Renewable resources:

Resources that are capable of being replenished.

Nonrenewable resources:

Resources that cannot be replenished (made again) in a short period of time.

Stewardship Scenarios

Scenario One:

A third grader and her family live in Wyoming and have chickens. She noticed that the machine feeder that scatters the chickens' corn in the morning and afternoon has to be plugged in because it requires electricity. For a science fair project, she designs a wind turbine that will power a machine to feed the chickens twice a day. Her parents help her build it, and it works, allowing them to successfully feed the chickens without using additional electricity. The girl receives an A for her project.

Scenario Two:

A third-grade student comes home from school. As he walks through the house, he turns on a light in every room that he walks through. He ends up in the kitchen and stands in front of the refrigerator with the door open deciding on a snack.

Scenario Three:

A third-grade girl is doing her homework in her living room at 3:30. She is listening to music on her phone while watching her favorite cartoon. She also has the family's computer on, so she can research a topic. Two lamps and an overhead light are turned on, as well.

Scenario Four:

A third-grade boy's family is staying at a hotel while on vacation. He notices a card on the nightstand that talks about not receiving fresh towels and sheets everyday. He knows that hotels have to use a lot of water and electricity in order to wash and dry all of the towels and sheets. He and his family agree to not ask for new linens while they stay.

WYOMING STEWARDSHIP PROJECT

Name: _____

Energy Resources
Answer Key

Directions:
Match the word from the word bank with the image of the energy source it describes.

Word Bank:

Wind	Oil	Coal
Hydro	Natural Gas	Solar

Solar

Wind

Hydro

Natural Gas

Coal

Oil

Name: _____

Energy Resources

Directions:
Match the word from the word bank with the image of the energy source it describes.

Word Bank:

Wind	Oil	Coal
Hydro	Natural Gas	Solar


photo by Weston County Conservation District

_____


photo by Greg Goebel

_____


photo by Stephanie Russell

_____


photo by Wyoming Petroleum Association

_____


photo by Wyoming Mining Association

_____


photo by Wyoming Petroleum Association

_____

Energy Resource Production

Name: _____

Wind power is collected using wind turbines. As the wind moves the blades of the wind turbine, it creates electricity. When the wind stops, the blades come to a rest waiting for the wind to return.	R	N
Oil formed millions of years ago is pumped from underground and then refined to make fuel for electrical power plants. The oil is then burned to create steam, which turns a turbine that creates electricity. Once the oil from one area is gone, companies must find a new area with oil.	R	N
Coal formed millions of years ago is mined out of the ground and taken to electrical power plants. There it is burned to create steam, which turns a turbine that creates electricity. Once the coal from one area is gone, companies must find a new area with coal.	R	N
Solar power, or power from the sun, is collected using photovoltaic panels. The sunlight hits the solar panels and causes electrons to flow, producing electricity. Sometimes mirrors focus the sunlight to create steam, which turns a turbine that creates electricity. As long as the sun shines, power is created.	R	N
Hydro, or water, power is formed when water turns a turbine creating electricity. Often, these turbines are found near dams and reservoirs where there is enough water to turn the turbines. The water cycle keeps refilling the reservoirs powering the turbines.	R	N
Natural gas formed millions of years ago is pumped from underground and then piped as fuel for electrical power plants. The natural gas is then burned to create steam, which turns a turbine that creates electricity. Once the natural gas from one area is gone, companies must find a new area with natural gas.	R	N

What are all of these energy resources producing?

Lesson 1 - Exit Ticket

(Name/Date) _____

What makes a resource renewable?

_____

_____

What makes a resource nonrenewable?

_____

_____

What can you do to be a good steward of electricity?

_____

_____

Lesson 1 - Exit Ticket

(Name/Date) _____

What makes a resource renewable?

_____

_____

What makes a resource nonrenewable?

_____

_____

What can you do to be a good steward of electricity?

