DRAFT

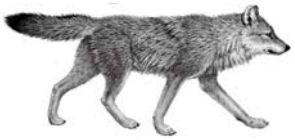
ENVIRONMENTAL ASSESSMENT

FOR THE

MANAGEMENT OF

WOLF CONFLICTS AND DEPREDATING WOLVES

IN MICHIGAN



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SUMMARY OF PROPOSED ACTION

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (WS) and the United States Department of the Interior, Fish and Wildlife Service (USFWS), and Michigan Department of Natural Resources (MDNR), in accordance with State and Federal regulations and guidance on wolf management, propose to implement an Integrated Wildlife Damage Management (IWDM) program in Michigan to protect resources from gray wolf *(Canis lupus)* damage and promote wolf conservation. The analysis covers wolf damage actions that could be conducted by the USFWS, WS and the MDNR while wolves are federally protected under the Endangered Species Act (ESA) and actions that could be taken by WS if wolves are officially classified as recovered and no longer protected by the ESA.[1] The proposed action includes the USFWS issuing permits for take of wolves under Section 10(a)(1)(A) of the Endangered Species Act. WS would act as agents of the Michigan Department of Natural Resources (MDNR) which is the agency requesting a permit for the take of depredating wolves from the USFWS. Under the preferred alternative, damage management would be conducted on private or public property in Michigan when the resource owners/managers request assistance to alleviate wolf damage, wolf damage is verified, and agreements have been completed specifying the details of the damage management action. The types of wolf conflicts that could be addressed include: 1) depredation on livestock, 2) depredation on pets, and 3) potential threats to human health and safety. Under the preferred alternative, the IWDM strategy would encompass the use of the full range of legal, practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, wolves, other species, and the environment. Under this action, WS and the MDNR would provide technical assistance and operational damage management, including non-lethal and lethal management methods selected after applying the WS Decision Model (Slate et al. 1992). When appropriate, best management practices (animal husbandry), frightening devices, and livestock guarding animals could be recommended and utilized to reduce wolf damage. In other situations, when the damage situation and landowner practices meet USFWS and MDNR requirements, wolves would be removed as humanely as possible using foot-hold traps, foot snares, neck snares, and shooting. In determining the damage management strategy, preference would be given to non-lethal methods when they are deemed practical and effective. Lethal methods would be used to reduce damage after practical and appropriate non-lethal methods have been considered and determined to be ineffective or inappropriate in reducing damage to acceptable levels. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate initial response to a wolf damage problem could be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. All wolf damage management would be conducted in compliance with appropriate federal, state, and local laws and court-mandated restrictions.

[1] While wolves are federally protected under the Endangered Species Act, actions taken by the MDNR will depend upon the management decisions (permits, 4(d) rules) of the USFWS which are subject to the requirements of NEPA. When wolves are no longer federally protected as a threatened or endangered species, authority for wolf management will be transferred to the MDNR which is not required to conduct a NEPA analysis of its management decision. WS could be involved in WDM at any time and this analysis addresses alternatives for WS' actions during and after the period when wolves are federally listed as a threatened or endangered species.

ACRONYMS /ABBREVIATIONS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BO	Biological Opinion
CDFG	California Department of Fish and Game
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DPS	Distinct Population Segment
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
GAO	U. S. General Accounting Office
GLIFWC	Great Lakes Indian Fish and Wildlife Commission
IPM	Integrated Pest Management
IWDM	Integrated Wildlife Damage Management
MDA	Michigan Department of Agriculture
MDNR	Michigan Department of Natural Resources
MGWRMP	Michigan Gray Wolf Recovery and Management Plan
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NWRC	National Wildlife Research Center
SOP	Standard Operating Procedure
T/E	Threatened and Endangered
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U. S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WDM	Wolf Damage Management
WS	Wildlife Services

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.0 INTRODUCTION

Gray wolf *(Canis lupus)* populations in North America, including the wolf population in Michigan, have undergone a dramatic recovery in recent years. The combination of an increasing Michigan wolf population, human encroachment on wild habitats and conversion of natural landscapes to agricultural and urban environments has lead to increased conflicts between wolves and humans. Conflicts with wolves include predation on livestock and pets, and risks to human health and safety from potentially hazardous or threatening wolves. Management of conflicts with wolves is addressed in the Michigan Gray Wolf Recovery and Management Plan (MGWRMP; MDNR 1997) and in the United States Department of the Interior, Fish and Wildlife Service (USFWS) Eastern Timber Wolf Recovery Plan (USFWS 1992). Prompt, professional management of damage and conflicts with wolves is an important component of wolf recovery efforts because it facilitates local public acceptance and tolerance of wolves (Fritts 1993, Mech 1995, MDNR 1997, 50 CFR 17.40(o)).

Gray wolves are currently federally listed as an endangered species under Section 4 of the Endangered Species Act (ESA). While federally listed, primary management authority for wolves rests with the USFWS. The ESA and its implementing regulations found at 50 CFR 17.21 set forth a series of general prohibitions and exceptions that apply to all endangered wildlife. These prohibitions, in part, make it illegal to take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) any endangered wildlife species. However, under the provisions of Section 10 of the ESA, the USFWS may grant permits for the take of a federally listed species for, "scientific purposes or to enhance the propagation or survival of the affected species, including, but not limited to, acts necessary for the establishment and maintenance of experimental populations pursuant subsection (j); or (B) any taking otherwise prohibited by section 9(a)(1)(B) if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity". The USFWS cooperates with the Michigan Department of Natural Resources (MDNR) on the management of wolves in the state. If wolves were to be reclassified to a threatened species, the USFWS would retain primary management authority for wolves, but could designate additional management authority to state and tribal natural resource agencies via 4(d) rules under the ESA. Once wolves are removed from the Federal list of threatened and endangered species, states and tribes would have full management authority for wolves. MDNR would manage wolves in accordance with the MGWRMP[2]. Wildlife Services could provide assistance with management of conflicts with wolves at the request of the USFWS, as the designated agent of MDNR or at the request of a specific tribe.

Wildlife damage management, a specialized field within the wildlife management profession, is the science of reducing damage or other problems caused by wildlife and is recognized as an integral part of wildlife management (Berryman 1991, The Wildlife Society 1992). Wildlife Services[3] (WS) is the Federal agency authorized by Congress to conduct wildlife damage management to protect American agricultural, industrial and natural resources, property and human health and safety from damage associated with wildlife (Act of March 2, 1931 as amended 46 Stat. 1486; 7 USC 426-426c (for additional discussion on legal authorities see Appendix B). Wildlife Services is a cooperatively-funded, service-oriented program that provides assistance to requesting public and private entities and government agencies. Before WS responds to requests for assistance and conducts any wildlife damage management, a request must be received and an *Agreement for Control* must be signed by the landowner/administrator

[2] The MGWRMP is currently undergoing revision. See Section 1.4.3 for potential impacts of the revision on this EA.

[3] On August 1, 1997, the Animal Damage Control program was officially renamed "Wildlife Services."

for private lands or other comparable documents for public lands must be in place. Wildlife Services responds to requests for assistance when valued resources are damaged or threatened by wildlife. Responses can be in the form of technical assistance or operational damage management depending on the complexity of the wildlife problem and the funding that is available. Wildlife Services activities are conducted in accordance with applicable Federal, State and local laws, Cooperative Agreements, "Agreements for Control", Memoranda of Understanding (MOUs), and other applicable documents (WS Directive 2.210). These documents establish the need for the requested work, legal authorities and regulations allowing the requested work, and the responsibilities of WS and its cooperators.

This environmental assessment (EA) documents the potential impacts to the human environment of alternatives for USFWS, WS and MDNR involvement in wolf conflict management in Michigan. This analysis relies mainly on existing data contained in published documents (Appendix A), including The Eastern Timber Wolf Recovery Plan (USFWS 1992), the Animal Damage Control (WS) Programmatic Final Environmental Impact Statement (EIS) (U.S. Department of Agriculture (USDA) 1997, Revised), and the MGWRMP (MDNR 1997) whereby pertinent portions of these documents are incorporated by reference. The WS programmatic EIS (USDA 1997 Revised) may be obtained by contacting the USDA, APHIS, WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

1.1 PURPOSE

The purpose of this EA is to evaluate the potential impacts of alternatives for managing conflicts with wolves in Michigan including actions that may be taken with permits issued by the USFWS under Section 10(a)(1)(A) of the ESA or via special conservation regulation promulgated by USFWS under section 4(d) of the ESA. Management activities would be intended to protect agricultural resources, pets, and human health and safety in Michigan, and to conserve wolf populations. This EA evaluates management of conflicts with wolves while wolves are federally protected under the ESA and after the wolf population in Michigan has officially recovered and is no longer protected by the ESA.

1.2 NEED FOR WOLF DAMAGE MANAGEMENT IN MICHIGAN

The need for action in Michigan is based on wolf predation on and threats to livestock, game farm animals and pets, and potential risks to human health and safety from potentially hazardous or threatening wolves. A prompt, professional, effective program to resolve wolf conflicts is needed in order to minimize negative attitudes toward wolf recovery in Michigan and enhance wolf conservation efforts. Any wolf damage management (WDM) program developed should include access to a range of damage management techniques that allow for the minimum impact to wolves while still effectively addressing damage by and conflicts with wolves. The program should be conducted by personnel well trained and qualified in WDM. Control methods should target depredating wolves. There should be a system for monitoring of use of WDM control methods and cumulative impacts on the wolf population. WDM should not have significant adverse effects on the statewide wolf population or non-target species populations.

Section 10(a)(1)(A) of the ESA allows the USFWS to grant permits for the take of a federally listed species for, "scientific purposes or to enhance the propagation or survival of the affected species". If wolves are federally reclassified as threatened, the USFWS may also issue special conservation regulation promulgated by USFWS under section 4(d) of the ESA which could also allow for WDM. In the revised Eastern Timber Wolf Recovery Plan (USFWS 1992) and the MGWRMP (MDNR 1997), the USFWS and MDNR determined that a wolf damage management program including the relocation and/or removal of depredating wolves is necessary and advisable to minimize negative attitudes toward wolf recovery and

facilitate wolf conservation. The MDNR has identified social tolerance of wolves as one of the primary factors limiting expansion of the Michigan wolf population. This determination is consistent with the opinion of wolf experts who have asserted that wolf distributions could be expanded if some form of wolf damage management were implemented (Bangs et al. 1995, Mech 1995, Boitani 2003, Fritts et al. 2003, Mech and Boitani 2003). Mech (1995), the nation's leading expert in wolf biology and management, noted that wolf conservation at the local level may become more socially acceptable if some form of localized wolf control is allowed (Mech 1995; Section 2.2.4). The Wildlife Society is an international organization of professional wildlife biologists especially focused on North America. This professional organization has stated that "Control of wolves preying on livestock and pets is imperative and should be prompt and efficient if illegal killing is to be prevented and human tolerance of the presence of wolves is to be maintained" (Peek et al. 1991).

1.3 BACKGROUND

1.3.1 Wolf Distribution and Classification - General

The original distribution of wolves covered most of the Northern Hemisphere north of latitude 20ºN (Mech 1974). This places the wolf second only to the Pleistocene lions (*Panthera leo*) in having attained the widest distribution of all wild land-dwelling mammals (Nowak 1983). Wolves are not restricted to specific habitat types but once occurred in the Middle East and all across Europe, including the old Soviet Union (Pimlott 1975, Mech 1982).

Prior to European settlement, gray wolves occupied much of North America except, possibly, for the large desert areas of the United States and the Southeast. Subsequent to European settlement, the decline in wolf numbers in the United States progressed rapidly, starting from the east and moving westward. By about 1900 the species had disappeared from the eastern half of the United States except for the upper Great Lakes region, and by about 1930 most wolf populations in the west were almost eliminated. In Canada the trend was similar (Carbyn 1983*a*) but not as complete. Then occurred what Nowak (1983) referred to as "one of the most remarkable wildlife comebacks in history."

In 1974 the gray wolf in the contiguous 48 states was listed as endangered under provisions of the ESA. A Federal "*Recovery Plan for the Eastern Timber Wolf*", approved in 1978 and revised in 1992, stated that a primary objective is to reestablish viable populations in as much of its former range as possible (USFWS 1978, 1992). As a result of the protection placed upon them, wolves spread back into formerly occupied ranges from Alaska to the Great Lakes. In response to increasing and expanding wolf populations, on April 1, 2003, the USFWS changed the classification of the gray wolf under the ESA. The USFWS established three distinct population segments (DPSs) for the wolf in the conterminous US. The wolves in Michigan were in the Eastern DPS and were reclassified from endangered to threatened in this action (68 FR 15804-15875). The USFWS also established a special regulation under section 4(d) of the ESA which applied provisions similar to those in Minnesota, where wolves have been classified as "threatened" since the 1974 listing, to most of the Eastern DPS. This special regulation allowed for lethal control of depredating wolves in situations where management authorities deemed those actions were warranted. USFWS found that these special rules were necessary and advisable to provide for the conservation of the wolves in the Western and Eastern DPS (50 CFR 17.40(n) and (o), respectively). Lethal control was carried out by the MDNR and USFWS or their designated agents. Personnel from WS were designated agents of the MDNR through a cooperative agreement signed by the MDNR and WS. On July 21, 2004, the USFWS initiated the process for delisting wolves in the Eastern DPS (69 FR 43663 43692).

On January 31, 2005 a United States District court in Oregon enjoined and vacated the USFWS' Final Reclassification Rule of April 2003 that changed the status of the gray wolf from endangered to threatened in the Eastern and Western DPSs. The ruling effectively returned the wolves in Michigan to their previous endangered status and cancelled the special regulations established under section 4(d) of the ESA. After learning of the court ruling, the USFWS advised MDNR to cease any lethal control activities including actions by their authorized agent, WS. Lethal removal of depredating wolves now requires a Section 10(a)(1)(A) permit from the USFWS. On April 19, 2005 the USFWS issued a Section 10(a)(1)(A) permit which allowed MDNR and WS (as MDNR's authorized agents) to resume most of the wolf depredation control activities allowed under the previous 4(d) rule. On September 13, 2005 the United States District Court in the District of Columbia enjoined the USFWS from allowing any activities authorized under the permits because of procedural problems with the permits. MDNR subsequently applied for a new permit for similar damage mangement take activities. At present MDNR and WS assistance with wolf depredations on livestock is limited to documenting the event and providing technical assistance on non-lethal methods for resolving wolf damage including husbandry techniques (e.g., fencing, bringing animals in at night, guard dogs) and other non-lethal methods permitted under the cooperative conservation agreement between the USFWS and MDNR (Section 1.7.8).

1.3.2 Wolves in Michigan

Gray wolves occurred throughout Michigan prior to European settlement. As the Europeans settled Michigan, they brought their wolf prejudices with them (Lopez 1978). European werewolf mythology, fairy tales, and religious beliefs, along with views that wolves were incompatible with civilization, resulted in the persecution of wolves in Michigan. In addition, the United States Congress passed a wolf bounty in 1817 in the Northwest Territories, which included what is now Michigan. A wolf bounty was the ninth law passed by the First Michigan Legislature in 1838. The Michigan wolf bounty continued until the period between 1922 and 1935 when a state trapper system was in effect. The bounty was reinstated in 1935 and repealed in 1960, only after wolves were nearly eliminated from the state. Michigan wolves were given complete legal protection (under state law) in 1965.

By the time bounties were imposed in the 1800s, wolves were nearly gone from the southern Lower Peninsula and were absent from the entire Lower Peninsula by about 1935 (Stebler 1944). In the more sparsely settled Upper Peninsula, the decline was less noticeable. In 1956, the population was estimated at 100 wolves in seven major areas in the Upper Peninsula (Arnold and Schofield 1956). The Michigan wolf population was estimated at six animals in the Upper Peninsula in 1973; sporadic breeding and occasional immigration of wolves from more secure populations in Ontario and Minnesota were postulated as the factors that maintained a small population of wolves in the Upper Peninsula (Hendrickson et al. 1975). It is likely that a few animals persisted in remote areas of the Upper Peninsula and that wolves were never extirpated from the state.

Under the protections of Federal listing as an endangered species, in 1974, wolf populations in Wisconsin and Minnesota began to expand and freely disperse. Wolf population monitoring by MDNR began in the 1980s. Each winter a comprehensive wolf population census is conducted in the Upper Peninsula. Since FY2000, WS has provided partial funding, personnel, and equipment for this census. This census is conducted through the use of winter track counts, aerial surveys and radio-telemetry.

Wolf numbers have increased in Michigan in recent years (Table 1-1). Michigan's annual minimum wolf population estimates are provided in Table 1-1 (Brian Roelle, MDNR, pers. comm. July 2005). These estimates are derived from surveys conducted during winter, prior to pup production, when population size is at an annual low. In 1991, the confirmed wolf population was 17 animals consisting of only one confirmed pack and scattered individuals (MGWRMP 1997). During the winter of 2004-2005, there were estimated to be at least 87 packs across the Upper Peninsula. These estimates of the Michigan wolf population exclude wolves on Isle Royale. The annual percent change in the Michigan wolf population from 1994 – 2005 has ranged from -3.45% to +48%. The Michigan minimum wolf population estimate of 405 for 2005 is a 13% increase from 2004. Prior to October 2004, all wolves were believed to live in the Upper Peninsula. However, in October of 2004, a wolf was accidentally killed by a trapper in Presque Isle County in the northern Lower Peninsula. Since then, the tracks of two more wolves have been confirmed in Presque Isle County.

Table 1-1. Confirmed Late Winter Wolf Numbers in Michigan and Wisconsin 1995-2005.

	Michigan		Wisconsin	
Year	**Number of Wolves[1]**	**Number of Packs[1]**	**Number of Wolves[2]**	**Number of Packs[2]**
1995	80	27	83	18
1996	116	33	99	28
1997	112	35	148	35
1998	140	42	178	47
1999	174	52	205	57
2000	216	63	248	66
2001	249	70	257	70
2002	278	63	323	83
2003	321	68	335	94
2004	360	77	373	108
2005	405	87	425	108

[1] Isle Royale wolves not included.
[2] Estimate does not include wolves on tribal lands.

While federally listed, the USFWS has primary authority for the management of wolves, however, management of resident wildlife species is also the responsibility of the MDNR and local tribes. Wolves are also protected under state endangered species regulations. In 1992, the director of the MDNR created a ten-member Michigan Gray Wolf Recovery Team to develop the MGWRMP. The Plan was approved by the director of the MDNR in 1997. The MDNR is currently revising the Michigan Gray Wolf Recovery and Management Plan. The 1997 plan follows the intent of the Federal Recovery Plan and supports reclassification of the wolf in Michigan from *"endangered"* to *"threatened"* when a minimum combined population of 100 animals was maintained in Michigan and Wisconsin for five consecutive years. This goal was met in 1998 and wolves in Michigan were Federally reclassified as "threatened" in 2003. However, this decision was enjoined and vacated by a Federal court, thereby returning wolves to their Federal "endangered" status.

According to the MGWRMP, in order for MDNR to remove wolves from the Michigan endangered species list, a minimum population of 200 wolves must be observed for five consecutive years. This State recovery goal was set higher than the federal recovery goal

because factors affecting wolf immigration from Ontario, Minnesota, and Wisconsin are outside the control of Michigan. Therefore, to meet the State's goal to ensure their long-term survival, Michigan wolves were considered an isolated population, as defined in the Eastern Timber Wolf Recovery Plan. This requires a minimum population of 200 wolves. According to the State plan, wolves would be considered recovered in Michigan when there has been a winter population of 200 wolves for five consecutive years. The wolf population in Michigan met this goal in 2004. However, until federal delisting occurs, the gray wolf will remain protected under the provisions of the Michigan Endangered Species Protection Law (Public Act 451 of 1994, Part 365). Following potential state and federal delisting, the wolf would be considered a protected species under the Michigan Wildlife Conservation Act (MDNR 1997).

1.3.3 Benefits of Wolves

Wildlife generally is regarded as a source of economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Direct benefits are derived from a user's personal relationship or direct contact with wildlife and may include both consumptive (e.g., using or intending to use the animal such as in hunting or fishing) and non-consumptive uses (e.g., observing or photographing animals) (Decker and Goff 1987).

Wolves play an important role in predator/prey relationships. By culling old, young, sick, and injured individuals from a prey population, it is believed that wolves help maintain healthier, viable prey populations when other prey population mortality factors are in balance (Mech 1970).

Wolves may also play a role in the development of riparian and upland plant communities in various locations within the U.S. Research has shown that wolf predation on elk in the greater Yellowstone National Park region of northwestern Wyoming and southwestern Montana altered elk behavior and habitat use which, in turn, resulted in less foraging pressure on sensitive riparian areas and increased willow and quaking aspen height in riparian/wet meadow habitats (Ripple et al 2001, Ripple and Beschta 2004). A similar study by Fortin et al (2005) suggests that there may also be a behavioral component to these wolf-elk interactions. Elk may still travel through high wolf use areas, but they may alter their habitat preferences from aspen in riparian zones to conifer forest and open meadow habitat types (Fortin et al. 2005). On Isle Royale National Park in Lake Superior, balsam fir growth has been linked to wolf-moose interactions (McLaren and Peterson 1994). When wolves were relatively scarce, moose numbers grew, which led to depletion of balsam fir forage. It was observed that vegetation response followed moose response. When wolf numbers were higher, moose numbers were low and balsam fir growth increased (McLaren and Peterson 1994). These studies suggest that wolf recovery may present a management tool for helping to restore certain types of vegetation and to conserve biodiversity (Ripple et al 2001, Ripple and Beschta 2004).

Viewing wolves or hearing them howl in their natural habitat is a popular activity in certain areas and is considered to add value to many people's outdoor experience. Organized tours for the purpose of viewing wolves or hearing them howl are conducted at some U.S. and Canadian national parks such as Yellowstone (WY), Denali (AK), Wood Buffalo (Alberta, Canada), and Riding Mountain (Alberta, Canada). Small or large group howling attempts can also be made in any area where wolves are known to be present. Such activities provide not only aesthetic viewing but there may also be associated economic (tourism) benefits.

1.3.4 Wolf Predation on Livestock and Pets

The ability of wolves to kill cattle, sheep, poultry, game farm animals and other livestock is well documented (Young and Goldman 1944, Fritts 1982, Carbyn 1983*a*, Fritts et al. 1992, USDA 2005). The economic impact of wolf depredation on livestock can be substantial for individual producers. Further, when wolves come into contact with people (Linnel et al. 2002) and kill or injure their pets there is both an economic and an emotional loss. There is the cost to replace a pet that has been killed or to care for one that has been injured. Also, many people are attached emotionally to their pets and have very strong feelings concerning their injury or loss.

The number of wolf depredation events reported to the MDNR has shown a generally increasing trend at the same time that State wolf population has increased (Figure 1-1 and Table 1-2). In 1996 one depredation was reported to the MDNR, but since that time, the MDNR and WS have verified up to 22 depredations per year. During 1996-2004, the MDNR and WS have verified wolf depredation complaints involving 67 different properties. As the wolf population expands in Michigan, the need for wolf damage management (WDM) to reduce damages will increase as will efforts to monitor and maintain public support and acceptance of wolves (MDNR 1997). The proportion of all farms in the Upper Peninsula with verified wolf depredation is very low (34 wolf depredation sites over the period of 1996-2004 and a total of 746 cattle farms in the Upper Peninsula in 2002 (NASS 2002)). However, the impacts on individual producers can be substantial.

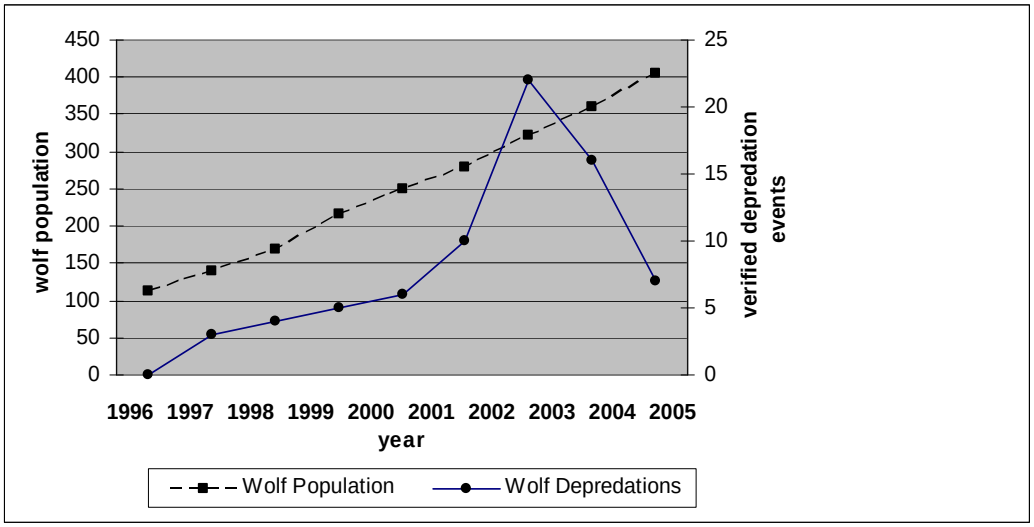


Figure 1-1. Annual Verified Wolf Depredations On Livestock And Pets And Annual Minimum Wolf Population Estimates In Michigan (D. Beyer, MDNR, pers. comm. 2005)

Table 1-2. Summary of Verified Wolf Depredation Events (D. Beyer, MDNR, pers. comm. 2005).

Year	Cattle	Sheep	Chickens	Dogs	Cervids	Totals
1996	0	0	0	1	0	1
1997	0	0	0	0	0	0
1998	3	0	0	0	0	3
1999	1	0	0	3	0	4
2000	2	1	2	0	0	5
2001	3	0	0	3	0	6
2002	4	0	1	5	0	10
2003	11	1	1	9	0	22
2004	7	2	0	5	2	16
2005	2	2	1	2	0	7
Total	**33**	**6**	**5**	**28**	**2**	**74**

Domestic dogs and cats are occasionally killed and eaten by wolves (Fritts and Paul 1989). In Michigan, hunting dogs used to pursue bear, coyotes, and bobcats are occasionally killed by wolves during hunting seasons. From 1996-2005, MDNR has verified that wolves killed 28 dogs (D. Beyer, MDNR pers. comm. 2005). There are probably other instances where wolves attacked dogs, but the incidents were not reported or the dogs just "turned-up" missing. Wolves may carry off the carcass of a small dog or drag a dog's carcass out of the yard and into the woods. Such attacks raise public concerns about both pet and human safety.

The Michigan Department of Agriculture (MDA) provides compensation payments for all verified wolf depredations of livestock. State law limits payments to market value at the time of loss, and Defenders of Wildlife, provides additional funding for the difference between the value of young of the year livestock and their fall market value. Wolf damage compensation payments made by MDA from 1998 through 2004 have totaled $14,838.50, and included damage or depredations to cattle, sheep, poultry and cervids. Most depredation events involve one or two animals; however in 2003, 21 poultry were killed at one location (J. Pickworth, MDA pers. comm. 2005).

1.3.5 Other Types of Wolf Conflicts

The regulations pertaining to the taking of a Federally-listed Threatened or Endangered Species act allow any individual to take an endangered species in defense of his own life or in the defense of others (50 CFR 17.21). Responses to demonstrable but non-immediate risks are subject to the same requirements for permits and/or 4(d) rules and authorities granted under 50 CFR 17.21 to any employee or agent of the FWS, any other Federal land management agency, or a State conservation agency, who is designated by his agency for that purpose.

There have been few reported wolf attacks on people. However, there are reports where wolves have been viewed as threatening to human health and safety or have stalked and attacked people for unknown reasons (e.g., reasons unrelated to disease or injury; Linnel et al. 2002, McNay 2002). When wolves approach human residences and threaten or kill people's pets or exhibit bold behavior, people often become concerned for human safety. This is especially true if small children are present at those residences.

Linnel et al. (2002) were able to find and report several cases from around the world in which non-diseased wolves attacked people, but no humans were killed during the attacks; the wolves, in most cases, were later killed and examined. The wolves involved in those attacks seemed to have acclimated to the presence of people and became more aggressive (bold) toward people. Fortunately, in many of these incidents, others accompanied the person attacked and they were able to drive the wolf away. In many cases the person attacked received minor injuries and made a full recovery in a few days to weeks. There are no verified instances of wolves having attacked and injured people in the lower 48 United States. However, in January of 2005, an individual was attacked by a wolf while jogging near the community of Key Lake in northern Saskatchewan, Canada. The man was able to fight off the animal and later was flown to a hospital for stitches to non-life threatening injuries. An attack by wolves appears to have been the cause of death for a man near Wollaston Lake in Northern Saskatchewan, Canada on November 8, 2005. The investigation has not been completed, but the injuries discovered in the autopsy are consistent with animal bites and wolf tracks were found near the body. The wolves involved in the attack may have become accustomed to humans and/or may have been deliberately or inadvertently (via improperly stored garbage) fed by humans. A group of 4 wolves had been seen in the area for some time and appeared to be losing their fear of humans. There was also evidence that the victim and friends had been recently interacting with the wolves at close range (International Wolf Center 2005). Michigan has not had any reported cases where wolves have stalked or attacked people.

McNay (2002) reviewed human-wolf interactions and analyzed case histories of incidents where wolves had behaved aggressively towards humans in Alaska and Canada. McNay notes that incidents of wolves behaving aggressively towards humans are extremely rare. For much of the 20th century there were no documented cases of wolves killing or seriously injuring a person in North America. McNay (2002) does provide case histories for 11 instances of what he considered unprovoked incidences of aggressive behavior of wolves which resulted in no injury (4) or minor injuries (7) over the period of 1969-1993. As wolf and human populations have increased, the opportunity for interaction between the species has also increased. Although wolves have a high aesthetic and cultural value and calling and viewing wolves is extremely popular, not all of these interactions have been positive. McNay provided evidence of 7 cases of unprovoked wolf aggression over the period of 1994-2000, 5 of which involved wolves inflicting severe bites on humans.

Wolf familiarity with (habituation to) humans appears to be an important factor in aggressive behavior of wolves toward humans. Of the 18 unprovoked incidents of aggressive behavior reported by McNay for the period of 1969-2000, 11 were associated with what he defined as habituated wolves, (e.g. wolves which had lost their fear response to humans after repeated non-consequential encounters). Bites were inflicted in all 11 cases where habituated wolves displayed unprovoked aggressive behavior, but bites were inflicted in only 2 of the 7 cases where naïve wolves displayed aggressive behavior. All instances where wolves inflicted severe bites were associated with habituated wolves. Human behavior may have had an impact on the outcome of interactions between wolves and humans. In most instances where naïve wolves behaved aggressively toward humans, the humans defended themselves by hitting the wolf with a heavy object, firing a rifle into the air or, in two instances, killing the wolf. None of the individuals who were bit by habituated wolves defended themselves with anything other than their voices, hands or arms. It was difficult to determine if food conditioning (wolves learning to associate humans with the availability of food) played a role in all cases. However, 6 of the 11 aggressive habituated wolves were known to be food conditioned. It was unlikely that the naïve wolves were food conditioned because all of those incidents occurred at sites well away from human use areas. The data provided by McNay (2002) indicates the importance of human behavior

management and public education programs in the prevention of adverse human-wolf encounters. These efforts coupled with non-lethal techniques designed to reduce or prevent wolf habituation to humans will likely prevent or resolve most situations where wolf behavior causes concern for human safety. However, there will be rare instances where removal of the problem wolf may be necessary.

In Michigan, most of the cases of requests for assistance regarding perceived threats from wolves involve young male wolves that are dispersing. Young males have wandered into small residential areas where they remained for a few days before frightening devices were used to move them along. However, in 2005, WS, with approval from the MDNR[4], lethally removed a crippled male wolf that wouldn't leave the Cisco Lake resort community after repeated attempts to frighten the individual (D. Lonsway, WS, pers. comm.).

Wild wolves rarely contract rabies, but it is possible, and there is a serious concern for humans or their pets should they be bitten. McNay (2002) reported 2 people that died as result of bites from wolves with rabies in Alaska in the 1940s, but radies is rare in wolves south of the arctic in North America. Wolves could possibly spread other wildlife diseases to dogs (e.g., sarcoptic mange) should they have contact with a dog or their environment and *vice versa*. For example, in Wisconsin, wolf deaths attributed to infectious disease have been primarily attributable to mange (Thomas et al. 2005, Wydeven and Wiedenhoeft 2005)

1.3.6 Wildlife Services and Michigan Department of Natural Resources Efforts to Reduce Wolf Damage in Michigan

Wildlife Services' efforts to alleviate wolf problems have been based on a combination of technical assistance and operational damage management in an Integrated Wildlife Damage Management (IWDM) program. As the number of wolf conflicts in Michigan has increased, so has the need to implement operational damage management projects (Figure 1-1).

In 1980 the MDNR completed a cooperative conservation agreement with the USFWS. This cooperative conservation agreement allows qualified and authorized MDNR personnel and their agents to conduct some types of non-lethal WDM activities (Section , research, and trap and relocate activities without needing a permit or special 4(d) rule from the USFWS (50 CFR 17.21 (a)(5), also see Section 1.7.7 of this EA).

In FY 2000, WS entered into a cooperative agreement with the MDNR concerning several aspects of wolf management including damage management. Wildlife Services assists MDNR with capturing and radio-collaring wolves within packs so that the activity and number of individuals within packs can be monitored. Due to the extensive efforts by MDNR and WS staff, Michigan is one of the few states with an actual wolf census (count) and not just a wolf population index which can only indicate population change (stable, increasing, decreasing). Wildlife Services currently has employees in the Upper Peninsula that assist with monitoring of wolf packs and depredation complaints. Wildlife Services provides technical assistance to producers on WDM, and, upon request by MDNR, WS live-traps wolves at or near verified (confirmed or probable) depredation sites, and relocates or euthanizes captured wolves. Prior to reclassification to threatened in 2003, all problematic wolves were trapped and relocated by MDNR and WS personnel. Under the 4(d) rule which was in effect from April 2003 through January 2005, 10 wolves known to have been involved in depredation events were euthanized at the direction of MDNR. As discussed in Section 1.3.2, a decision by the United States District

[4] The state authority to take diseased, sick, or injured wolves is in 50 CFR 17.21.

court in Oregon returned Michigan wolves to their previous status as “endangered” in January 2005. After learning of the court ruling, MDNR ceased all lethal WDM activities including actions by their authorized agent, WS. On April 19, 2005 the MDNR obtained a USFWS Section 10(a)(1)(A) permit which allowed MDNR and WS (as MDNR’s authorized agent) to resume most of the wolf depredation control activities allowed under the previous 4(d) rule. All WDM activities allowed under the permit were enjoined by the U.S. District Court in the District of Columbia on September on September 13, 2005 for procedural reasons. At present MDNR and WS assistance with wolf depredations on livestock is limited to documenting the event and providing technical assistance on non-lethal methods for resolving wolf damage including husbandry techniques (e.g., fencing, bringing animals in at night, guard dogs) and other non-lethal methods permitted under the cooperative conservation agreement between the USFWS and MDNR (Section 1.7.7). The MDNR has requested a new permit for select WDM actions.

1.3.7 Wolf Ecology

Gray wolves obtain their food by running down prey. They can attain speeds of 35–44 miles/hour over short distances (Mech 1974) and a travel gait of five miles/hour can be maintained for long distances. The presence of wolves in an area is dictated in part by the availability of habitat for its prey species. Wolves in forested environments appear to depend generally on their sense of smell and hearing (Mech 1970). Their sense of smell is highly developed, enabling them to detect odors from distances as far as 1½ miles; smell functions both to detect prey (Mech 1970) and in territorial marking and social interaction (Asa et al. 1985). Harrington and Mech (1982) reported that wolves replied to human howls from a distance of three miles and possibly from as far as six miles. Vision in wolves is apparently acute but, compared with smell and hearing, may be the least highly developed; however, this is difficult to test.

The social behavior of gray wolves is affected by their reproductive cycle and need to hunt in packs. Pack dynamics, social status of individuals, movements, and certain aspects of seasonal habitat use are all affected by their reproductive behavior. Gray wolf packs normally consist of several sub adult and adult males and females that can produce young. However, about 38% of all adult females fail to reproduce (Packard et al. 1983). This failure is believed to be the result of deferred reproduction (i.e., lack of copulation) rather than the suppression of hormonal cycles (Packard et al. 1983, 1985). Delayed behavioral maturation provides an adaptive advantage to the pack in that many members help raise just a few young or the young of the dominant pair. The pack can remain as a viable social unit, necessary for successful hunting, while reducing competition for mates and maintaining pack unity through their social hierarchy. This also provides an advantage to the alpha males and females by increasing the probability that only their genes are passed on.

The social standing of wolves within a pack influences the breeding cycle among high-ranking members in the hierarchy. Alpha animals suppress lower-ranking animals in their behavior towards them and generally mate with other high-ranking animals. Some captive females have been observed as capable of conceiving at ten months of age (Medjo and Mech 1976), but sexual maturity in the wild usually is attained at 22 months and often wolves do not breed until their third or subsequent years. Females coming into estrus for the first time may do so two weeks later than those that have previously bred (Rausch 1967). Estrus in wolves lasts from five to seven days (Mech 1974) or longer and occurs any time from January to March, depending on latitude. Most breeding in Michigan occurs in February (MDNR 1997).

