

Acknowledgments

The Eau Claire Lakes Area Property Owner Association Board of Directors and their Education Committee made up of Cris Neff, Fred Haueter, Bob Hershey, John Kudlas and Jerry Kaiser would like to acknowledge the following people and organizations for their contributions to the development of this program;

- ~Bayfield County Land and Water Conservation Department including; Butch Lobermeier-(’09), Stefania Strzalkowska (’09-’10), Travis Tulowitzsky-Land Use Specialist, Jeremy Bates-AIS Coordinator, Ben Dufford-Conservationist*
- ~Douglas County Aquatic Invasive Species Coordinator; Carrie Sanda*
- ~Drummond Area Schools; Steve Stipetich-retired, Ellen Nelson-retired, Andy Arthur and John Knight*
- ~Eau Claire Lakes Area Property Owners Association; Contributing Membership*
- ~ FOTSCH - Friends of the St. Croix Headwaters – Scott and Susan Peterson*
 - Canoes On Wheels – provided by FOTSCH*
 - ‘Native Aquatic Plants Instructional Guides’ – Provided by FOTSCH*
- ~M&M Greenhouse; Native Plant Specialists Barnes, WI.*
 - Ann Brovold, Arlyn Posekany for their native plant expertise and time sharing their knowledge*
- ~Polk County Land and Water Resources – Jeremy Williamson-Water Quality Specialist*
- ~Volunteers –Lee Wiesner-teaching students about water chemistry and testing, for the use of his pontoon and fishing boat; Ingemar Ekstrom-teaching students about AIS and for the use of his property on Tomahawk lake; Shelby Woodard, Carole Rusch, Jon Harkness and Leslie Hall from the POA Board, Jim Johnson-pontoon boat use; Quentin Ruprecht-pontoon boat use; Dave Papelka-pontoon boat use; Jack Gribble.*
- ~Wisconsin DNR; Alex Smith – Fisheries Technician; Pam Toshner – Water Resources Management Specialist; Scott Toshner- Fish Biologist; Steve Bolssen – Fisheries Policy and Operations*

A special note of appreciation to ~Carol Lebreck~ for her encouragement and inspirations early on, to take on this project, for her ongoing support and for the use of her Bony Lake property during the field trips! And Ron Pearson for editing and checking this text!

~we apologize if there is anyone we failed to mention



INTRODUCTION

GENESIS: Eco-Day was developed by the *Barnes Eau Claire Lakes Area Property Owner's Association* in 2009 to support local educators in promoting appreciation and educational values of Wisconsin lakes. Committee members included Cris Neff, Jerry Kaiser, John Kudlas, Bob Hershey and Fred Haueter. Jeremy Bates, Bayfield County AIS Coordinator, Travis Tulowitzky, Land Use Specialist of the Bayfield County Land and Water Conservation Department and Alex Smith of the WDNR provided expertise. The project was supported by a \$3000 WDNR *Small Lakes Management Planning Grant*. The committee aligned the curricular material with state standards to insure validity and worked in concert with Andy Arthur, science teacher at the Drummond School District. The seventh grade science classes were the targeted students.

MISSION: Inasmuch as Wisconsin, especially Northern Wisconsin, Possesses a vast number of pristine lakes, *the mission of the committee is to utilize safe "hands-on" experiential activities to safely explore the educational opportunities on Wisconsin lakes, rivers and streams.*

CONTENT: Activities were designated as Fall and Spring to coincide with plants and animal life cycles. Preparatory indoor sessions were utilized before the outdoor sessions.

Fall:

Indoor: Drummond School

- **Critical Habitat:** Students utilized computers to check the DNR selected lake to determine what factors within the lake were designated as "critical" in preparation to visiting those areas during Eco-Day.
- **Water Quality:** Students engaged in investigative activities to ascertain the chemical/physical quality of unknown samples of water. Temperature, pH, clarity (turbidity) and dissolved oxygen were checked. Phosphates and Nitrates were discussed, but not analyzed.
- **Aquatic Invasive Species:** Students were presented with an array of Aquatic Invasive Species that might threaten our lakes and waters. Students were able to handle and compare various native and invasive plants and animals.
- **Safety:** Canoeing/hypothermia and pfd skills were emphasized and practiced.

Outdoor: Middle Eau Claire Lake

- **Critical Habitat:** Students and chaperones canoed to various Critical Habitat sites and used aqua-scopes to view, identify and photograph each unique site.
- **Aquatic Plants:** Students "Keyed" various plants from an assortment of aquatic plants and "raked" unknown plants to classify on site. Students were awarded "stars" for plants identified to add a fun competitive component.
- **Water Quality:** Students were taken via pontoon boats to a deep water site where they measured temperature and dissolved oxygen at five foot increments, pH and clarity using the secchi disk. Students were asked to make a qualitative analysis of the lake.

Assessment: Each session concluded with a group assessment time for students' input.

Spring Indoor: (sample) Drummond School

- **Macroinvertebrates:** Students, using prepared lab materials, differentiate various macro types and how they indicate water quality.
- **Shoreline Restoration and Reforestation:** Students learn about the value of terrestrial plants around lakes and learn transplanting methodology.
- **Food/Energy Chain/Pyramid/Web:** Using prepared lab materials, students learn how living and non-living things are connected and how the flow of materials and energy are established in healthy terrestrial and aquatic environments.

Spring Outdoor: (sample) Bony Lake

- **Macroinvertebrates:** From the lake, students gathered and classified macros to ascertain the quality of the water utilizing species specific categories.
- **Shoreline restoration and Reforestation:** At a predetermined location, students planted buffer plants and seedlings under the guidance of Bayfield County personnel.
- **Food/Energy Chain/Pyramid/Web.** Students gather and record aquatic plants and animals and place them into appropriate categories of producers/consumers/decomposers.
- **Scavenger Hunt/Culminating Activity.** Students explore the shoreline and water via canoes to gather materials and data in a safe manner to demonstrate their learning during the *Eco-Day* activities.

Assessment: Each session concluded with a group assessment time for students' input.

Evaluation: *Eco-Day* concludes with a student/teacher evaluation regarding the value of the activities based on the predetermined objectives and standards.

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Helpful Suggestions

“Our Association believes that lake and environmental stewardship in the future begins with education of our children today!”

In preparing and developing this program over the past three years, we have learned what is necessary to conduct an effective learning experience for children, especially when combining school classroom labs with the outdoor classroom experiences. These helpful suggestions are designed to clarify details that help deliver this curriculum more effectively.

1. **Getting Started/School Contact;** A connection with the school is important. Your organization may have parents or committee members who are passionate about environmental stewardship and the educating of youth to be environmentalists today and in the future. They can be involved with the local school system in many ways, from a pen pal program to attending after school events or sports. An organization member may have a child who is a student or is connected to the school. Having this contact is helpful when scheduling a meeting with the school to discuss the program.
2. **Turn Key Program;** Teachers today are extremely overloaded, especially in these small consolidated school system environments, and it may be difficult for them to envision adding anything new to their overburdened school calendar. However, the turn-key approach of this program removes any additional teacher burden allaying their concerns so that they are able to view the possibilities for their students and the value of this resource.
3. **Cooperative Effort;** Work to seek and maintain a cooperative effort among an enthusiastic teacher, the school and the lake association. Our Lake Association provided for the fieldtrip bus costs, and also provided the volunteers to teach the programs and lead the fieldtrips which removed an important budgetary obstacle for the school. The teacher and school provided us with the opportunity to engage the students in eco-education.
4. **Safety First;** Safety is paramount and must be incorporated in all facets of the program. Safety needs to be emphasized to the students and all participants by conducting safety overviews at the beginning of each segment. It is important that all participants in the program be trained in the safety practices relative to each segment. Students must wear PFD's (personal flotation devices) for all water and shoreline activities. All canoes will be visible from a safety rescue boat during canoeing activities. **NOTE: All adults and volunteers should be aware of the first aid kits and other safety equipment (cell phone) and these should be readily available.**
5. **Handicap Accessibility;** Students with disabilities should be taken into account when working with the school to provide access to and inclusion in the program when possible.
6. **Itinerary;** Creating a workable and complete itinerary is extremely important. Be sure to include: destination location/address, bus driver directions, contact name

and phone numbers; note about **proper clothing** and **water shoes**; group breakouts, detailed time increments, especially including school departure and estimated return time. **NOTE: Work with the teacher/ school on lunch arrangements, whether they provide a bag lunch or prepare hot lunches for the student's possible late return. Remember to make sure the School is aware that there is a possibility for a late return.**

7. **Segment Rotation/Group Sizing;** Rotation planning is a critical piece of the program. The number of students and the length of the rotation are two of the most important elements in the field trip planning. Plan to break the class sessions into equal rotations, or segments of time, so that the students will all be simultaneously engaged in their group's work. **NOTE: Schools will require a plan displaying the student's productive use of time during the fieldtrip. This is a key point on the itinerary, which must be turned into the school well in advance.** The purpose of the rotations is to break the student groups into workable sizes. The teacher can help with organizing the students into groups that will support their learning. Eight to twelve students per session, working in pairs or teams of four works very well. If there are more than 36 students for a fieldtrip, an alternative of running the fieldtrip twice in the same day, (morning and afternoon) to create more manageable numbers is possible. **NOTE: Important Safety Concerns:** Be aware of the legal occupancy requirements for pontoon boats, numbers of canoes available and sufficient PFD's (personal floatation devices). Remember to take these requirements into consideration when planning student rotations. Don't overlook including student aides, instructors, boat drivers, or chaperones. All of these participants impact the total occupancy restrictions.
8. **Indoor Classroom Sessions Essential;** Be sure to incorporate indoor classroom sessions! These are essential to making the outdoor segments successful, hands-on and a more positive learning experience. The classroom sessions prepare the students for the outdoor labs, allow the students to become more quickly engaged in the activities, and make their experiences more enjoyable which contributes to their depth and retention of learning.
9. **Local Organizations/WDNR/Colleges:** Involvement of local organizations like the County Conservation Departments, the WDNR, and local colleges really enhances the program. These organizations typically already have budgeted programs for educating the public and they are very helpful and excited to share their expertise. **Important:** Be sure to get on their calendars early and have them be engaged in the planning from the early stages forward.
10. **Hands-On vs. Lecturing; Minimize lecturing and Maximize hands-on!!** This is critical. In an emersion program, the students become engaged by "doing". Indoor and outdoor 'hands- on' activities are more effective than lecturing, which results in excellent engagement and retention by the students. These types of program can springboard students into future interest in environmental stewardship and participation in outdoor activities. *It is most effective to have segment leaders who are enthusiastic, knowledgeable, engaging hands-on instructors.*

11. **Effective Student Aides;** High school students that can share their own enthusiasm for environmental studies create excellent peer mentoring and are highly effective. Additionally, the student aides assist in supervising and managing the students' behavior. Be sure to clearly communicate this with the teacher so that they will select individuals who have enthusiasm for both the environment and the kids. This can make a huge difference in the experience the students have on the fieldtrip.
12. **Canoeing;** The canoe training session on the water is essential to the student's successful and confident participation in the canoeing aspect of the fieldtrip. Without pre-exposure to canoeing, the student's lack of skill creates a challenge. Based on the positive feedback from students, canoeing is now part of both our Fall and Spring programs. Including the canoe training and the two fieldtrips, the students are now exposed to three canoeing opportunities. This greatly improves canoe skill mastery, which contributes confidence and teamwork skills while promoting fitness and present/ future lake stewardship. **NOTE: It is important to communicate to the teacher the benefit of pairing students according to weight, and skill level to create the best canoeing experience possible for each student.**
13. **Cameras as Educational Tools;** The addition of cameras for the student groups to use for documentation of their data provides an alternative journalism opportunity for those that may struggle with writing. It also adds a different perspective to the lab and a purpose for more students in the process. The class room follow up can include photo collages, power point presentations, etc. to validate and contribute to student mastery. The use of cameras can be pricy, but the added benefits of being able to teach through diversified skills means engaging students that may otherwise not have been reached. **Be sure to remind students to take pictures during all the segments. It is helpful to start mentioning the photo aspect of the project in the classroom sessions, so that when they get outside and are in the midst of the fieldtrip activities, they remember to photo document the process.**
14. **Program 'Support' Cast;** Have plenty of supporting cast / volunteers available to assist with details, e.g.; helping with the activities, loading canoes, handing out materials, serving the snacks etc. This backup support allows those leading the event to stay focused on the students and the teaching experience.
15. **Curricula and the Seasons;** Match the field trip events to the calendar and the seasons, i.e. there aren't many aquatic plants in the Spring.
16. **Prepare for Inclement Weather;** Schedule back up days with all participants in the event of foul weather.
17. **Break Time;** The sponsoring organization should provide; water, snacks, waste/ recycle containers and port-o-lets for break time.
18. **Permission/Waiver forms;** When the teachers receive the program itinerary, they use that information to create permission and waiver forms. Be sure to get your itinerary to the school well in advance, to facilitate this procedure. Students are not allowed to participate without completed forms.



Scott Peterson with the Canoes On Wheels (COW) equipment disembarking canoes/students



John Kudlas assisting with macroinvertebrate identification

Equipment List

General note: We purchased all of our supplies through the help of the education grant we obtained through the WDNR. The numbers of each item we purchased was based on having student groups of 12 or less and planned to have the students work in pairs or groups of four. Try and have enough of each item available so each student can be involved and have a “hands on” experience.

Critical Habitat

Aqua View Scopes (4) Item #224180	Ben Meadows.com
Under Water Disposable Cameras (8)	Walgreens/Wal-Mart

Macro Invertebrates

Student Dip Nets (6) Item#224902	Ben Meadows.com
Forceps (20)	Forestry-supplies.com
Magnifier lenses (6)	“ ”
Plastic ice cube trays (12)	Wal-Mart

Water Quality

Dissolved Oxygen/Temp. meters (6)	Cabela’s Item IK-0193119
Secchi-Disc (4-6)	Ben Meadows.com
Transparency Tubes (2)	“ ”
pH Paper	“ ”
Safety Glasses (18)	“ ”

Aquatic Plants

Pronged Garden Rakes (2-4)	Used our own/with rope attached to the handle for tossing and retrieving
Aquatic Plant Identification Books	Supplied by FOTSCH. The WDNR also has booklets and resource materials

Shoreline Restoration/Reforestation

Plastic Scrub Pails (6)	Wal-Mart
Trowels (6)	“ ”
Twine (200ft.)	“ ”
Garden Hoes (4)	Ben Meadows
Native Plants (1-2 per student)	Local Green House
Seedling Trees (1-2 per student)	County Forestry Dept.
Marker Flags (100)	Forestry-supplies.com
Cotton work gloves (24 pr.)	Wal-Mart

Canoeing

PFD for each student	Our PFDs were supplied with the “Canoes On Wheels Program”
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General

Clip Boards (24)	Ben Meadows
Pencils (24)	Wal-Mart
Pencil sharpeners	“ ”
Color Highlighters	“ ”
Sharpie Markers	“ ”
First Aid Kit	Ben Meadows
Sun Screen	Wal-Mart
Name tags	“ ”
Bug Repellent	“ ”
Post-it Notes	“ ”
Tote Bins (4Large) to store equipment	“ ”
File folders, dividers, ring binders (as needed)	“ ”
Large Storage Cabinet (to store tote bins and other equipment)	Menards

Equipment in use:



Eco-Education Field Trip Itinerary Template

(Name of Field trip, School class, Date of Field trip)

_____ **School Departure Time**

_____ **Destination Arrival Time**

(Destination Address, Lake, Phone Numbers, etc.)

_____ **Time for Safety instructions/Rotation procedure briefing/Distribute Cameras,(Each camera stays with a 3 / 4 person group for all of their rotations.) Groups previously assigned by the teacher at the beginning of the in-class sessions, taking into account canoe pairing i.e. skill and weight.**

_____ **Number of Rotations and amount of time for each**

_____ **Proceed to First Rotation (time, start and finish)**

5 Minute rotation change, bathroom etc.

_____ **Proceed to Second Rotation (time, start and finish)**

10 Minute water and snack break

_____ **Proceed to Third Rotation (time, start and finish)**

5 Minute Return Life Jackets, materials, reassemble for questions and wrap-up

_____ **Questions and wrap-up (10 minutes approximately)**

_____ **Load Bus and Departure Time**

_____ **Approximate Arrival Time at School**

Note: Accessories for field trip _____

(Contact Person and Cell phone number)

Sponsored By:

*See the "Helpful Suggestions" pages for more information on creating your itinerary and running a successful field trip.

FALL SAMPLE ITINERARY

***Teacher's Name 7th Grade Science Class, School name Middle School
Eco-Field Trip, Tuesday September 20th, 2011***

8:40 Load Bus and Depart from Drummond Middle School to **Barnes, Middle Eau Claire boat landing on Hwy27.**

9:10 Arrive at Middle Eau Claire Lake boat landing

9:10-9:15 Instruction on Rotations, Safety, Lifejackets, etc.

- **Pass out Cameras- don't forget to take pictures!**

3 Rotations of 45 minutes each

1. Water Quality – Lee Wiesner, Fred Haueter
2. Native Aquatic Plants- John Kudlas, Jeremy Bates, Carrie Sanda
3. Critical Habitat- Jerry Kaiser, Shelby Woodard

9:15- 10:00 1stRotation

5 minute- rotation change, bathroom, etc.

10:05-10:50 2nd Rotation

10:50-11:00 Cookie & Water Break

11:00- 11:45 3rdRotation

11:45-11:50 Return Life Jackets /Reassemble for questions and wrap-up

11:50-12:00 Questions and wrap-up

12:00 Load Bus and return to school (Approximate arrival at school 12:30)

Contact: *Name and cell phone (Coordinating person on site)*

Sponsored by:
Eau Claire Lakes Area Property Owner's Association

SPRING SAMPLE ITINERARY
Teacher's Name 7th Grade Science Class, School name Middle School
Eco-Educational Fieldtrip May 23, 2011

8:40 Leave school

9:05-9:10 Arrive at Bony Lake – Owner's property. (The class will be walking from the end of the driveway.) The Bus will need to park on road.

9:10-9:15 Go over Safety/Boat instructions, briefing of procedures (direction of rotation) and ground rules for the day, divide up, distribute cameras.(Cameras stay with 4 person group for all three rotations.)

9:15-10:45 Group's 1, 2, 3, 4 Critical Habitat (proceed to dock)

9:15-10:00 Group's 5 & 6 Shoreline Restoration/Reforestation

9:15- 10:00 Group's 7 & 8 Macro Invertebrates (stay with Mr. Kudlas)

10:00 Proceed to next area. (Group's 5, 6, 7, 8)

10:00- 10:45 Group's 7 & 8 Shoreline Restoration/Reforestation

10:00- 10:45 Group's 5 & 6 Macro Invertebrates

10:45-10:55 Short water/cookie- break and proceed to next area.

10:55- 12:25 Group's 5, 6, 7, 8 Critical Habitat (proceed to dock)

10:55- 11:40 Group's 1 & 2 Shoreline Restoration/ Reforestation

10:55- 11:40 Group's 3 & 4 Macro Invertebrates (stay with Mr. Kudlas)

11:40 Proceed to next area. (Group's 1, 2, 3, 4)

11:40- 12:25 Group's 3 & 4 Shoreline Restoration/ Reforestation

11:40- 12:25 Group's 1 & 2 Macro Invertebrates

12:25 – 12:35 Pickup stations (collect lifejackets, lab equipment, cameras, etc.), gather for summery/review/ questions.

12:35 Load and depart for school

1:00 Approximate arrival at school (Late Lunch, tentative time)

Note: accessories for trip (appropriate shoes for mud and water, jackets, hats, sunglasses)

Address: Property Owner's name and address (sign at end of driveway; name)

(Cell Phone: onsite contact person/ 2nd onsite contact person)

Directions: Bony Lake Road is accessed off of Birch Lake Road which runs between County Road N and Lake Road. If the Bus turns left at Lake Road by Northwood's Tap it will continue on until three way stop by The Windsor Supper club.(Formerly Marie's Laker Lounge) Turn right onto Birch Lake road and go about ¼ mile to Bony Lake Road on your left. Turn left and the driveway is the first one on your left. (fire number and street name)

Three Way Rotations

Critical Habitat- 90 minutes (canoes)

Shoreline Restoration/Reforestation- 45 minutes

Macro Invertebrates- 45 minutes

Sponsored by: The Eau Claire Lakes Area Property Owner's Association

NOTE: In the "Spring 2012 fieldtrip", we will be adding a lunch followed by a culminating activity; the Aquatic/Shoreline Scavenger Hunt.



SUGGESTED SAFETY AND CANOEING SKILLS

Below is a list that should be considered before taking students on the *ECO-DAY* field trip to insure safe conduct, aquatic learning and enjoyment. One indoor class session can be used to review safety and paddling strokes. All the paddling skills can be practiced indoors utilizing the paddles and a widely spaced row of chairs (mimicking canoes). Students can also practice putting on PFD's properly indoors to save outdoor time.

Another class can be used at a local pond/lake to practice necessary skills. One of the best outdoor exercises for learning how to paddle is for students to weave their canoes through a maze of three anchored buoyed empty milk containers. This exercise requires the use of most of the strokes practiced indoors.

Canoes, trailer, PFD's, paddles and other equipment is available for free use through the *Canoes on Wheels (COW)* program and can be reserved by contacting Scott Peterson (Scott@fotsch.org). The Canoes are stored in Gordon, Wisconsin.

Personal Behavior Considerations:

- All rules same as on campus
- Control substances (alcohol/drugs)
- Private property rights
- Litter
- Etiquette –at landings and on water, noise, etc.
- Parental permission protocol
- Limiting electronic entertainment
- Horseplay on the water

Personal Considerations:

- Swimming ability- Identify non swimmers
- Medical/physical concerns/limitations
- Physical fitness and warm-ups

Equipment:

- Canoes: types, parts, materials, care
- Paddles: types, parts, hand positions, sizing, care
- Life jackets (PFD): types, materials, correct fit, care

Group Dynamics and Class Control:

- Group aware of expectations/learning goals
- Discipline problems- affects safety
- Preliminary objectives should be evident
- Group visibility/compactness- essential for monitoring, partnering

Instructional Considerations- covered indoors and practiced outdoors:

- Safe paddling and boat handling- state laws
- Personal equipment- raingear, sunscreen, drinking liquids
- Safety and rescue- where to get help: 911-cell phone
- Boat carries: suitcase, overhead
- Launching: from land or docks- stern person enters first
- Tandem communication
- Hull trim
- Positions: sitting, kneeling, standing?

Safety & Rescue Considerations- covered indoors and practiced outdoors:

- Canoe/Buddy system- looking out for each other
- Hypothermia- HELP & HUDDLE, Care (plastic bags/space blanket), clothing
- Hyperthermia- hydration, clothing
- Rescue procedure- stay with canoe- keep upstream. Reach-throw first.
- Rescue priorities- people, canoes, gear
- How to empty a canoe full of water-canoe-over-canoe rescue
- Staying with capsized canoe

Strokes & Maneuvers:

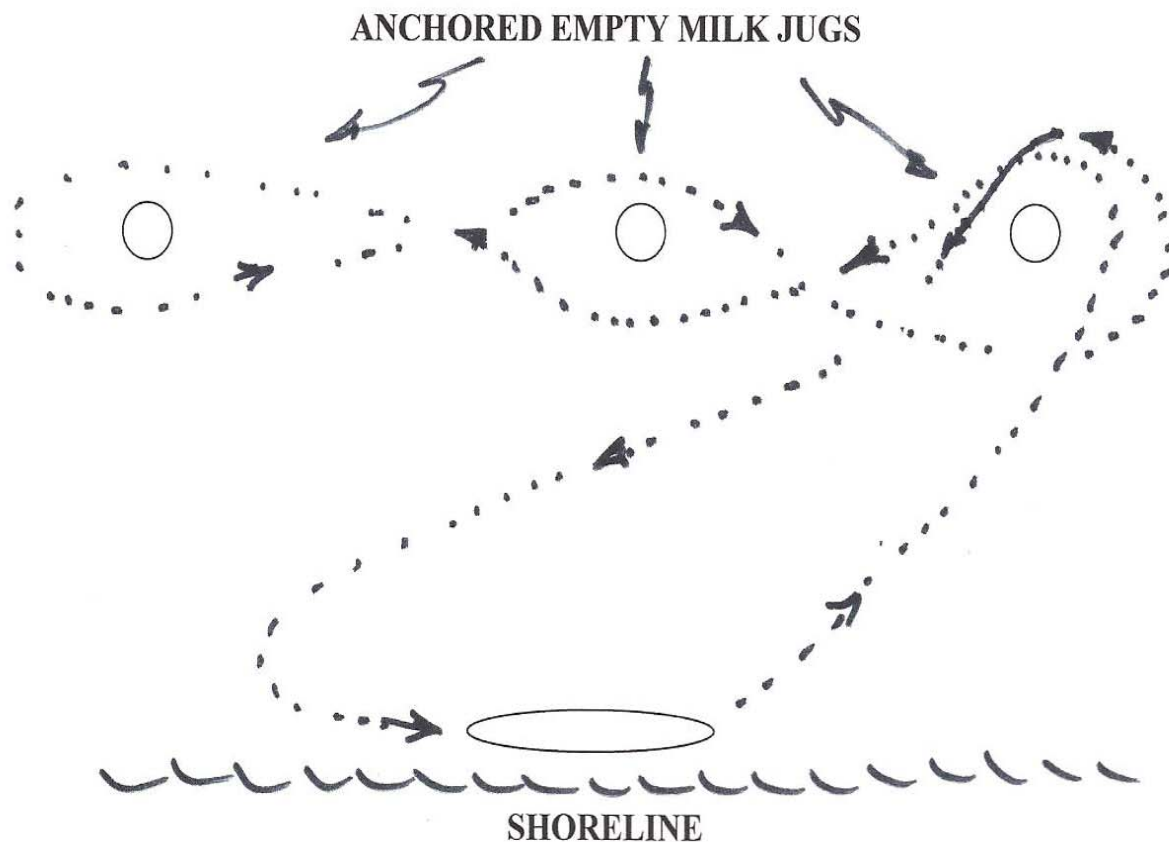
- Strokes- forward, back, “C,” “J,” push-away, pry, draw, crossbow
- Demonstrational skills:
 1. Forward travel in reasonably straight line
 2. Stopping in reasonable distance
 3. Spin- pivot in place
 4. Turn arc both directions while underway
 5. Navigate through maze
 6. Repeat 1-5 in both stern and bow positions
 7. Repeat 1-5 while solo canoeing

