Teacher Checklist

Before the program

☐ Program Application and Intake Form
☐ Pre-Assessments
☐ Attend Watershed Wise Teacher Training
☐ Check our calendar for program scheduling
☐ Print data sheets for your class

During the program

☐ Have fun!

After the program

☐ Post-Assessments
☐ Program Evaluation
☐ Stewardship project summary (short description of your students' work emailed to watershd@uvm.edu)
Stream Monitoring & Stewardship

PROGRAM DESCRIPTIONS

Watershed Model Demonstration/Discussion
Grade Level: 5th – 12th
Time Required: 1 – 1 ½ hours
Description: This interactive table-top model by Enviroscape® is designed to introduce key watershed concepts including the definition of watershed, types and sources of pollution, effects of pollution on humans and ecosystems, the differences between non-point and point source pollution, and best management practices.

Study Design and Equipment/Methods Demo (mandatory)
Grade Level: 5th – 12th
Time Required: 1+ hour
Description: It is imperative that students understand the scientific method and identify the monitoring question driving the field study before collecting data. Introducing the study design and the methods that we’ll use in the field will increase the quality of the data collected and help to ensure that the field experience goes smoothly and efficiently. One of several options for covering these topics are self-paced exploration stations (see program handbook for additional information).

Introduction to Watershed and Water Quality Monitoring
Grade Level: 7th – 12th
Time Required: 30 minutes – 1 hour
Description: This PowerPoint presentation covers the definition of a watershed, effects of imperious surfaces on the water cycle, benefits of healthy watersheds, reasons why we monitor water quality, and an introduction to aquatic ecology and water quality parameters.

Habitat/Physical Assessment
Grade Level: 5th – 12th
Time Required: 1 hour
Description: Monitoring physical characteristics of the river can provide a context for evaluating chemical and biological parameters, and can be the simplest and most effective way of evaluating a river’s health if time and resources are limited. It can also be useful to compare physical assessments from year to year to understand the dynamics of a river system. Physical parameters include stream depth and width, velocity, substrate, discharge, and transparency.

Chemical Monitoring
Grade Level: 5th – 12th except where noted under equipment/methods
Time Required: 1+ hour (for all parameters)
Description: Chemical monitoring allows us to view water quality parameters for a snapshot in time. Collecting chemical data can be useful for identifying areas for further investigation, and can help students better understand the differences between and interactions of abiotic and biotic components of an aquatic ecosystem.
  
  **pH** (10 minutes)
  Equipment/Methods: Hach pH test strips
Dissolved Oxygen (20 minutes)
Equipment/Methods: Hach Dissolved Oxygen Test Kits (Winkler Method), demonstrate for grades 5th – 8th; YSI 85 Meter

Phosphorus (15 minutes)
Equipment: Hach Pocket Colorimeter II Test Kit, demonstrate for 5th and 6th grades

Conductivity (10 minutes)
Equipment: YSI 85 Meter

Benthic Macroinvertebrate Sampling
Grade Level: 5th – 12th
Time Required: 1+ hour for Streamside Survey; 4 hours for Intensive Laboratory Inventory

Streamside Survey: In this method, all work is done in the field. This involves collecting the sample using a net, sorting and identification of major groups (mostly orders, a few families, some classes) of benthic macroinvertebrates, and assessment of primary habitat characteristics. Approximately 0.28 square meters of the stream bottom are sampled. The relative abundance and richness of the each major group is determined, a field sheet is filled out, and the organisms are returned to the stream.

Microbiology
Grade Level: 5th – 12th
Time Required: 10 minutes (sample collection), 24 – 48 hours (sample processing)

Total Coliform/E.coli: We use the Quanti-Tray method to quantify Total Coliform and E. coli. A 100 ml water sample is collected in the field, kept on ice, and processed in the lab no longer than 6 hours after the sample was collected. We use two different nutrient reagents: Colilert, which is E.P.A. certified for testing ambient waters and has an incubation time of 24 – 28 hours; and Colisure, which is not E.P.A. certified for testing ambient waters (it’s E.P.A. certified for testing drinking water), but has an incubation time of 24 – 48 hours. We will email you with your results.

