

Renewable Fuels



Renewable Fuels Foundation



Renewable Fuels Association



Geography of Ethanol Production

Unit 2 Lesson 5

Precepts

- A. Action
 - A5. Communicate effectively with others.
- J. Mental Growth
 - J2. Think creatively.

National Standards

- NL-ENG.K-12.4. Communication Skills.
- NSS-G.K-12.6. Uses of Geography.

Student Learning Objectives

- As a result of this lesson, the student will ...
 - 1. Identify where many U.S. ethanol production plants are located.
 - 2. Describe three factors that determine where ethanol facilities are built.

Time

Instruction time for this lesson: 90 minutes.

Resources

- www.ne-ethanol.org/industry/evalreq.pdf
- www.ethanolrfa.org
- www.50states.com

Tools, Equipment, Supplies

- Writing surface
- Projector
- Colored pencils/crayons/markers
- Large butcher paper- one piece for each group of four
- AS.A- one per student
- AS.B- one per class
- AS.C – one per student
- TM.A
- TM.B
- Computers/Internet Access (if available)

INTEREST APPROACH

Utilize the Me-You –Us Moment to have students think about and share their thoughts on ethanol production locations. Provide each student with AS.A, which is a blank map of the United States. Using colored pencils, crayons or markers have each student shade the area they think most ethanol plants are located. After they have shaded where they think most plants are located, have them list two reasons why they thought most plants would be located in that area.



When I say “map it,” each of us will be receiving a blank map of the United States. Using our knowledge of ethanol production, what part of the country do we think has the most ethanol plants? Take a colored pencil and shade the part of the country you think has the most ethanol plants. After you have shaded the area, write down two reasons you think that particular part of the country has the most ethanol plants. Questions? Map it!

Give the students a few minutes to shade their map and to write down their reasons on the back of the paper. Have them share their maps and their reasons with someone that is sitting next to them.



Turn to the person sitting next to you and tell them “Here’s what I think...” *Allow students to tell their neighbor, “Here’s what I think”.* Share your map and the reasons you think ethanol is produced in that region.

Give the students time to share their maps and reasons with those sitting around them. After they have done that, ask for volunteers to share their maps and reasons with the entire class.



Nice work! From what I have heard, there are some great ideas of where ethanol is produced and why it is produced there. Who will share their ideas with the class? *Have one or two students share their maps and their reasons.* Thanks for sharing! Excellent thoughts! Well, let’s see exactly where most ethanol plants are located.

Using TM.A, show the students where most of the plants are located. After the map is revealed, ask the students to compare their map with the map on the screen.



Direct your eyes toward the projector screen, we see a map that shows the locations of ethanol plants in the United States. Notice that there are almost 140 plants currently in operation and another 62 currently under construction. Take note of where most of the plants are located. Why do you think they are concentrated in the upper Midwest? *Allow students to offer suggestions.* Great thoughts!

Well, it’s not just by chance that most plants are built in the Midwest. As companies make considerations where to build, they have to look at several factors that help them make their decision. Today, we are going to get a first-hand look at where these plants are located and begin to discover how they select where ethanol plants should be constructed.

OBJECTIVE 1. Identify where many U.S. ethanol production plants are located.

NOTE: Before this lesson is taught, it would be helpful to read the RFA Outlook on ethanol located on the www.ethanolrfa.org website. This will give updated yearly information.

On AS.B, you will find the content that students will need to write in their notes. Use the Go Get It Moment to engage the students in writing the content in their notes. Follow the steps below to complete the activity.

1. *Chunk the information. After you have printed the activity sheet, cut the information up into equal chunks.*
2. *Place the information around the room. Before class begins, tape the information to the walls, door, or even student's chairs.*
3. *Learners get the information. Explain that each student will be responsible for locating the slips of paper and writing that information down in their notebooks. Be sure to give them a specific amount of time to complete the task and give them instructions what to do when they are finished.*



You may have noticed that there are five pieces of paper located around the room. When I say “move,” we will have six minutes to make our way to each piece of paper and write the information in our notebooks. Once you have written down all five pieces of information, please return to your desk. Questions? Move!

Monitor the student's progress while this activity is being completed. Make sure that they are writing down the information into their notebooks, and when they are finished, make sure they have returned to their desks. After all students have written the information, have one student read the statements and have a brief discussion about the content.



