area depending on the risk to wolves.

Integration of many of these road variables in a land-use plan is the key to effectively providing for wolf recovery. Biologists and land-management personnel must consider the environmental variables affecting wolf numbers in a given area along with the variables of road design and use to accurately prescribe a suitable road-management program. This type of evaluation and the recognition that access provides risk to wolves through human activities is necessary for wolf recovery.

Road Management Guidelines: Within designated critical habitat, or areas of potential habitat needed to achieve recovery plan objectives, the following road management guidelines should be considered by landowners and land management agencies:

1. Ensure that the average density of roads *open to public vehicles* does not exceed 1 mile per square mile (0.6 km/km^2) in sufficiently large areas to allow wolves to meet their biological needs in suitable wolf habitat. The types of roads important in this regard are permanent roads requiring routine maintenance that are accessible year-round by 2-wheel-drive vehicles. Included are the following: Primary, Secondary, Arterial, Collector, Local All Weather, Federal-State-County Highways, Bituminous Concrete, Soil Aggregate, Graded and Drained, and/or U.S. Forest Service Traffic Service Levels, A, B, and C (USDA Forest Service, 1986 and undated).
2. Review management plans and existing road systems for opportunities to close or revegetate roads that are not needed for public use.
3. Close temporary and low standard roads as soon as their intended purpose has been achieved.
4. On Federal, State, industrial, and private lands, consider wolf habitat requirements. Identify areas of suitable habitat where road densities can be managed to achieve recovery objectives. Recognize these in current and future land management plans.

Ecologically Sound Management

Ecologically sound management includes (1) protection where needed to help restore the eastern timber wolf to areas of its original range and to preserve a naturally functioning population that can serve as a living museum, as a scientific subject, and as a reservoir to repopulate adjacent areas; (2) depredation control where wolves are killing domestic animals; (3) restocking of wolves into suitable areas of their former range, when feasible; (4) continued research and monitoring of wolf populations; and (5) provision of adequate prey diversity and numbers through habitat and population management and reintroductions where appropriate.

The FWS recommends that in Michigan and Wisconsin, and in Zone 1, 2, 3, and 4 of Minnesota (Appendix III), strict protection should be afforded the wolf. Legal protection, however, is only as effective as the public acceptance of laws and regulations needed for wolf management, and the degree of law enforcement devoted to it. Law enforcement is especially needed during fall and winter hunting and trapping seasons, generally September through March. Besides more rigorous and timely enforcement of the laws actually protecting the wolf, additional enforcement is also necessary to insure that vehicles, including off-road vehicles, be kept off roads restricted against their use. Even the regular presence of law enforcement agents in wolf areas is a valuable deterrent to violations.

In all Minnesota Wolf Management Zones, however, government wolf depredation control should be applied in documented cases of depredations on livestock and pets where there is a likelihood that additional depredations will occur. Because livestock raising in the primary range (Zones 1, 2, and 3) is minimal, little taking of wolves there isanticipated. Zone 5 is not suitable for wolves. Wolves found there should be eliminated by any legal means.

The need for a possible exception to the policy of complete protection in Minnesota Zones 2 and 3 (except for livestock-depredation control) activities, is recognized, however. During a series of severe winters a wolf population can contribute strongly to the depletion of local deer herds (Mech and Karns 1977), and then itself be forced to decrease (Mech 1977b, 1986). Therefore, to help ensure that deer populations, and thus wolf numbers, remain high, the FWS believes that if over any 3-year period deer numbers decline below those necessary to support one wolf per 10 square miles (26 km^2) in Zones 2 or 3 consideration should be given to artificially reducing wolf numbers there until the deer herd recovers. Such reduction of wolves is not currently legal, but under such conditions this measure might be biologically appropriate. The possibility that deer numbers might drop because of habitat changes or weather conditions, and corrective action must be taken in the form of controlling or reducing wolf numbers, should be considered.

The same principle could also be applied to Zone 1. However, the FWS believes that the value of this Zone for allowing wolf numbers to fluctuate naturally outweighs the

advantage of trying to maintain wolves there at maximum densities. The only wolf control permitted in Zone 1 should be livetrapping and translocation of wolves following verified incidents of depredation on lawfully present domestic animals.

Wild Prey

The wolf is dependent upon a continual supply of deer, moose and beaver. Thus, one of the most important aspects of this plan is to maintain habitat in a high carrying capacity for prey. The most feasible method of doing this is through commercial and noncommercial timber sales and habitat improvement projects for these species. Such programs require temporary roads, but these can later be obliterated or gated. In protected areas such as Voyageurs National Park or the Boundary Waters Canoe Area where timber sales are prohibited or restricted the prescribed use of fire may produce the mosaic of habitats necessary for a diversity of prey species.

Good deer habitat consists of a high percentage of early forest successional types, especially shade-intolerant species, plus a scattering of forest openings on primarily summer range. Winter range requires adequate shelter with good overhead crown cover. White cedar is best, hemlock is good, and balsam fir is fair. To maintain high density deer herds this winter range should have adequate and suitable browse species intermixed with the cover or along edges.

This plan proposes the use of forest cuttings and prescribed burning to periodically set back forest succession to improve deer and moose habitat. Much of this can be done through commercial cutting developed from sound silvicultural and wildlife management prescriptions. Where commercial sales are not possible subsidized cutting may be called for. These subsidized cuttings and the costs of prescribed burning may be high, butbesides helping the wolf and its prey, such improvements will benefit many other species of wildlife as well as consumptive and non-consumptive users of wildlife. Wildlife managers and foresters must work together in carrying out these practices.

Timber harvesting is compatible with the achieving of wolf population objectives and can be done while following road density guidelines. In areas where wolf numbers are limited because of high road density any new roads required for habitat management or timber harvest should be closed when the management or harvest is completed to comply with road management guidelines. Alternatively, new roads could be left open to the public while adjacent older roads are closed to achieve the same road density goals.

It is also possible that under extreme circumstances, such as a series of severe winters, it may be biologically sound to temporarily reduce or prohibit harvesting of various prey species. Members of the Recovery Team have detected local public sentiment in favor of this approach as applied to deer, beaver, and moose. The intent of this sentiment was not to benefit the wolf but rather to help increase the numbers of

the herbivores, and ultimately to benefit the humans that harvest them. However, restricted harvesting when prey numbers are below the carrying capacity of their range would also help benefit the wolf.

To bolster the prey base of the Minnesota wolf population, the FWS recommends considering re-establishment of the woodland caribou (*Rangifer tarandus*) as an alternate prey species. A remnant caribou herd inhabited Minnesota as recently as 1937 (Moyle 1965), and a large amount of bog habitat similar to that in which the last herds lived is still present throughout much of northern Minnesota. With one more species of potential prey in various local areas, the Minnesota wolf population would be less subject to decline if other prey species decreased. Of special interest as caribou habitat is the Little Saganaga Lake area of the Superior National Forest. Voyageurs National Park is also currently conducting a caribou habitat suitability assessment for the Park area. If a caribou re-establishment program is undertaken some local wolf control might be necessary in early years to foster the effort.

Public Education

Because of the degree of misunderstanding about wolf ecology, population dynamics, and management, the Recovery Plan in 1975 recommended concerted efforts at public information and education.

Since then much popular attention has been given the wolf via magazines, newspapers, radio, and television. In addition, the Science Museum of Minnesota developed the 8,000 square-foot "Wolves and Humans" exhibit which was displayed in St. Paul, Yellowstone Park, Boise, Boston, New York City, Fort Worth, Washington, Miami, Ottawa, St. Louis, Green Bay, Seattle, Bozeman, Davis, Vancouver, and Albuquerque, and has so far been viewed by about two million people. The exhibit will return to Minnesota, and it will be housed permanently in an International Wolf Center proposed to openin Ely in May of 1993. The Center was designed specifically for the exhibit and for a variety of other wolf education activities.

Nevertheless, as surveys by Kellert (1986, 1990) indicate, considerable misinformation still exists among several segments of the Minnesota and Michigan population. Thus, concerted information and education are still strongly needed.

Parasites and Diseases

As stated earlier, in recent years a number of new diseases and parasites have been clearly documented as occurring in wolf populations in Minnesota, Wisconsin, and Michigan. Heartworm, CPV, and Lyme disease each have the potential to become limiting factors acting upon survival, reproduction, and dispersal of large numbers of wolves, and thus may determine the fate of isolated wolf populations. Wolf

populations will be able to survive only if they are somehow able to contend with these new threats.

Part II: RECOVERY

Objective

The primary objective of the Recovery Plan for the Eastern Timber Wolf is to maintain and reestablish viable populations of the eastern timber wolf in as much of its former range as is feasible.

Recovery of the eastern timber wolf will be achieved when the following two criteria are met (see also page 25): (1) the survival of the wolf in Minnesota is assured, and (2) at least one viable population (as defined below) of eastern timber wolves outside Minnesota and Isle Royale in the contiguous 48 states of the USA is re-established.

When condition 1 is met and there are 80 wolves (based upon late winter counts) in Wisconsin for a minimum of three consecutive years, the eastern timber wolf should be downlisted to threatened in Wisconsin. At that time consideration may also be given to the downlisting of the Michigan wolf population.

Background

The Plan's basic approach to eastern timber wolf recovery is, and has always been, to try to ensure that there be at least two viable populations of wolves within the historic range in the United States. The requirement for more than a single recovery population stems from the basic concept of conservation biology that a species can never be assumed to be secure from extinction if only a single population exists. The possibility of disease, loss of prey species, catastrophic habitat modifications, etc., adversely impacting a single population must be recognized and minimized during recovery planning. The only satisfactory means of reducing the threat ofextinction from an unexpected catastrophe is to ensure that more than a single population is established prior to declaring the species recovered. U.S. Fish and Wildlife Service recovery plans, in general, require multiple secure and viable populations prior to consideration of delisting.

The Eastern Timber Wolf Recovery Team has always recognized that the Minnesota population represents a viable population. In fact, the Team's earliest action was to recommend the downlisting of the Minnesota wolf population from endangered to threatened, which was accomplished in 1978. The Recovery Team would like to have several wolf populations prior to recommending delisting, but settled on two as the minimal acceptable number.

From a conservation biology standpoint, ideal multiple recovery populations should: (1) be completely separated from each other so as to eliminate the possibility of

transmission of disease, parasites, etc., from one population to the other, thereby potentially transferring a catastrophe, and (2) be close enough to allow a low level of exchange of genes between them so as to maintain maximum genetic diversity in all populations if they are very small.

These two ideal characteristics are frequently incompatible, and compromises usually are necessary to arrive at realistic locations for establishing multiple recovery populations. These compromises adopt three approaches:

1. Establish completely separate, but small, recovery populations, and supplement their genetic diversity by transplanting animals from one to another at appropriate intervals;
2. Establish completely separate, but larger, recovery populations with sufficient founders so that genetic diversity is likely to be maintained without immigration;
3. Foster the establishment of small, but nearby, semi-isolated populations that can experience natural immigration of individuals and their genetic material.

Although the 1978 Recovery Plan specifies the need for two viable populations (including the Minnesota population) it did not specify the characteristics of the second population. In 1981 (letter from Ralph E. Bailey, Eastern Timber Wolf Recovery Team Leader, to Harvey K. Nelson, Regional Director, U.S. Fish and Wildlife Service, Twin Cities, Minnesota, dated September 15, 1981; memorandum from Assistant Regional Director (SE) to holders of the Eastern Timber Wolf Recovery Plan, dated October 19, 1981) the Eastern Timber Wolf Recovery Team clarified this. It recommended adopting either of the latter two approaches listed above by characterizing "viable population" in two different ways: (1) A population of at least 200 wolves established at a distance greater than 200 miles from the Minnesota population (e.g. northern New York or northern Maine) is believed to be large enough to be viable, as well as to have sufficient genetic diversity, to exist indefinitely in total isolation from any other wolfpopulation. (2) A smaller population (greater that 100 wolves) in Wisconsin/Michigan, closely tied to the Minnesota population will be able to remain viable, and by occasional immigration of Minnesota wolves, will retain sufficient genetic diversity to cope with environmental fluctuations. Because the immigration corridor between the Minnesota and Wisconsin/Michigan populations is narrow, the team believes the threat of disease transmission is at an acceptably low level for this second situation.