Ovulation and implantation are regulated by a number of factors. In one study (Rausch 1967), females breeding for the first time shed an average of 6.1 ova and implanted 5.4 embryos, whereas older females shed an average of 7.3 ova and implanted 6.5 embryos. Five adult females found in Wisconsin in the 1980s and early 1990s, had an average of 5.2 (range 3-8) fetuses. Gestation lasts about 63 days and average litter size is about six, with extremes recorded being from 1 to 11 (Mech 1974). A wolf pack generally produces one litter per year (Packard and Mech 1980); however, well-documented cases of births of more than one litter per pack per year have been recorded both in captivity (Paquet et al. 1982) and in the wild (Murie 1944, Van Ballenberghe 1983). In Yellowstone National Park, a single pack producing 2-3 litters in one year has been routinely documented (USFWS et al. 2002, Smith et al. 2005). In such cases, adults in the pack often divide their time between dens and will unite the family groups after the pups become mobile (Murie 1944). Occasionally, subordinate wolves that have left the pack are known to have produced pups (Peterson et al. 1984).

Young are usually born in earthen dens dug by female wolves or in dens taken over from other animals. Availability of suitable habitat for denning is only of secondary importance when compared to prey availability (Carbyn 1975, Ballard and Dau 1983). Young are born with their eyes closed and initially have a poor thermoregulatory system. In Michigan, birth occurs from mid to late April (MDNR 1997). Newborn pups weigh about one pound (Rutter and Pimlott 1968) and their movements are limited to a slow crawl. Eyes open at 11–15 days (Mech 1970), but pups see poorly until they are several weeks old.

At about three weeks pups will emerge from the den and can be found romping near den entrances (Young and Goldman 1944). Social interactions begin to develop during this period. After several weeks pups are moved to activity sites, which are also referred to as *"rendezvous"* or *"home sites"*; generally less than 1.2 miles from den sites (Carbyn 1975, Peterson et al. 1984). Thereafter, pup activity is centered on a succession of home sites progressively farther from the den. By four to six months, pups have reached nearly adult size; they then range with packs in winter circuits.

Wolves are opportunistic predators and prey most extensively on ungulates and beaver (*Castor canadensis*); although in exceptional cases they have resorted to feeding on garbage (Grace 1976) or such unusual food items as insects (Kuyt 1972) and fish (Bromley 1973). Mandernack (1983) found deer at 55%, beaver at 17%, and snowshoe hare (*Lepus americanus)* at 12% volume (relative bulk density) of 334 wolf scats found in Wisconsin, but scat samples were biased toward the warmer months. Mettke (1998) found 78% deer by volume in 47 scats from a pack in northwest Wisconsin in late winter and early spring. Surprisingly both studies also found pig (*Sus scrofa),* probably from carcasses thrown in the forest, and Metttke (1998) also found 3% volume of calf remains in scats

In general, wolves prey on the most vulnerable animals. Young, older, or otherwise less robust individuals are most vulnerable to wolf predation (Murie 1944, Pimlott et al. 1969, Mech and Frenzel 1971, Mech and Karns 1977, Peterson 1977, Carbyn 1983*b*). Snow conditions and forage limitations may render a large proportion of a prey population vulnerable to wolves. When food is plentiful, wolves normally eat meat at about 2 oz prey/pound of wolf/day (Kolenosky 1972) (i.e., an 80 pound wolf would consume about 10 pounds of meat); however, consumption rates in the wild may be as high as 3 oz. prey/pound wolf (i.e., 15 pounds of meat for an 80 pound wolf) (Fuller and Keith 1980) and 4 oz prey/pound wolf (20 pounds of meat for an 80 pound wolf) (Carbyn 1983*b*). However, wolves have an amazing ability to survive long periods with little or no food. Mech (1977) learned that as a result of food deprivation during winter, wolves conserved energy by traveling less and sleeping more than under normal conditions.

Wolves kill and consume other carnivores, including other wolves (Van Ballenberghe and Erickson 1973, Fuller and Keith 1980), dogs (L. Carbyn, pers. observation) and bears (*Ursus americanus*, *U. maritimus*) (Horejsi et al. 1984, Ramsay and Stirling 1984, Paquet and Carbyn 1986). At other times carnivores are killed and not consumed. For example, wolves have been observed to kill but not eat dogs, coyotes (*Canis latrans*) (Carbyn 1982), wolverines (*Gulo gulo*) (Boles 1977), and mink (*Mustela vison*). In addition, instances have been recorded where more prey are killed than can be consumed (i.e., surplus killing) (Bjärvall and Nilsson 1976, Mech 1977, Eide and Ballard 1982, DelGiudice 1998). Killing by wolves ranges from predation (killing to eat either an entire carcass or part of it) to defensive, territorial and surplus killing. In cases where coyotes, dogs, or other wolves are killed but not consumed defensive or territorial killing is implicated.

Once thought to need wilderness areas to survive, research, as well as the expansion of wolf range over the last two decades, has shown that wolves can successfully occupy a wide range of habitats, and they are not dependent on wilderness areas for their survival. Wolves tend to more readily occupy heavily forested areas and landscapes with low road densities (Mladenoff et al. 1995). Mech (1995) believes that inadequate prey density and a high level of human persecution are the main factors that limit wolf distribution.

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.4.1 Actions Analyzed

The scope of this EA is to evaluate the potential impacts of alternatives for by the USFWS, WS and the MDNR involvement in WDM in Michigan while wolves are federally protected under the ESA and the potential impacts of WS actions if and when wolves are no longer federally listed as a threatened or endangered species. While wolves are federally protected under the ESA, actions taken by the MDNR will depend upon the management decisions (permits, 4(d) rules) of the USFWS which are subject to the requirements of NEPA. When wolves are no longer federally protected as a threatened or endangered species, authority for wolf management will be transferred to the MDNR which is not required to conduct a NEPA analysis of its management decision. WS could be involved in WDM at any time and this analysis addresses alternatives for WS' actions during and after the period when wolves are federally listed as a threatened or endangered species.

Activities could include wolf damage management initiated to protect agricultural resources, pets, and human health and safety in Michigan, and to enhance local tolerance of wolves, and wolf population monitoring. While wolves are a federally protected endangered species, the USFWS retains primary management authority for wolves, and may issue special permits for wolf take under Section 10(a)(1)(A). When and if wolves are reclassified to be a threatened species, the USFWS would retain ultimate management authority for wolves, but could designate additional management authority to state and tribal natural resource agencies via section 4(d) rules under the ESA. Once wolves are removed from the Federal list of threatened and endangered species, states and tribes would have full management authority for wolves. MDNR would manage wolves in accordance with the MGWRMP. Any direct action taken by Michigan WS to address wolf conflicts would be conducted at the request of the USFWS (while wolves are ferally listed as a threatened or endangered species) or as the designated agent of MDNR or a specific tribe.

Damage problems can occur throughout the State, resulting in requests for WS assistance. The USFWS, WS and MDNR anticipate that the proposed action would only occur at individual damage sites (properties) distributed primarily within the Upper Peninsula. However, as discussed in Section 1.3.2, wolves have been found in the northern portions of the Lower Peninsula, and it is likely that WDM assistance will eventually be needed in the Lower Peninsula. Under the Proposed Action, wolf management could be conducted on private, Federal[5], State, tribal[6], county, and municipal lands in Michigan with the permission of the appropriate land owner/manager. Most wolf damage management activities would be conducted on private land. Wolf damage management activities are only likely to be conducted on public land if that land is within the damage management perimeter (set by USFWS permits, 4(d) rules and the MGWRMP) around the site of a verified depredation event on private land or in the rare instance that a wolf is exhibiting behavior that poses a threat to human safety. For example, of the three wolf damage management projects conducted in FY 2004(5) only 1, a project for the protection of public health and safety (Section 1.3.5), involved work on public lands. However, wolf trapping and radio-collaring for wolf population monitoring is usually conducted on public land (state, county and national forest lands). The public lands where wolf trapping for the purpose of radio-collaring and population monitoring has been conducted include Copper Country State Forest, Escanaba River State Forest, Lake Superior State Forest, Ottawa National Forest, and the Hiawatha National Forest.

The USFWS, WS and MDNR anticipate increases in future requests for WDM assistance as wolf populations increase and disperse into more agricultural and suburban/urban areas. This EA takes the potential increase in future requests into account by considering potential needs for WDM and the number of wolves likely to be removed as a function of population size (Chapter 4). Through USFWS, WS, and MDNR wolf monitoring and surveillance, any increase in wolf populations and damage management activities would be accounted for and any adaptive management adjustments would be considered to ensure wolf conservation.

1.4.2 Native American Lands and Tribes

Tribal wolf management decisions are outside the scope of this analysis and decisions made in this EA do not alter the tribes' authority or rights relating to wolf management. However, this analysis does include the types of assistance WS may offer the tribes, if requested. Wildlife Services would only conduct WDM activities on reservation lands at the request of the Tribe and only after appropriate authorizing documents (including MOUs) were signed. Currently, Michigan WS does not have any MOUs with any American Indian Tribes. If WS enters into an agreement with a Tribe for WDM, this EA would be reviewed and supplemented, if appropriate, to ensure compliance with NEPA. MOUs, agreements, and NEPA compliance would be conducted as appropriate before conducting WDM on reservation lands.

Michigan tribes are working with MDNR to address concerns regarding wolf management on ceded territories and wolf management in the vicinity of tribal lands. Wildlife Services' WDM actions will be conducted in accordance with agreements and MOUs between MDNR and the tribes.

[5] WS anticipates that limited wolf damage management will occur on public lands.

[6] WS wolf damage management would only be conducted on tribal lands with the Tribes request/consent and only after appropriate documents had been signed by WS and the respective Tribe.

1.4.3 Period for which this EA is Valid

If it is determined that an EIS is not needed, this EA would remain valid until Michigan WS and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be amended pursuant to NEPA. Monitoring and review of this EA will be conducted each year to ensure that the impacts of the program are within parameters analyzed in the EA.

It is anticipated that the Federal status of wolves in Michigan (currently Federally listed as "Endangered") may change. As authority for wolf management is returned to the state and tribes, the importance of the MGWRMP increases. Wildlife Services is cooperatively working with the MDNR and will comply with the policies and guidelines set forth in the MGWRMP (MDNR 1997) whereby pertinent portions are incorporated in this EA by reference. The MDNR is currently revising the MGWRMP. Once the revised MGWRMP is completed, WS will evaluate this EA to determine if WS' compliance with the revised MGWRMP would result in needs for action and/or impacts greater than those analyzed. Some examples of actions that might be taken when the revised MGWRMP is implemented that could trigger revision of this analysis include: (1) WS is requested to take a higher proportion of the wolf population than is proposed in this EA or cumulative impacts on the wolf population in Michigan (mortality from all know causes) exceeds that analyzed in this EA; (2) the plan results in a request for WS to conduct WDM to protect resources not analyzed in this EA; (3) the plan results in requests for WS to change or add methods of conducting WDM that would result in greater impacts on the affected environment than those analyzed in this EA; or (4) mortality from all know causes results in a precipitous decline in statewide wolf populations. If this is the case then WS will revise this EA in accordance with the NEPA.

1.4.4 Site Specificity

This EA analyzes the potential impacts of wolf damage and potential WS activities on all public and private lands in Michigan under MOU, Cooperative Agreement, and in cooperation with the appropriate public land management agencies. To date, wolf damage management activities and wolf monitoring activities have only been conducted in the Upper Peninsula. However, WS has also assisted with surveys for wolves in the northern portion of the Lower Peninsula. As discussed in Section 1.3.2, wolves have been found in the northern portions of the LP, and it is likely that wolf monitoring and WDM assistance will be needed in the LP.

Planning for the management of wolf damage is conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc. Although some of the sites where wolf damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever wolf conflicts and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Michigan (see Chapter 3 for a description of the Decision Model and its application). The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within the State of Michigan. In this way, WS and the USFWS believe they meet the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS and

the USFWS to comply with NEPA and still be able to meet needs for assistance with WDM in a timely fashion.

The EA also addresses the impacts of WDM on areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional wildlife damage management efforts could occur. Thus, the EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever wolf damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Michigan (see Chapter 3 for a description of the Decision Model and its application).

1.4.5 Public Involvement/Notification

On December 10th, 2004, an invitation for public involvement letter was sent to 47 interested parties and a notice was placed in *The Detroit News/Free Press* notifying the public of this initial request for comments related to wolf management in Michigan. Comments were received from fourteen parties. The lead and consulting agencies have addressed these comments in this document.

As part of the public involvement process, and as required by the Council on Environmental Quality (CEQ), APHIS-NEPA, and DOI implementing regulations, this document and the subsequent Decision will be made available to the public through "Notices of Availability" (NOA) published in local media, direct mailings of NOA to parties that have specifically requested to be notified, and through agency news releases and web sites. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised. Public notification regarding the availability of the final EA and Decision will be identical to that used for the draft EA.

1.5 DECISION TO BE MADE

WS and the USFWS are lead agencies in the preparation of this EA. This proposal would require the participation of other agencies that have management authority and expertise related to this project (consulting agencies). The Michigan Department of Natural Resources provides for the control, management, restoration, conservation and regulation of birds, fish, game, forestry and all wildlife resources of the state. The Tribes exercise similar authority on tribal lands, in addition to having retained the right to hunt, fish, and gather on lands and waters in the ceded territories. The Great Lakes Indian Fish and Wildlife Commission (GLIFWC) manages/represents tribal interests in wildlife management on lands in the ceded territories. The MDNR and GLIFWC have agreed to be consulting agencies in the preparation of this EA. The lead and consulting agencies will work together to address the following questions in the EA.

- How can WS, MDNR and the USFWS best respond to the need to reduce conflicts with wolves and assist with wolf management in Michigan?

- What are the environmental impacts of alternatives for reducing damage by and conflicts with wolves and assist with wolf management in Michigan?

- Would the proposed action have significant impacts on the quality of the human environment requiring preparation of an EIS?

Although the lead and consulting agencies have worked together to produce a joint document and intend to collaborate on WDM in Michigan, each agency will be making its own decision on the alternative to be selected in accordance with the standard practices and legal requirements pertaining to each agency's decision making process.

1.6 OBJECTIVES FOR THE WILDLIFE DAMAGE MANAGEMENT PROGRAM

- Respond to 100% of requests for wolf damage management assistance within 48 hours.
- No significant adverse effects on the statewide wolf population or non-target species populations.
- Contribute to understanding, ecology, biology and health of the Michigan wolf population.

All WDM would be conducted in compliance with appropriate federal, state, and local laws and court-mandated restrictions.

1.7 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

1.7.1 ADC Programmatic EIS. Wildlife Services has issued a final EIS (USDA 1997 Revised) and Record of Decision on the National APHIS-WS program. This EA is tiered to the ADC Programmatic EIS.

1.7.2 USDA-APHIS-WS/USFWS Biological Opinion. A Biological Opinion (BO) (USDI 1992) was prepared on the national WS program to comply with Section 7 of the ESA and to determine if the proposed action would adversely affect any listed species. Wildlife Services and MDNR will comply with any Terms and Conditions, permit conditions and other regulations that the USFWS provided to reduce risks to threatened and endangered (T/E) species.

1.7.3 USDA-APHIS-Michigan WS/USFWS Biological Assessment. A formal section 7 consultation under the Endangered Species Act was initiated between the USFWS and WS on July 10, 2003 and September 4, 2003. The USFWS determined that individual gray wolves would be adversely impacted by the proposed WDM program, however USFWS concluded that the activity would not jeopardize the continued existence of the Eastern timber wolf population. The USFWS also concurred with WS that current and proposed WDM program would have no effect or would not be likely to adversely affect other listed species in Michigan (C. Czarnecki, USFWS letter to P. Butchko, WS, May 7, 2004).

1.7.4 USDA-APHIS-Michigan WS/MDNR Environmental Review. The MDNR will be reviewing the current and proposed WDM program to ensure that State-listed species in Michigan will not be adversely affected.

1.7.5 USFWS Eastern Timber Wolf Recovery Plan. This plan (USFWS 1992) outlines Federal management strategies and population goals for recovery of wolf populations and provides recommendations for wolf depredation control. Pertinent information from this recovery plan is incorporated into this EA by reference.

1.7.6 Michigan Gray Wolf Recovery and Management Plan (MGWRMP) . A State recovery plan, initiated in 1992 by the ten-member Michigan Gray Wolf Recovery Team and signed in 1997 by the director of the MDNR, set a goal for removing the wolf from the State T/E Species List once the population remained at 200 of more wolves for five consecutive years. By early 2000, the wolf population had increased to 216 and has been at 200 or more since then. The MGWRMP outlines management of wolves in Michigan for the next five years or until federal reclassification is completed. These guidelines provide a conservation strategy for maintaining a healthy, viable gray wolf population in Michigan and contribute toward recovery, while addressing problems that may occur with wolf depredation on livestock or pets. Wildlife Services is cooperatively working with the MDNR and will comply with the policies and guidelines set forth in the MGWRMP (MDNR 1997) whereby pertinent portions are incorporated by reference. The MDNR is currently revising the MGWRMP. MDNR anticipates that a draft of the plan will be available for public comment December 2006. Once the revised MGWRMP is completed, WS will evaluate this EA to determine if WS' compliance with the revised MGWRMP would result in needs for action and/or impacts greater than those analyzed. If this is the case then WS will revise this EA in accordance with the NEPA.

1.7.7 Endangered Species Cooperative Agreement Between the United States Fish and Wildlife Service and the Michigan Department of Natural Resources. Effective date: February 7, 1980. Section 6 of the Endangered Species Act allows the USFWS to establish cooperative agreements with the states for the management of federally listed species. Under such agreements, any qualified and authorized employee or similarly qualified and authorized agent of a State Conservation Agency with a cooperative conservation agreement with the USFWS may take an endangered species without a permit or 4(d) rule from the USFWS so long as the taking cannot be reasonably expected to result in: 1) the death or permanent disabling of the specimen; 2) the removal of the specimen from the state where the taking occurred; 3) the introduction of the specimen to an area outside the historical range of the species; or 4) holding the species in captivity for a period of more than 45 days. (50 CFR 17.21 (a)(5)). Wolf management activities in Michigan that are not covered by 50 CFR 17.21 and would require a USFWS permit or 4(d) rule include aversive conditioning using modified dog-training shock collars, rubber bullets and other non-lethal projectiles, and lethal removal of depredating wolves.

1.8 AUTHORITY AND COMPLIANCE

1.8.1 Authority of Agencies involved in WDM in Michigan

Wildlife Services and the USFWS are the lead agencies in the preparation of this EA. Wolf damage management in Michigan requires the participation of other agencies that have management authority and expertise related to this project (consulting agencies). The MDNR and GLIFWC are consulting agencies in the production of this EA.

1.8.1.1 Wildlife Services

The mission of the USDA/APHIS/WS program is to provide federal leadership in managing conflicts with wildlife. Wildlife Services' mission, developed through its strategic planning process (USDA 1999), is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* Wildlife Services' Policy

Manual[7] reflects this mission and provides guidance for engaging in wildlife damage management through:

- Training wildlife damage management professionals;
- Research, development and improvement of strategies to reduce losses and threats from wildlife;
- Collection, evaluation, and dissemination of management information;
- Informing and educating the public on how to reduce wildlife damage; and
- Providing a source for limited-use management materials and equipment, including pesticides.

The primary statutory authorities for the Wildlife Services program are the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 U.S.C. 426c). WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can cause damage to agriculture and property, pose risks to human health and safety, and affect industrial and natural resources. WS conducts programs of research, technical assistance and applied management to resolve problems that occur when human activity and wildlife conflict.

WS has limited Federal authority in controlling wolf damage in Michigan, and must acquire State issued permits in order to collect, trap, or otherwise take wildlife in the State of Michigan.

Normally, individual wildlife damage management actions could be categorically excluded from further National Environmental Policy Act (NEPA) analysis, in accordance with implementing procedures for NEPA for the Animal and Plant Health Inspection Service (APHIS) (7 CFR 372.5(c), 60 Fed. Reg. 6,000, 6,003, (1995)). However, preparation of EAs serves to: 1) facilitate planning, interagency coordination, and the streamlining of program management; 2) clearly communicate to the public the analysis of individual and cumulative impacts of program activities; and 3) evaluate and determine whether there are any potentially significant or cumulative adverse impacts from the proposed program.

1.8.1.2 U.S. Department of the Interior, Fish and Wildlife Service (USFWS)

The Mission of the U.S. Fish & Wildlife Service is to work with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. Under the authority of the ESA, the USFWS acts to prevent the extinction of plant and animal species. It does this by identifying species at risk of extinction, designating ("listing") these species as threatened or endangered, providing protection for these species and their habitats, developing and implementing recovery plans to improve their status, and ultimately "delisting" these species and returning full management authority to the states and tribes. While a species is listed, most management authority for the species rests with the USFWS. However, the USFWS continues to work with other Federal agencies, states, and tribes along with private landowners to protect and recover the species. The USFWS helps ensure protection of listed species through consultations (section 7 of the ESA) with other Federal agencies.

[7] WS' Policy Manual provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced as Literature Cited in Appendix A.

Under section 10 of the ESA, the USFWS also issues permits which provide exceptions to the prohibitions established by other parts of the Act. These permits provide for conducting various activities including scientific research, enhancement of propagation or survival, and incidental take while minimizing potential harm to the species. For species federally classified as threatened, the USFWS may also issue 4(d) rules which may allow for greater management flexibility for the species. The USFWS also issues grants for protection and enhancement of habitat and for research intended to improve the status of a listed species. 16 United States Code (U.S.C.) 1531 *et seq.*, Endangered Species Act (ESA) of 1973, as amended; 16 U.S.C. 703-712,

1.8.1.3 Michigan Department of Natural Resources (MDNR)

The Michigan Department of Natural Resources authority in wildlife management is given under Article I, Part 5, Regulation 324.503 of Public Act 451 of 1994. This section states in part;

"The department shall protect and conserve the natural resources of this state; provide and develop facilities for outdoor recreation; prevent the destruction of timber and other forest growth by fire or otherwise; promote the reforesting of forest lands belonging to the state; prevent and guard against the pollution of lakes and streams within the state and enforce all laws provided for that purpose with all authority granted by law; and foster and encourage the protecting and propagation of game and fish."

The MDNR has additional authority for the management of wolves provided by a cooperative conservation agreement, under Section 6 of the ESA, established with the USFWS as detailed in 50 CFR 17.21 (Section 1.7.7).

After wolves reverted to "endangered" status in 2004 because of a court ruling, the MDNR's authority to respond to wolf-related damage and human safety concerns was provided by 50 CFR 17.21 as noted above and a permit issued under Section 10(a)(1)(A) of the Federal ESA. On September 13, 2005 the United States District Court in the District of Columbia enjoined the USFWS from allowing any activities authorized under permits issued to Michigan and Wisconsin, and the USFWS was further directed to "immediately halt any "takings" of gray wolves for depredation control purposes in Michigan and Wisconsin pursuant to these permits". At present MDNR authority for assistance with wolf depredations on livestock is limited to documenting the event and providing technical and operational assistance with non-lethal methods for resolving wolf damage including husbandry techniques (e.g., fencing, bringing animals in at night, guard dogs), and other non-lethal methods authorized under the cooperative conservation agreement between the USFWS and MDNR (Section 1.7.7).

1.8.1.4 Great Lakes Indian Fish and Wildlife Commission (GLIFWC)

The Great Lakes Indian Fish and Wildlife Commission is an agency of eleven Ojibwe nations in Minnesota, Wisconsin, and Michigan, with off-reservation treaty rights to hunt, fish and gather in treaty-ceded lands and waters. It exercises powers delegated by its member tribes. GLIFWC assists its member tribes in the implementation of off-reservation treaty seasons and in the protection of treaty rights and natural resources. GLIFWC provides natural resource management expertise, conservation enforcement, legal and policy analysis, and public information services. GLIFWC's member tribes include: the Bay Mills Indian Community, Keweenaw Bay Indian Community and the

Lac Vieux Desert Band in Michigan; the Bad River, Red Cliff, Lac du Flambeau, Lac Courte Oreilles, Sokaogon and St. Croix Bands in Wisconsin; and the Fond du Lac and Mille Lacs tribes in Minnesota. All member tribes retained hunting, fishing and gathering rights in treaties with the U.S. government, including the 1836, 1837, 1842, and 1854 Treaties.

GLIFWC's Board of Commissioners, comprised of a representative from each member tribe, provides the direction and policy for the organization. Recommendations are made to the Board of Commissioners from several standing committees, including the Voigt Intertribal Task Force (VITF). The VITF was formed following the 1983 Voigt decision and makes recommendations regarding the management of the fishery in inland lakes and wild game and wild plants in treaty-ceded lands of Wisconsin.

1.8.1.5 Federally Recognized Native American Tribes in Michigan.

If and when wolves are removed from the federal endangered species list, the Michigan Native American tribes will have authority for wolf management on tribal lands. The federally recognized Native American tribes in Michigan at the time this EA was completed include the Bay Mills Indian Community; Grand Traverse Band of Ottawa and Chippewa Indians; Hannahville Indian Community; Huron Potawatomi, Inc.; Keweenaw Bay Indian Community; Lac Vieux Desert Band of Lake Superior Chippewa Indians; Little River Band of Ottawa Indians; Little Traverse Bay Bands of Odawa Indians; Match-e-be-nash-she-wis Band of Potawatomi Indians of Michigan; Pokagon Band of Potawatomi Indians, Michigan and Indiana; Saginaw Chippewa Indian Tribe of Michigan; Sault Ste. Marie Tribe of Chippewa Indians of Michigan.

1.8.2 Compliance with Federal and State Statutes

Several federal laws, state laws, and state regulations regulate WS and USFWS actions. Wildlife Services and the USFWS comply with these laws and regulations, and consult and cooperate with other agencies as appropriate.

1.8.2.1 National Environmental Policy Act (NEPA). The National Environmental Policy Act (NEPA) of 1969 (42 USC Section 4231 et seq.) is implemented by Federal Agencies pursuant to Council on Environmental Quality (CEQ) Regulations (40 CFR Sections 1500-1508) and agency implementing regulations. Wildlife Services and the USFWS prepare analyses of the potential environmental impacts of program activities to meet procedural requirements of NEPA and to facilitate planning, decision-making, and public and interagency involvement.

NEPA and its supporting regulations require that an EA be a concise public document that provides sufficient evidence and analysis to determine if an EIS should be prepared, aids in WS' compliance with NEPA, describes the need for action, alternatives, and environmental impacts, and includes a list of agencies/persons consulted.

Environmental documents pursuant to NEPA must be completed before work plans consistent with the NEPA decision can be implemented. Wildlife Services also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any wildlife damage management that may affect resources managed by these agencies or affect other areas of mutual concern.

1.8.2.2 Endangered Species Act (ESA). It is Federal policy, under the ESA, that all Federal agencies seek to conserve threatened and endangered (T&E) species and utilize their authorities in furtherance of the purposes of the Act (Sec.2(c); Sec.7(a)(1)). Where appropriate, WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)). Wildlife Services obtained a Biological Opinion (BO) from USFWS in 1992 regarding the potential effects of the National WS program on T&E species and prescribing conservation recommendation and reasonable and prudent measures for avoiding jeopardy (USDA 1997 Revised, Appendix F). Wildlife Services is in the process of initiating formal consultation at the programmatic level to reevaluate the 1992 BO and to fully evaluate potential effects on T&E species listed or proposed for listing since the 1992 USFWS BO. In addition to this programmatic consultation, Michigan WS has completed a formal Section 7 consultation on methods for WDM with the East Lansing Field Office of the USFWS regarding potential effects of the proposed action for this EA (C. Czarnecki, USFWS, May 7, 2004). Furthermore, if USFWS issues a section 10(a)1(A) permit or 4(d) rule for depredation control, as described in this EA, the USFWS will complete an internal formal consultation on the issuance of that permit/rule. When this consultation is completed, WS and the MDNR will comply with all reasonable and prudent measures identified in the Biological Opinion (BO), and the extent practicable, any additional conservation recommendations.

1.8.2.3 National Historic Preservation Act (NHPA) of 1966 as amended. The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. Wildlife Services actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties. Activities described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. Wildlife Services and the USFWS have determined that WDM actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties. A copy of the initial invitation for public involvement was given to each of the Native American tribes in Michigan and the GLIFWC. GLIFWC is a consulting agency in the preparation of this EA. The draft EA is being provided to each Native American tribe in the State to allow them opportunity to express any concerns that might need to be addressed prior to a decision.

1.8.2.4 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations."* Executive Order 12898, entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations" promotes the fair treatment of people of all races, income levels and cultures with respect to the

development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Environmental Justice is a priority all Federal Agencies. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. Wildlife Services personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low income persons or populations**.**

1.8.2.5 Executive Order 13045 - *Protection of Children from Environmental Health and Safety Risks.* Children may suffer disproportionately from environmental health and safety risks for many reasons, including their development, physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed WDM would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action.

CHAPTER 2: ISSUES

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues relevant to the analysis, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences) and issues not considered in detail, with the rationale. Pertinent portions of the affected environment are included in this chapter in the discussion of issues to be addressed in detail. Additional information on the affected environment is incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program.

2.1 ISSUES CONSIDERED IN DETAIL IN CHAPTER 4

The following are issues that have been identified as areas of concern requiring consideration in this EA and were used to develop alternatives:

- Effects on wolf populations in Michigan
- Effects on non-target species populations, including T&E species
- Effects on public and pet health and safety
- Impacts to stakeholders, including aesthetics of wildlife

2.1.1 Effects on Wolf Populations in Michigan

The Federally protected gray wolf, which currently is listed as "endangered" in Michigan is targeted by the proposed action. Some persons may be concerned that WDM activities would result in the loss of local populations of wolves or have a cumulative adverse affect on the viability of Michigan's wolf population. As analyzed, WS and MDNR would remove only a small percentage of the wolf population in relation to the total Michigan wolf population. Additionally, natural dispersal and reproduction of wolves in Michigan, and wolf reproduction and dispersal from Wisconsin into Michigan would continue to aid in the recolonization and recovery of wolves. The Michigan wolf population is estimated to have increased five fold in the past 10 years. The USFWS, WS and MDNR anticipate that the Michigan wolf population will continue to increase.

2.1.2 Effects on Non-target Species Populations, Including Threatened and Endangered Species

A common concern among members of the public and wildlife professionals, including WS, MDNR and USFWS personnel, is that the proposed action or any of the alternatives would result in removing individuals or adversely impact populations of native wildlife species, particularly State or Federally listed threatened and endangered species. Special efforts are made to avoid jeopardizing threatened and endangered species though biological evaluations of the potential effects of the alternatives and the establishment of special restrictions or standard operating procedures. Wildlife Services has consulted with the USFWS under Section 7 of the Endangered Species Act concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (BO) on the national WS program (USDA 1997, Revised, Appendix F).

Michigan WS conducted a formal Section 7 consultation on methods for WDM with the East Lansing Field Office of the USFWS. The USFWS concurred with WS' determination that the proposed WDM program will not affect the following threatened and endangered species: Karner blue butterfly (*Lycaeides Melissa samuelis*), lakeside daisy (*Hymenoxys herbacea*), American hart's-tongue fern (*Asplenium scolopendrium*), Houghton's goldenrod (*Solidago houghtonii*), dwarf lake iris (*Iris lacustris*), Michigan monkey flower (*Mimulus glabratus var. michiganensis*), piping plover (*Charadrius melodus*), Pitcher's thistle (*Cirsium pitcheri*), and Kirtland's warbler (*Dendroica kirtlandii*) (C. Czarnecki, USFWS, May 7, 2004). In addition, since the discovery of wolves in the northern Lower Peninsula, WS has determined that the expansion of their proposed WDM program to the Lower Peninsula will not affect the following federally listed threatened and endangered species: Indiana bat (*Myotis sodalis*), Hungerford's crawling water beetle (*Brychius hungerfordi*), Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*), Northern clubshell (*Pleurobema clava*), Hine's emerald dragonfly (*Somatochlora hineana*), Northern riffleshell (*Epioblasma torulosa rangiana*), copperbelly water snake (*Nerodia erythrogaster neglecta*), Eastern prairie fringed orchid (*Platanthera leucophaea*), piping plover critical habitat and the small whorled pogonia (*Isotria medeoloides*). These species had not been included in the May 7, 2004 consultation with the USFWS. Actions proposed in this consultation are similar to those proposed in this EA.

If USFWS issues a section 10(a)1(A) permit or 4(d) rule for depredation control as described in this EA, the USFWS will complete an internal formal consultation on the issuance of that permit/rule. When this consultation is completed, WS and the MDNR will comply with all reasonable and prudent measures identified in the BO, and to the extent practicable, any additional conservation recommendations. The standard operating procedures include measures intended to reduce the effects on non-target species populations and are described in Sections 3.5, 4.2, and Appendix B. Currently, there are 23 federally listed T&E plant and animal species and 342 state listed T&E plant and animal species in Michigan. SOPs that are designed to reduce the risk of adverse impacts on non-target species and to avoid jeopardizing threatened and endangered species populations are presented in Chapter 3.

2.1.3 Effects on public safety and pet health and safety

A common concern is whether the proposed action or any of the alternatives pose an increased threat to public and pet health and safety. In particular, there is concern that the methods of wolf removal (i.e., trapping, snaring, and shooting) may be hazardous to people and pets, or that continued increases in wolf populations might threaten public and pet health or safety. As discussed above, there are also concerns about the potential risks to the safety of humans and pets from an increasing wolf population. Wildlife Services will respond to complaints regarding wolf depredations on pets and concerns about human health and safety as outlined in the MGWRMP (MDNR 1997).

Firearm use is a very sensitive issue because of concerns relating to public safety and firearms misuse. To ensure safe use and awareness of firearms issues, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). Wildlife Services employees who use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

2.1.4 Humaneness of methods to be used

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Kellert and Berry (1980) in a survey of American attitudes toward animals stated that 58% of their respondents, "*. . . care more about the suffering of individual animals . . . than they do about species population levels."* Schmidt (1989) indicated that vertebrate pest control for societal benefits could be compatible with animal welfare concerns, if *" . . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*. Suffering has been described as a *" . . . highly unpleasant emotional response usually associated with pain and distress*." However, suffering *" . . . can occur without pain . . . ,*" and *". . . pain can occur without suffering . . ."* (American Veterinary Medical Association (AVMA) 2001). Because suffering carries with it the implication of a time frame, a case could be made for *" . . . little or no suffering where death comes immediately . . ."* (California Department of Fish and Game (CDFG) 1999), as in the case of shooting or drug-induced euthanasia.

Defining pain as a component of humaneness may be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would *" . . . probably be causes for pain in other animals . . ."* (AVMA 1987). However, pain experienced by individual animals probably ranges from none to considerable (CDFG 1999). Wildlife Services acknowledges that some damage management methods, such as foot-hold traps and body snares, may cause varying degrees of pain in different animal species for varying lengths of time. However, at what point pain diminishes or stops under these types of restraint has not been measured by the scientific community.

Pain and suffering as it relates to tools used to capture animals, is often interpreted differently by professional wildlife biologists and lay people. People that receive damage or threats of damage may perceive humaneness differently, particularly if their pets or livestock are injured or killed and they contemplate the humaneness of having their pets or livestock killed by wolves. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since *" . . . neither medical nor veterinary curricula explicitly address suffering or its relief"* (CDFG 1991, 1999). Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, which, in turn, is governed by the person's past experiences. Different people may perceive the humaneness of an action in different ways. The challenge in coping with this issue is how to achieve the least amount of suffering with the constraints imposed by current technology, funding, workforce and social concerns. Research suggests that with some methods, such as restraint in foot-hold traps, changes in the blood chemistry of trapped animals indicate "*stress*" (USDA 1997 Revised: 3-81). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in comparing the relative humaneness of WDM techniques.

The decision making process involves tradeoffs between the aforementioned aspects of pain from damage management activities and the needs of humans to reduce wildlife damage. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans and prey animals if damage and losses are not stopped.

Michigan WS and MDNR personnel are trained professionals who strive to use the most humane methods available to them, recognizing the constraints of current technology, workforce, funding and social concerns. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could be a

combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy.

Wildlife Services has improved the selectivity and humaneness of many management devices through research and is striving to bring new, more humane tools and methods into use. Wildlife Services, through the combined efforts of the WS state programs and the USDA, APHIS, WS, National Wildlife Research Center, has been involved in the testing and development of a number of non-lethal WDM techniques including fladry (Section 3.3.1), pyrotechnics, livestock guarding animals, remote activated guard (RAG) devices, and light-siren devices (Appendix B). The NWRC has also been conducting research on tranquilizer devices to reduce stress and injuries to animals captured in traps. However, improved WDM methods are still needed. Until new methods and tools are developed, a certain amount of animal suffering could occur (e.g., when non-lethal damage management methods are neither practical, available, nor effective). Whenever possible and practical, WS also employs euthanasia methods recommended by the AVMA (2001) or the recommendations of a veterinarian, even though the AVMA euthanasia methods were developed principally for companion animals and slaughter of food animals, and not for free-ranging wildlife.

