

Doing Science Outdoors: Field Investigations at the Glacier Creek Preserve

Sample Modules for Water Quality

Modules include activities for:

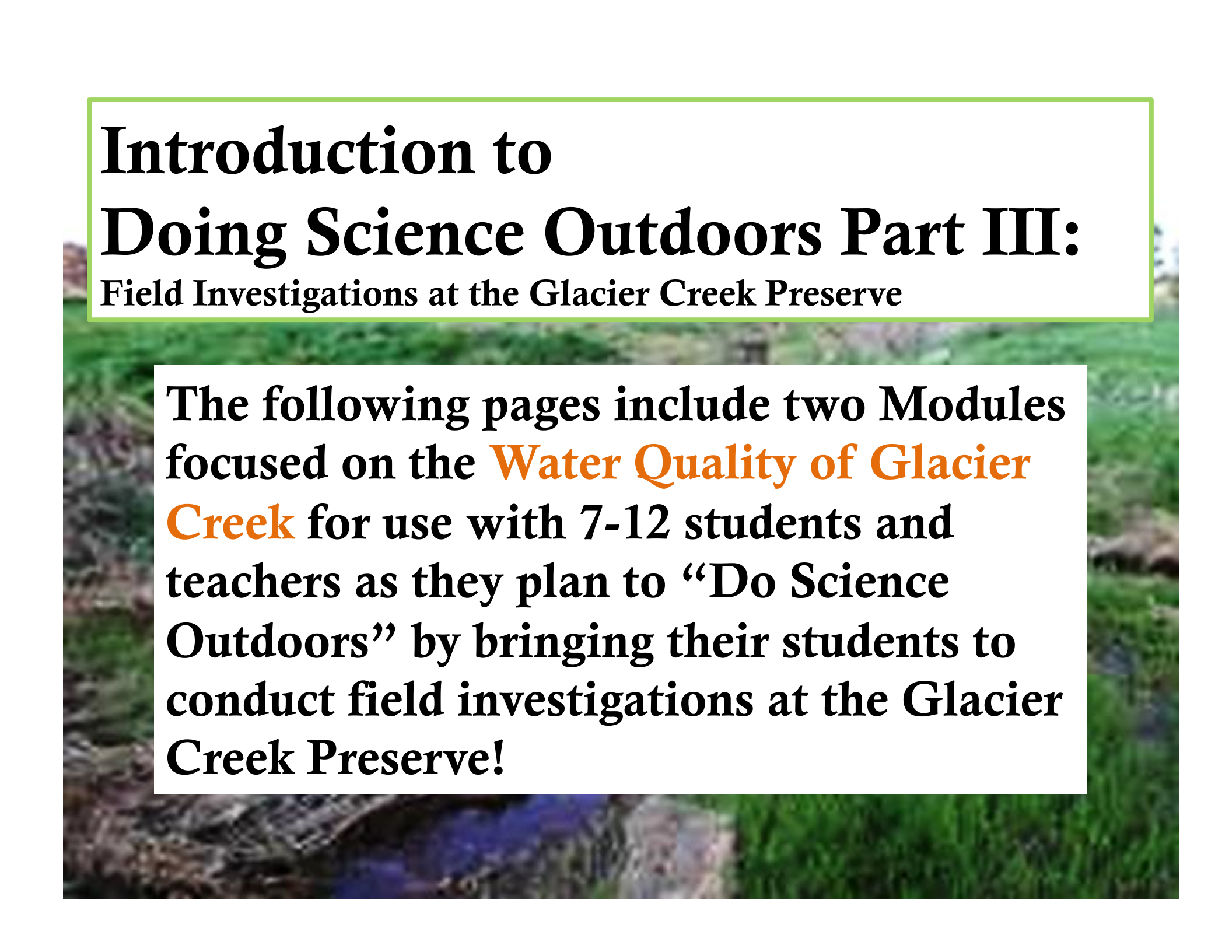
- 1. PRE-Field trip**
- 2. ON- Field trip**
- 3. POST- Field trip**

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The background of the slide is a photograph of a stream flowing through a lush green forest. The water is clear and reflects the surrounding foliage. The stream is bordered by rocks and dense vegetation.

