



**GRAY
WOLVES**



**GRAY
MATTER**

Exploring the Social and Biological Issues of Wolf Survival

SECOND EDITION

Appendices



International Wolf Center
Teaching the World about Wolves

A PUBLICATION OF THE INTERNATIONAL WOLF CENTER
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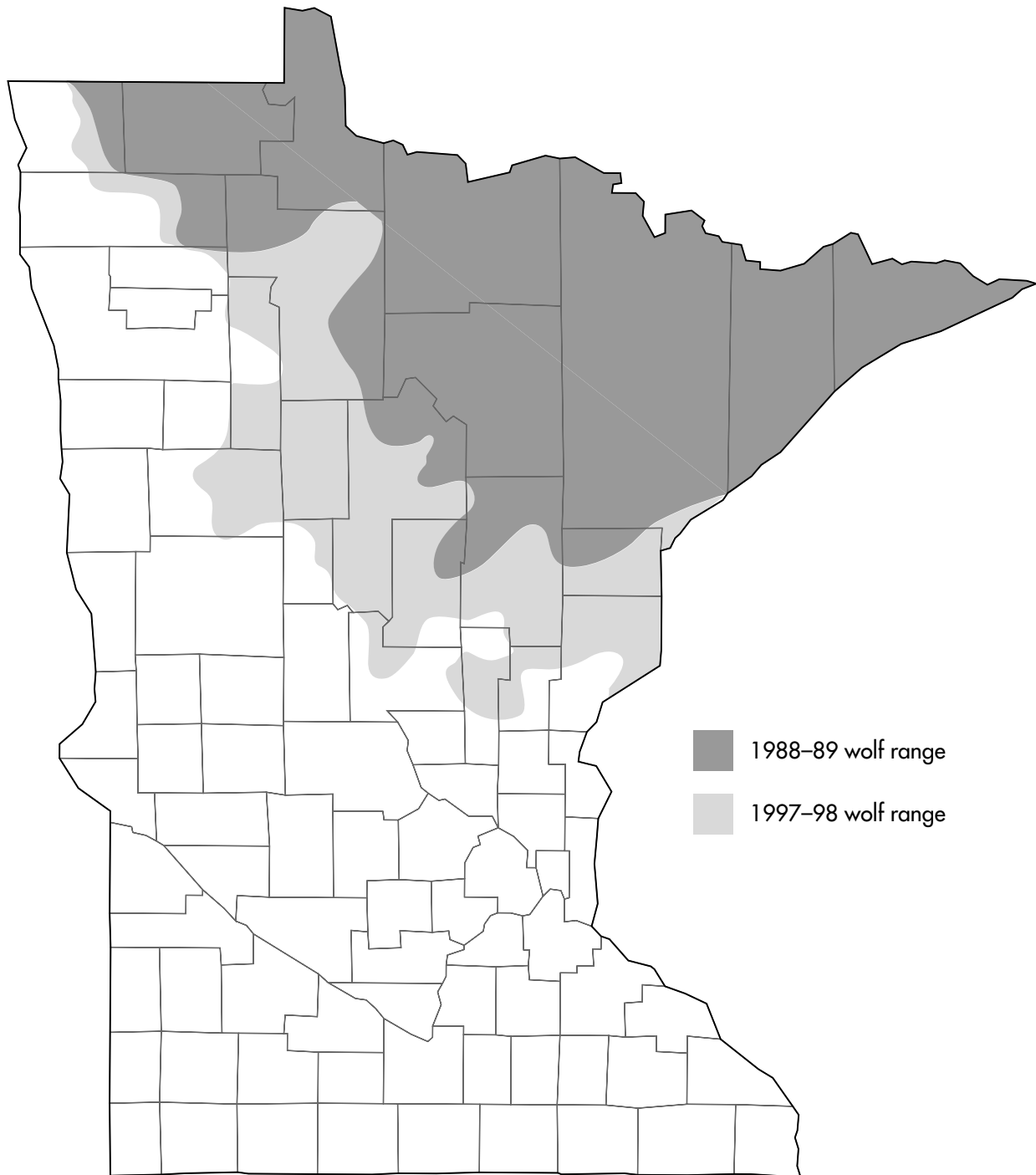
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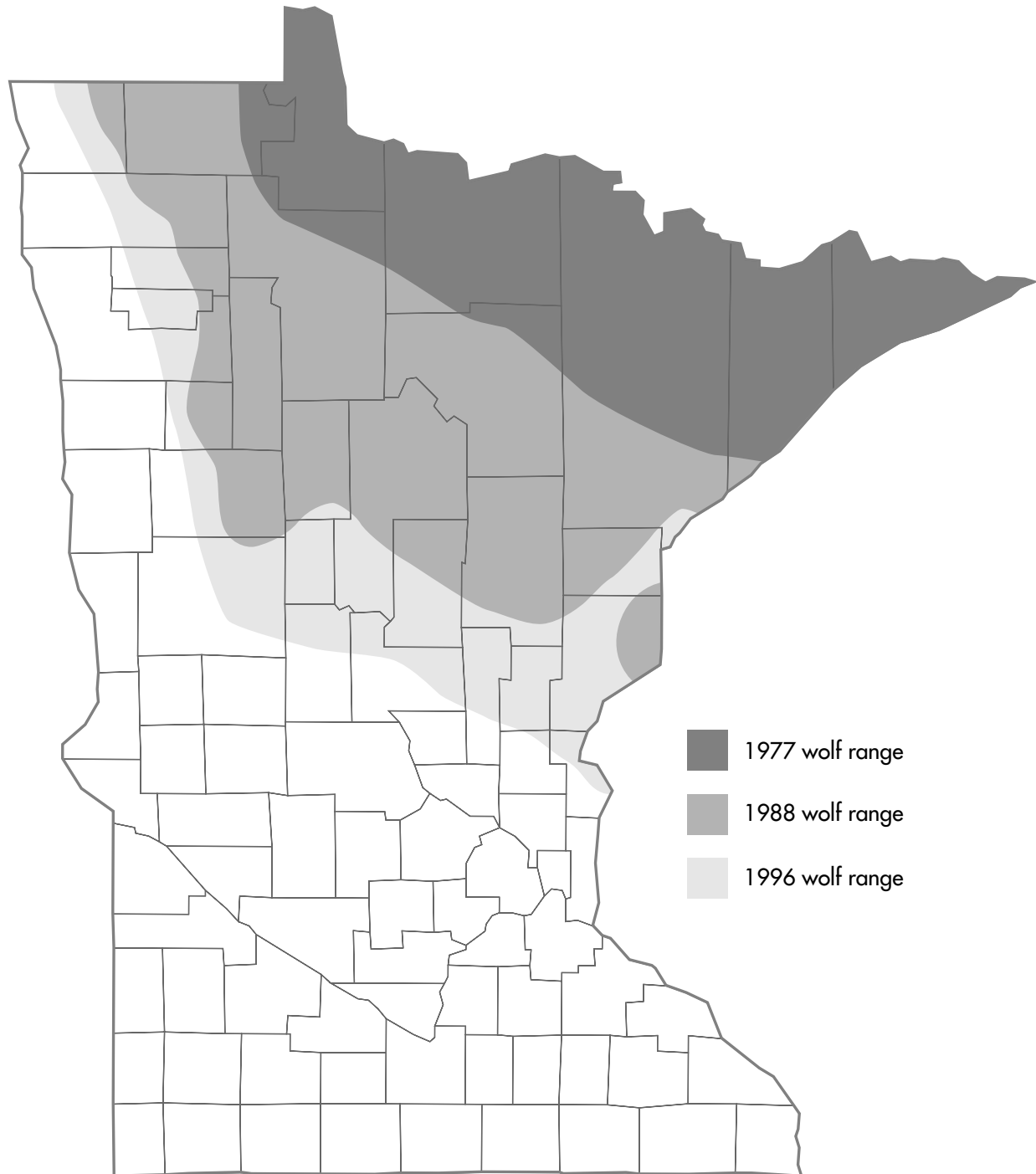
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Current Wolf Range in Minnesota



