



Can you guess the correct name of the game these 2nd Graders are playing in Ophir School gym?

HINT. It's part of a new statewide pilot program to stop Eurasian watermilfoil.

Second graders discover wet and exotic plants and animals playing games designed to create lasting memories.

Briefing provided by Ophir School Professional Teacher Brittany Ellis, Professional Trainer Ciara Wolfe, and Statewide Noxious Weed Awareness and Education Campaign Coordinator Carla Hoopes

Natural resource interpreters generally agree that an effective inquiry-based activity can appeal to the audience's auditory, visual, verbal, and kinesthetic learning styles--addressing multiple styles of learning. Educators generally agree that certain training techniques such as action-oriented learning can increase the possibility for longer-term recall. For example, the National Association for Interpretation (2000) suggests that students have better retention when teachers create opportunities for repeated exposure to relevant content that is practical to nature, based on real-life experiences, and perceived as connected to the student's everyday life. Doug Knapp (2007) wrote Applied Interpretation to advance the field of interpretation. He reported that Koriati's 2003 meta-analysis suggests that participants will have better episodic memories with increased participation in action events.

We wanted to apply these concepts of learning, so we created *Our Wetland Project* to engage students repeatedly in games that demonstrate invasive species science concepts. *Our Wetland Project* Pilot Project Leaders worked under the expectation that students who are actively engaged in the games will be more likely to remember these events and associated science concepts throughout their lives than students who do not engage in the repetitious activities.

June 4, 2010. *Ophir School second graders learn about aquatic invasive species by playing games that demonstrate impacts to macroinvertebrates and fish populations from reduced oxygen associated with uninvited Eurasian watermilfoil.*

If you can name this game, contact Carla Hoopes at choopes@montana.edu. If you are correct we'll send you a children's learning book and teacher activity guide.

If you think you may be interested in obtaining teacher training or helping at a field work day related to the aquatic nuisance species pilot project we'll help you explore participation opportunities.;

Work Group Leaders

Brittany Ellis, Professional Teacher
Jeremy Harder, Professional Teacher
Stephanie Kissell, Professional Teacher
Ciara Wolfe, Professional Trainer
Heidi Sedivy, Eurasian Watermilfoil Task Force Coordinator
Mike Jones, Gallatin Big Sky CWMA Weed Coordinator
John Halpop, Sanders County Weed Coordinator

Cooperators

APHIS, Plant Protection and Quarantine
Western Regional Panel on Aquatic Nuisance Species
U.S. Forest Service Northern Region
U.S. Fish and Wildlife Service
Montana Fish, Wildlife and Parks
Montana Department of Transportation
Montana Noxious Weed Trust Fund
Bureau of Land Management
Bureau of Reclamation
Montana Stockgrowers Association
Montana Assoc. of State Grazing Districts
Ophir Elementary School, Big Sky

Trainer and Coordinator

Ciara Wolfe, Professional Trainer
Carla Hoopes, Project Coordinator

BELOW. **May 22, 2010.** Ciara Wolfe, Mike Jones, Jeremy Harder and son, Stephanie Kissell, and Brittany Ellis refine the Aquatic Invasives *Our Wetland Project* program to meet the needs of second graders at a training workshop hosted by Ophir School near Big Sky.



BELOW. **June 4, 2010.** Ciara reads from *Our Wetland Project* and asks open questions to encourage students to discover their own relationship with purple loosestrife, Eurasian watermilfoil, and New Zealand mudsnails.



Prior to implementing the action-oriented training with second graders, Ophir School hosted the teacher training session with professional teachers representing Kindergarten-Stephanie Kissell; Second Grade-Brittany Ellis; and Fourth Grade-Jeremy Harder (and son). Gallatin Big Sky Weed Coordinator Mike Jones and Professional Trainer Ciara Wolfe, demonstrated *Our Wetland Project* and the aquatic invasive species teacher activity guide.

Teachers provided feedback, and the design for the action-oriented discovery experience for second graders was formalized. Ciara and Carla returned on Friday morning, June 4, ready to help Brittany implement the design.

The bell rang. Students stood for the pledge of allegiance respecting the United States of America flag. A clapping exercise brought the class to attention and Brittany asked her students, those who had participated in the October noxious weed field day at Red Cliff Campground, to describe what they remembered about the day last fall. Five new students and one continuing student had not attended the weed education activity.

Students not only remembered the importance of mapping, identification, and management methods from the field day, they also remembered specific concepts related to plant parts, prevention, and spread. They spoke in the language and demeanor of scientists as they expressed what they had learned in the style of a science teacher to new students.

Brittany reintroduced Ciara and Carla to the class and Ciara engaged the students by reading from and asking questions about the children's training book *Our Wetland Project*.

The training workshop was held at Ophir Elementary School near Big Sky, Montana.

Ciara applied inquiry-based techniques to engage the students immediately in open questions--questions that engage and have no right or wrong answer. She asked for ideas about the definitions of vocabulary words like aquatic nuisance species and noxious weeds that they would use in the activity later in the gymnasium. With each question students began to interpret connections between invasive species and their own relationship with wetlands, weeds, insects, Quagga mussels, whirling disease, and frogs. With a strong relationship developing between the students' real-life experiences and the topic, Ciara encouraged the students to think in new ways about aquatic plants and invasive species and to explore implications of actions they might take like washing their boats and boots. The students contributed their own ideas, expanding on concepts in the training book, about what they might be able to do. It was time for the activity.

If our children don't understand how a stream works or the food chain, how can we expect them to understand how noxious weeds may harm our health or the environment?

Time for the activity

The students followed along in an organized single-file and came together in a circle in the center of the gymnasium waiting for instructions. Ciara continued asking questions to keep the students positively thinking in new ways about aquatic invasive species as she explained why they would be playing the game.



Can you guess the name of the game they are about to play?

Before reading more can you guess what they are doing in the photo?

BELOW. Trainer Ciara Wolfe asks questions to engage 2nd grade students in thinking about how aquatic nuisance species might be spread before playing a game to demonstrate Eurasian watermilfoil associated reduced-oxygen-level hindrance on macroinvertebrates.



Background for the Activity

Teachers provided materials for 26 students. Ciara provided background for the activity explaining that a macroinvertebrate is an animal without a backbone living in one stage of its life cycle, usually the nymph or larval stage. Visible without a microscope macroinvertebrates can spend a few years living in a freshwater habitat. Many are benthic (oceanic or deep sea) organisms, or bottom dwellers.

Eurasian watermilfoil *Myriophyllum spicatum* is an attractive plant with feathery underwater foliage. It was once commonly sold as an aquarium plant. Eurasian watermilfoil, hereafter called milfoil, originates from Europe and Asia, but was introduced to North America many years ago and is now found over much of the United States. This plant was introduced to the eastern United States at least as long ago as the 1940s, but it may have arrived as early as the late 1800s. It is very apparent that milfoil has been spread from lake to lake on boat trailers. Montana confirmed an infestation of Eurasian watermilfoil at Noxon and Cabinet reservoirs in 2007. It is important to know what it looks like because there are milfoils native to Montana in the same waters.

Ciara continued by explaining growth habitat. Because Eurasian milfoil is widely distributed and difficult to control, milfoil is considered to be a very problematic plant. The introduction of milfoil can drastically alter a water body's ecology. Milfoil forms very dense mats of vegetation on the surface of the water. These mats interfere with recreational activities such as swimming, fishing, water skiing, and boating.

The sheer mass of plants can cause flooding and the stagnant mats can create good habitat for mosquitoes. Milfoil mats can rob oxygen from the water by preventing the wind from mixing the oxygenated surface waters to deeper water. The dense mats of vegetation can also increase the sedimentation rate by trapping sediments.

Milfoil also starts spring growth sooner than native aquatic plants and can shade out these beneficial plants. When milfoil invades new territory, species diversity of aquatic plants typically declines. Although some species of waterfowl will eat milfoil, it is not considered to be a good food source. Milfoil reproduces extremely rapidly and can infest an entire lake within two years of introduction to the system.

With this background, Ciara explained the game pictured at the beginning of this article. *Do you know the name of this game?*

Here's how the game is played.

STEP ONE. Flag the playing area boundaries before the lesson.

STEP TWO. Tell students they are going to play a game that stimulates changes in a pond when an environmental stressor, Eurasian watermilfoil, is introduced. Show students the playing field and indicate the boundaries.

STEP THREE. Split students into teams. Have one student volunteer to be an environmental stressor, Eurasian watermilfoil. Discuss the ways that a pond can become infested with Eurasian Watermilfoil and how this can alter pond conditions. *(With a large class or playing field, more students will need to be stressors.)* Divide the rest of the class into seven groups to play the game. Each group represents one type of macroinvertebrate species. Record the number of members in each group, using a table. *(Try to have at least four students in each group. For smaller classes, reduce the number of groups.)*

Children's Book
and 52-page
Teacher Guide to
formal classroom
and informal outdoor
learning settings for
**Aquatic Invasive
Species Activities
for Ages 6-14**



BELOW. You can create cards with neck strings to identify which students are environmental stressors, in this case Eurasian watermilfoil, or a macroinvertebrate such as Caddisfly larvae shown in the photo. Copies of macroinvertebrates can be made from the illustrated key in the 52-page *Our Wetland Project* Teacher Guide.



