

**FINAL ENVIRONMENTAL ASSESSMENT**

**AQUATIC RODENT DAMAGE MANAGEMENT IN  
NEBRASKA**

**UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)  
ANIMAL AND PLANT HEALTH INSPECTION SERVICE (APHIS)  
WILDLIFE SERVICES (WS)**

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## ACRONYMS

AMDUCA	Animal Medicinal Drug Use Clarification Act
APHIS	Animal and Plant Health Inspection Service
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FLIR	Forward Looking Infrared
FR	Federal Register
FY	Fiscal Year
IC	Intracardiac
IV	Intravenous
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NWP	Nationwide Permit
NWRC	National Wildlife Research Center
PL	Public Law
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
TCEQ	Nebraska Commission on Environmental Quality
NDA	Nebraska Department of Agriculture
NGPC	Nebraska Game and Parks Commission
TWDMA	Nebraska Wildlife Damage Management Association
WS-Nebraska	Nebraska Wildlife Services Program
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Services
WS	Wildlife Services

## CHAPTER 1: PURPOSE AND NEED FOR ACTION

### 1.1 INTRODUCTION

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services Nebraska (WS-Nebraska) continues to receive requests for assistance to resolve or prevent damage associated with beaver (*Castor canadensis*), and muskrats (*Ondatra zibethicus*). This document will collectively refer to these species as aquatic rodents.

The WS<sup>1</sup> program is the federal agency responsible for providing federal leadership with managing conflicts with animals

In Nebraska, beaver, and muskrat are classified as furbearers. Furbearers are protected by State law and the Nebraska Game and Parks Commission (NGPC) is responsible for management of those species. Under State law, private landowners or their lessees, public entities, or others can address furbearers when they are a nuisance or causing damage. NGPC, has regulatory responsibilities toward aquatic rodents and provides both WS-Nebraska as well as the general public, with depredation permits.

WS-Nebraska is responsible for responding to requests for assistance associated with aquatic rodents in Nebraska.

### 1.2 WHAT IS THE EA ABOUT?

The purpose of this Environmental Assessment (EA) is to evaluate the cumulative effects of Aquatic Rodent Damage Management (ARDM) conducted by WS-Nebraska. This EA will evaluate previous and anticipated future actions taken by WS-Nebraska to address damage caused by aquatic rodents in order to determine if those effects could have a significant impact on the human environment.

WS-Nebraska previously developed an EA and a supplement to that EA that evaluated the effects of activities conducted by WS-Nebraska to manage damage and threats of damage caused by aquatic rodents in the State. Based on the analyses in that EA and the supplement to the EA, WS signed a Decision and Finding of No Significant Impact for the proposed action alternative. The proposed action alternative implemented a program that integrates a variety of methods. WS-Nebraska is preparing this EA to: 1) facilitate planning, 2) promote interagency coordination, 3) streamline program management, 4) clearly communicate to the public the analysis of individual and cumulative impacts of proposed activities, and 5) determine if there would be any potentially significant or cumulative effects from the alternative approaches developed to meet the need for action. Since this EA will re-evaluate activities conducted under the previous EA, this analysis and the outcome of the Decision issued based on the analyses in this EA will supersede the previous ARDM EA. The analyses contained in this EA are based on information derived from WS' Management Information System, published documents interagency consultations, and public involvement.

This EA will analyze three alternatives to address the need for action and assist in determining if the proposed ARDM could have a significant impact on the environment for both people and other organisms. This EA will also document and inform the public of the environmental consequences that could occur from implementing the alternatives to comply with the National Environmental Policy Act (NEPA). WS-

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<sup>1</sup>WS-Nebraska is authorized to protect agriculture and other resources from damage caused by animals through the Act of March 2, 1931 (46 Stat. 1468; 7 USC 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c).

Nebraska will use this EA to coordinate efforts associated with meeting the need for action. WS-Nebraska will make this EA available to the public for review and comment prior to the issuance of a Decision<sup>2</sup>.

### **1.3 WHAT ARE THE NEEDS FOR THE WS-NEBRASKA AQUATIC MAMMAL DAMAGE MANAGEMENT?**

Some species of wildlife have adapted to and have thrived in human altered habitats. Those species, in particular, are often responsible for the majority of conflicts between people and wildlife. Those conflicts often lead people to request assistance with reducing damage to resources and to reduce threats to human safety. Beaver and muskrat are aquatic rodents that have adapted to habitats near human populations where conflicts between people and those species can occur.

Historically, habitat conditions and exploitation by Native Americans likely limited beaver populations in North America, since climax forest types that historically covered the eastern United States have a relatively low carrying capacity for beaver in comparison with forests in younger growth stages. Beaver were important to Native Americans for food, clothing, tools, and items of trade. Those factors, coupled with the onset of the North American fur trade by Europeans in the early 1600s and the westward advancement of settlement, led to the decline in beaver populations in North America (Lowery 1974, Hill 1976, Woodward 1983, Novak 1987, Baker and Hill 2003). Beaver pelts were the most important item in the early fur trade (Wright 1987). Through overharvest and loss of habitat, the beaver population in the United States rapidly declined in the late 1800s and early 1900s with beaver nearly trapped to extinction by the late 1890s (Hill 1976, Wesley 1978, Baker and Hill 2003). In the 1700s, beaver harvests remained high, but harvests declined continually during the 1800s and reached a record low between 1900 and 1919 (Novak 1987).

The pelts of aquatic rodents were common in many fur markets and provided economic revenue for many people. In addition, people have used the meat of beaver, and muskrat for food, primarily by subsistence hunters and trappers; however, some organizations have promoted muskrat meat as table fare in restaurants. People have also used their meat to produce food for pets. After the formation of federal, state, and provincial wildlife conservation agencies and the enactment of new regulations that controlled beaver harvest, beaver populations began to recover. In addition, many states began restocking programs in the 1920s through the 1950s (Salzer 1946, Hill 1982, Baker and Hill 2003). Today, beaver occur throughout most of North America, including Canada, Alaska, all 48 contiguous states of the United States, and northern portions of Mexico (Deems and Pursley 1978, Novak 1987, Baker and Hill 2003, Linzey and NatureServe 2013).

Following the decimation of the beaver population in the late 1800s and early 1900s, the number of beaver trappers declined. As beaver populations began to recover and trapping seasons were re-opened, the number of beaver trappers and demand for fur had declined. Consequently, interest in harvesting beaver declined, which allowed the beaver population to expand and continue to increase. Today, beaver occur throughout most of their original range (Hill 1982, Novak 1987, Baker and Hill 2003) and some people now view beaver as a nuisance species because of the damage they can cause (Hill 1976, Hill 1982, Woodward 1983, Woodward et al. 1985, Novak 1987, Dickson 2001, Baker and Hill 2003).

Although beaver may cause extensive damage, they can be beneficial in many situations, especially where their activities do not compete with human use of land or property (Wade and Ramsey 1986). Beaver can be ecosystem engineers by constructing dams that impound water, trap sediment, and increase the productivity of riparian zones (Rosell et al. 2005). Positive ecological influences on wetland habitats (Arner

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<sup>2</sup>After the development of the EA by and after public involvement in identifying new issues and alternatives, will issue a Decision. Based on the analyses in the EA after public involvement, will make a decision to publish a Notice of Intent to prepare an Environmental Impact Statement or will issue a Finding of No Significant Impact notice to the public in accordance to the NEPA and the Council of Environmental Quality regulations.



et al. 1967a, Arner et al. 1967b, Reese and Hair 1976, Snodgrass 1997, Pollock et al. 2004, Pollock et al. 2012, Pollock et al. 2014) and economic gains from fur production (Arner and Dubose 1978a, Arner and Dubose 1978b) make beaver important animals in the United States. Opinions and attitudes of individuals, communities, and organizations vary greatly and are primarily influenced and formed by the positive and negative experiences of the person or entity expressing the judgment (Hill 1982, Baker and Hill 2003). Property ownership, options for public and private land use, and effects on adjacent property impact public attitudes toward beaver (Hill 1982, Baker and Hill 2003). In some situations, the damage and threats caused by beaver outweigh the benefits (Grasse and Putnam 1955, Woodward et al. 1985, Novak 1987, Baker and Hill 2003).

Woodward et al. (1976) found that 24% of landowners who reported beaver activity on their property indicated benefits to having beaver ponds on their land, including aesthetic enjoyment, increased livestock water sources, providing irrigation water, and the creation of beaver ponds for waterfowl hunting, fishing, and recreational trapping. However, many landowners request assistance with beaver pond management (Hill 1976, Woodward et al. 1985). Some of the benefits of beaver ponds include activities such as photography, trapping, hunting, and fishing. In agricultural landscapes, beaver ponds can provide a potential water source for livestock. The ecological value of beaver ponds in the natural environment can also be important. For example, beaver ponds can contribute to the stabilization of water tables, help reduce rapid run-off from rain (Wade and Ramsey 1986, Pollock et al. 2014), and serve as basins for the entrapment of streambed silt and eroding soil (Hill 1982, Baker and Hill 2003, Pollock et al. 2014). Beaver ponds can also function as sinks, helping to filter nutrients and reduce sedimentation downstream, which can maintain the quality of nearby water systems (Arner and Hepp 1989). Pollock et al. (2014) proposed using beaver to restore degraded stream ecosystems.

Beaver may increase habitat diversity by flooding and opening forest habitats, which can result in greater interspersed vegetative successional stages and increase the floral and faunal diversity (Hill 1982, Arner and Hepp 1989, Baker and Hill 2003). Hood and Bayley (2008) found that ponds with beaver had nine times more open water than when beaver were not present in those same ponds. Creation of standing water, edge habitat, and an increase in plant diversity can result in excellent wildlife habitat (Hill 1982, Baker and Hill 2003, Cooke and Zack 2008). Habitat modification by beaver, primarily dam building and tree cutting, can benefit many species of wildlife (Jenkins and Busher 1979, Arner and DuBose 1982, Hill 1982, Arner and Hepp 1989, Medin and Clary 1990, Medin and Clary 1991, Baker and Hill 2003, Cooke and Zack 2008). The impounding of water by beaver through their dam building activities may be beneficial to some fish, reptiles, amphibians, waterfowl, shorebirds, and furbearers, such as muskrats, river otter (*Lontra canadensis*), and mink (*Neovison vison*) (Arner and DuBose 1982, Naimen et al. 1986, Miller and Yarrow 1994, Snodgrass 1997, Snodgrass and Meffe 1998, Snodgrass and Meffe 1999, Metts et al. 2001, Cunningham et al. 2007, Stevens et al. 2007). Hood and Larson (2014) found that beaver could alter shallow-water wetlands, which can influence aquatic invertebrate diversity and abundance. Hood and Larson (2015) found that beaver can increase the volume-to-surface area ratio of impoundments by nearly 50% and can increase the average perimeter edge of water impoundments by over 575% through their digging and channeling behaviors.

Beaver created impoundments can also be attractive to some fish species (Hanson and Campbell 1963, Pullen 1971, Snodgrass and Meffe 1998, Snodgrass and Meffe 1999). In South Carolina, Snodgrass and Meffe (1998) found that beaver activities altered streams by decreasing water current and by increasing water depth, stream width, siltation, and aquatic vegetation, which influenced the richness of fish species in their study area. However, Snodgrass and Meffe (1998) noted that fish species richness was dependent on watershed position and the age of the beaver ponds located on the stream. Snodgrass and Meffe (1998) stated, “*For example, at one of our study sites..., 158 fish and 11 species were collected from a 45-m reach of unimpounded stream. Approximately 3 [months] later, following beaver impoundment of the reach, only 11 fish and 3 species were collected from the same stream reach...*”. In addition, Snodgrass and Meffe (1998)

found that fish species richness was highest in beaver ponds that were 9 to 17 years old and decreased to the lowest species richness in beaver ponds more than 17 years old.

Pollock et al. (2004) concluded that beaver ponds could be an integral part of increasing the production of Coho Salmon (*Oncorhynchus kisutch*) in a river basin within Washington. Pollock et al. (2012) also proposed encouraging beaver activities in an Oregon stream system to restore salmon habitat. Stevens et al. (2007) found that beaver created impoundments on small streams in the Boreal Foothills of west-central Alberta in Canada contained a higher number of three species of frogs than those streams with no obstructions. Metts et al. (2001) found that the abundance, species richness, and species diversity of reptiles was higher at beaver impoundments when compared to unimpounded streams; however, the species richness, species diversity, and evenness of amphibians were higher at unimpounded streams compared to beaver impoundments. Russell et al. (1999) found the species richness and species abundance of reptiles was statistically higher at older beaver ponds ( $\geq 10$  years) when compared to newer beaver ponds ( $\leq 5$  years) and unimpounded streams. Similarly, to Metts et al. (2001), Russell et al. (1999) found that species richness and the total abundance of amphibians was not statistically different among new beaver ponds ( $\leq 5$  years), older beaver ponds ( $\geq 10$  years), and unimpounded streams.

Beaver impoundments can provide aesthetic and recreational opportunities for wildlife observation through the attractiveness of habitat diversity and environmental education (Wade and Ramsey 1986). In addition, beaver ponds may be beneficial to threatened and endangered (T&E) species. For example, some beaver ponds in Mississippi over three years in age were found to have developed plant communities that increased their value 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 throughout the year and that the value of the beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). Similarly, Edwards and Otis (1999) found that established beaver ponds (10 to 35 years old) were attractive to several bird species seasonally, with the average species richness during all seasons ranging from 23.3 to 30.3 bird species. The average species richness was highest during the spring and lowest during the fall and winter (Edwards and Otis 1999). Cooke and Zack (2008) suggested that beaver dams could be important to creating riparian conditions that foster rich and abundant bird communities in semiarid regions.

Like beaver, muskrats can have an economic value from the sale of their meat and pelt, as well as filling an important niche in the ecosystem. Historically, muskrats have been the most heavily utilized furbearer in North America with six to 20 million harvested annually between the 1930s and 1980s (Boutin and Birkenholz 1987). Muskrats provide opportunities for recreation and satisfaction to people that like to observe wildlife in a natural setting. In the prairie pothole region of the United States and Canada, muskrats clear or open small areas through feeding and house building in otherwise dense cattail marshes. The small openings create nesting and brood rearing habitat for nesting waterfowl.

Beaver, and muskrats can also be potential food sources for many other species of wildlife. Coyotes (*Canis latrans*), black bears (*Ursus americanus*), bobcats (*Lynx rufus*), fishers (*Pekania pennanti*), red fox (*Vulpes vulpes*), river otters, mink, and large raptors, such as hawks and owls, can prey on beaver (Tesky 1993, Baker and Hill 2003, Jackson and Decker 2004). Predators of muskrat include great horned owls, barred owls, red-tailed hawks, bald eagles, raccoons, mink, river otter, coyotes, bobcat, red fox, gray fox (*Urocyon cinereoargenteus*), Northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), snapping turtles (*Chelydra serpentina*), and bullfrogs (*Rana catesbeiana*).

River otters are semi-aquatic rodents that can occur anywhere there is suitable aquatic habitat. While they usually prefer freshwater, they can also occur in saltwater along the coast. They will often make their homes around secluded rivers, lakes, ponds, and streams that are shallower and have easy access to land. These bodies of water are usually located in forests, wetlands, swamps, and marshes. Otters typically use

the dens of other animals such as beavers, or use natural dens sites like hollow logs, undercut banks, or rock crevices. They are often mistaken for beaver.

Otters are carnivores and they will hunt for food both in the water and on land. Otters direct most of their activity toward hunting and eating their food. Fish is a favored food among otter, but they also consume various amphibians (such as salamanders and frogs), freshwater clams, mussels, snails, small turtles, and crayfish. Instances of river otters eating small rodents and occasionally birds have been reported as well (Melquist and Dronkert 1987).

Human perceptions of wildlife, including beaver, muskrat, and otter, can range drastically. In general, people regard wildlife as providing economic, recreational, and aesthetic benefits. For some people, wildlife holds an intrinsic value. Knowing that wildlife exists in the natural environment provides its own benefit. People who have had negative encounters with wildlife resulting in economic losses to agricultural resources, natural resources, property, and even threats to human health and safety, may view wildlife negatively. Being aware of these varying perspectives will aid managers in finding a balance between the needs of various groups of people and the needs of wildlife. When addressing damage or threats of damage caused by wildlife, managers must consider not only the needs of those people directly affected by wildlife damage but also the environmental, sociocultural, and economic implications of their decisions.

Resolving wildlife damage problems requires consideration of both sociological and biological carrying capacities. The wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Biological carrying capacity is the land or habitat's ability to support healthy populations of wildlife without degradation to the species' health or their environment during an extended period of time (Decker and Purdy 1988). Those phenomena are especially important because they define the sensitivity of a person or community to a wildlife species. For any given damage situation, there are varying thresholds of tolerance exhibited by those people directly and indirectly affected by the species and any associated damage. This damage threshold determines the wildlife acceptance capacity. While the biological carrying capacity of the habitat may support higher populations of wildlife, in many cases the wildlife acceptance capacity is lower. Once the wildlife acceptance capacity is met or exceeded, people begin to implement population or damage management to alleviate damage or address threats to human health and safety.

Wildlife damage management is the alleviation of damage or other problems caused by or related to the behavior of wildlife and can be an integral component of wildlife management (Berryman 1991, The Wildlife Society 2015). The threat of damage or loss of resources is often sufficient for people to initiate individual actions and the need for damage management can occur from specific threats to resources. Those species have no intent to do harm. They utilize habitats (*e.g.*, feed, shelter, reproduce) where they can find a niche. If their activities result in lost economic value of resources or threaten human safety, people often characterize this as damage. When damage exceeds or threatens to exceed an economic threshold and/or pose a threat to human safety, people often seek assistance with resolving damage or reducing threats to human safety. The threshold triggering a request for assistance is often unique to the individual person requesting assistance and many factors can influence when people request assistance (*e.g.*, economic, social, aesthetics). Therefore, what constitutes damage is often unique to the individual person. What one individual person considers damage; another person may not consider as damage. However, the use of the term "*damage*" is consistently used to describe situations where the individual person has determined the losses associated with wildlife is actual damage requiring assistance (*i.e.*, has reached an individual threshold). Many people define the term "*damage*" as economic losses to resources or threats to human safety; however, "*damage*" could also occur from a loss in the aesthetic value of property and other situations where the behavior of wildlife was no longer tolerable to an individual person.

The need for action to manage damage and threats associated with aquatic rodents in Nebraska arises from

requests for assistance<sup>3</sup> received by WS-Nebraska. WS-Nebraska receives requests to reduce or prevent damage from occurring to four major categories: agricultural resources, natural resources, property, and threats to human health and safety. Through a review of previous requests for assistance, WS-Nebraska has identified those aquatic rodent species most likely to be responsible for causing damage to those four categories in the State. Table 1.1 lists the technical assistance projects conducted by WS-Nebraska associated ARDM in Nebraska from the federal fiscal year<sup>4</sup> (FY) 2015 through FY 2019.

**Table 1.1 – Technical and operational assistance projects conducted by WS-Nebraska, FY 2015 - FY 2019**

Species			Fiscal Year			
	2015	2016	2017	2018	2019	TOTAL
<b>Beaver</b>	55	44	51	34	47	<b>231</b>
<b>Muskrat</b>	3	3	8	3	6	<b>23</b>

<sup>†</sup>Information provided in the table includes technical assistance projects only and does not include direct operational assistance projects that WS-Nebraska conducted. See Chapter 3 for further discussion on technical assistance and direct operational assistance.

As shown in Table 1.1, WS-Nebraska has conducted 254 technical assistance and operational projects in Nebraska from FY 2015 through FY 2019 associated with beaver and muskrats. Nearly 91% of the projects conducted by WS-Nebraska have involved beaver. Technical assistance provides information and recommendations on ARDM that the requester could conduct without the direct involvement of WS-Nebraska. Direct operational assistance projects occur when a person requested the assistance of WS-Nebraska through the direct application of methods. This EA discusses technical assistance and direct operational assistance activities further in Chapter 3.

Between FY 2015 and FY 2019, WS-Nebraska verified, and cooperators reported over \$1.3 million in damages and losses from beaver, and muskrat, in Nebraska (see Table 1.2). On properties owned or managed by people requesting assistance from WS-Nebraska, aquatic rodents caused over \$250 thousand in economic damages to timber resources. Damage to timber was primarily associated with beaver, where dams built by beaver impounded water that caused areas to flood, which can result in the death of trees if inundation occurs for extended periods. Overall, aquatic rodents caused over \$1 million in damages to dams, ditches, roads, and bridges, primarily from burrowing into embankments and from flooding. Table 1.2 only reflects damage to resources associated with someone requesting assistance from WS-Nebraska; therefore, the damage information presented in Table 1.2 does not reflect all damage that occurred annually in the Nebraska.

<sup>3</sup>WS would only conduct aquatic rodent damage management after receiving a request for assistance. Before initiating damage management activities, WS and the cooperating entity would sign a Memorandum of Understanding, work initiation document, or another comparable document that would list all the methods the property owner or manager would allow WS to use on property they owned and/or managed.

<sup>4</sup> The federal fiscal year begins on October 1 and ends on September 30 the following year.

**Table 1.2 – Losses to resources caused by aquatic rodents in Nebraska, FY 2015 - FY 2019<sup>†</sup>**

Resource	Economic Loss <sup>‡</sup> by Fiscal Year					TOTAL
	2015	2016	2017	2018	2019	
Roads/Bridges	\$15,250	\$5,000	\$9,500	\$2000	\$0	\$31,750
Timber	\$145,478	\$81,395	\$7,250	\$21,124	\$19,700	\$274,947
Dams/Ditches	\$12,450	\$1,002,700	\$0	\$2,200	\$0	\$1,017,350
Crops	\$148,253	\$72,735	\$62,694	\$61,348	\$34,829	\$379,859
Other	\$4,500	\$4,800	\$0	\$11,000	\$0	\$20,300
<b>TOTAL</b>	<b>\$325,931</b>	<b>\$1,166,630</b>	<b>\$79,444</b>	<b>\$97,672</b>	<b>\$54,529</b>	<b>\$1,724,206</b>

<sup>†</sup>Losses to resources associated with assistance requests received by WS-Nebraska; damage does not necessarily reflect all damage that occurs.

<sup>‡</sup>Resources damaged as reported by a cooperator or verified by WS-Nebraska through site visits.

Table 1.3 lists, WS-Nebraska from occurring to resources on properties where owners or managers requested direct operational assistance from WS-Nebraska. WS-Nebraska estimates that activities conducted from FY 2015 through FY 2019 prevented over \$35 million in additional damages from occurring to roads, bridges, timber, dams, ditches, agricultural crops, and other resources. WS-Nebraska ARDM prevented over \$8 million in damages to timber resources from FY 2015 through FY 2019. Overall, WS-Nebraska ARDM prevented an additional \$22 million in damages to roads, bridges, dams, and ditches within the State. WS-Nebraska ARDM prevented nearly \$4 million in damages to agricultural crops in the State between FY 2015 and FY 2019.

**Table 1.3 – Aquatic rodent damage prevented by activities of WS-Nebraska, FY 2015 - FY 2018**

Resource	Resources Saved <sup>‡</sup> by Fiscal Year					TOTAL
	2015	2016	2017	2018	2019	
Roads/Bridge	\$4,030,000	\$4,030,000	\$5,546,198	\$2,937,346	\$833,828,600	\$850,372,144
Timber	\$3,996,100	\$2,425,000	\$908,000	\$1,064,333	\$950,000	\$9,343,433
Dams/Ditches	1,655,000	\$2,425,000	\$2,435,000	\$40,000	\$0	\$6,555,000
Crops	\$1,118,854	\$2,020,000	\$107,335	\$509,855	\$2,367,626	\$6,123,670
Other	\$0	\$120,000	\$0	\$0	\$0	\$120,000
<b>TOTAL</b>	<b>\$10,799,954</b>	<b>\$11,020,000</b>	<b>\$8,996,533</b>	<b>\$4,551,534</b>	<b>\$837,146,226</b>	<b>\$872,514,247</b>

<sup>‡</sup>The resources that aquatic rodents could have damaged further without WS' involvement in resolving and preventing the initial damage originating from a request for assistance.

WS-Nebraska periodically updates the resource values per unit of measure for resource types to remain current in the value of resources; therefore, the value of resources damaged in FY 2015 may be different from the value for the same resources in FY 2019. For example, the value of 10 acres of hardwood timber that floods from water impounded by a beaver dam during FY 2015 may have a different value for the same 10 acres during FY 2019 because of changes in timber prices. Crop prices can also change from year to year.

Miller (1983) estimated that the annual damage in the United States caused by beaver alone was \$75 to \$100 million. The value of beaver damage is perhaps greater than that of any other single wildlife species in the United States. Arner and Dubose (1982) estimated the economic damage that beaver caused in the southeastern United States alone exceeded \$4 billion over a 40-year period.

In 1991 and 1992, Dams et al. (1995) surveyed a river drainage in the southern Appalachian Mountains for beaver impacts on streams and timber damage. Dams et al. (1995) located 62 streams within the river drainage and found 413 beaver dams and 222 impoundments on 36 streams. Dams et al. (1995) characterized 11 streams as “*heavily to severely impacted*” by beaver activities (17 to 35 dams and ponds per mile), nine streams as “*moderately impacted*” (10 to 16 dams and ponds per mile), and 16 streams as “*slightly impacted*” (1 to 9 dams and ponds per mile). On those streams with beaver dams, Dams et al. (1995) found that dam frequency ranged from one to 29 dams per mile and averaged 7.4 dams per mile of

stream. In addition, seven streams had more than 16.1 dams per mile. The dams ranged from three to 200 feet in length and 0.5 to 6.6 feet in height with an average of 21.7 feet in length, 2.5 feet in height, and 4.9 feet in width (Dams et al. 1995). The beaver dams were constructed of a variety of materials with smaller dams (less than one foot in height) constructed mostly of mud and debris pushed up from the stream channel. Larger dams consisted primarily of woody stems up to six inches in diameter and four to six feet in length (Dams et al. 1995).

Of the 62 streams surveyed by Dams et al. (1995), 26 streams showed no signs of beaver activities. Those streams with no sign of beaver activity generally had steep gradients and narrow stream channels with a mean average slope of 6.5% and generally no associated floodplains. The mean average slope of the 36 streams that showed signs of beaver activity was 4.3%. In streams with the highest beaver activities, the slopes were equal to or less than 2% (Dams et al. 1995).

Aquatic rodent species can cause damage to or pose threats to a variety of resources. In Nebraska, most requests for assistance that WS-Nebraska receives are associated with damage or threats of damage that aquatic rodent species can cause to property. The following subsections provide more information on the threats that aquatic rodents can pose to human safety and the damage that can occur to agricultural resources, natural resources, and property.

### **1.3.1 Need for Aquatic Rodent Damage Management to Protect Human Health and Safety**

Zoonotic diseases (*i.e.*, wildlife diseases transmissible to people) can be a major concern of cooperators when requesting assistance ARDM. Individuals or property owners that request assistance with aquatic rodents frequently are concerned about potential disease risks but are unaware of the types of diseases those animals could transmit. In many circumstances, when human health concerns are the primary reason for requesting the assistance of WS-Nebraska there may have been no actual cases of transmission of disease to people by aquatic rodents.

In most cases when human exposure occurs, the presence of a disease vector across a broad range of naturally occurring sources, including occurring in wildlife populations, can complicate determining the origin of the vector. Disease transmission directly from wildlife to people is uncommon. However, the infrequency of such transmission does not diminish the concerns of those people requesting assistance since disease transmission could occur. WS-Nebraska actively attempts to educate the public about the risks associated with disease transmission from wildlife to people through technical assistance and by providing technical leaflets on the risks of exposure.

Beaver can be carriers of the intestinal parasite *Giardia lamblia*, can contaminate human water supplies and cause outbreaks of the disease Giardiasis in people (Woodward 1983, Beach and McCulloch 1985, Wade and Ramsey 1986, Miller and Yarrow 1994). Giardiasis is an illness caused by a microscopic parasite that the Centers for Disease Control and Prevention (CDC) report as one of the most common causes of waterborne disease in people across the United States (CDC 2015). People can contract giardiasis by swallowing contaminated water or putting anything in their mouth that has touched the fecal matter of an infected animal or person. Symptoms of giardiasis include diarrhea, cramps, and nausea (CDC 2015). Beaver can also be carriers of tularemia, a bacterial disease that is transmittable to people through bites by insect vectors, bites of infected animals, or by handling animals or carcasses that are infected (Wade and Ramsey 1986). In cattle ranching sections of Wyoming, Skinner et al. (1984) found that the fecal bacteria count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationists.

Although reports of rabies in beaver, muskrats, and otter are not common, those species of aquatic rodents have tested positive for rabies in the United States. Between 2008 and 2013, two muskrats, 10 otters, and 10 beaver across the United States have tested positive for the rabies virus (see Table 1.4). Beaver infected with the rabies virus have aggressively attacked pets and people (Brakhage and Sampson 1952, CDC 2002, Caudell 2012). In 2001, a beaver tested positive for rabies that was exhibiting aggressive behavior by charging canoes and kayaks on a river in Florida (CDC 2002). A beaver that tested positive for rabies attacked a person wading in a New York river during 2012 (Caudell 2012). The person suffered six puncture wounds over their body and underwent treatment for rabies (Caudell 2012).

**Table 1.4 – Muskrat and beaver reported with rabies in the United States, 2008 – 2013<sup>†</sup>**

Species	Year						TOTAL
	2008	2009	2010	2011	2012	2013	
<b>Beaver</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>10</b>
<b>Muskrat</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>River Otter</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>10</b>

<sup>†</sup>Based on information from Blanton et al. (2009), Blanton et al. (2010), Blanton et al. (2011), Blanton et al. (2012), Dyer et al. (2013), Dyer et al. (2014)

Beaver activity in certain situations can become a threat to public health and safety (*e.g.*, burrowing into or flooding of roadways and railroad beds can result in serious accidents) (Miller 1983, Woodward 1983). 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). Beaver can dig burrows into embankments with underwater entrances along shorelines and burrowing may not be readily evident until serious damage has occurred. When water levels drop, beaver often expand the entrances of their burrows to keep pace with the retreating water level. In addition, when water levels rise, beaver often expand the entrances upward. Those burrows can collapse when people or animals walk upon them and when crossed over with heavy equipment (*e.g.*, mowers, tractors). Beaver damming activity can also create conditions favorable to mosquitoes and can hinder mosquito control efforts or result in population increases of these insects (Wade and Ramsey 1986). While the presence of these insects is largely a nuisance, mosquitoes can transmit diseases, such as encephalitis (Mallis 1982) and West Nile Virus (CDC 2000). Furthermore, damming of streams sometimes increases the presence of aquatic snakes, including the venomous cottonmouth (*Agkistrodon piscivorus*) (Wade and Ramsey 1986).

Burrowing by muskrats and beaver may sometimes threaten earthen dams as they form networks of burrows, which can weaken such structures, causing erosion and failure. Such incidents can threaten the safety and lives of people living downstream from the dam. For that reason, managers of such sites are concerned with preventing excessive burrowing by those animals at dam sites. Much of the damage caused by muskrats is primarily through their burrowing activity (Miller 1994, Linzey 1998, Erb and Perry 2003) in dikes, dams, ditches, ponds, and shorelines. Muskrats can dig burrows into banks and levees, which can compromise the integrity of embankments (Linzey 1998, Erb and Perry 2003).

Muskrats can dig burrows with underwater entrances along shorelines and burrowing may not be readily evident until serious damage has occurred. When water levels drop, muskrats often expand the holes and tunnels to keep pace with the retreating water level. Additionally, when water levels rise muskrats expand the burrows upward. Those burrows can collapse when people or animals walk over them and when heavy equipment (*e.g.*, mowers, tractors) crosses over.

### 1.3.2 Disease Surveillance and Monitoring

Public awareness and health risks associated with zoonotic diseases have increased in recent years. This EA briefly addressed some of the more commonly known zoonotic diseases associated with aquatic

rodents. Those zoonotic diseases remain a concern and continue to pose threats to human safety where people encounter aquatic rodents. WS-Nebraska could conduct or assist with disease monitoring or surveillance activities for any of the aquatic rodent species addressed in this EA. Most disease sampling would occur ancillary to other wildlife damage management activities (*i.e.*, disease sampling would occur after wildlife have been captured or lethally removed for other purposes).

### **1.3.3 Need for Aquatic Rodent Damage Management to Alleviate Agricultural Damage**

Beaver are the largest member of the Order Rodentia in North America, which consists of species that have upper and lower incisors (teeth) that grow continually. To prevent the overgrowth of the incisors, beaver must wear down their teeth through gnawing. Beaver feed and gnaw on woody vegetation to keep teeth worn to appropriate levels. This feeding and gnawing behavior often girdles trees and other woody vegetation leading to the death of the vegetation. Beaver also feed on agricultural crops, such as soybeans and corn (Chapman 1949, Roberts and Arner 1984). Where beaver are located near agricultural fields, consumption of crops can be high. During stomach content analyses of beaver, Roberts and Arner (1984) found that the stomachs of 83% of the beaver sampled in the summer near soybean fields contained only soybeans. From FY 2015 through FY 2019, WS-Nebraska verified approximately \$196,777 in crop damage from aquatic rodents.

Flooding damage caused by beavers occurs when crops or pastures are inundated causing the death of plants. Flooding can also prevent access of agricultural producers to crops or livestock to forage areas. Beaver dams across irrigation canals can prevent irrigation activities and flood surrounding cropland. Beavers and muskrats often burrow into earthen embankments of canals, which can weaken the structural integrity of the structure through erosion and by allowing water to seep into the interior of the structure. Aquatic rodent damage can lead to the failure of the embankments leading to costly repairs of the embankment and the potential for flooding.

Aquaculture, the cultivation of finfish and invertebrates in captivity, has grown exponentially in the past several decades (Price and Nickum 1995). Economic loss due to muskrat damage can be very high in some areas, particularly in aquaculture producing areas. In some states, damage may be as much as \$1 million per year (Miller 1994). Damage to aquaculture resources could occur from the economic losses associated with muskrats killing, consuming, and/or injuring fish and other commercially raised aquatic wildlife. Transmission of diseases by muskrats and beaver from the outside environment to aquaculture facilities, between impoundments, and from facility to facility is also a concern. Given the confinement of aquatic wildlife inside impoundments at aquaculture facilities and the high densities of those organisms in the impoundments, the introduction of a disease can result in substantial economic losses since the entire impoundment is likely to become infected, which can result in extensive mortality. Although the actual transmission of diseases through transport by muskrats and beaver is difficult to document, large rodents have the capability of spreading diseases through fecal droppings and possibly through other mechanical means such as on fur and feet.

### **1.3.4 Need for Aquatic Rodent Damage Management to Alleviate Natural Resources Damage**

Aquatic rodents can also cause damage to natural resources. Natural resources can be those assets belonging to the public that government agencies, as representatives of the people, often manage and hold in trust. Such resources may be plants or animals, including threatened or endangered species, historic properties, or habitats in general. Examples of natural resources in Nebraska may include parks and recreational areas; natural areas, including unique habitats or topographic features; threatened or endangered plants and animals; and any plant or animal populations that the public has identified as a natural resource.

While beaver activity can enhance habitat for some species, the presence of beaver in some areas could



destroy habitat and negatively affect some wildlife species. Knudsen (1962) and Avery (1992) reported that the presence of beaver dams could negatively affect some fisheries. Beaver dams may adversely affect stream ecosystems by increasing sedimentation in streams upstream of the dam; thereby, affecting wildlife that depend on clear water, such as certain species of fish and mussels. Stagnant water impounded by beaver dams can increase the temperature of water impounded upstream of the dam, which can negatively affect aquatic organisms. Beaver dams can also act as barriers that inhibit movement of aquatic organisms and prevent the migration of fish to spawning areas.

Increased soil moisture both within and surrounding beaver-flooded areas can result in reduced timber growth and mast production and increased bank destabilization. These habitat modifications can conflict with human land or resource management objectives and can oppress some plants and animals, including threatened or endangered species. WS-Nebraska could receive requests to conduct ARDM to protect threatened or endangered species.