Let's share what we have written down? Who will read one of the statements? Continue this process until all statements have been read. Thanks for reading!

I. U.S. ethanol production is reaching unprecedented levels.

A. Farmers and local investors own approximately 40 percent of ethanol facilities. These ethanol cooperatives have driven the growth of the industry over the past decade.

B. Much of the industry's growth is still focused on traditional corn-producing regions within the corn belt.

C. In 2006, construction began on a number of biorefineries outside the “corn belt” states including Arizona, Oregon, Texas and New York.

D. The first cellulosic ethanol refinery opened in 2008 with the promising outlook of more to come in the future.



So, it sounds like the ethanol business in the United States is booming! Even though many plants are located in the corn belt, plants are becoming more common outside of the Midwest.

When companies begin to decide where to build new ethanol production facilities, they evaluate many considerations. Again, it is a very deliberate process. Companies do extensive research to evaluate the risks associated with the development of a facility.

Let's explore some of the preliminary considerations in ethanol facility placement.

OBJECTIVE 2. Describe three factors that determine where ethanol facilities are built.

For the next activity students will be placed into groups of four. Each group will receive a large piece of butcher paper and markers. Within their groups, they will select their dream business to start. After they have decided upon a business, they will need to identify where their business will be located. They need to be specific with where it will be located. For example, do not just allow them to give a town; they need to tell where in the town it should be located. They will also need to provide justification for why they are building their business in that location. They need to think about attracting customers, how it relates with surrounding businesses, etc.



If you think about it, for some people, an ethanol plant is their dream business. It is something that the entrepreneur has worked long and hard to create. Ponder these questions...What if you were an entrepreneur? What if you could start any business you wanted? What would it be? Where would it be located? Why would it be located in that particular location?

In just a minute, we will be able to create our dream business! If we could start any type of business, what would it be? After we decide upon our dream business we will also need to identify what city that business would be located in. After that, be specific about where in the city it would be located. Be able to justify why our business is in that specific location. How does that location help the business?

Starting on the left side of the room begin counting off one through four.

Now, when I say “go,” we will have 15 minutes to get into our groups, decide upon a business and identify where it would be located and why. We will want to write all information on the large piece of paper that will be provided to our group. Questions? Go!

Have the groups arrange themselves throughout the room and give them paper and markers.

As the students are working it will be important to monitor their progress; be prepared to offer suggestions and make sure they are describing why they selected the location their business is being built. After time is up or all students have completed, have each group share their business and corresponding information with the group.



Looks like we have some great ideas! Which group will share first? Allow the groups to share with the class. Continue the process until all groups have shared their business. Awesome work! We did an excellent job developing our businesses.

It was interesting to hear the reasons many of us selected a particular location for our business. For some it was about getting the most customers, and for others they were more concerned about being able to have access to other businesses that would support them. No matter what the reason it is a fact that all businesses have justification for why they build in a certain location.

The same goes for ethanol plants. There are several factors that are used to determine where ethanol plants are built.

Use the Little Professor Moment to engage the students in the following content. Follow these steps to complete the activity. The content needed for the activity is located on TM.B.

1. *Chunk your content. Determine the portions of information. Make the portions uniform both in amount and number so that the time spent teaching each group of students is approximately the same.*
2. *Establish roles. Each student exhibits two roles—one while they are taking notes and one while they wait. While they learn from you, they are eager learners, full of wonder and interest. While they wait, they are the “invisible person,” neither sitting still and neither moving nor speaking. Note: Some students may find being “invisible” too challenging. Instead of sitting still and silent, they can read.*
3. *Establish personas. Review with students the characteristics of a stereotypical university professor. As they teach the new material they act as if they have their PhD in the subject area, and from this point forward are referred to by their peer as Dr. (fill in their last name). For ease of teaching, address the first student in each pair as Little Professor I and the second student as Little Professor II.*
4. *Teach the first chunk. Little Professor I listens and takes appropriate notes. Keep this short and to the point. Little Professor I then teaches his or her partner. This is a timed event! Give them only 30 to 60 seconds to instruct. Before moving to the second chunk of information, check Little Professor II’s understanding.*
5. *Teach the second chunk. Now it’s Little Professor II’s turn to take notes. Little Professor II will then teach his or her partner.*
6. *Repeat the cycle. Repeat steps for as many chunks of information there are.*

II. Factors that determine where ethanol facilities are built.

- A. Current and projected regional markets, including competing gasoline components and prices.
- B. Feedstock availability
- C. Demand and cost
- D. Utilities and related infrastructure (includes waste water treatment options, roads and drinking water quantity and quality)
- E. Transportation options
- F. Pre-existing environmental conditions that may impact the area
- G. Land zoning and cost
- H. Weather and prevailing wind patterns
- I. Key economic issues, including eligibility for public finance programs.

