Minnesota Department of Natural Resources

Strategic Management Plan for Elk

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DNR received input and advice from citizen volunteers from across the region and state. Two work groups representing the Grygla area and Kittson County met during 2014 to review the 2009 plan and make recommendations for the 2016 plan. DNR would like to thank and recognize these volunteers for their contributions of ideas and time to complete the plan.

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STRATEGIC VISION

The Minnesota Department of Natural Resources will maintain a free-ranging, wild elk population. The long-term vision is to enhance the size and range extent of Minnesota's elk population and provide increased recreational opportunities, while maintaining positive coexistence with private landowners.

We envision a healthy, self-sustaining, managed population that affords recreational (including regular hunting seasons) and economic opportunities for all state citizens, while actively addressing elk depredation situations. Habitats and herd structure are maintained for sustainable reproductive potential. Hunting is offered both as a recreational opportunity and as a tool to manage elk populations and reduce elk-landowner conflicts. Continued growth of Minnesota's elk herd will include establishing enduring relationships with landowners to minimize elk damage and provide elk recreational opportunities to the citizens of Minnesota.

ELK MANAGEMENT GOAL

Goal: Increase the size and range extent of Minnesota's elk population while maintaining positive coexistence with private landowners and provide increased recreational opportunities to the citizens of Minnesota.

Nine broad objectives frame the elk management plan to help DNR reach its goal:

1. Maintain a socially acceptable and biologically sound number of elk in the three elk ranges of the state, including the Caribou-Vita subgroup, which is shared with Manitoba.
2. Work cooperatively with landowners and producers to identify private land management opportunities and prevent or minimize property damage caused by elk.
3. Continue to improve and maintain quality habitat on, and encourage elk use of, public lands that benefit elk.
4. Ensure the health and reproductive potential of the elk population.
5. Provide consumptive and non-consumptive recreational opportunities.
6. Provide information to stakeholders.
7. Conduct and pursue funding for research that addresses known information gaps regarding elk management and recreational opportunities in Minnesota.
8. Support external research to evaluate the feasibility of elk restoration in northeastern Minnesota.
9. Inform and educate elected officials on elk management and legislative opportunities.

2016—2020 OBJECTIVES AND STRATEGIES

Objective 1. Maintain a socially acceptable and biologically sound number of elk in the three elk ranges of the state, including the Caribou-Vita subgroup, which is shared with Manitoba.

Strategy 1A.	Maintain sustainable pre-calving population of 30-38 elk in the Grygla herd.
Strategy 1B.	Maintain sustainable pre-calving population of 65-75 elk in the Kittson County herd, not including the Caribou-Vita subgroup.
Strategy 1C.	Manage the Caribou-Vita herd for a population of 150-200 animals in consultation with Manitoba.
Strategy 1D.	Conduct annual population surveys to monitor population status. Coordinate with Manitoba Conservation on surveys conducted on the Caribou-Vita subgroup.
Strategy 1E.	Review and update existing survey methodology and tools to monitor the populations. Continue to record citizen elk observations.
Strategy 1F.	Use hunting seasons as a population management tool and to maintain elk wariness.
Strategy 1G.	Review hunting regulations annually and adjust as needed.

Objective 2. Work cooperatively with landowners and producers to identify private land management opportunities and prevent or minimize property damage caused by elk.

Strategy 2A.	Provide technical, material, and/or financial assistance through DNR's animal damage management program and in cooperation with other conservation agencies and non-governmental organizations for private land management that benefits elk. Where appropriate, expand the use of private land food plots.
Strategy 2B.	Work proactively with landowners and producers to identify depredation situations and prepare a Cooperative Damage Management Agreement (CDMA) that identifies and provides a progressive series of abatement and prevention techniques and materials, including the use of depredation shooting permits.
Strategy 2C.	Work with the Minnesota Department of Agriculture and the Minnesota Legislature to encourage full and timely payment of all valid elk damage claims.
Strategy 2D.	When elk are taken using depredation shooting permits, notify the affected landowners of disease testing results. Post all elk disease testing results on the DNR web site.
Strategy 2E.	Evaluate existing and potential pilot projects with landowners and producers using permanent and temporary fencing and other barrier materials to prevent elk damage of stored forage. Evaluate for expanded use in subsequent years.

Objective 3. Continue to improve and maintain quality habitat on, and encourage elk use of, public lands that benefit elk (See Appendix 5 for additional considerations).	
Strategy 3A.	Continue habitat management through brushland management, timber harvest, and prescribed burning on state wildlife management areas throughout the elk range.
Strategy 3B.	Evaluate current food plots and practices on WMA lands to maximize the return on dollars invested and crops produced.
Strategy 3C.	Dedicate a portion of the new Karlstad Assistant Wildlife Manager position responsibilities to specific elk habitat management duties in the Kittson and Grygla elk ranges.
Strategy 3D.	Continue the food plot program on public lands throughout the elk range, making improvements in location, function, quality, and crop type where appropriate.
Strategy 3E.	Create an Elk Management Fund to be used specifically for elk habitat management activities. Potential revenue sources could be appropriated through grants, elk license applications and sales.

Objective 4. Ensure the health and reproductive potential of the elk population.	
Strategy 4A.	Test all harvested elk, and all other suitable elk carcasses found within the state for bovine tuberculosis, chronic wasting disease, and other diseases.
Strategy 4B.	Implement strategies, such as fencing, that are known to minimize elk-livestock contact in stored forage and feedlot situations.
Strategy 4C.	Maintain a targeted post-hunt sex ratio of one adult bull per two cows (50 to 100).
Strategy 4D.	Manage the elk population to reduce herd vulnerability associated with potential catastrophic events.

Objective 5. Provide consumptive and non-consumptive recreational opportunities.

Strategy 5A.	Annually survey elk in both the Grygla and Kittson County subgroups to determine population estimates, track range expansion, and establish fall hunting seasons per management goals in the elk plan.
Strategy 5B.	Maintain elk hunting seasons to manage the population within goal levels, provide recreational opportunity, and maintain elk wariness. Consider limited hunting when populations are below goal levels to maintain wariness within limits of herd minimum size levels. Limit the use of extended season hunting and revise hunting zones as needed to better reflect elk distribution.
Strategy 5C.	Evaluate alternative elk hunting license opportunities to better align with management objectives and public interest. Consider landowner licensing options or related tools that serve to incentivize elk presence, management, and enthusiasm on private lands while maintaining public opportunity.
Strategy 5D.	Coordinate with Manitoba Conservation to develop independent hunting management strategies that are socially and biologically acceptable to stakeholders in both countries.
Strategy 5E.	Maintain a limited hunt on the Caribou-Vita herd in consultation with Manitoba Conservation.
Strategy 5F.	Work with stakeholders, including local communities, chambers of commerce, the Rocky Mountain Elk Foundation, and Minnesota tourism industry, to promote elk awareness, elk-related recreation, and the economic opportunities wild elk can provide.

Objective 6. Provide information to stakeholders.

Strategy 6A.	Post elk population survey reports, harvest reports, disease testing results, and MDA damage payments annually on the *Elk management* web page of the DNR website.
Strategy 6B.	Annually post elk range management activities on the *Elk management* web page of the DNR website.
Strategy 6C.	Develop a communication strategy to increase awareness and inform Minnesota citizens of elk recreational opportunities and management activities.
Strategy 6D.	Meet with the 2016 elk plan working groups on an annual basis to provide updates and seek input for elk plan implementation and marketing of elk recreational opportunities.

Objective 7. Conduct and pursue funding for research that addresses known information gaps regarding elk management and recreational opportunities in Minnesota.	
Strategy 7A.	Implement findings from 2016-2018 elk research to improve current management efforts and techniques. See Appendices 3 and 4.
Strategy 7B.	Conduct citizen and landowner surveys and evaluate attitudes, values and beliefs regarding elk in the current and potential elk range, including understanding public familiarity with elk in Minnesota. See Appendix 4.
Objective 8. Support external research on the feasibility of elk restoration in eastern Minnesota.	
Strategy 8A.	Continue to voice support for research on potential elk restoration as proposed by the University of Minnesota and the Fond du Lac Band of Lake Superior Chippewa.
Strategy 8B.	Review and collaborate on elk research, when possible, to foster a more comprehensive understanding of elk management opportunities in Minnesota (e.g., through comparison of DNR research in the current elk range with proposed research in eastern Minnesota).
Objective 9. Inform and educate elected officials on elk management and legislative opportunities.	
Strategy 9A.	Communicate opportunities to support the 2016-2020 Strategic Elk Management Plan goal.
Strategy 9B.	Communicate the need to maintain adequate funding for elk damage compensation (in coordination with the Minnesota Department of Agriculture) and elk depredation management.

BACKGROUND

In 1987, legislation (Minnesota Statute 97B.516) was passed that required the Minnesota Department of Natural Resources (DNR) to write an elk management plan that:

- Recognizes the value and uniqueness of elk,
- Provides for integrated herd management,
- Affords optimum recreational opportunities,
- Restricts elk to nonagricultural land in the state (this restriction was removed in 2014).

This legislation was in response to public controversy and debate surrounding elk management and elk impacts to agriculture. An initial draft version was developed in 1988 with input from a citizen's advisory committee. Public input was solicited again in 1999 when the plan was updated following implementation of a number of the original plan's provisions (including public hunts and depredation payments).

An updated Strategic Management Plan for Elk was adopted in November 2009. The 2009 plan received input from two citizen advisory panels and covered a 6-year period through 2015. The 2016 plan is an update that considered input from the citizen advisory panels, the public and DNR wildlife managers, and will cover the period from 2016-2020.

The long-term goal of the Minnesota DNR is to manage for elk populations larger than outlined in the 2009 plan. Ideally, the 2016 plan will create a climate that will allow for the future growth of Minnesota's elk population both in number and extent.

Minnesota's native elk were originally distributed over most of the state, but were functionally extirpated by the early 1900s due to overharvest and conversion of Minnesota's vast prairie ecosystem to agriculture (Hazard 1982). Today, elk are restricted to northwestern Minnesota, primarily in three localized herds in two areas (Figure 1). A history of elk and elk management in Minnesota is provided in Appendix 1.