Muskrats are largely herbivores; however, they also eat other animals as part of their diet (Erb and Perry 2003). Schwartz and Schwartz (1959), Neves and Odom (1989), and Miller (1994) reported muskrats also ate animal matter including mussels, clams, snails, crustaceans (*e.g.*, crayfish), and young birds. Muskrats may also feed upon fish, frogs, and small turtles. Muskrats can negatively affect native vegetation. When muskrats become over-populated an “*eat-out*” may occur which denudes large areas of aquatic vegetation. Those events may result in the feeding area being unsuitable for other wildlife species for a number of years (O’Neil 1949). The loss of vegetation removes food and cover for muskrats and other wildlife. Marsh damage from muskrats is inevitable when areas heavily populated by muskrats are under-trapped (Lynch et al. 1947). While overgrazing of vegetation can be beneficial to some bird species, it can also result in stagnant water, which predisposes the same birds to diseases (Lynch et al. 1947).

### **1.3.5 Need for Aquatic Rodent Damage Management to Alleviate Property Damage**

Aquatic rodents cause damage to a variety of property types in Nebraska each year. Property damage can occur in a variety of ways. Aquatic rodent damage to property occurs primarily through direct damage to structures. Beaver can flood land, roads, and railways. They can girdle trees, consume landscaping, and burrowing activities may cause damage to earthen dams and roadways. In addition, aquatic rodents crossing runways and taxiways near water bodies can contribute to aircraft strike risks. Between FY 2015 and FY 2019 those people in Nebraska requesting assistance from WS-Nebraska reported or WS-Nebraska verified during site visits nearly \$1 million in damages to roads, bridges, dams, and ditches (see Table 1.2).

In some situations, the damage and threats caused by beaver outweigh the benefits (Grasse and Putnam 1955, Woodward et al. 1985, Novak 1987). Damage to resources associated with beaver are most often a result of their feeding, burrowing, and dam building behaviors.

Beaver often will gnaw through trees and other woody vegetation for use in dam building, food caches, and the building of lodges. The girdling and felling of trees and other woody vegetation can cause economic losses, can threaten human safety and property when trees fall, and the loss of trees can be aesthetically displeasing to property owners. The loss of timber (*e.g.*, from flooding, gnawing) is the most common type of damage associated with beaver (Hill 1976, Hill 1982, Woodward et al. 1985, Baker and Hill 2003). Tracts of bottomland hardwood timber up to several thousand acres in size may be lost to beaver activity (Miller and Yarrow 1994). Timber damage caused by beaver in the southeastern United States has been estimated at \$2.2 million annually in Mississippi (Arner and Dubose 1982), \$2.2 million in Alabama (Hill 1976), and \$45 million in Georgia (Godbee and Price 1975). Shwiff et al. (2011) estimated the Beaver Control Assistance Program in Mississippi provided average direct program benefits that ranged from \$25 million to \$57 million per year between 2005 and 2009. In 1991 and 1992, Dams et al. (1995) estimated beaver caused \$817.28 in damages to timber resources per acre in areas of northwestern South Carolina where

beaver activities occurred.

Beaver dams impound water, which can flood property resulting in economic damage. Flooding from beaver dams can cause damage to roads, impede traffic, inundate timber, weaken earthen embankments, and cause damage to residential and commercial utilities.

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, impounded water may damage roads and railroads by saturating roadbeds or railroad beds (Jensen et al. 2001). Burrowing by beaver and muskrats can compromise the banks of roadbeds and railroad beds. During a survey of people in the United States and Canada, D'Eon et al. (1995) found that culvert blockage and road flooding were the most frequently reported types of beaver damage. Jensen et al. (2001) stated, "*Small culverts may be especially prone to plugging for numerous reasons. Small culverts often constrict streams, which increases stream velocity and generates sound that beavers may respond to (Novak 1987)*". Their burrowing activities can also pose risks to earthen dams that retain water (Federal Emergency Management Agency 2005). In addition, aircraft have struck beaver and muskrats at air facilities in the United States (Dolbeer et al. 2015) and strikes could occur at air facilities in Nebraska.

Damage caused by muskrats is usually not a major problem but can be in some situations (Wade and Ramsey 1986), such as in aquaculture systems or when burrowing into earthen embankments. Economic loss is often associated with muskrat feeding and burrowing into banks, dikes, levees, shorelines, and dams associated with ponds, lakes, and drainages (Miller 1994, Linzey 1998, Erb and Perry 2003). In some states, damage may be as much as \$1 million per year (Miller 1994). Elsewhere, economic losses caused by muskrats may be limited and confined primarily to burrowing or feeding on desirable plants in farm ponds. In such areas, the cost of the damage can often outweigh the benefits of having a muskrat population present in the pond.

Burrowing activity of muskrats can seriously weaken dams and levees causing them to leak or collapse (Erb and Perry 2003, Federal Emergency Management Agency 2005). Loss of water from irrigated areas or flooding may lead to loss of crops (Wade and Ramsey 1986). Entrances to burrows are normally underwater and may not be evident until serious damage has occurred. Associated burrows and dens can erode along the shorelines of lakes and create washouts of associated properties when they collapse, posing a hazard to humans, livestock, and equipment used on site. In 2008, the burrowing activities of muskrats likely caused the failure of a Missouri levee holding back floodwaters along the Mississippi River (Caudell 2008). The muskrat burrows likely weakened the structure and caused the levee to collapse, resulting in the flooding of a community.

WS-Nebraska has received numerous requests in the past for assistance in resolving property damage caused by aquatic rodents. As part of the proposed program, WS-Nebraska could provide ARDM assistance to any requester experiencing such damage throughout Nebraska.

## **1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT**

### **Actions Analyzed**

This EA documents the need for ARDM, the issues associated with meeting that need, and alternative approaches to address those issues and to meet the need for action. The mission of WS is to provide federal leadership with managing damage and threats of damage associated with animals (see WS Directive 1.201). WS-Nebraska would only provide assistance when the appropriate property manager or property owner requested assistance. WS-Nebraska could receive a request for assistance from a property owner or manager

to conduct activities on property they own or manage, which may include federal, state, tribal, municipal, and private land within the State of Nebraska.

### **Federal, State, County, City, and Private Lands**

WS-Nebraska could continue to provide ARDM on federal, state, county, municipal, and private land in Nebraska when WS-Nebraska receives a request for such services by the appropriate resource owner or manager. In those cases where a federal agency requests ARDM assistance on property they own or manage, the requesting agency would be responsible for analyzing those activities in accordance with the NEPA. However, this EA could cover such actions if the requesting federal agency determined the analyses and scope of this EA were appropriate for those actions and the requesting federal agency adopted this EA through their own Decision based on the analyses in this EA.

### **Native American Lands and Tribes**

WS-Nebraska would only conduct damage ARDM on Native American lands when requested by a Native American Tribe. WS-Nebraska would only conduct RDM after WS-Nebraska and the Tribe requesting assistance signed a MOU, a work initiation document, or a similar document. Tribe's would determine what activities would be allowed. Because Tribal officials would be responsible for requesting assistance from WS-Nebraska and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would likely occur.

### **Period for which this EA is Valid**

If the preparation of an Environmental Impact Statement (EIS) is not warranted based on the analyses associated with this EA, WS-Nebraska would review activities conducted under the selected alternative to ensure those activities occurred within the parameters evaluated in the EA. This EA would remain valid until WS-Nebraska determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, WS-Nebraska would supplement this analysis or conduct a separate evaluation pursuant to the NEPA. WS-Nebraska will monitor all ARDM to ensure the analysis in this EA remains valid.

### **Site Specificity**

As mentioned previously, WS-Nebraska would only conduct ARDM when requested by the appropriate resource owner or manager. This EA analyzes the potential impacts of ARDM based on previous activities conducted on private and public lands in Nebraska. The EA also addresses the potential impacts of ARDM in areas where WS-Nebraska and a cooperating entity could sign future agreements. Thus, this EA anticipates those additional efforts and analyzes the impacts of those efforts.

The species addressed in this EA occur statewide and throughout the year in the State; therefore, damage or threats of damage could occur wherever those aquatic rodents occur. Planning for ARDM must be viewed as being conceptually similar to the actions of other entities whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they would occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire departments, police departments, emergency clean-up organizations, and insurance companies. This EA emphasizes major issues as those issues relate to specific areas whenever possible; however, many issues apply wherever aquatic rodent damage and the resulting management actions occurs and are treated as such.

Chapter 2 of this EA identifies and discusses issues relating to managing damage caused by aquatic rodents in Nebraska. The WS Decision Model Directive 2.201 would be the site-specific procedure for individual actions that WS-Nebraska could conduct in the State (see Chapter 3 for a description of the Decision Model and its application). Decisions made using the model would be in accordance with WS' directives and Operating Policies described in this EA, as well as relevant laws and regulations. The analyses in this EA would apply to any action that may occur in any locale and at any time within Nebraska.

## **1.5 PUBLIC INVOLVEMENT**

WS-Nebraska initially developed the issues associated with conducting ARDM in consultation with the NGPC, and the USFWS. WS-Nebraska defined the issues and identified the preliminary alternatives through the scoping process. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS implementing regulations for NEPA, WS-Nebraska will make this document available to the public for review and comment. WS-Nebraska will make the document available to the public through regulations.gov, the WS Website, legal notices published in local print media, through direct notification of parties that have requested notification, or parties that have a potential interest in ARDM in the State. I

WS-Nebraska will provide for a minimum of a 30-day comment period for the public and interested parties to provide new issues, concerns, and/or alternatives. Through the public involvement process, WS-Nebraska will clearly communicate to the public and interested parties the analyses of potential environmental impacts on the quality of the human environment. WS-Nebraska will fully consider new issues, concerns, or alternatives the public identifies during the public involvement period to determine whether WS-Nebraska should revisit the EA and, if appropriate, revise the EA prior to issuance of a Decision.

## **1.6 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS**

**WS' Environmental Assessment – Aquatic Rodent Damage Management:** WS-Nebraska has previously developed an EA and a supplement to the EA that analyzed the need for action to manage damage associated with aquatic rodents in the State. This current EA will address more recently identified changes in activities and will assess the potential environmental impacts of program alternatives based on those changes. This EA will re-evaluate activities conducted under the previous EA and the supplement to the EA to address the new need for action and the associated affected environment. Therefore, the outcome of the Decision issued based on the analyses in this EA will supersede the previous EA and the supplement to the EA that addressed managing damage caused by aquatic rodents.

## **1.7 WHAT IS THE FEDERAL LAW AUTHORIZING WILDLIFE SERVICES' ACTION?**

Below are brief discussions of the authorities of the entities within WS-Nebraska and other agencies, as those authorities relate to conducting wildlife damage management.

### **WS' Legislative Authority**

The primary statutory authority for WS-Nebraska is the Act of March 2, 1931 (46 Stat. 1468; 7 USC 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). WS-Nebraska is the lead federal authority in managing damage to agricultural resources, natural resources, property, and threats to human safety associated with animals. WS' directives define program objectives and guide WS' activities.

## **1.8 AUTHORITY OF FEDERAL AGENCIES**

### **United States Environmental Protection Agency (EPA)**

The 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 (CWA) with the United States Army Corps of Engineers that established a permit program for the review and approval of water quality standards that directly affect wetlands.

### **Authority of the United States Fish and Wildlife Service**

The USFWS is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife resources and their habitats. The USFWS mission is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Responsibilities are shared with other federal, state, tribal, and local entities. However, the USFWS has specific responsibilities for the protection of T&E species under the ESA, migratory birds, inter-jurisdictional fish, and certain marine mammals, as well as, for lands and waters that the USFWS administers for the management and protection of those resources, such as the National Wildlife Refuge System. Under 50 CFR 30.11, feral animals without ownership that have reverted to the wild from a domestic state may be taken by authorized federal or state personnel or by private persons operating under permit in accordance with applicable provisions of federal or state law or regulation on National Wildlife Refuges.

### **Natural Resources Conservation Service (NRCS)**

The NRCS is responsible for making certified wetland determinations/delineations on agricultural lands and at the request of USDA program participants. All wetland determinations/delineations are conducted or verified on-site by properly trained NRCS personnel. County offices of the Farm Services Agency maintains maps of wetlands certified by the NRCS.

### **United States Army Corps of Engineers**

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

## **1.9 AUTHORITY OF STATE AGENCIES**

### **Nebraska Game and Parks Commission**

The NGPC has the primary responsibility to manage the State's fish and wildlife resources as directed in the Nebraska Statutes, including (furbearers). In addition, the NGPC has many programs that help protect and manage wetlands and coordinated the development of a Wetland Program Plan for Nebraska.

### **Nebraska Department of Agriculture (NDA)**

The NDA is responsible for regulating pesticide use. WS-Nebraska registers pesticides with the NDA and has one registration, zinc phosphide, for muskrat control. Personnel with WS-Nebraska that use restricted-use pesticides in their job duties must become a certified pesticide applicator by the NDA to use them or be supervised by a certified applicator.

### **Nebraska Department of Environmental Quality (NDEQ)**

The NDEQ is responsible for implementing much of the Nebraska Water Code and the federal Clean Water Act. The NDEQ reviews applications for Clean Water Act Section 404 permits. They have adopted, for the most part, the identical regulations of the federal Clean Water Act.

## **1.10 COMPLIANCE WITH LAWS AND STATUTES**

Several laws or statutes would authorize, regulate, or otherwise affect activities of WS-Nebraska under the alternatives. WS-Nebraska complies with applicable federal, state, and local laws and regulations in accordance with WS Directive 2.210. Below is a brief discussion of laws and regulations related to ARDM in Nebraska

### **National Environmental Policy Act**

All federal actions are subject to the NEPA (Public Law 9-190, 42 USC 4321 et seq.). WS follows the CEQ regulations implementing the NEPA (40 CFR 1500 et seq.) along with the USDA (7 CFR 1b) and the APHIS implementing guidelines (7 CFR 372) as part of the decision-making process. Those laws, regulations, and guidelines generally outline five broad types of activities that federal agencies must accomplish as part of any project: public involvement, analysis, documentation, implementation, and monitoring. The NEPA also sets forth the requirement that all major federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. In part, the CEQ, through regulations in 40 CFR, Parts 1500-1508, regulate federal activities that could affect the physical and biological environment. In accordance with regulations of the CEQ and the USDA, the APHIS has published guidelines concerning the implementation of the NEPA (see 44 CFR 50381-50384). **For this EA, WS will proceed under the 1978 NEPA regulations and existing APHIS procedures since this EA was initiated prior to the September 14, 2020 NEPA revisions.**

Pursuant to the NEPA and the CEQ regulations, this EA documents the analyses resulting from proposed federal actions, informs decision-makers and the public of reasonable alternatives capable of avoiding or minimizing adverse impacts, and serves as a decision-aiding mechanism to ensure that WS infuses the policies and goals of the NEPA into agency actions.

### **Endangered Species Act**

Under the ESA, all federal agencies will seek to conserve T&E species and will utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS-Nebraska conducts consultations with the USFWS pursuant to Section 7 of the ESA 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 will use the best scientific and commercial data available”* (Sec.7 (a)(2)). Evaluation of the alternatives in regard to the ESA will occur in Chapter 3 of this EA.

### **Federal Insecticide, Fungicide, and Rodenticide Act**

The FIFRA and its implementing regulations (Public Law 110-426, 7 USC 136 et. seq.) require the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing the FIFRA. The EPA and the NDA regulate pesticides that could be available to manage damage associated with aquatic rodents in the State.

### **National Historic Preservation Act (NHPA) of 1966, as amended**

The NHPA and its implementing regulations (see 36 CFR 800) require federal agencies to initiate the Section 106 process if an agency determines that the agency's actions are undertakings as defined in Section 800.16(y) and, if so, whether it is a type of activity that has the potential to cause effects on historic properties. The methods that would be available under the alternatives would not generally be the types of methods that would have the potential to affect historic properties. If WS-Nebraska planned an individual activity with the potential to affect historic resources under an alternative selected because of a decision on this EA, WS-Nebraska would conduct the site-specific consultation, as required by Section 106 of the NHPA, as necessary.

### **Native American Graves Protection and Repatriation Act of 1990**

The Native American Graves Protection and Repatriation Act (Public Law 101-106, 25 USC 3001) requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal agencies are to discontinue work until the agency has made a reasonable effort to protect the items and notify the proper authority.

### **Federal Food, Drug, and Cosmetic Act (21 USC 360)**

This law places administration of pharmaceutical drugs, including those immobilizing drugs used for wildlife capture and handling, under the Food and Drug Administration.

### **Controlled Substances Act of 1970 (21 USC 821 et seq.)**

This law requires an individual or agency to have a special registration number from the United States Drug Enforcement Administration to possess controlled substances, including controlled substances used for wildlife capture and handling.

### **Section 401 of the Clean Water Act**

As required by Section 401 of the CWA (see 33 USC 1341), an applicant for a permit issued pursuant to Section 404 of the CWA must also possess a permit from the state in which the discharge originates or will originate, when applicable. The Nebraska Commission on Environmental Quality is responsible for reviewing Water Quality Certifications applications required by Section 401 of the CWA.

### **Section 404 of the Clean Water Act**

Section 404 (see 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 United States Army Corps of Engineers unless the specific activity is exempted in 33 CFR 323 or covered by a nationwide permit (NWP) in 33 CFR 330.

### **Food Security Act**

The Wetland Conservation provision (Swampbuster) of the 1985 (16 USC 3801-3862), 1990 (as amended by Public Law 101-624), and 1996 (as amended by Public Law 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 because 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 five consecutive years and wetland characteristics return, the cropland is considered abandoned and then becomes a wetland subject to regulations under Swampbuster and Section 404 of the CWA.

### **Protection of Wetlands – Executive Order 11990**

Executive Order 11990 was signed to “*minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands*”. To meet those objectives, Executive Order 11990 requires federal agencies to consider alternatives to wetland sites, in planning their actions, and to limit potential damage, if a federal agency cannot avoid an activity affecting a wetland.

### **Environmental Justice in Minority and Low-Income Populations - Executive Order 12898**

Executive Order 12898 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 socio-economic status. 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. This EA will evaluate activities addressed in the alternatives for their potential impacts on the human environment and compliance with Executive Order 12898.

### **Protection of Children from Environmental Health and Safety Risks - Executive Order 13045**

Children may suffer disproportionately for many reasons from environmental health and safety risks, including the development of their physical and mental status. WS-Nebraska makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. Executive Order 13045 helps ensure the policies, programs, activities, and standards of federal agencies address disproportionate risks to children that result from environmental health risks or safety risks.

### **Invasive Species - Executive Order 13112**

Executive Order 13112 establishes guidance for federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm or harm to human health. The Order states that each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law: 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations and provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control and promote public education of invasive species.

### **Nebraska Statute – 37-461 – Muskrats or Beavers; permit to destroy; violation; penalty**

If any dam, canal, drainage ditch, irrigation ditch, private fish pond, aquaculture facility, artificial waterway, railroad embankment, or other property is being damaged or destroyed by muskrats or beavers, the commission may issue a permit to the person who owns or controls the property allowing the person or his or her designee to take or destroy such muskrats or beavers. The muskrats, beavers, or parts thereof taken



under the authority of such permit shall not be sold or used unless the permit holder also possesses a fur-harvesting permit that is current or valid at the time of the sale or use. The commission may adopt and promulgate rules and regulations in connection with the issuance of such permits. Any person violating this section shall be guilty of a Class III misdemeanor and shall be fined at least fifty dollars.

#### **Nebraska Statute – 37-225 – Fur harvesting, defined**

Fur harvesting means taking or attempting to take any fur-bearing animal by any means as prescribed by rules and regulations of the commission.

#### **Nebraska Statute – 37-226 – Fur-bearing animals, defined**

Fur-bearing animals means all beaver, martens, mink, muskrats, raccoons, opossums, otters, bobcats, gray foxes, red foxes, badgers, long-tailed weasels, Canada lynx, and skunks, except mutation minks and mutation foxes.

### **1.11 DECISIONS TO BE MADE**

Based on agency relationships, MOUs, and legislative authorities, WS-Nebraska is the lead agency for this EA, and therefore, responsible for the scope, content, and decisions made. The USFWS, the United States Army Corps of Engineers, the NRCS, and the NGPC provided input during the preparation of this EA to facilitate an interdisciplinary approach to comply with NEPA and agency mandates, policies, and regulations.

Based on the scope of this EA, the decisions to be made are: 1) should WS-Nebraska conduct ARDM when requested, 2) should WS-Nebraska conduct disease surveillance and monitoring in aquatic rodent populations when requested, 3) should WS-Nebraska implement an integrated methods approach, including technical assistance and direct operational assistance, to meet the need for action in Nebraska, 4) if not, should WS-Nebraska attempt to implement one of the alternatives to an integrated methods strategy, and 5) would the proposed action or the other alternatives result in potential effects to the environment requiring the preparation of an EIS.

### **1.12 AFFECTED ENVIRONMENT AND ISSUES**

Chapter 2 contains a discussion of the issues and alternatives, including issues and alternatives that will receive detailed environmental impact analysis in Chapter 3 (Environmental Consequences), issues that have driven the development of Operating Policies, and issues and alternatives that WS-Nebraska did not consider in detail, with rationale.

#### **1.12.1 AFFECTED ENVIRONMENT**

Beaver, and muskrats, are semi-aquatic species that are closely associated with aquatic habitats. The aquatic rodent species addressed in this EA are capable of utilizing a variety of aquatic habitats in the State. The aquatic rodents addressed in this EA occur throughout the year across the State where suitable aquatic habitat exists for foraging and shelter. Damage or threats of damage caused by those aquatic rodent species could occur statewide in Nebraska wherever those aquatic rodents occur.

However, damage management would only be conducted by WS-Nebraska when requested by a landowner or manager and only on properties where an MOU, work initiation document, or another comparable document were signed between WS-Nebraska and a cooperating entity.

The ideal beaver habitat consists of ponds, small lakes with muddy bottoms, and meandering streams, but

can consist of artificial ponds, reservoirs, and drainage ditches that contain nearby food sources (Novak 1987). Slough and Sadleir (1977) stated, “*Beavers prefer a seasonal stable water level. The most stable environment is one which they can control themselves by damming, thus low gradient (slow flowing), narrow streams, and lakes with dammable outlets are preferred (damming also creates new aquatic habitat... and increases accessibility of onshore woody species)*”. In mixed coniferous-deciduous forest habitat, Howard and Larson (1985) found the percentage of hardwood vegetation, watershed size, and stream width had positive effects on active beaver colony density, while an increase in stream gradient and progressively well-drained soils had negative effects on active colony density.

A model used by Curtis and Jensen (2004) found the percentage of roadside devoid of wood vegetation, stream gradient, and stream width were the primary factors for predicting beaver occupancy along roadsides. As the proportion of the roadside area devoid of vegetation and the stream gradient increased, the probability of beaver occupying a site along a roadside declined (Curtis and Jensen 2004). Curtis and Jensen (2004) stated, “*Roadside areas where stream gradients were >3% or where >50% of the roadside area was devoid of woody vegetation usually were not suitable beaver habitat in New York state*”. In a study conducted by Jensen et al. (2001), beaver was also unlikely to colonize streams with gradients greater than 3%. In addition, Jensen et al. (2001) found the inlet opening of culverts under roads and stream gradient were the most important determinant of whether beaver would plug culverts. Jakes et al. (2007) found that beaver was more likely to impound streams crossed by roads in areas with a gradient of 0.6 to 1.2% and watershed sizes of approximately 6,200 acres. Therefore, the availability of woody vegetation, stream gradient, and stream depth appear to be major factors that influence the probability of beaver occupying a site. Beaver can eat a variety of woody vegetation. For example, the analysis of beaver stomach contents in Mississippi identified 42 species of trees, 36 genera of herbaceous plants, 4 types of woody vines, and many species of grass (Graminae) (Roberts and Arner 1984). Some of the common forbs eaten by beaver across the southern United States includes rice cutgrass (*Leersia oryzoides*), golden club (*Orontium aquaticum*), switchgrass (*Arundinaria tecta*), poison ivy (*Toxicodendron radicans*), soybean (*Glycine max*), and pondweed (*Potamogeton* spp.) (Novak 1987). In Nebraska, beaver occur throughout the State where suitable aquatic habitats are available.

The habitat requirements of muskrats are extremely flexible, but they must have a source of permanent water and a protected area for shelter and raising young, such as a lodge built of vegetation or a den burrowed into banks (Boutin and Birkenholz 1987). They inhabit creeks, rivers, lakes, ponds, and drainage ditches with a steady water level feeding primarily on cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), and aquatic grasses. It has historically been the most heavily exploited furbearer in North America with 6-20 million harvested annually since about 1935 (Boutin and Birkenholz 1998). Boutin and Birkenholz (1998) provide a comprehensive review of muskrat natural history and population dynamics.

Nebraska encompasses 77,421 square miles, which consists of 76,940 square miles of land area and 481 square miles of water. Areas where damage or threats of damage could occur include, but would not be limited to agricultural fields, vineyards, orchards, farmyards, dairies, ranches, livestock operations, aquaculture facilities, fish hatcheries, grain mills, grain handling areas, railroad yards, waste handling facilities, industrial sites, natural resource areas, park lands, and historic sites; state and interstate highways and roads; railroads, railroad beds, and their rights-of-way; property in or adjacent to subdivisions, businesses, and industrial parks; timberlands, croplands, and pastures; private and public property where burrowing aquatic rodents cause damage to structures, dams, dikes, ditches, ponds, and levees; public and private properties in rural/urban/suburban areas where aquatic rodents cause damage to landscaping and natural resources, property, and are a threat to human safety through the spread of disease. The area would also include airports and military airbases where aquatic rodents could be a threat to human safety and to property; areas where aquatic rodents negatively affect wildlife, including T&E species; and public property where aquatic rodents were negatively affecting historic structures, cultural landscapes, and natural resources.

## Environmental Status Quo

As defined by the NEPA implementing regulations, the “*human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment*” (40 CFR 1508.14). Therefore, when a federal action agency analyzes their potential impacts on the “*human environment*”, it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or could occur in the absence of the federal action by a non-federal entity. This concept is applicable to situations involving federal assistance to reduce damage associated with wildlife species.

Neither state nor federal laws protect some wildlife species, such as most non-native invasive species. State authority or law manages most aquatic rodent species without any federal oversight or protection. In some situations, with the possible exception of restrictions on methods (*e.g.*, firearms restrictions, pesticide regulations), unprotected wildlife species and certain resident wildlife species are managed with little or no restrictions, which allows anyone to lethally remove or take those species at any time when they are committing damage. In Nebraska, the NGPC has the authority to manage aquatic rodent populations in the State.

When a non-federal entity (*e.g.*, agricultural producers, municipalities, counties, private companies, individuals, or any other non-federal entity) takes an action to alleviate aquatic rodent damage or threat, the action is not subject to compliance with the NEPA due to the lack of federal involvement in the action. Under such circumstances, the environmental baseline or status quo would be an environment that includes those resources as other non-federal entities manage or affect those resources in the absence of the federal action. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards aquatic rodents should occur and even the particular methods that should be used, the involvement of WS-Nebraska in the action would not affect the environmental status quo since the entity could take the action in the absence of involvement by WS-Nebraska. Involvement by WS-Nebraska would not change the environmental status quo if the requester had conducted the action in the absence of involvement by WS-Nebraska in the action.

In Nebraska individuals require a damage permit given by the NGPC. For example, landowners or their designees can remove beaver and muskrats that are causing damage to their property with the proper permit from the NGPC. In addition, other entities could remove aquatic rodents to alleviate damage during the trapping season. In addition, most methods available for resolving damage associated with aquatic rodents would also be available for use by other entities. Therefore, the decision-making ability of WS-Nebraska would be restricted to one of three alternatives. WS-Nebraska could take the action using the specific methods as decided upon by the non-federal entity, provide technical assistance only, or take no action. If WS-Nebraska takes no action, another entity could take the action anyway using the same methods without the need for a permit, during the trapping season, or through the issuance of a permit by the NGPC. Under those circumstances, WS-Nebraska would have virtually no ability to affect the environmental status quo since the action would likely occur in the absence of WS-Nebraska direct involvement.

Based on the discussion above, it is clear that in those situations where a non-federal entity has obtained the appropriate permit or authority, and has already made the decision to remove or otherwise manage aquatic rodents to stop damage with or without the assistance of WS-Nebraska, the participation of WS-Nebraska in carrying out the action would not affect the environmental status quo.

## **CHAPTER 2 ISSUES AND ALTERNATIVES**

### **2.1 ISSUES ASSOCIATED WITH AQUATIC MAMMAL DAMAGE MANAGEMENT**

Issues are concerns regarding potential adverse effects that might occur from a proposed action. Federal agencies must consider such issues during the NEPA decision-making process. Initially, WS-Nebraska developed the issues related to ARDM in Nebraska in consultation with the NGPC.

WS-Nebraska made the EA available to the public for review and comment by a legal notice published in the *Lincoln Journal Star*, on the APHIS website on September 22, 2020 and on the federal e-rulemaking portal at the regulations.gov website beginning on September 21, 2020. WS-Nebraska also sent a notice of availability directly to agencies, stakeholders, organizations, and individuals with probable interest in ARDM in the state through the gov. delivery portal on September 22, 2020. The opportunity for public comment closed on November 6, 2020.

During the public comment period, WS-Nebraska only received 2 comment submissions on regulations.gov, neither of which contained any substantive information that warranted changes to the EA. Comments that are individual opinions or comments that oppose or support an agencies actions without any substantive information included in the comment do not warrant an agency response.

Chapter 3 discusses the issues, as those issues relate to the possible implementation of the alternatives, including the proposed action. WS-Nebraska evaluated, in detail, the following issues:

#### **2.1.1 Issue 1 - Effects of ARDM on Target Aquatic Rodent Populations**

A common issue when addressing damage caused by wildlife are the potential impacts of management actions on the populations of target species. Lethal and non-lethal methods would be available to resolve ARDM issues.

Non-lethal methods could disperse or otherwise make an area unattractive to target species, which could reduce the presence of those species at the site and potentially the immediate area around the site where an entity employed those methods. Lethal methods could remove a single aquatic rodent or those aquatic rodents responsible for causing damage or posing threats to human safety. Therefore, the use of lethal methods could result in local population reductions in the area where damage or threats were occurring. The number of individual animals from a target species that WS-Nebraska could remove from the population using lethal methods would be dependent on the number of requests for assistance received, the number of individual aquatic rodents involved with the associated damage or threat, and the efficacy of methods employed.

Another issue commonly identified is a concern that damage management activities conducted by WS-Nebraska would affect the ability of people to harvest those species during the regulated trapping seasons either by reducing local populations through the lethal take of aquatic rodents or by reducing the number of aquatic rodents present in an area through dispersal techniques.

The analysis will measure the number of individual animals lethally removed in relation to that species abundance to determine the magnitude of impact to the populations of those species from the use of lethal methods. Magnitude may be determined either quantitatively or qualitatively. Determinations based on population estimates, allowable harvest levels, and actual harvest data are quantitative. Determinations based on population trends and harvest trend data are qualitative.

People can harvest beaver and muskrats in Nebraska during annual trapping seasons and when those species

cause damage or pose threats of damage when authorized by the NGPC. Therefore, any damage management activities conducted by WS-Nebraska under the alternatives would be occurring along with other natural processes and human-induced events, such as natural mortality, human-induced mortality from private damage management activities, damage management activities from other agencies, counties, or municipal governments, mortality from regulated harvest, and human-induced alterations of wildlife habitat.

Information on aquatic rodent populations and trends are available from several sources including the fur harvest reports, damage complaints, ground surveys, aerial surveys, and published literature.

### **2.1.2 Issue 2 - Effects of ARDM on Non-target Species, Including T&E Species**

The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture, or kill non-target wildlife.

There are also concerns about the potential for adverse effects to occur to non-target animals from the use of chemical methods. Chemical methods that would be available for ARDM include immobilizing drugs, euthanasia chemicals, zinc phosphide (muskrats only)<sup>5</sup>, and repellents. Chapter 3 further discusses those chemical methods available.

As part of the scoping process for this EA, WS-Nebraska consulted with the USFWS pursuant to Section 7 of the ESA to facilitate interagency cooperation between WS-Nebraska and the USFWS. In December of 2017 WS-Nebraska completed a Biological assessment for all threatened and endangered species. USFWS as well as NGPC both approved the biological assessment and concurred that WS-Nebraska would have no adverse effects on any threatened or endangered species. Chapter 3 discusses the potential effects of the alternatives on this issue.

### **2.1.3 Issue 3 - Effects of Damage Management Methods on Human Health and Safety**

An additional issue often raised is the potential risks to human safety associated with employing methods to manage damage caused by target species. Both chemical and non-chemical methods have the potential to have adverse effects on human safety. Employees of WS-Nebraska could use and recommend only those methods that were legally available under each of the alternatives. Still, some concerns exist regarding the safety of methods available despite their legality and selectivity. As a result, this EA will analyze the potential for proposed methods to pose a risk to members of the public. In addition to the potential risks to the public associated with the methods available under each of the alternatives, risks to employees of WS-Nebraska would also be a concern. Injuries to employees of WS-Nebraska could occur during the use of methods, as well as subject to workplace accidents. Selection of methods, under the alternatives, would include consideration for public and employee safety.

The issue of using chemical methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use or recommendation of chemical methods could include immobilizing drugs, euthanasia chemicals, repellents, and zinc phosphide. Zinc phosphide would only be available to manage damage caused by muskrats. The EPA through the FIFRA and the NDA through State laws would regulate pesticide use. The United States Drug Enforcement Administration and the United States Food and Drug Administration would regulate immobilizing drugs and euthanasia chemicals. In addition, the use of all chemical methods by WS-Nebraska would be subject to Nebraska laws and WS' Directives.

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<sup>5</sup>EPA registration number 56228-06

WS-Nebraska could also use binary explosives to remove or breach beaver dams in the State, when requested. Binary explosives require the mixing of two components for activation. Employees of WS-Nebraska would keep the two components separated until ready for use at a beaver dam. The national WS program has formed an Explosives Safety Committee composed of qualified WS' personnel that are responsible for developing explosives safety and security for WS, conducting explosives training, and certifying WS' explosives specialists.

The most commonly used ARDM methods for aquatic rodents, are cage traps, foothold traps, body-gripping traps, cable devices, shooting, or the recommendation that trappers reduce a local population of aquatic rodents during the annual trapping seasons. WS risk assessments for cage traps determined that potential human health and environmental risks from the proposed use of all types of cage traps including purse and box traps, and drive or herd style cage traps by WS has been evaluated by APHIS and determined that the risks to human health and the environment are negligible. According to WS risk assessment on cable devices, "Overall, the evaluation of risks to human health and safety and the environment from the use of cable devices are minimal." The WS risk assessment on foothold traps also concluded that the overall, the risks to human health and safety and the environment from the use of foothold traps are minimal. WS personnel are professional with their use of foothold traps and try to minimize the identified potential risks. WS risk assessments evaluated shooting and concluded that potential human health and environmental risks from the proposed use of all types of firearms, including rifles, handguns, shotguns, and other firearm-like and ancillary devices, by WS has been evaluated by APHIS and determined that the risks to human health and the environment are negligible. Shooting is a target specific method and only has a minimal risk to people, pets, and nontarget species. WS personnel are trained and certified to use firearms to ensure operations are conducted safely.

The primary safety risk of most ARDM methods occur directly to the applicator or those persons assisting the applicator. However, risks to others do exist when employing ARDM methods, such as when using firearms or body-gripping traps. Most of the ARDM methods available to address aquatic rodent damage in Nebraska would be available for use under any of the alternatives and by any entity, when permitted. Chapter 3 further discusses the risks to human safety from the use of ARDM methods as this issue relates to the alternatives.

. The need for action in Chapter 1 addresses the risks to human safety from diseases associated with certain aquatic rodent populations. The low risk of disease transmission from aquatic rodents does not lessen the concerns of cooperators requesting assistance to reduce threats from zoonotic diseases. Increased public awareness of zoonotic events has only heightened the concern of direct or indirect exposure to zoonotic diseases. Not adequately addressing the threats associated with potential zoonotic diseases could lead to an increase in incidences of injury, illness, or loss of human life.

