Schoolyard Wetlands
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By
Anderson County Schools
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This young researcher is checking a funnel trap—a standard technique used to inventory and monitor wetland organisms.

Making the Most of Schoolyards

Adult Marbled Salamander

Adult Length ~100 mm (4 inches)

The marbled salamander is one of several species of long-lived amphibians that depend on seasonal pools. Breeding takes place in the fall and females lay 40 to 200 eggs in small depressions around pool areas that will be flooded during winter rains. Females may stay with their eggs until the pool is filled.
What is a schoolyard wetland?

Created or restored schoolyard wetlands generally fall under the category of semipermanent seasonal pools. This type of wetland undergoes seasonal fluctuations in water levels, but does not dry annually like other types of seasonal pools. **Hydroperiod** - the duration of time a wetland is saturated or covered with water - is an important feature for describing wetlands. For example, ephemeral pools are characterized by a hydroperiod of less than two months while an annual pool has a hydroperiod of 2 to 12 months. Even though semipermanent pools may have a hydroperiod longer than 12 months, they still undergo significant fluctuations in water levels and may dry in severe drought years. Compared to ponds and lakes, the small size and shallow depth of naturally occurring seasonal pools makes them more vulnerable to pressures from development, but these same attributes are what make them immensely valuable from a biological standpoint. The shallow water rapidly warsms in late winter and spring, providing favorable breeding conditions for amphibians and many other seasonal pool dependent organisms. The periodic drying supports a distinctive biological community of uniquely adapted animals that have an increased chance of successful reproduction in the absence of predatory fish.

Do wetlands increase mosquitoes?

Mosquitoes are more likely to successfully breed in old tires, buckets and jars, clogged gutters, and foil-lined chip bags than in healthy wetlands with mosquito predators.

Small wetlands can actually reduce mosquito density because of the large number of mosquito eating predators associated with these unique habitats. Examples include salamander larvae, dragonfly and damselfly nymphs, water boatman, backswimmers, water striders, and bats. The “mosquitoes check in, but they don’t check out.” Mosquitoes are more likely to successfully breed in old tires, buckets and jars, clogged gutters, and foil-lined chip bags than in healthy wetlands with mosquito predators. The next time you slap a mosquito you might ask— did it come from a healthy wetland or from the puddle on top of the woodpile tarp or the neighbors unkempt swimming pool?
Should fish be added to schoolyard wetlands?

The presence of fish in seasonal pools reduces the number of mosquito predators, especially certain amphibian and dragonfly species. In nature, many seasonal pools undergo dry-downs in late summer which renews wetland vigor by eliminating fish, bullfrog tadpoles, and newts. The absence of these predators allows for greater reproductive success of a higher diversity of organisms when winter and spring rains recharge breeding sites. Dry-downs are a critical abiotic factor for proper seasonal pool function. Adding fish to small wetlands is an adverse management strategy and should be discouraged.

Female wood frogs commonly deposit their eggs in communal clusters in the same area of the pool each year. The clusters help trap heat which speeds up embryo development. Each egg mass contains 500 to 1000 eggs and represents the efforts of one female. Wood frogs require fish-free pools for long-term survival.

These fifth grade students are counting wood frog egg masses found on 25 February 09 in their schoolyard wetland. Keeping records on when animals are active at seasonal pools is important for understanding their long-term patterns of behavior and how potential human impacts (e.g., climate change) might alter those patterns.

Wood frogs can be identified by their cackling duck-like quacks and characteristic dark mask. Male wood frogs arrive at breeding pools in mid to late winter. They are normally darker and smaller than females and have enlarged thumbs during the breeding season.

High levels of glucose in the body fluids of wood frogs act as an antifreeze and protects them against freezing temperatures. Their egg masses are sometimes found under a layer of ice after a late freeze, but the embryos can still survive and develop into tadpoles.
What factors are considered when selecting a site for a schoolyard wetland?

- Low, flat sites near the school that allow easy access and have the potential to capture parking lot and rooftop runoff or air conditioning condensation are preferred. Using these concentrated sources of water allows fast recharging of the wetland during rain events.
- Avoid areas that would disrupt normal student activities.
- Selected sites are commonly overgrown with non-native invasive plants. Eliminating these “pests” in the construction process and replacing them with attractive native plants will improve the value of the area both economically and ecologically.
- Bioretention swales and buffer zones of native plants are used to filter sediment (a major pollutant in most states) and clean the water before it enters the wetland. Bioretention applications include parking lot landscape islands, end-of-island bioretention cells, swales around a parking lot perimeter, and emergent wetland supplements. Property owners, businesses, and developers can use similar strategies to create attractive wildlife habitats. Developers should consider the long-term solutions and potential cost savings of bioretention applications. These landscaping strategies not only beautify an area with low maintenance native plants, but also lower water temperature and clean runoff before it flows into streams and rivers. Specific information on bioretention landscaping can be found on the Environmental Protection Agency website – search for the Low Impact Development Center. Improving site hydrology and reducing long-term schoolyard maintenance are important goals of schoolyard wetland projects.

