FOOD FOR THOUGHT Geography of Minnesota Agriculture



A Standards-Based K-12 Curriculum Teacher Guide with Master Maps

A Partnership of: Minnesota Agriculture in the Classroom Minnesota Alliance for Geographic Education • Minnesota Department of Agriculture

FOOD FOR THOUGHT A Geography of Minnesota Agriculture



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For additional educational resources, including the popular student Minnesota AgMag Series, set of 19 Minnesota Commodity Cards, Minnesota Agricultural Profile and our Agricultural Children's Literature 22 Title "Book Bundle" go to www.mda.state.mn.us/maitc or contact Al Withers, at 651-296-6688 or email alan.withers@state.mn.us

Table of Contents

Forwar	d Page	4
Introdu	ction Page	5
Introdu	ictory Lessons	
1.	How to Read a Map Page	7
2.	Working with Reference and Thematic Maps Page	9
Lesson	is for the Primary Grades, K-3	
1.	What's Where? Page	11
2.	Where Does Your Garden Grow? Page	14
Lesson	is for the Middle Grades, 4-8	
1.	Crop Regions in Minnesota Page	16
2.	Little Houses on the Prairies, the Woods and the Rivers Page	20
3.	Urban, Rural, Suburban; Where does your garden grow? Page	22
4.	Where in the World is Wheat? Page	24
Lesson	n for Secondary Level, 9-12	
1.	Impact of Distance on Agribusiness Page	29
Glossa	ry Page	34
Index: I	Black Line Maps Page	35

Web Site Connections:

The complete Food for Thought curriculum, including the student color desk map and all black line master maps can be found on the Minnesota Agriculture in the Classroom web site at www.mda.state.mn.us/maitc. You can also link to this site from the Macalester College Geography Department web site at http://www. macalester.edu/geography/mage/curriculum

For the most recent state agricultural statistics and commodity information go to the Minnesota Agricultural Statistics Service web site at http://www.nass.usda. gov/mn/ which also links to the USDA National Agricultural Statistics web site.

Forward

Agriculture is fundamental to the lives of all Minnesotans. Not only do we depend upon agricultural products to sustain our bodies, but the agricultural economy directly and indirectly employs a large fraction of our labor force. The lifestyle and land use of agriculture has a pronounced geography. There are significant patterns of commodity production, processing and transportation, as well as consumption. If we are to know who we are, we must first know where we are! These maps and lessons are designed to enable students and others to locate themselves amidst the grand mosaic of fields, processing plants and roads in Minnesota. It is our hope that this curriculum will create a sense of connection between residents of urban areas and those producing agriculture. It is vital that this connection is taught in schools because today's students have few, if any, first-hand experiences with farm life and farm families.

The bond between agriculture and culture of Minnesota was recognized by the Minnesota State Legislature in the creation of the new graduation requirements or standards. The geography of agriculture is singled-out as a topic in both the elementary and secondary standards. In addition, students are expected to be able to use maps to understand regions and analyze contemporary lifestyles. The lessons in this document are specifically developed to enable students to master those standards.

The geography of Minnesota is fascinating to study. We hope these maps and lessons spark students' curiosity and lead them to further explore the land and people of Minnesota.

David Lanegran, Ph.D.

Coordinator, Minnesota Alliance for Geographic Education and Macalester College Professor of Geography

Introduction

Welcome to Food for Thought, A Geography of Minnesota Agriculture. We hope the lessons and maps included in this Teacher Guide with Master Maps will inspire interest in the geography of Minnesota agriculture and enrich your curriculum.

About the Maps

The maps in this curriculum have been designed specifically to enable students to master the essential skill standards.

Grades 4-8 Standard: The student will use maps, globes, geographic information systems and other sources of information to analyze the natures of places at a variety of scales.

Benchmark: 2. Students will make inferences and draw conclusions about the character of places based on analyses and comparison of maps, aerial photos, and other images.

Grades 9-12 Standard: The student will use maps, globes, geographic information systems and other sources of information to analyze the natures of places at a variety of scales. **Benchmark: 3.** Students will demonstrate the ability to use geographic information from a variety of sources to determine feasible locations for economic activities.

The master maps included in the Teacher Guide have been designed to overlay each other so the teacher can demonstrate to students how geographers use the concept of layers, or surfaces of data, abstracted from the landscape. Layers can be compared to see what correlations and causal relationships exist among the patterns of data examined. This concept is the foundation of Geographic Information Science and Geographic Information Systems (the computer programs and databases) designed to enable geographers to analyze a wide range of data. "Layering" map information is a valuable tool to enhance learning for students. By making transparencies of these black line master maps and layering the maps sequentially, teachers can expand a student's comparison skills. Students then use the information on several different maps to answer questions, observe patterns, and discover connections. For the student color desk map, we encourage teachers to laminate them to assure multi-year use with students.

Suggestions for Layering the Black Line Maps

The black line maps were designed for use on overhead projectors and also for use by individual students. You may photocopy them for either purpose.

Minnesota is the same size on all the black line maps. We encourage you to layer and mix and match the maps to fit the subject for the day. The following suggestions for layering or matching maps facilitate map comparison and lead students to discover geographic relationships. The maps listed in bold type on pages 5 and 6 should serve as the main focus for each inquiry. Start with the maps in bold type and successively overlay other maps in pairs.

Layering that focuses on livestock

Overlay <u>Map 10 (Dairy Cows)</u>, Map 24 (Dairy Product Processing Sites), and Map 30 (Major Cities and Major Water Features). In general, begin with the map about dairy cows (or another livestock map) and describe the relationship to processing sites and to potential markets for the products.

Layering that focuses on crops

Overlay <u>Map 3 (Corn)</u>, Map 21 (Ethanol), Map 13 (Hogs), Map 20 (Largest Grain-Loading Facilities), and Map 30 (Major Cities and Major Water Features). Use the map about corn (or another crop map) to analyze the relationship of the crop to processing sites, to on-farm use within Minnesota, and to shipment outside of Minnesota.

Layering that focuses on the physical environment

Overlay <u>Map 4 (Soybeans)</u>, Map 26 (Native Vegetation), Map 27 (Landforms), Map 28 (Annual Precipitation), and Map 29 (Annual Frost-Free Days). Consider different crops in relation to variations in physical environment and climate in Minnesota. For example, note the characteristics of regions where crop production is low vs. regions where crop production is high.

Layering that focuses on population characteristics

Overlay Map 19 (Population Change), Map 18 (Farmland), and Map 30 (Major Cities and Major Water Features). Contrast the population characteristics of farming areas vs. large urban areas.

Layering that focuses on the Twin Cities as a market area and production area

Overlay Map 30 (Major Cities and Major Water Features), Map 9 (Nursery and Greenhouse Crops), Map 16 (Horses and Ponies), and Map 18 (Farmland). How does the concentration of people around St. Paul and Minneapolis affect two particular commodities and more generally the use of land for farming?

Layering that focuses on the pattern of cities in Minnesota

Overlay <u>Map 30 (Major Cities and Major Water Features)</u>, Map 31 (Major Highways), Map 32 (Railroads), and Map 18 (Farmland). Why are cities located where they are in Minnesota? Why did they grow in those places? Compare cities to water features, then to highways and railroads, and finally to farmland. It is important that students recognize that Minnesota's large cities are connected to a highly productive agricultural heartland/hinterland.

Cartographer's Notes:

Several maps on the color desk map and in the set of black line maps have a category called "No data reported." When the 2002 Census of Agriculture provides digital data files, it also provides explanatory notes about reasons for reporting no data. There are two main reasons why data are not available: (1) the commodity occurs in extremely small amounts and is essentially a zero value or (2) data are withheld to avoid disclosing information about individual farms because there are relatively few producers in the county.