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

The following pages include two Modules focused on the **Water Quality of Glacier Creek** for use with 7-12 students and teachers as they plan to “Do Science Outdoors” by bringing their students to conduct field investigations at the Glacier Creek Preserve!



Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Level 3 Middle School (6-8)

Test for the biological parameter of a creek

Level 4 High School (9-12)

Test for the biological, chemical, and physical parameters of a creek



Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

**Level 3 (Grades 6-8):
This Prairie Water Quality Module
is designed to be used with
students in Middle School.**

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #3a: Middle School (6-8)
PRE- Fieldtrip Activities students are introduced to how to test for the biological parameter of a creek.

- 1. Show students the website for the Glacier Creek Preserve found at <http://www.unomaha.edu/prairie/glaciercreek.php> and examine the map to locate the Glacier Creek on the Preserve.**
- 2. Explain to the students that they will be visiting the Glacier Creek and that they will collect macroinvertebrates using dip nets, they will identify the different organisms and they will count the number of each type of organism they find. All organisms will be returned to the creek after they have been identified and counted.**

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Prairie Water Quality Module #3b: Middle School (6-8)
**PRE- Fieldtrip Activities students are introduced to how to test for
the biological parameter of a creek.**

- 3. Either the teacher should project up on the screen or the students should be instructed to go to the Environmental Protection Agency's *Volunteer Stream Monitoring: A Methods Manual* at**
- 4. <http://www.epa.gov/owow/monitoring/volunteer/stream/stream.pdf>, go to page 28.**
- 5. The students should read and then discuss the importance of safety when doing water quality studies.**
- 6. The teacher should instruct the students how to dress for the field trip and make a list of all students with serious allergies to insect stings and those with asthma. The teacher will be responsible to bring appropriate inhalers and epi-pens for emergencies.**

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #3c: Middle School (6-8)
PRE- Fieldtrip Activities students are introduced to how to test for the biological parameter of a creek.

7. Introduction to the Biological Parameter: Macroinvertebrates

Students go to

<http://www.ncsu.edu/sciencejunction/depot/experiments/water/lessons/macro/whymacro.htm> and read and discuss the Science Junction “*Water What-ifs Reasons to Assess Macroinvertebrate Populations*”.

8. Students and teacher discuss the student lesson titled *Introductory Lesson- Determination of Overall Water Quality Using a Quantitative Macroinvertebrate Survey* found at

<http://www.ncsu.edu/sciencejunction/depot/experiments/water/lessons/macro/macrolesson1.html>

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #3d: Middle School (6-8)
PRE- Fieldtrip Activities students are introduced to how to test for the biological parameter of a creek.

9. Print a copy of the macroinvertebrate identification sheet for each student, it is found at <https://whiteclay.org/wp-content/uploads/2013/08/MacroKey.pdf>
10. Find Utah State Universities file of the water quality macroinvertebrates at <https://extension.usu.edu/waterquality/files/uploads/EducatorResources/LessonPlans/macros/AllBugs-2sides.pdf>. Each of the adult larvae are not labeled. Show the class the images and have the students, using their copy of the macroinvertebrate identification sheet, work in their group to identify the insect image and explain to each other how they were able to identify the organism based on the picture.

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #3e: Middle School (6-8)
PRE- Fieldtrip Activities students are introduced to how to test for the biological parameter of a creek.

- 11. The teacher will need to explain to the students how the identification chart indicates the water quality and how if the water is clean, they will only find those organisms labeled on the chart.**
- 12. Next have the students determine the water quality that each organism in the pictures indicates using their identification chart.**
- 13. The macroinvertebrate file at <https://extension.usu.edu/waterquality/files/uploads/EducatorResources/LessonPlans/macros/AllBugs-2sides.pdf> can also be printed for students to make a Flip Book they can carry with them on their Glacier Creek Preserve field trip.**

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #3f: Middle School (6-8)

ON- Fieldtrip Activities students are introduced to how to test for the biological parameter of a creek.

14. The teacher and students will walk along the path to the designated area.

15. There will be a set of tubs in the area with clean Glacier Creek water. Each group of students will be provided a dip net and assigned to one of the tubs for their catch.

