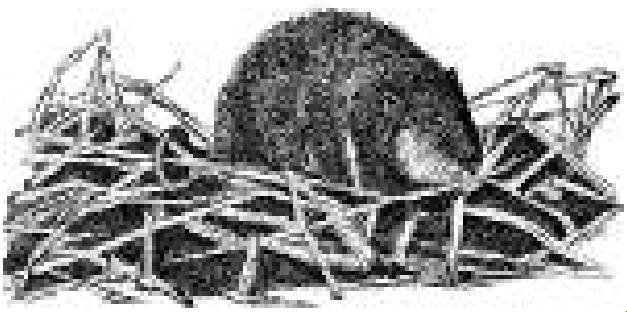
ENVIRONMENTAL ASSESSMENT

BEAVER DAMAGE MANAGEMENT TO PROTECT COLDWATER ECOSYSTEMS, FOREST RESOURCES, ROADS AND BRIDGES, SENSITIVE HABITATS AND PROPERTY IN WISCONSIN



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LIST OF ACRONYMS

AVMA	American Veterinary Medical Association
APHIS	Animal and Plant Health Inspection Service
BDM	Beaver Damage Management
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSA	Cooperative Service Agreement
CWA	Clean Water Act
CY	Calendar Year
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
GLIFWC	Great Lakes Indian Fish and Wildlife Commission
IPM	Integrated Pest Management
IWDM	Integrated Wildlife Damage Management
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	Notices of Availability
NRCS	Natural Resource Conservation Service
NWCO	Nuisance Wildlife Control Operator
NWP	Nationwide Permit
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDI	U.S. Department of Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Services
WDNR	Wisconsin Department of Natural Resources
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The United States Department of Agriculture (USDA) is authorized to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the USDA, Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program is the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended and the Act of December 1987 (101 Stat. 13290331, 7 U.S.C. 426c). WS activities are conducted in cooperation with other federal, tribal, state and local agencies; and private organizations and individuals. Federal agencies, including the United States Department of Interior (USDI), Fish and Wildlife Service (USFWS) and USDA Forest Service (USFS), recognize the expertise of WS to address wildlife damage issues related to beavers. This Environmental Assessment (EA) evaluates the environmental impacts of alternatives for WS involvement in beaver damage management in Wisconsin. The USFS, Wisconsin Department of Natural Resources, Bad River Band of Lake Superior Tribe of Chippewa Indians, the Forest County Potawatomi Community, and the Red Cliff Band of Lake Superior Chippewa were cooperating agencies in the preparation of this EA. The Great Lakes Indian Fish and Wildlife Commission and Wisconsin Division of Public Health were also consulted during preparation of the EA. Once completed, this analysis will replace a 1996 WS EA on beaver damage management in Wisconsin.

Wildlife damage management is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife. It is an integral component of wildlife management (The Wildlife Society 1992). The WS program uses an Integrated Wildlife Damage Management (IWDM) approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended in combination or sequentially to reduce wildlife damage (Directive 2.105). These methods may include cultural practices, exclusion, habitat management and behavioral modification to prevent damage. The control of wildlife damage may also require that the offending animal(s) be removed or that local populations of the damaging species are reduced through lethal methods.

WS is a cooperatively funded and service oriented program. Before any operational wildlife damage management is conducted, WS and the landowner/manager must complete a *Work Initiation Document for Wildlife Damage Management* or other comparable instruments. WS cooperates with private landowner/managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, tribal, and local laws. The WS Decision Model (Slate et al. 1992) is the thought process used by WS to develop site specific management plans which reduce damage and meet landowner/manager objectives for the site, while also minimizing potential for adverse impacts on the human environment.

Individual actions on the types of sites encompassed by this analysis may be categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). WS has decided to prepare this EA to assist in planning beaver damage management (BDM) activities, coordinate management activities with cooperating agencies and the tribes, and to clearly communicate with the public the analysis of potential cumulative impacts of alternatives for WS involvement in beaver damage in Wisconsin.

This analysis covers WS plans for current and future BDM actions wherever they might be requested in Wisconsin.

1.2 PURPOSE

The purpose of this EA is to analyze the effects of alternatives for WS involvement in the management of damage by beaver (*Castor canadensis)* in Wisconsin. Resources protected by such activities include but are not limited to: coldwater ecosystems, forest resources, roads, bridges, dikes, property, crops, other natural resources, and human health and safety. Some of the types of damage that resource owners and managers seek to alleviate are: flooding of agricultural lands, roads, and bridges, burrowing in levies and water control structures, road bed failures due to impounded water, damage to commercial timber and ornamental trees and shrubs from flooding and cutting, structural degradation of storm water ditches, loss of or damage to habitat for native wildlife and fish species, and hazards to aviation at airports.

1.3 SUMMARY OF PROPOSED ACTION

WS proposes to continue its current BDM program for the State of Wisconsin. An IWDM approach, including technical assistance and operational damage management services, would be implemented to reduce beaver damage to property, roads, bridges, railroads, agricultural and natural resources and risks to public health and safety. Damage management would be conducted on public, tribal and private property in Wisconsin where a need exists and when resource owners (property owners) or managers request WS assistance. The IWDM strategy would encompass the use of all legally-available practical and effective non-lethal and lethal methods of preventing or reducing damage while minimizing harmful effects of damage management methods on humans, target and non-target species, and the environment. Site-specific management plans would be developed using the WS Decision Model (Slate et al. 1992). When appropriate, nonlethal methods such as physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. Beavers captured in non-lethal devices (foot-hold traps, snares, cage traps, etc.) would usually be euthanized but relocation would also be possible in if authorized by the WDNR. In other situations, problem animals would be removed as humanely as possible using lethal methods including body gripping traps (e.g., Conibear-type), foot-hold traps equipped with drowning devices, snares and shooting. When appropriate, beaver dams could be removed by using binary explosives or by hand. Preference would be given to practical and effective non-lethal methods, but non-lethal method 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 instance where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State when requested on private, tribal or public property after a *Work Initiation Document for Wildlife Damage Management* or other comparable document has been completed and funding has been secured. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, tribal, state and local laws.

1.4 BEAVER ECOLOGY AND BENEFITS

1.4.1 Beaver Ecology

Beaver are the largest rodent in North America. Adult beaver weigh, on average, from 35-50 pounds, with individuals attaining weights up to 100 lbs. The beaver is physically adapted for life in an aquatic environment with webbed rear feet, a flat paddle-like tail, valvular nose and ears, lips that close behind the four large incisor teeth and dense waterproof fur (Miller and Yarrow 1994).

Beaver are found throughout North America, except for the arctic tundra, most of peninsular Florida and southwestern desert areas. The species may be locally abundant wherever suitable habitat is found (Miller and Yarrow 1994). Beaver have only a few natural predators aside from humans, including wolves, coyotes, bobcats, river otter, bears, and mink who prey on the young (Miller and Yarrow 1994).

Beaver habitat occurs almost anywhere there is a year-round source of water and an adequate food source. Due to the beaver's ability to construct dams on waterways beaver have the capacity to greatly alter the immediate landscape. Beaver modify their habitat by building dams to impound water to provide protection from predators and access to food sources. Dams are usually built with mud and sticks, but rocks, corn stalks and other available materials are also occasionally used (Miller and Yarrow 1994). Depending upon site conditions, beaver may not always build dams. Beaver reside in lodges that are constructed of mud and sticks, or in bank dens, for warmth, security and raising young (Miller and Yarrow 1994). Entrances for these structures are located underwater for security purposes. Entrances may be from a few inches to several feet below the surface. Beaver usually have at least two to three entrances to their lodges or bank dens (McNeely 1995).

Beaver are strict herbivores and feed on a variety of trees, herbaceous and aquatic vegetation. Beaver eat mainly herbaceous vegetation when available and actively growing, although leaves and the growing tips of branches may also be a large portion of the summer diet (Baker and Hill 2003). In Northern portions of the country where water freezes, beaver store woody vegetation in a food cache to feed on during winter (Payne 1989). Beaver eat the leaves, buds, twigs, non-corky bark, roots, and fruits of deciduous woody plants. Water lilies are a preferred food and in northern latitudes, and rhizomes from water lily (*Nymphaea and Nuphar* spp.) may be stored in food caches for use in winter (Baker and Hill 2003). In Wisconsin, woody species preferred by beaver are aspen (*Populus spp.)*, birch *(Betula* spp.), alder (*Alnus* spp.), ash (*Fraxinus spp*.), and willow (*Salix spp.*) (Jackson 1961).

Beavers are generally monogamous and usually have one litter a year of approximately 3-4 kits which are born fully-furred. Young beaver often remain in the colony with the adults and aid in territory defense and dam and den construction until sexually mature (approximately 2 years old) (Miller and Yarrow 1994).

1.4.2 Benefits of Beaver

Beaver have aesthetic and existence value for many individuals who enjoy native wildlife and who appreciate the behavior and construction abilities of beaver (Beavers Wetlands and Wildlife 2012, Tournay 2008, Dyan 2008, Organ and Ellingwood 2000). Beaver impoundments can provide aesthetic and recreational opportunities for wildlife observation and photography (Wade and Ramsey 1986), and have been found to improve the quality and diversity of riparian habitat, which can benefit some species of fish and wildlife and make it areas more appealing to recreational users (Finnigan 1999, Ringleman 1991, Wade and Ramsey 1986). Sociological benefits of beaver ponds also include activities such as trapping, hunting, and fishing (IDNR 2006; Lisle 2003, 1996; McNeely 1995; Hill 1976).

Beaver can provide many ecological benefits associated with the creation of wetland habitats (Fouty 2008a, b; Hood and Bayley 2008; Pollock et al. 2007; Bergman et al. 2007; Rossell et al. 2005; Wright 2002; Munther 1982). Beaver ponds increase surface and groundwater storage which can help reduce problems with flooding by slowing the downstream movement of water during high-flow events and help to mitigate the adverse impacts of drought (Fouty 2008*a*, Hey and Phillips 1995, Naiman et al. 1988, Wade and Ramsey 1986). Hood and Bayley (2008) determined that the presence of beaver can help reduce the loss of open water wetlands during warm, dry years. The presence of active beaver lodges accounted for over 80% of the variability in the amount of open water wetlands in the mixed-wood boreal region of east-central Alberta. Temperature and rainfall also influenced the amount of open-water wetlands, but to a much lesser extent than the presence of beaver. During wet and dry years, the presence of beaver was associated with a 9-fold increase in open water area over the same areas when beaver were absent. The authors note that beaver could mitigate some of the adverse impacts of global warming through their ability to create and maintain areas of open water. Beaver ponds and associated wetlands can provide a potential water source for livestock, serve as basins for the entrapment of streambed silt and eroding soil (Hill 1982), and help to filter nutrients from the water thereby maintaining the quality of nearby water systems (Arner and Hepp 1989).

Beaver may increase habitat diversity by opening forest habitats via dam building and tree cutting which results in a greater mix of plant species, and different-aged plant communities (Hill 1982, Arner and Hepp 1989). Creation of standing water, edge habitat, and plant diversity, all in close proximity, results in excellent habitat for many wildlife species (Jenkins and Busher 1979, Arner and DuBose 1982, Hill 1982, Arner and Hepp 1989, Medin and Clary 1990, Medin and Clary 1991). The wetland habitat associated with beaver ponds is beneficial to some warm water fish species, reptiles, amphibians, waterfowl, shorebirds, and furbearers such as muskrats, otter, and mink (Arner and DuBose 1982, Naimen et al. 1986, Miller and Yarrow 1994). In Mississippi, beaver ponds over three years in age were found to have developed plant communities valuable as nesting and brood rearing habitat for wood ducks (Arner and DuBose 1982). Reese and Hair (1976) found that beaver pond habitats were highly attractive to a large number of birds year-round and that the value of beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). Beaver ponds are also beneficial to some threatened and endangered (T&E) species. The United States Fish and Wildlife Service (USFWS) estimates that up to 43% of T&E species rely directly or indirectly on wetlands for their survival (Environmental Protection Agency (EPA) 1995).

1.5 WISCONSIN ATTITUDES TOWARDS BEAVER DAMAGE

A Beaver Management Survey was conducted in Wisconsin in 2011 by a multi-agency Beaver Task Force in order to gauge public opinion to assist in the development of a Beaver Management Plan. The survey was open to anyone with interest in beaver management. A total of 571 respondents represented a number of interests including interested citizens (47%), trout anglers (46%), landowners (36%) or trappers (35%). Among trappers, acknowledgement of beaver damage to trout streams as a common problem was substantial (61%). Among the entire group, a majority (68%) found the level of all beaver damage to be acceptable though they were accepting of beaver removal on trout streams (58%) and a majority (54%) also felt that beaver populations were, to varying extents, damaging to trout populations. They further strongly supported beaver removal on class 1 trout streams (68%) and more supported beaver removal on Class 2 trout streams (46%) than opposed (39%) (Wisconsin Department of Natural Resources (WDNR), unpublished data).

WDNR Bureau of Fisheries Management also recently conducted several surveys of trout management practices including beaver removal for protection of trout stream habitat. The first was an on-line survey open to anyone, although the questions were directed at trout anglers. Over 1,500 people responded. As to fishing trout streams with beaver dams on them, 39% preferred not to fish these streams, another 38% said they sometimes fished these streams, 19% said this factor did not concern them or they were unsure, while 4.5% preferred to fish streams with beaver dams present. Conversely, when asked about fishing on trout streams where beaver dams had been removed, 24% preferred to fish this type of stream, 43% sometimes fished this type of stream, 25 % were not concerned with this factor or were unsure while 8% preferred not to fish this type of stream. This survey indicates that considerably more trout anglers strongly support beaver dam removal on trout streams than oppose it, but there is a significant portion of anglers who are unconcerned or at least are willing fish streams with or without beaver dams (WDNR, unpublished data).

Role of Beaver in Wisconsin Native American Culture

To many Native American cultures, the beaver is held in high esteem as a sacred being; an innovative builder and an inspiration of wisdom and resourcefulness. In Algonquin society (including the Potawatomi), the beaver is the Spirit Keeper of the East whose wisdom helps man master his relationship with the environment (Stricker and Lambrecht 2010). To the Potawatomi, the A'mek or Mek (beaver) is an important Clan Animal that to this day still represents strong family bonds and family groups. Much of Potawatomi spiritual and religious life was and is organized around the clans. Each clan has a series of oral traditions, medicines, and ceremonies specific to the clan. The beaver is also represented in the Potawatomi creation story. Further, the Potawatomi depended heavily on beaver for food, and their pelts as a commodity and means for trade with early French settlers. The pelts are still highly valued for use in traditional artwork and pow-wow regalia and the meat is still used in traditional recipes.

The Ojibwe or Anishinabe continue to recall the efforts of Amik (beaver) from ancient stories that originate during the time of the first cleansing of the Earth. Amik is also recognized as a Clan in the traditional system of Anishinabe governance, and during the creation of Long Island in Chequamegon Bay and the Apostle Islands (Edith Leoso/John Gilbert, GLIFWC, personal communication). Amik pelts are used in current cultural practices of the Midewiwin Society and several Amik pelts are still in the possession of museums and other institutes subject to repatriation by Tribes under the Native American Graves Protection Act. (Edith Leoso, personal

communication). Beavers are trapped both on-reservation and off-reservation on public lands. This cultural practice not only provides both pelts and other items for ceremonial use, but provides income to some who sell the pelts (J. Gilbert, GLIFWC, personal communication).

1.6 NEED FOR ACTION

1.6.1 Beaver Damage and Conflicts

Property Damage

Most of the damage caused by beaver is a result of dam building, bank burrowing, tree cutting and girdling, obstructing overflow structures and spillways, and flooding. Some cases of beaver damage include flooded state highways, reservoir dams destroyed or weakened by bank dens and burrows, and train derailments due to track damage resulting from continued flooding and burrowing (Miller and Yarrow 1994). Housing developments also have been threatened by flooding and small bridges have been destroyed because of beaver dam construction. Miller (1983) estimated the annual damage in the United States was $75-$100 million. Economic damage was estimated to have exceeded $4 billion in the southeastern United States over a 40-year period (Arner and Dubose 1979). In some southeastern States, losses from beaver damage have been estimated from $3 to 5 million annually (Miller and Yarrow 1994), with timber losses being reported as the most common type of damage (Hill 1982). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost due to beaver activity (Miller and Yarrow 1994).

Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986). Additionally, roads and railroads beds may be damaged by saturation from beaver flooding or by beaver burrowing. Consequently, roadbed and railroad bed safety and integrity are compromised.

Beaver also cause an assortment of other damage such as: flooding of croplands, pastures, and timberlands, feeding on crops such as corn, soybeans, sorghum, etc., and interfering with irrigation systems and water level control structures (Hill 1982, Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). Beaver have been documented damaging fiber optic cables by gnawing (Unpub. data, South Carolina WS)

Health and Safety

Increased water levels in urban areas resulting from beaver activity can lead to unsanitary conditions and potential health problems by flooding septic systems and sewage treatment facilities (DeAlmeida 1987, Loeb 1994). Although increases in the water table which may result from beaver ponds are desirable in some areas, in others, the increase in water table has resulted in malfunctioning septic systems.

Beaver ponds provide conditions favorable to some types of mosquitoes and can hinder mosquito control efforts or result in increases in insect populations (Wade and Ramsey 1986). While the presence of these insects is largely a nuisance, mosquitoes can transmit diseases, such as encephalitis (Mallis 1982) caused by viruses such as West Nile virus or Eastern Equine Encephalitis virus. Beaver are one of the species which can carry the intestinal parasite *Giardia lamblia*, and beaver feces can contaminate human water supplies and cause outbreaks of the disease giardiasis in humans (Fayer et al. 2006, Sulaiman et al. 2003, Appelbee et al. 2002, Beach and McCulloch 1985)[1]. Beaver also are known carriers of tularemia, a bacterial disease that is transmittable to humans through bites by insects or infected animals or by handling animals or carcasses which are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle-ranching sections of Wyoming, the fecal bacterial count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationalists. On rare occasions, beaver may contract the rabies virus and attack humans. In February 1999, a beaver attacked and wounded a dog and chased children that were playing near a stream in Vienna, Virginia. Approximately a week later, a beaver was found dead at the site and tested positive for rabies. In August 2012, a Boy Scout leader that was swimming in the Delaware River, in Pennsylvania and was bitten multiple times by a beaver. The animal was subsequently euthanized and tested positive for rabies (Feldman 2012).

Adverse Impacts on Natural Resources

As discussed above, beaver ponds provide many ecological benefits, but beaver activities can also negatively impact critical habitat types (e.g. free-flowing water, spring ponds, old growth forests, riparian areas, and bird roosting and nesting areas) which are important to wildlife species, including certain species of fish and mussels, which are dependent upon clear, cool and/or fast moving water and plant species that cannot tolerate flooded conditions. Sediment accumulates behind beaver dams which can negatively impact some species that depend on clear water and gravel stream bottoms. For example, the Louisiana WS program has conducted beaver damage management activities to protect the Louisiana pearlshell (*Margaritifera hembeli*), which requires clear, free-flowing water to survive (D. LeBlanc, USDA/APHIS/WS, personal communication). As early as 1937 the United States Forest Service in Wisconsin reported beaver damage to trout streams, hay meadows, and cedar swamps.

Negative impacts to coldwater fisheries habitat from beaver have been a concern of Wisconsin fisheries managers and some segments of the public since at least 1950 when a

1 Although the term "beaver fever" is used to refer to giardiasis, as Erlandsen et al. (1996) noted, beaver are not the only source for *Giardia* contamination. Other wildlife species such as muskrats, voles and wading birds can have higher rates of infection with *Giardia* than those observed in beaver (Trout et al. 2005, Dunlap and Theis 2002, Heitman et al. 2002). Contamination with human waste or runoff from livestock facilities can also be a significant source of *Giardia* contamination (Heitman et al. 2002, Erlandsen and Bemrick 1988, Erlandsen 1993, Suck et al. 1987).

Wisconsin Conservation Department beaver-trout committee was formed. Beaver impacts on trout habitat have been a major concern of the Wisconsin Department of Natural Resources and the general public since as early as 1950. Patterson (1951) found beaver impoundments in the Peshtigo River Watershed caused significant negative impacts to trout habitat by raising water temperatures, destroying immediate bank cover, changing water and soil conditions, and causing silt accumulations in spawning areas. Studies from other areas also document negative impacts of beaver impoundments on trout habitat (Sayler 1935, Cook 1940, Sprules 1940, Bailey and Stevens 1951). The WDNR guidelines for management of trout stream habitat stated that beaver dams are a major source of damage to trout streams (White and Brynildson 1967, Churchill 1980). More recent studies have documented improvements to trout habitat upon removal of beaver dams. Avery (1992) found wild brook trout populations in tributaries to the north branch of the Pemebonwon River in northeastern Wisconsin improved significantly following the removal of beaver dams. Species abundance, species distribution, and total biomass of non-salmonids also increased following the removal of beaver dams (Avery 1992). In an evaluation of nine different habitat development techniques applied to Wisconsin trout streams, 1985-2000, Avery (2004) determined that beaver dam removal resulted in a high degree of success and is the most cost effective tool for habitat improvement in the northern half of the state. In 2000, summer water temperatures in the 7 tributaries to the Pemonee River were significantly cooler than in 1982 as were water temperatures in the Pemonee River, despite the fact that 2000 was a warmer, dryer summer (Avery 2002). Brook trout populations in all 7 tributaries were significantly higher than in 1982 as were populations in the Pemonee River. Brook trout populations in the Pemonee River exceeded those in 1982 by 67% in the spring and 27% in the fall. Abundance of harvestable brook trout, angler harvest and average size of trout in creel surveys also exceeded 1982 levels. Abundance of mottled sculpin (*Cottus bairdi*), another species intolerant of warm water, also increased.

1.6.2 Beaver Management in Wisconsin

Beaver populations in Wisconsin have exhibited a pattern of exploitation followed by strict protection and subsequent growth common to many states and Canadian provinces. Overharvest and habitat alterations resulted in the near extirpation of beaver from Wisconsin by 1900 (Jackson 1961). Beginning in the early 1900s, strict government regulation protected beaver populations (Jackson 1961). Beaver harvest was not permitted in Wisconsin from 1903 through 1933 (Knudsen 1963). The period of strict protection coincided with an increase of habitat favorable to beaver, including the growth of aspen - birch (Populus - *Betula* sp.) forests in areas which had been logged. Shade intolerant, pioneer forest types, such as aspen can support substantially higher beaver populations than other food sources (Huey 1965, Hay 1958, Ingle-Sidorowicz). As a result of protection from trapping and favorable habitat conditions, beaver populations began a steady increase and range expansion (Knusden 1959) that continued into the early 1990s.

As with many other areas in North America, expansion of the Wisconsin beaver population has resulted in conflicts between beaver and humans (Novak 1987). Increased beaver complaints documented between 1946 and 1986, included damage to roads, timber, railroads, cold water ecosystems (including trout habitat), and property. To address the burgeoning beaver damage complaints and increasing demand for more effective beaver damage management, a multi- program beaver management task force was formed within WDNR in 1989. The task force also included a representative from

the Great Lakes Indian Fish and Wildlife Commission (GLIFWC). The goal of the task force was to develop a statewide Beaver Management Plan (BMP) that considered the need for effective damage management while also recognizing the beneficial impacts of beaver. The plan was released in 1990. The plan provided an integrated management approach to BDM, and recognized the beneficial aspects of beaver and beaver impoundments as well as the detrimental effects.

The BMP established four beaver management zones in the state (Figure 1-2). The BMP identified Zone B (northeast Wisconsin) as the area experiencing the highest level of beaver damage including adverse impacts on trout habitat. The BMP's stated primary goal for Zone B was damage control with beaver population reduction identified as necessary to achieve the management goal. Beaver management Zone A was also identified as having significant beaver damage problems. However, the WDNR concluded that this zone did not need the intensive management effort and liberalized harvest seasons needed for Zone B, in part, because Zone A had the highest number of licensed beaver trappers in the state, which helped reduce beaver conflicts in this management zone. The goal for Zone A was site-specific damage management. In Zone C, most of southern and central Wisconsin, there were fewer problems with beaver at the time the plan was developed. In Zone C, greater emphasis was placed on tolerance for beaver because of the importance of beaver impoundments in the creation of valuable waterfowl habitat in the northern and eastern portions of Zone C. Zone D is a narrow area along the Mississippi River that extends from the southern border to central Wisconsin. Conflicts with beaver were minimal at the time the plan was developed and beaver impoundments created valuable waterfowl habitat in this zone as well. The trapping season in this area starts after the waterfowl hunting seasons to avoid conflicts between trappers and waterfowl hunters.