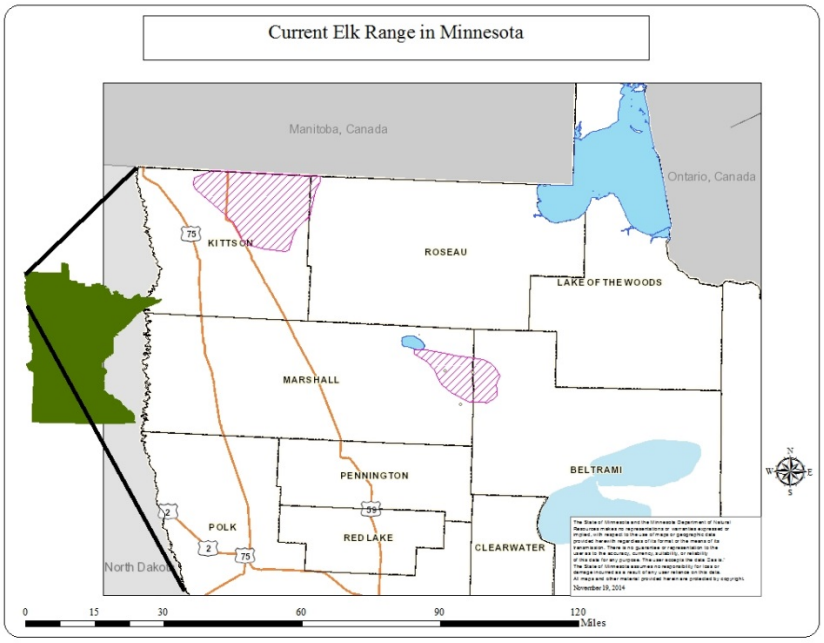

Figure 1. Current Elk Range in Minnesota

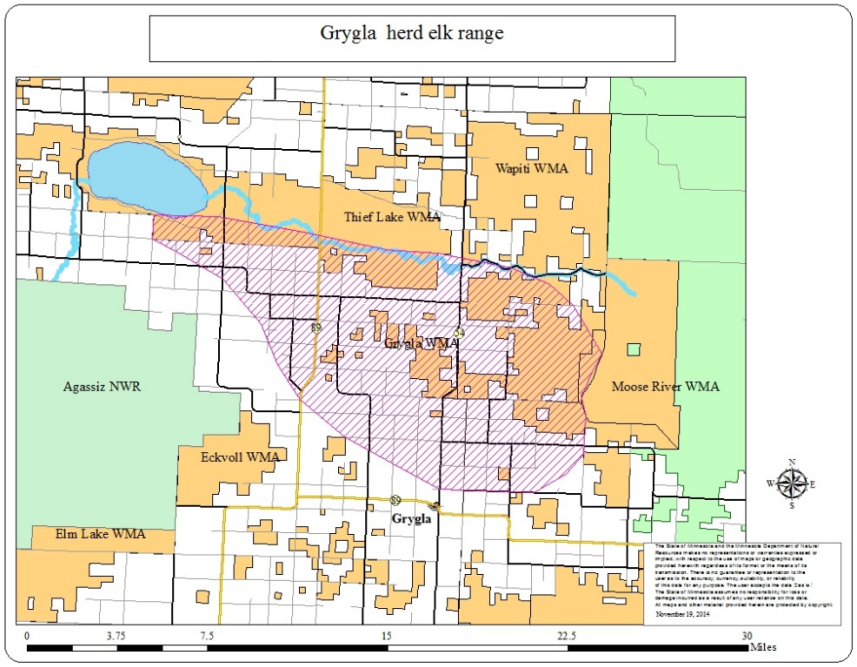

Figure 2. Grygla Elk Range

The Grygla herd, a remnant from a 1935 reintroduction effort, primarily occupies the area north of Grygla.

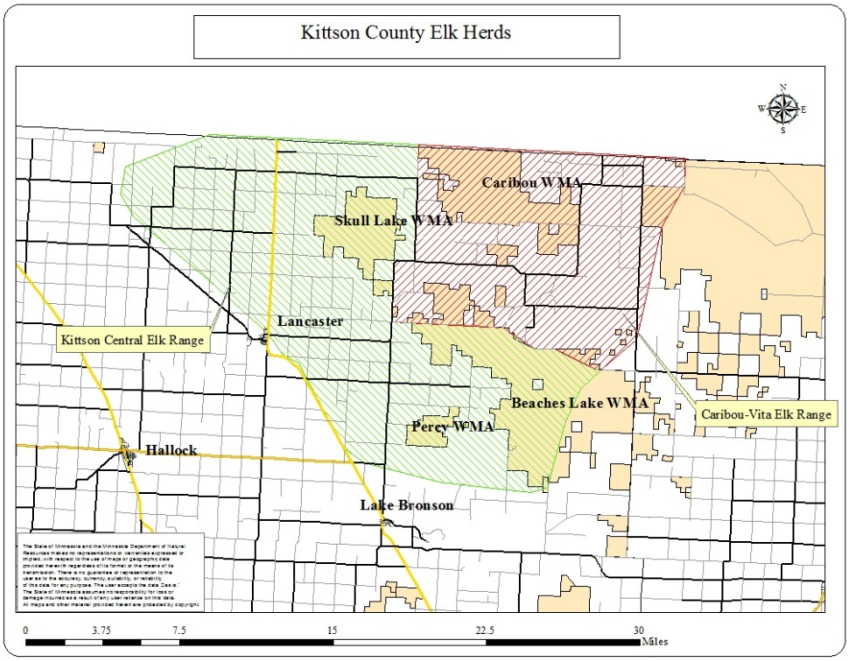

Figure 3. Kittson County Elk Range

Two additional herds are found in Kittson and Roseau counties (Figure 3). The Caribou-Vita herd is located in Caribou Township in northeast Kittson County and moves between there and the town of Vita, Manitoba. The Kittson Central herd is found primarily in Minnesota near the town of Lancaster.

CURRENT SITUATION

Support for an increase in Minnesota's elk population appears to be growing among Minnesota citizens. However, local landowners who are also agricultural producers and are negatively impacted by elk have communicated limited-to-no tolerance for elk. Ultimately, the long-term viability of elk populations in Minnesota will be determined by a balance between landowner tolerance of, and public support for, elk.

Elk management continues to be challenging due to the divergent opinions regarding many aspects of Minnesota's elk program. Opinions range from eliminating the herd to greatly increasing their numbers by reintroducing elk in several locations around the state. During spring 2009, DNR established working groups in both the Grygla area and Kittson County to discuss elk management in these areas. The result was the Strategic Management Plan for Elk 2009-2015. The 2009 plan listed five goals:

1. Monitor population status and achieve the population goals outlined in this plan within legal, social, and environmental limits.
2. Increase landowner acceptance of elk on the landscape by addressing and resolving landowner concerns.
3. Manage Minnesota's aspen parklands landscape as an integral component of elk habitat.

4. Provide opportunities for appreciation and recreational use including regular hunting seasons.
5. Increase information sharing with the public regarding elk and elk management issues.

DNR made progress on each goal through various strategies. Notable among them is reaching the population goal range for the Grygla herd and making substantial progress toward reaching the Kittson elk population goal. A summary of the 2009-2014 accomplishments is included in Appendix 2.

New working groups were convened in 2014 to re-visit goals and recommend updates to the plan. This updated plan reflects the efforts of those groups and input from Minnesota citizens. It is intended to further address the issues surrounding Minnesota elk and set a direction for the future by finalizing the DNR's 2016 – 2020 Strategic Management Plan for Minnesota Elk.

HABITAT AND HABITAT MANAGEMENT

Elk are primarily grazers and prefer open brushlands and grasslands for foraging and forested areas for winter and security cover. Native elk habitat in Minnesota was abundant in the prairie and forest transition zones prior to European settlement and elk are a keystone species in the prairie environment. Ideal elk habitat in the current Minnesota elk range is comprised of a mosaic of brushland and grassland with islands of forest - a feature characteristic of the Tallgrass Aspen Parkland biome, which has been identified as a focal area for the *Minnesota Prairie Plan* due to its unique characteristics. The mixed habitats in the elk range are also interspersed with significant agricultural lands, a component of the current landscape that has greatly impacted social acceptance of elk due to crop depredation complaints.

Elk food preferences vary with the time of year. Among natural foods, grasses and forbs comprise the bulk of the diet during the snow-free period. Woody browse is consumed during late fall and winter when herbaceous forage is less abundant. Elk also utilize agricultural crops, particularly those adjacent to wild land where they can feed without venturing far from cover. Sunflowers, soybeans and oats are favored crops. Corn, wheat and barley are also utilized. Alfalfa is utilized during spring green-up and late in the fall. Baled second and third cuttings of alfalfa and baled grain are highly preferred winter foods where available, especially during winters with deep snow.

A variety of intensive management efforts have been undertaken on public lands in the elk range to improve habitat for the benefit of elk and other native wildlife species. Efforts are aimed at setting back plant succession through prescribed burning and mechanical treatment of brush. Other efforts include accelerated timber harvest, which maintains the aspen cover type and provides early successional habitats for elk and other wildlife. The objective of these management activities is to attract elk to non-agricultural land. Within the Grygla and Kittson County elk ranges, additional active management strategies, including food plots and rotational cattle grazing, have been used to encourage elk use of state land rather than adjoining private lands. The DNR plans to continue this intensive management on state lands. Additionally, DNR will continue to work with partner organizations such as The Nature Conservancy (TNC), Rocky Mountain Elk Foundation (RMEF), Minnesota Deer Hunters Association (MDHA), and other organizations and agencies on elk related habitat management projects.

Wildlife food plots have been a significant component of management in the elk range. Food plots have been established to encourage elk to remain on public lands or private lands where elk are acceptable. Food plots from 3 to 40 acres in size are planted to sunflowers, soybeans, oats, winter wheat, corn, buckwheat, clover, canola or alfalfa in an effort to reduce elk depredation on private lands. In 2014, a new food plot mixture of rape, turnips and radishes was added to the planting options and has been particularly useful for sites that are impacted by wet conditions. Food plots have also been established on privately owned fields in Kittson County to reduce elk damage on nearby cropland.

ELK DEPREDATION PREVENTION AND COMPENSATION

Elk damage to agricultural crops and private land occurs in a number of ways, including damaging growing crops such as grains and hay, consuming and contaminating stored forage, knocking down pasture fences, and damaging gardens.

Preventing or minimizing elk damage to agricultural crops, stored forage or fencing is essential to elk management in northwestern Minnesota. DNR uses and recommends a variety of techniques to prevent, minimize or mitigate elk damage, including:

- Stored forage management,
- Temporary and permanent fences or panels around stored forage,
- Non-lethal hazing,
- Recreational hunting,
- Food plots on public and private land,
- Damage payments from the Department of Agriculture to landowners that experience crop depredation and fence damage by elk, and
- Depredation shooting permits.

Stored forage management

During winter months, stored forage, such as feed or silage piles and baled hay, are attractive to elk. Damage results from direct consumption and contamination from feces and urine. Aggregating forage in locations near building sites and properly stacking bales in patterns can reduce occasional damage. For more chronic damage situations, DNR recommends and will provide permanent fencing and panel materials in accordance with a Cooperative Damage Management Agreement (CDMA). As provided in MN Statute 97A.028, producers are eligible to apply for fencing and other deterrent material assistance to protect stored forage or other specialty crops.

Temporary and permanent fences around stored forage

Elk may damage traditional livestock fencing. Chronic fence damage is burdensome to the producer and is a difficult problem to resolve. Minnesota Statute 3.7371 includes damage to fences in the list of damages from elk that can be reimbursed. In addition, Minnesota Statute 97A.028 provides for fencing materials to help protect stored forage crops, agricultural crops or pasture up to a value of $5000.

In 2006, Minnesota Statute 97A.028 allowed producers to receive up to $5,000 in measures to prevent the spread of Bovine TB which was found in cattle and wild deer in NW Minnesota in 2005. Several

permanent fences were constructed in the Grygla elk range where cattle had been present in (and related to) the Bovine Tuberculosis TB Zone. Since that time up to the present (October 2015) no additional permanent fencing options have been requested for elk damage prevention in or around any of the three elk ranges of the state.

Minnesota DNR continues to evaluate different fencing options, including temporary barriers that provide more permanent, but moveable, solutions. Landowner use of fencing materials as provided will reduce depredation payments and the potential for a backlog of unpaid claims experienced by producers waiting for MDA payments.

