



Jacquelyn Fallon

# Mapping a Wolf's World

*Students use maps to deduce critical wolf habitat components and make correlations between different factors affecting wolf populations.*

## SECTION 2 Natural Systems

### Subjects:

*geography,  
sociology,  
biology,  
mathematics*



### Approximate lesson time:

*2 hours*



### Materials:

*overheads of maps,  
paper and pencil*

### STUDENT OBJECTIVES:

At the end of this lesson, students will be able to:

1. Define “limiting factors” and identify what limiting factors may affect wolves in Minnesota.
2. Analyze data through identifying relationships between the wolf and habitat components.
3. Predict how wolf habitat may change in the future and speculate on how this may affect wolf range and the management of the animal.

### VOCABULARY:

limiting factors • density • carrying capacity

### TEACHER BACKGROUND:

A limiting factor is a component of an animal's habitat (home) that may prevent the animal from increasing its population indefinitely. Many factors determine where an animal can live, such as food availability, appropriate shelter, temperature and snowfall. In this activity, students will look at maps of Minnesota and determine what factors affect where the wolf lives now and where its population

may expand in the future. Maps students will examine include the location of food sources, human population densities and habitat type. When an area holds the maximum number of animals that it can sustainably support, we say that it has reached its carrying capacity.

For example, on Isle Royale, there is a limited amount of vegetation on the island. When the moose population exceeds the amount of food that can support all individuals, many moose die of starvation, and the population crashes. The moose exceeded the island's carrying capacity. Since it is impossible for moose to migrate or switch food sources, they starve. The vegetation is a limiting factor for the moose.

A close analysis of potential limiting factors is one way to determine whether an animal can be successful in an area. The enclosed series of Minnesota maps will allow the students to discover correlations between a number of different potential limiting factors and the presence of wolves. Understanding how all of these limiting factors affect the wolf will give students a better sense

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### 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*

*For more correlations, please see Appendix IV.*

of the complex factors influencing the successful survival of the wolf. By grasping these concepts, students will get a better idea of the challenges facing wildlife managers.

### Preparatory Work

You may choose to photocopy the maps in Appendix I onto overhead sheets, then overlap various maps to show the relationships between them. It is also possible to simply compare paper copies of the maps by holding two maps up to the light or visually comparing them side by side.

### ACTIVITIES:

1. Divide students into groups of three to four. Place a pair of maps on the overhead. Have the students discuss and answer questions in small groups.
2. NOTE TO TEACHERS: Some maps have been included that have no apparent relevance to wolf populations. Students should be encouraged to hypothesize and use logic to support their answers but also think creatively. Here is a listing of suggested maps to pair with questions to help students make correlations.

#### A. Maps: Major Cities in Minnesota and Major Highways in Minnesota

**Question:** What correlations can you find between these maps?

**Extension:** Speculate on why the cities are located where they are, using your knowledge of Minnesota geography and history.

#### B. Maps: Current Wolf Range and Minnesota Population by County

**Question:** Do you see any connections between where major cities are located and where wolves live?

**Extension:** What physical characteristics do cities have that may or may not provide wolves with their basic needs?

#### C. Maps: Expansion Range by Contiguous Packs and Head of Livestock

**Question:** What correlations can you draw between the density of wolves (past and present) and the presence of cows/sheep in the state?

**Extension:** Do you think that there have been more or less wolf attacks on livestock in the past compared to more recent years? Why?

#### D. Maps: Current Wolf Range and Turkeys in Minnesota

**Question:** What observation can you make between wolf range and turkeys?

**Extension:** Wild turkeys used to be more common in Minnesota. Do you think that wild turkeys used to be a common food source for wolves? Why or why not? Do you think that wolves had something to do with the turkey population decline?

E. Maps: **Current Wolf Range and Deer in Minnesota** or **Moose Range**

**Question:** Do you see any similarities between wolf range and these animals' ranges?

**Extension:** Deer can often be found in a mixture of forest and open land. When settlers cleared forested land to plant crops, they created more deer habitat. It seems logical that wolves would have followed this food source into new areas. Speculate on why there aren't more wolves in this type of habitat.

F. Maps: **Current Wolf Range and Major Vegetation Types (1990s)**

**Question:** What type of land cover is associated with wolf presence?

**Extension:** Examine the Native Vegetation map (late 1800s). Speculate on wolf territory in the past: do you think it has increased or decreased? Why?

G. Maps: **Current Wolf Range and Annual Precipitation or Landforms**

**Question:** Does precipitation or landforms seem to be limiting factors for wolves?

**Extension:** Can examining these maps help us understand any facets of wolf population dynamics?

H. Maps: **DNR Management Zones**

**Question:** Why do you think the DNR has divided the state into two zones with different wolf management plans?

**Extension:** Who do you think had a stake in deciding this plan? What type of groups might have lobbied for or against this plan? Why?

I. Direct students to look for other correlations on the different maps and ask their own questions.

**More questions:**

- Why might wolves be living primarily in areas with lower human density?
- Why are there fewer humans where there are fewer roads?
- Do most wolves live in areas where there is high road density (and presumably lots of humans)?
- Is the human population more dense in certain vegetative regions? Why?
- Which directions are wolves expanding in Minnesota? Why?
- Make a list of all the possible limiting factors affecting wolves.
- What factors do not seem to have any effect on wolf populations?
- How might any of these maps have been different in 1800?

**ASSESSMENT:**

1. After comparing all the maps, have students decide what parts of the state could reasonably support wolves. Students will need to find a balance between habitat qualities and human presence. Have students sketch their hypothesis onto the blank map of Minnesota.
2. Have students project the following: How might dynamics in the state change in the next 10 years? The next 50 years? Which might affect wolf populations? What problems might arise from these changes? How might this affect wolf populations? What solutions would you propose?