WDNR developed and tested a beaver population helicopter survey in the winter of 1990-92 capable of estimating regional beaver populations with a degree of accuracy of ± 20% (Fig. 1-1). Due to differences in methodology population estimates from the surveys in 1992 and 1995 cannot be accurately compared to surveys beginning in 1998. The 1992 and 1995 estimates are likely higher than they would have been if the survey protocol begun in 1998 had been used (David McFarland, personal communication). Due to the inconsistencies between survey designs the apparent population decline between 1995 and 1998 may not have occurred. Many factors impact beaver populations. Fluctuations and changes in population estimates between 1998 and 2011 are likely due to variability of fur trapper harvest, implementation of the 1990 BMP, changes in habitat (forest type changes as well as rainfall fluctuations), and other factors.

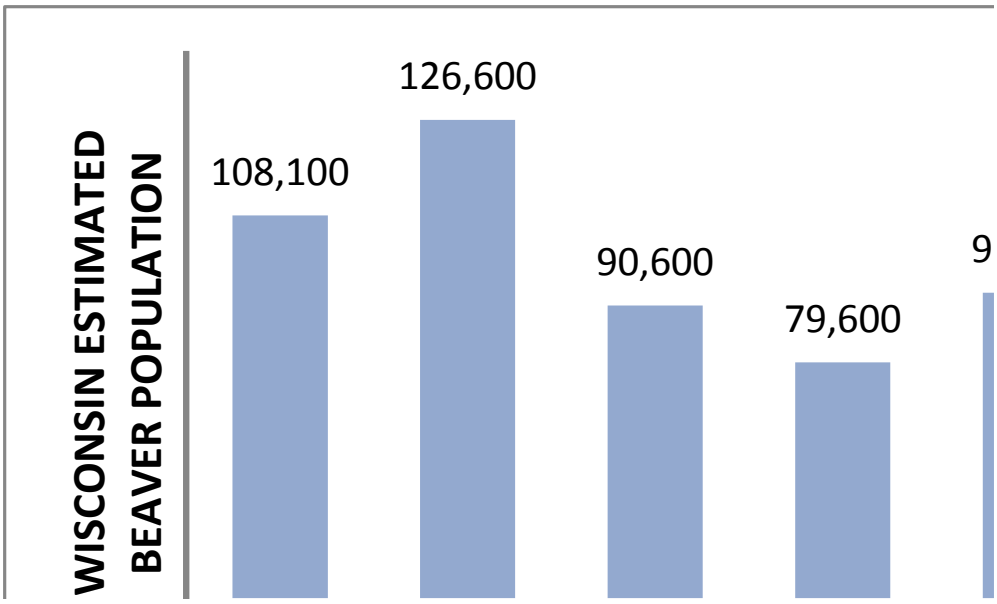

Figure 1.1. Wisconsin estimated beaver population. Survey protocols used in 1992 and 1995 may have yielded higher population estimates than protocols used from 1998-2011.

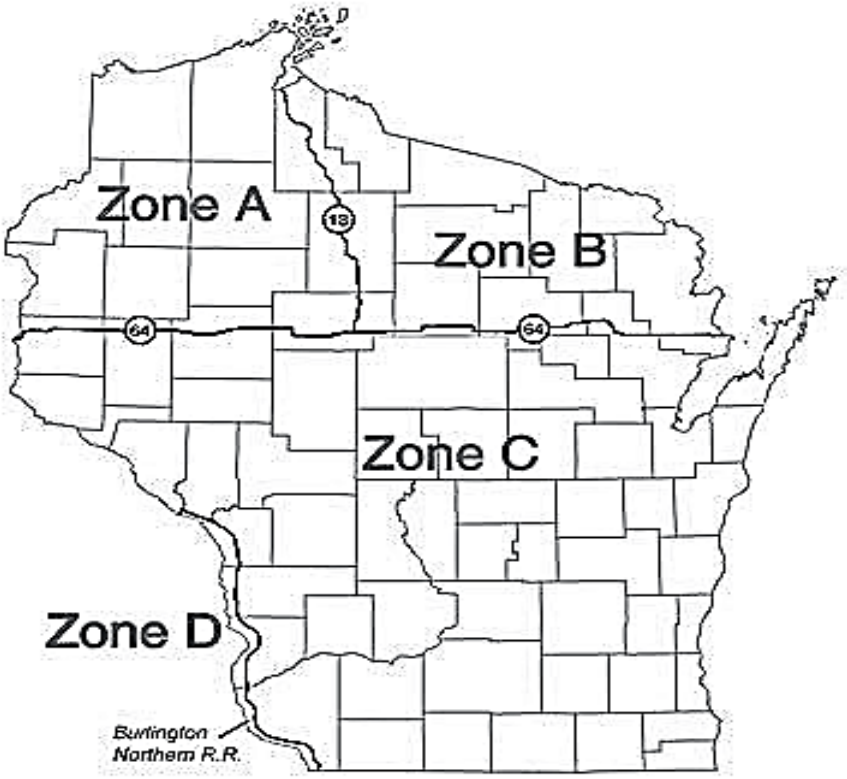

Figure 1-2. Wisconsin Department of Natural Resources Beaver Management Zones (WDNR 1992).

1.6.3 The Wisconsin WS Beaver Damage Management Program

The need for action in Wisconsin is based on beaver damage to: 1) coldwater fisheries, 2) natural resources, including forests and wild rice, 3) roads, bridges, and railroads, 4) other property (such as ornamental trees) and 5) risks to public health and safety (Table 1.3). Beaver populations can have a negative economic impact throughout the state. State agencies in Wisconsin provide little to no direct assistance to landowners with beaver damage management due to time and funding constraints and a lack of expertise. Non-government trappers may also provide varying degrees of services to alleviate beaver damage in local situations. However, in the past the WDNR attempted to manage beaver conflicts in a variety of ways, many of which supported non-government trappers, such as extended seasons, elimination of bag limits, trapper contracts and subsidy payments. These efforts had only limited success in adequately and consistent resolving damage problems, particularly in regards to protection of coldwater ecosystems.

WS records beaver damage by type of resource damaged and, when available, the dollar value of damage caused. Damage reported by complainants as well as damage verified by WS staff is recorded. Table 1.1 shows combined reported and verified beaver damage recorded by WS, FY 2009 – 2011. Some resources protected by WS BDM, such as spring ponds or old growth forest sites, cannot be assigned a meaningful monetary value. It is estimated that during 2009 -2011, the Wisconsin USDA Wildlife Services program annually protected approximately 8 million dollars' worth of resources. The top three resources protected with associated annual values include; timber (4 million), cold water ecosystems / trout habitat (2.5 million), and roads / bridges (1.1 million; unpublished data).

Table 1.1 Monetary value of beaver damage in Wisconsin by damage type, FY 2009- 2011, documented by WS (includes damage confirmed by WS and damage reported by cooperators). This data does not include loss estimates from landowner/managers who handle beaver problems on their own (Wildlife Services MIS data).

	Trout Habitat/Sensitive Habitats	Forest Resources	Roads/Bridges	Dikes/Dams	Property (other)	Crops/Pasture
2009	53,000	13,500	588,550	59,500	400	3,500
2010	0	11,000	1,543,000	46,500	0	0
2011	4,000	7,000	1,686,500	83,000	0	0
Total	57,000	31,500	3,818,050	189,000	400	3,500

1.7 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER DOCUMENTS

WS Programmatic EIS
WS issued a Final Environmental Impact Statement on the national APHIS/WS program (formerly Animal Damage Control; USDA 1997 Revised). Pertinent information available in the EIS has been referenced in this EA.

Environmental Assessment (EA): Beaver Damage Management to Protect Wildlife Habitat, Forest Resources, and Property in Wisconsin.
On September 10, 1996, The Wisconsin WS program completed an Environmental Assessment on alternatives for WS involvement in beaver damage management in the state. Once completed, this EA and associated decision will replace the 1996 EA.

The Wisconsin Beaver Management Plan (BMP).
Complaints about beaver damage and the need to maintain healthy beaver populations prompted the WDNR to develop a comprehensive Beaver Management Plan (BMP) which was finalized in 1990. The plan provided an integrated management approach to BDM, and recognized the beneficial aspects of beaver and beaver impoundments as well as the detrimental effects. The BMP has provided an effective and consistent framework for reducing conflicts caused by previously high populations of beaver. Facets of the BMP intended to promote more effective beaver population management include the establishment of beaver management zones, beaver population monitoring, more liberal regulations regarding the take of problem beaver, removal of dams by landowners, a beaver harvest subsidy, and more liberal fur harvest seasons in some beaver management zones (Section 1.6.2).

A new Wisconsin Beaver Task force was established during 2011. The charge of the group was to evaluate the current BMP and to update or develop an entirely new Beaver Management Plan. A final plan is anticipated to be completed sometime in 2013.

1.8 DECISION TO BE MADE

This EA evaluates the environmental impacts of alternatives for WS involvement in beaver damage management in Wisconsin. Based on agency relationships, Memorandum of Understanding (MOUs), and legislative authorities, WS is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. Wildlife management is a complex issue requiring coordination among state and federal agencies and the tribes. The USFS, Wisconsin Department of Natural Resources, Bad River Band of Lake Superior Tribe of Chippewa Indians, the Forest County Potawatomi Community, and the Red Cliff Band of Lake Superior Chippewa were cooperating agencies in the preparation of this EA. The Great Lakes Indian Fish and Wildlife Commission and Wisconsin Division of Public Health were also consulted during preparation of the EA. The WDNR provides for the control, management, restoration, conservation, and regulation of birds, game and all other wildlife resources for the state of Wisconsin. The USFS has responsibility for management of natural resources in lands under their jurisdiction. The Wisconsin Department of Public Health has technical expertise on diseases in wildlife transmissible to humans.

The Bad River Band of Lake Superior Tribe of Chippewa Indians, the Forest County Potawatomi Community, and the Red Cliff Band of Lake Superior Chippewa have management authority for natural resources on tribal lands. In accordance with applicable treaties, the Bad River Band of

Lake Superior Tribe of Chippewa Indians and the Red Cliff Band of Lake Superior Chippewa also have the right to hunt, fish, and gather in the ceded territories. The GLIFWC is an agency of 11 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.

Based on the scope of the EA, the lead, cooperating and consulting agencies worked together to address the following questions in the EA:

- Should BDM as currently implemented by the WS program be continued in Wisconsin?
- If not, how can WS best respond to the need to reduce beaver damage in Wisconsin?
- What are the potential impacts of the alternatives for addressing beaver damage?
- Do the alternatives have significant impacts meriting an Environmental Impact Statement (EIS)?

1.9 SCOPE OF THE ENVIRONMENTAL ANALYSIS

1.9.1 Actions Analyzed This EA evaluates beaver damage management by WS to protect property, agriculture, natural resources, and human health and safety throughout Wisconsin wherever such management is requested from the WS program.

1.9.2 Period for Which this EA is Valid If it is determined that an EIS is not required, this EA will remain valid until WS determines that new needs for action, new alternatives having different environmental effects, or changes in environmental conditions must be analyzed. At that time, this analysis will be revised as necessary. This EA will be reviewed each year to determine if the impacts of WS BDM activities are consistent with the impacts presented in this analysis.

1.9.3 Native American Lands and Tribes The WS program does not conduct beaver damage management actions on tribal lands without the consent of the Tribe. Currently WS has a program-wide MOU with the Forest County Potawatomi Community. WS also has a recurring Cooperative Service Agreement (CSA) with the Sokaogan Chippewa Community for a beaver damage management program focused on the restoration and protection of coldwater fisheries habitat and wild rice beds and a recurring CSA with GLIFWC for the restoration and protection of wild rice beds in ceded territory. The Bad River Band has also worked with APHIS-WS on beaver damage management. Work has been conducted on Graveyard Creek for Brook Trout Habitat restoration and this past year for an area where beavers were causing flooding near a highway. This EA analyzes the potential impacts of WS BDM to Tribal resources including ceded territory resources co-operatively managed by the state of Wisconsin and the Wisconsin Tribes included in the Voigt Decision.

1.9.4 Site Specificity This EA analyzes the potential impacts of WS' BDM activities on all lands in Wisconsin where WS is currently or has been requested to provide assistance. It also addresses the impacts of BDM activities on areas where WS may work in the future. This EA anticipates the potential expansion of WS activities and analyzes the impacts of such efforts.

Planning for BDM must be viewed as being 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 BDM will occur can be predicted, most 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 beaver 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 Wisconsin (*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 analysis area. In this way, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.9.5 Public Involvement/Notification. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and the associated Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. All comments received during the public review period for this EA will be fully considered and, where appropriate, incorporated into the analysis and final Decision.

1.10 AUTHORITY AND COMPLIANCE

1.10.1 Authority of Federal and State Agencies in Wildlife Damage Management within the State of Wisconsin

WS Legislative Authority

WS is the federal program authorized by law to reduce damage caused by wildlife (the Act of March 2, 1931 (46 Stat. 1468; 7 U.S.C. 426-426b) as amended and the Act of December 1987 (101 Stat. 1329-331, 7 U.S.C. 426c).

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." 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's Policy Manual reflects the program mission and provides guidance for engaging in wildlife damage management through:*

- Training wildlife damage management professionals;

• Developing and improving strategies to reduce losses and threats to humans from wildlife;
• Collecting, evaluating, and disseminating management information;
• Informing and educating the public on how to reduce wildlife damage;
• Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

U.S. Fish and Wildlife Service (USFWS)
The USFWS is charged with implementation and enforcement of the ESA of 1973, as amended and with developing recovery plans for listed species. The U. S. Fish and Wildlife Service's authority for action is also based on the Migratory Bird Treaty Act of 1918 (as amended), which implements treaties with the United States, Great Britain (for Canada), the United Mexican States, Japan, and the Soviet Union for the conservation of migratory birds.

Wisconsin Department of Natural Resources (WDNR)
The WDNR, under the direction of the Governor appointed Natural Resources Board (NRB), is specifically charged by the state Legislature with the management of the State's wildlife resources. Although many legal mandates of the NRB and the Department are expressed throughout the Administrative Code of Wisconsin, the primary statutory authorities include establishment of a system to protect, develop and use the forest, fish and game, lakes, streams, plant life, flowers, and other outdoor resources of the state (s. 23.09 Wis. Stats.) and law enforcement authorities (s.29.001 and s. 29.921 Wis. Stats). The NRB adopted mission statements to help clarify and interpret the role of WDNR in managing natural resources in Wisconsin. They are:

- To protect and enhance our natural resources: our air, land and water; our wildlife, fish and forests and the ecosystems that sustain all life.
- To provide a healthy sustainable environment and a full range of outdoor opportunities.
- To ensure the right of all people to use and enjoy these resources in their work and leisure.
- To work with people to understand each other's views and carry out the public will. And in this partnership consider the future and generations to follow.

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. It exercises powers delegated by its member tribes. GLIFWC assists its member bands 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; 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. The Voigt Intertribal Task Force 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.

Federally Recognized Native American Tribes in Wisconsin.
The federally recognized Native American tribes in Wisconsin at the time this EA was completed include the Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Forest County Potawatomi Community, Ho-Chunk Nation of Wisconsin, Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin, Lac du Flambeau Band of Lake Superior Chippewa Indians of the Lac du Flambeau Reservation of Wisconsin, Oneida Tribe of Indians in Wisconsin, Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin, Sokaogon Chippewa Community, St. Croix Chippewa Indians of Wisconsin, Stockbridge Munsee Community, and the Menominee Indian Tribe of Wisconsin. Tribes have management authority for Natural Resources on Reservation lands.

Natural Resource Conservation Service (NRCS)
NRCS is responsible for certifying wetlands under the Wetland Conservation provisions of the Food Security Act (16 U.S.C. 3821 and 3822). Topographic maps are available through their offices that identify the presence of wetlands.

U.S. Army Corps of Engineers (USACE)
The USACE regulates and permits activities regarding waters of the United States including their protection and utilization under Section 404 of the Clean Water Act.

Environmental Protection Agency (EPA)
EPA is responsible for implementing and enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) which regulates the registration and use of pesticides. The EPA is also responsible for administering and enforcing the Section 404 program of the Clean Water Act with the USACE; which established a permit program for the review and approval of water quality standards that directly impact wetlands.

1.10.2 COMPLIANCE WITH FEDERAL LAWS

Several other federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act (NEPA)
All federal actions are subject to NEPA (Public Law 91-190, 42 U.S.C. 4321 et seq.). WS follows the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500 et seq.), USDA NEPA implementing regulations (7 CFR 1b), and the APHIS Implementing Procedures (7 CFR 372) as a part of the decision-making process. NEPA sets forth the requirement that federal actions with the potential to significantly affect the human environment be evaluated in terms of their impacts for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. Federal activities affecting the physical and biological environment are regulated, in part, by CEQ through regulations in Title 40, Code of Federal Regulations, Parts 1500-1508. In accordance with CEQ and USDA regulations, APHIS NEPA Procedures, as published in the Federal Register (44 CFR 50381-50384) provide guidance to APHIS regarding the NEPA process.

Pursuant to NEPA and CEQ regulations, this EA documents the analysis of a proposed federal action's impact, informs decision-makers and the public of reasonable alternatives, and serves as a decision-aiding mechanism to ensure that the policies and goals of NEPA are infused into federal agency planning and decision making. An EA is prepared by integrating as many of the natural and social sciences as may be warranted based on the potential effects of the proposed action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

Endangered Species Act (ESA)
It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2 I). WS conducts Section 7 consultations with the USFWS to use their expertise 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)). WS obtained a Biological Opinion (B.O.) from USFWS for the National WS Program in 1992 describing potential effects on T&E species and prescribing reasonable and prudent measures for minimizing risks to T&E species (USDA 1997 Revised, Appendix F). Wisconsin WS also consulted with the USFWS regarding the potential risks of BDM techniques to T&E species in Wisconsin. (USFWS October 31, 2012 ESA Section 7 Consultation letter, APHIS Integrated Beaver Damage Management Program, Wisconsin.)

National Historic Preservation Act (NHPA) of 1966 as amended
The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that have the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (i.e. State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS 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.

The BDM methods described in this EA that might be used operationally by WS will not result in changes in the character or use of historic properties. WS services are provided at the request of the owner or manager. WS actions do not involve the sale, lease, or transfer of ownership of any property. In general, WS methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

There is potential for audible effects on the use and enjoyment of a historic property when methods such firearms, explosives, or other noise-making methods are used at or in close proximity to such sites for purposes of removing beavers or beaver dams. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to benefit the historic property. A built-in mitigating factor for this issue is that virtually all of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. In some situations it may also be possible to schedule these activities at times when impact would be minimized. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

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. It is a priority within APHIS and WS. 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. WS 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.

Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)
Children may suffer disproportionately from environmental health and safety risks for many reasons. Wildlife damage management as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

Executive Order 13112 – Invasive Species
This Executive Order directs federal agencies to use their programs and authorities to prevent the spread of or to control populations of invasive species that cause economic or environmental harm, or harm to human health. To comply with Executive Order 13112, WS may utilize protocols that address the spread of invasive aquatic plants and organisms between water bodies.

The Clean Water Act (CWA; 33 U.S.C. 1344)
The CWA provides regulatory authority and guidelines for the EPA and the U.S. Army Corps of Engineers related to wetlands. Several Sections of the CWA pertain to regulating effects to wetlands. Section 101 specifies the objectives of this Act, which are implemented largely through Subchapter III (Standards and Enforcement), Section 301 (Prohibitions). The discharge of dredged or fill material into water of the United States is subject to permitting specified under Subchapter IV (Permits and Licenses of this Act). Section 401 (Certification) specifies additional regulatory authorities when wetlands exist in proximity to proposed activities or when such activities might impact wetland areas. Such consultations are designed to determine if any wetland will be affected by proposed actions.

Section 404 (33 USC 1344) of the CWA prohibits the discharge of dredged or fill material into waters of the United States without a permit from the USACE unless the specific activity is exempted in 33 CFR 323 or covered by a Nationwide Permit in 33 CFR 330. Breaching of most beaver dams is covered by these regulations (33 CFR 323 and 330).

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing FIFRA. All chemical methods integrated into the Wisconsin WS program are registered with and regulated by the EPA and Wisconsin Department of Agriculture Trade and Consumer Protection. All chemical methods used by WS would be in compliance with labeling procedures and requirements.

Food Security Act
The Wetland Conservation provision (Swampbuster) of the 1985 (16 USC 3801-3862), 1990 (as amended by PL 101-624), and 1996 (as amended by PL 104-127) farm bills require all agricultural producers to protect wetlands on the farms they own. Wetlands converted to farmland prior to December 23, 1985 are not subject to wetland compliance provisions even if wetland conditions return as a result of lack of maintenance or management. If prior converted cropland is not planted to an agricultural commodity (crops, native and improved pastures, rangeland, tree farms, and livestock production) for more than 5 consecutive years and wetland characteristics return, the cropland is considered abandoned. Once cropland is considered abandoned, the cropland becomes a wetland subject to regulations under Swampbuster and Section 404 of the CWA. The

Natural Resource Conservation Service (NRCS) is responsible for certifying wetland determinations according to this Act.

Coastal Zone Management Act of 1972, as amended
This law established a voluntary national program within the Department of Commerce to encourage coastal states to develop and implement coastal zone management plans. Funds were authorized for cost-sharing grants to states to develop their programs. Subsequent to federal approval of their plans, grants would be awarded for implementation purposes. In order to be eligible for federal approval, each state's plan was required to define boundaries of the coastal zone, to identify uses of the area to be regulated by the state, the mechanism (criteria, standards or regulations) for controlling such uses, and broad guidelines for priorities of uses within the coastal zone. In addition, this law established a system of criteria and standards for requiring that federal actions be conducted in a manner consistent with the federally approved plan. The standard for determining consistency varied depending on whether the federal action involved a permit, license, financial assistance, or a federally-authorized activity. Wildlife Services is consulting with the Wisconsin Department of State regarding the consistency of the proposed MDM program with the state coastal management plan.

1.10.3 COMPLIANCE WITH STATE LAWS

Removal of Wild Animals and Authorization to Remove Wild Animals Causing Damage or Nuisance.
Wisconsin regulations (Wis. Stat. 29.885) grants WDNR the authority to authorize the removal of wild animals causing damage or a nuisance. WDNR Code (WAC, Natural Resources (NR) 12.10) is established to administer Wisconsin regulations relating to the removal of wild animals causing damage or nuisance. This administrative rule defines criteria whereby landowner, lessees, or occupants may remove from lands under their control wild animals constituting a nuisance. WS assistance to those requesting assistance in reducing beaver damage, which could involve the removal of beaver, would be conducted under authority granted to WS, or landowners, lessees, or occupants, by the WDNR.

This statute also stipulates that a person who owns, leases or occupies property on which a beaver or a beaver structure is causing damage and who fails or refuses to give consent to the department to remove the beaver or the structure is liable for any damage caused by the beaver or the structure to public property or the property of others.

Wisconsin Administrative Code NR1.16 (4) (b) (not a statute but a rule), specifically authorizes beaver control activities to protect trout habitat on all Class I and select Class II or III trout streams and productive lowland coniferous stands.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues identified by agencies and the public as being relevant to the development and selection of BDM alternatives. These issues were also used to develop mitigation in Standard Operating Procedures (SOPs). This chapter also includes a discussion of the issues not considered in detail. Pertinent information on the affected environment is included in this chapter in the discussion of issues to be addressed in detail. Additional information on affected environments is incorporated into the discussion of environmental impacts in Chapter 4.

2.1 AFFECTED ENVIRONMENT

Upon request for assistance, beaver damage management could be conducted on private, federal, tribal, state, county, and municipal lands in Wisconsin to protect agricultural and natural resources, property, roads, bridges, railroads, and public health and safety. Areas of the proposed action could include state and interstate highways and roads, and railroads and their right-of-ways where beaver activities cause damage. BDM actions could be conducted on property in or adjacent to subdivisions, businesses, and industrial parks where beaver impound water and gnaw or fell trees. Additionally, affected areas could include timberlands, croplands, and pastures that experience financial losses from beaver flooding or gnawing. The proposed action also could include private and public property where beaver burrowing causes damage to dikes, ditches, ponds, and levees, and where feeding causes agricultural crop losses and negatively impacts wildlife, including T&E species. Natural resources affected could include coldwater eco-systems, wild rice beds on lakes and rivers, and sensitive habitats such as old growth sites or lowland habitats which support rare, endangered or sensitive plant species.

