The Crystal Sugar Cooperative: Changing Landscapes Along the Red River Valley

OVERVIEW & OBJECTIVES	GRADES
Students will examine Crystal Sugar, a major company located along the Red River Valley, as a case study. Students will begin by examining the physical and human environment of the Red River Valley. Next, students will investigate the agricultural cooperative as an example of the changing physical and human environment of the region. This lesson is adaptable to grade level and student ability by outlining strategies from which the teacher may select. *Students will be able to...* • Identify the Red River Valley as a region • Explain why the Red River Valley is a productive agricultural region • Summarize how sugar is made from sugar beets • Identify the historical development of sugar beet production • List advantages and disadvantages of migrant labor • Define a cooperative and list its advantages and disadvantages • Explain how Crystal Sugar reflects the changes in the physical and human landscape of the Red River Valley	6th and 8th **TIME** 2 – 3 classes **REQUIRED MATERIALS** ✓ Computer projector ✓ Student access to Internet ✓ Lake Winnipeg Watershed Map (optional) ✓ Northern Lights textbook (optional) ✓ Bags of granulated sugar, powdered sugar, and brown sugar from Crystal Sugar (optional) ✓ Handouts: "Red River Valley Environment"; "Sugar Beets"; "Red River Valley Populations"; "Crystal Sugar Cooperative"

MINNESOTA SOCIAL STUDIES STANDARDS & BENCHMARKS

(6th Grade)
Standard 1. People use geographic representations and geospatial technologies to acquire, process and report information within a spatial context.
6.3.1.1.1 Create and use various kinds of maps, including overlaying thematic maps, of places in Minnesota; incorporate the "TODALSS" map basics, as well as points, lines and colored areas to display spatial information.
Standard 6. Geographic factors influence the distribution, functions, growth and patterns of cities and other human settlements.
6.3.3.6.1 Locate, identify and describe major physical features in Minnesota; explain how physical features and the location of resources affect settlement patterns and the growth of cities in different parts of Minnesota.
Standard 10. The meaning, use, distribution and importance of resources changes over time.
6.3.4.10.1 Describe how land was used during different time periods in Minnesota history; explain how and why land use has changed over time.

(8th Grade)
Standard 1. People use geographic representations and geospatial technologies to acquire, process and report information within a spatial context.
8.3.1.1.1 Obtain and analyze geographic information from a variety of print and electronic sources to investigate places or answer specific geographic questions; provide rationale for its use.
Standard 2. Geographic inquiry is a process in which people ask geographic questions and gather, organize and analyze information to solve problems and plan for the future.
8.3.1.2.1 Formulate questions about topics in geography; pose possible answers; use geospatial technology to analyze problems and make decisions within a spatial context.
Standard 6. Geographic factors influence the distribution, functions, growth and patterns of cities and human settlements.
8.3.3.6.1 Describe how the physical and environmental features of the United States and Canada affect human activity and settlement.

SUGGESTED PROCEDURE

Introduction

The teacher begins by showing bags of sugar and asking students how these might be used at your home. Students may suggest various foods including jams, jellies, pickles, cookies, and cakes. Students may also suggest other uses such as sweetener, hummingbird food, and body scrub. The teacher will identify other uses including livestock feed and fertilizer, as well as use in alcohol and pharmaceutical industries. Tell students that they will be investigating the major beet sugar producer in the U.S., Crystal Sugar, how the company makes sugar from sugar beets, and how the company reflects the changes in the physical and human landscape of the Red River Valley.

Red River Valley Environment

Students will examine several maps and readings as a class or in small groups to understand the Red River Valley environment. The teacher selects the maps and readings based on student abilities and depth of investigation.

