



Education and Research: Testing Hypotheses

Lesson Plan— The Calm After the Storm...Water Quality (and Habitat Data – ext.)

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Summary

Students will use data collected from Duke University's Unmanned Facilities Systems (i.e., Drones) to observe the impacts of storm water runoff to water quality before and after storm events. Students will explore drone and other unmanned autonomous systems to develop an understanding of the various applications these technologies provide to study changes in the environment. Students will analyze various data sets and incorporate mapping skills with their knowledge of water quality variables to identify environmental influences to the local estuarine water system.

[TAGS: Drones, Estuary, Runoff, Point Source Pollution.]

Key Concepts

- Human impacts to the environment; point-source pollution; run-off
- Water quality variables
- Spectral analysis
- Real data
- Drones and unmanned aerial systems
- Align with the NGSS Disciplinary Core Ideas (Orange foundation box):
<http://www.nextgenscience.org/search-standards-dci> (See attached NGSS Checklist for *After the Storm*)

North Carolina Essential Standards for Science:

- *8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: -Estuaries -Marine ecosystems -Behavior of gases in the marine environment*
- *8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: Temperature, Dissolved oxygen, pH, Nitrates and phosphates, Turbidity Bio-indicators*
- *8.E.1.4 Conclude that the good health of humans requires: -Monitoring of the hydrosphere - Water quality standards -Methods of water treatment -Maintaining safe water quality - Stewardship*

Objectives

You are a scientist observing the water quality of an estuary before and after a major storm to assess the impact of point-source pollution to the Rachel Carson Estuarine Research Reserve (RCERR). Storm water drains from downtown Beaufort, NC into Taylor's Creek, which is adjacent to the RCERR. (Extension: What effect does storm water runoff have to the surrounding ecosystem within the Reserve. Complete the following objectives:

- **Observe and describe** water quality variables measured using drone technology.

- **Identify** appropriate levels of water quality variables and justification for testing these variables (why do we record salinity, why do we record pH, etc.).
****Reasons behind variables refer to extension-leading to habitat impact****
- **Record** data from the water quality tests recorded by the researchers using drones (based on the researchers timeline (before and after storms); **Record** weather events that coincide with the water quality data collected.
- **Demonstrate** their understanding of water quality variables by identifying cause and effect relationships with natural and manmade environmental impacts.
- **Communicate** results through PSA's, Website development, and Videos ways to reduce storm water pollution, Town Hall meetings.

Materials

- Access to Data from Duke Marine Lab and Unoccupied Systems Facility
- Access to Google maps in order to track the watershed area and document drainage plane for the storm water runoff/Also to hypothesize potential point-source pollution areas
- Track real time data in a timeline based on researchers decision of schedule

Procedure

1. Include the step-by-step procedure for completing the lesson

Assessment

- **Performance**—what will students do during the lesson to demonstrate understanding?
- **Product**—what will students produce to demonstrate understanding?
- Assessment should be directly related to the lesson objectives
- *Assessment rubrics that you would use in the classroom are also helpful*

Additional Resources

Please list any Web sites, books, publications, or other resources that would be helpful for teachers or students preparing for this lesson.