2.2 ISSUES ANALYZED 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 assess the alternatives and develop mitigation measures:

- What are the impacts on statewide and regional (state beaver management zones) beaver populations?
- What are the impacts on non-target wildlife, including threatened and endangered species?
- What are the impacts on public health and safety?
- What are the impacts on wetland habitats?
- What are the impacts on stakeholders (e.g. aesthetic and recreational impacts)?

2.2.1 Impacts on Statewide and Regional Beaver Populations

There is concern that some alternatives could result in the loss of local beaver populations or could have a cumulative adverse impact on regional or statewide beaver populations.

2.2.2 Impacts on Plants and other Wildlife Species, including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is that the proposed action or any of the alternatives would result in unintended death or injury of species not associated with the damage problem (non-target species), particularly T&E species.

Impacts on Non-target Wildlife
A relatively small number of non-target animals may be unintentionally captured and killed by Wisconsin WS during BDM activities depending upon the alternative selected. Non-target species such as otters, muskrats, raccoons, fish and turtles are the species most likely to be captured in traps and snares. Rarely, some species of waterfowl, and great blue herons are caught. To reduce the risks of adversely affecting non-target species WS would use damage management methods that are as target-selective as possible and WS would apply such methods in ways to reduce the likelihood of capturing non-target species. Before using capture devices or other BDM methods, WS would select sites which are extensively used by the target species and use baits or lures which are preferred by the target species. WS SOPs are designed to reduce effects on non-target species and are presented in Chapter 3. Healthy, uninjured non-target animals would be released unharmed at the capture site.

Impacts on T&E Species (Plants and Animals)
Special efforts are made to avoid take of T&E species through evaluations of the potential effects of each of the proposed damage management techniques and the establishment of special restrictions or mitigation measures to reduce the risk of adversely impacting T&E species. WS consulted with the USFWS and WDNR concerning potential impacts of beaver damage management methods on T&E species in Wisconsin (Section 4.2.3).

Impacts on Native Plants
Removal of beaver and breaching/removing beaver dams would impact plant species in the area impacted by the beaver dam. Some impacts may be beneficial to native plant species that may be killed by foraging beavers and flooding related to the creation of beaver dams and the failure of water management structures. Wild rice requires precise water levels to thrive and beaver removal along with beaver dam breaching/removal can be beneficial to wild rice production. Increased soil moisture associated with excess flooding may result in reduced plant or timber growth and vitality and could be detrimental to sensitive and unique habitat sites, such as old growth forests. Conversely, as discussed in section 1.4.2, beaver ponds that remain in place over a period of years allow for the establishment of certain other species of aquatic vegetation and provide valuable habitat to a variety of species.

2.2.3 Impacts on Public and Pet Health and Safety

A common concern is whether the proposed action or any of the alternatives pose a threat to public and pet health and safety. In particular, there is concern that lethal methods of beaver removal (i.e., trapping, snares, shooting) and explosives used in dam removal may be hazardous to people and pets. WS SOPs include measures intended to mitigate or reduce the effects on human and pet health and safety and are presented in Chapter 3. Another common concern, discussed in Chapter 1, is that some problems caused by beaver, such as flooding of roadways and bridges, may threaten human health or safety. In the absence of effective BDM, these types of risks to public health and safety may increase. For example, the flooding or washing out of roadways and railroad beds can result in serious accidents (Woodward 1983, Miller and Yarrow 1994). Beaver also are carriers of the intestinal parasite *Giardia lamblia*, which can contaminate water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). Additionally, the standing water created by beaver dams provides breeding areas for mosquitos which are vectors for several viruses that can cause encephalitis in humans and certain animal species.

2.2.4 Humaneness of Methods to be Used

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but very complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. People concerned with animal welfare are concerned with minimizing animal suffering as much as possible, or eliminating unnecessary suffering. The determination of what is unnecessary suffering is subject to debate (Schmidt 1989). Schmidt (1989) indicated that vertebrate pest damage management 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 is 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) 1987). 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) 1991), such as precision shooting.

Pain obviously occurs in animals, but assessing pain experienced by animals can be challenging (AVMA 2007, CDFG 1991). The AVMA defines pain as being, "that sensation (perception) that results from nerve impulses reaching the cerebral cortex via ascending neural pathways" (AVMA 2007). The key component of this definition is the perception of pain. The AVMA (2007) notes that "pain" should not be used for stimuli, receptors, reflexes, or pathways because these factors may be active without pain perception. For pain to be experienced, the cerebral cortex and subcortical structures must be functional. If the cerebral cortex is nonfunctional because of hypoxia, depression by drugs, electric shock, or concussion, pain is not experienced.

Stress has been defined as the effect of physical, physiologic, or emotional factors (stressors) that induce an alteration in an animal's base or adaptive state. Responses to stimuli vary among animals based on the animal's experiences, age, species and current condition. Not all forms of stress result in adverse consequences for the animal and some

forms of stress serve a positive, adaptive function for the animal. Eustress describes the response of animals to harmless stimuli which initiate responses that are beneficial to the animal. Neutral stress is the term for response to stimuli which have neither harmful nor beneficial effects to the animal. Distress results when an animal's response to stimuli interferes with its well-being and comfort (AVMA 2007).

The AVMA states "*... euthanasia is the act of inducing humane death in an animal*" and that "*...that if an animal's life is to be taken, it is done with the highest degree of respect, and with an emphasis on making the death as painless and distress free as possible*" (AVMA 2007). Additionally, euthanasia methods should minimize any stress and anxiety experienced by the animal prior to unconsciousness." Although use of euthanasia methods to end an animal's life is desirable, as noted by the AVMA, "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but terms such as killing, collecting, or harvesting, recognizing that a distress- free death may not be possible.*" (AVMA 2001).

Analysis of this issue must consider not only the welfare of the animals captured, but also the welfare of humans, livestock and some T&E species if damage management methods are not used. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. WS personnel are concerned about animal welfare. WS is aware that techniques like snares and traps are controversial, but also believes that these activities are being conducted as humanely and responsibly as practical. WS and the National Wildlife Research Center are striving to bring additional non-lethal damage management alternatives into practical use and to improve the selectivity and humaneness of management devices. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in situations when non-lethal damage management methods are not practical or effective. WS supports the most humane, selective, and effective damage management techniques, and would continue to incorporate advances into program activities.

Wisconsin WS personnel are experienced and professional in use of management methods to increase humaneness as much as possible under the constraints of current technology, workforce, and funding. WS personnel use equipment and methods as recommended by the Association of Fish and Wildlife Agencies Best Management Practices for Beaver (Association of Fish and Wildlife Agencies 2012). The BMP program aims to evaluate animal welfare, identify efficient tools and techniques, and develop recommendations for state fish and wildlife agencies to consider as an element of their wildlife management programs. SOPs used to maximize humaneness are listed in Chapter 3.

Some people are concerned about the humaneness of drowning beaver while restrained by foothold traps. Considerable debate and disagreement among animal activists, veterinarians, wildlife professionals, fur trappers, and nuisance wildlife specialists is apparent. Some debate centers around an uncertainty as to whether drowning animals are rendered unconscious by high levels of carbon dioxide (CO_2) and thus insensitive to distress and pain (Ludders et al. 1999). The AVMA identifies drowning as an unacceptable method of euthanasia (Beaver et al. 2001), but provides no details on the reasons for this decision. Ludders et al. (1999) concluded drowning is not euthanasia based on the animals not dying from CO_2 narcosis, because CO_2 narcosis does not occur until 95 millimeters of mercury in arterial blood is exceeded. Ludders et al. (1999)

showed death during drowning is from hypoxia and anoxia, and thus animals experience hypoxemia. Ludders et al. (1999) also concluded that animals that drown are distressed because of stress related hormones, therefore, drowning is not euthanasia. Use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic mammals such as beaver. Trapper education manuals and other wildlife damage management manuals written by wildlife biologists recommend drowning sets for foothold traps set for beaver (Howard et al. 1980, Randolph 1988, Bromley et al. 1994, Dolbeer et al. 1994, Miller and Yarrow 1994). Best Management Practices for beaver established by the Association of Fish and Wildlife Agencies stipulate that foothold traps meet BMP criteria if they are submersion (drowning) sets (Association of Fish and Wildlife Agencies 2012). Snares may be set as for live restraint or submersion depending upon the design of the snare. Drowning trap sets are considered by some to be the most appropriate and effective method available to capture beaver for some situations. These people generally perceive the relatively short time to death from drowning (minutes) to be preferable to the potential pain, stress and distress an animal might experience while in a live capture device (hours) until eventually euthanized. Animals in live capture devices are vulnerable to being harassed, killed or injured by humans, dogs, or other wildlife (Miller and Yarrow 1994). Drowning sets make the captured animal and trap less visible and prevent injury (i.e., bites and scratches) to people who may otherwise approach a restrained animal. Some sites may be unsuitable for body-gripping traps or snares because of unstable banks, deep water, or substrate conditions. However, these sites may be suitable for foothold traps.

Given the relatively short time period of a drowning event compared to being held in a live capture device, acceptance of catching and drowning beaver by International Humane Trapping Standards, the conclusion has been drawn that drowning, will continue to be included as an available method in alternatives that allow for lethal methods of BDM. However, we are aware that some people will feel strongly that the use of any lethal methods, drowning sets in particular, is inhumane and unacceptable.

2.2.5 Impacts on Wetlands

Some people are concerned about the effects of the alternatives on wetland ecosystems, specifically that the removal of beaver or breaching/removing beaver dams from an area will result in the loss of a certain wetland habitat and the plant and animal species and other ecological benefits associated with those habitats.

Beaver build dams primarily in smaller rivers (intermittent and perennial streams and creeks) with dams consisting of mud, sticks, and other vegetative materials. Dams obstruct the normal flow of water and typically transform the preexisting wetland hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment. Depth of the bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water. If a beaver dam is not breached/removed and water levels remain constant, hydric soils and hydrophytic vegetation eventually form. This process can take anywhere from several months to years depending on preexisting conditions. Hydric soils are those soils that are saturated, flooded, or submerged long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much faster in areas where wetlands have previously existed. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive

water content. If these conditions are met, a wetland can develop that would have different wildlife habitat values than an area recently impounded by beaver dam activity.

Some wildlife species benefit from the addition of a beaver dam on a stream or creek, while others will suffer negative impacts. The snuffbox mussel (*Epioblasma triquetra*) was federally listed as endangered in February 2012. Snuffbox mussels usually live in small to medium-sized creeks but may also be found in larger rivers. They prefer areas with a swift current and cannot live in lakes or slow water created by dams (USFWS 2012). In Wisconsin, snuffbox mussels are known to occur in the St. Croix, Wolf, Embarrass and Little Wolf Rivers and in Willow Creek in Outagamie, Pierce, Polk, St. Croix, Shawano, Waupaca and Waushara Counties. Sediment that blankets river bottoms can suffocate snuffbox mussels. Beaver and beaver dam removal helps to restore free-flowing water conditions and may be beneficial to snuffbox mussels, a species that relies on a swift flowing stream habitat. On the other hand, beaver dams can potentially be beneficial to species of wildlife such as river otters, Neotropical birds, and waterfowl. Abandoned beaver dams and the subsequent grassy/shrubby habitat that develops after the disappearance of water were found to be beneficial to bird species and supported higher bird numbers and diversity than nearby riparian areas (Aznar and Desrochers 2008).

In Wisconsin, the long term deleterious effects of beaver impoundments on salmonid habitat in low gradient trout streams of the Upper Midwest has long been viewed as a serious threat to native brook trout populations (Avery 2002). A number of research evaluations in Wisconsin have clearly documented the negative relationship between the two species. Removal of beaver and beaver dams over an 18 year period in a Northern Wisconsin brook trout stream resulted in significantly cooler water temperatures, more trout, improved coldwater stream aquatic community dynamics and gradual rehabilitation of coldwater stream habitat. Removal of beaver and beaver dams has also been shown to be the most successful and cost- effective technique evaluated in Wisconsin at rehabilitation of brook trout streams (Avery 2004).

WS BDM activities would primarily be conducted to alleviate damages to forest resources, agricultural crops, and public property such as roads, bridges, and water management facilities. BDM would also be conducted to enhance, protect or reclaim coldwater fisheries as well as other sensitive and unique habitats (wild rice lakes, old growth forest sites). Activities most often take place on watersheds designated by WDNR as being priority-classed coldwater systems, as well as streams, drainages, and ditches where beaver activity causes damage to roads, bridges, railways or presents public health and safety concern. Under the preferred alternative, BDM to alleviate damage to structures such as roads, typically involves removing beaver and breaching or removing beaver dams only in the immediate vicinity of the specific damage problem. Dams would be breached/removed by hand when possible, or the smallest and most effective charges of binary explosives would be used when necessary. Generally, only the portion of the dam blocking the stream or ditch channel is altered or breached. Projects involving the use of binary explosives would be conducted by trained WS certified explosive specialists. After a blast, any remaining fill material still obstructing the channel is normally washed downstream by water current. The short term noticeable side effects from this activity are diluted mud, water, and small amounts of debris from the dam scattered around the blasting site. Considerably less than ten cubic yards of material would be moved in each of these project activities.

The United States Army Corps of Engineers (USACE) has criteria that would be implemented by WS during dam breaching/removal activities to minimize any impacts to the water course basin, adjacent riparian areas, or surrounding vegetation (see Appendix C). The intent of most dam breaching/removal is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities involve removal of recently-built dams to return an area back to its preexisting condition. Hydric soils and wetland conditions usually take many years to develop, often greater than 5 years as recognized by Swampbuster provisions (Food Security Act of 1985 P.L. 99-198). Most beaver dam removal by WS is either exempt from regulation under Section 404 of the Clean Water Act as stated in 33 CFR part 323 or may be authorized under the USACE Nationwide Permit System in 33 CFR part 330. However, breaching/removal of some beaver dams can involve certain portions of Section 404 to require landowners to obtain permits from the USACE. WS personnel determine the proper course of action upon inspecting a beaver dam impoundment. Appendix C describes the procedures used by WS to assure compliance with the pertinent laws and regulations.

2.2.6 Economic Losses to Property

Some people are concerned about the negative economic impacts that beaver are having on property such as flooding of septic systems or gnawing of ornamental trees. These people are concerned as to whether the proposed action or any of the alternatives would reduce such damage to acceptable levels.

2.2.7 Impacts to Stakeholders, including Aesthetics

Some concern exists that the proposed action or the alternatives would result in loss of aesthetic benefits to the public, landowners/resource managers, or neighboring residents. Wildlife generally is regarded as providing 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 in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g. wildlife-related recreation, observation, harvest, sale), indirect benefits derived from various wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: (1) bequest which is providing for future generations, and (2) pure existence which is merely knowledge that the animals exist (Decker and Goff 1987).

What constitutes an acceptable wildlife damage management technique and an acceptable impact on the aesthetic value of beavers and beaver ponds is highly subjective. Many

people directly affected by problems and threats to public health or safety caused by beaver insist upon removal of beavers from the property or public location when damage is apparent. Some people believe that all wildlife damage problems should be resolved by capturing and relocating problem animals to another area. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. People who are totally opposed to beaver damage management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some people who oppose removal of wildlife do so because of human-affectionate bonds with individual animals. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment of individual animals.

Wisconsin WS only conducts beaver damage management at the request of affected resource management agencies, governmental entities responsible for maintaining public roads, private landowners, and others with documented beaver damage problems. WS gives preference to non-lethal methods when effective and practical non-lethal methods are available. When WS receives requests from an individual or official for beaver damage management, concerns regarding the humaneness and aesthetic value of beavers would be incorporated in the development of a management strategy via the use of the WS Decision Model (Chapter 3). Management actions would be carried out in a humane and professional manner.

2.3 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.3.1 WS Impact on Biodiversity

Wisconsin WS BDM is not conducted to eradicate native wildlife populations. WS works with WDNR to ensure that damage management actions do not result in adverse impacts on beaver populations. WS operates according to applicable federal, state and local laws and regulations to ensure species viability. By applying BDM actions only at areas or sites specifically designated by cooperators, WS has relatively little impact across a broader region or statewide. WS operates on a relatively small percentage of the land area of the State, and WS' take of any wildlife species analyzed in this EA is a small proportion of the total population and insignificant to the viability and health of the population (*see* Section 4.2.3).

2.3.2 No Wildlife Damage Management at Taxpayer Expense (wildlife damage management should be fee based)

Funding for Wisconsin WS comes from a variety of sources including USDA appropriations, WDNR segregated funds (hunting and fishing license fees), Tribes, Wisconsin counties and townships, and private organizations and individuals. Federal, state, and local officials have decided that wildlife damage management should be conducted by appropriating funds. WS was established by Congress as the agency responsible for providing wildlife damage management to US citizens. Wildlife damage management is an appropriate sphere of activity for government programs, since aspects of wildlife damage management are a government responsibility authorized by law.

2.3.3 Beaver Should be Managed by Trappers and Nuisance Wildlife Control Agents/Pest Control Operators

During the period of 2009-2011, the estimated number of recreational beaver fur trappers in Wisconsin has averaged 2,493 trappers (WDNR Wildlife Surveys, August 2009-2011). The estimated number of beaver fur trappers that trapped during the 2010-11 season was 2,454. During the 2010-11 trapping season the majority of furbearer trappers in Wisconsin trapped in northern Wisconsin (WDNR Wildlife Surveys, August 2011).

Fur trapper numbers fluctuate each season based on several variables, including pelt value, fuel prices and weather conditions, and consequently harvest numbers fluctuate as well. For this reason, the general beaver fur harvest, while having an impact on overall beaver numbers, typically does not address site specific beaver damage problems.

It is generally not cost effective for a private beaver trapper to provide site specific control based on the value of fur taken. Many beaver damage complaints occur outside of the season when beaver pelts are not prime and have little to no value. Most private trappers cannot afford to provide year-around site-specific beaver damage management unless they are subsidized by the entity requesting beaver damage management services. However, even if paid for services it is difficult for a private trapper to provide consistent, timely and effective beaver damage management services for large areas, such as a coldwater stream or a county road system. Wisconsin law allows private landowners experiencing beaver damage to remove beaver and beaver dams on their property at any time, or to hire a trapper to provide these services. The option of using a private trapper remains open to landowners experiencing damage or threats of damage. WS recommends this option to private landowners experiencing small scale beaver damage problems, and provides information to landowners about private trappers. Typically the private landowner pays for these services.

Assistance from Wisconsin WS may be requested to achieve management objectives. Typically, damage management involves removing a small number of beaver from a specific area. WS is not involved in statewide or large scale beaver population reduction (See analysis of impacts on beaver populations for each alternative in Chapter 4). Targeted beaver populations include those found near damage sites (i.e. site-specific areas, such as road culverts, bridges, critical wildlife habitat, and managed forests).

Some landowners/resource managers may prefer that a government agency trap beaver instead of using private trappers or nuisance wildlife control agents, and large landowners/resource managers with numerous damage sites (i.e. railroads or highway departments) because of reduced administrative burden. Some landowners/resource managers may prefer to use private trappers or nuisance wildlife control agents instead of WS. Thus, WS beaver damage management activities would not eliminate opportunities for private trappers or nuisance wildlife control agents. Any actions by WS would be conducted in accordance with Wildlife Services Directive 4.220 Avoidance of Competition with Private Business.

2.3.4 Damage should be managed through exclusive use of water control and exclusion devices

Efficacy of Beaver Exclusion and Water Control Systems: Exclusion devices and water control systems have been used for many years with varying degrees of success (USGAO 2001). Landowner management objectives play a role in how the efficacy of a water control system is perceived (Nolte et al. 2001). Survey respondents classified pond levelers

installed to manage wetlands for waterfowl habitat more successful than levelers installed to provide relief from flooding (Nolte et al. 2001). Success rates as low as 4.5% and 3% have been reported by the Massachusetts Division of Fisheries and Wildlife and New York Department of Natural Resources (Langlois and Decker 1997). Nolte et al. (2001) reported only 50% of installed pond levelers in Mississippi meet landowner objectives and found that pond levelers placed in sites with high beaver activity more frequently failed if installed without implementing population control measures. Higher success rates have been reported for newer exclusion and water control systems ranging from 87% - 93% (Boyles and Savitzky 2007, Boyles 2006; Simon 2006; Callahan 2005). Lisle (2003) reported that use of the devices or a combination of a Beaver Deceiver™ and flow management device virtually eliminated the need for maintenance and beaver removal at 20 sites where clogged culverts and flooded roads had previously been a routine issue.

Exclusion and water control systems must be specifically designed to meet the needs of each site. Consequently, devices installed by inexperienced individuals may have a higher failure rate than those installed by a professional (Boyles 2006, Simon 2006, Spock 2006, Callahan 2003, Lisle 1996). Higher success rates reported for newer exclusion and water control devices may be indicative of increased understanding of the kinds of situations where these devices work best. For example, Callahan (2005) noted that exclusion and water control systems installed at culvert sites were more successful than similar systems installed at free-standing dams. Callahan (2005, 2003) also provides a list of sites that are not well suited to the use of exclusion or water control devices. Boyles and Savitzky (2007) and Boyles (2006) reported some of the highest success rates for the new exclusion and water control systems, but only tested the devices for use in managing conflicts with roadways (blocked culverts and high water levels).

Beaver build dams to raise water levels to meet their needs for security and access to forage. While pond levelers allow for the retention of some water, if the water level does not meet the needs of the beaver, they may move a short distance downstream and build a new dam (Clemson University 2006, Callahan 2003). This may merely result in moving the problem to a new landowner or, depending upon site characteristics, the resulting pond may result in new or increased damage problems for the original landowner. McNeely (1995) reported the most common reasons cited for lack of success were blocking caused by debris or silt and beaver construction of additional dams slightly upstream or downstream of the management device. In the study by Callahan (2005), construction of a new dam upstream or downstream of the device was the most common cause of failure for free-standing dams (e.g., dams not associated with a culvert or other similar constriction in water flow, 11 of 156 sites), but insufficient pipe capacity (6 sites) and lack of maintenance (2 sites) were also problems. At culvert sites, lack of maintenance was the primary cause of device failure (4 of 227 sites). There was also a problem with vandalism at one of the culvert sites. At two culvert sites and two free-standing dams, the beaver appeared to be able to thwart the exclusion devices and water control systems and build dams that reduced or completely impeded the operation of the devices (Callahan 2005). Nolte et al. (2001) also reported need to address problems with dams upstream or downstream of the device.

Most pond levelers and water control devices require maintenance. The amount of maintenance required can vary considerably among sites, depending on site conditions and the type of water control device (Boyles 2006, Spock 2006, Callahan 2005, Nolte et al. 2001). Stream flow, leaf fall, floods and beaver activity will continuously bring debris to the intake of the water control device. Ice damage and damage from debris washed downstream during high water events may also trigger need for maintenance. Although

most exclusion and water control devices generally require some level of maintenance, there are reports of devices which have remained effective for a period of years with no maintenance (Nolte et al. 2001). Nolte et al. (2001) reported that post-installation maintenance had been performed on 70% of the 20 successfully operating Clemson pond levels installed by WS. The most common action was to adjust the riser on the pipe to manipulate water levels. Other maintenance included removal of vegetation and secondary dams built after the installation of the devices. In a survey of individuals who had received assistance with exclusion and water control devices from Beaver Remedies program (Simon 2006), half the survey respondents 18 of 36 reported maintaining their devices and device installation program staff monitored an additional 10 devices. Sixty one percent of respondents reported that routine maintenance took 15 minutes or less and 93% reported that maintenance took a half hour or less. Boyles (2006) reported that time spent in device maintenance ranged from 1 to 4.75 hours per year. Illinois WS assists with the maintenance of the 7 levelers used by the Shawnee National Forest to address flooding issues. The pond levelers require maintenance every year to remove roots which can clog the intake pipe. If the levelers were not maintained they would have to be replaced approximately once every 5 years. A fire pump is used to clean out the levelers, and it takes 1-2 days for 3 – 5 people to clean out 2-3 levelers each year.