2.1.5 Sociological Issues Including Impacts on Aesthetic Values

2.1.5.1 Variations in Perception of Wildlife Damage

During the last 200 years, broad-scale changes in land-use patterns have occurred as the increasing human population settled North America. Notable is the large-scale conversion of natural landscapes to agricultural and urban environments. As humans encroach on wild habitats, they compete with wildlife for space and other resources, which increases the potential for conflicts. Concurrent with this growth and change is a desire by some segments of the public to completely protect all wildlife, which can create localized conflicts with resource managers and owners experiencing problems with some species. *The Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) (USDA 1997, Revised) summarizes the American perspective of the relationship between wildlife values and wildlife damage, as follows:

"*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.*"

Biological carrying capacity is the limit of the land or habitat to support healthy populations of species without long-term degradation of either the health of the species or the associated environment (Decker and Purdy 1988). The wildlife acceptance capacity (also known as cultural carrying capacity) is the limit of human tolerance for wildlife, or the maximum number of a given species that can coexist compatibly with local human populations (Decker and Purdy 1988). These capacities are especially important in areas inhabited by humans because they define the sensitivity of a local community to a

specific wildlife species/problem. For any given situation involving a wildlife conflict, individuals directly or indirectly affected by the damage will have varying degrees of tolerance for the damage and the species involved in the damage. This tolerance determines the "wildlife acceptance capacity," which is often lower than the "biological carrying capacity." For example, the biological carrying capacity of gray wolves (*Canis lupus*) in Michigan appears higher than their current population; however, for some individuals and groups, the state has as many or more wolves than can be tolerated (i.e., for those individuals, the wildlife acceptance capacity has been reached). Once the wildlife acceptance capacity of a species is reached or exceeded, humans will demand implementation of programs, both lethal and non-lethal to reduce damage or threats of damage.

The human attraction to animals has been well documented throughout history, an idea supported by prehistoric cave paintings and the domestication of wild animals. Today's American public is no exception, as evidenced by the large percentage of households that have pets or observe wildlife. Some people also may consider individual wild mammals and birds as "pets" and exhibit affection toward these animals. They may also want to have more wild animals in their immediate environment. Some people also claim that they have a spiritual bond with wild animals. Conversely, some people have no emotional attachment to wildlife; some may even fear the presence of wild animals in their vicinity and demand their immediate removal. Conflicting wildlife values result in highly variable public opinions about the best ways to manage conflicts between humans and wildlife, making the implementation and conduct of wildlife damage management programs extremely complex.

Ideas about how these programs are implemented and conducted are as unique as the almost infinite combinations of philosophies, psyches, aesthetic values, personal attitudes, and opinions found in humans. These differences of opinion result in concerns that the proposed action or the alternatives would result in the loss of aesthetic or cultural/spiritual benefits to the general public and resource owners.

2.1.5.2 Aesthetic and Sociological Values of Wildlife

Wildlife generally is regarded as a source of economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective, dependent on what an observer regards as beautiful. Wildlife populations provide a range of direct and indirect social and economic benefits (Decker and Goff 1987). Direct benefits are derived from a user's personal relationship or direct contact with wildlife and may include either consumptive (e.g., using or intending to use the animal such as in hunting or fishing) or non-consumptive use (e.g., observing or photographing animals) (Decker and Goff 1987). Indirect benefits, or indirect exercised values, arise without a human being in direct contact with an animal and are derived from experiences such as looking at pictures or videos of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Two forms of indirect benefits exist according to Decker and Goff (1987): bequest and pure existence. Bequest benefits arise from the belief that wildlife should exist for future generations to enjoy; pure existence benefits accrue from the knowledge that the animals exist in the human environment (Decker and Goff 1987) or that they contribute to the stability of natural ecosystems (Bishop 1987).

Some people directly affected by problems caused by wolves insist on the lethal removal of the problem animal(s) from the area where the conflict occurs. Others have the view that all wildlife involved in conflicts should be captured and relocated to another area to alleviate the problem. Individuals not directly affected by a conflict may be supportive of affected humans, neutral, or totally opposed to any removal of wildlife from specific locations or sites.

Those who oppose removal of wildlife may do so because of emotional ties to the animals, which are similar to the bonds that may exist between a human and a pet. Some may totally oppose WDM, especially if lethal methods are used, and want WS, MDNR and the USFWS to teach tolerance of wolves causing conflicts.

The goal of IWDM is to provide relief from damage or threats of damage while minimizing the potential for negative impacts on the environment including aesthetic and social values. Michigan WS only conducts WDM at the request of citizens, organizations, and others who are experiencing problems (i.e., where a need exists) and in coordination with the MDNR and tribes, as appropriate. When requests for WDM assistance are received, WS, the MDNR, consult with the person or agency with the damage problem, issues/concerns are addressed, an appropriate plan of action is developed, and reasons for selecting the action are explained. Management actions are carried out in a dedicated, humane and professional manner and as outlined in the MGWRMP (MDNR 1997).

2.2 ISSUES NOT CONSIDERED IN DETAIL AND RATIONALE FOR EXCLUSION

2.2.1 Wildlife Services' Impacts on Michigan's Biodiversity

No Michigan WS or MDNR project is conducted to eradicate any native wildlife species or population, including wolves. Wildlife Services and the MDNR operate according to International, Federal, and State laws and regulations enacted to ensure species viability. The proposed action would be conducted on a relatively small percentage of the Michigan land mass. The take of any wildlife species analyzed in this EA is a small proportion of the total population and is probably insignificant to the viability and health of the population (see Section 4.3). In addition, any reduction in the local population is temporary because immigration from adjacent areas and reproduction by the remaining animals replaces the animals removed during damage management operations as long as suitable habitat exists. None of the alternatives proposed in this EA will affect the viability of wolf or non-target wildlife species populations, and, consequently, the impacts of the current WS program on biodiversity statewide and nationwide are expected to be very minor (USDA 1997 Revised).

2.2.2 Wolf Damage Should be Managed by Hunters and Trappers

Because wolves are Federally protected, and because of the court-ordered reversion of wolves to endangered, private hunters and trappers cannot be authorized to conduct WDM in Michigan at the present time. If WS selects Alternatives 1-4, WS will be acting as agents of the MDNR when conducting WDM activities (P. Lederle, MDNR, pers. comm. 2003). Once wolves are removed from the federal list of threatened and endangered species, the MDNR and the tribes will have authority to determine the role of hunter and trappers in WDM.

Wildlife Services provides professional wildlife damage management services at site-specific locations when requested by citizens experiencing a wildlife/human conflict. Wildlife Services personnel respond to requests for assistance in accordance with the Congressional direction provided to WS that authorizes the program. Hunters and trappers do not always have the time, resources, or training to respond to site specific problems with wolves.

2.2.3 Appropriateness of Preparing an EA Instead of an EIS for Such a Large Area

Some individuals might question whether preparing an EA for an area as large as the State of Michigan would meet the NEPA requirements for site specificity. If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared in accordance with NEPA. In terms of considering cumulative impacts, a single EA analyzing impact for the entire State should provide a better analysis of cumulative impacts than multiple EAs covering several smaller areas. In addition, Michigan WS and MDNR would only conduct WDM in a very small area of the state where damage is occurring or likely to occur and damage may occur anywhere in Michigan.

2.2.4 How can killing wolves benefit the recovery of the species?

There has been some question as to how and if killing wolves can actually benefit the recovery of the wolf population. The question was addressed in the documents supporting the MDNR request for wolf depredation permits from the USFWS (Lederle and Moritz 2005). The following explanation is taken from that document.

"The question at issue is whether removal of individual problem wolves (e.g., those involved with confirmed cases of livestock depredation) can prevent or minimize the development of negative public attitudes, or even foster greater tolerance, toward wolves and therefore enhance the survival and recovery of the species. Considerable information from prominent social theory and research shows that tolerance toward a wildlife species is influenced by the value of losses attributable to that species, the benefits attributable to the species by the affected individual, and by the perception of the risk of losses as controlled or voluntary (Slovic 1987).

Risks considered involuntary by an individual are less likely to be viewed as acceptable whereas risks that can be controlled are generally considered to be more acceptable. Risk theory and associated research (e.g., Slovic 1987) suggest that a government which simultaneously imposes the risk of wolf depredation (i.e., supports wolf recovery) and prohibits individuals from effectively reducing those risks (i.e., no chance for removal of problem wolves) is creating an intolerance of the wolf presence. In effect, this situation lowers the social carrying capacity for wolves and could threaten the well being of the population, both presently and in the future if the situation persists.

The number of animals is not the most influential factor determining the social carrying capacity for wolves in Michigan. Rather, it is the nature and frequency of positive and negative interactions between wolves and stakeholders (R.B. Peyton, Michigan State University, pers. comm.). However, the public often focuses on the number of wolves when positive interactions (e.g., sightings by wolf enthusiasts) are too low or negative interactions (e.g., livestock depredations) are too high. Negative interactions associated with livestock depredation do not necessarily increase proportionately with wolf abundance per se; rather, they are localized events. While the wolf population in the Upper Peninsula (UP) increased by an average of approximately 19 percent per year between 1996 and 2004, the annual rate of confirmed depredation cases was variable, ranging from 0 cases per 100 wolves in 1996 and 1997 to 4 cases per 100 wolves in

2003. An appropriate management response to depredation is to address the negative interactions and target problem wolves in a local area rather than implement broad population-level controls focusing on reducing overall numbers of wolves. Removing problem wolves can reduce the negative interactions that create intolerance for wolves among livestock producers. Livestock producers have the capability to resolve their own depredation problems, either legally or illegally, with or without assistance from the government (Dorrance 1983). **If no government-sanctioned relief from the loss of livestock is in sight, intolerant stakeholders will likely adopt anti-wolf behaviors including illegal killing (Fuller et al. 2003). In this scenario, social carrying capacity effectively will be lowered because stakeholders erroneously turn their attention to the wolf population at large as the primary cause of wolf problems.** [emphasis added]

Studies demonstrate public support for the presence of large carnivores largely depends on confidence that problems caused by individual animals will be resolved effectively. A public attitude survey of residents in Ninemile Valley, Montana found that 65 percent of wolf supporters might change their support for the presence of the population if wolves that kill livestock were not controlled quickly or effectively (Wolstenholme 1996). In a study that examined which factors would encourage residents of the Flathead Indian Reservation to support protection of grizzly bear habitat on private lands, Frost (1985) found that rapid assistance to bear-related problems was the most important factor, with 76 percent of respondents desiring that assurance. By contrast, only 42 percent of respondents felt that compensation for livestock losses was a valid incentive for supporting protection.

Additional studies from other parts of the world show the frequency of livestock depredation by wolves can be a predictor of the attitudes toward wolves held by local human populations. A study by Huber et al. (1992) found that all surveyed Macedonia residents agreed that wolves cause far more damage to livestock than does any other wildlife species, whereas surveyed Croatia residents indicated that multiple species, including bear, wild boar, and fox cause more livestock damage than wolves. One hundred percent of surveyed Macedonia residents indicated that the wolf was a 'harmful species' and that the wolf population was too large. By contrast, only 26 percent of surveyed Croatians felt the wolf was a 'harmful species' and only four percent felt the wolf population was too large. The authors concluded the extent of regional livestock damage was the principal factor which determined these differing attitudes. This study indicates the ability to minimize livestock losses can prevent or minimize the development of negative attitudes toward wolves.

Another global example of how livestock losses and ensuing public attitudes can adversely impact wolf populations comes from India. In response to livestock depredation in the trans-Himalaya region, villagers routinely kill adult wolves and destroy wolf dens and litters, despite recently increased legal protection of wild carnivores (Mishra 1997). Targeting of wolves occurs despite the belief of villagers that most livestock kills are committed by snow leopards. This behavior demonstrates that people retaliate against wolf populations at large, even when depredations are caused by other species altogether. Retaliation against a wolf population is likely to be even more severe when individual wolves are actually involved in livestock kills. Therefore, an ability to remove individual problem wolves becomes even more important."

"The relationship between preventing wildlife damage and maintaining public support for wildlife populations has been documented not only for carnivores but for other species as well. With deer, for example, depredation permits to allow culling have become a standard practice in most States where crop depredation by deer occurs. Sufficient evaluations of this and other practices have been conducted in Michigan (e.g., Fritzell 1998) and elsewhere to establish that

they prevent intolerance from leading to anti-wildlife attitudes and behaviors, whether or not they increase tolerances for the wildlife species in question."

As an example of the attitudes that may be addressed by an effective, professional WDM program; the agencies are aware of a web site already in existence that provides instructions for the broadcast poisoning of wolves. The following quotes are from the prelude to the instructions for poisoning wolves. The sentiments expressed in the article are neither unique nor are they exclusive to the western U.S.

> *"Poison causes an agonizing, violent death. I think every animal on earth deserves better, but under the circumstances, in the U. S., if these federally dumped and federally protected wolves populate further out of control, we will lose our hunting heritage, hunting/outfitting revenues, gun ownership, ranching industry and many other blessings we derive from proper management of our resources….Poisoning wolves is illegal in the U. S. and Canada. I am only passing on information that was sent to me. People will have to decide for themselves just how much they will allow an out of control federal agency (USFWS) to destroy their rights, hobbies, businesses and misuse the supposed "public trust"…*
>
> *…Wolves will continue to breed and expand while the bureaucrats argue about wolves, so if "we the people" do nothing, the wolves will destroy our game herds and businesses all on their own. Throughout the history of this country, civil disobedience has set the government straight when they were out of control--prohibition comes to mind. It is our choice, although our only viable timely options to control wolf numbers are currently illegal…...Each rocky mountain state has only a few federal (USFWS) law enforcement personnel…If a sufficient number of wolf killings took place, they would be over loaded in very short order."*

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of six parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including the Proposed Action (Alternative 2), 3) a description of IWDM, 4) WDM methods that could be used or recommended, 5) a description of alternatives considered, but eliminated from detailed analysis, and 6) a table of SOPs. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), "*Methods of Control*" (USDA 1997 Revised, Appendix J) and the *"Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program"* (USDA 1997 Revised, Appendix P). Four alternatives were recognized, developed, and analyzed in detail; and six alternatives were considered but not analyzed in detail with supporting rationale.

Agency Decisions

These alternatives describe the actions available to the USFWS (issuing permits or developing special section 4(d) regulations for wolves[8]), and WS and MDNR (involvement in wolf damage management). Although the lead and consulting agencies have worked together to produce a joint document and intend to collaborate on WDM in Michigan, each of the lead agencies will be making its own decision on the alternative to be selected in accordance with the standard practices and legal requirements pertaining to each agency's decision making process.

Although the agencies make independent decisions, the decisions made by the agency with regulatory authority can restrict the actions taken by the other agencies. For example, while wolves are federally listed, permitting decisions and 4(d) rules by the USFWS can limit the actions taken by the state and WS. WS may select an alternative that would give it access to all non-lethal and lethal WDM techniques but it would only be able to use methods allowed by the USFWS. Conversely, the USFWS may issue a permit/rule allowing for the use of non-lethal and lethal WDM techniques, but WS could select an alternative that only allowed WS to use non-lethal methods. In this instance, the permittee (MDNR) could use non-lethal and lethal WDM techniques but WS would only provide assistance with non-lethal methods.

WS would conduct WDM activities in Michigan as an agent of the MDNR and it is the MDNR that would apply for a permit from the USFWS. Therefore, management decisions by the state can also impact WS' actions. The USFWS would approve or deny access to methods specifically requested by MDNR. If MDNR only asks for permission to use a limited set of WDM techniques, WS' actions would be limited to that set of methods even if WS chose an alternative that allowed for the use of any WDM method. However, similar to the discussion above, WS is not obligated to use all methods permitted by MDNR. WS could select an alternative which restricted WS to using a subset of the total methods permitted by MDNR. When wolves are no-longer federally listed, MDNR and the Tribes would have regulatory authority for wolves in the state. The relationship between the management decisions of these entities and WS actions would be as described for the USFWS and WS in the paragraph above.

For simplicity and clarity of analysis, each of the alternatives below is described and its impacts are analyzed as if the lead agencies had selected the same alternative. If agencies make different decisions, the impact of the action will be intermediate to the impacts of the alternatives analyzed in the EA and

[8] The USFWS may develop 4(d) rules if wolves are federally reclassified as "threatened".

would usually be most similar to the impact of the more restrictive of the various independent decisions, depending upon the relative authority of each agency.

The four alternatives analyzed in detail are:

Alternative 1 - Non-lethal WDM Only. Under this alternative, the USFWS would issue Section 10(a)(1)(A) permits or develop and implement section 4(d) regulations authorizing the use of non-lethal WDM techniques. This alternative may be selected with or without an option to restrict use of some non-lethal WDM techniques to WS and MDNR. While federally listed as a threatened or endangered species, WS and MDNR would only provide technical and operational assistance with non-lethal WDM. If wolves are removed from the Federal list of threatened and endangered species, WS would still be restricted to the use of non-lethal WDM methods. MDNR would manage wolves in accordance with the MGWRMP.

Alternative 2 - Integrated WDM (No Action / Proposed Action). The No Action alternative serves as the baseline against which the impacts of management alternatives can be compared and can be defined as being the continuation of current management practices (CEQ 1981). However, the current program of non-lethal WDM has only been in effect since the Federal Court Decision on September 13, 2005 (Sections 1.3.1 and 1.3.6). Insufficient data exist at this time to adequately use current management conditions as a baseline for analysis. In contrast, Alternative 2 was used for most of the period of 2003 to September 2005 and data are available on the environmental impacts of this alternative. Therefore, for purposes of analysis, we are using Alternative 2 as the "No Action" baseline when comparing the other alternatives to determine if the real or potential adverse affects are greater, lesser or the same (Table 4-4). Under this alternative, the USFWS would issue Section 10(a)(1)(A) permits or section 4(d) regulations authorizing the use of lethal and non-lethal WDM techniques. The state and WS would have access to the complete range of non-lethal and lethal WDM methods. This alternative may be selected with or without an option to restrict use of some non-lethal WDM techniques to WS and MDNR. If WS were to select this Alternative, but the USFWS decided not to issue Section 10(a)(1)(A) permits, this Alternative could only be fully implemented following de-listing of the wolf.

Alternative 3 - Technical Assistance Only. While federally listed, the USFWS would not issue any Section 10(a)(1)(A) permits or develop and implement section 4(d) regulations for wolf damage management. WS would not conduct operational WDM in Michigan but could provide technical assistance on WDM methods that do not require permits or other authorization from the USFWS (Appendix B). Wildlife Services would also be able to conduct evaluations of potential wolf depredation sites needed to administer the wolf damage compensation program. Because of the cooperative conservation agreement between the USFWS and MDNR, the state could still use and authorize others to use many non-lethal WDM techniques while wolves are federally listed (Section 1.7.7, Appendix B).

Alternative 4 - No Federal WDM in Michigan. Under this alternative, the USFWS and WS would provide no assistance with WDM. The USFWS would not issue any Section 10(a)(1)(A) permits for wolf damage management. Wildlife Services would not provide technical assistance or operational damage management services. Because of the cooperative conservation agreement between the USFWS and MDNR, the state could still use and authorize others to use many non-lethal WDM techniques while wolves are federally listed (Section 1.7.7, Appendix B).

3.1 DESCRIPTION OF ALTERNATIVES

3.1.1 Alternative 1 - Non-lethal WDM Only

Under this alternative, the USFWS would only issue permits or develop and implement section 4(d) regulations for the use of non-lethal WDM techniques, and WS would only provide operational and technical assistance with non-lethal WDM methods. Wildlife Services would also assist the MDNR with radio-collaring and monitoring the Michigan wolf population.

Many non-lethal WDM techniques do not require "take" as defined by the ESA and its implementing regulations, and do not require permits or authorization from the USFWS. These methods include but are not limited to animal husbandry practices, installation of fencing and use of livestock guarding animals (Section 3.2.1, Appendix B). The MDNR and their appropriately trained and designated agents have access to some non-lethal techniques involving harassment or handling of wolves without permits from the USFWS (Section 3.2.2). Authority for these methods is granted under (50 CFR 17.21) because of the endangered species cooperative conservation agreement between the USFWS and MDNR (Section 1.7.7). However, some non-lethal methods require a permit or other authorization from the USFWS, specifically, dog training collars for aversive conditioning and non-lethal projectiles like rubber bullets and bean bags. In the permits/authorization, the USFWS has the option of restricting the use of these methods to WS and the MDNR, or the USFWS may grant the MDNR and WS the authority to train and equip personnel outside their agencies to use these methods.

There are provisions within the regulations pertaining to the ESA that allow for the lethal take of an endangered species in response to a demonstrable (either immediate or non-immediate) threat to human safety. Response to less immediate threats and wolf predation on pets will be restricted to non-lethal methods.

While federally listed, no lethal take of wolves for damage management could occur. If and/or when wolves are removed from the Federal list of threatened and endangered species, management authority would transfer to the MDNR and the tribes which would manage wolves in accordance with their respective management plans and policies. In this instance, WS would refer requests for information regarding lethal WDM techniques to MDNR or the tribes, as appropriate. If wolves are removed from the Federal list of threatened and endangered species, individuals may choose to implement WS non-lethal recommendations on their own, request lethal control actions from authorized agencies other than WS, contract for WS non-lethal damage management services, or take no action.

3.1.2 Alternative 2 - Integrated WDM (No Action/ Proposed Action)

Under this alternative, an IWDM program would be used in Michigan to protect domesticated resources and human health and safety from gray wolf damage and promote wolf conservation in accordance with the MGWRMP (WDNR 1997), the USFWS rules and/or permits for WDM, the Eastern Gray Wolf Recovery Plan (USFWS 1992) any MDNR guidelines for conducting depredation control (Appendix E), and all applicable policies, agreements and guidelines among MDNR, WS, USFWS and the tribes. All WDM activities would also be consistent with other uses of the area and would comply with appropriate Federal, State and local laws and conducted in cooperation with other governmental agencies and tribal governments, as appropriate.

The IWDM strategy would encompass the use of the full range of legal, practical and effective methods of preventing or reducing damage and conserving the wolf population while minimizing

harmful effects of damage management measures on humans, wolves, other wildlife species, domestic animals, and the environment. Under this action, WS and the MDNR would provide technical assistance and operational damage management, including non-lethal and lethal management methods selected after applying the WS Decision Model (Slate et al. 1992). WS would be able to assist with wolf research and population monitoring. This alternative would be similar to Michigan WDM practices that were conducted under the 2003 section 4(d) rule and an April 2004 permit issued by the USFWS. This strategy for WDM was discontinued on September 13, 2005 when all WDM activities allowed under the USFWS permit were enjoined by the U.S. District Court in the District of Columbia.

Wolf damage management would be conducted on private or public property in Michigan when the resource owners/ managers (property owners/ land managers) request assistance to alleviate wolf damage, wolf damage is verified by WS or MDNR, and an *Agreement for Control* or other comparable document has been completed. The MGWRMP (MDNR 1997) further establishes that in order for lethal WDM methods to be used, the producer/owner must sign a depredation management plan (farm plan) for the property which includes damage abatement recommendations and that lethal control efforts will not be implemented at livestock operations or on other private lands with previous wolf depredations that fail to follow technical assistance guidelines in a timely manner. The cooperator is required to agree to (sign) the plan prior to receiving any operational WDM assistance. Individuals and agencies with wolf damage and/or concerns about wolves would receive technical assistance in the form of instructional sessions, demonstrations, equipment loans, and information on the availability and use of non-lethal and lethal methods (Section 3.3, Appendix B). In determining the damage management strategy, preference would be given to non-lethal methods when they are deemed practical and effective. Non-lethal methods used by landowners could include, but would not be limited to, changes in farm practices (best management practices) and pet care/supervision, frightening devices, exclusion, guarding animals, habitat modification, frightening devices, and behavior modification of problem wolves. Non-lethal methods used operationally by WS and MDNR may include foot-hold traps and land restraint snares with "stops" (used to live capture wolves for relocation and/or attaching radio collars, and collars used to activate frightening devices), frightening devices and aversive conditioning (e.g., with modified dog training collars) and non-lethal projectiles (Appendix B). In its permit request, the MDNR has requested that USFWS grant the MDNR and WS the authority to train and equip landowners/managers to use non-lethal projectiles.

Lethal methods would be used to reduce damage after practical and appropriate non-lethal methods have been considered and determined to be ineffective or inappropriate in reducing damage to acceptable levels. In some instances, the most appropriate initial response to a wolf damage problem could involve concurrent use of a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Lethal methods could include shooting, neck snares, and euthanasia of wolves live-captured in foot-hold traps, snares or other live-capture devices.

The MDNR has also asked for authority to take up to 10% of the annual wolf population estimate each year.[9] Actual annual take of wolves for WDM is anticipated to usually be much lower than this level. The annual maximum value of 10% was estimated based on review of similar WDM program which has been in effect in Minnesota since 1986. For the period of 1993 to 2002 intentional take for WDM in Minnesota ranged from 3.9 to 9.4% (average 6.4%) of the estimated

[9] These estimates are derived from surveys conducted during winter, prior to pup production, when population size is at an annual low.

state population. During the period of 2003-2005 when an integrated WDM approach was used in Michigan, take ranged from 0.3 to 1.6% of the wolf population (Table 4-2).

Wolves in Michigan are currently a Federally protected "endangered" species. Except in situations of threat to human safety[10] or to aid an individual wolf[11], endangered wolves can only be taken by MDNR, or agents of the MDNR, using non-lethal means. Additional forms of take of endangered wolves, including lethal take, can be authorized by a permit from USFWS. Taking wolves by members of the public without a permit are subject to stiff penalties, including fines and imprisonment., If wolves are reclassified as a threatened species, the USFWS could grant limited authority for the take of depredating wolves in a 4(d) rule. WS would only be involved in wolf damage management as an agent of MDNR or as requested by a tribe. While federally listed the USFWS would issue permits or authorization via special rules under section 4(d) for the use of non-lethal (i.e., aversive conditioning and non-lethal projectiles) and lethal WDM techniques. The permits or authorizations would stipulate the number of animals that can be taken and the methods that can be used; requirements for reporting take and disposition of carcasses; and provides measures to operate under which would minimize the risk of or prevent the unintentional take of wolves; and annual reporting requirements (Section 3.5 and Chapter 4 discussions of impacts of each alternative on wolves and non-target species). The draft permit requires that all wolf mortalities be reported within 5 calendar days. The reporting requirements and close interagency coordination enable the use of an adaptive management approach which would be able to rapidly respond to unanticipated changes in the wolf population and impacts of the program. USFWS permits for the take of wolves would have to be renewed annually after an evaluation of the wolf population and impacts of the WDM program. While wolves are Federally protected, the MDNR will determine on a case by case basis when WS will use lethal WDM techniques under their respective permits and authorities granted by the USFWS.

Most wolf damage management activities are likely to be conducted on private land. Wolf damage management activities are only likely to be conducted on public land if that land is within the damage management perimeter (set by USFWS permits or other USFWS authorizations and the MGWRMP) around the site of a verified depredation event on private land or in the rare instance that a wolf poses a threat to human safety. However, wolf trapping and radio-collaring for wolf population monitoring is usually conducted on public land.

If and/or when wolves are removed from the Federal list of threatened and Endangered species, management authority would transfer to the MDNR and the tribes which would manage wolves in accordance with their respective management plans and policies. The WDNR and Tribes would have final authority on when WS will use lethal control on wolves on lands under their respective jurisdictions.

3.1.3 Alternative 3 - Technical Assistance Only

While federally listed, the USFWS would not issue any Section 10(a)(1)(A) permits or promulgate section 4(d) regulations for wolf damage management. WS would not conduct operational WDM in Michigan but could provide technical assistance on WDM methods that do

[10] While federally protected under the ESA, anyone can take a wolf in defense of human life, that is, when a wolf is attacking a person. Additionally, USFWS, Federal land management agencies, MDNR or their designated agents can take wolves in cases of non-immediate but demonstrable threats to human safety without a permit or other authorization from the USFWS.

[11] USFWS, MDNR, federal land management agencies, or their designated agents, may take a wolf to aid a sick, injured, or orphaned wolf.

not require permits from the USFWS (Appendix B). WS could also do site visits and evaluations of depredation events for compensation payments. Because of the ESA section 6 cooperative conservation agreement between the USFWS and MDNR, the state could still operationally use and authorize others to use many non-lethal WDM techniques (Section 1.7.7, Appendix B). This is the wolf damage management alternative that has been in effect since September 13, 2005 when all WDM activities allowed under a permit issued by the USFWS were enjoined by the U.S. District Court in the District of Columbia.

Wolves in Michigan are currently a Federally protected "endangered" species. Except in situations of threat to human safety[10], or to aid an individual wolf[11], endangered wolves can only be taken by MDNR, or agents of the MDNR, using non-lethal means. Additional forms of take of endangered wolves, including lethal take, can be authorized by a permit from USFWS. Taking wolves by members of the public without a permit are subject to stiff penalties, including fines and imprisonment., If wolves are reclassified as a threatened species, the USFWS could grant limited authority for the take of depredating wolves in a 4(d) rule. While federally protected, the technical assistance recommendations that WS could provide would be limited to measures legally available without special authorization from the USFWS. Individuals might choose to implement WS non-lethal WDM recommendations on their own, request non-lethal control actions from authorized agencies and entities other than WS, or take no action.

If wolves are removed from the Federal list of threatened and endangered species, the MDNR and the tribes would manage wolves in accordance with the provisions of their respective wolf management plans. WS would provide technical assistance on methods permitted by these plans. WS could also do site visits and evaluations of depredation events for compensation payments.

3.1.4 Alternative 4 - No Federal WDM in Michigan

This alternative would result in no assistance from WS or the USFWS in reducing wolf damage in Michigan. The USFWS would not issue any Section 10(a)(1)(A) permits or other authorizations for wolf damage management. Wildlife Services would not provide technical assistance or operational damage management services. Because of the cooperative conservation agreement between the USFWS and MDNR, the state could still operationally use and authorize others to use many non-lethal WDM techniques (Section 1.7.7, Appendix B). All requests for WDM would be referred to the MDNR or the Tribes as appropriate.

If wolves are removed from the Federal list of threatened and endangered species, the MDNR and the tribes would manage wolves in accordance with the provisions of their respective wolf management plans. WS would not have a role in WDM in Michigan.

3.2 WOLF DAMAGE MANAGEMENT STRATEGIES AND METHODOLOGIES

Wildlife damage management is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife (USDA 1997 Revised). A general description of the wildlife damage management approaches that could be used is provided below:

3.2.1 Integrated Wildlife Damage Management

During more than 80 years of resolving wildlife damage problems, WS has considered, developed, and used numerous methods for reducing wildlife damage problems (USDA 1997 Revised). Wildlife Services' efforts have involved the research and development of new

methods, improvement of existing methods, and the implementation of effective strategies to resolve and prevent wildlife damage. The Michigan WS program works closely with the researchers with the USDA, APHIS, WS, National Wildlife Research Center (NWRC). The NWRC is the research arm of the USDA, APHIS, Wildlife Services Program. The NWRC facility at Utah State University is the leading predator research complex in the world. Scientists assigned to the facility are dedicated to the WS operational program. Research at this facility has been critical to the testing and development of non-lethal methods of WDM, and has improved the selectivity, humaneness and efficacy of capture devices (Appendix B). State WS programs assist the NWRC with research projects and, because of the close collaboration between NWRC and the state programs, the latest research findings are rapidly incorporated into state damage management programs.

Usually, the most effective approach to resolve wildlife damage is to integrate the use of several methods simultaneously or sequentially. Integrated Wildlife Damage Management (IWDM) is the implementation and application of safe and practical methods for the prevention and reduction of damage caused by wildlife based on local problem analyses and the informed judgment of trained personnel. The WS Program applies IWDM, commonly known as Integrated Pest Management (IPM), to reduce damage applying the Decision Model discussed in section 3.2.3 (Slate et al. 1992). The philosophy behind IWDM is to implement effective management techniques in the most cost-effective[12] manner possible while minimizing the potentially harmful effects to humans, target and non-target species, and the environment.

IWDM draws from the largest possible array of options to create a combination of techniques for the specific situations. IWDM may incorporate cultural practices, habitat modification, animal behavior modification, removal of individual animals, local population reduction, or any combination of these, depending on the characteristics of the specific damage problems.

3.2.2 Integrated WDM Strategies

3.2.2.1 **Technical Assistance Recommendations** (implementation is the responsibility of the requester):

Technical assistance includes demonstrations on the proper use of some management devices (e.g., propane exploders, electronic guards, etc.) and information on animal husbandry, wildlife habits, habitat management and animal behavior modification. Technical assistance is generally provided following an on-site visit or verbal consultation with the requester. Typically, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need and practical application. Technical assistance may require substantial effort by agency personnel in the decision making process, but the actual implementation is the responsibility of the requester. Technical assistance also includes site visits and verification of the cause of damage as may be necessary for compensation and financial assistance (for WDM prevention equipment) programs.

Education is an important element of program activities because wildlife damage management is about finding "balance" or coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature is not in static balance, but

[12] The cost of control may be a secondary concern because of overriding environmental, health and legal considerations.

rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to farmers, homeowners, and other interested groups. Wildlife Services frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are updated on recent developments in damage management technology, laws and regulations, and agency policies.

3.2.2.2 Operational Damage Management:

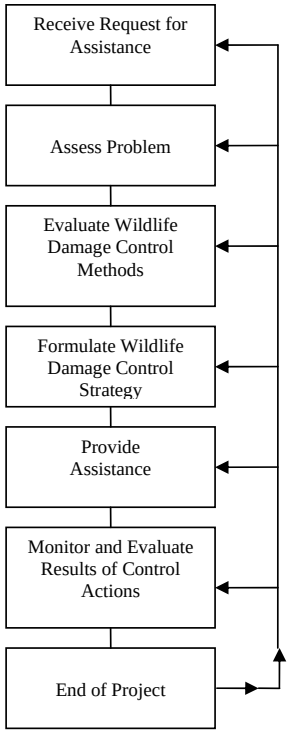
Operational damage management assistance is implemented when the problem cannot be resolved through technical assistance. The initial investigation defines the nature and history of the problem, extent of damage, and verifies whether or not the problem is caused by wolves. Professional assistance is often required to resolve problems effectively, especially if the problem is complex, or the management technique requires the direct supervision or involvement of a wildlife professional. Wolf biology and behavior and other factors are considered (WS Decision Model; Slate et al 1992) when developing site specific damage management strategies.

3.2.3 Wildlife Services Decision Model used for Decision Making.

WS and MDNR personnel use a thought process for evaluating and responding to damage complaints that is depicted by the WS Decision Model described by Slate et al. (1992) (Figure 3-1). The Decision Model is not a written documented process, but a mental problem-solving process similar to that used by all wildlife management professionals including those in the lead and consulting agencies when addressing a wildlife damage problem. Trained personnel assess the problem; and evaluate the appropriateness and availability (legal and administrative) of damage management strategies and methods based on biological, economic and social considerations including:

- Species responsible for the damage (did wolves cause the problem or was it some other species?)
- Magnitude, geographic extent, frequency, historical damage and duration of the problem including review of animal husbandry practices and producer efforts at non-lethal WDM.
- Status of target and non-target species, including T/E species
- Local environmental conditions
- Potential biological, physical, economic, and social impacts

Figure 3-1. APHIS, WS Decision Model



- Potential legal restrictions
- Costs of damage management[13]

Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. When damage continues intermittently over time, WS or MDNR personnel and the requester monitor and reevaluate the situation. If one method or a combination of methods fails to stop damage, a different strategy is implemented. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results, with the damage management strategy reevaluated and revised periodically if necessary.

3.2.4 Local Decision Making Process

The WDM program in Michigan follows the "co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, trained personnel provide technical assistance regarding the biology and ecology of wolves and effective, practical, and reasonable methods available to the local decision maker(s) to reduce wildlife damage. These decision makers may include community leaders, private property owners/managers, and public property owners/managers. This includes non-lethal and lethal methods. Technical assistance on alleviating damage caused by wolves is also available from other State, Federal, and private organizations. Wildlife Services and other State and Federal wildlife or wildlife damage management agencies may facilitate discussions at local community meetings when resources are available, and make recommendations. Resource owners and others directly affected by wolf damage or conflicts have direct input into the strategies to resolve the problem(s). They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations. Local decision makers compare the benefits versus the damage when deciding which methods would be implemented. Local decision makers must weigh the cost of implementing each methodology or a series of methodologies. These decision makers may include community leaders, private property owners/managers, and public property owners/managers.

3.3 WOLF DAMAGE MANAGEMENT METHODS

USDA (1997 Revised, Appendix J) describes some methods currently available for WDM. Several of these were considered in this assessment because of their potential use in reducing wolf damage to agricultural and natural resources, property and pets, and human health and safety. A listing and more detailed description of the methods used for WDM is found in Appendix B of this EA.