Many of the color and black line maps are based on numerical data from the Census of Agriculture. These maps deliberately display percentages and numbers per square mile. By using "per" numbers we can compare counties that differ greatly in size. "Per" numbers also allow us to think about each topic in terms of concentrations or densities. Our legends that show percentage or per square mile data consistently use darker shading to represent higher numerical values.

All the maps are based on data sources, which are noted on the maps themselves. We, in turn, bear responsibility for how we have chosen to represent the information.

Introductory Lesson:

How to Read a Map Working with Reference and Thematic Maps

1. How to Read a Map

Overview: The Language of Maps

Reading a map is a lot like reading a book or article: check out the title and the brief description that is sometimes on the cover. The title of a map gives away just what the map is about and the brief description can be found in the legend. Go on to use the clues of the colors on the map, the scale, date, source, orientation or compass rose and the source of the map to help you read the map just as you would use chapter titles, charts, graphs, and illustrations to find out the content of what you are reading in a book or story.

Grade levels: K-12

Minnesota State Standards:

- 1. **(K-8)** The student will use maps and globes to demonstrate specific geographical knowledge.
- 2. **(9-12)** The student will use maps, globes, geographic information systems, and other databases to answer geographic questions at a variety of scales from local to global.

Objectives

• Define and use the language of maps correctly.

Time Required

One forty minute session

Materials

- U Wall maps of Minnesota, U.S. and World
- □ Variety of reference maps including a state road map
- Given the students of the stud

Vocabulary

title, legend, orientation, compass rose, source, scale, grid, index

Activities:*

As you read the terms of maps together, have the students list the terms and define them.

- 1. Using the wall maps, discuss the importance of the **title** on the maps:
 - a. What is the map telling you? Why would you want to read this map?

- 2. Find the legends on different maps.
 - a. What is similar in all the legends? What are the differences?
 - b. List the different types of information the different legends give you.
 - c. Is there more information on the map than is listed in the legend? What is it?
 - d. Could you understand the maps without the legend?

3. Find the compass rose or orientation.

- a. Where do you usually find the north arrow? Why? Does it have to point to the top of the map? Why or why not? (Answer: it doesn't)
- b. What is the value of having an orientation on a map?
- 4. Find the **source** or creator of the map.
 - a. Does it matter who made the map? How might the author influence the information that is on the map?
- 5. Find the **date** the map was produced or, on a historical map, the date the map refers to.
 - a. Are maps always the same? How do they change over time?
 - b. Considering the dates on a map, which map would we want to use to plan a trip this summer, to study changes in the population in an area, to understand the votes in a recent election?
- 6. Find the scale on the map. Demonstrate to younger students what scale means.
 - a. Use a ruler to determine the distances on the map between two points.
 - b. What would happen to the map if the scale was larger? smaller?
- 7. Using the world map, find the grid system that should show the longitude and latitude.
 - a. How do we use this "square" overlay to find our way around the world?
 - b. Are there grids on other maps? Why? (answer: a grid system gives places addresses that are based on directions rather than relationship to other places as in 45 degrees north by 90 degrees west.)
- 8. Using the road map, point out that some maps have indexes.
 - a. Define an index and find one in a reference book.
 - b. What is the value of having an index on a map?
- 9. Conclude this part of the lesson by having the students find the Title, Orientation, Author, Date, Legend, Scale, Grid, and Index on different types of maps. In partners, they should explain what they read in their maps to other pairs. When students make any maps in the future or when maps are being read together in class, refer to this language of maps.

- 1. Observation of conversation between pairs explaining maps.
- 2. Reflections in which students define the terms in their own words or create a fictional map showing the different elements of maps.

2. Working with Reference and Thematic Maps

Overview:

You and your students will encounter many different types of maps in your lifetimes. Clarifying the differences between reference and thematic maps and how they are used opens up exploring the many topics of geography and increases map literacy.

Grade levels: K-12

Minnesota State Standards:

- 1. (K-8) The student will use maps and globes to demonstrate specific geographical knowledge.
- 2. (9-12) The student will use maps, globes, geographic information systems, and other databases to answer geographic questions at a variety of scales from local to global.

Objectives

- Interpret map legends on both reference and thematic maps.
- Recognize the differences between reference and thematic maps.

Time Required

One forty minute session

Materials

- U Wall maps of Minnesota, U.S. and World
- □ Variety of reference maps including a state road map
- Food for Thought color placemat maps
- Student atlases if available
- Overheads and outline maps that have been laminated (one of each type) of a variety of thematic maps from Food for Thought

Vocabulary:

reference, thematic

Activities:*

Reference Maps

The main purpose of a reference map is to show locations of many types of features (e.g. cities in relation to highways and rivers or campgrounds in relation to parks and highways). Reference maps often use conventional colors and symbols to represent a great variety of topics. Make several different maps available to your class as you do this lesson. These maps could include political maps of different places, road maps, physical maps that include political demarcations, etc.

- 1. As a class, look over the wall maps and the legends on reference maps.
 - a. What are some of the colors or symbols that are the same on these maps? What do these colors and symbols stand for? List these together and discuss why we use the same colors and symbols usually on maps.
- 2. Distribute different reference maps or use maps in the student atlases that are of different places. In pairs, students should list the different features that the map shows, for instance, roads, rivers, lakes, cities, towns, etc.
- 3. Compare the different lists and discuss what is <u>not</u> shown on the maps. (i.e. population density, Dairy Queens, coal mining, corn growing regions).

Thematic Maps

Unlike a reference map, a thematic map usually presents only one topic. After reading the title of a thematic map, you can use the information on the map to explain the title, just as the topic sentence is reinforced in a paragraph by the other sentences.

- 1. Display on an overhead one of the first 17 black line maps from Food for Thought. Do not show the title nor the legend. Discuss what the map is trying to show and list guesses.
 - a. Why are there different shades of one color? What does the darker color stand for?
 - b. Tell the students that this map shows an agricultural product produced in Minnesota and continue their guessing.
 - c. Show the title and the legend and discuss the use of shading. (This type of map is a choropleth map.)
 - d. Decide together why a map of this type might be used. Who would use it and for what purpose? Does this map give as much information as a reference map? What other kinds of maps similar to this one might be important?
- 2. Distribute copies of the first 17 maps to students working in pairs (or display on the overhead) or refer to the placemat maps. Assign one map to each pair of students who should list five facts they have learned from the map.
- 3. Use thematic maps to explore causation. Display an overhead of the Frost-Free Days map and ask the students how the information on this map might be related to the information on the maps they have. They should add this comparison to their list of facts.
- 4. You can go further with this, if you wish, using the Landforms, Annual Precipitation, (which are on the placemat) and Major Cities and Major Water Features maps to compare to the crop maps.

- 1. List of five facts and comparison to another map generated during the lesson.
- 2. Quiz showing different maps and deciding if they are reference or thematic maps.
- * To teachers of primary students: Please read over these lessons and choose what information you feel your children will understand. Being introduced to the language of maps at an early age and using the language will help your students in the future.

Lessons for Primary Grades, K-3

1. What's Where?

Overview:

Where are we going? What will be there? What's that over there? Ever heard those questions before? This lesson uses the resources of Minnesota to help us find our way around a map.

Grade Levels: K-3 (or early English learners, special needs students, etc.)

Minnesota State Standards:

- 1. The student will use directional and positional words to locate and describe people, places, and things.
- 2. The student will demonstrate working knowledge of the cardinal directions.
- 3. The student will use maps and globes to demonstrate geographical knowledge.

Objectives:

- Explain where locations are, on a map, using directional and positional terms.
- Create a simple compass rose.
- Find locations of particular places on a map by following clues which use cardinal directions.

