Activity Title: Banking Data on Cordell Bank

Subject (Focus/Topic): Marine Ecosystems off of the coast of California

Grade Level: 9-10

Average Learning Time: 3 or 4 One-Hour long periods

Lesson Summary (Overview/Purpose): Students will learn to use historic data to predict the health of a marine ecosystem.

Overall Concept (Big Idea/Essential Question): Students will understand the critical importance of actively protecting the health of the world's oceans.

Specific Concepts (Key Concepts):

*Accessing and applying National Oceanic and Atmospheric Administration (NOAA) Research Data

* Graphing data gathered from their web site

*Connecting different sources of data (i.e. Krill samples, phytoplankton samples, marine mammal and seabird observations) to create a clear picture of the ecosystem at a point in time.

*Using prior data, form a hypothesis of future health of ecosystem.

Focus Questions (Specific Questions):

*What is an ecosystem?

*What are the primary predator/ prey relationships in your transect area?

*Identify at least one global event (natural or manmade) that has affected your transect and how it has affected the area. Be specific.

*Based on what you know and have learned about National Marine Sanctuaries, what can you do to positively effect them for the future of our planet?

Objectives/Learning Goals:

*In groups of 3 or 4, students will access NOAA research data and record data specific to their assigned transect with 95% accuracy in one half class period.

*As a group students will create a timeline charting data from NOAA website with 100% accuracy.

*Students will create an artifact of their choice (i.e. chart, map, etc.) illustrating/ explaining the impact of a global event of their choice on their assigned transect with a minimum score of 4 out of 6 using a pre-determined rubric.

Background Information: State any information needed in order for this lesson to be taught most clearly and accurately. What do students need to know to succeed with the lesson? Offer common pitfalls, special notes, or hints in what to look out for.

- Students should grasp concepts such as atmospheric conditions, tidal patterns, wave action, pollutants, global movement of categories of organisms (whale migration, bird migration, phytoplankton growth, algae, etc.)
- Students need to know how to navigate research web sites, how to search for additional information (relating to global environmental impact events such as tsunamis, storms, volcanic eruptions, oil spills, plastic islands…)
- Students can become distracted or confused by too much information, and may need support to guide them in how to filter data to identify critical and/or important versus irrelevant material.
- Provide students with exemplars of artifacts will help them conceptualize their finished product since they will understand they are to be able to present to the class from their designed item.

Common Misconceptions/Preconceptions: State any common preconceived ideas or misconceptions that students may have about the topic of the lesson.

- Students may misunderstand that the health of the ecosystems below sea level does not have a direct, significant, or immediate impact on the potential for human survival.
- Students may not believe they can individually make a difference in the choices they make that will positively impact Earth's oceanic health.

Materials: Computers with Internet access, notebooks, pen/pencil, posters, markers, etc.

Technical Requirements: Computers with Internet access.

Teacher Preparation:

*Teachers need to be familiar with both the NOAA web site and also have an available list of other websites students can search to locate historic data about global events that have affected marine life since 2004

Keywords:

transect, ecosystem, food web, predator/prey relationships, primary producer, biosphere,

Pre-assessment Strategy/Anticipatory Set (Optional):

- Students will be shown a slide presentation of their teacher doing the work aboard a research vessel, looking windblown, seasick, and dealing with the challenges of physical data gathering during adverse conditions.
- A general question and answer will follow the slide show, highlighting the camaraderie, opportunity for other than desk-work professional opportunities, and the importance of each small piece of the data gathering efforts worldwide in building the essential information platform in service of Earth's survival.

Lesson Procedure:

Show slide show. (Includes teacher at sea material, National Marine Sanctuary photos and diagram information explaining transect locations, and identification of wildlife sighting procedures.)

Facilitate question and answer session, emphasize importance of research, and shared information

Show students how to navigate NOAA web site to find their information

Break students into assigned groups, assign each group a specific transect.

Provide students with list of web sites for seeking data on global events.

Provide students with artifact exemplar and discuss attributes of what rubric scores require for success.

Assessment and Evaluation: Explain how students' learning of the concept will be assessed and measured. *Note: The assessment and evaluation component should correspond to the objectives.*

- *Copy of rubric: presentation: clarity, artistic effort, effective communication of information, grammatically correct, includes all key pieces of information for connection between transect and global event*
- *Students are subject to usual scoring teacher uses for measuring contributions to group participation events—time on task, encouragement, management of time and materials, appropriate use of web sites and focus during internet search, ultimate product created, presentation support, clear presentation of all relevant information required for assignment.*

Standards:

- **National Science Education Standard(s) Addressed:**

  Standard A, Standard B, Standard C, Standard D, and Standard E

- **Ocean Literacy Principles Addressed:**

  The Earth has one big ocean with many features, the ocean supports a great diversity of life and ecosystems, the ocean and humans are inextricably interconnected.

- **State Science Standard(s) Addressed:**

- 6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:

  a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.

  b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.

  c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death. **Additional Resources:** List any books, articles, Web sites, videos, etc. that may enhance this lesson for students, teachers, parents/guardians or others.

  e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.

  f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.