16. The teacher will demonstrate how the students can use a dip net to catch the macroinvertebrates. The students need to be instructed on the specific number of dips they should do and the number of times that should occur in an assigned area.

17. The groups should be spread out along the creek so there is space between the groups.

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**Prairie Water Quality Module #3g: Middle School (6-8)
ON- Fieldtrip Activities students are introduced to how to test
for the biological parameter of a creek.**

18. Each time the dip is completed, the student will bring the dip net to their tub of water and pick out the insects that they collected and all of the group helps them locate the insects and drop them into the tub of water.

19. Each student should have the opportunity to dip for macroinvertebrates. (The number of times that the dips should occur is based on the number of students in the largest group).

20. Once all the dips have been completed, the groups should work on identifying and counting the organisms present in their groups tub. This should then be recorded on their data sheet.

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**Prairie Water Quality Module #3h: Middle School (6-8)
ON- Fieldtrip Activities students are introduced to how to test
for the biological parameter of a creek.**

21. The data collected and recorded will go with the students back to their classroom.

22. Each group needs to empty their tub of organisms back into the creek and try to clean the dip net the best they can in the creek.

23. Students will carry their groups equipment back to The Barn and place them in the assigned area. One student from each group will take their net to the sprayer to clean it of mud and plant debris.



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**Prairie Water Quality Module #3i: Middle School (6-8)
POST- Fieldtrip Activities students are introduced to how to test
for the biological parameter of a creek.**

- 25. The students will use the data they collected and recorded on their field trip to make an Excel spreadsheet. The teacher will help the students compile all the data into one set of organisms with the total based on adding those counted by each group.**
- 26. The teacher will send a spreadsheet with the data from each group as well as the data compiled to the Glacier Creek Preserve for the data base.**



Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

**Level 4 (Grades 9-12): This
Prairie Water Quality Module
is designed to be used with
students in High School.**

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #4a: High School (9-12)
PRE- Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

During a week's time or five days, students should be instructed to read various sections about water quality monitoring using the Environmental Protection Agency's *Volunteer Stream Monitoring: A Methods Manual* which is found at <http://www.epa.gov/owow/monitoring/volunteer/stream/stream.pdf>.

1. Day 1:

- a) Have students work in groups to go through pages 10-24 to determine the "Basics of Water Quality Monitoring".
- b) Explain to the students that they will be conducting a water quality study at the Glacier Creek Preserve and that they will be studying the Glacier Creek.
- c) Show students the website for the Glacier Creek Preserve found at <http://www.unomaha.edu/prairie/glaciercreek.php> and examine the map to locate the Glacier Creek on the Preserve.

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #4b: High School (9-12)

PRE- Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

2. Day 2: Introduction to Biological Parameter: Macroinvertebrates

Students go to

<http://www.ncsu.edu/sciencejunction/depot/experiments/water/lessons/macro/whymacro.htm> and read and discuss the Science Junction “*Water What-ifs Reasons to Assess Macroinvertebrate Populations*”.

3. Students and teacher discuss the student lesson titled *Introductory Lesson- Determination of Overall Water Quality Using a Quantitative Macroinvertebrate Survey* found at

<http://www.ncsu.edu/sciencejunction/depot/experiments/water/lessons/macro/macrolesson1.html>

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #4c: High School (9-12) PRE-Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

4. Print a copy of the macroinvertebrate identification sheet for each student, it is found at <https://whiteclay.org/wp-content/uploads/2013/08/MacroKey.pdf>
5. Find Utah State Universities file of the water quality macroinvertebrates at <https://extension.usu.edu/waterquality/files/uploads/EducatorResources/LessonPlans/macros/AllBugs-2sides.pdf>. Each of the adult larvae are not labeled. Show the class the images and have the students, using their copy of the macroinvertebrate identification sheet, work in their group to identify the insect image and explain to each other how they were able to identify the organism based on the picture. The students should determine the water quality this organism indicates. The teacher should explain that they will collect macroinvertebrates from Glacier Creek and identify them in the field.