Assessment/Evaluation:

- Each tandem team run the three “jug” maze successfully
- Each student solo runs the three “jug” maze successfully (if time permits)



PRACTICE CANOE SLALOM COURSE



1. Students Always have properly fitting pfd on while engaged in this activity
2. Students paired according to ability and classroom teacher recommendation
3. Instructor on shore to help students embark and disembark
4. Instructor/s on the lake with a boat/canoe to assist students having difficulty
5. Students in tandem position run the slalom
6. Students return to shore and exchange positions and re-run the course
7. If time permits, each student run the slalom course as a solo paddler
8. Students having difficulty may change partners/try over again

INDOOR CRITICAL HABITAT LESSON PLAN

[NOTE: WDNR MAY CHANGE THEIR CRITICAL HABITAT PROTOCOL, SO CHECK THEIR WEBSITE BEFORE PROCEEDING AND SELECTING A LOCAL LAKE](#)

Team Members: WDNR Representatives, POA Volunteers

Subject Area/s: Inland Lake Critical Habitat Designations

Grade Levels/s: Middle School Science

Season/instructional time: Spring Session / 45 minutes

- I. **Learning Goals/s:** Learners will be able to more clearly understand what critical habitat areas are and why they are designated as such.

- II. **Objective/s:**
 - Learners will be able to identify a critical habitat area type
 - Learners will be able to determine why an area of a lake could be designated as a critical habitat area.
 - Learners will be able to differentiate between critical habitat and other habitat.
 - Learners will be able to navigate through a series of web sites to find specific information pertaining to critical habitat and research of a specific body of water. (Middle Eau Claire Lake)

- III. **State Standards:**
 - **A.8.4** Use critical thinking strategies to interpret and analyze gathered information.
 - **A.8.1** Identify environment issue questions that can be investigated using resources and equipment available
 - **A.8.5** Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding
 - **C.8.2** Use environmental monitoring techniques; such as, observations, chemical analysis, and computer mapping software to collect data about environmental problems
 - **D.8.5** Explain how personal actions can impact an environmental issue; e.g., doing volunteer work in conservation
 - **B.8.8** Explain interactions among organisms or populations of organisms

- IV. **Setting/Area:** Indoor classroom

- V. **Materials/Resources:** Students will be introduced to the topics in the classroom and then proceed to the computer lab for research activity.
 - Provided documentation of WDNR Critical Habitat
 - Provided web sites for research
 - Provided a lab sheet to support research and mapping activities, lecture material review items, quiz questions
 - Critical habitat experts on hand to support the students with additional information as needed.

VI. Delivery:

Introduction of Lesson / In School Computer lab with Teacher

- Review Critical Habitat Information from DNR Website. Create a web link file that could be used by teacher / or WDNR Representative in computer lab.
- Review critical habitat criteria / identification of types
- Create a map of (sample) Middle Eau Claire Lake with CH areas identified (available to be printed from WDNR Website)
- Label the map with Team Name
- Turn in maps and lab sheets following session (to be used during outdoor field trip)

Large Group:

- In class room, go over introductory materials,
- Review the Critical Habitat Program as listed on the WDNR Web site
- Review what Critical Habitat is,
- Review computer lab procedures

Small Group:

- In Computer lab, work in pairs at each work station.
- Navigate through web sites as instructed on lab sheet and as provided by the instructor
- Print off map of (sample) Middle Eau Claire Lake to be used during field trip activity

VII. Assessment:

- Have each group (two students) write a short paragraph about what they accomplished in the computer lab work session. They should also attach their printed map that will be used during the field trip. (Plan to allow 10-15 minutes for documentation and map completion prior to wrap up.
- Have an informal class discussion (wrap up) about the activity.



INDOOR CRITICAL HABITAT LAB SHEET

TEAM MEMBERS:

BACKGROUND:

Things you should learn:

- What is Critical Habitat?
- What percent of living things found in lakes and rivers can be found along the shores and shallow margins?
- What part of the lake do 80% of all plants and animals on the state's endangered or threatened species list spend all or part of their life cycle?
- What are things that affect critical habitat?

Web site work:

- Go to the WDNR Critical Habitat Homepage:

<http://dnr.wi.gov/lakes/criticalhabitat/>

Critical Habitat Areas

Assuring Public Rights in Waters of the State

Critical Habitat Designation - The Program

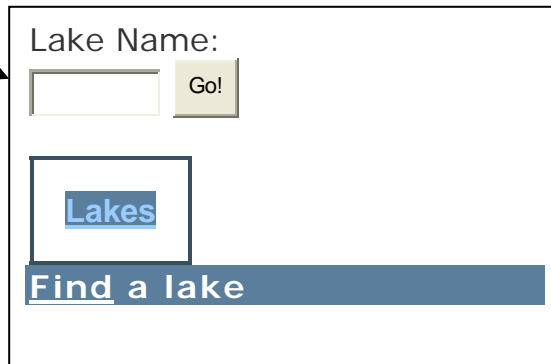
Every body of water has critical habitat - those areas that are most important to the overall health of the aquatic plants and animals. Remarkably, eighty percent of the plants and animals on the state's endangered and threatened species list spend all or part of their life cycle within the near shore zone. As many as ninety percent of the living things in lakes and rivers are found along the shallow margins and shores. Wisconsin law mandates special protections for these critical habitats. Critical Habitat Designation is a program that recognizes those areas and maps them so that everyone knows which areas are most vulnerable to impacts from human activity. A critical habitat designation assists waterfront owners by identifying these areas up front, so they can design their waterfront projects to protect habitat and ensure the long-term health of the lake they where they live. Areas are designated as Critical Habitat if they have Public Rights Features, Sensitive areas or both. Public rights features (defined in NR 1.06, Wis. Adm. Code) include the following:

- Fish and wildlife habitat
- Physical features of lakes and streams that ensure protection of water quality
- Reaches of bank, shore or bed that are predominantly natural in appearance
- Navigation thoroughfares
- Sensitive Areas. Sensitive Areas are defined in Ch. NR 107 as: areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat to the body of water.



To Print Map:

Using the “Lake Name” Text Box in the upper right corner of this page enter the Lake Name (*Middle Eau Claire*)
Click on the “Go” button



Find a Lake

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#) [All](#) | [To Excel](#)

Location:

Statewide Lakes With:

Lake Name:

Lake Name	County	Size (Acres)
Middle Eau Claire Lake	Bayfield	880

- **Confirm lake choice:** Click on ([Middle Eau Claire Lake](#)) to display Lake description page

Lake Description Page:

Middle Eau Claire Lake
Bayfield County, 880 Acres

[Overview](#)

[Facts & Figures](#)

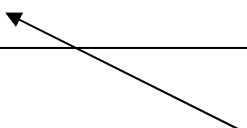
[More](#)

Middle Eau Claire Lake is a 880 acre lake located in Bayfield County. It has a maximum depth of 66 feet. Visitors have access to the lake from a public boat landing. Fish include Musky, Panfish, Largemouth Bass, Smallmouth Bass, Northern Pike and Walleye. The lake's water clarity is moderate.

Typical Conditions
Typical Water Clarity: Moderate
Typical Water Temperature: | May: 51 F | June: 68 F | July: 73 F | August: 72 F | September: 70 F

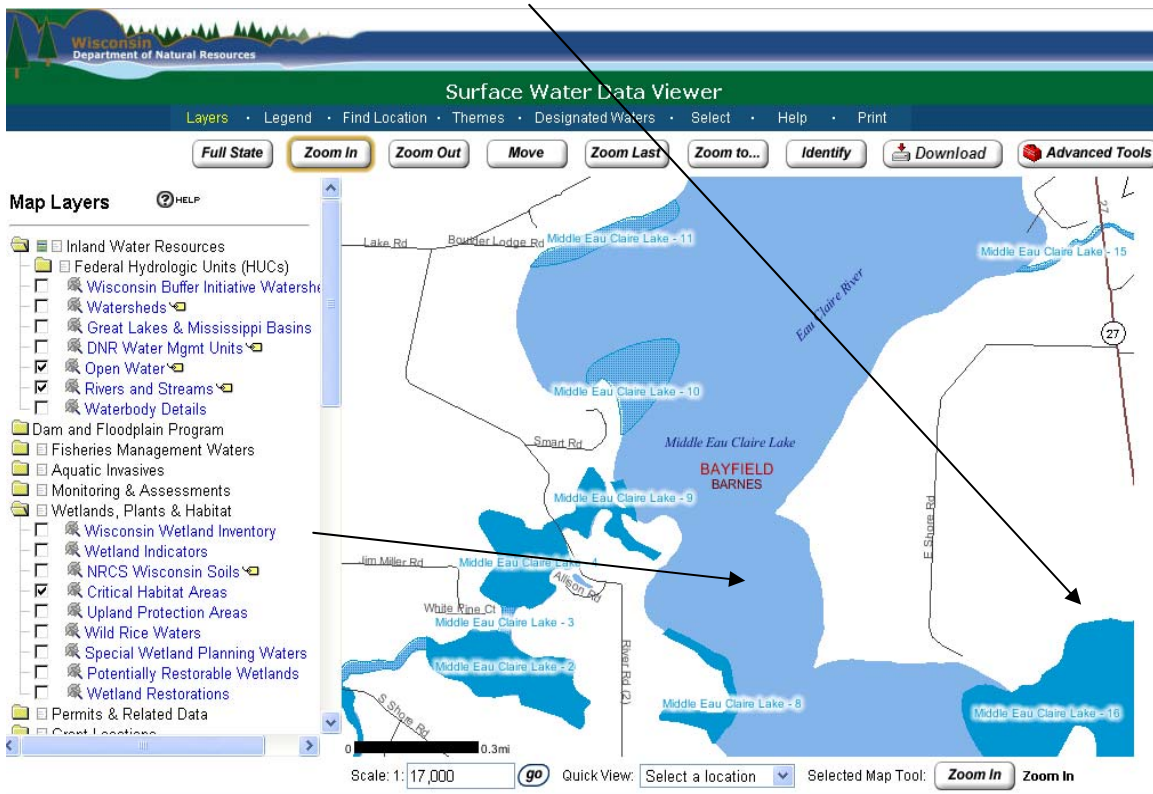
Before You Go
[Fish Consumption Advisories](#)
[State Fishing Regulations](#)

Maps
[Contour \(Bathymetric\) Map](#)
[Interactive Map](#) (click here to display the "surface water viewer" page)

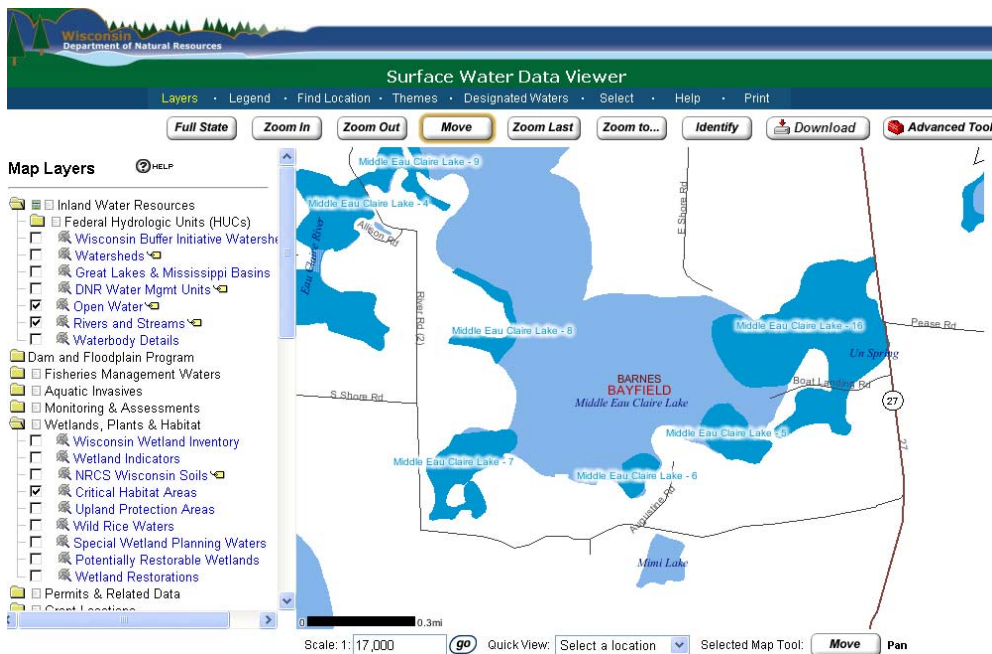
- 
- **Click on [Interactive Map](#) in the lower left corner of the page under 'Maps'**
 - **The "Surface Water Data Viewer" page, this will display the map of the lake, but the Critical Habitat designated areas will not be showing.**