- J. Labor availability.
- K. An assessment of co-products and by-products from preferred feed stocks and production processes, and a preliminary assessment of markets for co-products.
- L. Assessment of the approximate economic impact of the proposed plant on the local area is also completed.
- M. Review of a financial model that is applicable to the proposed process.
- N. Review of the business structure options that may be viable for the proposed project.
- O. A review of additional informational and potential financial resources that may be available to project developers.



Turn to your partner and tell them thanks! We can see that there are many factors that are taken into consideration when deciding to build an ethanol facility. Let's take a further look at ethanol production plant locations

Have students complete AS.C using a computer. This interactive web quest will allow students to further explore ethanol production plant locations. NOTE: If a computer is not available, print out the necessary information for students to complete in class.

REVIEW/SUMMARY

Utilize the Me-You-Us Moment to have students answer the following questions. Give each student a sticky-note and ask him or her to answer the questions as their ticket out the door.



We've covered quite a bit of ground today! Each of you has a sticky-note and on it you will need to answer the following two questions about today's class. First question: Why is this information important? Second question: What is the most important factor that determines where ethanol is produced?

Once students have answered those questions, have them share their responses with their neighbor.



Let's hear some of your ideas? Allow students to share their ideas with the class. Nice work! You all have done an excellent job today. Thanks for your effort!

APPLICATION

Extended classroom activity: *Students can research corn production centers in the United States. Using the Internet, students will be able to identify the largest producers of corn and starch crops in the U.S.. Based on the findings and the information provided in class, students will write a one-paragraph position statement identifying the rationale for the placement of the majority of ethanol production facilities. This can be used as a basis for discussion in class or in a club.*

FFA activity: *Locate the closest ethanol production facility. If it is feasible, take a tour of the facility. If not, invite a representative from the facility to speak to the FFA chapter.*

SAE activity: *Students can do further research on selecting locations for ethanol plants. The time and work that is completed can be counted as Research SAE hours.*

EVALUATION

Assess. A

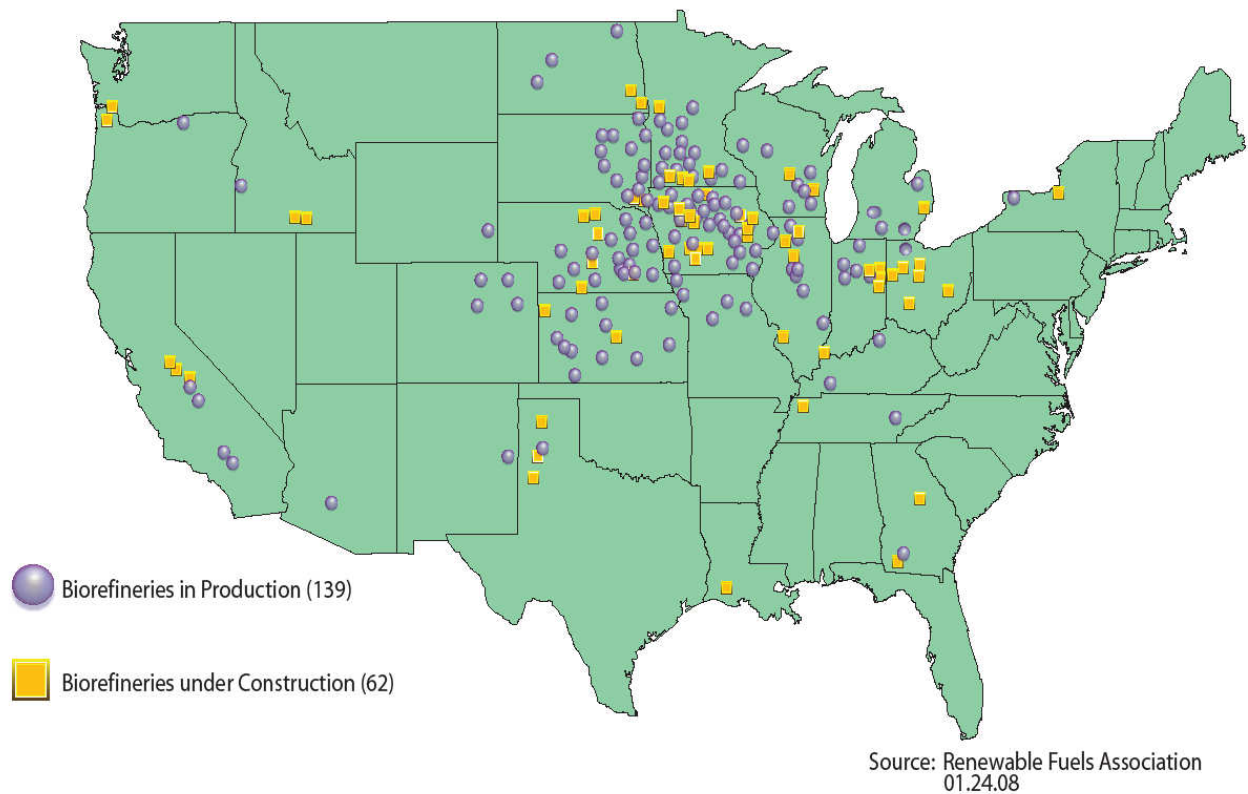
Answers to Assessment:

Short Answer:

1. Investors must review the current and projected regional markets, including competing gasoline components and prices, feedstock availability, demand and cost, utilities and related infrastructure including waste water treatment options, roads, process and drinking water quantity and quality; transportation options; pre-existing environmental conditions that may impact the area; land zoning and cost; weather and prevailing wind patterns; key economic issues, including eligibility for public finance programs; labor availability; an assessment of co-products and by-products from preferred feed stocks and production processes, and a preliminary assessment of markets for co-products.
2. Most ethanol production plants are located in the Midwest because supplies of raw materials such as corn, barley and wheat are abundant in this location.

TM.A

U.S. Ethanol Biorefinery Locations

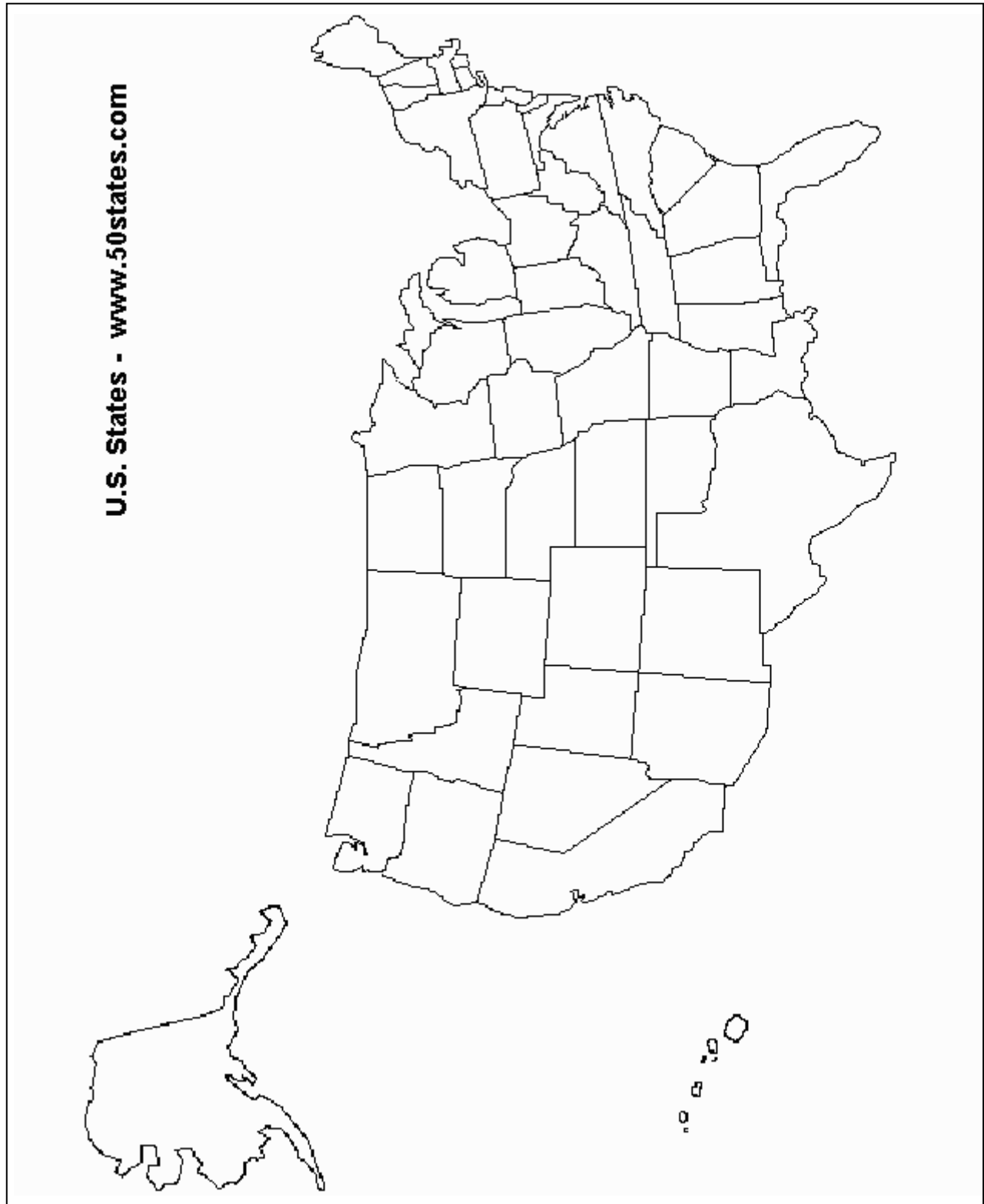


TM.B

II. Factors that determine where ethanol facilities are built.

- A. Current and projected regional markets, including competing gasoline components and prices.
- B. Feedstock availability
- C. Demand and cost
- D. Utilities and related infrastructure (includes waste water treatment options, roads, and drinking water quantity and quality)
- E. Transportation options
- F. Pre-existing environmental conditions that may impact the area
- G. Land zoning and cost
- H. Weather and prevailing wind patterns
- I. Key economic issues, including eligibility for public finance programs.
- J. Labor availability.
- K. An assessment of co-products and by-products from preferred feed stocks and production processes, and a preliminary assessment of markets for co-products.
- L. Assessment of the approximate economic impact of the proposed plant on the local area is also completed.
- M. Review of a financial model that is applicable to the proposed process.