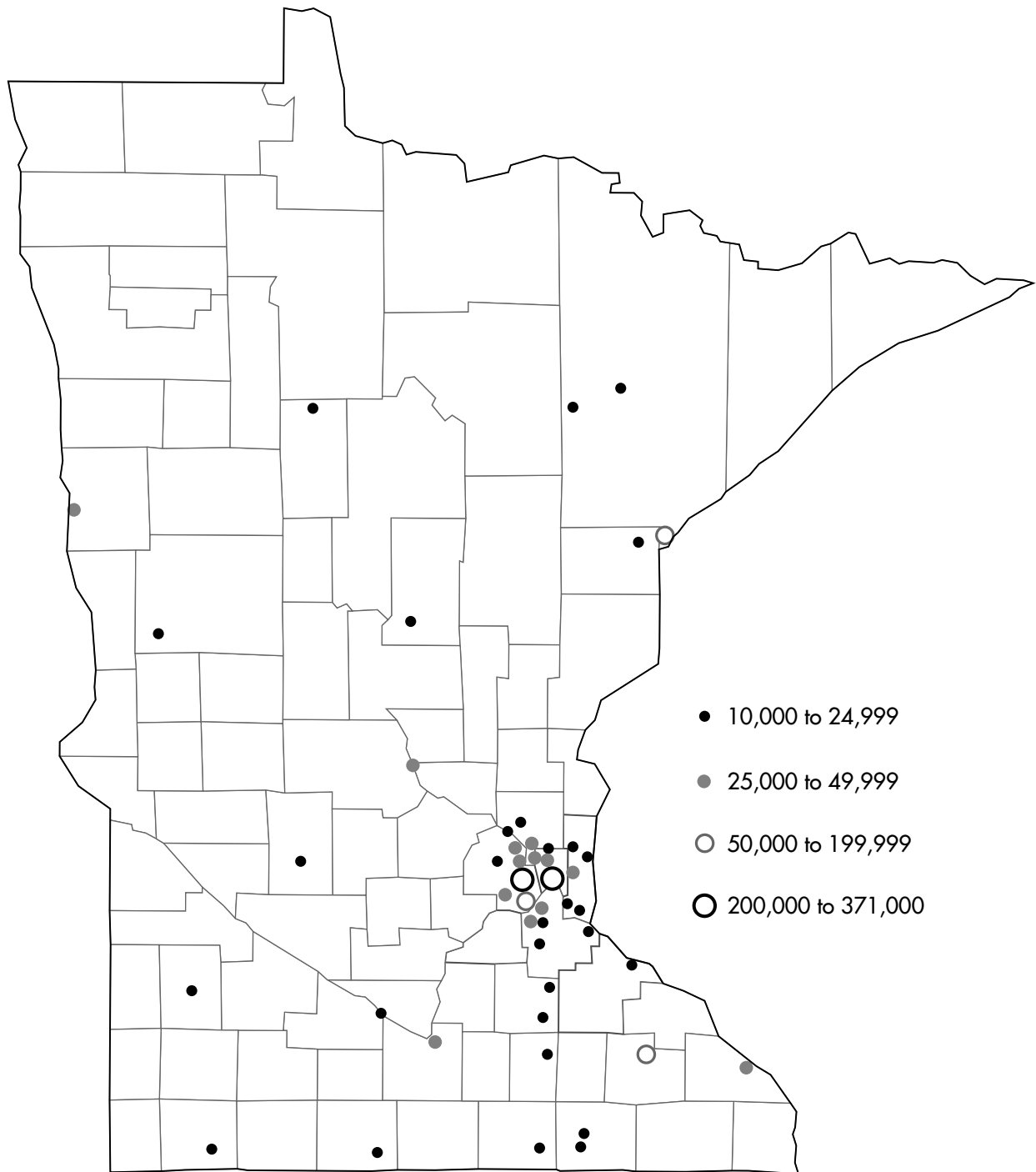
Source: International Wolf Center

Expansion Range by Contiguous Packs 1978–2005



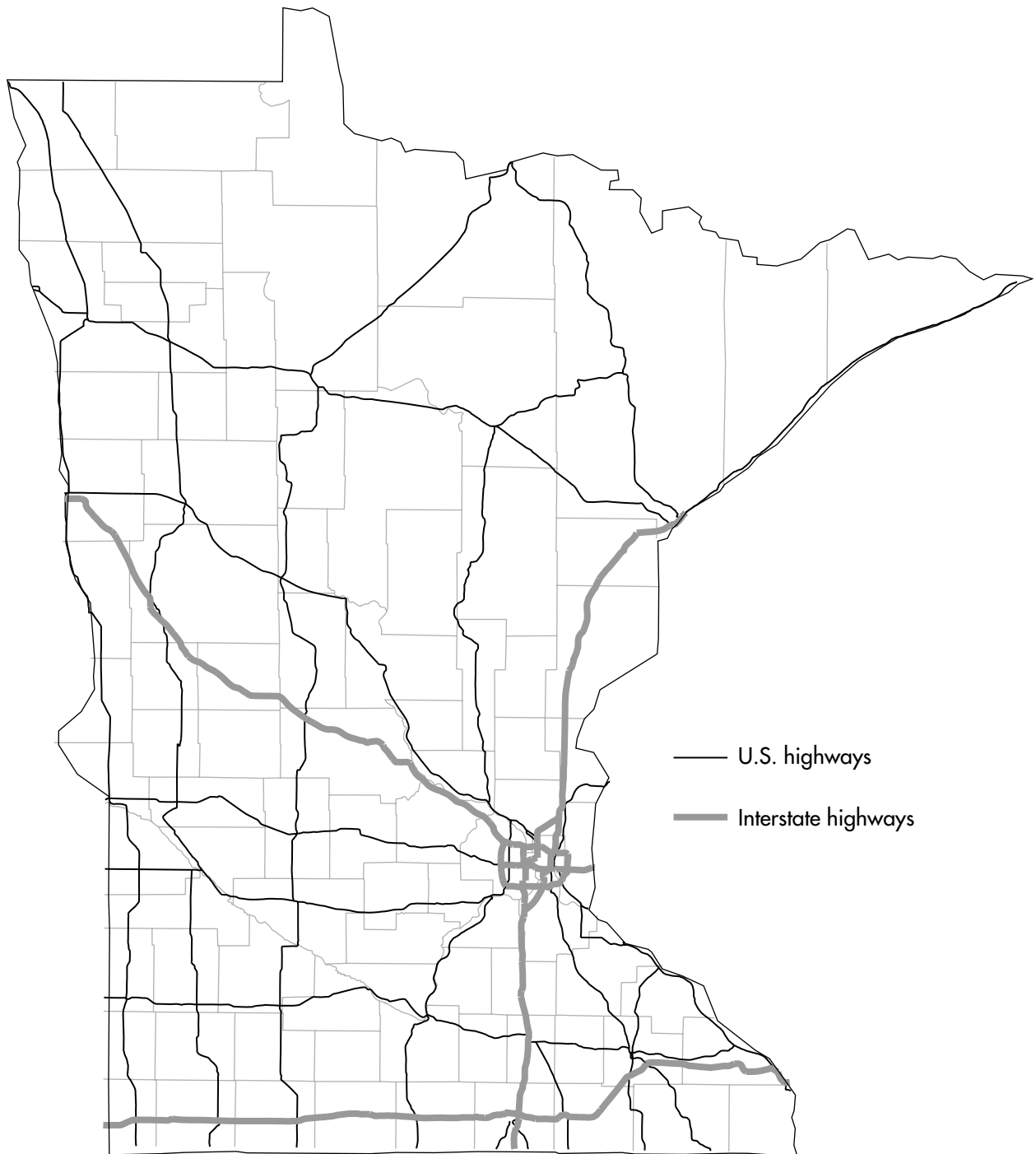
Source: International Wolf Center

Major Cities in Minnesota



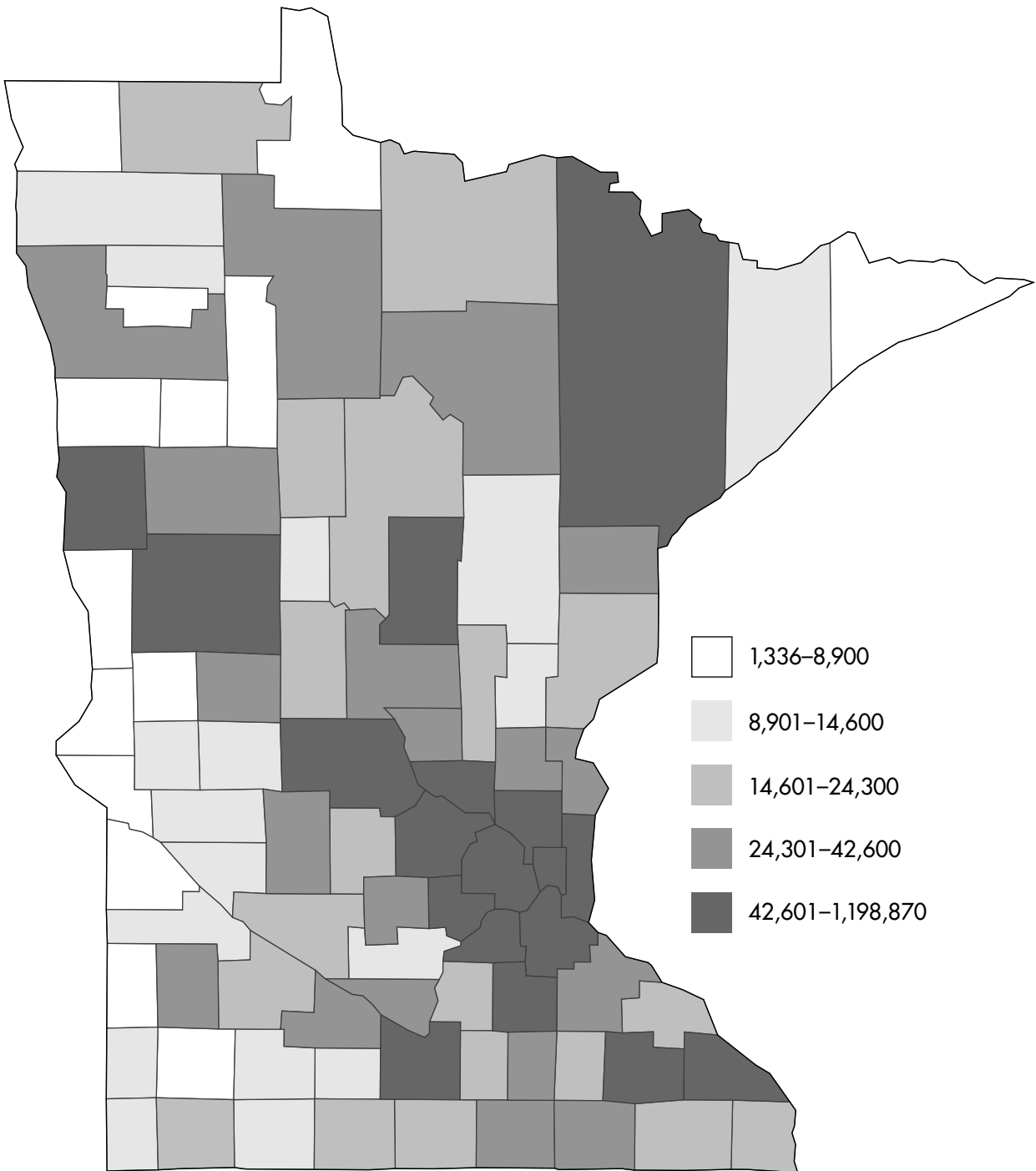
Source: Minnesota Department of Transportation

Major Highways in Minnesota



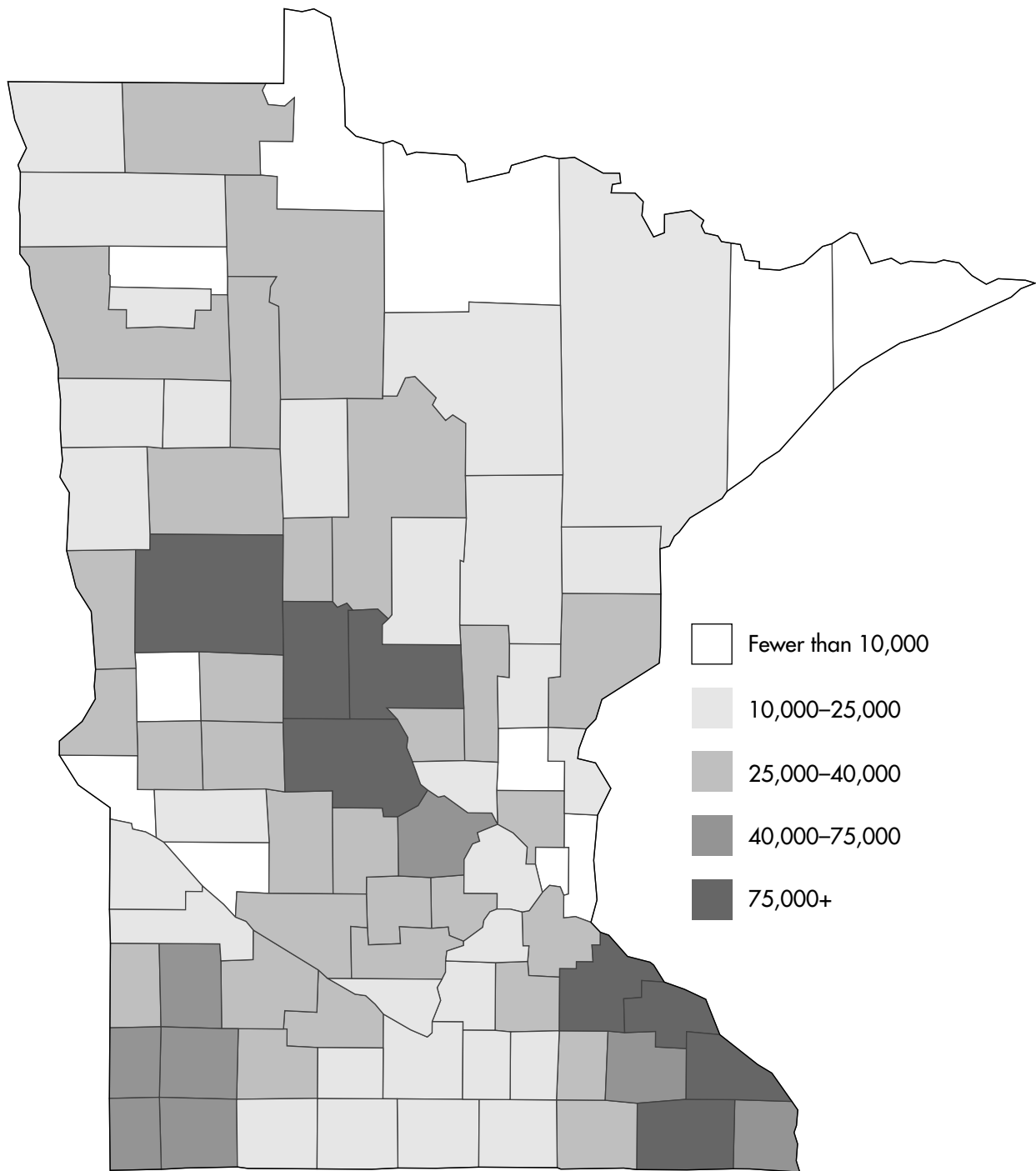
Source: Minnesota Department of Transportation

Minnesota Population by County



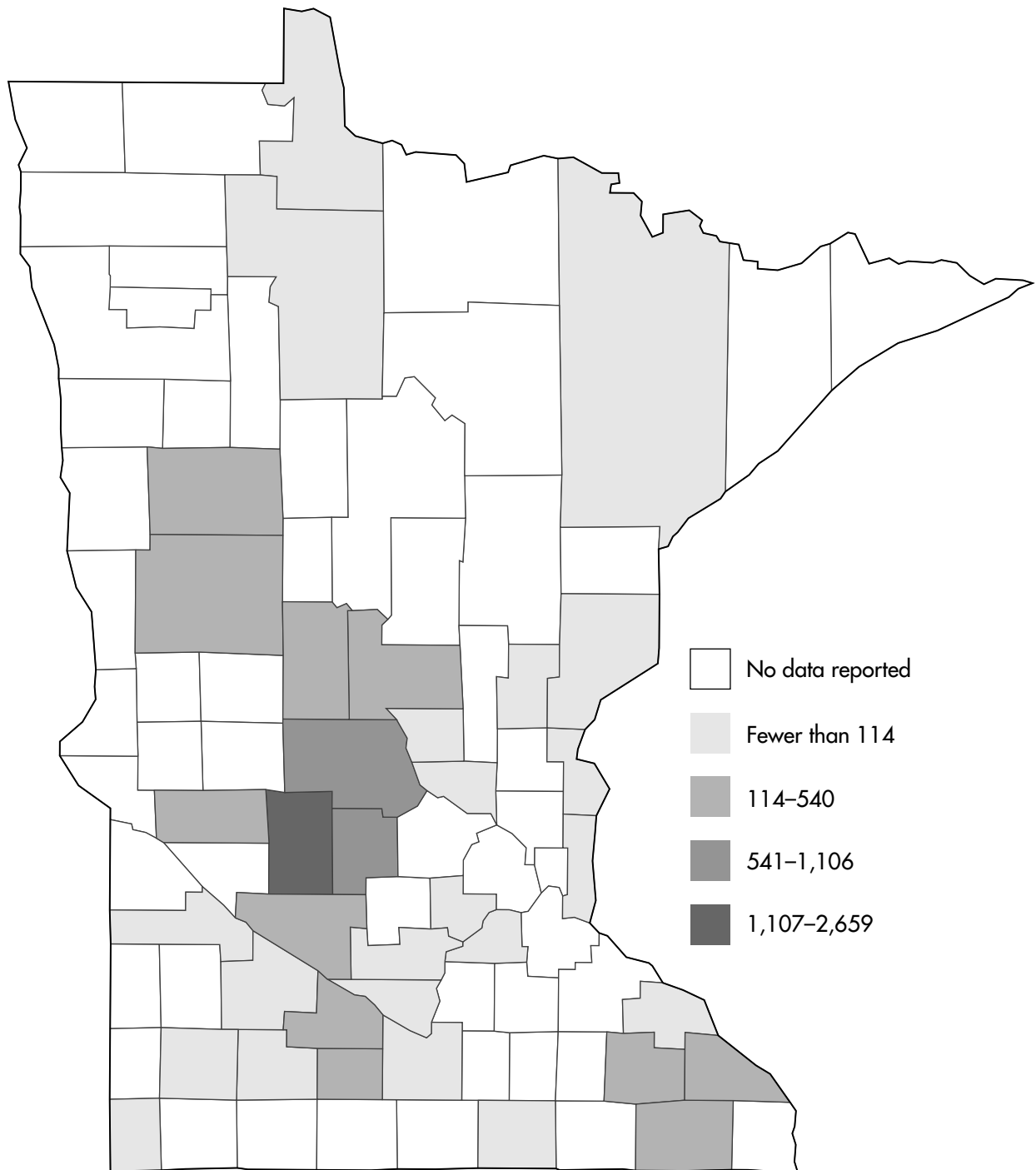
Source: Minnesota Land Management Information Center