Recreational hunting

Managed public hunting is the primary tool for keeping elk populations within the limits set forth by the elk management plan. Hunting removes animals from the population, makes remaining animals more wary of humans, and depending on the timing and location of harvest, can remove specific problem animals in some situations. Details of hunt history and administration are set forth in the section entitled Hunting Season Management.

Food plots on public and private land

Food plot agreements with local growers in appropriate locations on private land may help minimize the impact of foraging elk on agricultural operations. Food plots established by the DNR or Cooperative Farming Agreements on public lands may attract and encourage elk to spend less time on private land. DNR has partnerships with organizations such as RMEF and MDHA to provide additional funding for elk management, including food plots, on both public and private land.

Damage payments to producers who experience crop depredation and fence damage by elk

Crop and livestock depredation from elk and wolf are managed differently than crop and livestock depredation caused by other species. Minnesota Statute 3.7371 requires the Commissioner of the MDA to verify damage claims and compensate producers for crops or fences damaged or destroyed by elk and livestock losses from wolf. Along with crop depredation, fence damage significantly contributes to the existing low tolerance of elk by producers in northwestern Minnesota. In some years, claims have exceeded the amount of money available, leaving a balance of unpaid claims. When this occurs, unpaid claims are held over for the next fiscal year and paid first before new claims are processed. In the past, backlogs of unpaid claims have occurred in association with budget cuts and increased damage claims (most recently in 2013). In response, funding for crop damage compensation was addressed by the 2015 Minnesota Legislature. However, the need to maintain adequate funding warrants continued monitoring in coordination with MDA.

Depredation shooting permits

Shooting permits are one of several tools used for elk depredation management. Because of the historically low population levels, elk shooting permits have been issued only in extreme situations. Currently, elk taken under shooting permits are given to food shelves or provided directly to needy families and are not retained by the permittee. In 2013, the Legislature modified Minnesota Statute 97B.515 to allow licensed elk hunters to assist the DNR with control of nuisance elk, outside of the open seasons established by the Commissioner, from August 15 through March 1.

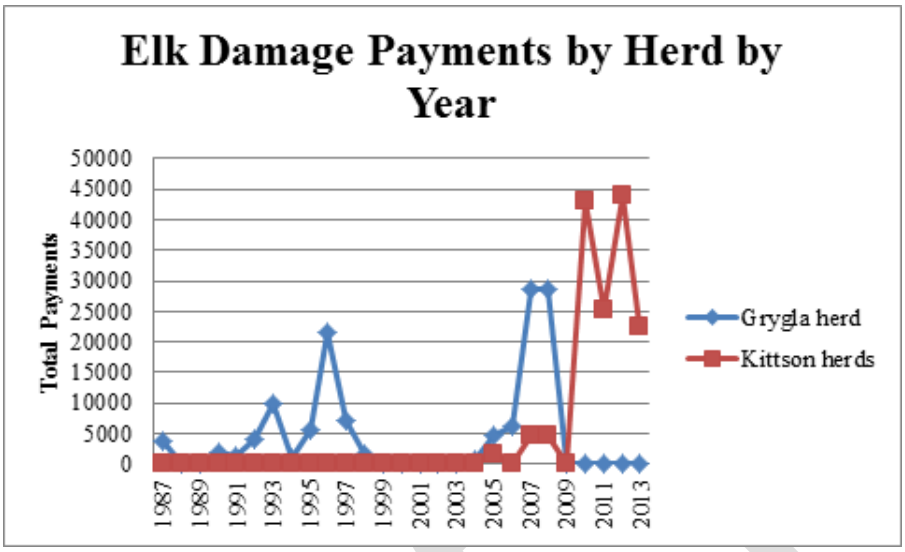

Figure 4. Damage Payments by Herd by Year Through 2013

Other supplemental feeding

The DNR discourages supplemental feeding of deer and elk in all but extreme cases. Supplemental feeding (short stopping) to abate local damage was used in the past in acute situations typically to detour elk feeding on stored forage (hay). Supplemental feeding can concentrate animals unnaturally. It increases the potential for disease transmission; alters behavior by habituating elk to a feeding situation; and may cause unintended consequences through altered habitat use and distribution. For these reasons, the DNR does not support supplemental feeding and will not financially or otherwise support voluntary feeding by others.

POPULATION MANAGEMENT

Population goals set in this plan reflect local, social carrying capacity, or publicly acceptable population goals. In addition to what is publicly acceptable, wildlife managers must also recognize biological factors, such as genetic viability considerations in small populations, known mortality factors, elk behavior and reproductive biology, in order to manage the population.

Genetics

Elk behavior (i.e., social structure and mating system) and reproductive biology tends to put this species at greater risk for genetic problems (Williams *et al.* 2002, Hand *et al.* 2014). In fact, Conard *et al.* (2010) suggested that isolated elk populations require a population size significantly higher than those identified by current Minnesota population goals to support long-term genetic diversity.

An analysis of genetic material from elk in the Grygla area suggests that this herd is not isolated, and that there is a periodic infusion of new animals into this herd, likely from the Kittson County and southern Manitoba herds and and/or from the Pembina Hills in northeast North Dakota (Denome 1998).

Additionally, Denome (1998) found that elk herds across North America had low levels of genetic variation, low levels of inbreeding, and little population differentiation. This and other studies suggest that a lack of genetic variation in elk may be a characteristic of the species and suggests that genetic isolation may not be a limiting factor for Minnesota elk.

More recent studies suggest greater caution with respect to genetic variability in small, isolated, or restored elk populations (Polziehn *et al.* 2000, Williams *et al.* 2002, and Conard *et al.* 2010). For example, the reintroduced Pennsylvania elk herd has demonstrated a high level of inbreeding and low genetic variation compared to other elk populations in North America (Williams *et al.* 2002). In the case of the Pennsylvania herd, the authors suggested that a small founding population in concert with a long-term period of low (24-65) population size – a population bottleneck – resulted in genetic diversity comparable only to that found in small island populations or endangered populations of animals (Williams *et al.* 2002). Elk in Minnesota experienced a similarly small founding population and even longer population bottleneck. However, unlike elk in Pennsylvania, elk in Minnesota may benefit from genetic inflow from other herds (Hicks *et al.* 2007).

Mortality Factors

The known mortality factors for elk in Minnesota are hunting, shooting for depredation control, poaching, predation, and accidents. Gray wolves and black bear inhabit the elk range and are known to prey on elk, but the extent of predation is unknown. White-tailed deer may cause indirect elk mortality through transmission of the meningeal worm (*Parelaphstrongylus tenuis*). Although deer are unaffected by these parasites, elk are susceptible to brainworm. *P. tenuis*-like larvae have been found in fecal samples of Minnesota elk, and several mortalities of elk in the Grygla range have come back as probable brainworm cases.

Age and Sex Structure

Research in western states suggests that bull age significantly influences the timing and synchrony of the rut (Noyes et al. 2006), and that bull to cow ratios, or bulls per 100 cows, around 25 to 100 result in tending of all females in a harem (Bender 2002). Typically, when mature bulls (> 4 years old) are present, a harem situation is established where a dominant male (called a “herd” bull) controls several cows in a herd. Younger bulls (called “satellite” bulls) stay on the periphery of the harem and try to breed individual cows from the harem. The herd bull spends a great deal of time protecting his harem from satellite bulls; thus, naturally occurring elk populations will not achieve a 1 to 1 adult sex ratio. In Michigan, elk harem size is related to bull to cow ratios, which have been reported as high as 60 to 100 (Bender 1996). Given the low total population size in Minnesota elk herds, a bull to cow ratio of roughly 50 to 100 should be adequate to maintain a natural elk breeding complex and a sustainable number of males in the breeding population. A smaller number of bulls would result in a herd more susceptible to catastrophic events, such as poaching or other mortality events.

Population Estimates

Elk population estimates for the Grygla elk herd are currently generated from annual aerial surveys conducted during the winter (Fig. 5), and from ground survey routes that are driven multiple times from spring through fall. Population estimates from the past 11 years have ranged from 18 to 55 animals. Note that population estimation techniques have been modified since 1940 and, therefore, current estimates may not be directly comparable to those of early years.

Population estimates for the Kittson County herds are generated from annual aerial surveys conducted during the winter, ground observations, reports from local residents living in the elk range, and population estimates provided by Manitoba Conservation (currently coordinated between DNR and Manitoba Conservation). Currently, two generally distinct populations exist in Kittson County; the Kittson Central herd and the Caribou-Vita herd (Fig. 6). Population estimates for the Kittson Central herd from the past six years have ranged from 34-45.

The last survey coordinated with Manitoba on the Caribou-Vita herd was conducted in 2011. A total of 98 elk were observed with a population estimate of 120-150. Scattered elk also show up from time to time on the periphery of the traditional elk ranges each year.