Additional concerns occur when inadequately addressing threats to human safety associated with aircraft striking aquatic rodents at airports in the State. Between 1990 and 2014, civil aircraft have struck at least 2 beaver and 25 muskrats at airports in the United States (Dolbeer et al. 2015). Although aircraft strikes involving aquatic rodents occur rarely, aquatic rodents have the potential to cause damage to aircraft, which can threaten the safety of passengers. Limiting or preventing the use of certain methods to address the potential for aircraft striking aquatic rodents could lead to higher risks to passenger safety. Chapter 3 further evaluates those concerns in relationship to the alternatives.

#### **2.1.4 Issue 4 - Effects on the Aesthetic Values of Aquatic Rodents**

One issue is the concern that the proposed action or the other alternatives would result in the loss of aesthetic benefits of target aquatic rodents to the public, resource owners, or neighboring residents. People generally

regard wildlife 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.

The human attraction to animals likely started when people began domesticating animals. The public today share a similar bond with animals and/or wildlife in general and in modern societies, a large percentage of households have indoor or outdoor pets. However, some people may consider individual wild animals and aquatic rodents as “*pets*” or exhibit affection toward those animals, especially people who enjoy viewing wildlife. Therefore, the public reaction can be variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between people and wildlife.

Wildlife populations provide a wide range of social and economic benefits (Decker and Goff 1987). Those include direct benefits related to consumptive and non-consumptive uses, indirect benefits derived from vicarious wildlife related experiences, and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (Bishop 1987). Direct benefits are derived from a personal relationship with animals and may take the form of direct consumptive use (*i.e.*, using parts of or the entire animal) or non-consumptive use (*e.g.*, viewing the animal in nature or in a zoo, photographing) (Decker and Goff 1987).

Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and originate from experiences, such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals (*e.g.*, their use in research) (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public attitudes toward wildlife vary considerably. Some people believe that WS-Nebraska should capture and translocate all animals to another area to alleviate damage or threats those animals pose. In some cases, people directly affected by wildlife strongly support take. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any take of wildlife from specific locations or sites. Some people totally opposed to wildlife damage management want WS-Nebraska to teach tolerance for damage and threats caused by wildlife, and that people should never kill wildlife. Some of the people who oppose take of wildlife do so because of human-affectionate bonds with individual wildlife. Those human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

### **2.1.5 Issue 5 - Humaneness and Animal Welfare Concerns of ARDM**

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but very complex concept that people can interpret in a variety of ways. Schmidt (1989) indicated that vertebrate 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.*”

The American Veterinary Medical Association (1987) has previously described suffering as a “...*highly unpleasant emotional response usually associated with pain and distress.*” However, suffering “...*can occur without pain...*” and “...*pain can occur without suffering...*”. 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 1991). Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress.

Suffering can occur when a person does not take action to alleviate conditions that cause pain or distress in animals.

Defining pain as a component in humaneness appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior in animals can be indicators of pain. However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (California Department of Fish and Game 1991).

The American Veterinary Medical Association has previously stated “...*euthanasia is the act of inducing humane death in an animal*” and “... *the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness*” (Beaver et al. 2001). Some people would prefer using American Veterinary Medical Association accepted methods of euthanasia when killing all animals, including wild and invasive animals. The American Veterinary Medical Association has stated, “[f]or 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” (Beaver et al. 2001).

Pain and suffering, as it relates to methods available for use to manage aquatic rodents has both a professional and lay point of arbitration. Wildlife managers and the public must recognize the complexity of defining suffering, since “...*neither medical nor veterinary curricula explicitly address suffering or its relief*” (California Department of Fish and Game 1991). Research suggests that with some methods (e.g., foothold trap) changes in the blood chemistry of trapped animals indicate the existence of some level of “stress” (Kreeger et al. 1990). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991, Sharp and Saunders 2008, Sharp and Saunders 2011).

The decision-making process involves tradeoffs between the above aspects of pain and humaneness. Therefore, humaneness, in part, appears to be a person’s perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering. Chapter 3 further discusses the issue of humaneness and animal welfare. Section discusses operating policies intended to alleviate pain and suffering.

#### **2.1.6 Issue 6 – Effects of Beaver Take and Dam Manipulation on the Status of Wetlands in the State**

Wetlands are a valuable component of land-based ecosystems that provide numerous direct and indirect benefits to people and wildlife (e.g., see Costanza et al. 1997, Millennium Ecosystem Assessment 2005). Between the 1780s and the 1980s, Dahl (1990) estimated 53% of the original wetland acres in the lower 48 states were lost, primarily from human development. Beaver, through their building of dams and impounding water can have a unique role in establishing wetlands that not only provide benefit to the beaver, but to people and other wildlife. Wildlife professionals often consider beaver a “keystone” species for their ability to manipulate and create their own habitats, which can also provide benefits to other wildlife and people. Beaver may also be an inexpensive way of restoring wetlands or creating new wetlands (e.g., see Hey and Philippi 1995, Muller-Schwarze and Sun 2003, Buckley et al. 2011).

The issue of potential impacts to wetlands from ARDM conducted by WS-Nebraska could occur primarily from the breaching or take of beaver dams. Beaver dams obstruct the normal flow of water, which can change the preexisting hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment over time. The depth of the bottom sediment behind a beaver dam depends on the length of time water covers an area and the amount of suspended sediment in the water.

Beaver dams, over time, can establish new wetlands. The regulatory definition of a wetland stated by the



United States Army Corps of Engineers and the EPA (40 CFR 232.2) is:

*“Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”*

Therefore, the breaching or take of a beaver dam could result in the degrading or take of a wetland, if wetland characteristics exist at a location where a beaver dam occurs. The preexisting habitat (prior to the building of the dam) and the altered habitat (areas flooded by impounded water) have different ecological values to the fish and wildlife native to the area. Some species may benefit by the addition of a beaver dam that creates a wetland, while the presence of some species of wildlife may decline. For example, some darter species listed as federally endangered require fast moving waters over gravel or cobble beds, which beaver dams can eliminate; thus, reducing the availability of habitat. In areas where bottomland forests were flooded by beaver dams, a change in species composition could occur over time as trees die. Flooding often kills hardwood trees, especially when flooding persists for extended periods, as soils become saturated. Conversely, beaver dams could be beneficial to some wildlife, such as river otter, Neotropical migratory birds, and waterfowl that require aquatic habitats.

If water impounded by a beaver dam persists for an extended period, hydric soils and hydrophytic vegetation could eventually form. This process could take anywhere from several months to years depending on preexisting conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content. If those conditions exist, then a wetland has developed that would have different wildlife habitat values than an area of impounded water from more recent beaver activity.

If WS-Nebraska removed beaver from an area and removed or breached any associated beaver dam, the manipulation of water levels by removing/breaching the dam could prevent the establishment of wetlands by preventing water conditions to persist long enough to establish wetland characteristics. If WS-Nebraska removed beaver but left the beaver dam undisturbed, the lack of maintenance to the dam by beaver would likely result in the eventual recession of the impounded water as weathering eroded the dam. If a beaver dam is to be removed from an established wetland, then WS-Nebraska would consult with US Army Corp of Engineers before the take of the dam. Each dam site is evaluated to determine if a consult is necessary. According to the US Army Corp of Engineers, if the site has been a wetland more than 30 years or if the vegetation has changed, to aquatic vegetation, then a consult is needed.

## **2.2 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE**

WS-Nebraska identified several additional issues during the scoping process of this EA. Below is a discussion of those additional issues and the reasons for not analyzing those issues in detail.

### **2.2.1 Appropriateness of Preparing an EA (instead of an EIS) for Such a Large Area**

Wildlife damage management falls within the category of actions in which the exact timing or location of individual activities can be difficult to predict well enough ahead of time to describe accurately such locations or times in an EA or even an EIS. Although WS-Nebraska could predict some of the possible locations or types of situations and sites where some kinds of wildlife damage would occur, the program cannot predict the specific locations or times at which affected resource owners would determine a damage problem had become intolerable to the point that they request assistance from WS-Nebraska.

Lead agencies have the discretion to determine the geographic scope of their analyses under the NEPA (Kleppe v Sierra Club, 427 U.S. 390, 414 (1976), CEQ 1508.25). Ordinarily, according to the APHIS procedures implementing the NEPA, WS' individual wildlife damage management actions could be categorically excluded (7 CFR 372.5(c)). The intent in developing this EA has been to determine if the proposed action or the other alternatives could potentially have significant individual and/or cumulative impacts on the quality of the human environment that would warrant the preparation of an EIS. This EA addresses ARDM in Nebraska to analyze individual and cumulative impacts and to provide a thorough analysis.

In terms of considering cumulative effects, one EA analyzing impacts for the entire State would provide a more comprehensive and less redundant analysis than multiple EAs covering smaller areas. If WS-Nebraska made a determination through this EA that the proposed action or the other alternatives could have a significant impact on the quality of the human environment, then WS-Nebraska would publish a notice of intent to prepare an EIS and this EA would be the foundation for developing the EIS. Based on previous requests for assistance, WS-Nebraska would continue to conduct ARDM on a very small percentage of the land area in the State where damage was occurring or likely to occur.

### **2.2.2 Impact on Biodiversity from Activities Conducted by WS-Nebraska**

WS-Nebraska does not attempt to eradicate any species of native wildlife in the State. WS-Nebraska operates in accordance with federal and state laws and regulations enacted to ensure species viability. WS-Nebraska would use available methods to target individual aquatic rodents or groups of aquatic rodents identified as causing damage or posing a threat of damage. Any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. As stated previously, WS-Nebraska would only provide assistance under the appropriate alternatives after receiving a request to manage damage or threats. Therefore, if WS-Nebraska provided direct operational assistance under the alternatives, WS-Nebraska would provide assistance on a small percentage of the land area of Nebraska. WS-Nebraska would only target those aquatic rodents identified as causing damage or posing a threat.

WS-Nebraska would not attempt to suppress wildlife populations across broad geographical areas at such intensity levels for prolonged durations that significant ecological effects would occur. The goal of WS-Nebraska would not be to manage wildlife populations but to manage damage caused by specific individuals of a species. The ability of an animal population to sustain a certain level of take and to return to pre-management levels demonstrates that limited, localized damage management methods have minimal impacts on species' populations.

WS-Nebraska's reporting to NGPC would ensure cumulative take levels would occur within allowable levels to maintain species' populations and meet population objectives for each species. Therefore, activities conducted pursuant to any of the alternatives would not adversely affect biodiversity in the State.

### **2.2.3 A Loss Threshold Should Be Established Before Allowing Lethal Methods**

One issue identified by WS-Nebraska is a concern that WS-Nebraska or other entities should establish a threshold of loss before employing lethal methods to resolve damage and that wildlife damage should be a cost of doing business. In some cases, cooperators likely tolerate some damage and economic loss until the damage reaches a threshold where the damage becomes an economic burden. The appropriate level of allowed tolerance or threshold before employing lethal methods would differ among cooperators and damage situations. Establishing a threshold would be difficult or inappropriate to apply to human health and safety situations. For example, aircraft striking aquatic rodents could lead to property damage and could threaten

passenger safety if a catastrophic failure of the aircraft occurred because of the strike. Therefore, addressing the threats of wildlife strikes prior to an actual strike occurring would be appropriate.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah determined that a forest supervisor could establish a need for wildlife damage management if the supervisor could show that damage from wildlife was threatened (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as a percentage of loss of a particular resource to justify the need for ARDM.

#### **2.2.4 Aquatic Rodent Damage Management Should Not Occur at Taxpayer Expense**

Another issue identified is the concern that WS-Nebraska should not provide assistance at the expense of the taxpayer or that activities should be fee-based. Funding for WS-Nebraska activities could occur from federal appropriations, through state funding, and through cooperative funding. Cooperative service agreements with individual property owners or managers could also fund activities conducted by WS-Nebraska. WS-Nebraska receives a minimal federal appropriation for the maintenance of the WS-Nebraska program. The remainder of WS-Nebraska funding would mostly be fee-based. WS-Nebraska would provide technical assistance to requesters as part of the federally funded activities; however, the majority of funding for ARDM would occur through cooperative service agreements between the requester and WS-Nebraska.

Treves and Naughton-Treves (2005) and the International Association of Fish and Wildlife Agencies (2005) discuss the need for wildlife damage management and that an accountable government agency is best suited to take the lead in such activities because it increases the tolerance for wildlife by those people being impacted by their damage and has the least impacts on wildlife overall.

#### **2.2.5 Cost Effectiveness of Management Methods**

The CEQ does not require a formal, monetized cost benefit analysis to comply with the NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives WS-Nebraska is considering. As part of an integrated approach and as part of the WS Decision Model, evaluation of methods would continually occur to allow for those methods that were most effective at resolving damage or threats. to be employed under similar circumstance where aquatic rodents were causing damage or posing a threat. The cost of methods can often influence the availability of methods to resolve damage, which can influence the effectiveness of methods.

#### **2.2.6 Aquatic Rodent Damage Should be managed by Private Wildlife Control Agents or Trappers**

People experiencing damage caused by aquatic rodents could contact wildlife control agents and private trappers to reduce aquatic rodent damage when deemed appropriate by the resource owner. In addition, WS-Nebraska could refer persons requesting assistance to agents and/or private individuals under all of the alternatives fully evaluated in the EA.

WS Directive 3.101 provides guidance on establishing cooperative projects and interfacing with private businesses. WS-Nebraska would only respond to requests for assistance received and would not respond to public bid notices. When responding to requests for assistance, WS-Nebraska would inform requesters that other service providers, including private entities, might be available to provide assistance.

#### **2.2.7 Effects from the Use of Lead Ammunition in Firearms**

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms

to remove aquatic rodents. The lethal take of aquatic rodents with firearms by WS-Nebraska could occur using a handgun, rifle, or shotgun. According to WS risk assessment for the use of lead, risk to human health from lead ammunition (e.g., through consumption of carcasses) is minimized by training WS personnel and the WS carcass disposal policy. WS risk assessment also concludes that ecological impacts to aquatic resources are also expected to be minimal based on the low potential for exposure to most aquatic biota.

When possible, personnel from WS-Nebraska would retrieve aquatic rodent carcasses for disposal. With risks of lead exposure occurring primarily from ingestion of bullet fragments, the retrieval and proper disposal of aquatic rodent carcasses would greatly reduce the risk of scavengers ingesting lead that carcasses may contain.

Deposition of lead into soil could occur if the projectile passed through the target animal, if misses occurred, or if the retrieval of the carcass did not occur. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil generally stays within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could contaminate ground water or surface water. Stansley et al. (1992) studied lead levels in water subject to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to “transport” readily in surface water when soils were neutral or slightly alkaline in pH (*i.e.*, not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot “fall zones” at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot was highly accumulated in areas with permanent water bodies present, the lead did not necessarily cause elevated lead levels in water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the “action level” of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e.*, capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the lead oxide deposits that form on the surface of bullets and shot serves to reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead that WS-Nebraska could deposit and the concentrations that would occur from the activities conducted by WS-Nebraska to reduce aquatic rodent damage using firearms, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent.

Since those aquatic rodents removed by WS-Nebraska using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of involvement by WS-Nebraska, assistance with ARDM by WS-Nebraska would not be additive to the environmental status quo. The proficiency training received by employees of WS-Nebraska in firearm use and accuracy would increase the likelihood that aquatic rodents were lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which further reduces the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. Based on current information, the risks associated with lead projectiles that WS-Nebraska could contribute to the environment due to misses, the projectile passing through the carcass, or from aquatic rodent carcasses that may be irretrievable would be below any level that would pose any risk from exposure or significant contamination.

### 2.2.8 Effects of Activities on Soils, Water, and Air Quality

The implementation of those alternative approaches discussed in Section 3.1 by WS-Nebraska would meet the requirements of applicable federal laws, regulations, and Executive Orders for the protection of the environment, including the Clean Air Act and Executive Order 13514<sup>6</sup>. The actions discussed in this EA do not involve major ground disturbance, construction, or habitat alteration. Chapter 2 discusses the SOPs to reduce risks to the environment that WS-Nebraska would incorporate into activities when implementing applicable alternative approaches to ARDM. Activities that WS-Nebraska could implement pursuant to those applicable alternative approaches discussed in Section 2.3 would not alter aquatic systems or cause changes in the flow, quantity, or storage of water resources. Personnel of WS-Nebraska would use, store, and dispose of all chemical methods in accordance with applicable laws and regulations pursuant to WS Directive 2.210. The use, storage, and disposal of chemical methods by WS' personnel would also follow WS' directives, including WS Directive 2.401, WS Directive 2.405, WS Directive 2.415, WS Directive 2.430, WS Directive 2.455, and WS Directive 2.465.

Personnel of WS-Nebraska would follow EPA-approved label directions for all pesticide use (see WS Directive 2.401). The intent of the registration process for chemical pesticides is to assure minimal adverse effects occur to the environment when people use the chemicals in accordance with label directions. WS-Nebraska would properly dispose of any excess solid or hazardous waste in accordance with applicable federal, tribal, state, and local regulations.

Consequently, WS-Nebraska does not expect the alternative approaches discussed in Section 2.3 to significantly impact soils, geology, minerals, water quality and quantity, floodplains, other aquatic resources, air quality, prime and unique farmlands, timber, and range. Therefore, this EA will not analyze those elements further.

### 2.2.9 Influence of Global Climate Change

The State of the Climate in 2012 report indicates that every year has been warmer than the long-term average since 1976 (Blunden and Arndt 2013). Impacts of this change will vary throughout the United States, but some areas will experience air and water temperature increases, alterations in precipitation, and increased severe weather events. Temperature and precipitation often influence the distribution and abundance of a plant or animal species. According to the EPA (2016), as temperatures continue to increase, the ranges of many species will likely expand into northern latitudes and higher altitudes. Species adapted to cold climates may struggle to adjust to changing climate conditions (*e.g.*, less snowfall, range expansions of other species).

The impact of climate change on wildlife and their habitats is of increasing concern to land managers, biologists, and members of the public. For example, climate change may alter the frequency and severity of habitat-altering events, such as wildfires, weather extremes, such as drought, presence of invasive species, and wildlife diseases. WS recognizes that climate change is an ongoing concern and may result in changes in species range and abundance. Over time, a combination of factors is likely to lead to changes in the scope and nature of human-wildlife conflicts in the State. Because these types of changes are an ongoing process, this EA has developed a dynamic system, including Operating Policies, and built in measures that allow agencies to monitor for and adjust to impacts of ongoing changes in the affected environment (see Section 2.5 and Section 2.6).

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<sup>6</sup>Executive Order 13514 mandates that at least 15 percent of existing federal buildings and leases meet Energy Efficiency Guiding Principles by 2015, and that annual progress be made toward 100 percent conformance of all federal buildings, with a goal of 100% of all new federal buildings achieving zero-net-energy by 2030. "Zero-net-energy building" is defined in Executive Order 13514 as "a building that is designed, constructed, and operated to require a greatly reduced quantity of energy to operate, meet the balance of energy needs from sources of energy that do not produce greenhouse gases, and therefore result in no net emissions of greenhouse gases and be economically viable".

### **2.2.10 Greenhouse Gas Emissions by WS-Nebraska**

Under the alternative approaches intended to meet the need for action discussed in Chapter 3, WS-Nebraska could potentially produce criteria pollutants (*i.e.*, pollutants for which maximum allowable emission levels and concentrations are enforced by state agencies). Those activities could include working in the office, travel from office to field locations, and travel at field locations (vehicles or ATV). During evaluations of the national program to manage feral swine (*Sus scrofa*), WS-Nebraska reviewed greenhouse gas emissions for the entire national WS program (USDA 2015). The analysis estimated effects of vehicle, aircraft, office, and ATV use by WS for FY 2013 and included the potential new vehicle purchases that could be associated with a national program to manage damage caused by feral swine. The review concluded that the range of Carbon Dioxide Equivalents (includes CO<sub>2</sub>, NO<sub>x</sub> CO, and SO<sub>x</sub>) for the entire national WS program would be below the reference point of 25,000 metric tons per year recommended by CEQ for actions requiring detailed review of impacts on greenhouse gas emissions. The activities that WS-Nebraska could conduct under the alternative approaches would have negligible cumulative effects on atmospheric conditions, including the global climate.

### **2.2.11 A Site-Specific Analysis Should be made for Every Location Where Damage Management Would Occur**

As discussed previously, one EA analyzing impacts for the entire State would provide a more comprehensive and less redundant analysis that allows for a better cumulative impact analysis. If a determination were made through this EA that the alternatives developed to meet the need for action could result in a significant impact on the quality of the human environment, then an EIS would be prepared.

## **2.3 ALTERNATIVES CONSIDERED IN DETAIL**

### **DESCRIPTION OF THE ALTERNATIVES**

WS-Nebraska developed the following alternatives to meet the need for action and address the identified issues associated with managing damage caused by aquatic rodents in the State.

#### **2.3.1 Alternative 1 – WS-Nebraska Would Continue the Current Adaptive Integrated Methods Approach to ARDM in Nebraska (No Action/Proposed Action)**

This alternative would continue the current implementation of an adaptive integrated approach utilizing non-lethal and lethal techniques, when requested, as deemed appropriate using the WS Decision Model, to reduce damage and threats caused by aquatic rodents in Nebraska. A major goal of the program would be to resolve and prevent damage caused by aquatic rodents, and to reduce threats to agriculture, infrastructure including roads and bridges, and human safety. To meet this goal, WS-Nebraska would continue to respond to requests for assistance with, at a minimum, technical assistance, or when funding was available, operational damage management. Funding could occur through federal appropriations, through state funding, or from cooperative funding. The adaptive approach to managing damage associated with aquatic rodents would integrate the use of the most practical and effective methods to resolve a request for damage management as determined by a site-specific evaluation to reduce damage or threats to human safety for each request. WS-Nebraska would provide city/town managers, agricultural producers, property owners, and others requesting assistance with information regarding the use of appropriate non-lethal and lethal techniques.

Under this alternative, WS-Nebraska could respond to requests for assistance by: 1) taking no action, if warranted, 2) providing only technical assistance to property owners or managers on actions they could take to reduce damages caused by aquatic rodents, or 3) providing technical assistance and direct operational assistance to a property owner or manager experiencing damage. To meet the need for action, the objectives of this alternative would be to assist all of the people requesting assistance from WS-Nebraska, within the constraints of available funding and workforce.

WS-Nebraska could provide property owners or managers requesting assistance with information regarding the use of effective and practical non-lethal and lethal techniques. WS-Nebraska would give preference to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). Property owners or managers may choose to implement the recommendations of WS-Nebraska on their own (*i.e.*, technical assistance), use contractual services of private businesses, use volunteer services of private organizations, use the services of WS-Nebraska (*i.e.*, direct operational assistance), take the management action themselves, or take no further action.

WS-Nebraska would work with those persons experiencing aquatic rodent damage to address those aquatic rodents responsible for causing damage as expeditiously as possible. To be most effective, damage management activities should occur as soon as aquatic rodents begin to cause damage. Once aquatic rodents become familiar with a particular location (*i.e.*, conditioned to an area), dispersing those aquatic rodents or making the area unattractive can be difficult. WS-Nebraska would work closely with those entities requesting assistance to identify situations where damage could occur and begin to implement damage management activities under this alternative as early as possible to increase the likelihood of those methods achieving the level of damage reduction requested by the cooperating entity.

The WS Decision Model would be the implementing mechanism for ARDM under Alternative 1, which would be adapted to an individual damage situation. This alternative would allow WS-Nebraska to use the broadest range of methods to address damage or the threat of damage. When WS-Nebraska receives a request for direct operational assistance, WS-Nebraska would conduct site visits to assess the damage or threats, would identify the cause of the damage, and would apply the Decision Model WS Directive 2.201 to determine the appropriate methods to resolve or prevent damage. Discussion of the WS Decision Model and the use of the Model by WS-Nebraska under Alternative 1 occur below.

Non-lethal methods that would be available for use by WS-Nebraska under this alternative include, but are not limited to minor habitat modification, live traps, translocation, exclusionary devices, water control devices for beaver, frightening devices, immobilizing drugs, and chemical repellents. In addition, WS-Nebraska could remove or breach beaver dams using binary explosives and hand tools. Once the determination was made that removing or breaching a beaver dam was appropriate and the beaver dam could be removed in accordance with the CWA, the breaching or take of the dam could be conducted manually using hand tools or when safe and appropriate, with use of binary explosives.

Lethal methods that would be available to WS under this alternative include body-gripping traps, foothold traps, cable devices, the recommendation of harvest during the hunting and/or trapping seasons, euthanasia chemicals, zinc phosphide (muskrats only), and shooting. Target aquatic rodent species live-captured using non-lethal methods (*e.g.*, live-traps, immobilizing drugs) could be euthanized. The lethal control of target aquatic rodents would comply with WS Directive 2.505.

Discussing methods does not imply that all methods would be used or recommended by WS-Nebraska to resolve requests for assistance and does not imply that all methods would be used to resolve every request for assistance. The most appropriate response would often 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. For example, if an entity requesting assistance had already attempted to alleviate damage using non-lethal methods, WS-Nebraska would not necessarily employ those same non-lethal methods, since the previous use of those methods were ineffective at reducing damage or threats to an acceptable level to the requester.

Many lethal and non-lethal methods are intended to be short-term attempts at reducing damage occurring at the time those methods were employed. Long-term solutions to managing aquatic rodent damage could include limited habitat manipulations and changes in cultural practices, which are techniques addressed further below and in Appendix B.

Non-lethal methods can disperse or otherwise make an area unattractive to aquatic rodents causing damage; thereby, reducing the presence of aquatic rodents at the site and potentially the immediate area around the site where non-lethal methods were employed. WS-Nebraska would give preference to non-lethal methods when addressing requests for assistance (see WS Directive 2.101). However, WS-Nebraska would not necessarily employ non-lethal methods to resolve every request for assistance if deemed inappropriate by personnel of WS-Nebraska using the WS Decision Model, especially when the requesting entity had used non-lethal methods previously and found those methods to be inadequate to resolving the damage or threats of damage. WS-Nebraska would use non-lethal methods to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse aquatic rodents from an area resulting in a reduction in the presence of those aquatic rodents. Employing methods soon after damage begins or soon after a property owner or manager identifies threats, increases the likelihood that those damage management activities would achieve success in addressing damage. Therefore, coordination and timing of methods would be necessary to be effective in achieving expedient resolution of aquatic rodent damage.

In some situations, a cooperating entity has tried to employ non-lethal methods to resolve damage prior to contacting WS-Nebraska for assistance. In those cases, the methods employed by the requester were either unsuccessful or the reduction in damage or threats had not reached a level that was tolerable to the requesting entity. In many situations, the implementation of non-lethal methods, such as exclusion-type barriers, would be the responsibility of the requester, which means that, in those situations, the only function of WS-Nebraska would be to implement lethal methods, if determined to be appropriate using the WS Decision Model.

WS-Nebraska could employ lethal methods to resolve damage associated with those aquatic rodents. Surveys in North Carolina and Alabama indicated the majority of landowners with beaver damage on their property that were surveyed desired damage management via beaver take (Hill 1976, Woodward et al. 1985). Loker et al. (1999) found that suburban residents also might desire lethal management methods to resolve beaver damage conflicts. Such conflicts that occur between property owners and beaver can result in negative effects that often outweigh the benefits of having beaver on an owner's property (Miller and Yarrow 1994). The use of lethal methods could result in local population reductions in the area where damage or threats were occurring since people could remove individual aquatic rodents from the population. WS-Nebraska and other entities often employ lethal methods to reinforce non-lethal methods and to remove aquatic rodents that WS-Nebraska or other entities identify as causing damage or posing a threat to human safety. The number of aquatic rodents removed from the population using lethal methods under Alternative 1 would be dependent on the number of requests for assistance received, the number of aquatic rodents involved with the associated damage or threat, and the efficacy of methods employed.

Often of concern with the use of lethal methods is that aquatic rodents that were lethally removed would only be replaced by other aquatic rodents either after the application of those methods (*e.g.*, aquatic rodents that relocate into the area) or by aquatic rodents the following year (*e.g.*, increase in reproduction and survivability that could result from less competition). As stated previously, WS-Nebraska would not use



lethal methods as population management tools over broad areas. The use of lethal methods would be intended to reduce the number of individuals of a target aquatic rodent species present at a specific location where damage was occurring.

WS may recommend that people harvest aquatic rodents during the regulated trapping season for those species in an attempt to reduce the number of aquatic rodents causing damage. Managing aquatic rodent populations over broad areas could lead to a decrease in the number of aquatic rodents causing damage. Establishing hunting or trapping seasons and the allowed harvest levels during those seasons is the responsibility of the NGPC. WS-Nebraska does not have the authority to establish hunting or trapping seasons or to set allowed harvest numbers during those seasons.

### **Technical Assistance Recommendations**

Under Alternative 1, WS-Nebraska would provide technical assistance to those persons requesting assistance as part of an integrated approach to ARDM. Technical assistance would occur as described in Alternative 2 of this EA. From FY 2015 through FY 2019, WS-Nebraska conducted 35 technical assistance projects that involved ARDM (see Table 1.1).

### **Direct Operational Assistance**

Operational damage management assistance would include damage management activities that personnel of WS-Nebraska conduct directly or activities that employees of WS-Nebraska supervised. Initiation of operational damage management assistance could occur when the problem could not be effectively resolved through technical assistance alone and there was a written MOU, work initiation document, or other comparable document signed between WS-Nebraska and the entity requesting assistance. The initial investigation by personnel of WS-Nebraska would define the nature, history, and extent of the problem; species responsible for the damage; and methods available to resolve the problem. The professional skills of personnel of WS-Nebraska could be required to resolve problems effectively. To meet the need for action, the objective of WS-Nebraska would be to provide direct operational assistance within two weeks of WS-Nebraska receiving a request for such assistance.

### **Educational Efforts**

Education is an important element of activities because wildlife damage management is about finding balance and coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations, WS-Nebraska provides lectures, courses, and demonstrations to producers, homeowners, state and county agents, colleges and universities, and other interested groups. WS-Nebraska frequently cooperates with other entities in education and public information efforts. Additionally, employees of WS-Nebraska would continue to write technical papers and provide presentations at professional meetings and conferences so that other wildlife professionals and the public were aware of recent developments in damage management technology, programs, laws and regulations, and agency policies.

### **Research and Development**

The National Wildlife Research Center (NWRC) functions as the research unit of WS by providing scientific information and the development of methods for wildlife damage management, which are effective and environmentally responsible. Research biologists with the NWRC work closely with wildlife managers,

researchers, and others to develop and evaluate methods and techniques for managing wildlife damage. Research biologists with the NWRC have authored hundreds of scientific publications and reports based on research conducted involving animals and methods to manage damage.

### **WS' Decision Making Procedures**

The WS Decision Model (see WS Directive 2.201) depicts how personnel from WS-Nebraska would use a thought process for evaluating and responding to damage complaints. Personnel from WS-Nebraska would assess the problem and then evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic, and social considerations. Following this evaluation, employees of WS-Nebraska would incorporate methods deemed practical for the situation into a damage management strategy. After employees of WS-Nebraska implemented this strategy, employees would continue to monitor and evaluate the strategy to assess effectiveness. If the strategy were effective, the need for further management would end. In terms of the WS Decision Model, most efforts to resolve animal damage consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a written documented process, but a mental problem-solving process common to most, if not all, professions, including WS-Nebraska.

The general thought process and procedures of the WS Decision Model would include the following steps.

1. **Receive Request for Assistance:** WS-Nebraska would only provide assistance after receiving a request for such assistance. WS-Nebraska would not respond to public bid notices.
2. **Assess Problem:** First, WS-Nebraska would make a determination as to whether the assistance request was within the authority of WS-Nebraska. If an assistance request were within the authority of WS-Nebraska, employees of WS-Nebraska would gather and analyze damage information to determine applicable factors, such as what species was responsible for the damage, the type of damage, the extent of damage, and the magnitude of damage. Other factors that employees of WS-Nebraska could gather and analyze would include the current economic loss or current threat (*e.g.*, threat to human safety), the potential for future losses or damage, the local history of damage, and what management methods, if any, were used to reduce past damage and the results of those actions.
3. **Evaluate Management Methods:** Once a problem assessment was completed, an employee of WS-Nebraska would conduct an evaluation of available management methods. The employee would evaluate available methods in the context of their legal and administrative availability and their acceptability based on biological, environmental, social, and cultural factors.
4. **Formulate Management Strategy:** An employee of WS-Nebraska would formulate a management strategy using those methods that the employee determines to be practical for use. The employee would also consider factors essential to formulating each management strategy, such as available expertise, legal constraints on available methods, costs, and effectiveness.
5. **Provide Assistance:** After formulating a management strategy, an employee of WS-Nebraska could provide technical assistance and/or direct operational assistance to the requester (see WS Directive 2.101).
6. **Monitor and Evaluate Results of Management Actions:** When providing direct operational assistance, it is necessary to monitor the results of the management strategy. Monitoring would be important for determining whether further assistance was required or whether the management strategy resolved the request for assistance. Through monitoring, an employee of WS-Nebraska would continually evaluate the management strategy to determine whether additional techniques or modification of the strategy was necessary.
7. **End of Project:** When providing technical assistance, a project would normally end after an employee of WS-Nebraska provided recommendations or advice to the requester. A direct operational assistance project would normally end when personnel of WS-Nebraska stop or reduce the damage or threat to an acceptable level to the requester or to the extent possible. Some damage

situations may require continuing or intermittent assistance from personnel of WS-Nebraska and may have no well-defined termination point, such as aquatic rodents burrowing into levees where non-lethal methods (e.g., rip-rap) were not possible or practical.

### **Community-based Decision Making**

WS-Nebraska could receive requests for assistance from community leaders and/or representatives. In those situations, WS-Nebraska would follow the “*co-managerial approach*” to solve wildlife damage or conflicts as described by Decker and Chase (1997) under this alternative. Within this management model, WS-Nebraska could provide technical assistance regarding the biology and ecology of aquatic rodents and effective, practical, and reasonable methods available to the local decision-maker(s) to reduce damage or threats. This could include non-lethal and lethal methods. WS-Nebraska and other state and federal wildlife management agencies may facilitate discussions at local community meetings when resources were available. Under this approach, resource owners and others directly affected by aquatic rodent damage or conflicts would have direct input into the resolution of such problems. They may implement management recommendations provided by WS-Nebraska or others or may request direct operational assistance from WS-Nebraska, other wildlife management agencies, local animal control agencies, or private businesses or organizations.

The community representative(s) and/or decision-maker(s) for the local community would be elected officials or representatives of the communities. The community representative(s) and/or decision-maker(s) who oversee the interests and business of the local community would generally be residents of the local community or appointees that other members of the community popularly elected. This person or persons would represent the local community’s interest and make decisions for the local community or bring information back to a higher authority or the community for discussion and decision-making. Identifying the decision-maker for local business communities can be more complex because building owners may not indicate whether the business must manage wildlife damage themselves or seek approval to manage wildlife from the property owner or manager, or from a governing board of representatives.

Under a community based decision-making process, WS-Nebraska could provide information, demonstration, and discussion on available methods to the appropriate representative(s) of the community and/or community decision-maker(s) that requested assistance, which would help ensure that decisions made by representatives of the community and/or the decision-makers were based on community-based input. WS-Nebraska would only provide direct operational assistance if the local community representative(s) and/or decision-maker(s) requested such assistance and only if the assistance requested was compatible with recommendations made by WS-Nebraska.

### **Decision-makers on Private Property**

In the case of private property owners, the decision-maker is the individual that owns or manages the affected property. The decision-maker has the discretion to involve others as to what occurs or does not occur on property they own or manage. Therefore, in the case of an individual property owner or manager, the involvement of others and to what degree others were involved in the decision-making process would be a decision made by that individual. WS-Nebraska could provide direct operational assistance when requested; however, WS-Nebraska would only provide assistance if the requested management actions were in accordance with recommendations made by WS-Nebraska.

### **Decision-makers on Public Property**

The decision-maker for local, state, or federal property would be the official responsible for or authorized

to manage the public land to meet interests, goals, and legal mandates for the property. WS-Nebraska could provide technical assistance to this person and make recommendations to reduce damage. WS-Nebraska could provide direct operational assistance when requested; however, WS-Nebraska would only provide assistance if the requested management actions were in accordance with the recommendations made by WS-Nebraska.

