8. Agricultural Regions in Minnesota

Overview
Minnesota’s vegetation regions 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
Time: Five to seven 30 minute class periods.
Part One: one to two 30 minute class periods
Part Two: one to two 30 minute class periods
Part Three: one to two 30 minute class periods
Part Four: one to two 30 minute class periods

Minnesota State Standards: Geography
Benchmark: 4.3.4.10.1
Describe how the location of resources and the distribution of people and their various economic activities has created different regions in the United States and Canada.

Benchmark 4.3.4.10.
Analyze the impact of geographic factors on the development of modern agricultural regions in Minnesota and the United States.
For example: Agricultural regions such as Corn Belt, Dairy Belt, crop regions.

Benchmark 4.3.3.6.1
Explain how geographic factors affect population distribution and the growth of cities in the United States and Canada.
For example: Geographic factors—climate, landforms, availability of natural resources.

Benchmark 4.3.2.3.1
Locate and identify the physical and human characteristics of places in the United States, and also Canada or Mexico.
For example: Physical characteristics—landforms (Rocky Mountains), ecosystems (forest), bodies of water (Mississippi River, Hudson Bay), soil, vegetation, weather and climate. Human characteristics—structures (Statue of Liberty), bridges (Golden Gate Bridge), canals (Erie Canal), cities, political boundaries, population distribution, settlement patterns, language, ethnicity, nationality, religious beliefs.

Part 1 - Agricultural Regions in Minnesota

Objectives
• To understand which counties in Minnesota are the biggest producers of five of Minnesota’s crops by reviewing choropleth maps.
• To create a map showing the different regions of cropland in Minnesota and to label the parts of the map correctly.

Materials
• Food for Thought Maps found at http://www.mda.state.mn.us/fft
  ➢ Wheat in MN Counties (2012) (Map 2), one enlarged (11” x 17”)
  ➢ Corn for Grain in MN Counties (2012) (Map 4), one enlarged
  ➢ Soybeans in MN Counties (2012) (Map 6), one enlarged
  ➢ All Hay in MN Counties (Map 8), one enlarged
Sugarbeets in MN Counties (Map 15), one enlarged
Minnesota Counties (unnamed) (Map 42), one enlarged for each pair of students. Note: Mount map on cardboard, tag board or open file folder

- Purchase the following grains at a local co-op or grocery store:
  - 2 pounds popcorn kernels (can use field corn if available)
  - 1 cup soybeans
  - 2 cups wheat berries
  - 1 box sugar cubes
(It might be possible to obtain these grains by contacting a local farmer or the Agronomy Department at a local college or university)

- 6 bottles of glue

Key Words
- choropleth map, regions, wheat, corn, soybeans, sugarbeets, hay

Procedure
Set up five eye-level stations around the classroom. Place a different grain at each station along with the corresponding choropleth crop outline map, and a bottle of glue. Note: Prepare or have students glue the blank outline county maps to their cardboard, tag board or open file folder.

1. Show each grain to the class and have the students guess how the grain is used. Record correct guesses on an overhead or the board. Note: The popcorn is being used to represent corn for grain (Map 4).

2. Show one of the enlarged choropleth maps and explain why there are varying shades of color, e.g., dark shades represent more grain than light shades. Next, have students find which counties have a lot of the grain and which do not. Instruct the students (in pairs) to make a map of the regions in the state where each of the five grains are grown. First, have the students glue one grain (seed) to each of the counties that have the highest percentage of the corresponding crop. As they continue to work, students should glue a second grain onto the map legend and add the name of the crop.

3. After moving through each station, students should complete their maps by adding a compass rose, labeling neighboring states, labeling the province of Ontario (bordering Minnesota), adding a map title and their names.

   Note: To condense Part One, use the Color Student Desk Map with the following four crops: wheat, hay, soybeans and corn; provide those four grains and a blank county outline map.

Assessments
1. Instruct students to write five questions about their map that could be answered by a fellow student viewing their map.

2. Assess the completeness and accuracy of the student-made maps; check that they have correctly identified the highest grain counties, look for a map title, legend, labeling of neighboring states and province, and authors’ names.