Viable Population

A viable population of eastern timber wolves outside of Minnesota must meet one of the following two descriptions, based upon late winter counts:

1. An isolated eastern timber wolf population in the United States must average at least one wolf per 50 square miles (a self-sustaining population of at least 200 wolves) distributed within a minimum area of at least 10,000 contiguous

square miles (25,600 km^2) of suitable habitat over a period of five successive years, or

2. An eastern timber wolf population in the United States, located within 100 miles (160 km) of a self-sustaining wolf population (as described in item 1), must average at least one wolf per 50 square miles (128 km^2) or consists of 100 wolves distributed within an area of at least 5,000 contiguous square miles (12,800 km^2) of suitable habitat over a period of five consecutive years. These 100 wolves do not have to be evenly distributed.

A number of factors are considered essential to maintain viable populations of the eastern timber wolf:

1. The presence of large tracts of wild land with low human densities and minimal accessibility,
2. The use of ecologically sound management,
3. The availability of adequate wild prey,
4. Adequate understanding of wolf ecology and management, and
5. The ability of wolves to withstand new diseases such as canine parvovirus, Lyme disease, and heartworm.

In addition, genetic variability is essential to maintaining a healthy, self-sustaining population. Minimum-viable-population estimates are highly subjective, based on different combinations of assumptions, upon which reasonable biologists will disagree. The FWS judges that a healthy, self-sustaining wolf population should include at least 100 interbreeding wolves. This level is considered essential to maintain an acceptable level of genetic diversity.

Therefore, the FWS considers that the eastern timber wolf will be "recovered" and removed from the Federal list of threatened and endangered plants and animals when the survival of the wolf in Minnesota is assured, and at least one viable population outside of Minnesota and Isle Royale in the contiguous 48 states is re-established. The assurance of wolf survival in Minnesota assumes that (1) the provisions of this Plan for the Minnesota wolf population will be kept in effect subsequent to delisting, and that (2) protection of essential areas (Zone 1, 2 and 3 in Minnesota) is assured. Pages 28-31 reflect the considerations needed to ensure adequate protection.

In addition, the 1988 amendments to the Endangered Species Act mandate that species which have recovered and been removed from the threatened or endangered species list must be monitored for a minimum of five years following the delisting. Should the wolf population fall below the levels prescribed in this plan, the wolf shall be re-listed as a threatened or endangered species, using the emergency re-listing procedure, if necessary. Prior to completing the delisting of the eastern timber wolf a detailed monitoring plan must be developed and agreed to by the cooperating and responsible agencies, and funding sources for the monitoring must be identified.

Wolf population goals

Federal and state natural resource management agencies have established population goals for specific areas to facilitate planning at the management level (Table 1). Other land managing agencies, in consultation with the FWS, are encouraged to similarly develop goals for areas within their jurisdiction. These goals, in total, exceed what is required for recovery and delisting of the eastern timber wolf.

Methods of Achieving Goals

This plan addresses the five factors critical to the perpetuation of the eastern timber wolf outlined above, through the following main objectives: (1) ensuring the survival of the animal in Minnesota by highly regulated management, including complete protection in Zone 1 (except for livetrapping and transplanting to reduce depredation problems), and by extensive improvement of the habitat of its prey in Zones 2-4, and (2) attempting to re-establish at least one viable population of eastern timber wolves outside Minnesota and Isle Royale. Both will require an intensive public education campaign designed to enlighten the public about the ecology and management of the wolf.

Because wolves have survived for so long in Minnesota despite bounties and year-around hunting and trapping, there may be a question as to why any restrictions need now be placed on the taking of the wolf. However, future circumstances are unpredictable and those that now exist could change drastically. For example, widespread industrialization, mineral exploitation, and general development could threaten much of the wolf's remaining range, making protective regulations increasingly significant to the populations left. Additional roads, railroads, power lines, mines, and tourist facilities could further carve up much of northern Minnesota. This would disrupt the natural repopulation of depleted areas by wolves and promote higher human densities which could compete with wolves for their wild prey. A conservative approach should be taken when one is dealing with threatened or endangered populations.

In addition to management actions, a strong research effort is also needed. This should provide better understanding of wolf ecology, predation, population dynamics, dispersal, and causes of range restriction and mortality including parasites and diseases, as well as of the effects of development on wolf populations. Research into re-establishment of wolves or augmenting low wolf populations is also desirable.

Because there is so much misinformation disseminated about the wolf (Van Ballenberghe 1974) by both pro and anti-wolf advocates, it is imperative that a strong public information program be continued to explain wolf ecology and management. The expected result will be a greater public understanding and acceptance of an ecologically sound, scientific wolf management program.

TABLE 1: Eastern timber wolf population goals for planning purposes- Year 2000

MINNESOTA		*1251-1400*
	No. Packs	*No. Wolves*
Chippewa National Forest	5	40
Superior National Forest	50	400
Voyageurs National Park	3-4	20-30
Rice Lake National Wildlife Refuge	1	5
Agassiz National Wildlife Refuge	1	6
State & county owned lands	None set	None set
Private lands, including industrial forests	None set	None set
WISCONSIN		*80*
	No. Packs	*No. Wolves*
Chequamegon National Forest	2	20
Nicolet National Forest	2	20
State & county owned lands	None set	None set
Private lands, including industrial forests	None set	None set
MICHIGAN.		*80-90*
	No. Packs	*No. Wolves*
Ottawa National Forest	4	24
Hiawatha National Forest[1]	1	6
Isle Royale National Park [2]	3-4	20-30
Pictured Rocks National Lakeshore	None set	None set
State & county owned lands	None set	None set
Private lands, including industrial forests	None set	None set
Total Planning Goals for Lake States		*1411-1570*

Recovery plan goals for Minnesota by Zone:

Zone	*Numerical Goal*
Zone 1: 1 per 10-15 square miles	297-446
Zone 2: 1 per 10 square miles	186
Zone 3: 1 per 10 square miles	350
Zone 4: 1 per 50 square miles	418
Zone 5: no wolves	0
Total	1251-1400

1 This is a joint planning goal for Hiawatha National Forest and Seney National Wildlife Refuge

2 The Isle Royale population does not count toward achieving this recovery criterion

For the present, it is important to remember that the wolf is controversial, so it is likely there will be local opposition to any attempt to re-establish the animal or afford it measures of protection. Similarly there will be opposition from other quarters in efforts to control the animal, although control may be necessary for the good of the wolf itself in certain areas. If wolf re-establishment is accomplished, regulated taking of the animal undoubtedly will be necessary in the restored range sooner or later (Mech 1979).

For those reasons, it is imperative that re-establishment of the wolf be undertaken only after a great deal of thought, background research,planning, and consultation with local people—lay individuals as well as professionals. It must also be realized from the beginning that such investigations may indicate that re-establishment of the wolf may not be prudent.

Nevertheless, it is important to explore all possibilities and to give the highest priority throughout this entire recovery plan to the biological and ecological considerations. They are the only ones that will be significant 100 years from now.

Recovery Plan Outline

Primary Objective: Maintain and re-establish viable populations of the eastern timber wolf in as much of its former range as is feasible

1 *Insure perpetuation of the eastern timber wolf population at levels optimum to the various parts of its present Minnesota range (optimum level includes biological carrying capacity and compatibility with humans): Zone 1, to fluctuate naturally; Zones 2 and 3, 1 wolf per 10 mi²; Zone 4, 1 wolf per 50 mi²; Zone 5, no wolves.*

11 Monitor Minnesota wolf population distribution and status statewide

111 Survey canid trappers and Minnesota DNR field personnel for information on wolf distribution at least every five years

112 Radio-track and observe wolves in sample study areas during at least one winter every five years to accurately determine local wolf densities

113 Monitor wolf populations annually in Zone 1 to determine the extent of normal population fluctuations under near natural conditions

113-1 Maintain a wolf population with sufficient members wearing active radio-collars

113-2 Aerially radio-track and observe radio-collared wolves to obtain annual counts of pack sizes

12 Monitor status of diseases and parasites in Minnesota wolf population annually

121 Obtain blood and fecal samples from wolves taken during livestock-depredation control and live-trapped for research

122 Check wolf condition, parasite load, and disease exposure through laboratory analyses of specimens collected

123 Examine wolves found dead and determine cause of death

13 Obtain accurate information about wolf survival, mortality causes, productivity, ecology, behavior, and relations with prey under various weather conditions and phases of wolf population cycle in Zone 1.

131 Continue research on wolf ecology, behavior, and genetics

132 Continue research on the ecology, behavior, and habitat requirements of deer, moose, and beaver

14 Provide large tracts of wild land with low human densities and minimal access in Zones 1, 2, and 3

141 Evaluate effects of changing current Minnesota Wolf Management Zone boundaries as recommended in Appendix III, or a modification of those recommendations, to better reflect past and present habitat conditions and increased knowledge of wolf habitat usage. (See also task 182.)

141-1 Obtain current data on land use, highways, forest cover, ownership, and human population density for current management Zones and proposed modified Zones.

141-2 Prepare economic analysis of the impacts of any proposed new critical habitat, and carry out rule-making

142 Maintain road densities in Zones 1, 2, and 3 at present levels or reduce them to below-threshold levels (one road mile/mi^2 or 0.6 km/km^2) (See Road Density Statement, p. 17)

143 Further study the relationship of human access by type, volume, and periodicity on wolf behavior, survival, and distribution

144 Encourage land-use regulations in Zones 1, 2, and 3 that minimize accessibility and intensive commercial development

145 Require federal agencies to prepare environmental assessments and/or environmental impact statements to evaluate project impacts on the wolf and initiate Section 7 consultation on Federal activities

146 Encourage habitat management compatible with wolf ecology

147 Discourage, in Zones 1, 2, and 3, building of permanent roads, adverse development, settlement, and the destruction, disturbance, or other adverse modification of habitat that might reduce wolf populations or restrict their recovery

15 Maintain or increase prey populations in all zones by habitat improvement or other appropriate management practices

151 Inventory forest acreage to determine conifer-hardwood composition in age classes and vegetation types

152 Promote adequate hardwood and conifer composition in age classes and types to provide for maintenance or improvement of forest diversity

152-1 Promote logging practices to provide adequate supply, distribution, and age classes of hardwoods, with emphasis on aspen and birch

152-2 Design and carry out prescribed burning and other site preparation practices to stimulate hardwood and conifer regeneration, especially aspen and birch where possible

152-3 Create and maintain well dispersed permanent openings

153 Increase forest/wildlife coordination on the Superior National Forest and Chippewa National Forest to promote use of the forest plan standards and guidelines to increase habitat inventory analysis and habitat manipulation

154 Encourage other public forest management agencies to develop forest/wildlife coordination programs

155 Determine the degree to which lower than optimum prey populations are the result of habitat deficiencies and/or overhunting

156 Re-establish woodland caribou in suitable range, if feasible

156-1 Review past feasibility studies and conduct new ones if necessary

156-2 Establish a task force to plan caribou re-establishment

156-3 Arrange with Canada to provide caribou

156-4 Radio-tag, release, and monitor caribou to determine survival, behavior, and habitat use

156-5 Locally and temporarily reduce wolf density to assist in caribou establishment, if necessary

16 Provide concerted law enforcement in all zones

161 Inform the public regarding illegality of killing wolves by posting signs and through the media immediately before hunting season

162 Respond quickly and openly to any report of illegal killing of wolves

163 Increase law enforcement officers before and during hunting seasons

17 Regulate harvest of prey species in all zones to insure sufficient surplus for wolf population needs

171 Monitor wolf population

172 Monitor prey populations

173 Reduce harvest of deer, moose, and/or beaver if harvesting is demonstrated to be a cause of less than optimum numbers of wolves

18 Minimize domestic animal losses from wolf predation

181 Continue allowing the taking by authorized government (State or Federal) employees of individual wolves killing domestic animals

182 Refine the depredation control program regulations to further reduce depredation problems while avoiding adversely affecting the Minnesota wolf population

182-1 Evaluate effects of changing current Zone boundaries as recommended in Appendix III, or a modification of those recommendations, to better reflect past and present habitat

conditions and increased knowledge of wolf habitat usage. (See task 141.)

