

Watershed Mysteries

Students analyze data from a coastal habitat scenario, plan a presentation, decide on actions for improving the health of the habitat and present their action projects

OBJECTIVES

Identify and role-play the participants in ecosystem health scenarios

Weigh risks and benefits of coastal habitat planning decisions

Defend one view on an environmental issue related to coastal habitats

SUBJECT

Ecology, Debate, Land Management

PREREQUISITE

#4: Explore and Restore
#6: Coastal Habitat Research

VOCABULARY

flux
groundwater
headwaters
infiltration
invasive species
permeable
reservoir
runoff
surface water
wetland

MATERIALS

scenarios
chart paper
library access
internet access

TIME/DURATION



90 minutes +
60 minutes
for each
additional “public
meeting”

SETTING

Indoors

This Great Lakes in My World 9-12 activity is aligned to the Common Core State Standards (as available). This alignment is available on your Great Lakes in My World 9-12 USB flash drive in the “Standards” folder and on-line at <http://www.greatlakes.org/GLiMWstandards>.

BACKGROUND

Public meetings are held in local or relatively large communities to debate or discuss issues, including land management and watershed planning. Students will discuss multiple scenarios, and debate these issues as they relate to Great Lakes restoration and coastal habitat management. They will also take on different roles and look at different perspectives as they debate and research Great Lakes issues, discussing the pros and cons of issues.

Debates can range from having detailed and formal structures, like Lincoln-Douglas Debates, which are presented by some debate teams (see resource list for more information). Debates can also be simple and informal, such as when students are paired to research and discuss the pros and cons of an issue. As they identify, research, and argue about complex ideas, they will hone their skills in critical thinking, organization, persuasion, public speaking, research and teamwork.

PROCEDURE

PART ONE: LARGE GROUP DISCUSSION

1. Introduce the topic of Great Lakes restoration and coastal habitat management. What current issues are the open waters of the Great Lakes facing? What current issues are the coastal habitats of the Great Lakes facing? What current issues are the communities within the Great Lakes basin, or Great Lakes watershed, facing?
2. Discuss what makes a good debate. Have students brainstorm a list of ideas for ways to make the debate successful. *The list might include: Listening to each other, talking loudly enough for others to hear, being polite, choosing a moderator to facilitate, etc.*

Note: This activity includes four scenarios that Great Lakes communities have faced. The teacher can select one of these issues ahead of time, or the teacher can read all four scenarios to the students and ask students which scenario they would like to debate or discuss as a class.

3. As a class, brainstorm a list of relevant characters involved in the decision-making and problem-solving of these Great Lakes issues, which can be gleaned from the articles that students have read. Another option is to give students the included “scenario cards,” but they may have additional or alternate ideas for who should participate in the debate.
4. As a class, decide on the roles needed for the debate or have students work in teams to create solid arguments for the roles provided on the “scenario cards.” For example, there could be a group of residents or a water company group that works together to prepare their roles for the debate.
5. Once the roles have been chosen, students should review their own roles, as well as the roles of others within the community. Students will create a written summary of the statements that they would like to contribute to the debate. In addition, students should write a three-to-five sentence summary of their personal beliefs on the issue.

PART TWO: (MOCK) PUBLIC MEETING

6. Review the elements of a successful public meeting and determine which scenario the class will debate or discuss.
7. Assign each student a role. One person’s role should be the moderator. The moderator (the educator, or another student,) calls the class to order.
8. Each character group will have two minutes to make an initial statement. Once this is complete, each will have two minutes to make counter-arguments.
9. The group should attempt to come to some sort of consensus, or one “character” or group could make the final decision.
10. Observers should report on their observations. Discuss as a class: What was positive about the public meeting and how could it have been more effective?

PART THREE: RESEARCHING A GREAT LAKES ISSUE

11. Students conduct independent research on a Great Lakes issue using the library, Internet and/or teacher’s resources.
12. Students write an essay summarizing the Great Lakes restoration or coastal management issue that was debated in class. The essay should explain their stances on the issue. The opinions should be backed up by facts found through independent research and/or from the background information that was provided.

WRAP-UP

13. Students use their observations of the public meeting and their written summaries to answer the journal questions and discuss them as a class.