Maps:

1. Lake Winnipeg Watershed Map and Historical Maps OR
2. Historical maps and Food for Thought Color Maps Collection:
   - Wheat in Minnesota Counties
   - Sugar Beets in Minnesota Counties
   - Minnesota Native Vegetation
   - Landforms of Minnesota
   - Minnesota Annual Precipitation
   - Minnesota Annual Frost Free Days
   - Minnesota Counties

   Interactive Map—click and zoom in to the meandering Red River

Readings:

1. Handouts: “Red River Valley Environment”; “Sugar Beets”; “Red River Valley Populations” OR

2. Northern Lights selections on the Red River Valley

Students examine the location and landscape of the Red River Valley using the Lake Winnipeg Watershed Map or the Food for Thought maps to address the Red River Valley Environment questions below. The teacher should emphasize the Red River Valley as a region and how it extends beyond political borders. Next, students compare the map(s) with one or both of the historical maps to determine changes in the physical and human environments over 200 years as shown on the maps. Students then read about the Red River Valley and its changing physical and human environments using the readings.

Students will use the information derived from the resources to answer several questions. The teacher will have students complete the Red River Valley Environment questions or use them in a class discussion.

1. What direction does the Red River flow?
2. Describe the flow of the river.
3. Identify the predominant landforms and vegetation.
4. Why is the Red River Valley a valuable, productive agricultural region?
5. What causes the Red River to flood?
6. What could be done to reduce flooding and its impact?
7. Describe the Red River landscape 200 years ago (the early 1800s).
8. What major cities are located along the river on the Minnesota-North Dakota border?
9. Describe the current population of the Red River Valley.
10. How has the Red River Valley changed over time?

Crystal Sugar

The teacher begins with a review of the Red River Valley Environment using a strategy such as "Give One-Get One" or "3-2-1" (explained under Teacher Note). Next, the teacher shows pictures of sugar beets and explains that students will be investigating where sugar beets are grown, how sugar beets are made into sugar, and who produces the sugar.

Students will be placed in groups to investigate the Crystal Sugar Company website, each with a different topic and task, using the handout "Crystal Sugar Cooperative". Students will complete their tasks and either jigsaw their learning or present their findings to the class. The topics are:

1. What are the important historical events of sugar production in the Red River Valley?
2. How is sugar made from sugar beets?
3. What products are produced from sugar beet production, what are they used for, and who buys them?
4. Where are the Red River Valley factories for processing sugar beets located and what are their characteristics?
5. Who are the employees of the American Crystal Sugar Company?
6. The American Crystal Sugar Company is a cooperative. Explain what is a cooperative and how Crystal Sugar operates.

Alternative single readings to answer the questions can be used by selecting one of the following two readings also located at the Crystal Sugar website:

1. Read "Cooperative Profile" under COMMUNICATIONS by clicking Cooperative Profile

2. Download the Brochure located at "Publications and Videos" under COMMUNICATIONS by clicking Cooperative Profile

Next, students will address the following comprehensive questions either written (T-chart, essay) or oral (small group or whole-class discussion) based on students' abilities.

- How effective is Crystal Sugar in utilizing all parts of the sugar beet?
- What are the advantages and disadvantages of a farm cooperative?
- What are the advantages and disadvantages of migrant labor?
- How does the American Crystal Sugar Company reflect the changes in the physical and human landscape of the Red River Valley?

Teacher Note: In the "Give One-Get One" strategy the students number their paper 1 to 3 and record 3 things they learned the previous day. Then they fold their paper in half and number the bottom half 1 to 3. Next, they exchange their 3 responses with 3 different students recording the other students' names after each item they gave. After 5 minutes, the teacher begins a discussion with students sharing one of the things they acquired from another student while providing that student's name. In the "3-2-1" strategy the students record 3 things they learned the previous day. Then they record 2 reactions to the learning and 1 question that they still have about the topic. After 5 minutes the teacher begins a discussion with students sharing their responses.