Time required:

Two 40 minute class periods or four 20 minute classes

Materials:

- Copies of Map 35 (Five State Region) and Map 30 (Major Cities and Major Water Features) for each pair of students
- Two Five State Region maps for the teacher. (Enlarge into a wall map, if possible, as you could use this map for many other references.)
- Overheads of Map 26 (Native Vegetation) and 2-3 maps of the different crops (Maps 1-17) or use color placemat maps
- □ 3" by 3" squares of paper, one per student
- One dark crayon or marker per student
- A working compass *(optional)*

Vocabulary

next to, behind, in front of, opposite, near, far, right, left, up, down, above, below, north, south, east, west, compass rose, northeast, southeast, northwest, southwest

Activities:

Part 1

- 1. Using the Five State Region map, decide where we live and mark it. Find your own city or town. Label the surrounding states, using the positional words above as you mark them.
- 2. Choose five students to be Minnesota, Wisconsin, Iowa, North Dakota and South Dakota. Have the class tell you how they should stand to show how they neighbor Minnesota. (Add the Canadian provinces, Lake Superior or other, further neighbors, if you wish).
- 3. Display the second Five State Region map and explain that you have become confused as to whom our neighboring states are; could the students please explain what is where? Label this map according to what the students tell you.
- 4. Repeat step two with other students to reinforce the learning. Label parts of the classroom showing where our neighboring states are located.

Part 2

- 1. Explain that maps use other directional words and arrows to point the way. Have four students stand in front of the class. Arrange them in north, south, east, and west directions. Ask everyone to point or walk to the different directions in the classroom. Each student creates a sentence that uses one of the four words telling where something is in the room (i.e. the pencil sharpener is in the east).
- 2. Give each student a 3" by 3" paper and instruct them to fold it in half. They should then fold it the other direction in half to create a perpendicular pair of lines. At the end of one line, have them write "N". Explain they have just labeled the line "N" for north. Label the opposite end of the same line "S" for south; continue by labeling the east and west ends of the other lines. *(If you have a compass, this would be a time to show it.)*
- 3. In pairs, the students place their compass on the edge of the Five State Region map. Using the correct names of the states, have students explain using the cardinal directions how the states are related to each other. They may also write this in sentences.

Part 3

- 1. Using the compass rose the students created in part 2, have them apply that knowledge to the different thematic maps. With their compass roses in front of them, tell them that they are detectives using clues to find a place in Minnesota.
- 2. Display Map 26 (Native Vegetation) and add a mark for your own community. Have the students find the same map on their placemats and follow along. Discuss what the legend tells us. Tell them that you are thinking of a place in Minnesota and have them ask you only yes or no questions to find it; the questions should use positional words or the cardinal directions. (i.e. "Is it north of the deciduous forest? Is it next to a swamp?")
- 3. Repeat the questioning with another thematic map, again reading the legend to understand the map.
- 4. You may want to have each student choose a thematic map and mark a place on their own map, asking their partner to find the place through questioning.

Part 4

- 1. Bring eight students to the front of the class. Arrange four of them as the cardinal directions. Then ask if the others stood between the first four, putting a student between north and east, what would be the names of the additional four students? (ne, se, nw, sw) Repeat the activity of finding objects in the classroom, but use the additional direction terms.
- 2. Draw or fold a new compass rose, adding northeast, southeast, northwest and southwest. Discuss why we want to have those new terms on a map.
- 3. Apply these terms again to one of the maps.

- 1. Lists or narratives using the cardinal directions to explain where things are in the class or where our neighbors are in the five state region.
- 2. Treasure hunts created by the students that use cardinal directions in the clues.

Lessons for Primary Grades, K-3

2. Where Does Your Garden Grow?

Overview:

Listening to and reading non-fiction not only gives children facts but acquaints them with another style of writing. There is also an emphasis on non-fiction reading in the new Minnesota State Standards. The natural resources and crops of Minnesota can be viewed on a map and in the written word.

Grade Levels: K-3

Minnesota State Standards:

- 1. The student will use and create maps and globes to locate people, places, and things.
- 2 The students will use maps and globes to demonstrate specific geographical knowledge.

Objectives:

- Listen to and view picture books about the different natural resources and crops of Minnesota.
- Locate on a map the different crops and natural resources in Minnesota.

Time required:

15-20 minutes per book

Materials:

- Trade books that are listed within the lesson or books of your choice that relate to the different maps
- Copies of the maps for the class that are linked to the books you choose, including the Food for Thought color placemat map
- Large outline map of Minnesota counties for the class

Vocabulary:

crops, resources, location, other terms that apply to the crop or animal that you are discussing

Activities:

Pre-reading warm-up

Create a class K/L chart by listing what your students know about a particular crop grown in Minnesota on half of a large sheet of paper or on the board (this is on the K or Know side of a chart). Save this list of facts and add new facts you have learned to the L or Learned side when you have completed reading about the crop.

- 1. Read aloud or in small groups the books listed below.
- 2. Eat a food using the crop or play a game simulating the use of the animal or crop.
- 3. Sing "Inch by Inch" or "The Farmer in the Dell".

- 4. Draw the crop or animal and place it where it would live at a farm.
- 5. Plant a seed and watch it grow; find seeds within different fruits, vegetables and nuts.
- 7. Using the appropriate map, find where in Minnesota you would be most likely to find this animal or crop and place a symbol for that region on the large Minnesota map.
- 8. Repeat using a different book.

Suggested titles and appropriate map(s):

- **Farm**, Ned Halley, Alfred A. Knopf, N.Y. 1996 An overview of farming including the history and references to different types of farming and farm equipment. Great visuals. Maps 10 (Dairy cows), 12 (Beef cows), 13 (Hogs and pigs), 14 (Turkeys), 15 (Meat-type chickens) and 9 (Nursery and greenhouse crops)
- <u>At the Farm</u>, Sandy Francis, The Child's World, Inc. CA 2000 *Easy picture book defining farm terms and showing the activities on different types of farms. Maps 10 (Dairy cows), 13 (Hogs and pigs), 5 (Hay), 16 (Horses and ponies)*
- <u>If It Weren't for Farmers</u>, Allan Fowler, Children's Press, Chicago 1993 A very easy picture book of photos showing what is produced by farms. Maps 1 (Wheat), 10 (Dairy cows), 9 (Nursery and greenhouse crops), 14 (Turkeys), 15 (Meat-type chickens), 12 (Beef cows), 13 (Hogs and pigs)
- <u>Garden</u>, Robert Maass, Henry Holt and Company, N.Y. 1998 A beautiful photo-picture book explaining how a garden grows and what different fruits, vegetables and flowers are grown in gardens.
- **My First Garden Book**, Angela Wilkes, Alfred A. Knopf, N.Y. 1992 A truly life size guide to how to plant different gardens, explaining the different tools and seeds needed for flowers and vegetables.
- **Farmer's Market**, Marcie R.Rendon and Cheryl Walsh-Bellville, Carolrhoda Books, Inc. Mpls. 2001 A very beautiful book contrasting two different families who bring their produce to the St. Paul farmer's market to sell.
- <u>Wheat</u>, Sylvia Johnson, Lerner Publications Co., Mpls. 1990 *Explanation of what wheat is made of and what wheat can make; fairly difficult terms. Map 1 (Wheat)*
- **Everybody Bakes Bread**, Dorothy Norah, Carolrhoda Books, Mpls. 1996 A very fine picture book showing culturally different families baking bread.
- **<u>Corn is Maize The Gift of the Indians</u>**, Thomas Y. Aliki, Crowell Company, N.Y. 1976 An easy to follow explanation of what corn is and the history of how and where it has been used, using clear illustrations and graphs. Map 3 (Corn)
- <u>The Sacred Harvest Ojibway Wild Rice Harvesting</u>, Gordon Regguinti, Lerner Publications, Mpls. 1992
 A detailed photo book showing the process of growing and harvesting wild rice near Leech Lake, MN. Map 7 (Wild Rice) shows cultivated wild rice only, not hand-harvested.
- <u>Great additional resources for educators:</u> You can order a free set of 19 Minnesota Commodity Cards, including major plants grown and animals raised, from Minnesota Agriculture in the Classroom (M-AITC). The program also offers a neat Agricultural Children's Literature "Book Bundle" which can also enhance this lesson. This book bundle includes 22 titles, mostly non-fiction, representing plants, animals, agriculture and the food and fiber system. To order your free set of commodity cards and for book bundle pricing and ordering information, go to www.mda.state.mn.us/maitc