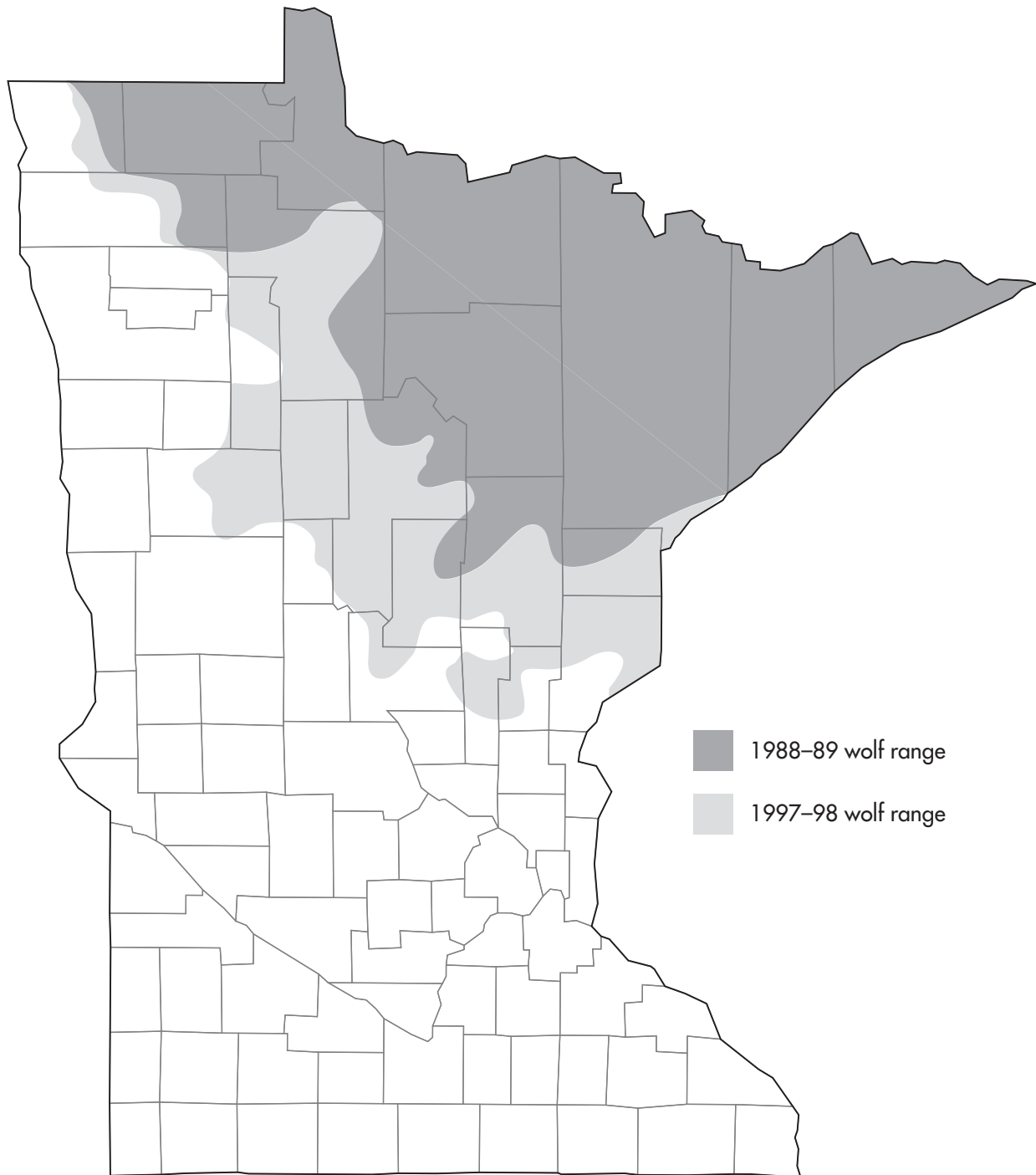
**EXTENSIONS:**

Tell students to research another species. Collect maps (or draw based on readings) related to this species' habitat needs. Share this information with classmates, younger students or family members.