Assessment

- "Crystal Sugar Cooperative" Handout
- Red River Valley Environment questions
- Comprehensive questions
- Class discussion

Extension

Students investigate FEMCO Farms and its role in agricultural development, especially crop rotation, purebred animals, and diversification, in the Red River Valley and Minnesota.
http://www.wahpetondailynews.com/news/femco-farms-of-wilkin-county/article_e4cdada1-6750-5d23-83de-be0b71a270ee.html

Website Resources

American Crystal Sugar Company
https://www.crystalsugar.com/

"Food for Thought" at Minnesota Agriculture in the Classroom
http://minnesota.agclassroom.org/educator/fft.cfm

"First Published Map of Louisiana Purchase" by Samuel Lewis (ca.1753-1822). "Louisiana" in Aaron Arrowsmith, *New and Elegant General Atlas*. Philadelphia: 1804. Geography and Map Division at Library of Congress
https://www.loc.gov/exhibits/lewisandclark/lewis-before.html

"Map of the territory of Minnesota exhibiting the route of the expedition to the Red River of the north, in the summer of 1849" by John Pope (1822-1892); 1849 at Library of Congress
https://www.loc.gov/item/74696065/

Reference Websites

"A Glacier, A Lake, A Valley and Soil for the Future" by William Hoffman at University of Minnesota Report, May 1979
http://mbbnet.umn.edu/hoff/hoff_agassiz.html

"Bargaining for Beets: Migrants and Growers in the Red River Valley" by Jim Norris at Minnesota Historical Society
http://collections.mnhs.org/MNHistoryMagazine/articles/58/v58i04p196-209.pdf

"More Retirees are Turning to Migrant Work" at Star Tribune, October 26, 2014
http://www.startribune.com/more-retirees-are-turning-to-red-river-valley-migrant-work/280424002/

"Pembina County" at rootsweb
http://www.rootsweb.ancestry.com/~ndpembin/html/native_americans.htm

"Geographic Profiles" at Minnesota Compass
http://www.mncompass.org/profiles

"Economic Contribution of the Sugarbeet Industry in Minnesota and North Dakota" at AAE Report No 688, February 2012
https://www.crystalsugar.com/media/42851/impact2012.pdf

"American Fact Finder" at United States Census Bureau
http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

Additional Website Resources

"Minnesota's Hispanic Population: 5 Interesting Trends" at Minnesota Compass
http://www.mncompass.org/trends/insights/2014-10-02-hispanic-population-trends
This link includes a map showing the distribution of Mexicans in Minnesota

"Minnesota CropMAP" at Center for New Crops & Plant Products, Purdue University
https://www.hort.purdue.edu/newcrop/cropmap/minnesota/
This website provides agriculture statistics by county

"State Highway Map" at Minnesota Department of Transportation
http://www.dot.state.mn.us/statemap/
Download the Minnesota State Highway Map as well as Minnesota regional maps

"GLO Historic Plat Map Retrieval System" at Minnesota Geospatial Information Office
http://www.mngeo.state.mn.us/glo/index.html
Investigate Minnesota by examining historic township plat maps

"County Agricultural Profile" at Minnesota Department of Agriculture
http://www.mda.state.mn.us/
Type the county in the Search for charts and graphs of agriculture summary

"Migrant Workers in Minnesota" at Twin Cities Daily Planet (August 30, 2007)
http://www.tcdailyplanet.net/migrant-workers-minnesota/
This link provides a brief overview of Mexican migrant workers in Minnesota

"History" by Neoma A. Laken at Wilkin County, Minnesota Official Site
http://co.wilkin.mn.us/history.asp
This link provides an excellent summary of the Red River Valley's history

Red River Valley Environment

The Red River begins at the confluence of the Bois de Sioux and Otter Tail Rivers at the twin cities of Breckenridge (Minnesota) and Wahpeton (North Dakota). It flows north forming the boundary between Minnesota and North Dakota. Major cities along the route include Fargo-Moorhead, Grand Forks-East Grand Forks, Crookston, and Winnipeg.

The river creates a narrow, shallow valley as it flows into Canada emptying into Lake Winnipeg. It is just over 500 miles long (which is almost double its distance if it flowed straight) and is a slow moving, meandering river falling only 200 feet over its entire course.

The valley was once the floor of glacial Lake Agassiz, making it extremely flat. Since the Red River has existed for less than 10,000 years, the river has not created a deep valley, but the floodplain is 50 miles wide. The Red River was named because of its reddish-brown silt, which has made the Red River Valley one of the most fertile farming regions in North America with rich topsoil from 5 to 60 feet deep. The flat plains, fertile soil, and plentiful water make this agricultural land extremely productive despite the short growing season. The major crops are wheat and sugar beets, but other crops including soybeans, barley, and sunflowers are also grown.

Environment Change

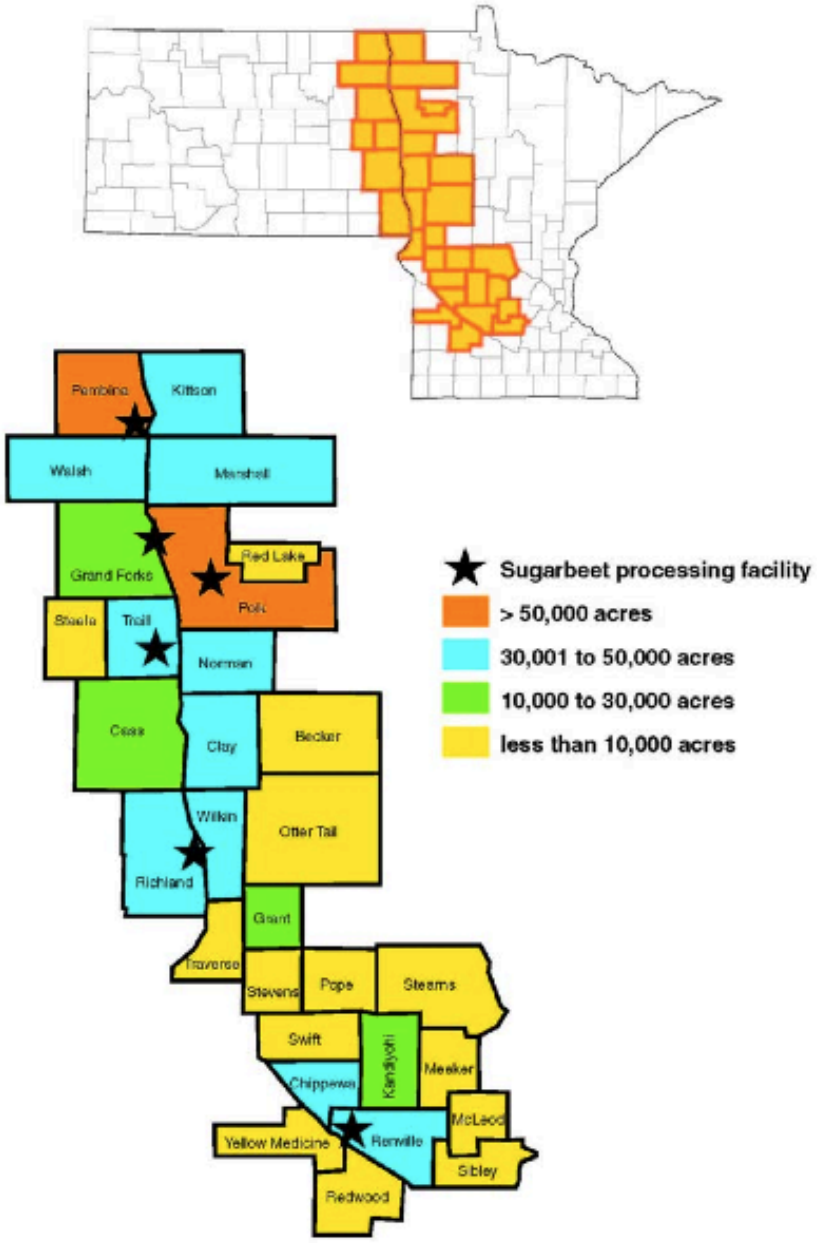
The Red River floods for several reasons. The spring thaw melts the snow beginning in the south so flooding moves gradually northward. The ice jams block the movement of the water north causing more flooding. Also, the tributaries add more water. Moreover, adjacent wetlands that used to absorb much of the water have been drained for agriculture. With these conditions, including the ground saturated with water and still frozen, flooding occurs.