_____

_____

Energy Resources

photo by Weston County Conservation District

Energy Resources

Energy Resources

photo by Stephanie Russell

Energy Resources

photo by Wyoming Petroleum Association

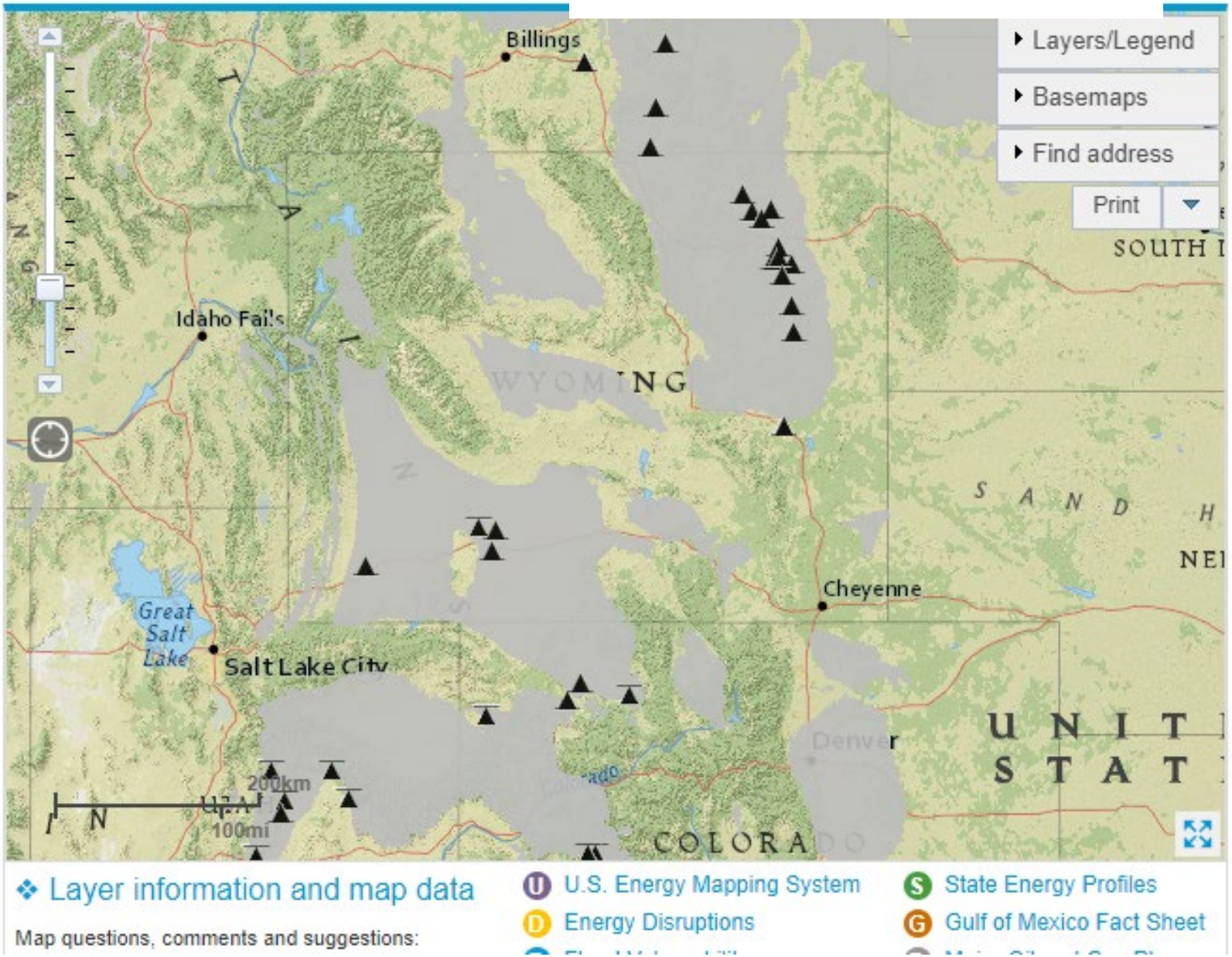
Energy Resources

photo by Wyoming Mining Association