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #4e: High School (9-12) PRE-Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

6. Day 3 Chemical and Physical Parameter Tests

Show students the Chemical test kit they will use when they go the Glacier Creek Preserve. Explain that they will be collecting data for each of the chemical tests that are provided for within the Kit: *pH, dissolved oxygen, biochemical oxygen demand, nitrate, and phosphate.*



7. Explain that this kit also contains a biological test for coliform bacteria and physical parameter tests for temperature and turbidity.

8. Show students the videos for how to conduct the tests titled *Water Testing Tutorials* provided by the World Water Monitoring Challenge at <https://www.youtube.com/playlist?list=PLA4CFD8518BCB9470>

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

Prairie Water Quality Module #4e: High School (9-12)

PRE- Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

9. Day 4 Chemical and Physical Parameter Tests

Discuss with students that getting the specific reading using the test kit for *pH*, *dissolved oxygen*, *biochemical oxygen demand*, *nitrate*, and *phosphate* is only the first step. Just like identifying the macroinvertebrates doesn't tell water quality until you look at the chart, after getting the value for each test, then the students need to use a chart for each test to determine what that value means for water quality.



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Prairie Water Quality Module #4f: High School (9-12)

PRE- Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

10. Day 4: Interpreting the Chemical and Physical Parameter Test Data

Have students use Environmental Protection Agency's *Volunteer Stream Monitoring: A Methods Manual* which is found at

<http://www.epa.gov/owow/monitoring/volunteer/stream/stream.pdf> to investigate how each of the tests can be used to provide the quality of the water and how each chemical finds its way into the creek.

- Page 139 for Dissolved Oxygen
- Page 147 for Temperature
- Page 151 for Ph
- Page 154 for Turbidity
- Page 168 for Nitrates
- Page 161 for Phosphates

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Prairie Water Quality Module #4g: High School (9-12)

PRE- Fieldtrip Activities students are introduced to how to test for the biological, chemical, and physical parameters of a creek.

11. Day 5: Coliform Bacteria and Safety at Glacier Creek

Have students use Environmental Protection Agency's *Volunteer Stream Monitoring: A Methods Manual* which is found at

<http://www.epa.gov/owow/monitoring/volunteer/stream/stream.pdf> to investigate how Coliform Bacteria can be used to indicate the quality of the water and how then discuss safety and appropriate behavior for the field trip.

- Page 189 for Fecal Bacteria
- Page 28 for Safety Information

12. The teacher should instruct the students how to dress for the field trip and make a list of all students with serious allergies to insect stings and those with asthma. The teacher will be responsible to bring appropriate inhalers and epi-pens for emergencies.

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

**Prairie Water Quality Module #4h: High School (9-12)
ON- Fieldtrip Activities students conduct the biological,
chemical, and physical parameter tests at Glacier Creek.**

- 13. The teacher should divide the class into three student groups and assign one group to conduct macroinvertebrate testing, another to conduct chemical testing and the other to do physical parameters.**
- 14. Each group will carry their set of equipment and their worksheet to record their data to the designated test site on the creek.**
- 15. The chemical test group should obtain their bucket of water first so that they work with a clean bucket of water.**
- 16. The physical group can go upstream to collect their measurements and the macroinvertebrate group can go downstream to conduct their work.**



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**Prairie Water Quality Module #4i: High School (9-12)
ON- Fieldtrip Activities students conduct the biological,
chemical, and physical parameter tests at Glacier Creek.**

- 17. Each group of students will be responsible for returning their equipment to The Barn and cleaning the equipment.**
- 18. The worksheets with the recorded data will go back to their school with the students for compiling and analysis.**

Introduction to Doing Science Outdoors Part III: Field Investigations at the Glacier Creek Preserve

**Prairie Water Quality Module #4i: High School (9-12)
POST- Fieldtrip Activities students conduct the biological,
chemical, and physical parameter tests at Glacier Creek.**

- 19. Each group of students will put the data they collected on their field trip to make an Excel spreadsheet.**
- 20. The students should use the water quality references to analyze their data and judge the water quality based on the data.**
- 21. The teacher will send all the spreadsheets to the Glacier Creek Preserve for the data base.**