Costs: Installation and upkeep of water control devices vary from site to site. Callahan (2005) reported that the average cost for an exclusion fence at a culvert was $750 with average annual maintenance cost of approximately $200. Flexible leveler pipe systems cost an average of $1,000 to install and $100 per year in maintenance. Average cost to install a combination fence and leveler was $1,400 with approximately $150 per year in maintenance. Properly maintained, a fence or pipe system may be expected to last approximately 10 years. Annualizing the costs of maintenance and levelers ranged from $200 – $275/year (Callahan 2005). The cost of a Beaver Deceiver™ may range from $150 - $1,500, and an additional cost would be applied if pipes were needed at the site (S. Lisle, Penobscot Nation, letter to J. Cromwell, WS, September 7, 2000). Spock (2006) reported that exclusion and/or water control device installation costs ranged from < $600 to over $3,000 dollars. Slightly more than half the systems (58.2%) cost between $600 and $1,000 to install. In many cases the cost included the first year of maintenance. Maintenance costs, when available, ranged from $50 - $600 per year with 49.9% of maintenance agreements costing from $100 - $200. The more expensive installations tended to be extensive fence and leveler systems or systems with numerous leveler pipes. Boyles (2006) reported that device installation cost an average of $1,349 per device and $3,180 per site. Subsequent annual maintenance cost an average of $19.75 per site per year. However, unlike the study by Callahan (2005) the devices had only been in place for a relatively short time (Boyles (2006) average time in place 15 months, range 6 - 22 months; Callahan (2005) average time in place 36.6 months, range 3 to 75 months). Cost of maintenance may change over time as site conditions change in response to new conditions resulting from the devices and/or beaver activity. As noted above, IL WS assists with the maintenance of the 7 levelers used by the Shawnee National Forest to address flooding issues. Average annual maintenance cost of just 2-3 of the 7 levelers is $7,358.

In addition, the installation of water control structures or just removing dams would not alleviate damage from gnawing or felling of trees or the damage associated with burrowing activities. The damage to trout and other coldwater stream species and habitat by beaver damming is not instantaneous but rather cumulative and long-term. Short term benefits to angling from the creation of pools behind beaver dams allowing for more space to support larger fish are rapidly diminished as other coldwater stream habitat elements decline. Once

damaged, recovery of these habitats is very difficult. Maintenance of a viable trout fishery is very difficult with beaver present. The initial costs of beaver and dam removal are much higher than maintenance of free-flowing conditions once beaver have been completely removed. For these reasons maintenance of beaver-free conditions on coldwater streams is the most successful and cost-effective means of protecting and rehabilitating coldwater stream habitats and trout fisheries (Avery 2002). Given the differing and often competing interests in beaver presence, the most challenging task is to decide which streams to maintain beaver free (Steve AveLallemant, WDNR, Pers. Comm.).

Beaver dam removal/breaching and the use of water control devices could be used or recommended as part of the WS BDM program where appropriate. WS provides information on installation of water control devices to those persons requesting assistance. In these situations it is the responsibility of the person requesting assistance to construct and install the device. However, as noted above, there are limits to the utility of levelers and exclusion devices, and it is our determination that exclusive use of these systems will not adequately resolve the current range of beaver conflicts in Wisconsin.

2.3.5 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 Wisconsin would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire state may provide a better analysis than multiple EAs covering smaller zones. Additionally, although this EA addresses impacts that may occur if WS conducts beaver damage management anywhere in the state of Wisconsin, in actuality Wisconsin WS only conducts beaver damage management in a very small proportion of the state where damage is occurring or likely to occur.

2.3.6 Old studies are used to cite that beaver adversely impact trout habitat. Studies failed to measure water temperature at lower depths. Bottom layers may remain cool while top warms. More recent studies indicate that beaver ponds can be quite beneficial to some species of fish. Beaver and trout evolved together. Why are beaver a problem now?

The impact of beaver ponds on fish populations depends on the area and the species under consideration. We agree that there are many examples of situations where beaver ponds have a beneficial impact on fish populations (Bergman et al. 2007, Pollock 2007, Rossell et al. 2005). However, as discussed in the EA (Section 1.6.1), beaver ponds have been shown to have an adverse impact on trout populations in areas like Wisconsin. Because the impact of beaver removal does depend on the species of fish involved and local environmental conditions, WS would only conduct beaver removal projects for the enhancement of fish populations at the recommendation of fisheries managers/biologists with the WDNR or the appropriate land management entity.

Fishery biologists place a great deal of emphasis on preserving and enhancing the remaining streams that still support self-sustaining wild trout populations. Logging practices have also altered the relationship between beaver and trout in these streams. Prior to European settlement, most of the trout streams ran through areas of mature forest which provided canopy cover for the streams and relatively limited riparian food sources for beaver interspersed with patches of early-succession stage forest in areas recently disturbed

by fire or flooding. When the mature forest areas were clear cut, the early succession plant communities that developed provided a more abundant food supply for beaver than the previous mature hardwood forest (Knudsen 1963). Consequently the trout streams went from a system with canopy shade and relatively few beaver colonies to a system with less canopy cover and substantially increased beaver populations. Trout fishery management efforts in these areas recognize the importance of mature forests to trout populations and are working with foresters on strategies to enhance development of riparian vegetation to achieve these older forest communities. It is the hope of the biologists working on these projects that the need for beaver management will be reduced or eliminated with the return of later successional habitat conditions.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of seven parts: 1) introduction, 2) description of alternatives considered and analyzed in detail including the Proposed Action (Alternative 3), 3) beaver damage management approaches used by WS, 4) beaver damage methods authorized for use or recommended, 5) methodologies recommended but deemed impractical, ineffective, or unsafe at the present time, 6) a description of alternatives considered, but eliminated from detailed analysis, and 7) mitigation in standard operating procedures. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), Methods of Control (USDA 1997 Revised), and "*Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program*" (USDA 1997 Revised).

3.1 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

Five alternatives were recognized, developed, and analyzed in detail. An additional six alternatives / methods were considered, but not analyzed in detail. (3.5). The five alternatives analyzed in detail are:

3.1.1 Alternative 1 - No WS Beaver Damage Management in Wisconsin

This alternative would result in no assistance from WS in reducing beaver damage in Wisconsin. All requests for beaver damage management assistance would be referred to the WDNR, local animal control agencies, or private businesses or organizations. Assistance may or may not be available from any of these entities.

3.1.2 Alternative 2 - Only Lethal Beaver Damage Management

Under this alternative, WS would only provide technical assistance and operational beaver damage management for lethal management techniques. Non-lethal capture devices such as snares, foothold traps, and cage traps could be used under this alternative. However, all beavers captured in these non-lethal devices would subsequently be euthanized. The WS Decision Model (Section 3.2.3) would be used to select among the lethal management alternatives available to WS in order to meet the needs of the specific damage situation while minimizing potential harmful effects of damage management measures on humans, target and non-target species, and the environment. Requests for information regarding non-lethal management approaches would be referred to WDNR, local animal control agencies, or private businesses or organizations. WS would not remove or breach beaver dams under this alternative. Individuals or agencies might choose to implement WS lethal recommendations on their own, implement non-lethal methods or other methods not recommended by WS, arrange for WS assistance with lethal management techniques, use contractual services of private businesses, use volunteer services, or take no action. WS would provide assistance with lethal beaver damage management when requested on private, tribal, or public property only after a *Work Initiation Document for Wildlife Damage Management* or other comparable document has been completed and funding has been secured. All WS beaver damage management would be consistent with other uses of the area and would comply with applicable Federal, State and local laws.

3.1.3 Alternative 3- Fully Integrated Beaver Damage Management for all Public and Private Land (No Action/Proposed Action)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with guidance from the CEQ (CEQ 1981). In this guidance, the No Action alternative for situations where there is an ongoing management program may be interpreted as "no change" from current management direction or level of management intensity.

WS proposes to continue the current BDM program in the state of Wisconsin. An IWDM approach, including technical assistance and operational damage management services, would be implemented to reduce beaver damage to property, roads, bridges, railroads, agricultural and natural resources, and risks to public health and safety. Damage management would be conducted on public, private, and tribal property in Wisconsin where a need exists and when landowners/managers request WS assistance. The IWDM strategy would encompass the use of practical and effective non-lethal and lethal methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and non-target species, and the environment. The WS Decision Model (Slate et al. 1992; Section 3.2.3) would be used to select among the full range of management methods available when developing site-specific plans to address beaver damage. When appropriate nonlethal methods such as textural barriers (e.g., sand in paint), physical exclusion or habitat modification (e.g., water control devices) could be recommended and utilized to reduce beaver damage. Beavers captured in non-lethal devices (foothold traps, snares, cage traps, etc.) would usually be euthanized unless relocation was authorized by the WDNR. In other situations problem animals would be removed as humanely as possible using: body gripping traps (e.g., Conibear-type), snares, and shooting. When appropriate, beaver dams could be removed by using binary explosives or by hand. Preference would be given to practical and effective non-lethal methods, but 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. All WS beaver damage management would be consistent with other uses of the area and would comply with applicable federal, state and local laws.

Landowners/managers could continue to implement their own beaver damage management program, use contractual services of private businesses, use volunteer services, or take no action.

3.1.4 Alternative 4- Technical Assistance Only

This alternative would only allow Wisconsin WS to provide technical assistance to individuals or agencies requesting beaver damage management in Wisconsin. WS would not remove or breach beaver dams under this alternative. The WS Decision Model (Section 3.2.3) would be used when recommending management alternatives that meet the needs of the specific damage situation. Landowners/managers could implement their own beaver damage management program, use contractual services of private businesses, use volunteer services, or take no action. This alternative would place the immediate burden of operational damage management work on the property owners and other federal, tribal, state, or local agencies. All WS technical assistance for beaver damage management would be consistent with other uses of the area and would comply with applicable federal, state and local laws.

3.1.5 Alternative 5- Non-lethal Beaver Damage Management

Under this alternative, WS would only use and recommend nonlethal BDM methods. The WS Decision Model (Section 3.2.3) would be used to select among the non-lethal management alternatives available to WS in order to meet the needs of the specific damage situation. Requests for information regarding lethal management approaches would be referred to WDNR, local animal control agencies, or private businesses or organizations. Individuals or agencies might choose to implement WS non-lethal recommendations on their own, implement lethal methods or other methods not recommended by WS, contract for WS non-lethal damage management services, use contractual services or private businesses, use volunteer services, or take no action. Unwanted beaver dams could be removed or breached by hand or with binary explosives under this alternative. WS would provide assistance with non-lethal beaver damage management on private, tribal or public property only after a *Work Initiation Document for Wildlife Damage Management* or other comparable document has been completed and funding has been secured. All WS beaver damage management would be consistent with other uses of the area and would comply with applicable federal, state and local laws.

3.2 BEAVER DAMAGE MANAGEMENT APPROACHES USED BY WS

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). The wildlife damage management approach currently used by WS to address beaver damage in Wisconsin is described below:

3.2.1 Integrated Wildlife Damage Management (IWDM)

During more than 80 years of resolving wildlife damage problems, WS has considered, developed, and used numerous methods of reducing damage problems (USDA 1997 Revised). WS efforts have involved the research and development of new methods and the implementation of effective strategies to resolve and prevent wildlife damage.

Usually, the most effective approach to resolving wildlife damage is to integrate use of several methods simultaneously or sequentially. 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. WS program applies IWDM, commonly known as Integrated Pest Management (IPM; WS Directive 2.105), to reduce damage through the WS Decision Model (Slate et al. 1992).

The philosophy behind IWDM is to implement effective management techniques in a cost-effective manner 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 situation. IWDM may incorporate cultural practices, habitat modification, animal behavior modification, removal of individual animals, local population reduction, or any combination of these methods depending on the characteristics of the specific damage problem.

3.2.2 Integrated Beaver Damage Management Strategies used by WS

Technical Assistance Recommendations (management decision and implementation is the responsibility of the requester). WS personnel provide information, instructional sessions, demonstrations, and advice on available beaver damage management techniques, or referral to WDNR for technical assistance. Technical assistance may include demonstrations on the proper use of damage reduction devices (body-grip traps, foothold traps, tree guards, etc.) and information on water control devices, wildlife habits and biology, habitat management, and animal behavior modification. Technical assistance may be provided following an on-site visit or verbal consultation with the requester. Bulletins and leaflets on beaver could be sent to requesters to inform them about aesthetic values of aquatic furbearers, types of damage, and damage management methods. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems. These strategies are based on factors such as need and practical application. Technical assistance may require substantial effort by WS personnel in the decision making process, but the actual damage reduction work is the responsibility of the requester. WS may refer requestors to appropriate WDNR offices or websites for additional information.

Operational Damage Management Assistance (management conducted or supervised by WS personnel). Operational damage management assistance is implemented when the problem cannot be resolved through technical assistance and when Cooperative Agreements provide for WS operational assistance. The initial investigation explores and defines the nature and history of the problem, extent of damage, and the species responsible for the damage. Professional skills of WS personnel are often required to resolve problems effectively, efficiently, and safely, if the problem is sufficiently complex to require the direct involvement of a wildlife management professional. WS considers the biology and behavior of the damaging species, and other factors using the WS Decision Model (Slate et al. 1992). Recommended strategies may include any combination of preventive actions, generally implemented by the landowner/manager, and corrective actions, generally implemented by WS. Corrective damage management is applying management techniques to stop or reduce current losses. As requested and appropriate, WS personnel may provide information on non-lethal and lethal techniques, conduct demonstrations, or take action to prevent additional losses from occurring.

Education. Education is an important element of WS program activities, because wildlife damage management is about finding a balance or co-existence between the needs of people and wildlife. 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. WS 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. WS may provide informational leaflets about beaver damage management, biology, and ecology.

3.2.3 The WS Decision Model

The procedures used by WS personnel to determine management strategies or methods applied to specific damage problems can be found in USDA (1997). Additionally, the WS Decision Model (Figure 3.1) considers the following factors before selecting or recommending damage management methods and techniques:

- Species responsible for the damage,
- Magnitude, geographic extent, frequency, historical damage, and duration of the problem,
- Status of target and non-target species, including T&E species,
- Local environmental conditions,
- Potential biological, physical, economic, and social impacts,
- Potential legal restrictions, and
- Costs of damage management options.

The decision making process is a procedure for evaluating and responding to damage complaints. WS personnel are frequently contacted after requesters have tried non-lethal techniques and found them to be inadequate for reducing damage to an acceptable level. WS personnel assess the problem, evaluate different methods for availability (legal and administrative), and base biological, economic, and social considerations on suitability. Following this evaluation, methods deemed to be practical for the situations are formed into a management strategy. After the management strategy has been implemented, monitoring and evaluation of the strategy is conducted to assess effectiveness of the strategy. If the strategy is effective, the present need for management is ended. When damage continues intermittently over time, WS personnel and the requester monitor and re-evaluate 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 re-evaluated and revised periodically if necessary. The Decision Model is not a documented process, but a mental problem-solving process common to most, if not all, professions.

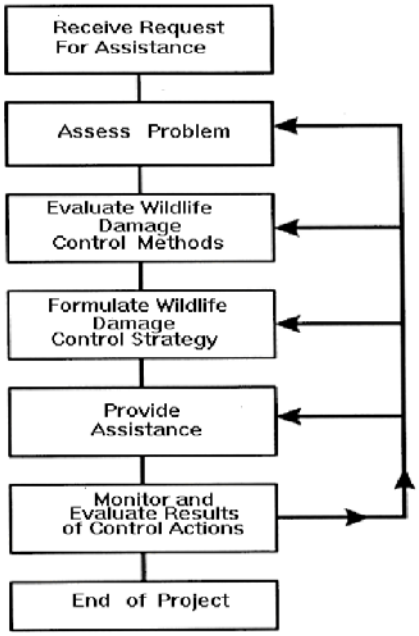

Figure 3.1 WS Decision Model as presented by Slate et al. (1992) for developing a strategy to respond to a request for assistance with human-wildlife conflict.

3.2.4 Local Decision Making Process

WS provides technical assistance to the requester regarding the biology and ecology of beaver and effective, practical, and reasonable methods to reduce wildlife damage. Technical assistance includes instructions on non-lethal and lethal methods. WS 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. In Wisconsin resource owners and others directly affected by beaver damage or conflicts have direct input into the resolution of such problems. Requesters may implement management recommendations provided by WS or others on their own, or request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

Local decision makers have the final decision on which available (legally and administratively) methods would be used to solve a human-wildlife conflict. Decision makers also may compare the benefits versus the damage when deciding which methods would be implemented including weighing the cost of implementing each methodology or a series of methodologies. In Wisconsin, community leaders, private property owners/managers, and public property owners/managers are often the local decision makers.

3.3 BEAVER DAMAGE MANAGEMENT METHODS AUTHORIZED FOR USE OR RECOMMENDED BY WS

This section provides a summary of methods which may be used for BDM depending upon the management alternative selected. A listing and more detailed description of the methods used by Wisconsin WS for beaver damage management is found in Appendix D of this EA.

3.3.1 Non-lethal Beaver Management Methods

Habitat Management - Habitat management generally refers to riparian vegetation manipulation to reduce the land's ability to support beaver. Habitat management often involves the promotion of riparian species not favored by beaver, such as promoting the replacement of aspen or birch with conifers and older forest ecosystems which are not favored by beaver. Forestry management practices that restrict clear cutting along stream banks are examples of habitat management to reduce beaver numbers. Clear cutting promotes the growth of pioneer species such as aspen and birch. Habitat management also may involve manipulating water levels in beaver impoundments to reduce damage or conflict caused by flooding. Water control devices and pond levelers may be installed to regulate the volume of water and can be effective in reducing flooding in certain situations.

Exclusion – Exclusion involves the use of physical barriers such as tree wraps and fencing to prevent beaver access to protected resources. Various devices can be used to prevent beavers from entering and damming culverts, including culvert guards, grills, fences, and wire mesh culvert extensions. Textural barriers such as using sand in paint to deter gnawing on specific surfaces may also be an effective solution for some situations.

Beaver Dam Breaching/Removal - Beaver dam breaching/removal involves the removal of debris deposited by beaver that impedes water flow. Debris would be removed from beaver dams with binary explosives, mechanical equipment, or hand tools.

3.3.2 Techniques for Animal Removal

These methods are specifically designed to reduce local beaver populations in order to stabilize, reduce, or eliminate damage as part of an IWDM approach. The number of animals removed necessary to achieve a reduction of beaver damage varies according to the resource protected, habitat, size of local population, effectiveness of other damage management strategies, and other factors. Although some of the methods described below can be used to live-capture beaver, for reasons described in Section 3.5.5, in most situations, live-captured beaver will be euthanized via gunshot and not relocated.

Foothold traps- Foothold traps are used to effectively capture a variety of animals. Generally all footholds traps used to capture beavers are set near adequate water depth and rigged with a drowning mechanism that will dispatch the animal. Effective trap placement, trap adjustment, and selection and placement of appropriate lures contribute to the foothold trap's selectivity.

Snares- Snares are live-capture devices consisting of a cable loop and a locking device. Snares also are equipped with a swivel to minimize cable twisting and fraying, thus reducing snare breakage. Snares set by WS for beaver will be placed where at least half of the noose is underwater. Snares may be set as drowning devices.

Hancock traps- Hancock or Bailey traps are designed to live-capture beaver. The trap is constructed of a hinged, metal frame covered with chain-link fence. Large springs cause the trap to close when tripped. Trap appearance is similar to a large suitcase when closed. When set the trap is opened into a flattened position to allow an animal to enter. When the trap is tripped, the sides of the trap close around the animal.

Shooting- Shooting is the most selective method for removing target species. Shooting is conducted with shotguns, rifles, or pistols.

Body-grip traps- Body-grip (e.g., Conibear) traps are designed to cause the quick death of the animal that activates the trap. The appropriate size trap would be used for beaver. Body-grip traps are placed at various depths ranging from at least half of the trap jaw underwater to several feet below the water surface.

3.3.3 Chemical Management Methods

No chemical control methods are utilized by WS for beaver removal in Wisconsin. Chemicals found in the binary components of explosives used for beaver dam breaching/removal are destroyed during the explosion or made inert when coming in contact with water.

3.4 METHODS CONSIDERED BUT DEEMED IMPRACTICAL, INEFFECTIVE, OR UNSAFE AT THE PRESENT TIME

3.4.1 Harassment Activities

Harassment techniques, such as the use of noise or light stimuli, have generally proven ineffective in reducing beaver problems (Jackson and Decker 1993). Harassing beaver by destroying beaver dams and lodges rarely resolves damage problems. Beaver usually rebuild dams and lodges in the same vicinity in a very short time.

3.4.2 Repellents

Repellents generally consist of products which are designed to make an animal avoid a food item or area because of a disagreeable odor, taste or texture. Some repellents cause avoidance by making an animal ill when it eats a treated food item (conditioned aversion). No effective chemical repellents are registered for beaver damage management.

3.4.3 Reproduction Control

A review of research evaluating chemically induced and surgically induced reproductive inhibition as a method for controlling nuisance beaver populations is contained in Novak (1987a). Although these methods were effective in reducing beaver reproduction by up to 50%, methods were not practical or too expensive for large-scale application. Additionally, reproductive control does not alleviate current damage problems (Organ et al. 1996). No chemical reproductive inhibitors are currently registered for use on beaver damage management in the United States.

As with chemical repellents and toxicants, a reproduction inhibitor could potentially affect non-target wildlife and the environment. Any inhibitor would have to be tested intensively and approved for use. Inhibition of reproduction also may affect behavior, physiological mechanisms, and colony integrity (Brooks et al. 1980). Additional research is needed to test the environmental effects, effects to overall populations, and effects to individual animals. If a technique or chemical becomes registered for use, WS could incorporate it into BDM in Wisconsin.

3.5 ALTERNATIVES NOT CONSIDERED IN DETAIL, WITH RATIONALE

3.5.1 Eradication and Suppression

An eradication and suppression alternative would direct all Wisconsin WS beaver damage management efforts toward planned, total elimination or suppression of this species.

Eradication of beaver in Wisconsin is not supported by Wisconsin WS, WDNR, or USFS. This alternative was not considered in detail because:

- Wisconsin WS opposes eradication of any native wildlife species,
- WDNR , USFS, and Wisconsin Tribes oppose eradication of any native Wisconsin wildlife species,
- Eradication of a native species would be extremely difficult if not impossible to accomplish, and cost prohibitive, and
- Eradication of native species is not acceptable to most members of the public.

Suppression would direct Wisconsin WS program efforts and resources toward managed large-scale reduction of beaver. WS only conducts damage management in response to specific damage problems and makes every effort to only target the problem animals. To consider large-scale population suppression of native species as a goal of the Wisconsin WS program is not realistic, practical, or appropriate for resolving specific damage problems.

3.5.2 Compensation for Wildlife Damage Losses

The compensation alternative would direct all Wisconsin WS program efforts and resources toward the verification of losses from beaver and to provide monetary compensation for the losses. Wisconsin WS activities would not include any operational damage management or technical assistance.

This alternative was analyzed in the Programmatic EIS for WS. Analysis of this alternative in USDA (1997) shows that it has the following drawbacks:

- Compensation would not be practical for public health and safety problems,
- Compensation would not prevent or abate beaver damage to roads, bridges, or forest resources and other natural resources.
- Larger expenditures of money to investigate and validate all losses, and determine and administer appropriate compensation would be required.
- Timely responses to all requests to assess and confirm losses would be difficult, and many losses could not be verified.
- Compensation would give little incentive to limit losses through other management strategies.
- Compensation would do nothing to assist WDNR to achieve management objectives for the protection or recovery of coldwater ecosystems.
- Neither Congress nor the State of Wisconsin has appropriated funds for a beaver damage compensation program.

3.5.3 Bounties

Bounties can be defined as payments of funds for killing beaver. Currently, no statewide bounties exist for beavers in Wisconsin. Payment of funds for killing beaver suspected of causing economic loss is not supported by WS, and Wisconsin WS does not have authority to establish a bounty program. Bounties are not considered because:

- Bounties are generally not effective in managing wildlife or reducing damage,
- Circumstances surrounding take of animals is largely unregulated, and
- No process exists to prohibit taking of animals from outside the damage management area for compensation purposes.