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What safety issues are associated with having a schoolyard wetland?

Schoolyard wetlands are not steep-sided pond structures. They have gradual slopes (< 10%) and range in maximum depth from 18 to 24 inches. These wetlands are very shallow with soft bottoms, unlike deep swimming pools or bath tubs that have hard surfaces.

Just as it is crucial for staff members to know who has a food allergy, the same awareness is needed for individuals allergic to bee stings and poison ivy. Long-term safety, both in and out of school, can best be enhanced by kids learning to use a sensible and knowledgeable approach to exploring local environments.

There are few situations in life where zero risk conditions exist, but the minor perils associated with wetlands are offset by the curiosity, questions, and excitement they can help generate for kids (and adults).

In 2005, author Richard Louv, in his book *Last Child in the Woods*, presented a solid case for the declining physical and emotional health of our youth being linked, at least in part, to reduced contact time with the outdoors. Wetlands provide opportunities for young and old alike to participate in structured and unstructured exploration of the natural world.

How do students benefit academically from a schoolyard wetland project?

Student involvement in all phases of the project is important – from site selection and construction to helping create good habitat structure for promoting diversity. Asking the questions “what’s here and how and why does it change over time” demands a curriculum rich in discovery and hypotheses-based science, applied math, literacy, and technology. Wetland projects offer excellent opportunities to challenge students with applied questions such as:

- How do we determine runoff volumes from a rooftop or parking lot?
- How does an engineer build a wetland having a 10% slope?
- What are some ways to determine if the soil will hold water?
- What are some management solutions for erosion problems?

Creating healthy wetlands involves problem solving and thinking in new ways about the meaning of complex concepts like good habitat structure and how to best promote diversity. Actions as simple as placing logs in a wetland to provide calling perches, hiding places, and sunning areas for animals require careful thought. For example, bat activity may be reduced if the logs interfere with flight paths for drinking water.

Businesses cannot remain viable if management lacks an organizational plan for keeping up with inventories and variables that determine change in product demand. Students in the role of land managers face similar challenges when developing qualitative and quantitative inventory and monitoring techniques for determining wetland diversity. Identifying abiotic and biotic variables that alter wetland dynamics necessitates a broad range of skills, from understanding the implications of water and soil chemistry to identifying potential animal disease pathways. For example, something as seemingly harmless as putting a pet frog into a wetland may have devastating consequences if a deadly virus is introduced in the process.

Having a sound base of facts is important, but students need a steady diet of problematic situations that allow for facts to be used in meaningful context in order to develop depth of understanding. The study of wetlands and associated terrestrial zones presents students with a wealth of problem solving challenges and many schools now offer summer science camps which focus on wetland investigations.
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These students are planting native species around their schoolyard wetland. Having a wetland surrounded with attractive native plants improves the value of an area both economically and ecologically.

**What are potential negative environmental impacts of wetland projects?**

Because so many wetlands were drained historically, bringing them back is almost always a good thing to do. One concern is the human relocation of organisms from one site to another when the wetland is built. Good intentions can result in problems if diseased or nonnative animals are introduced into a wetland ecosystem and even highly adaptive native animals like box turtles can be stressed or killed when trying to return to their home area after being displaced. We encourage everyone not to add animals or nonnative plants to schoolyard wetlands. Another potential problem is creating a diversity sink. Many wetland dependent organisms (e.g., certain insects and amphibians) have complex life cycles that require water for completing the first phase of their development. Most of these organisms can complete the aquatic part of their cycle within 90 days or less. The best scenario is for schoolyard wetlands to hold water at least into mid-August. A wetland can become a death trap (sink) if it dries too early in the season. It is also crucial to provide diverse plant zones around wetlands which provide food resources and hiding places, and thus promotes survivorship. Many wetland organisms migrate from one pool to another, which may reduce competition for resources and augment the species genetic pool of potentially adaptive traits. Identifying nearby out-breeding sites is an important consideration for wetland creation or restoration projects. Project managers should also carefully weigh the pros and cons of creating/restoring isolated wetlands along heavily traveled roads where amphibian and reptile mortality may be high during spring and fall migrations. Eco-passages under roads at large migration sites are becoming more common for reconnecting isolated wetlands and reducing road mortality.