- 1. Students do reports or projects on different Minnesota crops, writing a description of where and how it is produced and how we eat or use the crop.
- 2. The class has a feast of the different crops and students orally explain the food they know about. You might want to also read the story "Stone Soup" and then make your own stone soup of Minnesota produce.
- 3. Collect produce and grain products to donate to a food shelf.

Lessons for Middle Grades, 4-8

1. Crop Regions in Minnesota

Part 1

Overview:

Minnesota's three different regions of vegetation offer distinct soils and growing patterns for different types of crops. These regions have influenced the development of cities and transportation systems throughout our state.

Grade Levels: 4-8

Minnesota State Standards:

- 1. The student will identify and locate major physical and cultural features that played an important role in the history of Minnesota.
- 2. The student will use maps and globes to demonstrate specific and increasingly complex geographic knowledge.
- 3. The student will make and use maps to acquire, process, and report on the spatial organization of people and places on Earth.
- 4. The student will identify and locate geographic features associated with the development of Minnesota.
- 5. The student will identify physical characteristics of places and use this knowledge to define regions, their relationships among regions, and their patterns of change.
- 6. The student will give examples that demonstrate how people are connected to each other and the environment.
- 7. The student will describe how humans influence the environment and in turn are influenced by it.
- 8. The student will demonstrate how various regional frameworks are used to analyze the variation in physical environment.

Objectives:

- Understand which counties in Minnesota are the biggest producers of six of the crops grown in Minnesota by reading choropleth maps.
- Create a map showing the different regions of cropland in Minnesota and label the parts of the map correctly.

Time required:

4-5 class periods depending on which parts of the lesson you choose to do

Materials:

- One enlarged copy of Map 34 (MN Counties), for every pair of students. Mount on cardboard or tag board (you can use a file folder opened up)
- One enlarged copy (11"x17") of each of the following black line master choropleth maps: Map 1 (Wheat), Map 2 (Barley), Map 3 (Corn), Map 4 (Soybeans), Map 6 (Sugarbeets), and Map 7 (Cultivated Wild Rice)
- □ The following grains purchased at a local co-op or grocery store (you can possibly obtain these grains through contacting the Agronomy Department at your local College or University) 2 lbs. popcorn kernels, 1 c. soybeans, 2 c. wheat berries, 1 c. barley kernels, 1/2 c. wild rice and 1 box sugar cubes
- **6** bottles of glue
- □ (*For a briefer lesson*, use the color placemat map which shows four crops (substitute alfalfa seed for barley): wheat, hay (alfalfa), soybeans and corn; provide those four crops and blank county outline maps)

Vocabulary

choropleth map, regions, wheat, soybeans, barley, sugarbeets, wild rice, hay (alfalfa)

Activities:

Pre-lesson Preparation: Set up six stations around the room with a different seed/grain at each station and the choropleth crop outline map that goes with that grain at eye level. Include a bottle of glue. Have students glue their blank outline county maps to the cardboard or tag board.

- 1. Show each grain and have the students guess how it can be used. Record correct guesses on a chart or the board.
- 2. Show one of the enlarged choropleth maps and explain that the darker the color, the more of the grain it represents is grown there. Discuss one of the maps, finding which counties have a lot of the grain and which do not. Explain that they will be making a map of the regions in the state where the different grains are grown. In partners, they are to glue one grain/seed to each of the counties that have the very highest percentage of that crop grown there. As they work, they should glue a second grain/seed into the legend on the map and add the name of the crop.
- After getting to each station, the students should complete their maps by adding a compass rose, labeling neighboring states and the province Ontario bordering Minnesota, and adding a title and their names.

- 1. Request that students write five questions that could be answered by someone else when they looked at the student-made maps.
- 2. Assess the completeness of the student-made maps, looking for a title, legend, authors, and labeling of neighboring states and province.

Part 2

Objectives:

• Compare the student-made map to native vegetation, annual frost free days, landforms, and annual precipitation maps to further understand why there are different crop regions in Minnesota.

Materials:

- Copies of four of the maps for each of the pairs of students: Map 26 (Native Vegetation), Map 27 (Landforms), Map 28 (Annual Precipitation), Map 29 (Annual Frost-Free Days) or color placemat maps for each pair of students
- Student-made crop maps of counties showing which county has the highest percentage of the six Minnesota crops
- Student paper folded or divided into areas, one for each of the crops they have used

Time required:

1-2 class periods

Vocabulary

Native vegetation, landforms, annual precipitation, annual frost free days

Activities:

- Ask if any of the students have ever grown any of the crops they placed on their maps or if they have ever had their own garden. List together the needs of a garden in order to produce a good crop: good soil, warm weather, water, sun, etc. Explain that different crops do well with different amounts of the needs, (i.e. oranges would not grow well in Minnesota because of the cold but apples like the colder climate, etc.).
- 2. Read together the four maps on the placemat, determining what they tell us about growing seasons.
- 3. In the divided paper, working with a partner, write the names of the different crops in the different sections. Next, each pair writes three guesses that they believe are true as to why the different crops grow where they do in Minnesota. For example, sugarbeets grow in northwestern Minnesota because the soil is rich, and the combination of cool nights and warm days provide for ideal growing conditions for beets to produce a high amount of sugar. They may also illustrate their guesses.
- 4. Each pair should share their assumptions with another pair. They then choose two assumptions they are sure are true and share those with the class.

- 1. Chart that has been created listing the different guesses about the growth of the crops.
- 2. Class discussion and participation in the discussion.

Part 3

Objectives:

• Using the student-made map of crops, identify where a particular crop should be processed and the route the crop will take to get to market.

Materials:

- Student-made map of crops
- Copies of Map 30 (Major Cities and Major Water Features) for each pair of students or color placemat map for each pair
- 2 blank outline maps of Minnesota, 8 1/2" by 11" for each pair of students (can be back to back)
- Overheads of Map 20 (Largest Grain-Loading Facilities), Map 23 (Cultivated Wild Rice Processing and Vegetable Canning Sites), Map 22 (Sugarbeet and Soybean Processing Sites), Map 24 (Dairy Product Processing Sites), Map 31 (Major Highways of Minnesota), Map 32 (Railroads in Minnesota 2004)

Time required

1-2 class periods

Vocabulary

processing, market, facilities, sites,

Activities:

- Divide the class into six groups after explaining that they are in charge of getting all the crops they
 have learned about to market in Minnesota. Discuss what happens to crops after they are grown, how
 people need to have something done to the crop before they can eat or use it (such as corn ethanol)
 and we often preserve the prepared crop to eat at a different time. Decide together which crops might
 need to be canned, frozen, bagged or cleaned, etc.
- 2. Read the map of major cities and major water features together, and discuss how that affects where food is prepared and to where food must be moved. Assign a different crop to each of the six groups. Using their blank outline Minnesota maps, have them work as a group and come to consensus choosing three sites for the processing plants for their crop. Mark them on the map and in a legend. Decide where the market would be for their crop and draw in railroad lines or highways to show the best way to get it to the market. Add these marks to the legend and add a title to the map.
- 3. As each group finishes, give them the appropriate overhead map that shows the processing sites for their crops and Minnesota's major highways and railroads (layer the maps on top of each other on the overhead). Each group member should then write how their map was the same as the real maps and how they differed. They should also write a sentence describing how well they worked in the small group and a third part telling what they learned as an individual.
- 4. Discuss as a class what they learned. Why are the railroads and highways where they are in Minnesota? How do they relate to the major cities? What difference would it make where these are located to the farmer?