- To display the Critical Habitat designations we need to complete the following steps:
 - 1st, the Scale of the map must be reduced to below 24,000
(Depending on the size of the lake, you may need to adjust the scale to adjust the fit of the map on the page)
 - In the Scale box at the bottom of the map, change the number to **17,000** and click on **“GO”**. This will change the size of the lake in the map
 - 2nd, click on the **“Layers”** button in the upper **‘Blue’** tool bar at the top of the page. This will display many available map layers.
 - 3rd, click on the **Wetlands, Plant and Habitat** folder
 - 4th, in that drop down check the **“Critical Habitat Area”** box. This will display the critical habitat designated areas for the lake
- Screen with Critical Habitat Areas shaded



- Because this is a large lake on a small viewing area, we need to move the lake around on the map and center the area we are going to working on in the viewing area.
- Click on **“Move”**
- Move your cursor and place the large + over the **“Middle Eau Claire Lake – 8”**, right on the 8. Hold down the left cursor button and move the + to the middle of the map area and release the cursor button. The map will now be moved and the Critical Habitat areas we will be working in, #16 and # 5, will be more centered in the viewing area. Lake Map is now more centered and better displaying areas we will work in;



- In preparation to printing the map, we need to mark our field trip location and identify our map with our team name:

- Click on **“Advanced Tools”**
- Click on the first **“Pencil Point”** tool

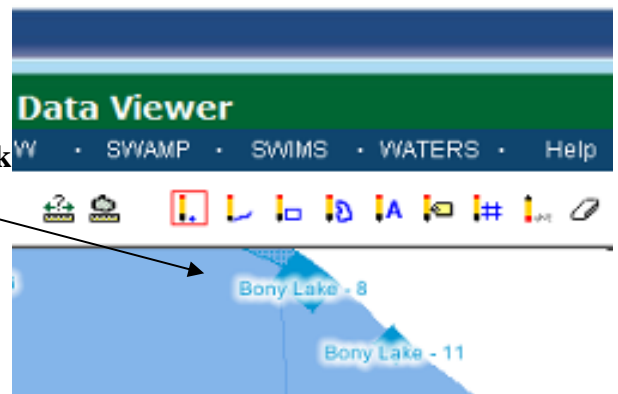
Move cursor to the location of the boat

landing (As directed by teacher) and left click

to put a Point on the boat landing

(this will open a label text box, type in Boat Landing)

Click **“Submit”**



To Print Map:

- On the upper dark blue tool bar Click **“Print”**
- In the ‘Map Title Box’ add your team name
- Click **“OK”**
- Click on **“Open Map”**
- Right Click anywhere on the map to get a drop down box.
- Click **“Print”** to print the map

Students complete the following:

- **Summary paragraph:** in the space below write a brief summary of what you have learned and what they accomplished in today’s computer lab session.

- **Answer the following questions “Things you should have learned”**

- What is Critical Habitat?
- What percent of living things found in lakes and rivers can be found along the shores and shallow margins?
- What part of the lake do 80% of all plants and animals on the state’s endangered or threatened species list spend all or part of their life cycle?
- Things that affect critical habitat?

- **attach your maps and return to the instructor**

TURN IN YOUR MAP WITH THIS LAB SHEET THESE WILL BE RETURNED AT THE FIELD TRIP.

INDOOR WATER QUALITY LESSON PLAN

Team Members:

Subject Area: Water Quality

Grade Level/s: Middle School Science

Season/Instruction Time: Fall, before outdoor water studies/45 minutes

I. Learning Goal/s: Learners will understand the importance of water resource quality and human impact upon the water resource

II. Objective/s:

- Learners will learn basic chemistry/physical factors related to water resources
- Learners will understand “levels of acceptance” as it relates to water resources
- Learner will understand personal behavior’s affect upon water resources

III. State Standards:

- **A.8.2** Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information
- **A.8.5** Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding
- **B.8.5** Give examples of human impact on various ecosystems
- **B.8.10** Explain and cite examples of how humans shape the environment
- **B.8.17** Explain how human resources use can impact the environment; e.g., erosion, burning fossil fuels



IV. Setting/Area: Indoor Lab Area

V. Materials/Resources: Students divided into small groups of 3-5

- Enclosed lab sheet record analytical material
 - Safety glasses
 - Liter/quart container of water for each group to analyze. Each container altered using baking soda or vinegar or food coloring, etc.
 - pH paper
 - Thermometer/oxygen meter
 - Vinegar
 - Baking Soda
 - Mini Secchi disk tube and bucket (to prevent spills)
 - Limiting “factors” overhead transparency and projector
-
- **VI. Delivery:**
 - Review safety issues; e.g., handling instruments/chemicals, safety glasses
 - Review factors on overhead projector and how the factors affect aquatic life
 - Review lab protocol. Cooperative learning, Agreeing on findings, etc.
 - Distribute water containers to group with cautions and directions. Some containers will have vinegar in them and some Baking soda to alter pH



WATER QUALITY FACTORS

FACTOR	DEFINITION	IMPORTANCE	ACCEPTABLE
Turbidity	Water clarity soil/algae/plankton/ Microbes	Affects water temperature/ oxygen/photosynthesis/ clog fish gills/spawning	50 NTU
Dissolved Oxygen	Oxygen in water More in cold, shade, Running water	For fish to breathe	4-5 mg/L
Phosphorus Phosphate	Plant growth fertilizer, animal Wastes	Cause eutrophication and fish kills	Less than .1 mg/L
Acidity	pH 1-6 range 7-neutral-water	Affects oxygen use by organisms	5.5- 7.5- most fish 6.5- 8.2- optimal
Alkalinity (Base)	pH 8-14 range 7-neutral-water In rocks/soils	Buffers (neutralizes) acids	100-200 mg/l- best
Nitrate	In fertilizers Septic systems	Cause eutrophication fish kills	Unpolluted water < 1 mg/L
Temperature	Certain species can't tolerate warm water		Most fish: 35-65 degrees F

SUGGESTED OVERHEAD TRANSPARENCY

WATER QUALITY LAB SHEET

Team Members:

Materials: Get the following materials from your instructor:

- Safety goggles
- Water sample (prepared by instructor)
- Oxygen/thermometer meter (share)
- Mini secchi disk tube (share) and bucket (share)
- Ph paper

Directions:

1. Put on safety goggles and keep them on for the entire lab
2. Test your water as directed by your instructor
3. Insert the Ph paper in the water and record your findings
4. Check your water for oxygen and record
5. Check your water for temperature and record
6. Check your water clarity with the mini secchi disk tube and record
7. We will not test for phosphate/nitrates

DATA TABLE

WATER SAMPLE : _____

FACTOR

FINDINGS

ANALYSIS

TURBIDITY (cm) _____

DISOLVED (mg/L)

OXYGEN _____

Ph _____

TEMPERATURE (C/F) _____

ASSESSMENT: Provided other factors were okay, would you consider this water good or bad for aquatic life? Why/why not? Be prepared to discuss this at the end of the lab.

INDOOR AQUATIC PLANT LESSON PLAN

Team Members:

Subject Area/s: Aquatic Plants and Invasive Species

Grade Level/s: Middle School Science

Season/instructional time: Fall before outdoor water studies/45 minutes

I. Learning Goal/s: Learners will be able to use aquatic plant materials to identify native and invasive species and value of aquatic plants

II. Objective/s:

- Learners will be able to discern *Emergent/Free Floating/Submersed/Floating Leaf Aquatic plants*
- Learners will determine the benefits/value of aquatic plants and life cycles
- Learners will differentiate between native and invasive aquatic plants

III. State Standards:

- **A.8.1** Identify environmental issue questions that can be investigated using resources and equipment available
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.5** Give examples of human impact on various ecosystems
- **B.8.8** Explain interactions among organisms or populations of organisms
- **D.8.5** Explain how personal actions can impact an environmental issue;*e.g., doing volunteer work in conservation
- **E.8.1** Formulate a personal plan for environmental stewardship

IV. Setting/Area: Indoor classroom

V. Materials/Resources: Students divided into small groups of 3-5

- Enclosed lab sheet to compare and record “collected” aquatic plants
- Resource texts: *Through the Looking Glass* and *Lake Plants You Should Know*
- Pencils/clip boards
- Samples of aquatic plants

VI. Delivery:

Introduction of Lesson:

Review/discuss aquatic green plants and their benefits:

1. habitat for animals
2. spawning areas
3. Absorb/hold phosphorous/nitrogen
4. Food for mammals, waterfowl, insects and fish
5. Roots stabilize sediments at shoreline
6. Cover of near shore animals(ducklings)

7. Oxygen for animals in littoral zone
8. Nesting areas for marsh birds, songbirds and waterfowl

Review/show examples of aquatic plant types:

1. Emergent
2. Free Floating
3. Submersed
4. Floating Leaf

Review destructive nature of aquatic invasive species

Review invasive species targeted in our area:

1. Eurasian Water-milfoil, and
2. Curly-leaf pondweed and their destructive nature to over-take native species

Review laws re/transport of aquatic plants

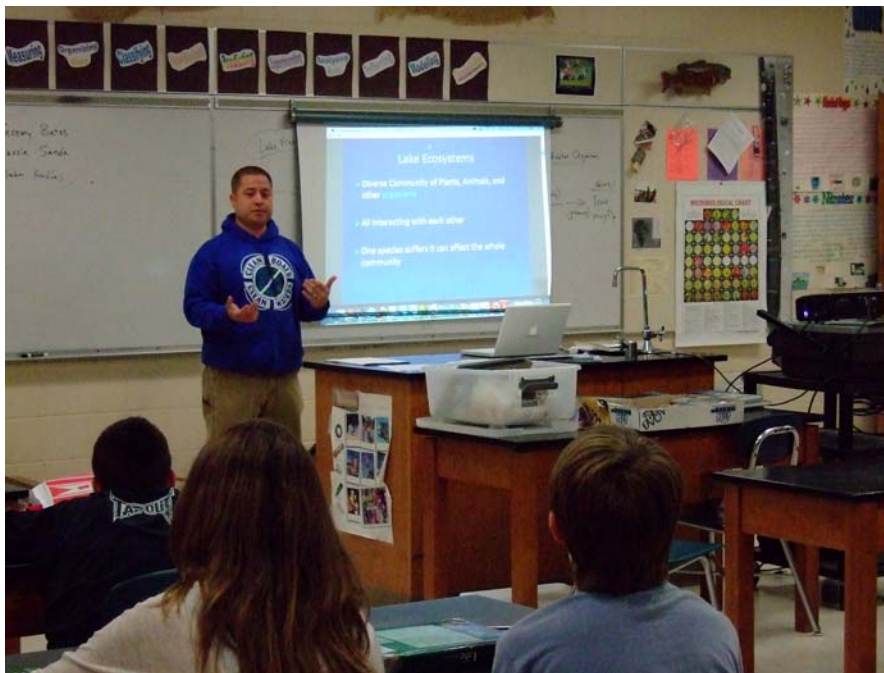
Large Group: Go over introductory materials and hand out equipment

Small Group: Each small group goes to a lab/desk area. Learners will identify the aquatic plants on the sheet according to their “types,” and record them. The learners will then identify the plants using resource materials.

Outdoor Preparation: Learners should wear warm clothing and rain gear in case of rain. Old tennis shoes or boots should be worn because their feet will probably get wet.

VIII. Assessment:

- Have *each group* write a short paragraph about their findings on the *Tally Sheet*.
- Have an informal class discussion (wrap-up) about the activity.