Part 2 - Agricultural Regions in Minnesota

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

Materials
- Food for Thought Maps found at http://www.mda.state.mn.us/fft
  - MN Native Vegetation (Map 34), one for each pair of students
  - Landforms of MN (Map 35), one for each pair of students
  - MN Annual Precipitation (Map 36), one for each pair of students
  - MN Annual Frost Free Days (Map 37), one for each pair of students
Food for Thought Color Student Desk Map, one for each student (Order this free resource at http://www.mda.state.mn.us/fft)

- Student-made crop maps from Activity 1
- 8” x 11” plain paper

Key Words
- native vegetation, landforms, annual precipitation, annual frost free days

Procedure
1. Ask the students if they have ever had their own garden; specifically have they grown any of the crops they placed on their maps. Together, list the needs of a garden in order to produce a good crop, i.e., good soil, warm weather, water, sun, etc. Explain that different crops do well with a variety of different growing conditions, i.e., oranges would not grow well in Minnesota because of the cold, but apples thrive in cooler climates.

2. Together, review the four maps on the Color Student Desk Map and determine what clues they give about the growing seasons in relation to different crops.

3. Working as partners, have each pair fold four pieces of plain paper in half and then in half again, dividing the paper into four equal sections. Pairs should write the name of a different Minnesota crop in each of the four sections. Next, after reviewing Maps 34, 35, 36 and 37, students should write three hypotheses in each of their four sections as to why the crop grows where it does in Minnesota. For example, sugarbeets grow in northwestern Minnesota because the soil is rich, and the combination of cool nights and warm days provide ideal growing conditions for beets to produce a high amount of sugar.

4. Each pair should share their hypothesis with another pair in the classroom. Then the group of four should choose two hypotheses they are confident are true and share those with the rest of the class.

Assessments
1. Chart that has been created (students’ folded papers) listing the different hypotheses about the growth of the crops.

- Participation in the class discussion.

Part 3 - Agricultural Regions in Minnesota

Objectives
- Using the crop and livestock maps, identify where a particular crop or agricultural product should be processed and the route the crop should take to get to market.
- Students will examine how the location of highways and railroads impact farmers.

Materials
- Corn for Grain in MN Counties (2012) (Map 4)
- Dairy Cows in MN Counties (Map 9)
- Ethanol Production in MN (Map 27)
- Dairy Product Processing Sites in MN (Map 29)
- Major Highways in Minnesota (Map 38)
- Railroads in Minnesota (Map 39)
- Minnesota Counties (unnamed) (Map 42)
- Food for Thought Color Student Desk Map, one for each student (Order this free resource at http://www.mda.state.mn.us/fft)
• MN Ag in the Classroom Commodity Cards, one set for reference (Order this free resource at http://www.mda.state.mn.us/cc) The commodity cards focused on Wheat, Sugarbeets, Dairy Cattle, and Corn will be used in this activity.

• Student-made crop maps from Activity 1

Key Words
• processing, market, facilities, sites, ethanol

Procedure
1. Discuss what happens to crops after they are grown and what must be done to them before they can be consumed or used. Explain that some crops need to be preserved so that we can consume them later. Other crops are processed.

2. Explain to students that they will gather information about two of the crops on their student-made crop map. Half of the class will read about wheat and the other half will read about sugarbeets. Tell students to pay particular attention to the harvesting of each of the crops. Have students answer the following questions as they read:
   - What steps take place before the crop is ready for consumption?
   - Does the farmer complete all the steps?
   - What products come from the crops?

3. Have students share with the class their findings after reading.

4. Explain that farmers use processing sites once their crop is harvested. The processing sites prepare the crops for the market.

5. Ask students to think about where processing sites might be located for sugarbeets or wheat. Are they going to be close or far away from the farmers? What about the markets? How do the wheat or sugarbeets get to the market once they are processed and ready for consumption? Review the Minnesota Reference map showing major cities and water features together. Discuss how the city locations and water features affect where food is prepared and where and why food must be transported.

6. Have students work with a partner or a group of three. Give half of the groups the Dairy Cattle commodity card, and the other half the Corn commodity card. After reading the commodity card, students will use their Minnesota Counties (unnamed) Map (Map 42) to identify three sites for processing plants. Students should mark them on the map and in a legend. Once they have identified processing plants, they will then decide where the market should be located for the products. Students will also draw in highways and railroads to show the best way to transport their crops to market. They should include symbols on their map legend to identify these features and also add a map title.