182-2 Carry out rule-making process for any changes resulting from task 182-1, and for tasks 182-3, 182-4, and 182-5.

182-3 Initiate livetrapping and translocation of Zone 1 wolves following verified incidents of depredations on lawfully present domestic animals where there is a likelihood of additional depredation occurring.

182-4 Initiate preventive depredation control of wolves in Zone 4 where a history of verified wolf depredations has been established in at least three of the last six years and depredation is likely to recur. Wolf trapping will be restricted to locations within one-half mile of the previous depredation site.

182-5 Initiate similar preventive depredation control of wolves in Zone 5 if no other legal means of controlling wolf populations there is established. Wolf trapping will be restricted to locations within five miles of the previous depredation site.

183 Encourage ranchers to obey laws requiring proper disposal of livestock carcasses

184 Enforce livestock carcass disposal laws

185 Encourage ranchers to keep livestock in or near barns until young are produced

186 Study factors affecting wolf-livestock depredations

187 Encourage Minnesota Department of Agriculture to continue its program of compensation for livestock that are killed by wolves

188 Initiate a program of Federal compensation to owners of domestic animals verified as having been killed by wolves.

19 Promote efforts to educate the public about wolves

191 Encourage media to accurately report news about wolves

192 Publish research findings and provide to the media

193 Support the development and activities of public education organizations such as the International Wolf Center

194 Develop and initiate an educational program on wolf natural history and ecology for grade schools and high schools

195 Develop and initiate an adult education program on wolf natural history and ecology

2 *Enhance and re-establish a viable wolf population in Michigan (excluding Isle Royale) and Wisconsin*

21 Protect and enhance existing wolf populations to restore a viable population of at least 100 wolves in Wisconsin and Michigan

211 Continue monitoring numbers, status, and distribution of wolves in Wisconsin, and begin monitoring in Michigan

211-1 Maintain population of radio-tagged wolves

211-2 Aerially radio-track and census radioed wolves and their packs

212 Continue monitoring disease exposure and parasite loads annually and develop treatments where necessary

212-1 Collect blood and fecal samples from live-trapped wolves

212-2 Have laboratory analyses conducted of specimens collected

212-3 Develop vaccine for canine parvovirus useful with wild wolves

213 Have each wolf found dead necropsied for cause of death

214 Conduct concerted law enforcement

214-1 Inform the public regarding illegality of killing wolves by posting signs and through the media immediately before hunting season

214-2 Respond quickly and openly to illegal killing of wolves

214-3 Increase law enforcement before and during hunting seasons

215 Manage recovery areas to provide open (non-gated) road densities at or below threshold levels (see Road Density statement, p. 17).

215-1 Enter into cooperative agreements with interested agencies, landowners, and resource-user groups to manage access wherever possible to meet road-density guidelines

215-2 Manage roads within recovery areas to meet road density standards

215-3 Continue research on road density wolf mortality

216 Analyze, summarize, and publish existing data about Wisconsin-Michigan wolf population

217 Conduct research on wolf population in the peripheral area of Minnesota, in the St. Mary's river area of Ontario in proximity to Wisconsin and Michigan, and in other areas to identify habitat components of "dispersal corridors" and to ascertain the rate of interchange of individuals between these regions.

Determine where wolf re-establishment is ecologically sound and may occur naturally or may be accomplished through a transplant

221 Consult vegetation and ownership maps, land use maps and plans, and local biologists to define and select suitable areas for re-establishment

222 Determine potential prey densities in the selected areas

223 Determine human densities and use patterns in the selected areas

224 Determine possible impact of re-establishment on public health

225 Estimate effect of re-establishing wolves on other wildlife and domestic animals

226 Select most inaccessible areas with adequate food supply and minimum human population

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23 Gain public support for re-establishing the eastern timber wolf

231 Obtain cooperation from appropriate State and Federal agencies

232 Obtain support of local people

232-1 Assess public attitudes and contact selected individuals and key groups for support

232-2 Publish facts of situation in news media

233 Inform key legislators and gain their support

234 Develop management practices, including the potential taking of problem animals, to be applied when wolf populations are re-established (These should be agreed upon and announced before re-establishment takes place)

235 Hold public meetings and seek support

236 Determine legal implications if transplants are proposed

237 Conduct intensive public education campaign via organizations such as the Timber Wolf Alliance (See item #19)

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24 Stock wolves in new areas if wolf populations are not rebuilding naturally

241 Obtain permits from appropriate State and Federal agencies

242 Obtain disease-free wolves from nearest substantial population

242-1 Arrange for appropriate agency in Minnesota, Ontario, or Quebec to provide wolves

242-2 Prescribe manner and season of live-trapping and handling of wolves

242-3 Provide holding pens in capture area

242-4 Examine, ear-tag, radio-tag, and vaccinate wolves

243 Deliver wolves to release point

243-1 Arrange shortest and most direct flight

243-2 Tranquilize wolves

244 Effect non-traumatic release of wolves

244-1 Select appropriate release sites

244-2 Build appropriate pens in release sites

244-3 Hold wolves on release site for 6 months

244-4 Feed wolves local wild prey

244-5 Allow wolves to leave pens at will after 6 months

244-6 Consider providing carcasses of wild prey near release site

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25 Monitor restocking efforts and population levels in new areas; collect appropriate research data to refine each subsequent reintroduction

251 Train local biologists to radio-track

252 Radio-track transplanted wolves daily for first week and at intervals of twice per week for next 2 months and appropriate intervals thereafter

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26 Close coyote seasons during big game season in wolf area

27 Develop and implement plans for habitat improvement and maintenance for appropriate prey species to maintain wolf populations

3 *Continue management to perpetuate natural conditions for the eastern timber wolf on Isle Royale National Park, Michigan*

- 31 Continue to provide complete protection
- 32 Permit natural fires to run their course
- 33 Continue research on wolf ecology

4 *Re-establish wolf population in Adirondack Mountains (New York), northwestern Maine/adjacent New Hampshire, and/or northeastern Maine*

- 41 Determine where re-establishment is ecologically sound
  - 411 Consult vegetation and ownership maps, land use maps and plans, and local biologists to define and select all suitable areas for transplant
  - 412 Determine potential prey densities in the selected areas
  - 413 Determine human densities and use patterns in the selected areas
  - 414 Determine possible impact of transplants on public health
  - 415 Estimate effect of establishing wolves on other wildlife and domestic animals
  - 416 Select most inaccessible areas with adequate food supply and minimum human population
- 42 Gain public support for re-establishing the eastern timber wolf
  - 421 Obtain cooperation from appropriate State and Federal agencies
  - 422 Obtain support of local people
    - 422-1 Contact selected individuals and key groups for support
    - 422-2 Publish facts of situation in news media
  - 423 Obtain approval of key legislators
  - 424 Develop management practices to be applied when wolf populations are re-established (These should be agreed upon and announced before transplants take place)
  - 425 Hold public meetings and seek support
  - 426 Determine legal implications of transplant
  - 427 Conduct intensive public education campaign (See item #19)
- 43 Stock wolves in new areas
  - 431 Obtain permits from appropriate State and Federal agencies
  - 432 Obtain disease-free wolves from nearest viable population
    - 432-1 Arrange for appropriate agency in Minnesota, Ontario, or Quebec to provide wolves
    - 432-2 Prescribe manner and season of live-trapping and handling of wolves
    - 432-3 Provide holding pens in capture area
    - 432-4 Examine, ear-tag, radio-tag, and vaccinate wolves
  - 433 Deliver wolves to release point

433-1 Arrange shortest and most direct fligh:

433-2 Tranquilize wolves

434 Effect non-traumatic release of wolves

434-1 Select appropriate release sites

434-2 Build appropriate pens in release sites

434-3 Hold wolves on release site for 6 months

434-4 Feed wolves local wild prey

434-5 Allow wolves to leave pens at will after 6 months

434-6 Consider providing carcasses of wild prey near release site

44 Monitor restocking efforts and population levels in new areas

441 Train local biologists to radio-track

442 Radio-track transplanted wolves daily for first week and at intervals of twice per week for next 2 months and appropriate intervals thereafter

45 Close coyote seasons during big game season in wolf area

46 Develop and implement plans for habitat improvement and maintenance for appropriate prey species to maintain wolf populations

5 *Create a Coordination Committee of state and Federal representatives to implement the Eastern Timber Wolf Recovery Plan*

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PART III: IMPLEMENTATION TABLE

INTRODUCTION

The Implementation Table that follows outlines actions and estimated costs for the recovery program. It is a guide for meeting the objectives discussed in Part II of this Plan. This schedule indicates task priorities, task numbers, task descriptions, duration of tasks, the responsible agencies, and lastly, estimated costs. These actions, when accomplished, are anticipated to bring about the recovery of the eastern timber wolf and protect its habitat. It should be noted that the Plan, and thus the Implementation Table, represent an attempt to plan for all reasonably foreseeable circumstances. Therefore, it may not be necessary to carry out all the describe activities, or spend all the identified funds.

EXPLANATION OF DEFINITIONS AND ACRONYMS USED IN TABLE

Recovery Task Priority Numbers

Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.

Priority 3 - All other actions necessary to provide for full recovery of the species.