3.5.4 Live-trap and Relocate

Relocation of problem wildlife species is a technique occasionally used to alleviate wildlife damage problems. This method retains popularity because it does not result in the certain death of the animals associated with the damage problem. Relocation may also be preferred in situations where the beaver population is low and establishment of new beaver colonies is desired. Beaver are abundant in suitable habitat in Wisconsin, and relocation is not necessary for the maintenance or expansion of viable populations. Because beaver are abundant in Wisconsin, beaver relocated into suitable habitat are very likely to encounter other beaver with established territories. Beaver are highly territorial, and newly introduced beaver, which are disoriented and at a disadvantage, are often attacked viciously and oftentimes killed from these encounters (McNeely 1995). Survival of relocated animals is generally very poor, and relocated animals face many challenges in the new environment (Courcelles and Nault 1983, McNeely 1995, Craven 1992). In Wyoming during the period of 1994-1999, 234 beaver were trapped and relocated to sites where the state wanted to re-establish beaver populations (McKinstry and Anderson 2002). Radio telemetry was used to track the fate of 114 of the beaver. Mortality and emigration (emigration rate included loss of transmitter) rates for tracked beaver were 30% and 51% respectively. Kaplan Meir survival estimates for the year after relocation were 0.43 (SE = 0.084). On average it took relocating 17 beaver to a site for a successful introduction (i.e., a pair established and breeding within 3 km of the

release site). Courcelles and Nault (1983) found that 50% (n=10) of radio-collared, relocated beaver died, probably from stress or predation resulting from the relocation.

Relocated beaver also may disperse long distances from the release site (Novak 1987). Hibbard (1958) recorded an average dispersal distance by 17 relocated beaver to be approximately 9 miles in North Dakota, and Denney (1952) reported an average dispersal of 10.4 miles and a maximum dispersal of 30 miles for 26 transplanted beaver in Colorado. Beaver relocated on streams and later recaptured (n=200) moved an average distance of 4.6 miles, and in lake and pothole relocations (n=272) moved an average of 2 miles (Knudsen and Hale 1965). Only 12% of beaver relocated on streams and 33% of beaver relocated on lake and pothole areas remained at the release site (Knudsen and Hale 1965).

Relocation of beavers causing damage could result in similar damage problems at the release site or dispersal site. In this case, the original damage problem has simply been shifted from one property to another. If Wisconsin WS relocated a problem animal, Wisconsin WS could possibly be held liable for any subsequent damage caused by that animal. Relocation of problem beaver is not an accepted management practice by the WDNR.

Other challenges to relocation of aquatic rodents are that the animals may cause similar damage problems at the release site or dispersal site. The AVMA, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists oppose the relocation of mammals because of disease transmission risks, particularly for small mammals (Center for Disease Control 1990).

Animal advocacy groups appear to be in disagreement about relocating wildlife to alleviate damage. Some animal rights organizations oppose relocation of problem beaver, because they believe relocation is cruel (Redmon 1999, 2000). The HSUS believes relocation is preferable to death in some circumstances, but point out that relocation could be stressful and result in suffering or death (Bridgeland et al. 1997). The HSUS openly advocates relocating muskrats to alleviate damage, but is less clear about beaver (Bridgeland et al. 1991).

For the above stated reasons, Wisconsin WS does not generally support the relocation of beavers for damage management. However, the program recognizes that there may be limited circumstances when beaver relocation may be warranted. Consequently, WS will relocate beaver when authorized by the WDNR.

3.6 MITIGATION IN STANDARD OPERATING PROCEDURES FOR BEAVER MANAGEMENT

Mitigation is any feature of an action that serves to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Wisconsin, incorporates mitigations in its standard operating procedures (Table 3.1). Mitigations are discussed in detail in Chapter 5 of USDA (1997).

Table 3.1 Mitigation in standard operating procedures for beaver damage management in Wisconsin.

Standard Operating Procedures	**Alternatives[1]**				
	1	2	3	4	5
Animal Welfare and Humaneness of Methods Used by WS					
Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate.		X	X	X	X
The Decision Model (Slate et al. 1992) would be used to identify effective biologically and ecologically sound beaver damage management strategies and their impacts.		X	X	X	X
Captured non-target animals would be released unless it is determined by Wisconsin WS personnel that the animal would not survive.		X	X		X
Use of traps and snares would conform to current laws and regulations administered by WDNR and Wisconsin WS policy, except if exempted by WDNR.		X	X		
Where practical, euthanasia procedures approved by the AVMA that cause minimal pain would be used for live animals.		X	X		
Use of newly-developed, proven, non-lethal methods would be encouraged when appropriate.			X	X	X
Safety Concerns Regarding WS BDM Methods					
The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, would be used to determine beaver damage management strategies.		X	X	X	X
Beaver damage management conducted on public lands would be coordinated with the management agency.		X	X		X
Live-traps would be placed so that captured animals would not be readily visible from any road or public area.		X	X		X
Concerns about Impacts of Damage Management on Target Species, T&E Species, Species of Special Concern, and Non-target Species.					
WS consulted with USFWS and WDNR WI program and would continue to implement all applicable measures identified by the USFWS and WDNR to ensure protection of T&E species.		X	X		X
Wisconsin WS take would be considered with the statewide “total harvest” (Wisconsin WS take and fur harvest) when estimating the impact on wildlife species.		X	X		
Management actions would be directed toward localized populations or groups and/or individual offending animals, dependent on the magnitude of the problem.		X	X		X

Standard Operating Procedures	**Alternatives**[1]				
	1	2	3	4	5
WS would initiate informal consultation with the USFWS and WDNR following any incidental take of T&E species.		X	X		X

[1] Alternative 1 No WS Beaver Management in Wisconsin
Alternative 2 Only Lethal Beaver Damage Management
Alternative 3 Fully Integrated Beaver Damage Management for all public, tribal and private land (No Action/Proposed Action) Current program in Wisconsin
Alternative 4 Technical Assistance Only
Alternative 5 Non-Lethal Beaver Damage Management

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information for making informed decisions about alternatives for addressing the beaver damage described in Chapter 1. This chapter consists of: 1) a general discussion of the analysis of environmental consequences, 2) analysis of each alternative against the issues considered in detail described in Chapter 2, and 3) summary of WS impacts.

4.1 ENVIRONMENTAL CONSEQUENCES

This section analyzes the environmental impacts of each alternative using Alternative 3 (the current program) as the baseline (no action) when comparing the other alternatives to determine if real or potential impacts are greater, lesser, or the same (Table 4.3). The No Action Alternative, as defined here, is consistent with the CEQ guidance (CEQ 1981). In this guidance, the No Action alternative for situations where there is an ongoing management program may be interpreted as "no change" from current management direction or level of management intensity. Alternative 1 is the analysis of impacts associated with no WS involvement in BDM.

It should be noted that landowners/managers in Wisconsin have the legal authority to resolve beaver damage on their own or to obtain the assistance of a designated agent (e.g. recreational trappers, private or public specialists) without involvement by WS. Therefore, a major factor in determining the potential environmental impacts of WS's involvement in BDM, is that such management will apparently be conducted by state, local government, or private entities that are not subject to compliance with NEPA if WS is not involved. WS does not have the authority to manage the landowners/ managers ability to try and reduce wildlife damage problems on their own.

The following resource values within Wisconsin would not be adversely impacted by any of the alternatives analyzed: soils, geology, minerals, flood plains, visual resources, air quality, prime and unique farmlands, timber, and range. These resources will not be analyzed further.

4.1.1 Social and Recreational Concerns

Social and recreational concerns are discussed throughout the document as they relate to issues raised during public involvement. Although WS beaver damage management efforts are generally conducted outside of the State's fur trapping season, WS activities and private trapper activities may overlap briefly in spring and fall. WS makes every attempt to avoid conflicts with recreational trappers during this period. If WS specialists and private trappers seek the same locations to set traps in the spring and fall, WS specialists are instructed not to set near private trappers, and to pull their own sets if a private trapper has set nearby. WS has no reason to compete with the private fur trapper, as the goal of cooperative beaver damage management efforts is always the safe and effective resolution of the conflict. Strict policy adherence, training, and common sense have resulted in very few conflicts between the public and WS BDM over the last two decades.

In addition to fur trappers, other interest groups possess concerns and strong feelings regarding BDM, including wildlife watchers, trout anglers and waterfowl hunters. However, a public attitude survey conducted in 2011 by the multi-agency Beaver Task

Force as part of the development process of a new beaver management plan showed widespread support for BDM. A total of 571 respondents represented a number of interests including interested citizens (47%), trout anglers (46%), landowners (36%) or trappers (35%). Several of the questions were trapper focused and as expected, respondents to those questions were likely primarily trappers (38% of total). Among trappers, acknowledgement of beaver damage to trout streams as a common problem was substantial (61%). The rest of the questions were answered by the entire group. Among those respondents a majority (68%) found the level of all beaver damage done to be acceptable though they were accepting of beaver removal on trout streams (58%) and a majority (54%) also felt that beaver populations were, to varying extents, damaging to trout populations. They further strongly supported beaver removal on class 1 trout streams (68%) and more supported beaver removal on Class 2 trout streams (46%) than opposed (39%) (WDNR, unpublished data).

4.1.2 Cumulative and Unavoidable Impacts

Impacts that are cumulative and unavoidable are discussed in relationship to each environmental impact analyzed in this chapter. This EA defines the total annual removal of individual animals from wildlife populations from all sources as cumulative mortality. Analysis of Wisconsin WS take during 2007-2011 and anticipated future WS take, in combination with other mortality, indicates that cumulative impacts are not adversely affecting the viability and health of wildlife populations. It is not anticipated that the Wisconsin WS program would result in any adverse cumulative impacts to T&E species, and beaver damage management activities do not jeopardize public health and safety.

4.1.3 Irreversible and Irretrievable Commitments of Resources

Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, no irreversible or irretrievable commitments of resources are apparent. The Wisconsin WS program produces very negligible cumulative impacts on the supply of fossil fuels and electrical energy.

4.2 ISSUES ANALYZED IN DETAIL

4.2.1 Alternative 1. No WS Beaver Damage Management in Wisconsin

Effects on beaver populations- WS would have no impact on beaver populations in Wisconsin. Impacts to beaver under this alternative would be variable and dependent upon actions taken by affected landowners/resource managers. Landowners/resource managers would receive no guidance from WS regarding their options, but it is likely that most resource managers would continue to attempt to do something about their beaver damage. Some landowners/resource managers experiencing damage would trap or shoot beaver, or hire private trappers to conduct the work in accordance with state regulations. A landowner who refuses to allow a beaver dam that is causing damage on adjacent property to be removed may be held liable for damages pursuant to s. 29.885(6). If lethal techniques are used, this alternative would result in short-term, localized decreases in target species populations at damage management sites. Some resource managers experiencing damage may take illegal or unsafe action against local populations of beaver either unintentionally due to lack of training, or deliberately out of frustration with continued damage. In these instances, more beaver may be taken than with a professional

WDM program (Alternatives 2&3) or in situations where technical assistance and or non-lethal alternatives are readily available (Alternatives 3-5). Therefore, depending upon the actions taken by resource managers or landowners, overall impacts of this alternative on target beaver populations may be similar to Alternative 2 and similar to or slightly higher than Alternatives 3-5.

Effects on plants and other wildlife species, including T&E species- In the absence of WS assistance, some landowners/resource managers may attempt to remove beavers causing damage problems themselves or hire private trappers with variable degrees of damage management experience. Without direct supervision, depending upon their training and individual ethics, these landowners/resource managers or trappers could be more likely than WS personnel to trap non-target species and might not report non-target take to regulatory authorities. Other landowners/resource managers experiencing damage may take illegal or unsafe action against local populations of beaver either out of frustration with continued damage or for economic reasons resulting in elevated risks to plant and wildlife populations.

One anticipated outcome of no WS beaver damage management is a likely increase in beaver damage and associated beaver created impoundments if resource owners do not effectively remove beaver dams. As discussed in Sections 1.4 and 1.5 beaver impoundments have an impact on other wildlife and plant species. Extent and nature of the impacts would depend upon the size of the beaver created impoundment, the length of time the impoundment had been present and type of plant and animal species in the area. Since the presence of beaver impoundments has been identified as a factor that significantly degrades trout habitat in Wisconsin, this alternative could result in the degradation of hundreds of miles of priority classed trout streams. An increase in beaver impoundments would benefit certain species of plants and wildlife that thrive in a beaver pond habitat.

Beaver feeding damage to native plant species may increase under this alternative unless affected resource owners implement their own beaver damage management plan.

Effects on public and pet health and safety - If resource owners do not implement an effective beaver damage management program in the absence of WS, potential for increased risks to public health and safety from unresolved damage situations may occur. For example, the flooding or washing out of roadways and railroad beds can result in serious accidents (Woodward 1983, Miller and Yarrow 1994). Beaver also are carriers of the intestinal parasite *Giardia lamblia*, which can contaminate water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994).

Additionally, resource owners inexperienced in the safe and proper use of management tools may attempt to resolve beaver damage problems themselves. Without professional assistance or proper training in the use of damage management tools there will be increased risks to public and pet safety. Increased risks are associated with the improper or inexperienced use of damage management methods such as trapping and shooting.

Humaneness of methods to be used - Individuals concerned about government involvement in actions they consider inhumane would find this alternative more acceptable than Alternatives 2 and 3, and possibly Alternatives 5 depending upon individual perceptions of non-lethal BDM techniques. However, the overall humaneness

of the alternative is not likely to be substantially different than Alternatives 2 and 3 because landowners/resource managers could still use lethal and non-lethal methods to reduce beaver damage in the absence of WS as authorized by the state. Impacts on humaneness would depend on the experience of the person implementing the control method. Use of capture devices by inexperienced personnel may lead to increased pain and suffering by target and non-target animals. Some resource/property owners may take illegal action against localized populations of beaver out of frustration with continued damage. Illegal actions may be less humane than methods used by experienced WS personnel.

Effects on wetlands - Under this alternative, WS would have no impact on wetlands. Beaver dam breaching and removal needs would be met by private, state, or local government entities.

Economic losses to property - Beaver damage would likely continue to increase unless an effective damage management program was implemented by non-WS personnel. Depending upon the level of experience and methods available to non-WS personnel conducting the damage management, the BDM program may be less efficient and effective than a WS program thereby increasing costs to the landowner/resource manager through additional costs to conduct management as well as costs of the property damage itself.

Impact to stakeholders, including aesthetics - Impacts of this alternative to stakeholders would be variable depending on their values regarding wildlife. Landowners/resource managers with damage from beaver would likely strongly oppose this alternative and likely perceive it as an unjust restriction on their opportunity to obtain WS assistance with problems caused by the public's wildlife. Individuals opposed to government involvement in BDM, especially the use of lethal management tools, would prefer this alternative.

Some people would support this alternative if they feel that their opportunity to enjoy seeing beaver and other wildlife associated with beaver ponds would increase. Waterfowl hunters may support this alternative if they feel that the lack of WS involvement would allow an increase in beaver impoundments where waterfowl could be hunted. Fur trappers may also support this alternative if they perceive that this alternative would lead to an increase in beaver available for fur harvest. Similarly, Nuisance Wildlife Control Operators (NWCOs) also may support this alternative if they perceive that this alternative would increase their opportunity for handling nuisance beaver complaints. However, while WS would take no action under this alternative, other individuals or entities could, and likely would, conduct damage management activities resulting in impacts similar to Alternative 3. Some people may not support this alternative if they feel lack of WS involvement will lead to degradation of coldwater ecosystems due to inconsistent management of beaver damage to trout streams. Trout fishers may be negatively impacted if beaver and beaver dams are allowed to increase to a level where trout habitat is degraded to the point where trout numbers and size decline, limiting fishing opportunities and success.

4.2.2 Alternative 2. Only Lethal Beaver Damage Management by WS

Effects on beaver populations - This alternative could result in a localized decrease in beaver numbers at specific site where the damage management occurs, such as at road

culverts, flooded timber sites, and select trout streams. It is possible, that in the absence of readily available information on non-lethal techniques from WS, more resource managers/landowners would use lethal techniques to address their beaver problems. For example, without information on how to protect trees with fencing, landowners may resort to only lethal methods. Sites where dams are not removed may be more readily re-colonized by beaver which could potentially increase the number of animals which are lethally removed at a given site, unless dam removal is conducted by the landowner/manager. Therefore, the number of beavers killed by under this alternative may be slightly higher than for Alternative 3 but, given WDNR oversight and monitoring, is not likely to be high enough to have a significant adverse impact on the state beaver population.

Effects on plants and other wildlife species, including T&E species - Non-target species such as otter, raccoons, and turtles may occasionally be killed as a result of WS lethal beaver management. WS impacts on non-target species from capture methods would be similar to those described in Alternative 3. However, the potential for greater use of lethal methods may lead to an increase in the kill of non-target species.

Removal of beaver may reduce gnawing and feeding on certain plants. Reduction in beaver damage to native plant species would be similar to Alternative 3 when lethal methods are effective in reducing such damage. WS would not remove or breach beaver dams under this alternative. Impacts related to beaver dam breaching or removal on native plants and animals would be similar to Alternative 1. Increased use of lethal methods in situations where nonlethal methods may effectively resolve conflicts may result in unnecessary loss of beaver pond habitats and adversely impact the species which depend on these habitats. WS would use the same measures for the protection of T&E species described for Alternative 3. Therefore, impacts of WS damage management methods on T&E species would be similar to Alternative 3. Consequently, any adverse impacts are likely to be localized and will not be of sufficient frequency or magnitude to reduce state populations of nontarget species.

Effects on public and pet health and safety - WS impacts on public and pet health and safety resulting from the reduction of beaver health and safety risks would be similar to those described in Alternative 3, except in those situations where health and safety risks would be reduced by the use of non-lethal methods, such as removal or breaching of beaver dams or installation of water control structures. Since WS would not implement or recommend non-lethal control methods under this alternative, impacts related to non-lethal methods would be similar to Alternative 1. Risks to public and pet health and safety from WS' use of lethal methods would be very low, but could be slightly higher than Alternative 3 because of the potential increase in use of lethal management techniques.

Humaneness of methods to be used - WS personnel are experienced and professional in using management methods and tools humanely and effectively. Under this alternative, beaver would be humanely trapped, snared or shot by experienced WS personnel using the best methods available. Beaver live-captured in traps or snares would be euthanized by shooting. Beavers also would be removed through the use of drowning trap and snare sets. Humaneness issues relative to the use of lethal management techniques will be similar to Alternative 3. However, because of the lack of WS involvement in the use of non-lethal techniques, there may be higher use of lethal management methods. Persons opposed to the use of lethal techniques will be more opposed to this alternative than to

Alternative 3 because of the potential for increased use lethal techniques. Individuals concerned about animal welfare and the need to ensure that animals are not killed or do not suffer needlessly will also likely be opposed to this alternative because WS will not be providing information on non-lethal methods for solving damage problems or preventing new problems.

Effects on wetlands - Under this alternative, WS would remove beaver from a site; however, WS would not remove or breach beaver dams. Some beaver dams will remain for a period after beaver are removed without maintenance. Beaver dams could be removed by the landowner/manager. Therefore, effects on wetlands from dam removal and breeching activities would be similar to Alternative 1.

Economic losses to property - Damage to property would be expected to decrease as beaver are removed at the damage site in some situations, but would remain the same in other situations where beaver dam removal/breaching is needed to reduce damage but does not occur. However, non-WS personnel could remove dams to reduce damage in those situations.

Impacts to stakeholders, including aesthetics - Impacts of this alternative would be variable depending on each stakeholder's values toward wildlife. This alternative would likely be favored by landowners/resource managers with damage if lethal methods reduced damage to acceptable levels. Some people may be opposed to this alternative if they feel it will decrease their opportunity to view, and enjoy beaver and because there will be situations where lethal methods are used to resolve problems that could be solved nonlethally. There would be no substantial reduction in the statewide beaver population in Wisconsin (Section 4.2.3), so opportunities to view beaver would be available to individuals visiting sites with adequate habitat outside of the damage management area. Fur trappers may be opposed to this alternative if they perceive that this alternative would lead to a decrease in beaver available for fur harvest in their immediate area. Similarly, NWCO's also may be opposed to this alternative if they perceive that this alternative would decrease their opportunity for handling nuisance beaver complaints.

Other landowner/resource managers are likely to oppose restrictions to their access to the full range of management methods from WS, especially non-lethal techniques which are generally perceived as being more humane and which often serve to prevent new problems or extend the time between damage occurrences. Some individuals will oppose this alternative because of a strong moral belief that killing or using animals for any reason is wrong. Other individuals will believe that the benefits from beaver would outweigh the associated damage and that resource managers should learn to live with the damage.

4.2.3 Alternative 3. WS Fully Integrated Beaver Damage Management for all Public, Tribal and Private Land (No Action/Proposed Action)

Effects on beaver populations - Wisconsin WS program removes a relatively small number of beaver from the statewide population in Wisconsin (Table 4.1). Unlike Alternative 2, the use of exclusion, habitat modification, beaver dam breaching and removal, and water control devices could be used as part of an IWDM approach. Use of non-lethal methods would have little or no direct effect on beaver populations, but may decrease the need for lethal methods thereby reducing the number of animals taken with lethal control.

Table 4.1 Beaver taken by WS for wildlife damage management in Wisconsin and harvested by licensed fur trappers and, 2007 - 2011[1].

	FY 2007 (Trapping Season 2006-07)	**FY 2008 (Trapping season 2007-08)**	**FY 2009 (Trapping season 2008-09)**	**FY 2010 (Trapping season 2009-10)**	**FY 2011 (Trapping season 2010-11)**	**Average**
# Beaver removed by WS	906	1,126	1,149	863	1,285	1,066
# Beaver harvested by licensed trappers	48,716	29,924	37,425	31,049	25,540	34,531
Total Take of Beaver In Wisconsin	49,622	31,050	38,574	31,912	26,825	35,597
% WS Take of Total Beaver Take	0.02	0.04	0.03	0.03	0.05	0.03
Estimated Wisconsin Beaver Population	93,100	66,800	66,800	66,800	80,473	
% of State Beaver Population Removed by WS	0.01	0.02	0.02	0.01	0.02	0. 02
% of State Beaver Population Removed by Fur Trappers	0.52	0.45	0.56	0.46	0.32	0.46
% of State Beaver Population Removed by All Sources	0.53	0.46	0.58	0.48	0.33	0.48

[1] Year indicates the federal fiscal year (October 1 thru September 30) and the Wisconsin trapping season (October-April).

Use of lethal methods may result in short-term local reductions in the density of beavers at site specific damage areas such as at road culverts, sensitive habitat sites, and timber damage areas. The amount of time until new beaver move into the area would vary depending on habitat type and quality, time of year, and population densities in surrounding areas. Lethal removal of beaver from stream systems in order to protect and recover coldwater ecosystems would result in low densities of beaver in those stream systems designated by WDNR and USFS fisheries managers. Once management objectives are achieved for these streams ongoing BDM activities are required to maintain the free flowing condition required for trout habitat. Ongoing removal of beaver in these streams results in relatively few beaver being taken by WS annually, than during the early stages of the project due to low beaver density.

Beaver Population Information and Impact Analysis- Beaver are usually found in family groups that are comprised of 2 adult parents with 2-6 offspring from the current or previous breeding season (Novak 1987). Average family group size has been documented as ranging from 3.0 to 9.2 beaver (Novak 1987). Beaver abundance has been reported in terms of families/kilometer of stream or families/square kilometer of habitat. Novak (1987a) summarized reported beaver family abundance as ranging from 0.31 to 1.5 families/kilometer of stream, which converts to 0.5 – 2.4 families/mile of stream. Densities reported in terms of families/square kilometer have been reported to range from 0.15 to 3.9 (Novak 1987) which is the same as 0.24 to 6.3 families/square mile. Additionally, Novak (1987a) indicates population growth rates of beaver are density dependent, which means rates of population growth generally increase as a population is reduced and decrease as a population reaches carrying capacity[1]. This is a natural function of most wildlife populations which helps to mitigate population reductions. Logan et al. (1996) indicated that wildlife populations being held at a level below carrying capacity can sustain a higher level of harvest because of the compensatory mechanisms that cause higher rates of increase in such populations.

Beaver take by WS, estimated licensed harvest and the state beaver population estimate are provided in Table 4.1. It is important to note that the number of beaver taken by licensed harvest and the number of beaver in the state are estimates, and that the systems used for these estimates have limitations. The WDNR does not have bag limits for beaver harvest or require individuals to report beaver harvest. Consequently WDNR does not have a precise count of the beaver taken by licensed hunters/trappers. Instead, beaver harvest is estimated using a special beaver questionnaire that is included with a fur trapper questionnaire sent to a sample of licensed trappers and Wisconsin fur buyers. Comparison of survey answers to actual numbers for furbearers that trappers are required to register (e.g., bobcat) indicates that the trappers report more animals on the survey than they actually take.

