MAPPING OUR PARKS
Teacher Notes

Overview

Mapping Our Parks (MOP) is a middle and high school three-lesson unit developed by the University of Maryland Center for Environmental Science ALESE group (http://alese.al.umces.edu) in collaboration with the National Park Service, Alice Ferguson Foundation and National Geographic Society. The MOP unit seeks to engage students in a watershed investigation that extends their *Bridging the Watershed* (BTW) field study and helps them understand land use impacts on the stream ecosystem at a particular site. While it can be used after any BTW field study, the MOP unit best supports *Don't Get Sedimental*, followed by *Watershed Watchdogs* and *Water Canaries*.

The unit uses real-world scientific data and "FieldScope"—an online mapping program developed by National Geographic ("Mapping Our Parks" at http://www.fieldscope.us/). Data in FieldScope have been customized for the MOP unit (e.g., high spatial resolution data are only provided within the MOP watersheds).

The MOP unit was constructed using the *Understanding by Design* curriculum framework (McTighe J. & Wiggins G.P. (2005); also see http://www.ubdexchange.org/). It centers on two enduring understandings (see *MOP 2009 Understanding by Design Curriculum Framework* document for targeted standards):

- A stream site is affected by environmental conditions in its upstream watershed.
- Human land use choices can alter runoff and negatively impact stream ecosystems.

MOP Unit Organization

To complete the unit, you will need multiple school computers with relatively fast Internet connections (ideally no more than two students per computer). To run the online FieldScope program, these computers must have the latest version of Adobe Flash Player. This free computer plug-in is likely already on school computers; if it is not, it can be downloaded from http://get.adobe.com/flashplayer/otherversions/. No other software or data need to be downloaded to school computers.

The MOP unit consists of three lessons (provided as PDF and Word documents in separate lesson folders on your CD). These lessons should be completed after the BTW field study because students will be analyzing spatial data pertinent to that experience (if you must do the MOP unit first, you will have to revise it somewhat). We recommend students complete all three lessons (as written or adapted in minor ways). The lessons include assessment in the form of reflection questions and the *MOP Report Worksheet*. The reflection questions are embedded within each lesson document and provided as separate documents within each lesson folder.

The FieldScope software is quite intuitive and the lesson instructions are fairly simple (additional guidance is provided in small yellow boxes in each lesson). Given this, we encourage you to verbally direct students through each activity—using the detailed written lessons as your guide. You can also use a computer and LCD projector to illustrate each step. In any case, you will need to distribute the following to students.

- Each lesson's reflection questions (provided as separate documents in corresponding lesson folders)
- *MOP Report* (students complete this over the course of the three MOP lessons)

Lesson Comments and Implementation Suggestions

Lesson 1

- Step 2
  - To save time, you may omit this step.
  - During the discussion, students should identify different surfaces on the land and describe (in their own words) how rainwater absorbs into some but not others.
  - During the discussion, point out any sediment in the river in the *Satellite Imagery* layer.
- Step 3: If necessary, tell students the national park stream site is near but not at the field site.
- Step 4: Students often just circle an area around the site. That is, they typically do not consider elevation or streams. This is fine at this stage. Later they will compare their predicted area of impact with the actual watershed provided by FieldScope.
- Step 5:
  - When computing the watershed, students must be somewhat zoomed in to ensure they are clicking directly on their park stream site; otherwise they will get an incorrect watershed.
  - Emphasize they must reduce the watershed's opacity to make it transparent.
- Steps 7 and 8: Students must click inside the watershed. If they click outside, they will get an incorrect flow path. Note that watersheds or flow paths outside the MOP watersheds will be coarser (more error) than those within the MOP watersheds.
- Step 9: Recall higher spatial resolution data are used to calculate the MOP watersheds and flow paths within these watersheds (relative to data outside these watersheds). However, these data are still at a lower resolution than that shown on the shaded relief map. Therefore, your students should see some errors when comparing watersheds or flow paths to the shaded relief map (e.g., the watershed boundary may incorrectly exclude a stream in its network or the flow path may not precisely follow a stream). Use these errors to clarify students' understanding of how water moves across the landscape (e.g., a watershed boundary cannot cross a stream) and to emphasize that all models (like the watersheds, flow paths, and even the shade relief map) have errors associated with them. You will have to adapt this discussion as appropriate for younger students who are less familiar with models.
- Reflection Question 3: You may need to help orient students in terms of compass direction.

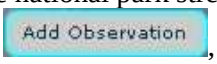
Lesson 2

- Step 1: When predicting which land cover types produce a large amount of stormwater runoff, students should suggest more human-dominated land cover types such as cities and suburbs (or sidewalks, parking lots, roofs), cleared areas (e.g., in preparation for a new housing development), and mined lands. They might not realize that agriculture can also produce runoff. For example, rain may not fully absorb into croplands or bare/sparsely-vegetated soil that is compacted by livestock or heavy farm equipment. Stormwater runoff from farms may contain loose soil (sediment), fertilizer and manure. In a reflection question, students are asked to consider possible impacts of agriculture on stormwater runoff; their answer may include one of the above examples or others (e.g., cattle crossing streams break down stream banks and/or add manure directly to stream water).
- Step 2 and 3: You may choose to round differently—if at all.
- Steps 2 – 4: These steps use proportions, which range from 0-1.
- Step 3
  - The rain depth of 5 cm was estimated using NOAA's National Weather Service Hydrometeorological Design Studies Center Point Precipitation Frequency Estimates from NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/) data. It is based on a large storm 6 hours in duration that occurs every 2-5 years in Frostburg MD, which is representative of the Central Appalachian region.
  - Remind students to convert the depth of rain to km first, then multiply it by their value for *MOP Report* item 1.2 (i.e., watershed area), and NOT by the value 1.2.

Lesson 3

- Steps 3 and 6: To save time, you may omit these steps. If you do, you must also omit *MOP Report* items *3.3 – 3.5*, and *3.7*.
- The definition of each land cover type is provided in FieldScope. Open the information window for the *Land Cover* layer, position the mouse over each land cover type, and a new window will open with that definition.

Miscellaneous

- Younger students may have difficulty with the layout of the directions and the reading level. If necessary, review how the directions are laid out before starting the unit (i.e., the numbered item is a general description of what they will do in a step; often below a numbered item are bulleted directions for accomplishing that step). You may need to verbally clarify a particular direction or description.
- Before beginning the unit, check EACH computer to ensure the latest Adobe Flash Player is installed.
- You may wish to divide the *MOP Report* into three separate handouts according to lesson.
- Between the lesson 1 overview and step 1, direct students' attention to the *MOP Report* and explain how they will be using the directions in the lesson to gather data and record it on the report.
- After lessons 1 and 2, save each partially completed *MOP Report* for the next lesson.
- If you implement multiple lessons in one day, refresh your web browser between lessons to return to the main starting screen.
- You may add observation data that your students collect at the national park stream site using the following steps: log in, click on the **Add Observation** button 

, click on the map at your observation location, and then edit/enter your data in the **Edit Observation** window that opens. For the *Organization*, you must enter "MOP."
- You may instruct students to print any maps they create using the following steps: click on **Save Map…** in the lower right corner of your screen; in the **Opening FieldScope_Map.png** window that opens, click on the radio button next to **Save File**, then click **OK**; in the **Enter Name of File to Save To** window that opens, navigate to the location you want to **Save in:**, type a descriptive **File name:**, leave the **Save as type:** as PNG Image, and click **Save**.