3.3.1 Non-Lethal Methods Available to All Without a USFWS Permit

Some WDM methods are available to anyone without a permit. These consist primarily of non-lethal preventive methods such as cultural practices and habitat modification. Cultural practices and other management techniques are implemented by the livestock producer and property

[13] The cost of management may sometimes be secondary because of overriding environmental, legal, public health and safety, animal welfare or other concerns

owners/managers. Livestock producers and property owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. WS, MDNR and USFWS involvement in the use of these methods is usually limited to providing technical assistance. However, it should be noted that the MDNR guidelines for the use of lethal control to address confirmed depredation problems states that, "8) Lethal control efforts will not be implemented at livestock operations or on other private lands with previous wolf depredations that fail to follow technical assistance guidelines in a timely manner."

Best Management Practices (BMPs) implemented by livestock producers to prevent or reduce wolf damage might include: 1) maintaining healthy, well-fed animals, 2) pregnancy testing cattle, 3) properly disposing of dead livestock carcasses through rendering, burying, liming, or burning, 4) conducting calving or lambing operations in close proximity to the farmyard, when practical, 5) penning vulnerable livestock at night where practical, 6) monitoring livestock on a regular basis to detect any disease, natural mortality, or predation, and 7) incorporating non-lethal methods. Property owners and land managers could implement their own best management practices or request the assistance of other agencies or private organizations to implement them, or take no action.

Exclusion may be used to prevent or limit access by predators to livestock pastures, calving or lambing areas, or livestock confinement areas. Several designs of anti-predator fencing have been developed and tested. Where practical and cost effective, sheep, calves or other vulnerable livestock may be penned near farm buildings at night.

Fladry involves installing waving flags hanging about every 20 inches from thin rope or cable stretched about 20 inches above the ground. Fladry may be used in addition to or in substitution of fences, as a new means to protect domestic animals from depredation by wolves.

Livestock guarding animals such as guarding dogs may be used to protect livestock from wolves. Livestock guarding animals may distract, deter, repel or attract wolves that could depredate on livestock.

Guarding and hazing involves guarding an area and then using pyrotechnics or other light/noisemaking devices to frighten wolves away from the site. It can be used as an aversive technique, but requires that the projectiles must be used every time the animal attempts to prey on the protected resource so they don't identify conditions when they can obtain prey without receiving a negative experience (Shivik 2004).

Frightening devices are methods that usually involve a light, sound, or motion device designed to deter wolves from a certain area. Strobe and flashing lights, propane exploders, sirens, and various combinations of these devices have all been used in attempts to reduce livestock losses to coyote, with wide ranging degrees of effectiveness (Linhart 1984, Andelt 1987). Animal habituation (becoming accustomed) to the stimulus is one of the primary limiting factors for primary repellents. Moving the devices intermittently and randomly as well as alternating the stimuli (e.g. a different type of noise or light) may extend the effective period of the system (Shivik and Martin 2001). The period of efficacy may also be extended by using systems which are motion activated or only activated when a wolf wearing a transmitter collar comes into close proximity to the protected site (Appendix B). However, systems which require capturing the wolf and installing a special transmitter collar to activate the device are not included in the methods available to anyone without a permit (Section 3.3.2).

Compensation for wolf damage in the form of monetary payments to livestock producers for full or partial value for domestic animals killed. Such payments may be made by State, Federal, or private organizations.

3.3.2 Non-lethal Methods Available without Federal Permits for States with Cooperative Conservation Agreements with the USFWS

Some non-lethal WDM methods and research projects (e.g., population monitoring) involve harassment or handling wolves that is considered "taking" of an endangered species as defined by the ESA. These activities would ordinarily require a permit from the USFWS. However, Section 6 of the ESA allows the USFWS to establish cooperative agreements with the states for the management of federally listed species (Section 1.7.7). Appropriately trained and authorized personnel or their designated agents from states with these agreements are authorized to use some non-lethal methods that would otherwise be considered take. Methods that require capture and handling of wolves would be conducted only by personnel from the MDNR or their appropriately trained and authorized designated agents.

Frightening Devices that require placing a transmitter collar on a wolf are available to the State and their designated agents without a permit because of the cooperative conservation agreement. Overall efficacy and the period of efficacy of frightening devices may be improved by using systems which are motion activated or only activated when a wolf wearing a transmitter collar comes into close proximity to the protected site (e.g., a Radio Activated Guard; Appendix B). Methods that do not require placing a transmitter collar or similar device on the wolf are available to anyone without a permit (Section 3.3.1).

Capture and relocation of problem wildlife species is a technique that is sometimes used to alleviate wildlife damage problems. The success of a relocation effort, however, depends on the potential for the problem individuals to be captured efficiently and the existence of an appropriate relocation site (Nielsen 1988). While relocation may be appropriate in some situations when the species population is small, wolves are found in much of the suitable habitat in the Upper Peninsula and relocation is not necessary for the maintenance of viable populations. Because wolves are found in much of the suitable habitat in the Upper Peninsula, wolves relocated into suitable habitat in the Upper Peninsula are very likely to encounter other wolves with established territories. Wolves are highly territorial and the newly introduced wolves may trespass into already established wolf territories and be attacked and killed by the resident pack (Mech 1970).

Relocated wolves may also disperse long distances from the release site (Fritts 1983). Relocated wolves can potentially return to the damage sites from which they were removed (Fritts et. al. 1984), or after dispersal movements, cause damage problems at the dispersal site. In this case, the original damage problem has simply been shifted from one property to another.

> ***Foot-hold traps*** can be effectively used to live capture wolves. When used as a live-capture device, wolves are either released on site (e.g., after receiving a radio-collar for research and monitoring) or may be relocated (see relocation above). Wolves live-captured by this method may also be be euthanized (Section 3.3.4). Effective trap placement, pan-tension devices, and the selection and placement of appropriate lures by trained WS personnel contribute to the foot-hold trap's selectivity.
>
> ***Foot snares*** are devices consisting of a cable loop and a locking device that captures an animal around their foot or lower leg. The cable may be activated around the lower leg with a spring (Aldrich) or trap-type (Belisle) device. The foot snare can be modified with

a stop on the snare cable. As with foot-hold traps, when foot snares are used as a live-capture device, wolves are either released on site (e.g., after receiving a radio-collar for research and monitoring) or may be relocated (see relocation above). Wolves live-captured by this method may also be be euthanized (Section 3.3.4).

Dart guns are non-lethal capture devices that utilize a dart filled with tranquilizer fired from a specially designed rifle. Once tranquilized, the animal may be handled safely for research or relocation purposes. Under special situations, a tranquilized animal could also be euthanized if lethal removal is warranted. Use of dart guns would have no effect on non-target wolves because positive target species identification is made before animals are shot. Thus, WS use of dart guns is expected to continue to be virtually 100% selective for target individuals and species, and would not pose a risk to non-target species and individuals. Use of dart guns may sometimes be the only control option available if other factors preclude the setting of equipment.

3.3.3 Non-lethal Methods which Require Permits from the USFWS

Some animal behavior modification systems involve capturing wolves and fitting wolves with collars used to deliver or trigger repellent stimuli (i.e., aversive conditioning). Other systems involve shooting wolves with non-lethal projectiles like rubber bullets. These non-lethal techniques involve intentionally using painful stimuli to manage wolf behavior, and the USFWS has determined that, while wolves are federally protected as a threatened or endangered species, permits or other authorizations are required to use these methods. If and when wolves are removed from the Federal list of threatened and endangered species, the availability of these methods would be determined by the MDNR in accordance with the MGWRMP. Methods that require capture and handling of wolves would be conducted only by personnel from the MDNR, WS or the Tribes.

Aversive Stimuli are stimuli that cause discomfort, pain and/or an otherwise negative experience paired with specific behaviors to achieve conditioning against these behaviors. One example would be using something like a dog training shock collar that is activated when wolves came into close proximity to a protected area (e.g., livestock pens).

Non-lethal Projectiles This involves guarding an area and then using rubber bullets or other non-lethal projectiles to prevent a predation event. It can be used as an aversive technique, but requires that the projectiles must be used every time the animal attempts to prey on the protected resource so they don't identify conditions when they can obtain prey without receiving a negative experience (Shivik 2004). Methods which require around-the-clock presence of a person to guard the resource are most efficiently used when the landowner/resource manager assists with the implementation. The USFWS may choose to allow the MDNR and WS to train and authorize private individuals to use this method.

3.3.4 Lethal Methods[14]:

These methods are specifically designed to lethally remove wolves in certain situations to stabilize, reduce, or eliminate damage. While federally listed, the use of lethal control would

[14] No toxicants are currently registered by U.S. EPA for wolf damage management in Michigan.

require a permit from the USFWS or the establishment of special 4(d) rules, and these techniques could only be used by qualified and authorized personnel from WS, MDNR, or the tribes and other entities specified in the permits or special rules. The amount of removal necessary to achieve a reduction in wolf damage varies according to the effectiveness of other damage management strategies, the damage situation, and the level and likelihood of continued depredations.

While federally listed, and if permits or other authorizations are issued by the USFWS, the MDNR would use the criteria established by the USFWS and the MGWRMP to determine when lethal control can be used. WS would only use lethal WDM methods with the consent of the MDNR. Under the MGWRMP (MDNR 1997), lethal control can be used when: 1) there have been documented, confirmed losses at a site, 2) the producer/owner has a signed depredation management plan (farm plan) for the property which includes damage abatement recommendations. 3) WS Specialists recommend euthanizing, and the MDNR approves. Permits or other authorizations from the USFWS, the MGWRMP and the "Michigan guidelines for management and lethal control of wolves following confirmed depredation events" (Appendix E) would provide restrictions on the timing and location of lethal WDM methods.

Shooting is selective for the target species and may involve the use of either a shotgun or rifle and night vision equipment.

Land restraint snares are devices consisting of a cable loop and a locking device that are placed in travel ways. Snares can be used as killing devices but can also be modified with a stop on the snare cable for a live-capture device.

Foot-hold traps and foot snares are discussed in Section 3.3.2. When used as a lethal damage management technique, captured wolves are euthanized via shooting or administration of sodium phenobarbitol.

Dart guns are non-lethal capture devices that utilize a dart filled with tranquilizer fired from a specially designed rifle (see also Section 3.3.2). Under special situations, a tranquilized animal could also be euthanized if lethal removal is warranted.

Sodium Pentobarbital (Beuthanasia-D) is registered for with the FDA for euthanasia of dogs, but legally may be used on other animals if the animal is not intended for human consumption. Barbiturates depress the central nervous system in descending order, beginning with the cerebral cortex, with unconsciousness progressing to anesthesia. The primary advantage of barbiturates is the speed of action on the animal. Barbiturates induce euthanasia smoothly, with minimal discomfort to the animal (AVMA 1993) after an animal has been anesthetized.

3.4 ALTERNATIVES CONSIDERED BUT NOT IN DETAIL, WITH RATIONALE

3.4.1 Bounties

Payment of funds for killing wildlife (bounties) suspected of causing economic losses is not considered effective to reduce wolf damage at this time. This alternative will not be considered in detail because:

- A bounty program would not be allowed as long as wolves are a listed species.
- Bounties are generally not as effective in reducing damage because depredating

individuals/local populations are not specifically targeted.
- Circumstances surrounding take of animals is largely unregulated.
- No effective process exists to prevent taking of animals from outside the damage management area for compensation purposes.

3.4.2 Eradication and Suppression

An eradication alternative would direct all WS program efforts toward planned, total elimination of wolves. However, this alternative will not be considered in detail because:

- The attempted eradication of established wolf populations is contrary to state and federal efforts to protect wolves and recover the species.
- Eradication of wolves is not acceptable to most members of the public. It is also not realistic, practical, or allowable under present WS policy to consider large-scale population suppression.

3.4.3 Damage Management through Birth Control

Under this alternative, wolf populations would be managed through the use of contraceptives. Wolves would be sterilized or contraceptives administered to limit their ability to produce offspring. A wolf contraceptive, chemosterilant or immunocontraceptive, if delivered to a sufficient number of individuals, could temporarily suppress local breeding populations by inhibiting reproduction. At present, efforts to reduce wolf populations would be contrary to state and federal wolf recovery efforts. Additionally, there are no approved chemical or biological contraceptive agents for wolves.

Reduction of local populations would result from natural mortality and inhibited reproduction. No wolves would be killed directly with this method; however treated wolves may continue to cause damage, but probably at a lower rate, because there would be no pups to feed.

Contraceptive measures for mammals can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immunocontraception (the use of contraceptive vaccines). These techniques would require that wolves receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of this method would be subject to approval by Federal and State Agencies. This alternative is limited because: (1) it may take a number of years of implementation before the wolf population would decline, and, damage may continue for a number of years; (2) surgical sterilization would have to be conducted by licensed veterinarians, which would therefore be extremely expensive; (3) it is difficult to effectively live trap or chemically capture the number of wolves that would need to be sterilized in order to effect an eventual decline in the population; (4) no chemical or biological agents for contracepting wolves have been approved for use by State and Federal regulatory authorities. (5) sterilization or other forms of fertility control have an unknown impact on wolf social structure (Haber 1996).

Sterilization may be useful as an experimental technique to reduce depredation in some highly specialized situations in the future. In coyotes, breeding pairs with pups are most likely to depredate on sheep (Till and Knowlton 1983, Till 1992, Bromley and Gese 2001, Blejwas et al. 2002), and the same may be true for wolves and cattle (A. P. Wydeven, WDNR, pers. comm. 2003). Sterilized coyote (Bromley and Gese 2001) and wolf (Mech et al. 1996) packs continue to maintain territories, and sterilization does not seem to adversely affect survival of sterilized adults. In chronic areas, sterilization may reduce the need to remove problem wolves by keeping

the wolf population low, and eliminating pup production (Haight and Mech 1997). Sterilization continues to be experimental and would only be done after approval from State and Federal regulatory agencies and if it can be carefully monitored.

Sterilization is not being used for WDM at this time, and would normally only be done as part of an experimental procedure, in which careful monitoring is done of the treated wolves. Any attempts to sterilize wolves would be initiated by and coordinated with MDNR, and would need USFWS approval while wolves are federally listed.

3.4.4 Non-lethal before Lethal

Under this alternative, lethal techniques would not be used unless all reasonable non-lethal methods had been tried and failed to reduce damage. This alternative was not considered in detail because, the proposed alternative, Integrated Wolf Damage Management, as outlined in the EA is similar to a non-lethal before lethal alternative because WS and MDNR would encourage and consider the use of non-lethal methods before lethal methods (WS Directive 2.101, MDNR 1997) and because of the conditions that must be met before lethal control will be authorized by MDNR. In accordance with the MGWRMP (MDNR 1997), lethal control can be used when: 1) there have been documented, confirmed losses at a site, 2) the producer/owner has a signed depredation management plan (farm plan) for the property which includes damage abatement recommendations. 3) WS Specialists recommend euthanizing, and the MDNR approves. The MDNR guidelines for the use of lethal control to address confirmed depredation problems further states that, "Lethal control efforts will not be implemented at livestock operations or on other private lands with previous wolf depredations that fail to follow technical assistance guidelines in a timely manner." Therefore, adding a non-lethal before lethal alternative and the associated analysis would not add additional information to the analysis for the public or decision maker.

3.4.5 Provide Funding for Damage Prevention Supplies and Equipment

Under this alternative livestock producers would be given financial assistance with the acquisition of supplies for non-lethal wolf damage management. This alternative could work as a component of Alternatives 1, 2, and 4. This alternative was not considered in detail because funding currently only covers current operational wolf damage management efforts and is not sufficient to help producers purchase materials. The MDA only provides funds to compensate producers for livestock lost to wolf predation. Even if this alternative were selected, funds would likely still be needed for wolf population monitoring. Implementation of this alternative would not necessarily prevent all damage because it would be impossible to predict and equip all locations where wolves might come into conflict with humans, and non-lethal methods are not necessarily effective or applicable to all wolf conflicts. Therefore, unless the agencies were to choose to not respond to depredation events, funding will also be needed to provide operational or technical assistance to places where wolf depredation occurs. The funding remaining after these needs are met is unlikely to adequately address the potential demand for damage prevention materials. Under select circumstances, some producers may qualify for assistance from private programs like the Bailey Wildlife Foundation Proactive Carnivore Conservation Fund administered by Defenders of Wildlife. Where applicable, cooperators can be provided with information on these opportunities.

3.4.6 Lethal Only Program

Under this alternative, the USFWS would only issue Section 10(a)(1)(A) permits or other authorizations for the use of lethal WDM techniques. WS would only provide technical and

operational assistance with lethal damage management techniques. Prohibiting the USFWS and WS from permitting, using or providing technical assistance on effective and practical non-lethal WDM alternatives is not in the best interest of the recovery of the species, is contrary to agency policy and directives (WS Directive 2.101), and will not be discussed further.

3.5 STANDARD OPERATING PROCEDURES FOR WILDLIFE DAMAGE MANAGEMENT TECHNIQUES

The WS program, nationwide and in Michigan, uses many Standard Operating Procedures (SOPs) to improve the safety, selectivity and efficacy of its wildlife damage management techniques. These SOPs are discussed in detail in USDA (1997 Revised, Chapter 5). The following SOPs apply to some or all of the alternatives, as indicated in the columns.

- Alternative 1. Non-lethal Damage Management.
- Alternative 2. Integrated WDM (No Action/ Proposed Action)
- Alternative 3 Technical Assistance
- Alternative 4. No Federal WS WDM in Michigan

Standard Operating Procedures by Alternative	1	2	3	4
General Procedures and Conditions for Conducting WDM				
Wolf damage management would follow guidelines as specified and agreed upon in MOUs and depredation management plans and permits.	X	X	X	
Wolf damage management would be conducted only when and where a need exists. [1]	X	X		
Wolves may be taken by anyone if they pose an immediate and demonstrable threat to human safety	X	X	X	X
The USFWS, Federal land management agencies, MDNR or their designated agents can take wolves in cases of non-immediate but demonstrable threats to human safety without a permit or other authorization from the USFWS.	X	X	X	X
Lethal WDM will not be conducted unless wolf depredation on lawfully present domestic animals is verified by appropriately trained personnel and there is reasonable expectation that the depredation at the site is likely to continue if the depredating wolves are not removed[1].		X		
Lethal control may not be used when wolves kill dogs that are free-roaming, hunting, or training on public lands. [1]		X		
Lethal control efforts may not be implemented at livestock operations or on other private lands that fail to follow technical assistance guidelines in a timely manner.		X		

Standard Operating Procedures by Alternative	1	2	3	4
If a verified depredation has not occurred in the current calendar year, lethal control shall only proceed when all of the following conditions are met: 1) Verified depredation occurred at the site or in the immediate vicinity during the previous year; 2) There is strong evidence one or more members of the depredating pack has remained in the area since the verified depredation; 3) Based on wolf behavior and other factors, the depredation is likely to be repeated; and 3) Trapping is conducted in a location and in a manner to minimize the likelihood a wolf or wolves from a non-depredating pack is captured. [1]		X		
No lethal preventive damage management would be conducted by WS unless authorized by the MDNR and/or the USFWS as appropriate.		X		
Lethal depredation control activities must occur within 1 mile of the depredation site. [1]		X		
Young-of-year wolves trapped before August 1 must be released. [1]	X	X		
Lactating females trapped before July 1 must be released near the point of capture unless they have been involved with chronic depredation problems; in this case, lactating females may be captured and euthanized. [1]	X	X		
While wolves are federally listed, the accidental serious injury or mortality resulting from trapping activities to young of the year prior to August 1 may not exceed the number of individuals specified in the permit from the USFWS. In the event this number is met, all trapping activities shall cease. [1]	X	X		
While wolves are federally listed, capture of lactating females prior to July 1 may not exceed the level stipulated by the USFWS. In the event this number is met, all trapping shall cease until July 1. Capture of lactating females prior to July 1, regardless of their condition at the time of their release, shall be reported to USFWS within 5 calendar days. [1]	X	X		
While federally listed, all mortalities and serious injuries, whether intentional or incidental, shall be reported to the Service's Region 3 Endangered Species Permits Biologist, the Green Bay Field Office, and the Service's Law Enforcement Office within 5 calendar days. [1]	X	X		
While federally listed, an annual report of activities conducted under the authority of a USFWS permit is due on January 31. [1]	X	X		
On public lands, vehicle use would be limited to existing roads unless authorized by the land management agency.	X	X	X	
While federally listed, wolves, or wolf parts legally taken may be transferred to Native Americans for religious and/or cultural purposes, public educational use, or scientific research purposes. Specimens not suitable, or not needed, for such use must be destroyed.		X		
Animal Welfare and Humaneness of Methods Used by WS				
The use or recommendations of non-lethal methods such as guard dogs, scare devices, and other methods, would be encouraged when appropriate. [1]	X	X	X	

Standard Operating Procedures by Alternative	1	2	3	4
While wolves are federally listed, MDNR and WS could be authorized to train landowners and resource managers in the safe and effective use of non-lethal projectiles. These methods would not be available to landowners and resource managers without specific training from MDNR and WS personnel. [1]	X	X	X	
Wolf capture, handling, and euthanizing must be carried out in a humane manner which may include the use of steel foot-hold traps, snares, shooting, and lethal injection. [1]	X	X		
Traps and snares would be checked consistent with MDNR and USFWS requirements. At present, this includes a requirement that traps be checked at least once every 24 hours.[1]	X	X		
Research would continue to improve the selectivity and humaneness of management devices and these would be implemented into the WS Program.	X	X	X	X
Pan-tension devices are used to reduce the incidence of smaller non-target animal capture in foot-hold traps. [1]	X	X		
Breakaway snares have been developed and implemented into the program. (breakaway snares are designed to break open and release with tension exerted by larger non-target animals such as deer and livestock.)	X1	X		
All trappers shall be trained in the trapping, chemical immobilization, and medical handling of animals, with emphasis on wolves, to minimize accidental injury and death of wolves. [1]	X	X		
Non-lethal projectiles (e.g., rubber bullets and bean bag projectiles) will be utilized when a wolf attacks or closely approaches livestock or other domestic animals or people.	X	X		
Non-lethal projectiles will not be used in a manner that would cause permanent physical damage or death to a wolf.	X	X		
Personnel will be trained in the safe and appropriate use of WDM techniques and equipment.	X	X	X	
Safety Concerns Regarding Use of Traps and Snares				
The WS' Decision Model, designed to identify the most appropriate wildlife damage management strategies and their impacts, is used.	X	X	X	
Traps and snares would be placed so that captured animals would not be readily visible.	X1	X		
Warning signs would be posted on main roads and/or trails leading into any areas where traps or snares were being used. These signs would be removed at the end of the damage management activities.	X	X		
No traps or snares would be used by WS within one fourth mile of any residence, community, or developed recreation site, unless requested by the owner of a privately-owned property or an official from the appropriate land management agency.	X	X		

Standard Operating Procedures by Alternative	1	2	3	4
Concerns About Impacts of WDM Activities on T/E Species, Other Species of Special Concern, and Cumulative Effects				
Wildlife Services and MDNR consulted with the USFWS on the impacts of the program to Federally listed T/E species in Michigan and will adopt all Reasonable and Prudent Measures established by the USFWS for the protection of threatened and endangered species.	X	X	X	X
Wildlife Services personnel are directed to resolve depredation problems by taking action against individual problem animals, or local populations or groups.	X	X	X	
Foot-hold traps or spring activated foot snares set near baits would incorporate tension devices to preclude capture of eagles and other non-target species.	X	X		
No foot-hold traps or snares would be set within 30 feet of any exposed bait or animal carcass to prevent capture of raptors.	X	X		
No pesticides would be used by WS during WDM operations.		X		
The appropriate land manager and the USFWS would be notified as soon as possible, if a federally listed species is caught or killed.	X	X		
Cultural Resources/Native American Concerns				
This EA will be provided to the American Indian Tribes in a Pre-Decisional form to determine if all cultural issues have been addressed.	X	X	X	X
The Great Lakes Indian Fish and Wildlife Commission is a Consulting Agency in the preparation of this EA	X	X	X	X
Wildlife Services will inform GLIFWC prior to using lethal techniques to address wolf damage issues on lands in the ceded territories but outside tribal boundaries.	X	X	X	

[1] Items required in draft permit identified in the Conservation Measures or Terms and Conditions of the 2004 Biological Opinion on WDM from USFWS. Details may change slightly as, depending upon the Alternative selected, any permits and associated new Biological Opinions are completed (Section

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information needed for making informed decisions on the WDM objectives outlined in Chapter 1, the issues and affected environment discussed in Chapter 2, and the alternatives discussed in Chapter 3. This chapter analyzes the environmental consequences of each alternative and consists of 1) analysis of environmental consequences, 2) analysis of each alternative against the issues considered in detail, and 3) summary of impacts.

Under ordinary circumstance, impacts of the alternatives would be compared to the Current Program/ No Action alternative (CEQ 1981). CEQ guidance states that the "No Action" alternative can be defined as being the continuation of current management practices (CEQ 1981). However, the current program has only been in effect since the Federal Court Decision on September 13, 2005 (Sections 1.3.1 and 1.3.6). Insufficient data exist at this time to adequately use the impact of current management practices as a baseline for analysis. Alternative 2, the Proposed Action alternative was in effect for most of the period of 2003 to September 2005 and is similar to the proposed action. Data are available on the environmental impacts of this earlier program. Therefore, for purposes of analysis we use Alternative 2, as the "No Action" baseline when comparing the other alternatives to determine if the real or potential adverse affects of the alternatives are greater, lesser or the same (Table 4-4).

4.1 SOCIAL AND RECREATIONAL CONCERNS, RESOURCE USE AND IMPACTS ON HISTORIC AND CULTURAL RESOURCES

4.1.1 Social and Recreational Concerns

Social and recreational concerns are discussed throughout the EA, in the MGWRMP (MDNR 1997), and in USDA (1997 Revised) whereby pertinent portions have been incorporated by reference. Social and recreational concerns are also addressed in the analysis of impacts on stakeholders, including aesthetics of wildlife, and impacts on humaneness for each of the alternatives analyzed in detail in Section 4.2 of this EA.

4.1.2 Irreversible and Irretrievable Commitments of Resources

The following resource values within Michigan would not be adversely impacted by any of the alternatives analyzed in this EA: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These will not be analyzed further.

Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the Michigan WDM program produces very negligible impacts on the supply of fossil fuels and electrical energy.

4.1.3 Impacts on Cultural, Archaeological and Historic Resources

Activities described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. Wildlife Services and

the USFWS have determined that WDM actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties. A copy of the initial invitation for public involvement was given to each of the Native American tribes in Michigan and the GLIFWC. GLIFWC is a consulting agency in the preparation of this EA. The draft EA is being provided to each Native American tribe in the State to allow them opportunity to express any concerns that might need to be addressed prior to a decision.

4.2 ISSUES ANALYZED BY ALTERNATIVES

This section presents the expected consequences of each alternative on each of the issues analyzed in detail.

4.2.1 Alternative 1 - Non-lethal Damage Management Only

Effects on wolf populations. Under this alternative, the USFWS would not authorize the lethal take of wolves and WS would not use lethal methods for wolf damage management. The USFWS would authorize the use of non-lethal projectiles and aversive conditioning (e.g., dog training collars). Most non-lethal methods included in this alternative have been and are currently being utilized to reduce wolf predation on livestock in Michigan and do not require authorization from the USFWS (Section 1.7.7, Appendix B). Improvements in animal husbandry practices and the utilization of other non-lethal WDM methods like livestock guarding animals have the potential to reduce wolf damage, however, these methods have not always resolved the damage problem in other areas, including Minnesota and Wisconsin. There are also situations where some non-lethal methods are not appropriate (e.g., the use of some noise-making frightening devices may be incompatible with land uses on adjacent properties). Bangs and Shivik (2001) reported that while non-lethal methods can be effective, many were expensive to implement and none available at the time were widely effective. A State compensation program would continue to be a valuable method for reimbursing farmers for losses and in preventing the wolf population from being an economic burden on individuals. However, there are also some difficulties with compensation programs (Appendix B, Wagner et al. 1997).

There will be no intentional take of wolves for damage management under this alternative. However, regular use of techniques like non-lethal projectiles, aversive conditioning (e.g., dog training collars), and disruptive stimuli (remote activated frightening devices and guarding-and-hazing) is likely to be higher if access to lethal WDM methods is prohibited. Use of capture and relocation may also increase, but this may be a method of last resort because of difficulties with relocation discussed in Section 3.1.2 and Appendix B. Any activity that involves the capture and handling of wolves involves a risk of unintentional death of the wolf. Additional incidental take associated with capture and holding of females with pups may also occur and is as discussed for Alternative 2. There is also a low chance that the use of non-lethal projectiles could result in the death or serious injury of a wolf. WDM would be conducted in accordance with all permit conditions and other regulations established by the USFWS for the protection of wolves, and protective measures and regulations set by the MDNR. The use of traps and snares to capture wolves for non-lethal WDM projects may be higher under this alternative than for Alternative 2, so incidental take of wolves for this alternative is anticipated to be low but still higher than for Alternative 2.

As discussed above, non-lethal methods are not always effective. This alternative is expected to result in a reduction in the efficacy of services provided to resolve wolf depredation conflicts; and

it is reasonable to conclude will result in a reduction in tolerance of wolves by the landowners and an increase in illegal kill (Section 2.2.4). Illegal lethal control actions by private individuals are less likely to be very specific or very humane, and could potentially have more adverse impacts on the wolf population we are trying to recover than focused lethal actions by trained, authorized professionals. Any illegal lethal control by individuals is also less likely to be effective in reducing depredation events, as it would be less likely to target the specific depredating animals.

Cumulative Impacts

In summary, while wolves are federally listed, the removal of wolves by authorized agency actions will be lower than Alternative 2 because there will be no intentional take of wolves for WDM. However, as discussed above, there is likely to be an increase in illegal take of wolves by frustrated private individuals. The level of illegal take is difficult to predict, and, because of the remote rural nature of much of the Upper Peninsula, will be difficult to prevent. Furthermore, it is unlikely that this illegal take will remove the depredating wolves, thus additional illegal take may follow. It is possible that cumulative take may exceed that anticipated under Alternative 2. Attitudes of landowners in areas where wolves are present are also likely to impact attitudes of landowners in areas where the wolf population may expand and could adversely impact future growth and expansion of the Michigan wolf population.

As discussed for Alternative 2, WDM decisions made in Michigan will have impacts on public reaction to management decisions in Wisconsin and *vice versa*. If this alternative is selected in Michigan, but a less restrictive version is selected in Wisconsin without clear-cut reasons for the decision, it is likely to increase public dissatisfaction with wolf management in Michigan, and may increase the likelihood that frustrated individuals will engage in illegal killing of wolves. If the same alternative were selected for the wolf depredation permit submitted by the WDNR, the anticipated negative actions are likely to be enhanced. Those livestock owners inclined to take illegal actions would find support and justification from their counterparts in the adjacent state, potentially increasing the amount of illegal take.

If wolves are removed from the Federal list of threatened and endangered species, WS would still be restricted to the use of non-lethal WDM methods and assisting the MDNR with wolf population monitoring and the wolf damage compensation program. However the MDNR and tribes could allow the use of lethal techniques in accordance with their respective management plans and policies. If non-lethal methods fail to resolve wolf damage, property owners are likely to request lethal damage management actions from authorized entities. MDNR biologists have the skills to effectively use lethal WDM techniques, but budget and time constraints may prohibit them from providing the same level of prompt, timely assistance as WS. Overall impacts of actions by entities other than WS will depend on the skill and resources of the individuals conducting WDM. Actions by individuals with less training and experience in WDM are less likely to be selective for individual depredating wolves and may result in increased take of wolves before the damage problem is resolved. Cumulative impacts are anticipated to be similar to or slightly higher than Alternative 2 and would not decrease the wolf population in MI.

Effects on public and pet health and safety. While federally listed, there would be no lethal WDM activities. However, Wildlife Services and MDNR would be using traps and snares to capture wolves for population monitoring. Use of non-lethal methods like aversive conditioning and remote activated frightening devices that require a collar on a wolf, and trap-and-relocate efforts may increase if access to lethal WDM is not permitted. This could increase the use of traps and snares to capture wolves for non-lethal techniques over that anticipated for Alternative

2, but would likely not exceed the total agency use of traps and snares (non-lethal and lethal WDM combined) anticipated for Alternative 2. As with Alternative 2, traps and snares would be strategically placed to minimize exposure to the public and pets. WS and MDNR post appropriate warning signs on properties where traps or snares are set to alert the public of their presence. Under this alternative, traps and snares would only be used with the specific intent of keeping the captured animal alive. Measures to prevent injuries and keep wolves alive will also reduce potential risks to pets and non-target species. Michigan WS and MDNR have not captured any dogs or cats over the interval of 2000-2004. In general, agency impacts under this alternative are likely to be similar to or slightly lower than the low risks from the Past Action/Proposed Action program (Alternative 2).

There are provisions within the regulations pertaining to the ESA that allow for the lethal take of an endangered species in response to a demonstrable (either immediate or non-immediate) threat to human safety. Response to threats to and wolf predation on pets will be restricted to non-lethal methods. As discussed above, non-lethal methods are not always effective in reducing problems with wolves. If wolf populations continue to increase without an effective damage management program in place, there may be potential threats to public and pet health and safety from wolves that enter people's yards or attack their pets. Therefore, risks to human and pet safety from wolves would likely be similar to or higher for this alternative than Alternative 2 because fewer WDM methods would be available. Additionally, frustrated individuals may attempt to solve wolf damage problems through illegal shooting, trapping, snaring, or poisoning. As a result of these illegal actions, there could be increased risks to public and pet safety from improper or unscrupulous efforts to resolve perceived problems with wolves. Poisons, especially, have high risks of severe adverse impacts on public and pet health and safety, as well as on non-target wildlife species.

If wolves are removed from the federal endangered species list, WS would still be restricted to the use of non-lethal WDM techniques. Impacts of WS' actions would not change from those anticipated while wolves are federally listed. However, the MDNR and the tribes would be able to use and authorize others to use lethal WDM techniques in accordance with their respective management plans and policies. The efficacy of these programs in reducing risks from wolves would be variable depending upon the training and experience of the individual conducting the WDM, but generally similar to impacts as anticipated for Alternative 2.

Humaneness of methods to be used. While wolves are federally listed, this alternative would be considered more humane than Alternative 2 by many people that are opposed to lethal WDM techniques. However, because of personal beliefs that foot-hold traps and snares are inherently inhumane, their use to capture wolves for research and non-lethal WDM projects will cause some individuals to view this alternative inhumane. When capturing wolves for population monitoring and non-lethal WDM efforts, wolves would be humanely captured by experienced WS and MDNR personnel using the best methods available. Tranquilizer trap devices (TTDs) can be used on wolf traps to reduce the incidence of self-inflicted injuries by captured animals (Appendix B). All activities would be conducted in accordance with Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed. Some individuals would prefer that cage traps be used to capture wolves and would perceive this method as being more humane than traps and snares. Unfortunately, the use of cage traps to capture wolves is usually impractical and ineffective because it is extremely difficult to get a cage trap big enough for an adult wolf into remote locations, and because it is rare to captue an adult wolf in a cage trap.

While federally listed, some property owners may take illegal action against localized populations of wolves out of frustration with continued damage and lack of legal access to the full range of WDM methods. Some illegal methods, like poisons, may be less humane than methods used by experienced agency personnel.

If wolves are removed from the Federal list of threatened and endangered species, WS would still be resticted to the use of non-lethal techniques and the humaneness of WS' action would not change. However the MGWRMP allows for the use of lethal WDM techniques. Humaneness of WDM activities by DNR, Tribes and/or private entities would be variable depending upon the skill, experience and equipment available to the individual conducting the WDM. In general, perceptions of the humaneness of these actions would be similar to alternative 2.

Impact to stakeholders, including aesthetics of wildlife. The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and relationship to the problem. For example, individuals directly impacted by wolf predation may be less tolerant of wolves than individuals whose property and pets are not at risk. While wolves are federally protected individuals experiencing damage from wolves would likely oppose this alternative because they would likely feel that their access to an effective management alternative was being unduly restricted. They would probably be less opposed to this alternative once wolves are removed from the Federal list of threatened and endangered species because access to lethal WDM techniques would likely be available from entities other than WS in accordance with the MGWRMP.

While wolves are federally protected, some individuals would prefer this alternative because they believe it is morally wrong to kill animals for any reason. However, there may still be concern about the use of traps and snares to capture wolves for population monitoring and/or attachment of collars required for some non-lethal WDM methods. If wolves are removed from the Federal list of threatened and endangered species, lethal WDM techniques may be available in accordance with the MGWRMP and perceptions of this alternative by individuals opposed to lethal WDM would likely be the same as Alternative 2. However, this alternative may still be preferable to Alternative 2 for individuals who are specifically opposed to federal (WS) involvement in the operational use of lethal WDM techniques.

Some people would support this alternative because they enjoy seeing wolves, or having wolves nearby, and while wolves are federally listed, this alternative would prohibit the lethal removal of wolves. However, they might still be affected by relocation of depredating wolves. As discussed above, there is strong evidence from previous years and actions in other states that this alternative will result in a decline in wolf density in Michigan and any difference in wolf viewing opportunities is likely to be negligible. Other opportunties to view, call and aesthetically enjoy wolves will be available to people who make the effort to visit sites with adequate habitat adjacent to the immediate area where the wolf relocation occurred.