Energy Resources

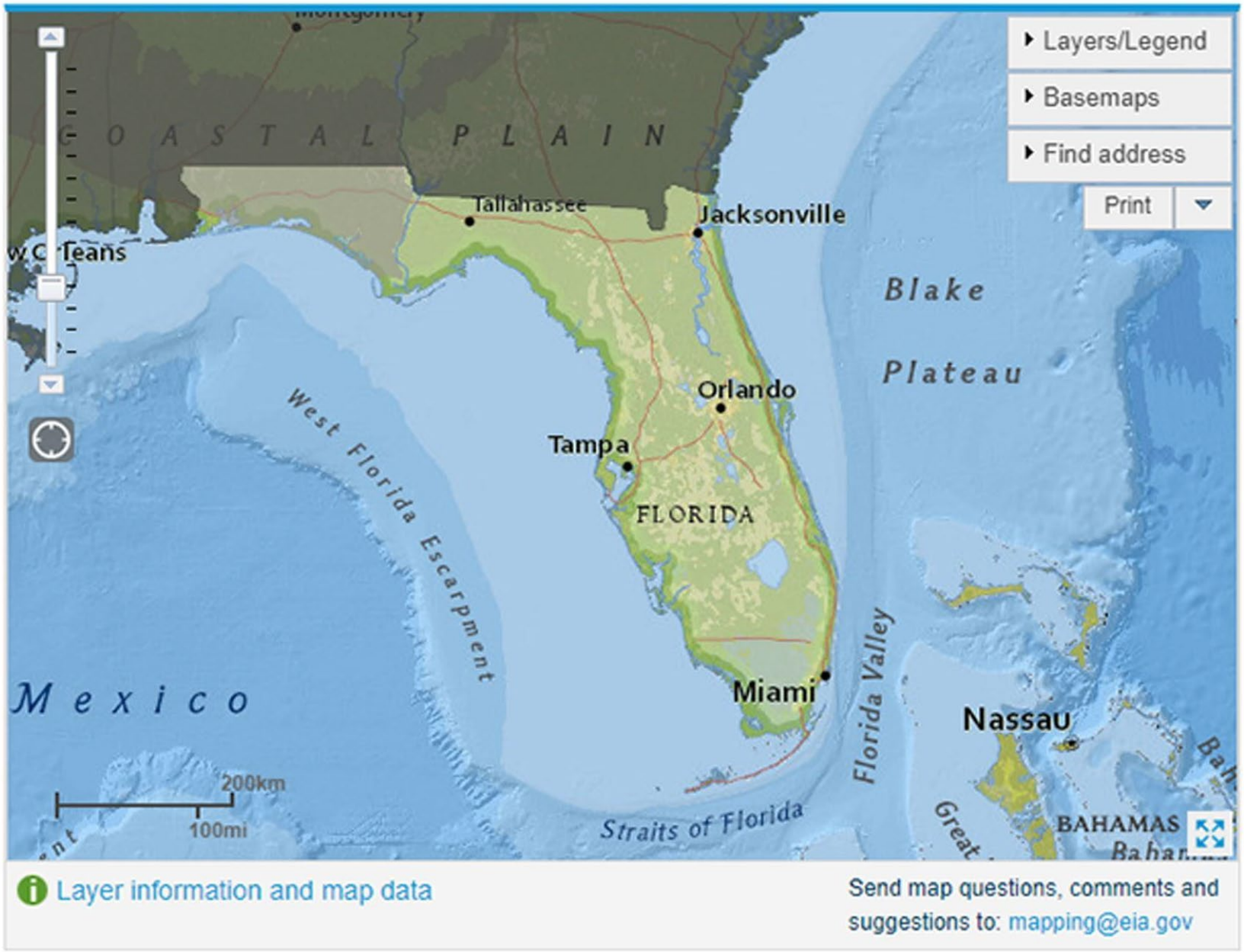
photo by Wyoming Petroleum Association

“All Coal Mines” and “Fossil Fuels” - Coal



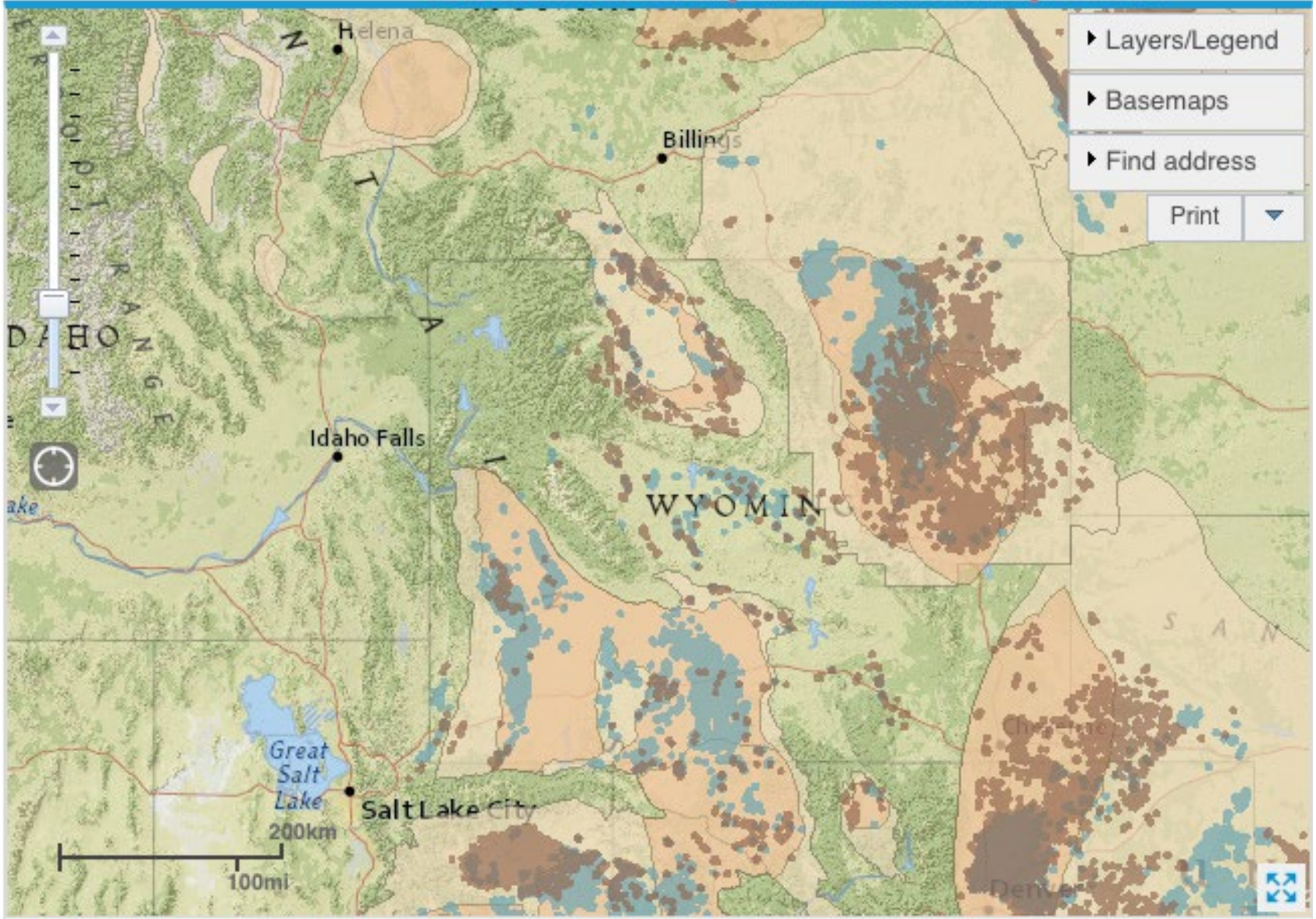
Profile Overview

"All Coal MInes" and "Fossil Fuels"- Coal



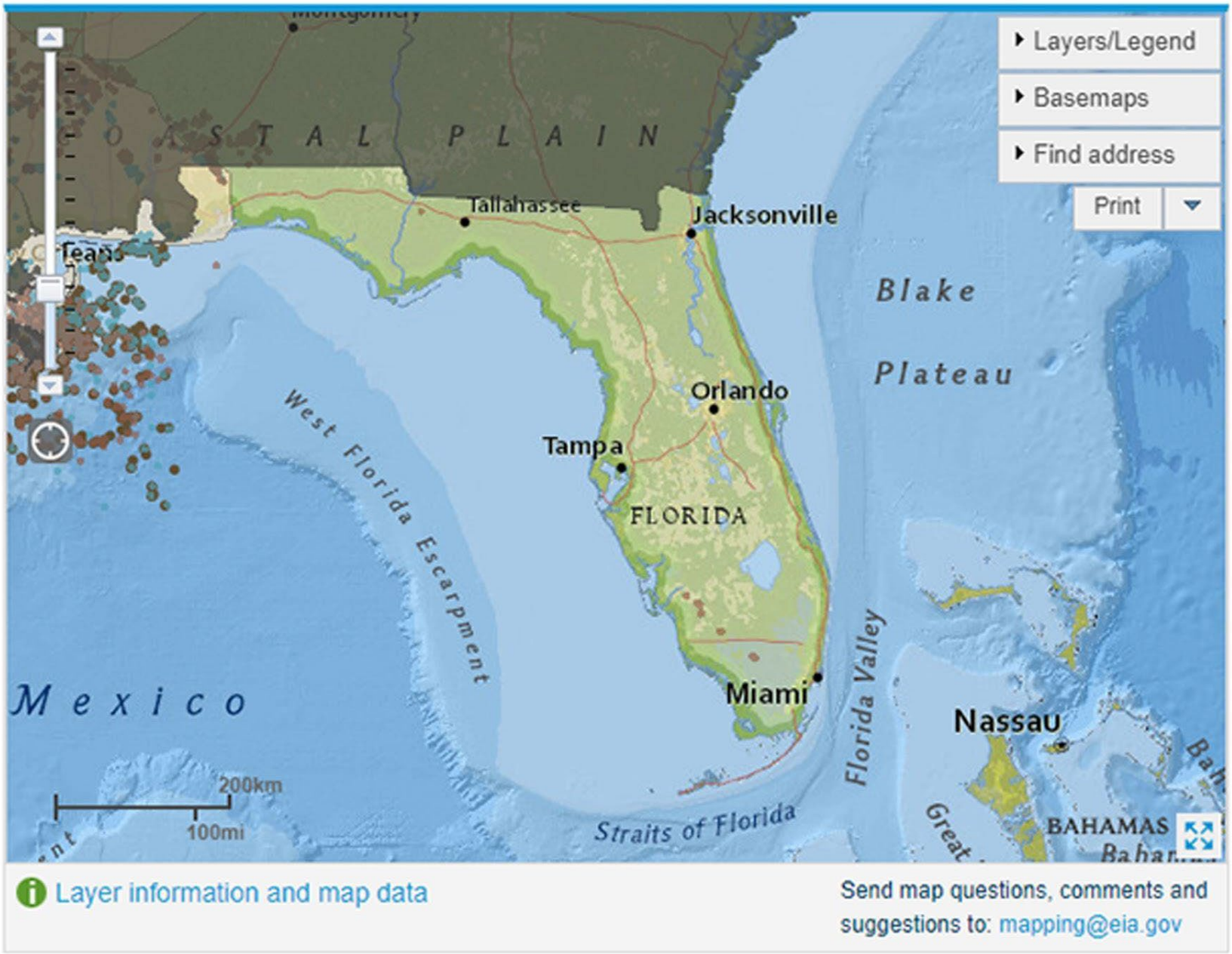