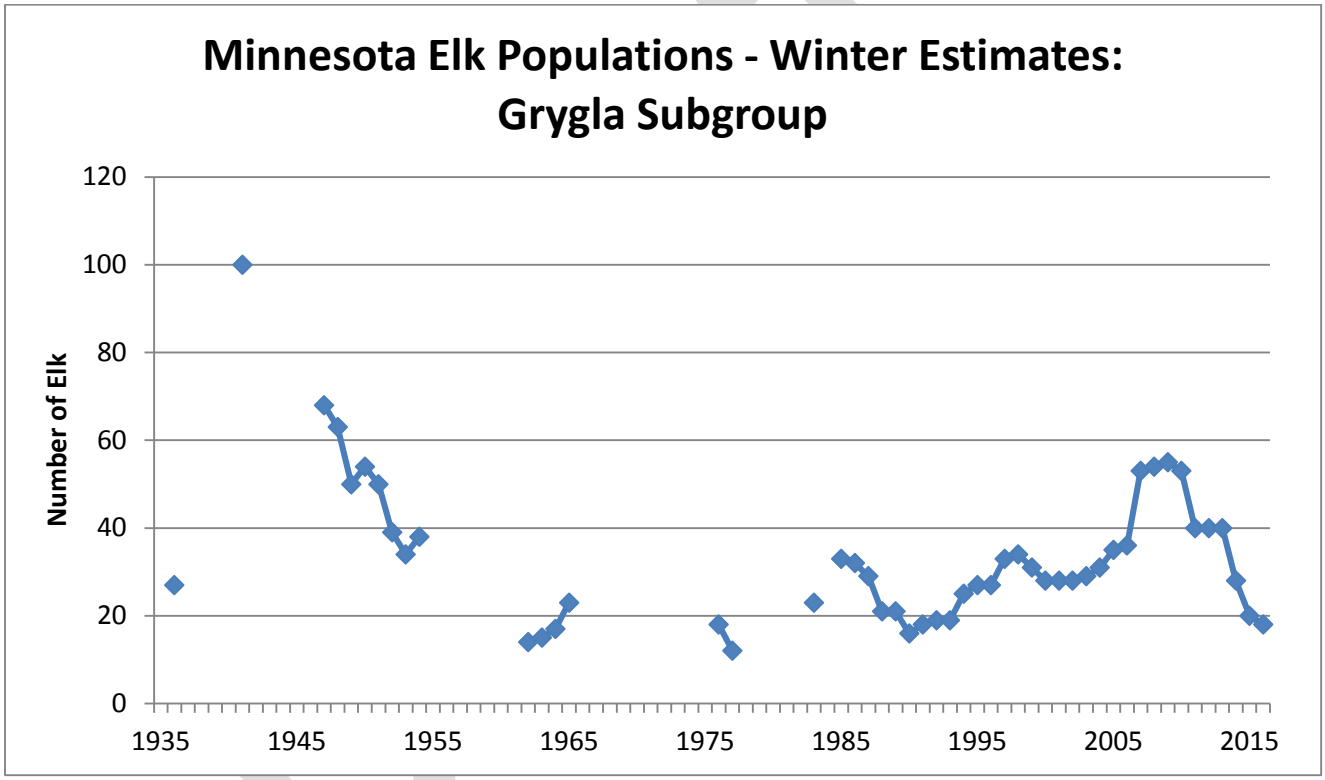

Figure 5. Estimated Elk Population--Grygla Herd

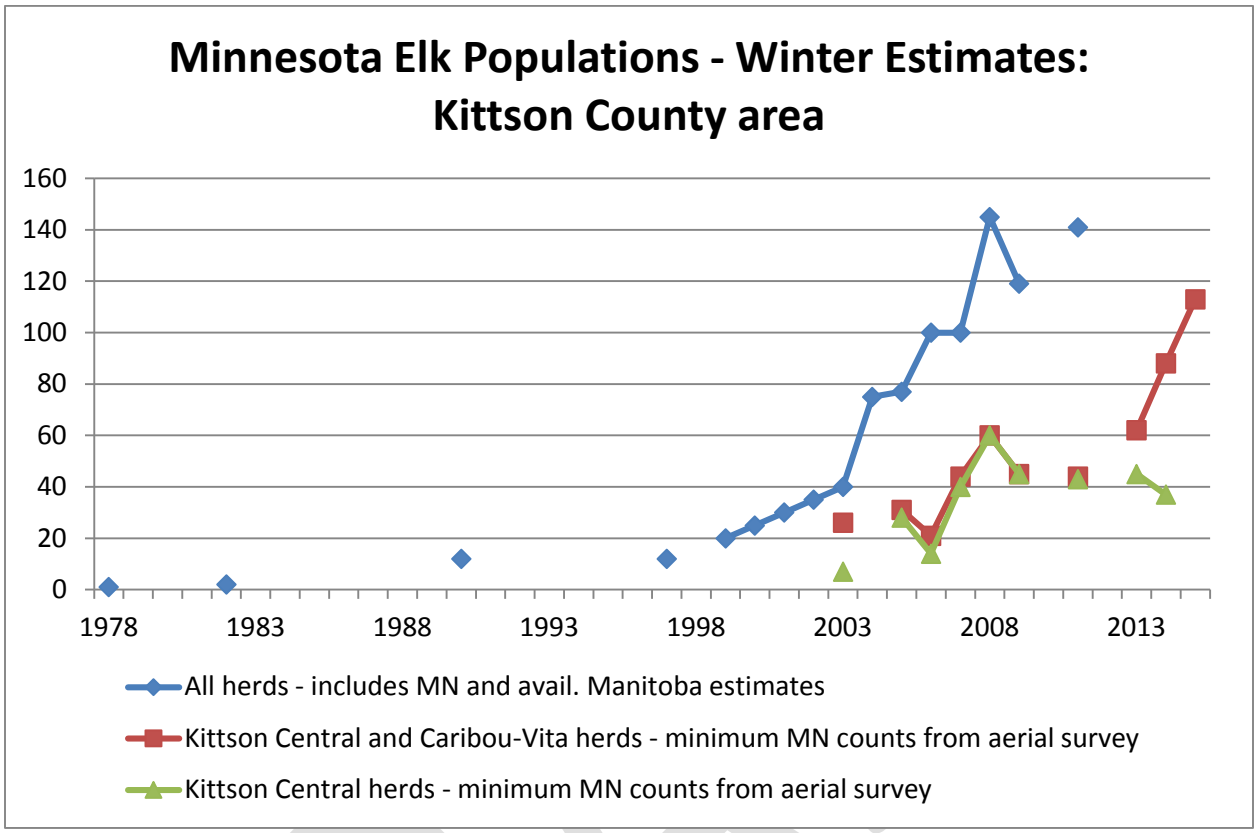

Figure 6. Estimated Elk Population --Kittson Central and Caribou-Vita Herds

DISEASE MANAGEMENT

Elk are susceptible to a variety of known wildlife and domestic animal diseases and parasites. Minnesota's free-ranging elk populations are exposed to both captive cervids and livestock (primarily beef cattle) operations, and the potential movement of diseases between captive and wild animals is an ongoing risk factor. Therefore, monitoring of Minnesota's wild elk for a wide variety of pathogens is important to maintaining the overall health of the population.

Chronic Wasting Disease (CWD) has become a concern with deer and elk populations nationwide and in some Canadian provinces in recent years. CWD has been documented in wild white-tailed deer populations in the neighboring states of Wisconsin, Iowa, and South Dakota, as well as Saskatchewan to the northwest. The presence of CWD in wild deer in adjacent states prompted monitoring in wild populations of deer in Minnesota beginning in 2002. Since then, CWD has been documented in five different captive deer or elk herds in Minnesota, and in one free-ranging white-tailed deer in Olmsted County. Through November 2014, 113 wild elk have been tested for CWD and none were positive.

Bovine tuberculosis (TB) is a contagious bacterium of the family *Mycobacterium*. The disease has its origin in European cattle and was most likely imported into North America from the European continent.

Through the turn of the 20th century, the federal government implemented a bovine TB eradication program, which has largely been successful, as the prevalence of the disease in domestic cattle has been reduced to very low levels.

In summer 2005, bovine TB was diagnosed in five Minnesota cattle farms near the town of Skime in southeastern Roseau County. By 2009, the number of bovine TB-infected cattle farms identified had grown to 12. Subsequent to the discovery in cattle, DNR implemented a bovine TB surveillance program for wild deer and detected 27 positive deer with a limited geographic distribution of 165 mi^2 area centered on Skime. In addition to testing of hunter-harvested white-tailed deer, an extensive deer population reduction project was initiated in 2006 to decrease deer densities and the potential for deer-to-deer transmission of the bovine TB bacteria in northwestern Minnesota.

Beginning in 2008, elk were included in the targeted TB surveillance so that if they became available to sharpshooters, they would be removed and tested per the deer protocol. One bull elk was taken as a result of the TB testing effort in March 2009 and it tested negative.

Continued surveillance in both cattle and deer in the area from 2010-2012 revealed no additional TB-positive cases and the disease has been reduced to an undetectable level, if not eliminated. There have been concerns about potential disease transmission to elk because the Grygla elk range overlaps with some of the infected cattle farms. All elk taken during Minnesota hunting seasons, as well as other elk carcasses that are obtained, are tested for bovine TB and CWD.

HUNTING SEASON MANAGEMENT

Minnesota Statute 97B.515 allows for an elk hunting season when the pre-calving population exceeds 20 animals. Hunter harvest has been the principal tool used to limit elk population growth. Generally, bull or either-sex seasons have been held in September while antlerless hunts have been scheduled later in the fall and into winter. Applicants for the hunts are required to submit an application for a party of one or two. Successful applicants are required to attend an orientation session where licenses are validated and hunters are briefed on factors pertaining to the hunt. Minnesota Statute 97A.433 requires that the elk hunt is a once-in-a-lifetime opportunity.

Under existing MN Rules, landowners and tenants are eligible for up to 20 percent of the issued licenses as determined by the DNR commissioner. At least one landowner permit has been authorized for each annual hunt. Landowners or tenants who receive a license through the separate selection must allow public elk hunting on their land during the applicable elk season.

Seasons have been held when two or more licenses could be issued. Factors such as population estimates and associated goals, the relative proportion of bulls and cows in the population, the age distribution of animals in the herd, and depredation complaints are considered prior to authorizing a hunt. Currently, licensed hunters may be authorized to take problem elk from August 15 to March 1.

Grygla

In 1987, Minnesota held its first elk hunt since 1893 (Table 1). Seasons in the Grygla area have since been held in 1996-1998 and again in 2004-2012. Elk hunting on the Grygla herd was suspended in 2013,

2014, and will be in 2015 because the population survey for those years indicated numbers below the goal range of 30 animals. The Grygla hunting zone is depicted in figure 7. The DNR holds hunting seasons on the Grygla herd according to population and management goals. The population goal for the Grygla herd remains unchanged for the 2016 elk management plan at 30 to 38 due to the opposition of local producers to any population increase.

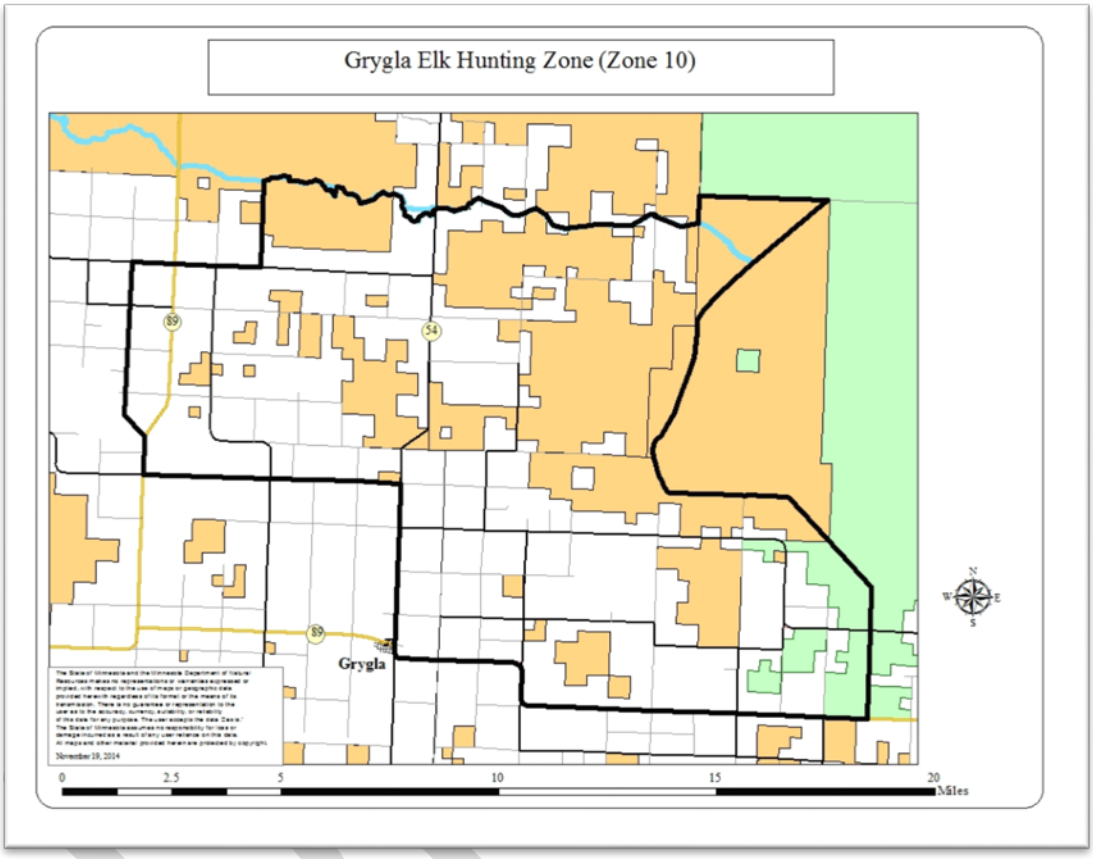

Figure 7. Grygla Elk Hunting Zone

Kittson County

The first elk hunt in Kittson County on the Kittson Central herd was held during 2008 in a 125mi^2 area located east and south of Lancaster. This hunt was instituted in response to an increasing number of standing crop and stored forage depredation complaints. In total, 11 licenses were offered (1 either-sex, 10 antlerless) and all were filled. The hunt targeted the Lancaster subgroup found in the Kittson Central herd at that time. The current Kittson hunt zone is depicted in figure 8.

