**MWEE Topic #10: Leaf Peeking**

**Issue:** Climate change is affecting many things in nature, and one of the more visible signs is the seasonal timing of leaf and flower appearance, which is coming earlier due to a warming trend. During the past few decades, scientists have watched and recorded the seasonal patterns of plants, which can have a ripple effect on numerous other communities in the natural world. A significantly earlier time of leaf out can influence the emergence of spring insect life, for example, disrupting the food source for migrant birds that arrive on a fixed “schedule.” ***Phenology*** is the study of the life cycle events -- known as *phenophases* -- of plants and animals. Scientists who observe the plant world are interested in numerous markers in this cycle, including: the time when leaves begin to unfold (budburst), when all the leaves are out, the time leaves turn color in the fall, and when the leaves drop. Students and others can be *citizen scientists* and help professional phenologists record data that contributes to establishing a pattern for individual species in different parts of the country.

**OUTDOOR FIELD EXPERIENCE:** Students choose specific trees on their campus to observe during the school year. In the fall, they record the day when the leaves on the trees reach a stage of about 50 percent color, and the day when about half of the leaves have dropped. In the spring, students mark the day when their tree experiences budburst (the shedding of protective scale covering of the bud, which exposes the soft new growth of one or more flowers or leaves). The next data entry is made when the tree has approximately 90 percent of its leaves unfolded completely.

**ACTION PROJECT:** Project Budburst (<http://budburst.org/education_9-12>) is an online site where non-scientists record data that will help professional phenologists. Students can register their observations at the site, and also begin to assemble a class data base that can form a final project at the end of the school year.

**SYNTHESIS AND CONCLUSION:** Students organize and make a presentation to other environmental science classes on their project, including a discussion of whether climate change would make a significant difference to the District.

**INTENSIFICATION:** Students use the plant phenology protocol as a starting point for a wider survey of organism life cycles on the campus. Other subjects for study might include the cicada, whose autumn disappearance varies depending on weather patterns. A bird box can be set up so that a common species such as the house sparrow, which nests almost anywhere, can be easily observed. The students record dates when the bird lays eggs, the young emerge and fledge. The information can become part of a school data base.

**ORGANIZATIONAL SUPPORT:** In addition to the Project Budbreak website noted above, Casey Trees has a phenology project, and can send a representative to the class to train students in the collection of data.

**MWEE Topic #11: Environmental Non-profits / Careers**

**Issue:** The Washington area, just like other regions of the country, has experienced a boom in non-profit organizations that make use of extensive volunteer networks and other resources to carry out ecological restoration and protection activities. This is one product of the environmental movement whose emergence was signaled by the first Earth Day in 1970. Groups such as the Anacostia Watershed Society, the Earth Conservation Corps, and the Rock Creek Conservancy complement the work done by government, often carrying out activities, such as advocacy and trash clean-ups, that are beyond the mission or capabilities of official agencies. The non-profit is a specific organization model that allows tax-free activities as long as the work is done for public benefit rather than production of income for shareholders or owners.

**OUTDOOR FIELD EXPERIENCE:** Teacher contacts one of the non-profit organizations and arranges for an environmental project on or near the campus. The activity is preceded by a classroom visit by a representative who discusses the organization’s history and mission, how he or she became involved with the group, and previews the planned activity.

**ACTION PROJECT:** After the activity, students discuss and evaluate the experience with a written report. The class discusses a follow-on project by the school and takes responsibility for organizing the event. Different school groups (athletes, thespians, honor societies, science clubs) are approached to contribute volunteers.

**SYNTHESIS AND CONCLUSION:** Class examines the idea of a watershed club that could be a permanent school organization dedicated to recruiting and deploying student volunteers (who would receive service hour credits) to perform the various environmental tasks around the campus – such as invasive plant removal – that have been introduced as part of the MWEE curriculum.

**INTENSIFICATION:** Students select and invite a representative of a government environmental agency to make a presentation to class on the career path to work as a scientist or policy-maker. The class contacts organizers of an upcoming school “Career Day” to ensure that environmental work is part of the event.

**ORGANIZATIONAL SUPPORT:** Groups cited above. Also, Rock Creek Park rangers are sometimes available to make class visits to discuss their work and career paths.

**MWEE Topic #12: Land Use and Environmental Justice**

**Issue:** Although the District of Columbia is not a classical example of a heavily industrialized city, its history and development show very well how Washington’s point source pollution has disproportionately affected neighborhoods of poverty and color. The concentration of toxic power plant sites along the Anacostia River, and the discharge of raw sewage – persisting even today – illustrate the necessity for environmental justice. Minority populations undertake or are subjected to environmentally hazardous activities because they lack political power, have few economic alternatives and/or are not fully aware of the risks involved. Along with the need to address remaining environmental issues in more affluent DC neighborhoods (e.g. World War I chemical munitions buried in Spring Valley), special attention must be paid to cleaning up the legacy of large-scale pollution in poor neighborhoods, and ensuring that these communities aren’t subject to environmental hazards in the future.

**OUTDOOR FIELD EXPERIENCE:**  A field trip, for schools located close to the Anacostia River or one of the toxic sites. Another potential destination could be the gigantic storage tunnels that are being built to hold sewage and storm water that normally would flow into the Anacostia or Potomac rivers, until the polluted water can be cleaned. Students research the history of the efforts to clean up the Anacostia River culminating in the lawsuit launched by the Anacostia Watershed Society in 1999, which targeted the DC government for failing to enforce U.S. environmental protection laws.

If the school is not in the Anacostia area, a walking tour can be made of the perimeter of the campus, noting the kinds of buildings (commercial, residential, government, other) that are on adjacent blocks. This forms a basis for a student hypothesis as to what the zoning is for the school neighborhood. Students research the different categories of zoning in the city and determine the zoning actually applied to the school neighborhood.

**ACTION PROJECT:** (Rebecca -- any ideas for this or the next category?

**SYNTHESIS AND CONCLUSION:**

**INTENSIFICATION:** Students research and write an environmental history of the school neighborhood or ward.

**ORGANIZATIONAL SUPPORT:** Anacostia Watershed Society, Earth Conservation Corps, DDOEE, DC Water.