Head of Livestock (cattle, sheep)



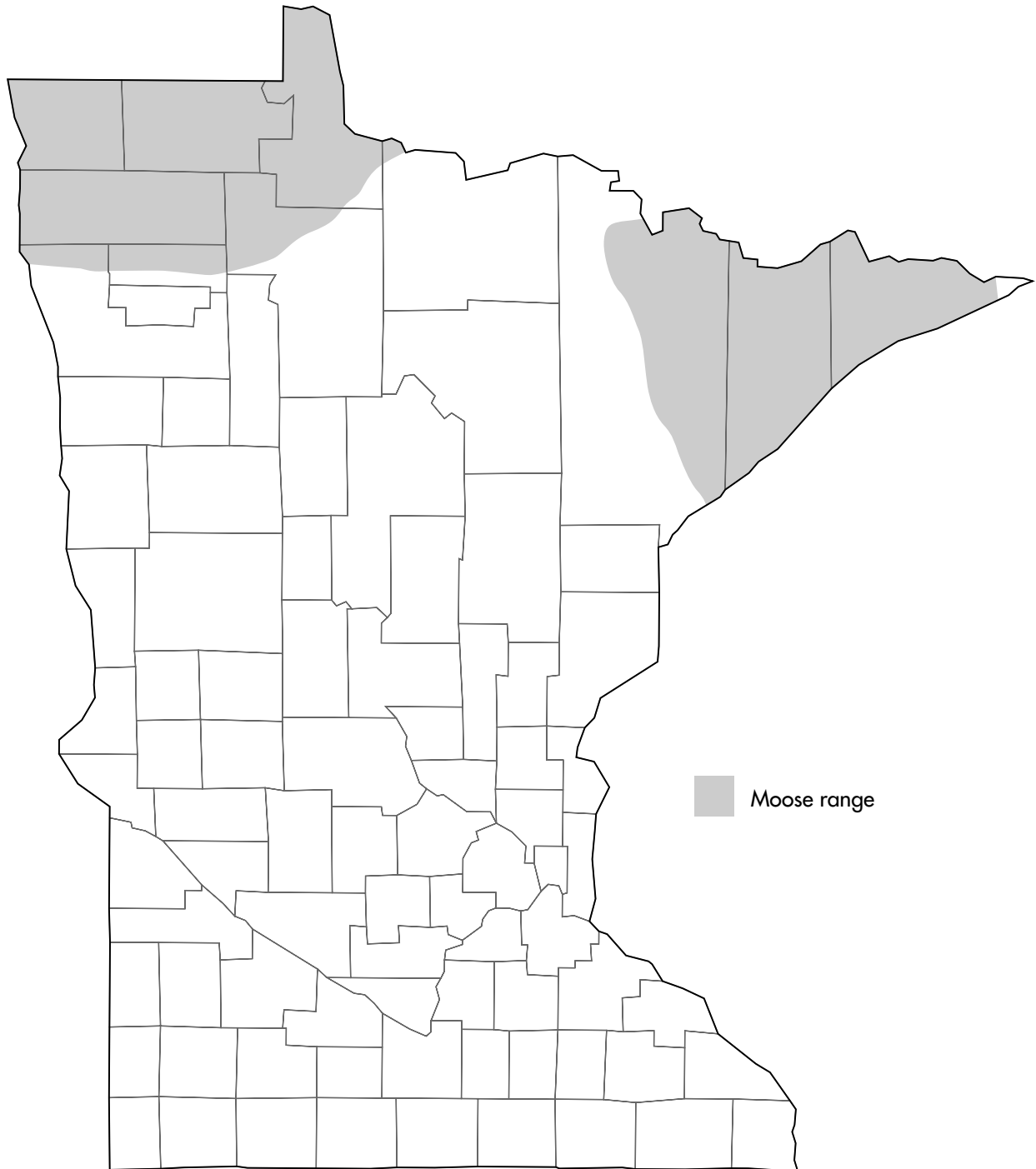
Source: Minnesota Agricultural Statistics Service

Turkeys in Minnesota



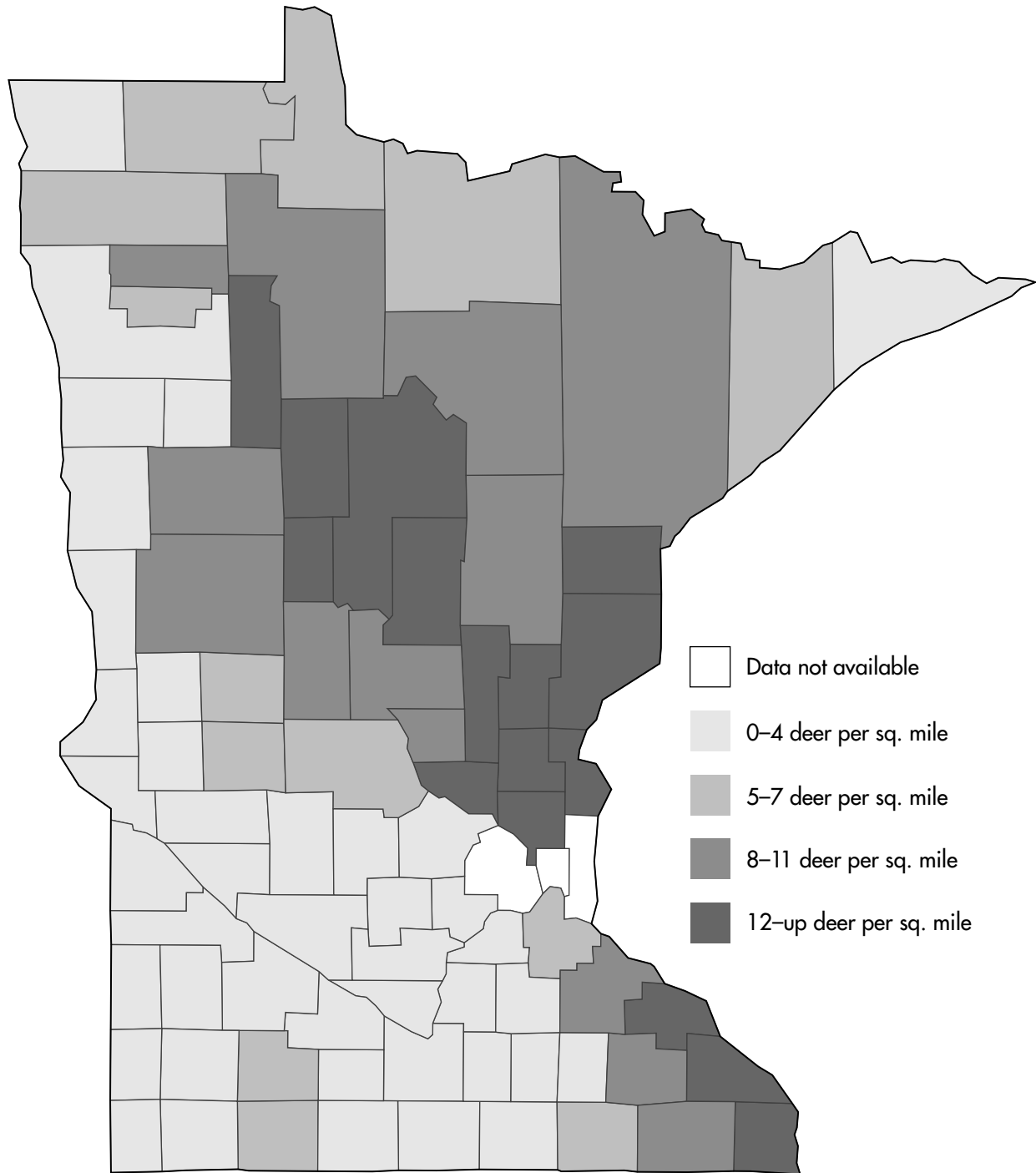
Source: Minnesota Agricultural Statistics Service

Moose Range in Minnesota



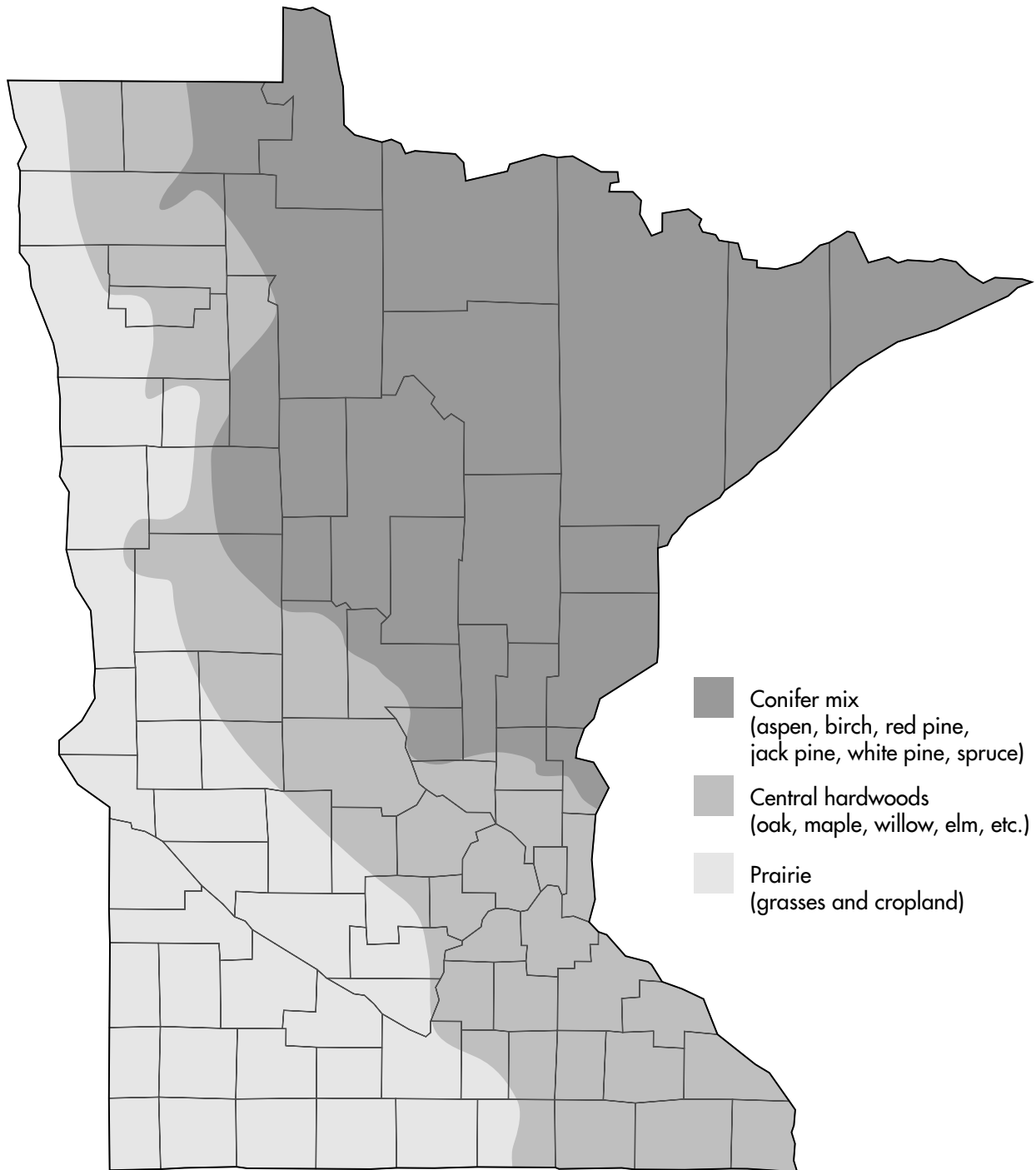
Source: Minnesota Department of Natural Resources