Water and wind erosion is causing the loss of 8-10 tons of rich topsoil every year. Water erosion occurs with the annual spring flooding and wind erosion occurs because of the extremely flat prairie lands. Water erosion could be reduced by taking action to control flooding. Specifically, farmers should not drain the wetlands that absorb the floodwaters; also, they should construct man-made ponds to contain the floodwaters, which would also provide habitat for wildlife and recreation for citizens. Wind erosion could be reduced by building windbreaks—a line of trees and shrubs that protect the landscape from wind and blowing snow. But farmers avoid these measures for several reasons. First, they hesitate to convert rich farmland into ponds, which would reduce their annual agricultural production. Second, they avoid building windbreaks because the lines of trees are obstacles to the efficiency of their large farm machinery that can be 50 feet wide.

Sugar Beets

Most of the U.S. sugar production is from sugar beets (55%) with the rest from sugar cane. Crystal Sugar is the largest beet sugar producer in the United States with most of its fields and factories located in the Red River Valley. Crystal Sugar processes sugar beets into sugar and agri-products such as molasses and sugar beet pulp from 423,000 acres in the Red River Valley.

Red River Valley sugar beet farmers belong to a cooperative, in which farmers work together to grow the crop, process it at facilities, and sell it on the market. The farmers purchase the expensive machinery that cannot be used for other crops, build the facilities that process sugar beets, and market their crop together. Red River Valley farmers who want to increase their acreage or begin sugar beet farming are limited. No new processing facilities have been built since 1975 and all the facilities are currently operating at full capacity. The present growers have first opportunity to grow more sugar beets and a new grower must purchase an existing contract from a current grower to become a member of the cooperative.



Sugar beets are a root crop with the beet grown in the ground with green leafy tops. They are about a foot long and weigh 2 pounds when harvested in the fall. Sugar beets are usually grown in rotation with wheat or barley. Sugar beets are sent to a nearby factory to be processed. The steps include washing and slicing the beets before separating the juice from the pulp. The sugar juice goes through purification and evaporation before crystallization. Various products are made, including granulated, powered, and brown sugar; byproducts from the processing are used for animal feed, fertilizer and pet food.

https://www.crystalsugar.com/media/42851/impact2012.pdf

Red River Valley Populations

The Red River Valley has always been populated. The river and the land provided food and shelter for centuries. Ojibwe, Dakota, Assiniboine, Cree and Cheyenne traveled within the area. European traders came by the 1800s and intermarried with the native people creating a new culture, the Métis. The Métis used the valley as an oxcart trail for trade with St. Paul from the 1820s. By the 1860s the steamboat was an important form of transportation on the river. But it was the railroads that brought large numbers of people to the Red River Valley beginning in the 1870s. Settlers came from the East and the South and many immigrants came from Norway and Sweden, but also Germany and the British Isles. They were able to purchase land from the railroads that had been granted land by the government to encourage settlement. The population increased dramatically. For example, Wilkin County's population in 1860 was 40; in 1870 it was 295; in 1880 it was 1,908; and by 1890 the population was 4,346. The table shows current populations for counties in the Red River Valley.

Minnesota County	Total Population	White Non-Hispanic	Am. Indian	Asian	Black	Hispanic	Two+ Races
Kittson	4,501	4,423	6	20	20	84	29
Marshall	9,447	9,223	43	15	32	364	99
Polk	31,630	29,286	291	235	358	1,809	810
Norman	6,725	6,292	125	34	29	302	182
Clay	60, 249	55,694	765	690	960	1,653	2,351
Wilkin	6,561	6,370	62	10	24	151	91

Migrant Workers

Over the decades migrant workers—perhaps as many as 26,000 altogether—came to the Red River Valley to grow, harvest, and process sugar beets. Mexicans and their families came after the devastating Mexican Revolution of 1910 as the sugar beet industry began. By the end of the 1920s Mexicans made up 35% of the workers. World War II brought more Mexicans as temporary workers because of labor shortages. By 1949, there were almost 5,000 Mexican workers in the Red River Valley. Because local white people avoided the work, migrant workers could get better working conditions. As a result, the growers began to rely on machinery to do much of the work and many Mexicans moved to nearby cities seeking permanent jobs. As the demand for sugar increased, more land was used to produce sugar beets and more machinery could be purchased. Today, permanent populations of Mexican-Americans in Fargo-Moorhead, Grand Forks-East Grand Forks, and Crookston have changed the human landscape of the cities in the Red River Valley.