Jeremy Bates, Bayfield Co. AIS Coordinator; discussing Aquatic Plants and AIS

AQUATIC PLANTS

FREE-FLOATING- Float, not attached

SUBMERSED- Most below surface

FLOATING LEAF- Leaves on surface

EMERGENT- Leaves above surface

SUGGESTED OVERHEAD TRANSPARENCY

AQUATIC PLANT LAB SHEET

Team Members:

Materials: Get the following materials from your instructor/assistant:

- Clip board/pencil
- Resource book *Through the Looking Glass* and *Lake Plants You Should Know*

Directions:

1. Take one of the sample plants from the front lab table
2. Look through the resource books and identify the plant
3. Also tell what type of plant you have (emergent/free floating/submersed/floating leaf)
4. Also tell if it is native or invasive
5. Return the plant to the front lab table and select the next plant until you have completed all the samples/as many as time will permit.

<u>SAMPLE</u>	<u>PLANT NAME</u>	<u>TYPE</u>	<u>NATIVE/INVASIVE</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____

Assessment: Write below what you think the major problems are with an invasive aquatic plant species and how we can prevent their spreading to other lakes. Explain what **YOU** can do to prevent the spread of aquatic invasive species.

INDOOR AQUATIC INVASIVE SPECIES LESSON PLAN

Team Members:

Subject Area/s: Invasive Species

Grade Level/s: Middle School Science

Season/instructional time: Before Fall outdoor water studies: 45 minutes

I. Learning Goal/s: Learners will be able to use aquatic plant/animal materials to identify aquatic invasive species and their destructive nature

II. Objective/s:

- Learners will be able to discern *Emergent/Free Floating/Submersed/Floating Leaf Aquatic plants*
- Learners will determine the benefits/value of aquatic plants and life cycles
- Learners will differentiate between native and invasive aquatic species
- Learners will learn appropriate personal conduct near water resources
- Learners will become familiar with CBCW and invasive species transport regulations

III. State Standards:

- **A.8.1** Identify environmental issue questions that can be investigated using resources and equipment available
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.5** Give examples of human impact on various ecosystems
- **B.8.8** Explain interactions among organisms or populations of organisms
- **D.8.5** Explain how personal actions can impact an environmental issue; *e.g., doing volunteer work in conservation
- **E.8.1** Formulate a personal plan for environmental stewardship

IV. Setting/Area: Indoor classroom

V. Materials/Resources: Students divided into small groups of 3-5

- Enclosed lab sheet to compare and record “collected” aquatic plants
- Brochures/handouts from county/state describing various aquatic invasive species
- Live and preserved samples of aquatic invasive species
- Resource texts: *Through the Looking Glass* and *Lake Plants You Should Know*
- Pencils/clip boards
- Samples of aquatic invasive plants/animals

VI. Delivery: Students work at their lab tables

- Have student teams inspect and differentiate native and invasive species
- Have student teams differentiate native and invasive species

Introduction of Lesson:

- Review/discuss aquatic green plants and their benefits:
 1. habitat for animals
 2. spawning areas
 3. Absorb/hold phosphorous/nitrogen
 4. Food for mammals, waterfowl, insects and fish
 5. Roots stabilize sediments at shoreline
 6. Cover of near shore animals(ducklings)
 7. Oxygen for animals in littoral zone
 8. Nesting areas for marsh birds, songbirds and waterfowl
- Review/show examples of aquatic plant types: Emergent/Free Floating/Submersed/Floating Leaf
- Review destructive nature of aquatic invasive species
- Review invasive species targeted in our area: Eurasian Water-milfoil/Curly-leaf pondweed and their destructive nature: to over-take native species
- Review laws re/transport of aquatic plants

Large Group: Go over introductory materials and hand out equipment

Small Group: Each small group goes to a lab/desk area. Learners will identify the invasive species and record them using resource materials.

Outdoor Preparation: Learners should wear warm clothing and rain gear in case of rain. Old tennis shoes or boots should be worn because their feet will probably get wet.

VIII. Assessment:

- Have *each group* write a short paragraph about their findings on the *Tally Sheet*.
- Have an informal class discussion (wrap-up) about invasive species.
- Have an informal discussion about their personal actions around water resources and what they can do to curb the spread of invasive species



INDOOR AQUATIC INVASIVE SPECIES LAB SHEET

Team Members:

Background: Things you should know. Answer the following:

1. What are the four types of aquatic plants?
2. What is an invasive species
3. Name at least four things plants provide for other living things

Directions: Take a sample from the front lab table and identify what kind of invasive species it is and why it is destructive. Use the resource handouts provide by the instructor. Return the sample to the lab table and take another. Continue the process until you have all of the samples identified.

SAMPLE #	NAME	DESTRUCTIVE NATURE
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____

Describe what you personally can do to reduce the spread of aquatic invasive species:

OUTDOOR CRITICAL HABITAT LESSON PLAN

Team Members: WDNR Representatives, POA Volunteers

Subject Area/s: Inland Lake Critical Habitat Designations

Grade Levels/s: Middle School Science

Season/instructional time: Spring Session / 45 minutes

I. Learning Goals/s: Learners will be able to more clearly understand what critical habitat areas are and why they are designated as such.

II. Objective/s:

- Learners will be able to identify a critical habitat area type
- Learners will be able to determine why an area of a lake could be designated as a critical habitat area.
- Learners will be able differentiate between critical habitat and other habitat.
- Learners will be able to navigate the lake via canoe, to different critical habitat locations and ID their locations their map.

III. State Standards:

- **A.8.4** Use critical thinking strategies to interpret and analyze gathered information.
- **A.8.1** Identify environment issue questions that can be investigated using resources and equipment available
- **A.8.5** Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding
- **C.8.2** Use environmental monitoring techniques; such as, observations, chemical analysis, and computer mapping software to collect data about environmental problems
- **D.8.5** Explain how personal actions can impact an environmental issue; e.g., doing volunteer work in conservation
- **B.8.8** Explain interactions among organisms or populations of organisms

IV. Setting/Area: Shoreline areas or littoral areas.

V. Materials/Resources: Students will survey open water areas in canoes, ideally two per canoe.

- Provided documentation of WDNR Critical Habitat
- Laminated photo examples of critical habitat designations with descriptions
- Printed maps and lab sheets completed in previous indoor session
- Lecture material review items, assessment questions
- Safety items include, Lifejackets, sun screen
- Safety Boats (2) in canoeing area
- Critical habitat experts on hand to support the students with additional information as needed. Ideally if one expert could be located at each CH

VI. Delivery:

Large Group / Field trip to (sample) Middle Eau Claire Lake

- Introduction to days lesson, objectives and review expectations for the session
- Review Critical Habitat information and their previously created maps
- Review critical habitat identification of types
- Review map of Middle Eau Claire lake with CH areas identified
- Review canoeing safety
- Hand out materials as needed

Small Group: Field Trip on (sample) Middle Eau Claire Lake

- Canoe teams (4 people, 2/canoe) depart to critical habitat location marked by buoys. (two or more)
- Take few minutes to review each location and mark on map;
- ID the critical habitat type on their provided lab sheet. ID as many different types of habitat as possible at each location and document on your lab sheet
- Optional, take an underwater photo of the critical habitat item
- Proceed to additional locations, repeat process and return to shore.
- Once completed, turn in lab sheets, maps and camera (if used)

Outdoor Preparation:

- Two or more CH locations will need to be marked with buoys prior to the class arrival, label buoys to correspond with habitat number on map.
- Work with WDNR representatives to locate and ID if needed
- Have canoes delivered, paddles, life jackets etc.
- Prepare lab sheet for field work and identification of the critical habitat sites

VII. Assessment:

- Have each team write a short paragraph about their findings on the team's lab sheet. (This may be best done as a follow up by the instructor during next class session.)
- Each team should turn in their completed lab sheets which should include the correct critical habitat identifications.
- Optional, (could be used as an assessment tool by the instructor at the next class session.) – Have each student write a short essay on how this activity impacted them and their attitudes toward how they will act when using the lakes in the future. Including their thoughts of why critical habitat designations are truly “Critical”
- .Have an informal class discussion (wrap up) about the activity.

OUTDOOR CRITICAL HABITAT LAB

Team Members:

Materials: Get the following materials from your instructor/assistant:

- Printed Map previously made in computer lab session
- Laminated photo guide of critical habitat designations
- Copy of the “Aquatic Plants Field Guide” if available (one per team of two)
- Canoes with two paddles
- Aqua View tube (one per team of four)
- Clip board, pencil and lab sheet (one per team of two)
- Camera (one per team of four)
- Life jackets for each student

Directions- After getting the equipment:

- Assemble on dock for canoe assignment and instruction
- Pair up in canoes and follow map and canoe to the marker buoys
- Survey each Critical Habitat area to determine type
- Take a photo of each area and marker buoy
- Mark lab sheet with types of critical habitat (some have multiple types)
- Paddle to other selected areas and repeat tasks
- Return to canoe dock when complete
- Clean out canoe and return equipment
- Clean and dry Aqua View Tube
- Fill in lab sheets and check for completeness and sign your names
- Turn in lab sheets, maps and supplies

Describe your contributions to your groups work? (This may be used after the field by the instructor)

Short Essay Questions: (This may be used after field trip by the instructor)

1. How did this activity impact you and your attitude toward how you will use the lakes in the future? 2. Your thoughts on why critical habitat designations are “Critical”?

1. _____

2. _____

Teacher check:

_____ **Lab sheet with names**
_____ **Aqua view, pencil, clip board,**
_____ **Canoe equipment**

Evaluation: _____ **Excellent: followed directions, worked safely**
_____ **Other:** _____



**OUTDOOR CRITICAL HABITAT LAB
SELECTION WORKSHEET**

Directions:

Paddle to critical habitat area, look on and into the water between the marker buoys using the Aqua View Tube for different types of habitat. For each site, select the proper description options (A,B,C,D,E) and mark in the ID space. (there can be more than one)

SITE NUMBER

ID

MEC 5

MEC 16

CRITICAL HABITAT TYPE

Description options

(see attached photo examples)

A) Submerged Aquatic Vegetation

(under water vegetation)

B) Emergent and Floating Vegetation

(vegetation that is growing through the surface or floating)

C) Rush Beds

(reed or grass like growing up from bottom usually clusters of brown spikelets)

D) Woody Habitat

(Fishsticks, submerged trees)

E) Extensive Riparian Wetland

(usually large areas or sections of a lake that include in water and shoreland habitat.)

Extra Credit:

Using the supplied “Aquatic Plants Field Guide”, identify as many species of aquatic plants that you saw during this critical habitat identification process.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Critical Habitat Designation Descriptions



Biologically Diverse Submerged Aquatic Plants produce oxygen through photosynthesis and use nutrients that might otherwise fuel midsummer algae blooms. Submerged aquatic plants also provide spawning and nursery areas for certain types of fish; northern pike and yellow perch lay their eggs on aquatic plants.

Submerged Aquatic Vegetation Important to Fish and Wildlife Habitat. Aquatic plants provide food for waterfowl and habitat for insects, invertebrates, zooplankton, and many species of fishes. Specifically, the leaves and stems of aquatic plants are colonized by invertebrates offering forage opportunities for fish.



Emergent and Floating Leaf Vegetation help prevent shoreline erosion by stabilizing shoreline sediments and buffering wave action. The floating leaves offer shade and shelter for fish, reptiles, and invertebrates. The seeds of emergent and floating leaf plants are eaten by waterfowl including mallard, pintail, ringneck, and scaup. Muskrats and beaver also eat the rhizomes.

Rush Beds trap and prevent silt carried by waves from covering gravel used by bass and panfish for spawning. Bulrushes and other Rushes also reduce shoreline erosion by absorbing wave energy and stabilizing bank sediments. Rushes provide food and nesting material for muskrats, waterfowl, and marsh birds.



Wild Rice is valued by some waterfowl during migration specifically Sora rails. Red-wing blackbirds will also move into rice beds as the grains mature and consume the rice grains. Muskrats use the wild rice stems as both a food source as well as construction material for building their lodges.

Extensive Riparian Wetlands are spawning grounds for northern pike, nurseries for fish and ducklings, critical habitat for shorebirds and songbirds and lifelong habitat for some frogs and turtles. Wetlands also provide essential habitat for smaller aquatic organisms in the food web, including crustaceans, mollusks, insects, and plankton. Wetland vegetation provides food and cover for waterfowl, muskrats, and other wildlife. Wetlands also help keep lakes and rivers clean by filtering sediments and excess nutrients. Wetlands slow down the flow of water and act like natural sponges to reduce flooding, stabilize stream flow and lake levels, and provide recharge for groundwater.

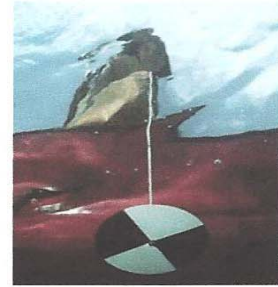


Woody Habitat is critical for all kinds of aquatic and terrestrial life. Water insects such as mayflies graze on the algae that grow on decomposing wood. Dragonfly nymphs hunt prey among the stems and branches. Fish often find food, shelter, or nesting habitat among these fallen trees. Above water, ducks and turtles loaf and sun themselves on the trunks. Muskrats use the trees as feeding platforms.