The Lancaster subgroup of elk was first noted in approximately 2004 and contained animals of captive origin. Due to this status and the chronic depredation issues associated with this subgroup, it was targeted for complete removal. Removal was accomplished though licensed hunting and with the

Table 1. Elk Permit Allocation and Harvest by Year and Sex

	Bulls		Antlerless	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
Grygla				
1987	2	1	2	1
1996	2	2	7 (1 alternate)	6
1997	5 (2 alternate)	1	5 (2 alternate)	2
1998	4 (2 alternate)	2	0	0
2004	1	1	4	2
2005	1	0	4	0
2006	2	2	6	2*
2007	0	0	6	6
2008	2	2	10	6
2009	2	3	12	11
2010	2	1	5	3
2011	2	2	2	0
2012	2	1	3	0
2013	No season			
2014	No season			
Total	27 (4 alternate)	19	66	39
	Either Sex (2008-2013) or Bulls (2014)		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
Kittson Central Herd				
2008	1	1	10	10
2009	12	9	4	5*
2010	1	1	3	3
2011	2	2	8	5
2012	3	3	13	3
2013	6	4	15	6
2014	7	4	0	0
Total	32	24	53	32
	Bulls		**Antlerless**	
Year	**Permits**	**Harvest**	**Permits**	**Harvest**
Caribou-Vita Herd				
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	2	1	0	0
2013	2	2	0	0
2014	2	2	0	0
Total	6	5	0	0

*One of two elk taken was a spike bull.

additional help of United States Department of Agriculture (USDA) Wildlife Services in 2010. Elk that repopulated this area following the removal effort are considered of wild origin and managed in a manner consistent with this plan.

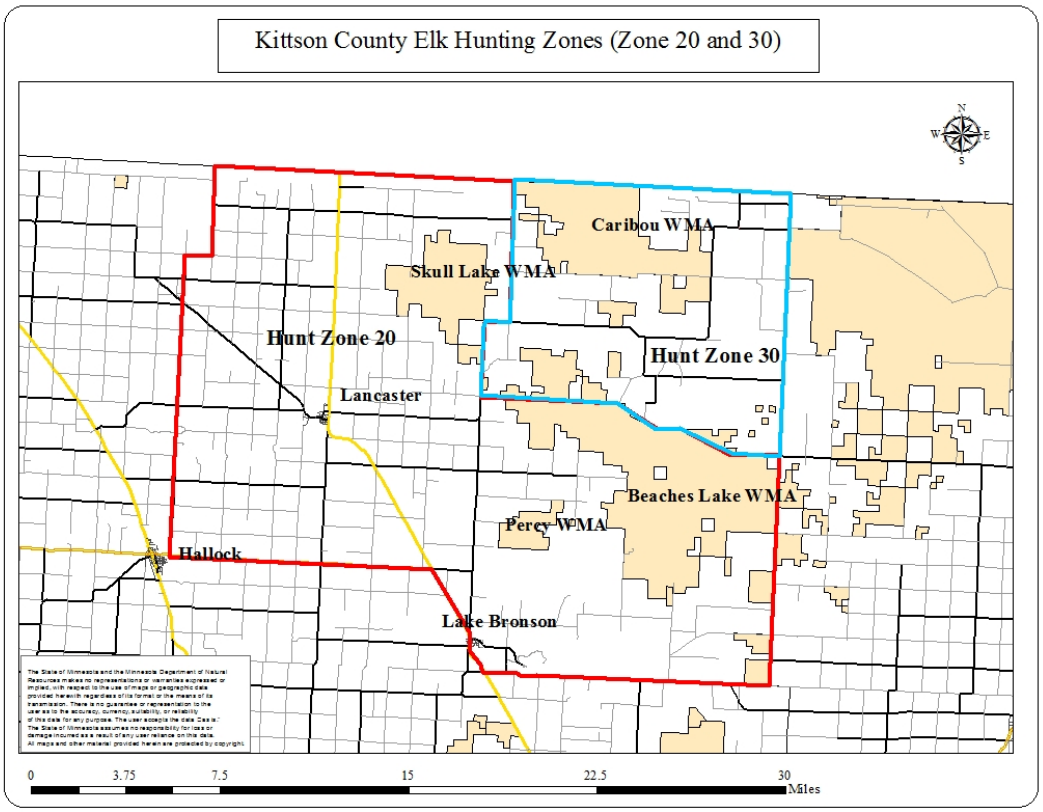

Figure 8. 2015 Kittson County Elk Hunting Zones

Beginning in January 2016, the new population goal for the Kittson Central herd is 65 – 75 elk. Management and hunt objectives will be focused on population growth toward this goal. DNR's primary hunt management focus will be to harvest bulls annually and retain cows to maintain the herd's maximum reproductive capacity until the goal population is reached. Limited hunting seasons are necessary to keep elk wary of human activity and reduce depredation.

The Caribou-Vita herd is shared with Manitoba along the U.S./Canada border. Therefore, ongoing coordination with representatives of Manitoba Conservation and Minnesota DNR is an important part of the Caribou-Vita elk herd management. Coordination occurs at annual meetings. Past meetings have focused on all aspects of management, including population survey results, population goals, hunting seasons, habitat management, and depredation issues.

The current population goal for this international herd is 150 to 200 by mutual agreement between Manitoba Conservation and Minnesota DNR. Manitoba Conservation will not consider a provincial

managed hunt for this herd in Canada until the population numbers at least 200; however, First Nations and Métis in Canada have harvesting rights to this and other elk herds and do harvest elk from the Caribou-Vita herd. Since 2012, Minnesota has implemented a limited hunt of two bulls annually on the U.S. side of the border in order to keep elk in the herd wary and shy of farmsteads.

Additional Opportunities

Over the course of the current plan, DNR will review and consider implementation of various public suggestions regarding future hunting opportunities. Public suggestions have included the implementation of an archery elk hunting season, additional elk harvest in the Caribou-Vita herd on the US side of the border, revision of hunt zone boundaries, and alternative licensing options that encourage landowner support for elk management.

ECONOMIC VALUE OF ELK

Minnesota Statute 97B.516 recognizes the value and uniqueness of elk; provides for integrated management of an elk population in harmony with the environment; and directs management to afford optimum recreational opportunities.

When developing the elk management plan, the DNR must not only consider the biological, social, and environmental issues, but also the potential economic benefits associated with a viable elk population. Elk have the potential to attract significant tourism by providing viewing opportunities and recreational hunting that benefits the local economies.

According to the U.S. Fish & Wildlife Service 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, state residents and nonresidents spent $3.9 billion on wildlife recreation in Minnesota in 2011. The survey reports that Minnesotans hunt an average of 12 days/year and spend an average of $42/day. Wildlife viewers engage in viewing activities an average of 14 days/year and spend an average of $33/day.

Several studies on the economic benefits to elk viewing in states such as Pennsylvania, Kentucky, and Oregon demonstrate that wildlife viewing benefits to local economies are substantial. Although difficult to estimate, wildlife viewing can contribute greatly to the economic development opportunities for communities.

Elk-related tourism, which includes hunting and recreational viewing, has bolstered local economies in other states where elk have been reestablished, most notably Kentucky (Cox 2011) and Virginia (McClafferty 2000). People from outside of the elk range travel to northwest Minnesota to view and hunt elk, and likely spend considerable resources in doing so. Elk have also been highlighted as one of the species to see at several of the stops on the area's Pine-to-Prairie Birding Trail and shed antler hunting is also popular.

The intrinsic value of maintaining elk on Minnesota's landscape is significant. Elk are a large, charismatic native species and a valuable but vulnerable part of Minnesota's natural history. The NW Minnesota Aspen Parkland and Tallgrass Prairie ecosystems are rich with abundant wildlife species, including elk,

that offer great opportunity for recreation and economic benefit.

ELK RESEARCH

Despite a century of managing elk in Minnesota, significant gaps in information exist about the local ecology of the population. To support the first study of elk seasonal movement and habitat use in Minnesota, a research proposal developed by DNR was recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR) for funding approval in 2015 by the Legislature. The Legislature approved funding the project via the Environment and Natural Resources Trust Fund (ENRTF) during the 2015 legislative session. Improving our understanding about seasonal movement patterns and habitat use of elk will facilitate population monitoring processes, help evaluate current habitat and depredation management actions, and aid in developing science-based options for managing elk and their habitats in future years. Minnesota DNR also recognizes the influence of stakeholder attitudes on elk management opportunities. As a result, the agency has committed additional research funding to study elk management preferences of landowners in Northwest Minnesota. Summaries of the elk research proposals are provided in Appendices 3 and 4.

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APPENDICES

Appendix 1. The History of Elk and Elk Management in Minnesota

Minnesota's native elk were originally abundantly distributed across much of the state, occurring everywhere except in native caribou range, but were extirpated by the early l900's (Hazard 1982). Minnesota's prairie elk were probably the Manitoba subspecies, *Cervus elaphus manitobensis* while the herds within the hardwood forest were likely eastern elk, *C. e. canadensis* (Fashingbauer 1965).

As late as 1841, elk were still common in southern Minnesota, and herds of a thousand or more animals were observed at that time. Elk were reported in Aitkin, Itasca, Roseau and Kittson Counties in the 1890s, in Lake of the Woods County in 1917, and in other parts of northwest Minnesota as late as 1932. Elk were granted complete protection from hunting from in 1893.

In 1913, the Minnesota Legislature appropriated $5,000 for the re-establishment of the elk population. Fifty-six elk of the Rocky Mountain subspecies, *C. e. nelsoni*, were obtained from Jackson, Wyoming in late 1914 and from north of Yellowstone National Park in 1915. An additional 14 elk, descendants of elk captured in Wyoming, were obtained from the James J. Hill farm in Ramsey County, Minnesota in 1914. These 70 elk were placed in an enclosure in Itasca State Park. Because the health of the animals deteriorated during shipment, only 13 elk remained after one year's time. By 1925, the herd had increased to about 25 animals. Some animals were then provided for display in other state parks, while others were permitted to roam free in Itasca State Park.

In 1929, 8 elk were released in the Stony River District in the western portion of the Superior National Forest. This introduction failed to establish a free-ranging elk herd. In November of 1935, 27 of the remaining Itasca State Park herd were released into northwestern Beltrami County, on the Haug Ridge area of the Red Lake Game Preserve, while seven were kept at Itasca State Park for display (Fashingbauer 1965). Since native elk were observed as late as 1932 in northwestern Minnesota, some native elk may have been present on or near the release area at the time of reintroduction. The Haug Ridge area was within the boundary of the Federal Government's Settler Relocation Program and as a result contained an interspersion of small fields, grass, brush, and timber. The elk population reached 100 animals within 10 years. During the 1940s, elk were observed as far south as Bagley and as far west as Thief River Falls.