- 1. Group maps of where they believe the sites should be and the transportation lines.
- 2. Individual student reflections done at the end of the lesson.

Lessons for Middle Grades, 4-8

2. Little Houses on the Prairies, the Woods and the Rivers

Overview:

As your students learn the history of Minnesota, they imagine they were early settlers and choose which crops they would plant on their farms. This lesson accompanies Chapter 10, "Sodbusters" from the textbook Northern Lights.

Grade levels: 4-8 or whenever Minnesota history is taught

Minnesota State Standards:

- 1. The student will identify and locate major physical and cultural features that played an important role in the history of Minnesota.
- 2. The student will use maps and globes to demonstrate specific and increasingly complex geographic knowledge.
- 3. The student will identify and locate geographic features associated with the development of Minnesota.
- 4. The student will identify examples of the changing relationships between the patterns of settlement and land use in Minnesota.

Objectives:

• Recognize that different factors influenced what crops were grown in different locations in Minnesota.

Materials:

- □ Class set of *Northern Lights* textbooks (Minnesota Historical Society Press 2003) and/or sets of *Little House on the Prairie* or *Little House in the Big Woods*, by Laura Ingalls Wilder, or read the parts of the novels aloud to the class
- Blank outline map of Minnesota showing names of counties for each pair of students
- Color placemat maps or Map 26 (Native Vegetation) and Map 30 (Major Cities and Major Water Features) for each student
- Set of slips indicating different counties
- Drawing paper and crayons or markers or colored pencils

Time required

1 class period

Vocabulary

subsistence farming, diversified farming, Homestead Act

Activities:

- 1. Read with the class either Chapter 10, "Sodbusters" in *Northern Lights* or sections of the Wilder books that describe 19th century life on the pioneer farms. Discuss what crops they would have grown first and how the natural environment, their life experiences, the climate, etc. affects the choices the farmers made.
- 2. Explain that they each will get a plot of land to homestead in different counties in the state. Tell them that they must decide as a pair what they will grow first as subsistence farmers. They should refer to the Native Vegetation map and Major Cities and Major Water Features map when choosing their crops. On the drawing paper, they should draw what their beginning farm would look like, showing what their farmhouse might have been made of and what crops they might have grown. They should make this drawing into a map and include a legend. As each pair finishes, decide on how accurately their choices reflect the environment and evaluate their maps.
- 3. If the first farm makes sense, allow them to diversify so that they can begin to make money and use their soil well. They should draw a second farm on the back of the paper, again explaining what they have drawn.
- 4. Share the different maps with the class, pointing out where the different farmers lived.

- 1. Accuracy and detail of the maps of the farms.
- 2. Each student writes a sentence using the terms "subsistence farming" and "diversified farming" accurately.

Lessons for Middle Grades, 4-8

3. Urban, Rural, Suburban: Where does your garden grow?

Overview:

As students explore the growth of the population of Minnesota through history, they learn how different types of communities have developed. These communities generate different agricultural needs that are met in their immediate surroundings.

Grade levels: 4-8

Minnesota State Standards:

- 1. The student will identify and locate major physical and cultural features that played an important role in the history of Minnesota.
- 2. The student will use maps and globes to demonstrate specific and increasingly complex geographic knowledge.
- 3. The student will identify and locate geographic features associated with the development of Minnesota.
- 4. The student will identify examples of the changing relationships between the patterns of settlement and land use in Minnesota.

Objectives:

- Define and understand the terms "rural", "urban", and "suburban".
- Recognize which crops in Minnesota are grown near the larger communities and theorize why this is.

Materials:

- Class set of Northern Lights, Minnesota Historical Society, 2003
- Overhead maps of Map 4 (Soybeans), Map 8 (Sweet Corn and Green Peas), Map 9 (Nursery and Greenhouse Crops), Map 10 (Dairy Cows), Map 13 (Hogs and Pigs), Map 16 (Horses and Ponies)
- Copies of Map 19 (Population Change) and Map 30 (Major Cities)

Time required

1-2 class periods

Vocabulary

suburb, rural, urban, population

Activities:

- 1. Draw on the chalkboard a circle and explain that it represents a city. Define city together and link it to the word "urban". Draw another circle around that circle and ask what this area might be labeled. Explain that this circle is "suburban" or outside the urban area. On the outside of that circle, explain that the land is known as "rural" and includes small towns, villages and farmland.
- 2. Read together Chapter 19 "Transforming the Land" in Northern Lights.
- 3. Hand out copies of Map 19 and 30, reading the maps together. Using lined paper, have the students number their papers to six, leaving two lines between each number. Write the terms Urban and Rural on the chalkboard. Explain that you are using Urban to refer to both suburban and city and have them find the counties on Map 19 that are mainly urban. (Urban agriculture is found in the Nursery and Greenhouse Crops map and Horses and Ponies map).
- 4. Show one overhead map at a time, asking the class to decide if the crop or animal shown on the map is found mainly in rural or urban areas. They should explain why that crop or animal is found in the area they chose on the blank lines.

- 1. Use the exercise above as a quiz and evaluate the students' answers.
- 2. Ask each student to write a paper describing their own community and what kind of community it is. They should also write about what crops or animals are found near their community. They could also write this as a piece of fiction and tell where they would want to live and what crops and farm animals would be found near their home.

Lessons for Middle Grades, 4-8

4: Where in the World is Wheat?

Grade Levels: 6-8

Minnesota State Standards:

Learning Area Seven: People and Cultures - Geography and Culture

(Middle Level/Grades 6-8)

Standard: The student will identify examples of the changing relationships between the patterns of settlement and land use in Minnesota.

Benchmark: Students will use regions to analyze modern agriculture in Minnesota.

Prior Knowledge

Familiarity with using a world atlas (reading latitude bands, identifying countries, etc.)

Objectives:

- Understand how crops are influenced by environmental conditions.
- Understand how farmers' decisions are influenced by environmental conditions.
- Compare map topics and map locations.
- Locate regions by common characteristics.
- Summarize the relationship between one topic (e.g., wheat production) and several explanatory variables (e.g., precipitation, native vegetation).
- Interpret and use maps at different scales (e.g., Minnesota and world).