Spawning Substrate Walleyes use clean gravel along wind swept shores for spawning. Aquatic insects, crayfish, rock bass, and smallmouth bass also hide and forage among the rocks and gravels.

Water Quality Physical features of lakes and streams that ensure protection of water quality. Physical features that protect water quality include stands of aquatic plants (that protect against erosion and so minimize sedimentation), natural streambed features such as riffles or boulders (that cause turbulent stream flow and so provide aeration), and natural ground water springs.



Natural Scenic Beauty –Reaches of bank, shore or bed that are predominantly natural in appearance (not man-made or artificial) or that screen man-made or artificial features. Reaches include those with stands of vegetation that include intermixed trees, shrubs and grasses; stands of mature pines or other conifer species; bog fringe; bluffs rising from the water's edge; beds of emergent plants such as wild rice, wild celery, reeds, arrowhead.

Navigation Thoroughfares are areas traditionally used for navigation during recreational boating, angling, hunting or enjoyment of natural scenic beauty. Physical features indicative of navigation thoroughfares include shallow water areas typically used by wading anglers or areas frequently occupied by regularly repeated public uses such as water shows.



OUTDOOR AQUATIC PLANT LESSON PLAN

Team Members:

Subject Area/s: Aquatic Plants and Invasive Species

Grade Level/s: Middle School Science

Season/instructional time: Fall;45 minutes

I. Learning Goal/s: Learners will be able to use aquatic plant materials to identify native and invasive species and value of aquatic plants

II. Objective/s:

- Learners will be able to discern *Emergent/Free Floating/Submersed/Floating Leaf Aquatic plants*
- Learners will determine the benefits/value of aquatic plants and life cycles
- Learners will differentiate between native and invasive aquatic plants

III. State Standards:

- **A.8.1** Identify environmental issue questions that can be investigated using resources and equipment available
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.5** Give examples of human impact on various ecosystems
- **B.8.8** Explain interactions among organisms or populations of organisms
- **D.8.5** Explain how personal actions can impact an environmental issue;*e.g., doing volunteer work in conservation
- **E.8.1** Formulate a personal plan for environmental stewardship

IV. Setting/Area: Outdoor classroom

V. Materials/Resources: Students divided into small groups of 3-5 or work individually

- Student *Aquatic Plant* lab sheet and pencil for each student
- Each student with a name tag to place “stickers”
- Small reward “stickers”
- Resource texts: *Through the Looking Glass* and *Lake Plants You Should Know*
- Samples of aquatic plants displayed and identified
- Pail of recently collected aquatic plants
- Rakes
- Extra bucket to place identified plants
- Plastic bags to collect unidentified/suspicious plants

VI. Delivery:

Introduction of Lesson:

- *Review/discuss from indoor session aquatic green plants and their benefits:*
 1. habitat for animals
 2. spawning areas
 3. Absorb/hold phosphorous/nitrogen
 4. Food for mammals, waterfowl, insects and fish

5. Roots stabilize sediments at shoreline
 6. Cover of near shore animals(ducklings)
 7. Oxygen for animals in littoral zone
 8. Nesting areas for marsh birds, songbirds and waterfowl
- Review/show examples of aquatic plant types: Emergent/Free Floating/Submersed/Floating Leaf
 - Review destructive nature of aquatic invasive species
 - Review invasive species targeted in our area: Eurasian Water-milfoil/Curly-leaf pondweed and their destructive nature: over-take native species
 - Review laws re/transport of aquatic plants

Outdoor Preparation: Learners should wear warm clothing and rain gear in case of rain. Old tennis shoes or boots should be worn because their feet will probably get wet.

Large Group: Go over introductory materials and hand out equipment

Small Group/Individual: Each small group/individual retrieves an unknown plant from the “bucket” of plants and compares it to the instructor’s samples. Learners will identify the aquatic plants, their “types” and if they are native or invasive to the instructor. Successful identification will result in a “sticker” on their name tag or on their lab sheet.

Optional extended activity: Have student “rake” aquatic plants from shore/dock and identify. Student should wear a pfd or be accompanied by an adult.

VIII. Assessment:

- Have an informal class discussion (wrap-up) about the activity.
- Students will “tally” their number of “stickers”
- Students hand in lab sheet



OUTDOOR AQUATIC PLANT LAB SHEET

Team Members:

Materials: Get the following materials from your instructor/assistant:

- Clip board/pencil
- Resource book *Through the Looking Glass* and *Lake Plants You Should Know*

Directions:

1. Take one of the sample plants from the “bucket” or raked from the shore as requested by the instructor/assistant
2. Look at samples and through the resource books and identify the plant
3. Also tell what type of plant you have (emergent/free floating/submersed/floating leaf) and if native or invasive
4. Identify your plant and show it to your instructor/assistant. You will receive a “sticker” for your name tag/lab if correct.
5. Return the plant to the “alternate bucket” and select the next plant until you have completed all the samples/as many as time will permit.
6. If you correctly identify 8 plants the instructor may ask you to collect and identify a plant/s from the lake with the rake.

<u>SAMPLE</u>	<u>PLANT NAME</u>	<u>TYPE</u>	<u>NATIVE/INVASIVE</u>
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Assessment: Write below or on back what you think the major problems are with an invasive aquatic plant species and how we can prevent their spreading to other lakes. Explain what YOU can do to prevent the spread of aquatic invasive species.

OUTDOOR WATER QUALITY LESSON PLAN

Team Members:

Subject Area: Water Quality

Grade Level/s: Middle School Science

Season/Instruction Time: Fall Session/45 minutes

I. Learning Goal/s: Learners will understand the importance of water resource quality and human impact upon the water resource.

II. Objective/s:

- Learners will learn basic chemistry/physical factors related to water resources
- Learners will understand “levels of acceptance” as it relates to water resources
- Learner will understand personal behavior’s affect upon water resources

III. State Standards:

- **A.8.2** Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information
- **A.8.5** Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding
- **B.8.5** Give examples of human impact on various ecosystems
- **B.8.10** Explain and cite examples of how humans shape the environment
- **B.8.17** Explain how human resources use can impact the environment; e.g., erosion, burning fossil fuels
-

IV. Setting/Area: Outdoor Lake Lab Area

V. Materials/Resources: Students divided into small groups of 3-5

- Life preservers for all participants
- Pontoon boat/several large fishing boats
- Enclosed lab sheet to record data & pencils & clipboards
- Paper/plastic cups
- Oxygen/temperature meters
- Ph paper
- Secchi discs
- Aquatic Chemical Factors Sheet (used in classroom)

VI. Delivery:

- Review safety issues; e.g., proper fitting of life preserves/working in pairs/ staying seated in the pontoon/boat when motoring
- Motor to predetermined deep portion of lake
- Demonstrate/instruct proper methods for acquiring data using meters/secchi disk/Ph paper
- Have students collect data required on lab sheet, answer questions and collect lab sheets

VII. Assessment: Have informal discussion regarding findings and their perception of the lake and its value.

OUTDOOR WATER QUALITY LAB

Team Members:

Materials: Get the following materials from your instructor before you get on the pontoon boat and return these items in good order when the lab is completed:

- Proper fitting life preserver
- This lab/pencil/clip board
- Oxygen/temperature meter
- Secchi disk
- Ph paper
- Cup to collect water sample
- Aquatic Chemical Factors Sheet (used in indoor session)

Directions: *Keep the life preserver on at all times when aboard the boat and keep close to your partner! Stay seated anytime the boat is moving!* Use the above equipment to gather data as directed by your instructor and as you learned during the indoor session.

Use the meter to determine the temperature and dissolved oxygen at 5 foot increments:

Oxygen

Surface 5 ft. 10ft. 15ft. 20ft. 25ft. 30ft. 35ft. 40ft. 45ft. bottom

Temperature

Surface 5 ft. 10ft. 15ft. 20ft. 25ft. 30ft. 35ft. 40ft. 45ft. bottom

Acidity/Alkalinity: take a small sample of water in your cup and test with Ph paper
What was the Ph? _____ Is it an acidic/alkaline/neutral? _____

Turbidity/clarity: Use the secci disc to determine turbidity/clarity: Holding on to the cord, lower the disc into the water on the shady side of the boat until you cannot see the secci disc. Retrieve the disc and determine how may feet down it was. *Be sure to not lose the disc!*

Questions: Answer the questions and prepare to report your data on shore.

1. Provided other factors are okay, what do you think of the water quality of this lake?

2. What did you find most interesting about this activity?

INDOOR MACROINVERTEBRATES LESSON PLAN

Team Members:

Subject Area/s: Water quality & Macroinvertebrates

Grade Level/s: Middle School Science

Season/instructional time: Spring before outdoor water studies/45 minutes

I. Learning Goal/s: Learners will be able to use macroinvertebrate data to evaluate lake/river/stream quality/health

II. Objective/s:

- Learners will be able to identify and record macroinvertebrates
- Learners will determine which macros indicate good water quality
- Learners will differentiate between complete & incomplete metamorphosis

III. State Standards:

- **A.8.2** Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations
- **A.8.3** Use techniques such as modeling and simulating to organize information gathered in their investigations
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information

IV. Setting/Area: Indoor classroom

V. Materials/Resources: Students divided into small groups of 3-5

- Enclosed lab sheet to compare and record “collected” macroinvertebrates
- “Key” to Macroinvertebrates
- Pencils/clip boards
- Enclosed “critter” macro sheet for each group
- Preserved macros
- Stamper
- Transparencies
- Overhead projector

VI. Delivery:

Introduction of Lesson:

- Review macroinvertebrates (animals without backbones that can be seen)
- Review life cycles of aquatic insects (complete/incomplete metamorphosis)
- Review water “quality/health”

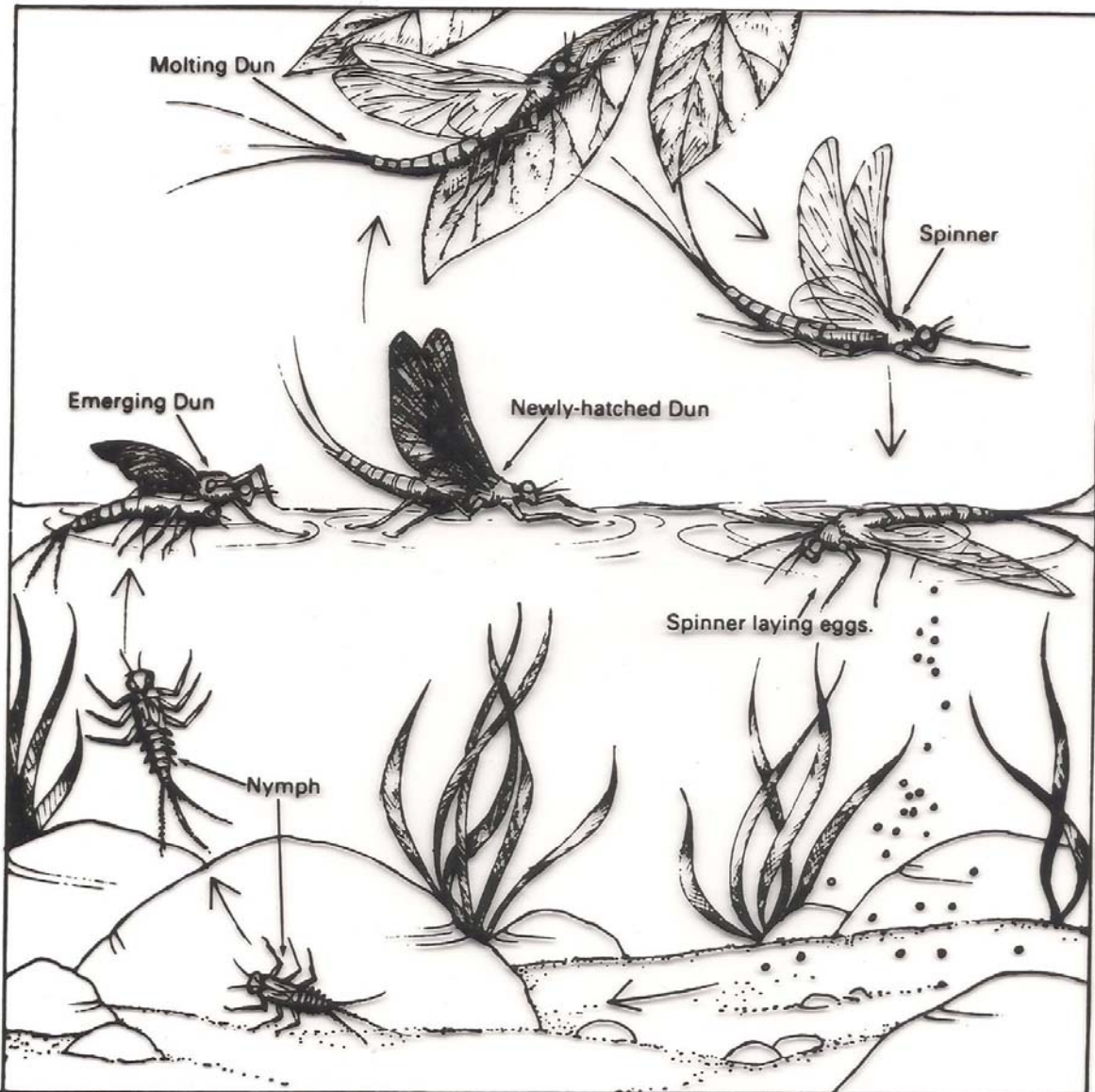
Large Group: Go over introductory materials and hand out equipment

Small Group: Each small group goes to a lab/desk area. Learners will identify the macros on the sheet according to their “groups,” count and record them. The learners will complete the “*Tally Sheet Recording Form*” and determine the water’s *index score*.