Deer in Minnesota



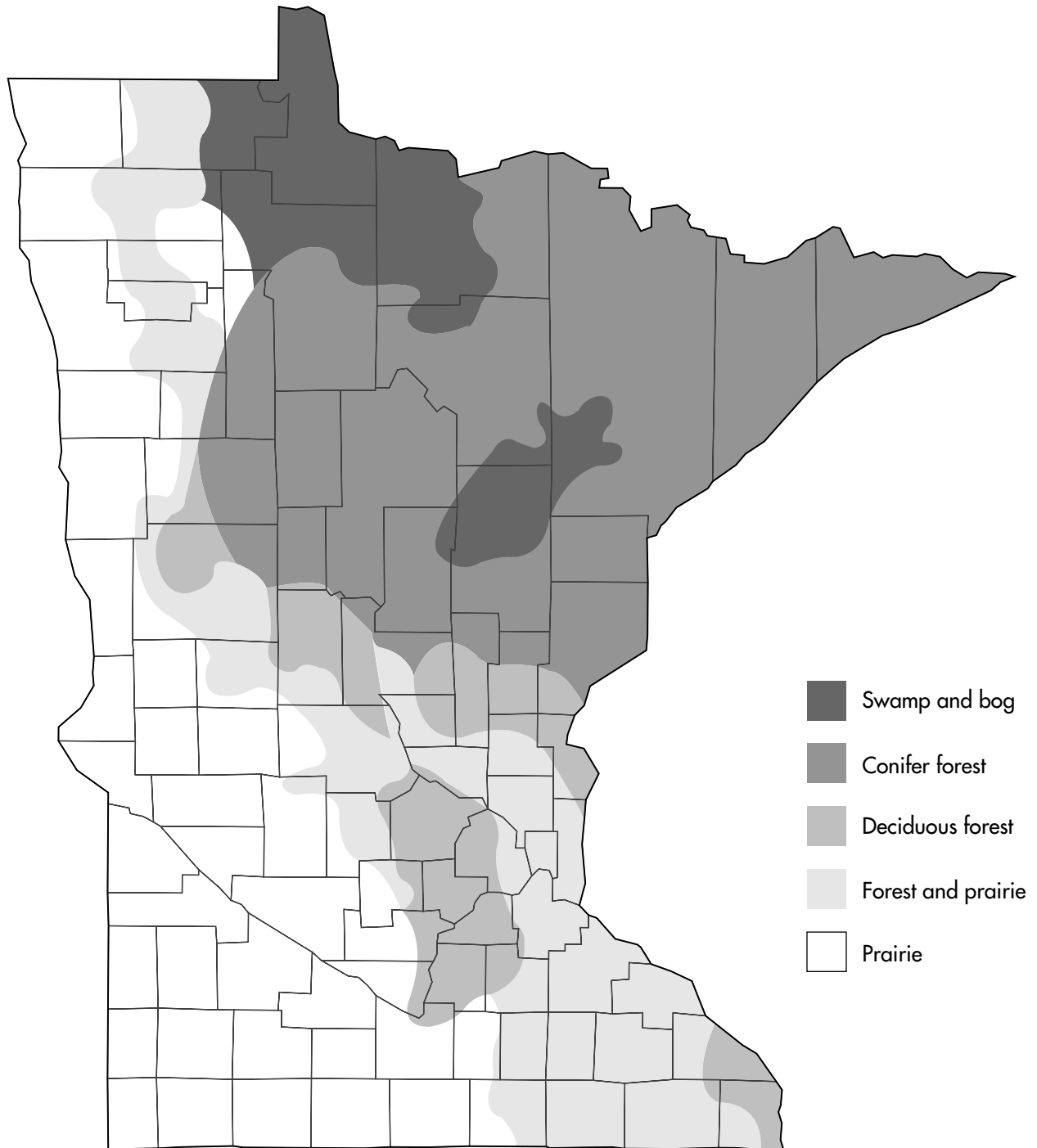
Source: Minnesota Department of Natural Resources

Major Vegetation Types in Minnesota, today



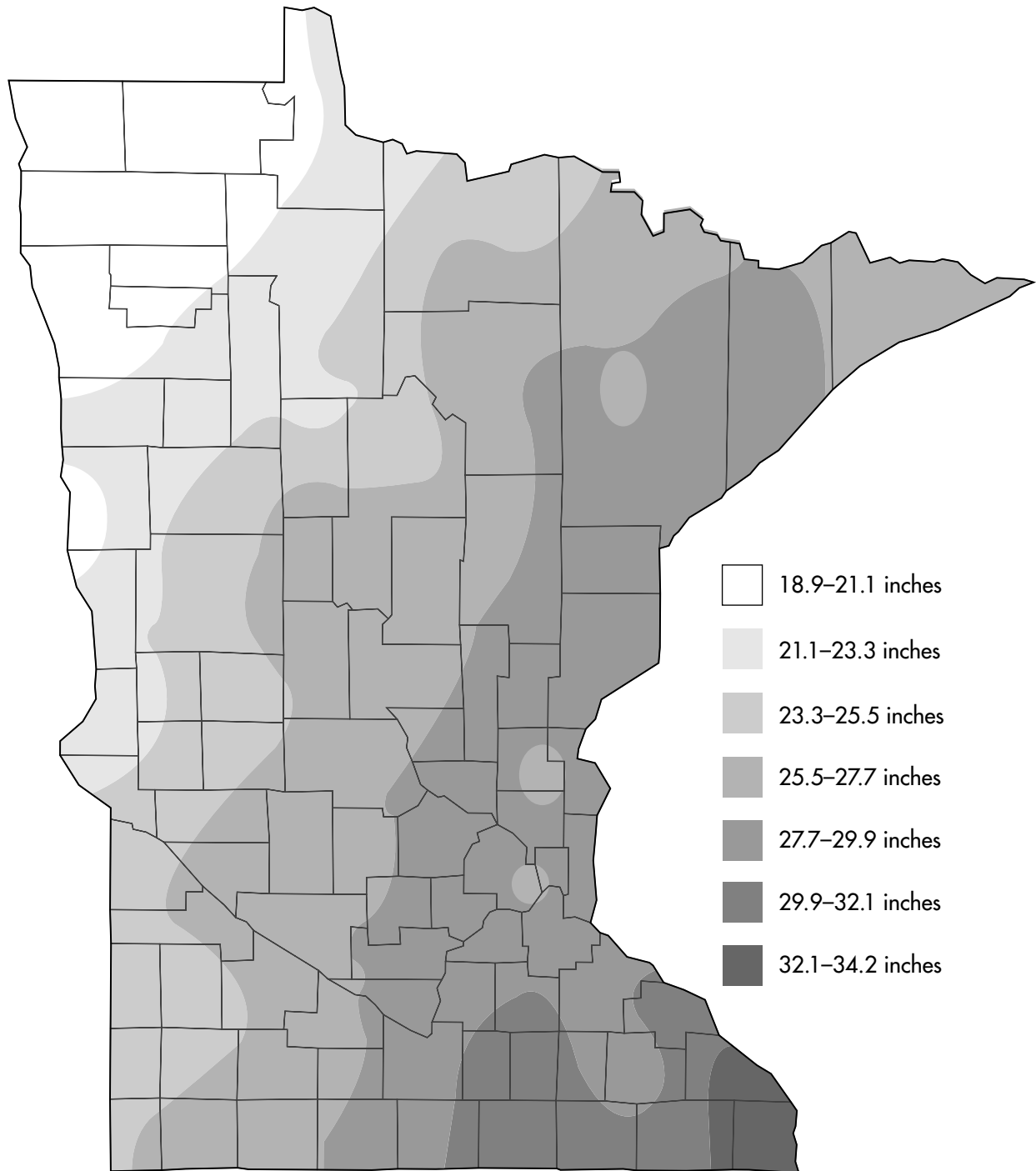
Source: Minnesota Department of Natural Resources

Minnesota Native Vegetation, late 1800s



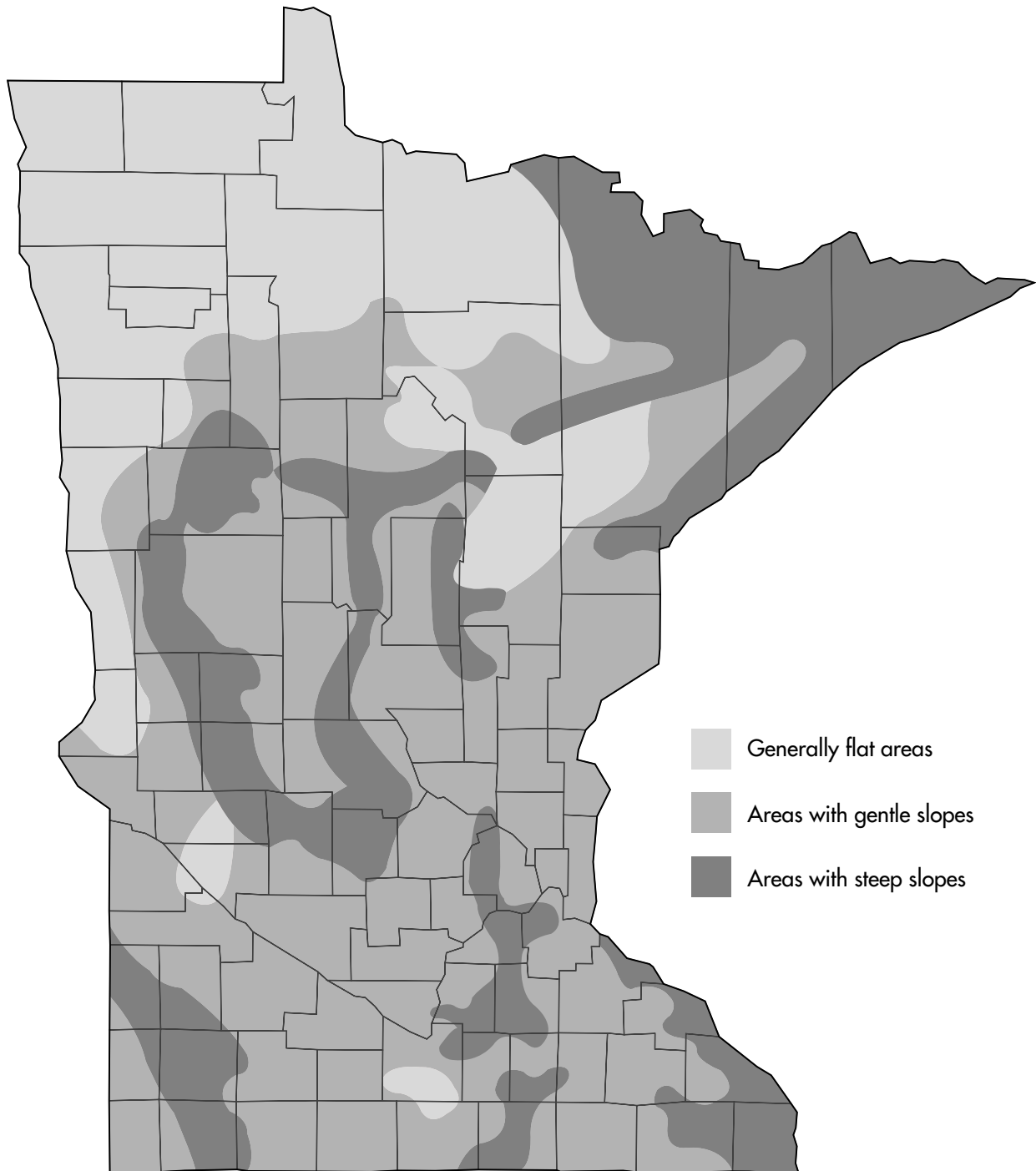
Source: Adapted from Minnesota Department of Natural Resources map that summarizes Public Land Survey 1847-1907