Management during the resettlement years was quite intensive, but management efforts diminished after 1940 when the Resettlement Project ended and World War II began. The first documented elk damage to haystacks and standing crops was reported in 1939. As damage continued, poaching became a problem and was considered to be the factor limiting the herd's increase. By 1946, the elk population had declined to 68. By 1949, damage was reported to be severe in the Grygla area. By 1950, the estimated number of elk had dropped to 50 animals. As habitat changed through vegetative succession, the elk continued to move southwest away from the original release site.

In 1975, a farmer experiencing elk damage to crops shot five elk in the Grygla area. In 1976, the DNR developed an elk management plan that set management goals for state lands and addressed crop

depredations. Although no special funding was appropriated, elk habitat management has been conducted since the late 1970s on state land including openings maintenance, food plots, winter feeding, and brushland shearing and prescribed burning. Winter feeding to hold elk in areas that minimize agricultural damage has been largely discontinued due to animal disease concerns, and is only used as an emergency measure in some depredation situations.

In August 1984, a legislative hearing was held in Grygla to address the elk crop depredation problem. When the problem was not resolved to the satisfaction of Grygla area farmers, they sought a legislative solution during the 1984-85 session. Consequently, legislation was passed requiring the DNR to remove all elk from Marshall, Roseau, Beltrami, and Pennington Counties by September 1, 1985.

In response, the DNR reviewed several potential elk relocation sites. Because primary criteria for selecting elk habitat included little or no private agricultural land, the Kiwosay Wildlife Sanctuary within the Red Lake Indian Reservation (RLIR) in Clearwater County was selected as the relocation site.

Although baiting elk into a corral during winter was recommended as the most successful method of capture for relocation, the DNR had to first attempt to employ other methods because of the September 1 deadline. Pre-winter baiting, driving with a helicopter, and darting were attempted with limited success. After a large bull was darted and subsequently drowned, the DNR was permitted to delay the relocation attempt until freeze-up when baiting could be used more effectively.

From October 1985 until March 1986, 14 elk were captured by driving, darting, and baiting. Nine of these elk were transported to the Red Lake Indian Reservation. Two of the elk were euthanized because of injuries received during relocation, and two were illegally killed in the spring following release. The remaining 5 elk were observed on the Red Lake Indian Reservation for about a year after their release. These animals likely account for subsequent sightings of elk in the Clearbrook-Gonvick area.

The DNR remained under legislative mandate to remove the elk from the Grygla area, so baiting efforts were initiated again in December 1986. However, on December 12, 1986, the Sierra Club and others were successful in imposing a court injunction on the DNR that enjoined the Department from any further elk roundup attempts. The court ruled that attempts to move the elk would jeopardize the welfare of the elk and could lead to their extirpation. The court ruled that it was the intent of the legislation to move the elk, not to eliminate them.

Legislation was drafted during the 1986-87 legislative session that allowed for an elk hunting season and financial compensation to farmers who experienced crop damage caused by elk. The bill subsequently passed and the first elk season since 1893 was held in the fall of 1987. At the time (1988), the pre-calving population of the Grygla herd was estimated to be 21 animals. By spring of 1996, the population had increased to 33 and an elk management roundtable was held in Thief River Falls to discuss the draft Minnesota Elk Management Plan and a hunting season proposal. This herd was hunted in 1996-98, and 2004-2009.

Elk were first noted in Kittson and Roseau Counties along the Manitoba border in the early 1980s. These animals were wintering in Manitoba, while calving and spending summers in Minnesota. The Kittson County herd as it is known is divided into three subgroups based on distinctive areas of use. These three

subgroups are the Water Tower subgroup (north of Lancaster), the Lancaster subgroup (east of Lancaster) and the Caribou/Vita subgroup (located between Caribou, MN and Vita, Manitoba). The Caribou/Vita herd is known to occupy either side of the international border at any time of year. The extent to which the other two subgroups cross into Canada is unknown. Little is also known regarding the extent of animal interchange between the Caribou/Vita subgroup and the other two subgroups.

In 2004 an escaped domestic elk from North Dakota was killed per the DNR's escaped cervid policy east of Lancaster. This was a bull elk having a tag in its ear leading to the escape origin discovery of the animal. A month later a number of elk were observed in the Lancaster area having "ear slots and holes" present in their ears indicative of captive origin. An additional 5 were shot and were examined for further evidence of their origin, however none was found.

Collectively, the three subgroup elk herds in Kittson County grew in size relatively quietly, until 2008. Crop depredation issues again brought Minnesota elk management into the public spotlight, and the DNR reacted by opening a hunting season on these animals for the first time in 2008. The Lancaster subgroup was noted for their curious unwary behavior of human farmsteads and people and this subgroup was also suspected of captive origin. Subsequent hunting seasons targeted this subgroup for full extermination and, following the hunting season of 2011, sharpshooters from USDA were hired to successfully eliminate the remaining elk of this subgroup. Following this event all elk in Kittson were deemed of wild origin in the remaining subgroups of the Water Tower herd and the Caribou-Vita herd. The remaining elk are now categorized in two generally distinct populations consisting of the Caribou-Vita herd (the cross border herd shared with Manitoba along the Canada/US border) and Kittson Central herd (all other elk found in Kittson County).

Per the population goals of the 2009 Elk Management Plan (Grygla herd 30-38 and Kittson Central herd 20-30) both the Grygla and the Kittson Central herds were above goal. Subsequent hunting seasons were directed to move the populations toward goal levels. In the 2013 elk survey the Grygla population was estimated at 28 animals and below the lower range desired for this population. No hunting season was held for the Grygla herd in 2013 or 2014 due to population counts below the lower end of the goal range. The Kittson Central herd was moving toward the upper end of the goal range and had a population count of 37 during the 2014 elk survey. A hunting season was held for the Kittson Central herd in 2014.

The Caribou-Vita population lacked a credible population estimate and in 2011 a joint Manitoba/Minnesota elk survey took place on each side of the border on the same day; an estimate for this herd was given as 120 to 150 animals following the survey. Annual meetings are held with Manitoba Conservation and Water Stewardship to effect joint management decisions for this shared resource. In 2012 a population goal of 150 to 200 elk was mutually set for the herd. Minnesota enacted the first hunt for this herd in 2012 with two bull permits offered largely to keep elk wary of farmsteads and have low impact to the population. Manitoba has set a target of 200 animals before a hunting season will be considered on their side of the border.

Appendix 2. 2009-2014 Elk Plan Accomplishments

In 2009 DNR formally adopted an elk management plan with the assistance of two consensus working groups established for the Kittson County elk herds and the Grygla elk herd. This report will briefly describe the accomplishments that have resulted from implementation of the plan, including those related to elk management and recreation as well as elk damage to crops and damage compensation.

The 2009 elk plan has five goals:

1. Monitor population status and achieve the population goals outlined in this plan within legal, social, and environmental limits.
2. Increase landowner acceptance of elk on the landscape by addressing and resolving landowner concerns.
3. Manage Minnesota's aspen parklands landscape as an integral component of elk habitat.
4. Provide opportunities for appreciation and recreational use including regular hunting seasons.
5. Increase information sharing with the public regarding elk and elk management issues.

In an effort to achieve these goals, six objectives and associated strategies were implemented over the course of the six-year plan. The 2009 objectives were as follows:

Objective 1. Maintain pre-calving populations of 30 – 38 elk in the Grygla herd and 20 - 30 in the Kittson County herd, not including the Caribou-Vita subgroup. Maintain a socially acceptable number of elk in the Caribou-Vita subgroup, which is shared with Manitoba.

Objective 2. Improve landowner acceptance of elk.

Objective 3. Improve forage quality and availability and maintain quality habitat on public lands for elk.

Objective 4. Maintain the health and reproductive potential of the elk population.

Objective 5. Provide regular hunting seasons for elk in Minnesota.

Objective 6. Provide information to stakeholders, the public, and landowners regarding elk populations and management.

A brief summary of these efforts and accomplishments are shown in *italic* below.

Objective 1 - Maintain pre-calving populations of 30 – 38 elk in the Grygla herd and 20 – 30 elk in the Kittson County herd, not including the Caribou-Vita subgroup (now also known as Kittson NE herd), which is shared with Manitoba.

Strategy A: Conduct annual population surveys to monitor population status. Coordinate on surveys conducted on the Caribou-Vita subgroup.

Strategy B: Review, and if feasible improve, existing survey methodology, and assess the value of citizen reporting in the survey.

Strategy C: Establish a process and timeline with Manitoba to determine the population goal of

the Caribou-Via subgroup.

Strategy D: To the greatest extent possible, use hunting seasons to manage elk populations at population goal levels.

Mid to late winter aerial elk surveys are conducted annually when favorable survey conditions develop (snow cover at least 8 inches). In 2010 helicopter aircraft were used to fly in designated survey areas with observers recording elk as they were found. During the 2013 and 2014 surveys a combination of fixed wing and helicopter aircraft were used as a method to improve the observability of elk. This method is under review currently for improvement in survey methodology. Additionally, public sightings are recorded as reported and serve to add information on herd size and location. These also help when conducting the formal aerial survey to have an approximation of where to expect elk to be found.

In 2011 a joint aerial survey was conducted on the Caribou-Vita herd (also known as the Kittson NE herd) with the Manitoba Conservation and Water Stewardship Agency and a population estimate of 120 - 150 elk was made. At the 2012 Manitoba/Minnesota Elk Meeting a population goal for this herd was set at 150 to 200 elk.

In 2009 both the Grygla and Kittson Central herds were known to be above population goals set for each herd in the elk plan. Hunting season structure and permit numbers issued have been designed since 2009 to bring the populations within goal range. The 2014 survey showed that the Kittson Central herd count was 37 and still above the upper end of the goal range. A hunt is planned in 2014 that should bring the herd closer to or within goal range. The Grygla herd in 2014 was found to be significantly below the lower end of the goal range and no hunt is planned for 2014.

Objective 2 – Improve landowner acceptance of elk.

Strategy A: Work with the Minnesota Department of Agriculture (MDA) and the Minnesota Legislature to continue a fully funded elk damage compensation program so that all damage claims are paid fully and timely.

Strategy B: DNR will work with MDA to better publicize annual crop damage payment information to the public.

Strategy C: DNR will work with agricultural agencies to document fence damage and find solutions to the problem, including testing of a variety of fence types.

Strategy D: Work with the Minnesota Legislature to increase the statutory limit on emergency deterrent materials in 97A.028 for assistance in stored forage protection. Coordinate additional technical assistance on abatement techniques through the University of Minnesota, MDA and DNR.

Strategy E: Work proactively with landowners to identify depredation situations and prepare a cooperative damage plan that identifies a progressive series of abatement techniques. Examples of abatement techniques include temporary and permanent fencing, hazing and depredation shooting permits.

Strategy F: Establish in MN Rule a mechanism to authorize licensed elk hunters to take depredating elk outside the hunting season.

