

## **Background:**

*The students will be given a problem-based learning scenario for the Great Lakes region. The scenario will focus on the science behind looking for how we can develop a MPA. They will develop their own ideas by creating essential questions (know/need to know lists) and doing online research using data for different aspects. The students will then create their own evaluation presentation.*

### *Problem Based Learning Scenario Great Lakes- MPAs*

*Dear Maine South High School Earth System Science students,*

*Congratulations on beginning your study of the Great Lakes Marine Protection challenges. As we continue in the 21<sup>st</sup> century, we will need the commitment and imagination of young people like you to help solve some of our problems.*

*We often take the Great Lakes region for granted. We receive water from our lakes, compete in fishing tournaments, go to the beaches, and build along the shorelines. Recently, we've seen some changes in these recreational & environmental health situations. Native species are decreasing at record numbers. Overall, rapid population growth, urbanization, pollution and climate change are adding even greater pressures in an already strained system.*

*As we continue to research the Great Lakes region, we must preserve areas in their nature habitats. As we look at those natural habitats we must consider many different dimensions. We must consider how fish and other animals move along the lake currents, how the habitat quality varies, where fishermen are searching for fish, and other varying environmental conditions.*

*As stakeholders in this process we must dive into this problem more to find out what we can do to help this endeavor. Learning more about this problem today will be vital to the search for solutions in the future.*

*Possible Essential Questions (if students are in need of coming up with good questions)*

- How does the geologic shape of an MPA influence the home range size of fish?*
- How do animals move throughout an MPA?*
- How do fishermen influence the edges of MPAs and how does spillover influence the types of fish?*
- How does human impact influence changes near MPAs?*
- How has climate change impacted the Great Lake regions in regards to MPAs?*

**Grade Level:** 9-12<sup>th</sup>, Regular level

**Time it will take:** 5 full class periods; presentations other days

### **Content Standards:**

*-Used for the Human Impact Course or Earth System Science Hydro Unit- shows connections to geography, social science, economics, and biology*

- *Connections to the National Geography Standards:*  
*Standard 14: "How human actions modify the physical environment"*

*National Science Education Standards:*

*\* F: Science in Personal and Social Perspectives: "Important personal and social decisions are made based on perceptions of benefits and risks"*

### ***Lesson Plan Objectives:***

*Students will:*

- 1. Define Marine Protected Areas*
- 2. Identify types of Marine Protected Areas*
- 3. Identify the stakeholders of particular Marine Protected Areas*
- 4. Identify an MPA in the Great Lakes region and analyze its productivity*

*One or two of the following in their cooperative group-*

- 4. Identify how the geology of a lake bed influences the home range size of fish*
- 5. Describe spillover and how it influences the edge of an MPA and the way fishermen will take from the lakes*
- 6. Identify and describe how humans influences changes near an MPA.*

### ***Relevant Vocabulary***

- Marine Protected Area*
- Stakeholder*
- Spillover*
- Habitat*
- Climate change*
- Any geological terms from previous units*

### ***Materials Required:***

- Computers with Internet access*
- Notebook paper for notes or butcher paper for know/need to know list*
- Spillover Activity Mini-lab for small groups*
- Any and all you tube clips related to MPAs for students on the class wiki (<http://gest.wetpaint.com>)*
- All student handouts as the lesson goes along*

***Procedures & Assessment & Calendar: 70 minute class periods***

*- Access the calendar and rubric attachment below.*

## ESS Plan- Lakes & MPAs

Monday	Tuesday	Wednesday	Thursday	Friday
Day 1: <b>video:</b> Water <b>meet</b> the problem letter <b>brainstorm:</b> problem <b>begin:</b> Know / Need to Know <b>homework:</b> Preliminary Water Webquest??	Day 2: Computers <b>Choose</b> project partner(s); begin background research update Know/Need to Know <b>homework:</b> complete Water Webquest	Day 3: Computers <b>Turn in</b> Water Webquest <b>Research:</b> 2 possible MPA locations; Peer evaluation; Present case study location rationale to class <b>homework:</b> create essential question	Day 4: Computers <b>create:</b> action plan <b>schedule:</b> Spillover Lab activity as part of action plan <b>research:</b> Day 1 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan & Group Vocabulary	Day 5: Computers <b>Review:</b> Know / Need to Know for case study area <b>research:</b> Day 2 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan
Day 6: Computers <b>Mini-lab: PPB?</b> <b>research:</b> Day 3 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan	Day 7 Computers <b>research:</b> Day 4 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan & Group Vocabulary & MPA Quiz- MPA in the News Due by next Wed.	Day 8 Computers <b>research:</b> Day 5 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan & Group Vocabulary	Day 9- Computers <b>research:</b> Day 6 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan	Day 10- Computers <b>research:</b> Day 7 research <b>submit</b> summary of today's research <b>homework:</b> set by action plan
Day 11- Computers Presentations- In Principal's Boardroom	4/14- Computers Presentations- In Principal's Boardroom			