EXTENSION

- A. Have students research other current issues facing the Great Lakes and host a public meeting as they did with the scenarios from the student pages.
- B. Students write a letter to their senator or representative expressing their views on Great Lakes protection. A list of senators and their addresses can be found at the U.S. Senate’s homepage (http://www.senate.gov/general/contact_information/senators_cfm.cfm).

ASSESSMENT

See rubric on page 138.

RESOURCES

Please see Resource List for additional information related to resources and organizations, watersheds and more.

SCENARIO 1 What is Watershed Management?

Watershed Management is a collaborative process of creating and implementing plans, projects and programs to sustain and enhance watershed functions that affect animal, plant and human communities within a watershed. Such topics for watershed management include drainage, water rights, stormwater runoff, and water quality and supply. Landowners, environmental specialists, stormwater management experts, citizens and land-use agencies are all involved in managing watersheds.

SCENARIO OBJECTIVES

Practice decision-making skills in a mock town meeting

Gain experience in recognizing potential hazards to the community's water supply

Weigh the risks and benefits of community development

In Clearwater, the local farmers have been using excess fertilizer on their soybean crops to combat the increased incidence of an invasive beetle that has been eating the soybeans. Three separate hydrologists have discovered a rapid increase in nitrogen and phosphorus concentrations in the nearby streams, compared with baseline data. Since a watershed is fed by these streams, the hydrologists have become concerned with the health of the watershed and have consulted with the Illinois Department of Natural Resources (IDNR) to hold a meeting today. This meeting is urgent because the health of the entire watershed is at stake due to fertilizer runoff within the local farming economy.

The meeting will be comprised of local farmers, citizens, the Environmental Protection Agency (EPA), the state DNR, and state and local officials. Students will be actively involved in an in-class simulation of the meeting to discover how watershed management is a cooperative process involving state, federal, and local stakeholders.

Three to five local farmers: This group seeks to dodge the idea that the rises in nitrogen and phosphorus levels are directly linked to their fertilizers. They will argue that the health of the crops is beneficial for everyone and if they had to cut back on fertilizer, the community would suffer from a lack of healthy produce.

Three hydrologists: These highly specialized water technicians are adamantly opposed to the increased concentrations of nitrogen and phosphorus in the watershed. Although nitrogen and phosphorus occur naturally in low concentrations, excessive amounts of phosphorus and nitrogen can enter waterways from agricultural runoff, untreated sewage discharges and phosphorus-based fertilizers and detergents. If there is too much of these nutrients in the water, then the amount of algae also rises – transforming the water into a green soup of algae and bacteria that can cause foul-smelling water, algae blooms, fish kills, and health threats such as toxic algae and contaminated drinking water. Since they completed field work where the levels of nitrogen and phosphorus were off the charts, and witnessed algal blooms, the hydrologists have become convinced

that pollution is having a very negative impact on the watershed. Since the health of the watershed is fragile, they would argue, the streams are biologically, ecologically and chemically in danger.

One person from the IDNR: The meeting today was led by this particular person, who tried to find a balance between local economic growth and the ecological health of the watershed. They are most concerned with hearing from the public, in terms of reaching a conclusion.

One person from the local government: This individual would like to promote the strength of the local farming economy because they would personally benefit from that, since they are elected by the citizens of Clearwater, based on economic growth. If the local economy were to decline because of a decrease in the use of fertilizer, this local government official fears that they would not be re-elected.

One person from the state government: The state government is concerned with how this region in Clearwater is going to affect other areas in the state. If the streams are polluted in Clearwater, the state government official fears that the pollution will spread to other populated areas in Clearwater, causing further distress. This state official would like to see a rapid decline in the farmers' use of fertilizer.

One person from the EPA: This person serves as a federal employee and must seek to find a solution that balances the needs and wants of the local and state stakeholders. They would argue that the local farmers should try to use more sustainable fertilizers that aren't harmful to the watershed. Such organic or sustainable fertilizers may help both the farmers succeed in growing crops and also help the entire watershed flourish from a drop in pollution.