Strategy G: Better clarify and communicate to hunters and landowners how non-licensed persons can provide assistance to licensed hunters during the elk hunt.

Strategy H: Expand the food plot program on public lands throughout the elk range using locally accepted agricultural practices.

Strategy I: Provide technical and financial assistance for private land management that benefits elk through the DNR private lands and private forest management programs. Expand the use of private land standing crop and green forage food plots.

Strategy J: When elk are taken using depredation shooting permits, notify the affected landowners of disease testing results. Post all elk disease testing results on the DNR web site.

Strategy K: Use existing authorities to promptly remove elk suspected of captive origin.

This objective has many strategies and while progress has been made on many of them, a few have yet to be accomplished. Work with the Minnesota Dept. of Agriculture (MDA) has largely been through the county extension office working through Minnesota Statute 3.731. During the course of the plan several legislative changes have been made in regarding this objective. A list of them follows:

- *The bi-annual appropriation for elk and wolf damage compensation has been raised from $150,000 per biennium to $300,000 per biennium. (The amount has since been reduced to $200,000 by the Legislature.)This also includes damage to fences.*
- *Emergency deterrent materials as provided under Minnesota Statue 97A.028 specific to elk depredation were increased up to $5000 per producer.*
- *Subdivision 4 under Minnesota Statue 97B.515 was added to allow a licensed elk hunter to take elk causing depredation during the timeframe of August 15 to March 1.*

Significant increases in elk food plot funding have been made and are discussed under Objective 3 below. This has allowed additional food plots to be added at strategic locations on both public and private land. Protocol for working with landowners experiencing elk depredation, including emergency deterrent materials, has been established using Cooperative Damage Management Agreements. Biological samples are collected from all elk taken during hunting seasons, and from shooting permits, road kills (if possible), and other means, and are sent to diagnostic labs for extensive disease testing. Additionally, any elk observed which have indications of captive origin are removed as soon as possible by existing staff and local authorities. Early in the plan the Lancaster herd was suspected to be of captive origin. This subgroup was removed by sport hunting and sharpshooting and all known elk in Kittson County are now deemed of wild origin.

Additional work to publicize annual crop depredation payments and disease testing results is needed. As envisioned, this information could be included on the MDA's and DNR's web sites. This information is currently shared with members of the elk working groups at the annual meeting.

Objective 3 – Improve forage quality and availability and maintain quality habitat on public land for elk.

Strategy A: Increase the quantity and quality of food plots on public lands throughout the elk range using locally recognized farming practices.

Strategy B: Continue habitat development through brushland shearing, timber harvest, and prescribed burning in the Wapiti, Grygla, Caribou, Skull Lake and Beaches Lake WMA's.

Since the elk plan adoption in 2009, funding for both public and private land food plots has been a Section of Wildlife priority. In recent years, $45,000 in Game and Fish fund dollars has been allocated annually for food plots. Additional cooperative funding from the Rocky Mountain Elk Foundation (RMEF) and the Minnesota Deer Hunters Association (MDHA) has been received and added to the total amount available for this effort. Habitat improvement projects are conducted annually on WMAs within the Elk Range; this includes prescribed burning to keep brushlands open and in an early successional state, mechanical brushland treatment via shearing and hydro-axe techniques, and timber harvest strategies to rejuvenate aspen stands. Funding for these habitat improvement activities is dependent on additional supplements from Lessard-Sams Outdoor Heritage Council, RMEF, MDHA, and DNR accounts.

Objective 4 – Maintain the health and reproductive potential of the elk population.

Strategy A: Test all harvested elk and all other suitable elk carcasses for bovine tuberculosis, chronic wasting disease and other diseases using adequately trained personnel.

Strategy B: Seek and implement strategies to minimize elk-cattle contact.

Strategy C: Maintain and enforce the existing wildlife feeding ban in the bovine TB management area.

Strategy D: Maintain a targeted post-hunt sex ratio of 2 cows per adult bull.

Strategy E: Use existing authorities to promptly remove elk suspected of captive origin. This includes the elk remaining in the Lancaster subgroup following the 2009 hunts. These animals will be removed by April 30, 2010. (Elk that repopulate this area following the removal effort will be considered of wild origin and managed in a manner consistent with the management plan.)

This objective was largely aimed at the Grygla herd as this herd's range overlapped with the bovine TB zone of the state. As mentioned in Objective 2, all available hunted and road-killed elk, regardless of where found in the state, are tested for many diseases including TB and CWD. Considerable effort was made in the TB zone and encouraged elsewhere to provide and construct permanent fencing for stored forage to exclude both elk and deer. DNR also worked with producers to evaluate feedlot and pasture practices to better understand how to minimize elk and deer contact with domestic livestock. A feeding ban for deer was put into place in a larger area surrounding and including the TB zone. This was maintained through the TB testing period and beyond the time when the state received TB free status. The feeding ban recently ended in the early part of 2014. See objective 2 discussion regarding removal of the Lancaster subgroup suspected to be of captive origin.

Objective 5 – Provide regular hunting seasons for elk in Minnesota.

Strategy A: Annually monitor elk herd movements and population levels for both the Grygla and Kittson County herds to determine hunting license numbers.

Strategy B: Establish hunting seasons for the Grygla herd to maintain a pre-calving population objective of 30-38 animals, which is based primarily on winter population surveys and other elk observations.

Strategy C: Establish hunting seasons for the Kittson County herd (excluding the Caribou-Vita subgroup) to maintain a pre-calving population objective of 20-30 animals, based primarily on winter population surveys and other elk observations.

Strategy D: Coordinate with Manitoba Conservation and Water Stewardship to determine a population level and hunting management strategy that is socially acceptable to stakeholders in both countries.

Strategy E: Work with the Minnesota Legislature to modify the "once-in-a-lifetime" elk license provision.

Strategy F: Establish in MN Rule a system that improves applicant's odds of drawing a permit over time.

Since and including the 2009 hunting season, harvest strategies have been designed to bring both the Kittson Central and Grygla elk herds within the designated goal range. This was accomplished in the Grygla herd following the hunting season of 2012. Additional non-hunting mortality has further lowered the elk population of that herd to an estimated 20 animals which is below the lower end of the goal range. The Kittson Central herd is still above the upper end of the goal range by seven animals as of the 2014 January survey. The 2014 season should bring that population within or close to the goal range considering the number of permits offered. Two bull elk permits have been offered annually for the Caribou-Vita herd (also known as the Kittson NE herd) since 2011. This was done primarily to keep elk from becoming accustomed to farmsteads and stored forage along the US/Canada border. As mentioned in Objective 1, the population goal for this international herd has been set at 150 – 200 animals.

As of today, the elk hunt is still a once-in-a-lifetime hunt as the legislature has not made any changes to alter that statute. The legislature has developed a preference system, enabling unsuccessful elk hunt applicants who have applied for an elk license for at least 10 years (as of 2006) to be grouped in a separate selection process that allots 20 percent of the elk permits to that group. The first year in which the preference lottery can occur will be 2016.

Objective 6 – Provide information to stakeholders, the public and landowners regarding elk populations and management.

Strategy A: DNR will work with the MDA to provide annual crop damage payment information to the public via the MDA website.

Strategy B: When elk are taken using depredation shooting permits, notify the affected landowners of disease testing results. Post all elk disease testing results on the "Elk Hunting" web page of the DNR website.

Strategy C: Formalize elk population surveys and harvest reports and post them annually on the "Elk Hunting" web page of the DNR website.

Strategy D: Annually post elk management expenditures on the "Elk Hunting" web page of the DNR website.

Strategy E: Work with stakeholders to promote elk-related recreation and the economic opportunities wild elk can provide.

Public information regarding elk management, harvest, testing, compensation payments, and other statistical data is available but additional progress needs to be made with respect to complete online availability. Largely this information has been and is shared during annual meetings with the elk working groups

Appendix 3. LCCMR Elk Research

PROJECT TITLE: Movement and Seasonal Habitat Use of Minnesota Elk

PROJECT STATEMENT: Elk (*Cervus elaphus*) were numerous across the Minnesota prairie and forest transition zone prior to settlement by Europeans. Due mainly to conversion of habitat to agriculture and over-exploitation, elk were extirpated from Minnesota by the early 1900s. Through restoration efforts and immigration, there are currently about 150 elk in northwest Minnesota (Figure 1). The primary objective of this study is to provide baseline information necessary to efficiently accelerate management of elk and their habitats for future enhancement of elk in the state. We will affix Global Positioning System (GPS) collars to 20 adult elk and study their movements and preferences for habitats. This study will provide the first information collected about movements, home ranges, and habitat use by elk in Minnesota. A two-pronged approach, including spatial analysis of elk movements and direct measurement of habitat characteristics, is necessary to classify fine-scale habitats preferred by elk in Minnesota. This information will enable MNDNR to improve management practices and to identify additional patches of habitat likely to be used by elk, which may be managed to aid in enhancing the population size and range extent of elk in the future. The goals of this project are to: 1) describe the home range sizes and movements of adult elk, and 2) characterize seasonal habitat use of elk at the landscape level and identify fine-scale habitat features preferred by elk. These data will inform future management of the population and will help design strategies to improve the habitats essential to elk. In subsequent research, MNDNR will use data generated in the proposed study to develop landscape level maps with Global Information Systems (GIS) to identify additional areas ideal for improving elk habitats to promote the enhancement of elk numbers and their range extent.

ACTIVITY 1: Describe home range sizes and movements of adult elk.

Description: Beginning in January 2016, we will capture 20 adult elk and fit them with GPS collars. We will set GPS collars to collect multiple daily locations of elk for one year. GPS collars will be programmed to obtain locations approximately every 2-4 hours. Locations will be automatically downloaded from Iridium satellites. We will segregate locations into discrete seasonal periods to determine home range sizes of elk and core areas of use during biologically critical time periods of the year, including pre-parturition, parturition, post-parturition, breeding, and post-breeding. We will calculate the size and spatial orientation of home ranges, and we will use a subset of clustered locations to develop core areas. Additionally, we will examine shifts in home ranges, changes in core areas of use among seasons, and spatial overlap among collared study animals.

ACTIVITY 2: Evaluate seasonal habitat use of adult elk.

Description: Within each seasonal core area for individual elk, we will select randomly 5 location points recorded by GPS collars to sample habitat characteristics. At each sampling point, we will center a sampling array oriented to a randomly generated azimuth. Sampling arrays will be sampled once during the growing season. Procedures will generally follow previously established methods for elk habitat evaluations.

Within each sampling plot, the following variables will be recorded: 1) woody seedlings-species and height; 2) percent cover of bare ground, litter, forbs, grasses, woody vegetation or other conditions to

be described; 3) biomass of herbaceous plants by species, 4) percent plant cover in vertical zones, 5) canopy coverage, and 6) a record all trees and shrubs by species and diameter at breast height.

DISSEMINATION:

Description: The results of the study will be reported in the MNDNR Summaries of Wildlife Research Findings, in a Master's thesis, in a peer-reviewed scientific journal, and in professional presentations at conferences. Also, the results will be shared with MNDNR area wildlife managers via summary reports and direct consultation. Working with the MNDNR Office of Communications and Outreach, we will publicize widely to the public about the progress and findings of the research.

