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| **Water Dawgs Lesson Plan**  **Topic: Urban Watersheds**  **Learning Module #3** | | | |
| **Lesson Objectives(s):** | | * SWBAT define: watershed, percolation, ground water, runoff, water quality monitoring. * SWBAT describe characteristics of an urban watershed. * SWBAT analyze maps to explain how land use changes could affect stream ecosystem health. | |
| **Associated NGSS Standard(s):** | | N/A | |
| **Associated A.P. Environmental Science Standard(s):** | | * ERT-4-F-Describe the characteristics of a watershed | |
| **Materials:** | | * PowerPoint * Printed Materials:   + Lesson Worksheets (WS) – 1 set for each student   + Maps A, B, C, and table from activity “Color Me a Watershed” (Handout 1 [H1]) – 1 set for each student   + UGA Campus Watershed Management Plan ­­– p. 1-9 (Handout 2 [H2]) – 1 for each student * Colored pencils * Markers * Poster paper (1 for each group) | |
| **Instructor to do before lesson** | | * Print:   + Lesson Worksheets (WS) – 1 set for each student   + Maps A, B, C from “Color Me a Watershed” Activity – pp. 246-248 (Handout 1 [H1]) – 1 set for each student   + UGA Campus Watershed Management Plan – p. 1-9 (Handout 2 [H2]) – 1 for each student * Look over PPT/Lesson plan * Ensure video works with sound * This lesson plans includes an activity from Project WET (“Color Me A Watershed”). You need to purchase this activity form Project WET:   https://www.projectwet.org/ | |
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| **Part of Lesson** | **Time** | **Duration** | **Lesson** |
| **ENGAGE** | 9:00 | 15 min | Think, Pair, Share  \*\*Pass out lesson worksheets (WS).  \*\*Students will answer the following questions as a think, pair, share:  Question 1: Why is access to clean/healthy water important?  Question 2: What are some factors that might make a water supply polluted or unhealthy?  ^^Allow ~6 min for writing, ~3 min for sharing with a partner, and ~6 min for class discussion. |
| **EXPLORE** | 9:15 | 1 hour | “Color Me a Watershed” from Project WET  \*\*Pass out copies of Maps A, B, and C “– pp. 246-248 of H1. Students will have the associated table in the lesson worksheet.  \*\*Explain maps represent aerial views of an area  of land taken over a period of 100 years.  \*\*Have students look at a key for each map.  \*\*Instruct students to designate each land area with a different color (e.g., all forest areas are green). They should use the same color scheme for all of the maps. Once students are done coloring-coding the maps for the different land types, they will calculate the % of each land type for each map.  \*\* Show an example of how to color in land types, and how to calculate % area.  *🡪We recommend that you have different students start on different maps (examples: students 1 and 2 start on map A, students 3 and 4 start on map B, students 5 and 6 start on Map C). Then, if students don’t complete activity in time allotted, they can work together to answer questions.*  ^^Allow 10 min for instruction  ^^Allow 35 min for color-coding and calculations  \*\*Lead the group in a discussion the following questions:  -What happens to the amount of forested land as you go from Map A to Map C?  -Which has the most land devoted to residential (i.e., human settlements?)  -Where are the most human settlements located? Why do you think that is?  -What effect might these human settlements have on the stream? Good or bad?  ^^Allow 15 min for discussion. You can have students answer as think, pair, share, or as class discussion. |
| BREAK | 10:15 | 15 min | BREAK |
| **EXPLAIN** | 10:30 | 30 min | PPT/Guided Notes  \*\*Review key concepts through a PPT and guided notes.  *🡪 Note that these slides are modified from the Atlanta Watershed Learning Network.*  ***🡪You can use the “notes” in the notes each slide of the PowerPoint to elaborate on/explain each slide.***    \*\*Explain instructions for guided notes:   * Listen and ask questions! * Write down anything you see that is **bold, brown, and underlined**   *🡪 Make sure to relate notes/definitions/topics to opening activity! …. in other words, try to make the “guided notes” section as interactive as possible!*  **Slide 1**  Watershed -- **an area of land where water drains into a larger body of water**  **Slide 2**  🡪*Connect term “watershed” to aerial photographs we analyzed in explore activity*  **Slide 2**  Filtration/Percolation – **when water drains through the soil**  Groundwater – **water held underground in soil or rock**  **Slide 3**  Natural water cycle vs. urban water cycle  *🡪 Connect “percolation” to forested areas in explore activity*  **Slide 4**  Runoff in urban areas  🡪 *Connect increased runoff to maps from explore activity.*  **Slide 5**  Impervious cover – **surfaces that do not permit water filtration through the soil**  **Slide 6**  Why is increased runoff in urban watersheds a problem?  ^^Allow students time to provide answers  **Slide 7**  Increased surface runoff =   * Increased sediment transport * Increased pollutant transport =   More polluted streams!!  **Slide 8**  How can we track how healthy a stream is?  **Slide 9**  Water quality monitoring – **sampling and analysis of water conditions**  *🡪Discuss ways we can monitor the water quality of a stream*  ^^Allow 30 min for guided notes. |
| BREAK | 10:45 | 15 min | BREAK |
| **ELABORATE** | 11:00 | 1:15 | Campus Watersheds Overview  \*\*Explain how we will be focusing our water quality monitoring efforts on a campus stream. Before we begin learning different ways to conduct water quality monitoring, we want to learn a little bit about the watersheds and about the history of the campus streams.  \*\*Show first four minutes of campus watershed video:  <http://waterlight.mynmi.net/watershed.html>  \*\*Pass out 9 Element Watershed Management Plan to students (p. 1-9 of H2).  \*\*Split students up into two groups: one for Tanyard and one for Lily Branch.  \*Students will read the section of the plan that pertains to their group (Tanyard or Lily Branch). While students read, students will circle terms they don’t understand.  ^^Allow 15 min for individual reading  \*Students will work within groups to make a list of unknown terms. Once they do this, each group will share out unknown terms to the class and we’ll work together to define them  \*\*Have students write out definitions on whiteboard or on overhead projector.  ^^ Allow 15 min for term defining  \*Students will work together in their groups to create a poster to summarize watershed characteristics of each campus stream (Tanyard or Lily). Student should include the following on their poster:  -Name of stream  -Drawing of watershed shape  -% impervious surface (estimate)  -% ownership of land (e.g. UGA vs. residential)  -Stream length  -Brief history  -Summary of water quality problems with stream  ^^Allow 30 min for poster creation  \*Each group will share their poster with the class.  ^^Allow 15 min for presentations |
| **EVALUATE** | 12:15 | 15 min | Exit slip  \*\*Have students answer questions on their lesson worksheets.  Question 1: How are urban watersheds different than non-urban watersheds? Explain with words or draw a picture.  Question 2: ow can urbanization negatively affect stream health? Explain in words.  ^^Allow 10 min. Collect responses and review after the lesson. |