Cutting Edge Workshop: Teaching Oceanography, Summer 2013
Share Fair Activity

"All Drains Lead to the Ocean"

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CONTEXT: I used this activity for the first time last year in my lower division, large-enrollment (90 students) introductory oceanography course. Most of my students are non-science majors fulfilling a liberal education requirement, some are pre-service teachers, and a few are geology majors/minors. This activity is completed in class at the conclusion of our ocean circulation and marine debris lesson.

DESCRIPTION: In this activity students are asked to demonstrate their connection as a college student at a landlocked university to the larger environmental issue of marine debris accumulation zones.

STUDENT LEARNING OUTCOMES:

1. Students should be able to assess their connection to trash found in marine accumulation zones despite living in a non-coastal community.

2. Students should be able to discriminate between different disposable materials and predict the behavior of collected materials if they were deposited in the ocean (i.e. sink/float).

3. Students should be able to compare and contrast the types of litter generated on their campus with that collected on beaches around the world on Coastal Cleanup Day.

ASSESSMENT: At the end of the class period students submit their completed worksheets for evaluation. This activity is worth 30 points toward their overall course score.

REFERENCES AND RESOURCES:

*AudubonMagazine.org. Shed Bird Image. http://archive.audubonmagazine.org/onepicture/onepicture1003.html (last accessed June 2013).
*Garrison, Tom. *Essentials of oceanography*. Thomson Brooks/Cole, 2011.
*Law, Kara Lavender. The science behind the ocean's "garbage patches." Enrichment Module Cengage Learning.
*Moore, Capt. Charles and Cassandra Phillips. *Plastic Ocean*. Avery. 2011.
*Ocean Conservancy, 2013. International Cleanup Day. http://www.oceanconservancy.org/our-work/international-coastal-cleanup/ (last accessed June 2013).

TEACHING NOTES: This activity could be expanded to include collection locations off campus. For example, Hueston Woods State Park is 5 miles west of our campus. Students could be asked to spend time collecting litter along the shorelines of the reservoir (Acton Lake) within the park. Although the lake is not the ocean, the biologic and environmental impacts of aquatic debris should be similar and provides the opportunity for landlocked students to engage with a body of water. I am also working with faculty on our regional campuses to make this type of project a shared common experience for all of our introductory oceanography students.

Student Worksheet

Background: During our last lesson you were introduced to **marine accumulation zones**, informally known as ocean garbage patches. Remember this debris, which includes plastic items, accumulates in the center of ocean basins within the major oceanic gyres, specifically the North Pacific and North Atlantic Gyres. These so-called garbage patches have been accumulating in the ocean for the last 60 years. Because plastics don't quickly decompose in the ocean it is considered to have a now permanent presence in the ocean. The source of debris is all human-generated products either directly or indirectly dumped into the ocean. The long-term consequences of the marine accumulation zones are just starting to be investigated, but the short-term consequences are clear. Human produced debris in the ocean is impacting the marine ecosystem, especially sea bird populations.

Directions: In this assignment, you are being asked to **explore your connection as a student at Miami University in Oxford, Ohio to the larger environmental issue of marine debris accumulation zones.** To help facilitate the process you are being asked to walk to an assigned portion of campus and collect ALL litter you encounter, including plastic containers. Your search should include larger trash items, such as an empty water bottle, but also make sure to look for smaller pieces of plastic and paper on the ground (i.e., a bottle cap, a broken plastic fork, gum wrapper). A collection bag and protective gloves will be provided to each group to help in the litter collection process. You will also be asked to pay attention to your surroundings for your own safety and to help you understand the potential sources and repositories for that litter, including the ocean.

Identify the sample area you would like to explore and write your name on the front board under the appropriate sample site number/location. Once everyone is part of a group you will be instructed to leave the classroom to start your litter collection. Once your group arrives at your sample location make sure to discuss and respond to the following questions about your sample location before returning back to the classroom with your collected litter.