Time Required

Two to three 1/2 hour sessions

Materials

- Color Desk Map
- □ World Atlas (including maps about wheat, precipitation, natural vegetation, soils, climate) (one world atlas for each pair of students in classroom)
- Colored pencils
- U Wheat Background (included in Teacher Guide)
- Map 33 (MN Counties Named), Map 1 (Wheat), Map 3 (Corn)
- Map 26 (Native Vegetation), Map 27 (Landforms), Map 28 (Annual Precipitation), Map 29 (Annual Frost-Free Days)
- Chart A (MN Wheat) and Chart B (World Wheat)
- Lesson 5 Student Checklist

Part I - Minnesota

- 1. Students begin by reading wheat background information (p. 26).
- 2. Ask students to hypothesize where wheat is grown in Minnesota.
- 3. Give each student Map 33 (MN Counties Named). Display Map 1 (Wheat) on the overhead projector. Instruct students to shade in counties that are in the highest category, above 40 percent.
- 4. Give each student Chart A (MN Wheat). Display Map 27 (Landforms) on the overhead projector. Have students use this map to fill in the chart column about landforms. Now, repeat the task using Map 26 (Native Vegetation), Map 28 (Precipitation), and Map 29 (Annual Frost-Free Days) to fill in the chart's remaining columns. Student answers should include the following:
 - Landforms-primarily plains
 - Native Vegetation-prairie or mixed forest and prairie
 - Precipitation-less than 23 inches
 - Frost-Free Days-134 days or less for most of the counties
- 5. Display Map 3 (Corn) on the overhead projector. Have students use the color desk map (color corn map) and Map 3 to form conclusions about the distribution of corn production. Have them write a paragraph describing the best places to be a corn farmer and why. They should construct their answer using the maps of landforms, native vegetation, annual precipitation, and annual frost free days where corn grows in Minnesota. Note: Explain that they do not have to describe each county where corn has a high percentage. Rather, they should focus on the high corn "region" of southern Minnesota.
- 6. Engage a discussion that contrasts the wheat region with the corn region.
 - a. How are the environments different in terms of precipitation and frost-free days?
 - b. What do you notice about native vegetation for the corn and wheat regions? (Environmental conditions are very important factors in a farmer's decision about what crop to plant. For example, Minnesota farmers plant wheat in drier, cooler regions than corn. Both corn and wheat grow in what formerly was prairie. Corn needs more moisture and sunlight (heat units) than wheat.)

Part II - World

- 1. Begin by asking students to predict where wheat may grow in the world.
- 2. Pair students and equip each pair with a world atlas and a copy of Chart B (World Wheat). Review instructions on the chart. To save time, half the student pairs could complete the precipitation and natural vegetation columns and the other half could complete the climate and soils columns. All pairs should complete the latitude column.
- 3. Engage students in a discussion that summarizes the environmental conditions of the wheat regions around the world. Simultaneously, display a black line world map on the overhead and outline each area as reported by the students. Use a different color transparency pen for each category on the chart. Discuss and answer:
 - a. At what latitude bands does wheat grow?
 - b. What precipitation ranges occur where wheat grows?
 - c. On what kind of soil is wheat most likely to grow?
 - d. Is wheat more likely to grow in grass regions or needle leaf evergreen regions? Student answers should include the following:
 - Latitude Bands: 35-40 and 45-55
 - Precipitation Ranges: mainly in ranges 10-20 and 20-40 inches
 - Soils: frequently mollisols and alfisols
 - Vegetation: grass or combination grass and broad leaf evergreen, and broad leaf deciduous

Wheat Background Information

Wheat is the largest acreage crop in the world and is the staple food for 35 percent of the world's population. History shows that the first people to eat wheat probably did so 17,000 years ago by chewing kernels of the wild grain.

There are two major types of wheat grown in the United States: winter wheat and spring wheat. Winter wheat is planted in the fall and harvested the following summer in the states from Nebraska south. Spring wheat is planted in April or May and harvested in August or September in states north of Nebraska. Minnesota wheat producers grow primarily Hard Red spring wheat, which is used primarily to make breads and hard rolls. Some durum wheat, used for certain kinds of pasta, is also grown in Minnesota.

Environment

Wheat is a cool season crop. Growth begins at temperatures of about 37 to 39 degrees. Its optimal growing temperature is 77 degrees. Wheat prefers a frost-free period of about 100 days. Compared to corn, wheat can tolerate a shorter growing season and drier conditions (less precipitation).

Planting

Spring wheat is typically planted when soil conditions permit tillage. A disk is used to turn and loosen the soil, and to kill any young weed plants. Pulled behind a tractor, the disk has a set of metal "plates" that dig deep into the soil. A disk shovel cuts a trench into the soil so the seeds can drop one at a time into the trench. Then, loose soil is pressed over the newly planted seeds. Wheat is planted in rows five to sixteen inches apart by a machine called a grain drill.

Growing Cycle

The seed begins to grow when there is enough moisture in the soil. Growth begins when tiny shoots stretch down into the soil. Eventually, a small shoot pushes upward through the soil. Tissue within the wheat seed provides the plant with its first nourishment. As the plant grows, it uses the sun to make food in its leaves. Its roots also get food (minerals and water) from the soil. In the spring, the wheat plant grows six to eight leaves per stem and sends up three to ten stalks of golden flowers called "heads". If the plant is fortunate enough to avoid diseases, kernels within the wheat head will grow healthy and plump for harvesting.

Harvest and Processing

Wheat must be dry before it can be harvested. In Minnesota, most harvesting occurs in August. With one pass through the wheat field, a "combine" machine is used to cut, separate, and clean the wheat. Minnesota averages about forty-five bushels of wheat per acre. The producer stores the grain in bins on the farm or at storage structures called "elevators" prior to shipment and processing. During processing, wheat is ground into flour at a mill. Bran, the outer layer of the wheat kernel, is often added to breakfast cereals and breads for nutritious fiber. Wheat products have carbohydrates, protein, minerals, and vitamins.

	Chart A	A: Wheat In Minn	iesota	
Directions: Describe native Add additional "	vegetation, landforms, precip 'second tier" counties as time	pitation, and frost-free days fo e permits.	or the four "high wheat" coun	nties in Minnesota.
Minnesota County	Native Vegetation	Landforms	Annual Precipitation	Annual Frost-Free Days
1.				
2.				
3.				
4.				
5.				
6.				
7.				
.8				
.6				

		Chart	B: Wheat Ard	ound the Wor	ld	
ē	ctions: Use a world atla ic. Describe the for the wheat re about agricultur	s. Find a thematic ma latitude band, the ran gion of each country. al products.	that shows world w ige of annual precipit Note: If the atlas doe	rheat production. Sec ation, the natural vege s not include a map s	cond, find maps abou station, the soils and t solely about wheat, th	it each column top- the climate region en look for maps
	Country	Latitude Band	Annual Precipitation Range	Natural Vegetation Category	Soils Category	Climate Category
<u> </u>	Canada					
~i	U.S.					
с.	France					
4.	Kazakhstan					
5.	India					
.9	China					
	Australia					
œ	Argentina					

Lesson for Upper Grades, 9-12

1: Impact of Distance on Agribusiness

Grade Levels: 9-12

Minnesota State Standards:

Standard: The student will use regions and the interaction among them to analyze the present patterns of economic activity in the United States and around the world at various scales.

Benchmarks: Students will describe how geographic models can help to explain the location of commercial activities and land use patterns in the United States and the world.

Students will explain the variations in economic activity and land use within Minnesota, analyze issues related to land use, and reach conclusions about the potential for change in various regions.

Students will describe how the technological and managerial changes associated with the third agricultural revolution have impacted the regional patterns of crop and livestock production.

Students will understand how the transportation and communication systems have impacted the development of regions.

Students will describe patterns of consumption and production of the agricultural commodities that are traded among nations.

Prior Knowledge

Basic map reading skills and knowledge of Minnesota regions.

Objectives:

- Students will be able to apply the concepts of the model developed by Alfred Weber to make decisions on where to locate processing and shipping facilities for crop and livestock agriculture.
- Students will be able to apply the concepts of data layering to determine the best locations for Minnesota agribusiness.
- Students will be able to predict the changes in the distribution of agricultural processing operations that will result from technological changes in agriculture and transportation.