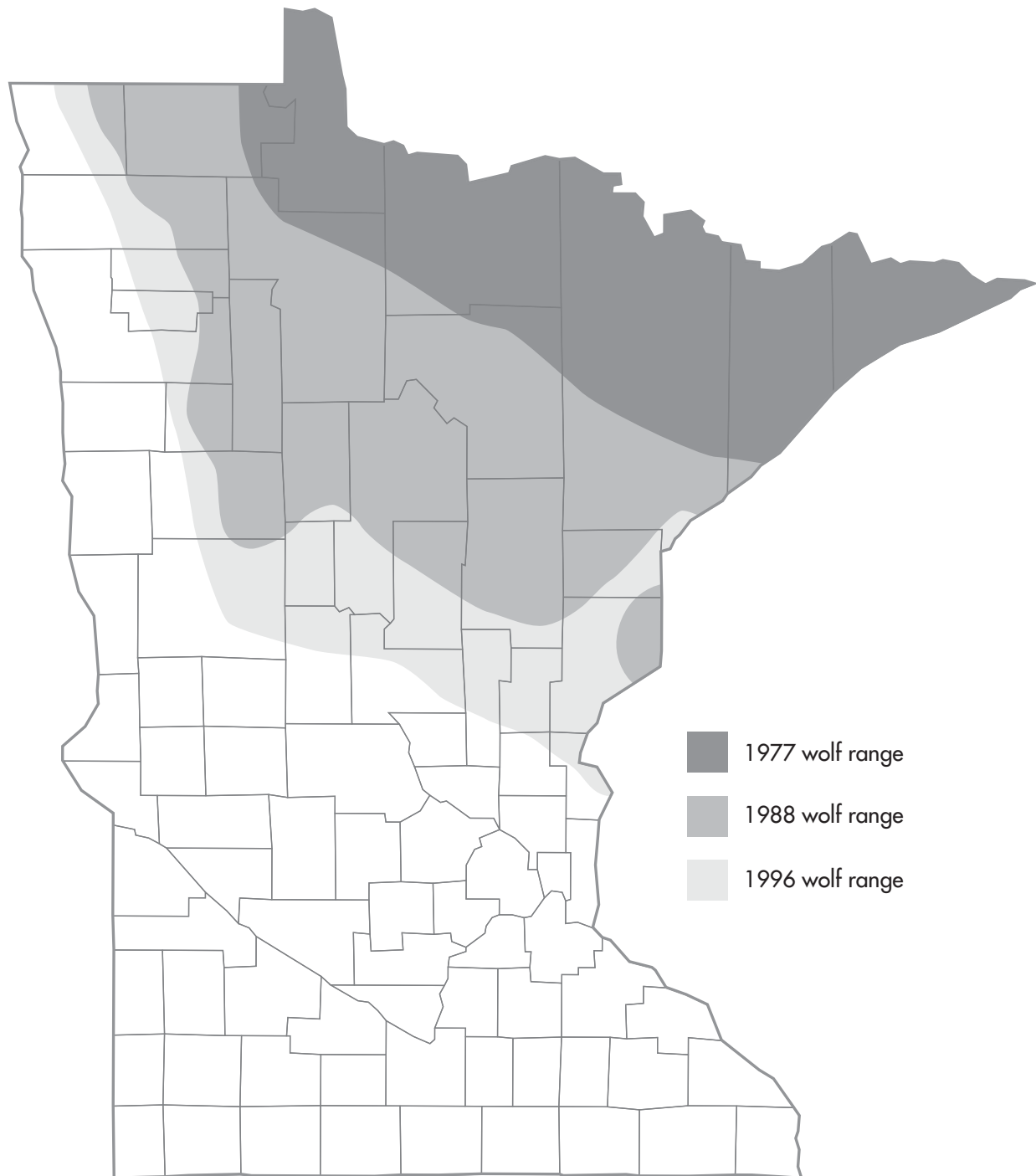
Serle Chapman

# Current Wolf Range in Minnesota



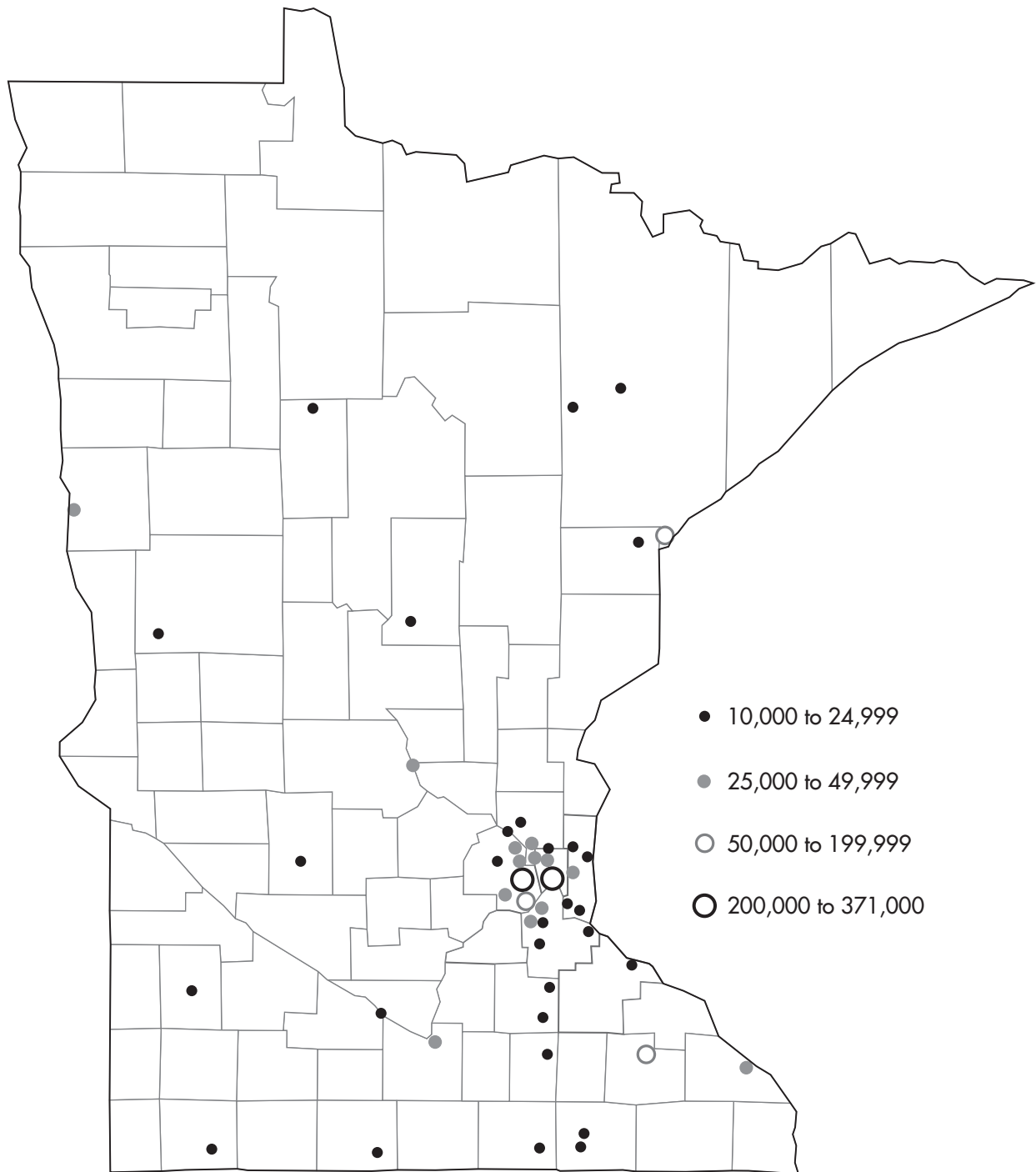
Source: International Wolf Center

# Expansion Range by Contiguous Packs 1978–2005