Outdoor Preparation: Learners should wear warm clothing and rain gear in case of rain. Old tennis shoes or boots should be worn because their feet will probably get wet.

VIII. Assessment:

- Have *each group* write a short paragraph about their findings on the *Tally Sheet*.
- Have an informal class discussion (wrap-up) about the activity.



SUGGESTED OVERHEAD TRANSPARENCY

TEAM MEMBERS:

Group 1: These are sensitive to pollutants. Circle each animal found.



Stonefly Larva



Dobsonfly Larva



Alderfly Larva



Water Snipe Fly Larva

Relative Size Key:
 = larger than picture
 = smaller than picture

Number of group 1 animals circled:

Group 2: These are semi-sensitive to pollutants. Circle each animal found.



Caddisfly Larva*

*All Caddisfly Larva = 1



Dragonfly Larva



Water Penny



Crawfish



Crane Fly Larva



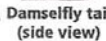
Freshwater Mussel or Fingernail clam



Mayfly Larva



Damselfly Larva



Damselfly tail (side view)



Riffle Beetle Larva*



Riffle Beetle Adult*

*All Riffle Beetles = 1

Number of group 2 animals circled:

Group 3: These are semi-tolerant of pollutants. Circle each animal found.



Black Fly Larva



Non-Red Midge Larva



Snails: Orb or Gilled (right side opening)



Amphipod or Scud

Number of group 3 animals circled:

Group 4: These are tolerant of pollutants. Circle each animal found.



Pouch Snail (left side opening)



Isopod or Aquatic Sowbug



Bloodworm Midge Larva (red)



Leech



Tubiflex Worm

Number of group 4 animals circled:

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Water Action Volunteers

TEAM MEMBERS:

Macroinvertebrate Tally Sheet Recording Form *

Name: _____ Date: _____

Stream Name: _____ Time: _____
(make up a name)

Number of animal types from Group 1: Sensitive _____ x 4 = _____

Number of animal types from Group 2: Semi-sensitive _____ x 3 = _____

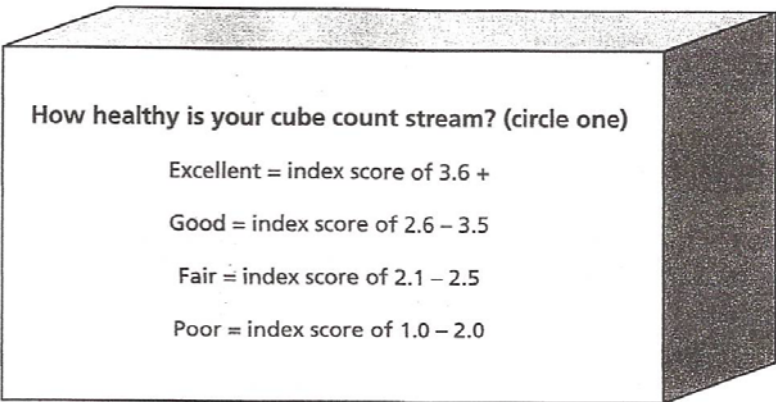
Number of animal types from Group 3: Semi-tolerant _____ x 2 = _____

Number of animal types from Group 4: Tolerant _____ x 1 = _____

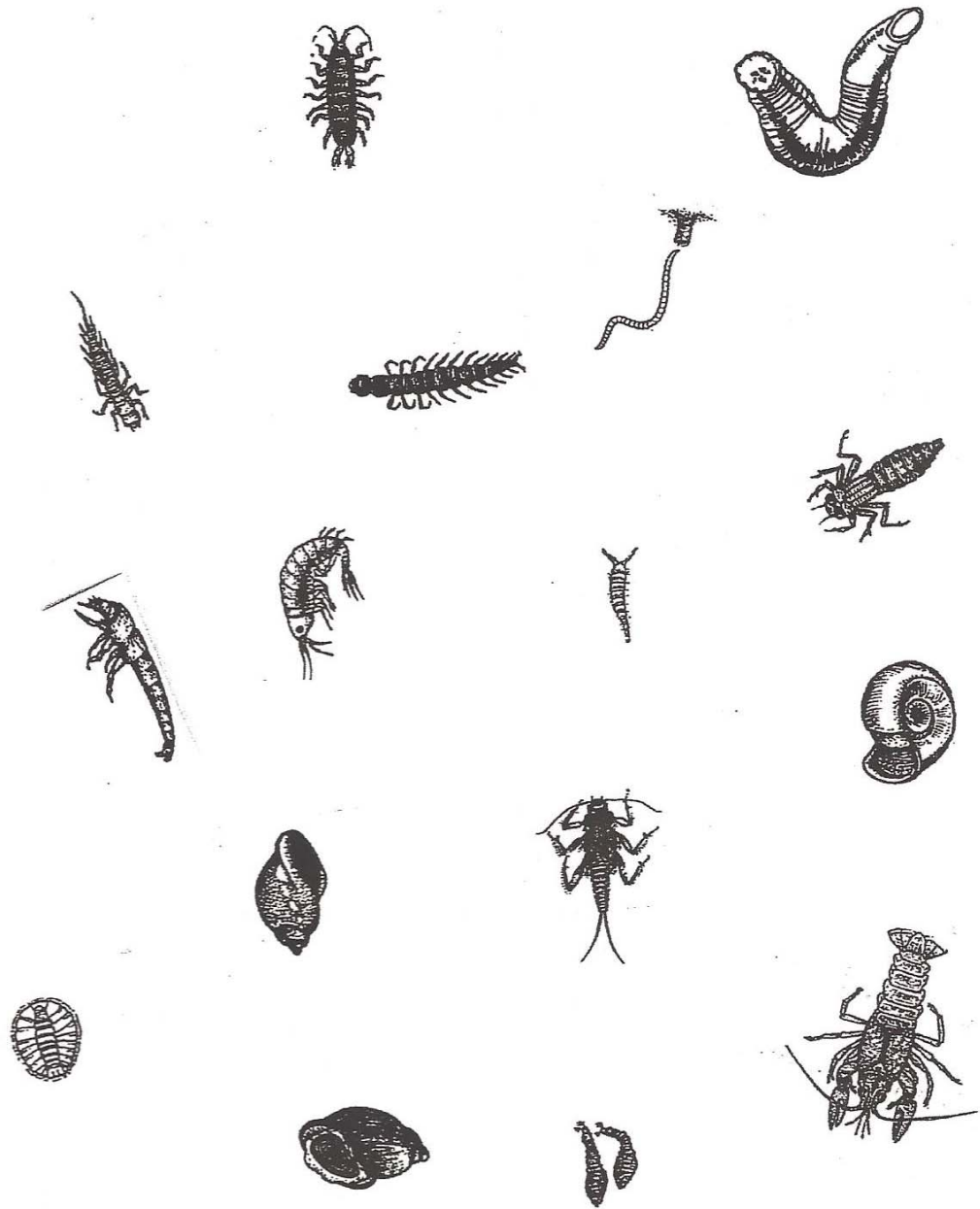
TOTAL NUMBER OF ANIMAL TYPES (A) _____ TOTAL VALUE (B) _____

Index score (C) = The total value (B) divided by the total number of animal type (A)
(C = B / A)

My stream had an index score of: _____



MACRO SAMPLE SHEET



INDOOR SHORELINE RESTORATION/REFORESTRATION LESSON PLAN

Team Members:

Subject Area/s: Shoreline Maintenance/Restoration

Grade Level/s: Middle School Science

Season/instructional time: Spring before outdoor water studies/45 minutes

I. Learning Goal/s: Learners will be able to determine appropriate shoreline quality and enhancement methods

II. Objective/s:

- Learners will know terms essential to conduct shoreline assessments
- Learners will know basic plant types
- Learners will work together to generate a shoreline restoration project/plan

III. State Standards:

- **A.8.4.** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.5.** Give examples of human impact on various ecosystems
- **B.8.10.** Explain and cite examples of how humans shape the environment
- **B8.17.** Explain how human resource use can impact the environment; e.g., erosion, burning fossil fuels

IV. Setting/Area: Indoor classroom

V. Materials/Resources: Students divided into small groups of 3-5 (keep same group for outdoors)

- Lake map (Bony sample)
- Student “lab” sheet
- Magic marker packet with blue, yellow, red and black
- Examples of basic plant groups/plants they might use
- Aerial photos of study area for students and one large photo

VI. Delivery:

Introduction of Lesson:

- Review lake zone terms:
 - Littoral zone- where rooted plants might grow
 - Limnetic zone- deeper area of lake
- Review littoral zone, terrestrial plant types and transplanting
 - Woody- hard, round, usually with stem, leaves and flowers
 - Forbs/Wild flowers
 - Grass/Sedges- plants with blade-like leaves
 - Review transplanting methods/ procedures

Large Group: Go over map, introductory materials and hand out equipment and break up into small groups

Small Group: Each small group goes to a lab/desk area. Each group will complete the enclosed lab sheet using the map and markers

Outdoor Preparation: Learners should wear warm clothing and rain gear in case of rain. Old tennis shoes or boots should be worn because their feet will probably get wet. Gloves would be a good idea also.

VIII. Assessment: Each group will report their findings and present their map.

COLLECT AND KEEP STUDENT MAPS FOR OUTDOOR CLASS

INDOOR SHORELINE RESTORATION/REFORESTATION LAB SHEET

TEAM MEMBERS:

BACKGROUND:

Things you should know. Answer the following:

- Littoral zone?
- Limnetic zone?
- Woody plants?
- Forbs/flowers?
- Grass/Sedges?

Things that affect rain/water “run-off” into lakes (erosion):

- Slope- How steep is the land surrounding the shore
- Type of soil- Sandy soil drains well, but doesn’t hold well
- Vegetation- Plants hold back water flow
- Prevailing wind-Winds “buff” shorelines causing erosion. Our prevailing winds come from the West.
- Light- essential for plants to grow, but too much causes drying.
- Human activity- Paths/roads directly to the lake enhance erosion.

MAP WORK: Study the map of (Sample)Bony Lake. This is the lake we will be working on.

- Where is the deepest part of the lake? Put a **BLACK “D”** on the area. How deep is it?
- Close contour lines mean “drop-offs.” Put a **BLACK “DO”** on the three areas with extreme drop offs. These drop-off areas usually extend into shoreline and land areas, so they will also be steep.
- With the **BLUE** marker color the lake and a little of the shoreline where it might be wet.
- With the **YELLOW** marker, color the land area around the lake and a little into the lake. Green should appear where the blue and yellow overlap. This **GREEN** area is the **LITTORAL** zone where most of the plants should be to enhance the shoreline and lake that we should protect. We will focus on this area.
- With the **RED** marker, color the areas most prone to erosion. Consider slope, wind and human activity.
- Now design your ideal house/cabin site. With the **BLACK** marker, make a **SQUARE** for a house/cabin and a **LINE** for a trail to the lake.

PRESENTATION: Present your map to the class. Each member of the team should present a part of the map lab.

RETURN YOUR LAB SHEET AND MAP

INDOOR FOOD/ENERGY CHAIN/PYRAMID/WEB LESSON PLAN

Team members:

Subject Area/s: Aquatic Food/Energy Chain/Pyramid/Web

Grade Level/s: Middle School Science

Season/Instructional Time: Sprint/45 minutes

I. Learning Goal/s: Learners will be able to differentiate segments of aquatic and terrestrial food/energy chains/pyramids/webs.

II. Objectives:

- Learners will learn to differentiate between energy and matter
- Learners will learn that the ultimate source of energy is the sun
- Learners will learn the “flow” of matter and energy through an ecosystem
- Learners will learn the differences between producers, consumers and decomposers

III. State Standards

- **A.8.4.** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.8.** Explain interactions among organisms or populations of organisms

IV. Setting/Area: Safe shore area with rich biotic environment

V. Materials/Resources: Students divided into small groups of 2/3/4

- Learners will need just a pencil and the enclosed lab
- Set of preserved skulls (from museum, etc.)