Profile Overview

Oil and Gas Wells and Platforms, Tight Oil/Shale Gas Play and Sedimentary Basin



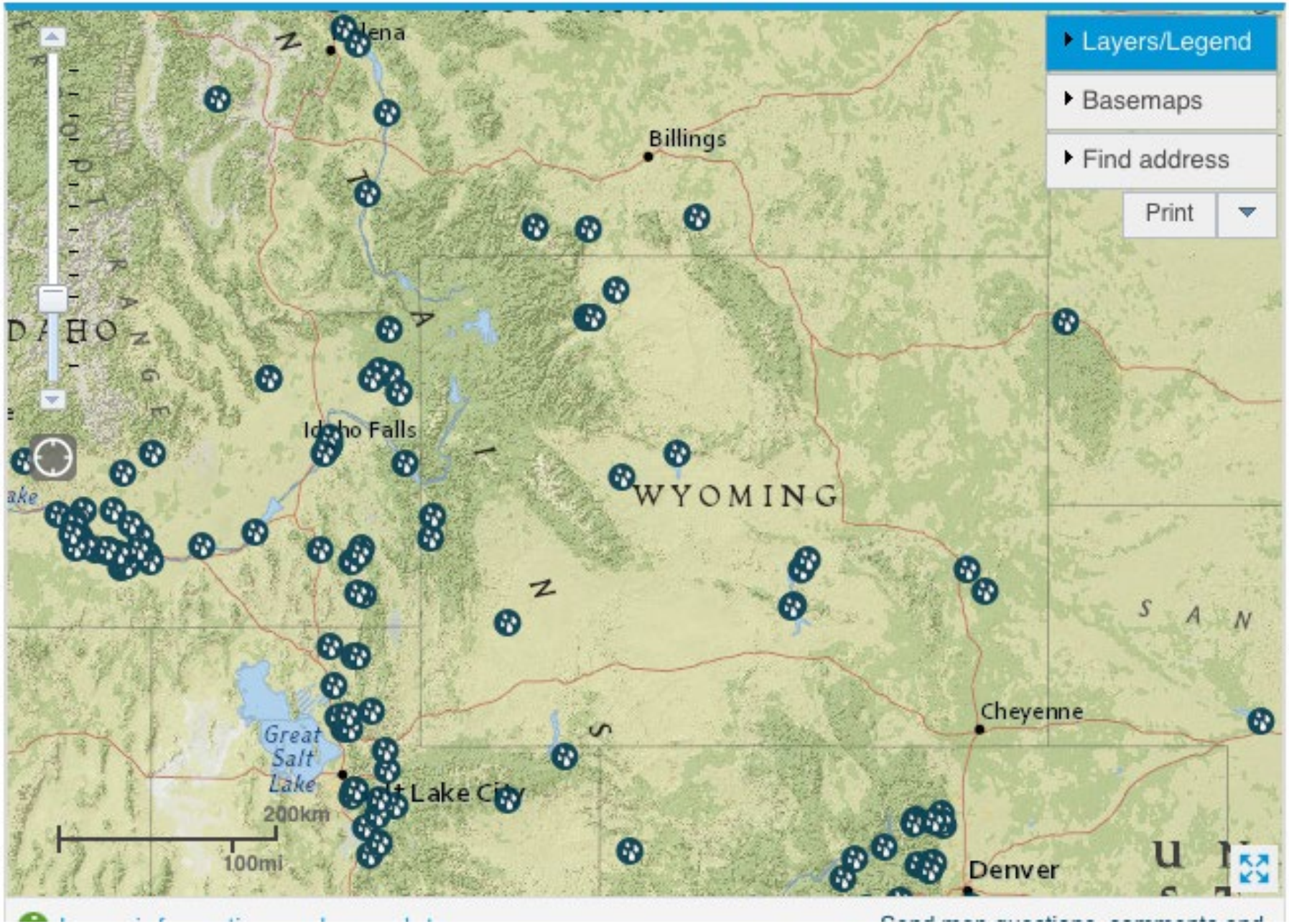
Profile Overview

Oil and Gas Wells and Platforms, Tight Oil/Shale Gas Play and Sedimentary Basin



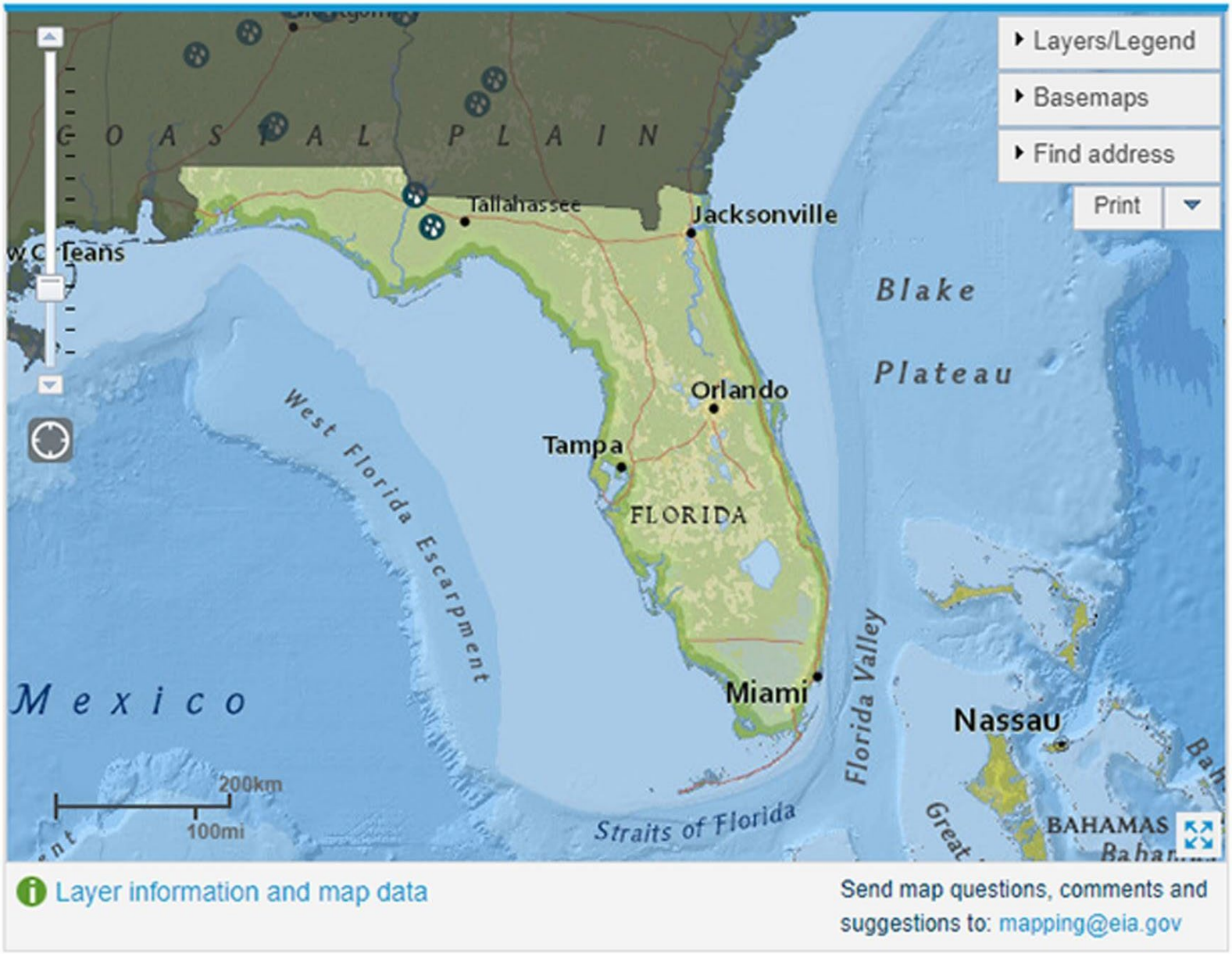
Profile Overview

All Power Plants- Hydroelectric Power Plants



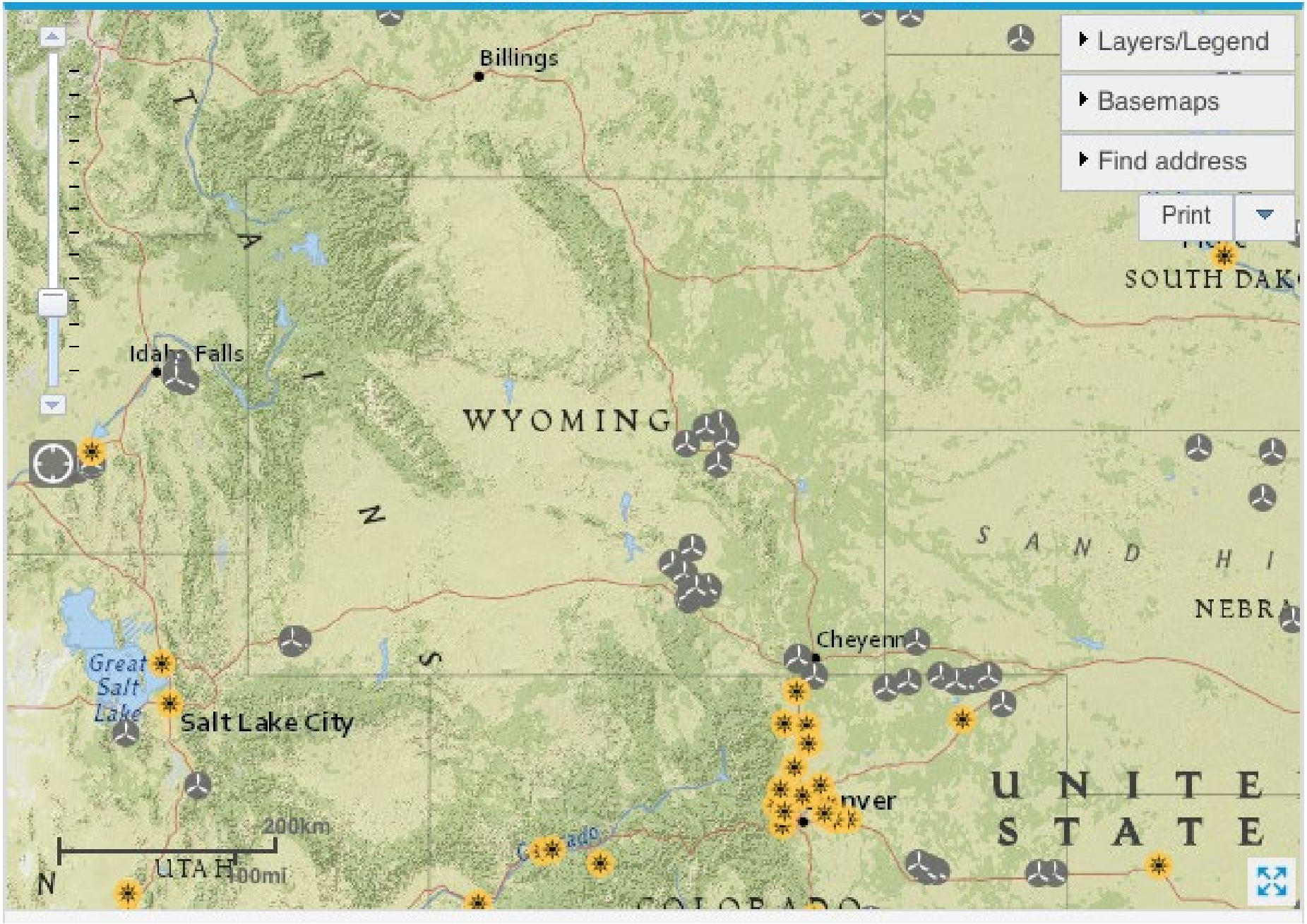
Profile Overview

"All Power Plants"
Hydroelectric Power Plants



Profile Overview

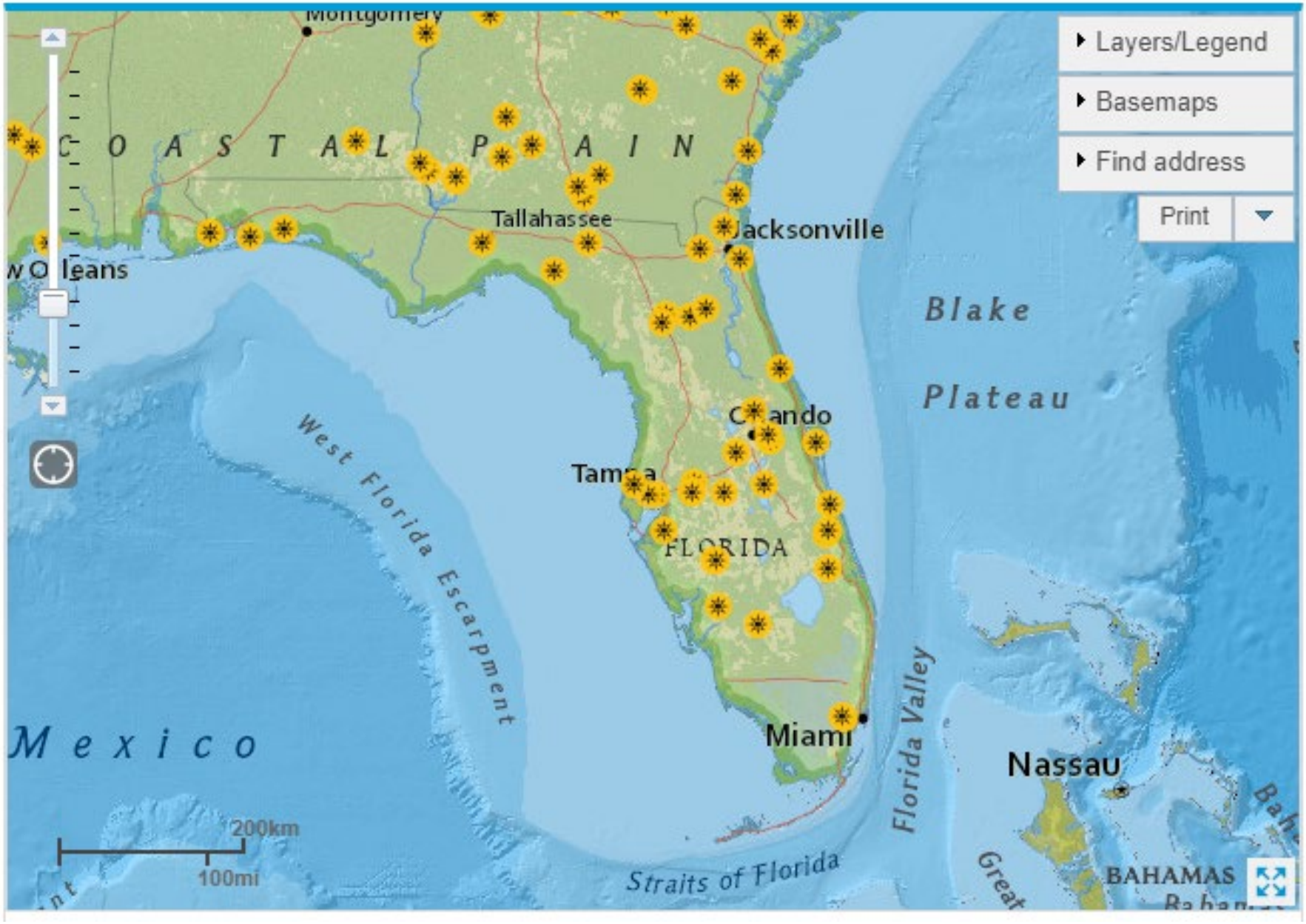
"All Power Plants" Solar Power Plants and Wind Power Plants



“All Power Plants”