7. As each group finishes, give them the appropriate map that shows the actual processing sites for their crops and Minnesota’s major highways and railroads. Have students compare the maps (transparencies can be made so students can place the transparency on top of their paper map). Next, individually, students should write a description of how their map was the same and/or different than the actual maps. They should also write a sentence or two describing how well their small group worked together and finally, what they learned as an individual.

8. Facilitate a class discussion about the outcomes of this activity. What did the class learn? Why are the highways located where they are? How do the highways relate to major cities? The railroads? What difference would it make where these are located to the farmer?

Assessments
1. Group maps of where they believe the sites should be and the transportation lines.

2. Individual student description/reflection written at the end of the lesson.
Part 4 - Agricultural Regions in Minnesota

Objectives
- To understand the relationship between land value and agricultural activity using maps.

Materials
- Food for Thought Maps found at http://www.mda.state.mn.us/fft
  - MN Native Vegetation (Map 34), one for each pair of students
  - Landforms of MN (Map 35), one for each pair of students
  - Nurseries in MN (Map 18)
  - Farmland Value in MN Counties (Map 26)
  - Population Change in MN Counties (2000-2010) (Map 32)
  - Minnesota Counties (named) (Map 41)
- Food for Thought Color Student Desk Map, one for each student
  (Order this free resource at http://www.mda.state.mn.us/fft)
- Readings One and Two (pages 41 & 42)
- Lesson Links for additional resources at http://www.mda.state.mn.us/fft
  + Minnesota Population Density 2010 Map

Key Words
- farm, land value, nursery crops, annuals, perennials, cultivated, propagate

Procedure
1. Using the Color Student Desk Map, have students identify the largest cities in Minnesota. Students should locate their home city/town on the map. Discuss why these cities are located where they are and how they are connected to one another. (Note: while the maps do not always illustrate, some locations were initially sited to be near the rivers, railroads or the ox-cart trails of the earliest settlers to Minnesota. Most cites shown are located near major highways or waterways of Minnesota.).

2. Distribute a copy of Reading One to half of the class and Reading Two to the other half. Have the students take notes or highlight important information from the articles. After students have completed their reading, have the students with Reading One form groups of four or five and have students with Reading Two do the same. Groups should decide the five most important facts about the nursery industry that they learned from their article. One member of the group should write down the facts and be prepared to share them with the class for discussion.

3. In pairs or small groups of three, give students the Color Student Desk Map, the Minnesota Population Density Map (2010) found at www.mda.state.mn.us/fft, Nurseries (Map 18), Farmland Value (Map 26), and Population Change (Map 32). Ask students to identify the ten counties with the largest number of nurseries. Have them list the farmland value for the identified counties. Ask them to hypothesize why these counties grow nursery stock, instead of other crops, like corn or wheat. What is the relationship between the farmland value and the type of plants grown? In Greater Minnesota, where population density is less, have students hypothesize what nursery crops are grown there. Students should write this down along with three reasons which can be supported by their maps.

Assessments
1. Students will write a paragraph about the nursery industry in Minnesota, citing types of crops grown and the locations where they are grown, based on their reading and the maps.
Study shows Minnesota nursery and landscape industry total economic impact at $3.5 billion.

Annuals, perennials, trees, shrubs, lawns, and... cash for Minnesota’s economy. The Minnesota nursery and landscape industry is generating a lot of “green”... in more ways than one.

A recently-completed study shows that the state’s nursery and landscape companies generate yearly sales of more than $1.9 billion and have a $3.5 billion direct effect on Minnesota’s economy.

Firms participating in the study included landscape contractors and designers, retail garden centers; wholesale tree, shrub, and flower growers; irrigation contractors; lawn, tree, and garden services; and landscape suppliers. There are approximately 2,000 family-owned companies in Minnesota that make up the professional nursery and landscape industry. National corporations selling plants and garden goods in Minnesota were not surveyed and estimates do not include gross sales and impacts from those companies.

Gross sales within three major industry segments were identified:

- Landscape services - $1.5 billion
- Retail sales - $198 million
- Wholesale Agricultural/Horticultural Production and Hard Goods - $892 million

Minnesota’s nursery and landscape exports are 15.7% of total sales or over $298 million, with much of that being tree and shrub sales across the nation and to Canada, as well as sales of landscape services in neighboring states.