Minnesota Annual Precipitation



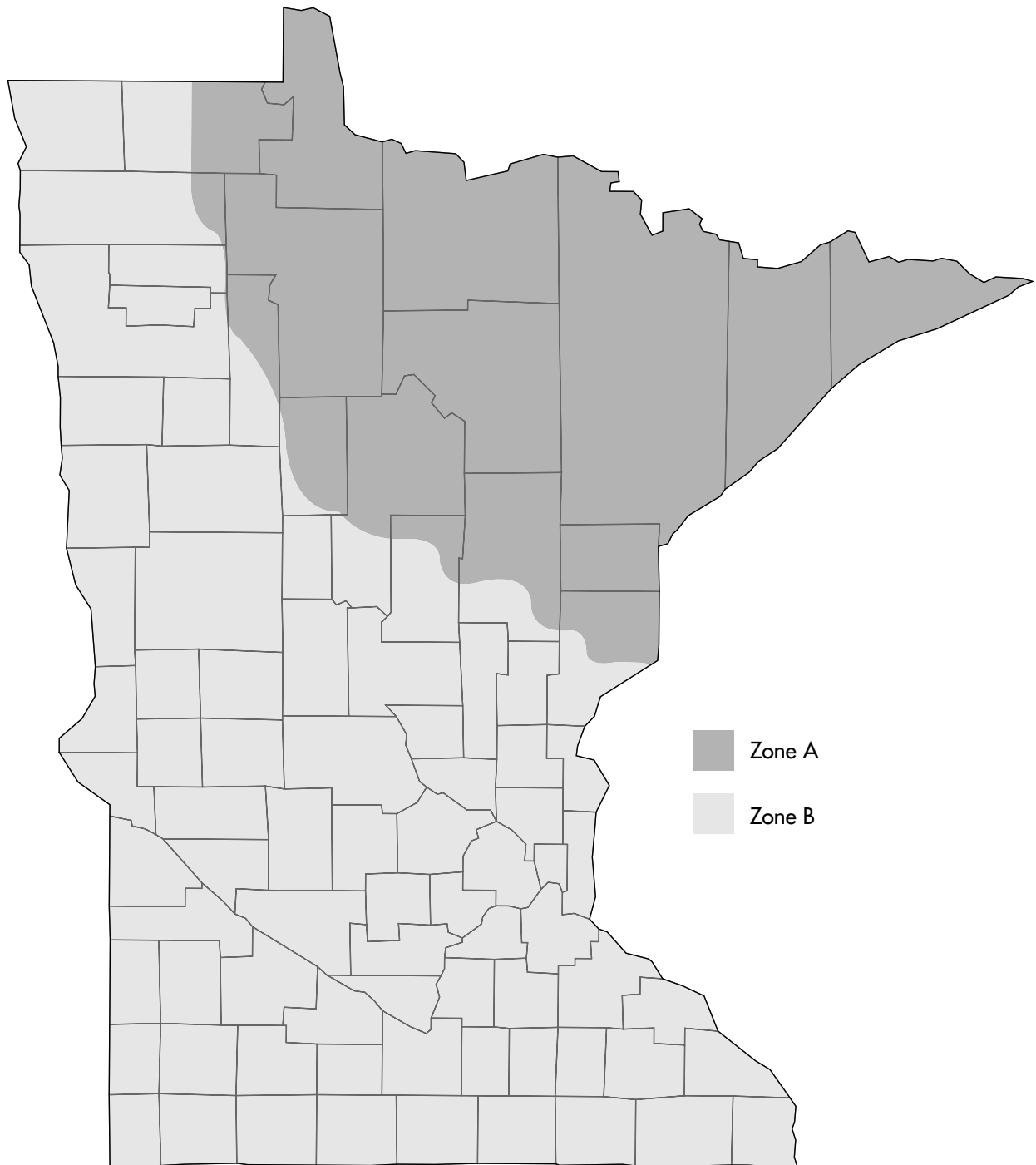
Annual average based on records for 1951-80
Source: Minnesota Weather by Keen; weather station records

Landforms in Minnesota



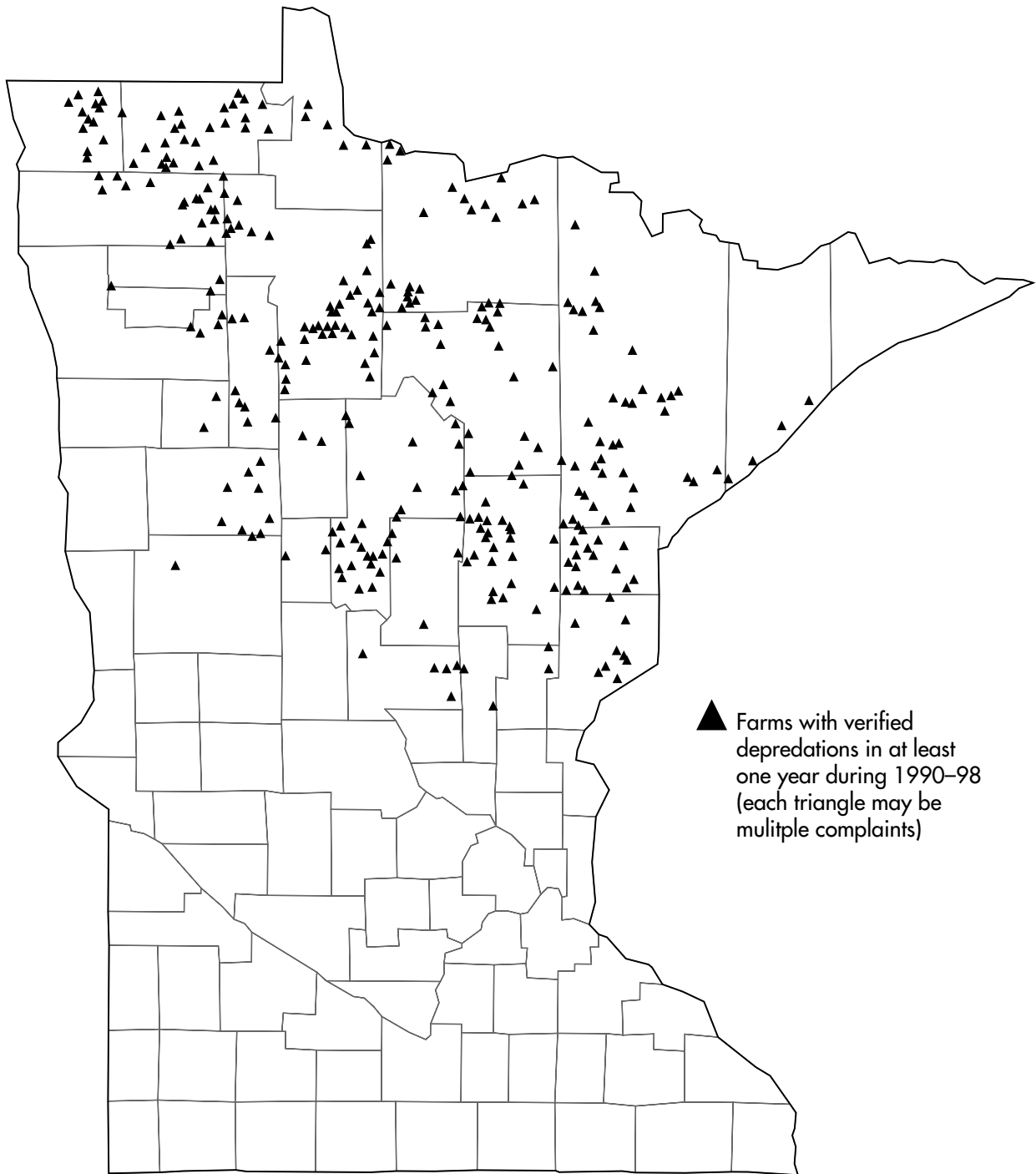
Source: Adapted from Landforms map in Atlas of Minnesota Resources and Settlement by Borchert and Gustafson

Minnesota DNR Management Zones



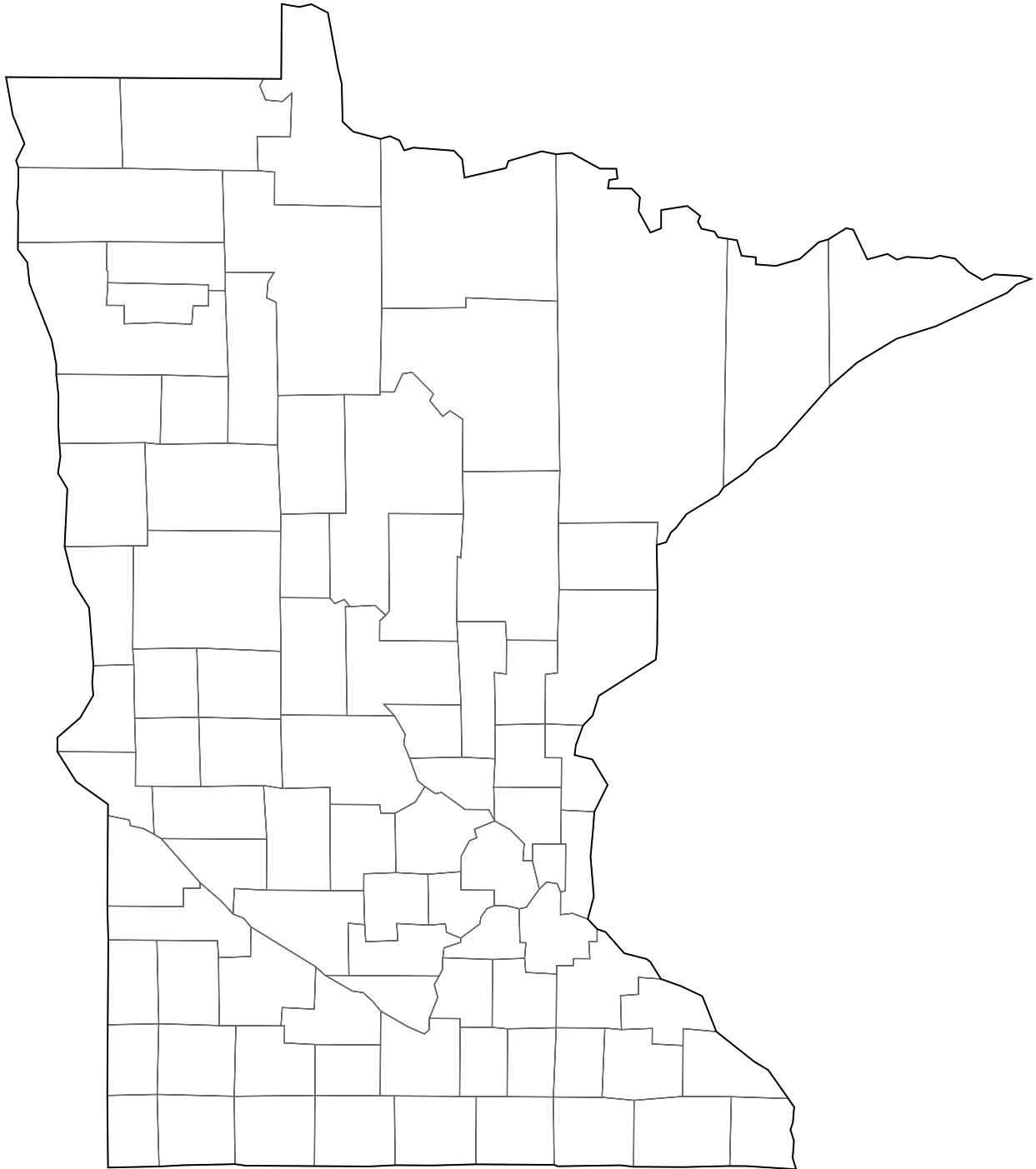
Source: Minnesota Department of Natural Resources

Wolf Depredation



Source: Liz Harper

Minnesota



APPENDIX II

What is the Endangered Species Act?

And what is the federal process of reclassifying and delisting the gray wolf, *Canis lupus*?

Purpose of the Endangered Species Act

The Endangered Species Act (ESA), passed by Congress in 1973, is intended to conserve endangered and threatened species and their habitats and to improve the species' status so that they no longer need ESA protection. When their recovery has progressed to that point, the U.S. Fish and Wildlife Service (USFWS) takes steps to delist, or remove, the species from the federal list of Endangered and Threatened Wildlife and Plants. If a species has been listed as endangered, the USFWS sometimes reclassifies it to threatened status as an intermediate step toward removal of ESA protection. Once a species is removed from the federal list, management authority for the species generally returns to the states and tribes that have jurisdiction over the areas that the species inhabits.

The ESA should be thought of as an emergency room for species; it provides emergency temporary care to ensure the species' survival and to pull it back from the brink of extinction. Once species are listed as threatened or endangered, the resulting intensive care they receive under the ESA, such as hunting restrictions or habitat protection, ideally leads to "recovery" to the extent that the species can be moved back to the more routine care and management of the states and tribes. The species can be delisted at that point.

"Recovery" under the ESA does not mean that the species will be returned to population levels that the geographic area could or should support before the species can be delisted. Rather, "recovery" under the ESA means that the species no longer needs the ESA's emergency care to keep it from becoming extinct in the foreseeable future.

Listings and Delistings Are Federal Rule Makings

Rule making is the name of the formal process by which a species is listed as endangered or threatened, and eventually reclassified or delisted. The same process is used for establishing special regulations for a species or for designating critical habitat. The rule-making process is designed to promote public involvement in the decision so that it is based on the best available information and to provide a full explanation of the decision when it is announced. For ESA listings, reclassifications and delistings, the rule-making process has a minimum of four steps:

1. The USFWS publishes the proposed change and the reasons for it in the Federal Register. The proposal is also publicized in other ways to ensure that interested individuals and organizations are aware of it.
2. A public comment period of at least 60 days provides an opportunity for any interested party to provide data or opinions relevant to the proposed action. If requested, the USFWS will hold one or more public hearings. There is often a 120-day comment period for gray wolf proposals, and numerous hearings and informational meetings are usually held when a new rule is proposed.

3. After the public comment period has closed, the USFWS reviews all new data and comments and reconsiders the proposed action. Alternate actions or modifications of the proposal are also considered.
4. The final decision is published in the Federal Register, announcing the effective date of the action. In some cases, the final decision may be to withdraw the proposed action or to adopt a modified version of it. Decisions are usually published within one year of the publication of the proposal.