Time Required

2-3 Class Periods/Hours

Materials

- Color Desk Map
- Colored pencils

 Map 33 (MN Counties Named), Map 1 (Wheat), Map 3 (Corn), Map 4 (Soybeans), Map 6 (Sugarbeets), Map 9 (Nursery and Greenhouse Crops), Map 10 (Dairy Cows), Map 11 (Milk Production), Map 12 (Beef Cows), Map 13 (Hogs), Map 14 (Turkeys), Map 15 (Meat-Type Chickens), Map 20 (Largest Grain-Loading Facilities), Map 21 (Ethanol), Map 22 (Sugarbeet and Soybean Processing), Map 24 (Dairy Processing), Map 25 (Meat Processing), Map 31 (Major Highways), Map 32 (Railroads)

U Weber model

Background Information on Weber's model of impact of transport costs

These models are intended to help geographers determine where to locate factories. They are based on the costs of shipping goods and help predict what other factors might be important in the location of economic activities.

Premises and Postulate

- 1. The unit of analysis is a single isolated country that is homogeneous in terms of climate, topography, population, and under one political authority.
- 2. Some natural resources (for instance, water and sand) are ubiquitous whereas (such as coal and iron ore) occur only in fixed locals.
- 3. Available workers are not ubiquitous; rather they are fixed in specific places.
- 4. Transportation costs are a function of weight and distances increasing in direct proportion to the length of shipment and weight of cargo.

Postulate

Manufacturing plants will be located in response to three forces relative to transport costs, labor costs, and agglomeration.

Case 1 – One Market and One Raw Material

- If the raw material is ubiquitous, then the factory will locate at the market.
- If the raw material is fixed, and no weight is lost in the manufacturing process, the factory can locate in either the market or at the source of raw material.
- If the raw material is fixed and weight is lost in the manufacturing process, the factory will locate at the source of raw material.

Case 2 - One Market and Two Raw Materials (R1 and R2)

If customers for a product are in only one place and the product is manufactured from two raw materials (R1 and R2) then manufacturing will tend to locate in one of the following ways;

- If both R1 and R2 are ubiquitous, then manufacturing will be at the market.
- If R1 is ubiquitous and R2 is fixed elsewhere than at the market, and if both are pure (no weight loss), then manufacturing will be at the market.
- If both raw materials are fixed and pure (no weight loss), the factory will be at the market.
- If both raw materials are fixed and gross (weight loss), the solution is complex and Weber introduced his famous locational triangle. (See diagrams below).

Suppose R1 and R2 loose 50% of their weight in the manufacturing process and 2000 tons of each are required a year. If the factory were located at M the total transportation costs would be (A.) 2,000 tons X 100 miles = 200,000 ton miles on R1 from SR 1 to M, plus (B) (200,000 ton miles on R2 from SR2 to M) or 400,000 ton miles in all.

However, if the factory were located at Point X, midway between SR1 and SR2, the transportation burden would be as follows: (A.) 2,000 tons X 50 miles = 100,000 ton miles on R1 from SR1 to X, plus (B) another 100,000 ton miles on R2 from SR2 to X plus (C) 200,000 tons X 87 miles = 174,000 ton miles on finished product from X to M or a total of 374,000 ton miles. This is less than the burden facing an enterprise with either M or SR1 or SR2.

If the two raw materials do not have the same weight loss or if different amounts are required, the factory would tend to locate nearer one of the raw materials sources so as to less the burden of transportation costs.



When applying the model to Minnesota agriculture and agribusiness it is important to remind students that most processes involve weight loss and bulk reduction. However, bottling liquid milk for direct consumption does not and, in addition, it must be delivered quickly to both the bottling plant and consumers. Grain shipping does not involve loss of weight or bulk. Ethanol involves weight and bulk-lose but the byproduct – corn mash, or dried distillers grain, can be sold for animal feed and so has a separate set of transport variables.

Background Readings:

Lanegran, David. Modern Agriculture in Advance Placement Human Geography. Journal of Geography Vol. 88, Nos. 3-4 (August 2000): 132-141.

Hart, John Fraser. <u>The Changing Scale of American Agriculture</u>. Charlottesville: University of Virginia Press, 2003.

Procedure

Setting:

Students have been selected to serve on a statewide task force to determine what sorts of tax benefits should be made available to counties interested in developing industrial facilities to support Minnesota agriculture. While all counties may want to have processing facilities in their tax authority as representations of the state, the students must develop a way to maximize the benefits of the state subsidies. That is, the public funds should be devoted to places where the endeavors have the greatest likelihood for success.

In developing their opinions the students should make the following assumptions:

- 1. There will be enough labor in each of the interested communities or labor will move to the communities to take the new jobs created and labor costs will be essentially the same in all locations.
- 2. There is both a state and national market for the goods produced.
- 3. The basic geography of the production of crops and livestock will not change during the time the task force is deliberating.
- 4. No county will be able to opt out of State and Federal regulations designed to protect the environment.

Part One

In order to facilitate the students resolving this issue the teacher should lead the entire class through an example of how to determine the effects of transport on the processing operations by the map layering techniques. Teachers should select any commodity in which they have a special interest. The example of milk is provided because most students will have some familiarity with it.

- 1. Begin by making overhead transparencies of Maps 10, 11 and 24.
- 2. Activate prior knowledge by asking the students what they know about the production of milk and how it is processed. Discussion should include:
 - a. Milk comes from cows.
 - b. Milk can spoil or turn sour quickly.

- c. Milk is sold in small volumes directly to the consumers bottle, carton, etc.
- d. The number of dairy farms is decreasing due to the economies of scale that can be realized by large. producers. Larger producers milk 700 to 1000 cows.
- e. Milk is shipped from farm to processing plant in refrigerated tank trucks.
- f. Milk must be kept refrigerated between the time it leaves the cow until it is processed.
- 3. Place transparency of Map 10 (Dairy Cows) on the overhead.
 - Ask students to explain the distribution of cows.
 - a. Dairy farms are concentrated in the areas that are not primary production zones for grain because the cattle can graze on hilly pastures unsuitable for grain.
 - b. Dairy farms are near the urban areas.
 - c. Dairy farms are not found in the cold forested region of northern Minnesota.
- 4. Place the transparency of milk production over the map of dairy cows. Ask the students to explain what correlations exist between the two maps.
- 5. Place the transparency of dairy product processing sites over the map of milk production.

Using the discussion of Weber's model ask the students to explain the distribution of bottled milk plants.

Students should note that of the 13 bottling plants in the state, nine are located near markets. This can be explained by using the model and what they know about the production and processing of "bottled" milk.

- If the raw material is ubiquitous, then the factory will locate at the market.
- If the raw material is fixed, and no weight is lost in the manufacturing process, the factory can locate in either the market or at the source of raw material.

<u>Using the discussion of Weber's model ask the students to explain the distribution of butter, cheese or ice cream</u> <u>plants.</u> Students should note that of the 19 plants in the state, one is obviously located near markets. This can be explained by using the model and what they know about the production of these products. Because all three of these products reduce the bulk of the fresh milk and the product is less perishable than milk, they may locate plants in ways that will reduce the transportation costs of the fresh liquid milk. The refrigerated products can then be shipped greater distances.

• If the raw material is fixed and weight is lost in the manufacturing process, the factory will locate at the source of raw material.

Part Two

- 1. Divide the class into "task force subcommittees".
- 2. Assign each subcommittee a commodity and processing operation to analyze. Instruct students to use the appropriate maps and aspects of the model to identify those counties NOT being efficient location sites, or the county that best meets the locational criteria. Have students prepare a one page report summarizing how they came to their conclusion.
- 3. Report should include list of maps consulted and principles from Weber model.

The assignments are as follows.