### **2.3.2 Alternative 2 – WS-Nebraska Provides ARDM Technical Assistance Only**

Under this alternative, WS-Nebraska would provide those people seeking assistance with technical assistance only. Similar to the other alternatives, WS could receive requests for assistance from community representatives, private individuals/businesses, or from public entities. Technical assistance WS-Nebraska would provide those people experiencing damage or threats caused by aquatic rodents with information, demonstrations, and recommendations on available and appropriate methods. The implementation of methods and techniques to resolve or prevent damage would be the responsibility of the requester with no direct involvement by WS-Nebraska. In some cases, WS may provide supplies or materials that were of limited availability for use by private entities (*e.g.*, loaning of traps). Technical assistance could be provided through a personal or telephone consultation, or during an on-site visit with the requester.

Generally, WS' personnel would describe several management strategies to the requester for short and long-term solutions to managing damage. WS' personnel would base those strategies on the level of risk, need, and the practicality of their application. Personnel with WS-Nebraska would use the WS Decision Model to recommend those methods and techniques available to the requester to manage damage and threats of damage. Those people receiving technical assistance from WS-Nebraska could implement those methods recommended by WS, could employ other methods not recommended by WS, could seek assistance from WS-Nebraska, could seek assistance from other entities, or take no further action.

Under Alternative 2, WS-Nebraska would recommend an integrated approach similar to Alternative 1 when receiving a request for assistance; however, WS-Nebraska would not provide direct operational assistance under this alternative. WS' personnel would give preference to non-lethal methods when practical and effective under this alternative (see WS Directive 2.101). WS' personnel would use the WS Decision Model and information provided by the individual seeking assistance as the basis for determining and recommending appropriate methods and techniques. In some instances, wildlife-related information provided to the requester by WS-Nebraska would result in tolerance/acceptance of the situation. In other instances, WS' personnel would discuss and recommend damage management options. WS' personnel would only recommend or loan those methods that were legally available for use by the appropriate individual. Similar to Alternative 1, those methods described would be available to those people experiencing damage or threats associated with aquatic rodents in the State; however, immobilizing drugs and euthanasia chemicals would have limited availability to the public and other entities under this alternative and Alternative 3.

Immobilizing drugs and euthanasia chemicals would only be available to employees of WS-Nebraska, appropriately licensed veterinarians, or people under the supervision of a veterinarian. The EPA has designated zinc phosphide as a restricted use pesticide; therefore, only persons that have completed the requirements for obtaining a pesticide applicators license issued by the NDA could purchase zinc phosphide and only licensed pesticide applicators could use zinc phosphide or people under their supervision.

This alternative would place the immediate burden of operational damage management work on the resource owner, other governmental agencies, and/or private businesses. Those persons experiencing damage or were concerned with threats posed by aquatic rodents could seek assistance from WS-Nebraska, other governmental agencies, private entities, or conduct damage management on their own.

### **2.3.3 Alternative 3 – No Involvement in ARDM by WS-Nebraska**

Under this alternative, WS-Nebraska would not provide any assistance with ARDM in the State. WS-Nebraska would continue to participate with other activities but would not provide ARDM assistance. WS' personnel would refer all ARDM requests to WS-Nebraska NGPC, other governmental agencies, and/or private entities.

WS-Nebraska Those people experiencing damage or threats of damage caused by aquatic rodents could continue to employ those methods legally available to address aquatic rodent damage on their own. The take of aquatic rodents by other entities could occur after authorization by the NGPC, when required, and during the hunting and/or trapping seasons. Landowners or their designees can remove beaver, otter, and muskrat that are causing damage to their property without the need for a permit from NGPC. In addition, property owners or managers experiencing damage could request assistance from other entities (*e.g.*, private trappers, private business).

Similar to Alternative 2, those methods described would generally be available to those people experiencing damage or threats associated with aquatic rodents in the State; however, immobilizing drugs and euthanasia chemicals would have limited availability to the public and other entities under this alternative. Under this alternative, appropriately licensed veterinarians or people under their supervision would be the only entities that could use immobilizing drugs and euthanasia chemicals. Zinc phosphide is a restricted use pesticide; therefore, only persons with a pesticide applicators license could purchase zinc phosphide and only licensed pesticide applicators could use zinc phosphide or people under their supervision.

## **2.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL**

In addition to those alternatives analyzed in detail, WS-Nebraska identified several additional alternatives. However, those alternatives will not receive detailed analyses for the reasons provided below. Those alternatives considered but not analyzed in detail include:

### **2.4.1 Non-lethal Methods Implemented Before Lethal Methods**

This alternative would require that WS-Nebraska apply non-lethal methods before lethal methods for ARDM in the State. If the use of non-lethal methods failed to resolve the damage situation or reduce threats to human safety at each damage situation, WS-Nebraska could employ lethal methods to resolve the request. WS-Nebraska would apply non-lethal methods to every request for assistance regardless of severity or intensity of the damage or threat until deemed inadequate to resolve the request. This alternative would not prevent the use of lethal methods by WS-Nebraska, other entities, or by those persons experiencing aquatic rodent damage but would only prevent the use of those methods by the federal WS program until WS had employed non-lethal methods.

Those people experiencing damage often employ non-lethal methods to reduce damage or threats prior to contacting WS-Nebraska. Verification of the methods used would be the responsibility of WS-Nebraska. No standard exists to determine requester diligence in applying those methods, nor are there any standards to determine how many non-lethal applications are necessary before the initiation of lethal methods. Thus, WS-Nebraska could only evaluate the presence or absence of non-lethal methods. Alternative 1 and Alternative 2 would be similar to a non-lethal before lethal alternative because WS-Nebraska would give preference to the use of non-lethal methods before lethal methods (see WS Directive 2.101). Adding a non-lethal before lethal alternative and the associated analysis would not contribute additional information to the analyses in the EA.

#### **2.4.2 Use of Non-lethal Methods Only by WS-Nebraska**

Under this alternative, WS-Nebraska would be required to implement non-lethal methods only to resolve damage caused by aquatic rodents in the State. WS-Nebraska would only employ those methods discussed in Appendix B that were non-lethal. No intentional lethal take of aquatic rodents would occur by WS-Nebraska. The use of lethal methods could continue under this alternative by other entities or by those persons experiencing damage by aquatic rodents. The non-lethal methods used or recommended by WS-Nebraska under this alternative would be identical to those non-lethal methods identified in any of the alternatives.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, the WS-Nebraska program could refer requests for information regarding lethal methods to NGPC, private businesses, or other entities.

Property owners or managers could conduct management using any method that was legal. Property owners or managers might choose to implement non-lethal recommendations made by WS-Nebraska, implement lethal methods, or request assistance from a private or public entity other than WS-Nebraska. Property owners/managers frustrated by the lack of assistance of WS-Nebraska with the full range of aquatic rodent damage management techniques may try methods not recommended by WS-Nebraska or use illegal methods (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what was necessary, which could then become hazardous and pose threats to the safety of people and non-target species.

Using an integrated damage management approach, Alternative 1 incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods would effectively resolve damage from aquatic rodents, WS-Nebraska would use or recommend those methods under Alternative 1. Since non-lethal methods would be available for use under the alternative 1 and 2 this alternative would not add to the analyses. Those persons experiencing damage or threats of damage could lethally remove aquatic rodents under any of the alternatives even if WS-Nebraska was limited to using non-lethal methods only.

#### **2.4.3 Use of Lethal Methods Only by WS-Nebraska**

This alternative would require the use of lethal methods only to reduce threats and damage associated with aquatic rodents. However, non-lethal methods can be effective in preventing damage in certain instances. For example, Sheffels et al. (2014) found that placing plastic mesh tubes around newly planted woody vegetation at riparian restoration sites could prevent muskrats from feeding on the vegetation. WS-Nebraska non-lethal methods have been effective in alleviating aquatic rodent damage in some cases. For example, exclusion methods can be effective at preventing beaver from chewing on and felling trees. In those situations where damage could be alleviated effectively using non-lethal methods, WS-Nebraska would employ or recommend those methods as determined by the WS Decision Model. Therefore, WS-Nebraska did not consider this alternative in detail.

#### **2.4.4 Live-capture and Translocate Aquatic Rodents Only**

Under this alternative, WS-Nebraska would address all requests for assistance using live-capture methods or the recommendation of live-capture methods and WS-Nebraska would translocate all aquatic rodents live-captured. The success of translocation efforts would depend on efficiently capturing the target aquatic rodents causing damage and the existence of an appropriate release site (Nielsen 1988). Aquatic rodents would be live-captured using live-traps to alleviate damage. WS-Nebraska would translocate all aquatic rodents live-captured through direct operational assistance under this alternative. Translocation sites would

be identified and have to be approved by the NGPC and/or the property owner where the translocated aquatic rodents would be released prior to live-capture and translocation. Live-capture and translocation of aquatic rodents could be conducted as part of the alternatives analyzed in detail. However, the translocation of aquatic rodents could only occur under the authority of the NGPC. WS-Nebraska when requested by the NGPC, WS-Nebraska could translocate aquatic rodents or recommend translocation under any of the alternatives analyzed in detail, except under the no involvement by WS-Nebraska alternative (Alternative 3). However, other entities could translocate aquatic rodents under Alternative 3, if authorized by the NGPC.

Translocation may be appropriate in some situations when a species population is low. However, aquatic rodents are abundant in much of the suitable habitat in Nebraska, and translocation is not necessary for the maintenance of viable populations in the State. Because aquatic rodents are abundant in Nebraska, the aquatic rodents that WS-Nebraska translocated and released into suitable habitat would likely encounter other aquatic rodents with established territories. For example, if WS-Nebraska could translocate beaver, the release of beaver into suitable habitat would likely occur in areas where other beaver already occurs. Beaver are territorial and introducing translocated beaver into new areas often disorients the beaver because they are unfamiliar with their surroundings. Therefore, translocated beaver is often at a disadvantage. Territorial beaver often viciously attacks other beaver that people release or that wander into their territories and those injuries sustained during those attacks oftentimes causes the death of translocated beaver (McNeely 1995). Survival of translocated animals is generally very poor due to the stress of translocation, and in many cases, released animals suffer mortality in a new environment (Craven et al. 1998, Petro et al. 2015). Courcelles and Nault (1983) found that 50% (n=10) of radio-collared, relocated beaver died, probably from stress or predation resulting from the relocation. Of the 30 beaver radio tagged by Petro et al. (2015) in Oregon, eight died within 30 days of release and four died within 90 days of release, with predation and disease/illness being the primary cause of death. Petro et al. (2015) found that most predation on relocated beaver occurred during the first week after release.

Relocated beaver also may disperse long distances from the release site (Novak 1987). Only 12% of beaver relocated in streams and 33% of beaver relocated in lake and pothole areas remained at the release site (Knudsen and Hale 1965). 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 beaver transplanted 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). Of 114 beaver relocated in Wyoming, McKinstry and Anderson (2002) found that 51% of the beaver moved more than 6.2 miles from their release site. Petro et al. (2015) found relocated beaver in Oregon traveled a mean distance of nearly 2.1 stream miles within 16 weeks post-release, with the longest dispersal distance being 18.1 stream miles from the release site.

Generally, translocating aquatic rodents that have caused damage to other areas following live capture would not be effective or cost-effective. Translocation is generally ineffective because aquatic rodents are highly mobile and can easily return to damage sites from long distances, aquatic rodents generally already occupy habitats in other areas, and translocation could result in damage problems at the new location. For example, a property owner may give permission to relocate beaver to their property; however, since beaver are likely to disperse from their release site, they may cross several landowner boundaries during their dispersal, which entities must consider during efforts to translocate beaver (Petro et al. 2015). Live-trapping and translocating aquatic rodents is biologically unsound and not cost-efficient (Wade and Ramsey 1986). Translocation of wildlife is also discouraged by WS policy (see WS Directive 2.501) because of the stress to the translocated animal, poor survival rates, threat of spreading diseases, and the difficulties that translocated wildlife have with adapting to new locations or habitats (Nielsen 1988).

#### **2.4.5 Reducing Damage by Managing Aquatic Rodent Populations through the Use of Reproductive Inhibitors**

Under this alternative, the only method that would be available to resolve requests for assistance by WS-Nebraska would be the recommendation and the use of reproductive inhibitors to reduce or prevent reproduction in aquatic rodents responsible for causing damage. Wildlife professionals often consider reproductive inhibitors for use where wildlife populations are overabundant and where traditional hunting or lethal control programs are not publicly acceptable (Muller et al. 1997). Population dynamic characteristics (*e.g.*, longevity, age at onset of reproduction, population size, and biological/cultural carrying capacity), habitat and environmental factors (*e.g.*, isolation of target population, cover types, and access to target individuals), socioeconomic, and other factors often limit the use and effectiveness of reproductive control as a tool for wildlife population management.

Reproductive control for wildlife could occur through sterilization (permanent) or contraception (reversible). Sterilization could be accomplished through 1) surgical sterilization (vasectomy, castration, and tubal ligation), 2) chemosterilization, and 3) through gene therapy. Contraception could be accomplished through 1) hormone implantation (synthetic steroids such as progestins), 2) immunocontraception (contraceptive vaccines), and 3) oral contraception (progestin administered daily).

Population modeling indicates that reproductive control is more efficient than lethal control only for some rodent and small bird species with high reproductive rates and low survival rates (Dolbeer 1998). Additionally, the need to treat a sufficiently large number of target animals, multiple treatments, and population dynamics of free-ranging populations place considerable logistic and economic constraints on the adoption of reproduction control technologies as a wildlife management tool for some species.

Novak (1987) conducted a review of research evaluating chemically induced and surgically induced reproductive inhibition as a method for controlling beaver populations. Research on several reproductive inhibitors proposed for use in beaver population reduction has occurred, including research on quinestrol (17-alpha-ethynyl-estradiol-3-cyclopentylether) and mestranol (Gordon and Arner 1976, Wesley 1978). The use of chemosterilants as a means of managing the reproductive output of beaver has been successful in controlled experiments (Davis 1961, Arner 1964). However, while evidence suggests chemosterilants could reduce beaver reproduction in controlled experiments, no practical and effective method for distributing chemosterilants in a consistent way to wild, free ranging beaver populations has been developed or proven (Hill et al. 1978, Wesley 1978). Although those methods were effective in reducing beaver reproduction by up to 50%, those methods were not practical or too expensive for large-scale application. Inhibition of reproduction also may affect behavior, physiological mechanisms, and colony integrity (Brooks et al. 1980). Additionally, reproductive control does not alleviate current damage problems (Organ et al. 1996).

Currently, chemical reproductive inhibitors are not available for use to manage aquatic rodent populations. Given the costs associated with live-capturing and performing sterilization procedures on aquatic rodents and the lack of availability of chemical reproductive inhibitors for the management of most aquatic rodent populations, this alternative was not evaluated in detail. If reproductive inhibitors become available to manage aquatic rodent populations and are effective in reducing localized aquatic rodent populations, WS-Nebraska could evaluate the use of the inhibitor as a method available to manage damage. The use of reproductive inhibitors would require the approval of the NDA.

#### **2.4.6 Compensation for Aquatic Rodent Damage**

The compensation alternative would require WS-Nebraska to establish a system to reimburse persons impacted by aquatic rodent damage and to seek funding for the program. Under such an alternative, WS-



Nebraska would continue to provide technical assistance to those persons seeking assistance with managing damage. In addition, WS-Nebraska would conduct site visits to verify damage. Evaluation of this alternative indicates that a compensation only alternative has many drawbacks. Compensation would require large expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation. Compensation most likely would be below full market value and would give little incentive to resource owners to limit damage through improved cultural or other practices and management strategies. In addition, providing compensation would not be practical for reducing threats to human health and safety.

#### **2.4.7 Short Term Eradication and Long-Term Population Suppression**

An eradication alternative would direct all the efforts of WS-Nebraska toward total long-term elimination of aquatic rodent populations wherever WS-Nebraska initiated a ARDM in Nebraska. Eradication of native aquatic rodent species is not a desired population management goal of State agencies or WS-Nebraska. WS-Nebraska did not consider eradication as a general strategy for ARDM because WS-Nebraska, the NGPC, and other state or federal agencies with interest in, or jurisdiction over, wildlife oppose eradication of any native wildlife species and eradication is not acceptable to most people.

#### **2.4.8 Bounties for Aquatic Rodents**

Bounties are often ineffective at controlling damage over a wide area, such as across the entire State. When a person claims a bounty, it is difficult or impossible to assure that people did not lethally remove animals outside an area where those species were causing damage. In addition, WS-Nebraska does not have the authority to establish a bounty program.

### **2.5 OPERATING POLICIES FOR ARDM**

These policies improve the safety, selectivity, and efficacy of activities intended to resolve wildlife damage. Personnel of WS-Nebraska would incorporate those policies into activities under the appropriate alternatives when addressing aquatic rodent damage and threats in the State.

Some key policies pertinent to resolving aquatic rodent damage in the State include the following:

- Personnel of WS-Nebraska would consistently use and apply the WS Decision Model, which would identify effective strategies to managing damage and the potential effects of those strategies, when addressing aquatic rodent damage.
- Personnel of WS-Nebraska would follow the EPA-approved label directions for all pesticide use. The intent of the registration process for chemical pesticides is to assure minimal adverse effects occur to the environment when entities use chemicals in accordance with label directions.
- Personnel of WS-Nebraska would use immobilizing drugs and euthanasia chemicals according to the United States Drug Enforcement Administration and United States Food and Drug Administration guidelines, along with WS' directives and procedures.
- Personnel of WS-Nebraska would only use controlled substances registered with the United States Drug Enforcement Administration or the United States Food and Drug Administration.
- Employees of WS-Nebraska would follow approved procedures outlined in the WS' Immobilization

and Euthanasia manual (USDA 2019).

- Employees of WS-Nebraska receive training and certification to use controlled substances.
- Employees of WS-Nebraska who use pesticides and controlled substances for ARDM would participate in State-approved continuing education to keep current of developments and maintain their certifications.
- Pesticide and controlled substance use, storage, and disposal would conform to label instructions and other applicable laws and regulations, and Executive Order 12898.
- Personnel of WS-Nebraska involved with specific damage management activities would receive appropriate Material Safety Data Sheets for pesticides and controlled substances.
- All personnel who use firearms would receive safety training according to WS' Directives.
- Employees of WS-Nebraska would consider the use of non-lethal methods prior to the use of lethal methods when conducting ARDM.
- Employees of WS-Nebraska would direct management actions toward localized populations, individuals, or groups of target species. WS-Nebraska would not conduct generalized population suppression across the entire State, or even across major portions of Nebraska.
- Employees of WS-Nebraska would release non-target animals live-captured in traps unless it was determined that the animal would not survive and/or that the animal could not be released safely.

## **2.6 ADDITIONAL OPERATING POLICIES SPECIFIC TO THE ISSUES**

Several additional policies are applicable to the alternatives and the issues identified in Chapter 2 including the following:

### **Issue 1 - Effects of ARDM Activities on Target Aquatic Rodent Populations**

- WS-Nebraska would monitor the lethal take of aquatic rodents to evaluate population trends and to evaluate the magnitude of WS-Nebraska take of aquatic rodents in Nebraska.
- WS-Nebraska would provide the NGPC with information on the take of aquatic rodents which would ensure management objectives for aquatic rodent species in Nebraska.
- WS-Nebraska would only target those individuals or groups of target species identified as causing damage or posing a threat to human safety.
- Personnel of WS-Nebraska would use the WS Decision Model, designed to identify the most appropriate damage management strategies and their impacts, to determine strategies for resolving aquatic rodent damage.
- WS-Nebraska would monitor activities to ensure those activities do not adversely affect aquatic rodent populations in the State.
- Personnel of WS-Nebraska would give preference to non-lethal methods when practical and

effective.

## **Issue 2 - Effects of ARDM on Non-target Species, Including T&E Species**

- When conducting take operations via shooting, identification of the target would occur prior to application.
- As appropriate, personnel of WS-Nebraska would use suppressed firearms to minimize noise.
- Personnel would use lures, trap placements, and capture devices that employees would strategically place at locations likely to capture a target animal and minimize the potential of non-target animal captures.
- Personnel of WS-Nebraska would release any non-target animals live-captured in cage traps or any other restraining device whenever it was possible and safe to do so.
- Personnel would check live-capture methods in accordance with Nebraska laws and regulations. This would help ensure that WS-Nebraska personnel could release non-target species in a timely manner.
- Employees of WS-Nebraska would dispose of aquatic rodent carcasses retrieved after conducting damage management activities in accordance with WS Directive 2.515.
- WS-Nebraska has consulted with the USFWS and the NGPC to evaluate activities to resolve aquatic rodent damage and threats to ensure the protection of T&E species.

## **Issue 3 - Effects of ARDM Methods on Human and Pet Safety**

- Employees of WS-Nebraska would conduct damage management activities professionally and in the safest manner possible. Whenever possible, employees would conduct ARDM activities away from areas of high human activity. If this were not possible, then employees would conduct activities during periods when human activity was low (*e.g.*, early morning).
- Personnel of WS-Nebraska would conduct shooting during times when public activity and access to the control areas were restricted. Personnel involved in shooting operations receive annual training in the proper and safe use of firearms. WS completed a formal risk assessment for the use of firearms in wildlife damage management (USDA 2019)
- To provide procedures and accountability for the use of explosives to remove beaver dams by WS-Nebraska, employees would adhere to WS Directive 2.435.
- All personnel employing chemical methods would receive proper training and certification in the use of those chemicals. All chemicals used by WS-Nebraska would be securely stored and properly monitored to ensure the safety of the public. WS Directive 2.401 and WS Directive 2.430 outline how WS-Nebraska would use chemicals and training requirements to use those chemicals.
- All chemical methods used by WS-Nebraska or recommended by WS-Nebraska would be registered with the EPA, the United States Drug Enforcement Administration, the United States Food and Drug Administration and/or the NDA, as appropriate.

- WS-Nebraska would adhere to all established withdrawal times agreed up by WS-Nebraska and veterinarian authorities for aquatic rodents when using immobilizing drugs for the capture of aquatic rodents. Although unlikely, in the event that WS-Nebraska was requested to immobilize aquatic rodents, during a time when harvest of those aquatic rodent species was occurring or during a time where the withdrawal period could overlap with the start of a harvest season, WS-Nebraska would euthanize the animal or mark the animal with a tag. Tags would be labeled with a “do not eat” warning and appropriate contact information.
- Personnel of WS-Nebraska would dispose of aquatic rodent carcasses retrieved after damage management activities in accordance with WS Directive 2.515.

#### **Issue 4 - Effects on the Aesthetics**

- To preserve aesthetic value personnel of WS-Nebraska would direct management actions to reduce or prevent damage caused by aquatic rodents toward specific individuals identified as responsible for the damage and not entire species, identified as posing a threat to human safety, or identified as posing a threat of damage.
- Those entities requesting assistance would agree upon all methods or techniques applied to resolve damage or threats to human safety by signing a work initiation document, MOU, or comparable document prior to the implementation of those methods. This would ensure that all groups agree to target problem animals and not all aquatic rodents in the area.
- Personnel of WS-Nebraska would give preference to non-lethal methods when practical and effective. When practical WS-Nebraska will use exclusion methods, so the aesthetic value of the animal remains as well as solving the damage or health issue.

#### **Issue 5 - Humaneness and Animal Welfare Concerns**

- Personnel would receive training in the latest and most humane devices/methods for removing target aquatic rodents causing damage.
- Personnel of WS-Nebraska would check methods in accordance with the laws and regulations in Nebraska to address those aquatic rodents live-captured in a timely manner, which would minimize the stress of the animal.
- When deemed appropriate using the WS Decision Model, the use of lethal methods by WS-Nebraska would comply with WS’ directives (*e.g.*, see WS Directive 2.401, WS Directive 2.430, WS Directive 2.505).
- The NWRC is continually conducting research to improve the selectivity and humaneness of wildlife damage management devices used by personnel in the field.
- Personnel of WS-Nebraska would consider the use of non-lethal methods prior to the use of lethal methods when managing aquatic rodent damage.

#### **Issue 6 – Effects of Beaver Take and Dam Manipulation on the Status of Wetlands in the State**

- Personnel of WS-Nebraska would remove beaver dams in accordance with federal and state laws

and regulations for environmental protection. WS-Nebraska would conduct beaver dam take to restore drainage or the stream channel for an area that has not become an established wetland.

- Upon receiving a request to remove beaver dams, WS-Nebraska would visually inspect the dam and the associated water impoundment to determine if characteristics exist at the site that would meet the definition of a wetland under section 404 of the CWA (40 CFR 232.2; see Issue 6 in Section 2.2 of this EA). If wetland conditions were present at the site, WS-Nebraska would proceed consistent with guidance from the United States Army Corps of Engineers.

## **CHAPTER 3: ENVIRONMENTAL CONSEQUENCES**

Chapter 3 provides information needed for making informed decisions when selecting the appropriate alternative to address the need for action described in Chapter 1 and the issues described in Chapter 2. This chapter analyzes the environmental consequences of each alternative as that alternative relates to the issues identified.

### **3.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL**

This section analyzes the environmental consequences of each alternative in comparison to determine the extent of actual or potential impacts on the issues. Therefore, the proposed action/no action alternative (Alternative 1) serves as the baseline for the analysis and the comparison of expected impacts among the alternatives.

### **3.2 Effects of Damage Management Activities on Target Aquatic Rodents in Nebraska**

The NEPA requires federal agencies to determine whether their actions have a “*significant impact on the quality of the human environment*”. A declining population of a resident wildlife species on a local level does not necessarily equate to a “*significant impact*” as defined by the NEPA if the decline is collectively condoned or desired by the people that live in the affected human population. It is reasonable and proper to rely on the representative form of government within a state as the established mechanism for determining the “*collective*” desires or endorsements of the people of a state. WS-Nebraska abides by this philosophy and defers to the collective desires of the people of the State of Nebraska by complying with State laws and regulations that govern the take or capture of resident wildlife. Although the analysis herein indicates no negative impacts to aquatic rodent populations, should a decline occur in the future, it would not constitute a “*significant*” impact, as defined by the NEPA, if actions causing the decline are in accordance with State law, and concomitantly, the collective desires of the people of Nebraska.

#### **3.2.1 Effects of Alternative 1 on Target Aquatic Rodents in Nebraska**

Under Alternative 1, WS-Nebraska would continue to provide both technical assistance and direct operational assistance to those persons requesting ARDM assistance in Nebraska. WS-Nebraska could employ all methods described in Appendix B.

The analysis for each of the species includes annual take by WS-Nebraska as compared to statewide population estimates for the species. The estimated statewide population for each species uses the best available information. Population estimates use conservative calculations based upon habitat availability and a species use of those habitats.

The analysis to determine the magnitude of impact from lethal take can occur either quantitatively or qualitatively. Population estimates, allowable harvest levels, and actual harvest data are quantitative examples. Population trends and harvest trend data are qualitative example. Take under Alternative 1 would be monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take was maintained below the level that would cause undesired adverse effects to the viability of native species' populations. The potential impacts on the populations of target aquatic rodent species from the implementation of the proposed action (Alternative 1) are provided for each species below.

## BEAVER POPULATION INFORMATION AND EFFECTS ANALYSIS

The North American beaver is a semi-aquatic rodent occurring in rivers, streams, lakes, reservoirs, and wetlands across North America. Beaver are large, bulky rodents whose most prominent features include a large scaly, paddle-shaped tail and nearly orange colored incisors (Hill 1982). Most adults weigh from 15.8 to 38.3 kg (35 to 50 lbs.) with some occasionally reaching more than 45 kg (100 lbs.) and are the largest North American rodents (Miller and Yarrow 1994). They range throughout most of Canada and the United States, with the exception of portions of Florida and the desert southwest. Beaver are active throughout most of the year and are primarily nocturnal, but they can be active during daylight hours. Beaver living along a river or large stream generally make bank burrows with multiple underwater entrances. Those in quiet streams, lakes, and ponds usually build dams and a lodge (National Audubon Society 2000). Signs that beaver are present in an area include gnawing around the bases of trees and trees that have fallen because of the gnawing. Beaver strip and eat bark, which is their primary source of food. Beaver are unique in their ability to create and modify their habitat by building dams (Boyles and Owens 2007).

Fur harvesters trapped beaver extensively during the 19th and part of the 20th century, and as a result, beaver disappeared from much of their range (Novak 1987). Through translocation efforts of state wildlife agencies and the regulation of harvest to protect from overexploitation, beaver currently occupy most of their former range and have exceeded the social carrying capacity in some areas. Dams built and maintained by beaver may flood stands of timber, roadways, and croplands. However, the dams also help reduce erosion, and the water impoundments formed by dams may create a favorable habitat for many forms of life (Hill 1982, Baker and Hill 2003).

Beaver often occur in family groups that consist of two adult parents with offspring from the current and/or the previous breeding season. The average family group ranges from 3.2 to 9.2 individuals (Novak 1987). Reports of beaver abundance often occur in terms of families per kilometer of stream or per square kilometer of habitat. Densities in terms of families per square kilometer have been reported to range from 0.15 to 4.6 families (Novak 1987), which is the same as 0.4 to 11.9 families per square mile. In streams, Novak (1987) summarized beaver abundance as ranging from 0.31 to 1.5 families per kilometer of stream, which converts to 0.8 to 3.9 families per mile of stream. Novak (1987) stated beaver populations are density dependent, which means that rates of increase generally occur as a population reduction occurs and become less as a population increases toward its carrying capacity<sup>7</sup>. This natural function of most wildlife populations helps to mitigate population reductions. Logan et al. (1996) indicated that wildlife populations held at a level below carrying capacity could sustain a higher level of harvest because of the compensatory mechanisms that cause higher rates of increase in such populations.

Beaver have a relatively low biotic potential due to their small litter size and a long juvenile development

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<sup>7</sup>Carrying capacity is the maximum number of animals that the environment can sustain and is determined by the availability of food, water, cover, and the tolerance of crowding by the species in question.

period. Population matrix models show that survival of kits (1st year juveniles) and yearlings (2nd year juveniles) is the most critical factor in population viability. Survival of those age classes is partly dependent on the ability of beaver to successfully disperse and re-colonize habitats. Beaver are strong dispersers, and populations can recover quickly from local reductions when dispersal corridors are maintained (Boyles and Owens 2007).

Coyotes, black bears, bobcats, fishers, red fox, river otters, mink, and large raptors, such as hawks and owls, can prey on beaver (Tesky 1993, Baker and Hill 2003, Jackson and Decker 2004). With the exception of coyote, bear, and bobcat predation, most predation likely occurs to kits, yearlings, and young adults. With little exception, those predator species do not appear to exert significant predation pressure on beaver populations (Baker and Hill 2003).

The current population of beaver in the State is unknown; however, beaver are present in nearly all of the counties in Nebraska, and their population is not known to be declining. Since population estimates are not currently available, the analysis will be based off of fur harvest reports created by NGPC and compared to WS-Nebraska take to provide an indication of the magnitude of take by WS-Nebraska.

According to NGPC 2016/2017 fur harvest survey, there were 5,957 beavers taken during the harvest season. Of those harvested, there were 3,375 beaver harvested on depredation permits. According to the 2013-2017 harvest surveys the average number of beavers taken in Nebraska each year is 7,672.

Between FY 2015 and FY 2019, WS-Nebraska received 231 requests for ARDM. Requests for assistance associated with beaver were primarily associated with flooding and burrowing damage, along with damage from beaver felling and girdling trees. Nebraska employed multiple methods to remove those beaver identified as causing damage or posing a threat of damage (see Table 4.1).

**Table 4.1 - Analysis of beaver take by WS-Nebraska, FY 2015 – FY 2019**

<b>Fiscal Year</b>	<b>WS-Nebraska Take</b>	<b>Estimated Annual Harvest</b>	<b>WS-Nebraska Take % of Annual Harvest</b>
2015	218	7672	2.84%
2016	158	7672	2.06%
2017	112	7672	1.46%
2018	148	7672	1.93%
2019	133	7672	1.73%
<b>Ave.</b>	<b>154</b>	<b>7672</b>	<b>2.01%</b>

WS-Nebraska primarily employed body-gripping traps to remove beaver from FY 2015 through FY 2019. WS-Nebraska also removed beaver using foothold traps, cable restraints, and firearms between FY 2015 and FY 2019. In addition, WS-Nebraska breached or removed 170 beaver dams between FY 2015 and FY 2019, which is an average annual take of 34 beaver dams. In total, WS-Nebraska removed 62 dams using binary explosives and breached or removed 108 dams using hand tools.

If the beaver harvest has remained relatively stable at 7,672 beaver in Nebraska, the highest level of annual take by WS-Nebraska that occurred in FY 2015 would represent 2.84% of the estimated harvest. The number of beavers removed for damage management by other entities in Nebraska is unknown. An allowable harvest level for beaver may be as high as 30% of the population (Novak 1987).

Beaver dams are removed primarily from man-made structures, such as culverts, irrigation structures or drainage ditches. WS-Nebraska could also receive requests to install devices to control the water flow through dams to alleviate flooding or install exclusion devices to prevent damming. When personnel breach or remove dams, WS-Nebraska would primarily utilize manual methods (*e.g.*, hands and hand tools). WS-Nebraska could also use binary explosives. WS-Nebraska anticipates breaching, removing, or installing flow control devices in up to 20 beaver dams annually as part of an integrated ARDM program.

When breaching or removing a dam, personnel of WS-Nebraska would discard the building material used to create the dam (*e.g.*, sticks, logs, and other vegetative matter) on the bank or would release those materials to flow downstream. Mud and small materials, such as bark and other plant debris, could also escape downstream and would tend to settle out within a short distance of the dam. Small to medium limbs, along with sediments, may drift further distances downstream. Dam breaching and take would generally be conducted in conjunction with the take of beaver responsible for constructing the dam since beaver would likely repair and/or rebuild dams quickly if dams were breached or removed prior to the beaver being removed. Therefore, the take or breaching of beaver dams would not adversely affect beaver populations in the State since WS-Nebraska would conduct those activities in association with removing beaver from the site; therefore, the take would be included in the estimated annual take levels of beaver addressed *previously*.

### ***MUSKRAT POPULATION INFORMATION AND EFFECTS ANALYSIS***

Muskrats build houses, or lodges of aquatic plants, especially cattails, up to 2.4 m (8 feet) in diameter and 1.5 m (5 feet) high. Muskrats usually build those structures atop piles of roots, mud, or similar support in marshy areas, streams, lakes, or along water banks. They also burrow in stream or pond banks with entrances often above the water line. Another sign of the presence of muskrat includes the presence of feeding platforms that muskrats build out of cut vegetation in water or on ice. These feeding platforms are marked by discarded or uneaten grasses or reed cuttings and floating blades of cattails, sedges, and similar vegetation located near the banks. This species is most active at dusk, dawn, and at night, but may be visible at any time of the day in all seasons, especially spring. Muskrats are excellent swimmers and spend much of their time in the water. They inhabit fresh, salt, and brackish waters throughout most of Canada and the United States, except for the Arctic regions (National Audubon Society 2000). They occur in marshes, ponds, sloughs, lakes, ditches, streams, and rivers (Boutin and Birkenholz 1987).

Muskrat are prolific and produce three to four litters per year that average five to eight young per litter (Wade and Ramsey 1986), which makes them relatively immune to overharvest (Boutin and Birkenholz 1987). Gestation period varies between 25 and 30 days. Young muskrats can reproduce the spring after their birth. Harvest rates of three to eight animals per acre may be sustainable in muskrat populations (Boutin and Birkenholz 1987). Muskrat home ranges vary from 529 square feet to 11,970 square feet (0.1 to 0.25 acres), with the size of home ranges occupied by muskrat's dependent upon habitat quality and population density (Boutin and Birkenholz 1987).

Young muskrats are especially vulnerable to predation. Adult muskrats may also be subject to predation, but rarely in numbers that would lower populations. Predation alone does not appear to solve damage problems caused by muskrats (Miller 1994). Predators of muskrat include great horned and barred owls, red-tailed hawks, bald eagles, raccoons, mink, river otter, red fox, gray fox, coyotes, bobcat, Northern pike, largemouth bass, snapping turtles, and bullfrogs. Adult muskrats also occasionally kill young muskrats (Miller 1994).