### Part of Action Plan &/or Homework

- MPA Cartoon Creation
- Spillover Lab
- Geology- geologic habitat activity??
- PPB lab (contamination lab activity)
- Online Wiki or Ning Quiz- MPAs in the News- access on the wiki page

## MPAs Grading Rubric- Movie or PPT (need to have written script)

Component	Exceeds Expectations  3 points	Meets Expectations  2 points	Does Not Meets Expectations 1 point	Absent  0 points
Case study problem statement.	Correctly identifies current and future water quality issues.	Correctly identifies either current or future water quality issues.	Incorrectly identifies current or future water quality issues.	No problem statement present.
Characterization of study area.	Current MPAs information <b>with</b> reference.	Current MPAs information <b>without</b> reference.	Incomplete MPAs information.	No MPAs information.
<b>General Info:</b> - Types of fish and other animals & their movement - Varying environmental conditions - Habitat quality - Population of surroundings - Current Influences & Stresses	All 5 are included <b>and</b> referenced	3-4 included <b>and</b> referenced	1-2 included <b>and</b> referenced	None are referenced.
Physical Description of study area. Climate Vegetation Topography- Geology beds	Climate Vegetation Topography with images	Climate Vegetation and Topography described w/o images	Incorrect or missing information on climate, vegetation and topography	Physical description missing
MPA description.	MPA correctly described with illustration or images.	MPA correctly described without illustration or images.	MPA incompletely described.	MPA information missing or incorrect.
Define the problem and extent of problem within the geology of the area	correctly defined including visuals	correctly defined no visuals	incomplete definition	missing or incorrect
Environmental Data	Accurate environmental data presented in an appropriate tabular or graphical format.	Accurate data presented in an inappropriate tabular or graphical format.	Incomplete data presented.	No data present
Analysis/conclusion of data.	Logical conclusion based on analysis of data based on and referencing data.	Logical conclusions drawn with loosely referenced data.	Data incorrectly analyzed.	No conclusion or analysis of data.
Discussion of possible solutions	Solutions are logical, follow data and have realistic outcomes.	Solutions are logical and loosely referenced the data.	Solutions are logical however, no data referenced.	No solution given.

<b>Component</b>	<b>Exceeds Expectations</b> <b>3 points</b>	<b>Meets Expectations</b> <b>2 points</b>	<b>Does Not Meets Expectations</b> <b>1 point</b>	<b>Absent</b> <b>0 points</b>
Fit of solution to problem	Shows strong evidence of meeting all criteria of problem statement.	Shows evidence of meeting most criteria of problem statement.	Shows little evidence of meeting criteria of problem statement.	No evidence of meeting criteria of problem statement.
Counter Argument	Effectively counters alternate views substantiated by data.	Effectively counters alternate views.	Considers alternate views.	Does
Social Science Content	Shows strong knowledge of political and social impact.	Shows some knowledge of political and social impact.	Shows little knowledge of political and social impact.	No knowledge of political or social impact.
Graphics (charts, graphs, etc.)	Effective graphics to enhance the presentations.	Uses clear graphics to support the presentation.	Uses few graphics to support presentation.	No graphics support presentation
Group Collaboration	Shows strong evidence that all members contributed to the presentation		Very little evidence that all members contributed to the presentation.	Only one member contributed to the presentation.
Presentation skills (clarity, volume, eye contact, body language)	Demonstrates all criteria appropriately.	Demonstrates most criteria appropriately.	Demonstrates few criteria appropriately.	Does not demonstrate any of the criteria.
Presentation performance	All group members participate equally in presentation time.		Unequal distribution of presentation time.	Not everyone presents.
Total				

Comments: