5 Forestry Lessons
By Margaret M. McGregor

Unit Overview
I have chosen to integrate activities throughout the school year rather than as a single five day unit, and incorporate into both the 6th grade and 7th grade science curriculum as follows:

6th Grade:
Lesson One – Signs of Fall
Lesson Five – 400-Acre Wood
Lesson Four – Stream Study

7th Grade
Lesson Two – Water Wonders
Lesson Three – Understanding Watersheds

With the sixth graders, I would like to start the school year by using the schoolyard to work on observation, identification, measurement, and prediction skills. Since we are now a trimester school year, I would like them to revisit their areas again during the winter and spring terms. Additionally, I would like to update our ecology unit with new stream study and wrap-up activities.

The seventh grade curriculum will use the watershed lessons. Based on the MEAP results, this is an area where improvements can be implemented for better retention and testing results. We tried remediation this past year with both sixth and seventh graders regarding the water cycle in general. I would like to strengthen that unit, especially now that it’s a 7th grade Grade Level Content Expectation (GLCE).

Sources

Content Benchmarks

6th Grade

Inquiry Process
S.IP.06.11 Generate scientific questions based on observations, investigations, and research.
S.IP.06.13 Use tools and equipment (spring scales, stop watches, meter sticks, and tapes, models, hand lens, thermometer, sieves, microscopes) appropriate to scientific investigations.
S.IP.06.14 Use metric measurement devices in an investigation.
S.IP.06.15 Construct charts and graphs from data and observations.
S.IP.06.16 Identify patterns in data.

**Inquiry Analysis and Communication**
S.IA.06.11 Analyze information from data tables and graphs to answer scientific questions.
S.IA.06.12 Evaluate data, claims, and personal knowledge through collaborative science discourse.
S.IA.06.13 Communicate and defend findings of observations and investigations using evidence.
S.IA.06.14 Draw conclusions from sets of data from multiple trials of a scientific investigation.

**Reflection and Social Implications**
S.RS.06.13 Identify the need for evidence in making scientific decisions.
S.RS.06.15 Demonstrate scientific concepts through various illustrations, performances, model, exhibits, and activities.
S.RS.06.17 Describe the effects humans and other organisms have on the balance of the natural world.

**Ecosystems**
L.EC.06.11 Identify and describe examples of populations, communities and ecosystems including the Great Lakes region.
L.EC.06.31 Identify the living (biotic) and nonliving (abiotic) components of an ecosystem.
L.EC. Describe how human beings are part of the ecosystem of the Earth and that human activity can purposefully, or accidentally, alter the balance in ecosystems.

**7th Grade:**

**Inquiry Analysis and Communication**
S.IP.07.11 Generate scientific questions based on observations, investigations, and research.
S.IP.07.13 Use tools and equipment (spring scales, stop watches, meter sticks, and tapes, models, hand lens, thermometer, sieves, microscopes) appropriate to scientific investigations.

**Earth Systems**
E.ES.07.81 Explain the water cycle and describe how evaporation, transpiration, condensation, cloud formation, precipitation, infiltration, surface runoff, ground water, and absorption occur within the cycle.
E.ES.07.82 Analyze the flow of water between the components of a water shed, including surface features (lakes, streams, rivers, wetlands), and groundwater.

**Lesson One – Signs of Fall**

**Overview**
This activity will be a bridging experiment for the students from prior activities involving schoolyard observations and measurements made during the opening weeks of school and chemistry and photosynthesis units they will experience later in the school year. Students can have trouble make the connections between the various branches of science. Since schoolyard observations can be made throughout the year, students will also be able to make the connection that all of science is can on-going dynamic process.

**Grade level: 6th grade**

**Objectives:** Students will be able to
1. Understand why leaves of deciduous trees change color in the fall.
2. Demonstrate the process of paper chromatography.
3. Demonstrate that chlorophyll is decreased or lacking in dying or dead leaves.
4. Compare and share their results with other students.
5. Complete a lab report using the scientific method.

Materials:
Coffee filters
Tape
Scissors
Metric rulers
Rubbing alcohol
Safety goggles
Green leaves
Leaves of various colors
Clear jars

Activity
Using the scientific method, students will investigate the question “Why do leaves change color in the fall?” Using Part B of the Learning Tree Activity “Signs of Fall”, students will conduct chromatography experiments to verify their hypothesis. Give students the background information found in the lesson which discusses various seasonal changes in the fall, focusing particularly on the role of chlorophyll. Explain to the students the process of chromatography in determining which chemicals cause coloration in leaves. Do the experiment using rubbing alcohol to separate the green chlorophyll pigments from the orange carotenoid pigments. Student should be filling in their lab reports* at the appropriate times while the experiment is conducted. As the lesson suggests, students could be divided into groups assigned to different colored leaves. Using shared student data during class discussion following the completion of the experiment, individual students should recorded additional data about leaves that vary in color from their own.

Assessment:
Each student should fill in their own copy of the lab sheet as they prepare, conduct and analyze the experiment. Conclusions should not be written before class discussion has taken place. The completed lab report will be turned in for a lab grade. Interested students are encouraged to return after school to repeat the experiment using dead leaves. Their results can then be shared with their classmates.
Lab Report Form

Title of Lab ________________________________

Question or Problem

Hypothesis

Materials

Data

Analysis

Conclusion

Reasons for Errors or Improvements
Lesson Two - Water Wonders

Overview
After reviewing the latest MEAP results for the eighth graders, it was evident that our students needed remediation in their understanding of the water cycle. A simple series of pre- and post- quizzes used by the sixth and seventh grade students were developed based on various short “bell ringer” activities (basically repeats of the pre-test facts). These were very brief and passive assignments. I would like to pilot portions of the Project Learning Tree, Activity 44 – “Water Wonders” when we explore the water cycle so that more active student integration is involved.

Grade level: 7th grade

Objectives: Students will be able to
1. Name and define the various component of the water cycle.
2. Describe the path a water molecule might take on its way through the water cycle.
3. Label a diagram of the water cycle.

Materials:
- Project Learning Tree Activity Guide
- 2 stream tables – one with sod, one with bare soil
- Enlarged copies of the water cycle diagram from page 189 minus the labels, printed on one side of the student handout sheet
- Water Cycle Score Card, printed on the other side of student handout sheet
- Set of direction cards for “Go to the Head of the Cloud” simulation
- Overhead enlargement of Earth’s water distribution chart

Activity:
Prior to using the “Water Wonders” activity from Project Learning Tree, have students fill out their copies of the water cycle with the missing vocabulary terms. Terms can be listed on the board or overhead. Assuming that this is review from previous lessons, students may work with their table partner if desired. Check for accuracy and clarifications. Proceed to follow as written the directions for playing “Go to the Head of the Cloud” game from the manual. Pay extra attention to the questions in step 2. (Example: Do you think water always follows the same path as shown in the water cycle?) Basically the activity works as follows: Divide the class into seven groups who will be directed to go one of seven stations titled either Cloud, Glacier, Ocean, Stream, Groundwater, Animal, or Plant. Station locations have already been identify and marked before play begins. To start, each group receives an instruction card that list six steps in the path their water molecule will follow. When the teacher calls “cycle” students move to the next station as directed on their card. Run through at least nine “cycles”. Using questions from step 10 discuss what different path ways the students experienced.

Assessment:
Students will discuss in their science logs any modification that might be needed to the labeled water cycle that reflects local conditions and the Great Lakes area. Groups can hold discussions before a final class consensus is taken. Students should note any additional notations in their science logs. This entry will be part of their science log trimester grade.
Lesson Three – Understanding Watersheds

Overview
As with Lesson Two above, after review the latest MEAP results for the eighth graders, it was evident that our students needed remediation in their understanding of watersheds. I would like to pilot portions of the MEECS Water Quality Lesson 3 – “Do You Know YOUR Watershed?” when we explore watersheds so that more active student integration is involved.