Outreach/Stewardship Project (mandatory)
Grade Level: 5th – 12th
Time Required: varies
Description: UVM Watershed Alliance emphasizes action based on unbiased scientific information. The Community Outreach/Stewardship component allows students to utilize their creativity while they extend their findings to and become engaged in their local community.

Community Outreach: Program participants have presented their findings to local planning commissions, school boards, watershed groups, and parents. Other Community Outreach projects have included the production of a series of public service announcements broadcasted on the radio, brochures, websites, and participant led lessons for younger students.

Conservation Service/Stewardship: Opportunities exist to partner with community organizations to implement on the ground conservation service or stewardship projects. UVM Watershed Alliance can assist your class in identifying a meaningful project and establishing a partnership with the appropriate community organization. Examples in the past have included riparian tree plantings, invasive species removal and clean-up days.
Teacher Expectations Agreement

In order to ensure that students get the most out of our programs and that data collected in the field is accurate and useful, we ask that teachers participating in our programs sign an expectations agreement of their duties and responsibilities before the start of a program. After you have read through all the criteria please sign on the line below. If you have any questions or concerns with these criteria please contact Erin De Vries to discuss options and/or alternatives.

1. Teachers must actively participate in group management of their students while they are engaged with UVM Watershed Alliance programs. This will ensure that watershed educators can focus on giving the most informative and engaging lesson possible.

2. Teachers must ensure that students fill out their data sheets completely. If students work better individually or in teams that is fine, as long as one datasheet per site is filled out in its entirety.

3. Teachers must collect all datasheets from their students and upload this data onto the Watershed Alliance database (instructions will be provided). If data is taken from more than one site, teachers will need to average this data before putting it online.
   (Note: if students are split up in groups and have collected data from two different spots from the same stream, this counts as two sites)

4. Teachers must organize and implement a Community Outreach and/or Stream Stewardship piece for the benefit of their community immediately following the end of a WA program. WA staff will assist in providing ideas and contacts for this project.

5. Teachers must administer a pre-assessment to their students 1 week prior to participating in a program. These assessments need to be collected and sent to WA via snail mail, scan or personal delivery so that educators are aware of where students are at in the learning process.

6. Teachers must ensure that all of the forms/documents below have been completed and are sent to UVM WA at the appropriate time listed below. These documents can be sent online or mailed to WA’s physical address.
   - Application Form (pre-program)
   - Intake Form (pre-program)
   - Pre-assessments (1 week before start of program)
   - Post-assessments (1 week after last program date)
   - Evaluation and Program Stats form (1 week from last program date)
   - Community Outreach and/or Stream Stewardship project work i.e. photos, reports, stream clean-up posters, announcements, etc....

The deadline for sending these items will be on June 20th and November 20th depending on whether you participate in a spring or fall program. Any school participating in an off-season program (e.g. summer or winter) has two weeks to send documents after the end of the last program.

Print Name: ___________________________ Date: ________________

Signature: ___________________________ Date: ________________
Please use the links provided below to access forms we require before and after your work with UVM Watershed Alliance (UVM WA). We can provide hardcopies if that is your preference, but please be aware that we encourage the use of our online forms.

**Required before beginning a program with UVM WA**

Stream Monitoring and Stewardship Program (SMSP) Application:
http://www.uvm.edu/watershed/stream-monitoring-and-stewardship-program-teacher-application-0

SMSP Intake Form:
http://www.uvm.edu/watershed/stream-monitoring-and-stewardship-program-intake-form-0

**Required after program is complete:**

Program Statistics and Evaluation Form:
http://www.uvm.edu/watershed/program-statistics-and-evaluation

Downloading Data onto website:
http://www.uvm.edu/watershed/video-tutorials-data-reporting

(This is a series of videos that provide instructions on how to upload stream monitoring data onto our website)
UVM Watershed Alliance
Stream Monitoring & Stewardship Program Assessment for Elementary-Middle School students

School: ____________________________ Grade: _______________ Date: _______

Circle one: Is this your Pre or Post Program Assessment?

1. How does water move from land to air, through soil, and back to land again as part of the water cycle? Label 2 of the white boxes, which explain a part of the water cycle.

2. What is a watershed? **Circle ONE answer:**
   a. An area of land that catches rain water and drains it into a body of water
   b. Another name for groundwater
   c. A body of water that is larger than a pond but smaller than a lake

3. **Circle the 2 Non-Point Sources** of water pollution:
   a. A farm (with fertilizers, pesticides, manure, and soil erosion)
   b. A residential area (with pet waste, household chemicals, fertilizers and pesticides)
   c. An industrial plant (with treated waste liquids)

4. What is the name of the process of soil being worn away or removed from the surface of the land by wind or water?

   The name of the process is: ______________________________

5. Can water go through (infiltrate) cement, pavement or hard packed soil?

   **Circle:** Yes or No

Bonus Point: What is the definition of pervious?

6. **List 1 Benthic Macro Invertebrate** (small organisms that live under rocks in streams and rivers) that are sensitive to pollution in the water, and are very important to look for when measuring the health of a stream or river:

   Name one pollution intolerant BMI: ______________________________
7. List 2 Best Management Practices (BMPs) that you can do in order to reduce the amount of pollutants entering your local streams and lakes:
   a. 
   b. 

8. What is turbidity a measure of?

9. Which nutrient, when in excess, can lead to algae blooms in some areas of Lake Champlain? Circle one. (Extra bonus point if you can name two)

   A. Potassium
   B. Phosphorus
   C. Calcium
   D. Fluoride
   E. Nitrogen

10. What part of the river contains the most oxygen?

    a. Run (where water moves somewhat quickly)
    b. Pool (where water moves very slow)
    c. Riffle (where water moves quickly)

11. Humans go to a stream and remove all of the trees that live around the banks so they can develop the property. Is this good or bad for river fish? Explain your answer.

12. Circle the benthic macroinvertebrate that is intolerant of pollution: (Extra bonus point if you can name the species)
1. How does water move from land to air, through soil, and back to land again as part of the water cycle? **Label 3 of the white boxes**, which explain a part of the water cycle.

2. If the grass in the image above were covered in pavement or cement, the rainwater would be able to **infiltrate** the soil. **Circle True** or **False**

3. What is a **watershed**? **Circle ONE answer**:
   a. An area of land that catches rain water and drains it into a body of water
   b. Another name for groundwater
   c. A body of water that is larger than a pond but smaller than a lake

4. **Circle the 3 Non-Point Sources** of water pollution:
   a. A farm (with fertilizers, pesticides, manure, and soil erosion)
   b. A residential area (with pet waste, household chemicals, fertilizers and pesticides)
   c. An industrial plant (with treated waste liquids)
   d. Stream banks and lakeshore (with erosion)

5. **List 2 ways** oxygen becomes dissolved in water:
   a. 
   b. 

6. What is turbidity a measure of?
7. Benthic Macro Invertebrates (BMIs) need certain stream or river conditions to survive. Some BMIs are tolerant of pollution while others are very sensitive. Mayflies, caddisflies and stoneflies are particularly sensitive to pollution.

<table>
<thead>
<tr>
<th>Type of Aquatic Insects collected</th>
<th>Number of Aquatic Insects collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dragonfly</td>
<td>2</td>
</tr>
<tr>
<td>Leech</td>
<td>1</td>
</tr>
<tr>
<td>Water Penny</td>
<td>3</td>
</tr>
<tr>
<td>Mayfly</td>
<td>8</td>
</tr>
<tr>
<td>Midge</td>
<td>1</td>
</tr>
<tr>
<td>Caddisfly</td>
<td>7</td>
</tr>
<tr>
<td>Stonefly</td>
<td>9</td>
</tr>
</tbody>
</table>

Using the data in the table above, is the pollution level high or low in the stream?

a. Circle **High** or **Low**

b. Explain your answer:

8. Which nutrient, when in excess, can lead to algae blooms in some areas of Lake Champlain? **Circle one.** *(Extra bonus point if you can name two)*

   F. Potassium
   G. Phosphorus
   H. Calcium
   I. Fluoride
   J. Nitrogen

9. What part of the river contains the most oxygen?

d. Run (where water moves somewhat quickly)
e. Pool (where water moves very slow)
f. Riffle (where water moves quickly)

10. Humans go to a stream and remove all of the trees that live around the banks so they can develop the property. Is this good or bad for river fish? Explain your answer.

11. Circle the benthic macroinvertebrate that is intolerant of pollution: *(Extra bonus point if you can name the species)*
POST-MONITORING ACTIVITIES

Community Outreach and Stream Stewardship

UVM Watershed Alliance requires that all groups participating in our Stream Monitoring and Stewardship Program complete a community outreach and/or stream stewardship project. We encourage groups to take action based on unbiased scientific information. Community outreach is an essential part of watershed education because it gives students the opportunity to apply information learned through the monitoring process and positively impact their community and their watershed. Students learn about civic participation and the importance of community involvement, and are often proud to share the results of their hard work with parents, peers, community members, and local officials.

The outcomes of the Watershed Alliance education programs are multiplied many times by the effort of the students who by far outnumber the educators enlisted with us. This “multiplication effect” is essential to our efforts as educators in strengthening the environmental knowledge base and positive community involvement in Vermont.

Ideas for outreach and stewardship projects:

- Presentation of data/projects to a local conservation board/commission/district, town planners, local watershed organization, parents, peers, students in the same school, and/or students in a neighboring school
- Educational outreach and mentoring—hands on learning day with younger students
- Create a slide show (PowerPoint or photo) for presentation
- Create a video
- Write/produce a play
- Produce a radio ad and air it on local radio station
- Hold an informational poster campaign in school/community
- Hold a community watershed forum with speakers and open communication session
- Hold a watershed speaker series followed by presentation of student data/project
- Hold a watershed exposition at the school, library, or town green
- Work with local conservation district to plant trees and shrubs along riverbanks
- Organize a river/stream clean-up and invite the local paper

There are many options for outreach and stewardship projects, but we recommend you hold a brainstorming session to come up with student-led project ideas. Generally, it is best to decide on a project early in the planning phase, and before you begin your stream study. Additionally, it can be useful to alert the local press to your river study and outreach project. Many of our past participants have been featured in newspaper articles. Let’s celebrate the students’ learning and action.

Examples of past or on-going outreach projects:

Gay Craig and her Champlain Valley Union students (9/10th grade) present an annual report to the Lewis Creek Association (LCA). The students work closely with LCA to ensure that the data collected is useful to them.

Williston Central School worked with the Winooski Conservation District and UVM Watershed Alliance to remove invasive buckthorn and honeysuckle and planted willow and dogwood shrubs along Allen Brook in Williston.
Websterville Baptist Christian School students, led by teacher Virginia Collins, produced an educational radio ad about their Winooski River study.

Shelburne Community School 5th grade students created public service announcements and submitted them to the Voices for the Lake project at the ECHO Lake Aquarium and Science Center.

During a UVM WA project, students in a local school discovered E.Coli bacteria in the school water and presented the data to town officials. This led to a “boil water” notice for the entire town, and the repair of the problem.

Students at Danby’s Currier Memorial School, led by Carrie Mauhs-Pugh, are working with local farmers on an on-going yearly study of a stream near the farm. The students plan to present the findings to the farmers along with suggested Best Management Practices.