No population estimates are available in Nebraska for muskrats; however, muskrats occur statewide in suitable habitat. Since population estimates are not currently available, the analysis will be based off of fur harvest reports created by NGPC and compared to WS-Nebraska take to provide an indication of the



magnitude of take proposed by WS-Nebraska.

Muskrats are classified as regulated furbearers in Nebraska, and seasons and limits for harvest are set by the NGPC. People can harvest muskrats during annual trappings seasons in the State with no limit on the number of muskrats that can be harvested.

According to NGPC 2016/2017 fur harvest survey, there were 20,243 muskrats trapped during the harvest season. Of those taken, there were 4,806 muskrats harvested on depredation permits.

WS-Nebraska lethally removed 25(2015), 8(2016), 31(2017), 63(2018), and 68(2019) muskrats in the State during FY 2015 through FY 2019, for an average of 39 muskrats per year. Using the harvest survey estimates at 20,243 muskrats, the lethal take of WS-Nebraska muskrats annually would represent 0.001% of the statewide harvest. The unlimited take allowed by the NGPC provides an indication that the statewide densities of muskrats are sufficient that overharvest is not likely to occur. In addition, most muskrats would probably be removed in habitats where little or no trapping by fur harvesters is done. Damage management activities associated with muskrats would target single animals or localized populations at sites where their presence was causing unacceptable damage to agriculture, human health and safety, natural resources, or property. Based on the limited take proposed by WS and the oversight by the NGPC, the take of muskrats annually by WS-Nebraska would have no effect on the ability of those persons interested to harvest muskrats.

## **WILDLIFE DISEASE SURVEILLANCE AND MONITORING**

The ability to efficiently conduct surveillance for and detect diseases is dependent upon rapid detection of the introduced pathogen. Effective implementation of a surveillance system would facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It would also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.

Implementation of disease sampling strategies by WS-Nebraska to detect or monitor diseases in the United States would not adversely affect aquatic rodent populations in the State. Sampling strategies that WS-Nebraska could employ would involve sampling live-captured that personnel of WS-Nebraska could release on site after sampling occurs. The sampling (*e.g.*, drawing blood, tissue sample, collecting fecal samples) and the subsequent release of live captured would not result in adverse effects since those aquatic rodents would be released unharmed on site. In addition, the sampling of that were sick, dying, or harvested by hunters would not result in the additive lethal take of that would not have already occurred in the absence of disease sampling. Therefore, the sampling of aquatic rodents for diseases would not adversely affect the populations of any of the aquatic rodents addressed in this EA nor would sampling result in any lethal take of aquatic rodents that would not have already occurred in the absence of disease sampling (*e.g.*, hunter harvest).

### **3.2.2 Effects of Alternative 2 on Target Aquatic Rodents in Nebraska**

Under this alternative, WS-Nebraska would only provide advice or guidance on ARDM activities. WS-Nebraska would not conduct any direct ARDM operational assistance and therefore, would not have any impact on aquatic rodents in Nebraska. Other entities, including private entities, could provide assistance in the absence of any involvement by WS-Nebraska. Persons experiencing damage or threats from aquatic rodents may implement methods based on recommendations of WS-Nebraska. Therefore, under this

alternative the number of aquatic rodents lethally removed annually would likely be similar to the other alternatives since take could occur by other entities or by those persons experiencing damage.

Take of aquatic rodents to alleviate damage by other entities would likely be similar to the other alternatives since take could occur through the issuance of a permit by the NGPC, when required. Take could continue to occur during the harvest season for those species. WS' participation in ARDM would not be additive to an action that would occur in the absence of WS' participation. Recommendation of the use of lethal methods by WS-Nebraska under this alternative would not limit the ability of those persons interested in harvesting during the regulated season since the NGPC determines the number of that people may lethally remove during the hunting/trapping season and under permits.

If direct operational assistance was not available from WS-Nebraska or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (*e.g.*, see Bailey 1954, Allen et al. 1996, Jonker et al. 2006).

### **3.2.3 Effects of Alternative 3 on Target Aquatic Rodents in Nebraska**

Under this alternative, WS-Nebraska would not provide ARDM assistance; therefore, WS-Nebraska would not have any effect on target aquatic rodent populations in the State. However, similar to Alternative 2, Nebraska state agencies and private entities or organizations could and would likely continue to conduct ARDM and those activities could increase in proportion to the reduction of assistance provided by WS-Nebraska. Those people experiencing damage or threats of damage could conduct activities themselves to resolve damage. While WS-Nebraska would provide no assistance under this alternative, other individuals or entities could conduct ARDM resulting in lethal take levels similar to Alternative 1 and Alternative 2. Therefore, local aquatic rodent populations could decline, stay the same, or increase depending on actions taken by those persons experiencing aquatic rodent damage.

For the reasons discussed in the population impacts analysis under Alternative 1, it is highly unlikely that implementation of this alternative would affect aquatic rodent populations in the State. If direct operational assistance was not available from WS or other entities, it is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal take, which could lead to real but unknown effects on other wildlife populations. People have resorted to the illegal use of chemicals and methods to resolve wildlife damage issues (*e.g.*, see Bailey 1954, Allen et al. 1996, Jonker et al. 2006). Additionally, if no agency, groups, or individuals were able to respond to damage complaints, much of the public could become intolerant of wildlife as a whole (International Association of Fish and Wildlife Agencies 2005).

## **3.3 Effects of ARDM on Non-target Species, Including T&E Species**

Discussion on the potential effects of the ARDM alternatives on the populations of non-target wildlife species, including T&E species, occurs below.

### **3.3.1 Effects of Alternative 1 on Nontarget species including T&E Species**

The potential for adverse effects on non-target animal populations occurs from the employment of ARDM methods. Under Alternative 1, WS-Nebraska could provide both technical assistance and direct operational assistance. The risks to non-target animals from the use of non-lethal methods as part of an integrated direct operational assistance program would be similar to those risks to non-target animals discussed in the other

alternatives.

Personnel from WS-Nebraska would be experienced with managing wildlife damage and would receive training in the employment of methods, which would allow employees to use the WS Decision Model to select the most appropriate methods to address damage caused by targeted animals and excluding non-target species. To reduce the likelihood of capturing non-target animals, WS-Nebraska would employ the most selective methods for the target species, would employ the use of attractants, when applicable, that were as specific to target species as possible, and determine placement of methods to avoid exposure to non-target animals. Chapter 2 of this EA discusses the Operating Policies to prevent and reduce any potential adverse effects on non-target animals. .

Non-lethal methods have the potential to cause adverse effects to non-target animals primarily through exclusion, harassment, and dispersal. Any exclusionary device erected to prevent access of target species also potentially excludes species that were not the primary reason for erecting the exclusion; therefore, exclusion methods potentially could adversely affect non-target species if the area excluded was large enough. The use of auditory and visual dispersal methods to reduce damage or threats caused by aquatic rodents would also likely disperse non-target animals in the immediate area the methods were employed. However, like target species, the potential impacts on non-target species would likely be temporary with target and non-target species often returning after the cessation of dispersal methods.

Any exclusionary device constructed to prevent access by target species could also exclude access to some non-target species. The persistent use of those non-lethal methods could result in the dispersal or abandonment of those areas where non-lethal methods were employed by both target and non-target species. Although exclusion and dispersal methods do not result in the lethal take of non-target animals, the use of those methods could restrict or prevent access of non-target animals to beneficial resources.

Long-term adverse effects would not occur to any species' population since WS-Nebraska would not employ those methods over large geographical areas or at such intensity levels that resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope. Exclusion and dispersal methods would generally have minimal impacts on overall populations of wildlife since individuals of those species would be unharmed. Overall, the use of non-lethal methods would not adversely affect populations of animals since those methods would often be temporary.

Other non-lethal methods available for use under this alternative would include live traps, water control devices, repellents, and immobilizing drugs. Live traps restrain wildlife once captured; therefore, those methods are live-capture methods. Live traps would have the potential to capture non-target species. Trap placement in areas where target species were active, and the use of target-specific attractants would likely minimize the capture of non-target animals. Attending to traps appropriately would allow the release of any non-target animals captured unharmed. Water control devices are systems that allow the passage of water through a beaver dam to manage the level of impounded water. Taylor and Singleton (2014) provide a comprehensive summary of the evolution of water control devices to reduce flooding by beaver. The use or recommendation of water control devices would not adversely affect non-target animals.

Chemical repellents could also be available to reduce aquatic rodent damage. WS-Nebraska has not used repellents to reduce aquatic rodent damage in the State. However, WS-Nebraska may recommend or employ commercially available repellents when providing technical assistance and direct operational assistance. WS-Nebraska would only use or recommend those products registered with the EPA pursuant to the FIFRA and registered with NDA under this alternative. The active ingredients in many commercially available repellents are naturally occurring substances (*e.g.*, capsaicin, whole egg solids), which are often used in food preparation (EPA 2001). When used according to label instructions, most repellents would be safe since 1) they are not toxic to animals, if ingested; 2) there is normally little to no contact between animals and the

active ingredient, and 3) the active ingredients are found in the environment and degrade quickly (EPA 2001). Therefore, the use and recommendation of repellents would not have negative impacts on non-target species when used according to label requirements. Most repellents for aquatic rodents pose a very low risk to non-target animals when exposed to or when ingested.

WS-Nebraska could employ immobilizing drugs to handle and transport target aquatic rodent species. Personnel of WS-Nebraska would apply immobilizing drugs directly to target animals through hand injection. Therefore, no direct effects to non-target animals would be likely since identification would occur prior to application. Animals anesthetized using immobilizing drugs recover once the animal's body has fully metabolized the drug. Therefore, non-target animals that may consume animals that recover are unlikely to receive a dosage that would cause any impairment. When using immobilizing drugs to handle or transport target animals, WS-Nebraska would monitor anesthetized animals until that animal recovers sufficiently to leave the site.

WS-Nebraska could also employ and/or recommend lethal methods under Alternative 1 to alleviate damage, when WS-Nebraska personnel deemed those methods appropriate for use using the WS Decision Model. Lethal methods available for ARDM include the recommendation of harvest during hunting and/or trapping seasons, shooting, body-gripping traps, cable devices, zinc phosphide (muskrats only), and euthanasia chemicals, including euthanasia after live-capture. WS-Nebraska could also use foothold traps and submersion cables or rods as a submersion set. Available methods and the application of those methods to resolve aquatic rodent damage is further discussed in Appendix B.

Zinc phosphide is a toxicant used to kill small rodents, lagomorphs, and muskrats. Zinc phosphide is two to 15 times more toxic to rodents than to carnivores (Hill and Carpenter 1982). Secondary risks appear to be minimal to predators and scavengers that scavenge carcasses of animals killed with zinc phosphide (Tietjen 1976, Hegdal and Gatz 1977, Hegdal et al. 1980, Hill and Carpenter 1982, Johnson and Fagerstone 1994). Risks would be minimal since the digestive tract detoxifies 90% of the zinc phosphide ingested by rodents (Hegdal et al. 1980) and 99% of the zinc phosphide residues occur in the digestive tracts, with none occurring in the muscle. In addition, the amount of zinc phosphide required to kill target rodents is not enough to kill most other predatory animals that consume tissue (Johnson and Fagerstone 1994).

In addition, zinc phosphide has a strong emetic action (*i.e.*, causes vomiting) and most non-target animals in research tests regurgitated bait or tissues contaminated with zinc phosphide without succumbing to the toxicant (Hegdal and Gatz 1977, Hegdal et al. 1980, Johnson and Fagerstone 1994). Furthermore, predators tend to eviscerate zinc phosphide-poisoned rodents before eating them or otherwise avoid the digestive tract and generally do not eat the stomach and intestines (Hegdal et al. 1980, Johnson and Fagerstone 1994). Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. Many birds appear capable of distinguishing treated from untreated baits and they prefer untreated grain when given a choice (Siegfried 1968, Johnson and Fagerstone 1994). Birds appear particularly susceptible to the emetic effects of zinc phosphide, which would tend to offer an extra degree of protection against bird species dying from the consumption of grain treated with zinc phosphide or, for scavenging bird species, from eating poisoned rodents. Use of rolled oats instead of whole grain also appears to reduce bird acceptance of bait. Uresk et al. (1988) reported on the effects of zinc phosphide on six non-target rodent populations. Uresk et al. (1988) observed no differences in populations of eastern cottontail rabbits and white-tailed jackrabbits (*Lepus townsendii*) between areas treated with zinc phosphide (ground application) and untreated areas eight months after applying treated bait for black-tailed prairie dogs (*Cynomys ludovicianus*). However, primary consumption of bait by non-target wildlife could occur and potentially cause mortality. Uresk et al. (1988) reported a 79% reduction in deer mouse populations in areas treated with zinc phosphide; however, the effect was not statistically significant because of high variability in

densities and the reduction was not long-term (Deisch et al. 1990).

Five weeks after treatment, Ramey et al. (2000) reported that zinc phosphide baiting did not kill any ring-necked pheasants (*Phasianus colchicus*). In addition, Hegdal and Gatz (1977) determined that zinc phosphide did not affect non-target populations and that predators killed more radio-tracked animals than died from zinc phosphide intoxication (Hegdal and Gatz 1977, Ramey et al. 2000). Tietjen (1976) observed horned larks (*Eremophila alpestris*) and mourning doves (*Zenaida macroura*) on zinc phosphide-treated prairie dog colonies, but observations after treatment did not locate any sick or dead birds, a finding similar to Apa et al. (1991). Uresk et al. (1988) reported that ground-feeding birds showed no difference in numbers between control and treated sites. Apa et al. (1991) further stated that horned larks did not consume zinc phosphide because: 1) poisoned grain remaining for their consumption was low (*i.e.*, prairie dogs consumed the bait before larks could consume it), 2) birds have an aversion to black-colored foods, and 3) birds have a negative sensory response to zinc phosphide.

Tietjen and Matschke (1982) have also reported minimal impacts on birds associated with the use of zinc phosphide. Deisch et al. (1989) reported on the effect zinc phosphide has on invertebrates. Deisch et al. (1989) determined that zinc phosphide bait reduced ant densities; however, bait did not affect spider mites, crickets, wolf spiders, ground beetles, darkling beetles, and dung beetles. Wolf spiders and ground beetles showed increases after one year on zinc phosphide treated areas (Deisch 1986). Generally, direct long-term impacts from rodenticide treatments were minimal for the population of insects that were sampled (Deisch et al. 1989). Long-term effects were not directly related to rodenticides, but more to habitat changes (Deisch 1986) as vegetative cover and prey diversity increased without prairie dogs grazing and clipping the vegetation (Deisch et al. 1989).

Use of zinc phosphide on various types of fruit, vegetable, or cereal baits (*e.g.*, apples, carrots, sweet potatoes, oats, and barley) has proven to be effective at suppressing target wildlife populations. Specific bait applications can also minimize non-target hazards. Personnel of WS-Nebraska would use zinc phosphide in accordance with the requirements of the product label that the EPA and the NDA have approved. Personnel of WS-Nebraska that use chemical methods would be certified as pesticide applicators by the NDA and would adhere to all certification requirements set forth in the FIFRA and the Nebraska pesticide control laws and regulations. Personnel of WS-Nebraska would not use zinc phosphide without authorization from the property owner or manager.

The use of firearms is selective for target species since personnel of WS-Nebraska would identify animals prior to application; therefore, adverse effects are not likely to occur from use of this method. Similarly, the use of euthanasia methods would not result in non-target animal take since identification would occur prior to euthanizing an animal.

Personnel of WS-Nebraska would take precautions to safeguard against dispersing, capturing, or lethally removing non-target animals during operational ARDM; however, the use of such methods could result in the incidental lethal take of unintended species. The unintentional take and capture of wildlife species during damage management activities conducted under Alternative 1 would primarily be associated with the use of body-gripping traps and in some situations, with live-capture methods, such as foothold traps, cage traps, and cable devices.

The take of non-target animals by WS-Nebraska occurs primarily during activities targeting beaver. Since FY 2016, the take non-target animals by WS-Nebraska for ARDM included 1 raccoon (*Procyon lotor*), 1 great blue heron (*Ardea herodias*), 10 river otters (*Lontra canadensis*), 1 turtle<sup>8</sup>, and 1 feral cat (*Felis catus*) in Nebraska.

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<sup>8</sup>The information tracking systems used by WS does not distinguish between all species of turtles.

Similar to the analyses of lethal take on the populations of target species addressed under Issue 1, of primary concern with take of non-target animals is the magnitude of take on those species' populations. The lethal take of any single species of non-target animals by WS-Nebraska since FY 2015 has not exceeded one or two individuals annually, except for river otters. For those species in which WS-Nebraska unintentional take did not exceed one or two individuals annually from FY 2015 through FY 2019, WS-Nebraska take did not adversely affect those species' populations based on the limited take that occurred.

During regulated hunting and/or trapping seasons, hunters and trappers can harvest many of the species that WS-Nebraska lethally removed unintentionally. There are annual harvest seasons for raccoons, bobcats, Virginia opossum, turtles, and in Nebraska. The unintentional take of those species by WS-Nebraska when compared to the harvest level of those species would be of low magnitude. Activities of WS-Nebraska did not limit the ability to harvest those species during the regulated season given the limited take that occurred by WS-Nebraska.

The previous non-target animals lethally removed unintentionally by WS-Nebraska are representative of non-target animals that WS-Nebraska could lethally remove under Alternative 1. Although personnel of WS-Nebraska could lethally remove additional species of non-target animals unintentionally, the take of individuals from any additional species would not be likely to increase substantively above the number of non-target animals removed annually by WS-Nebraska during previous ARDM activities.

WS-Nebraska would continue to monitor activities, including non-target animal take, to ensure the annual take of non-target animals would not result in adverse effects to a species' population. WS-Nebraska has not captured or adversely affected any T&E species during previous activities conducted in Nebraska. For those wildlife species where the unintentional take has or could exceeded one or two individuals per year, the potential impacts to those species' populations from the unintentional take occurs by species below.

## **T&E SPECIES EFFECTS**

WS-Nebraska would make special efforts to avoid jeopardizing T&E species through biological evaluations of potential effects and the establishment of special restrictions or minimization measures through consultation with the USFWS and NGPC. Chapter 2 of this EA describes several Operating Policies to avoid effects to T&E species.

In 2017, WS-Nebraska submitted a biological assessment to the USFWS in conjunction with an informal Section 7 consultation request. The USFWS concurred that the activities of WS-Nebraska were not likely to adversely affect any listed T&E species. WS-Nebraska has not taken any federally listed T&E species in the State and does not anticipate take under this alternative. NGPC also concurred with the 2017 Biological Assessment that WS-Nebraska's activities would have no effect or would not likely adversely affect any federal or state listed T&E species in Nebraska.

### **3.3.2 Effects of Alternative 2 on Nontarget Species including T&E Species**

Under this alternative, WS would have no direct impact on non-target species, including T&E species. People seeking technical assistance from WS-Nebraska could employ those methods that employees of WS recommend or provide through loaning of equipment. WS' personnel would base recommendations on the WS Decision Model using information provided by the person requesting assistance or through site visits. Recommendations would include methods or techniques to minimize non-target impacts associated with

the methods that employees recommend or loan. Methods recommended could include non-lethal and lethal methods as deemed appropriate by the WS Decision Model and as permitted by laws and regulations.

The potential impacts to non-target animals under this alternative would be variable and based on several factors. If people requesting assistance employed methods as recommended by WS-Nebraska, the potential impacts to non-target animals would likely be similar to Alternative 1. If people did not follow the recommendations made on methods and techniques or if other methods were employed that were not recommended, the potential impacts on non-target species, including T&E species, would likely be higher compared to Alternative 1.

The knowledge and skill of those persons implementing recommended methods would influence the potential for impacts to occur. If those persons experiencing damage do not implement methods or techniques correctly, the potential impacts from providing only technical assistance could be greater than Alternative 1. The incorrect implementation of methods or techniques recommended by WS-Nebraska could lead to an increase in non-target animal take when compared to the non-target animal take that could occur by WS-Nebraska under Alternative 1.

When those persons experiencing damage caused by wildlife reach a level where assistance does not adequately reduce damage or where no assistance is available, people have resorted to illegal actions (*e.g.*, see Bailey 1954, Allen et al. 1996, Jonker et al. 2006). Illegal actions could result in losses of both target and non-target wildlife. Illegal actions by those persons frustrated with the lack of assistance or assistance that inadequately reduces damage to an acceptable level can often result in the indiscriminate take of wildlife species.

The skills and abilities of the people implementing damage management actions would determine their ability to reduce risks. Similar to Alternative 3, Extension Service and the NGPC along with private entities or organizations could and would likely continue to conduct ARDM activities and those activities could increase in proportion to the reduction of direct assistance provided by WS-Nebraska. Risks to non-target animals and T&E species would continue to occur from activities conducted by Nebraska state agencies and private entities or organizations, including from those people who implement ARDM activities on their own. Those risks to non-target animals and T&E species from activities conducted by Nebraska state agencies and private entities or organizations would likely be similar to those discussed when implementing Alternative 1.

### **3.3.3 Effects of Alternative 3 on Nontarget Species Including T&E Species**

Under this alternative, WS-Nebraska would not have any involvement in ARDM. Therefore, no direct impacts to non-target animals or T&E species would occur by WS-Nebraska. However, Nebraska state agencies and private entities or organizations could and would likely continue to conduct ARDM and those activities could be reduced, stay the same, or potentially increase in proportion to the reduction of assistance provided by WS-Nebraska. Risks to non-target animals and T&E species would continue to occur from activities conducted by Nebraska state agencies and private entities or organizations, including from those people who implement ARDM on their own.

The Nebraska Extension Services, and the NGPC would likely provide some level of assistance. Nontarget take would likely be similar to Alternative 1, since similar methods would continue to be available for use. If the assistance provided by those entities increased in proportion to assistance that WS-Nebraska would have provided, the effects on non-target animals would likely be similar to Alternative 1 and Alternative 2. If those entities did not increase assistance in proportion to the assistance that WS-Nebraska would have provided, those activities conducted by private entities could increase. This could result in less experienced persons implementing methods and could lead to greater lethal take of non-target animals than Alternative

1. Other entities could use methods where the personnel of WS-Nebraska may not because WS' personnel would follow those Operating Policies outlined in section 2.5 and 2.6 of the EA. Therefore, the risks of nontarget take may be greater under this alternative.

### **3.4 Effects of ARDM on Human Health and Safety**

A common concern is the potential adverse effects that methods available could have on human health and safety. Each of the alternatives evaluates the threats to human safety of methods available under the alternatives below.

#### **3.4.1 Effects of Alternative 1 on Human Health and Safety**

The cooperator requesting assistance would be made aware through a MOU, work initiation document, or a similar document that those methods agreed upon could potentially be used on property owned or managed by the cooperator.

Under Alternative 1, WS-Nebraska could use or recommend those methods discussed in Appendix B. WS-Nebraska would use the Decision Model to determine the appropriate method or methods that would effectively resolve the request for assistance. Those methods would be continually evaluated for effectiveness and if necessary, additional methods could be employed. Non-lethal and lethal methods could be used under this alternative. WS-Nebraska would continue to provide technical assistance and/or direct operational assistance to those persons seeking assistance with managing damage or threats from aquatic rodents. Risks to human safety from technical assistance conducted by WS-Nebraska would be similar to those risks addressed under Alternative 2. Those non-lethal methods that could be used as part of an integrated approach to managing damage, that would be available for use by WS-Nebraska as part of direct operational assistance, would be similar to those risks associated with the use of those methods under the other alternatives.

Lethal methods available under this alternative would include the use of body-gripping traps, cable devices, the recommendation of harvest during hunting and/or trapping seasons, shooting, zinc phosphide, and euthanasia chemicals. In addition, target aquatic rodent species live-captured using non-lethal methods (e.g., live-traps, immobilizing drugs) could be euthanized. WS-Nebraska could also use foothold traps and submersion rods or cables for drowning sets. Those lethal methods available under this alternative (or similar products) would also be available under the other alternatives. Euthanasia chemicals would not be available to the public, but those aquatic rodents live-captured could be killed using other methods. Other entities (e.g., veterinarians) could be available to euthanize animals using euthanasia chemicals. Zinc phosphide would only be available to persons with a pesticide applicators license issued by NDA.

Employees of WS-Nebraska who conduct ARDM would be knowledgeable in the use of those methods available, the wildlife species responsible for causing damage or threats, and WS' directives. That knowledge would be incorporated into the decision-making process inherent with the WS Decision Model that would be applied when addressing threats and damage caused by aquatic rodents. WS also have risk assessments in place for many of damage management techniques. The risk assessments were peer reviewed to ensure that WS techniques and tools were impacting the environment.

When using lethal methods, employees of WS-Nebraska would consider risks to human safety when employing those methods based on location and method. For example, risks to human safety from the use of methods would likely be lower in rural areas that are less densely populated. Consideration would also be given to the location where damage management activities would be conducted based on property ownership. If locations where methods would be employed occur on private property in rural areas where



access to the property could be controlled and monitored, the risks to human safety from the use of methods would likely be less. If damage management activities occurred at public parks or near other public use areas, then risks of the public encountering damage management methods and the corresponding risk to human safety would increase. Activities would generally be conducted when human activity was minimal (*e.g.*, early mornings, at night) or in areas where human activities were minimal (*e.g.*, in areas closed to the public). Signs warning of the use of those tools in the area could be posted for public view at access points to increase awareness that those devices were being used and to avoid the area, especially pet owners.

The use of live-capture traps, restraining devices (*e.g.*, foothold traps, some cable devices), and body-gripping traps have been identified as a potential issue. Live-capture traps available for aquatic rodents would typically be walk-in style traps where aquatic rodents enter but are unable to exit. Live-traps, restraining devices, and body-gripping traps would typically be set in situations where human activity was minimal to ensure public safety. Those methods rarely cause serious injury and would only be triggered through direct activation of the device. Therefore, human safety concerns associated with live-traps, restraining devices, and body-gripping traps used to capture wildlife, including aquatic rodents, would require direct contact to cause bodily harm. Therefore, if left undisturbed, risks to human safety would be minimal. Nebraska trapping laws require traps be checked once every 24 hours, and that body grip traps that are 330's are to be set fully under water.

To help ensure the safe use of firearms and to increase awareness of those risks, employees of WS-Nebraska who use firearms during official duties would be required to attend an approved firearm safety-training course and to remain certified for firearm use must attend a safety-training course in accordance with WS Directive 2.615. As a condition of employment, WS-Nebraska employees who carry and use firearms are subject to the Lautenberg Domestic Confiscation Law, which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence (18 USC § 922(g)(9)). A safety assessment based on site evaluations, coordination with cooperating and local agencies (if applicable), and consultation with cooperators would be conducted before firearms were deemed appropriate to alleviate or reduce damage and threats to human safety when conducting activities. WS-Nebraska would work closely with cooperators requesting assistance to ensure all safety issues were considered before firearms would be deemed appropriate for use. The use of all methods, including firearms, would be agreed upon with the cooperator to ensure the safe use of those methods. The security of firearms would also occur pursuant to WS Directive 2.615.

The recommendation by WS-Nebraska that aquatic rodents be harvested during the regulated trapping season that are established by the NGPC would not increase risks to human safety above those risks already inherent with trapping those species. Recommendations of allowing trapping on property owned or managed by a cooperator to reduce aquatic rodent populations, which could then reduce damage or threats, would not increase risks to human safety. Safety requirements established by the NGPC for the regulated trapping season would further minimize risks associated with hunting and trapping. Although hunting and trapping accidents do occur, the recommendation of allowing hunting or trapping to reduce localized populations of aquatic rodents would not increase those risks.

The issue of using chemical methods as part of managing damage associated with wildlife relates to the potential for human exposure either through direct contact with the chemical or exposure to the chemical from wildlife that have been exposed. Under the alternatives identified, the use of chemical methods could include immobilizing drugs, euthanasia chemicals, zinc phosphide, binary explosives, and repellents.

Employees of WS-Nebraska would only administer immobilizing drugs to aquatic rodents that have been live-captured using other methods. Employees of WS-Nebraska would use immobilizing drugs to sedate target animals for temporarily handling and/or to transport target animals. Sedating target animals can lessen

the distress to the animal from the experience. Drug delivery would occur on site with close monitoring of the animal to ensure proper care of the animal. Immobilizing drugs would be reversible with a full recovery of sedated animals occurring. Drugs used in capturing and handling wildlife that would be available include Ketamine, a mixture of Ketamine/Xylazine, and Telazol. Appendix B contains a list and description of immobilizing drugs available for use under the identified alternatives.

The Additionally, the need for action identified a need to reduce threats to human safety, including risks to children posed by aquatic rodents. Based on the use patterns of methods available to address damage caused by aquatic rodents, this alternative would comply with Executive Order 12898 and Executive Order 13045.

### **3.4.2 Effects of Alternative 2 on Human Health and Safety**

Under this alternative, WS-Nebraska would be restricted to making recommendations on the use of ARDM methods. WS' personnel would only provide technical assistance to those people requesting assistance with ARDM. WS' personnel would base technical assistance recommendations on information provided by the person requesting assistance or through site visits. Therefore, those persons requesting assistance could use the methods that WS' personnel recommend or provide through loaning of equipment. WS' personnel would make the cooperator requesting assistance aware of threats to human safety associated with the use of those methods recommended by WS-Nebraska. Risks to human safety from activities and methods recommended under this alternative would be similar to the other alternatives since the same methods would be available.

Methods recommended could include non-lethal and lethal methods as deemed appropriate by WS' Decision Model and as permitted by laws and regulations. The Nebraska Extension Service and the NGPC along with private entities or organizations could and would likely continue to conduct damage management activities and those activities could increase in proportion to the reduction of direct assistance provided by WS-Nebraska. Threats to human safety would continue to occur from activities conducted by Nebraska state agencies and private entities or organizations, including from those people who implement damage management activities on their own similar to Alternative 3.

Although hazards to human safety from non-lethal methods exist, those methods are generally safe when used by trained individuals who are experienced in their use. Risks to human safety associated with non-chemical methods would be low based on their use profile for alleviating damage associated with wildlife.

Under this alternative, the availability of immobilizing drugs and euthanasia chemicals would be limited. Immobilizing drugs used in capturing and handling wildlife could be administered under the direction and authority of state veterinary authorities, either directly or through procedures agreed upon between those authorities and other entities, such as WS-Nebraska and/or the NGPC. Without access to immobilizing drugs or euthanizing chemicals, those persons capturing aquatic rodents using live-traps or other live-capture methods would be responsible for euthanizing or handling live-captured captive animals. Since the availability of immobilizing drugs and euthanizing chemicals would be limited under this alternative, a gunshot would likely be the primary method of euthanasia.

The use of chemical methods that are considered non-lethal could continue to be available under this alternative. Chemical methods available would include repellents. There are few chemical repellents registered for use to manage damage caused by aquatic rodents in the State. Most repellents require ingestion of the chemical to achieve the desired effects on target species. Repellents that require ingestion are intended to discourage foraging on vulnerable resources and to disperse aquatic rodents from areas where the repellents were applied. Repellents, when used according to label directions, are generally regarded as safe especially when the ingredients are considered naturally occurring. Some risk of exposure to the chemical would occur to the applicator, as well as others, as the product was applied due to the potential for drift.

Some repellents also have restrictions on whether application can occur on edible plants with some restricting harvest for a designated period after application. All restrictions on harvest and required personal protective equipment would be included on the label and if followed, would minimize risks to human safety associated with the use of those products.

The recommendation by WS-Nebraska that aquatic rodents be harvested during the regulated hunting and/or trapping season, which would be established by the NGPC, would not increase risks to human safety above those risks already inherent with hunting and trapping aquatic rodents. Recommendations of allowing hunting or trapping on property owned or managed by a cooperator to reduce local aquatic rodent populations that could then reduce aquatic rodent damage or threats would not increase risks to human safety. Safety requirements established by the NGPC for the regulated hunting and trapping season would further minimize risks associated with those activities. Although hunting and trapping accidents do occur, the recommendation of allowing hunting or trapping to reduce localized aquatic rodent populations would not increase those risks.

The recommendation of shooting with firearms as a method of direct lethal take could occur under this alternative. Safety issues do arise related to misusing firearms and the potential human hazards associated with firearms use when employed to reduce damage and threats. When used appropriately and with consideration for human safety, risks associated with firearms would be minimal. If firearms were employed inappropriately or without regard to human safety, serious injuries could occur. Under this alternative, recommendations of the use of firearms by WS-Nebraska would include human safety considerations. Since the use of firearms to alleviate aquatic rodent damage would be available under any of the alternatives and the use of firearms by those persons experiencing aquatic rodent damage could occur whether WS-Nebraska was consulted or contacted, the risks to human safety from the use of firearms would be similar among all the alternatives.

The skills and abilities of the people implementing damage management actions would determine their ability to reduce risks. Similar to Alternative 3, the Nebraska Extension Service and the NGPC along with private entities or organizations could and would likely continue to conduct ARDM and those activities could increase in proportion to the reduction of direct assistance provided by WS-Nebraska. Risks to human health and safety would continue to occur from activities conducted by Nebraska state agencies (*e.g.*, Nebraska Extension Service and NGPC), and private entities or organizations, including from those people who implement damage management activities on their own. Those risks to human health and safety from activities conducted by Nebraska state agencies and private entities or organizations would likely be similar to those discussed when implementing Alternative 1 but could potentially increase if individuals were not properly trained in the use of ARDM methods.

### **3.4.3 Effects of Alternative 3 on Human Health and Safety**

Under this alternative, WS-Nebraska would not be directly involved with ARDM in Nebraska. Therefore, no direct impacts to human safety from methods would occur by WS under this alternative. However, like Alternative 2, Nebraska state agencies (*e.g.*, Nebraska Extension Service and NGPC), and private entities or organizations could and would likely continue to conduct damage management activities and those activities could increase in proportion to the reduction of assistance provided by WS-Nebraska. Threats to human safety would continue to occur from methods used by Nebraska state agencies and private entities or organizations, including from those people who implement damage management activities on their own.

The ability to reduce threats to human safety posed by available methods would be variable based upon the skills and abilities of the person implementing damage management actions under this alternative. The Nebraska Extension Services, and the NGPC would likely still provide some level of assistance, but without assistance by WS-Nebraska. Those entities would likely continue to employ those methods discussed in

Appendix B. Similar to Alternative 2, immobilizing drugs and euthanasia chemicals would have limited availability under this alternative to the public. Zinc phosphide would continue to be available to those persons with the appropriate pesticide applicators license. Since most methods available to resolve or prevent aquatic rodent damage or threats would be available to anyone, the threats to human safety from the use of those methods would be similar between the alternatives. However, methods employed by those persons not experienced in the use of methods or were not trained in their proper use, could increase threats to human safety.

### **3.5 Effects on the Aesthetic Values of Aquatic Rodents**

Another concern often raised is the potential impact the alternatives could have on the aesthetic value that people often regard for aquatic rodents. The effects of the alternatives on this issue are analyzed below by alternative.

#### **3.5.1 Effects of Alternative 1 on the Aesthetic Values of Aquatic Rodents –**

Under this alternative, methods would be employed that would result in the dispersal, exclusion, or take of individuals or small groups of aquatic rodents to resolve damage and threats. In some instances where aquatic rodents were dispersed or removed, the ability of interested persons to observe and enjoy those aquatic rodents would likely temporarily decline.

Even the use of exclusionary devices can lead to the dispersal of wildlife if the resource being damaged was acting as an attractant. Thus, once the attractant was removed or made unavailable, the wildlife would likely disperse to other areas where resources would be more vulnerable.

The use of lethal methods would result in temporary declines in local populations resulting from the take of aquatic rodents to address or prevent damage and threats. The goal of Alternative 1 would be to respond to requests for assistance and to manage those aquatic rodents responsible for the resulting damage. Therefore, the ability to view and enjoy aquatic rodents would remain if a reasonable effort were made to locate aquatic rodents outside the area in which damage management activities were occurring. In most cases, the aquatic rodents removed by WS-Nebraska could be removed by the person experiencing damage or removed by other entities if no assistance was provided by WS-Nebraska.

All activities would be conducted where a request for assistance was received and only after the cooperator and WS-Nebraska had signed a MOU, work initiation document, or similar document. Some aesthetic value would be gained by the take of aquatic rodents and the return of a more natural environment, including the return of native wildlife and plant species that may be suppressed or displaced by high aquatic rodent densities.