Grade level: Seventh Grade

Objectives: Students will be able to
1. Define and identify a watershed and associated terminology
2. Model and label an example of a watershed

Materials:
Teacher demonstration
- MEECS Water Quality manual
- Table cloth
- Squirt bottle of blue colored water
- Set of watershed labels
- Poster of Michigan’s watersheds

Student
- Disposable plastic table clothes cut into quarters to use in student groups, one section per group
- Permanent markers
- Paper cups
- Dissection pin
- List of watershed terms
- Student Journal/log
- Sponges
- Buckets

Activity:
Using procedure 2 of Lesson 3 – "Do You Know YOUR Watershed?", create a demonstration landscape as directed for the class. Students will develop a vocabulary list based on the twelve terms listed on page 44. As the teacher identifies these features while spraying and then placing the labels on the watershed landscape, students will write descriptive definitions on their science logs. The teacher may wish to use overhead copies of page 50 – “Diagram of a Watershed” and/or page 51 – “Overview of a Stream” to supplement the physical demonstration. Students are encouraged to draw their own diagrams in their logs. Clear the labels then rearrange the watershed landscape and have students place the labels in appropriate positions this time.

If weather permits take student outside to build their own watershed landscapes. Otherwise, tables or indoor floor space could be used. Demonstrate the paper cup method of creating rain. Distribute group supplies and allow student to arrange their own water sheds using various materials they have on hand. Students can carefully label their watersheds with the permanent markers.
Assessment

Before final cleanup, each student should sketch in their logs, the watershed his/her group developed, including correctly labeled features. Using the Michigan watersheds poster*, during class discussion, students will label by local names as many features as they can identify. Their entry will become part of their science log grade for that trimester.

* Sorry, I can not identify the creator of this map but I have used it often in past years. It is currently stored at school. More local landmarks are named and label than the one included in the supplements we received. I believe it is part of a Great Lakes kit produced some years ago by the DEQ.

Note: If time warrants, this activity could be scaled back for the sixth graders prior to their annual spring field trip to the local nature center.

Lesson Four – Stream Study

Rationale

For several years, our annual trip to the local nature center has included a study of the biotic and abiotic components of one of the streams. While the students have fun exploring the stream there is little formal data collection and analysis of the health of the stream. I would like to pilot an upgrade of this activity using some of the techniques described in MEECS Water Quality Lesson 7.

Grade level: Sixth grade

Objectives: Students will be able to
1. Determine the relative health of a local stream using data collected on site
2. Use various measurement instruments correctly
3. Determine if the local stream can support brook trout and validate their answer with collected data.

Materials:

Copies of the following pages of lesson 7 from MEECS Water Quality binder:
- Aquatic Food Chain in a Stream
- Information on the Brook Trout
- Temperature/pH/Dissolved Oxygen
- Biological Assessment Data Form
- Stream Habitat Assessment
- Physical Stream Measurements: Velocity and Flow Data Sheet
- Included in FTI packet on stream study
- Stream Assessment Worksheet (teacher generated)
- Clipboards
- Pencils

Note: All equipment and test kits are available at the nature center – thermometers, ph test kits, meter sticks, packaging peanuts/corks, collection pans, microscope, etc.
Activity:
After listening to an introductory lecture by the nature center staff and using parts of lesson 7 of the MEECS Water Quality binder, students will observe, test, measure and record data taken streamside for analysis back in the classroom. Typically, a class of 30 students is divided into two general groups to study the biotic and abiotic characteristics of the stream. This will be either a full morning or afternoon session.

The abiotic group is further divided into groups that will measure the following data – water pH, turbidity (new data), temperature, average water depth of at least 3 different locations (new data), stream habitat assessment sheets (new data), rate of stream flow (new data).

Down stream, the biotic group spreads out in pairs to collect aquatic organisms for sampling and counts (new data). They will use the Biological Assessment Data form to record and interpret their finds.

Groups then exchange places and complete their data collection.

Once back in the classroom small teams of four students will compare data and complete the steam assessment worksheet to determine if the stream is healthy enough to support a population of brook trout. Each team will also be given copies of the brook trout information and Temperature/pH/ Dissolved Oxygen fact sheet.

Assessment:
The Stream Assessment Worksheet must be completed by each team before a classroom discussion can take place. Collected data from each team will be compared and general consensus should be reached and verified. Teams will submit their worksheets for assignment credit. This data will also be used in Lesson Five.