Citizens of Clearwater (the rest of the class): This role is crucial, because without the citizens of Clearwater at the meeting, it's difficult to know what the perspective of the community is. The citizens have valuable input into how their drinking water has been greatly affected by the excess nitrogen and phosphorus. They want to argue for a better fertilizer substitute or none at all.

SCENARIO 2
What is Land-Use planning?

Land-use planning is a branch of public policy which includes different disciplines, focusing on how to use land in an efficient and ethical manner, preventing land-use conflicts.

SCENARIO OBJECTIVES

Practice decision-making skills in a mock city hall meeting

Gain experience in recognizing potential threats to ecosystems

Weigh the risks and benefits of land use

A new plan proposes constructing an outlet shopping mall in what is now a wetland preserve. The new economic oasis would, in theory, collect millions of dollars each year stimulating the local and state economy, but at what cost would this development succeed? The existing wetland oasis is a thriving ecosystem with native plants, animals and insects, and it helps water enter, or infiltrate, into the soil. Local environmental organizations have been outraged by this new plan, and have decided to hold a meeting at City Hall today.

This meeting will include the city planner, mayor, state governmental officials, environmental scientists, citizens, and the new outlet shopping mall developers. The purpose of the meeting is to establish a balance between urban development and ecological gems, such as wetlands. The class will randomly divide up into different roles to come to a conclusion using an active and involved discourse.

One city planner: This person's job is primarily to oversee all of the development and planning of the city. They are concerned with the aesthetics of the town and argue that there is greater value in wetlands than in a concrete shopping mall, because too many strip malls will degrade the value of the community. This kind of development may scare people away instead of bringing people to the town.

Five to ten environmental scientists: The environmental scientists obviously argue against the development of the outlet shopping mall because such a structure would disrupt the entire ecosystem of the wetland. Without the tall grasses, water will definitely run off at a very strong rate instead of infiltrating into the long roots of the native plants. By paving over wetlands, water has the ability to run off instead of infiltrate, which can disrupt the water cycle that the community has relied on for decades. The biodiversity would decline at an extreme rate, threatening the extinction of many rare native plants, birds, insects and other animals. The environmental scientists have data including examples of wetlands that have been converted into paved shopping centers, which supports their arguments.

One mayor: The mayor is in favor of preserving and restoring the wetland area because they grew up in this town and know that, without the wetlands, the entire ecosystem and town would degrade in its number and variety of species, as well as in its appearance.

Two state governmental officials: These individuals are in favor of the construction of the new outlet shopping center because it will bring great growth to the entire state. These officials argue that the economic benefits outweigh the ecological costs and support the continuation of the development of the outlet shopping mall.

Five to ten outlet mall developers: These outlet mall developers are obviously in favor of the construction of the new shopping haven and believe that the economic profits are so great that it would be foolish not to take advantage of this prime spot by Lake Michigan. Disregarding the severe ecological threats, the developers think that turf grass and paved cement will only have a small negative impact on how well the urban ecosystem functions.

Citizens: Some citizens support the idea of the outlet mall, for it will bring jobs and tourism into the local community, and some fear that the increased development of the area will lead to the ecological decline of the unique community. The town was originally all wetlands, but a large amount of development there in the twentieth century resulted in only a few wetlands remaining. This led many of the citizens to agree that their ecological gem should be guarded and preserved forever. It takes hundreds of years to create a wetland community and future generations should be able to enjoy the beauty of the wetland.

SCENARIO 3
What is Coastal Land-Use Planning?

Coastal land-use planning is similar to land-use planning, but focuses on carefully using and protecting the coasts near bodies of water, creating a balance between urban development and natural ecosystems.

SCENARIO OBJECTIVES

Practice decision-making skills in a mock city hall meeting

Understand the delicate balance between urban development and natural ecosystems

Weigh the risks and benefits of land use

Residents have built homes on the coasts of Lake Michigan for decades. Recently passed legislation determined that homes can no longer be built on these coasts for fear of the erosion of the Indiana Dunes and of coastal ecosystem degradation. Local citizens are outraged that they can no longer reside directly on the shores of Lake Michigan. Coastal land managers have been consulted by the Indiana Department of Natural Resources, the Alliance for the Great Lakes, residential developers, and local citizens. Randomly divide up the classroom and then hold a mock town hall meeting to discuss the recent state legislation regarding coastal land development. Decide as a class what should be done to homes that have been built on the coasts, and what actions should be taken regarding the new or future construction of homes along the Great Lakes coasts.