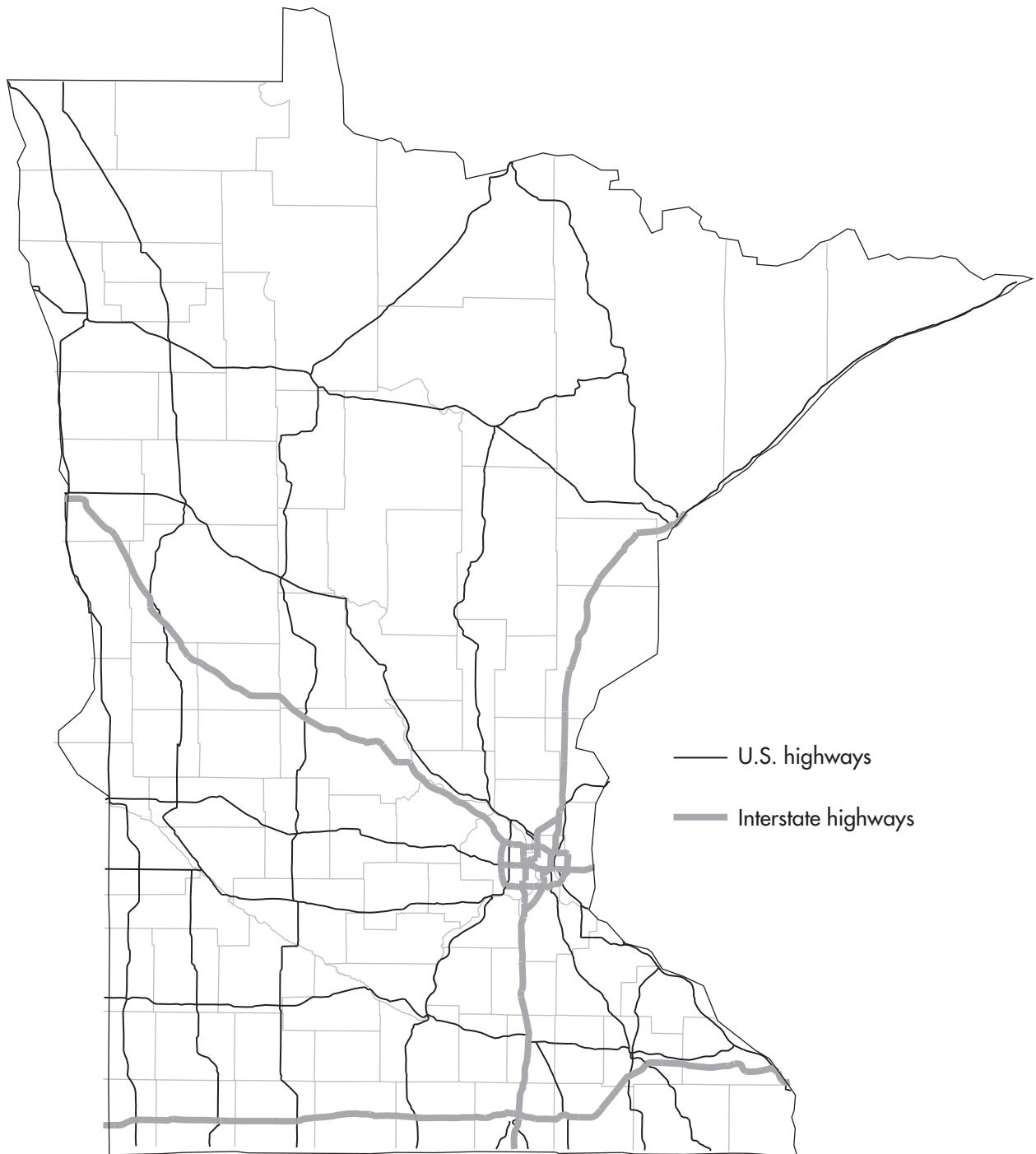
Source: International Wolf Center

# Major Cities in Minnesota



Source: Minnesota Department of Transportation

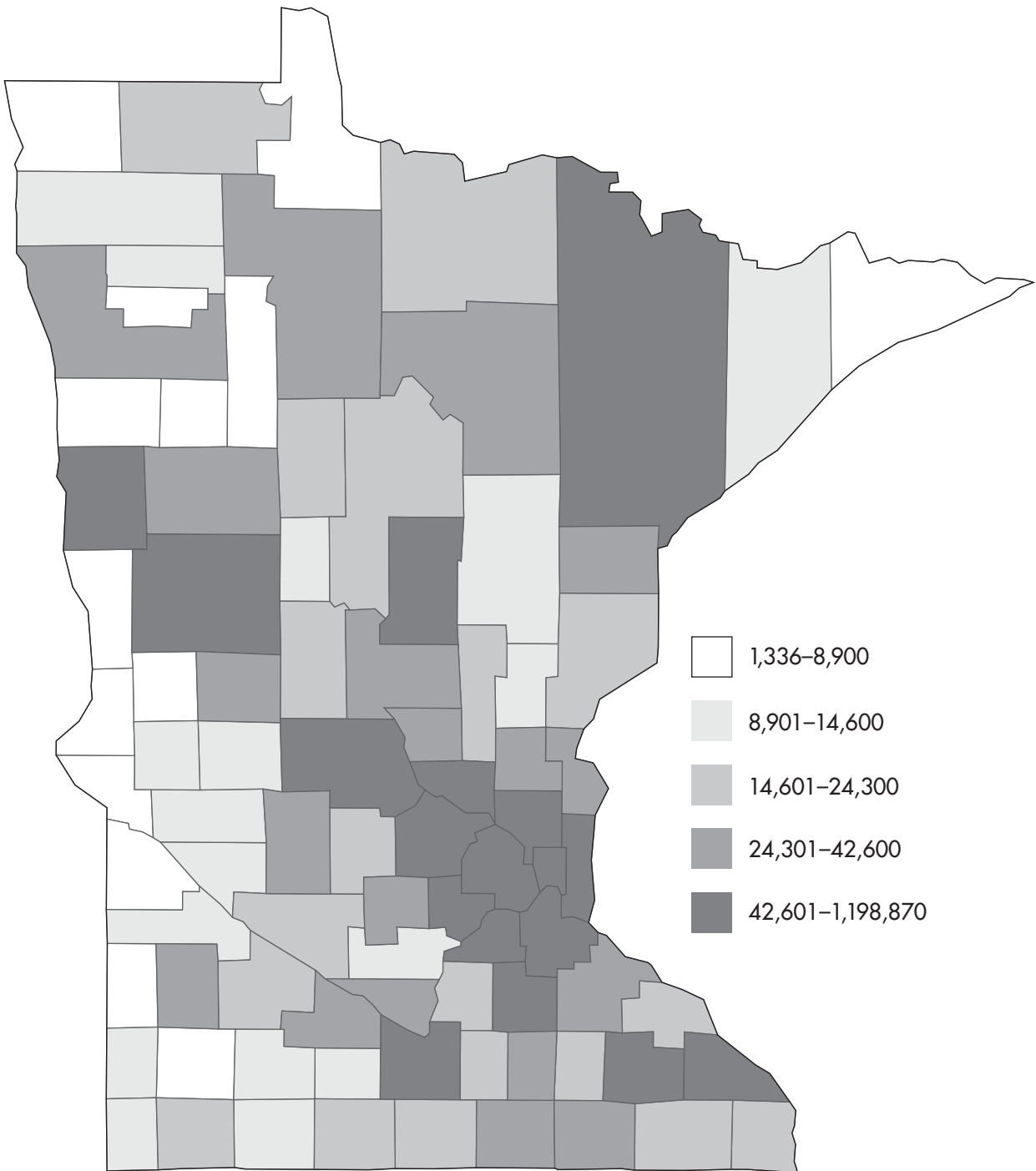