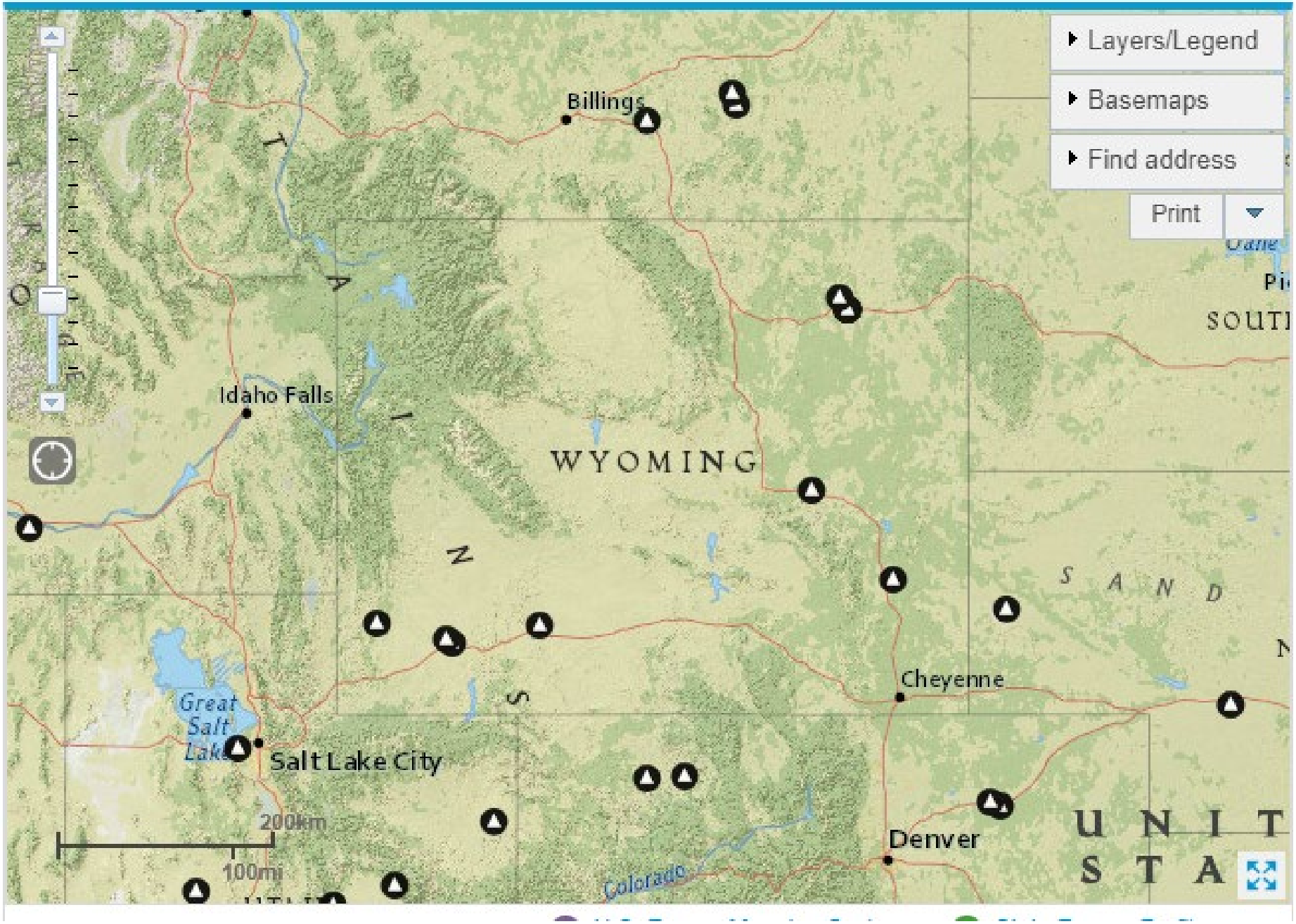
Profile Overview

Solar Power Plants and Wind Power Plants



Profile Overview

"Coal Power Plant"



Profile Overview

“Coal Power Plant”

What Do I Notice?

Name: _____

	Wyoming	Florida
Coal		
Oil/Natural Gas		
Hydro		
Solar/Wind		

Write a brief summary about things you noticed about energy resources in Wyoming.

_____

_____

Choices, Choices, Wyoming's Energy Mix

Opinion A

Electricity comes from many different resources. Some resources can be replaced, and others cannot. A resource that can be replaced is called renewable. Wind and solar are examples of renewable resources. This is the best way for us to get our electricity. These resources are found all over the world. People who live away from powerlines and cities have used these energy resources for decades. They used windmills and solar panels to help pump water for livestock. Even in the city, people can use solar panels on their houses to provide power.

Renewable energy doesn't run out! Each day the sun comes up and gives us energy. The sun's energy also powers the wind and water cycle. As we use these renewables, they keep coming back and always will.

Wind turbines and solar panels don't produce air and water pollution. This is healthy for people, animals, and the environment. Wind and solar are great renewable resources for us to get electricity from.

Choices, Choices, Wyoming's Energy Mix

Opinion B

Renewable energy resources can generate a lot of electricity for Wyoming, but they have some issues. The first deals with maintenance, which means being able to fix or help keep something in a good condition, so it lasts longer and stays safe. Infrastructure (the equipment that gets the generated electricity to people's homes) still needs to be built for wind and solar power plants. This is a complicated and costly process. Since solar energy depends on the sun, and wind turbines need wind to move, the electricity generated by these methods is not always reliable. People want electricity when they want to use it. That is not always possible with renewables, unless storage systems are available. Unfortunately, right now, the technology does not exist to best store the electricity from renewable resources. Because of these of reasons, renewable energy can cost more for people to use on daily basis.

Another negative is the environmental impact. Wyoming is known for wide open land, beautiful landscapes, and wildlife. Renewable energy needs a lot of land and space in order to produce electricity. With these large structures, this negatively affects Wyoming's landscape by disrupting the natural beauty of the land. These structures also have an impact on birds and bats by causing their deaths when the animals encounter them. Though renewables do offer benefits, one cannot ignore the challenges involved with using them.

Choices, Choices, Wyoming's Energy Mix

Opinion C

Wyoming is very fortunate to have many nonrenewable energy resources available in our state. These energy resources include: coal, oil, natural gas, and uranium. These extraction industries provide many high-paying jobs. 40% of our nation's coal comes from Wyoming. This coal provides electricity that is affordable, and burning Wyoming coal is cleaner for our environment. Coal also makes many other products that are used on a daily basis. Wyoming has an abundance of coal which is stored all over the state. Uranium is another Wyoming resource. It is the fuel that nuclear power plants use to generate electricity without harmful air pollution. Finally, Wyoming contains massive oil reserves. Oil is the energy resource that allows us to power our vehicles and is the basis of multiple products we use everyday.

In Wyoming, we have long, cold winters and hot summers. Natural gas is the energy resource that keeps houses warm in the winter and cool in the summer. Come rain or shine, these resources consistently generate electricity for people to use when they want it. A few other positive effects are that all of these energy resources create many well-paying jobs for Wyoming citizens. Taxes from these energy resources provide funding for our schools. Even though nonrenewable resources do not regenerate quickly, they are a great benefit to Wyoming.