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There are 8 possible sample locations (see campus map):

Sample area #1: Intersection of Route 73 and Patterson Avenue and adjacent south parking lot area of Cook Field. ~10 people needed

Sample area #2: Sidewalk and adjacent parking lots between Patterson Avenue and west Cook Field area. ~10 people needed

Sample area #3: Sidewalk and adjacent areas along High Street between Patterson and Talawanda. ~10 people needed

Sample area #4: Western sidewalk and adjacent areas along Talawanda Road between High Street and East Vine Street. ~ 10 people needed

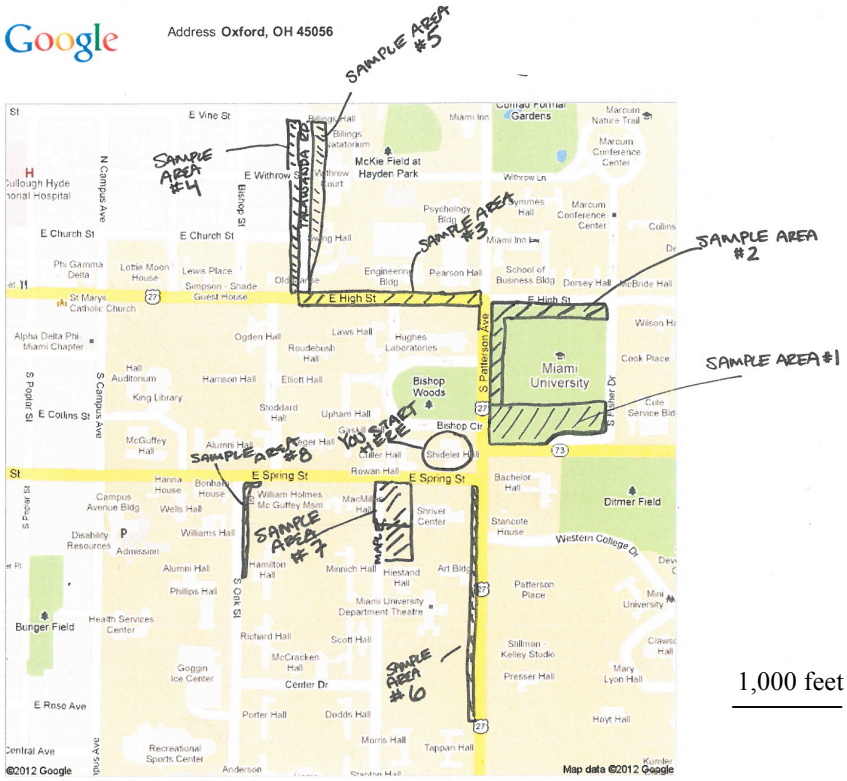
Sample area #5: Eastern sidewalk and adjacent areas along Talawanda Road between High Street and East Vine Street. ~ 10 people needed

Sample area #6: Western sidewalk and adjacent areas along Patterson Avenue between Spring Street and Tappan Hall. ~10 people needed

Sample area #7: Sidewalks and adjacent parking lot area along Maple Street between Spring Street and the Shriver Center. ~10 people needed

Sample area #8: Sidewalks and adjacent areas along Oak Street between Spring Street and Hamilton Hall. ~10 people needed

Campus map with the eight possible litter collection sites labeled.



Questions:

1. What types of debris did you find within your assigned collection area? What was the range in size of the litter collected? Was there any trend in the type of materials collected? Was there any litter you didn't collect? Explain.

2. Where did you find litter (i.e. along the curb, walkways, lawn)?

3. Based on what you observed, what do you think are the likely contributing sources of the litter you collected? Circle all that apply:

A. Material was ejected from an automobile
B. A pedestrian improperly discarded material
C. Material fell out of a nearby trash/recycling can that was too full
D. Material was improperly discarded by the residents/employees of a nearby building
E. Other (please specify):

4. Look around your collection site to identify if ANY type of drain is present. Remember ALL drains eventually lead to the ocean! How many were you able to locate? Were any of the drains you identified official marked with the statement "no dumping, leads to waterway?"

5. Based on the litter you found and the location of the drains is it possible for any of the litter present in the sample area to either be blown or washed down one of these drains?

6. Based on your observation and collection experience, in what ways do Miami University students/faculty/staff contribute to the problem of marine accumulation zones in the ocean? In what ways do you think we could also contribute to a solution?