Furthermore, while population data for the northern 2 beaver management zones should be relatively accurate, there is no survey data for Zones C/D which comprises 1/2 to 2/3 of the state. Instead, WDNR estimates the beaver population in Zone C/D based on population and harvest data in Zones A and B. This requires making assumptions about the beaver population and beaver harvest which may not be accurate. However, the

[1]Carrying capacity is maximum number of animals the environment can sustain and is determined by food availability, water, cover, and tolerance of crowding by the particular species.

survey, as conducted from (1998-2011) does provide a consistent index for monitoring trends in the beaver population (Section 1.6.2).

Over the period of 2007-2011, cumulative estimated beaver take was approximately 48% of the estimated state beaver population (Table 4.1). This number is higher than the sustainable harvest level of 30% noted in the WS programmatic EIS (USDA 1997, Revised). As noted above, there is potential for error in the state system for estimating the beaver population and beaver harvest. If the harvest truly had averaged 48%, beaver populations would be declining precipitously. However, state population surveys indicate no such decline (Section 1.6.2, Figure 1.1). The WDNR developed and tested a beaver population helicopter survey in the winter of 1990-92 capable of estimating regional beaver populations with a degree of accuracy of ± 20% (Fig. 1-1). Unfortunately, due to differences in methodology population estimates from the surveys in 1992 and 1995 cannot be accurately compared to surveys beginning in 1998. The 1992 and 1995 estimates are likely higher than they would have been if the survey protocol begun in 1998 had been used (David McFarland, WDNR, personal communication). Due to the inconsistencies between survey designs the apparent population decline between 1995 and 1998 may not have occurred. Data from 1998-2011 appear indicative of a stable or gradually decreasing state beaver population, consistent with WDNR management objectives. WS take is on average about 3% of the total estimated cumulative take (Range 2-5%; Table 4.1) and only approximately 2% of the total estimated beaver population. Future WS take of beaver for damage management is expected to be similar to recent years and will not exceed 2.5% of the estimated beaver population.

WS beaver damage management actions are not evenly distributed throughout beaver habitat. Some areas, such as high priority trout streams will have localized population reductions. However, beaver are managed on only about 2,000 miles (approximately 1,500 miles by WS (Figure 4.1); 500 miles by WDNR) of the approximately 13,000 miles of trout streams in the state (Steve AveLallemant, WDNR, Pers. Comm.) and trout streams comprise only a fraction of the total suitable beaver habitat in Wisconsin. Beaver habitat can be found any place where there is water and suitable vegetation. This includes areas around lakes, marshes, impoundments, rivers, as well as streams. The distribution of trout streams are clustered around the state. In most counties, less than 50% of stream miles are considered suitable for trout. (Figure 4.2) Class I trout streams represent less than 50% of total stream miles in all but two counties in the state. (Figure 4.3) Given WDNR oversight of beaver harvest and beaver take for damage management, WDNR beaver surveys, and the above information it is determined that the current and anticipated future WS beaver damage management program would not have an adverse cumulative impact on the statewide beaver population.

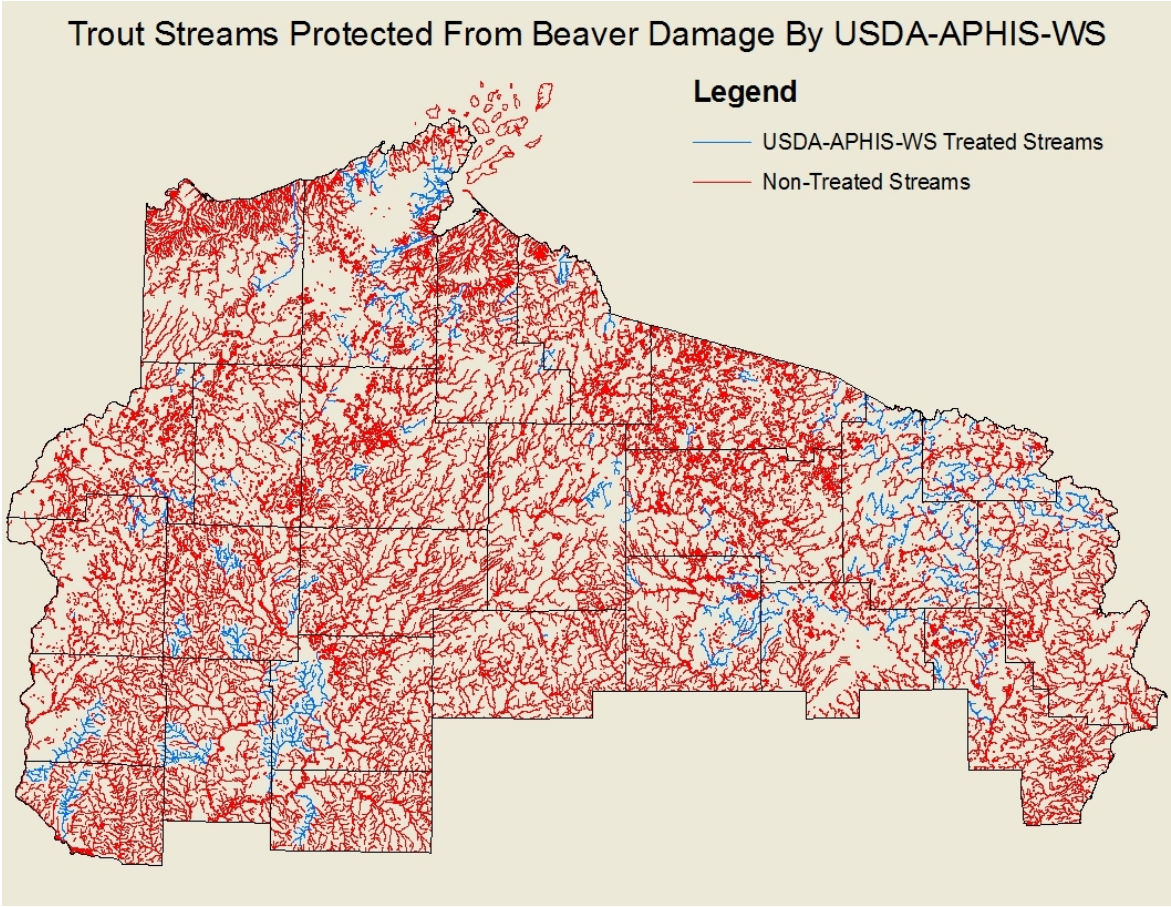

Figure 4.1. Trout streams in Northern Wisconsin where WS conducts beaver damage management.

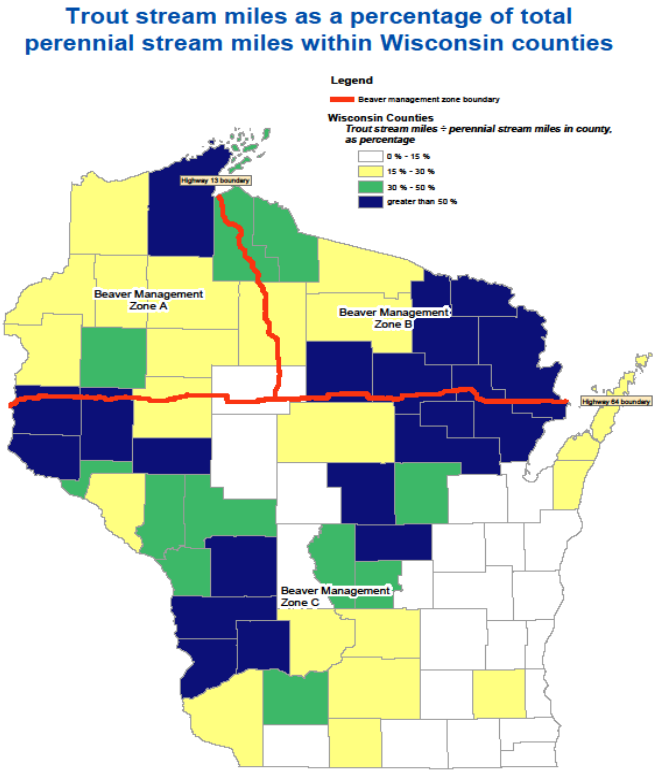

Figure 4.2

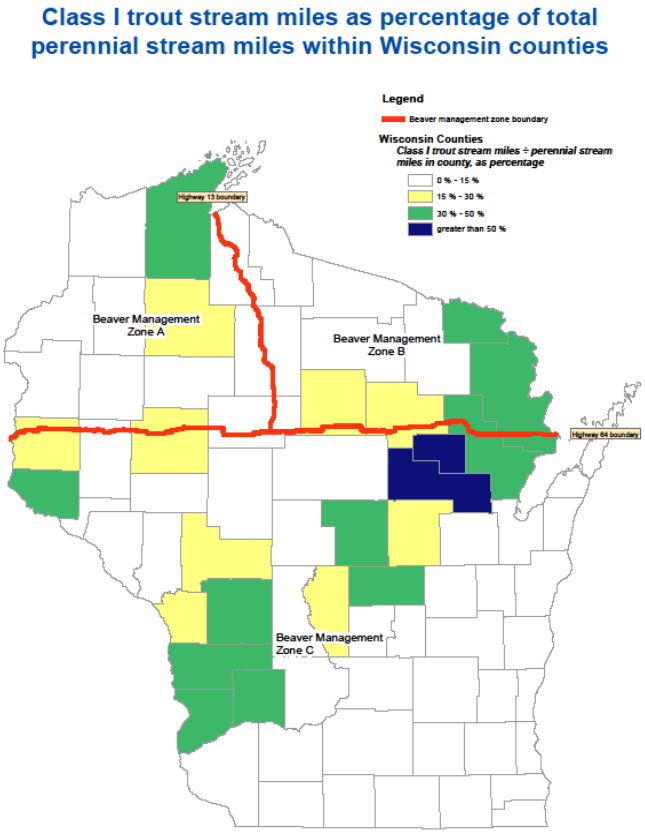

Figure 4.3

Effects on plants and other wildlife species, including T&E species - Direct impacts on non-target species would occur if WS program personnel were to inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species. WS personnel are experienced and trained in wildlife identification, and to select the most appropriate methods for taking targeted animals and excluding non-target species. Shooting is virtually 100% selective for the target species; therefore no adverse impacts on non-target species are anticipated from use of this method. WS personnel select lures and capture equipment and set traps and snares in locations that are most likely to capture target animals while minimizing potential impacts to non-target species. Any non-target species captured unharmed in a live trap would be subsequently released on site. Non-target animals captured alive but injured would be assessed and euthanized if it is determined the animal could not survive.

Impacts on Federally Listed Species:

MAMMALS **-** The Canada lynx (*Lynx canadensis*) was listed as a threatened species on March 24, 2000. On August 23, 2006, Wisconsin WS completed a consultation with the USFWS Region 3 regarding the impacts of program activities, including BDM, on lynx. The USFWS concurred with WS' determination that WS' wildlife damage management activities in Wisconsin may affect but are unlikely to adversely affect Canada lynx. The USFWS letter states, "Because of the locations and conditions under which each of these methods is deployed, the potential for adverse effects to Canada lynx are believed to be low. In particular, the low likelihood of occurrence of the species in the action area, the fact that wildlife damage control activities are not generally conducted in habitats utilized by lynx, and that the target control methods utilized by Wildlife Services, makes the likelihood of an incidental capture an unlikely occurrence, therefore discountable."

BIRDS - Bald Eagle (*Haliaeetus leucocephalus*): The USFWS Biological Opinion, prepared while eagles were a federally-listed threatened species, stated that WS BDM activities will not jeopardize the continued existence of the Bald Eagle (*Haliaeetus leucocephalus*), a federally-listed threatened species up until June 28, 2007 when they were removed from the endangered and threatened species list. Bald Eagles remain protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Two Bald Eagles were taken as a result of WS BDM activity, 1988-1992. Wisconsin WS instituted new policy in 1992 to reduce the likelihood of a Bald Eagle capture. No eagles were captured as a result of BDM since the new policies were implemented until 2010. A Bald Eagle was captured and released unharmed from a foothold trap in April 2010 and also in May 2012. Although any capture of eagles is undesirable, current and potential future impacts would not adversely impact the state eagle population. The Wisconsin WS program has requested a non-purposeful take permit from the USFWS to address potential risks to eagles.

Kirtland's Warbler (E) (*Dendroica kirtlandii*): Kirtland's Warblers are found in areas at least 30 hectares in size, where scrubby jack pine (2 to 6 meters high) is interspersed with many small openings and minimal ground cover (USFWS 2012*a*). These areas are not locations where WS receives requests to conduct BDM, so the proposed action is not expected to have any effect on Kirtland's Warblers. Additionally, the WS program is a partner in the Wisconsin Kirtland Warbler recovery project and is familiar with the known locations of the nesting warblers. WS would re-initiate consultation with the USFWS in the unlikely event that WS receives a request to conduct BDM in Kirtland

warbler habitat in Adams, Bayfield, Douglas, Jackson, Marinette, and Vilas Counties at times when warblers may be nesting.

Piping Plover (*Charadrius melodus)*: Piping plovers are tiny shorebirds that inhabit sandy beaches where vegetation is sparse (USFWS 2012*b*). BDM is not conducted in habitat where this species occurs.

Whooping Crane (*Grus americana*): On June 26, 2001, an experimental non-essential population of Whooping Cranes was established in the central U.S. Most of the reintroduced birds spend the summer in Wisconsin. Rules established for the protection of the cranes do not include restrictions on the use of trapping devices for beaver removal. WS has captured Great Blue Herons and Sandhill Cranes while conducting BDM activities. WS' incidental capture of Great Blue Herons and Sandhill Cranes has been low relative to the number of beaver taken. For the period of 2007-2011, unintentional take of Great Blue Herons has ranged from 0-3 birds per year (median = 1.2) Three Sandhill Cranes were captured and released.. The risk to Great Blue Herons is as expected given that this species is commonly observed using beaver ponds. Both species are far more common than Whooping Cranes. The Wisconsin Checklist Project uses a series of volunteers to monitor relative abundance of birds in Wisconsin. Volunteers complete weekly forms indicating the species of birds observed during the week. In 2010, 30.9% of forms turned in included observations of Great Blue Herons and 47.4% included observations of Sandhill Cranes. Based on the low level of unintentional take of Great Blue Herons and Sandhill Cranes which are more common than Whooping Cranes, and WS SOPs for the prevention of take of nontarget species, we have determined that the risk to Whooping Cranes from WS beaver damage management is extremely low. However, the USFWS has requested that consultation be reinitiated for the Whooping Crane when beaver damage projects are proposed for National Wildlife Refuge or the National Park System lands.

REPTILES - Eastern massasauga rattlesnake (C) (*Sistrurus catenatus)* is listed as a candidate species. This snake is strongly associated with floodplain habitats along medium to large rivers, especially near river confluences, where they primarily occupy open canopy wetlands, such as sedge meadows, fresh wet meadows, scrub carr and adjacent upland prairies and old fields (USFWS 2012*c*). Today the massasauga is found only in several isolated localities in southeastern, central, and westcentral Wisconsin. (WDNR website, 2012). WS has not conducted BDM activities in areas where massasauga occur. Therefore, the WS BDM program will have no effect on the eastern massasauga at this time. If future BDM activities that impact established wetlands are proposed in localities where massasauga may be present (Buffalo, Crawford, Jackson, Juneau, Lacrosse, Monroe, Pepin, Trempealeau, Walworth and Wood Counties), a consultation would be conducted prior to implementing activities.

INSECTS - Karner blue butterfly (E) (*Lycaeides melissa samuelis)*is found in pine barrens and oak savanna in close association with its larval host plant lupine (*Lupinus perennis*). In Wisconsin, also found along utility and road right-of-ways, abandonded agricultural fields, and managed forests (USFWS 2012*d*). BDM is not conducted in areas where this species occurs.

Hine's emerald dragonfly (E) (*Somatochlora hineana)*: There are 11 units of critical habitat designated in Wisconsin for this species. Ten units occur in Door County and one unit is in Ozaukee County (USFWS 2012*c*). BDM activities are not conducted in these

critical habitat units and there would be no impacts from BDM activities. If future BDM activities are proposed in Door, Kewaunee, Richland, Iowa, Grant and Ozaukee Counties, a consultation would be conducted prior to implementing activities.

Poweshiek skipperling (C) (*Oarisma poweshiek*): Poweshieks require wet mesic prairie or southern fen habitat with native grasses, sedges, and a significant component of plants in the sunflower family (USFWS 2012*f*). BDM is not conducted in habitat where this species occurs.

The Higgin's eye pearly mussel (*Lampsilis higginsii* - endangered), winged mapleleaf (*Quadrula fragosa* - endangered), sheepnose mussel (*Plethobasus cyphyus* - endangered) and spectaclecase (*Cumberlandia monodonta* - endangered) are aquatic organisms, they inhabit large to medium rivers (e.g. Mississippi and St. Croix rivers) and are not found in locations where WS conducts BDM. (USFWS 2012g,h,i and j). Therefore, the WS BDM program will have no effect on these mussel species. The snuffbox mussel (*Epioblasma triquetra*) was listed as endangered in February 2012. Snuffbox mussels usually live in small to medium-sized creeks but may also be found in larger rivers. They prefer areas with a swift current and cannot live in lakes or slow water created by dams (USFWS 2012*k*). In Wisconsin, snuffbox mussels are known to occur in the St. Croix, Wolf, Embarrass and Little Wolf Rivers and in Willow Creek in Outagamie, Pierce, Polk, St. Croix, Shawano, Waupaca and Waushara Counties. Sediment that blankets river bottoms can suffocate snuffbox mussels. Beaver and beaver dam removal helps to restore free-flowing water conditions and may be beneficial to snuffbox mussels. Based on the above information, BDM is unlikely to adversely affect listed mussels. However, However, the USFWS has requested further consultation if beaver damage management should occur in Polk, St Croix, Outagamie, Shawano, Waupaca, and Waushara Counties.

PLANTS - Dwarf lake iris (T) (*Iris lacustris*): Occurs on northern shores of Great Lakes. BDM is not conducted in areas where this species occurs.

Eastern prairie fringed orchid (T) (*Platanthera leucophaea)* : Found in moist, undisturbed, deep-soiled and/or calcareous prairies and rarely in tamarack fens. BDM is not conducted in habitat where this species occurs.

Fassett's locoweed (T) (*Oxytropis campestris* var. *chartacea*): Found in sandy, fluctuating lakeshores. Its appearance is sporadic depending on water level. BDM is not conducted in habitat where this species occurs.

Mead's milkweed (T) (*Asclepias meadii*): Reintroduced populations occur in in Dane, Columbia, and Sauk Counties. BDM is not conducted in habitat where this species occurs.

Northern wild monkshood (T) *(Aconitum noveboracense)*: Found on shaded cliffs and talus slopes; seepage springs. BDM is not generally conducted in habitat where this species occurs.

Pitcher's thistle (T) *(Cirsium pitcheri)*: Found in the shoreline dune systems of Lakes Michigan, Huron and Superior. BDM is not conducted in habitat where this species occurs.

Prairie bush-clover (T) *(Lespedeza leptostachya*): Found in gravelly or sandy hillside prairies. BDM is not conducted in habitat where this species occurs.

In Summary, WS concluded that, given the analysis and protective measures noted above the IBDM program may affect but was not likely to adversely affect Canada lynx, Whooping Crane, or the snuffbox mussel and would have no effect on the remaining federally-listed species in the state. The USFWS concurred with WS determination October 31, 2012, provided that WS adhered to the protective measures and requests for re-initiation of consultation noted above.

State Listed Species:

In a letter dated February 14, 1996, the WDNR concurred with WS' determination that BDM activities would not be likely to adversely impact state listed T&E species. Since February 14, 1996 a total of 32 new species have been added to the state's endangered and threatened species list; 21 plant species, 6 insect species, 3 bird species, one reptile species, and one fish species (WDNR 2004). After reviewing the initial consultation, WS and the information on the impacts of the BDM program, WS has determined that the assessment of risks to state-listed species in the 1996 consultation is still valid. WS has reinitiated consultation with the WDNR to address potential risks to species listed since the 1996 consultation. WS determined that, given the provisions and protective measures noted below, the IBDM program would not adversely the species which have been listed since the 1996 consultation was completed. On October 29, 2012, the WDNR concurred with WS' determination.

With the exception of the Snowy Egret (*Egretta thula*), Yellow Rail (*Coturnicops noveboracensis*), and Spruce Grouse (*Dendragapus canadensis*) the newly listed species either do not occur in counties where WS has conducted BDM, or do not occur in habitat where WS conducts BDM. The Spruce Grouse requires large tracts of lowland coniferous forest. The removal of beaver created impoundments may benefit spruce grouse by reducing the incidence of flooding and timber damage in the habitat used by grouse.

The Yellow Rail is a small, sparrow sized bird and is a rare migrant in Wisconsin. Pan tension devices used by WS on all foot-hold traps to reduce the risks to nontarget species that are lighter than target species are likely to exclude Yellow Rails from these traps. Based on the bird's small size and rarity in the state risks to this species from WS BDM are minimal.

The Snowy Egret is regarded as an uncommon migrant in Wisconsin and a rare summer resident in the Eastern portions of the state. The Snowy Egret has been proposed by DNR for removal from the threatened and endangered species list. Snowy Egrets are absent from the majority of area where BDM activities are conducted. As indicated in Table 4.2, WS has captured Great Blue Herons and Sandhill Cranes which are more common than and larger than the Snowy Egrets. The Wisconsin Checklist Project uses a series of volunteers to monitor relative abundance of birds in Wisconsin. Volunteers complete weekly forms indicating the species of birds observed during the week. In 2010, 30.9% of forms turned in included observations of Great Blue Herons and 47.4% included observations of Sandhill Cranes, but only 0.4% included observations of Snowy Egrets (Rolley 2010). Despite being more common than Snow Egrets, WS' incidental capture of Great Blue Herons and Sandhill Cranes has been relatively low. For the period of 2009-2011, unintentional take of Great Blue Herons has totaled 3 birds (ranged from 0-2 birds per year) and no Sandhill Cranes were taken. The higher risk to Great Blue Herons

is as expected given that this species is commonly observed using beaver ponds. Based on the low level of unintentional take of Great Blue Herons which are commonly observed using beaver ponds and the relative scarcity of Snowy Egrets, we have determined that the risk to Snowy Egrets from WS beaver damage management is extremely low.

Other Nontarget Species Impacts

OTHER BIRDS - Aside from the birds already mentioned above, WS BDM activities for the period of 2009-2010 have resulted in the capture and killing of 21 ducks and 10 Canada geese (Table 4.2). Duck species included Common Meganser (*Mergus merganser*), Mallard (*Anas platyrhynchos*) and Wood Duck (*Aix sponsa*). Based on data from the Wisconsin Checklist Project, 1983-2009, the population trends for Common Merganser, Hooded Merganser, Wood Duck, and Canada goose are increasing (Rolley 2010). The very small numbers of these species taken as a result of BDM have no impact on statewide populations.

OTHER MAMMALS - Mammals taken by WS as part of BDM activities other than previously discussed include river otters (*Lutra canadensis*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*) and mink (*Mustela vison*).

In FY 2009, WS unintentionally caught 100 otter with 97 killed (Table 4.2). The 97 non-target otter killed by WS in FY 2009 represent 13.7% of the total number of otter (710) registered during the 2008-09 trapping season (this includes tribal harvest and incidental take). WS take however, represents 0.010 of the preharvest population of 9,300. Significantly fewer permits were issued to private trappers for the 2008-09 fur harvest season than in past years. Number of permits issued was the lowest since the permit system began in 1976 and was 48% lower than the number of permits issued the year before. A revision to the otter population model by DNR in 2009 in order to improve the correspondence between aerial surveys and the population model led to a declining population trend from 1994 through 2007-08. Fewer permits issued corresponded to a lower fur harvest take. During FY 2010, 70 river otters were unintentionally caught by WS with 68 killed and two freed (Table 4.2). The 68 non-target otters that were killed by WS in FY 2010 represent 9.0% of the total number of otter (753) registered during the 2009-10 trapping season and 0.007 of the preharvest population of 9,900. Number of permits issued to private trappers was again very low, and represented the second lowest number of permits issued since the permit system began in 1976. During FY 2011, 64 river otters were unintentionally caught by WS with 62 killed and two freed (Table 4.2). The 62 non-target otters killed represent 7.0% of the total number of otters registered (913) in the 20010-11 season and 0.006 of the preharvest population of 10,600 (Dhuey and Olson 2011). This take is of low magnitude when compared to total population estimates and will not adversely affect the viability of the statewide otter population.