Acronyms & Definitions

ADC Animal Damage Control Program, U.S. Department of Agriculture

County County or local land planning/land use agencies

CWS Canadian Wildlife Service

DES Division of Endangered Species, U.S. Fish and Wildlife Service

DNR's Departments of Natural Resources in Minnesota, Michigan, and Wisconsin; also includes other units of state governments which have authority to conserve endangered species, such as the New York State Department of Environmental Conservation

LE - Division of Law Enforcement, U.S. Fish and Wildlife Service

MIDNR - Michigan Department of Natural Resources

MNDOA - Minnesota Department of Agriculture

MNDNR - Minnesota Department of Natural Resources

NPS - National Park Service

Private - Private organizations involved in wolf conservation activities

Refuges - Division of Refuge Management, U.S. Fish and Wildlife Service

Region 3 - FWS Region 3, covering the Michigan, Minnesota, and Wisconsin wolf recovery and law enforcement activities

Region 5 - FWS Region 5, covering the Mid-Atlantic and New England wolf recovery and law enforcement activities

Region 8 - FWS Region 8, handling FWS eastern timber wolf research projects

USFS - U.S. Forest Service, U.S. Dept. of Agriculture

WIDNR - Wisconsin Department of Natural Resources

PART III IMPLEMENTATION TABLE FOR THE EASTERN TIMBER WOLF RECOVERY PLAN

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	11	Monitor Minnesota wolf population, distribution and status	ongoing			MNDNR USFS	115	125	135	
3	111	Survey canid trappers, DNR field personnel	every 5 years	8	Research	MNDNR				costs included under 11
3	112	Radio-track in sample areas to determine local densities	every 5 years	8	Research	USFS				costs included under 11
2	113	Monitor annually in zone 1	ongoing	8	Research	USFS				costs included under 11
2	12	Monitor status of disease and parasites in Minnesota wolves	ongoing	8	Research	ADC	15	17.5	20	
3	121	Obtain blood & fecal samples from depredation control & wolves trapped for research	ongoing	8	Research	ADC				costs included under 12
2	122	Check wolf condition, parasite load, & disease exposure via lab. analysis of specimens collected	ongoing	8	Research	ADC MNDNR				costs included under 12
3	123	Necropsy all wolves found dead	ongoing	8	Research	MNDNR				costs included under 12
3	13	Obtain accurate information about wolf survival, mortality causes, productivity, ecology, behavior, and relations with prey under various weather conditions and phases of wolf population cycle in zone 1	ongoing	8	Research	USFS	270	283	297	
2	131	Continue research on wolf ecology, behavior , and genetics	ongoing	8	Research	USFS				costs included under 13
2	132	Continue research on the ecology, behavior, and habitat requirements of deer, moose, and beaver	ongoing	8	Research	USFS MNDNR				costs included under 13
2	14	Provide large tracts of wild land with low human densities and minimal access in zones 1, 2, and 3	ongoing	3	DES	USFS MNDNR NPS	25	30	35	costs shown are only for monitoring and evaluating proposed land use changes

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
2	141	Evaluate effects of changing current Minnesota Wolf Management Zone boundaries as recommended in Appendix III, or a modification of those recommendations, to better reflect past and present habitat conditions and increased knowledge of wolf habitat usage	2 years	3	DES	MNDNR MNDOA USFS NPS				Costs to be determined
2	141-1	Obtain current data on land use, highways, forest cover, ownership, and human population density for existing management Zones and proposed Zone modifications	1 year	3	DES	USFS NPS MNDNR MNDOA				Costs to be determined
2	141-2	Prepare economic analysis of any proposed new critical habitat designation; carry out rule-making	2 years	3	DES	USFS NPS MNDNR MNDOA				costs to be determined
2	142	Maintain road densities in zones 1, 2, and 3 at present levels or reduce them to levels below threshold levels	ongoing	3	DES	USFS MNDNR NPS				costs included in 14
3	143	Further study the relationship of human access by type, volume, and periodicity on wolf behavior, survival, and distribution	ongoing	8	Research	USFS NPS	50	60	70	
3	144	Encourage land-use regulations in zones 1, 2, and 3 that minimize accessibility and intensive commercial development	ongoing	3	DES	MNDNR USFS NPS County				costs included in 14
3	145	Require Federal agencies to prepare environmental assessments and/or environmental impact statements to evaluate project impacts on the wolf and initiate Section 7 consultations	ongoing	3	DES	MNDNR				costs included in 14
2	146	Encourage habitat management compatible with wolf ecology	ongoing	3	DES	USFS MNDNR				costs included in 14

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	147	Discourage, in zones 1, 2, and 3, building of permanent roads, adverse development, settlement, and the destruction, disturbance, of other adverse modification of habitat that might reduce wolf populations or restrict their recovery.	ongoing	3	DES	USFS MNDNR NPS				costs included in 14
3	15	Maintain or increase prey populations in all zones by habitat improvement or other appropriate management practices	ongoing	3	DES	USFS MNDNR NPS	200	215	235	
3	151	Inventory forest acreage to determine conifer-hardwood composition in age classes and vegetation types	...			USFS MNDNR				costs included in 15
3	152	Promote adequate hardwood and conifer compositions in age classes and types to provide for maintenance or improvement of forest diversity	ongoing			USFS MNDNR				costs included in 15
3	153	Increase forest/wildlife coordinations on the Superior NF and Chippewa NF to promote the use of the forest plan standards and guidelines to increase habitat inventory analysis and habitat manipulation	ongoing			USFS MNDNR				costs included in 15
3	154	Encourage other public forest management agencies to develop forest/ wildlife coordination programs	ongoing	3	DES	USFS MNDNR				costs included in 15
3	155	Determine the degree to which lower than optimum prey populations are the result of habitat deficiencies and/or overhunting	...			MNDNR				costs included in 15
3	156	Re-establish woodland caribou in suitable range, if feasible	5 years	3	DES	USFS MNDNR				costs to be determined
2	16	Provide concerted law enforcement in all zones	ongoing	3	LE	MNDNR	60	65	70	
2	161	Inform the public regarding illegality of killing wolves by posting signs and through the media immediately before hunting season	ongoing	3	LE	MNDNR				costs included in 16

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
2	162	Respond quickly and openly to any report of illegal killing of wolves	ongoing	3	LE	MNDNR				costs included in 16
2	163	Increase law enforcement officers before and during hunting seasons	ongoing	3	LE	MNDNR				costs included in 16
3	17	Regulate harvest of prey species in all zones to ensure sufficient surplus for wolf populations needs	ongoing			MNDNR				costs included in 11
3	171	Monitor wolf population	ongoing	8	Research	MNDNR USFS				costs included in 11
3	172	Monitor prey populations	ongoing	8	Research	MNDNR USFS				costs included in 11
3	173	Reduce harvest of deer, moose, and/or beaver if harvesting is demonstrated to be a cause of less than optimum numbers of wolves	if needed			MNDNR				no additional cost
3	18	Minimize domestic animal losses from wolf predation	ongoing	3	DES	ADC MNDNR	125	135	150	costs based upon current depredation control regulations
3	181	Continue allowing the taking by authorized government (state or federal) employees of individual wolves killing domestic animals	ongoing	3	DES	ADC				costing included in 18
3	182	Refine depredation control program regulations to reduce depredation problems while avoiding adversely affecting the wolf population	2 years	3	DES	ADC	10	7	-	
3	182-1	Evaluate effects of adjusting current Zone boundaries based upon habitat suitability	1 year	3	DES	ADC				See task 141. Costs included there.
3	182-2	Carry out rule-making process for any changes resulting from task 182-1, and for tasks 182-3, 182-4, and 182-5	2 years	3	DES					No additional cost
3	182-3	Initiate livetrapping and translocation in zone 1 for verified depredation incidents	ongoing			ADC	-	5	6	Begin after finalizing regulations; see 182-2
3	182-4	Initiate preventive depredation control in Zone 4 at locations where ongoing depredation problems are verified	ongoing			ADC	-	10	12	Begin after finalizing regulations; see 182-2

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	182-5	Initiate preventive depredation control in zone 5 if no other legal means of control is established	ongoing			ADC	-	10	12	Begin after finalizing regulations; see 182-2
3	183	Encourage ranchers to obey laws requiring proper disposal of livestock carcasses	ongoing			ADC MNDOA MNDNR	2	2	2	
3	184	Enforce livestock carcass disposal law	ongoing			MNDOA	2	2	2	
3	185	Encourage ranchers to keep livestock in or near barns until young are born	ongoing			MNDOA	2	2	2	
3	186	Study factors affecting wolf-livestock depredations		8	Research		75	80	85	
3	187	Encourage Minnesota Department of Agriculture to continue its program of compensation for livestock that are killed by wolves	ongoing	3	DES	MNDNR MNDOA	40	42	0	State program should continue if Federal program is not initiated
3	188	Initiate a program of Federal compensation to owners of domestic animals verified as having been killed by wolves	ongoing	3	DES	ADC	--	--	50	
3	19	Promote efforts to educate the public about wolves	ongoing	3	DES	DNR's Private USFS	50	55	60	
3	191	Assist media in accurately reporting news about wolves	ongoing	3 8	DES Research	DNR's USFS				costs included under 19
3	192	Publish research findings and provide to the media	ongoing	8	Research	DNR's USFS				costs included under 19
3	193	Support the development and activities of public education organizations such as the International Wolf Center	ongoing	3 8	DES Research	DNR's Private USFS				International Wolf Center startup funding appropriated by MN Legislature in 1990
3	194	Develop and initiate an educational program on wolf natural history and ecology for grade schools and high schools	ongoing	3 8	DES Research	DNR's USFS Private	50	25	25	

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	195	Develop and initiate an adult education program on wolf natural history and ecology	ongoing	3 8	DES Research	DNR's USFS Private	50	25	25	
3	21	Protect and enhance existing wolf populations to restore a viable population of at least 100 wolves in Wisconsin and Michigan (outside of Isle Royale)	ongoing	3 3 8	DES Refuges Research	USFS NPS WIDNR MIDNR				
3	211	Continue monitoring numbers, status, and distribution of wolves in Wisconsin and Michigan using radio-telemetry	annually	3 8	DES Research	USFS WIDNR MIDNR	100	115	130	
3	212	Continue monitoring disease exposure and parasite loads and develop treatments	annually	8	Research	WIDNR MIDNR	5	5	5	Canine parvovirus vaccine developed
3	213	Have each wolf found dead necropsied	ongoing	8	Research	DNR's	1	1	1	
3	214	Conduct concerted law enforcement	ongoing	3	LE	DNR's	10	10	10	see number 16
3	215	Manage recovery areas to provide open (non-gated) road densities at or below threshold levels	ongoing	3	Refuges	USFS WIDNR MIDNR	100	110	120	
3	215-1	Enter into cooperative agreements with interested agencies, landowners, and resource-user groups to manage access wherever possible to meet road-density guidelines	ongoing	3	DES	WIDNR MIDNR				costs included in 215
3	215-2	Manage roads within recovery areas to meet road density standards	ongoing	3	Refuges	USFS DNR's Private County				costs included in 215
3	215-3	Continue research on road density and wolf mortality	ongoing	8	Research	USFS DNR's				costs included in 215
3	216	Analyze, summarize and publish existing data about Wisconsin-Michigan wolf population	annually	3	DES	WIDNR MNDNR	7	8	9	

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	217	Conduct research on wolf population in the peripheral areas of Minnesota, in the St. Mary's River Area of Ontario in proximity to Wisconsin and Michigan, and in other areas to identify habitat components of "dispersal corridors" and to ascertain the rate of interchange of individuals between these regions	5 years	8	Research	USFS WIDNR MIDNR MNDNR NPS CWS	60	65	70	
3	22	Determine where wolf re-establishment is ecologically sound and may occur naturally or may be accomplished through a transplant	3 years	3	DES	USFS WIDNR MIDNR	50	55	60	
3	221	Consult vegetation and ownership maps, land use maps and plans, and local biologists to define and select suitable areas for re-establishment	??	3	DES	USFS WIDNR MIDNR				costs included in 22
3	222	Determine potential prey densities in the selected areas		3	DES	USFS DNR's				costs included in 22
3	223	Determine human densities and land use patterns in the selected areas		3	DES	USFS DNR's				costs included in 22
3	224	Determine possible impact of re-establishment on public health		3	DES	DNR's				costs included in 22
3	225	Estimate effect of re-establishing wolves on other wildlife and domestic animals		3	DES	DNR's				costs included in 22
3	226	Select most inaccessible areas with adequate food supply and minimum human population		3	DES	DNR's				costs included in 22
3	23	Gain public support for re-establishing the eastern timber wolf		3	DES	DNR's	100	110	120	
3	231	Obtain cooperation from appropriate State and Federal agencies		3	DES	DNR's				costs included in 23
3	232	Obtain support of local people		3	DES	DNR's				costs included in 23
3	232-1	Assess public attitudes and contact selected individuals and key groups for support		3	DES	DNR's				costs included in 23
3	232-2	Publish facts of situation in news media		3	DES	DNR's				costs included in 23