If wolves are removed from the federal T&E species list, lethal WDM would be permitted in accordance with the MGWRMP. Impacts on opportunities to view and enjoy wolves would likely be similar to Alterantive 2.

Effects on non-target species populations, including T&E species. While federally listed, there would be no lethal WDM activities. However, WS and the MDNR would use traps and snares to capture wolves for wolf population monitoring and some non-lethal WDM methods. Lack of access to lethal WDM techniques may result in an increase the use of traps and snares associated with non-lethal techniques over that anticipated for Alternative 2, but would likely not

exceed the total agency use of traps and snares (non-lethal and lethal WDM combined) anticipated for Alternative 2. As with Alternative 2, trap and snare selection, settings (stops on snares, pan tension devices, etc.), placement and lures will be designed to minimize risks to non-target species. Unfortunately, despite these precautions, traps and snares may occasionally capture non-target species such as white-tailed deer (*Odocoileus virgianus*), black bear, bobcat (*Felix rufus*), coyote and dogs[15] (Table 4-3). Overall risks to non-target species from legal WDM actions would be similar to or slightly lower than Alternative 2 (no action / proposed action). Under this alternative, traps and snares would only be used with the specific intent of keeping the captured animal alive. Measures to prevent injuries and keep wolves alive will also reduce risks to non-target species. These risks are very low and take is anticipated to be well below the sustainable harvest level for non-target species populations. Measures to reduce risks to non-target species are included in the SOPs described in Chapter 3 and discussed in Appendix B. All actions would be conducted in accordance with Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed.

Some individuals frustrated with wolf management policies might attempt to illegally shoot, trap, snare, or poison wolves with potential detrimental effects on non-target species including T/E species (Schueler 1993, USDA 1997, Revised). Illegal use of toxicants represents one of the cheapest forms of predator removal, but it also presents the greatest environmental risks (Allen et al. 1996). Under this alternative and while wolves are federally listed, risks to T/E and other non-target species from illegal actions, especially the use of poisons, would probably be greater than Alternative 2.

The USFWS has concurred that the WS WDM methods are not likely to adversely affect the bald eagle (*Haliaeetus leucocephalus*), will not jeopardize the continued existence of Canada lynx (*Lynx canadensis*) and are not anticipated to result in the incidental take of lynx (C. Czarnecki, USFWS, May 7, 2004). WS has determined that the proposed action will have no effect on all other federally listed non-target species and critical habitat in Michigan with the exception of wolves (target species discussed above). WS has determined that impacts of methods proposed in this EA on T/E species other than the wolf would be the same as addressed in the 2004 Biological Opinion. WS and MDNR will adhere to all Conservation Measures, Terms and Conditions and other provisions identified in the Biological Opinion currently being prepared by the USFWS for the protection of federally listed species. The MDNR is reviewing this EA to verify that WS' WDM activities would have no effect on or are not likely to adversely affect state listed T/E species. Any recommendations made by the MDNR to protect state listed species would be incorporated into WS' WDM and wolf population monitoring efforts. Standard Operating Procedures intended to reduce the risks to non-target species are provided in Chapter 3.

If wolves are removed from the Federal list of threatened and endangered species, WS would still be restricted to using non-lethal techniques and the impacts of WS' actions would not change. However, lethal WDM methods could be used by other entities in accordance with the MGWRMP. Impacts of damage management actions by entities other than WS would be variable depending upon the training, experience and equipment available to the individual conducting the WDM. Risks to non-target species may be greater than with Alternative 2 if the individual conducting the WDM does not have the experience, training, or equipment needed to

[15] Michigan WS has not captured any dogs or cats over the interval of 2000-2004, but in rare instances, dogs and cats have been captured in other states during similar wolf management efforts.

minimize risks to non-target species. In general, risks to non-target species would be similar to or slightly higher than those described for Alternative 2.

4.2.2 Alternative 2 - Integrated WDM (No Action / Proposed Action)

Effects on wolf populations. This alternative was used for most of the period of 2003 to September 2005 (Section 1.3.6). However, since the September 13, 2005 court injunction prohibiting WDM efforts that were covered under specific authorization from the USFWS, the MDNR, WS and USFWS have only been providing technical assistance on non-lethal methods that can be used in Michigan without a permit from the USFWS. Integrated wolf control management strategies and methods proposed for use under this alternative would ensure resolution of the highest number of damage incidents with minimal negative environmental impacts. A State compensation program would continue to be a valuable method for reimbursing farmers for losses to wolves helps to prevent the wolf population from being an economic burden on individual livestock producers. However, there are some difficulties with compensation programs (Appendix B; Wagner et al. 1997). Livestock producers would be provided information about best management practices (animal husbandry) and non-lethal methods to help reduce the potential for wolf damage at farms or mitigate such damage. Wolf damage management actions would be conducted in accordance with all Federal and State requirements for the conservation of gray wolves including permit conditions and other regulations established by the USFWS in 10(a)(1)(A) permits and 4(d) rules, and requirements of the MGWRMP.

Environmental Baseline for Michigan Wolf Population

Throughout the range of the wolf, generally three factors dominate wolf population dynamics: food, people, and source populations (Fuller et al. 2003). These factors are likely to play the primary role regulating the Upper Peninsula's wolf population, as well.

Food

Prey density and vulnerability are important in determining what areas wolves inhabit and at what level. It appears that, over time, absent severe human persecution, wolf numbers are mainly limited only by food (Fuller et al. 2003). In establishing populations, as in the Upper Peninsula, the wolf population is likely to grow until food is a limiting factor. As the Upper Peninsula wolf population continues to grow by approximately 15% annually (Figure 1-1), it is unlikely that prey is a limiting factor for wolves in Michigan at this time.

People

The indirect or direct killing of wolves by humans also is important in determining the location and density of wolf populations (Fuller et al. 2003). Direct killing of wolves still occurs, however at much lower rates than was experienced in the past. In Wisconsin, there were 32 known wolves killed as a result of poaching from 2000 to 2003. In 2004, 10 of 21 radio-collared wolf mortalities in Michigan were due to poaching.

Wolf populations do not appear to be greatly affected by other human factors such as snowmobiles, vehicles, or logging activities, except when they result in accidental or intentional killing of wolves or changes to prey density (Fuller et al. 2003). If the wolf population is large enough, even when these factors have an adverse affect on individuals, these activities seem to have little effect the wolf population (Fuller et al. 2003). From 1992 – 2004, 34 wolves have been killed in Michigan as a result of vehicle collisions (Dean Beyer,

MDNR, unpublished information). This level of mortality has apparently not inhibited the continued increase of the Michigan wolf population over the same period (Figure 1-1).

Source Populations

Source populations are important in establishing new populations and maintaining populations that are heavily harvested or experience high mortality from other causes (Fuller et al. 2003). As the Upper Peninsula has had a resident wolf population for over 10 years and is not presently subject to heavy harvesting or other forms of excessive mortality, connectivity with source populations in Wisconsin, Minnesota, and Canada is probably of lesser importance at this time. However, it is important to note that the Upper Peninsula is not an isolated population. Immigration and emigration of wolves among the Upper Peninsula, Wisconsin, Canada, and Minnesota occurs, and immigration is the probable basis for the re-establishment of the Upper Peninsula wolf population. However, it is possible that a few animals persisted in remote areas of the Upper Peninsula and that these individuals also contributed to the present population. Immigration may not have a large annual effect on the Michigan wolf population but it likely contributes to the long-term sustainability of the population.

Other Factors

Natural mortality is a factor affecting the wolf population in the Upper Peninsula. The two main sources of natural wolf mortality described by Fuller et al. (2003) were starvation and intraspecific strife. On Isle Royale, where no human-caused wolf deaths occur, annual mortality due to starvation and intraspecific strife averaged 32.5% from 1971 – 1995 (Peterson et al. 1998). Diseases, such as mange, also can affect wolf populations. From 2000 to 2004, WDNR documented that natural mortality resulting from mange is the cause of 26% of all radio-collared wolf deaths in Wisconsin (Table 4-1). MDNR collects similar mortality data, however, until recently all radio-collared wolves were vaccinated and therefore did not reflect the true level of disease mortality experienced by the larger population. In Michigan, natural mortality of wolves does not seem to be adversely impacting the wolf population as it continues to increase by approximately 15% annually.

Table 4-1. Natural mortality of radio collared wolves in Wisconsin 2000 – 2004 (Adrian Wydevan, WDNR, pers. comm. March 2005). Number in parenthesis is percentage of total mortality (natural and human caused) observed in radio collared wolves.

Mortality Factor	**2000**	**2001**	**2002**	**2003**	**2004**	**Total[1]**
Mange	4	4	2	6	3	19 (26%)
Other disease	1	2	1	2	-	5 (7%)
Malnutrition	-	-	2	-	-	2 (2%)
Other wolves	3	2	1	1	1	8 (11%)
Accident	-		1	-	-	1 (1%)
Total	8	8	7	8	4	35 (48%)

[1] Proportion of all known mortality attributable to this cause.

It is unknown how the addition of human-caused mortality would affect natural mortality rates. However, as compensation operates in wolf populations as in other populations, an increase in human caused mortality likely would result in a decrease in natural mortality. In

any case, the demonstrated annual rate of increase in the Michigan wolf population has occurred in spite of all causes of mortality and cumulative impacts on the population including WDM.

The eastern timber wolf has exceeded the numerical recovery goals as listed in the Federal and State recovery plans. The Federal plan requires that at least two viable wolf populations must exist within the eastern United States. One of these populations must be reestablished outside of Minnesota and Isle Royale. The Federal recovery plan provides two alternatives for reestablishing this second viable wolf population. If the wolf population is more than 100 miles from the Minnesota population, it must contain 200 wolves for at least 5 consecutive years (USFWS 2003a). If the wolf population is less than 100 miles of the Minnesota population, it must contain at least 100 wolves for at least 5 consecutive years (USFWS 2003). The Michigan/Wisconsin wolf population is more than 100 miles from Minnesota and recent surveys indicate more than 800 wolves in these two states. A minimum population of at least 200 wolves has been exceeded for ten consecutive years (Fig 1-3). Also, while no numerical individual state recovery criteria for Michigan and Wisconsin are listed in the Federal plan, State subgoals were incorporated. For Wisconsin and Michigan, the subgoals are 80 and 80 – 90 wolves, respectively (USFWS 1992). Current populations in both these States are more than four times these numerical subgoals. Recent data indicate that the wolf population in Wisconsin, and Michigan continues to increase.

The Federal recovery plan also required that, the wolf population in Minnesota be stable or growing, and its continued survival must be assured. In Minnesota, the wolf population size is not surveyed or estimated annually, however during the winter of 2003-2004, the Minnesota Department of Natural Resources (MNDNR) conducted a new survey of wolf distribution and abundance in Minnesota (Erb and Benson 2004). The survey estimated that there could now be as many as 3,020 wolves (range 2,300 – 3,700) in the state, but cautioned that during 2001-2003 Minnesota's wolf population may have actually stabilized around 2,500 wolves due to wolf mortality from a significant outbreak of sarcoptic mange. A wolf depredation control program, similar to the preferred alternative for this EA, has been conducted in Minnesota since 1978 when wolves were reclassified as threatened and a 4(d) regulation was promulgated. After 25 years of wolf damage management including lethal removal of wolves, the Minnesota wolf population continues to increase.

The primary factors influencing wolf recovery in the Upper Peninsula are prey density, human related mortality, and natural mortality. The current rate of population increase will likely not continue into the foreseeable future. As the wolf population in Michigan expands to fill all available habitat, or as the cultural carrying capacity is approached, the rapid population growth rate is expected to slow and eventually stop. At that time we would expect to see negative growth rates (that is, wolf population declines) in some years, due to short-term fluctuations in birth and mortality rates. However, adequate wolf monitoring programs, as identified in the MGWRMP (MDNR 1997), should identify excessively high mortality rates or low birth rates and would trigger timely corrective action (e.g., reductions in allowable take for WDM, measures to address the source of the high mortality rates or low birth rates) when necessary.

Impact of Proposed Action

Intentional Take

For most of the period from 2003 until the court order in September 2005, the WDNR and Michigan Department of Natural Resources (MDNR) operated wolf damage management programs under the authority of a special 4(d) rule or a 10(a)(1)(A) permit. The level of intentional take of wolves at depredation sites in Michigan has been 1.2, 1.6, and 0.5% of the late-winter Michigan wolf population for 2003, 2004, and 2005, respectively (Table 4-2). Under this alternative, an annual maximum of 10% of the previous late-winter wolf population would be intentionally taken for WDM. For a Michigan late-winter wolf population of 405 individuals, maximum annual take would be 40 individuals. Actual annual take of wolves for WDM is anticipated to usually be much lower than this level. However, as the wolf population in Michigan increases, WS, MDNR and the USFWS anticipate that requests for WDM assistance will also increase. The level of maximum anticipated annual take for the future is based on review of a similar program which has been in effect in Minnesota since 1986. For the period of 1993 to 2002 intentional take for WDM in Minnesota ranged from 3.9 to 9.4% (average 6.4%) of the estimated state population. Based on data from the larger WDM program in Wisconsin, some of the animals euthanized during this period are likely to be young of the year taken after August 1, and, thus, were members of an age group not yet in existence at the time of the late winter count. For example, in Wisconsin WDM work, the ratio of young of the year to adults for 2003-2005 was 8:17, 4:24, and 9:29 respectively. For all three years combined, 21 out of 70 wolves captured at depredation sites were young of the year, representing 30% of lethal take. Based upon these data, it seems clear that the percentage of take calculated by dividing the total number of individuals taken for WDM during the year by the number of wolves in the previous late winter wolf population would likely be an over-estimate of the take because not all the individuals taken would have been in the population at the time it was estimated.

Table 4-2. Michigan estimated wolf population and known mortality.

Year	Estimated Wolf Population at End of Previous Winter	Known Mortality after Population Estimate	Wolves Euthanized	% of Late-winter Population Euthanized	Total % Mortality of Late-winter Population
2000	216	26	0	0%	12.0%
2001	249	27	0	0%	10.8%
2002	278	62	1	0.3%	22.3%
2003	321	22	4	1.2%	9.5%
2004	360	37	6	1.6%	10.3%
2005	405	40	2	0.5%	9.9%

Incidental Take

Incidental take is the unintentional injury or death of wolves as a result of management activities. Sources of incidental take from non-lethal WDM methods include death or serious injury of a wolf from a poorly placed or close range shot from a non-lethal projectile, potential injuries associated with aversive conditioning methods like dog shock collars, and

injury or death of wolves captured for population monitoring or attachment of collars used for non-lethal WDM methods like Radio Activated Guard (RAG) boxes (Appendix B). Incidental take associated with lethal WDM methods includes injury or death of young of year taken prior to August 1; indirect injury or death of pups if lactating females are captured (prior to July 1) and die or are not released in a timely fashion; and indirect injury or death of pups if lactating females are euthanized. Implementation of the Conservation Measures and Reasonable and Prudent Measures permit conditions or other requirements that could be established in future 4(d) rules by the USFWS would minimize incidental take. The estimates provided below are based on past experiences combined with a prediction of future wolf depredation control needs and are the best estimates currently available.

Non-lethal projectiles (rubber bullets and bean-bag projectiles) are among the methods available under this alternative. Use of this method requires that the projectiles be used every time the wolf attempts to prey on the protected resource so the wolf does not identify conditions when they can obtain prey without receiving a negative experience (Shivik 2004). Consequently, this method is most effective when the landowner/resource manager(s) assist with the implementation. The USFWS may choose to allow the MDNR and WS to train individuals in the use of this method. Anyone using this method would be required to go through a training course on the safe and effective use of this technique. These projectiles can be deadly at very close range or if a vulnerable spot on the body is hit, although the likelihood of this type of injury is very low (Bangs, USFWS, pers. comm., Bangs et al. 2004, Appendix B). However, the USFWS has issued approximately 200 permits to landowners for the use of non-lethal projectiles after the landowner had received special training in the use of the method. In that time, only a few dozen wolves have been shot at and less than 5 have been hit. All of the wolves ran away, and none of the wolves appeared to have been seriously injured (Bangs, USFWS, pers. comm.). Based on past experience, risks to wolves from this technique are considered to be extremely low (<1 wolf/5 years).

Some non-lethal techniques like frightening with RAG boxes and aversive conditioning with dog training collars (Appendix B) require the placement of a transmitter collar on the wolf. Wolves are also captured and transmitter collars installed as part of MDNR wolf population monitoring. MDNR estimates that about 20 wolves annually will be collared in the Upper Peninsula (Dean Beyer, MDNR, pers comm.). Wolves are typically captured using foot hold traps, anesthetized, collared, and then released. Use of cage-type live-capture devices is not very effective and, because of the size of the trap required and the remote location of many trapping sites, it is also impractical. Although this activity is similar to trapping for lethal control of wolves, the intent of this activity is not to harm, but rather to gather information and release the animal unharmed. Injury to or death of a wolf from the capture, handling and anesthesia process can occur but incidence of these occurrences is very low. In over 10 years and 167 handling events by MDNR, only 2 deaths have been associated with capture and collaring wolves as part of ongoing research (Dean Beyer, MDNR, pers comm..). At a capture rate of about 20 wolves annually, the lead and consulting agencies anticipate 1 wolf death every 5 years (C. Czarnecki, USFWS May 7, 2004, USFWS 2003).

As indicated above incidental take may result from capture and release of lactating females prior to July 1, capture and euthanization of lactating females prior to July 1, and capture and release of young of year prior to August 1. At a population of 405 wolves in Michigan, MDNR anticipates that up to 4 lactating female wolves could be captured prior to July 1 (Brian Roell, MDNR, pers. comm. March 2005). This represents about 1% of the late winter 2004-2005 adult wolf population estimate of 405 individuals. Out of these 4 lactating females only 1 would likely need to be euthanized due to involvement with repeat

depredation (Brian Roell, MDNR, pers. comm. March 2005). This represents the best available estimate, based on past experiences and a prediction of potential wolf depredation control needs into the future.

Associated with the capture of lactating females is the indirect incidental take of young of year wolves. The average litter size in Michigan is 5 pups. If 3 lactating females were captured and released up to 15 pups could be incidentally taken (3 females x 5 pups each = 15). We anticipate that incidental take of these pups will likely be in the form of harm or injury, not necessarily death since these lactating females will be released within 24 hours. If one lactating female was captured and euthanized, up to 5 pups may be incidentally taken. Depending on the pup's stage of development, the incidental take may result in harm or death. An estimated maximum of 20 pups (includes both harm and lethal take) may be incidentally taken annually as a result of the proposed action.

Additionally, we anticipate that 4 young of year wolves may be incidentally captured or injured prior to August 1 annually. Incidental take associated with trapping young of year wolves would likely be in the form of harm and injury, but not death, as young would be released within 24 hours.

Incidental take is based on the annual MDNR late-winter population estimate, so the actual number of wolves involved will be adjusted upon release of each annual population estimate. Currently, the MDNR's 2004-2005 estimate of 405 wolves in Michigan is in effect and this equates to the incidental take of up to 4 wolves (405 x 0.01 = 4) in 2005. The allowable amount of incidental take of young of year wolves will also be calculated annually by determining what 1% of the current year wolf population is, multiplying that figure by 5, and then adding 4. Using the 2004-2005 estimate of 405 wolves, 4 lactating females (1% of 405) and up to 24 young of year (4 x 5 = 20 + 4) could be incidentally taken in 2005. We anticipate that this "take" would be in the form of harm or injury not necessarily death.

Impacts on the Michigan Wolf Population

We anticipate a combined incidental and purposeful death of up to 11% of the wolf population estimate from the previous winter (10% intentional take, 1% incidental take) annually in Michigan. Many studies have examined various levels of mortality and harvest and the impacts these mortality levels have on gray wolf populations:

- Mech (1970) suggests that over 50% of wolves older than 5-10 months must be killed to "control" the wolf population. Control in this instance means keeping the wolf population below the level to which it would rise without human caused mortality.
- Gasaway et al. (1983) recorded stable wolf populations after early winter harvests of 16 to 24%, and wolf population declines of 20 – 52% after harvests of 42 - 61%.
- Ballard et al. (1997) suggests that the wolf population remained stable at 53% winter mortality, which included some natural mortality.
- Fuller (1989) observed stable or slight increases in the wolf population at an annual mortality rate of 29%.
- During the period of 1993-2002, the USDA WS program in Minnesota has lethally taken an average of 6.4% of the winter wolf population as part of implementing a depredation control program in Minnesota. Despite this level of take for WDM, the Minnesota wolf population increased from an estimated 1,500 wolves in 233 packs in 1988-98 to 2,445 wolves in 385 packs in 1997-1998 and 3,020 wolves in an estimated 485 packs in 2004.

This increase occurred while the WS control program occurred, and while other natural and human caused mortality occurred and while this population provided most, if not all, of the source wolves for Wisconsin and Michigan.

- Haber (1996) reported that wolf populations may not be able to withstand repeated annual reductions of 25-50%. He believes these removals, in the form of hunting, trapping, and government control efforts, may have impacts on wolf population dynamics, social interactions, and the long-term health of the population. Haber also reported that it is difficult to fully understand the impacts of wolf exploitation because detailed comparative information on behavior from both exploited and protected wolf populations is scarce (Haber 1996).
- Haight et al. (2002) modeled the impacts of various wolf removal strategies for WDM including reactive removal (wolves removed after depredation occurs), preventive removal (wolves removed in winter from areas with a history of wolf conflicts); and population size management (wolves removed annually from all territories near farms). None of the strategies threatened wolf populations unless the wolf population was isolated because WDM was confined to the area near farms. For isolated populations, reactive removal was the only alternative that ensured damage reduction and population conservation. The model predicted that population could withstand a sustained harvest of 20-25%. The authors considered this to be a conservative estimate and that the model likely underestimated compensatory factors in wolf population biology.

As discussed previously, compensatory mortality operates within the wolf population. Compensatory mortality suggests that if more wolves are killed for depredation control purposes, fewer wolves will die from starvation, interspecific strife, or other natural causes. Therefore, based upon the various studies cited previously, it is the belief of WS, USFWS, and MDNR that the removal of 11% of the population annually will not increase total mortality by 11%, and will not greatly influence gray wolf numbers in Michigan. Even if a large portion of the 11% take is additive mortality, this additional mortality might result in a slightly decreased rate of population growth, but is not expected to reduce the recovery or survival of the wolf in Michigan.

A given wolf population's productivity is likely the most important factor in determining the annual percentage of a wolf population that can be killed by humans without reducing the population (Fuller et al. 2003). The higher the population's productivity, the higher the level of mortality the population may sustain. Currently, the Michigan wolf population is highly productive. Over the past 5 years the wolf population in Michigan increased at an average of +15% annually (Figure 4-1).

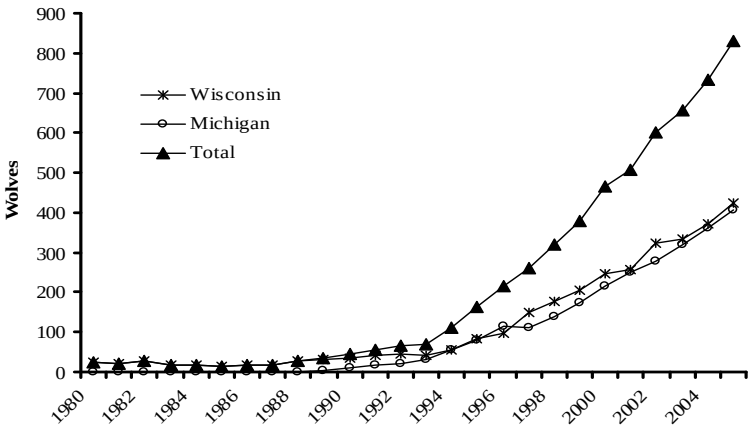


Figure 4-1. Wolf population estimates for Wisconsin, Michigan, and Wisconsin and Michigan combined (total) from 1980 - 2005.

Furthermore, wolf mortality due to poaching may decrease with the implementation of the depredation compensation program. In the absence of a compensation program, it is more likely that wolves perceived to be causing depredation would be illegally killed. Illegal killing likely would be less selective and may remove more individuals than is necessary to curtail depredation activities. Hence, a reduction in poaching may off-set some of the mortality associated with the depredation control program.

Cumulative Impacts on the Wolf Population

One of the best predictors of the cumulative impact of WDM and all other factors on the Michigan wolf population is the impact of similar wolf damage management programs in Minnesota and Wisconsin. In Minnesota, the wolf population size is not surveyed or estimated annually, however in 2004 Minnesota Department of Natural Resources (MNDNR) estimated the wolf population had reached approximately 3,020 individuals. The previous estimate (for the winter of 1997-98) estimated a Minnesota wolf population of 2,445 wolves. A wolf depredation control program, similar to the one described for Michigan in this EA, has been conducted in Minnesota since 1978 when wolves were reclassified as threatened and a 4(d) regulation was promulgated. As discussed above, for the period of 1993 to 2002 intentional take for WDM ranged from 3.9 to 9.4% (average 6.4%) of the estimated state population. During 25 years of lethal wolf control, the Minnesota wolf population increased. This level of take does not appear to have hindered the recovery of the gray wolf in Minnesota or the establishment and recovery of the gray wolf populations in Wisconsin and Michigan.

In Wisconsin, the wolf population has also been increasing (Figure 4-1). For most of the period from early 2003 until the court order in September 2005, the Wisconsin Department of Natural Resources (WDNR) operated a wolf damage management program under the authority of a special 4(d) rule or a 10(a)(1)(A) permit. The level of intentional take of wolves at depredation sites in Wisconsin has been 5.1, 6.4, and 6.8%

of the late-winter Wisconsin wolf population for 2003, 2004, and 2005, respectively. During this same period, the Wisconsin wolf population has experienced annual growth rates of 3.7%, 11.3% and 13.9%, respectively. The observed levels of population increase have occurred despite all known and unknown (cumulative) impacts on the wolf populations in these states.

Like MDNR, the WDNR has also sent the USFWS a request for permission to use non-lethal projectiles, aversive conditioning and lethal WDM methods. An analysis of alternatives for addressing wolf damage and conflict management in Wisconsin will be released for pubic comment shortly after this draft EA. If the Integrated WDM Alternative (both non-lethal and lethal control) is selected for both states, management of the respective wolf populations would be similar to the management that has occurred in Minnesota for the past 25 years. Existing data strongly indicates that the wolf population in all three states would continue to increase, or at a minimum (i.e., in Minnesota), remain stable. At the same time, it is believed that if this alternative were implemented in both Michigan and Wisconsin, public acceptance of the wolf population would be greater than for any of the other alternatives because there would be an effective legal recourse to depredation problems and assurance that management agencies would be able to protect human safety and domestic livestock.

Although this alternative is not anticipated to result in a reduction in the state wolf population, this alternative could result in a localized decrease in the wolf population at the specific site where the damage management occurs. New wolves would likely recolonize removal sites as long as suitable habitat exists at the site. Dispersing wolves can establish new territories if suitable areas and mates are available. Such areas are either unoccupied spaces or sections at the edge of existing territories. The amount of time until new wolves move into the area would vary depending on the habitat type, time of year, and the population density of wolves in nearby areas. Local population reductions as the result of depredation control activities would not result in a decline in the overall Michigan wolf population, but may decrease rates of growth..

Wolf populations in Michigan, Wisconsin and Minnesota have exceeded state and federal recovery goals and are expected to continue to increase until suitable habitat has been saturated. Recovery criteria in the Federal Wolf Recovery Plan require that at least two viable wolf populations must exist within the eastern United States. Furthermore, these two populations must satisfy the following conditions. First, the survival of the wolf in Minnesota must be stable or growing, and its continued survival must be assured. Second, another population must be reestablished outside of Minnesota and Isle Royale. The Plan provides two alternatives for reestablishing this second viable wolf population. If the population is beyond 100 miles from Minnesota population, it must contain 200 wolves for at least 5 consecutive years (USFWS 1992). If the population is within 100 miles of the Minnesota population, it must contain at least 100 wolves for at least 5 consecutive years (USFWS 1992). While the Plan identifies no numerical recovery criterion for Minnesota, the Plan does identify State subgoals for use by land managers and planners. For Minnesota, the Plan's subgoal is 1,251 to 1,400 wolves. The Minnesota wolf population currently is estimated to be more than double that numerical goal. The Michigan/Wisconsin wolf population is less than 100 miles from Minnesota and recent surveys indicate more than 800 wolves in these two states. The combined Michigan/Wisconsin population has contained over 100 wolves for 12 years. Also, while no numerical individual state recovery criteria for Michigan and Wisconsin are listed in the Plan, State subgoals were incorporated. For Wisconsin and Michigan, the Plan's

subgoals are 80 and 80 – 90 wolves, respectively (USFWS 1992). Current populations in both these States are more than four times these numerical subgoals.

Wolves in Michigan and Wisconsin have the same Federal recovery status; the wolf populations in both states have exceeded State and Federal recovery goals; and both States have requested permits for WDM. Management decisions made in one State will have impacts on public reaction to management decisions in the other State. For example, if the same management alternative is selected for both states, there is unlikely to be any public reaction other than that directly related to individual perceptions of the alternative. However, selection of differing alternatives without clear-cut reasons for the decision is likely to increase public dissatisfaction with wolf management, and, in the area with the most restrictive management alternative, may increase the likelihood that frustrated individuals will engage in illegal killing of wolves.

As the status of wolves changes from Federally listed as endangered to eventual removal from the Federal endangered species list, there could be different impacts to wolves from other entities that implement damage control strategies to reduce wolf damage. This could take the form of increased private trapping, a State agency taking a larger role in lethal WDM, or control efforts by individual resource owners or managers. WS will work with the USFWS and MDNR to monitor the impact of all known sources of mortality on the wolf population and will update this analysis as necessary pursuant to the NEPA requirement if anticipated cumulative impacts exceed those analyzed in this EA.

All indications from the literature and the analysis above indicate that, given that WDM would be conducted in accordance with all permit conditions and other regulations established by the USFWS for the protection of wolvese Conservation Measures and Reasonable and Prudent measures proposed by the USFWS in the draft permit and associated Biological Opinion, implementation of this alternative is not likely to threaten the continued persistence of the wolf population, and would likely still allow for some level of population increase. Based on the rate of increase for the Michigan and Wisconsin wolf populations, the wolf population is large enough and healthy enough that even while the proposed action and all other mortality factors have adverse affects on individuals, they will not result in a reduction in the state wolf population. The following factors were of primary importance in this determination:

1) The wolf population in Michigan, Wisconsin, and Minnesota has surpassed recovery goals and the wolf population continues to increase in all three States.
2) The average annual rate of increase for the Michigan and Wisconsin wolf population over the last 5 years is approximately 12%.
3) Mortality as a result of the proposed action would likely be partially compensatory. However, the proposed action could increase the mortality rate for the Upper Peninsula wolf population by up to 11%. The wolf population in the Upper Peninsula is increasing by an average of 14% annually over the last 5 years.
4) Based on literature and experiences from the Minnesota wolf depredation control program, purposeful and incidental take of up to 11% is unlikely to cause a decline in the wolf population. The current rate of increase in the Michigan population may slow as a result of the proposed action.
5) In 2003 and 2004, MDNR employed the same lethal methods discussed here to resolve selected wolf depredations. Those measures appear to have had limited impact on the overall Michigan wolf population.

6) Implementation of the proposed action will help to preserve current levels of human tolerance for the species in Michigan, which is expected to prevent an increase in illegal take of wolves that may otherwise occur in the absence of lethal control of depredating wolves. This action is expected to stabilize or reduce that component of the current mortality rate, which will partially off-set the additional mortality that will occur as a result of the proposed action.

7) We believe that the proposed action is unlikely to cause a substantial decline in annual recruitment and will not appreciably reduce the survival or recovery of the wolf in Michigan.

Effects on public and pet health and safety. WS conducted a formal risk assessment of methods proposed for use in this EA (USDA 1997 Revised). The assessment concluded that when traps, snares, firearms and frightening devices are used by appropriately trained and authorized personnel, in accordance with applicable laws, regulations and agency policy, the proposed WDM methods pose minimal or no risk to public health and safety. The greatest risks to human health and safety from the use of WDM techniques are incurred by the specialists who use these methods. There have been no reported injuries to WS and MDNR personnel or the public from wolf management activities in Michigan.

Firearm use is a very sensitive issue and a public concern because of fears regarding the potential for misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). All firearm safety precautions are followed by WS and MDNR when conducting damage management and WS and MDNR comply with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles would sometimes be used to reduce wolf damage when lethal methods are determined to be appropriate. Firearms would also be used to euthanize captured wolves in a humane manner. Wildlife Services employees, who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. Shooting is virtually 100% selective for target species and may be used in conjunction with spotlights and night vision equipment.

Wildlife Services' traps and snares are strategically placed to minimize exposure to the public and pets. Appropriate warning signs are posted on properties where traps or snares are set to alert the public of their presence. To date, the MDNR and WS have not captured any dogs or cats during its wolf management efforts. However, we are aware that dogs and cats have been captured during wolf damage management efforts in other states. To date, most non-target animals taken by Michigan WDM program have been released (Table 4-3).

Table 4-3. Number of Non-target Species Taken by WS Personnel During Wolf Management Projects in Michigan Compared to Public Take (FY 00-FY 04).

	WS Capture of Non-Target Species Killed(Released)					Fur Harvest / Public Take (FY)				
Species	**2000[1]**	**2001[1]**	**2002[1]**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**
White-tailed Deer	0	0	0	0	1(4)	534,374	463,706	476,215	499,747	456,422
Black Bear	0(2)	0(3)	0(5)	0(2)	0(9)	1,890	2,110	2,221	2,366	2,204
Coyote	0(2)	0(5)	0(11)	2(7)	0(46)	14,931	17,417	22,385	19,778	10,791
Bobcat	0	0(3)	0(3)	0(1)	1(15)	686	1,192	1,223	960	999
Red Fox	0	0	0	0(1)	0(1)	6,895	8,672	8,389	9,312	9347
Gray fox	0	0	0	0	1(0)	2,212	2,781	2,786	3,662	NA

[1] Take occurred during research efforts and trap and relocation projects.

This alternative also could provide relief from damage or threats to public health and safety to people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by wolf depredations on domestic animals, especially pets that are killed in their yards, express concern for human safety and insist upon the removal of wolves from their property when they cause damage. Wolves that have become habituated to humans (bold) are especially unpredictable (Section 1.3.5). In many situations where wolves may pose a risk to human health and safety, management of human behavior and non-lethal techniques may be sufficient to resolve the problem (Section 1.3.5) however, in some situations, removal of the problem individual may be the most appropriate solution. In addition to authorizations required from the USFWS, the MDNR also requires that it review and approve use of lethal control for the reduction of wolf depredation on pets and non-immediate risks to human safety on a case-by-case basis. (See also Appendix E and the MGWRMP).

Humaneness of methods to be used. Wildlife Services and MDNR personnel are experienced and professional in their use of WDM methods. Under this alternative, wolves would be trapped, snared, or shot by experienced personnel as humanely as possible using the best methods available. Tranquilizer trap devices (TTDs) can be used on wolf traps to reduce the incidence of self-inflicted injuries by captured animals. Wildlife Services is not exempt from Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed.

Some individuals would consider this alternative inhumane because they oppose all lethal methods of damage management. Others will be opposed to this alternative because they object to specific lethal WDM methods like traps and snares and perceive these methods as being unjustifiably cruel and inhumane. Some individuals would prefer that cage traps be used to capture wolves and would perceive this method as being more humane than traps and snares. Unfortunately, the use of cage traps to capture wolves is both impractical and ineffective because it is extremely difficult to get a cage trap big enough for an adult wolf into remote locations, and because it is rare to captue an adult wolf in a cage trap. Individuals with animals that have been injured, threatened or killed by wolves may see this alternative as being more humane because it has the greatest likelihood of preventing futher injuries to their livestock and pets.

Impacts to stakeholders, including aesthetics of wildlife. Public reaction would be variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife. The impacts of this alternative to stakeholders would primarily depend on their values towards wildlife and their relationship to the damage problem. This alternative would likely be favored by property owners who are experiencing damage because this alternative has the greatest likelihood of successfully resolving wolf conflicts, but others would be saddened if the wolves were removed. Individuals not directly affected by the threats or damage may be supportive, neutral, or totally opposed to any removal of wolves from specific locations or sites. Some individuals would strongly oppose this alternative because they believe it is morally wrong to kill or use animals for any reason or they believe the benefits from wolves outweigh the associated damage. Individuals totally opposed to lethal WDM methods want agencies to teach tolerance for wolf damage and threats to public and pet health or safety, and that wolves should never be killed.

As discussed in Section 2.1.5.2, wolves have high nonconsumptive (viewing, calling, photographing) and indirect values (e.g., spiritual, and existence values) for many people. The ability to view and aesthetically enjoy wolves at a particular site could be temporarily limited if the wolves are removed. New animals would most likely use the site in the future, although the length of time until new wolves arrive is variable, depending on the habitat type, time of year, and population density of wolves in nearby areas. Given the increasing number of wolf packs in Michigan and that this action will not reduce the Michigan wolf population, other opportunties to view, call and aesthetically enjoy wolves will be available to people who make the effort to visit sites with adequate habitat outside of the damage management area.