An average of 37 muskrats (range of 29-43) were killed annually by WS BDM activities, 2009-2011 (Table 4.2). Muskrats are abundant in Wisconsin. During the 2010-11 fur trapping season the muskrat take by licensed private trappers was estimated at 334,276 (Dhuey and Olson 2011.). WS take of muskrats is insignificant when compared to the take by the public.

An average of 27 raccoons (range of 23-31) were killed annually by WS BDM activities, 2009-2011 (Table 4.2). One raccoon was captured and freed. Raccoons are abundant in

Wisconsin. During the 2010-11 fur trapping season, the raccoon take by licensed private trappers was estimated at 109,084 with another 40,535 estimated killed by hunters (Dhuey and Olson 2011). WS take of raccoons is insignificant when compared to the take by the public.

Turtles

A total of 106 turtles were captured by WS as a result of BDM activities, FYs 2009-2011 (Table 4.2). Most (89%) of these turtles were released unharmed. All turtles captured were common snapping turtles (*Chelydra serpentine*). Two species of turtles are listed as threatened by the state (wood turtle (*Clemmys insculpta*), Blanding's turtle (*Emydoidea blandingii*)), and one species is listed as endangered (ornate box turtle (*Terrapene ornata*)) by the state. None of these species has any federal threatened or endangered status. Ornate box turtles are strictly terrestrial and are not at risk from WS' BDM activities. Wood turtles are a semi-aquatic species that prefer moderate to fast-flowing water. They spend a great deal of time in forested habitats adjacent to rivers and streams. BDM activities which restore streams to free flowing condition may benefit wood turtles. Blanding's turtle populations are stable or slightly declining in Wisconsin and have been proposed to be removed from the state list of threatened and endangered species. Blanding's turtles occur primarily in central and southern Wisconsin counties and do not occur in a large area of northern Wisconsin along the Michigan border and much of Bayfield County where most BDM occurs. Given the relatively low number of turtles taken relative to the number of beaver removed, that most turtles captured in traps are released alive and that, to date, all nontarget turtles captured have been snapping turtles, risks to Blandings and Wood turtles are extremely low and will not adversely impact state populations of these species.

WS nontarget take of other species is limited to a few individuals of each species and will not adversely impact statewide populations of these species (Table 4.2).

Table 4.2. Nontarget species captured and fate during WS BDM activities, FY 2009-2011.

		FY 2009				FY 2010				FY 2011				
		Method				Method				Method				
Species	Fate	FH[1]	BG[2]	S[3]	Total	FH	BG	S	Total	FH	BG	S	Shot	Total
	K													
Bear, Black	F									1				1
	K													
Bobcat	F					1			1					
Deer, White-	K									1				1
tailed	F	1			1	1			1					
Ducks, Common	K		4		4		1		1		2			2
Merganser	F													
	K		5		5	1	7		8	1	1			2
Ducks, Mallard	F													
	K						1		1		1			1
Ducks, Wood	F		1		1	1			1					
	K													
Eagle, Bald	F					1			1					
	K													
Fish (Other)	F		4		4		1		1					
	K	2	1		3	5	1		6	1				1
Geese, Canada	F													
Herons, Great	K	2			2	1			1					
Blue	F													

Minks	K						2		2		1			1
	F													
Muskrats	K	6	37		43	5	24		29	3	35		1	39
	F													
Otter, River	K	22	75		97	11	56	1	68	8	54			62
	F		3		3		2		2			2		2
Raccoons	K	20	3		23	25	3		28	27	4			31
	F					1			1					
Turtles, Common Snapping	K		7		7		5		5		4	1		5
	F	4	27		31	1	24		25	1	30	2		33

1 Foothold trap
2 Body-gripping trap
3 Snare

As discussed in Section 1.5, removal of beavers may have beneficial impacts on some plant and animal species. Removal of beaver may reduce gnawing and feeding on certain native plant and mussel species. This alternative would have the greatest likelihood of reducing such damage since all available methods could be used or recommended. This Alternative may also result in a reduction in beaver created impoundments. The extent and nature of impacts would depend upon size of beaver created impoundments, whether the impoundment had been in place long enough for wetland plant and animal community to develop, and the diversity of plant and animal species in surrounding areas. Most beaver impoundments that are drained as a result of WS actions to alleviate damage to roads, bridges, and other structures have only been in place for a short period of time and the beaver removal returns the site to previous conditions. Positive and negative impacts of beavers are discussed in section 1.4 and 1.5, respectively.

Effects on public and pet health and safety - The Wisconsin WS program has had no accidents involving the use of firearms, traps, snares, or explosives in which any person was harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997 Revised, Appendix P). Therefore, no adverse effects on human safety from WS's use of these methods are expected. Mitigation measures designed and implemented to avoid adverse effects on public and pet health and safety are described in Chapter 3.

WS may occasionally use binary explosives to breach or remove beaver dams. WS personnel responsible for use of explosives are required to complete intensive training and must demonstrate competence and safety with use of explosives. Employees adhere to WS policies as well as regulations from the Bureau of Alcohol, Tobacco, and Firearms, the Occupational Safety and Health Administration, and the U.S. Department of Transportation with regards to explosives use, storage, safety, and transportation. Wisconsin requires that people using explosives be licensed by the Wisconsin Department of Commerce-Safety and Buildings Division. WS uses a two-component, or binary, explosives system which require the mixing of two non-explosive components to create a high explosive. Prior to mixing the components are not considered high explosives. Once mixed, the high explosive requires detonation from an explosive detonator to initiate the explosion. Use of binary explosives reduces the hazard of accidental detonation during storage and transportation. Storage and transportation of mixed binary explosives is not allowed. When explosives are being used by WS, warning signs are posted to restrict public entry. When beaver dams are near roads or highways, WS staff, police or highway department officials are used to help stop traffic

and restrict public entry. Therefore, no adverse effects to public safety are expected from the use of explosives by WS under any alternative.

WS traps are strategically placed to minimize exposure to the public and pets. Appropriate cautionary signs are posted on all properties where traps are set to alert the public of trap presence. Body-grip (e.g., Conibear-type) traps used for beaver are restricted to water sets which further reduce threats to public and pet health and safety.

Firearms and firearm misuse are a cause of concern because of issues relating to public safety and accidental injury or death. To ensure safe use of firearms, 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 annually afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment must comply with all applicable federal, state and local regulations including the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Shooting is a species selective method used by WS which poses minimal or no threat to pets and/or public health and safety. All firearm safety precautions are followed by WS when conducting BDM and WS complies with all applicable laws and regulations governing the lawful use of firearms. Shooting with shotguns, pistols, or rifles is sometimes used to reduce beaver damage when lethal methods are determined to be appropriate. WS uses firearms to humanely euthanize beavers caught in live traps.

This alternative would allow WS to use or recommend all available and effective damage reduction strategies and methods to reduce threats to public health and safety caused by beaver and beaver created impoundments. Access to the full range of BDM methods results in the greatest possibility of alleviating risks to human health and safety from flooding, damage to roads, railroad beds and water management structures, and possible outbreaks of mosquito borne illnesses.

Humaneness of methods to be used – Under this Alternative, beaver could be lethally removed with the use of traps, snares and firearms. In most cases, traps and snares used to capture beaver are rigged as drowning sets. Issues related to the humaneness of methods available to WS under this alternative are discussed in Section 2.2.4. WS personnel are experienced and professional in use of management methods, and methods are applied humanely. As discussed in Section 3.5.5, beaver live-captured in traps or snares would be euthanized by shooting and are not relocated. As with Alternative 2, use of lethal BDM techniques will be perceived as inhumane by individuals opposed to actions that result in the death of the problem animal, especially advocates of animal rights. Alternative 3 may be perceived as more humane than Alternatives 1, 2, by individuals who are concerned about animal welfare, but not necessarily opposed to the use of lethal management techniques if needed because it allows WS to use non-lethal management techniques where appropriate. They may also see it as more humane than Alternatives 1, 4 and 5 because lethal management techniques would be used by trained professionals who will use these methods as humanely as possible.

Effects on wetlands – Under this alternative beaver dams could be breached or removed by hand or with explosives for the purpose of returning streams, channels, dikes, culverts, and irrigation canals to their original drainage pattern and removing water from roadbeds, forests, and other flooded areas. Beaver dams are removed according to Section 404 of

the Clean Water Act (CWA). WS breaches/removes many beaver dams because of flooding in areas such as roads, railroads, trails, timberlands, croplands, pastures, and other types of property or resources that were not previously flooded. Recently flooded sites do not possess wetland characteristics, and wildlife habitat values are not the same as established wetlands (Appendix C). In the instances when WS removes dams from areas where wetland communities have developed, such as in streams, WS uses the procedures described in Appendix C to assure compliance with pertinent laws and regulations.

Under this alternative there may be concerns that the level of beaver removal conducted for trout stream enhancement may result in loss of a high portion of the state's wetlands. However, beaver removals for trout stream enhancement are conducted in about 2,000 (Fig. 4.1) of the approximately 13,000 miles of trout stream.

Based on the above information and the analysis above indicating that WS beaver damage management is not substantively impacting beaver population trends in the state, the proposed action will not have a significant adverse impact on the availability of beaver pond wetlands.

Economic losses to property

As stated in Section (3.2.1) this alternative is anticipated to be the most effective because it allows WS to select non-lethal and lethal damage management techniques when developing site-specific damage management plans. Property damage would be expected to decrease under this Alternative since all available damage management methods and strategies would be available for WS use and consideration.

Impacts to stakeholders, including aesthetics

Impacts of this Alternative to stakeholders would be variable depending on individual values regarding wildlife. This Alternative would likely be favored by most resource owners who are experiencing damage, because it allows for a variety of effective methods to be utilized with an IWDM approach to resolving damage problems. Most stakeholders without damage and individuals concerned about animal welfare also would prefer this Alternative to Alternative 2, because non-lethal methods could be implemented when appropriate to resolve damage problems. Some individuals will oppose this alternative because of a strong moral belief that killing or using animals for any reason is wrong. Some individuals will believe that the benefits from beaver and beaver impoundments would outweigh the associated damage and that resource managers should learn to live with the damage. Fur trappers may be opposed to this alternative if they perceive that this alternative would lead to a decrease in beaver available for fur harvest. NWCO's also may be opposed to this alternative if they perceive that this alternative would decrease their opportunity for handling nuisance beaver complaints. Opportunities for viewing and enjoying beaver and beaver pond habitat at a particular site would be limited if these animals are removed and the dams breached or removed. However, since statewide beaver numbers are not negatively impacted by WS under this alternative, opportunities remain in areas of beaver habitat for enjoying beaver and beaver ponds. Those who enjoy free flowing, coldwater streams for viewing or for activities such as trout fishing would favor this alternative.

4.2.4 Alternative 4. Technical Assistance Only

Effects on beaver populations

WS would have no direct impact on beaver populations in Wisconsin. Impacts to beaver would be variable depending upon actions taken by affected landowners/resource managers. WS would provide technical advice to those persons requesting assistance. Landowners/resource managers could use information provided by WS or implement their own damage reduction program without WS technical assistance. Use of WS technical assistance may decrease the risks associated with uniformed use of lethal management techniques and may increase the use of non-lethal alternatives over that expected under Alternative 1. Overall impacts on target species populations would be similar to or slightly lower than Alternative 1 depending upon the extent to which resource managers use the technical assistance provide by WS.

Effects on plants and other wildlife species, including T&E species

When WS technical advice is requested and followed, negative impacts to plants and wildlife species resulting from the improper use of control methods should be less than Alternative 1. However, landowners/resource managers could implement their own damage reduction program without WS technical assistance. Impacts from beaver dam breaching and removal activities would be similar to Alternative 1. Beaver damage to native plant species may increase under this alternative unless affected resource owners implement their own beaver damage management plan.

Effects on public and pet health and safety

WS would provide technical advice to those persons requesting assistance. Negative impacts to public and pet safety resulting from the improper use of control methods should be less than Alternative 1 when WS technical advice is followed. Landowners/resource managers could use information provided by WS or implement damage reduction methods without WS technical assistance. Impacts to public and pet safety resulting from the reduction of beaver damage and conflicts would be similar to Alternative 1.

Humaneness of methods to be used

Individuals concerned about government involvement in actions they consider inhumane would find this alternative more acceptable than Alternatives 2 and 3, and possibly Alternative 5, depending upon individual perceptions of non-lethal BDM techniques. Some individuals may oppose WS providing information on the use of lethal damage management techniques. The overall humaneness of this alternative is not likely to be substantially different than Alternatives 2 and 3 because landowners/resource managers could use lethal and non-lethal methods to reduce beaver damage in the absence of WS. Impacts on humaneness would depend on the experience of the person implementing the control method. Use of capture devices by inexperienced personnel may lead to increased pain and suffering by target and non-target animals. However, impacts associated with inexperienced and misinformed use of damage management techniques may be less than Alternative 1 if WS technical advice is requested and used. Some landowners/resource managers may take illegal action against localized populations of beaver out of frustration with continued damage. Illegal actions may be less humane than the regulated, supervised methods used by experienced WS personnel.

Effects on wetlands

WS would have no direct impact on wetlands under this alternative. WS would provide technical advice to those persons requesting assistance. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Overall impacts should be less than Alternative 1 when WS technical advice is requested and followed.

Economic losses to property

WS would provide technical advice to those persons requesting assistance to reduce economic losses. Landowners/resource managers could use information provided by WS or implement a damage reduction program without WS technical assistance. Overall impacts would be similar to or slightly better than Alternative 1 depending upon whether or not the resource manager/landowner uses WS technical assistance.

Impacts to stakeholders, including aesthetics

WS would provide technical advice to those persons requesting assistance. Resource/property owners could use information provided by WS or implement a damage reduction program without WS technical assistance. Overall impacts would be similar to Alternative 1.

4.2.5 Alternative 5. Non-lethal Beaver Damage Management by WS

Effects on beaver populations

No beaver would be killed by WS under this Alternative. Resource managers/ landowners will have readily available access to advice/assistance with non-lethal damage management techniques. Use of non-lethal methods (e.g., water control devices or removal of dams) by WS would have little or no direct effect on beaver populations. However, if WS recommendations and use of non-lethal methods are effective in reducing damage, fewer beaver might be lethally removed by resource owners/managers than under Alternatives 1 and 2. In these instances, overall impacts on target species populations will be similar to Alternative 3 wherein WS would use non-lethal techniques whenever practical and appropriate. In situations where damage is not reduced to acceptable levels by non-lethal methods, the impact on target species populations will depend upon the actions taken by resource owners/managers and are likely to be similar to Alternative 1.

Effects on plants and other wildlife species, including T&E species

WS lethal take of other wildlife species would not occur under this alternative. However, in those situations where non-lethal methods are not effective in reducing the damage problem, landowners/resource managers may attempt to trap and shoot beaver or contract private trappers with variable levels of experience resulting in risks to non-target species including T&E species similar to those described for Alternative 1. Impacts of WS use of non-lethal methods on T&E species would be similar to Alternative 3. Impacts of WS beaver dam removal and breaching activities would be similar to Alternative 3. In situations where non-lethal methods do not effectively reduce beaver damage to plant and wildlife species, impacts would be similar to Alternative 1.

Effects on public and pet health and safety

Non-lethal methods, including exclusion and habitat modifications, would not be efficient or effective in resolving many beaver types of damage situations. In situations where WS non-lethal methods and recommendations are ineffective at reducing damage to acceptable levels, impacts would be similar to Alternative 1. In situations where non-lethal methods are effective, impacts would be similar to Alternative 3.

Potential risks to public and pet safety from the use of non-lethal capture methods by WS including the removal of dams would be the same as Alternative 3. There would be no risk from WS use lethal damage management techniques because WS would not have access to these methods. However, in those situations where non-lethal methods do not reduce damage to acceptable levels, non-WS personnel may implement their own control program resulting in risks and impacts similar to Alternative 1.

Humaneness of methods to be used

Under this Alternative, only non-lethal beaver damage management methods would be implemented by WS. Some individuals may perceive this approach as humane because animals would not be taken lethally by WS. However, when non-lethal methods are ineffective at reducing damage to acceptable levels, resource/property owners may implement an unsupervised lethal damage management program or take illegal action against some local populations of beaver resulting in impacts similar to Alternative 1. WS would not provide technical assistance with the use of lethal damage management techniques so the impacts associated with inexperienced or poorly informed use of lethal damage management techniques will be similar to Alternative 1.

Effects on wetlands

Beaver created impoundments could be breached/removed by hand, with machinery, or with explosives by WS for the purpose of returning streams, channels, ditches, and irrigation canals to the original drainage under this alternative. Overall impacts would be similar to Alternative 3.

Economic losses to property

Damage to property would be expected to increase when non-lethal methods are ineffective unless the landowner/resource manager seeks to implement lethal damage management techniques without WS assistance. Depending upon the level of experience and methods available to non-WS personnel conducting the damage management, the BDM program may be less efficient and effective than a WS program thereby increasing costs to the resource manager.

Impacts to stakeholders, including aesthetics

While WS would provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management. Impacts of this alternative to stakeholders would be variable depending on effectiveness of WS non-lethal methods and resource manager/landowner actions. This alternative would not be favored by most resource managers/landowners who are receiving damage when non-lethal methods do not reduce damage. Most stakeholders without damage would prefer this Alternative to Alternative 2, because it could make it easier for resource managers to receive help with non-lethal methods than lethal methods. Some individuals would likely support this alternative because of a strong moral belief that killing or using animals for any reason is wrong. If resource managers/landowners do not accept WS non-lethal control methods and implement another type of control program, impacts would be similar to Alternative 1.

In situations where non-lethal methods are effective, there should be little to no impact on wildlife viewing opportunities. If non-lethal methods are not effective and the resource manager chooses to use lethal damage management techniques without WS assistance, the impacts are likely to be similar to Alternative 1.

4.3 CUMULATIVE IMPACTS

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

Under Alternatives 2, 3, 4 and 5, WS would address damage associated with beavers in a number of situations throughout the State. The WS BDM program would be the primary federal program with BDM responsibilities in Wisconsin; however, some state and local government agencies conduct BDM activities in Wisconsin as well. Through ongoing coordination with these agencies, WS is aware of such BDM activities and may provide technical assistance in such efforts if requested. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area, but may conduct BDM activities at adjacent sites within the same time frame. In addition, commercial pest control companies or private trappers may conduct BDM activities in the same area. It is the policy of WI WS to avoid competition with private trappers during those times when WS BDM activities may overlap with beaver fur trapping seasons. WS will avoid trapping at or near locations where private trappers have traps set. The potential cumulative impacts analyzed below could occur either as a result of WS BDM program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

4.3.1 Cumulative Impacts on Wildlife Populations

Beaver damage management methods used or recommended by the WS program in Wisconsin will likely have no cumulative adverse impacts on target and non-target wildlife populations. As analyzed above, WS limited lethal take of target beaver species is anticipated to have minimal impacts on target populations in Wisconsin. WS works with the WDNR and the USFS to determine that beaver removals conducted by WS in combination with all other known beaver removals, including recreational harvest, are not adversely impacting wildlife populations. A WS representative serves on the WDNR Furbearer Advisory Committee and the Wisconsin Beaver Management Task Force.

4.3.2 Cumulative Impact Potential from Chemical Components

No chemical control methods are utilized by WS for beaver removal in Wisconsin. Chemicals found in the binary components of explosives used for beaver dam breaching/removal are destroyed during the explosion or made inert when coming in contact with water. These chemicals pose no risk to wildlife and do not result in any cumulative impacts.

4.3.3 Cumulative Impact Potential from Non-chemical Components

Non-chemical methods used or recommended by WS IWDM program may include exclusion, habitat modification, beaver dam removal/breaching, live trapping and euthanasia, and lethal trapping, snaring, and shooting. Since WS takes only a small percentage of the total Wisconsin beaver population annually as part of BDM activities, and beaver have a high reproductive potential, no cumulative impacts from WS use of these methods to take beaver are expected. Since WS utilizes mitigation measures to reduce and prevent the capture of non-target species, and the annual catch of non-target species is minimal when compared to statewide populations of species caught, it is concluded that there are no cumulative impacts to non-target species.

4.4 SUMMARY

Table 4.2 presents a summary of relative comparisons of the anticipated impacts of each of the alternatives as they relate to each of the major issues identified in Chapter 2.

No significant cumulative environmental impacts are expected from any of the listed Alternatives (Table 4.3). With regard to Alternatives 2 and 3, Lethal Removal Only and the Proposed Action, respectively, lethal removal of beaver by WS would have no adverse affect on beaver populations in Wisconsin. No adverse risk to public or pet health and safety is expected from control methods implemented by WS under Alternatives 2, 3, and 5. However, some persons would likely oppose lethal removal of beaver under any circumstance. Analyses in this EA indicate that such removals would result in no significant cumulative adverse impacts on the quality of the human environment.

Table 4.3. Summary of cumulative environmental impacts and Alternatives presented for BDM conducted in Wisconsin.

	Alternative 1: *No WS Beaver Damage Management*	**Alternative 2**: *Only Lethal Beaver Damage Management by WS*	**Alternative 3**: *Integrated Beaver Damage Management by WS (No Action/ Proposed Action)*	**Alternative 4**: *WS only Provides Technical Assistance*	**Alternative 5:** *Only Non-lethal Beaver Damage Management by WS*
Effects on Beaver Populations	No impacts by WS. Impact on population will depend on actions of resource managers.	Possible reduction in local populations, no statewide aimpact.	Possible reduction in local populations, no statewide impact.	No affects by WS. Impacts on populations will depend on actions of resource managers.	No affects by WS. Impacts on populations will depend on actions by resource managers.
Effects on plants and other wildlife species, including T&E Species	No impacts by WS. Impacts by non-WS personnel would be variable.	Very low negative impacts on plant and wildlife species, including T&E species populations.	Very low negative impact to plant and wildlife species, including T&E species populations.	No affects by WS. Impacts by non-WS personnel would be variable.	Low impacts to plant and wildlife species, including T&E species by WS. Impacts by non-WS personnel would be variable
Effects on Public and Pet Health and Safety	No impact by WS. Risks variable depending upon actions taken by resource managers.	No threat to public and pet safety from WS actions. Reduction of risks from flooding, burrowing, and diseases.	No threat to public and pet safety from WS control methods. Greatest reduction of risks from flooding, burrowing, and diseases.	No affects by WS. Risks variable depending upon actions taken by resource managers.	No threat to public and pet safety from WS control methods. Some reduction of risks from flooding, burrowing, and diseases. Some risks variable depending upon actions of non-WS personnel.
Humaneness of Methods to be Used	No impactt by WS. Impacts by non-WS personnel would be variable because managers could still use lethal and non-lethal.	WS personnel are trained in humane use of lethal methods. Some people would oppose all lethal methods. Resource managers could still implement non-lethal.	WS uses the most humane methods available. Some activists would oppose all lethal methods. May be preferable to Alt. 2 because WS would use non-lethal.	No affect by WS. Impacts by non-WS personnel would be variable. Mangers could still use lethal and non-lethal.	WS actions would probably be considered more humane than Alts 2 and 3. Managers can still use lethal techniques.
Effects on Wetlands	No impact by WS. Impacts by managers depends on methods selected.	Minor impact by WS because of beaver removal. Impacts by managers depends on methods selected	Extremely low impacts because most sites are not established wetlands.	No affect by WS. Impacts by managers depends on methods selected.	Extremely low impacts because most sites are not established wetlands.
Economic Losses to Property	Losses would likely increase unless action	Losses could be reduced or eliminated by	Highest likelihood that losses would be reduced or	Losses could be reduced or eliminated if	Losses could be reduced by WS but not as much or as

	taken without WS.	WS unless non-lethal more appropriate.	eliminated by WS.	resource owners take action. Success more likely if WS information is used.	likely as with Alts 2 and 3. Managers may be able to get further reduction if they use lethal techniques.
Impacts to Stakeholders, including Aesthetics	No impacts by WS. Variable, some people prefer this method. People receiving damage probably oppose this alternative. Managers could still use lethal and non-lethal without WS.	Variable, those receiving damage would probably favor this alternative if damage could be reduced by lethal methods. Some people will oppose WS' use of lethal, but managers can still use lethal without WS.	Variable, those receiving damage would probably favor this alternative. Some people will oppose WS' use of lethal, but managers can still use lethal without WS.	No affects by WS. Variable, some people prefer this method. People receiving damage probably oppose this alternative. Managers could still use lethal and non-lethal without WS.	Variable, those receiving damage would probably favor this alternative if damage could be reduced by non-lethal methods. Some people would favor this alternative because no WS use of lethal. Managers could still use lethal without WS.