Good intentions can result in problems if diseased or nonnative animals are introduced into a wetland ecosystem. Even highly adaptive native animals like box turtles can be stressed or killed when trying to return to their home area after being displaced. Please do not add animals or nonnative plants to wetlands. Wetland dependent organisms are admirably adapted for locating their required habitats.
What are some best use strategies for studying wetlands?

Students naturally like to wade in the water while observing and capturing organisms. However, for the long-term health of the wetland it is best to disturb the bottom sediment as little as possible. Muddy water clogs gills, reduces visibility, and generally makes life tougher for wetland organisms and human observers. The vast majority of wetland critters are found around the edges, making it fairly easy to gain access to them. Thus, photographing, trapping, and collecting organisms for observation can best be accomplished from the wetland edges. Some basic courtesies should also be considered when studying wetlands. For example, instead of removing dragonfly exuviae (cast skeletons) from their natural position, use photographs or diagrams to document these special discoveries. This will allow others to share in the experience when they visit the wetland. Of course there will be times when accessing interesting elements in the wetland will demand some wading in the water, but a goal should be to keep disturbance to a minimum. Installing a boardwalk is an excellent strategy for minimizing disturbance while studying wetlands.

There are certain pathogenic viruses and fungi that can cause amphibian die-offs if transferred into your wetland. Wetland users should periodically decontaminate their boots and other equipment (for example, nets and traps) that are in contact with the water and the soil around the wetland. This can easily be accomplished by dipping the equipment into a five gallon bucket of 10% bleach solution and then rinsing with fresh water after 10 minutes. Boots that students bring from home should be decontaminated before wearing them to the wetland. Having a student set of rubber boots that remain at school will reduce decontamination time.

How are schoolyard wetland projects organized and funded?

Projects are supported primarily by a combination of community funding and volunteer labor. A priority of a wetlands project should be to bring together community groups and organizations that model a positive example of accomplishments through team work. Our first project succeeded because the principal of the school put together an enthusiastic implementation team of students, teachers, parent representatives, local government agencies, and businesses. Thanks to the continued efforts of the above groups we have completed construction of six elementary schoolyard wetlands and four bioretention swales. Each project continues to depend on in-kind community support and teacher written grants.

If your school decides to undertake a wetland project it will be advantageous to have individuals with specific skills on the team, including a hydrologist and or geologist, and a biologist with wetlands experience. Wetland consultants will often provide in-kind support to schoolyard projects.
Landscape Education

Small wetlands (seasonal pools) are rapidly disappearing and education on the important role of these habitats is essential for the long-term health and vigor of our local and global landscape. Schoolyard wetland projects strive to immerse students in their local environment with a broader goal of developing citizens with an increased understanding of how local social, economic, and environmental issues relate to the well-being of world ecosystems. Understanding these issues requires thinking through abstract problems and across disciplines, working in teams, and analyzing qualitative and quantitative information for effective decision-making. The benefits, both mentally and physically, of experiencing the excitement of a wetland far outweigh sitting passively at a desk reading about them.

There is a pressing need for educational programs that promote basic understanding of land-use and water management techniques. Water is a vital resource for life on earth and there are numerous strategies available to citizens for improving water conservation. Simple acts such as keeping car motor products (e.g., oil, gasoline, brake fluid, and antifreeze) out of storm drains can make a significant contribution to the water quality in our streams, rivers, and lakes. See the EPA website Stop Pointless Personal Pollution for more information. There is also an excellent wetland resource book (Wetland Drainage, Restoration, and Repair) by Thomas Biebighauser. The book has a delightful chapter on using wetlands as outdoor classrooms entitled “Do Waders Come in Size 4?”

Limited space prevents the acknowledgement of all the supporters and volunteers associated with the Anderson County Wetlands Project, but organizations listed below have been vital to the project.

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ARCADIS
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AC Schools Board of Education
Clinton Courier
Native Gardens
Sunlight Gardens
Roundstone Native Seed
Toyota
Lowe’s

Many communities have directly experienced the negative impacts of losing the benefits of wetland functions by increased flooding, lowered water tables, contaminated streams, and diminished wildlife habitat. The overall health of a landscape largely depends on the depth of understanding of citizen stewards about the roles of special landscape features such as seasonal pools.

Questions and Comments may be submitted to:
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