

Grade 9-12

Duration: Group study (4 to 6 weeks).

Objectives: Students will research, write a paper, and present on what comprises a high quality vernal pool(s) and how surrounding land use affects the pool(s). (1) Students will also monitor a pool and identify the species within it.

Key Terms: Buffer, indicator species, impacts, quality, watershed, and high quality.

Method: Students are placed into groups and investigate a vernal pool using sampling techniques. Students review existing literature on vernal pools.

Materials: identification book and forms, sampling equipment, such as seine nets, sieves, trays, assorted containers, white trays (plastic porcelain), Magnifying lenses, and forceps, water quality test kit, (test both pH and dissolved oxygen), thermometer, list of resources students can go to view current literature.

Background: Building on early lessons, this lesson has the students test their collective knowledge on vernal pools and how to assess a pool while researching impacts and water quality. Students should connect certain species (spotted salamanders, wood frogs, and fairy shrimp) with vernal pools and their water quality. A healthy vernal pool is an indication of low impacts in the area. Additionally, it may be an indicator of a healthy section of a watershed.

If the vernal pool is impaired, there are reasons why such as, sediment/pesticide run off, habitat destruction (trees removed), or invasive species.

By monitoring the vernal pool, the students can educate the land owner on what a vernal pool is, who lives there, and why it has value.

Procedure:

Before the activity

1. Contact local watershed groups (ohiowatersheds.osu.edu) to determine if several vernal pools are available for monitoring. Please be sensitive to the impact students may have in and around the pool as samples are gathered. Break students up into groups and ask them to establish ethical guidelines for their sampling activities. Have the students form work groups and each work group must draft a proposal to the watershed coordinator of the importance of the vernal pool to the watershed and the animals. Additionally, this proposal should include how the students plan on monitoring the pool and by what means. Make sure to go over the ethical guidelines right before the students head out to the pool.

NOTE: Amphibians should be handled with wet hands and photographed only not transported to classrooms for identification. For live specimens contact your local zoo or watershed group.

NOTE: if visiting the site is not possible, students should delve into greater detail in their paper as well as have visuals.

2. Emphasize that all wildlife should be returned to the pool unharmed. Teachers may determine whether it is appropriate to take samples back to the classroom for further study.

3. To begin students should develop an outline of their project similar to:

- *Introduction
- *description of a vernal pool (includes habitat and many stages of wetness)
- *Description of the animals in a vernal pool and their function
- *How to properly monitor a vernal pool and with what equipment
- *Connection to the larger watershed
- *Impacts to vernal pools
- *How to protect vernal pools

Review each groups monitoring techniques to ensure they obtain proper samples (see Water Canaries lesson for specific sampling techniques).

4. Students should review current literature on vernal pools. This literature can be found in the library, at watershed groups, and over the internet (see “Websites of Interest” sheet).

5. Students should use the Ohio Vernal Pool Partnership Monitoring Forms to determine the health of the vernal pool. Given the detail and equipment involved, not all fields of the form will be completed. However, this should give the students an appreciation of the number of factors to successfully monitor a vernal pool. Students should be encouraged to take many pictures of the organisms and habitat.

6. Encourage the students to discuss their observations and research with their group. Each group should give a 15 minute presentation on what they found in monitoring a vernal pool as well as impacts that could affect it.

Evaluation: How well do the students present and research the following questions?

- *description of a vernal pool (includes habitat)
- *Description of the animals in a vernal pool and their function
- *How to properly monitor a vernal pool and with what equipment
- *Connection to the larger watershed
- *Impacts to vernal pools
- *How to protect vernal pools

Do they have visuals (pictures, painting, drawings, etc) to support their observations?
Encourage the students to share the results with their families and friends to educate others about vernal pools.

pH Ranges that Support Aquatic Life.

Most Acidic _____ Neutral _____ Most Basic
 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Bacteria

1.0 _____ 13.0

Plants (algae, rooted etc.) 6.5 _____ 13.0

Snails, clams, mussels 6.5 _____ 9.0

Largest variety of animals 6.0 _____ 8.5
 (mayflies, stonefly, caddisfly, dragonfly)

Temperature Ranges (approximate) Required for Certain Organisms

Greater than 68 °F (20 °C) = Warm water	Much plant life, many fish diseases Catfish, bass, crappie, caddisfly, Dragonfly, mayfly
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55- 68 °F (12.8 - 20 °C) = Cool water	Plant life some fish diseases. Salmon, trout, stonefly, mayfly, caddisfly, waterbeetles, minnows, darters,
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Less than 55 °F (12.8 °C) = Cold water	Trout, caddisfly, mayfly, stonefly, minnows, darters, sculpins
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Dissolved oxygen (DO) requirements in parts per million [ppm]

Below 68 °F cold water organisms
6 ppm

Above 68 °F Warm water organisms
5ppm

NOTE: See separate monitoring forms from the Ohio Vernal Pool Partnership. These forms were created by the Ohio Environmental Council, in consultation with the Ohio EPA, teachers and scientists.

State standards alignment

(<http://www.dnr.state.oh.us/dnnapps/education/correlations/searchresults.asp?intpage=2&action=P#REVIOUS&hidID=###>)

Activity Guide	Activity Title	Grade Level Band	Grade Level	Content Standard	Benchmark	Organizer	Grade Level Indicator
WILD-Aquatic	Vernal Pools the Connection	9-12	9-10	Earth and Space Sciences (ES)	D, E	Earth Systems	10
WILD-Aquatic	Vernal Pools the Connection	9-12	9-10	Life Sciences (L)	F, G	Diversity and Interdependence of Life	10
WILD-Aquatic	Vernal Pools the Connection	9-12	9-10	Scientific Inquiry (SI)	A	Doing Scientific Inquiry	9, 10
WILD-Aquatic	Vernal Pools the Connection	9-12	9-10	Scientific Ways of Knowing (ST)	A,B,C,D	Nature of Science/ethical practices/scientific theories/science and society	9, 10
WILD-Aquatic	Vernal Pools the Connection	9-12	11-12	Earth and Space Sciences (ES)	A, B, C	Earth systems	11
WILD-Aquatic	Vernal Pools the Connection	9-12	11-12	Life Sciences (LS)	B, E, F	Characteristics and Structure on Life/ Diversity and Interdependence of Life/Evolutionally Theory	11, 12
Activity Guide	Activity Title	Grade Level Band	Grade Level	Content Standard	Benchmark	Organizer	Grade Level Indicator
WILD-Aquatic	Vernal Pools the Connection	9-12	11-12	Science and Technology (ST)	A	Understanding Technology	11, 12

WILD- Aquatic	Vernal Pools the Connection	9-12	11-12	Scientific Inquiry (SI)	A	Doing Scientific Inquiry	11, 12
WILD- Aquatic	Vernal Pools the Connection	9-12	11-12	Scientific Ways of Knowing	A, B, C	Nature of Science/Ethical Practices/ Science and Society	11, 12