The IWDM approach, which includes non-lethal and lethal methods as appropriate, provides relief from threats to public safety and attacks on pets to people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by problems and threats caused by wolves insist upon their removal from the property or public location when the wildlife acceptance capacity is reached or exceeded. Some people will have the opinion that wolves should be captured and relocated to a rural area to alleviate damage or threats. Some people would strongly oppose removal of wolves regardless of the nature of the damage problem.

Effects on non-target species populations, including Threatened and Endangered species. Of the WDM methods proposed for use, foot-hold traps and snares pose the greatest risk to non-target species. Some non-target species, such as white-tailed deer, black bear, bobcat, coyotes and feral dogs may occasionally be captured during WDM (Table 4-3). Wildlife Services does not expect the rate of non-target species take to substantially increase above current program levels and the take of non-target animals by WS and MDNR is well below the sustainable harvest level. To date, Michigan WS and MDNR have been fortunate in that most of the non-target animals captured could be released. For purposes of analysis, even if all non-target animals captured had been killed, the number of animals taken by WS relative to the number taken for sport harvest is negligible. Using available harvest data and the annual take by WS, the magnitude of impact for the proposed action is considered extremely low (USDA 1997, Revised).

The USFWS has concurred that WS' WDM methods are not likely to adversely affect the bald eagle (*Haliaeetus leucocephalus*), will not jeopardize the continued existence of Canada lynx (*Lynx canadensis*) and are not anticipated to result in the incidental take of lynx (C. Czarnecki, USFWS, May 7, 2004). WS has determined that the proposed action will have no effect on all other federally listed non-target species and critical habitat in Michigan. Impacts on wolves

(target species) are discussed above. WS and MDNR will adhere to all Conservation Measures, Terms and Conditions and other provisions for the protection of federally listed species provided in the Section 7 consultation with the USFWS (C. Czarnecki, USFWS, May 7, 2004). The SOPs in Chapter 3 include measures intended to reduce the effects on non-target species populations and to avoid jeopardizing T/E species' populations. Measures to reduce risks to non-target species are also discussed in Appendix B. All actions would be conducted in accordance with Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed.

4.2.3 Alternative 3 - Technical Assistance Only (No Action Alternative)

Effects on wolf populations.

Under this alternative, the USFWS would not issue any Section 10(a)(1)(A) permits or other authorization for wolf damage management. Wildlife Services would not conduct operational WDM in Michigan but could provide technical assistance on WDM methods that do not require permits or other authorization from the USFWS (Appendix B). Wildlife Services would also be able to conduct evaluations of potential wolf depredation sites needed to administer the wolf damage compensation program. The MDNR would have access to non-lethal techniques that are allowed without a permit or which are permitted because of the cooperative conservation agreement between the MDNR and the USFWS (Section 1.7.7). Non-lethal techniques that require permits or other authorization from the USFWS would not be available so there would be no incidental take from these methods. Consequently, impacts of agency actions on the wolf population would be similar to or slightly lower than Alternative 1.

As discussed above, non-lethal methods are not always effective. This alternative is expected to result in a reduction in the efficacy of WDM efforts; and it is reasonable to conclude will also result in a reduction in tolerance of wolves by the landowners and an increase in illegal kill (Section 2.2.4). Illegal lethal control actions by private individuals are less likely to be very specific or very humane, and could potentially have more adverse impacts on the wolf population we are trying to recover than focused lethal actions by trained, authorized professionals. Any illegal lethal control by individuals is also less likely to be effective in reducing depredation events, as it would be less likely to target the specific depredating animals.

Cumulative Impacts

Authorized take will be much lower than Alternative 2. However, because of anticipated increases in illegal take discussed above, cumulative impacts on the wolf population from all sources of mortality are likely to be similar to or slightly higher than Alternative 2. As discussed for Alternative 2, WDM decisions made in Michigan will have impacts on public reaction to management decisions in Wisconsin and *vice versa*. If this alternative were selected for both Michigan and Wisconsin, the results are likely to be similar to that described for Alternative 1, only amplified because the frustration among livestock owners and others is likely to be even greater.

If wolves are removed from the federal endangered species list, MDNR and the Tribes would have authority for wolf damage management in accordance with their respective management plans and policies. If damage occurred, property owners could request operational assistance with WDM including lethal WDM techniques from authorized agencies other than WS. WS would continue to be restricted to providing technical assistance. The MDNR may choose to

allow individual property owners/managers or their designated agents to remove depredating wolves. In this instance, impact on the wolf population would be variable, but could be higher than Alternative 2 if individuals with limited WDM experience attempt to manage wolf conflicts. These individuals may remove more wolves than necessary to resolve the problem. Impacts on wolves may be lower than Alternative 4 if individuals chose to seek and use technical assistance from WS.

Effects on public and pet health and safety. Wildlife Services would not provide operational assistance with WDM, so there would be no risks to humans or pets from WS' use of WDM methods. The USFWS would not issue permits or other authorizations for WDM so WDM methods would be resticted to non-lethal techniques including those allowed because of the cooperative conservation agreement between the MDNR and the USFWS (Section 1.7.7). Under this alternative, there would be no use of non-lethal projectiles and no trapping to capture wolves and attach collars for aversive conditioning, so there would be no risk to the public or pets from these methods. However, even under Alternative 1, use of these methods is anticipated to be low, so the reduction in the already very low risk to public and pet health and safety from agency actions is likely to be negligible. Risks associated with actions of individuals dissatisfied with the program will be as described for Alterantive 1. Cumulative impacts of WDM methods on public health and safety under this alternative are likely to be similar to Alternative 1.

If and when wolves are no longer Federally protected, management of wolf damage would depend upon respective state (MGWRMP) and tribal wolf management plans and policies. The state may choose to allow individual property owners/managers or their designated agents to remove depredating wolves. In this instance, risks to pets and the public would be variable, but could be higher than Alternative 2 if individuals with limited WDM experience attempt to manage wolf conflicts. Risks may be lower than Alternative 4 if individuals seek and use technical assistance from the lead and consulting agencies.

There are provisions within the regulations pertaining to the ESA that allow for the lethal take of an endangered species that is a demonstrable (either immediate or non-immediate) threat to human safety and response to these issues will be as described for Alternative 2. Response to non-demonstrable threats and threats to pets will be restricted to non-lethal methods. As discussed above, non-lethal methods are not always effective in reducing problems with wolves. If wolf populations continue to increase without an effective damage management program in place, there may be potential threats to public safety and pets from wolves that enter people's yards or attack their pets. Therefore, risks to human and pet safety from wolves would likely be similar to or higher for this alternative than Alternative 2 because fewer WDM methods would be available. Additionally, frustrated individuals may attempt to solve wolf damage problems through illegal shooting, trapping, snaring, or poisoning. As a result of these illegal actions, there could be increased risks to public and pet safety from improper or unscrupulous efforts to resolve perceived problems with wolves.

If and when wolves are no longer federally protected, management of wolf damage would depend upon the provisions of the state (MGWRMP) and tribal wolf management plans and policies. The state may choose to allow individual property owners/managers or their designated agents to address perceived threats to human or pet health and safety from wolves. The efficacy of these efforts will vary depending upon the training and experience of the individuals conducting WDM. Efficacy in reducing risks from wolves may be greater than Alternative 4 if individuals seek and use technical assistance from the lead and consulting agencies.

Humaneness of methods to be used. WS would not provide operational assistance with WDM, so the issue of humaneness as it relates to WS use of control methods under this alternative is not applicable. However, operational WDM assistance with non-lethal WDM techniques allowed without permits or under the authorities of the cooperative conservation agreement between MDNR and the USFWS would still be available. These methods could involve the use of traps and snares to live-capture wolves and public perceptions of the humaneness of these non-lethal WDM methods would be as described for Alternative 1. Some individuals may perceive this alternative as less humane than Alternative 1 because access to some non-lethal method would be prohibited. Others may perceive the use of non-lethal projectiles which cause pain in the animal struck and the shock administered by the modified dog training collars used for aversive conditioning as being inhumane. As with Alternative 1, frustrated individuals may attempt to solve wolf damage problems through illegal shooting, trapping, snaring, or poisoning. Some of these methods are likely to be less humane than the methods that could be used by agency personnel. Overall, the perceptions of the humaneness of this alternative will be as described for Alternative 1.

If and when wolves are no longer federally protected, management of wolf damage would depend upon the provisions of the state (MGWRMP) and tribal wolf management plans and policies. The state may choose to allow individual property owners/managers or their designated agents to remove depredating wolves. If applied by inexperienced personnel, some of these methods may be less humane than if used by qualified WS, MDNR or Tribal staff because there may be greater injuries to trapped animals and greater risks to non-target speics. These risks may be lower than Alternative 4 if individuals chose to seek and use technical assistance from the lead and consulting agencies.

Impact to stakeholders, including aesthetics of wildlife. The impacts of this alternative to stakeholders would vary depending on individual values toward wildlife, and the relationship of the individual to the damage problem. Property owners who are experiencing damage from wolves may oppose this alternative because they may perceive it as restricting their access to WDM assistance. Some people would support this alternative because WS would not be using Federal resources for WDM and would have no direct impact on wolf populations. Others would oppose this alternative because they believe property owners would resort to illegal, inhumane, or environmentally unsafe wolf control methods.

As with Alternative 1, while wolves are federally protected, some individuals would prefer this alternative because they believe it is morally wrong to kill animals for any reason. However, there may still be concern about the use of traps and snares to capture wolves for population monitoring and/or attachment of collars required for some non-lethal WDM methods. If wolves are removed from the Federal list of threatened and endangered species, lethal WDM techniques would be available in accordance with the MGWRMP and perceptions of this alternative by individuals opposed to lethal WDM would likely be the same as Alternative 2. However, this alternative may still be preferable to alternative 2 for individuals who are specifically opposed to federal (WS) involvement in the use of lethal WDM techniques.

Some people would support this alternative because they enjoy seeing wolves, or having wolves nearby, and while wolves are federally protected under the ESA, this alternative would prohibit the lethal removal of wolves. However, they might still be affected by capture and relocation of depredating wolves. As discussed above, this alternative is not anticipated to result in a decline in wolf density in Michigan and any difference in wolf viewing opportunities is likely to be neglible. Other opportunties to view, call and aesthetically enjoy wolves will be available to people who make the effort to visit sites with adequate habitat outside of the damage management area.

If wolves are removed from the federal T&E species list, lethal WDM would be permitted in accordance with the MGWRMP. Impacts on opportunities to view and enjoy wolves would likely be similar to Alterantive 2.

Effects on non-target species populations, including T&E species

Wildlife Services would have no direct impact on non-target and T&E species from the use of control methods. While wolves are Federally protected, this work would be likely be conducted by MDNR and risks to non-target and T/E species from WDM methods would be similar to Alternative 2. If and when wolves are no longer Federally protected, management of wolf damage would depend upon the provisions of the state (MGWRMP) and tribal wolf management plans and policies. The state may choose to allow individual property owners/mangers or their designated agents to remove depredating wolves. In this instance, risks to non-target and T/E species would be variable, but could be higher than Alternative 2 if individuals with limited WDM experience attempt to manage wolf conflicts. Risks may be lower than Alternative 4 if individuals chose to seek and use technical assistance from the lead and consulting agencies.

Property owners who are experiencing damage from wolves may oppose this alternative because they may perceive it as restricting their access to WDM assistance. As discussed above, depending upon budget and personnel limitations, the state and tribes may not be able to provide the same level of prompt assistance as a WS program. Frustrated individuals may attempt to solve wolf damage problems through illegal shooting, trapping, snaring, or poisoning with potential detrimental effects on non-target species or T/E species. Use of illegal pesticides (Schueler 1993, Allen et al. 1996, USDA 1997 Revised), is a relatively cheap form of predation control that represents one of the greatest threats to the environment, T/E species, domestic animals, and public safety.

4.2.4 Alternative 4 - No Federal WDM in Michigan

Effects on wolf populations. Under this alternative, the USFWS would not issue any permits or other authorizations for WDM and there would be no WS WDM program. While wolves are federally protected under the ESA there would be no lethal WDM in Michigan and use of non-lethal projectiles and aversive conditioning (dog training collars) would be prohibited. The MDNR would be restricted to the use of non-lethal techniques for wolf damage management that they can access via authorities granted under 50 CFR 17.21. While Federally protected under the ESA, overall impacts of this alternative will be similar to Alternative 1 and identical to Alternative 3.

As discussed above, non-lethal methods are not always effective. This alternative is expected to result in a reduction in the efficacy of WDM efforts; and it is reasonable to conclude will also result in a reduction in tolerance of wolves by the landowners and an increase in illegal kill (Section 2.2.4). Frustration with wolf management and levels of wolf poaching may be highest for this alternative because of what individuals may perceive as a federal refusal to respond to problems caused by Federal [federally protected] wolves. Illegal lethal control actions by private individuals are less likely to be very specific or very humane, and could potentially have more adverse impacts on the wolf population we are trying to recover than focused lethal actions by trained, authorized professionals. Any illegal lethal control by individuals is also less likely to be effective in reducing depredation events, as it would be less likely to target the specific depredating animals.

Cumulative Impacts

Authorized take will be much lower than Alternative 2. However, because of anticipated increases in illegal take discussed above, cumulative impacts on the wolf population from all sources of mortality are likely to be similar to or slightly higher than Alternative 2. As discussed for Alternative 2, WDM decisions made in Michigan will have impacts on public reaction to management decisions in Wisconsin and *vice versa*. If this alternative is selected in Michigan, but a less restrictive version is selected in Wisconsin without clear-cut reasons for the decision, it is likely to increase public dissatisfaction with wolf management in Michigan, and may increase the likelihood that frustrated individuals will engage in illegal killing of wolves. If this alternative were selected for both Michigan and Wisconsin, the results are likely to be similar to that described for Alternative 1, only amplified because the frustration among livestock owners and others is likely to be even greater.

If and when wolves are no longer federally protected, management of wolf damage would depend upon the provisions of the state (MGWRMP) and tribal wolf management plans and policies. Overall impacts of actions by entities other than WS will depend on the skill and resources of the individuals conducting WDM. Actions by individuals with less training and experience in WDM are less likely to be selective for offending individuals and may result in increased take of wolves before the damage problem is resolved. Cumulative impacts are anticipated to be similar to or slightly higher than Alternative 2 and would not jeopardize the wolf population in MI. Risks of increased take of wolves by individuals lacking the experience and equipment for WDM available to the agencies may be higher for this alternative than for Alternatives 1 and 3 because there would be one less readily available source for technical assistance (WS).

Effects on public and pet health and safety. While wolves are Federally protected under the ESA, no permits or other authorizations would be issued for the use of lethal WDM techniques, non-lethal projectiles or aversive conditioning (e.g. dog training collars). However, under the authority granted under 50CFR 17.21, MDNR would still be able to trap and relocate depredating wolves, conduct the wolf population monitoring program and use all other non-lethal WDM techniques. As with Alternative 1 use of non-lethal methods like remote activated frightening devices that require a collar on a wolf, and trap-and-relocate efforts may increase if lethal WDM alternatives are not available. This could increase the wolf capture effort associated with non-lethal techniques over that anticipated for Alternative 2, but would likely not exceed the cumulative agency wolf capture effort (non-lethal and lethal WDM combined) anticipated for Alternative 2. As with Alternative 2, traps and snares would be strategically placed to minimize exposure to the public and pets. Under this alternative, traps and snares would only be used with the specific intent of keeping the captured animal alive. In general, while wolves are federally protected under the ESA, risks to human and pet safety from the use of WDM techniques would be lower than Alternatives 2 and 3 because there would be no lethal WDM by any agency, no use of non-lethal projectiles, and no trapping effort to attach training collars. Wildlife Services would have no impact on public and pet safety from the use of control methods because WS would not be invovled in any aspect of WDM.

Non-lethal WDM techniques are not always adequate to resolve conflicts with wolves. It is also possible that, depending upon budget and personnel limitations, the State and Tribes may not be able to provide the same level of prompt assistance as a WS program. Frustrated individuals may attempt to solve wolf damage problems through illegal shooting, trapping, snaring, or poisoning. As a result of these illegal actions, there could be increased risks to public and pet safety from improper or unscrupulous use of these methods.

If and when wolves are no longer Federally protected under the ESA, management of wolf damage would depend upon the provisions of the state (MGWRMP) and tribal wolf management plans and policies. The state may choose to allow individual property owners/mangers or their designated agents to remove depredating wolves. In this instance, risks to pets and the public would be variable, but could be higher than Alternative 2 if individuals with limited WDM experience attempt to manage wolf conflicts. It may also be slightly higher than Alternatives 1 and 3 because there would be one less source of readily available technical assistance with WDM (WS).

Under this alternative, WS would not be able to assist with management of threats to public or pet health and safety. While wolves are Federally protected under the ESA, the MDNR would have access to most non-lethal WDM methods to reduce conflicts with wolves. However, depending upon budget and personnel limitations, these entities may not be able to provide the same level of prompt assistance as a WS program. These agencies would not have access to the full range of WDM methods and may not be as effective in reducing some wolf conflicts as with Alternative 2 or 3.

If and when wolves are no longer Federally protected under the ESA, management of risks to human and pet health and safety from wolves would depend upon the provisions of the state (MGWRMP) and tribal wolf management plans and policies. The state may choose to allow individual property owners/managers or their designated agents to addressed perceived threats to human or pet health and safety from wolves. The efficacy of these efforts will vary depending upon the training and experience of the individuals conducting WDM but is likely to be similar to or slightly lower than Alterantive 2. It may also be lower than Alternatives 1 and 3 because there would be one less source of readily available technical assistance with WDM (WS).

Humaneness of methods to be used. While wolves are federally protected under the ESA, this alternative would be considered humane by many people that are opposed to lethal WDM. However, MDNR would still use traps and snares to capture and relocate problem wolves, and to radio collar wolves for population monitoring and non-lethal WDM techniques which require a collar on the wolf (exclusive of dog training collars). When capturing wolves for population monitoring and non-lethal WDM efforts, wolves would be humanely captured by experienced WS and MDNR personnel using the best methods available. Tranquilizer trap devices (TTDs) can be used on wolf traps to reduce the incidence of self-inflicted injuries by captured animals (Appendix B). All activities would be conducted in accordance with Michigan dry land trapping regulations which require dry land trap sets to be checked at least once each day. Daily trap checks minimize the amount of time target and non-target animals remain in traps, and improve the likelihood that a non-target animal may be released unharmed. As explained for Alternative 1, cage traps are usually impractical and not effective in capturing wolves.

While federally protected under the ESA, some property owners may take illegal action against localized populations of wolves out of frustration with continued damage and lack of legal access to the full range of WDM methods. Some illegal methods, like poisons, may be less humane than methods used by experienced agency personnel.

If and when wolves are no longer Federally protected, management of wolf damage would depend upon the provisions of the state wolf management plan. The state may choose to allow individual property owners/mangers or their designated agents to remove depredating wolves. If applied by inexperienced personnel, some of these methods may be less humane than if used by qualified WS, Tribal or MDNR staff because there may be greater injuries to trapped animals and

greater risks to non-target speics. Some property owners may take illegal action against local populations of wolves out of frustration. Some of these illegal actions may be less humane than methods used by WS personnel.

Impact to stakeholders, including aesthetics of wildlife. Wildlife Services would have no direct impact on stakeholders, or the aesthetic value of wildlife. The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and relationship to the problem. Individuals directly impacted by wolf predation may be less tolerant of wolves that individuals whos property and pets are not at risk. While wolves are federally protected individuals experiencing damage from wolves would likely oppose this alternative because they would likely feel that their access to an effective management techniques and Federal (WS) assistance was being unduely restricted. Access to WDM methods would be even more restricted under this alternative than under Alternative 1 because non-lethal projectiles and aversive conditioning (dog training collars) could not be used. They would likely be less opposed to this alternative once wolves are removed from the Federal list of threatened and endangered species because access to lethal WDM techniques would likely be available from entities other than WS in accordance with the MGWRMP.

While wolves are federally protected, some individuals would prefer this alternative because they believe it is morally wrong to kill animals for any reason. However, there may still be concern about the use of traps and snares to capture wolves for population monitoring and/or attachment of collars required for some non-lethal WDM methods. If wolves are removed from the Federal list of threatened and endangered species, lethal WDM techniques would be available in accordance with the MGWRMP and perceptions of this alternative by individuals opposed to lethal WDM would likely be the same as Alternative 2. However, this alternative may still be preferable to alternative 2 for individuals who are specifically opposed to federal (WS) involvement in the use of lethal WDM techniques.

Some people would support this alternative because they enjoy seeing wolves, or having wolves nearby, and while wolves are federally protected under the ESA, this alternative would prohibit the lethal removal of wolves. However, they might still be affected by relocation of depredating wolves. As discussed above, this alternative is not anticipated to result in a decline in wolf density in Michigan and any difference in wolf viewing opportunities is likely to be neglible. Other opportunties to view, call and aesthetically enjoy wolves will be available to people who make the effort to visit sites with adequate habitat outside of the damage management area.

If wolves are removed from the federal T&E species list, lethal WDM would be permitted in accordance with the MGWRMP. Impacts on opportunities to view and enjoy wolves would likely be similar to Alterantive 2.

Effects on non-target species populations, including T&E species.

No operational WS activities would be conducted pursuant to this alternative so there would be no risks to non-target or T/E species from WS. While wolves are federally protected the MDNR could provide assistance with most non-lethal WDM methods although access to non-lethal projectiles and training collars would be prohibited. Since capture and handling of wolves is required for the use of some aversive stimuli (e.g., attaching collars) so risks to non-target species will be similar to or slightly lower than Alternative 1.

Non-lethal methods are not always effective in resolving damage problems and, depending upon budget and personnel limitations, the Tribes and MDNR may not be able to provide the same

level of prompt assistance as a WS program. Some individuals frustrated with wolf management policies might attempt to illegally shoot, trap, snare, or poison wolves with potential detrimental effects on non-target species or T/E species. Lacking professional assistance, some individuals might use illegal pesticides (Schueler 1993, Allen et al. 1996, USDA 1997 Revised), a cheaper form of predation control that represents one of the greatest threats to the environment, T/E species, domestic animals, and public safety.

If and when wolves are no longer federally protected, management of wolf damage would depend upon the provisions of the applicable State and Tribal wolf management plans and policies. The State may choose to allow individual property owners/managers or their designated agents to remove depredating wolves. In this instance, impact on non-target species including T/E species population would be variable, but could be higher than Alternative 2 if individuals with limited WDM experience attempt to manage wolf conflicts. It may also be slightly higher than Alternatives 1 and 3 because there would be one less source of readily available technical assistance with WDM (WS).

4.3 SUMMARY OF IMPACTS

Table 4-4 highlights the potential impacts of each alternative for the issues that were analyzed in detail. Cumulative impacts are discussed in relationship to each of the wildlife species and the environmental impacts analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. No single or cumulative adverse environmental consequences are expected to result from the proposed action. When used in accordance with all appropriate Federal, State and WS requirements and guidance, impacts on non-target species from the proposed methods would be extremely low. None of the federally protected threatened, endangered or candidate species or species listed by the MDNR would be jeopardized by the proposed action (C. Czarnecki, USFWS May 7, 2004, USFWS 2003). Economic and social impacts would primarily be beneficial, although some segments of the human population might be opposed to the killing of wolves. Negative impacts to the physical environment would be non-existent.

Any localized reduction of wolf populations would likely soon be replaced and habitats reoccupied as IWDM would only be conducted in specific areas near the location where the specific conflict has occurred. All actions would be conducted in strict compliance with the requirements set by the USFWS for wolf management and associated policies and agreements between MDNR, WS, and USFWS. The proposed action may have negative effects on individual wolves but will not result in declines in the state wolf population, and in fact is expected to result in a net benefit to the Michigan wolf population. Based on past experience with IWDM programs in Minnesota, Wisconsin and Michigan, it is likely that the Michigan wolf population will continue to grow even with the intentional and incidental take anticipated for the preferred alternative and all other cumulative impacts on the wolf population.

Table 4-4. Summary of Impacts

Issues/Impacts	Alternative 1: Non-lethal Only	Alternative 2: IWDM Program (Proposed Action/No Action)	Alternative 3: Technical Assistance	Alternative 4: No Program
Wolf populations	While Federally Protected: No lethal removal of wolves. Increased risk that frustrated individuals may use illegal WDM methods. Because of increased risk of illegal take, cumulative population impacts similar to or slightly greater than for Alternative 2. Wolves Not Federally Protected: No lethal WDM by WS but lethal WDM could occur in accordance with MGWRMP. Impacts similar to Alternative 2.	While Federally Protected and After Federally Protected. Possible temporary reduction in local populations, no reduction in statewide population. Risk of illegal action still possible but least likely for this Alternative. Evidence to date indicates State wolf population will contine to increase. Impacts similar with and without federal protection of wolves.	While Federally Protected: No impact by WS. Technical assistance available from WS. Operational assistance with non-lethal available from others. Increased risk that frustrated individuals may use illegal WDM methods. Because of increased risk of illegal take, cumulative population impacts variable but likely similar to or slightly greater than for Alternative 2. Wolves Not Federally Protected: No lethal WDM by WS but lethal WDM could occur in accordance with MGWRMP. Impacts similar to Alternative 2.	While Federally Protected: No lethal removal of wolves. No WS involvement in WDM. Operational assistance with non-lethal available from others. Most non-lethal methods available to MDNR. Because of increased risk of illegal take, cumulative population impacts variable but impacts variable but increased illegal take will cause greater impacts to wolf population than Alternative 2. Wolves Not Federally Protected: No WDM by WS but lethal WDM could occur in accordance with MGWRMP. Impacts similar to Alternative 2.

Non-target Species, Including T&E Species	While Federally Protected: Low risk to non-target species from use of traps and snares for non-lethal WDM and wolf population monitoring. Risks from authorized WDM lower than Alternative 2. Risks to non-target species from illegal actions likely higher than Alternative 2. Wolves Not Federally Protected: No use of lethal WDM by WS so risks from WS use of capture techniques lower. Lethal WDM available from others. Risks variable depending upon individual conducting WDM but likely similar to or slightly higher than Alt 2.	Low risks to non-target species from some WDM methods. No adverse impact to T&E or non- target species populations. Risk of illegal action still possible but least likely for this Alternative. Impacts similar with and without federal protection of wolves.	While Federally Protected: No effects by WS. Low risk to non-target species from use of traps and snares for non-lethal WDM and wolf population monitoring. Risks from authorized WDM lower than Alternative 2. Risks to non-target species from illegal actions likely higher than Alternative 2. Wolves Not Federally Protected: No operational WDM by WS. Lethal WDM available from others. Risks variable depending upon individual conducting WDM but likely similar to or slightly higher than Alt 2.	While Federally Protected: No effects by WS. Low risk to non-target species from use of traps and snares for non-lethal WDM and wolf population monitoring by authorized agencies. Risks from authorized WDM lower than Alternative 2. Risks to non-target species from illegal actions likely higher than Alternative 2. Wolves Not Federally Protected: No operational WDM by WS. Lethal WDM available from others. Risks variable depending upon individual conducting WDM but likely similar to or slightly higher than Alt 2.
Public and Pet Safety	While Federally Protected: Risk from agency use of WDM methods similar to or lower than Alternative 2. Variable risks from illegal lethal WDM methods used by others. Overall risk from WDM methods similar to Alternative 2. Risks from wolves would likely be slightly higher than Alternative 2 because of restrictions in WDM methods Wolves Not Federally Protected: No lethal WDM by WS but full range of WDM methods available to others. Impacts similar to Alternative 2	Very low risk from WDM methods. Best reduction of risks from wolves. Impacts similar with and without federal protection of wolves.	While Federally Protected: No effect by WS. Variable risks from illegal lethal WDM methods used by others. Risks from wolves would likely be slightly higher than Alternative 2 because of restrictions in WDM methods. Wolves Not Federally Protected: No operational WDM by WS but full range of WDM methods available to others. Impacts similar to Alternative 2.	While Federally Protected: No effect by WS. Risk from WDM methods and wolves dependent upon actions of other agencies. Wolves Not Federally Protected: No operational WDM by WS but full range of WDM methods available to others. Impacts similar to Alternative 2.

Humaneness of Method	While Federally Protected: Agency actions probably considered more humane by most people than lethal measures. There will still be concerns about the use of traps and snares for live capture of wolves. Illegal use of lethal methods by others may increase. These methods may be less humane than methods proposed under Alternative 2. Wolves Not Federally Protected: No lethal WDM by WS but full range of WDM methods available to others. Overall perception of humaneness similar to Alternative 2.	While Federally Protected: Agencies will use the most humane methods available. Some will perceive lethal methods and the use of traps and snares for live capture of wolves as inhumane. Perceptions of humaneness similar with and without federal protection of wolves.	While Federally Protected: No WS involvement in operational WDM but non-lethal methods including the use of traps and snares for live capture can be conducted by others. Alternative may be perceived as more humane by people opposed to lethal measures and Federal involvement in WDM. Illegal use of lethal methods by others may increase. These methods may be less humane than methods proposed under Alternative 2. Wolves Not Federally Protected: No operational WDM by WS but full range of WDM methods available to others. Overall perception of humaneness similar to Alternative 2.	While Federally Protected: No WS involvement in WDM but non-lethal methods including the use of traps and snares for live captured can be conducte by others. Alternative may be perceived as more humane by people opposed to lethal measures and Federal involvement in WDM. Illegal use of lethal methods by others may increase. These methods may be less humane than methods proposed under Alternative 2. Wolves Not Federally Protected: No lethal WDM by WS but full range of WDM methods available to others. Overall perception of humaneness similar to Alternative 2.

Impact to Stakeholders, Including Aesthetics	While Federally Protected: Variable. Those with wolf conflicts may be glad to have some assistance but frustrated by lack of access to all WDM methods. Some may prefer this Alternative to Alternative 2 because no lethal WDM. Wolves Not Federally Protected: No lethal WDM by WS. Full range of methods available from others. Overall perceptions likely similar to Alternative 2. This alternative may be preferable to some because WS limited to use of non-lethal methods.	While Federally Protected: Variable. Those receiving damage would probably favor this alternative. Some animal advocates would oppose this alternative because it includes use of lethal methods and WS (Federal) involvement in lethal WDM.	While Federally Protected: Variable. Those receiving damage probably oppose this alternative because of restrictions in access to WDM methods. Some animal advocates may prefer this alternative because there will be no use of lethal WDM and very limited WS involvement in WDM. Wolves Not Federally Protected: No operational WDM by WS. Full range of methods available from others. Overall perceptions likely similar to Alternative 2. This alternative may be preferable to some because of limitations on WS involvement in WDM.	While Federally Protected: Variable. Those receiving damage probably oppose this alternative because of restrictions in access to WDM methods. Some animal advocates may prefer this alternative because there will be no use of lethal WDM and no WS involvement in WDM. Wolves Not Federally Protected: No WDM by WS. Full range of methods available from others. Overall perceptions likely similar to Alternative 2. This alternative may be preferable to some because no WS involvement in WDM

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APPENDIX A

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APPENDIX B

METHODS EMPLOYED OR RECOMMENDED BY MICHIGAN WS FOR WOLF DAMAGE MANAGEMENT

NON-LETHAL METHODS

While wolves are federally listed as endangered some non-lethal WDM techniques can be used by anyone while other techniques will require special permits from the USFWS or a cooperative conservation agreement between the USFWS and MDNR. The list of non-lethal methods provided below describes the non-lethal methods available and the requirements for the method to be used by the public or agency personnel. Modifications to these requirements may be made through the establishment of a 4(d) rule if the Federal classification of wolves changes from endangered to threatened. Once wolves are removed from the Federal list of threatened and endangered species, use of non-lethal and lethal wolf damage management techniques will be dictated by the provisions of the MGWRMP and tribal policies and regulations. If WS personnel are to be involved in the operational methods, an *Agreement for Control on Private Property* and/or similar document for public lands must be signed by the landowner or administrator authorizing the use of each damage management method.

Non-Lethal Methods Available to All Without a USFWS Permit

Some WDM methods are available to anyone without a permit. These consist primarily of non-lethal preventive methods such as cultural practices and habitat modification. Cultural practices and other management techniques are implemented by the livestock producer and property owners. Livestock producers and property owners may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. WS and USFWS involvement in the use of these methods is usually limited to providing technical assistance. Technical assistance includes providing advice, recommendations, and information regarding wildlife damage management methods and techniques to individuals and groups. It also involves providing presentations or demonstrations on management techniques. These methods include:

- **Animal husbandry practices** involve the basic management practices used by farmers and ranchers in the care and production of livestock. The modification or use of certain animal husbandry practices has been reported to have some effectiveness in reducing depredations by coyotes (Robel et al. 1981, Linhart 1984). These practices may include use of shed lambing, clearing of woody or brushy pastures, modifications to lambing or calving schedules, and proper dead animal disposal procedures. Fritts (1982) reported that many instances of wolf depredation on livestock in Minnesota were related to animal husbandry practices, such as the pasturing of cattle in extensive woodlots and allowing calving in woodlots or remote pastures. Fritts also wrote that improper carcass disposal may encourage or perpetuate depredations. Animal husbandry practices include, but are not limited to, the use of:

  Guarding animals include the use of dogs, donkeys, and llamas. These animals can effectively reduce coyote predation losses in some situations (Meadows and Knowlton 2000, Cavalcanti and Knowlton 1998, Green and Woodruff 1996). Several breeds of large dogs have been used for centuries by rural societies in the Old World to guard livestock from predators (Linhart 1984). Studies conducted in the U.S. have shown the use of Old World guarding dog breeds, such as Great Pyrenees, Kangal, and Komondor, to be effective in the protection of livestock from coyote predation (Linhart et al. 1979, Coppinger et al. 1988, Andelt 1992). In most situations guarding dogs provide protection

from coyote depredations by "warning" or chasing the coyote away (McGrew and Blahesley 1982). The effectiveness of guarding dogs for protection from wolves in the U.S. has been questioned (Coppinger and Coppinger 1995), and may be complicated by the nature of farming and ranching practices in wolf habitat (i.e. large, remote, woody or brushy pastures) (Fritts el al. 1992). In addition, wolves may perceive guard dogs as "new" wolves and may kill these intruders into their territories (Shivik 2001).

Success in using guard dogs is highly dependent on proper breeding and bonding with the type of livestock the dog is to protect. Effective use of guard dogs depends on training, obedience, care, and feeding (Green and Woodruff 1996). The efficacy of guard dogs is affected by the amount of predation loss, size and topography of the pasture, acceptance of the dog by the livestock, training, compatibility with humans, compatibility with other predator damage management methods, and the species of predator. Guard dogs breeds mature at about 2 years of age and may begin protecting livestock at this age. Guard dogs generally have an effective working life of less than 3 years because of accidents, disease, and people misidentifying the guard dog as a threat to the livestock and shoot the dog (Lorenz et al. 1986, Green 1989). Guard dogs may kill, injure, harass, or try to breed sheep and goats (Green and Woodruff 1983).

Wolves avoided livestock guarding dogs initially, but over a period of a few weeks came closer and closer until near contact was made (Smith et al. 2000b). The wolves eventually showed dominance over the dogs in direct confrontations. In addition, wolves have killed guarding dogs, including Anatolian Shepherds in Minnesota and Montana (Fritts and Paul 1989). Bangs et al. (1989) also identified guard dog mortalities attributed to wolves during the last five years of wolf recovery in the Rocky Mountains.

Guard donkeys have been used to protect livestock with mixed results. The reported most effective guard donkey is a jenny with a foal. Guard donkeys are probably more effective at deterring dog and coyote predation than wolf predation.

Guard llamas have also been used with mixed success to protect livestock. Some producers believe guard llamas are better at defending livestock from dogs than coyotes. Llamas are typically aggressive toward dogs and appear to readily bond with sheep (Cavalcanti and Knowlton 1998). Llamas are able to reduce coyote predation on sheep initially (Meadows and Knowlton 2000). Dogs and coyotes adapt to the protective nature of llamas thereby reducing their effectiveness over time (Meadows and Knowlton 2000). Further, in Montana during the last five fiscal years, wolves killed 12 llamas (Montana MIS unpubl. data FY98, FY99, FY00, FY01, FY02 (annual reports).

Carcass removal is burying, liming or incinerating dead livestock to remove an attractant for predators. However, Mech (1999) could find no clear relationship between the application of carcass removal and a reduction in wolf predation on livestock in Minnesota, but left open the possibility that larger farms tend to attract wolves by providing a more reliable food source in the form of carcasses.

Pasture selection is placing or moving cattle in pastures believed less likely to expose livestock to predation. Usually, moving livestock to pastures near human habitation is believed to expose livestock to fewer predators. Livestock producers eventually must move livestock to distant pastures to graze, however, they may wait until calves are larger and older in the hope to reduce their vulnerability to predation.

- **Habitat modification** is used whenever practical to attract or repel certain wildlife species or to separate livestock from predators. For example, clearing brush from calving pastures or near residences reduces available cover for predators.