Recovery Plans

After the gray wolf was placed on the endangered species list in 1974, the USFWS developed recovery programs in three regions of the United States: Western, Southwestern (Mexican wolf), and Eastern (also known as the Eastern Timber Wolf Recovery Program). The USFWS also operates a separate recovery program for a related species, the red wolf (*Canis rufus*), which is being reintroduced to sites in the southeastern United States.

Each of the three regions has its own recovery plan, which was developed by a team of experts on the species in that part of the country. Those plans contain recovery (that is, delisting) and reclassification criteria that specify goals for the distribution and numbers of wolves in each of the recovery regions. These criteria guide the USFWS in deciding if the ESA protections can be reduced (by reclassifying to threatened) or removed (by delisting the species).

Flexibility Under the ESA

In situations when the USFWS cannot or chooses not to delist a species for various reasons, the ESA contains a variety of clauses that allow for more flexible management of the species when appropriate.

- 4(d) rule: Allows the USFWS to make regulations that apply to threatened species that will benefit the conservation of that species. The USFWS uses this clause to allow certain people to kill wolves under certain circumstances, for example, when a wolf kills livestock.
- 10(a)(1)(A) rule: Allows actions toward endangered species that would otherwise be prohibited by the ESA if those actions will enhance the propagation or survival of the affected species.
- 10(j) rule: Allows the USFWS to release wolves into new areas to further the conservation of the species. Those wolves and their offspring can be declared “experimental,” which allows them to be treated as “threatened” outside of national parks and refuges even though naturally occurring wolves in those areas would have been classified as “endangered.”

Criteria to Evaluate Recovery Success

The recovery and reclassification criteria spelled out in the recovery plans are not the only yardsticks that must be used to determine if federal status of the gray wolf should be changed. The ESA identifies five factors that must be considered in any listing, reclassification or delisting decision:

1. threats to, or actual destruction of, the habitat needed by the species;
 2. threats from the overuse of the species for commercial, recreational, scientific or educational purposes;
 3. threats from disease or predation;
 4. the amount of protection provided to the species or its habitat by other laws and regulations;
- and

5. any other natural or human-made factors that might affect the continued existence of the species.

Achievement, or nearing achievement, of the recovery plan's delisting or recovery criteria causes the USFWS to evaluate the species using these five factors. This evaluation includes an assessment of whether these factors are likely to increase and reendanger the species if it is delisted. A discussion of these five factors must be included in any ESA proposal that is published in the Federal Register.

One important ingredient that the USFWS considers when evaluating human-made factors that affect the continued existence of wolves is the management wolves will receive after the anticipated delisting. Because delisting essentially means returning management authority over wolves to state or tribal agencies where wolves live, the USFWS must assure that those entities have management plans in place that will provide adequate protection to wolves so they will not need the ESA's emergency care again in the foreseeable future. As part of the delisting process, the USFWS must approve the state and tribal wolf management plans.

Post-Delisting Monitoring

As additional insurance to protect species that might have been delisted prematurely, the ESA requires that delisted species be monitored for at least five years. If monitoring indicates that the delisting was premature, the USFWS can relist the species, even on an emergency basis, to protect the species under the ESA. Emergency listings can be completed in a matter of weeks and take effect as soon as the relisting notice appears in the Federal Register. They provide full, but short-term, protection by the ESA while the USFWS determines if relisting is needed.

Efforts to Delist the Gray Wolf

Acknowledging the increasing wolf population in certain areas of the lower 48 United States, the USFWS has taken steps to reduce or remove federal protections from wolves. Decreasing federal protection over wolves would result in increased state or tribal authority over wolves.

March 2003: USFWS reclassifies the gray wolf

In March 2003, the USFWS reclassified certain gray wolf populations from endangered to threatened and removed the ESA protections across 30 states where gray wolf recovery was not feasible or not necessary under the ESA. It established three "Distinct Population Segments" (DPS) for the gray wolf, which allowed for recovery to proceed independently in each of the three geographic areas: East, West, and Southwest.

In the Eastern DPS, including states from the Great Plains to the Atlantic coast, the USFWS downlisted wolves to threatened instead of the previous, more protective endangered status. Wolves in the state of Minnesota had been classified as threatened since 1978, so the March 2003 action did not change the classification of wolves there. The USFWS determined that the expanding population of wolves in Minnesota, Wisconsin, and Michigan had met or exceeded recovery goals and each state possessed an acceptable management plan. Because of the successful reintroduction of wolves into Yellowstone National Park and central Idaho and the successive wolf population growth in that area, the USFWS reclassified wolves from endangered to threatened in the Western DPS, an area consisting of states along the Pacific coast and into the Northern Rocky Mountains region. The reduction in status allowed special regulations for increased management

flexibility in removing wolves that caused problems with human activities. Certain portions of that region had previously been classified as “nonessential experimental,” and those areas retain this classification.

Wolves in the Southwestern DPS, which contains Arizona, New Mexico and portions of Utah, Colorado, Texas and Oklahoma, retained their endangered classification because the wolf population there had not yet reached recovery goals.

Several lawsuits were filed in response to this USFWS ruling.

July 2004: USFWS proposes to delist the gray wolf from the Dakotas to Maine

In July 2004, the USFWS proposed to remove wolves in the Eastern DPS from the federal list of endangered and threatened species. The proposal declared that the gray wolf in this region had met the population criteria set forth in the original recovery plan and is, therefore, no longer in need of recovery or federal protection. Gray wolves outside of the Eastern DPS were unaffected by this proposal.

In the proposal, the USFWS recognized that Minnesota’s gray wolf population is large enough to assure future survival and that populations in Wisconsin and Michigan have reached stable and viable levels. In addition, the proposal confirms that the USFWS carefully examined and approved the individual management plans for all the states and tribal authorities that possess wolf populations in that region.

Delisting the gray wolf in the Eastern DPS would officially finalize gray wolf recovery for the area, and it would help shift attention—time and money—toward other species that are in more dire need of protection.

2005: Courts rule on 2003 lawsuit, revoke reclassification

In district courts in Oregon and Vermont overturned the 2003 USFWS rule reclassifying wolves. The rulings nullified the creation of the three Distinct Population Segments and returned wolves to their pre-2003 classifications. As a result of these rulings, wolves in the Eastern and Western regions moved one step away from delisting, resuming the more protective “endangered” status. In the Western region, certain areas continue to be managed as “nonessential experimental” because that designation was established prior to, and separate from, the 2003 rule. Similarly, in the Eastern region, the wolves in Minnesota continue to be classified as threatened because that designation was established prior to the 2003 rule. Because the courts’ decisions overturned the basis on which the USFWS declared wolves in the Eastern region ready for removal from the list, the decision postpones the possibility that wolves there will be delisted.

Resources:

The USFWS provides information about the Endangered Species Act, including the document itself, on their Web site: <http://endangered.fws.gov/>. You may also contact them for more information at 1-800-344-9453.

APPENDIX III

ROCKY MOUNTAIN NEWS, JUNE 21, 2004

LET'S WELCOME THE WANDERING WOLVES

State must devise balanced management plan

Reprinted with permission of the Rocky Mountain News.

For many Coloradans, wolves are a symbol either of all that should be protected and preserved in the wild or of aggressive government intrusion threatening all that is good about rural life. Between the two, middle ground can be tough to find. But that's precisely what the state's wolf-management panel should be aiming for.

The panel met for the first time recently after the discovery of the first gray wolf in Colorado in nearly 70 years—a single dead female from Yellowstone National Park found on I-70 30 miles west of Denver. But there was little agreement as to whether the state should accommodate naturally migrating wolves, catch them and relocate them, or kill them on sight.

As policy, the last option isn't as implausible as you might think. Earlier this year, Wyoming officials decided to turn most of their state into a wolf free-fire zone. Perhaps that's what Les Hampton, a rancher and Moffat County commissioner, had in mind when he told his panel colleagues: "We need a plan because I have a whole bunch of neighbors who will produce their own if you don't."

But most Coloradans would reject such a solution. If it's inevitable wolves are coming to Colorado, the panel ought to submit a rational plan before the Fish & Wildlife Service removes the animals from federal protection and turns management over to the states. Any such plan would accommodate the views of conservationists, scientists and land managers while protecting the interests of ranchers and the peace of mind of urban residents.

The problem is, delisting has ground to a halt thanks to Wyoming, where politicians chose symbolism over common sense. The Fish & Wildlife Service had approved Idaho and Montana's plans to maintain 15 wolf packs each. But it rejected Wyoming's, which allowed wolves to be shot on sight outside Yellowstone and Grand Teton national parks and adjacent wilderness areas. The dispute has since headed to court.

If an open-season-on-wolves plan is beyond the pale in Colorado, a catch-and-release strategy has its own problems. "A costly, logistical nightmare," is how one expert put it. That leaves the third option: sensible accommodation. Stockgrowers must be compensated for their losses and allowed to protect their livestock without fear of penalty. Game managers must be able to cull problem wolves. And wolves that wander too close to urban populations must be hunted or relocated, much like mountain lions and black bears are managed under current state law.

One thing is for certain, Yellowstone wolves are not waiting for Coloradans to resolve their differences. Sooner or later a breeding pack will be roaming the state.

Surely there's a workable compromise between the extremes of the save-every-wolf environmentalists and the anti-wolf-niks for whom the only good wolf is a dead wolf. There must be, and the panel must provide it.

THE MISSOULIAN, MARCH 31, 2003

LABEL CHANGE FOR WOLVES IS GOOD NEWS **Undeniable success toward restoring this high-profile species is reason to celebrate.**

www.missoulian.com Reprinted with permission.

Public reaction has been muted and confused following a March 18 move by the U.S. Fish and Wildlife Service to upgrade the status of gray wolves to “threatened,” a substantial improvement over their “endangered” status since 1974. That’s too bad, because the change reflects great progress and cause for celebration.

The change reflects reality. Wolves no longer can be accurately considered on the brink of extinction in the lower 48 states. Dozens of wolf packs totaling close to 700 animals now roam the Northern Rockies, while thousands more are thriving in Minnesota, Wisconsin and Michigan. Changing their legal status to “threatened” allows greater flexibility in managing wolves and their habitat while maintaining substantial protection under the Endangered Species Act. This change puts wolves on the same level of protection as Montana’s grizzly bears.

Wolf advocates should be cheering. If anything, wolf recovery has proved more successful than they predicted, especially in this part of the country. Too many environmentalists, however, allow success to be overshadowed by mistrust of the government—suspecting that the reclassification somehow signals retreat in the commitment to protect wolves.

Ranchers and others who fought for so long against wolf-recovery efforts should be cheering, too. Their dire predictions of ruinous livestock losses have been proved wrong. Sen. Conrad Burns’ famous warning that wolves would kill children if reintroduced to Yellowstone turned out to be hyperbolic. Aren’t they glad they were wrong? They should be.

The change from “endangered” to “threatened” applies over a broad landscape, including areas where wolves could live but haven’t been restored. The change could slow the momentum toward broader wolf recovery; a lower risk of extinction changes the sense of urgency, legally and politically. But in the long run, the best way to foster wolf recovery in other regions probably is to complete the job where they already exist—that is, where wolves currently roam, work to get these critters off the threatened-and-endangered-species list altogether. We’ve already learned how to restore populations of these large predators. These lessons can be applied elsewhere. Showing that we can successfully manage wolves here over the long run, in balance with people and other wildlife, will do much to win support for wolves elsewhere in the West.

IDAHO STATE JOURNAL, JULY 27, 2004

WOLF PACK WAS SACRIFICED AS PART OF REINTRODUCTION DEAL

<http://www.journalnet.com/articles/2004/07/27/opinion/opinion01.txt>
Reprinted with permission.

The feds took out a nine-member wolf pack last week near McCall after failed attempts to convince the critters to remove sheep from their diet. By the resounding “Hallelujah!” heard around Idaho, you’d have thought the state sales tax had up and expired.

Truthfully, the demise of the Cook Pack—which over the last two summers killed in the neighborhood of 200 sheep—isn’t one which wolf restoration advocates should mourn. And for the anti-wolf crowd, it’s not one to cheer, either.

Gunning down all nine of these wolves from a helicopter is the kind of control the government must exercise if its efforts to keep wolves a part of the wild landscape of Idaho are to have any kind of validity. Granted, sheep just might be the least equipped of domestic livestock to deal with a pack of hungry wolves. Ed Bangs, the U.S. Fish and Wildlife Service wolf recovery coordinator, had this to say about sheep in last year’s Idaho State Journal: “Sheep are susceptible to just about any predator, whether it walks, runs or flies—they’re just looking for a place to die.”

Nevertheless, grazing sheep is an established land use in Idaho, and not one the government is going to reduce or further regulate, no matter how many wolves roam the countryside. The only option for wolf recovery officials is to occasionally exercise some lethal control. In effect, the Cook Pack took one for the team.

Oddly enough, that’s the way it’s supposed to work. If efforts fail to convince a pack of wolves to change its collective diet, there’s

usually only one thing left to do. In this instance, for the benefit of the entire Northern Rockies wolf population, a pack of nine animals had to be sacrificed. Simple as that.

And the rancher who owns the sheep? Because the sheep were clearly killed by wolves, the rancher can apply for financial relief through the Defenders of Wildlife’s Bailey Wildlife Foundation Wolf Compensation Fund. The existence of this fund is one of the many factors that convinced the government to undertake wolf reintroduction in the Northern Rockies in 1995.