Project Impact and Long-term Strategy:
This study will provide the first scientifically collected information about movements, home ranges, and habitat use by elk since reestablishment of the species in Minnesota. Improving our understanding about seasonal movement patterns and habitat use of elk will facilitate population monitoring processes, help evaluate current habitat and depredation management actions, and will allow MNDNR to develop science-based options for managing elk and their habitats. This study will provide MNDNR with the data necessary to identify portions of northwest Minnesota that are most likely to support viable and sustainable elk populations.

Procurement and manipulation of habitats to benefit elk in Minnesota is essential to the long-term management, enhancement, and viability of the species. Empirical evidence of the most effective habitat management strategies or the habitats most suited to manipulation to meet elk management goals is lacking. Identifying the habitat conditions critical to elk at key seasonal periods will improve application of specific management strategies where they are most needed. This will be an immediate benefit of the proposed research. Using data about elk movements, we will inform managers about the preferences of elk for landscape level habitat features. Results of fine-scale habitat evaluations will identify microhabitat characteristics important to elk, which may be achieved throughout the landscape by habitat management. Also, knowledge of elk locations in winter will improve the efficiency, accuracy, and precision of population surveys.

Data collected from this study will establish foundational information for more advanced analysis of the spatial relationships of habitat types and configurations. In subsequent research, we plan to use data collected from the currently proposed study to develop resource selection functions for elk in northwestern Minnesota. We will test variables important to predicting elk habitat use relative to available habitats in the region including land cover, distance to roads, distance to agriculture, distance to public land, and others habitat features elucidated as potentially important during our analyses of home ranges and local level habitat evaluations. This information will allow us to create predictive maps of habitats most suitable to elk, which will assist MNDNR in making informed predictions about the potential for natural expansion of elk across the landscape and other areas suitable to expansion of elk.

As an added benefit, the proposed research will stimulate the public's interest and understanding of elk and their habitats. By enhancing elk numbers and management, economic growth associated with elk-related recreation is quite likely.

Appendix 4. Human Dimension Study

Project Title: Landowner attitudes toward elk in northwest Minnesota

Issue/Problem: Through restoration efforts and immigration from Manitoba and North Dakota, there are currently about 150 elk (*Cervus elaphus*) in northwest Minnesota. In 1987, legislation was passed that required the Minnesota Department of Natural Resources (MNDNR) to write an elk management plan that recognized the value and uniqueness of elk, provided for integrated management, afforded optimum recreation opportunities, and restricted elk to nonagricultural land in the state.

Currently, MNDNR staff is working with public stakeholder teams to develop a revised elk management plan, and anecdotally, it appears that interest in Minnesota elk has been increasing in recent years. The long-term vision of MNDNR for elk management is to enhance the population size and range extent of Minnesota's elk while maintaining coexistence with private landowners. MNDNR lacks basic information about the ecology of elk in Minnesota and objective data about the attitudes of private citizens toward elk. These limitations inhibit the responsible advancement of elk management in the state.

Currently, MNDNR is requesting funding through the Legislative-Citizen Commission on Minnesota Resources to study the movements and seasonal habitat use of Minnesota elk. Information about elk movements and their preferences for specific habitats will facilitate the development of landscape level maps to identify additional areas for potential elk habitat to promote the enhancement of elk numbers and their range extent. Minimizing future elk-human conflicts is critical to the successful expansion of elk since they utilize habitats on public and private lands.

Although multiple states east of the Rocky Mountains have initiated elk restoration efforts, the primary literature lacks information pertinent to understanding the preferences of private landowners for elk management in an agricultural landscape. Citizens in northwest Minnesota have personally experienced living with elk, elk management, and elk-related tourism. They represent an ideal survey population to provide an understanding of the attitudes of private landowners toward elk in Minnesota.

By learning more about their experiences, we may anticipate future conflicts if the range of elk expands in Minnesota, identify opportunities for education and partnering, and integrate data about landowner attitudes into modeling of additional areas suitable for elk. The primary objective of the proposed study is to identify the attitudes of landowners within the elk range toward elk and their preferences for future elk management.

Methods: The proposed study would focus on the townships in northwest Minnesota encompassing the present range of elk. There are approximately 1,200 private landowners with >10 acres of land in this area. We will mail individuals a self-administered questionnaire with a cover letter, and postage-paid return envelope. To maximize response rates, we will conduct three mailings and a non-response survey.

Appendix 5. Habitat Management

Many factors affect the successful implementation of annual habitat management plans; the primary factor being weather. All management efforts including timber harvest and regeneration, brushland mechanical treatment, prescribed fire, and farming can be advanced, delayed or even prevented by the weather. Another significant factor to success is that most state lands in the elk habitat area are in lowlands and subject to wet conditions or flooding. The availability (or lack) of financial resources also has a direct impact on habitat management efforts and success.

Both working groups requested measurable goals for habitat management. This request, while simple in concept, becomes complicated in practice due to factors such as weather. Minimum goals were developed by both work areas for all habitat management activities occurring within the core elk range plus an additional ten mile buffer for each of the three elk populations. Over the course of the 2016 plan, DNR will strive for a goal of 6000 acres of habitat management activities (e.g., brushland management, timber harvest, and prescribed burning) in the Karlstad work area and 3000 acres in the Thief Lake work area. The Department will also strive for minimum annual goals of 100 acres of food plots on WMAs and 125 acres of food plots in the Karlstad area. In the Thief Lake area, the Department will strive for 200 acres of food plots on WMAs and to increase additional acres of private land foodplots.

In normal to good years the minimum goals listed can be achieved and surpassed. We can often surpass goals for management strategies such as prescribed fire by a considerable amount. In wet years, we may struggle to achieve progress in one or more activities listed. Local producers in both work areas experience the same weather-related farming constraints.

We seek to balance our management strategies and it is uncommon that all four listed habitat management activities (timber harvest and regeneration, brushland treatments, prescribed fire, and food plots) are implemented in any given year at their maximum or minimum potentials. When one is diminished another may be increased as a potential habitat management possibility. With that in mind the listed acres in Objective 3 are target averages.

Comments from managers at Thief Lake and Karlstad work areas on habitat and food plot management efforts are below.

Thief Lake Wildlife Management Area

A number of habitat management activities including timber harvest, brush treatments, and prescribed fire are undertaken within the range of the Grygla elk herd. Food plots are also extensively used. The discussion below includes activities within the area shown in Figure 2 and a 10 mile buffer around it.

DNR conducts brushland habitat management projects every winter. In the last five years, brushland projects were completed annually between Thief Lake WMA, Thief River Falls Area Wildlife office, and Red Lake WMA of the Grygla elk range. When brushland projects were averaged for each year, DNR completed work on 24 sites and 887 acres. The maximum for any one winter was 38 sites and 1,725 acres. This work includes shearing with a dozer and brush mowing with either a tractor and mower or a

skid-steer with a mower deck.

The Thief River Falls Wildlife office has submitted shearing proposals for 1,400 acres of large blocks to benefit sharp-tailed grouse, 300 acres for deer browse, and 250 acres in small openings for American woodcock. Funding availability will determine what actually occurs from these plans. DNR also partners with the American Bird Conservancy to shear habitat for golden-winged warblers and other early successional forest habitat dependent species of wildlife. DNR expects to continue to do similar amounts of brushland habitat management within the affected area in the future.

Prescribed fire over the past five years resulted in an average of 3.4 burns and 984 acres in the identified elk area. The range of accomplishments by year was from two burns and 384 acres to five burns and 2,947 acres.

Food plots – Within the core of the elk range, 70 acres of food plots are reviewed and managed annually by DNR. Management strategies include mowing or haying on clover or alfalfa sites. The sites are marginally low in elevation and there are many years when seeding or haying can be done on only half of the acreage. Crops that are planted include sunflowers, corn, soybeans, rye, oats, buckwheat, alfalfa, clover, and forage mixes (rape, radishes, turnips and peas). DNR has negotiated with some cooperators for private land food plots, but some years these areas are too wet to plant and new private land agreements can be difficult to secure.

Within the extended/buffered elk range area (ten miles), there are another 311.5 acres of food plots. Some of these are in the sanctuary area of Thief Lake WMA and are intended for geese, but can be used by all wildlife including elk. In a good year that is dry and budgets allow, we can access nearly all of these fields, although a few are in legume and treatment consists of haying or mowing. In a wet year or when budgets are tight, we may plant half of this acreage. Crops include winter wheat, oats, barley, rye, alfalfa, clover, rye, buckwheat, corn, soybeans and forage mixes presented above.

Cooperative Farming Agreement (CFA) food plots within the elk range amount to about another 28 acres in most years. DNR is in the process of re-negotiating some CFAs and this acreage may increase. Crops include corn, soybeans, sunflowers, oats and rye. Expected timber harvesting will result in an estimated 972 acres harvested in a typical year from the identified elk range. We can generally expect a more consistent timber harvest because of proximity to the mills, but the harvest can be subject to the vagaries of wood markets.

Karlstad

Timber Sale potential - There is an average 2-year window between the sale of timber and when a stand is cut and only about 50% of what is on the stand exam is eventually cut. That metric (50% harvest) may be high. One reason is that Kittson County and NW Roseau County are far from timber markets and are often the first sales dropped from loggers' plans when markets are bad. Commercial loggers do not have a large upfront investment in a sale and will abandon a sale to reduce losses. Based on the 2014 – 2018 stand exam years and using the 50% assumption, we can plan for an average of 531 acres/year logged in the Kittson buffered (ten mile) elk range. This is an optimistic goal and likely has never been achieved over a one year period.

Brush –Between 2010 and 2015 we cut an average of 183 acres/year. Note that our brushing acres range from zero (2013 – present) to over 400 acres/year in 2011 and 2012. The actual number of acres brushed will be highly dependent on funding because DNR doesn't have equipment or staff in the area to complete the work, particularly in winter when most of it is done. The roving burn crew may be able to do some work in the winter, but on fewer acres. A lowland brush proposal for FY17 was submitted to the Lessard-Sams Outdoor Heritage Cultural fund (LSOHC), but it was not successful. Large projects are dependent on successful funding from the LSOHC and DNR will continue to submit annual applications for project funding.

Prescribed burns –DNR expects to burn between 5,000-8,000 acres/year; with favorable conditions, more burns are accomplished.

Food Plots, private lands – The acres planted the last five years range from 52 to 168 acres, an average of 126 acres/year. Eighty acres were taken out of production this year when the owner enrolled his acres in CRP (Conservation Reserve Program). So far DNR has been unable to replace those acres. DNR signed up one cooperator for 20 acres, but his land might be too wet to plant. Private landowners seem to gravitate toward corn, soybeans, and oats as potential food plot crops.

Food Plots, public lands – An average of 97 acres of food plots have been planted each year in the Karlstad work area since 2012. Going forward we anticipate planting 100-150 acres/year. Annual funding is critical to maintain this program. DNR has successfully partnered with Minnesota Deer Hunters Association and Rocky Mountain Elk Foundation for grant funding as a supplement to agency funding sources. Weather also greatly impacts timing and therefore type of crops that ultimately are planted. Ideally, we hope to plant a mixture of spring and fall crops to include soybeans, sunflowers, corn, oats, clover, and forage mixes (rape, radishes, turnips and peas). If unusually wet conditions persist in the spring, then corn, sunflower and soybean acres may be interchanged to oats or a forage mix.