Since those aquatic rodents that could be removed by WS-Nebraska under this alternative could be removed by other entities, WS-Nebraska involvement in removing those aquatic rodents would not likely be additive to the number of aquatic rodents that could be removed in the absence of WS-Nebraska involvement. Other entities could remove aquatic rodents when the NGPC authorizes the take, without the need for a permit, if the species was unregulated (*e.g.*, beaver), or during the regulated hunting or trapping seasons. In addition, entities could request the assistance of other state and federal agencies or seek assistance from private entities to manage damage.

The take of aquatic rodents by WS-Nebraska from FY 2015 through FY 2019 has been of low magnitude compared to the total mortality and populations of those species. The activities of WS-Nebraska would not likely be additive to the aquatic rodents that could be lethally removed in the absence of involvement by

WS-Nebraska.

Given the limited take proposed by WS-Nebraska under this alternative when compared to the known sources of mortality of aquatic rodents and the population estimates of those species, aquatic rodent damage management activities conducted by WS-Nebraska pursuant to Alternative 1 would not adversely affect the aesthetic value of aquatic rodents. The impact on the aesthetic value of aquatic rodents and the ability of the public to view and enjoy aquatic rodents under Alternative 1 would be similar to the other alternatives and would likely be low.

### **3.5.2 Effects of Alternative 2 on the Aesthetic Values of Aquatic Rodents**

If those persons seeking assistance from WS-Nebraska were those persons likely to conduct damage management activities in the absence of involvement by WS-Nebraska or sought assistance from other entities, then technical assistance provided by WS-Nebraska would not adversely affect the aesthetic value of aquatic rodents in the State similar to Alternative 1. Aquatic rodents could be lethally removed under this alternative by those entities experiencing aquatic rodent damage or threats, which could result in localized reductions in the presence of aquatic rodents at the location where damage was occurring.

The presence of aquatic rodents where damage was occurring could be reduced where damage management activities were conducted under any of the alternatives. Even the recommendation of non-lethal methods would likely result in the dispersal of aquatic rodents from the area if those non-lethal methods recommended were employed by those persons receiving technical assistance. Therefore, technical assistance provided by WS-Nebraska would not prevent the aesthetic enjoyment of aquatic rodents since any activities conducted to alleviate aquatic rodent damage could occur in the absence of participation by WS-Nebraska in the action, either directly or indirectly.

Similar to the other alternatives, the geographical area in which damage management activities could occur would not be such that aquatic rodents would be dispersed or removed from such large areas that opportunities to view and enjoy aquatic rodents would be severely limited.

### **3.5.3 Effects of Alternative 3 on the Aesthetic Values of Aquatic Rodents**

Under the no aquatic rodent damage management by WS-Nebraska alternative, the actions of WS-Nebraska would have no impact on the aesthetic value of aquatic rodents in the State. Those people experiencing damage or threats from aquatic rodents would be responsible for researching, obtaining, and using all methods as permitted by federal, state, and local laws and regulations or seeking assistance from other entities. Aquatic rodents could continue to be dispersed and lethally removed under this alternative in the State. Like Alternative 2, Nebraska state agencies (*e.g.*, Nebraska Extension Service and NGPC), and private entities or organizations could and would likely continue to conduct damage management activities and those activities could increase in proportion to the reduction of assistance provided by WS-Nebraska. Potential impacts to aesthetics would continue to occur from methods used by Nebraska state agencies and private entities or organizations, including from those people who implement damage management activities on their own.

Since aquatic rodents would continue to be lethally removed under this alternative, despite the lack of involvement by WS-Nebraska, the ability to view and enjoy aquatic rodents would likely be similar to the other alternatives. The lack of involvement by WS-Nebraska would not lead to a reduction in the number of aquatic rodents dispersed or removed. The NGPC with management authority over aquatic rodents could continue to adjust all take levels based on population objectives for those aquatic rodent species in the State. Therefore, the number of aquatic rodents lethally removed annually through harvest and under permits would

be regulated and adjusted by the NGPC.

Those people experiencing damage or threats could continue to use those methods they feel appropriate to resolve aquatic rodent damage or threats, including lethal take or could seek the direct assistance of other entities. Therefore, WS' involvement in managing damage would not be additive to the aquatic rodents that could be dispersed or removed. The impacts to the aesthetic value of aquatic rodents would be similar to the other alternatives.

### **3.6 Humaneness and Animal Welfare Concerns ARDM**

As discussed previously, a common issue often raised is concerns about the humaneness of methods available under the alternatives for resolving aquatic rodent damage and threats. The issues of method humaneness relating to the alternatives are discussed below.

#### **3.6.1 Effects of Alternative 1 on Humaneness and Animal Welfare Concerns –**

Under this alternative, WS-Nebraska would integrate methods using the WS Decision Model as part of technical assistance and direct operational assistance. Methods available under this alternative could include non-lethal and lethal methods integrated into direct operational assistance conducted by WS. Under this alternative, non-lethal methods would be used by WS that were generally regarded as humane. Non-lethal methods that would be available include translocation, exclusion devices, frightening devices, cage traps, foothold traps, immobilizing drugs, and repellents.

As discussed previously, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering.

Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the multitude of attitudes on the meaning of humaneness and the varying perspectives on the most effective way to address damage and threats in a humane manner, agencies are challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS-Nebraska would be to use methods as humanely as possible to resolve requests for assistance to reduce damage and threats to human safety. WS-Nebraska would continue to evaluate methods and activities to minimize the pain and suffering of animals addressed when attempting to resolve requests for assistance.

Some methods have been stereotyped as "*humane*" or "*inhumane*". However, many "*humane*" methods can be inhumane if not used appropriately. For instance, a cage trap would generally be considered by most members of the public as "*humane*", since the animal would be alive and generally unharmed. Yet, without proper care, live-captured wildlife in a cage trap could be treated inhumanely if not attended to appropriately.

Therefore, the goal would be to address requests for assistance effectively using methods in the most humane way possible that minimizes the stress and pain to the animal. Overall, the use of exclusion and live-capture devices would be regarded as humane when used appropriately. Although some concern arises from the use of live-capture methods, the stress of animals is likely temporary.

Although some issues of humaneness could occur from the use of cage traps, foothold traps, translocation, immobilizing drugs, and repellents, those methods, when used appropriately and by trained personnel, would

not result in the inhumane treatment of wildlife. Concerns from the use of those non-lethal methods would be from injuries to animals while those animals were restrained and from the stress of the animal while being restrained or during the application of the method. Pain and physical restraint can cause stress in animals and the inability of animals to effectively deal with those stressors can lead to distress. Suffering occurs when action is not taken to alleviate conditions that cause pain or distress in animals.

If aquatic rodents were to be live-captured by WS-Nebraska, personnel would be present on-site during capture events or capture devices would be checked frequently to ensure aquatic rodents captured were addressed in a timely manner and to prevent injury. Although stress could occur from being restrained, timely attention to live-captured wildlife would alleviate suffering. Stress would likely be temporary.

Under this alternative, WS-Nebraska could employ lethal methods to alleviate or prevent aquatic rodent damage and threats, when requested. Lethal methods would include shooting, body-gripping traps, cable devices, euthanasia chemicals, zinc phosphide (muskrats only), and the recommendation of harvest during hunting and/or trapping seasons. WS-Nebraska could also use foothold traps and submersion cables or rods with drowning sets. In addition, target species live-captured using non-lethal methods could be euthanized by WS-Nebraska. The use of lethal control methods by WS-Nebraska under this alternative would follow those required by WS' directives (see WS Directive 2.430, WS Directive 2.505).

The euthanasia methods that WS-Nebraska is considering for use under this alternative for live-captured aquatic rodents are carbon dioxide, carbon monoxide, gunshot, and barbiturates or potassium chloride in conjunction with general anesthesia. When used appropriately, the American Veterinary Medical Association (2013) considers those methods to be acceptable forms of euthanasia. The use of carbon dioxide, carbon monoxide, barbiturates, and potassium chloride for euthanasia would occur after the animal was live-captured and would occur away from public view. Although the American Veterinary Medical Association guideline also lists gunshot as a conditionally acceptable method of euthanasia for free-ranging wildlife, there is greater potential the method may not consistently produce a humane death (American Veterinary Medical Association 2013). Personnel of WS-Nebraska that employ firearms to address aquatic rodent damage or threats to human safety would be trained in the proper placement of shots to ensure a timely and quick death.

An issue when dealing with aquatic rodent species is the use of foothold traps to create drowning sets and the humaneness of drowning. There is considerable debate and disagreement among animal interest groups, veterinarians, wildlife professionals, fur trappers, and nuisance wildlife agents on this issue. The debate centers on an uncertainty as to whether the drowning animals are rapidly rendered unconscious by high levels of carbon dioxide and therefore, insensitive to distress and pain (Ludders et al. 1999). The inhalation of carbon dioxide at concentrations of 7.5% can increase the pain threshold and higher concentrations can have a rapid anesthetic effect on animals (American Veterinary Medical Association 2013). For comparison, room air contains approximately 0.04% carbon dioxide (American Veterinary Medical Association 2007).

The American Veterinary Medical Association considers drowning to be an unacceptable method of euthanasia because the death of the animal does not meet their definition of euthanasia (Beaver et al. 2001, American Veterinary Medical Association 2007, and American Veterinary Medical Association 2013). Ludders et al. (1999) concluded animals that drowned were distressed because of the presence of high levels of the stress related hormones epinephrine and norepinephrine that were present in their bloodstreams. Ludders et al. (1999) showed death during drowning occurred from hypoxia and anoxia; thus, animals experienced hypoxemia. Ludders et al. (1999) reported carbon dioxide narcosis did not occur in drowning animals until the mercury levels in the arterial blood of animals exceeded 95 millimeters. Therefore, Ludders et al. (1999) also concluded drowning did not meet the definition of euthanasia. This conclusion was based on animals not dying rapidly from carbon dioxide narcosis (Ludders et al. 1999).

Death by drowning in the classical sense is caused by the inhalation of fluid into the lungs and is referred to as “wet” drowning (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that all submerged beaver do not die from wet drowning, but die of narcosis induced by carbon dioxide, and the American Veterinary Medical Association has stated the use of carbon dioxide is acceptable (Gilbert and Gofton 1982, Noonan 1998, American Veterinary Medical Association 2013). Gilbert and Gofton (1982) reported that after beaver were trapped and they entered the water, the beaver struggled for two to five minutes, followed by a period of reflexive responses. Andrews et al. (1993) stated that with some techniques that induce hypoxia, some animals have reflex motor activity followed by unconsciousness that is not perceived by the animal. Gilbert and Gofton (1982) stated it is unknown how much conscious control actually existed at this stage and they stated anoxia might have removed much of the sensory perception by five to seven minutes post submersion.

However, Gilbert and Gofton (1982) have been criticized because levels of carbon dioxide in the blood were not reported (Ludders et al. 1999) and there was insufficient evidence that the beaver in their study were under a state of carbon dioxide narcosis when they died (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study, to W. MacCallum, MDFW, June 15, 1998). Adding to the controversy, Clausen and Ersland (1970) did measure carbon dioxide in the blood for submersed restrained beaver; yet, none of the beaver in their study died, so Clausen and Ersland (1970) could not determine if beaver died of carbon dioxide narcosis. Clausen and Ersland (1970) demonstrated that carbon dioxide increased in arterial blood while beaver were submersed and carbon dioxide was retained in the tissues. While Clausen and Ersland (1970) did measure the amounts of carbon dioxide in the blood of submersed beaver, they did not attempt to measure the analgesic effect of carbon dioxide buildup to the beaver (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study, to W. MacCallum, MDFW, June 15, 1998). When beaver was trapped using foothold traps with intent to “drown”, the beaver exhibits a flight response. Gracely and Sternberg (1999) reported that there is stress-induced analgesia resulting in reduced pain sensitivity during flight or fight responses. Environmental stressors that animals experience during flight or fight activate the same stress-induced analgesia (Gracely and Sternberg 1999).

The use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic rodents, such as beaver and muskrat. Trapper education manuals and other 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). In some situations, drowning trap sets are the most appropriate and efficient method available to capture beaver and muskrat. For example, a drowning set attachment should be used with foothold traps when capturing beaver to prevent the animals from injuring themselves while restrained, or from escaping (Miller and Yarrow 1994).

Animals that drown die relatively quickly (*e.g.*, within minutes) versus the possible stress of being restrained and harassed by people, dogs, and other wildlife before being euthanized. Drowning sets make the captured animal, along with the trap, less visible and prevents injury from the trapped animal (*i.e.*, bites and scratches) to people who may otherwise approach a restrained animal. Furthermore, the sight of dead animals may offend some people. Drowning places the dead animal out of public view. Some sites may be unsuitable for body-gripping traps or cable devices because of unstable banks, deep water, or a pond with a soft bottom, but those sites would be suitable for foothold traps.

Although rarely used by WS-Nebraska, WS-Nebraska concludes that using drowning trap sets are acceptable and recognizes that some people disagree. WS-Nebraska based those conclusions on the short time period of a drowning event, the possible analgesic effect of carbon dioxide buildup, the minimal, if any, pain or distress on drowning animals, the American Veterinary Medical Association acceptance of hypoxemia as euthanasia, and the American Veterinary Medical Association acceptance of a minimum of pain and distress during euthanasia. In addition, the best management practice trapping standards for beaver and muskrat allow for the use of submersion sets (Association of Fish and Wildlife Agencies 2014a, Association of Fish



and Wildlife Agencies 2014b) and the current acceptance of catching and drowning muskrats and beaver approved by International Humane Trapping Standards (Fur Institute of Canada 2009).

Research and development by the NWRC have improved the selectivity and humaneness of management techniques. Research is continuing to bring new findings and products into practical use. Until new findings and products were found practical, a certain amount of animal suffering could occur when some methods were used in situations where non-lethal damage management methods were not practical or effective. As stated previously, research suggests that some methods, such as restraint in foothold traps or changes in the blood chemistry of trapped animals, indicate “*stress*” (Kreeger et al. 1990). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness (Bateson 1991, Sharp and Saunders 2008, Sharp and Saunders 2011).

Personnel from WS-Nebraska would be experienced and professional in their use of management methods. Consequently, management methods would be implemented in the most humane manner possible. Many of the methods discussed in Appendix B to alleviate aquatic rodent damage and/or threats in the State could be used under any of the alternatives by those persons experiencing damage regardless of WS’ direct involvement. The only methods that may have limited availability to those people experiencing damage associated with aquatic rodents would be zinc phosphide, immobilizing drugs, and euthanasia chemicals. Therefore, the issue of humaneness associated with methods would be similar across any of the alternatives since those methods could be employed by other entities in the absence of involvement by WS-Nebraska. Those persons who view a particular method as humane or inhumane would likely continue to view those methods as humane or inhumane under any of the alternatives. SOPs that would be incorporated into activities of WS-Nebraska to ensure methods were used by WS-Nebraska as humanely as possible are listed in Chapter 3.

### **3.6.2 Effects of Alternative 2 on Humaneness and Animal Welfare Concerns**

The issue of humaneness and the animal welfare of methods under this alternative would be similar to the humaneness issues discussed under Alternative 1. This similarity would be derived from WS’ recommendation of methods that some people may consider inhumane. WS would not be involved directly with ARDM under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods. Therefore, by recommending methods and thus a requester employing those methods, the issue of humaneness would be similar to Alternative 1. Under Alternative 2, WS would recommend the use of euthanasia methods pursuant to WS Directive 2.505. However, the person requesting assistance would determine what methods to use to euthanize or kill a live-captured animal under Alternative 2.

WS would instruct and demonstrate the proper use and placement of methodologies to increase effectiveness in capturing target aquatic rodent species and to ensure methods were used in such a way as to minimize pain and suffering. However, the efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requester in resolving the threat to safety or damage situation despite demonstration by WS. Therefore, a lack of understanding of the behavior of aquatic rodents or improperly identifying the damage caused by aquatic rodents along with inadequate knowledge and skill in using methodologies to resolve the damage or threat could lead to incidents with a greater probability of being perceived as inhumane. In those situations, the potential for pain and suffering would likely be regarded as greater than discussed for Alternative 1.

In addition, the issue of humaneness and animal welfare would continue to occur from methods used by Nebraska state agencies (e.g., Nebraska Extension Service, and NGPC), and private entities or organizations, including from those people who implement damage management activities on their own. Those entities and people experiencing damage or threats associated with aquatic rodents could continue to use those

methods legally available.

### **3.6.3 Effects of Alternative 3 on Humaneness and Animal Welfare Concerns**

Under this alternative, WS-Nebraska would not be involved with any aspect of aquatic rodent damage management in the State. Like Alternative 2, Nebraska state agencies (*e.g.*, Nebraska Extension Service, and NGPC), and private entities or organizations could and would likely continue to conduct damage management activities and those activities could increase in proportion to the reduction of assistance provided by WS-Nebraska. The issue of humaneness and animal welfare would continue to occur from methods used by Nebraska state agencies and private entities or organizations, including from those people who implement damage management activities on their own. Those entities and people experiencing damage or threats associated with aquatic rodents could continue to use those methods legally available.

Those methods would likely be considered inhumane by those persons who would consider methods proposed under any alternative as inhumane. The issue of humaneness would likely be directly linked to the methods legally available to the public since methods are often labeled as inhumane by segments of society no matter the entity employing those methods. The humaneness of methods would be based on the skill and knowledge of the person employing those methods. A lack of understanding of the target species or methods used could lead to an increase in situations perceived as being inhumane to wildlife despite the method used. Despite the lack of involvement by WS-Nebraska under this alternative, those methods perceived as inhumane by certain individuals and groups would still be available to use to resolve damage and threats caused by aquatic rodents. Under this alternative, euthanasia or killing of live-captured animals would also be determined by those persons employing methods to live-captured wildlife.

In addition, WS-Nebraska would be accountable to the public. WS-Nebraska makes information available to the public on the activities of the program. The public would be less aware of methods and activities that private individuals use and conduct to alleviate damage because there would be no reporting of activities. The people that perceive some methods as inhumane would be less informed about the activities being conducted by private individuals because private individuals would not be required to provide information under any policies or regulations similar to those of WS-Nebraska. Therefore, the perception of inhumane activities could be reduced because the activities of private individuals would not be publicly available, although the actual occurrence of activities may increase because private individuals would likely increase damage management activities in the absence of assistance.

### **3.7 Effects of Beaver Take and Dam Manipulation on the Status of Wetlands in the State**

Generally, people consider beaver to be beneficial where their activities do not compete with human land use or human health and safety (Wade and Ramsey 1986). The opinions and attitudes of individuals, organizations, and communities vary greatly and are primarily influenced and formed by the benefits and/or damage directly experienced by each individual (Hill 1982, Baker and Hill 2003). Woodward et al. (1976) found that 24% of landowners who reported beaver activity on their property indicated benefits to having beaver ponds on their land and desired assistance with beaver pond management (Hill 1976, Woodward et al. 1985). In some situations, the damage and threats caused by beaver outweigh the benefits (Grasse and Putnam 1955, Woodward et al. 1985, Novak 1987).

Concern has been expressed regarding the potential effects of Alternative 1 and the alternatives on wetland ecosystems associated with activities that could be conducted to address beaver damage or threats. Concerns have been raised that removing and/or modifying beaver dams in an area would result in the loss of wetland habitat and the plant and animal species associated with those wetlands. In addition, concerns are often raised regarding the use of lethal methods to remove beaver to alleviate damage or threats. If beaver were lethally removed from an area and any associated beaver dam was removed or breached, the manipulation

of water levels by removing/breaching the dam could prevent the establishment of wetlands in areas where water has been impounded by beaver dams for an extended period.

Over time, the impounding of water associated with beaver dams can establish new wetlands. Because beaver dams may involve waters of the United States, the take of a beaver dam is regulated under Section 404 of the CWA. The United States Army Corps Of Engineers and the EPA regulatory definition of a wetland (40 CFR 232.2) is “[t]hose areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

Although beaver can cause damage to resources, there can be many benefits associated with beaver and beaver activities. Beaver can provide ecological benefits associated with the creation of wetland habitats (e.g., see Munther 1982, Wright et al. 2002, Rosell et al. 2005, Pollock et al. 2007, Fouty 2003, Fouty 2008, Hood and Bayley 2008, Taylor et al. 2009, Pollock et al. 2012, Pollock et al. 2014). Beaver can also provide aesthetic and recreational opportunities for wildlife observation (Wade and Ramsey 1986, Ringleman 1991), improve water quality (Muller-Schwarze and Sun 2003), and provide cultural and economic gains from fur harvest (Hill 1976, McNeely 1995, Lisle 1996, Lisle 2003).

Beaver impoundments can 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 effects of drought (Wade and Ramsey 1986, Naiman et al. 1988, Hey and Philippi 1995, Fouty 2003, Westbrook et al. 2006, Fouty 2008). Hood and Bayley (2008) determined that the presence of beaver could help reduce the loss of open water wetlands during warm, dry years. The presence of beaver impoundments in riverine systems of the Rocky Mountains could affect groundwater recharge and the ability of the water table to withstand drought effects (Westbrook et al. 2006). The presence of active beaver lodges accounted for over 80% of the variability in the amount of open water present in the mixed-wood boreal region of east-central Alberta (Hood and Bayley 2008). Hood and Bayley (2008) also found temperature and rainfall influenced the number 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 was absent. Hood and Bayley (2008) noted that beaver could mitigate some of the adverse effects 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 can result in a greater mix of plant species, and different-aged plant communities (Hill 1982, Arner and Hepp 1989). The creation of standing water, edge habitat, and plant diversity, all in close proximity, can result 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, Edwards and Otis 1999). The wetland habitat that beaver ponds might create can be beneficial to some fish (primarily warm water species), reptiles, amphibians, waterfowl, shorebirds, and furbearers, such as muskrats, otter, and mink (Arner and DuBose 1982, Naiman et al. 1986, Miller and Yarrow 1994, Metts et al. 2001, Cunningham et al. 2007). For example, 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 throughout the year and that the value of beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). During the winter, Lochmiller (1979) found that woodpeckers spent more time at beaver ponds than areas upstream of beaver ponds. Edwards and Otis (1999) found that six established beaver ponds (10 to 35 years old) were attractive to several bird species seasonally, with the average species richness

during all seasons ranging from 23.3 to 30.3 bird species. Metts et al. (2001) found that the abundance, species richness, and species diversity of reptiles was higher at beaver impoundments when compared to unimpounded streams. However, the species richness, species diversity, and evenness of amphibians were higher at unimpounded streams compared to beaver impoundments (Metts et al. 2001). Beaver ponds could be beneficial to some T&E species. The USFWS estimates that up to 43% of T&E species rely directly or indirectly on wetlands for their survival (EPA 1995).

Under Alternative 1, WS-Nebraska could recommend and/or implement methods to manipulate water levels associated with water impounded by beaver dams to alleviate flooding damage. If the technical assistance alternative was selected, WS-Nebraska could recommend methods to people requesting assistance that could result in the manipulation of water levels associated with water impounded by beaver dams. WS-Nebraska would not be involved with any aspect of activities associated with beaver dams under this alternative. Methods that would generally be available under all the alternatives would include exclusion devices, explosives, and water flow devices (see Appendix B for additional information). However, the availability to breach or remove beaver dams using explosives would be limited under Alternative 2 and Alternative 3, since the property owner or manager seeking to remove or breach a dam would be required to locate a person certified to use explosives to conduct the work. In addition, the property owner or manager could use backhoes or other mechanical methods to remove or breach beaver dams under any of the alternatives; however, WS-Nebraska would not operationally employ backhoes or other large machinery to remove or breach dams.

Exclusion devices and water control systems have been used for many years to manipulate the level of water impounded by beaver dams with varying degrees of success (United States General Accounting Office 2001, Taylor and Singleton 2014). Taylor and Singleton (2014) provide a comprehensive summary of the evolution of flow devices to reduce flooding by beaver. Landowner management objectives play a role in how the efficacy of a level system is perceived (Nolte et al. 2001). Nolte et al. (2001) found that survey respondents classified pond levelers installed to manage wetlands for waterfowl habitat more successful than levelers installed to provide relief from flooding. Langlois and Decker (2004) reported that “...*very few beaver problems...can actually be solved with a water level control device*” with a 4.5% success rate in Massachusetts and a 3% success rate in New York. Nolte et al. (2001) reported only 50% of installed pond levelers in Mississippi met landowner objectives and found that pond levelers placed in sites with high beaver activity more frequently failed if installed without implementing population control measures. Taylor and Singleton (2014) recommended, “...*that natural resource managers avoid using fence systems or pipe systems alone, unless they can be used in areas where maintenance requirements and expected damage are extremely low. Flow devices are not intended to replace lethal control.*” Taylor and Singleton (2014) also recommended that flow devices be used “...*as part of integrated management plans where beaver flooding conflicts are expected and where local conditions allow flow-device installation and maintenance*”.

Higher success rates have been reported for newer exclusion and water control systems ranging from 87% to 93% (Callahan 2005, Boyles 2006, Simon 2006, Boyles and Owens 2007). Lisle (2003) reported the use of water control devices or a combination of a Beaver Deceiver™ and flow management device virtually eliminated the need for maintenance and beaver take at 20 sites where clogged culverts and flooded roads had previously been a routine issue.

When using exclusion and water control systems, those methods must be specifically designed to meet the needs of each site (Langlois and Decker 2004). Consequently, devices installed by inexperienced individuals may have a higher failure rate than those installed by a professional (Lisle 1996, Callahan 2003, Boyles 2006, Simon 2006, Spock 2006). Higher success rates reported for newer exclusion and water control devices may be indicative of increased understanding of the kinds of situations where those 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 freestanding dams. Callahan (2003) and

Callahan (2005) also provided a list of sites that were not well suited to the use of exclusion or water control devices. Boyles (2006) and Boyles and Owens (2007) reported some of the highest success rates for newer exclusion and water control systems; however, those devices were only tested at culvert sites.

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 upstream or downstream and build a new dam, or abandon the area (Callahan 2003, Langlois and Decker 2004). 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 of water flow devices were clogging caused by debris or silt and beaver construction of additional dams upstream or downstream of the management device. In a study by Callahan (2005), construction of a new dam upstream or downstream of a pond leveler 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). Callahan (2005) also found that insufficient pipe capacity (six sites), dammed fencing (two sites), and lack of maintenance (two sites) were causes for pond leveler failures. Nolte et al. (2001) also reported the need to address problems with dams upstream or downstream of a device. At culvert sites, Callahan (2005) found a lack of maintenance was the primary cause of failure with culvert exclusion devices (4 of 227 sites). Callahan (2005) also found vandalism resulted in the failure of a culvert device at one of the sites. At two culvert sites, Callahan (2005) found dammed fencing reduced or completely impeded the operation of exclusion devices.

Most pond levelers and exclusion devices require maintenance. The amount of maintenance required can vary considerably among sites, depending on site conditions and the type of device (Nolte et al. 2001, Callahan 2005, Boyles 2006, Spock 2006). Stream flow, leaf fall, floods, and beaver activity can continuously bring debris to the intake of a water control device. Ice damage and damage from debris washed downstream during high water events may also trigger the need for maintenance (e.g., cleaning out the intake pipe). Although most exclusion and water control devices generally require some level of maintenance, there are reports of devices that 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 by property owners or managers on 70% of the 20 successfully operating Clemson pond levels installed by WS in Mississippi. The most common action was to adjust the riser on the pipe to manipulate water levels. Other maintenance included take 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, Simon (2006) found 18 of 36 survey respondents reported maintaining their devices, while installation program staff monitored an additional 10 devices. Of those survey respondents, Simon (2006) found that 61% reported that routine maintenance took 15 minutes or less while 93% reported that maintenance took a half hour or less. Boyles (2006) reported that time spent on device maintenance ranged from one to 4.75 hours per year.

Installation and upkeep of water control devices vary from site to site. For example, transporting materials over long distances in difficult terrain to install devices in remote locations where road access is not available could increase costs compared to the ability to transport materials for installation at a culvert site along a roadway. Callahan (2005) reported that the average cost for an exclusion fence at a culvert was \$750 with an 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, while the average cost to install a combination fence and leveler was \$1,400 with approximately \$150 per year in maintenance (Callahan 2005). Over a ten-year period, Callahan (2005) estimated the cost of installation and annual maintenance would range from \$200 to \$290 per year depending on the device installed. Spock (2006) reported that exclusion and/or water control device installation cost ranged from < \$600 to over \$3,000 dollars, with slightly more than half the systems (58.2%) ranging between \$600 and \$1,000 to install. In many cases, Spock (2006) found the cost

included the first year of maintenance. The more expensive installations tended to be extensive fence and leveler systems or systems with numerous leveler pipes (Spock 2006). Boyles (2006) reported that device installation cost an average of \$1,349 per device and \$3,180 per site with subsequent annual maintenance cost averaging \$19.75 per site per year (Boyles 2006). However, unlike the study by Callahan (2005) the devices evaluated by Boyles (2006) had only been in place for a relatively short time (average time in place 15 months, range 6 to 22 months versus average time in place 36.6 months, range 3 to 75 months). The cost of maintenance may vary over time as site conditions change.

### **3.7.1 Alternative 1 – WS-Nebraska Would Continue the Current Adaptive Integrated Methods Approach to Managing Damage Caused by Aquatic Rodent in Nebraska (No Action/Proposed Action)**

Under this alternative, WS-Nebraska could manipulate water levels associated with water impoundments caused by beaver dams using either dam breaching, dam take, or the installation of water flow devices, including exclusion devices. Breaching or removing beaver dams would maintain the normal flow of water. Personnel of WS-Nebraska would not use heavy equipment, such as backhoes or bulldozers, to breach, remove, or install water flow devices. However, cooperators or their agents could utilize heavy machinery to breach a dam, remove a dam, or to install water flow devices in a dam. WS-Nebraska may utilize small all-terrain or amphibious vehicles and/or watercraft for transporting personnel, equipment, and supplies to worksites. WS-Nebraska would only remove or breach that portion of the beaver dam blocking the stream or ditch channel.

The breaching or take of dams could occur by hand. Breaching would normally occur through incremental stages of debris take from the dam, which would allow water levels to lower gradually. Breaching of dams would normally occur to limit the potential for flooding downstream by gradually allowing water levels to lower as personnel of WS-Nebraska breached more of the dam over time. Breaching also minimizes the release of debris and sediment downstream by allowing water to move slowly over or through the dam. Depending on the size of the impoundment, personnel of WS-Nebraska could lower water levels slowly over several hours or days when breaching dams. When breaching dams, personnel of WS-Nebraska would only alter or breach that portion of the dam blocking the stream or ditch channel, with the intent of returning water levels and flow rates to historical levels or to a level that eliminates damage threats that would be acceptable to the property owner or resource manager. Similar to breaching dams, the take of the dam removes the debris impounding water and restores the normal flow of water.

Personnel of WS-Nebraska would generally breach or remove beaver dams by hand with a rake or the use of power tools (*e.g.*, a winch). However, explosives would also be available to remove beaver dams. Explosives could potentially be utilized by the personnel of WS-Nebraska that are specially trained and certified to conduct such activities. Explosives are defined as any chemical mixture or device that serves as a blasting agent or detonator. Explosives would generally be used to remove beaver dams that were too large to remove by hand. After a blast, the majority of materials are lifted up and out of the drainage area, away from the water flow. Any remaining fill material still obstructing the channel would normally be washed downstream by water current. The only 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 10 cubic yards of material would be moved in each of those project activities. Explosives would only be used after beaver were removed from the site.

Personnel of WS-Nebraska would only utilize binary explosives (*i.e.*, explosives comprised of two parts that must be mixed at the site before they can be detonated as an explosive material) for beaver dam take, when requested. Binary explosives consist of ammonium nitrate and nitro-methane; however, those two components separated are not classified as explosives until mixed. Therefore, binary explosives would be subject to fewer regulations and controls. However, once mixed, binary explosives would be considered high explosives and subject to all applicable federal and state regulations. Detonating cord and detonators

would also be considered explosives and WS-Nebraska would adhere to all applicable state and federal regulations for storage, transportation, and handling. WS-Nebraska use of explosives and safety procedures would occur in accordance with WS Directive 2.435.

In addition to dam breaching and take, water flow devices and exclusion methods would also be available for WS-Nebraska to employ during direct operational assistance or to recommend during technical assistance. Several different designs of water flow devices and exclusion methods would be available; however, the intent of all those methods would be to lower water levels by allowing water to flow through the beaver dam using pipes and wire mesh. After installation, beaver dams would be left intact with water levels maintained at desired levels by adjusting the water flow device. Water flow devices and exclusion methods allow beaver to remain at the site and maintain the beaver dam.

Although dams could be breached/removed manually or with binary explosives, those methods can be ineffective because beaver could quickly repair or replace the dam if the beaver were not removed prior to breaching or removing the dam (McNeely 1995). Damage may be effectively reduced in some situations by installing exclusion and water control devices. Exclusion and water control devices can be designed so that the level of the beaver-created water impoundment can be managed to eliminate or minimize damage from flooding while retaining the ecological and recreational benefits derived from beaver impounding water over time. For example, WS-Nebraska may recommend modifications to site and culvert design (Jensen et al. 1999) as a non-lethal way of reducing problems with beaver dams at culverts.

Manipulating water levels impounded by beaver dams under this alternative would generally be conducted to maintain existing stream channels and drainage patterns, and to reduce water levels to alleviate flooding. WS-Nebraska could be requested to assist with manipulation of a beaver dam to alleviate flooding to agricultural crops, timber resources, public property, such as roads and bridges, private property, and water management structures, such as culverts. The intent of breaching or removing beaver dams would not be to drain established wetlands. With few exceptions, requests for assistance received by WS-Nebraska from public and private entities would involve breaching or removing dams to return an area to the condition that existed before the dam had been built, or before the impounded water had been affecting the area long enough for wetland characteristics to become established.

Most activities conducted by WS-Nebraska in Nebraska do not have the potential to affect wetlands, since those activities would not be conducted near or in wetlands. Under this alternative, water levels would be manipulated to return streams, channels, dikes, culverts, and canals to their original function. Most requests to alleviate flooding from impounded water would be associated roads, crops, merchantable timber, pastures, and other types of property or resources that were not previously flooded. Most dams removed would have been created because of recent beaver activity. Personnel of WS-Nebraska receive most requests for assistance associated with beaver dams soon after affected resource owners discover damage.

As stated previously, WS-Nebraska could install water control devices, breach, or remove up to 500 beaver dams annually under this alternative. Upon receiving a request to manipulate the water levels in impoundments caused by beaver dams, WS-Nebraska would visually inspect the dam and the associated water impoundment to determine if characteristics exist at the site that would meet the definition of a wetland under section 404 of the CWA (see 40 CFR 232.2). If wetland conditions were present at the site, the entities requesting assistance from WS-Nebraska would be notified that a permit might be required to manipulate the water levels impounded by the dam and to seek guidance from the TCEQ, the EPA, and/or the United States Army Corps of Engineers pursuant to State laws and the CWA. If the area does not already have hydric soils, it usually takes several years for them to develop and a wetland to become established. This process often takes more than 5 years as indicated by the Swampbuster provision of the Food Security Act. Most beaver dam take by WS-Nebraska would occur under exemptions stated in 33 CFR parts 323 and 330 of Section 404 of the CWA or parts 3821 and 3822 of the Food Security Act. However, manipulating water

levels associated with some beaver dams could trigger certain portions of Section 404 that require landowners to obtain permits from the United States Army Corps of Engineers prior to removing a blockage. Personnel of WS-Nebraska would determine the proper course of action upon inspecting a beaver dam impoundment. Appendix B describes the procedures used by WS-Nebraska to assure compliance with the pertinent laws and regulations.

The manipulation of water impoundment levels by WS-Nebraska through dam breaching, dam take, or installation of water flow devices would typically be associated with dams constructed from recent beaver activity and would not have occurred long enough to take on the qualities of a true wetland (*i.e.* hydric soils, hydrophytic vegetation, and hydrological function). Activities of WS-Nebraska associated with beaver dam breaching, beaver dam take, or the installation of flow control device would only be conducted to restore the normal flow of water through drainages, streams, creeks, canals, and other watercourses where flooding damage was occurring or would occur. Activities most often take place on small watershed streams, tributary drainages, and ditches and those activities can best be described as small, one-time projects conducted to restore water flow through previously existing channels. Beaver dam breaching or take would not affect substrate or the natural course of streams since only the dam would be breached or removed.