One coastal land manager: This individual has been assessing the condition of the coastal region of Lake Michigan for 30 years and has witnessed severe erosion from the development of homes on pristine sand dunes. The abnormal erosion rates, he argues, are a good enough reason to stop development completely on the coasts of Lake Michigan. He has set a distance of 1,000 feet away from the coast as a guideline for all new construction.

Three members of the Indiana Department of Natural Resources: These individuals are strongly opposed to any new construction on the coasts of Lake Michigan, because of the importance they place on public tourism. They are concerned that the past development of the area has degraded the beaches, and that the new construction projects will decimate them further.

Three members of the Alliance for the Great Lakes:

These informed environmental advocates have direct relationships with the Indiana Dunes and have witnessed severe erosion rates from an increase in residential property on the coasts of Lake Michigan. These citizens firmly believe that the coasts of Lake Michigan are public and should be available for all to enjoy instead of a select few. They also argue that coastal ecosystems would thrive without residential development.

Six local residential developers: These individuals feel that the communities of Lake Michigan are running out of space for development, and that the coasts are prime spots for houses, since this has been the custom for years. The developers don't see any long-term problems with developing the coasts, and threaten to build without permits.

Local citizens (the rest of the class): The local citizens are split on making a decision in the scenario; some are outraged by the construction but some feel that the state is taking away the freedom of choosing where to live.

Watershed Mysteries

BACKGROUND

Given a variety of scenarios, you will investigate Great Lakes restoration and coastal habitat management issues. After being assigned a role, you will participate in a public meeting to discuss and debate these topics. To complete the lesson, you will then do further research of some of the issues facing the Great Lakes and its coastal habitats.

INTRODUCTORY QUESTIONS

1. What issues have you debated with your parents or friends?
List at least three examples.

2. What issues might professionals debate, which are related to the Great Lakes coast and watershed?
List at least three examples.

VOCABULARY

flux
groundwater
headwaters
infiltration
invasive species
permeable
reservoir
runoff
surface water
wetland

3. What are the elements of a good debate?

PART 1 -- (MOCK) PUBLIC MEETING

Review the following scenarios, and then as a class select one to discuss. You will host a public meeting, inviting stakeholders to share their opinions on the situation.

SCENARIO 1: WHAT IS WATERSHED MANAGEMENT?

Watershed Management is a collaborative process of creating and implementing plans, projects, and programs to sustain and enhance watershed functions that affect animal, plant, and human communities within a watershed. Topics related to watershed management include drainage, water rights, stormwater runoff, water quality and water supply. Landowners, environmental specialists, stormwater management experts, citizens and land use agencies are all involved in managing watersheds.

SCENARIO OBJECTIVES

- Practice decision-making skills in a mock town meeting
- Gain experience in recognizing potential hazards to the community's water supply
- Weigh the risks and benefits of community development

In Clearwater, the local farmers have been using excess fertilizer on their soybean crops to combat the increased incidence of an invasive beetle that has been eating the soybeans. Three separate hydrologists have discovered a rapid increase in nitrogen and phosphorus concentrations in nearby streams, compared with baseline data. Since a watershed is fed by these streams, the hydrologists have become concerned with the health of the watershed and have consulted with the Illinois Department of Natural Resources (IDNR) to hold a meeting today. This meeting is urgent because the health of the entire watershed is at stake because of the fertilizer runoff used to support the local farming economy.

SCENARIO 2: WHAT IS LAND-USE PLANNING?

Land-use planning is a branch of public policy which includes different disciplines that seek to use land in an efficient and ethical manner, helping to prevent land-use conflicts.

SCENARIO OBJECTIVES

- Practice decision-making skills in a mock city hall meeting
- Gain experience in recognizing potential threats to ecosystems
- Weigh the risks and benefits of land use

There has been a recent proposal to build a new outlet shopping mall in what is now a wetland preserve. The new economic oasis is supposed to collect millions of dollars each year, stimulating the local and state economies, but at what cost should this development succeed? The existing wetland oasis is a thriving ecosystem with native plants, animals, and insects, which provides the entrance, or infiltration, of water into the soil. Local environmental organizations have been outraged by this new plan, and have decided to gather at a meeting at City Hall today.