# Major Highways in Minnesota



Source: Minnesota Department of Transportation

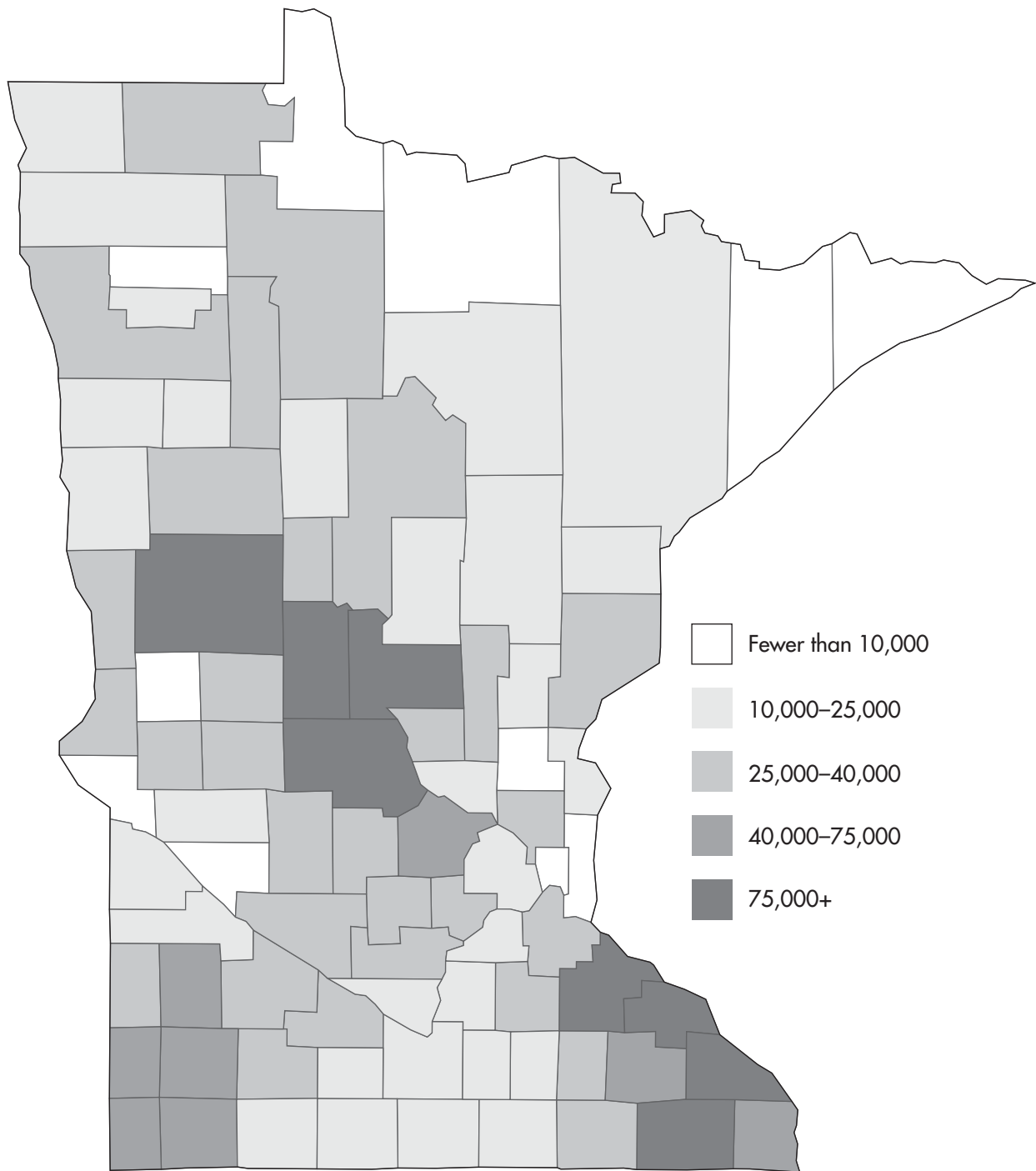


# Minnesota Population by County



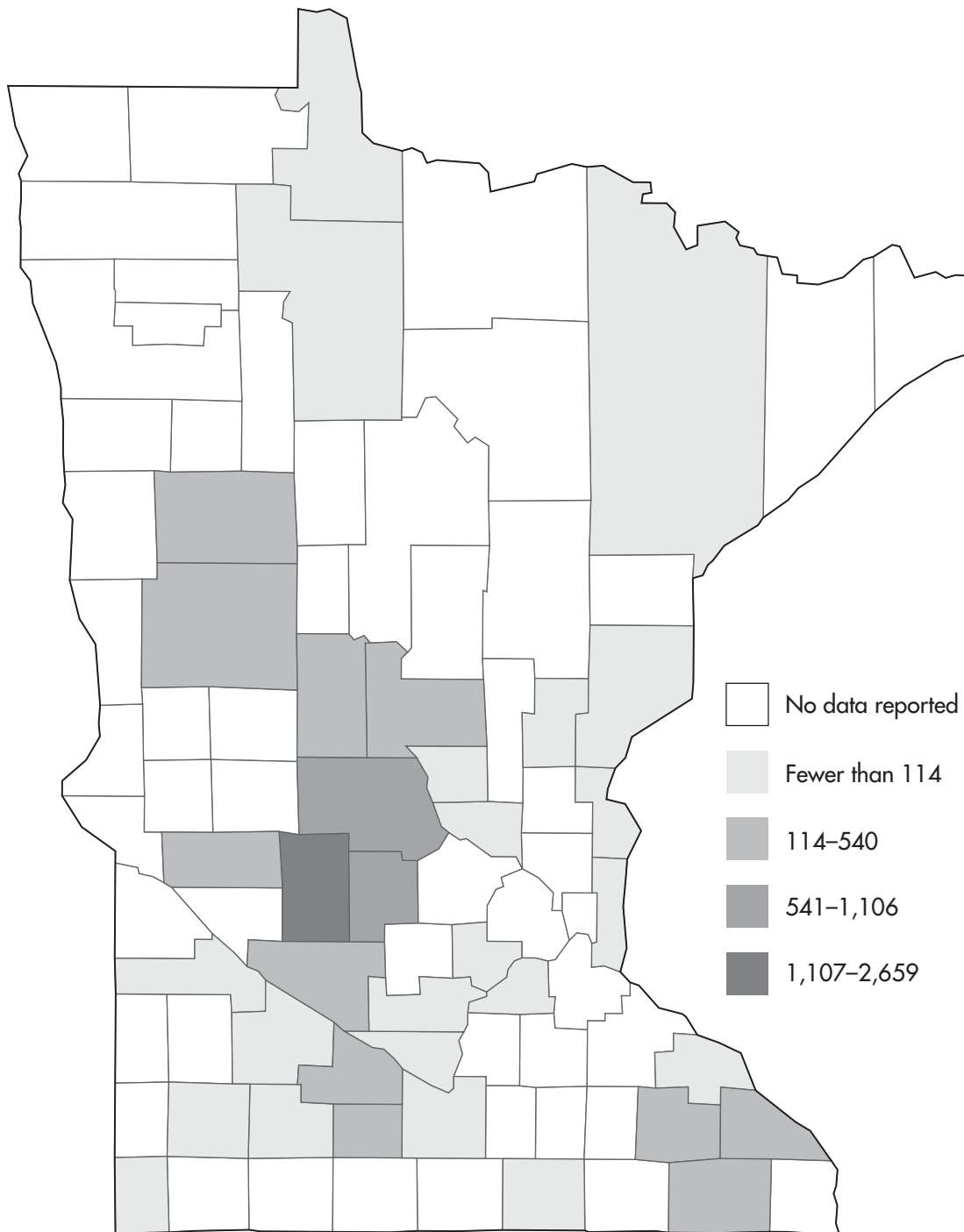
Source: Minnesota Land Management Information Center