For nearly a decade, Defenders of Wildlife has lived up to its title. It has paid thousands of dollars to farmers and ranchers who can prove wolves have unfortunately culled their herds. That fund has helped take some of the sting out of the reintroduction of one of the West’s native predators.

Is the system perfect? Not by a long shot. But removing a troublesome pack that did not respond to other means of control was the right decision. If the ecosystem is to be as close to complete as possible, wolves are a necessary ingredient, even if they occasionally have be checked. And while we’ll never see a pristine Rocky Mountain landscape, such as the one greeted by the first European-American explorers to venture into the Northwest 200 years ago, we can ensure the wilderness we have left is truly wilderness.

Nine wolves is a small price to pay for that.

WYOMING WILDLIFE MAGAZINE, JANUARY 2004

WOLVES: AN OUTFITTER'S VIEW ON WYOMING'S WOLF REINTRODUCTION PLAN

By Maury Jones Reprinted with permission.

Most Wyoming hunters opposed the introduction of the Canadian Gray Wolf and continue to oppose its protection. The primary reason for this opposition is very simple; wolves compete for the huntable surplus of game.

Historically, more animals are born than are needed to replace natural mortality. This recruitment enables the Wyoming Game and Fish Department to issue permits to hunters, producing revenue to pay for game management. Game populations are kept in balance through regulated hunting, and Wyoming hunters are able to get meat for the freezer to help feed their families. This system has worked for several decades.

Many outfitters don't believe wolves only kill the weak, sick and old of a herd.

Enter the Canadian Gray Wolf, courtesy of the U.S. Fish and Wildlife Service and those who push the anti-hunting, pro-predator agenda. They introduced this non-native wolf under the guise of "restoring historical balance to the Yellowstone ecosystem," even though strong evidence shows that wolves rarely entered Yellowstone in the 77 years prior to 1913 (National Park Service Documents, "The Wolves of Yellowstone" Weaver 1978).

Also, an official government document, Yellowstone Animal Census, 1912, lists various animals and their numbers, but under Gray Wolves the total is listed as NONE (Hornaday, Our Vanishing Wildlife, pg 336).

Canadian Grays are NOT the original wolf that was in Wyoming. The original Rocky Mountain Wolf was much smaller and did not run in packs. The only conclusion we hunters can make is that ending sport hunting is the major objective and not the recovery of an endangered species.

We believe the Canadian Gray Wolf is a MAJOR wildlife disaster in the making.

Our Wyoming big game populations are not evolved to deal with the predation of this huge non-native wolf, and it shows in the impact the wolf is making.

It is significant that both Alaska and British Columbia, which have thousands of wolves, have recently initiated wolf reduction programs in some areas to "increase numbers of ungulates for subsistence hunting."

Wyoming hunters don't necessarily hate wolves, but many of us strongly object to any efficient predator being imposed on our wildlife without adequate population control.

Other misinformation says a wolf will kill only the weak, the sick, the old, and will only kill what it needs. Facts refute that claim. On the Camp Creek Elk Feedground in 2002, a lone wolf killed five calf elk in one night, eating less than ten pounds of meat. Quite a number of elk, including some large bulls, have been killed on the Gros Ventre feedgrounds, and many of them have had just the lips and noses eaten. Wolves have not returned to these kills

Wolves: An Outfitters View

(continued)

no matter how little they have eaten of the carcass. Several mutilated elk have had to be put out of their misery.

Some claim the wolf is filling a vacant niche in the ecosystem and wolves will self-regulate their population to stay in balance with the prey base. Wyoming hunters don't believe it. Wolf populations will expand as long as they have something to eat. Wolf populations will not decline even when their prey base is scarce because then they will prey on livestock. Big game populations will soon be below the surplus level needed to sustain our historical hunting opportunities.

The wolf population is growing approximately 30% per year, according to USFWS figures. Biologists tend to be cautious (deceptive?) regarding wolf impact by just counting the numbers of wolves and the prey they consume; the results are becoming painfully obvious.

Using official USFWS statistics, the Greater Yellowstone Ecosystem has approximately 271 wolves as of December 2002, and each wolf kills approximately 1.9 elk per month. Therefore, about 514 elk are killed each month, more than 6,000 elk killed each year by wolves. These are the figures given by those in charge of wolf "management." (NOTE: Monitoring wolves does not constitute "management." Population control to keep them in balance with their prey base would be management.)

Those 6,000 elk could have been "sold," via hunting permits, thus generating millions of dollars for game departments and yielding over one million pounds of elk meat for families of hunters. Wyoming hunters feel it is unacceptable to feed that resource to non-native wolves. This "experimental non-essential population" of wolves has already reduced some of our hunting permits, contrary to projections, and will probably eliminate some hunts.

In conclusion, Wyoming hunters don't necessarily hate wolves, but many of us strongly object to any efficient predator being imposed on our wildlife without adequate population control.

Outfitter Maury Jones has run a hunting camp in Wyoming since 1978. He has served as the president of the Jackson Hole Outfitters and Guides Association and is currently on the board of the Wyoming Outfitters and Guides Association, where he serves on the wolf committee.

http://espn.go.com/outdoors/conservation/columns/guest_columnist/1687894.htm

APPENDIX IV

Correlations with National Science Education Standards

All activities in the *Gray Wolves, Gray Matter* curriculum support the National Science Education Standards. For correlations with other subject area standards, please visit www.wolf.org.

Back From the Brink

National Science Education Standards

- Unifying Concepts and Processes
 - Evidence, models, and explanation
 - Change, constancy, and measurement
- Life Science (5–8)
 - Populations and ecosystems
 - Science in Personal and Social Perspectives (5–8)
 - Risks and benefits
- Science in Personal and Social Perspectives (9–12)
 - Population Growth
 - Natural Resources
 - Environmental Quality

Biodiversity Case Studies

National Science Education Standards

- Unifying Concepts and Processes
 - Systems, order, and organization
 - Evidence, models, and explanation
 - Change, constancy, and measurement
 - Evolution and equilibrium
- Science as Inquiry
 - Abilities necessary to do scientific inquiry
 - Understanding about scientific inquiry
- Life Science (5–8)
 - Structure and function in living systems
 - Reproduction and heredity
 - Regulation and behavior
 - Population and ecosystems
 - Diversity and adaptations of organisms
- Life Science (9–12)
 - Biological evolution
 - Interdependence of organisms
 - Matter, energy, and organization in living systems
 - Behavior of organisms
- Science in Personal and Social Perspectives (5–8)
 - Populations, resources, and environments
- Science in Personal and Social Perspectives (9–12)
 - Population Growth
 - Natural Resources
 - Environmental Quality

Conflict Resolution

National Science Education Standards

- Unifying Concepts and Processes
 - Evidence, models, and explanation
- Science as Inquiry
 - Abilities necessary to do scientific inquiry
 - Understanding about scientific inquiry
- Science in Personal and Social Perspectives (9–12)
 - Environmental Quality

Designing a Management Plan

National Science Education Standards

- Unifying Concepts and Processes
 - Systems, order, and organization
 - Evidence, models, and explanation
 - Change, constancy, and measurement
- Life Science (5–8)
 - Structure and function in living systems
 - Reproduction and heredity
 - Regulation and behavior
 - Population and ecosystems
- Life Science (9–12)
 - Interdependence of organisms
 - Behavior of organisms
- Science in Personal and Social Perspectives (5–8)
 - Populations, resources, and environments
 - Risks and benefits
- Science in Personal and Social Perspectives (9–12)
 - Population Growth
 - Natural Resources
 - Environmental Quality

Fact and Opinion

National Science Education Standards

- Unifying Concepts and Processes
 - Evidence, models, and explanation
- Science as Inquiry
 - Abilities necessary to do scientific inquiry
 - Understanding about scientific inquiry

Folktale FocusNational Science Education Standards

Unifying Concepts and Processes
 Evidence, models, and explanation
 Change, constancy, and measurement

Home Is Where the Food IsNational Science Education Standards

Unifying Concepts and Processes
 Evidence, models, and explanation
 Change, constancy, and measurement

Science as Inquiry
 Abilities necessary to do scientific inquiry
 Understanding about scientific inquiry

Life Science (5–8)
 Populations and ecosystems

Science in Personal and Social Perspectives (5–8)
 Populations, resources, and environments

How Do You Know the Wolf?National Science Education Standards

Unifying Concepts and Processes
 Evidence, models, and explanation

Science as Inquiry
 Abilities necessary to do scientific inquiry
 Understanding about scientific inquiry

Science in Personal and Social Perspectives (9–12)
 Environmental Quality

Imaginary Wolf RecoveryNational Science Education Standards

Unifying Concepts and Processes
 Systems, order, and organization
 Evidence, models, and explanation
 Change, constancy, and measurement
 Evolution and equilibrium

Science as Inquiry
 Abilities necessary to do scientific inquiry
 Understanding about scientific inquiry

Life Science (5–8)
 Regulation and behavior
 Population and ecosystems
 Diversity and adaptations of organisms

Life Science (9–12)
 Biological evolution
 Interdependence of organisms
 Matter, energy, and organization in living systems
 Behavior of organisms

Science in Personal and Social Perspectives (5–8)
 Populations, resources, and environments
 Risks and benefits

Science in Personal and Social Perspectives (9–12)
 Population Growth
 Natural Resources
 Environmental Quality

Island of Gray WolvesNational Science Education Standards

Unifying Concepts and Processes
 Systems, order, and organization
 Evidence, models, and explanation
 Change, constancy, and measurement
 Evolution and equilibrium
 Form and Function

Science as Inquiry
 Abilities necessary to do scientific inquiry
 Understanding about scientific inquiry

Life Science (5–8)
 Structure and function in living systems
 Regulation and behavior
 Population and ecosystems

Life Science (9–12)
 Biological evolution
 Interdependence of organisms
 Matter, energy, and organization in living systems
 Behavior of organisms

Science in Personal and Social Perspectives (5–8)
 Populations, resources, and environments

Science in Personal and Social Perspectives (9–12)
 Population Growth

Less/MoreNational Science Education Standards

Unifying Concepts and Processes
 Systems, order, and organization
 Evidence, models, and explanation
 Change, constancy, and measurement

Science as Inquiry
 Abilities necessary to do scientific inquiry
 Understanding about scientific inquiry

Life Science (5–8)
 Structure and function in living systems
 Population and ecosystems

Life Science (9–12)
 Interdependence of organisms
 Matter, energy, and organization in living systems

Science in Personal and Social Perspectives (5–8)
 Populations, resources, and environments

Science in Personal and Social Perspectives (9–12)
 Population Growth

Little Red Takes Many PathsNational Science Education Standards

Unifying Concepts and Processes
 Evidence, models, and explanation
 Change, constancy, and measurement

Management Plan AnalysisNational Science Education Standards

Unifying Concepts and Processes
 Systems, order, and organization

Life Science (9–12)
 Interdependence of organisms
 Behavior of organisms

Science in Personal and Social Perspectives (5–8)
Populations, resources, and environments
Risks and benefits

Science in Personal and Social Perspectives (9–12)
Population Growth
Natural Resources
Environmental Quality

Mapping a Wolf's World

National Science Education Standards

Unifying Concepts and Processes
Systems, order, and organization
Evidence, models, and explanation
Change, constancy, and measurement
Evolution and equilibrium

Science as Inquiry
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)
Regulation and behavior
Population and ecosystems

Life Science (9–12)
Biological evolution
Interdependence of organisms
Matter, energy, and organization in living systems
Behavior of organisms

Science in Personal and Social Perspectives (5–8)
Populations, resources, and environments
Risks and benefits

Science in Personal and Social Perspectives (9–12)
Population Growth
Natural Resources
Environmental Quality

Mary Had a Little Lamb

National Science Education Standards

Unifying Concepts and Process
Systems, order, and organization
Change, constancy, measurement

Science as Inquiry
Skills necessary to become an independent thinker about the natural world.
Dispositions to use skill, abilities, and attitudes associated with science

Life Science Grades 5-8
Populations and ecosystems
Diversity and adaptations of organisms

Life Science Grades 9-12
Interdependence of organisms
Matter, energy, and organisms in living systems
Behavior of organisms

Science in Personal and Social Perspectives 5-8
Populations, resources, and the environment
Risks and benefits
Science and technology in society

Science in Personal and Social Perspectives 9-12
Perspectives and community health
Population growth
Science and technology in local, national, and global challenges

Nature's Stock Market

National Science Education Standards

Unifying Concepts and Processes
Systems, order, and organization
Change, constancy, and measurement
Evolution and equilibrium

Science as Inquiry
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)
Structure and function in living systems
Regulation and behavior

Life Science (9–12)
Interdependence of organisms

Science in Personal and Social Perspectives (5–8)
Populations, resources, and environments

Needs vs. Wants

National Science Education Standards

Unifying Concepts and Processes
Systems, order, and organization
Evidence, models, and explanation
Change, constancy, and measurement

Science in Personal and Social Perspectives (5–8)
Risks and benefits

Science in Personal and Social Perspectives (9–12)
Natural Resources
Environmental Quality