- **Physical exclusion** or fencing to protect livestock from wolf depredations is one of the earliest methods used to deal with wolf problems, and was used in early Europe as well as by American colonists (Wade 1978, Cluff and Murray 1995). Woven wire fencing with buried wire aprons were used in Texas sheep pastures to exclude coyotes but cost of materials and labor were generally prohibitive (Linhart 1984). Electric fencing has shown some success in reducing coyote depredation on sheep (Gates et al. 1978, Linhart 1984), but tests on wolves have not been reported (Cluff and Murray 1995). Widespread use of fencing as a non-lethal control technique for wolves has not occurred (Cluff and Murray 1995). Predator proof fencing may be effective in small, confined situations, or justified when protecting extremely high value animals. Wolves have the ability to jump over or dig under fences, so the fencing design must be of sufficient height and bottom repellency to deter wolves. Where practical, sheep or other vulnerable livestock may be penned near farm buildings at night to reduce the likelihood of wolf depredations. However, WS personnel have documented a number of instances where wolves have killed livestock in barnyards near farm buildings or entered open-sided barnyard shelter/loafing buildings. A predator-proof fence is possible to construct, but the initial cost of constructing such a fence usually keeps them from being built (Shivik 2001). If economically feasible, fencing is most appropriate in small areas, such as calving grounds and bedding areas (Shivik 2001).

  Fladry consists of attaching waving flags about every 20 inches from thin rope or cable stretched about 20 inches above the ground. Fladry may be used in addition to or in substitution of fences, as a new means to protect domestic animals from depredation by wolves. Fladry seems to work because it may be "novel" to wolves (Musiani and Visalberghi 2001), however, the length of time it may work is undetermined and variable (Shivik 2001). Fladry is likely to be limited to small and medium-sized fenced areas because the flags require maintenance, especially in areas with high winds (Shivik 2004).

  Compensation involves reimbursing individuals for the losses caused by wolves. Reimbursement provides producers monetary compensation for losses, it does not remove the problem nor does it assist with reducing future losses from predation. A compensation program may be helpful in reducing animosity towards wolves and in preventing the wolf population from being an economic burden on individuals. However, Wydeven and Naughton (2002) reported on a public attitudes survey regarding the compensation program for wolf damage in Wisconsin. They found no difference in tolerance for wolves between compensated and non-compensated individuals. They hypothesized that compensation may programs may not improve individual tolerance of wolves but may be important for establishing broader political support for wolf conservation. Additional difficulties with compensation programs (Wagner et al. 1997, USDA 1997 Revised) include:

  - Compensation is not practical for public health and safety problems.
  - In addition to the money required to reimburse livestock producers, compensation programs also require expenditures of staff time and money to investigate and validate all losses, and to determine and administer appropriate compensation.
  - Compensation is only paid for confirmed losses. In some cases it is not possible to conclusively ascertain that wolves caused the death of the animal or the animal/carcass is

missing. Producers may feel that they are not beeing adequately compensated for the full value of their losses.

- Compensation may not be a satisfactory solution for individuals who feeel responsible for the well-being of their livestock or in situations where there is an emotional attachment to the animal.

- **Animal Behavior Modification** refers to tactics that deter or repel predators and thus, reduce predation**.**. Unfortunately, many of these techniques are only effective for a short time before wildlife habituate to them (Pfeifer and Goos 1982, Conover 1982, Shivik 2001). These non-lethal methods[16] have been described as consisting of two stimuli: disruptive stimuli and aversive stimuli (Shivik 2001). Disruptive stimuli are novel or otherwise undesirable stimuli that prevent or alter behavior of animal. Disruptive stimulus devices will usually be limited to the protection of small areas. Aversive stimuli interfere with behaviors by capitalizing on animal's innate dislike of novel, disagreeable stimuli and the more noxious the stimuli, the more aversive the stimuli are likely to be. With disruptive stimuli, learning decreases effectiveness, but with aversive techniques, effectiveness is dependent on learning. Aversive stimuli are noxious stimuli that are paired with a specific behavior to condition an animal not to perform that behavior.

  Disruptive Stimuli Including Frightening Devices are methods that usually involve a light, sound, or motion device designed to deter wolves from a certain area. Strobe and flashing lights, propane exploders, sirens, and various combinations of these devices have all been used in attempts to reduce livestock losses to coyote, with wide ranging degrees of effectiveness (Linhart 1984, Andelt 1987). Animal habituation (becoming accustomed) to the stimulus is one of the primary limiting factors for primary repellents. Moving the devices intermittently and randomly as well as alternating the stimuli (e.g. a different type of noise or light) may extend the effective period of the system (Shivik and Martin 2001). Coyotes readily adapt to most repellent devices (Wade 1978), and the response of wolves in probably similar (Cluff and Murray 1995). Blinking highway safety lights and flagging were used to reduce wolf predation at cattle farms in Minnesota but the effectiveness of these methods could not be adequately measured (Fritts 1982). Electronic guards (siren strobe-light devices) are battery powered units operated by a photocell. The unit emits a flashing strobe light and siren call at regular intervals throughout the night. Efficacy of strobe-sirens is highly variable and less than three weeks (Linhart 1984). The device is a short-term tool used to deter predation until livestock can be moved to another pasture, brought to market, or other predator damage management methods implemented. Lights and flagging (fladry) may be most useful in wolf depredation situations where other control methods such as trapping are prohibited or impractical (Fritts et al. 1992).

  Guarding and Hazing involves guarding an area and then using pyrotechnics, crackershells or other light/noisemaking devices to frighten wolves away from the site. It can be used as an aversive technique, but requires that the projectiles must be used every time the animal attempts to prey on the protected resource so they don't identify conditions when they can obtain prey without receiving a negative experience (Shivik 2004).

[16] Chemical repellents, projectile repellents, visual and acoustic devices generally show little promise in reducing livestock depredation on a large-scale or long-term basis (Smith et al. 2000a).

Non-lethal Methods Available to States with Cooperative Conservation Agreements with the USFWS

Some non-lethal methods involve harassment or handling wolves that is considered "taking" of an endangered species as defined by the ESA. These activities would ordinarily require a permit from the USFWS. However, Section 6 of the ESA allows the USFWS to establish cooperative agreements with the states for the management of federally listed species. Under such agreements, any qualified and authorized employee or similarly qualified and authorized agent of the state conservation agency may take an endangered species without a permit from the USFWS so long as the taking cannot be reasonably expected to result in: 1) the death or permanent disabling of the specimen; 2) the removal of the specimen from the state where the taking occurred; 3) the introduction of the specimen to an area outside the historical range of the species; or 4) holding the species in captivity for a period of more than 45 days. (50 CFR 17.21 (a)(5). The MDNR has a cooperative conservation agreement with the USFWS for the management of wolves. Consequently, the state or WS, as qualified and authorized agents of the state, may use the following WDM techniques without a permit from the USFWS.

- **Animal Behavior Modification** (General description provided above.)

  Remote Activated Frightening Devices. These devices are frightening devices like those descried above under "Disruptive Stimuli Including Frightening Devices". The difference is that these devices work because a transmitter on a wolf collar or a motion detector activates frightening devices when wolves approach a protected area. It should take longer for wolves to habituate to these devices because they are only activated when a wolf, or in the case of motion detectors, another animal activates the system. Breck et al (2002) experimented with a Radio Activated Guard (RAG) device to protect livestock in small pastures. Results indicate the RAG device was effective for protecting livestock in small pastures. In addition, wolves exhibited no signs of habituation to the device. Limitations of the scare device include electronic complexity, area coverage, and price (Breck et. al. 2002). A similar Movement Activated Guard (MAG) device was effective in reducing consumption of deer carcasses by wolves (Shivik et al. 2003). These devices are included in the methods restricted to MDNR and their authorized agents because they require capture and handling of the wolf to attach the transmitter collar.

- **Capture, Collar and/or Relocate** includes capturing wolves and attaching a radio collar or collar that works as a part of a behavior modification system (discussed above). It also includes the practice of capturing a wolf or wolves and moving them to another location for release. Relocation may be effective in some situations, but success will vary depending on the trapping history of a problem wolf. Capture and relocation would only be conducted by authorized, specially trained personnel within the USFWS, MDNR or WS. Eventually relocation may be limited as the number of suitable release sites are occupied by wolves and lethal removal should be considered (Linnel et al. 1997). Identification of release sites and agreements with appropriate land owners/managers must be done before relocation efforts can be initiated. While federally listed, relocation sites would be agreed upon by the state.

  Shivik (2001) and Linnel et al. (1997) stated, however, that the truth is that most predators that are relocated either return (even when displaced hundreds of miles), get into the same or worse trouble than they were already in, or die. Relocated wolves, after being taken out of their element, often die, either slowly by starvation, brutally by another pack or killed on a highway (Shivik 2001), and some resume depredation at the relocation site (Bangs et al. 1995). The rate at which repeated depredation problems would occur is likely dependent on the conflict potential at the release site and the area through which the relocated animal(s) traveled after release. In

Michigan, relocation has become increasingly problematic and will rarely be practical (T. C. Hogrefe, MDNR, pers. comm.. 2004).

The following methods could be used during the process of capturing and collaring or relocating wolves

Foot-hold traps can be utilized to live-capture a variety of mammals, and are effectively used within Michigan to capture wolves. Three advantages of the foot-hold trap are: 1) they can be set under a wide variety of conditions, and 2) pan-tension devices can be used to reduce the probability of capturing smaller non-target animals (Turkowski et al. 1984, Phillips and Gruver 1996), and 3) non-target wildlife can be released. Effective trap placement and the use of appropriate lures by trained WS personnel also contribute to the foot-hold trap's selectivity. Foot-hold traps are difficult to keep operational during inclement weather and they lack selectivity where non-target species are of a similar or heavier weight than the target species. The use of foot-hold traps also requires more time and labor than some methods, but they are indispensable in resolving many depredation problems. Foot-hold traps are constantly being modified and tested to improve the welfare of captured animals. Additionally, the NWRC has developed a Tranquilizer Tab Device (TTD) that can be used in conjunction with traps and snares which can help reduce stress and injury of captured individuals (See TTD below).

Snares may be used as live-capture devices. Careful attention to details when placing snares and the use of a *"stop"* on the cable can allow for live-capture of neck-snared animals and can allow some non-target animals to pull out of the snare. Spring-activated foot snares could also be used to capture depredating wolves. As with traps, snare placement and, in the case of leg snares, the use of trigger tension systems reduce the risks to non-target species. Size and height of the snare loop above the ground can also reduce non-target species risks.

Chemical Immobilization and handling of live-captured wolves could be conducted by using several drugs approved and authorized for this purpose. These methods would only be used by personnel who have received training in the safe use of authorized immobilization/ euthanasia chemicals and are certified by WS or MDNR. This training involves hands-on application of state-of-the-art techniques and chemicals. Immobilization drugs approved for use by WS and the MDNR include:

Ketamine hydrochloride is a cyclohexamine (dissociative) type drug that produces immobilization and analgesia by selective depression of the central nervous system. Ketamine produces a state of unconsciousness that interrupts association pathways to the brain and allows for the maintenance of the protective reflexes, such as coughing, breathing, swallowing, and eye blinking. It is supplied as a slightly acidic solution (pH 3.5 to 5.5) for intramuscular injection. Ketamine is detoxified by the liver and excreted by the kidney. Following administration of recommended doses, animals become immobilized in about 5 minutes with anesthesia lasting from 30 to 45 minutes. Depending on dosage, recovery may be as quick as 4 to 5 hours or may take as long as 24 hours. Recovery is generally smooth and uneventful. Ketamine is rarely used in a pure state due to possible negative side effects. For wolf immobilizations, Ketamine would be used in combination with Xylazine in order to minimize side effects.

Xylazine hydrochloride is a sedative which produces central nervous system depression and moderate analgesia and muscle relaxant properties. Xylazine HCL is most often used

in combination with drugs such as Ketamine. Ketamine/Xylazine combinations can be used to effectively and safely immobilize a variety of mammals. At high dose rates the margin of safety decreases greatly. Recommended dosages are administered through intramuscular injection allowing the animal to become immobilized in about 5 minutes and lasting from 30 to 45 minutes.

Yohimbine is a useful and readily available antagonist used to reverse the effects of Xylazine.

Telazol is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride. The product is generally supplied sterile in vials, each containing 500 mg of active drug, and when dissolved in sterile water has a pH of 2.2 to 2.8. Telazol produces a state of unconsciousness in which protective reflexes, such as coughing and swallowing, are maintained during anesthesia. Schobert (1987) listed the dosage rates for many wild and exotic animals. Before using Telazol, the size, age, temperament, and health of the animal are considered. Following a deep intramuscular injection of Telazol, onset of anesthetic effect usually occurs within 5 to 12 minutes. Muscle relaxation is optimum for about the first 20 to 25 minutes after the administration, and then diminishes. Recovery varies with the age and physical condition of the animal and the dose of Telazol administered, but usually requires several hours.

Capture-All 5 is a combination of Ketaset and Xylazine, and is regulated by the FDA as an investigational new animal drug. The drug is available, through licensed veterinarians, to individuals sufficiently trained in the use of immobilization agents. Capture-All 5 is administered by intramuscular injection; it requires no mixing, and has a relatively long shelf life without refrigeration, all of which make it ideal for the sedation of various species.

Tranquilizer Tab Devices (TTDs) were developed by the NWRC as a means of sedating animals captured in foot-hold traps to reducing the potential for self-inflicted injuries to animals while held in the trap. Used properly the sedative, propiopromazine hydrochloride (Investigational New Animal Drug #9528) does not render the animal unconscious. The drug is administered via a rubber nipple (trap tab) fastened to the jaw of the trap. Upon capture the animal will instinctively bite on the trap tab and ingest the tranquilizer.

Non-lethal Methods which Require Permits from the USFWS

Some animal behavior modification systems involve capturing wolves and fitting wolves with collars used to deliver or trigger repellent stimuli (i.e., aversive conditioning). An additional non-lethal method consists of shooting wolves with non-lethal projectiles like rubber bullets. These non-lethal techniques involve intentionally using painful stimuli to manage wolf behavior, and the USFWS has determined that, while wolves are federally protected as a threatened or endangered species, permits or other authorizations are required to use these methods. If and when wolves are removed from the Federal list of threatened and endangered species, the availability of these methods would be determined by the MDNR in accordance with the MGWRMP. Methods that require capture and handling of wolves would be conducted only by personnel from the MDNR, WS or the Tribes.

- **Aversive stimuli** are stimuli that cause discomfort, pain and/or an otherwise negative experience paired with specific behaviors to achieve conditioning against these behaviors. These types of

repellents involve animal learning to be effective (Shivik et al. 2002, 2003). Electric shock from a modified dog training collar that was activated when wolves came into close proximity to livestock was tested by Shivik et al. (2002). Testing indicated potential, but numerous logistical obstacles to research design and operational must be overcome before this technique is likely to have operational value. Training collars did not result in a statistically significant reduction in wolf predation in a subsequent study by Shivik et al. (2003). The authors reported numerous difficulties in use of the training collars.

Shultz et al. 2005 reported the results of using dog training collars on 2 different wolves over a 4 year period. Their observations indicated that remote-activated training collars do appear to deter predation by wolves. Shocking did not appear to reduce den or rendezvous site attendance but did appear to result in an increase in distances moved during the period immediately after the shock was administered. Long-term avoidance of the farms did not seem possible unless the aversive stimulus (shock) was linked to a signal, like the beepers which sounded before the shock was administered. When training collars were placed on wolves after depredations had started, it appeared to affect the behavior of the collared wolf but seemed less likely to affect other wolves in the pack. Authors concluded that under specific circumstances, use of collars to condition wolves to avoid certain sites may be preferable and more cost-effective than traditional removal efforts. However, additional information is needed on the long-term physical and behavioral impacts of the collars on wolves.

- **Non-lethal Projectiles** This involves guarding an area and then using rubber bullets or other non-lethal projectiles to prevent a predation event. It can be used as an aversive technique, but requires that the projectiles be used every time the animal attempts to prey on the protected resource so the animal doesn't identify conditions when it can obtain prey without receiving a negative experience (Shivik 2004). In general, this method is intended for use on wolves that spend time around houses/farms repeatedly trying to get livestock and pets, and wolves that are acting too bold around humans (E. Bangs, USFWS, pers. comm.).

  Methods which require around-the-clock presence of a person to guard the resource are most efficiently used when the landowner/resource manager assists with the implementation. The USFWS may choose to allow the MDNR and WS to train individuals in the use of this method. It is possible, although unlikely that this method could result in the death of or injury to a wolf if used at close range or if a shot unintentionally hits a vulnerable spot on the wolf. There is some concern that use of this method by private citizens could result in greater risk to wolves than if its use is restricted to WS and MDNR personnel. However, Bangs et al. (2004) reported that over 100 permits were issued for this method and, although several wolves were hit, none seemed seriously injured. Individuals using the method reported that wolves did seem more wary after the technique was used.

LETHAL WOLF DAMAGE MANAGEMENT METHODS

Lethal removal of depredating wolves can resolve damage problems (Bradley 2004). While federally listed, lethal WDM techniques always require a permit from the USFWS. While wolves are federally listed, only MDNR, the Tribes and WS can use lethal WDM methods. Lethal control can be used to address wolf damage problems in Michigan when: 1) there have been documented, confirmed losses at a site and the WS or MDNR specialist on the site recommends removal, 2) while federally listed, a permit or similar authority has been granted to MDNR by the USFWS, 3) the MDNR has determined that the removal is consistent with the provisions of the MGWRMP (MDNR 1997) and approves the action, and 4) the producer/owner has a signed depredation management plan (farm plan) for the property which includes damage abatement recommendations. If WS is to conduct the removal an *Agreement for Control*

on Private Property and/or similar document for public lands must be signed by the landowner or administrator authorizing the use of each damage management method. Access to lethal WDM methods once wolves are removed from the Federal list of threatened and endangered species will be conducted in accordance with applicable MGWRMP or tribal policy and procedures.

- **Euthanization** of problem wolves caught or restrained by leg hold traps, snares, or dry land restraint devices will normally be conducted with the use of appropriate type of firearm by trained personnel. This is the preferred method of euthanasia to reduce handling and stress to the animal. Euthanasia may also be accomplished through the administering of approved and authorized chemical euthanasia agents, such as sodium pentabarbitol for properly immobilized animals.

- **Snares** may be used as either lethal or live-capture devices. Snares set to catch an animal by the neck are usually lethal, unless they are used *"stop"* on the cable to regulate the minimum size of the snare loop. Spring-activated foot snares could also be used to capture depredating wolves. Wolves captured by non-lethal restraint devices may be euthanized as described above.

- **Shooting** is selective for a target species and may involve the use of spotlights, night-vision, and predator calling. Removal of one or two specific animals by calling and shooting in the problem area can sometimes provide immediate relief from a predation problem.

  Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years afterwards (WS Directive 2.615). Wildlife Services employees, who carry firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

- **Dart guns** are non-lethal capture devices that utilize a dart filled with tranquilizer fired from a specially designed rifle. Once tranquilized, the animal may be handled safely for research or relocation purposes. Under special situations, a tranquilized animal could also be euthanized if lethal removal is warranted. Use of dart guns would have no effect on non-target wolves because positive target species identification is made before animals are shot. Thus, use of dart guns is expected to continue to be virtually 100% selective for target individuals and species, and would not pose a risk to non-target species and individuals. Use of dart guns may sometimes be the only control option available if other factors preclude the setting of equipment.

APPENDIX C

MICHIGAN FEDERAL THREATENED AND ENDANGERED SPECIES

U.S. FISH AND WILDLIFE SERVICE
EAST LANSING, MICHIGAN

Mammals

1. Gray wolf (E)
2. Indiana bat (E)
3. Eastern cougar (E, X)
4. Canada lynx (T, X)

Birds

1. Kirtland's warbler (E)
2. Piping plover (E)
3. Bald eagle (T)

Reptiles

1. Northern copperbelly watersnake (T)

Insects

1. Mitchell's satry butterfly (E)
2. Karner blue butterfly (E)
3. Hungerford's crawling water beetle (E)
4. American burying beetle (E)
5. Hine's emerald dragonfly (E)

Mussels

1. Northern riffleshell (E)
2. Clubshell (E)

Plants

1. Michigan monkey-flower (E)
2. Pitcher's thistle (T)
3. Houghton's goldenrod (T)
4. Dwarf lake iris (T)
5. Eastern prairie fringed orchid (T)
6. American hart's-tongue fern (T)
7. Lakeside daisy (E)
8. Small whorled pogonia (T)

E = endangered; T = threatened; PT = proposed threatened
X = not currently found, status uncertain in Michigan

APPENDIX D

SPECIES THAT ARE STATE LISTED AS ENDANGERED AND THREATENED IN THE STATE OF MICHIGAN

DEPARTMENT OF NATURAL RESOURCES
WILDLIFE DIVISION
ENDANGERED AND THREATENED SPECIES

(By authority conferred on the department of natural resources by section 36503 of 1994 PA 451, MCL 324.36503)

R 299.1021 Mollusks.

Rule 1. (1) The following species of mollusks of class Pelecypoda (mussels) are included on the state list of endangered species:

(a) Epioblasma obliqua perobliqua (Lea) [Dysnomia sulcata (Conrad)]	White catspaw
(b) Epioblasma torulosa rangiana (Rafinesque) [Dysnomia torulosa rangiana (Lea)]	Northern riffleshell
(c) Epioblasma triquetra (Rafinesque) [Dysnomia triquetra (Rafinesque)]	Snuffbox
(d) Obovaria subrotunda (Rafinesque)	Round hickorynut
(e) Pleurobema clava (Lamarck)	Clubshell
(f) Simpsonaias ambigua (Say) [Simpsoniconcha ambigua (Say)]	Salamander mussel
(g) Toxolasma lividus (Rafinesque) [Carunculina glans (Lea)]	Purple lilliput
(h) Villosa fabalis (Lea)	Rayed bean

(2) The following species of mollusks of class Pelecypoda (mussels) are included on the state list of threatened species:

(a) Anodonta subgibbosa (Anthony)	Lake floater
(b) Lampsilis fasciola Rafinesque	Wavyrayed lampmussel

(3) The following species of mollusks of class Gastropoda (snails) are included on the state list of endangered species:

(a) Planorbella multivolvis(Case) [Helisoma multivolvis]	Acorn ramshorn
(b) Stagnicola petoskeyensis (Walker)	Petoskey pondsnail

(4) The following species of mollusks of class Gastropoda (snails) are included on the state list of threatened species:

(a) Hendersonia occulta (Say)	Cherrystone drop
(b) Stagnicola contracta (Currier) [Lymanaea contracta]	Deepwater pondsnail

R 299.1022 Insects.

Rule 2. (1) The following species of insects are included on the state list of endangered species:

(a) Brychius hungerfordi Spangler	Hungerford's crawling water beetle
(b) Catocala amestris Strecker	Three-staff underwing
(c) Neonympha mitchellii mitchellii	French Mitchell's satyr
(d) Nicrophorus americanus Olivier	American burying beetle
(e) Schinia indiana (Smith)	Phlox moth
(f) Schinia lucens (Morrison)	Leadplant moth
(g) Somatochlora hineana Williamson	Hine’s emerald dragonfly
(h) Speyeria idalia (Drury)	Regal fritillary

(2) The following species of insects are included on the state list of threatened species:

(a) Atrytonopsis hianna Scudder	Dusted skipper
(b) Erynnis persius persius Scudder	Persius dusky wing
(c) Euphyes dukesi (Lindsey)	Dukes' skipper
(d) Hesperia ottoe Edwards	Ottoe skipper
(e) Incisalia irus Godart	Frosted elfin
(f) Lepyronia gibbosa Ball	Great Plains spittlebug
(g) Lycaeides idas nabokovi Masters	Northern blue
(h) Lycaeides melissa samuelis Nabakov	Karner blue
(i) Oarisma powesheik (Parker)	Powesheik skipperling
(j) Papaipema silphii Bird	Silphium borer moth
(k) Trimerotropis huroniana E. M. Walker	Lake Huron locust

R 299.1023 Fishes.

Rule 3. (1) The following species of fishes are included on the state list of endangered species:

(a) Clinostomus elongatus (Kirtland)	Redside dace
(b) Erimyzon oblongus (Mitchill)	Creek chubsucker
(c) Notropis photogenis (Cope)	Silver shiner
(d) Noturus stigmosus Taylor	Northern madtom
(e) Opsopoeodus emiliae Hay	Pugnose minnow
(f) Percina shumardi (Girard)	River darter
(g) Percina copelandi (Jordan)	Channel darter
(h) Phoxinus erythrogaster (Rafinesque)	Southern redbelly dace

(2) The following species of fishes are included on the state list of threatened species:

(a) Acipenser fulvescens Rafinesque	Lake sturgeon
(b) Ammocrypta pellucida (Putnam)	Eastern sand darter
(c) Coregonus artedii Lesueur	Cisco or lake herring
(d) Coregonus zenithicus (Jordan and Evermann)	Shortjaw cisco
(e) Hiodon tergisus Lesueur	Mooneye
(f) Moxostoma carinatum (Cope)	River redhorse
(g) Stizostedion canadense (Smith)	Sauger

(3) The following species of fishes are thought to be extirpated in Michigan, but, if rediscovered, will automatically be listed as threatened:

(a) Coregonus johannae (Wagner)	Deepwater cisco
(b) Coregonus nigripinnis (Gill)	Blackfin cisco
(c) Coregonus reighardi (Koelz)	Shortnose cisco
(d) Notropis amblops (Rafinesque)	Bigeye chub
(e) Notropis chalybaeus (Cope)	Ironcolor shiner
(f) Notropis texanus (Girard)	Weed shiner
(g) Polyodon spathula (Walbaum)	Paddlefish
(h) Stizostedion vitreum glaucum (Hubbs)	Bluepike
(i) Thymallus arcticus (Richardson)	Arctic grayling

R 299.1024 Amphibians.

Rule 4. (1) The following species of amphibians is included on the state list of endangered species:

Ambystoma texanum (Matthews)	Smallmouth salamander

(2) The following species of amphibians is included on the state list of threatened species:

Ambystoma opacum (Gravenhorst)	Marbled salamander

R 299.1025 Reptiles.

Rule 5. (1) The following species of reptiles are included on the state list of endangered species:

(a) Clonophis kirtlandii (Kennicott)	Kirtland's snake
(b) Nerodia erythrogaster neglecta (Conant)	Copperbelly watersnake

(2) The following species of reptiles are included on the state list of threatened species:

(a) Elaphe vulpina gloydi Conant	Eastern fox snake
(b) Clemmys guttata	Spotted turtle

R 299.1026 Birds.

Rule 6. (1) The following species of birds are included on the state list of endangered species:

(a) Asio flammeus (Pontoppidan)	Short-eared owl
(b) Charadrius melodus Ord	Piping plover
(c) Dendroica discolor (Vieillot)	Prairie warbler
(d) Dendroica kirtlandii (Baird)	Kirtland's warbler
(e) Falco peregrinus Tunstall	Peregrine falcon
(f) Lanius ludovicianus migrans (Palmer)	Migrant loggerhead shrike
(g) Rallus elegans Audubon	King rail
(h) Tyto alba (Scopoli)	Barn owl

(2) The following species of birds are included on the state list of threatened species:

(a) Ammodramus henslowii Audubon	Henslow’s sparrow

(b) Asio otis (Linnaeus)	Long-eared owl
(c) Buteo lineatus (Gmelin)	Red-shouldered hawk
(d) Corturnicops noveboracensis (Gmelin)	Yellow rail
(e) Dendroica dominica (Linnaeus)	Yellow-throated warbler
(f) Falco columbarius (Linnaeus)	Merlin
(g) Gavia immer (Brunnich)	Common loon
(h) Haliaeetus leucocephalus (Linnaeus)	Bald eagle
(i) Ixobrychus exilis (Gmelin)	Least bittern
(j) Pandion haliaetus (Linnaeus)	Osprey
(k) Sterna caspia Pallas	Caspian tern
(l) Sterna hirundo Linnaeus	Common tern
(m) Cygnus buccinator Richardson	Trumpeter swan

(3) The following species of birds are thought to be extirpated in Michigan, but, if rediscovered, will automatically be listed as threatened:

Chondestes grammacus (Say)	Lark sparrow

R 299.1027 Mammals.

Rule 7. (1) The following species of mammals are included on the state list of endangered species:

(A) Felis concolor Linnaeus	Cougar
(B) Lynx canadensis Kerr	Lynx
(C) Microtus ochrogaster (Wagner)	Prairie vole
(D) Myotis sodalis Miller and Allen	Indiana bat

(2) The following species of mammals are included on the state list of threatened species:

(A) Canis lupus Linnaeus	Gray wolf
(B) Cryptotis parva (Say)	Least shrew

R 299.1028 Plants.

Rule 8. (1) The following species of plants are included on the state list of endangered species:

(a) Agalinas gattingeri Small [Gerardia gattingeri Small]	Gattinger’s gerardia
(b) A. skinneriana (A. Wood) Britton [Gerardia skinneriana A. Wood]	Skinner’s gerardia
(c) Amerorchis rotundifolia (Pursh) Hultén	Small round-leaved orchis
(d) Asclepias ovalifolia Dcne.	Dwarf milkweed
(e) Androsace occidentalis Pursh	Rock-jasmine
(f) Arnica cordifolia Hooker	Heart-leaved arnica
(g) Asplenium ruta-muraria L.	Wall-rue
(h) A. scolopendrium L. var. americana (Fernald) Kartesz & Ghandi [Phyllitis scolopendrium var. americanum Fern.]	Hart's-tongue fern
(i) Baptisia leucophaea Nutt.	Cream wild indigo
(j) Botrychium acuminatum W. H. Wagner	Moonwort
(k) Carex heleonastes Ehrh.	Hudson Bay sedge

(l) C. nigra (L.) Reichard	Black sedge
(m) C. straminea Willd.	Straw sedge
(n) Castanea dentata (Marsh.) Borkh.	American chestnut
(o) Chamaerhodos nuttallii Fern.	Rock-rose
(p) Chelone obliqua L.	Purple turtlehead
(q) Cryptogramma acrostichoides R. Br.	American rock-brake
(r) Disporum hookeri (Torrey) Nicholson	Fairy bells
(s) Dodecatheon meadia L.	Shooting star
(t) Draba glabella Pursh.	Smooth whitlow grass
(u) Echinodorus tenellus (Mart.) Buchenau	Dwarf burhead
(v) Eleocharis atropurpurea (Retz.) Kunth	Purple spike rush
(w) E. microcarpa Torrey	Small-fruited spike-rush
(x) E. nitida Fern.	Slender spike rush
(y) Gentiana flavida A. Gray [G. alba Muhl.]	White gentian
(z) G. puberulenta J. Pringle [G. puberula Michaux]	Downy gentian
(aa)Gymnocarpium jessoense (Koidz.) Koidz.	Northern oak fern
(bb)Hedysarum alpinum L.	Alpine sainfoin
(cc)Hymenoxys herbacea (Greene) Cusick [Hymenoxys acaulis var. glabra (Gray) Parker	Lakeside daisy
(dd)Isoetes engelmannii A. Braun	Engelmann's quillwort
(ee)Isotria medeoloides (Pursh) Raf.	Smaller whorled pognia
(ff)Lygodium palmatum (Bernh.) Sw.	Climbing fern
(gg)Mimulus glabratus var. michiganensis (Pennell) Fassett	Michigan monkey flower
(hh)Nuphar pumila (Timm) DC. [N. microphylla (Pers.) Fern.]	Small yellow pond lily
(ii)Nymphaea tetragona Georgi	Pygmy water lily
(jj)Opuntia fragilis (Nutt.) Haw.	Fragile prickly pear
(kk)Panicum polyanthes Schultes	Many-flowered panic grass
(ll)Penstemon gracilis Nutt.	Slender beard tongue
(mm)Platanthera leucophaea (Nutt.) Lindley [Habenaria leucophea (Nutt.) A. Gray]	Prairie white-fringed orchid
(nn)Plantago cordata Lam.	Heart-leaved plantain
(oo)Poa canbyi (Scribner) Piper	Canbyi’s bluegrass
(pp)Populus heterophylla L.	Swamp or Black cottonwood
(qq)Proserpinaca pectinata Lam.	Mermaid-weed
(rr)Rhynchospora globularis (Chapman) Small	Globe beak-rush
(ss)Rubus acaulis Michaux	Dwarf raspberry
(tt)Rumex occidentalis S. Wats	Western dock
(uu)Scleria pauciflora Willd.	Few-flowered nut rush
(vv)Subularia aquatica L.	Awlwort
(ww)Trillium undulatum Willd.	Painted trillium
(xx)Utricularia inflata Walter [U. radiata Small]	Floating bladderwort
(yy)Vaccinium vitis-idaea L.	Mountain cranberry

(2) The following species of plants, listed by major group and family, are included on the state list of threatened species:

(a) PTERIDOPHYTES:

(i) ASPLENIACEAE (Spleenwort Fanily):

(A) Asplenium rhizophyllum L.	Walking fern

[Camptosorus rhizophyllus (L.) Link]	
(B) A. trichomanes-ramosum L. [A. viride Hudson]	Green spleenwort
(ii)DRYOPTERIDACEAE (Wood Fern Family):	
(A) Dryopteris celsa (W. Palmer) Small	Small log fern
(B) Gymnocarpium robertianum (Hoffman) Newman	Limestone oak fern
(C) Woodsia alpina (Bolton) S. F. Gray	Northern woodsia
(D) W. obtusa (Sprengel) Torrey	Blunt-lobed woodsia
(iii)LYCOPODIACEAE (Clubmoss family):	
Lycopodiella margaritae J. G. Bruce, W. H. Wagner, & Beitel	Clubmoss
(iv)OPHIOGLOSSACEAE (Adder's-tongue family):	
(A) Botrychium campestre W. H. Wagner	Prairie Moonwort or Dunewort
(B) B. hesperium (Maxon & Clausen) W. H. Wagner & Lellinger	Western moonwort
(C) B. mormo W. H. Wagner	Goblin moonwort
(D) Ophioglossum vulgatum L. [O. pycnostichum (Fern.) Löve & Löve]	Southeastern adder's-tongue
(v) PTERIDACEAE (Maidenhair Fern Family)	
Pellaea atropurpurea (L.) Link.	Purple cliff brake
(b) MONOCOTYLEDONS:	
(i) ALISMATACEAE (Water-plantain family):	
Sagittaria montevidensis Cham. & Schlecht.	Arrowhead
(ii) CYPERACEAE (Sedge family):	
(A) Carex albolutescens Schw.	Sedge
(B) C. assiniboinensis W. Boott	Assiniboia sedge
(C) C. atratiformis Britton	Sedge
(D) C. conjuncta F. Boott.	Sedge
(E) C. crus-corvi Kunze	Raven's-foot sedge
(F) C. lupuliformis Dewey	False hop sedge
(G) C. media R. Br.	Sedge
(H) C. novae-angliae Schwein.	New England sedge
(I) C. oligocarpa Willd.	Eastern few-fruited sedge
(J) C. platyphylla Carey	Broad-leaved sedge
(K) C. rossii Boott	Ross's sedge
(L) C. scirpoidea Michaux	Bulrush sedge
(M) C. seorsa Howe	Sedge
(N) C. typhina Michaux	Cattail sedge
(O) C. wiegandii Mackenzie	Wiegand's sedge
(P) Eleocharis geniculata (L.) R & S. [E.caribaea (Rottb.) S. F. Blake]	Spike rush
(Q) E. compressa Sulliv.	Flattened spike rush
(R) E. parvula (R. & S.) Link.	Dwarf spike rush
(S) E. tricostata Torrey	Three-ribbed spike rush
(T) Fuirena squarrosa Michaux	Umbrella grass

(U) Psilocarya scirpoides Torrey	Bald rush
(V) Scirpus hallii A. Gray	Hall's bulrush
(W) S. americanus Pers. [S. olneyi A. Gray]	Olney's bulrush
(X) Scleria reticularis Michaux	Netted nut rush

(iii) IRIDACEAE (Iris family):

(A) Iris lacustris Nutt.	Dwarf lake iris
(B) Sisyrinchium atlanticum Bickn.	Atlantic blue-eyed-grass

(iv) JUNCACEAE (Rush family):

(A) Juncus brachycarpus Engelm.	Short-fruited rush
(B) J. militaris Bigelow	Bayonet rush
(C) J. scirpoides Lam.	Scirpus-like rush
(D) J. stygius L.	Moor rush
(E) J. vaseyi Engelm.	Vasey's rush
(F) Luzula parviflora (Ehrh.) Desv.	Small-flowered wood rush

(v) LEMNACEAE (Duckweed family):

Wolffia papulifera Thompson [W. brasiliensis Weddell]	Watermeal

(vi) LILIACEAE (Lily family):

(A) Allium schoenoprasum L. (native variety)	Chives
(B) Camassia scilloides (Raf.) Cory	Wild hyacinth
(C) Disporum trachycarpum (Wats) B. & H.	Northern fairy bells
(D) Tofieldia pusilla (Michaux) Pers.	False asphodel
(E) Trillium nivale Riddell	Snow trillium
(F) T. recurvatum Beck	Prairie trillium
(G) T. sessile L.	Toadshade

(vii) ORCHIDACEAE (Orchid family):