In the majority of instances, beaver dam take would be accomplished by manual methods (*i.e.*, hand tools). Personnel of WS-Nebraska would not utilize heavy equipment, such as trackhoes or backhoes, for beaver dam take. In some cases, small explosive charges may be used by certified, trained personnel. These explosives would be placed in a manner to remove only that portion of the dam necessary to alleviate flooding. In addition, explosives are placed to lift and remove debris out from the drainage, stream, or creek flow to prevent unnecessary sediment or debris downstream. In all cases, only the portion of the dam blocking the stream or ditch channel would be breached or removed. In some instances, WS-Nebraska would install water flow devices to manage water levels at the site of a breached beaver dam. From FY 2009 through FY 2014, WS-Nebraska breached or removed 1,143 beaver dams (517 by hand and 626 by using explosives) during damage management activities associated with beaver. WS-Nebraska would use hand tools to breach or remove dams. Dams could be breached or removed in accordance with exemptions from Section 404 permit requirements established by regulation or as allowed under NWP's granted under Section 404 of the CWA (see Appendix C). The majority of impoundments that WS-Nebraska would remove would only be in existence for a few months. Therefore, those impoundments would generally not be considered wetlands as defined by 40 CFR 232.2 and those impoundments would not possess the same wildlife habitat values as established wetlands.

In those situations where a non-federal cooperator had already made the decision to breach or remove a beaver dam to manipulate water levels with or without the assistance of WS-Nebraska, participation in carrying out the action by WS-Nebraska would not affect the environmental status quo.

Additional concern has been raised relating to the lethal take of beaver by WS-Nebraska or the recommendation of lethal methods to alleviate damage or threats of damage under this alternative. Beaver lethally removed could be replaced by other beaver requiring additional assistance later. Houston et al. (1995) indicated that beaver tend to reoccupy vacant habitats. The likelihood that a site would be recolonized by beaver varies depending on many factors. For example, take of beaver and a beaver dam from a relatively uniform section of irrigation canal may resolve the problem for an extended period because the relatively uniform nature of the canal does not predispose a site to repeat problems. Re-colonization would also depend on the proximity and density of the beaver population in the surrounding area. Isolated areas or areas with a lower density of beaver would normally take longer for beaver to recolonize than areas with higher beaver densities. Activities conducted under Alternative 1 would be directed at specific beaver and/or beaver colonies and would not be conducted to suppress the overall beaver population in the State.

In accordance with WS Directive 2.101, preference would be given to non-lethal methods where practical



and effective. Although use of exclusion and water control devices could greatly reduce the need for lethal beaver take, beaver take may still be needed in some situations even though a flow device or water control system had been installed (Wood et al. 1994, Nolte et al. 2001, Simon 2006, Spock 2006). Callahan (2005) states the trapping of beaver to alleviate damage should occur “...where a flow device is either not feasible or fails, the water level needs to be drastically lowered, or the landowner wants no beavers or ponds on their property”. Spock (2006) reported that beaver had to be trapped out of one site when an exclusion system was augmented by the installation of a water control device. Lisle (1996) noted that it might be necessary to remove beaver that have learned to dam around exclusion and water control devices. In some instances, trapping during the annual trapping season for beaver continued to occur at or near the area where water control devices were installed but was not prompted by the failure of the devices (Lisle 1996, Simon 2006, Spock 2006).

Exclusion and water control devices may not be the most effective method in specific types of terrain and are not suitable for every site (Wood et al. 1994, Nolte et al. 2001, Langlois and Decker 2004, Callahan 2005). Exclusion devices and water control devices may not be suitable for man-made, uniform channels, such as agricultural drainage ditches and irrigation canals. In addition, exclusion devices and water control devices may not be suitable for reservoirs, areas where human health, property or safety would be threatened with even minor elevation in water level, and areas where the landowner has expressed zero tolerance for beaver activity on their property (Callahan 2003, Callahan 2005, Simon 2006). Water control devices may be ineffective in beaver ponds in broad, low-lying areas because even a slight increase in water depth can result in a substantial increase in the area flooded (Organ et al. 1996).

Exclusion and water control systems would not resolve problems related to beaver construction of bank dens. Depending upon site characteristics, beaver may build bank dens instead of lodges by burrowing into banks, levees, and other earthen impoundments. When bank dens are built in earthen levees or in banks supporting roadways or railroad tracks, they can greatly weaken the earthen structure. Burrowing into embankments can weaken the integrity of impoundments. Burrows allow water to infiltrate embankments, which can allow water to seep through the embankments causing erosion and weakening water impoundments. In those situations, take of the beaver (either by translocation or by lethal methods) could be the only practical solution to resolve the potential for damage.

Water control devices may also be inappropriate in areas that are managed for aquatic species that need free-flowing water conditions and gravel substrate to survive. The still water and silt that accumulates behind beaver dams can be detrimental to some species. In addition, beaver dams could impede the movement of fish upstream. Avery (2004) found the take of beaver dams resulted in substantial increases in the stream area where trout could be found. For example, a 9.8-mile treatment zone on the North Branch of the Pemebonwon River in Wisconsin and an additional 17.9 miles of seven tributaries to the treatment section of the river were maintained free of beaver dams since 1986. In 1982, prior to dam take, wild brook trout were found in only four of the seven tributaries within the treatment zone and at only four of the 12 survey stations. In the spring of 2000, wild brook trout were present in all seven tributaries and at all 12 survey stations (Avery 2004). In some cases, water control devices could be modified to improve fish passage (Close 2003). Although the presence of beaver dams could be detrimental to some species of fish, some fish species may benefit from the presence of a beaver dam (Rosell et al. 2005, Pollock et al. 2007, Taylor et al. 2009, Pollock et al. 2012, Pollock et al. 2014).

Although beaver can serve a valuable role in wetland ecology, the presence of beaver dams in existing wetlands that property owners or managers manage intensively could be a concern to those entities. In those wetlands, property owners or managers often use man-made water control structures to manage the water level in the wetland area in order to maximize habitat value for waterfowl and specific types of wetland-dependent wildlife. Therefore, the presence of beaver dams can impede the use of those structures or cause elevated water levels that are contrary to the objectives of the wetland. While general elevations or

reductions in water levels might conceivably be achieved by installing pipe systems through beaver dams in managed wetlands, the devices tend to be more difficult to adjust than man-made water control structures. More importantly, the primary difficulty associated with pipe systems in those situations comes when property owners or managers use drawdowns to achieve wetland management objectives. Drawdowns generally involve reducing the water level until large sections of mudflat are exposed. Many plant species valuable to waterfowl and other wetland bird species need exposed mudflats to sprout. Shorebirds can also use the mudflats to forage for invertebrates. The extent of the water level reduction conflicts with the beaver's desire for water deep enough to provide protection, and water area of sufficient extent to provide relatively easy access to foraging sites. The extent of the water level reduction during a drawdown would likely increase the risk of new dam creation in other locations that may cause new problems (Callahan 2003).

### **3.7.2 Alternative 2 – Aquatic Rodent Damage Management by WS-Nebraska through Technical Assistance Only**

The issues regarding the effects on wetlands under this alternative would likely be similar to those issues discussed under Alternative 1. This similarity would be based on the recommendation of methods by WS-Nebraska to manage damage caused by beaver and the recommendation of methods to manage the water impounded by beaver dams. Based on information provided by the person requesting assistance or based on site visits, WS-Nebraska could recommend that a landowner or manager manipulate beaver dams to reduce flooding damage or threats of damage. WS-Nebraska would not be directly involved with conducting activities associated with the manipulation of beaver dams under this alternative. However, the recommendation of the use of methods would likely result in the requester employing those methods or employing an agent to employ them. Therefore, by recommending methods and thus a requester employing those methods, the potential for those methods to reduce the presence of impounded water would be similar to Alternative 1.

WS-Nebraska could instruct and demonstrate the proper use and placement of flow control and exclusionary devices, as well as recommend the breaching or take of beaver dams, when appropriate. WS-Nebraska would also assist requesters by providing information on permit requirements and which state and/or federal agencies need to be contacted by the requester to obtain appropriate permits to manipulate the levels of water impounded by beaver dams.

The efficacy of methods employed by a cooperator would be based on the skill and knowledge of the requester or their agent despite recommendations or demonstration by WS-Nebraska. Therefore, a lack of understanding of the behavior of beaver along with inadequate knowledge and skill in using methodologies to resolve flooding could lead to incidents with a greater probability of unforeseen impacts to wetlands. In those situations, the potential for dam manipulation to affect the status of wetlands adversely would likely be regarded as greater than those affects discussed under Alternative 1.

WS-Nebraska would recommend the landowner or manager seek and obtain the proper permits to manipulate water levels impounded by beaver dams under this alternative; however, WS-Nebraska would not be responsible for ensuring that appropriate permits were obtained, proper methods were implemented for manipulating water levels, or for reviewing sites for the presence of T&E species. The requester would incur those responsibilities and they may or may not properly follow recommendations of WS-Nebraska.

In addition, WS-Nebraska, the NGPC, and/or private entities or organizations could and would likely continue to conduct damage management activities and those activities could increase in proportion to the reduction of assistance provided by WS-Nebraska. If other entities continued to provide assistance at a level similar to WS' involvement, the potential effects on this issue would be similar to Alternative 1.

### **3.7.3 Alternative 3 – No Involvement with Managing Aquatic Rodent Damage by WS-Nebraska**

Under this alternative, WS-Nebraska would not be involved with any aspect of managing water levels associated with beaver dam impoundments. Under this alternative, WS-Nebraska would not be involved with any aspect of managing damage associated with beaver in the State, including technical assistance. Due to the lack of involvement in managing damage caused by beaver, no impacts to wetlands would occur directly from WS-Nebraska. This alternative would not prevent those entities experiencing threats or damage due to flooding from manipulating water levels associated with beaver dams in the absence of assistance by WS-Nebraska or seeking the assistance of other entities. Those methods described previously would be available to other entities to breach or remove dams, including explosives and water flow devices. However, the use of explosives to remove dams under this alternative would be limited to those persons trained and licensed to use explosives. A property owner or manager could seek the services of an entity trained and licensed to use explosives to remove beaver dams under this alternative. The direct burden of implementing permitted methods would be placed on those persons experiencing damage. Like Alternative 2, WS-Nebraska, the NGPC, and/or private entities or organizations could and would likely continue to conduct damage management activities and those activities could increase in proportion to the reduction of assistance provided by WS-Nebraska. If other entities continued to provide assistance at a level similar to WS' involvement, the potential effects on this issue would be similar to Alternative 1.

Since the same methods would be available to resolve or prevent beaver damage or threats related to beaver dams, effects on the status of wetlands in the State from the use of those methods would be similar between the alternatives. However, manipulating water levels by those persons not experienced in identifying wetland characteristics or unaware of the requirement to seek appropriate permits to alter areas considered as a wetland, could increase threats to wetlands and the associated flora and fauna.

### **3.2 CUMULATIVE IMPACTS OF ALTERNATIVE 1 BY ISSUE**

Cumulative impacts, as defined by the 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 Alternative 1 and Alternative 2, WS-Nebraska would address damage associated with aquatic rodents either by providing technical assistance only (Alternative 2) or by providing technical assistance and direct operational assistance (Alternative 1) in the State. WS-Nebraska would be the primary federal agency conducting direct operational aquatic rodent damage management in the State under Alternative 1. However, other federal, state, and private entities could also be conducting aquatic rodent damage management in the State.

WS-Nebraska does not normally conduct direct damage management activities concurrently with such agencies or other entities in the same area but may conduct damage management activities at adjacent sites within the same period. In addition, commercial companies may conduct damage management activities in the same area. The potential cumulative impacts could occur from either damage management program activities by WS-Nebraska over time or from the aggregate effects of those activities combined with the activities of other agencies and private entities. Through ongoing coordination and collaboration between WS-Nebraska and the NGPC, activities of each agency and the take of aquatic rodents would be available. Damage management activities in the State would be monitored to evaluate and analyze activities to ensure they were within the scope of analysis of this EA.

The activities proposed in the alternatives would have a negligible effect on atmospheric conditions

including the global climate. Meaningful direct or indirect emissions of greenhouse gases would not occur because of any of the proposed alternatives. Those alternatives would meet the requirements of applicable laws, regulations, and Executive Orders including the Clean Air Act and Executive Order 13514.

### **Issue 1 - Effects of Damage Management Activities on Target Aquatic Rodent Populations**

The issue of the effects on target aquatic rodent species arises from the use of non-lethal and lethal methods to address the need for reducing damage and threats. As part of an integrated methods approach to managing damage and threats, WS-Nebraska could apply both lethal and non-lethal methods when requested by those persons experiencing damage.

Non-lethal methods could exclude, disperse, or otherwise make an area unattractive to aquatic rodents causing damage; thereby, reducing the presence of aquatic rodents at the site and potentially the immediate area around the site where non-lethal methods were employed. Employees of WS-Nebraska would give non-lethal methods priority when addressing requests for assistance (see WS Directive 2.101). However, WS-Nebraska would not necessarily employ non-lethal methods to resolve every request for assistance if deemed inappropriate by personnel of WS-Nebraska using the WS Decision Model. For example, if a cooperator requesting assistance, had already attempted to disperse aquatic rodents using non-lethal harassment methods, WS-Nebraska would not necessarily employ those methods again during direct operational assistance since those methods had already been proven to be ineffective in that particular situation. WS-Nebraska and other entities could use non-lethal methods to exclude, harass, and disperse target wildlife from areas where damage or threats were occurring. When effective, non-lethal methods would disperse aquatic rodents from an area resulting in a reduction in the presence of those aquatic rodents at the site where WS-Nebraska or other entities employed those methods. However, aquatic rodents responsible for causing damage or threats would likely disperse to other areas with minimal impacts occurring to those species' populations. WS-Nebraska would not employ non-lethal methods over large geographical areas or apply those methods at such intensity that essential resources (*e.g.*, food sources, habitat) would be unavailable for extended durations or over a wide geographical scope that long-term adverse effects would occur to a species' population. WS-Nebraska and most people generally regard non-lethal methods as having minimal impacts on overall populations of wildlife since individuals of those species would be unharmed. Therefore, the use of non-lethal methods would not have cumulative effects on aquatic rodent populations in the State.

Employees of WS-Nebraska could employ lethal methods to resolve damage associated with those target aquatic rodent species identified by WS-Nebraska as responsible for causing damage or threats to human safety. However, lethal take by WS-Nebraska would only occur after receiving a request for such assistance. Therefore, the use of lethal methods could result in local reductions in the number of target animals in the area where damage or threats were occurring since WS-Nebraska would remove those target individuals from the population. WS-Nebraska would often employ lethal methods to reinforce non-lethal methods and to remove aquatic rodents that have been identified as causing damage or posing a threat to human safety. The use of lethal methods could therefore result in local reductions of aquatic rodents in the area where damage or threats were occurring. The number of aquatic rodents removed from a species' population using lethal methods under Alternative 1 would be dependent on the number of requests for assistance received, the number of aquatic rodents involved with the associated damage or threat, and the efficacy of methods employed.

WS-Nebraska would monitor take by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take was below the level that would cause undesired adverse effects to the viability of native species populations. This EA analyzed the potential cumulative impacts on the populations of target aquatic rodent species from the implementation of Alternative 1 in Section 4.1.

Evaluation of activities relative to target species indicated that program activities would likely have no cumulative adverse effects on aquatic rodent populations when targeting those species responsible for damage at the levels addressed in this EA. The actions of WS-Nebraska would be occurring simultaneously, over time, with other natural processes and human generated changes that are currently taking place. These activities include, but would not be limited to:

- Natural mortality of aquatic rodents
- Mortality through vehicle strikes, aircraft strikes, and illegal harvest
- Human-induced mortality of aquatic rodents through annual hunting and trapping seasons
- Human-induced mortality of aquatic rodents through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in wildlife population densities
- Precipitation levels

All those factors play a role in the dynamics of aquatic rodent populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. The actions taken to minimize or eliminate damage would be constrained as to scope, duration, and intensity for the purpose of minimizing or avoiding impacts to the environment. WS-Nebraska would use the Decision Model to evaluate the damage occurring, including other affected elements and the dynamics of the damaging species, to determine appropriate strategies to minimize effects on environmental elements. The Model would allow WS-Nebraska to implement damage management actions and to monitor those actions to adjust/cease damage management actions, which would allow WS-Nebraska to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative effects on target species (Slate et al. 1992).

The populations of beaver and muskrats are sufficient to allow for annual harvest seasons that typically occur during the fall and winter. The NGPC is responsible for establishing trapping seasons in the State for aquatic rodents. The take of aquatic rodents by WS-Nebraska in Nebraska from FY 2013 through FY 2015 was of a low magnitude when compared to the total known take of those species and the populations of those species. The anticipated annual take of aquatic rodents would also be of low magnitude when compared to estimated populations and the annual harvest of those species. Therefore, the proposed activities would not limit the ability of people to harvest aquatic rodents in the State. No cumulative adverse effects on target and non-target wildlife would be expected from WS-Nebraska damage management activities based on the following considerations:

### **Historical outcomes of the damage management activities conducted by WS-Nebraska on populations**

WS-Nebraska would conduct damage management activities associated with aquatic rodents only at the request of a cooperator to reduce damage that was occurring or to prevent damage from occurring and only after methods to be used were agreed upon by all parties involved. WS-Nebraska would monitor activities to ensure any potential impacts were identified and addressed. WS-Nebraska would work closely with resource agencies to ensure damage management activities would not adversely affect aquatic rodent populations and that WS-Nebraska activities were considered as part of management goals established by those agencies. Historically, WS-Nebraska activities to manage damage caused by aquatic rodents in Nebraska have not reached a magnitude that would cause adverse effects to aquatic rodent populations in the State.

### **SOPs built into WS-Nebraska**

SOPs are designed to reduce the potential negative effects of the actions by WS-Nebraska on aquatic rodents

and have been tailored to respond to changes in wildlife populations that could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS-Nebraska. Alteration of activities would be defined through SOPs, and implementation would be insured through monitoring, in accordance with the WS Decision Model (see WS Directive 2.201; Slate et al. 1992).

## **Issue 2 - Effects on the Populations of Non-target Animals, Including T&E Species**

Potential effects on non-target species from conducting aquatic rodent damage management arise from the use of non-lethal and lethal methods to alleviate or prevent those damages. The use of non-lethal methods during activities to reduce or prevent damage caused by aquatic rodents has the potential to exclude, disperse, or capture non-target wildlife. However, the effects of non-lethal methods are often temporary and often do not involve the take (killing) of non-target wildlife species. When using exclusion devices and/or repellents, both target and non-target wildlife can be prevented from accessing the resource being damaged. Since exclusion and repellents do not involve lethal take, cumulative impacts on non-target species from the use of exclusionary methods or repellents would not occur but would likely disperse those individuals to other areas. Exclusionary methods and repellents can require constant maintenance to ensure effectiveness. Therefore, the use of exclusionary devices and repellents would be somewhat limited to small, high-value areas and not used to the extent that non-targets would be excluded from large areas that would cumulatively impact populations from the inability to access a resource, such as potential food sources or shelter. The use of visual and auditory harassment and dispersion methods would generally be temporary with non-target species returning after the cessation of those activities. Dispersal and harassment do not involve the take (killing) of non-target species and similar to exclusionary methods would not be used to the extent or at a constant level that would prevent non-target animals from accessing critical resources that would threaten survival of a population.

The use of lethal methods or those methods used to live-capture target species followed by euthanasia also have the potential to affect non-target wildlife through the take (killing) or capture of non-target species. Capture methods used are often methods that would be set to confine or restrain target wildlife after being triggered by a target individual. Capture methods would be employed in such a manner as to minimize the threat to non-target species by placement in those areas frequently used by target wildlife, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-target animals from capture. Most methods described in Appendix B are methods that would be employed to confine or restrain wildlife that would be subsequently euthanized using humane methods. With all live-capture devices, non-target wildlife captured could be released on site if determined to be able to survive following release. SOPs are intended to ensure take of non-target wildlife is minimal during the use of methods to capture target wildlife.

The use of firearms and euthanasia methods would essentially be selective for target species since identification of an individual would be made prior to the application of the method. Euthanasia methods would be applied through direct application to target wildlife. Therefore, the use of those methods would not affect non-target species.

WS-Nebraska would track and record chemical methods to ensure proper accounting of used and unused chemicals occur. All chemicals would be stored and transported according with WS' Directives and relevant federal, state, and local regulations. Appendix B describes the chemical methods available for use under Alternative 1. Personnel of WS-Nebraska would apply repellents directly to the affected resource. Similarly, employees of WS-Nebraska would apply immobilizing drugs or euthanasia chemicals directly to target animals. When using zinc phosphide for muskrats, WS would pre-bait areas with untreated bait during an acclimation period so target animals would become acclimated to feeding at the location. The acclimation period also allows WS' personnel to observe for non-target activity at the site. If personnel of WS-Nebraska

observed non-target animals feeding on untreated bait during the acclimation period, personnel of WS-Nebraska would abandon those locations. Per label requirements, baits would consist of apples, carrots, pears, and/or sweet potatoes, which are highly attractive to muskrats. Personnel of WS-Nebraska would place treated baits in areas where non-target exposure would be minimal (*e.g.*, on floating raft) or in areas (*e.g.*, beside a den entrance) in accordance with the label requirements. Personnel of WS-Nebraska would use all chemical methods according to product labels, which would ensure that proper use would minimize non-target threats. The adherence of WS-Nebraska to Directives and SOPs governing the use of chemicals would also ensure non-target hazards would be minimal.

Repellents may be used or recommended by WS-Nebraska in Nebraska to manage aquatic rodent damage. The active ingredients in numerous commercial repellents are capsaicin, pepper oil, and carnivore urine. Characteristics of these chemicals and potential use patterns indicate that no cumulative impacts related to environmental fate would be expected from their use in WS' programs in Nebraska when used according to label requirements.

The amount of chemicals used or stored by WS-Nebraska would be minimal to ensure human safety. All label requirements of repellents and toxicants would be followed to minimize non-target hazards. Based on this information, WS' use of chemical methods, as part of Alternative 1, would not have cumulative impacts on non-target animals.

The methods described in Appendix B have a high level of selectivity and could be employed using SOPs to ensure minimal impacts to non-target species. The unintentional take of wildlife would likely be limited and would not reach a magnitude where adverse effects would occur. Based on the methods available to resolve aquatic rodent damage and/or threats, WS-Nebraska does not anticipate the number of non-target animals lethally removed to reach a magnitude where declines in those species' populations would occur. Therefore, take under Alternative 1 of non-target animals would not cumulatively affect non-target species. WS-Nebraska has reviewed the T&E species listed by the NGPC, the USFWS, and the National Marine Fisheries Service, and has determined that damage management activities proposed by WS-Nebraska would not likely adversely affect T&E species. Cumulative impacts would be minimal on non-target animals from any of the alternatives discussed.

### **Issue 3 - Effects of Damage Management Methods on Human Health and Safety**

Non-chemical methods described in Appendix B would be used within a limited period, would not be residual, and do not possess properties capable of inducing cumulative effects on human health and safety. Non-chemical methods would be used after careful consideration of the safety of those persons employing methods and to the public. When possible, capture methods would be employed where human activity was minimal to ensure the safety of the public. Capture methods also require direct contact to trigger ensuring that those methods, when left undisturbed, would have no effect on human safety. All methods would be agreed upon by the requesting entities, which would be made aware of the safety issues of those methods when entering into a MOU, work initiation document, or another comparable document between WS and the cooperating entity. SOPs would also ensure the safety of the public from those methods used to capture or remove wildlife. Firearms used to alleviate or prevent damage, though hazards do exist, would be employed to ensure the safety of employees and the public.

Personnel employing non-chemical methods would continue to be trained to be proficient in the use of those methods to ensure the safety of the applicator and to the public. Based on the use patterns of non-chemical methods, those methods would not cumulatively affect human safety.

Repellents to disperse aquatic rodents from areas of application would be available. Repellents must be registered with the EPA according to the FIFRA and registered with the NDA. Many of the repellents

currently available for use have active ingredients that are naturally occurring and are generally regarded as safe. Although some hazards exist from the use of repellents, hazards occur primarily to the handler and applicator. When repellents were applied according to label requirements, no effects to human safety would be expected. Given the use patterns of repellents, no cumulative effects would occur to human safety.

When using explosives to remove beaver dams, WS-Nebraska would only use binary explosives (see Appendix B). Employees of WS-Nebraska who conduct activities using binary explosives would receive training in accordance with WS Directive 2.435. Personnel of WS-Nebraska who use explosives undergo extensive training and are certified to safely use explosives. Employees must adhere to the safe storage, transportation, use policies, and regulations of WS-Nebraska, the Bureau of Alcohol, Tobacco and Firearms, the Occupational Safety and Health Administration, and the Department of Transportation.

WS-Nebraska has received no reports or documented any effects to human safety from activities to manage damage caused by aquatic rodents conducted by WS-Nebraska from FY 2013 through FY 2015. No cumulative effects from the use of those methods discussed in Appendix B would be expected given the use patterns of those methods for resolving aquatic rodent damage in the State.

#### **Issue 4 - Effects on the Aesthetic Values of Aquatic Rodents**

The activities of WS-Nebraska would result in the take of aquatic rodents from those areas where damage or threats were occurring. Therefore, the aesthetic value of aquatic rodents in those areas where damage management activities were being conducted would be reduced. However, for some people, the aesthetic value of a more natural environment would be gained by reducing aquatic rodent densities, including the return of native species that may be suppressed or dispersed by non-native species.

Some people experience a decrease in aesthetic enjoyment of wildlife because they feel that overabundant species are objectionable and interfere with their enjoyment of wildlife in general. Continued increases in numbers of individuals or the continued presence of aquatic rodents may lead to further degradation of some people's enjoyment of any wildlife or the natural environment. The actions of WS-Nebraska could positively affect the aesthetic enjoyment of wildlife for those people that were being adversely affected by the target species identified in this EA.

Aquatic rodent population objectives would be established and enforced by the NGPC by regulating harvest during the statewide hunting and trapping seasons after consideration of other known mortality factors. Since those persons seeking assistance could remove aquatic rodents from areas where damage was occurring when permitted by the NGPC, WS-Nebraska involvement would have no effect on the aesthetic value of aquatic rodents in the area where damage was occurring. When damage caused by aquatic rodents has occurred, any take of aquatic rodents by the property or resource owner would likely occur whether WS-Nebraska was involved with taking the aquatic rodents or not.

In the wild, few animals in the United States have life spans approaching that of people. Mortality is high among wildlife populations and specific individuals among a species may experience death early in life. Mortality in wildlife populations is a natural occurrence and people who form affectionate bonds with animal's experience loss of those animals over time in most instances. A number of professionals in the field of psychology have studied human behavior in response to attachment to pet animals (Gerwolls and Labott 1994, Marks et al. 1994, Zasloff 1996, Archer 1999, Ross and Baron-Sorensen 1998, Meyers 2000). Similar observations were probably applicable to close bonds that could exist between people and wild animals. As observed by researchers in human behavior, normal human responses to loss of loved ones proceed through phases of shock or emotional numbness, sense of loss, grief, acceptance of the loss or what cannot be changed, healing, and acceptance and rebuilding which leads to resumption of normal lives (Lefrancois 1999). Those who lose companion animals, or animals for which they may have developed a



bond and affection, are observed to proceed through the same phases as with the loss of human companions (Gerwolls and Labott 1994, Boyce 1998, Meyers 2000). However, they usually establish a bond with other individual animals after such losses. Although they may lose the sense of enjoyment and meaning from the association with those animals that die or are no longer accessible, they usually find a similar meaningfulness by establishing an association with new individual animals or through other relational activities (Weisman 1991). Through this process of coping with the loss and establishing new affectionate bonds, people may avoid compounding emotional effects resulting from such losses (Lefrancois 1999).

Some aquatic rodents with which people have established affectionate bonds may be removed from some project sites by WS-Nebraska. However, other individuals of the same species would likely continue to be present in the affected area and people would tend to establish new bonds with those remaining animals. In addition, human behavior processes usually result in individuals ultimately returning to normalcy after experiencing the loss of association with a wild animal that might be removed from a specific location. Activities of WS-Nebraska would not be expected to have any cumulative effects on this element of the human environment.

#### **Issue 5 - Humaneness and Animal Welfare Concerns of Methods**

WS-Nebraska would continue to seek new methods and ways to improve current technology to improve the humaneness of methods used to manage damage caused by wildlife. Cooperation with individuals and organizations involved in animal welfare continues to be an agency priority for the purpose of evaluating strategies and defining research aimed at developing humane methods.

All methods not requiring direct supervision during employment (*e.g.*, live traps) would be checked in accordance with Nebraska laws and regulations to ensure any wildlife confined or restrained were addressed in a timely manner to minimize distress of the animal. All euthanasia methods used for live- captured aquatic rodents would be applied according to WS' directives. Shooting would occur in some situations and personnel would be trained in the proper use of firearms to minimize pain and suffering of aquatic rodents removed by this method.

WS-Nebraska would employ methods as humanely as possible by applying SOPs to minimize pain and that allow wildlife captured to be addressed in a timely manner to minimize distress. Through the establishment of SOPs that guide WS in the use of methods to address damage and threats associated with aquatic rodents in the State, the cumulative impacts on the issue of method humaneness would be minimal. All methods would be evaluated to ensure SOPs were adequate and that wildlife captured were addressed in a timely manner to minimize distress.

#### **Issue 6 – Effects of Beaver Take and Dam Manipulation on the Status of Wetlands in the State**

Beaver build dams primarily in smaller riverine streams (intermittent and perennial brooks, streams, and small rivers) and in drainage areas with dams consisting of mud, sticks and other vegetative materials. Their dams obstruct the normal flow of water and typically change the pre-existing hydrology from flowing or circulating waters to slower, deeper, more expansive waters that accumulate bottom sediment behind the dam. The depth of bottom sediment depends on the length of time an area is covered by water and the amount of suspended sediment in the water.

The pre-existing habitat and the altered habitat have different ecological values to the fish and wildlife native to an area. Some species would abound by the addition of a beaver dam, while others would diminish. For example, some fish species require fast moving waters over gravel or cobble beds, which beaver dams can eliminate, thus reducing the habitat's value for these species. In general, it has been found that wildlife habitat values decline around bottomland beaver impoundments because trees are killed from flooding and

mast production declines. On the other hand, beaver dams can potentially be beneficial to some species of fish and wildlife such as river otter, Neotropical birds, and waterfowl.

If a beaver dam is not breached and water is allowed to stand, hydric soils and hydrophytic vegetation may eventually form. This process can take anywhere from several months to years depending on pre-existing conditions. Hydric soils are those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions. In general, hydric soils form much easier where wetlands have preexisted. Hydrophytic vegetation includes those plants that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content. If these conditions are met, then a wetland has developed that would have different wildlife habitat values than an area that has been more recently impounded by beaver dam activity. For example, Russell et al. (1999) found that the species richness and the total abundance of reptiles were statistically higher at beaver ponds greater than 10 years old when compared to beaver ponds that were less than 5 years old.

The intent of most dam breaching is not to drain established wetlands. With few exceptions, requests from public and private individuals and entities that WS-Nebraska receives involve dam breaching to return an area back to its pre-existing condition within a few years after beaver create the dam. If the area does not have hydric soils, it usually takes many years for them to develop and a wetland to become established. This often takes greater than five years as recognized by the Swampbuster provisions. Most beaver dam take by WS-Nebraska is either exempt from regulation under Section 404 of the CWA as stated in 33 CFR Part 323 or may be authorized under the United States Army Corps of Engineers Nationwide Permit System in 33 CFR Part 330.

The Corps District Engineer is responsible for determining whether or not beaver dam takes in their District have the “*effect of fill*” in waters of the United States. Most of the Corps’ regulatory Districts in Nebraska are in the Southwestern Division. WS-Nebraska consulted with the Southwestern Division and determined that beaver dam take by hand generally does not have the “*effect of fill*” on waters of the United States and can often be removed without a permit per CWA.

It should also be noted that beaver created wetlands are dynamic and do not remain in one state for indefinite periods. Large beaver ponds may eventually fill with sediment and create a beaver meadow. Beaver may be removed from an area due to natural predation or they may abandon an area due to lack of food. Once a dam is abandoned, it is subject to natural decay and damage due to weather. The dam would eventually fail, and the wetland would return to a flowing stream or brook. WS-Nebraska beaver management activities may accelerate or modify these natural processes by removing beaver and restoring or increasing water flow; however, they are generally processing that would occur naturally over time.

Muskrat management would usually be intended to maintain or protect existing wetlands by reducing threats to natural and man-made wetlands and associated floral, faunal and T&E communities. Wetlands are often created by natural or man-made dams, dikes, levees and berms that contain standing water or control drainage, particularly after precipitation events that could result in flooding. Muskrat burrowing activity can degrade the integrity of these structures by allowing water infiltration or by causing erosion by feeding on vegetation intended to stabilize dirt structures. Muskrats are omnivores and feed on a variety of aquatic and terrestrial plants and aquatic animals. At high population densities, they may disrupt or damage natural wetland floral and faunal communities or they may feed on T&E species. The activities of WS-Nebraska would be intended to protect existing wetlands from damage caused by muskrats.

Therefore, the activities of WS-Nebraska to manage flooding damage by manipulating beaver dams would not be expected to have any cumulative adverse effects on wetlands in Nebraska when conducted in accordance with the CWA and the Swampbuster provision of the Food Security Act.

## **CHAPTER 4: LIST OF PREPARERS AND PERSONS CONSULTED**

### **4.1 LIST OF PREPARERS**

Tim Veenendaal, State Director	USDA-APHIS-Wildlife Services
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### **4.2 LIST OF AGENCIES CONSULTED**

Nebraska Game and Parks Commission  
Nebraska Extension Service  
United States Fish and Wildlife Service

## APPENDIX A

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## APPENDIX B

### METHODS AVAILABLE FOR RESOLVING OR PREVENTING AQUATIC MAMMAL DAMAGE IN NEBRASKA

The most effective approach to resolving wildlife damage problems would be to integrate the use of several methods, either simultaneously or sequentially. An adaptive plan would integrate and apply practical methods of prevention and reduce damage by aquatic rodents while minimizing harmful effects of damage reduction measures on people, other species, and the environment. An adaptive plan allows for the modification of strategies, depending on the characteristics of specific damage problems.

In selecting damage management techniques for specific damage situations, consideration would be given to the responsible species and the magnitude, geographic extent, duration and frequency, and likelihood of wildlife damage. Consideration would also be given to the status of target and potential non-target species, local environmental conditions and impacts, social and legal aspects, and relative costs of damage reduction options. The cost of damage reduction may sometimes be a secondary concern because of the overriding environmental, legal, and animal welfare considerations. Those factors would be evaluated in formulating damage management strategies that incorporate the application of one or more techniques.

A variety of methods would potentially be available to WS-Nebraska in Nebraska relative to the management or reduction of damage from aquatic rodents. Various federal, state, and local statutes and regulations would govern WS-Nebraska use of methods, including WS' directives. WS-Nebraska would develop and recommend or implement strategies for each request for assistance. Within each approach there may be available a number of specific methods or techniques. The following methods could be recommended or used by WS-Nebraska. Many of the methods described would also be available to other entities in the absence of any involvement by WS-Nebraska.