Problem Solving

National Science Education Standards

Unifying Concepts and Processes
Evidence, models, and explanation

Science as Inquiry
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)
Population and ecosystems

Life Science (9–12)
Interdependence of organisms

Science in Personal and Social Perspectives (5–8)
Populations, resources, and environments
Risks and benefits

Science in Personal and Social Perspectives (9–12)
Environmental Quality

Ripple Effect

National Science Education Standards

Unifying Concepts and Processes
Systems, order, and organization
Evidence, models, and explanation
Change, constancy, and measurement
Evolution and equilibrium
Form and Function

Science as Inquiry
Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)

Structure and function in living systems
Population and ecosystems
Diversity and adaptations of organisms

Life Science (9–12)

Biological evolution
Interdependence of organisms
Matter, energy, and organization in living systems
Behavior of organisms

Science in Personal and Social Perspectives (5–8)

Populations, resources, and environments

Science in Personal and Social Perspectives (9–12)

Population Growth
Natural Resources

Survey Says

National Science Education Standards

Unifying Concepts and Processes

Evidence, models, and explanation

Science as Inquiry

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Science in Personal and Social Perspectives (5–8)

Risks and benefits

Science in Personal and Social Perspectives (9–12)

Environmental Quality

Time Passes

National Science Education Standards

Unifying Concepts and Processes

Systems, order, and organization
Evidence, models, and explanation
Change, constancy, and measurement
Evolution and equilibrium
Form and Function

Science as Inquiry

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)

Structure and function in living systems
Regulation and behavior
Population and ecosystems
Diversity and adaptations of organisms

Life Science (9–12)

Biological evolution
Interdependence of organisms
Matter, energy, and organization in living systems
Behavior of organisms

Science in Personal and Social Perspectives (5–8)

Populations, resources, and environments
Risks and benefits

Science in Personal and Social Perspectives (9–12)

Population Growth-
National Resources
Environmental Quality

Values Clarification

National Science Education Standards

Unifying Concepts and Processes

Evidence, models, and explanation

Science as Inquiry

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Wolf Dollars & Sense

National Science Education Standards

Unifying Concepts and Processes

Change, constancy, and measurement

Science as Inquiry

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)

Population and ecosystems

Life Science (9–12)

Interdependence of organisms

Science in Personal and Social Perspectives (5–8)

Populations, resources, and environments
Risks and benefits

Science in Personal and Social Perspectives (9–12)

Population Growth
Natural Resources
Environmental Quality

Wolf Jeopardy

National Science Education Standards

Life Science (5–8)

Structure and function in living systems
Regulation and behavior
Population and ecosystems

Life Science (9–12)

Interdependence of organisms

Science in Personal and Social Perspectives (5–8)

Populations, resources, and environments

Science in Personal and Social Perspectives (9–12)

Population growth
Natural resources
Environmental quality

Wolf Management Scenarios

National Science Education Standards

Unifying Concepts and Processes

Evidence, models, and explanation
Change, constancy, and measurement
Evolution and equilibrium

Science as Inquiry

Abilities necessary to do scientific inquiry
Understanding about scientific inquiry

Life Science (5–8)

Regulation and behavior
Population and ecosystems

Life Science (9–12)

Interdependence of organisms
Behavior of organisms

Science in Personal and Social Perspectives (5–8)

Populations, resources, and environments
Risks and benefits

Science in Personal and Social Perspectives (9–12)

Population Growth
Natural Resources
Environmental Quality

Wolf Time LineNational Science Education Standards

- Unifying Concepts and Processes
 - Change, constancy, and measurement
- Life Science (9–12)
 - Interdependence of organisms
- Science in Personal and Social Perspectives (5–8)
 - Risks and benefits
- Science in Personal and Social Perspectives (9–12)
 - Environmental Quality

Wolf TurfNational Science Education Standards

- Unifying Concepts and Processes
 - Systems, order, and organization
 - Evidence, models, and explanation
 - Change, constancy, and measurement
 - Evolution and equilibrium
- Science as Inquiry
 - Abilities necessary to do scientific inquiry
 - Understanding about scientific inquiry
- Life Science (5–8)
 - Regulation and behavior
 - Population and ecosystems
- Life Science (9–12)
 - Interdependence of organisms
 - Matter, energy, and organization in living systems
 - Behavior of organisms
- Science in Personal and Social Perspectives (5–8)
 - Populations, resources, and environments
- Science in Personal and Social Perspectives (9–12)
 - Population Growth
 - Natural Resources
 - Environmental Quality

APPENDIX V

Vocabulary Quiz

Name: _____

Directions: write the term on the line in front of its definition.

TERMS

anthropo- morphism	capacity	Endangered Species Act	mortality	reimbursement
behavior	compromise	eradicate	nonlethal control	reintroduction
biodiversity	conflict	extirpate	opinion	stakeholder
bounty	consensus	folktale	poaching	territory
cache	culture	guard dog	prey	ungulate
carnivore	delisting	habitat	radio collar	wildlife management
carrying	depredation	limiting factor	ranch	
	disperser	livestock	recovery	
	ecosystem			

DEFINITIONS

_____ a wolf that leaves its natal pack

_____ transmittal device fitted onto a wolf's neck by researchers wishing to locate the wolf periodically

_____ a person or group affected by a particular issue

_____ a hoofed animal

_____ a congressional act passed in 1973 that provides for the identification and protection of species in danger of extinction or threatened by extinction in the foreseeable future

_____ methods to control wolf movement or behavior that do not kill the wolf

_____ the application of scientific knowledge and technical skills to influence animals' habitat, behavior and abundance

_____ wolf recovery strategy in which animals that have become locally extinct are put back into strategic places within their historic range

_____ process of regaining a stable, viable wildlife population

_____ repayment

_____ attributing human characteristics to animals

_____ an animal that kills and eats other animals, a meat eater

_____ the governmental process of removing an animal or plant from the endangered species list when its population is no longer in danger of going extinct

_____ a large farm, especially in the western United States, where large herds of cattle, sheep or horses are raised

VOCABULARY QUIZ PAGE 2

_____ the act of preying upon or plundering something of human value, usually in relation to wildlife damaging agricultural products

_____ disagreement, two or more people having different views

_____ payment or reward for removal of certain species of animals felt to be harmful, paid for any individual animal killed at any time in any place where the bounty applies

_____ to eliminate or completely get rid of

_____ illegal killing of wildlife

_____ story told orally for hundreds or thousands of years before being written down

_____ a belief or idea someone holds

_____ dogs specially trained to protect livestock from depredation by predators such as wolves or coyotes

_____ the maximum number of animals a given area can sustainably support over time

_____ a community of organisms interacting within and with their environment

_____ agreement of all parties

_____ place where food is stored for later use

_____ a habitat component that affects an organism's ability to survive and prevents the species from increasing its population indefinitely

_____ of or related to deaths

_____ a place that provides essential elements the individuals of a species need to survive, such as nutrients, water, sunlight, shelter and living space

_____ land or home range defended by a pack of wolves

_____ an animal that is captured and eaten by a predator

_____ the way in which an animal responds to its environment, how an animal acts

_____ settlement of differences in which all involved parties offer concessions

_____ a measure of the variety, complexity and relative abundance of plant and animal species present and interacting in an ecosystem, and the natural processes that support them

_____ beliefs, attitudes and traditions held by a definable group of people

_____ animals raised on a farm or ranch for meat, egg, milk or fur production

_____ the extermination or removal of a species from an entire area within its range but not from the entire planet

APPENDIX VI

Writing Reflection Questions

Teachers: use these questions to assess student learning on each lesson.

Back From the Brink

Research an animal that has become extinct in the past 200 years. Applying the criteria in the unit for why species may have become endangered, write a paragraph about why the animal went extinct and what might have been done to save the species from extinction.

Biodiversity Case Studies

Thinking back on the case studies from this unit, what similarities exist among all the studies in regards to changes occurring in each of the areas listed? What, then, is the importance of understanding biodiversity and the need for scientists and researchers to study these areas?

Conflict Resolution

Imagine that you have been brought in to mediate a conflict between ranchers and biologists over the issue of studying the possible relocation of wolves to a large wilderness area near several large cattle ranches. How would you get the two sides to begin talking with each other? Consider the conflict resolution exercises and whether any might apply to this situation.

Designing a Management Plan

Research an official position statement of a stakeholder group in a wolf controversy. Write a paragraph about why that particular stakeholder's point of view is valid.

Fact and Opinion

When considering the topic of wolves and wolf management, which do you believe is the more important when presenting information to the public regarding wolves: fact or opinion? Might both be needed? Please express your opinion on this.

Folktale Focus

Folktales and fables are designed to teach a lesson or a “moral” at the end of the story. Write what you believe is the appropriate lesson or moral for each of the folktales. Then, select any of the folktale stories and write a new version of that story, changing its emphasis (a “foolish wolf” story into a “wise wolf” story). Finally, explain how the change affects the lesson or moral, and write a new lesson or moral for your revised story.

Home Is Where the Food Is

Wolf researchers employ a variety of methods to assist them in gathering data about wolves. Discuss why researchers use these various methods, and why results of the data are useful for the researchers.

How Do You Know the Wolf?

After examining the various ways that people form their attitudes, write a paragraph in which you discuss how people's attitudes can be affected by learning new information.

Imaginary Wolf Recovery

Why would wolf recovery plans be necessary? Are such plans needed? Write an editorial in which you either support or are against a wolf recovery program. Read sample newspaper editorials to give you an idea of the style and language used in editorial writing.

Island of Gray Wolves

Island biogeography presents unique circumstances for the animal populations living on Isle Royale. Discuss the importance of maintaining a balance in the animal populations on Isle Royale, including information about what can happen when that balance is disturbed by a variety of factors.

Less/More

We have seen in this unit how all elements of our world are interconnected and rely upon one another. Write a brief discussion about how the diagram created would be different if the beginning was “less/fewer wolves.”

Little Red Takes Many Paths

Write a one-page essay in which you summarize the differences between the various versions of Little Red Riding Hood. Use the notes you took during the activity for supporting information.

Management Plan Analysis

Select one of the case studies in the unit. Discuss what may have happened had a different wildlife management plan been put into place. Base your information on facts from the case study, as well as speculation or hypothesizing on your part.

Mapping a Wolf's World

Create a hypothetical scenario in which you write about a specific way in which the dynamics of the state may change in the next 10 years. How would your change affect the wolf population? What problems might arise? What solutions would you propose?

Mary Had a Little Lamb

After completion of the unit, write a paragraph in which you agree or disagree with the solution proposed by the class. Be sure to include some evidence from the activities in the unit to back up your opinion, and don't just base it on your own feelings.

Nature's Stock Market

All animals need food, water, shelter and space. Describe three challenges an animal might face in the pursuit of these resources?

Needs vs. Wants

It is fairly easy to identify and distinguish between needs and wants as human beings. The ability to get what we need and, often, what we also want is taken for granted. However, we sometimes discover that human needs and wants can come into conflict with the world around us. Write a paragraph in which you discuss how humans may need to choose between their needs versus their wants when it comes to coexisting in the world with other species.

Problem Solving

How might the STOP technique be applied when considering wolf controversies? Use each letter, and write a few sentences about what that particular step would look like for wolf management.

Ripple Effect?

Every living thing on this planet has some sort of impact on the world. Write a paragraph in which you compare and contrast the wolf's effect on the ecosystem with the effects of humans on the environment.

Survey Says

Looking over your survey results, write a paragraph about how your survey might differ if you were (1) in a city much larger than the one you live in, (2) in an area whose economy is dependant on raising sheep and cattle, (3) a group of lawmakers.

Time Passes

In thinking about the activities in this unit, write a paragraph in which you discuss what role humans play and what responsibilities they have in the development of the world. Should humans be allowed to do anything they desire? Do humans have a responsibility to consider what is around them?

Values Clarification

Select any of the value barometer statements. Consider the discussions that centered around the statement you selected. Write a persuasive paragraph in which you address the point or points in the question.

Wolf Dollars and Sense

Livestock owners may use a variety of methods to protect their livestock from predators such as wolves. Lethal methods involve killing the predators; nonlethal methods try to deter the predators. Write a persuasive paragraph justifying the use of lethal predator control methods. Write another persuasive paragraph opposing lethal predator control methods.

Wolf Jeopardy

Write three questions you have about wolves. Research and write the answers to your questions.

Wolf Management Scenarios

As you were considering the particular elements of your wolf management scenario, consider how your own values had an impact on your decisions. Might this happen on a national level? Reexamine your scenario, and discuss in what areas personal values might have a large or small impact. Use specific examples.

Wolf Time Line

Based on the information you have learned from the Wolf Time Line cards, think about what wolf management might look like 20 years from now. Write a series of five new time line cards, dating them in 5-year increments. Use a landowner, a legislator, a U.S. Fish and Wildlife Service agent, a wolf researcher, and a livestock owner for your viewpoints.

Wolf Turf

The activities in the Wolf Turf lesson demonstrate the relationship between wolf populations and their food supply. Explain how this relationship is affected when changes occur in food availability and wolf numbers.