- N. Review of the business structure options that may be viable for the proposed project.
- O. A review of additional informational and potential financial resources that may be available to project developers.

AS.A



AS.B

I. U.S. ethanol production is reaching unprecedented levels.

A. Farmers and local investors own approximately 40 percent of ethanol facilities. These ethanol cooperatives have driven the growth of the industry over the past decade.

B. Much of the industry's growth is still focused on traditional corn-producing regions within the corn belt.

C. In 2006, construction began on a number of biorefineries outside the "corn belt" states including Arizona, Oregon, Texas and New York.

D. The first cellulosic ethanol refinery opened in 2008 with the promising outlook of more to come in the future.

AS.C

1. Go to www.ethanol.org and click on the link 'all about ethanol'. When the screen loads, scroll to the bottom and click on the link 'ethanol facilities'.
2. Read through the page before selecting one of the companies' facilities.
3. Fill out the following chart for the company and location chosen:

Company:	Plant Site:	State	MGY- million gallons/ year	Website

4. Click on the link to the company chosen and write a brief summary or history of the company or site.

5. What date was your facility opened? _____
6. Who financed your facility, is it farmer owned or corporate investor owned?

7. Is your company part of a chain of ethanol plants or is it a single entity?

8. What products, and by products does your plant produce?

Assess.A

Short Answer:

1. Name five things that should be assessed or looked at when considering building an ethanol facility in a certain location.

2. Explain why most ethanol plants are located in the Midwest and not in the Northeast, Southwest, or Central America.