#### **Non-chemical Wildlife Damage Management Methods**

Non-chemical methods consist primarily of tools or devices used to exclude, capture, or kill a particular animal or local population of wildlife to alleviate damage and conflicts. Methods may be non-lethal (e.g., fencing, cage traps) or lethal (e.g., firearms, body-grip traps). WS-Nebraska and the entity requesting assistance would agree upon all methods or techniques applied by WS to resolve damage or threats to human safety by signing a work initiation document, MOU, or another comparable document prior to the implementation of those methods. Non-chemical methods that personnel of WS-Nebraska could use or recommend include:

**Structural changes** could be methods that WS' employees recommend when providing technical assistance. For example, Jensen et al. (2001) recommended that highway departments install over-sized culverts in areas where beaver may be present. Jensen et al. (2001) stated, "*Due to the effects of stream gradients, culverts should be oversized to at least 2.1 m<sup>2</sup> (inlet opening area) for a 0% gradient stream and at least 0.8 m<sup>2</sup> for streams with gradients up to 3% to reduce the probability of plugging to 50%*". In addition, Jensen et al. (2001) stated, "*These recommendations should be considered minimum sizes, because culverts should be enlarged to at least a size that maintains the natural stream width.*" Structural changes would be methods the requester implements without any direct involvement by WS' personnel. Over the service life of a culvert, Jensen et al. (2001) speculated that installing oversized culverts by highway departments would be more cost-effective than trapping, debris take, or other short-term options to manage damage to roads associated with beaver.

**Exclusion** pertains to preventing access to resources through fencing or other barriers. Fencing of small

critical areas can sometimes prevent animals that cannot climb from entering areas of protected resources. Fencing of culverts, drainpipes, and other water control structures can sometimes prevent beaver from building dams that plug those devices. Using hardware cloth or other metal barriers can sometimes prevent girdling and gnawing of valuable trees. Construction of concrete spillways may reduce or prevent damage to dams by aquatic rodent species that burrow into embankments. Riprap used on dams and levees can sometimes deter aquatic rodents from burrowing. Using electric fences of various constructions can sometimes effectively reduce damage to various crops. Sheffels et al. (2014) found that placing plastic mesh tubes around newly planted woody vegetation at riparian restoration sites could prevent muskrats from feeding on the vegetation. In many cases, WS could recommend the use of exclusion but the implementation of specific methods would be the responsibility of the property owner or manager (*e.g.*, constructing concrete spillways, using riprap on dams and levees).

WS-Nebraska could recommend or implement beaver exclusion and the use of water control devices to alleviate flooding damage without removing beaver. Although beaver dams could be breached/removed manually or with binary explosives, those methods are usually ineffective because beaver quickly repair or replace the dam (McNeely 1995). In some situations, installing exclusion and water control devices can effectively reduce damage. WS could design exclusion and water control devices to maintain the beaver-created impoundment at a level that eliminates or minimizes damage while retaining the ecological and recreational benefits derived from beaver impoundments. WS-Nebraska could also recommend that modifications occur to culvert design (Jensen et al. 1999) as a non-lethal way of reducing problems with beaver dams at culverts.

Beaver exclusion generally involves the placement of fencing to prevent beaver from accessing water intake areas, such as culverts. Personnel of WS-Nebraska could recommend or implement a variety of exclusion systems, including the Beaver Deceiver™, Beaver Bafflers™, and pre-dams (Lisle 1996, Brown and Brown 1999, Lisle 1999, Brown et al. 2001, Partington 2002, Lisle 2003). The Beaver Deceiver™ is a fencing system that people can install to prevent beaver blockage of culverts by minimizing environmental cues that stimulate beaver to construct dams, and by making culverts less attractive as dam construction sites (Lisle 1996, Lisle 1999, Lisle 2003). Blocking culverts by installing a fence on the upstream end of the culvert can sometimes deter beaver from building dams at the entrance to or inside the culvert. Installation of a fence increases the length of the area that must be dammed to impound water, and if beaver build along the fence, may increase the distance between the beaver and the source of the cues that stimulate damming behavior (*e.g.*, water moving through culvert) (Lisle 1996, Lisle 1999, Lisle 2003, Callahan 2005). Beaver prefer to build dams perpendicular to water flow, so fences can be oriented at odd angles to water flow and can be set so that they do not block the stream channel. WS may also use fencing to cover the up and downstream ends of the culverts to prevent beaver from entering the deceiver from the downstream side of the culvert and to prevent any beaver that might make it past the outer fence from plugging the interior of the culvert. Efforts can also be 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). Using Beaver Deceivers™ in combination with water control devices can ensure sufficient water flow through the culvert (see discussion on Beaver Deceivers™ below).

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

Unlike Beaver Deceivers™ and cylindrical fences, pre-dam fences (*e.g.*, deep-water fences, diversion dams) (Brown and Brown 1999) can be designed with the specific intention that the beaver build the dam along the fence. Pre-dam fences can be short semicircular or circular fences built in an arc around a water inlet. The fence serves as a dam construction platform that allows beaver to build a dam at the site but prevents beaver from plugging the water intake. If the size of the upstream impoundment created from the impounded water were not a concern, no further modifications of the pre-dam would be needed. However, in most cases, pre-dams would be used in combination with water control devices to manage the size of the upstream pond to alleviate flooding concerns.

Fence mesh size can be selected to minimize risks to beaver and non-target 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 some remote areas where vehicular traffic is infrequent, it may be acceptable for animals that cannot pass through the fence mesh to travel across the road. However, for culverts under busy roads, it may be necessary to design special “doors” that allow the passage of beaver, large turtles, and other non-target animals through the device. For example, T-joints 30 centimeters in diameter 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 would not be attached to the up and down-stream ends of a culvert when it is necessary to allow passage of species like large turtles and beavers through a culvert. Fence caps would not be attached to the up and down-stream ends of a culvert when it is necessary to allow passage of species like large turtles and beavers through a culvert.

**Water control devices** (*e.g.*, pond levelers) are systems that allow the passage of water through a beaver dam. The devices could be used in situations where the presence of impounded water is desired, but it is necessary to manage the level of water in the pond. Various types of water control devices have been described (Arner 1964, Roblee 1984, Laramie and Knowles 1985, Miller and Yarrow 1994, Wood et al. 1994, Lisle 1996, Organ et al. 1996, Brown and Brown 1999, Lisle 1999, Brown et al. 2001, Close 2003, Lisle 2003, Simon 2006, Spock 2006, Taylor and Singleton 2014). Water control devices such as the corrugated plastic drainage tubing (Roblee 1984), the T-culvert guard (Roblee 1987), wire mesh culvert (Roblee 1983), and the Clemson beaver pond leveler (Miller and Yarrow 1994) can sometimes be used to control the water in beaver impoundment to desirable levels that do not cause damage. Taylor and Singleton (2014) provide a comprehensive summary of the evolution of flow devices to reduce flooding by beaver. The devices generally involve the use of one or more pipes installed through the beaver 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. Beaver 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 the associated beaver damming behavior, the end of the pipe may be capped with a series of holes or notches cut in the pipe, which allows water to flow into the pipe. Holes and notches may be placed on the underside of the pipe to reduce the sound of water movement. Alternatively, 90-degree elbow joints can be placed facing downward on the upstream end of the pipes to prevent the noise of running water and attracting beaver. A protective cage can be placed around the upstream end of the inlet pipe to prevent beaver from blocking the pipe and to 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 water impoundment at an acceptable level.

Beaver dam breaching/take would involve the take of debris deposited by beaver that impedes the flow of water. Removing or breaching a dam is generally conducted to maintain existing stream channels and drainage patterns and reduce floodwaters behind the dam. Beaver dams are made from natural debris such as logs, sticks and mud that beaver take from the immediate area and impound water, creating habitat that they utilize to build lodges and bank dens to raise their young and/or provide protection from predators. The impoundments that WS-Nebraska removes or breaches would typically be created by recent beaver activity and would not have been in place long enough to take on the qualities of a true wetland (*e.g.*, hydric soils, aquatic vegetation, pre-existing function). Unwanted beaver dams could be removed by hand with a rake or power tools (*e.g.*, a winch), or with explosives. Explosives would be used only by WS-Nebraska personnel specially trained and certified to conduct such activities, and only binary explosives would be used (*i.e.*, they are comprised of two parts that must be mixed at the site before they can be detonated as an explosive material). Beaver dam take or breaching by hand or with binary explosives would not affect the substrate or the natural course of the stream. Removing or breaching dams would return the area back to its pre-existing condition with similar flows and circulations. Because beaver dams involve waters of the United States, take is regulated under Section 404 of the CWA (see Appendix C).

Most beaver dam breaching, if considered discharge, would be covered under exemptions in 33 CFR 323 or under an NWP issued pursuant to 33 CFR 330 and do not require a permit. A permit would be required if the beaver dam breaching activity was not covered by a Section 404 permitting exemption or an NWP and the area affected by the beaver dam was considered a true wetland. The State of Nebraska may require additional permits (see Appendix C). Personnel of WS-Nebraska would 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 appeared to meet the definition of a true wetland, the landowner or cooperator would be 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).

**Live Capture and Translocation** can be accomplished using hand capture, catch poles, cage traps, suitcase type traps, cable devices, or with foothold traps to capture some aquatic rodent species for the purpose of translocating them for release in other areas. WS-Nebraska could employ those methods in Nebraska when the target animal(s) can legally be translocated or can be captured and handled with relative safety by personnel of WS-Nebraska. Live capture and handling of aquatic rodents poses an additional level of human health and safety threat if target animals are aggressive, large, or extremely sensitive to the close proximity of people. For that reason, WS-Nebraska may limit this method to specific situations and certain species. In addition, moving damage-causing individuals to other locations can typically result in damage at the new location, or the translocated individuals can move from the relocation site to areas where they are unwanted. In addition, translocation can facilitate the spread of diseases from one area to another. Although translocation is not necessarily precluded in all cases, it would be logistically impractical, in most cases, and biologically unwise in Nebraska due to the risk of disease transmission. High population densities of some animals may make this a poor wildlife management strategy for those species. Translocation would be evaluated by WS-Nebraska on a case-by-case basis.

**Trapping** can utilize a number of devices, including foothold traps, cage-type traps, body-gripping traps, and cable devices. Capture methods are often methods that would be set to confine or restrain target animals after they trigger the trap. Personnel would strategically place traps at locations likely to capture a target aquatic rodent and minimize the threat to non-target species by placement in those areas frequently used by the target aquatic rodent species, using baits or lures that are as species specific as possible, and modification of individual methods to exclude non-target animals from capture.

WS' personnel would check methods in accordance with WS Directive 2.210 and WS Directive 2.450.

Checking live-traps frequently would help ensure that personnel of WS-Nebraska could release live-captured non-target species in a timely manner. WS would monitor activities to ensure those activities do not negatively affect non-target species.

While personnel of WS-Nebraska would take precautions to safeguard against taking non-target animals during operational use of trapping methods and techniques for resolving damage and reducing threats caused by aquatic rodents, the use of such methods could result in the incidental lethal take of unintended species. The unintentional take and capture of animals during damage management activities conducted under the proposed activities would primarily be associated with the use of body-gripping traps and in some situations, with live-capture methods, such as foothold traps, cage traps, and cable devices. However, WS' personnel have not captured or killed any federally threatened, endangered, or candidate species in Nebraska previously using trapping methods

**Foothold Traps** can be effectively used to capture aquatic rodents. Foothold traps can be placed in travel ways being actively used by the target species. Placement of traps is contingent upon the habits of the respective target species, habitat conditions, and presence of non-target animals. Effective trap placement and adjustment, and the use and placement of appropriate baits and lures by trained personnel of WS-Nebraska also contribute to the selectivity of foothold traps. An additional advantage is that foothold traps can allow for the on-site release of non-target animals since animals are captured alive. For aquatic rodents, foothold traps are often placed just under the surface of the water in travel ways and are intended to capture the target aquatic rodent as they exit or enter the water. The use of foothold traps requires more skill than some methods. Foothold traps would generally be available for use by the public and other state or federal agencies.

WS-Nebraska could also attach a foothold trap to a submersion cable or rod that WS-Nebraska anchors at the trap set and in deep water. Attaching the trap to the cable or rod with a locking mechanism allows the trap to slide down the cable or rod into deeper water but prevents a captured animal from returning to the surface.

**Cable Devices** are typically made of wire or cable and can be set to capture an animal by the neck or body. Cable devices may be used as either lethal or live-capture devices depending on how or where they are set. Cable devices set to capture an animal by the neck are usually lethal but stops can be attached to the cable to increase the probability of a live capture depending on the trap check interval. Cable devices positioned to capture the animal around the body can be a useful live capture device but are more often used as a lethal control technique. Cable devices can incorporate a breakaway feature to release non-target wildlife and livestock where the target animal is smaller than potential non-target animals (Phillips 1996). Cable devices can be effectively used wherever a target animal moves through a restricted travel lane (*e.g.*, trails through vegetation). When an animal moves forward into the loop formed by the cable, the noose tightens, and the animal is held. Cable devices must be set in locations where the likelihood of capturing non-target animals would be minimized.

**Cage-type traps** come in a variety of styles to live-capture animals. The most commonly known cage traps for aquatic rodents are box traps and suitcase traps. Box traps are usually rectangular and are made from various materials, including metal, wire mesh, plastic, and wood. Box traps are generally portable and easy to set-up.

The disadvantages of using cage traps are: 1) some individual target animals may avoid cage traps; 2) some non-target animals may associate the traps with available food and purposely get captured to eat the bait, making the trap unavailable to catch target animals; 3) cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions; 4) some animals will fight to escape and may become injured; and 5) expense of purchasing traps.



Trap monitors are devices that send a radio signal to a receiver if a set trap is disturbed and alerts field personnel that an animal may be captured. Trap monitors can be attached directly to the trap or attached to a string or wire and then placed away from the trap in a tree or shrub. When the monitor is hung above the ground, it can be detected from several miles away, depending on the terrain in the area. There are many benefits to using trap monitors, such as saving considerable time when checking traps, decreasing fuel usage, prioritizing trap checks, and decreasing the need for human presence in the area. Trap monitors could be used when using cage traps. Trap monitors do not exempt WS-Nebraska from mandatory physical trap checks. Wireless trail (game) cameras could also be used to monitor traps where cell service is available. Some trail cameras allow images to be sent to cellular phones, which permits for fewer site visits and reduced cost associated with travel.

Trap monitoring devices could be employed, when applicable, that indicate when a trap has been activated. Trap monitoring devices would allow personnel to prioritize trap checks and decrease the amount of time required to check traps, which decreases the amount of time captured target or non-target animals would be restrained. By reducing the amount of time targets and non-target animals are restrained, pain and stress can be minimized, and captured wildlife can be addressed in a timely manner, which could allow non-target animals to be released unharmed. Trap monitoring devices could be employed where applicable to facilitate monitoring of the status of traps in remote locations to ensure any captured wildlife was removed promptly to minimize distress and to increase the likelihood non-target animals could be released unharmed.

**Hancock/Bailey Traps** (suitcase/basket type cage traps) are designed to live-capture beaver. The trap is constructed of a metal frame that is hinged with springs attached and covered with chain-link fence. The trap's appearance is similar to a large suitcase when closed. When set, the trap is generally baited and opened to allow an animal to enter. When tripped, the panels of the trap close around the animal capturing the animal. One advantage of using the Hancock or Bailey trap is the ease of release of beaver or non-target animals. Beaver caught in Hancock or Bailey traps could also be humanely euthanized. Disadvantages are that those traps can be expensive, cumbersome, and difficult to set (Miller and Yarrow 1994). The trap weighs about 25 pounds and is relatively bulky to carry and maneuver. Hancock and Bailey traps can also be dangerous to set (*i.e.*, hardhats are recommended when setting suitcase traps), are less cost and time-efficient than cable devices, foothold traps, or body-grip traps, and may cause serious and debilitating injury to river otters (Blundell et al. 1999).

**Body-grip Traps** are designed to cause the quick death of the animal that activates the trap. Body-grip traps consists of a pair of rectangular wire frames that close like scissors when triggered, killing the captured animal with a quick body blow. For body-grip traps, the traps should be placed to ensure the rotating jaws close on either side of the neck of the animal to ensure a quick death. Body-grip traps are lightweight and easily set. Safety hazards and risks to people are usually related to setting, placing, checking, or removing the traps. Selectivity of body-grip traps can be enhanced by placement, trap size, trigger configurations, and baits. When using body-gripping traps, risks of non-target capture can be minimized by using recessed sets (placing trap inside a cubby, cage, or burrow) or restricting openings. For example, body-grip traps set to capture beaver can be placed underwater to minimize risks to non-target animals. Choosing appropriately sized traps for the target species can also exclude non-target animals by preventing larger non-target animals from entering and triggering the trap. The trigger configurations of traps can be modified to minimize non-target capture. For example, offsetting the trigger can allow non-target animals to pass through body-grip traps without capture. Body-grip traps would be available for use by all entities.

**Shooting** with firearms is very selective for the target species and could be conducted with rifles,

handguns, and shotguns. Methods and approaches used by WS-Nebraska may include use of illuminating devices, bait, firearm suppressors, and night vision/thermal equipment. Shooting can be an effective method in some circumstances and can often provide immediate relief from the problem. Shooting may at times be one of the only methods available to effectively and efficiently resolve damage. Shooting would be limited to locations where it is legal and safe to discharge a weapon. In addition, WS' personnel could use firearms to euthanize live-captured animals.

Shooting can also be used in conjunction with an illumination device at night, which is especially useful for nocturnal aquatic rodents. Spotlights may or may not be covered with a red lens, which nocturnal animals may not be able to see, making it easier to locate them undisturbed. Night shooting may be conducted in sensitive areas that have high public use or other activity during the day, which would make daytime shooting unsafe. The use of night vision and Forward Looking Infrared (FLIR) devices can also be used to detect and shoot aquatic rodents at night and is often the preferred equipment due to the ability to detect and identify animals in complete darkness. Night vision and FLIR equipment aid in locating wildlife at night when wildlife may be more active. Night vision and FLIR equipment could be used during surveys and in combination with shooting to remove target aquatic rodents at night. WS-Nebraska personnel most often use this technology to target aquatic rodents in the act of causing damage or likely responsible for causing damage. Those methods aid in the use of other methods or allow other methods to be applied more selectively and efficiently. Night vision and FLIR equipment allow for the identification of target species during night activities, which reduces the risks to non-target animals and reduces human safety risks. Night vision equipment and FLIR devices only aid in the identification of wildlife and are not actual methods of take. The use of FLIR and night vision equipment to remove target aquatic rodents would increase the selectivity of direct management activities by targeting those aquatic rodents most likely responsible for causing damage or posing threats.

**Hunting/Trapping** is sometimes recommended by WS-Nebraska to resource owners. WS-Nebraska could recommend resource owners consider legal hunting and trapping as an option for reducing aquatic rodent damage. Although legal hunting/trapping is impractical and/or prohibited in many urban-suburban areas, it can be used to reduce some local populations of aquatic rodents.

### **Chemical Wildlife Damage Management Methods**

All pesticides used by WS-Nebraska would be registered under the FIFRA and administered by the EPA and NDA. All personnel of WS-Nebraska who apply restricted-use pesticides would be certified pesticide applicators by NDA and have specific training by WS-Nebraska for pesticide application. The EPA and the NDA require pesticide applicators to adhere to all certification requirements set forth in the FIFRA. Pharmaceutical drugs, including those used in wildlife capture and handling, are administered by the United States Food and Drug Administration and/or the United States Drug Enforcement Administration.

Chemicals would not be used by WS-Nebraska on public or private lands without authorization from the property owner or manager. The following chemical methods have been proven selective and effective in reducing damage by aquatic rodents.

**Ketamine** (Ketamine HCl) is a dissociative anesthetic that is used to capture wildlife. It is used to eliminate pain, calm fear, and allay anxiety. Ketamine is possibly the most versatile drug for chemical capture, and it has a wide safety margin (Johnson et al. 2001). When used alone, this drug may produce muscle tension, resulting in shaking, staring, increased body heat, and, on occasion, seizures. Usually, ketamine is combined with other drugs, such as Xylazine. The combination of such drugs is used to control an animal, maximize the reduction of stress and pain, and increase human and animal safety.

**Telazol** is a more powerful anesthetic and usually used for larger animals. Telazol is a combination of equal parts of tiletamine hydrochloride and zolazepam hydrochloride (a tranquilizer). Telazol produces a state of unconsciousness in which protective reflexes, such as coughing and swallowing, are maintained during anesthesia. Schobert (1987) listed the dosage rates for many wild and exotic animals. Before using Telazol, the size, age, temperament, and health of the animal are considered. Following a deep intramuscular injection of Telazol, onset of anesthetic effect usually occurs within 5 to 12 minutes. Muscle relaxation is optimum for about the first 20 to 25 minutes after the administration, and then diminishes. Recovery varies with the age and physical condition of the animal and the dose of Telazol administered, but usually requires several hours.

**Xylazine** is a sedative (analgesic) that calms nervousness, irritability, and excitement, usually by depressing the central nervous system. Xylazine is commonly used with ketamine to produce a relaxed anesthesia. It can also be used alone to facilitate physical restraint. Because Xylazine is not an anesthetic, sedated animals are usually responsive to stimuli. Therefore, personnel should be even more attentive to minimizing sight, sound, and touch. When using ketamine/Xylazine combinations, Xylazine will usually overcome the tension produced by ketamine, resulting in a relaxed, anesthetized animal (Johnson et al. 2001). This reduces heat production from muscle tension but can lead to lower body temperatures when working in cold conditions.

**Sodium Pentobarbital** is a barbiturate that rapidly depresses the central nervous system to the point of respiratory arrest. Barbiturates are a recommended euthanasia drug for free-ranging wildlife (American Veterinary Medical Association 2013). Sodium pentobarbital would only be administered after target animals were live-captured and properly immobilized to allow for direct injection. There are United States Drug Enforcement Administration restrictions on who can possess and administer this drug. Certified personnel of WS-Nebraska are authorized to use sodium pentobarbital and dilutions for euthanasia in accordance with United States Drug Enforcement Administration and state regulations. All animals euthanized using sodium pentobarbital and all of its dilutions (e.g. Beuthanasia-D, Fatal-Plus) are disposed of through incineration or deep burial to prevent secondary poisoning of scavenging animals and introduction of these chemicals to non-target animals.

**Potassium Chloride** used in conjunction with prior general anesthesia is used as a euthanasia agent for animals and is considered acceptable and humane by the American Veterinary Medical Association (2013). Animals that have been euthanized with this chemical experience cardiac arrest followed by death and are not toxic to predators or scavengers.

**Beuthanasia®-D** combines pentobarbital with another substance to hasten cardiac arrest. Intravenous (IV) and intracardiac (IC) are the only acceptable routes of injection. As with pure sodium pentobarbital, IC injections with Beuthanasia®-D are only acceptable for animals that are unconscious or deeply anesthetized. With other injection routes, there are concerns that the cardiotoxic properties may cause cardiac arrest before the animal is unconscious. It is a Schedule III drug, which means it can be obtained directly from the manufacturer by anyone with a United States Drug Enforcement Administration registration. However, Schedule III drugs are subject to the same security and record-keeping requirements as Schedule II drugs.

**Fatal-Plus®** combines pentobarbital with other substances to hasten cardiac arrest. IV is the preferred route of injection; however, IC is acceptable as part of the two-step procedure used by WS-Nebraska. Animals are first anesthetized and sedated using a combination of ketamine/Xylazine and once completely unresponsive to stimuli and thoroughly sedated, Fatal-Plus® is administered. Like Beuthanasia®-D, it is a Schedule III drug requiring a United States Drug Enforcement Administration registration for purchase and is subject to the security and record-keeping requirements of Schedule II drugs.

**Carbon dioxide** is sometimes used to euthanize aquatic rodents that are captured in live traps and when relocation is not a feasible option. Live aquatic rodents would be placed in a sealed chamber. Carbon dioxide gas is released into the chamber and the animal quickly dies after inhaling the gas. The American Veterinary Medical Association (2013) approves this method as a euthanizing agent. Carbon dioxide gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is the gas released by dry ice. The use of carbon dioxide by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by society.

**Zinc phosphide** is an inorganic compound used to control rats, mice, voles, ground squirrels, prairie dogs, muskrats, feral rabbits, and gophers. Zinc phosphide is a heavy, finely ground gray-black powder that is partially insoluble in water and alcohol. When exposed to moisture, it decomposes slowly and releases phosphine gas ( $\text{PH}_3$ ). When zinc phosphide treated bait encounters acids in the stomach, phosphate ( $\text{PH}_3$ ) gas is released, which may account in a large part for observed toxicity. Animals that ingest lethal amounts of bait usually succumb overnight with terminal symptoms of convulsions, paralysis, coma, and death from asphyxia. If death is prolonged for several days, intoxication that occurs is similar to intoxication with yellow phosphorous, in which the liver is heavily damaged. Prolonged exposure to phosphine can produce chronic phosphorous poisoning.

Although zinc phosphide baits have a strong, pungent, phosphorous-like odor (garlic like), this characteristic seems to attract rodents, particularly rats, and apparently makes the bait unattractive to some other animals. For many uses of zinc phosphide formulated on grain or grain-based baits, pre-baiting is recommended or necessary for achieving good bait acceptance. Primary toxicity risks to non-target species from the direct consumption of treated bait can be minimized by using bait stations to prevent access by non-target species such as birds.

Because zinc phosphide is not stored in muscle or other tissues of poisoned animals, there is no secondary poisoning with this rodenticide. The bait, however, remains toxic up to several days in the gut of the dead rodent. Other animals can be poisoned if they eat enough of the gut content of rodents recently killed with zinc phosphide.

**Repellents** are usually naturally occurring substances or chemicals formulated to be distasteful or to elicit pain or discomfort for target animals when they are smelled, tasted, or contacted. Repellents are variably effective and depend largely on resource to be protected, time and length of application, and sensitivity of the species causing damage. Again, acceptable levels of damage control would usually not be realized unless repellents were used in conjunction with other techniques. Repellents often contain different active ingredients with most ingredients occurring naturally in the environment. The most common ingredients of repellents are coyote urine, capsaicin, or sand (Silica) mixed with a non-toxic carrier for application to surfaces. Repellents for animals are not generally restricted-use products; therefore, a person does not need a pesticide applicators license to purchase or apply those products. People generally apply repellents directly to affected resources, which elicits an adverse taste or texture response when the target animal ingests the treated resource or the ingestion of the repellent cause's temporary sickness (*e.g.*, nausea). Products containing coyote urine or other odors associated with predatory wildlife are intended to elicit a fright response in target wildlife by imitating the presence of a predatory animal (*i.e.*, wildlife tend to avoid areas where predators are known to be present). If repellents were registered for use in the State to reduce damage caused by aquatic rodents, WS-Nebraska could employ or recommend for use those repellents that were available.

**Explosives** are defined as any chemical mixture or device that serves as a blasting agent or detonator. The procedures and accountability for WS' use of explosives for removing beaver dams and training

requirements for explosives certification would adhere to WS Directive 2.435. Explosives are generally used to breach beaver dams that are too large to remove by digging using hand tools. Explosives would be used to remove dams after the beaver were removed using other methods. WS-Nebraska would only use binary explosives to remove beaver dams. Binary explosives consist of two components that are contained separately. The two components of binary explosives are ammonium nitrate and nitro-methane or nitro-methane and aluminum powder, which are not classified as explosives until the two components are mixed. Therefore, binary explosives are subject to fewer regulations and controls because they are packaged separately. However, once mixed, binary explosives are considered high explosives and subject to all applicable federal and state requirements. When used to remove beaver dams, the two components would not be mixed until ready for use at the site where the dam was located. Detonating cord and detonators are also considered explosives and WS-Nebraska must adhere to all applicable state and federal regulations for storage, transportation, and handling. All explosive specialists in WS-Nebraska are required to attend extensive explosive safety training and spend time with a certified explosive specialist in the field prior to obtaining certification. Only well-trained, certified employees of WS-Nebraska and closely supervised personnel would use explosives in accordance with WS Directive 2.435. 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-Nebraska 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.

## APPENDIX C

### CRITERIA FOR BEAVER DAM BREACHING/TAKE

Beaver dam breaching is generally conducted to maintain existing stream channels and drainage patterns and reduce flooding. Beaver dams are made from natural debris such as logs, sticks, and mud that beaver take from the area. This portion would be dislodged during a beaver dam breaching operation. The impoundments that WS-Nebraska could remove would normally be from recent beaver activity and would not have been in place long enough to take on the qualities of a true wetland (*i.e.*, hydric soils, aquatic vegetation, pre-existing function). Beaver dam breaching and take by hand 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 since the impounded water can be released slowly over time.

Wetlands are recognized by three characteristics: hydric soils, hydrophytic vegetation, and general hydrology. Hydric soils either are 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. In addition, hydric soils may be bluish gray or gray below the surface or brownish black to black and have the smell of rotten eggs. Wetlands also have hydrophytic vegetation present such as cattails, bulrushes, willows, sedges, and water plantains. The final indicator is general hydrology which includes standing and flowing water or waterlogged soils during the growing season; high water marks 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 because siltation 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.

When a dam is removed or breached, debris could be discharged into the water. The debris that ends up in the water would be considered “*incidental fallback*” or discharge fill. However, in most beaver dam take or breaching operations, the material that would be displaced, if considered to be discharge, would be exempt from permit requirements under exemptions in 33 CFR 323 or under the NWP discussed in 33 CFR 330. If beaver dams could not be breached or removed under exemptions in 33 CFR 323 or pursuant to an NWP, then the property owner or manager would be responsible for seeking the necessary permit under Section 401 and Section 404 of the CWA. WS’ personnel would survey the beaver dam site and impoundment and determine whether conditions exist suggesting that the area may be a wetland as defined above. In addition, WS’ personnel would work to estimate the age of the beaver dam (*e.g.*, asking the landowner, using aerial photos). The characteristics of the impoundment and the age of the dam would be used to determine whether Swampbuster, Section 404 permit exemptions, or NWPs allow take of the dam. If not, the landowner would be required to obtain a Section 404 permit before the dam could be removed. In those cases, the EPA and/or the United States Army Corps of Engineers would be responsible for determining if the beaver dam and associated areas were actual wetlands and if so, whether to issue a permit to remove the dam.

#### **Federal Regulations - United States Army Corps of Engineers**

Under Section 404 of the CWA, the Corps of Engineers regulates all waters of the United States. Because beaver dams involve waters of the United States, dam breaching is regulated under Section 404 of the CWA. In most beaver dam breaching operations, the material that is displaced would be exempt from permitting or included in an NWP in accordance with Section 404 of the CWA (see 33 CFR Part 323, 33 CFR 330). A permit would be required if the impoundment caused by a beaver dam was not covered under an NWP or permitting exemption and was considered jurisdictional based on the Corps of Engineers 1987 Delineation Manual.

The following explains Section 404 exemptions and conditions that pertain to the breaching of beaver dams and are interpretation of the NWP by WS-Nebraska.

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 silviculture activities where they have been established do not require a permit as long as these drainages do not include the immediate or gradual conversion of a wetland 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 take 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 take 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 take 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. Take 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 Program. The United States Army Corps of Engineers, Chief of Engineers is authorized to grant certain dredge and fill activities on a nationwide basis if they have minimal impact on the environment. The NWPs are listed in Appendix D of 33 CFR 330 and permittees must satisfy all terms and conditions established to qualify for their use. Individual beaver dam breaching by WS-Nebraska may be covered by any of the following NWPs if not already exempted from permit requirements by the regulations discussed above. WS complies with all conditions and restrictions placed on NWPs for any instance of beaver dam breaching done under a specific NWP.

NWPs 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 waterbody, which is part of an area designated for “*Recreational or Ecological Significance*”.

The United States Army Corps of Engineers reissue the NWP every 5 years with some modifications to the NWPs and their general conditions. The effective date of the current NWPs is March 19, 2012. These NWPs will expire on March 18, 2017.

*NWP 18 - Minor Discharges:* This NWP authorizes minor discharges of dredged and fill material into all waters of the United States provided the activity meets specific criteria. One of the criteria is 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 5 cubic yards of backfill into the waters of the United States. Beaver dams periodically may be breached in a special aquatic area, but normally the aquatic site will be returned to normal. However, if beaver dam breaching is going to exceed the noted impact to waters of the United States for the NWP, including wetlands, then an Individual Permit must be obtained from the District Engineer.

*NWP 27 - Aquatic Habitat Restoration, Establishment, and Enhancement Activity:* This NWP allows for the discharge of dredge and fill in waters of the United States 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 the USFWS or the USDA-Natural Resources Conservation Service to conduct restoration; a voluntary wetland restoration project documented by Natural Resources Conservation Service; or notify the District Engineer according to “*notification*” procedures. On federal lands, including United States Army Corps of Engineers 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 of a beaver dam would be allowed as long as it was not a true wetland, and for non-federal public and private lands the appropriate agreement, project documentation, or notification is in place.

A quick response immediately resulting from permitting requirements can be critical to the success of minimizing or preventing damage. Exemptions contained in the above regulations or NWPs provide for the breaching of the majority of beaver dams that WS-Nebraska encounters. The primary determination that must be made by personnel of WS-Nebraska is whether a beaver impounded area has become a true wetland or is just a flooded area. The flexibility allowed by these exemptions and NWPs is important for the efficient and effective resolution of many beaver damage problems because damage escalates rapidly in many cases the longer an area remains flooded.



## Appendix D

### Nebraska Endangered and Threatened Species

	Common Name	Scientific Name	State Status	Federal Status
<b>BIRDS</b>	Eskimo Curlew*	<i>Numenius borealis</i>	Endangered	Endangered
	Whooping Crane	<i>Grus americana</i>	Endangered	Endangered
	Interior Least Tern	<i>Sternula antillarum athalassos</i>	Endangered	Endangered
	Piping Plover	<i>Charadrius melodus</i>	Threatened	Threatened
	Rufa Red Knot,...	<i>Calidris canutus rufa</i>	Threatened	Threatened
	McCown's Longspur	<i>Rhynchophanes mccownii</i>	Proposed T	
	Mountain Plover	<i>Charadrius montanus</i>	Threatened	
<b>MAMMALS</b>	Black-footed Ferret*	<i>Mustela nigripes</i>	Endangered	Endangered
	Gray Wolf,...	<i>Canis lupus</i>	Endangered	Endangered
	Swift Fox	<i>Vulpes velox</i>	Endangered	
	River Otter	<i>Lontra canadensis</i>	Threatened	
	Southern Flying Squirrel	<i>G/aucomyz volans</i>	Threatened	
	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Threatened	Threatened 4(d) rule
<b>FISH</b>	Pallid Sturgeon	<i>Scaphirhynchus a/bus</i>	Endangered	Endangered
	Topeka Shiner	<i>Notropis topeka</i>	Endangered	Endangered
	Sicklefin Chub	<i>Macrhybopsis meeki</i>	Proposed E	
	Sturgeon Chub	<i>Macrhybopsis gelida</i>	Endangered	
	Blacknose Shiner	<i>Notropis heterolepis</i>	Endangered	
	Lake Sturgeon	<i>Acipenser fulvescens</i>	Threatened	
	Northern Redbelly Dace	<i>Chrosomus eos</i>	Threatened	
	Finescale Dace	<i>Chrosomus neogaeus</i>	Threatened	
<b>INSECTS</b>	American Burying Beetle	<i>Nicrophorus americanus</i>	Endangered	Endangered
	Salt Creek Tiger Beetle	<i>Cicindela nevadica lincolniqna</i>	Endangered	Endangered
<b>REPTILES</b>	Timber Rattlesnake	<i>Crota/us horridus</i>	Proposed T	
	Western Massasauga	<i>Sistrurus tergeminus</i>	Threatened	
<b>MUSSELS</b>	Scaleshell Mussel	<i>Leptodealeptodon</i>	Endangered	Endangered
<b>PLANTS</b>	Blowout Penstemon	<i>Penstemon haydenii</i>	Endangered	Endangered
	Colorado Butterfly Plant	<i>Gaura neomexicana ssp. coloradensis</i>	Endangered	
	Saltwort	<i>Salicornia rubra</i>	Endangered	
	Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>	Threatened	Threatened

	Ute Ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened	Threatened
	American Ginseng	<i>Panax quinquefolius</i>	Threatened	
	Small White Lady's Slipper	<i>Cypripedium candidum</i>	Threatened	

\* There are historical records of these species in Nebraska, but no known recent records or extant populations in Nebraska.  
 ,... There are recent (not historical) records of these species in Nebraska. However, there are no known breeding populations and/or Nebraska does not provide an important stopover or migratory path for these species.

**30 State-listed Species:** 11 State & Federal Listed Endangered      5 State-listed Endangered  
    5 State & Federal Listed Threatened      9 State-listed Threatened  
    1 Proposed State-Listed Endangered      2 Proposed State-Listed Threatened

*Updated May 2020*