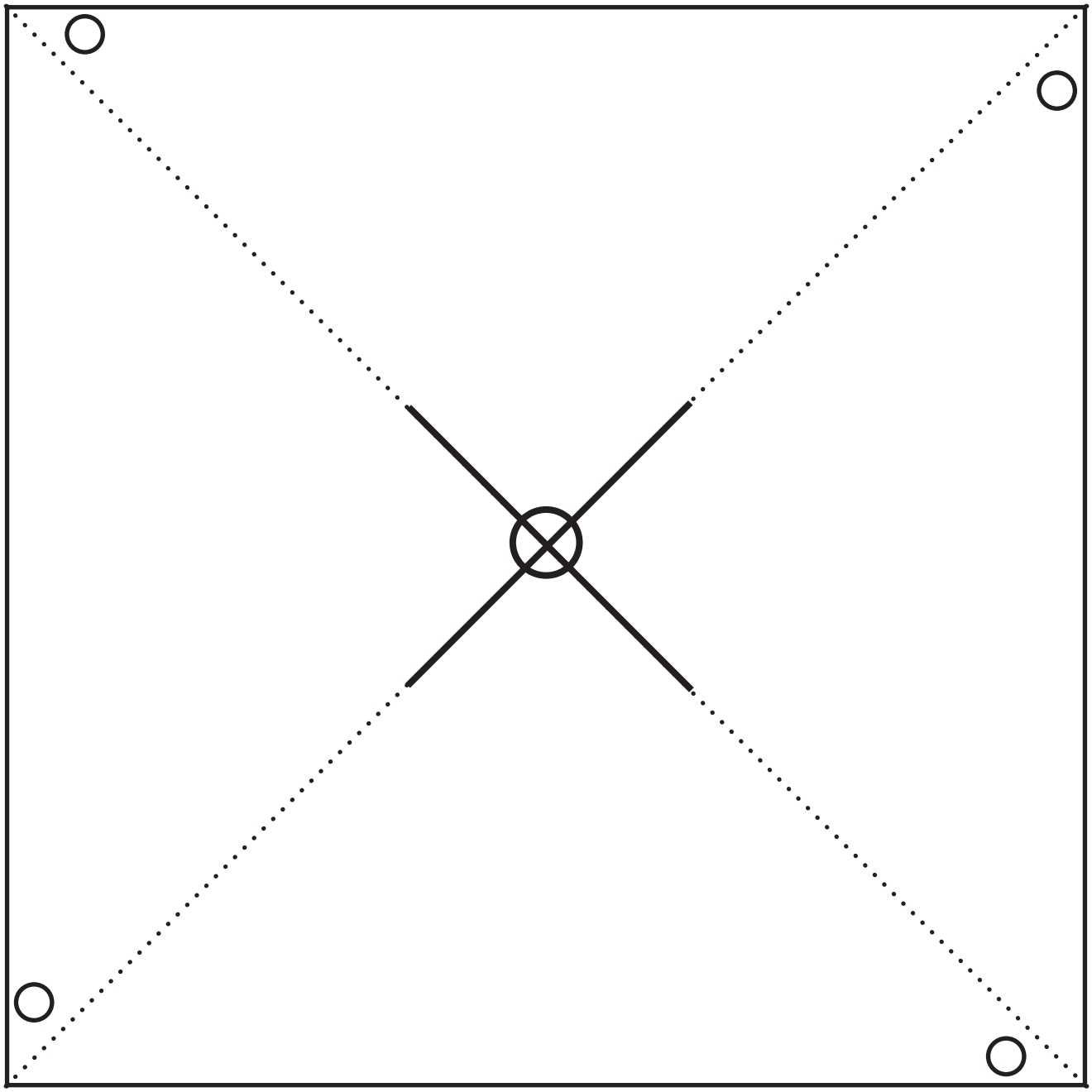
Choices, Choices, Wyoming's Energy Mix

Opinion D

The end is NEAR! Well, maybe not that near, but it is getting closer. Every year, we use millions of tons of fossil fuels and other nonrenewable resources to make electricity. With each shovel burnt, we approach the extinction of fossil fuels. Wyoming's vast and cheap fields of coal took millions of years to form. Nature can't make more quickly. Fossil fuel extraction provides lots of jobs when the market price for them is high. However, when the market price drops a bust cycle begins. The jobs are gone, and bustling communities become ghost towns since the people leave to find new jobs. Plus, when we use it up, what will we do? What will the next generation of people do? They won't have coal, oil, or natural gas to make electricity, tires, or other products we use everyday.

This is not just a future problem; what will we do with the effects from burning these fuels today? Burning fossil fuels produces pollution. Mining coal displaces large areas of land and disturbs plant and animal habitats. If mining companies don't reclaim their land, it can leave scars on the landscape. Oil spills from wells and pipelines have polluted oceans and waterways. Waste from nuclear power plants remains dangerous for centuries after the electricity is gone. Even though nonrenewable resources give us cheap, stable power now, will they always in the future?

Pinwheel Pattern



Directions:

1. Cut out a square of cardstock.
2. Cut along two diagonal lines to within $^{3}/_{4}$ inch of the center of the square
3. Fold the corners marked with circle into the center.
4. Pin, tape, or staple the layers together in the center.

Forces and Motion with Pinwheels

Name:

Predictions and Observations

1. Blow lightly on your pinwheel. Observe what happens. Blow as hard as you can. Observe what happens. Record the difference between the two trials:

_____

_____

_____

2. See if you can get your pinwheel to move in a clockwise direction, and then in counter-clockwise direction. Explain how you were able to make it spin in different directions.

_____

_____

_____

3. Write your prediction below of what you believe will happen when you use the fan to create a wind force. After creating the wind force with the fan, record your observation.

Prediction	Observation

How did the force of the fan compare to the force of the wind you created by blowing in step 1?

_____

_____

Forces and Motion with Pinwheels

Predictions and Observations

4. Write your prediction below of what you believe will happen when you use the hair dryer to create a wind force. After creating the wind force with the hair dryer, record your observation.

Prediction	Observation

How did the force of the hair dryer compare to the force of the wind you created by blowing in step 1?

_____

_____

Challenge experiments:

- Use a straw to create a wind force. See if you can get your pinwheel to spin as fast as it did with the fan.
- See how fast you can get your pinwheel to spin. See how lightly you can blow on it and have it not spin.
- Have both partners blow on the pinwheel at the same time. One should be blowing to make it move clockwise, and the other blowing to make it move counterclockwise. See if you can get the two forces to balance, so that the pinwheel doesn't actually move at all.

If you try a challenge experiment, be sure to record your observations on another page.

Forces and Motion

CLOZE activity key

Word Bank

rest	turbine	force
energy	more	wind
faster	motion	

1. A wind ___**turbine**___ is a device that spins to produce electrical __**energy**__.
2. Wind is a___**force**___ that results in the___**motion**___ of a turbine spinning.
3. The ___**faster**___ the wind is blowing; the ___**more**___ energy that will be produced by a turbine.
4. If there is no __**wind/force**__, a turbine will be at _____**rest**_____.

How does using wind power to generate electricity help us to be stewards of Wyoming's resources?

Student's answers will vary. Check to see if student is making a stewardship connection.

Credits/Sources:

U.S. Department of Energy. (n.d.). Animation: How a Wind Turbine Works. Retrieved June 28, 2017, from https://energy.gov/eere/wind/animation-how-wind-turbine-works

Home Training Tools Ltd. (n.d.). Experiment with Wind Power: Pinwheel Wind Turbine. Retrieved June 28, 2017, from https://www.homesciencetools.com/a/wind-energy-science-newsletter/

Forces and Motion

CLOZE activity key

Word Bank

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How does using wind power to generate electricity help us to be stewards of Wyoming's resources?