Pulling Together
Against Noxious Weeds

Statewide Noxious Weed Awareness and
Education Campaign

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INTOLERANT MACROINVERTEBRATES AND HINDRANCES

Organism	Hindrance	Rational for Hindrance
Caddisfly	Must place both feet in a bag* and hop across the field, stopping to gasp for breath every five hops	Caddisflies are intolerant of low oxygen levels
Stonefly	Must do a push-up every ten steps	When oxygen levels drop, stoneflies undulate their abdomens to increase the flow of water over their bodies
Mayfly	Must flap arms and spin in circles when crossing the field.	Mayflies often increase oxygen absorption by moving gills.

*Caddisfly larvae build cases and attach themselves to rocks for protection and stabilization.

STEP FOUR. Set-up the game. Distribute appropriate identification labels to all group members. The picture of each group's macroinvertebrate should face outward when labels are attached. Inform students that some macroinvertebrates have hindrances to crossing the field.

STEP FIVE. Assemble the macroinvertebrate groups at one end of the playing field and the environmental stressor(s) at midfield. When a round starts, macroinvertebrates will move toward the opposite end of the field and the stressor will try to tag them. To "survive", the macroinvertebrates must reach the opposite end of the field without being tagged by the environmental stressor. The environmental stressor can try to tag any of the macroinvertebrates, but will find it easier to catch those with hindered movements. When tagged, the macroinvertebrate becomes a Eurasian Watermilfoil and must remain "planted" where tagged. They may tag other macros but must not move their feet.

STEP SIX. Discuss how long it takes for the pond to become choked with milfoil and what happened to the macroinvertebrates that live there.

Students returned to the circle for a discussion. They discussed their experience and level of understanding of concepts acted out in the game. The next activity was a version of rock, paper, scissors designed to create an experience where students assume a role as a whirling disease spore, a trout, or an osprey. They engaged in a game of tag to illustrate what beats what.

The game begins when the moderator yells "aquatic nuisance species!" The activity is fully explained with other activities in the Teacher Guide. The 52-page Aquatic Invasive Species Teacher annotated Guide to implement *Our Wetland Project* contains 10-minute to 60-minute activities for ages 6-14. Activities help teachers use the children's training book to engage students in science concepts. The activities are designed to develop long-term memories through episodic (real-life-activity) repetition in formal and informal learning settings.

If your school or youth group is interested in participating in the pilot implementation of *Our Wetland Project* in Montana, check out the event calendar on www.weedawareness.org. Look for a training program in your area. Four training workshops are recently completed or in the works: Whitehall Biological Noxious Weed Control Project Bugs with an Attitude: *Our Wetland Project* demonstration July 7-9 teacher training (www.mtwow.org); Stone Child College adult student and teacher training July 19 (www.weedawareness.org); Bear River Migratory Bird Refuge *What's in Your World? Youth Naturalist--Weed Scientist - kNOweeds K-12 Curriculum - Our Wetland Project* for Refuge staff (contact Lindy Garner at lindy.garner@fws.gov), agency program managers (contact Carla Hoopes at choopes@montana.edu), and teachers (waiting list for limited space) September 15-16; and Eurasian Watermilfoil Task Force in Sanders County (contact Heidi Sedivy at aquaticweeds@sanderscounty.mt.gov) to learn about *Wayward Weeds* October 5 at the watershed festival.

If you would like to participate in the pilot implementation, or if you have questions about this program or the article, contact Carla Hoopes at choopes@montana.edu. Activities meet National Standards. Training development and resources were sponsored by the Western Regional Panel on Aquatic Nuisance Species; U. S. Fish and Wildlife Service; APHIS Plant Protection and Quarantine; and Partners to Implement the Statewide Noxious Weed Awareness and Education Campaign: Bureau of Land Management, Forest Service Northern Region, Bureau of Indian Affairs, Bureau of Reclamation, Montana Fish, Wildlife and Parks, Montana Department of Transportation, Montana Department of Agriculture, Montana Farm Bureau, Montana Stockgrowers Association, Association of State Irrigation Districts, Blackfoot Challenge, and Big Blackfoot Montana Chapter Trout Unlimited.



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