(A) Calypso bulbosa (L.) Oakes	Calypso or fairy-slipper
(B) Cypripedium candidum Willd.	White lady slipper
(C) Galearis spectabilis (L.) Raf.	Showy orchis
(D) Isotria verticillata (Willd.) Raf.	Whorled pogonia
(E) Platanthera ciliaris (L.) Lindley [Habenaria ciliaris (L.) R. Br.]	Orange- or yellow-fringed orchis
(F) Spiranthes ovalis Lindley	Lesser ladies'-tresses
(G) Tipularia discolor (Pursh) Nutt.	Cranefly orchid
(H) Triphora trianthophora (Sw.) Rydb.	Nodding pogonia or three birds orchid

(viii)POACEAE (Grass family):

(A) Aristida longespica Poiret	Three-awned grass
(B) A. tuberculosa Nutt.	Beach three-awned grass
(C) Beckmannia syzigachne (Steudel) Fern.	Slough grass
(D) Bouteloua curtipendula (Michaux)	Torrey Side oats grama
(E) Bromus pumpellianus Scribner	Pumpelly's bromegrass
(F) Calamagrostis lacustris (Kearney) Nash	Northern reedgrass
(G) C. stricta (Timm) Koeler	Narrow-leaved reedgrass
(H) Chasmanthium latifolium (Michx.) Yates [Uniola latifolia Michaux]	Wild oats
(I) Diarrhena americana Beauv.	Beak grass
(J) Festuca scabrella Torrey [F. altaica Trin.]	Rough fescue

(K) Muhlenbergia richardsonis (Trin.) Rydb.	Mat muhly
(L) Oryzopsis canadensis (Poiret) Torrey	Canada rice grass
(M) Panicum leibergii (Vasey) Scribner	Leiberg's panic grass
(N) P. longifolium Torrey	Panic grass
(O) P. verrucosum Muhl.	Warty panic grass
(P) Poa alpina L.	Alpine bluegrass
(Q) P. paludigena Fern. & Wieg.	Bog bluegrass
(R) Zizania aquatica var. aquatica L.	Wild rice

(ix) POTAMOGETONACEAE (Pondweed family):

(A) Potamogeton bicupulatus Fern. [P. capillaceus Poiret]	Waterthread pondweed
(B) P. hillii Morong	Hill's pondweed
(C) P. pulcher Tuckerman	Spotted pondweed
(D) P. vaseyi Robins	Vasey's pondweed

(x) RUPPIACEAE (Widgeon grass family):

Ruppia maritima L.	Widgeon grass

(c) DICOTYLEDONS:

(i) ACANTHACEAE (Acanthus family):

(A) Justicia americana (L.) Vahl	Water willow
(B) Ruellia humilis Nutt.	Hairy wild petunia
(C) R. strepens L.	Smooth wild petunia

(ii) APIACEAE (Parsley family):

(A) Berula erecta (Nutt.) Fern. [B. pusilla (Nutt.) Fern.]	Cut-leaved water parsnip
(B) Eryngium yuccifolium Michaux	Rattlesnake-master or button snakeroot
(C) Osmorhiza depauperata Phil.	Sweet Cicely
(D) Zizia aptera (A. Gray) Fern.	Prairie golden alexanders

(iii) ARALIACEAE (Ginseng family):

(A) Oplopanax horridus (Smith) Miq.	Devil's club
(B) Panax quinquefolius L.	Ginseng

(iv) ARISTOLOCHIACEAE (Birthwort family):

Aristolochia serpentaria L.	Virginia snakeroot

(v) ASCLEPIADACEAE (Milkweed family):

(A) Asclepias hirtella (Pennell) Woodson	Tall green milkweed
(B) A. sullivantii Engelm.	Sullivant's milkweed

(vi) ASTERACEAE (Composite family):

(A) Agoseris glauca (Pursh) Raf.	Prairie or pale agoseris
(B) Antennaria rosea Greene	Rosy pussytoes
(C) Artemisia ludoviciana Nutt.	Western mugwort
(D) Aster furcatus Burgess	Forked aster
(E) A. modestus Lindley	Great northern aster
(F) A. sericeus Vent.	Western silvery aster

(G) Cirsium pitcheri (Eaton) Torrey & A. Gray	Pitcher's thistle
(H) Coreopsis palmata Nutt.	Prairie coreopsis
(I) Erigeron hyssopifolius Michaux	Hyssop-leaved fleabane
(J) Eupatorium fistulosum Barratt	Hollow-stemmed Joe-pye weed
(K) E. sessilifolium L.	Upland boneset
(L) Gnaphalium sylvaticum L.	Woodland everlasting
(M) Helianthus mollis Lam.	Downy sunflower
(N) Lactuca floridana (L.) Gaertner	Woodland lettuce
(O) L. pulchella (Pursh) DC.	Wild blue lettuce
(P) Petasites sagittatus (Pursh) A. Gray	Sweet coltsfoot
(Q) Polymnia uvedalia L.	Yellow-flowered leafcup
(R) Senecio indecorus Greene	Northern ragwort
(S) Silphium integrifolium Michaux	Rosinweed
(T) S. laciniatum L.	Compass plant
(U) S. perfoliatum L.	Cup plant
(V) Solidago houghtonii A. Gray	Houghton's goldenrod
(W) S. missouriensis Nutt.	Missouri goldenrod
(X) Tanacetum huronense Nutt.	Lake Huron tansy
(vii) BORAGINACEAE (Borage family):	
Mertensia virginica Pers. (L.)	Virginia bluebells
(viii)BRASSICACEAE (Mustard family):	
(A) Arabis perstellata E. L. Braun	Rock cress
(B) Armoracia lacustris (A. Gray) Al-Shehbaz & V. Bates [A. aquatica (Eaton Wiegand)]	Lake cress
(C) Braya humilis (C. A. Meyer) Robinson	Low northern rock cress
(D) Dentaria maxima Nutt.	Large toothwort
(F) Draba cana Rydb.	Ashy whitlow grass
(G) D. incana L.	Twisted whitlow grass
(H) D. reptans (Lam.) Fern.	Creeping whitlow grass
(ix) CALLITRICHACEAE (Water-starwort family):	
Callitriche heterophylla Pursh	Large water starwort
(x) CAPRIFOLIACEAE (Honeysuckle family):	
(A) Lonicera involucrata (Richardson) Banks	Black twinberry
(B) Viburnum edule (Michx.) Raf.	Squashberry or mooseberry
(xi) CARYOPHYLLACEAE (Pink family):	
(A) Arenaria macrophylla Hooker	Large-leaved sandwort
(B) Sagina nodosa (L.) Fenzl	Pearlwort
(C) Silene stellata (L.) Aiton f.	Starry campion
(D) S. virginica L.	Fire pink
(E) Stellaria crassifolia Ehrh.	Fleshy stitchwort
(xii) CISTACEAE (Rockrose family):	
Lechea pulchella Raf. [L. leggettii Britton & Hollick]	Leggett's pinweed
(xiii) CONVOLVULACEAE (Morning-glory family):	
Ipomoea pandurata (L.) G. F. W. Meyer	Wild potato vine or man-of-the-earth

(xiv) EMPETRACEAE (Crowberry family):

Empetrum nigrum L.	Black crowberry

(xv) ERICACEAE (Heath family):

(A) Pterospora andromedea Nutt.	Pine-drops
(B) Vaccinium cespitosum Michaux	Dwarf bilberry
(C) V. uliginosum L.	Alpine blueberry

(xvi) EUPHORBIACEAE (Spurge family):

Euphorbia commutata Engelm.	Tinted spurge

(xvii) FABACEAE (Pea family):

(A) Astragalus canadensis L.	Canadian milk vetch
(B) Wisteria frutescens (L.) Poiret	Wisteria

(xviii) FUMARIACEAE (Fumitory family):

Corydalis flavula (Raf.) DC.	Yellow fumewort

(xix) GENTIANACEAE (Gentian family):

(A) Bartonia paniculata (Michaux) Muhl.	Panicled screwstem
(A) Gentiana linearis Froel.	Narrow-leaved gentian
(B) Gentianella quinquefolia (L.) Small	Stiff gentian
(C) Sabatia angularis (L.) Pursh	Rosepink

(xx) HALORAGACEAE (Water-milfoil family):

Myriophyllium farwellii Morong	Farwell’s water milfoil

(xxi) HYDROPHYLLACEAE (Waterleaf family):

Phacelia franklinii (R. Br.) A. Gray	Franklin's phacelia

(xxii) HYPERICACEAE (St. John's-wort family):

Hypericum sphaerocarpum Michaux	Round-fruited St. John's-wort

(xxiii) LAMIACEAE (Mint family):

(A) Lycopus virginicus L.	Virginia water-horehound
(B) Pycnanthemum muticum (Michx.) Pers.	Mountain mint
(C) P. pilosum Nutt.	Hairy mountain mint
(D) Scutellaria nervosa Pursh	Skullcap
(E) S. parvula Michaux [sensu lato]	Small skullcap
(F) Trichostema brachiatum L. [Isanthus brachiatus (L.) BSP.]	False pennyroyal
(G) T. dichotomum L.	Bastard pennyroyal

(xxiv) LENTIBULARIACEAE (Bladderwort family):

Utricularia subulata L.	Bladderwort

(xxv) LINACEAE (Flax family):

Linum virginianum L.	Virginia flax

(xxvi) MELASTOMATACEAE (Melastome family):

Rhexia mariana L.	Maryland meadow beauty
(xxvii) MORACEAE (Mulberry Family):	
Morus rubra L.	Red mulberry
(xxviii) NYMPHAEACEAE (Water-lily family):	
Nelumbo lutea (Willd.) Pers.	American lotus
[N. pentapetala (Walter) Fern.]	
(xxix) OLEACEAE (Olive family):	
Fraxinus profunda (Bush) Bush	
[F. tomentosa F. Michaux]	Pumpkin ash
(xxx) ONAGRACEAE (Evening-primrose family):	
Ludwigia sphaerocarpa Ell.	Globe-fruited seedbox
(xxxi) OROBANCHACEAE (Broom-rape family):	
Orobanche fasciculata Nutt.	Broomrape
(xxxii) OXALIDACEAE (Wood-sorrel family):	
Oxalis violacea L.	Violet wood sorrel
(xxxiii) POLEMONIACEAE (Phlox family):	
(A) Phlox bifida Beck.	Cleft phlox
(B) P. maculata L.	Wild sweet William
(C) Polemonium reptans L.	Jacob's ladder
(xxxiv) POLYGONACEAE (Smartweed family):	
(A) Polygonum careyi Olney	Carey's smartweed
(B) P. viviparum L.	Alpine bistort
(xxxv) RANUNCULACEAE (Crowfoot family):	
(A) Hydrastis canadensis L.	Goldenseal
(B) Ranunculus ambigens Watson	Spearwort
(C) R. cymbalaria Pursh	Seaside crowfoot
(D) R. lapponicus L.	Lapland buttercup
(E) R. macounii Britton	Macoun's buttercup
(F) R. rhomboideus Goldie	Prairie buttercup
(xxxvi) RHAMNACEAE (Buckthorn family):	
Ceanothus sanguineus Pursh	Wild lilac
(xxxvii) RUBIACEAE (Madder family):	
Galium kamtschaticum Schultes & J. H. Schultes	Bedstraw
(xxxviii) ROSACEAE (Rose family):	
(A) Dalibarda repens L.	False violet
(B) Filipendula rubra (Hill) Robinson	Queen-of-the-prairie
(C) Geum triflorum Pursh	Prairie smoke
(D) Porteranthus trifoliatus (L.) Britton	Bowman’s root
[Gillenia trifoliata (L.) Moench.]	

(E) Potentilla paradoxa Nutt.	Sand cinquefoil
(F) P. pensylvanica L.	Prairie cinquefoil
(G) Sanguisorba canadensis L.	Canadian burnet

(xxix) SALICACEAE (Willow family):

Salix planifolia Pursh	Tea-leaved willow

(xl) SARRACENIACEAE (Pitcher-plant family):

Sarracenia purpurea f. heterophylla (Eaton) Fern.	Yellow pitcher plant

(xli) SAXIFRAGACEAE (Saxifrage family):

(A) Parnassia palustris L.	Marsh grass-of-parnassus
(B) Saxifraga paniculata Miller [S. aizoön Jacq.]	Encrusted saxifrage
(C) S. tricuspidata Rottb.	Prickly saxifrage

(xliii) SCROPHULARIACEAE (Figwort family):

(A) Besseya bullii (Eaton) Rydb.	Kitten-tails
(B) Castilleja septentrionalis Lindley	Pale Indian paintbrush
(C) Collinsia parviflora Lindley	Small blue-eyed Mary
(D) Dasystoma macrophylla (Nutt.) Raf.	Mullein foxglove
(E) Euphrasia hudsoniana Fernald & Weigand	Eyebright
(F) E. nemorosa (Pers.) Wallr.	Eyebright
(G) Gratiola aurea Pursh)[G. lutea Raf.]	Hedge-hyssop
(H) G. virginiana L.	Annual hedge hyssop
(I) Penstemon calycosus Small	Beard tongue

(xliii) VALERIANACEAE (Valerian family):

(A) Valeriana edulis var. ciliata (T. & G.) Cronquest	Edible valerian
(B) Valerianella chenopodiifolia (Pursh) DC.	Goosefoot corn salad
(C) V. umbilicata (Sull.) A. W. Wood	Corn salad

(xliv) VIOLACEAE (Violet family):

(A) Viola epipsila Ledeb.	Northern marsh violet
(B) V. novae-angliae House	New England violet
(C) V. pedatifida G. Don	Prairie birdfoot violet

(xlv) VITACEAE (Grape family)

Vitis vulpina L.	Frost grape

(3) This rule does not apply to cultivated plants.

(4) The following species of plants are thought to be extirpated in Michigan, but, if rediscovered, will automatically be listed as threatened:

(a) Agropyron spicatum (Pursh) Scribner & J.G. Smith	Bluebunch wheatgrass
(b) Aristida dichotoma Michaux	Three-awned grass
(c) Asplenium montanum Willd.	Mountain spleenwort
(d) Buchnera americana L.	Bluehearts
(e) Carex decomposita Muhl.	Log sedge
(f) C gravida Bailey	Sedge
(g) C. haydenii Dewey	Hayden’s sedge

(h) Commelina erecta L.	Slender dayflower
(i) Cyperus acuminatus Torrey & Hooker Cyperus,	Nut grass
(j) Dalea purpurea Vent. [Petalostemon purpurem (Vent.) Rydb.]	purple prairie clover
(k) Dennstaedtia punctiloba (Michx.) T. Moore	Hay-scented fern
(l) Digitaria filiformis (L.) Koeler	Slender finger grass
(m) Disporum maculatum (Buckley) Britton	Nodding madarin
(n) Draba nemorosa L.	Whitlow grass
(o) Eleocharis radicans (Poiret) Kunth	Spike rush
(p) Echinacea purpurea (L.) Moench.	Purple coneflower
(q) Equisetum telmateia Ehrh.	Giant horsetail
(r) Fimbristylis puberula (Michaux) Vahl	Chestnut sedge
(s) Gentiana saponaria L.	Soapwort gentian
(t) Glyceria acutiflora Torrey	Manna grass
(u) Hedyotis nigricans (Lam.) Fosb.	Hedyotis
(v) Helianthus microcephalus Torrey & Gray	Small wood sunflower
(w) Lemna valdiviana Phil.	Pale duckweed
(x) Lespedeza procumbens Michaux	Trailing bush clover
(y) Liatris punctata Hooker	Dotted blazing star
(z) L. squarrosa (L.) Michx.	Plains blazing star
(aa) Lithospermum incisum Lehm.	Narrow-leaved puccoon
(bb) Mikania scandens (L.) Willd.	Mikania
(cc) Mimulus alatus Aiton	Winged monkey flower
(dd) Monarda didyma L.	Bee balm, Oswego tea
(ee) Muhlenbergia cuspidata (Hooker) Rydb.	Plains muhly
(ff) Onosmodium molle Michx.	Marbleweed
(gg) Phleum alpinum L.	Mountain timothy
(hh) Polygala incarnata L.	Pink milkwort
(ii) Polygonatum biflorum var. melleum (Farw.)	Ownbey Honey-flowered solomon seal
(jj) Polytaenia nuttallii DC.	Prairie parsley
(kk) Rudbeckia subtomentosa Pursh	Sweet coneflower
(ll) Scutellaria incana Biehler	Skullcap
(mm) S. ovata Hill	Forest skullcap
(nn) Senecio congestus (R. Br.) DC.	Marsh fleabane
(oo) Sisyrinchium farwellii Bickn.	Farwell's blue-eyed grass
(pp) S. hastile Bickn.	Blue-eyed grass
(qq) Tomanthera auriculata (Michaux) Raf. [Agalinas auriculata (Michaux) S. F. Blake]	Eared foxglove
(rr) Tradescantia bracteata Small.	Long-bracted spiderwort
(ss) Trillium viride Beck	Green trillium
(tt) Woodwardia areolata (L.) T. Moore	Netted chain fern

APPENDIX E

MICHIGAN GUIDELINES FOR MANAGEMENT AND LETHAL CONTROL OF WOLVES FOLLOWING CONFIRMED DEPREDATION EVENTS

Background

The eastern timber wolf or gray wolf is protected under both the federal Endangered Species Act and Michigan's Endangered Species Protection law. The U.S. Fish and Wildlife Service (USFWS) and the Michigan Department of Natural Resources (DNR), respectively, are responsible for ensuring compliance with these statutes.

During development of both Federal and State Recovery Plans, numerical recovery targets (population levels) were identified. The Federal Plan, which was approved in 1992 when there were very few wolves in Michigan, did not contain a population objective for reclassifying wolves in Michigan from endangered to threatened. The plan did specify that wolves in Wisconsin could be reclassified when the population was maintained at 80 or more wolves for three consecutive years. Unofficially, the Eastern Timber Wolf Recovery Team made the assumption that the same criteria would apply for Michigan (68 FR 15804). For federal delisting (*i.e.*, removal from the list of threatened and endangered species (50 CFR 17.11)), the number of wolves in Michigan and Wisconsin combined must be greater than 100 for five consecutive years.

The State Plan, signed by the Director of the DNR in 1997, calls for reclassification from endangered to threatened when there are more than 100 wolves in Michigan for five consecutive years (same as the Federal delisting criteria). The State delisting criteria will be met when there is a minimum sustainable population of 200 wolves in Michigan for five consecutive years. All population level recovery targets have been met except for State delisting. As of March 2003, the population in Michigan's Upper Peninsula was approximately 320 animals, and there have been greater than 200 animals in the Upper Peninsula for four consecutive years.

The USFWS published a proposed rule to reclassify wolves in Michigan from endangered to threatened on July 13, 2000 (65 FR 43450). A final rule was published on April 1, 2003 (68 FR 15804) and became effective immediately. In general, species listed as threatened retain the same protections as endangered species under the federal act. However, section 4(d) of the act allows special regulations, deemed necessary and advisable for the conservation of threatened species, to be issued. The final rule reclassifying wolves in Michigan includes a 4(d) rule allowing lethal control of depredating wolves in situations where management authorities deem these actions are warranted. A similar rule in Minnesota has played an important role in managing wolves where livestock depredation has occurred, has provided economic relief to livestock producers, and has reduced wolf/livestock conflicts.

Application of the 4(d) rule has several restrictions (68 FR 15804, page 15868)

1) Wolf depredation on lawfully present domestic animals must be verified.
2) Depredation is likely to be repeated.
3) The taking must occur within one mile of the depredation site.
4) Taking, wolf handling, and euthanizing must be carried out in a humane manner, which includes the use of steel foothold traps.
5) Young of the year trapped before August 1 must be released.
6) Lethal control can be carried out only by the DNR, USFWS, and Tribes within Michigan, or their designated agents. Personnel from U.S. Department of Agriculture-Wildlife Services (USDA-

WS) will become designated agents of the DNR through a cooperative agreement signed by the DNR Wildlife Division Chief and the State Director of USDA-WS.

7) Private citizens are not allowed to kill a wolf during or after an attack on livestock or pets. The only time citizens are allowed to kill a wolf is in defense of human life (50 CFR 17.21). The 4(d) rule applies only to wolf depredation and does not address other nuisance wolf issues (*e.g*., wolves exhibiting fearless behavior). Wolves exhibiting fearless behavior or those becoming habituated to humans and posing a non-immediate but demonstrable threat to human safety can be harassed or humanely dispatched by the USFWS, other federal land management agencies, state or tribal conservation agencies, or designated agents of any of these agencies under other regulations (50 CFR 17.21). A summary of federal regulations for taking gray wolves can be found in Appendix 1.

The USFWS defines depredation as the injury or killing of domestic animals which includes livestock (R. Refsnider, USFWS, personal communication). Livestock are defined by the Michigan Department of Agriculture (Animal Industry Act, Public Act 466 of 1988) and include, but are not limited to, cattle, sheep, new world camelids, goats, bison, privately owned cervids, ratites, swine, equine, poultry, aquaculture, and rabbits. Livestock does not include dogs and cats.

This procedure details how the State, in cooperation with its designated agents and other affected parties, will manage wolves following confirmed depredation events, including the use of lethal means of control. **However, in all cases, every MDNR employee, in consultation with their supervisors or others if so directed, has the discretion to make management decisions on a case by case basis in the exercise of his or her judgment.** This procedure will be reviewed periodically and will be revised to reflect the changing ecological and social situations impacting wolves in Michigan.

Wolf Depredation on Livestock

Verifying Wolf Depredation

Before lethal control methods can be used, DNR or USDA-WS personnel trained on depredation investigation techniques must verify depredation during a site visit. Appendix 2 outlines wolf depredation investigative criteria used successfully in Minnesota (W.J. Paul, USDA-WS, pers. comm.).

Verified wolf depredation means that the event was recorded as **confirmed** or **probable** on the *Report of Livestock Depredation* form filled out by investigating personnel. Confirmed depredation is defined as clear evidence that a wolf or wolves were responsible for the depredation, such as a carcass present with bite marks and associated hemorrhaging and wolf tracks and/or scat in the immediate vicinity. Probable depredation is defined as cases where the majority of a carcass was consumed eliminating evidence of an attack, but there is good evidence that depredation occurred, such as a kill site or blood trails with wolf tracks and/or scat in the immediate vicinity. Cases where livestock are missing and additional evidence such as a kill site is absent usually will not be considered probable depredation. The only scenario where an on-site depredation investigator might consider a "missing animal" as a probable wolf depredation would be if the investigator finds fresh wolf sign in the pasture coinciding with the time of loss and/or fresh wolf droppings containing livestock hair (with no livestock carcass dump present). Because wolf depredation must be verified before lethal control can be considered, harassment of livestock by wolves will not constitute verified depredation and lethal control will not be applied.

Depredation events are complicated to investigate, available evidence is often incomplete, and there will be varying levels of difficulty in confirming wolf kills. Whenever possible, individuals with the most experience investigating depredation incidents should conduct the site visit. However, because it is critical to initiate an investigation as soon as possible, there will be times when experienced investigators

are not available. In those instances, other personnel that have received training should travel to the site, meet with the livestock producer, and begin the investigation. However, if the evidence is not clearcut, a more experienced investigator should investigate. In all cases, the final determination will be at the discretion of the Management Unit Supervisor.

Use of Non-Lethal Means to Resolve Wolf-Livestock Conflicts

Available non-lethal methods to resolve wolf-livestock conflicts include improving animal husbandry practices, protection of livestock (*e.g*., fencing, livestock guarding animals), harassment (*e.g*., strobe light/siren devices), and translocation (trapping and relocation of depredating wolves). Non-lethal methods will be offered to livestock producers when wolves are known to be in an area where livestock are being housed or pastured, and there is a legitimate complaint that wolves are harassing, injuring or killing livestock. The legitimacy of these complaints will be evaluated in the field by DNR or USDA-WS personnel. A credible observation of wolves in an area frequented by livestock does not constitute enough of a threat to initiate the use of harassment techniques or translocation. All of these measures are detailed in the information pamphlet *How to Live With Wolves in Michigan.* This pamphlet is being developed and will be made available through the Farm Bureau, Michigan State University Extension, and the DNR.

Trapping and translocating depredating wolves is a non-lethal management option that can be used if it is verified that wolves have injured or killed livestock. All wolves trapped and relocated will be radio-collared. Unfortunately, trapping and relocating wolves has become increasingly problematic. The *Michigan Gray Wolf Recovery and Management Plan* requires selected relocation sites to be on public land in areas that will minimize the likelihood that the wolves will cause additional problems. None of the 24 wolves trapped and relocated from 5 depredation sites (1998-2002) have remained in the vicinity of the release site. Thus, the selection of a release site has no bearing on where translocated wolves will eventually settle. In addition, as the wolf population increases there are fewer suitable places to release wolves where a resident pack doesn't already exist. Also, trapping and relocating only should occur during periods of the year when ambient conditions help reduce potential for injury. Trapping during periods of extreme cold or heat may increase the potential for stress or injury. Human social factors also must be considered before relocating depredating animals. The public has expressed concern about moving depredation wolves into "their" area. There is also a widespread misconception in the Upper Peninsula that the DNR has been engaged in a wolf reintroduction project and the observation of personnel moving animals in cages or releasing animals from cages fuels that misconception.

Use of Lethal Control to Resolve Wolf Depredation on Livestock

Available lethal control methods to resolve wolf depredation on livestock include foothold traps and euthanasia, snares and euthanasia, and shooting. Wolves will be euthanized by shooting or lethal injection. Before lethal control can be considered as a management option, the first two requirements of the 4(d) rule must be met. These requirements are: (1) wolf depredation must be verified, and (2) wolf depredation is likely to be repeated. Requirements for verification of depredation have already been described. The evaluation of whether depredation is likely to occur again will be based on a field review by DNR or USDA-WS personnel, past history of depredations in the area, known pack locations and movement patterns, and consultation with Management Unit Supervisors. Once these two requirements have been met, lethal control can be used.

On farms that have suffered their first verified wolf depredation, livestock producers will be given the option of using non-lethal or lethal control techniques to be carried out by DNR or USDA-WS personnel. However, lethal control will be recommended on first time farms in the following circumstances:

1. On farms known to be frequented by a radio-collared wolf that has previously been associated (usually a translocated animal) with a depredation incident.
2. When control trapping would have to be conducted during periods of extreme cold or heat and these conditions would increase the likelihood of serious injury to a captured wolf.

Lethal control will be recommended on farms that have previously had one or more verified wolf depredations in the last five years. Non-lethal control measures usually will not be recommended on farms with chronic depredation problems.

Additional requirements for the use of lethal control include:

1. Field personnel will consult with the Management Unit Supervisor before using lethal control. Management Unit Supervisors will be responsible for the final judgment on the likelihood of repeated depredation.
2. Permission from the landowner must be obtained. This permission will be documented in writing on a standard *Landowner Permission Form* (currently under development).
3. The taking must occur within one mile of the depredation site. If lethal control is being used at a captive cervid facility, all trapping, snaring, or shooting will take place inside of the fence.
4. Snaring can be used only on the farm that suffered the depredation.
5. If trapping or shooting is going to be attempted on adjacent state, federal or commercial forest lands, the owner or managing authority must be contacted for permission, unless prior arrangements have been made.
6. Control on Tribal lands will only be done if requested by the Tribe.
7. Taking, wolf handling, and euthanizing must be carried out in a humane manner using accepted practices reviewed by DNR veterinarians.
8. Young of the year trapped before August 1 must be released near the point of capture.
9. Lactating females trapped before July 1 must be released near the point of capture unless there have been chronic depredation problems on a farm (three or more depredation events over two years). In this case, lactating females can be captured and euthanized with permission from the Management Unit Supervisor.
10. Traps and snares must be checked at least every 24 hours.
11. Snares must have a "deer stop" to prevent the loop from closing smaller than 2.5 inches.
12. Carcasses of wolves euthanized will be shipped to Rose Lake Wildlife Disease Laboratory for necropsy.
13. Disposal of carcasses and parts will follow the DNR *Disposal of Wildlife Carcasses and Parts* procedure.

Additional guidelines on the use of lethal control include:

1. Snares should be set for a non-lethal capture (*e.g*., avoid entanglement of the captured animal).
2. DNR or USDA-WS personnel are responsible for checking traps and snares. In most instances, this will be the person that set the traps or snares.
3. Radio-collared or tagged wolves will be treated as any other depredating wolf.
4. Control efforts (trapping and snaring) normally will be carried out for 10 to 15 days, however the duration of control efforts will vary and be determined by the DNR.
5. If trapping is going to be attempted on adjacent state, federal or commercial forest lands, the area should be signed to alert the public that trapping is occurring. Signs should be placed on all roads that provide access to the area being trapped. If needed, signs can also be placed every ½ mile along the roads that are being trapped.

6. On farms that suffer their first loss, control efforts will usually be stopped after two wolves have been captured.
7. Technical assistance will be provided to the extent practical to help address animal husbandry practices that may be contributing to wolf depredation. The DNR will cooperate with Michigan State University Extension (MSUE), Michigan Farm Bureau (MFB), Michigan Cattleman's Association (MCA) and other interested organizations to develop and distribute materials detailing appropriate management practices to be used on farms where wolves occur in the vicinity. It is hoped that the livestock producers will agree to a minimum set of animal husbandry standards. All technical assistance advised or given to producers prior to or after a depredation incident will be recorded.
8. Lethal control efforts will not be implemented at livestock operations or on other private lands with previous wolf depredations that fail to follow technical assistance guidelines in a timely manner. For example, it is well known that wolves will scavenge in uncovered carcass pits. If a producer continues to use an uncovered pit for livestock carcass disposal, repeated lethal control of wolves on such a farm will not occur.
9. Dogs captured at depredation sites will be turned over to the owner or local animal control officer.
10. Wolf-dog hybrids captured at depredation sites will be dispatched by DNR or USDA-WS personnel.

Wolf Depredation on Dogs

Wolf depredation on dogs will be investigated using the same techniques that are used for livestock depredations. The use of lethal control for wolf depredation on dogs is subject to the 4(d) restrictions. If wolf depredation is verified and it is likely that depredation will be repeated, lethal control can be used when wolves have killed dogs that were leashed, confined, or under the owners control on the owner's land. Lethal control will not be used when wolves kill dogs that are free-roaming, hunting, or training on public lands. Dogs used as livestock guard animals will be treated as livestock for verification and control purposes.

Documentation and Information Transfer

1. Personnel investigating a depredation complaint will fill out *Report of Livestock Depredation* form (Form R- 2566E, Rev. 12/2000). This form will be forwarded to the Management Unit Supervisor.
2. The Management Unit Supervisor will forward the form to appropriate Michigan Department of Agriculture personnel to review for indemnification payment. The Management Unit Supervisor will send copies to Lansing and Research.
3. If the Management Unit Supervisor authorizes lethal control, field personnel will obtain the landowners permission on a standard *Landowner Permission Form* (currently under development).
4. If DNR, MSUE, MFB, MCA or other organizations provide technical assistance, document that assistance and whether or not the measures were successful.
5. If trapping or shooting is going to be attempted on adjacent state, federal or commercial forestlands, the owner or managing authority must be contacted for permission, unless prior arrangements have been agreed upon. Permission can be documented by email.
6. Non-lethal and lethal control activities should be documented in detail by DNR or USDA-WS personnel. For example, time spent, miles driven, types of technical assistance, and numbers of traps set are all important factors to document.
7. If wolves are captured and euthanized, background information on the incident should be forwarded along with the animal to the Rose Lake Wildlife Disease Laboratory.

8. If wolves are euthanized during control efforts, field personnel will inform the Management Unit Supervisor as soon as possible. Management Unit Supervisors will notify the Endangered Species Program Coordinator who will notify the USFWS Law Enforcement (must be notified within 15 days) and appropriate DNR staff.

Required Training of Personnel

All DNR and USDA-WS personnel making field evaluations to determine if an incident constitutes a verified wolf depredation event will have undergone the depredation training provided by DNR Wildlife Division.

Appendix 1

Summary of Federal Regulations for Taking Gray Wolves in Michigan, April 1, 2003

Gray wolves throughout the Eastern DPS are classified as "threatened" under the federal Endangered Species Act (ESA). However, different regulations apply to these threatened wolves, depending on the location of the animals within the Eastern DPS. Special regulations for Minnesota wolves have been in effect since 1978. Special regulations for the other Midwestern states took effect on April 1, 2003. The following situations and associated regulations apply to Michigan.

Situation	Special regulations
In defense of human life	Any person can kill or injure a wolf in defense of his/her life or the life of others
A. Protecting human safety	Wolves that are a "demonstrable but nonimmediate threat to human life or safety" may be removed by FWS, other federal land management agencies, state or tribal conservation agencies, or designated agents[1] of any of these agencies
B. Aiding a sick, injured, or orphaned wolf; disposing of a dead wolf; or salvaging for scientific study	May be done by FWS, other federal land management agencies, state or tribal conservation agencies, or their agents[1]
C. Salvaging a dead wolf for traditional cultural purposes by Native American tribes	May be done by FWS, other federal land management agencies, state or tribal conservation agencies, or their agents[1]
D. Removing wolves attacking lawfully present domestic animals	May be done by employees of FWS, state or tribal natural resource management agencies, or their agents[1]
E. Taking wolves for research or conservation programs under ESA section 6 cooperative agreements	State conservation agencies which have approved section 6 cooperative agreements with FWS have full authority for such taking
F. Other forms of take may be carried our for various purposes under specific FWS permits, as authorized by 50 CFR 17.32	By various parties, if the take is for: • scientific purposes • enhancement of propagation or survival • zoological exhibition • educational purposes • incidental taking (with an HCP) special purposes consistent with ESA

[1] Personnel from U.S. Department of Agriculture-Wildlife Services (USDA-WS) will become designated agents of the DNR through a cooperative agreement signed by the DNR Wildlife Division Chief and the State Director of USDA-WS.

Appendix 2

Investigative Criteria to Differentiate Wolf Depredation from Depredation by Other Predators or Natural Mortality/Scavenging of Livestock.

The following investigative criteria were provided by William J. Paul, Assistant State Director, USDA Wildlife Services, Grand Rapids, Minnesota.

- The livestock carcass must be reasonably fresh (not more than a few days old). A determination can not be made on carcasses that are already rotted down to bare bones.
- Tracks left by wolves at kill sites are easily distinguishable from those of most other predators except large dogs.
- Wolf attacks on large livestock are characterized by bites and large ragged wounds on the hindquarters, flanks, and sometimes the upper shoulders. Attacks on young calves or sheep are characterized by bites on the throat, head, neck, back, or hind legs. Wolves and coyotes may cause extensive trauma to underlying tissues, but don't always penetrate the skin with their canines.
- Wolves usually begin feeding on the viscera and hindquarters. Much of the carcass may be eaten with large bones chewed and broken. The carcass is usually torn apart and scattered with subsequent feedings.
- Coyotes also eat the viscera and hindquarters first, but the feeding pattern is not as heavy as for a wolf. Coyotes tend to eat the meat from a carcass rather neatly leaving most of the skeleton intact in the early stages. They tend to chew just the tips of the ribs off (eat the cartilage). Coyotes (unlike wolves) may also chew the ears or nose off a calf carcass. Coyotes are an important predator on newborn and small calves up to a month old.
- Wolves and coyotes may show similar killing and feeding patterns on small livestock. Where wounds are present, the area should be skinned out so that the size and spacing of the tooth holes can be examined. Wolf canine tooth holes are about ¼ inch (0.6 cm) in diameter while those of a coyote are about 1/8 inch (0.3 cm) in diameter. Spacing of wolf canines ranges from 37.3 to 48.2 mm (n = 22) and spacing of coyote canines ranges from 22.3 to 35.8 mm (n = 30).
- Wolves are attracted to and will scavenge carcasses of livestock that have died of natural causes. It is important to distinguish between predation and scavenging. Evidence of predation includes signs of a struggle, and hemorrhaging beneath the skin in the throat, neck, back, or hindquarter area.
- Animals that have died of natural mortality do not exhibit any obvious wounds and may not be fed upon or may be fed upon very lightly. Skin out appropriate areas of the intact carcass to look for any signs of attack (not all predator bites produce canine punctures). Wolves do not kill livestock animals without feeding upon them—they also do not run animals to death where they just tip over.
- A depredation investigation should include examining all possible clues such as the presence of tracks, feeding pattern, nature of wounds, size of canine tooth holes, and possible mortality factors. Look for all of these factors before giving the livestock-producer a determination. Show the livestock producer any evidence that eliminates wolves but implicates another predator.
- Remember that at most farms in the wolf range, wolves, coyotes, and black bears are all present and could be involved in a depredation. Even at farms with chronic wolf problems, other predators such as coyotes may kill livestock or natural mortality may occur. Look at every depredation on a case-by-case basis even though the farm may have a history of wolf damage.
- Missing livestock: The only scenario where an on-site depredation investigator might consider a "missing animal" as a probable wolf depredation would be if the investigator finds fresh wolf sign in the pasture coinciding with the time of loss and/or fresh wolf droppings containing livestock hair (with no livestock carcass dump present) or a cow with a full bag and bellowing and obviously searching for a missing calf in a particular spot where wolf sign is present. These would be the only situations where physical evidence suggests an animal was killed but no carcass can be found.