_____

_____

_____

_____

_____

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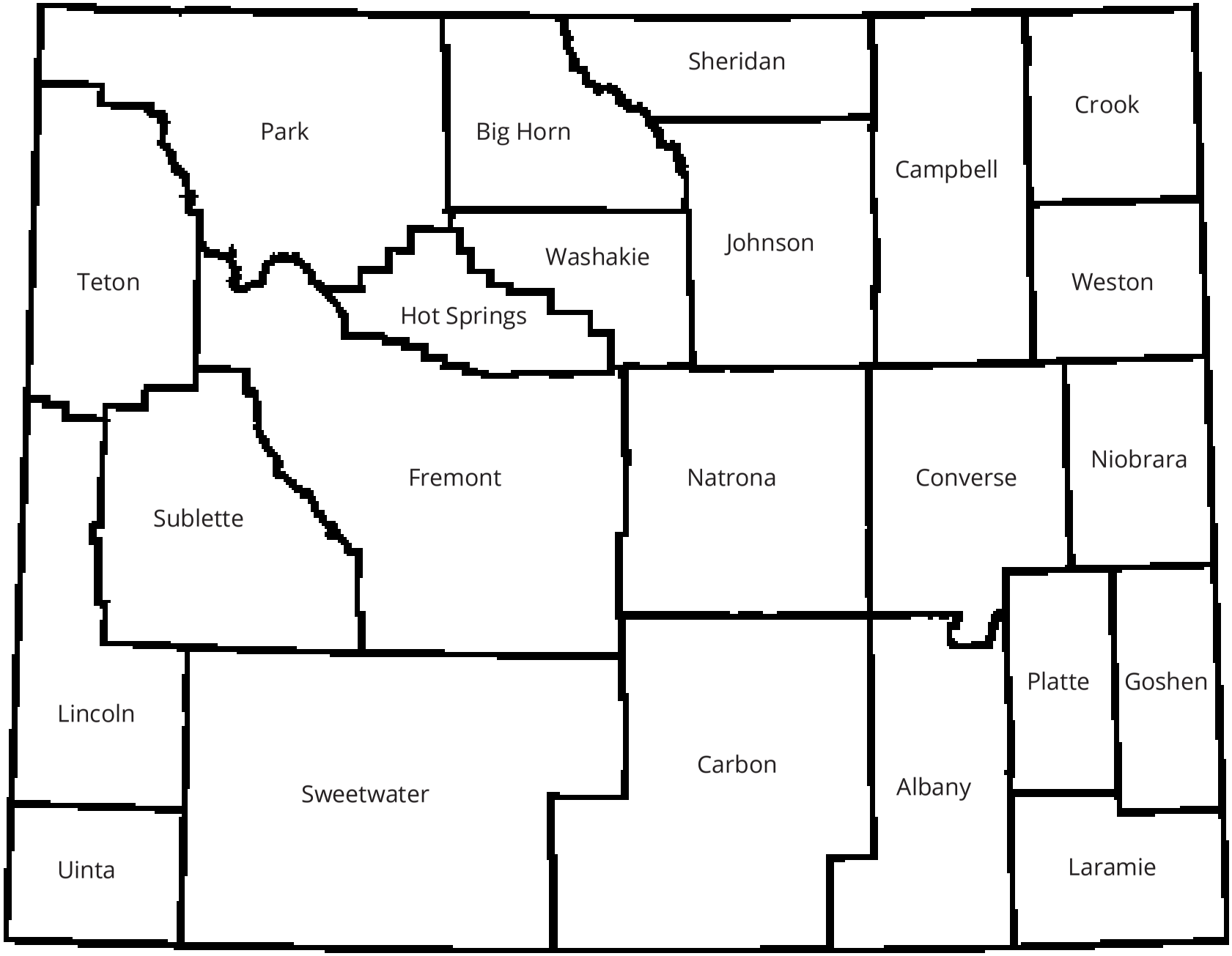
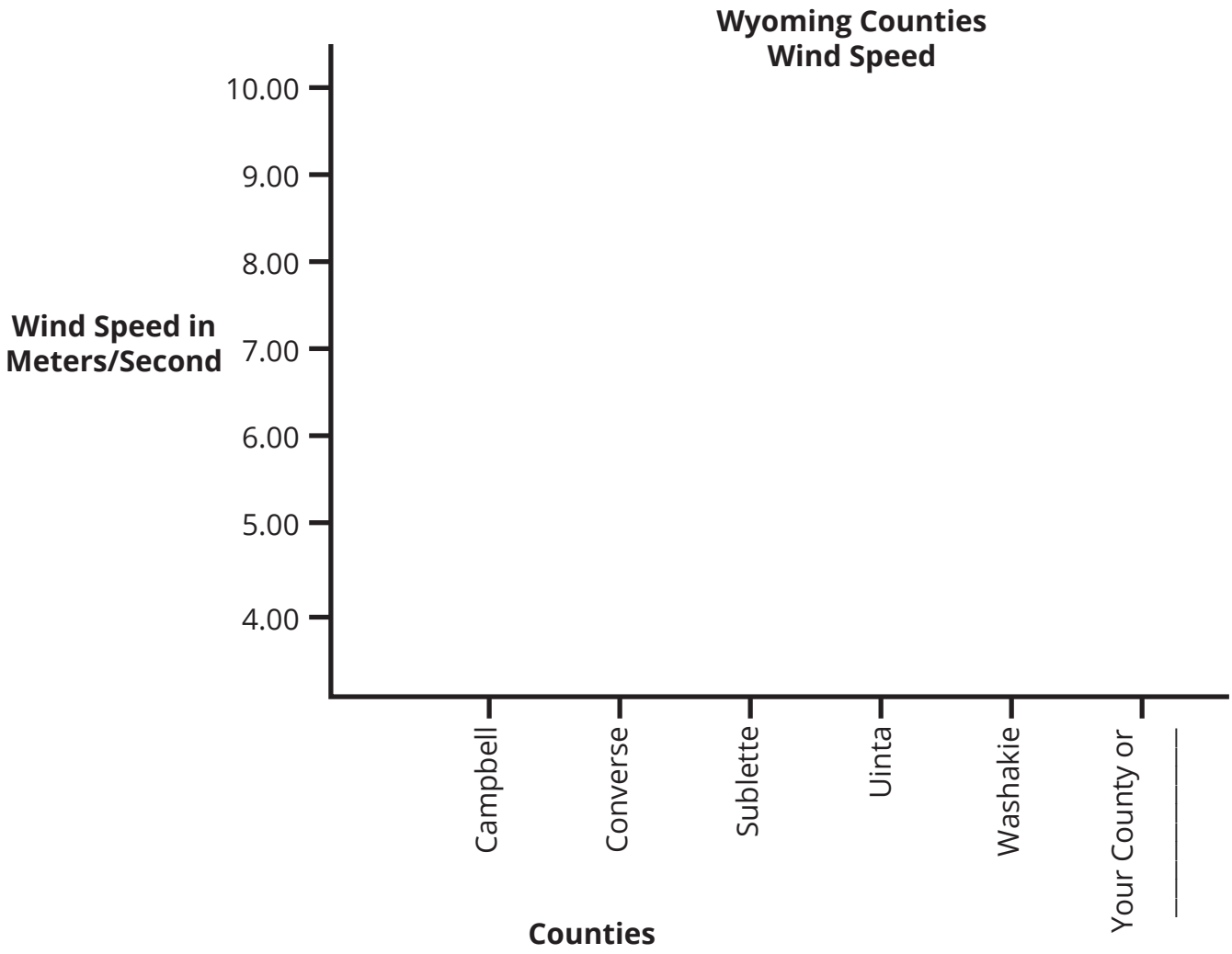
Home Training Tools Ltd. (n.d.). Experiment with Wind Power: Pinwheel Wind Turbine. Retrieved June 28, 2017, from https://www.homesciencetools.com/a/wind-energy-science-newsletter/

Blank Wyoming Map



Wyoming Energy
Bar Graph

Name: _____



1. Which of these counties would you build a wind farm in? Why?

_____

2. What would be another county that is not listed you would build a wind farm in? Why?

_____

3. Would Wyoming be a good place to build wind farms to generate electricity? Why or why not?

_____

_____

Wyoming Energy
Brainstorming

Name: _____

Problem 1:
Wind turbines kill birds and bats.

Problem 2:
Wind Turbines turn a natural landscape into a man-made landscape.

Problem 3:
Wyoming can generate electricity for other places, but transmission lines don't reach all locations good for wind farms. People don't want to see lots of powerlines all over our state.

Problem 4:
Because the wind doesn't blow all the time, the wind turbines cannot always generate electricity for when people need it.

Solution 1:

Solution 2:

Wyoming Energy
Brainstorming

Revised Solution:

Wyoming Energy Questions

1. Is this solution going to solve the problem?
   Yes or No. Why or why not?

2. Is this solution realistic?
   Yes or No. Why or why not?

3. Does this solution cost a lot of money to make?
   Yes or No. Why or why not?

4. Does this solution create bigger problems than the one you are trying to solve? **Yes or No. Why or why not?**

Wyoming Energy Questions

1. Is this solution going to solve the problem?
   Yes or No. Why or why not?

2. Is this solution realistic?
   Yes or No. Why or why not?

3. Does this solution cost a lot of money to make?
   Yes or No. Why or why not?

4. Does this solution create bigger problems than the one you are trying to solve? **Yes or No. Why or why not?**

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Renewable Resource Notes

Name:

Solar | Geothermal | Hydro

(circle assigned resource)

How does this resource generate electricity? Use pictures or words to explain.

List at least one advantage and disadvantage of the resource.

Advantages	Disadvantages

Renewable Resource Notes

The principal of a school wants to add a renewable energy source to his school. He can build a wind turbine, add an array of solar panels, install a geothermal heat pump, or harness the water power of a river close to the school. He only has enough money to purchase one. Choose the resource you think he should add. Explain why using the information you collected in your table.