SCENARIO 3: WHAT IS COASTAL LAND-USE PLANNING?

Coastal land-use planning is similar to general land-use planning, but focuses on carefully using and protecting coasts that are near bodies of water, to create a balance between urban development and natural ecosystems.

SCENARIO OBJECTIVES

- Practice decision-making skills in a mock city hall meeting
- Understand the delicate balance between urban development and natural ecosystems
- Weigh the risks and benefits of land use

On Lake Michigan, residents have been building homes on the coasts for decades. Recently-passed legislation has determined that homes can no longer be built on the coasts of Lake Michigan, for fear of erosion of the Indiana Dunes and of coastal ecosystem degradation. Local citizens are outraged that they can no longer reside directly on the shores of Lake Michigan. Coastal land managers have been consulted by the Indiana Department of Natural Resources, the Save the Dunes Conservation Fund, residential developers and local citizens. Your classroom will hold a mock town hall meeting to discuss the recent state legislature regarding coastal land development. Decide as a class what should be done to homes that have been located on the coasts for decades.

BEFORE THE PUBLIC MEETING

- 4. Write three sentences summarizing the background information related to the issue that you have been assigned. If you need more information, ask your teacher for an outside article on the issue.

- 5. List the possible characters that would be involved in a debate on this issue. Circle the names or titles of the characters which the class chooses for the (Mock) Public Meeting.

- 6. My character in the public meeting is: _____

- 7. Brainstorm a list of issues or opinions that are relevant to your character.

8. Write five to eight sentences summarizing how you or your group will contribute to the public meeting on behalf of your character. Include at least three of the vocabulary terms from this lesson in your summary.

9. Write five to eight sentences summarizing your personal beliefs on the issue. Explain if they are similar to, or different from, those your character will voice in the public meeting.

10. Write your opening statement here: (You will have two minutes to present this statement).

DURING THE PUBLIC MEETING

11. Make notes here during the public meeting for your counter-argument: (You will have two minutes to present this).

AFTER THE PUBLIC MEETING

12. How has your initial stance on the issue changed or not changed as a result of the public meeting?

13. What makes this a difficult issue to debate?

14. Which group do you believe had the strongest argument? Explain why you feel it was strong.

15. What made this public meeting work well?

16. What aspects of the public meeting could be improved?

17. Why is it important to learn about and listen to all sides of an issue?

PART 2 -- RESEARCHING GREAT LAKES RESTORATION

18. What are the main points that you are making in your essay and/or letter about this issue?

19. Conduct further research on Great Lakes restoration, and record the information below. Write down the source, title and author. Then write a three-sentence summary of each source.

a. Source: _____

Title: _____

Author: _____

Summary: _____

b. Source: _____

Title: _____

Author: _____

Summary: _____

c. Source: _____

Title: _____

Author: _____

Summary: _____

20. What evidence have you found to back up your claims?

21. Write your essay/letter on a separate page or on a computer. Cite all sources.

RUBRIC

ELEMENTS	☆☆☆☆	☆☆☆	☆☆	☆
BACKGROUND: Student reads the background information of the scenario that the class will debate. Student uses additional resources to brainstorm and writes five to eight sentences (using vocabulary words) that will describe their character's opinions in the debate. Student writes another five to eight sentences describing their personal belief on the issue and if it is the same or different than their character's. Student prepares an opening statement for the debate.	Addresses all of the components	Missing one of the components	Missing two components	Missing three or more components
ROLE PLAY: Student is well prepared for the debate and actively participates in character. Student uses background information that has been researched with validating points. Student speaks loud and clear, listens to others while they speak their opinions, and is polite. Student takes notes during debate to use for counter-argument and follow-up questions in student pages.	Addresses all of the components	Missing one of the components	Missing two components	Missing three or more components
ESSAY: Student conducts further research on the coastal management issue that was debated. Student writes an essay explaining the student's stance on the issue with at least three documented resources. Spelling and grammatical errors are minimal.	Addresses all of the components	Missing one of the components	Missing two components	Missing three or more components