# Head of Livestock (cattle, sheep)



Source: Minnesota Agricultural Statistics Service

# Turkeys in Minnesota



Source: Minnesota Agricultural Statistics Service

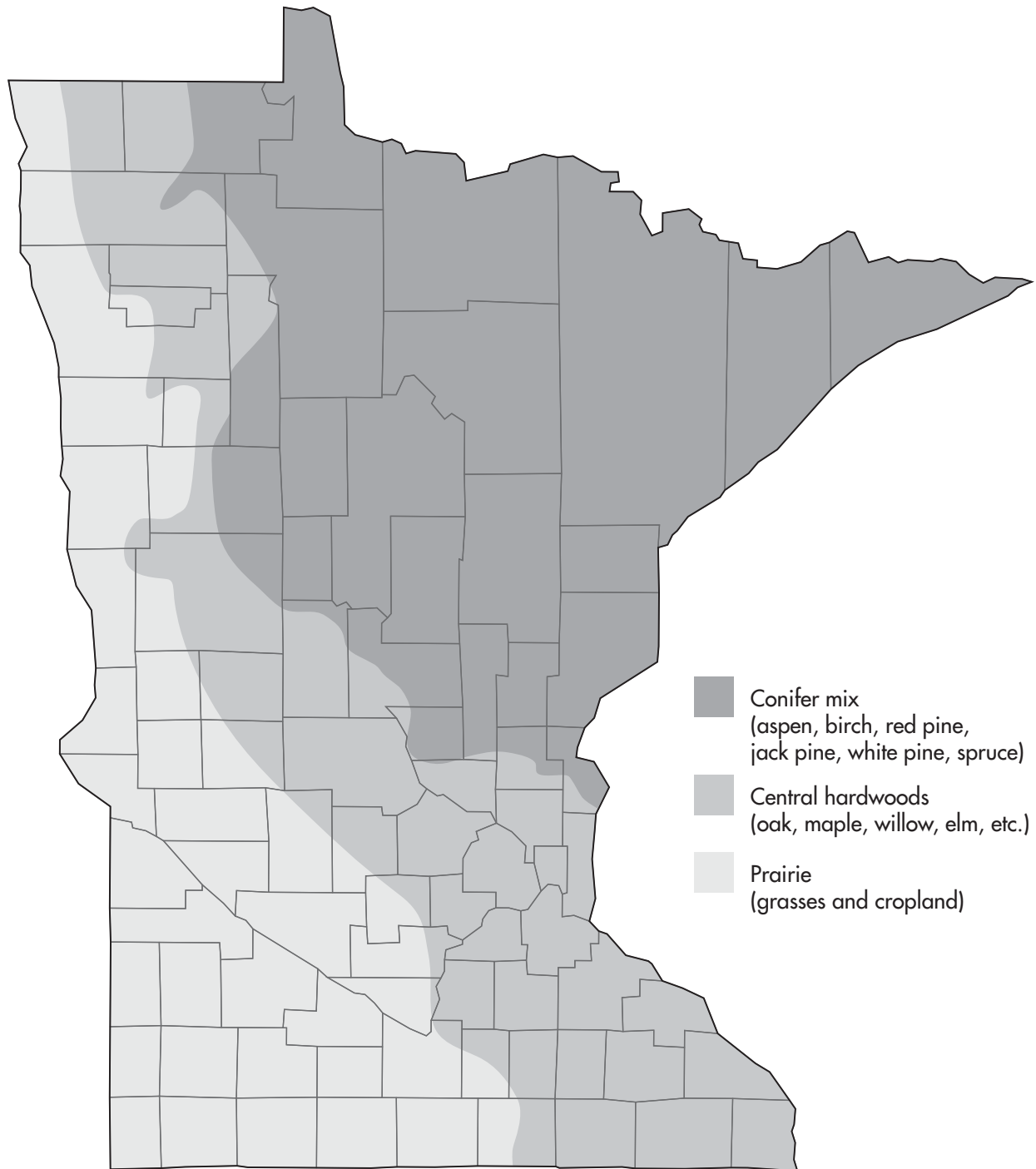
# Moose Range in Minnesota



Source: Minnesota Department of Natural Resources

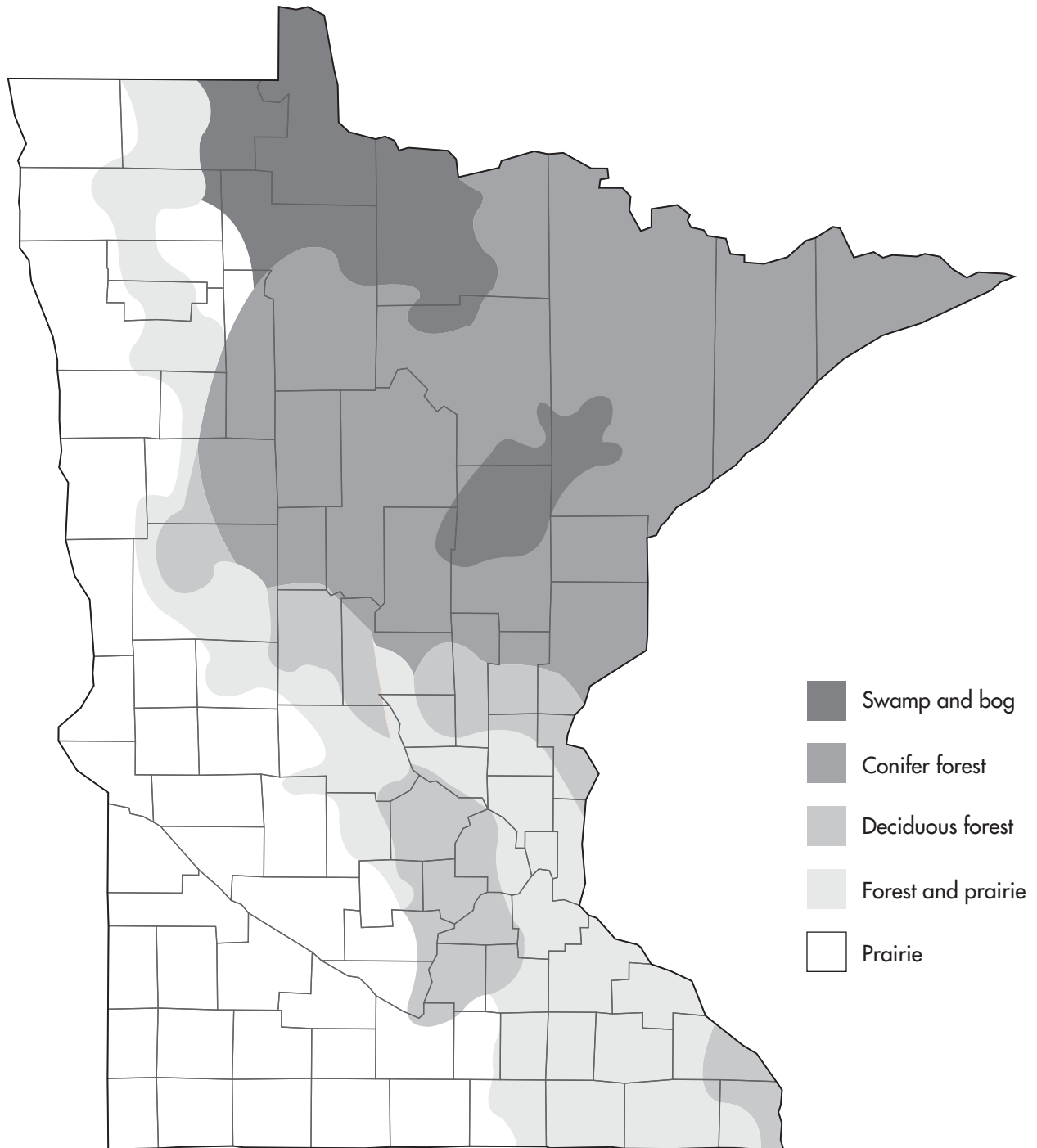


# Major Vegetation Types in Minnesota, today



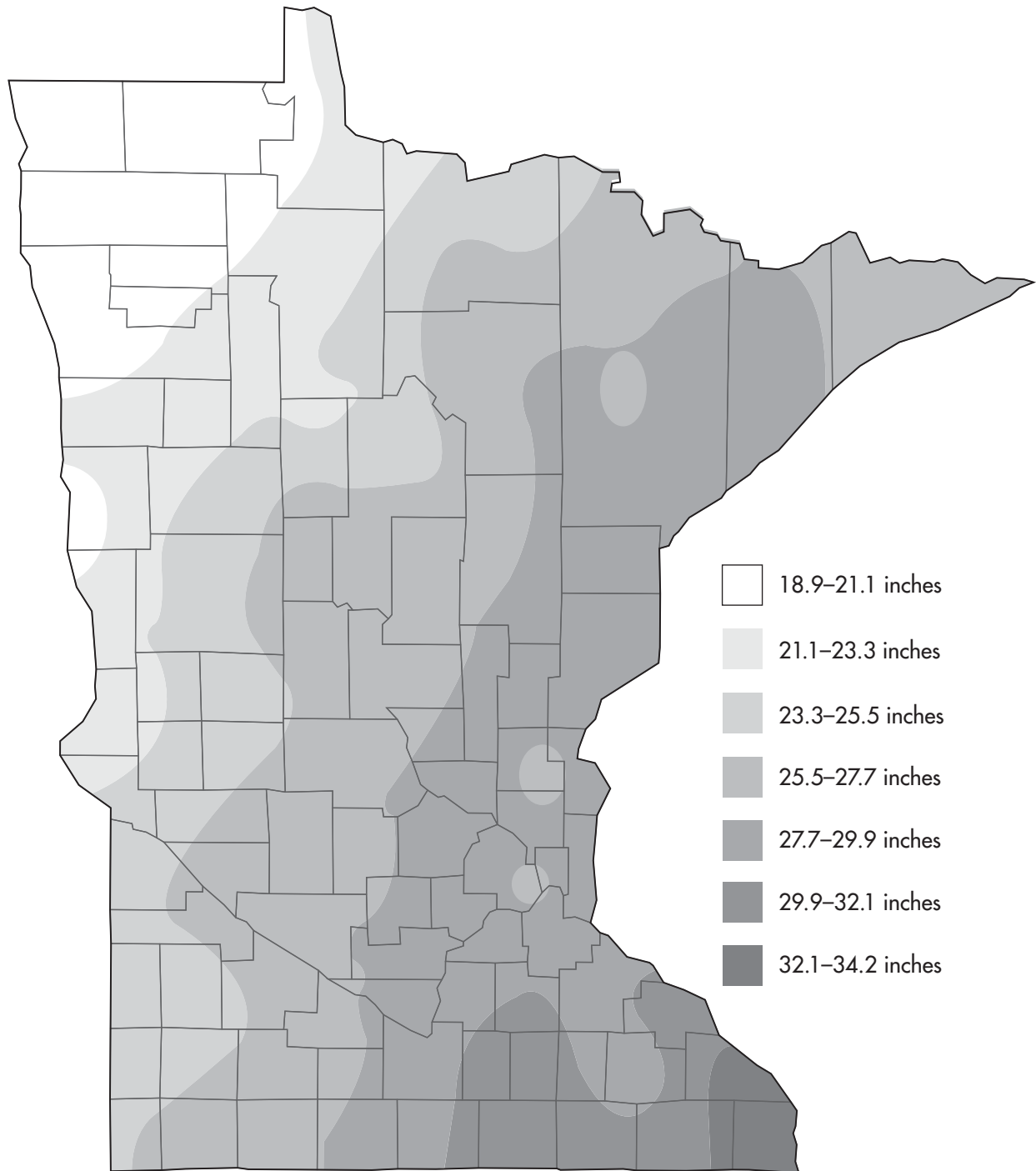
Source: Minnesota Department of Natural Resources

# Minnesota Native Vegetation, late 1800s



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

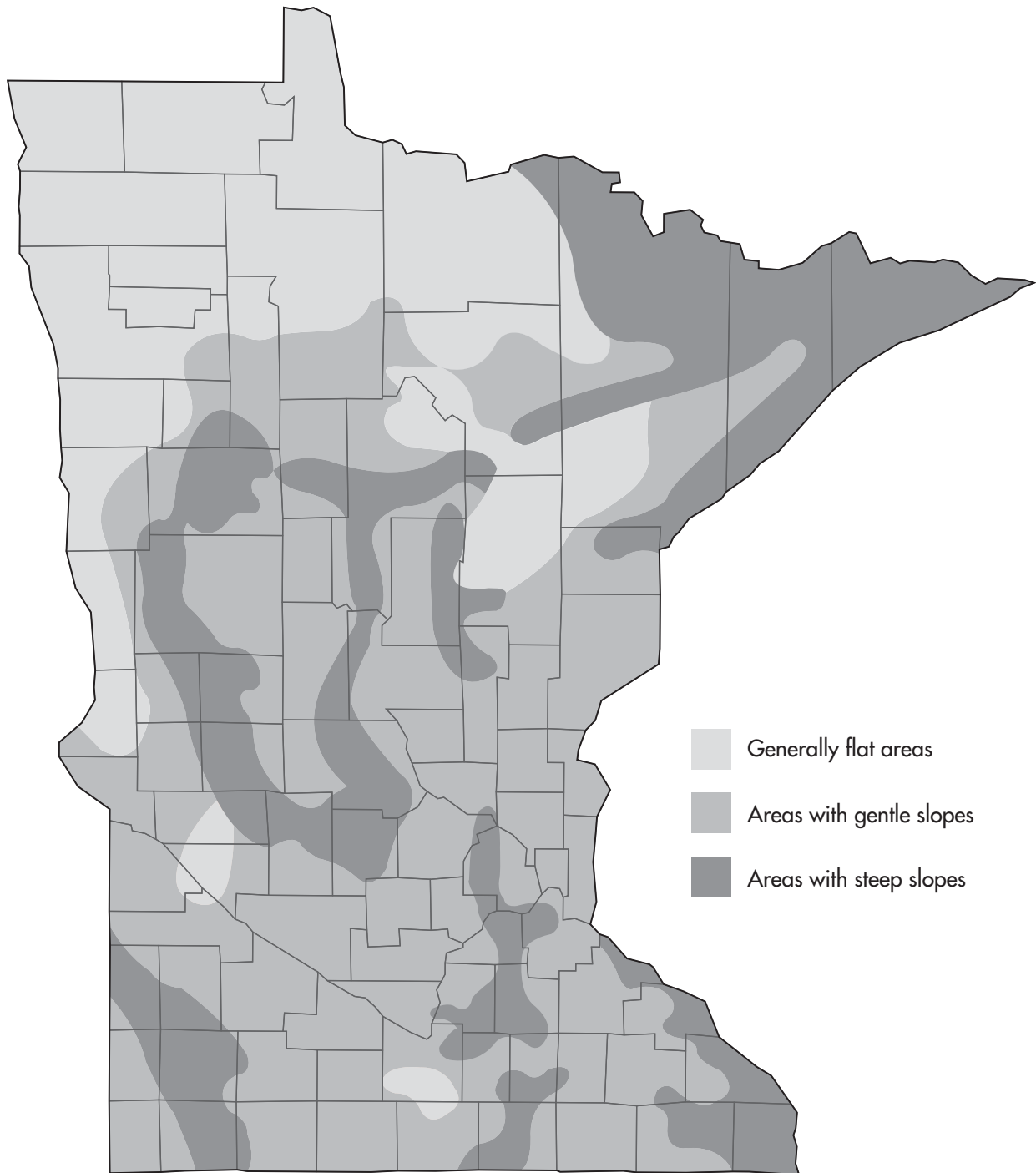
# Minnesota Annual Precipitation



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

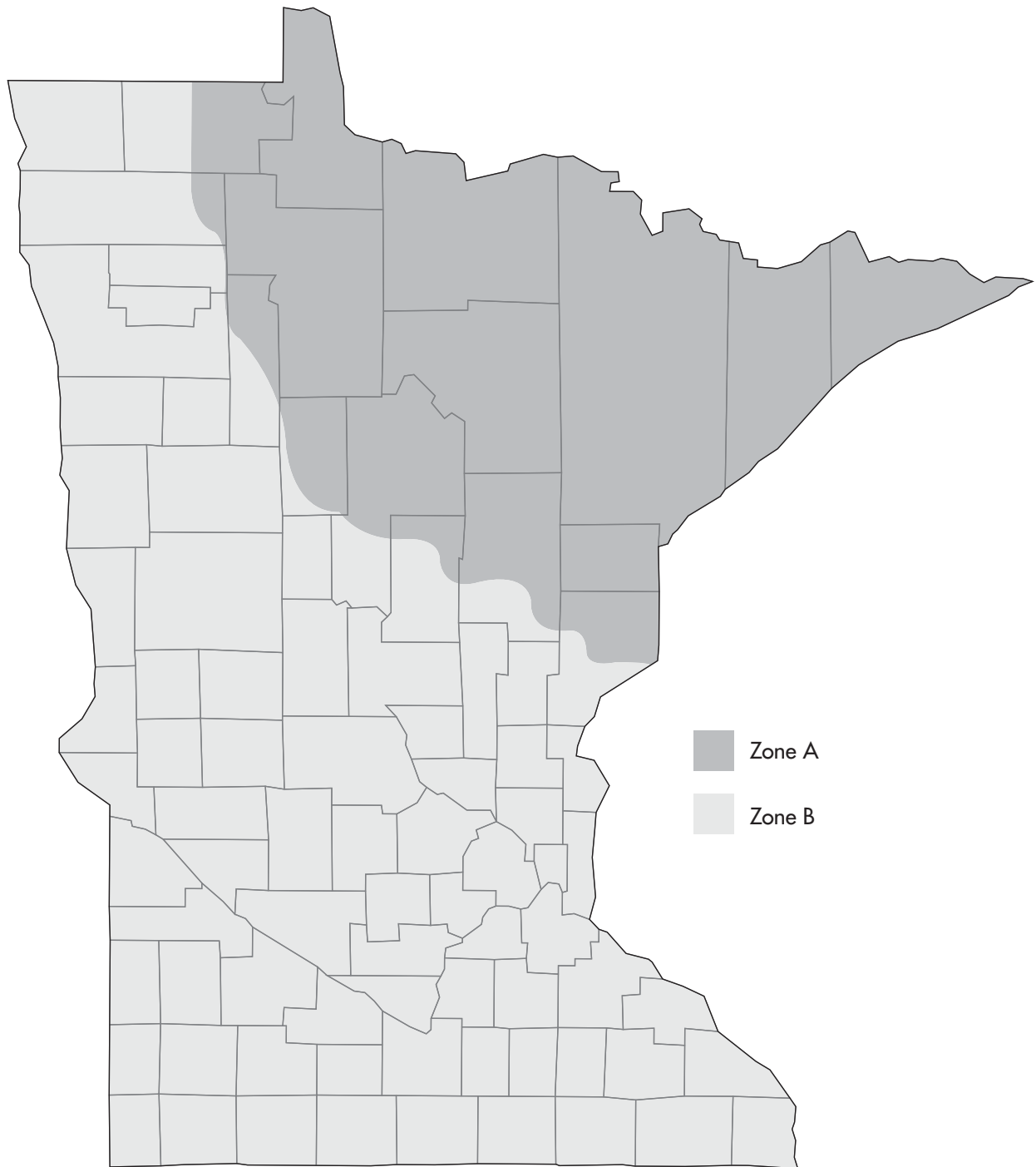


# Landforms in Minnesota



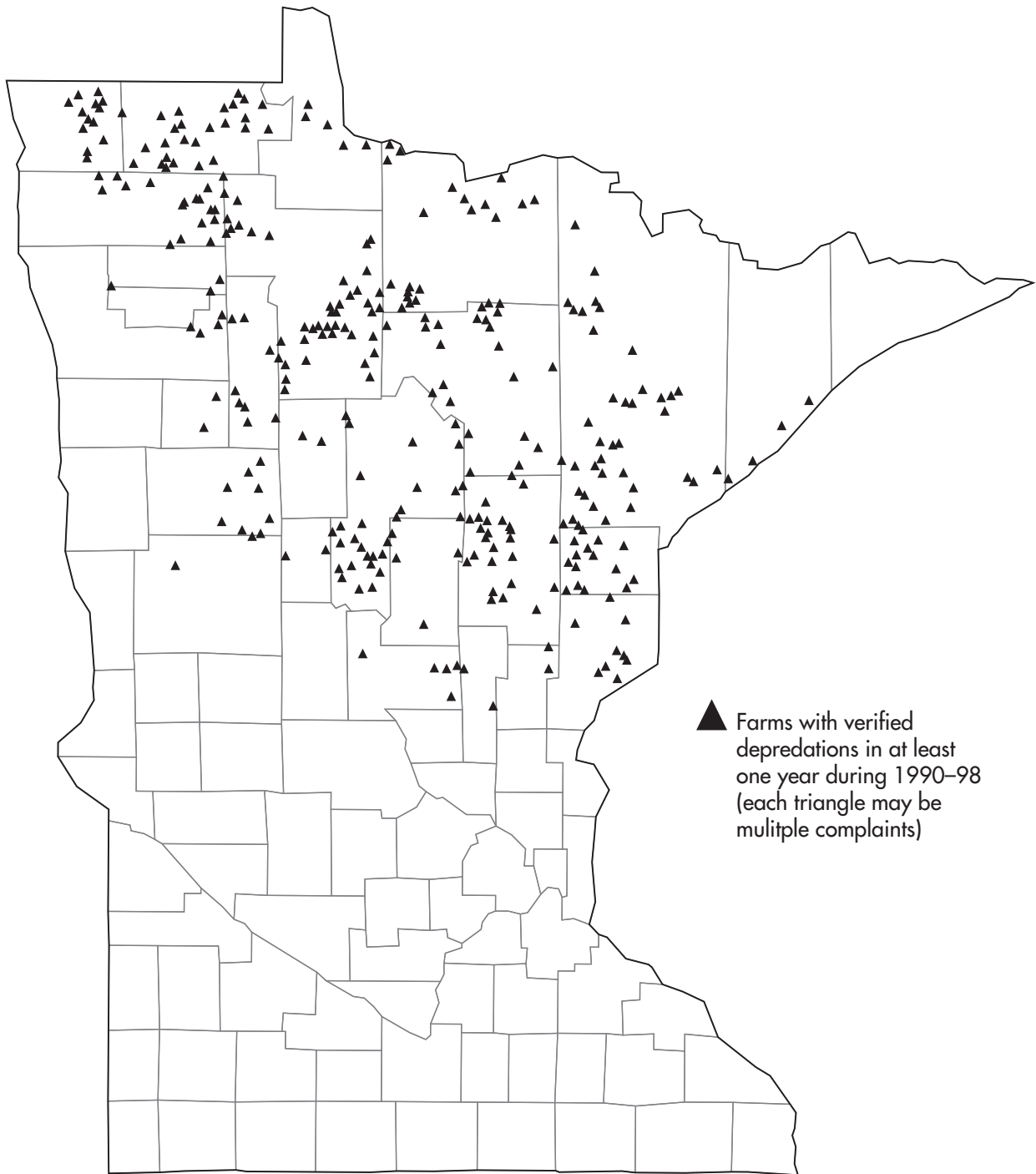
Source: Adapted from *Landforms map in Atlas of Minnesota Resources and Settlement* by Borchert and Gustafson.

# Minnesota DNR Management Zones



Source: Minnesota Department of Natural Resources

# Wolf Depredation



Source: Liz Harper

# Minnesota

