**Draft 1/26/16**

**MWEE Topic #4: Polluted Urban Runoff**

**Issue:** Urban creeks and rivers suffer from a wide range of pollutants, even if industrial factory discharges and other forms of “point” pollution have been curbed. Large concentrations of people produce large amounts of trash. Cars and trucks leave deposits of oil and other chemicals, and exhaust particulates find their way into waterways, too. Chemicals such as salt, and sand, used to treat snow and ice, are washed into storm sewers, as are herbicides and pesticides applied to gardens and grassy areas. Vast amounts of impervious surfaces overload sewer systems with storm water, which itself is considered a pollutant.

**OUTDOOR FIELD EXPERIENCE:** Students collect runoff samples from different places around campus, including street gutters, downspouts, and drainage swales, during the initial minutes of a steady rain. A trash filter made of wire mesh or other material should be set up near a storm sewer intake to collect trash. Tests for pH, nitrogen, phosphorus and other nutrients, and dissolved oxygen are conducted on the water; an inventory is made of the trash. Students prepare a report on the results including possible reasons for the degree of pollution shown by the tests.

**ACTION PROJECT**: Normally, natural surfaces and trees/shrubs would slow down, absorb, and filter rainfall before it flowed into stream or river. “Rain gardens” – special areas that are dug out and filled with absorbent soil and planted with species that can tolerate wet conditions – are an easily constructed form of green infrastructure that can absorb some of the runoff, as well as filter out a portion of the pollutants. Students can plant a rain garden of any size on a part of the campus that either receives water from a downspout, or naturally collects water because of the topography.

**SYNTHESIS AND CONCLUSION:** Students walk the grounds of their campus, and identify the many ways in which rain water is collected or diverted, and flows off the property. Students then diagram the campus with points of discharge from the building, sidewalks, parking lot, and landscape. The diagram shows where the water reach a storm drain or stream. Students should determine if there are ways to absorb more water on campus – such as disconnecting downspouts from pipes carrying water to the street, and directing the flow into a grassy area. These results can then be communicated to the school administration with recommendations for action.

**INTENSIFICATION:** Student report on the specific conditions of his/her residential block -- how the runoff flows into the street and to the nearest waterway. OR: field trip to a local stream for water quality monitoring including tests for coliform bacteria and the presence of macroinvertebrates, in addition a new set of the measurements performed on the school campus.

**ORGANIZATIONAL SUPPORT:** Rock Creek Conservancy, DC Water, Audubon Naturalist Society (Chevy Chase). Background information: <http://clean-water.uwex.edu/pubs/pdf/urban.pdf>

**MWEE Topic #5: Schoolyard Tree Canopy**

**ISSUE**: School properties often have relatively large sections of open areas on campus. Though some of it may a playground or other social space, there is usually a section that has been trampled and has no vegetation or groundcover. The District has a formal goal of increasing its tree cover from the current 35 percent to 40 percent by 2032, reversing a loss that began decades ago when the canopy cover was about 50 percent. Schools have an opportunity to host a variety of native trees and large shrubs that will contribute to meeting the goal and increasing biological diversity,

**OUTDOOR FIELD EXPERIENCE:** Students will walk the grounds -- or a nearby park, if school has little open space -- and note existing species of trees and shrubs, and their general condition. They will create maps of the campus showing flora, with background information including the condition, economic value to the neighborhood (for online calculator, see: <http://www.davey.com/arborist-advice/articles/national-tree-benefit-calculator/>); value to wildlife [(1) production of berries, nuts and other fruits and (2) hosting of insect species that are food for birds; see: <http://www.bringingnaturehome.net/what-to-plant.html>)], along with other characteristics of the species.

**ACTION PROJECT**: Students will work with advisers to draw up a list of trees/ shrubs that could be planted and flourish in the space available. They will select the species that has the most potential importance to wildlife, devise a plan for continuing care, and plant one tree and one shrub (or more, depending on teacher interest and availability space).

**SYNTHESIS AND CONCLUSION:**  Students will determine what if any plans exist to increase the campus tree cover. Then draw up a proposal to present to the administration or groundskeeper, detailing the importance of trees in an urban context.

**INTENSIFICATION**: Students complete tree condition data forms for several major trees on campus, which allow an in-depth picture of health. They compute the height and circumference of the tree using standard measuring techniques. A rough calculation is made to determine what percentage of the campus open space is covered by tree canopy, and whether it exceeds or falls short of the District’s 40 percent goal. If a proposal has been made to plant more trees, students will determine the costs associated with the proposal and identify two or three different ways to fund it (PTSO, DCPS, Casey Trees, etc). (Tree care worksheet example: <http://www.cityofgriffin.com/Portals/1/Documents/Public%20Works/Trees/UFMTreeForms/Tree_Health_Worksheet.pdf>) One possible suggestion we might incorporate is Casey tree/Davey tree new i-tree https://www.itreetools.org/

**SUPPORT:** UDC Cooperative Extension Service, Casey Trees, DDOE, DC Urban Forestry Administration. (also, see DC Urban Tree Canopy Plan: [**http://doee.dc.gov/sites/default/files/dc/sites/ddoe/page\_content/attachments/Draft\_Urban\_Tree\_Canopy\_Plan\_Final.pdf**](http://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Draft_Urban_Tree_Canopy_Plan_Final.pdf)**)**

**MWEE Topic #6: Invading Plants !!**

**ISSUE:** Washington DC’s temperate climate supports a wide range of plant species, both native and exotic. The latter have become a major threat to biological diversity, and are found almost everywhere there is a patch of soil that isn’t regularly mowed or trimmed. Most of the problematic European and Asian species were brought to the US for ornamental purposes. It wasn’t noticed until later that many of the species had an advantage over native species since they faced no natural pathogens and had few animal predators. The invading vines blanket trees and eventually kill them by blocking light, or cover the ground and prevent growth of native seedlings. English Ivy, Japanese bush honeysuckle, porcelainberry, and Japanese knotweed are some of the more troublesome species. A good deal of environmental volunteer work is directed at removing invasive plants.

**OUTDOOR FIELD EXPERIENCE:** Students take an inventory of non-native plants found on the campus, including hypotheses about the ways in which the plants first arrived on the campus, and continue to spread (seeds, rhizomes, etc).

**ACTION PROJECT:** Students research and write report on invasive plant control for species found on the campus. These methods may include: hand clipping and removal, digging up roots, regular mowing, or chemical treatment. Based on class discussion of what is feasible for the school, the report will outline a plan for control and/or removal of the invasive plants.

**SYNTHESIS AND CONCLUSION:** Students draw up letter to parents or guardians asking them to remove invasive plants on their home property. Flyers will be created that identify invasive plants, and ask neighbors to assist in an eradication campaign.

**INTENSIFICATION:** Research project into existing government and non-profit organizations NGO efforts to control invasive plants in the District. The project will detail the history of the problem in DC, successes in controlling the invasive species and continuing challenges. (for one example: http://www.rockcreekconservancy.org/what-we-do/english-ivy-initiative)

**ORGANIZATIONAL SUPPORT:** Rock Creek Conservancy, Anacostia Watershed Society, local native plant societies. These groups may be willing to send a representative to the class to assist with identifying invasive plants during the outdoor field experience.