- **Group 1:** Koochiching, Stearns, Brown, Norman, Kandiyohi, and Houston counties have applied for a grant to build an ethanol plant with a capacity of thirty million gallons per year. In which of these counties would such a facility be most likely to succeed and why?
- **Group 2:** The counties of McLeod, Houston, Lyon, Wadena, Todd, and Goodhue have applied for financial help to establish a railroad grain loading facility. In which of these counties would such a facility be most likely to succeed and why?
- **Group 3:** The counties of Morrison, Crow Wing, Martin, Clearwater, Pipestone, and Faribault have applied for a grant to develop a beef processing plant. In which of these counties would such a facility be most likely to succeed and why?

- **Group 4:** The counties of Rock, Chippewa, Meeker, Houston, Blue Earth, and Hennepin have applied for a grant to have a pork processing plant. In which of these counties would such a facility be most likely to succeed and why?
- **Group 5:** The counties of Hennepin, Ramsey, Carlton, Isanti, Chisago, and Martin have applied for a grant to establish a turkey processing plant. In which of these counties would such a facility be most likely to succeed and why?
- **Group 6:** The counties of Hennepin, Ramsey, Carlton, Isanti, Chisago, and Martin have applied for a grant to establish a chicken processing plant. In which of these counties would such a facility be most likely to succeed and why?
- **Group 7:** The counties of Olmsted, Dakota, Anoka, St. Louis, Benton, and Blue Earth have applied for a grant to establish a sugarbeet processing plant. In which of these counties would such a facility be most likely to succeed and why?

Part 3

Assessment:

Subcommittees select a representative to report back to the task force at-large. Prepare overheads of the appropriate maps of processing facilities. When a group finishes the teacher will show the appropriate map of these facilities to determine how close the groups' selected county is to the current processing centers. If the students' selection and the existing pattern diverge, discussion of why the difference exists should clarify how the Weberian model was used.

Extension Activities:

Three maps in the packet facilitate a discussion of the VonThunen model of land use. (Map 16 depicting the distribution of horses and ponies, Map 19 showing population change 1990-2003, and Map 9 of nursery & greenhouse crops).

VonThunen indicates that intensive agriculture (high inputs of labor and capital) will be located close to the market. This explains the distribution of Map 9 because the plants are expensive, easily damaged when shipping, and perishable. The great profitability of this agriculture enables farmers to maintain themselves in the face of the expanding urban population. The map showing population change indicates that eventually this pattern of nursery crops will have to shift outward. The map of horses and ponies illustrates the transfer of the horse from a farm animal to a recreational animal maintained by city dwellers for their pleasure. No other animal distribution resembles that of horses and ponies.

Glossary

alfisol

soils where top layers are moderately high in plant nutrients and organic matter; originally covered by deciduous tree vegetation

choropleth map symbols

shade areas (e.g., counties) with light or dark shading depending on numerical data to show concentration or density

commodity

types of crops (plants) or livestock (animals) produced for sale

conifer forest

vegetation region containing needle-leaved trees that are evergreen and bear cones (e.g., pines, spruces, firs)

data source and date

who collected numerical data; time period when the data occur

deciduous forest

vegetation region containing broad-leaved trees that loose their leaves in autumn (e.g., maples, oaks, elms, basswood)

export

to sell to other places outside of the area or the country

frost-free days

temperatures are above 32° F; number gives an idea of growing season length for plants sensitive to freezing temperature

ground moraine

landform surface that includes gentle slopes left long ago when glaciers pushed rocks and soil across Minnesota

ice-scoured bedrock

landform in northeastern Minnesota left long ago when glaciers scraped soils and rocks from the ground; tends to include steeper slopes

import

to bring into a place from somewhere else; often used to describe products brought into one country from another

key

explains meanings of symbols on a map

lake plain

flat land that long ago in glaciation period was the bottom of a lake

latitude

location on earth in relation to the equator

legend

explains meanings of symbols on a map

mollisol

soils whose top layers are high in organic matter, high in plant nutrients and dark in color; originally covered by grass vegetation

natural or native vegetation

the vegetation that was present in the mid-to-late 1800s (before European Americans introduced their agricultural methods) when Minnesota was populated mainly by American Indians

outwash plain

flat to gently-sloping landform left long ago when meltwater carried sand and soil away from glaciers

orientation or compass rose

map symbol that shows where north, south, east, west are on a particular map

prairie

vegetation region where grasses predominate

precipitation

rainfall and snowfall that provide water for plants and animals

regions

areas that share common characteristics

scale bar

a map symbol that shows how a length on the map relates to the distance in the real world

stream-dissected land

landform in southeastern Minnesota that includes steeper slopes because erosion by streams and rivers has carved valleys in the landscape; this area was affected least by the movement of glaciers

tillage

scraping or plowing soil to remove weeds or prepare a field for planting a crop

title

the brief summary of the map's contents

terminal moraine

landform surface that includes steeper slopes left when glaciers stopped movement across Minnesota and dumped irregular piles of soils and rocks

Index: Black Line Maps

Map 1: Wheat in MN Counties Map 2: Barley in MN Counties Map 3: Corn for Grain in MN Counties Map 4: Soybeans in MN Counties Map 5: All Hay in MN Counties Map 6: Sugarbeets in MN Counties Map 7: Cultivated Wild Rice in MN Counties Map 8: Sweet Corn and Green Peas in MN Counties Map 9: Nursery and Greenhouse Crops in Minnesota Map 10: Dairy Cows in MN Counties Map 11: Milk Production in MN Counties Map 12: Beef Cows in MN Counties Map 13: Hogs and Pigs in MN Counties Map 14: Turkeys in MN Counties Map 15: Meat-Type Chickens in MN Counties Map 16: Horses and Ponies in MN Counties Map 17: Organic Farms in Minnesota Map 18: Farmland in MN Counties Map 19: Population Change, 1990 to 2003, for MN Counties Map 20: Largest Grain-Loading Facilities Map 21: Ethanol Production in Minnesota Map 22: Sugarbeet and Soybean Processing Sites Map 23: Cultivated Wild Rice Processing and Vegetable Canning Sites Map 24: Dairy Product Processing Sites Map 25: Meat Processing Plants Map 26: Native Vegetation (late 1800s) Map 27: Landforms Map 28: Annual Precipitation Map 29: Annual Frost Free Days Map 30: Major Cities and Major Water Features Map 31: Major Highways in Minnesota Map 32: Railroads of Minnesota Map 33: Minnesota Counties (Named) Map 34: Minnesota Counties (Unnamed) Map 35: Five State Region

Map 36: World Basemap
Wheat in MN Counties



Barley in MN Counties



Corn for Grain in MN Counties





All Hay in MN Counties



Sugarbeets in MN Counties



Cultivated Wild Rice in MN Counties







100

Hiles

0

25

50



Milk Production in MN Counties

100

Miles

25

50

Milk Production (1000 lbs) 3000 - 90000 90001 - 232000 232001 - 486500 486501 - 1132500 No data reported Data Source: U.S. Dept. of Agriculture 2002 Census of Agriculture

Map produced by: The Minnesota Department of Agriculture Map 11



Hogs and Pigs in MN Counties



49.



Turkeys in MN Counties



Meat-Type Chickens in MN Counties



Horses and Ponies in MN Counties



The Minnesota Department of Agriculture

52.

Organic Farms in Minnesota



100

Miles

50

F

25

0

E

Farmland in MN Counties







Population Change, 1990 to 2003 for MN Counties



Largest Grain-Loading Facilities



Ethanol Production in Minnesota



Map 21

Sugarbeet and Soybean Processing Sites



Map 23



Dairy Product Processing Sites



Map produced by: The Minnesota Department of Agriculture

Miles

Meat Processing Plants







Native Vegetation



Map produced by:

The Minnesota Department of Agriculture

100

Miles

50

Landforms





Annual Precipitation







Annual Frost Free Days















Minnesota Counties (Named)

100

Miles

50

F

25

0

F



Minnesota Counties (Unnamed)