Ninth and tenth grade students at the SUCCESS School (an alternative school in Rutland) worked in conjunction with the VT Department of Environmental Conservation and the Rutland Natural Resource Conservation District on a study of the Moon Brook. The Moon Brook, located in Rutland city, is included on the state’s 303d list of impaired waters. The Upper Otter Creek Watershed Council (UOCWC), a group of local officials, experts, watershed organizations, and concerned citizens formed to address issues in the upper Otter Creek watershed, is interested in the data the students collected. Students plan to present their study at an UOCWC meeting.

At U-32 High School in Montpelier, Brian Slopey’s twelfth grade Environmental Science students acted as educators and mentors to students from the middle school. Slopey’s students designed hands-on projects that engaged the younger students as they taught them about watersheds and water quality. Slopey praised the students and the project, noting that his students benefited from the experience as much as those from the middle school did.
Photo Release Form

Person Appearing (Please print): ______________________________

I authorize the University of Vermont Watershed Alliance and Lake Champlain Sea Grant programs (UVM WA and LCSG, respectively) to use the above-named person’s image for UVM WA or LCSG related print and electronic publications and materials, without limitation, as UVM WA and LCSG shall in their sole discretion determine. The authorization is without date restriction. UVM WA and LCSG agrees that this photograph will not be given or sold to any individual or organization and will only be used for UVM WA or LCSG educational and informational purposes.

University of Vermont Watershed Alliance Program
Rubenstein Ecosystem Science Laboratory
3 College Street
Burlington, VT 05401
(802) 859-3086 ext.305
Watershd@uvm.edu

問い: If your school has students fill out a photo release forms for all programs, please inform the Watershed Alliance educators and let them know the names of people not able to be photographed. Thank you this will save us and you time in the long run.
Sampling Safety Tips

There are a number of additional considerations to make when teaching students in an outdoor setting. Below are some guidelines to follow to ensure impacts to natural resources are kept to a minimum and that students enjoy a safe, positive learning experience.

We ask teachers to manage their class and to the best of their ability the sets of groups that are participating in stream monitoring. The UVM Watershed Alliance educators will also be attuned to students and the activities around the water, however, the educators cannot teach effectively while managing class safety. Please read the following tips before venturing out on your own stream monitoring or working with UVM Watershed Alliance.

Sampling Safety

Closely manage your group in the field.
- Set distinct boundaries for the group, and keep all group members within sight and hearing distance (be aware that the noise of the river may greatly limit your hearing distance).
- Make sure you are aware of any severe student allergies such as bee stings and know how to respond in case of an allergic reaction.
- Keep a first aid kit with you and accessible at all times.
- Maintain an adult to student ratio of at least 8:1.

Be aware of potential field hazards.
- Wear appropriate clothing and footwear at all times.
- Visit the site prior to bringing your students and identify potential hazards such as high water, slippery rocks, poison ivy, steep banks, and downed trees. Discuss these hazards with your students before the field trip and what precautions they need to take to avoid them.
- Scout the area for any dangerous debris such as broken glass, wire, or other sharp objects; flag and avoid as needed.
- Never sample during a thunderstorm. Check the forecast and be aware of quickly changing conditions.

Follow safety guidelines for handling chemicals.
- Wear proper personal protection such as goggles and gloves when using chemical test kits.
- Dispose of used chemicals in an environmentally sound manner.
- Avoid opening reagent packets under windy conditions as the chemicals can get blown onto skin or into eyes.
- Be sure to wash hands thoroughly after handling chemicals.

Limit your site impact.
- Handle living organisms carefully and gently. Once they are collected in the net, quickly place them in the sorting tub or ice-cube tray, which should be filled with water in advance. Keep these in the shade to prevent them from heating up rapidly from the sun’s energy.
- Replace rocks you have overturned.
- Encourage students to explore freely, but only collect organisms with a purpose. Despite careful efforts, collecting can cause stress.
- Stay off of unstable and easily eroded stream banks.
- Sweep the area for any items the group may have left behind before leaving the sampling site.