In addition to substantial gross sales, the industry is a major Minnesota employer with a total payroll of over $1.2 billion. There are more than 14,000 full-time employees; 4,500 part-time employees; and 23,000 seasonal employees.

“While direct sales are down from the same study conducted in 2000, which listed $2.1 billion in direct sales, the fact that the number didn’t decline further is a testament to the family run businesses in our industry. Small, family-owned and operated businesses can succeed even through an economic downturn. Most of our industry’s companies have fewer than 10 full-time employees, yet collectively we provide more than 42,000 jobs. We’re a strong, diverse, and stable part of the Minnesota economy,” said Heidi Heiland, president of the Minnesota Nursery & Landscape Association. A professional gardener and landscape designer, Heiland owns and operates Heidi’s Lifestyle Gardens based in Plymouth, Minn.

Companies were surveyed in the winter of 2013-2014 and asked for sales figures for the year 2013. Data was compiled and analyzed by the School of Public Affairs Research Institute at St. Cloud State University. Spearheaded by the Minnesota Nursery & Landscape Association, partners in the project included the Agricultural Utilization Research Institute (AURI) and the Minnesota Department of Agriculture’s Minnesota Grown Program.
WHAT ARE NURSERY CROPS?
Nursery crops include all cultivated plants that are used to enhance the outdoor landscape. This includes trees, shrubs, herbaceous perennials, and annuals. They are used to beautify public and private landscapes, to provide privacy and protection from wind and sun, to produce nutritious berries and tree fruits, to re-vegetate disturbed sites with native plants, and to provide habitat for wildlife. Nurseries are responsible for propagating these plants and growing them to a size that is suitable for post-sale planting.

HOW ARE NURSERY CROPS PRODUCED?
Young plants are started in a greenhouse as cuttings or seedlings. After an appropriate time in controlled conditions, the plants are transplanted into the field or into containers. As the stock increases in size, it is either shifted into a larger container or dug and planted at a wider spacing. This ensures the plant has a strong root system and is well-shaped. Depending on the crop, it can take anywhere from a few months to 5 years before a crop reaches a marketable size.

Some nurseries use very sophisticated technology whereby plants are multiplied on an artificial nutrient medium in a sterile laboratory. This procedure is referred to as tissue culture. The advantages of the procedure are that it is an effective propagation method for some difficult-to-propagate plants, it is a quick method of multiplying new plants recently released from a breeding program, and it can be used to eliminate virus diseases in nursery stock. Once the plants are multiplied in the laboratory, they are moved to the greenhouse for rooting and growing-on.

In recent years there has been a shift towards greater container production, which generates more revenue per acre than field production. This is very significant in regions where property values are very high. This trend is also a response to changing consumer demand. Consumers prefer container-grown plants; they are easier to transplant and generally have higher survival rates.

Another important segment of the production cycle is the breeding and selection of improved plants. Breeding programs exist through many colleges and universities world-wide. These programs operate to bring new and very special plants to the nursery industry for propagation and distribution to the general public. As a result garden enthusiasts and casual gardeners alike have access to some beautiful plants that have demonstrated their superiority in carefully managed trials. These are the plants everyone “Just has to have”. Estimated worldwide sales of these “special” plants is in the millions.

WHAT DOES A NURSERY CROP LOOK LIKE WHEN I USE IT?
Nursery stock is used by landscapers and homeowners to design green spaces in private and public areas. From a nursery you can buy evergreen or deciduous trees and shrubs, roses, any one of hundreds of perennials and annuals, fruit trees, berry bushes, vines, ground covers or broadleaf evergreens. The nursery industry constantly introduces new and better varieties of plants in response to consumer demand. The recent expansion of multi-family residences has resulted in plants selected that grow well in planters or in smaller yards. Nursery plants provide a great deal of benefit in terms of beautification of the urban environment.

Some nurseries grow forest seedlings that are replanted into logged areas. Nurseries also grow fruit trees which are used to replenish orchards.

WHAT HAPPENS AFTER THE NURSERY CROP LEAVES THE FARM?
Some nurseries sell directly from the farm; others sell to wholesale producers, landscapers, retail garden centres or directly to the public. Over half the sales are to landscape contractors and retail garden centres. Nursery stock is transported almost exclusively by transport truck.

Source: Government of British Columbia, Canada
www.agf.gov.bc.ca/aboutind/products/plant/nursery.htm