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER				
				REG	PROGRAM		FY-92	FY-93	FY-94	
3	233	Inform key legislators and gain their support		3	DES	DNR's				costs included in 23
3	234	Develop management practices, including the potential taking of problem animals, to be applied when wolf populations are re-established		3	DES	DNR's				These should be agreed upon and announced before re-establishment takes place. Costs to be determined.
3	235	Hold public meetings and seek support		3	DES	DNR's				costs to be determined
3	236	Determine legal implications if transplants are proposed		3	DES	DNR's				costs to be determined
3	237	Conduct intensive public education campaign via organizations such as the Timber Wolf Alliance		3	DES	DNR's				see item 19; costs to be determined
3	24	Stock wolves in new areas if wolf populations are not rebuilding naturally		3	DES	DNR's				costs to be determined
3	241	Obtain permits from appropriate State and Federal agencies		3	DES	DNR's				costs to be determined
3	242	Obtain disease-free wolves from nearest substantial population		3	DES	DNR's				costs to be determined
3	243	Deliver wolves to release point		3	DES	DNR's				costs to be determined
3	244	Effect non-traumatic release of wolves		3	DES	DNR's				costs to be determined
3	25	Monitor restocking efforts and population levels in new areas; collect appropriate research data to refine each subsequent reintroduction		3 8	DES Research	DNR's				costs to be determined
3	251	Train local biologists to radio-track		8	Research	DNR's				costs to be determined
3	252	Radio-track transplanted wolves daily for first week and at intervals of twice/week for next 2 months and appropriate intervals thereafter		8	Research	DNR's				costs to be determined
3	26	Close coyote seasons during big game season in wolf areas				DNR's				costs to be determined

PRIOR-ITY #	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	27	Develop and implement plans for habitat improvement and maintenance for appropriate prey species to maintain wolf populations		3	DES	DNR's USFS	300	360	420	
3	3	Continue management to perpetuate natural conditions for the eastern timber wolf on Isle Royale National Park, Michigan	ongoing			NPS				No additional cost
3	31	Continue to provide complete protection	ongoing			NPS				No additional cost
3	32	Permit natural fires to run their course	ongoing			NPS				No additional cost
3	33	Continue research on wolf ecology	ongoing			NPS				No additional cost
3	41	Determine where re-establishment is ecologically sound in the Adirondack Mountains, N.Y. and Maine/New Hampshire		3 5	DES	DNR's	100	110	120	4.. series tasks to be initiated if WI/MI wolf population is failing
3	411	Consult vegetation and ownership maps, land use maps and plans, and local biologists to define and select all suitable areas for wolf transplants		3 5	DES	DNR's				Included in 41
3	412	Determine potential prey densities in the selected areas		3 5	DES	DNR'S				Included in 41
3	413	Determine human densities and land use patterns in the selected areas		3 5	DES	DNR'S				Included in 41
3	414	Determine possible impact of transplants on public health		3 5	DES	DNR'S				Included in 41
3	415	Estimate effect of establishing wolves on other wildlife and domestic animals		3 5	DES	DNR's				Included in 41
3	416	Select most inaccessible areas with adequate food supply and minimum human population		3 5	DES	DNR's				Included in 41
3	42	Gain public support for re-establishing the eastern timber wolf		3 5	DES	DNR's	150	160	175	
3	421	Obtain cooperation from appropriate State and Federal agencies		3 5	DES	DNR's				Included in 42
3	422	Obtain support of local people		3 5	DES	DNR's				Included in 42

PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS		OTHER	FY-92	FY-93	FY-94	
				REG	PROGRAM					
3	423	Obtain support of key legislatures		3 5	DES	DNR's				Included in 42
3	424	Develop management practices to be applied when wolf populations are re-established		3 5	DES	DNR's				These should be agreed upon and announced before transplants take place. Costs included in 42
3	425	Hold public meetings and seek support		3 5	DES	DNR's				Included in 42
3	426	Determine legal implications of transplant		3 5	DES	DNR's				Included in 42
3	427	Conduct intensive public education campaign		3 5	DES	DNR's				Included in 42 see item 19
3	43	Stock wolves in new areas		3 5	DES	DNR's				To be determined
3	431	Obtain permits from appropriate State and Federal agencies		3 5	DES	DNR's				To be determined
3	432	Obtain disease-free wolves from nearest viable population		3 5	DES	DNR's				To be determined
3	433	Deliver wolves to release point		3 5	DES	DNR's				To be determined
3	434	Effect non-traumatic release of wolves		3 5	DES	DNR's				To be determined
3	44	Monitor restocking efforts and population levels in new areas		3 5	DES	DNR's				To be determined
3	441	Train local biologists to radio-track		8	Research	DNR's				To be determined
3	442	Radio-track transplanted wolves daily for first week and at intervals of twice/week for next 2 months and appropriate intervals thereafter		3 5 8	DES DES Research	DNR's				To be determined
3	45	Close coyote seasons during big game season in wolf area				DNR's				No additional cost

	TASK #	TASK DESCRIPTION	TASK DURAT-ION (YRS.)	RESPONSIBLE PARTY			COST ESTIMATES ($1,000's)			COMMENTS
				FWS REG	FWS PROGRAM	OTHER	FY-92	FY-93	FY-94	
3	46	Develop and implement plans for habitat improvement and maintenance for appropriate prey species to maintain wolf populations		5	DES	DNR's	500	600	700	
3	5	Create a Coordination Committee of state and Federal representatives to implement the Eastern Timber Wolf Recovery Plan	ongoing	3	DES	DNR's NPS USFS	15	17	19	

APPENDIX I

PAST, PRESENT, AND POTENTIAL EASTERN TIMBER WOLF RANGE

Part 1. Areas to be investigated in the Eastern States for Eastern Timber Wolf Re-establishment Possibilities

Part 2. Eastern Timber Wolf Area Status Map

Part 1

Areas to be Investigated for Eastern Timber Wolf Re-establishment

In that part of the United States from which the eastern timber wolf has been extirpated, several areas deserve serious investigation as potential reintroduction sites.

The FWS recognizes the desirability of establishing and maintaining separate, viable population centers of the eastern timber wolf. Such a distribution gives greatest protection against catastrophic loss of the last remaining population segments and best assures the perpetuation of this (or any) endangered species.

The FWS also recognizes that vastly insufficient information exists concerning the ecological and social realities of reintroducing the eastern timber wolf into areas from which it has been extirpated for a considerable length of time. Prior to any reintroduction, thorough studies are needed that would determine the status of prey species, the adequacy of habitat factors such as available space and long-term food supplies, the probable effects on other wildlife populations in the area, the probable effect on domestic animals that may exist in or near the area under study, the probable reaction of local human residents of the surrounding area, and the chances that the eastern timber wolf could survive human antagonists.

The FWS is certain that any reintroduction scheme will fail unless the majority of the local human population is desirous of such action, and this will, in most instances, require that local residents be completely apprised of the facts concerning the nature of the eastern timber wolf as a species, and the facts concerning the procedures for making the reintroduction and the probable effects of such a reintroduction. In general, it is recommended that biological/ecological studies be performed prior to investigations into social reactions and education attempts. If an area is ecologically unsuited to a wolf reintroduction, there is little point in trying to convince local human populations that a reintroduction would be a proper move. This is not to say that local populations should not be informed about ecological studies that may be undertaken or contemplated—all segments of the program should be completely open to public scrutiny at all times.

All of the areas recommended for further study have been selected on the basis of (a) low or very low human population levels within the area, (b) large blocks of public lands characterizing the areas (except much of the land in Maine), and (c) favorable input from the states which were identified in the original version of the Recovery Plan as areas to be investigated. Correspondence received from the states since the original Recovery Plan was approved and distributed has led the FWS to delete some of the originally proposed study areas of Maine, the White Mountains, and the central and

southern Appalachians from areas to be considered for re-establishment potential. Public sentiment, local conflicting wolf/livestock and wolf/hunter-trapper interests, and efforts to reintroduce the red wolf to the Great Smokey Mountains have eliminated those areas from current consideration. The remaining areas selected as sites for potential wolf populations are outlined on the map that follows:

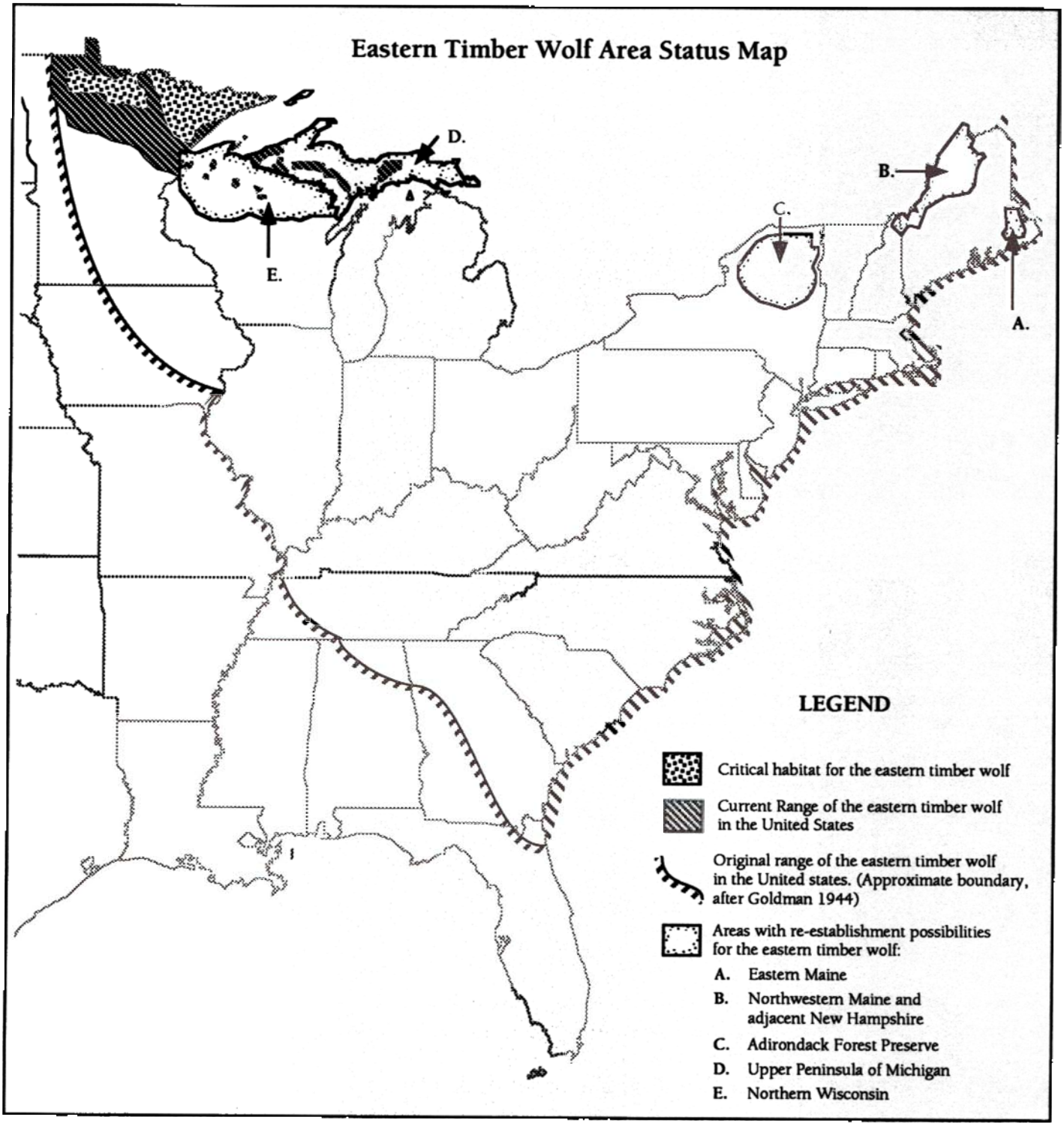
A. *Eastern Maine.* Consisting of about 2,500 square miles, much of this area is uninhabited on a permanent basis.