APPENDIX A

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APPENDIX B

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APPENDIX C

CRITERIA FOR BEAVER DAM BREACHING/REMOVAL

Beaver dam breaching/removal is generally conducted to maintain existing stream channels and drainage patterns and/or to reduce flood waters. Beaver dams are usually made from natural debris such as logs, sticks, and mud. However, beaver are opportunistic when it comes to materials for dam construction and dams may contain man-made materials such as tires, plastic pipe, or plywood. When beaver dams are breached, the material is removed from the approximate center of the dam or the area closest to the existing channel. The dams that WS removes are normally the result of recent beaver activity and the resulting ponds have not been in place long enough to generate characteristics of a true wetland (i.e., hydric soils, hydrophytic vegetation, and hydrology). Beaver dam breaching/removal by hand or with binary explosives does not affect the substrate or the natural course of the stream and returns the area back to its preexisting condition with similar flows and circulations. Because beaver dams involve waters of the United States, dam breaching/removal is regulated under Section 404 of the CWA.

Wetlands are recognized by three characteristics: hydric soils, hydrophytic vegetation, and general hydrology. Hydric soils are either composed of, or have a thick surface layer of, decomposed plant materials (muck); sandy soils have dark stains or streaks from organic material in the upper layer where plant material has attached to soil particles. Hydric soils may be bluish gray or gray below the surface or brownish black to black and commonly smell of rotten eggs. Wetlands also have hydrophytic vegetation present such as cattails, bulrushes, willows (*Salix* sp.), sedges (*Carex* sp.), and water plantains (*Alismataceae*). A final indicator is general hydrology which includes standing and flowing water or waterlogged soils during the growing season; high water marks often are present on trees and drift lines of small piles of debris are usually present. Beaver dams usually will develop a layer of organic material at the surface. Silt deposits can occur rapidly, but aquatic vegetation and high water marks (a new high water mark is created by the beaver dam) are usually not present. However, cattails and willows can show up rapidly if they are in the vicinity, but most hydrophytic vegetation takes time to establish.

In most beaver dam breaching/removal operations, the material that is displaced is exempt from permitting or included in a Nationwide Permit (NWP) in accordance with Section 404 of the CWA (33 CFR Part 323). A permit would be required if the impoundment caused by a beaver dam was not covered under a NWP or permitting exemption and was a true wetland. WS biologists and specialists survey the beaver dam site and impoundment to determine if conditions exist for classifying the site as a true wetland. If wetland conditions exist, the landowner or cooperator is asked the approximate age of the dam or how long he/she has known of its presence. This information is useful in determining if Swampbuster, Section 404 permit exemptions, or nationwide permits will allow breaching/removal of the beaver dam. If it is determined that a dam cannot be removed or breached under provisions provided by Swampbusters, 404 permit exemption or NWP, the landowner or cooperator is responsible for obtaining a Section 404 permit before the dam could be breached/removed by WS.
The following explains Section 404 exemptions and conditions that pertain to the breaching/removal of beaver dams.

33 CFR 323 - Permits For Discharges of Dredged or Fill Material into Waters of the United States. This regulation provides guidance to determine whether certain activities require permits under Section 404.

Part 323.4 Discharges not requiring permits. This section establishes exemptions for discharging certain types of fill into waters of the United States without a permit. Certain minor drainage activities connected with normal farming, ranching, and silvicultural practices do not require a permit as long as these drainages do not include the immediate or gradual conversion of a wetland (i.e., beaver ponds greater than 3 years old) to a non-wetland. Specifically, part (a)(1)(iii)(C)(i) states, "*...fill material incidental to connecting upland drainage facilities* (e.g., drainage ditches) *to waters of the United States, adequate to effect the removal of excess soil moisture from upland croplands...*". This indicates that beaver dams that block ditches, canals, or other structures designed to drain water from upland crop fields can be breached without a permit.

Moreover, (a)(1)(iii)(C)(iv) states the following types of activities do not require a permit. "*The discharges of dredged or fill materials incidental to the emergency removal of sandbars, gravel bars, or other similar blockages which are formed during flood flows or other events, where such blockages close or constrict previously existing drainage ways and, if not promptly removed, would result in damage to or loss of existing crops or would impair or prevent the plowing, seeding, harvesting or cultivating of crops on land in established use for crop production. Such removal does not include enlarging or extending the dimensions of, or changing the bottom elevations of, the affected drainage way as it existed prior to the formation of the blockage. Removal must be accomplished within one year of discovery of such blockages in order to be eligible for exemption.*" This allows the breaching of beaver dams in natural streams to restore drainage of agricultural lands within one year of discovery.

Part 323.4 (a)(2) allows "*Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption.*" This allows beaver dams to be breached without a permit where they have resulted in damage to roads, culverts, bridges, or levees if it is done in a reasonable amount of time.

33 CFR 330 – Nationwide Permit (NWP) Program

The USACE, Chief of Engineers is authorized to grant certain dredge and fill activities on a nationwide basis if they have minimal impact on the environment. NWP are listed in Appendix A of 33 CFR 330 and those permitted must satisfy all terms and conditions established to qualify for their use. Individual beaver dam breaching by WS may be covered by any of the following NWP if not already exempted from permit requirements by the regulations discussed above. WS complies with all conditions and restrictions placed on NWP for any instance of beaver dam breaching/removal done under a specific NWP.

Nationwide permits can be used **except** in any component of the National Wild and Scenic River System such as waterways listed as an "*Outstanding Water Resource*", or any water body which is part of an area designated for *"Recreational or Ecological Significance"*.

NWP 3 authorizes the rehabilitation of those structures, such as culverts, homes, and bridges, destroyed by floods and "discrete events," such as beaver dams, provided that

the activity is commenced within 2 years of the date when the beaver dam was established.

NWP 18 allows minor discharges of dredged and fill material, including the breaching of beaver dams, into all waters of the United States provided that the quantity of discharge and the volume of excavated area does not exceed 10 cubic yards below the plane of the ordinary high water mark (this is normally well below the level of the beaver dam) or is in a "special aquatic site" (wetlands, mudflats, vegetated shallows, riffle and pool complexes, sanctuaries, and refuges). The District Engineer must be "notified" (general conditions for notification apply), if the discharge is between 10-25 cubic yards for a single project or the project is in a special aquatic site and less than $^{1}/_{10}$ of an acre is expected to be lost. If the values are greater than those given, a permit is required. Beaver dams rarely would exceed 2 or 3 cubic yards of backfill into the waters and probably no more than 5 cubic yards would ever be exceeded. Therefore, this stipulation is not restrictive. Beaver dams periodically may be breached in a special aquatic area, but normally the aquatic site will be returned to normal. However, if a true wetland exists, and beaver dam breaching/removal is not allowed under another permit, then a permit must be obtained from the District Engineer.

NWP 27 provides for the discharge of dredge and fill for activities associated with the restoration of wetland and riparian areas with certain restrictions. On non-federal public and private lands, the owner must have: a binding agreement with USFWS or NRCS to conduct restoration; a voluntary wetland restoration project documented by NRCS; or notify the District Engineer according to "notification" procedures. On federal lands, including USACE and USFWS, wetland restoration can take place without any contract or notification. This NWP "*...applies to restoration projects that serve the purpose of restoring "natural" wetland hydrology, vegetation, and function to altered and degraded non-tidal wetlands and "natural" functions of riparian areas. This NWP does not authorize the conversion of natural wetlands to another aquatic use...*" If operating under this permit, the breaching/removal of a beaver dam would be allowed as long as it was not a true wetland. Non-federal public and private lands require the appropriate agreement, project documentation, or notification to be in place.

A quick response without delays resulting from permitting requirements can be critical to the success of minimizing or preventing beaver damage. Damage often escalates the longer an area remains flooded. Exemptions contained in the above regulations or NWP provide for the breaching/removal of the majority of beaver dams that Wisconsin WS encounters. The primary determination that must be made by WS personnel is whether a beaver impounded area meets the criteria to be classified as a true wetland or is the area a more recently flooded site lacking true wetland characteristics. Flexibility allowed by these exemptions and NWP is important for the efficient and effective resolution of many beaver damage problems.

APPENDIX D

METHODS USED OR RECOMMENDED BY WISCONSIN WS FOR BEAVER DAMAGE MANAGEMENT

Resource owners and government agencies have used a variety of techniques to reduce beaver damage. However, all lethal and non-lethal methods developed to date have limitations based on costs, logistics, and effectiveness. Below is a discussion of beaver damage management methods currently available to the Wisconsin WS program. If additional data or new products become available in the future, WS could consider these techniques among methods to be used. Any additional NEPA analysis deemed necessary will be conducted prior to incorporating the technique into the program.

NON-LETHAL DAMAGE MANAGEMENT METHODS

Habitat Management

Habitat management for the reduction of beaver damage refers to manipulation of vegetation or the physical characteristics of the site to reduce the attractiveness of the site to beaver. Habitat management may offer long-term solutions for addressing beaver damage in some situations. Unfortunately, use of habitat management is limited by the fact that alterations which make a site unsuitable for problem beavers often make the site unsuitable for many desirable wildlife species. WS may recommend habitat management practices, but the implementation is usually conducted by the resource manager.

Habitat alteration may be the most effective long-term method of reducing beaver density in some areas (Payne 1989). Forest management practices that discourage the establishment of willow (*Salix sp*.), sweet gum (*Liquidambar styraciflua*), and conifers and promote long-lived hardwoods within 200 - 400 feet of streams may reduce beaver populations on those streams. Payne (1989) suggested that reduced food availability might force beaver colonies to move more often. However, this increased movement could increase nuisance complaints.

Continual breaching of dams and removal of dam construction materials on a daily basis sometimes will cause beaver to move to other locations. The Beaver Deceiver is a water control system that attempts to quiet, calm, and deepen the water in front of culverts (to reduce the attractiveness to beaver) and exclude beaver from a wide area around the upstream opening of the culvert (Lisle 1996). However, effectiveness of this method has not been evaluated in published documents.

Water Management

Water management practices are those techniques intended to eliminate or minimize impacts associated with the ponds that result from beaver dams. These types of devices may be installed by WS or by the resource manager.

Water Control Devices

Water control devices (aka pond levelers) are systems used to allow the passage of water through a beaver dam. The devices are used in situations where the presence of a beaver pond is desired but it is necessary to manage the level of water in the pond. Various types of water control devices have been described (Perry 2007, Clemson University 2006, Spock 2006, Simon 2006, Close 2003, Lisle 2003, 1999, 1996, Brown et al. 2001, Brown and Brown 1999, Organ et al. 1996, Wood et al. 1994, Miller and Yarrow 1994, Laramie and Knowles 1985, Roblee 1984, Arner 1964). The devices generally involve the use of one or more pipes installed through the dam to increase the flow of water through the dam. Height and placement of pipes can be adjusted to achieve the desired water level in the beaver pond. Beavers generally only check the dam for leaks, so, when site conditions permit, the inlet of the pipe is placed away from the dam to make the source of the water flow more difficult to detect and decrease the likelihood that beaver will attempt to plug the device. To minimize the sound/sensation of water movement and associated beaver damming behavior, the end of the pipe may be capped and water allowed to flow into the pipe through series of holes or notches cut through the pipe. Holes and notches may be placed on the underside of the pipe to further reduce signs of water movement. Alternatively, ninety-degree elbow joints are placed facing downward on the upstream end of the pipes to prevent the noise of running water from escaping and attracting beaver. A protective cage is placed around the upstream end of the inlet pipe to prevent beaver from blocking the pipe and reduce problems with debris blocking the pipe. As noted above, water control systems can be combined with exclusion devices to prevent beaver from blocking culverts while still maintaining a beaver pond at an acceptable level. Efficacy and cost of this method is discussed in Section 2.3.4.

The use of water control device for the protection of coldwater ecosystems would not be practical or effective, (on a cost basis as well as effectiveness in meeting the objective of restoring or protecting coldwater resources). While it is recognized by ecologists that ecotones between beaver ponds and free flowing streams potentially support high invertebrate and fish abundance and diversity due to organic retention and nutrient cycling the long term impact to the biotic integrity of a coldwater ecosystem in a low gradient stream is generally negative (Avery 2002). Leaving beaver impoundments in place while regulating water flow through water control devices would not negate the deleterious effects impoundments have on coldwater ecosystems. Some of these negative effects include warming of water in summer, cooling of water in winter, blockage of trout movement, reduction of trout spawning and reduced levels of dissolved oxygen (Avery 2002).

Beaver Dam Breaching/Removal

Dam breaching involves the removal of debris deposited by beaver that impedes the flow of water. Breaching a beaver dam is generally conducted to maintain existing streams and irrigation channels, restore drainage patterns, and reduce flood waters that have negatively impacted silvicultural, agricultural, residential or ranching/farming activities. Beaver dams removed by WS are normally from recent beaver activity, and sites have not had enough time to develop characteristics of a true wetland (i.e., hydric soils, hydrophytic vegetation, and hydrological function). Unwanted beaver dams may be removed by hand or with explosives. Explosives are used only by WS personnel specially trained and certified to conduct such activities.

Because beaver dams involve waters of the United States, removal is regulated under Section 404 of the CWA (Appendix C). Beaver dam breaching does not affect substrate or natural course of streams. Breaching beaver dams often re-establishes preexisting conditions with similar flows and circulations. Most beaver dam breaching operations, if considered discharge, are covered under 33 CFR 323 or 330 and do not require a permit. A permit would be required if the beaver dam breaching activity is not covered by a 404 permitting exemption or NWP and the area affected by the beaver dam was considered a true wetland. WS personnel survey the site or impoundment to determine if conditions exist for classifying the site as a true wetland. If the site appears to have conditions over 3 years old or appears to meet the definition of a true wetland, the landowner or cooperator is required to obtain a permit before proceeding (See Appendix C for information that explains Section 404 permit exemptions and conditions for breaching/removing beaver dams).

Explosives

Explosives are defined as any chemical mixture or device which serves as a blasting agent or detonator. Explosives are generally used to breach beaver dams that are too large to remove by hand digging and after beaver have been removed from the site. Binary explosives consist of ammonium nitrate and nitro-methane and are not classified as explosives until mixed. Therefore, binary explosives are subject to fewer regulations and controls. However, once mixed, binary explosives are considered high explosives and subject to all applicable federal regulations. Detonating cord and detonators are considered explosives and WS must adhere to all applicable State and federal regulations for storage, transportation, and handling. All WS explosive specialists are required to attend 30 hours of extensive explosive safety training and spend time with a certified explosive specialist in the field prior to obtaining certification. All blasting activities are conducted by well-trained, certified blasters and closely supervised by professional wildlife biologists. Explosive handling and use procedures follow the rules and guidelines set forth by the Institute of Makers of Explosives which is the safety arm of the commercial explosive industry in the United States and Canada. WS also adheres to transportation and storage regulations from State and federal agencies such as Occupational Safety and Health Association, Bureau of Alcohol, Tobacco, and Firearms, and the Department of Transportation.

Exclusion Methods

Exclusion involves physically preventing beaver from gaining access to protected resources through fencing or other barriers. Some of these devices may be installed/used by WS, but most are installed by the resource manager. Fencing of small critical areas such as around culverts and drain pipes can sometimes prevent plugging by beaver. A variety of road culvert screens or fences have been used by county and local highway departments (See below). Construction of concrete spillways may reduce or prevent damage to dams. Rip-rap also can be used on dams or levees at times to deter burrowing. Electrical barriers have proven effective in limited situations for excluding mammals and birds. An electrical field through the water in a ditch or other narrow channel, or hot-wire suspended just above the water level in areas protected from public access, have been effective at excluding mammals and birds. Effectiveness of an electrical barrier is extended when used in conjunction with an odor or taste cue that is emitted, because beaver will continue to avoid the area even if the electrical field is discontinued (Kolz and Johnson 1997).

Protecting ornamental or landscape trees from beaver damage by using hardware cloth or similar material, or chain-link fence is recommended frequently by WS. Preliminary tests by the USDA, APHIS, WS National Wildlife Research Center suggest that sand mixed in paint may be an effective barrier against beaver gnawing and cutting of trees or other objects (D. Nolte, USDA/APHIS/WS/ National Wildlife Research Center, unpublished data). This method is used most frequently by property and homeowners. It is rarely, if ever, used to prevent large-scale timber or forest damage due to high material costs and labor required to wrap hundreds or thousands of trees in a managed forest.

Beaver exclusion Devices: Beaver exclusion generally involves the placement of fencing to prevent beaver access to water intake areas such as culverts or fencing individual trees or small areas to protect a group of trees. A variety of systems have been used to prevent beaver from blocking water intake structures including the Beaver Deceiver™, Beaver Bafflers™ and pre-dams (Lisle 2003, 1999, 1996, Partington 2002, Brown et al. 2001, Brown and Brown 1999). The Beaver Deceiver™ is a fencing system that is installed to prevent beaver blockage of culverts by minimizing environmental cues which stimulate dam construction, and by making culverts less attractive as dam construction sites (Lisle 2003, 1999, 1996). Beaver are deterred from blocking culverts by the installation of a fence around the upstream end of the culvert. Installation of a fence increases the length of the area which must be dammed, and may also increase the distance between the beaver and the source of the cues which stimulate damming behavior (e.g., water moving through culvert; Callahan 2005, Lisle 2003, 1999, 1996). Beaver prefer to build dams perpendicular to water flow, so fences are oriented at odd angles to water flow and are set so that they do not block the stream channel. Usually, fencing is also installed directly on the up and downstream ends of the culverts to prevent beaver from entering the deceiver from the downstream side of the culvert to prevent any beaver which might make it past the outer fence from plugging the interior of the culvert. Efforts are made to reduce the sound of water flowing through the culvert by raising the water level on the down-stream side of the culvert with dam boards or beaver-made dams; by constructing flumes to replace waterfalls, or, in extreme cases, by resetting the culvert (Lisle 1996). In situations where extra care is needed to ensure sufficient water flow through the culvert, Beaver Deceivers™ may be used in combination with water control devices (see below).

Cylindrical exclusion devices like the Beaver Bafflers™ are attached to culvert openings and reduce the likelihood that beaver will plug a culvert by spreading the water intake over a larger area (Brown et al. 2001). While effective in some situations (Partington 2002), in a study of beaver exclusion and water control devices, cylindrical shapes attached in-line with the culvert had a higher failure rate (40%) than trapezoidal shapes (e.g., Beaver Deceivers™ - 3% failure) and use of the cylindrical devices was discontinued in favor of trapezoidal fences (Callahan 2005).

Unlike Beaver Deceivers™ and cylindrical fences, pre-dam fences (aka, deep water fences, diversion dams; Brown and Brown 1999) are designed with the specific intention that the beaver build the dam along the fence. Pre-dam fences are short semicircular or circular fences that are built in an arc around a water inlet. The fence serves as a dam construction platform which allows beaver to build a dam and pond at the site but prevents beaver from plugging the water intake. If the size of the upstream pond is not an issue, no further modifications of the pre-dam are needed. However, in most cases, pre-dams are used in combination with water control devices to manage the size of the upstream pond.

Fence mesh size should be selected to minimize risks to beaver and nontarget species. Brown et al. (2001) noted that beaver occasionally became stuck in 6 inch mesh and that the risk of beaver

entrapment was lower with 5 inch mesh. Lisle (1999) noted that the size of the mesh on the fence of the Beaver Deceivers™ (6 inch mesh) was such that it allowed most species to pass through the fence except beaver and big turtles. In remote areas where there is little traffic it may be acceptable for animals which cannot pass through the deceiver to travel across the road. However, for culverts under busy roads, it is necessary to design special "doors" which can allow the passage of beaver and large turtles through the device. For example, 30 cm-diameter T-joints have been used to allow access through Beaver Deceiver™ fences. The T shape reduces the likelihood that beaver can haul woody debris for dam construction inside the device (Lisle 2003). Fence caps are not attached to the up and down-stream ends of the culvert when it's necessary to allow passage of species like large turtles and beavers through the culvert. Costs and efficacy of this method are discussed in Section 2.3.4

Capture Methods

In some instances, removal of specific animals in the problem area can provide immediate relief from a problem. In these situations, the goal is to reduce beaver numbers to a level that stabilizes, reduces or eliminates damage. Level of removal necessary to achieve a reduction of damage varies according to the resource protected, habitat, population, effectiveness of other damage management strategies, and other ecological factors. Some capture devices like snares, foothold traps, and cage traps can be set so that the animal is restrained until the WS specialist comes to relocate or euthanize the animal. The advantage of these types of devices is that non-target species can be released. Snares and foothold traps can also be set so that the animal is killed. Other capture devices like Conibear type body grip traps kill the captured animal. For reasons discussed in Section (3.5.5), WS does not relocate beaver in Wisconsin, and all live-captured target animals would be euthanized.

These techniques are usually implemented by WS personnel because of technical training required to safely and effectively use such devices. A formal risk assessment of all mechanical devices used by the WS program in Wisconsin can be found in USDA (1997). Despite the numerous damage management methods developed, trapping remains the most effective method of removing beaver and reducing damage (Hill 1976, Hill et al. 1977, Wigley 1981, Weaver et al. 1985).

> ***Foothold traps*** can be effectively used to capture beaver. Foothold traps are either placed beside, or in some situations, within travel ways being actively used by target species. Placement of traps is contingent upon habits of the respective target species, habitat conditions, and presence of non-target animals. Trap and lure placement and trap adjustment by trained WS personnel contribute to the foothold trap's efficacy and selectivity. Generally all foothold traps used to capture beavers are set near adequate water depth and rigged with a drowning mechanism that will immediately dispatch the animal. Use of foothold traps requires more skill than some methods, but leg-hold traps are indispensable in resolving many damage problems. Beaver live-captured in leg-hold traps would be euthanized by shooting.
>
> ***Snares*** are capture devices comprised of a cable formed in a loop with a locking device. All snares set for beaver would be water sets. Snares are easier to set and transport and are less affected by inclement weather than foothold and Conibear traps. Target animals are caught around the body, neck, or leg and later euthanized by shooting. As with foothold traps, snares also can be set so the animal is drowned after capture.

Hancock and Bailey traps (suitcase/basket type cage traps) are designed to live-capture beaver. This type of trap is constructed of a metal frame covered in chain-link fence that is hinged with springs. Trap appearance is similar to a large suitcase when closed. When set, the trap is opened to allow an animal to enter, and when tripped the sides close around the animal. One advantage of using the Hancock trap is the ease of release of beaver or non-target animals. Disadvantages of these traps are expense, bulky size, and difficulty to set (Miller and Yarrow 1994). Hancock traps can also be dangerous for humans to set (i.e., hardhats are recommended when setting suitcase traps), are less cost and time-efficient than snares, foothold, and body-grip traps, and may cause serious and debilitating injury to otters (Blundell et al. 1999). Beaver captured in Hancock traps would be euthanized by shooting. These type of traps are rarely used by WS BDM in Wisconsin.

Body-grip (e.g., Conibear) traps are designed to cause the quick death of the animal that activates the trap. The number 330 body-grip trap is generally used for beaver. Body-grip traps for beaver capture are used exclusively in aquatic habitats, with placement depths allowing for at least ½ the trap jaws below the water surface in accordance with Wisconsin trapping regulations.

Shooting

Shooting is the most selective method for removing target species and may involve use of shotguns, rifles, or pistols. Shooting is an effective method to remove small numbers of beaver in damage situations, especially where trapping is not feasible or appropriate for site conditions. Shooting is sometimes utilized as one of the first lethal damage management options because it offers the potential of resolving a problem more quickly and selectively than some other methods, but it does not always work. Shooting beavers may also be more labor-intensive than some other techniques. Shooting may sometimes be one of the only beaver management options available if other factors preclude setting of damage management equipment. WS personnel receive firearms safety training to use firearms that are necessary for performing damage management duties.

Firearm use is a very sensitive issue because of public concerns regarding firearm safety and misuse of firearms. WS employees who use firearms to conduct official duties are required to attend firearm safety and handling training within 3 months of their appointment and refresher training every year afterwards (WS Directive 2.615). Many WS employees carry firearms as a condition of employment and 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.

CHEMICAL MANAGEMENT METHODS

All chemicals used by Wisconsin WS are registered under FIFRA and administered by the EPA and the Wisconsin Department of Agriculture. No chemicals are currently used by WS for the taking of beaver.