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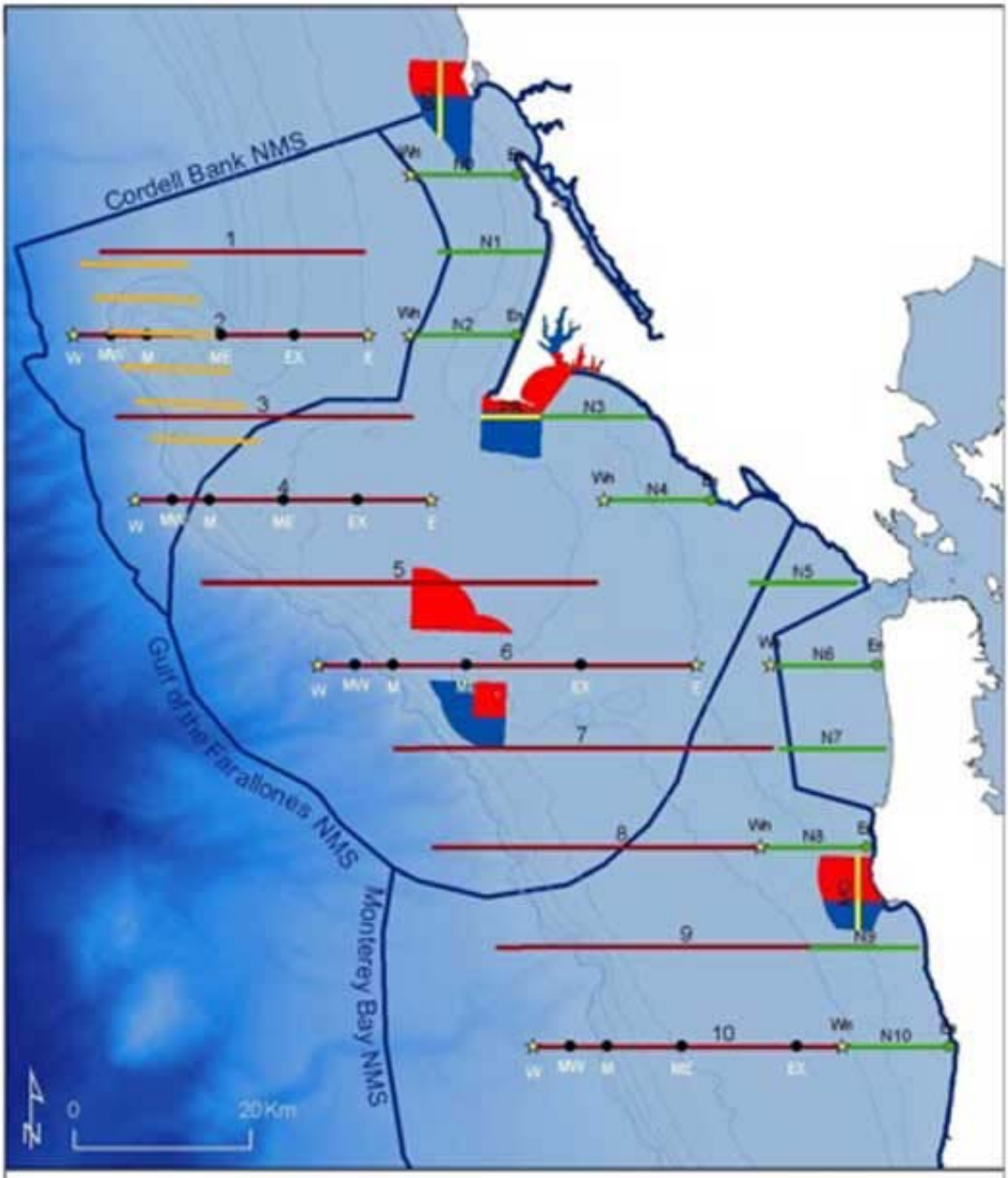

Nearshore and Offshore Transect Lines

- Nearshore Transects
- Limited Survey Transects
- Offshore Transects
- Fine-scale Transects, Cordell Bank
- ☆/● CTD / Phyto / Zoop Station
- CA MPA - SMCA
- CA MPA - SMR
- NMS Boundaries

Making A Brochure : or other Artifact

CATEGORY	4	3	2	1
Attractivenss & Organization	The brochure has exceptionally attractive formatting and well-organized information.	The brochure has attractive formatting and well-organized information.	The brochure has well-organized information.	The brochure's formatting and organization of material are confusing to the reader.
Spelling & Proofreading	No spelling errors remain after one person other than the typist reads and corrects the brochure.	No more than 1 spelling error remains after one person other than the typist reads and corrects the brochure.	No more than 3 spelling errors remain after one person other than the typist reads and corrects the brochure.	Several spelling errors in the brochure.
Knowledge Gained	All students in the group can accurately answer all questions related to facts in the brochure and to technical processes used to create the brochure.	All students in the group can accurately answer most questions related to facts in the brochure and to technical processes used to create the brochure.	Most students in the group can accurately answer most questions related to facts in the brochure and to technical processes used to create the brochure.	Several students in the group appear to have little knowledge about the facts or technical processes used in the brochure.
Graphics/Pictures	Graphics go well with the text and there is a good mix of text and graphics.	Graphics go well with the text, but there are so many that they distract from the text.	Graphics go well with the text, but there are too few and the brochure seems "text-heavy\".	Graphics do not go with the accompanying text or appear to be randomly chosen.
Key Elements	Careful and accurate records are kept to document 95-100% of the required elements	Careful and accurate records are kept to document 94-85% of the required elements	Careful and accurate records are kept to document 84-75% of the required elements.	Elements are not documented accurately or are not kept on many facts and graphics.

Websites:

National Hurricane Center: www.nhc.noaa.gov/

Emergency Management: www.epa.gov/**oilspill**/

NOAA Tsunami Website: http://www.tsunami.noaa.gov/

Pacific Tsunami Warning Center: ptwc.weather.gov/

Cordell Bank National Marine Sanctuary: **cordellbank**.noaa.gov/

Gulf of the Farallones National Marine Sanctuary: **farallones**.noaa.gov/

National Oceanic and Atmospheric Administration: www.**noaa**.gov/

National Weather Service: weather.gov

Sanctuary Integrated Monitoring Network: http://sanctuarysimon.org/species/