B. *Northwestern Maine and Adjacent New Hampshire.* This area is more than 11,300 square miles with a very low human population and includes Maine's Baxter State Park. Most of the land is privately owned.

C. *The Adirondack Forest Preserve Area of Northern New York.* Most of this area is occupied by the Adirondack State Forest Preserve, consists of approximately 9,375 square miles, and has a low human density.

D. *Upper Peninsula of Michigan.* While this area of some 15,000 square miles does contain residual wolf population elements, population strength is marginal at best. One transplant attempt in 1974 indicated that, biologically and ecologically, such transplants are possible, but it also showed that the wolf was socially unacceptable to many residents at that time, since all four transplanted wolves died of human causes (Weise et al. 1975). Further studies that would narrow the selection of transplant sites (National Forests, National Lakeshore, private lands, etc.) are needed. The Michigan DNR has recognized the potential for augmentation and/or reintroduction. In 1989 a survey of Upper Michigan deer hunters indicated that 80% of them favor wolf reintroduction (Kellert 1990). In the summer of 1991 the first breeding pack of wolves in 30 years was documented in the Upper Peninsula.

E. *Northern Wisconsin.* This is an area containing large amounts of public lands but sparse human population, and where wolves once lived in relative abundance. Currently a population of 30-50 wolves inhabits portions of northern Wisconsin. The Wisconsin Department of Natural Resources has assigned a biologist to inventory the habitat and monitor the population. Efforts are underway by the Wisconsin Department of Natural Resources to provide for the maintenance and subsequent enhancement of the population.


Eastern Timber Wolf Area Status Map
D.
B.
C.
E.
A.
LEGEND
Critical habitat for the eastern timber wolf
Current Range of the eastern timber wolf in the United States
Original range of the eastern timber wolf in the United states. (Approximate boundary, after Goldman 1944)
Areas with re-establishment possibilities for the eastern timber wolf:
A. Eastern Maine
B. Northwestern Maine and adjacent New Hampshire
C. Adirondack Forest Preserve
D. Upper Peninsula of Michigan
E. Northern Wisconsin

APPENDIX II

SUMMARY OF BASIC DATA FROM FWS/USDA WOLF-LIVESTOCK DEPREDATION CONTROL PROGRAMS IN MINNESOTA 1979-1991

(from Paul, W.J. 1992, unpublished USDA report)

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control

WOLF DEPREDATION ON LIVESTOCK IN MINNESOTA ANNUAL UPDATE OF STATISTICS - 1991

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Depredation by wolves (*Canis lupus*) on livestock and poultry in Minnesota is a problem for some producers. A small percentage of the farms in the wolf range are affected annually and a few of these farms suffer substantial monetary loss in a given year. From 1976 through 1991, the number of farms suffering verified wolf depredations ranged from 9 to 55 ($\bar{x}$ = 27) per year out of about 7,200. From 1977 through 1991 the highest cattle losses claimed by farmers were 0.47 per 1,000 available in 1990; the highest sheep losses claimed were 2.66 per 1,000 available in 1981. A state program which compensates farmers for livestock destroyed by wolves has paid an average of $26,762 per year from 1978 through 1991 (range = $14,444 to $43,664). Claims of losses (especially of calves) sometimes include missing animals. Misidentification by farmers in the wolf range in distinguishing wolf depredation from coyote (*Canis latrans*) depredation has magnified the view of wolves as livestock predators. Most losses occur in summer when livestock are released to graze in open and wooded pastures. Some animal husbandry practices, such as calving in forested or brushy pastures and disposal of livestock carcasses in or near pastures, are believed to contribute to instances of wolf depredation. The number of wolves captured on U.S. Fish and Wildlife Service depredation-control programs from 1976 through 1985 and the U.S. Department of Agriculture depredation-control program from 1986 through 1991 has ranged from 15 to 95 ($\bar{x}$ = 49) per year. Trapping that is initiated against depredating wolves soon after losses have occurred, coupled with improvements in animal husbandry practices, has potential for reducing both livestock losses and the number of wolves that need to be taken. However, the interface of these predators and livestock in Minnesota will necessitate the continued removal of depredating wolves.

SUMMARY OF BASIC DATA FROM FWS LIVESTOCK DEPREDATION CONTROL PROGRAM, 1979-85

	1979	1980	1981	1982			
Total complaints received	31	47	97	76	79	69	77
Complaints received involving livestock	29	40	86	65	69	59	70
Total complaints verified[1/]	16	28	60	34	40	35	39
No. complaints involving livestock that were verified	15	26	58	32	36	29	36
% of total complaints that were verified	51.6	59.6	61.8	44.7	50.6	50.7	50.6
No. complainants	23	31	67	60	63	53	58
No. farms where livestock (excluding dogs) were verified lost by FWS	12	17	38	27	28	19	27
Domestic animals claimed lost to wolves to FWS	7 cows 98 calves 1 sheep 3 chickens 1 dog	10 cows 45 calves 73 sheep 56 turkeys 1 foal 2 dogs	6 cows 60 calves 242 sheep 725 turkeys 10 geese 8 goats 1 pig 100 guineas 4 dogs	4 cows 54 calves 27 sheep 434 turkeys 1 goose 4 goats 6-20 pigs 2 dogs	17 cows 82 calves 45 sheep 127 turkeys 2 goats 284 pigs 1 horse 5 dogs	1 bull, 4 cows 4 yrl, 37 calves 161 sheep 296 turkeys 1 goat several pigs 1 horse 12 guineas 17 dogs	1 bull, 14 cows 1 yrl, 62 calves 149 sheep 120 turkeys 1 goat 1 horse 50 guineas 6 chickens 5 dogs
Domestic animals verified by FWS as lost to wolves	5 cows 12 calves 1 sheep 1 chicken 1 dog	4 cows 12 calves 56 sheep 56 turkeys 1 foal 1 dog	6 cows 24 calves 110 sheep 571 turkeys 6 geese 3 dogs	1 cow 23 calves 12 sheep 50 turkeys 2 pigs 2 dogs	3 cows 32 calves 29 sheep 127 turkeys 6 pigs 1 horse 4 dogs	1 cow, 1 yrl 8 calves 92 sheep 294 turkeys 3 pigs 1 horse 1 guinea 6 dogs	3 cows, 1 yrl 19 calves 75 sheep 1 goat 2 dogs
Complaints trapped	15	28	54	37	39	25	41
Wolves captured	15	26	42	24	49	47	36
Wolves killed	6	21	29	20	42	36	31

[1/] A verified complaint is one in which FWS determines that wolves have killed or maimed one or more domestic animals as evidenced by
(1) observing wounded animals or remains of animals killed and
(2) finding evidence of wolf involvement.

Other useful facts

1. Total farms in Minnesota wolf range - 12,230 (1979)
2. Total cattle in Minnesota wolf range - 234,000 (1979)
3. Total sheep in Minnesota wolf range - 91,000(1979)
4. Estimated no. wolves in Minnesota - 1,200; population increasing in some areas, decreasing in others, but general population about stable.

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SUMMARY OF BASIC DATA FROM USDA WOLF-LIVESTOCK DEPREDATION CONTROL PROGRAM IN MINNESOTA, 1986-89

	1986	1987	1988	1989
Total complaints received	59	65	86	100
Complaints received involving livestock	54	54	74	81
Total complaints verified[1/]	30	38	50	58
No. complaints involving livestock that were verified	29	33	45	49
% of total complaints that were verified	50.8	58.5	58.1	58.0
No. complainants	50	56	72	87
No. farms where livestock (excluding dogs) were verified lost by USDA	25	30	35	41
Domestic animals claimed lost to wolves to USDA	1 bull, 6 cows 4 yrl, 52 calves 36 sheep 481 turkeys 1 goat 1 horse 1 chicken 2 dogs	5 cows, 3 yrl, 40 calves, 24 sheep, 1903 turkeys 8 goats 1 horse 5 pigs, 7 geese 2 dogs	3 cows, 7 yrl, 60 calves 112 sheep 301 turkeys 3 geese, 1 duck 17 chickens 15-20 dogs, 1 cat	1 bull, 7 cows 5 yrl., 57 calves 73 sheep 2,031 turkeys 2 horses 1 goat 20 geese 14 dogs
Domestic animals verified by USDA as lost to wolves	4 cows, 3 yrl 19 calves 13 sheep 285 turkeys 1 goat 1 dog	4 cows, 1 yrl 19 calves, 9 sheep 1,753 turkeys 5 pigs, 1 goose 2 dogs	2 cows, 1 yrl 28 calves 68 sheep 251 turkeys 15 chickens, 1 duck 3 dogs	1 bull, 5 cows 3 yrl., 31 calves 47 sheep 1,636 turkeys 1 goat 10 dogs
Complaints trapped	31	34	52	51
Wolves captured	31	45	64	95
Wolves killed	31	43	59	81

[1/] A verified complaint is one in which USDA determines that wolves have killed or maimed one or more domestic animals as evidenced by (1) observing wounded animals or remains of animals killed and (2) finding evidence of wolf involvement

Other useful facts

1. Total farms in Minnesota wolf range - 7,200 (1982)
2. Total cattle in Minnesota wolf range - 232,000 (1986)
3. Total sheep in Minnesota wolf range - 16,000 (1986)
4. Estimated no. wolves in Minnesota - 1,200; population increasing in some areas, decreasing in others, but general population about stable.

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SUMMARY OF BASIC DATA FROM USDA WOLF-LIVESTOCK DEPREDATION CONTROL PROGRAM IN MINNESOTA, 1990-91

	1990	1991
Total complaints received	149	133
Complaints received involving livestock	125	117
Total complaints verified[1/]	76	55
No. complaints involving livestock that were verified	65	49
% of total complaints that were verified	51.0	41.4
No. complainants	124	117
No. farms where livestock (excluding dogs) were verified lost by USDA	55	42
Domestic animals claimed lost to wolves to USDA	13 cows 3 yrl, 92 calves 222 sheep 1,186 turkeys 4 horses 10 geese, 4 ducks 28 chickens 16 dogs, 20 cats	5 cows 5 yrl, 95 calves 205 sheep 1,216 turkeys 1 horse, 2 goats 2 llamas, 12 geese 10 ducks, 9 chickens 11 dogs
Domestic animals verified by USDA as lost to wolves	2 cows 35 calves 112 sheep 693 turkeys 1 goose, 3 chickens 11 dogs, 2 cats	3 cows 2 yrl, 30 calves 31 sheep 977 turkeys 1 goat, 5 geese 2 ducks, 9 dogs
Complaints trapped	55	46
Wolves captured	91	63
Wolves killed	91	54

[1/] A verified complaint is one in which USDA determines that wolves have killed or maimed one or more domestic animals as evidenced by (1) observing wounded animals or remains of animals killed and (2) finding evidence of wolf involvement

Other useful facts

1. Total farms in Minnesota wolf range - 7,200 (1982)
2. Total cattle in Minnesota wolf range - 232,000 (1986)
3. Total sheep in Minnesota wolf range - 16,000 (1986)
4. Estimated no. wolves in Minnesota - 1,750; population increasing

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Compensation paid by Minnesota Department of Agriculture for livestock destroyed by wolves

Calendar Year	No. claims made	No. claims paid	No. farmers to which claims paid	Amount paid	Losses authorized for payment
1977[a]	10	7	7	$ 8,667.50	1 cow, 16 calves, 17 ewes, 76 lambs
1978	28	25	19	22,482.08	6 cows, 69 calves, 8 ewes, 29 lambs, 124 turkeys
1979	23	23	15	20,773.22	9 cows, 48 calves[b], 15 ewes, 8 lambs, 2 goats, 5 ducks
1980	32	32	22	20,459.00	6 cows, 20 calves, 36 ewes, 72 lambs, 1 colt, 1 horse, 56 turkeys
1981	62	62	38	38,605.60	9 cows, 2 yrl., 24 calves, 57 ewes, 205 lambs, 2 pigs, 582 turkeys, 43 geese, 15 ducks, 100 chickens
1982	36	34	29	18,971.04	1 cow, 1 yrl., 30 calves, 7 ewes, 12 lambs, 640 turkeys
1983	37	34	27	24,868.66	2 cows, 8 yrl., 38 calves, 1 horse, 18 ewes, 11 lambs, 293 pigs, 127 turkeys

cont.

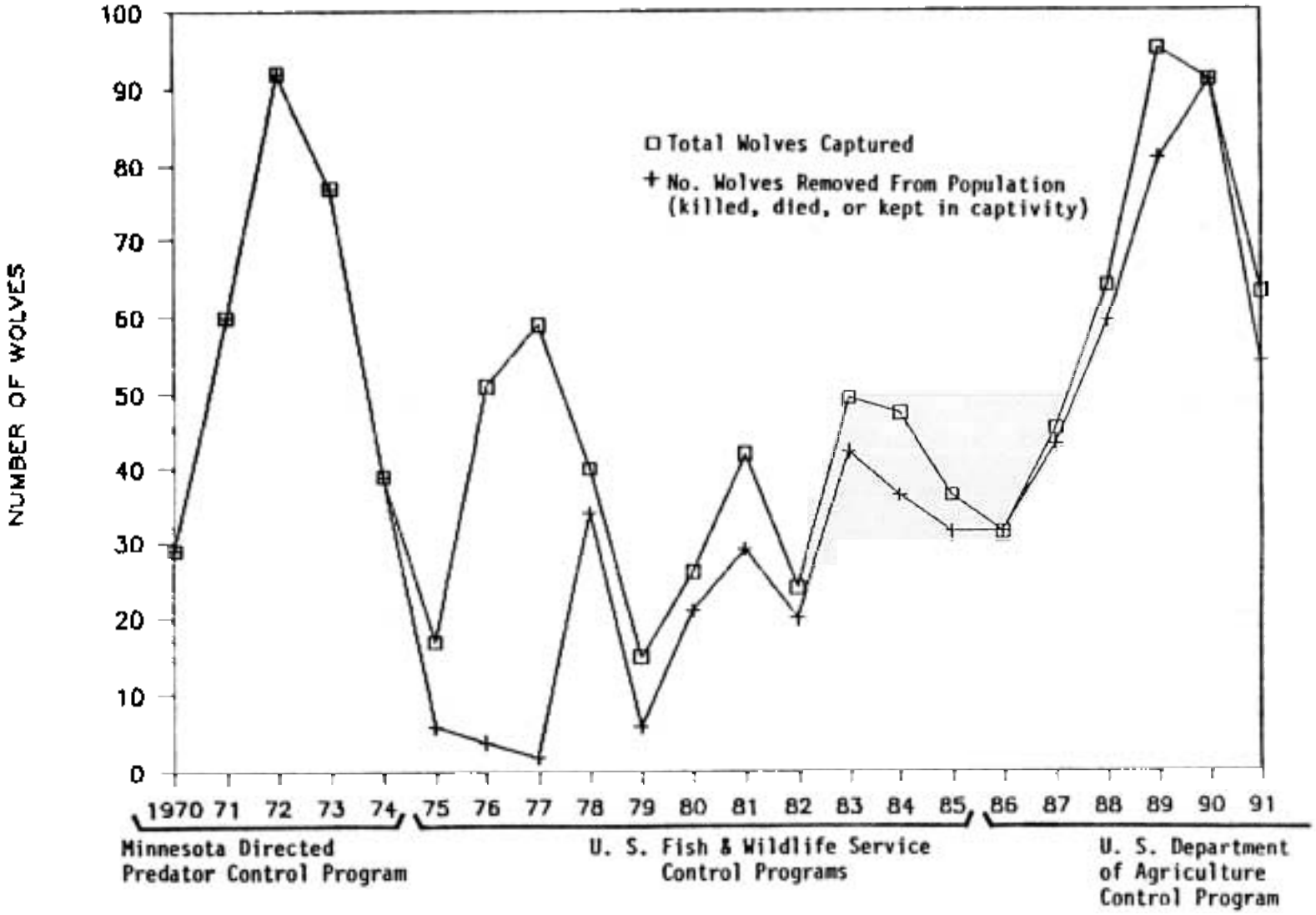
Compensation paid by Minnesota Department of Agriculture for livestock destroyed by wolves

Calendar Year	No. claims made	No. claims paid	No. farmers to which claims paid	Amount paid	Losses authorized for payment
1984	33	31	18	$19,457.74	1 bull, 3 cows, 3 yrl., 24 calves, 1 horse, 2 bucks, 24 ewes, 82 lambs, 1 pig, 296 turkeys
1985	46	45	28	23,558.50	1 bull, 12 cows, 1 yrl., 30 calves, 1 buck, 42 ewes, 77 lambs
1986	33	32	25	14,444.19	4 cows, 4 yrl., 22 calves, 10 ewes, 14 lambs, 481 turkeys
1987	45	44	32	24,233.64	5 cows, 2 yrl., 25 calves, 10 ewes, 4 lambs, 1,817 turkeys, 5 pigs
1988	50	49	30	28,109.90	4 cows, 5 yrl., 41 calves, 32 ewes, 47 lambs, 292 turkeys, 15 chickens, 1 duck
1989	77	76	40	43,663.92	1 bull, 6 cows, 3 yrl., 52 calves, 13 ewes, 32 lambs, 1,866 turkeys
1990	84	82	51	42,739.04	8 cows, 3 yrl., 50 calves, 1 buck, 64 ewes, 63 lambs, 1,170 turkeys, 4 ducks
1991	51	38 11 (pending)	24 8 (pending)	26,485.25 (5,811.86 still pending)	1 cow, 1 yrl., 31 calves, 11 ewes, 31 lambs, 986 turkeys, 1 goat --- 3 cows, 8 calves, 4 ewes, 9 lambs, 31 turkeys, 4 geese, 3 ducks, 7 chickens still pending

[a] Figures for 1977 probably underrepresent losses because of the 1 July starting date and low public awareness of the program.

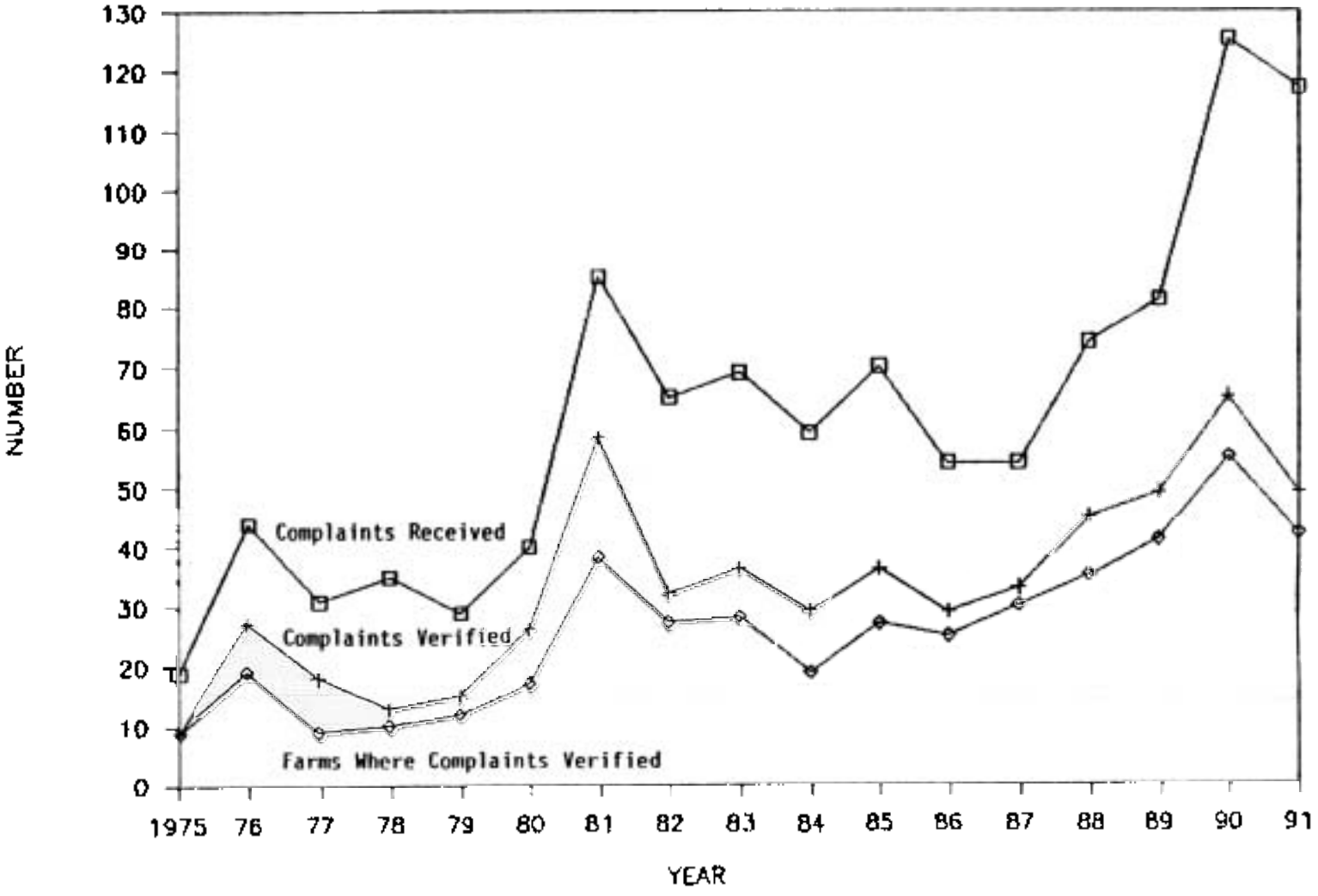
[b] About 35 of these calves were only missing; no remains were found, nor was there evidence that they had been killed by wolves even though wolves may have been near the farm.

WOLVES CAPTURED AND/OR REMOVED



Total number of wolves captured and number removed from the population by livestock-depredation control programs in Minnesota, 1970-1991. All wolves captured on the Minnesota directed control program were killed. Data for 1970-74 represent State fiscal years. Four wolves captured in late summer 1974 are included in fiscal year 1974. Data for 1975-91 represent calendar years.

INDICES TO WOLF–LIVESTOCK DEPREDATION



Indices to recent wolf depredations on livestock in Minnesota based on reports received by the U. S. Fish and Wildlife Service (FWS) from 1975 through 1985 and the U. S. Department of Agriculture (USDA) from 1986 through 1991. Minnesota Department of Agriculture data are not included. Total number of complaints received are all complaints received involving wolves and livestock, regardless of whether wolves killed a livestock individual. Number of complaints verified are the number of instances in which FWS or USDA investigation of a complaint produced evidence that wolves had killed or injured livestock. Each year after 1975 more than one complaint was verified at some farms. In 1975 the FWS had only a minor program (two trappers and no publicity), but enlarged its staff and publicity in 1976.

APPENDIX III

CRITICAL HABITAT AND MINNESOTA WOLF MANAGEMENT ZONES CURRENT AND PROPOSED BOUNDARIES

CRITICAL HABITAT AND MINNESOTA WOLF MANAGEMENT ZONES CURRENT AND PROPOSED BOUNDARIES

Minnesota Wolf Management Zones 1, 2, and 3, indicated in Appendix III, plus Isle Royale National Park, are considered to be critical habitat for the survival and recovery of the eastern timber wolf. These areas provide the space for normal growth and movement of established pack units and will supply sufficient food and cover for the assured survival of the species.

Obviously, any human activity that restricts or reduces the carrying capacity of prey species will ultimately affect the wolf adversely. The maintenance of the present forest products industry and its expansion, therefore, is encouraged. Activities or programs that provide forest/ wildlife management should be encouraged. Activities that permanently remove forest cover are to be discouraged, such as road building, mining, resort development, and major reservoir construction. State and Federal agencies should be encouraged to purchase in-holdings in their project areas. Where opportunities exist to expand these areas through purchase, it should be done.

Because of the diverse conditions within each zone, proposed developments would have a varying degree of significance. Each must be appraised in relation to the specific site for which it is proposed.

It is especially important to note that any single development may not in itself significantly degrade an area as wolf habitat, but that each would contribute to the ultimate unsuitability of the area for wolf survival. This cumulative effect must always be considered in evaluating the potential harm of any development in critical habitat.

All proposed Federal and State actions or programs requiring an Environmental Impact Statement in accordance with Section 202C of the Environmental Policy Act of 1969 (P.L. 91-190) should include an analysis of the impact of the project proposal on the eastern timber wolf. Projects requiring an environmental assessment should include an appraisal of its impact on the eastern timber wolf and measures to mitigate these impacts.

Recommended Changes

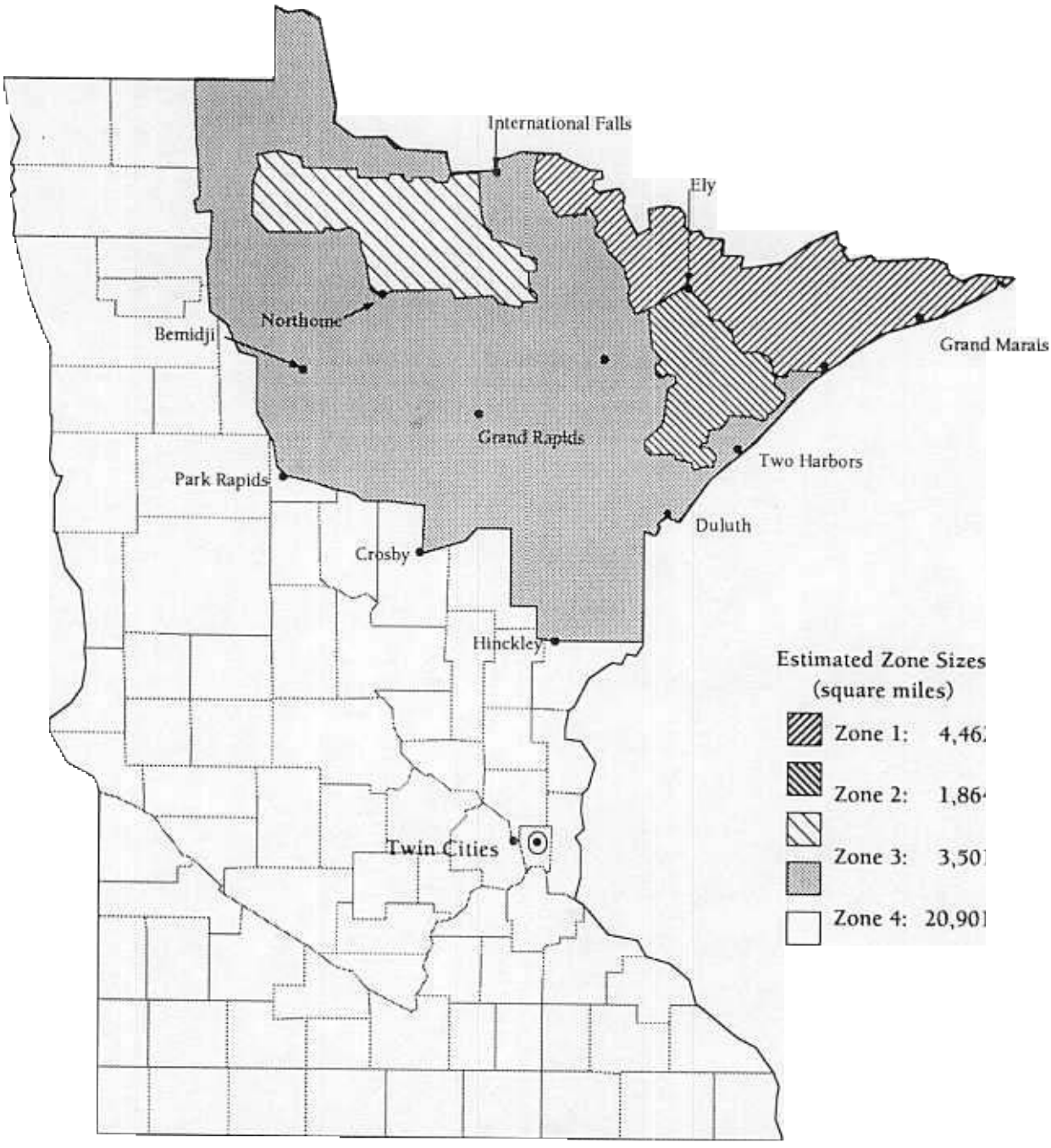
Since critical habitat was originally designated for the eastern timber wolf it has become apparent that some of the designated areas were, and continue to be, less suitable for long-term occupancy by wolves. It has also been recognized that, at the time of management zone delineation, certain areas of Zone 1 were too excessively subjected to the pressures of human development to be properly considered a wolf sanctuary. Furthermore, additional land use data now available for portions of Zones 3

and 4 show some areas to be more like Zone 5 in many ways, while another part of Zone 4 (much of the Chippewa National Forest) is similar to zone 3. Therefore the following maps detail changes, recommended by the Recovery Team, to currently designated Critical Habitat and to Minnesota Wolf Management Zone boundaries.

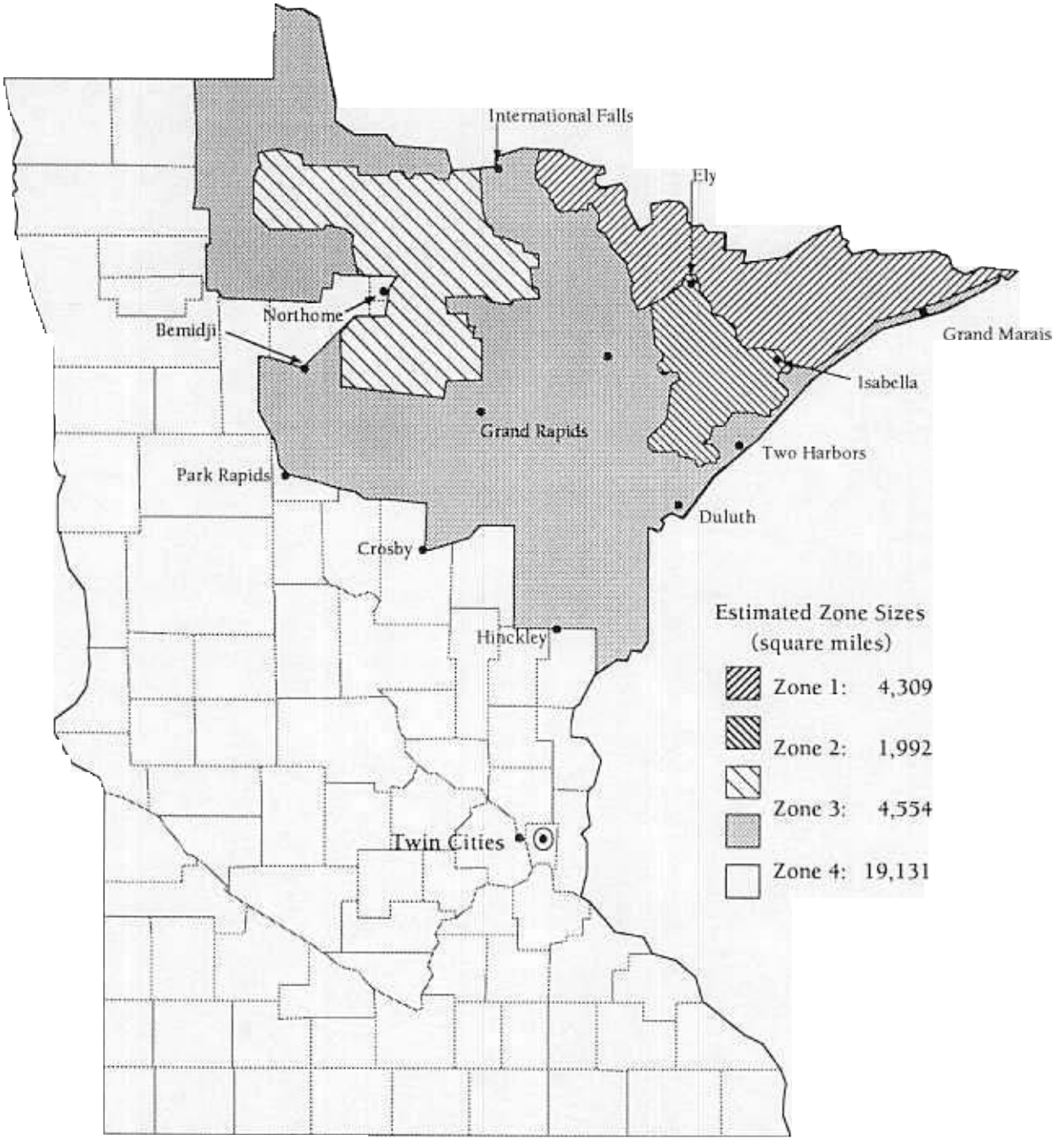
The changes are summarized as follows:

1. Corrections should be made to the Zone 1 boundary to exclude areas which were, at the time of original designation, and continue to be, relatively densely populated by humans. These changes will move out of Zone 1 all of Ely, Winton, Isabella, the area surrounding Burntside Lake, Grand Marais, and a strip of land one-half mile in width extending inland from the Lake Superior shoreline. These areas will become Zone 2, with the exception of the land along Lake Superior and around Grand Marais which will become Zone 4.
2. Zone 4 between the Red Lake Indian Reservation, Highway 2 west of Bemidji, and the northwestern boundary of the Chippewa National Forest should become Zone 5. A small portion of adjacent southwestern Zone 3 surrounding Northome should similarly be considered for reclassification to Zone 5.
3. All portions of the Chippewa National Forest north of Highway 2 should be redesignated from Zone 4 to Zone 3. In addition, the strip of land located north of the Chippewa National Forest and south of the current zone 3 boundary also should be redesignated as zone 3. This land is bounded on the north by State Highway 1, on the south by the north boundary of the Chippewa National Forest, on the east by State Highway 6, on the west by State Highway 46, and includes approximately 50 square miles.
4. A portion of Zone 5 southeast of Hinckley contains suitable wolf habitat and serves as part of the immigration corridor between Minnesota and Wisconsin-Michigan wolf populations. This area should be designated as Zone 4. The areas to be considered for such designation are St. Croix State Park and adjacent lands which are predominantly under State and Federal ownership.

MAPS OF CURRENT AND PROPOSED CRITICAL HABITAT AND MINNESOTA WOLF MANAGEMENT ZONES



Current Wolf Management Zones



Proposed Wolf Management Zones

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