Minnesota City	Total Population	White Non-Hispanic	Am. Indian	Asian	Black	Hispanic	Two+ Races
Moorhead	41,181	34,023	425	657	877	1,884	1,079
East Grand Forks	8,731	7,694	127	---	217	347	218
Crookston	7,902	6,487	---	130	73	959	212

A new trend has retirees from throughout the country working as migrants to harvest sugar beets. In 2014, 475 retirees were hired, comprising 1/3 of additional workers hired to harvest sugar beets. They call themselves "work campers" and travel in their RVs to different work sites throughout the United States—including the Red River Valley.

Crystal Sugar Cooperative

Directions: Use the Crystal Sugar website at https://www.crystalsugar.com/ to answer the following questions.

1) What are the important historical events of sugar beet production in the Red River Valley? Go to "History" found under ABOUT US by clicking "Cooperative Profile". Identify the important events for each of the dates below or construct a timeline of the dates and events.

Years	Summary of Events
1918	
1924	
1934	
1935	
1973	
1993	
1997	
2011	
2013	

2) How is sugar made from sugar beets? Go to "How We Make Sugar" by clicking "Sugar Processing". Explain the steps of the process below by summarizing each step.

1. Sugar Beet Handling

2. Factory—computerized work:
   a. Washing
   b. Slicing
   c. Diffusion
   d. Purification
   e. Evaporation
   f. Crystallization
   g. Sugar Handling

3) What products are produced from sugar beet production, what are they used for, and who buys them? Go to "Overview" found under AGRI-PRODUCTS and click "Sugar & Agri-Products". Also go to "Industrial Sugar Products" and "Retail Sugar Products" both under SUGAR PRODUCTS.

1. Products:
2. What they are used for:

3. Who buys them:

4) Who are the employees of the American Crystal Sugar Company? Go to "Employees" found at "Cooperative Profile" under COMMUNICATIONS by clicking Cooperative Profile to complete the table. Some boxes will remain empty.

	Full-Time Total	Hourly Paid	Salaried
Full-Time Employees			
Seasonal Employees	-----	Total Harvest Campaign	-----
Additional Employees	-----	Harvest	-----
Sugar Beet Growers*		-----	-----

*Answer found in 2nd paragraph under "Cooperative Profile"
("Campaign" employees are the factory workers)

5) Where are the Red River Valley factories for processing sugar beets located and what are their characteristics? Go to "Facilities" found under FACTORIES by clicking Sugar Processing. Complete the chart of factories along the Red River Valley in Minnesota and North Dakota.

Factory Locations	Year Built	*Annual Sugar Production	Number of Campaign Employees	Total Number of Employees	Number of Shareholders Producing	Number of Acres Planted	Size of Community
Crookston							
East Grand Forks							
Moorhead							
Drayton ND							
Hillsboro ND							

*Annual Sugar Production in centum weight (hundredweight),
("Campaign" employees are the factory workers)

6) The American Crystal Sugar Company is a cooperative. Explain what is a cooperative and how Crystal Sugar operates. Read the first few paragraphs at "Cooperative Profile" found under COMMUNICATIONS by clicking on "Cooperative Profile".

1. What is a "cooperative"?

2. Explain Crystal Sugar as a cooperative:
   - Identify the number of sugar beet growers
   - When was Crystal Sugar organized?
   - Who determines how much is grown each year?
   - How many acres are planted on average?
   - Who owns the lands and factories?