**Stream Assessment Worksheet**

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<tr>
<th>Group Members’ Names:</th>
<th>Date _______________</th>
<th>Class Hour ______</th>
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Directions:
Using the data you collect at the nature center and the information on brook trout and dissolved oxygen, discuss and complete the following table. Once you have finished the table use that information to determine whether the stream you studied is healthy enough to support brook trout. Include at least three reasons based on your data. Please use a formal paragraph when writing your answer.

A. List the habitat requirements needed by the Brook Trout in the first column. Insert the data from your stream study at the Nature Center in the second column.

<table>
<thead>
<tr>
<th>Abiotic Characteristics</th>
<th>Brook Trout requirements</th>
<th>Kalamazoo Nature Center</th>
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<tbody>
<tr>
<td>Water Temperature</td>
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<tr>
<td>Dissolved Oxygen (ppm)</td>
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<td>Ph of water</td>
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B. Is the stream you studied at the Kalamazoo Nature Center healthy enough to support a stable population of Brook trout? Using a paragraph, please give at least three reasons for your answer.

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**Lesson Five – 400-AcreWood**

**Rationale**
For several years, once our fieldtrip at the end of the school year was completed, there has been no formal way to wrap up and evaluate what students have learned from the ecology unit. I would like to pilot Project Learning Tree’s Lesson 50 as an assessment piece.

**Grade level: 6th grade**

**Objectives:** Students will be able to:
1.) develop a reasonable land use management plan based on scientific data.
2.) synthesize data and information collected throughout the year to support their solution to a real-life problem.
3.) consider and interpret the economic as well as the environmental impacts of their management plans.

**Materials:**
- **Teacher**
  - Project Learning Tree manual
  - Power points from Forestry Institute – various slides and topics
  - Various data and notes collected during the year

- **Students** - per group of four
  - One copy of student pages titled “If You Were the Boss” and “What’s the Score?” (plus enough for one per student)
  - Physical Stream Measurements: Velocity and Flow Data Sheet
  - Color markers
  - Poster paper
  - Calculators
  - Masking tape
  - Student data and notes collected during the year and on the nature center trip
  - Physical Stream Measurements: Velocity and Flow Data Sheet
Activity

Prior to the day of this student activity, the teacher will present some background information on forest management taken from the PLT and the slideshows given during the FTI. Students will keep notes in their science log to be used along with any prior data and information gathered during the school. The teacher may select prompting/discussion questions from the lesson as written or develop their own based on the experience the students have had during the year.

On the first day of the activity, students will be given copies of the “If You Were Boss” pages to be read and discussed as a class. Suggesting that management of our local nature center would now be in their hands, each student should start to devise a plan based on the “What’s the Score” worksheets. Remind students to use pencils since corrections might be needed once groups are formed. Students should use information from earlier studies to develop a plan that is practical based on biotic and abiotic factors that are currently found in their local community. (Students are encouraged to work on these at home to share ideas and suggestions with their families, as this is a much used preserve in our district.)

During day two students will divide into groups of four to consolidate their ideas into one plan making note on their own copy of any changes. For day three students will complete a map of their plan on a grid sheet which includes a color coded key with symbols. On day four groups will be presenting their plans to the entire class and putting them on display. Flexibility in the required number of class periods may be needed. If time permits, a general class discussion of their estimation of the best plan generated could be used to debrief the unit.

Assessment

Students will submit their personal copies of the “What’s the Score?” worksheet along with answers to several questions selected from step 8 of the lesson. Students will use data collected earlier to justify their answers. Any data used should be attached to their submission.

400 Acre Wood – Final Assessment

On a separate piece of paper please give thoughtful answers to the following questions. You may use any data we have collected throughout the year including in class information and observations or data collected from our school yard, the Nature Center, or your own backyard. Be sure to staple any data sheets or notes to your answers. Please use formal paragraph format.

1.) What do you think is most important: having the most trees, the most wildlife, or the most visitors? What information makes you think so?
2.) Which group plan is most realistic financially? Use score sheet data to show this.
3.) Which plan provides the best balance of money, wildlife, and visitors? Use data to back your selection.
# Rubric – 400 Acre Wood

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<th>Group ___________________________</th>
<th>Date ___________</th>
<th>Class Hour ______</th>
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## Group grade
- **Poster**
- **Final cost sheet**
- **Presentation**
- **Total Points**

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