VII. Delivery:

A. Introduction of Lesson:

- Learners should discuss the difference between “energy” and “matter” (food)
- Learners should discuss the source of energy...sun.
- Learners should discuss “cycles”
- Learners should discuss producers, consumers and decomposers as listed on the lab sheet.

B. Class Activity:

Large Group: Review above material

Small Group: Learners will work on enclosed lab with their groups. Interaction and discussion within their group is encouraged.

VII. Extended Student Options: Learners find representatives in the classroom and list them.

VII. Assessment: Learners discuss how human activity might disturb the living cycles of an aquatic environment. Have an informal discussion of what they learned and how they can apply what they learned.

INDOOR FOOD CHAIN/PYRAMID/WEB LAB

TEAM MEMBERS:

BACKGROUND:

Food is involved with both the flow of *energy* and the flow of *matter* through the living and sometimes non-living world. Matter is constantly recycled through living things and the earth, but energy is used and lost in the activities of living things. The *sun* provides all the energy and the *earth* provides all the matter or materials.

Matter flows through the system and recycles back in the following manner.

Give an example of each:

Producers → 1st Order Consumer → 2nd Order Consumer → 3rd Order Consumer
(Plants) (Herbivore) (Carnivore) (Carnivore)

Decomposer
(Saprophyte)

Energy flows through the system and is lost at each stage in the following manner:

Sun → Plants → 1st Order Consumer → 2nd Order Consumer → 3rd Order Consumer

DIRECTIONS

A. Arrange the following four organisms into a *food cycle* with arrows and describe the function of each in the ecosystem (producer/1st order consumer, 2nd order consumer, etc.)
Grouse, wild oats, owl, grasshopper, mushroom.

B. Arrange the following four organisms into a *food/energy pyramid*: tadpole, aquatic plant, northern pike, sunfish. Think about where most will be required to support a few? What information does a food/energy pyramid show?

C. A more complex and realistic illustration of matter and energy movement through an ecosystem is the *food web*. Use arrows to show the movement of matter and energy among the examples below to make a food web. The arrows should always point to the consuming organism. Also label which are producers (P), 1st order consumers (C1), 2nd order consumers (C2), 3rd order consumers (C3), and decomposers (D).

MOUNAIN LION	HAWK	SNAKE
	DEER	MOUSE
		RABBIT
SHRUBS	TREE	GRASS
	BACTRIA	MUSHROOM
		MAGGOT

D. Now make a food web for the *aquatic* ecosystem below

WALLEYE	NORTHERN PIKE	LARGE MOUTH BASS
	CRAPPIE	SUNFISH
		MINNOW
FROG	SNAIL	SANDWORM
	ALGAE	WATER PLANTS
	BACTERIA	FUNGUS

EXTRA CREDIT (IF AVAILABLE): Have your instructor check your lab sheet. If it is correct, look at the skulls on the front desk and tell where you think they might fit in the food web. Use P, C1 to C3, etc. Can you identify the animal?

- A.
- B.
- C.
- D.

OUTDOOR MACRO LESSON PLAN

Team Members: John Kudlas,

Subject Area/s: Water quality & Macroinvertebrates

Grade Level/s: Middle School Science

Season/instructional time: Spring/45 minutes

I. Learning Goal/s: Learners will be able to use macroinvertebrate data to evaluate lake/river/stream quality/health

II. Objective/s:

- Learners will be able to collect, identify and record macroinvertebrates
- Learners will use basic water quality research skills
- Learners will know life cycles of selected macroinvertebrates
- Learners will know how to safely conduct water studies

III. State Standards:

- **A.8.2** Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations
- **A.8.3** Use techniques such as modeling and simulating to organize information gathered in their investigations
- **A. 8.4** Use critical-thinking strategies to interpret and analyze gathered information

IV. Setting/Area: Local lake/river/stream

V. Materials/Resources: Students divided into small groups of 3-5

- Same lab sheets as used indoors to compare/record collected macroinvertebrates
- “Key” to Macroinvertebrates
- Pencils/clip boards
- Dip nets
- Ice cube trays
- Forceps (tweezers)
- Life preservers (if near deep/dangerous water), hip boots/waders
- First Aid kit
- Hand lenses/magnify glasses

VI. Delivery:

A. Introduction of Lesson:

- Before going outdoors, have students conduct indoor macro activity
- Review safety aspects (below)
- Review equipment care and maintenance
- Review life cycles of aquatic insects (complete/incomplete metamorphosis)
- Relate activity to indoor lab
- Encourage learners to collect macros in habitat areas near plants/debris

B. Safety Considerations:

- Learners should not be in the water bare-footed. Old tennis shoes/hip boots/waders should be used. Life preservers if needed
- Learners should stay with their groups at all times. Partner-up
- First Aid kit should be available
-

C. Class activity:

Large Group: Go over introductory materials and hand out equipment

Small Group: Each small groups goes to a designated area close to shore where they can be monitored. Learners will “sweep” the area for macros. Caught macros will be sorted in the ice cube trays according to macro “groups,” counted and recorded. On shore the learners will complete the “*Tally Sheet Recording Form*” and determine the waters *index score*. After the tally and score is completed, the macros are released in the area they were found.

VII. Extended Student Options:

- Learner “adopts” a safe water area near their home where they conduct a similar tally and complete an index score. Then write a summary of their findings.
- Learner writes an essay about one of the macros they find most interesting.
- Learner researches (computer, etc.) what might effect water quality/health.

VIII. Assessment:

- Have *each group* write a short paragraph about their findings on the *Tally Sheet*.
- Have *each student* write a short essay on how these findings will affect their attitude towards using the surface water and shoreline development.
- Discuss/review what macros are and how they fit into the water environment.
- Have an informal class discussion (wrap-up) about the activity.





SHORELINE RESTORATION/REFORESTRATION OUTDOOR LESSON PLAN

Team Members:

Subject Area/s: Shoreline restoration/reforestation

Grade Level/s: Middle School Science

Season/instructional time: Spring/45 minutes

I. Learning Goal/s: Learners will be able to determine how to restore/reforest the shoreline of a selected area of lake property

II. Objective/s:

- Learners will determine what plant types are appropriate for restoration/reforestation
- Learners will be able to select and transplant vegetation to enhance the shoreline and littoral zone
-

III. State Standards:

- **A.8.4.** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.5.** Give examples of human impact on various ecosystems
- **B.8.10.** Explain and cite examples of how humans shape the environment
- **B.8.17.** Explain how human resource use can impact the environment; e.g., erosion, burning fossil fuels

IV. Setting/Area: Local lake/river/stream

V. Materials/Resources: Students divided into small groups of 3-5 (same as indoor)

- String one meter long/popsicle stick
- Enclosed lab sheet, pencil, clipboard
- Lake map (from indoor activity)
- Shovels/trowels
- Marker flags (like gas/electric company markers)
- (Optional)- Compass, GPS
- Buckets to keep equipment together and to carry transplants and water
- Have professional (county/DNR/plant specialist) available

VI. Delivery:

A. Introduction of Lesson:

- Before going outdoors, have students conduct *Indoor Shoreline Restoration/Reforestation* activity
- Review safety aspects (below)
- Review equipment care and maintenance
- Relate Map Activity
- Review the transplanting process

B. Safety Considerations:

- Learners should be advised of delicate plants in the area not to be disturbed
- Learners should stay with their groups at all times. Partner-up
- First Aid kit should be available
-

C. Class activity:

Large Group: Go over introductory materials and hand out equipment

Small Group: Each small group goes to a designated area close where they can be monitored.

Learners will:

- Make a circle 2 meters in diameter using the string and determine what plants are in the circle. They will mark their circle with a flag with their name on the flag.
- Determine what plants would be appropriate for the area by looking at the light and soil type
- Select appropriate plants from the instructor, plant and water vegetation (3-4 plants) to the area. Learners encouraged to use ethical planting techniques

VII. Extended Student Options:

- Learner “adopts” a safe area near their home where they conduct a similar improvement project. Then write a summary of their findings.
- Learner formulates a photo essay of a restoration project
- Learner researches (computer, etc.) what plants might be most effective in reducing erosion.
-

VIII. Assessment:

- Have *each group* write a short paragraph about their findings on the *Lab Sheet*.
- Have *each student* write a short essay on how this activity will affect their attitude towards using the shoreline and shoreline development.
- Have an informal class discussion (wrap-up) about the activity.



Travis Tulowitzky, Bayfield Co. Land and Water Conservation Dept., demonstrating planting native vegetation

OUTDOOR SHORELINE RESTORATION /REFORESTRATION LAB

Team Members:

Materials: Get the following materials from your instructor/assistant:

- Piece of string one meter long
- Pencil and clipboard
- Lake map (from indoor activity)
- Transplanting equipment- bucket, shovel/trowel
- Marker flag

Directions- After getting the equipment:

- Select an area where you can make the 2 meter circle
- Estimate the number of plants within your circle
- Wood plants? _____
- Forbs/wild flowers? _____
- Grasses/sedges? _____
- Look up in the sky. What kind of light do you have?
- Very bright? _____ Shady _____ Very dark _____
- What kind of soil do you have in your ring?
- Sand _____ Clay _____ Loam _____ humus _____
- What about the slope?
- Very steep _____ Gradual _____ Level _____

- Select trees and plants provided that you think might live in your selected ring area and plant as directed.. Be sure to water after you plant. Show your instructor.
- Mark on your map where your ring area is and list the plants you put there
- Clean your tools and hand them in along with this lab sheet and map
- Each person explain what you did to contribute to your groups work?

Teacher check:

_____ Turned in lab sheet with names

_____ Returned bucket, trowel, string, pencil, clip board

Evaluation: _____ Excellent: followed directions, worked safely

Other: _____

OUTDOOR FOOD/ENERGY CHAIN/PYRAMID/WEB LESSON PLAN

Team members:

Subject Area/s: Aquatic Food/Energy Chain/Pyramid/Web

Grade Level/s: Middle School Science

Season/Instructional Time: Sprint/45 minutes

I. Learning Goal/s: Learners will be able to collect and recognize segments of Aquatic food/energy chains/pyramids/webs.

II. Objectives:

- Learners will learn how to ethically collect aquatic organisms
- Learners will be able to collect, identify and place collected organisms into appropriate places within a food/energy chain/pyramid/web
- Learners will be able to sketch/draw collected specimens

III. State Standards

- **A.8.4.** Use critical-thinking strategies to interpret and analyze gathered information
- **B.8.8.** Explain interactions among organisms or populations of organisms

IV. Setting/Area: Safe shore area with rich biotic environment

V. Materials/Resources: Students divided into small groups of 2/3/4

- Clip Board/drawing paper/pencil/stick pins/transparent tape

- Small piece of cardboard (about 8” X 11”)
- Dip nets
- Ice cube trays/buckets
- Forceps (tweezers)
- Hand lenses/magnify glasses
- Life preservers
- First Aid Kit

VII. Delivery:

A. Introduction of Lesson:

- Before going outdoors, have students conduct *Indoor Food/Energy Chain/Pyramid/Web* Lab
- Review safety aspects (below)
- Review equipment care and maintenance

B. Safety Considerations:

- Learners should **not** be in the water bare-footed. Old tennis shoes/hp boot/waders should be used. Life preservers if needed
- Learners should stay with their groups at all times. Partnered-up and within sight of the instructor at all times.

C. Class Activity:

Large Group: Review indoor material, safety precautions, formulate teams and distribute equipment.

Small Group: Each small group will go to directed area (rich with aquatic life) close to shore where they can be monitored.

- Learners will “sweep” and search the area for representatives of food/energy chain/pyramid/webs and place them in the bucket/ice cube tray.
- Learners will place the non-living representative on their “board” with a stick-pin and sketch the living representatives (after verifying with the instructor) in appropriate position on their “board” lab sheet.
- Learners will draw arrows in direction materials and energy travels. *Red for the direction of energy and Black for direction of matter.*
- Living representatives are returned to their habitat.

VII. Extended Student Options:

- Learners may conduct the same activity on the shore or inland using terrestrial representatives.
- Learners may write an essay about what they learned and how “man” fits into the scheme of living cycles.

VII. Assessment:

- Learners discuss how human activity might disturb the living cycles of an aquatic environment. Have an informal discussion of what they learned and how they can apply what they learned.

OUTDOOR AQUATIC FOOD CYCLE/PYRAMID/WEB LAB

TEAM MEMBERS:

DIRECTIONS: Get an ice cube tray, clip board, pencil, forceps, dip net and bucket from your instructor. Collect as many *organisms* as you can and put in the bucket and ice cube tray. Arrange them on this sheet in a food cycle, food/energy pyramid and food web. Be sure to label them P, C1-C3, D and return them to the lake unharmed. Have your instructor check each example. *You will receive a point for every correctly placed organism.*

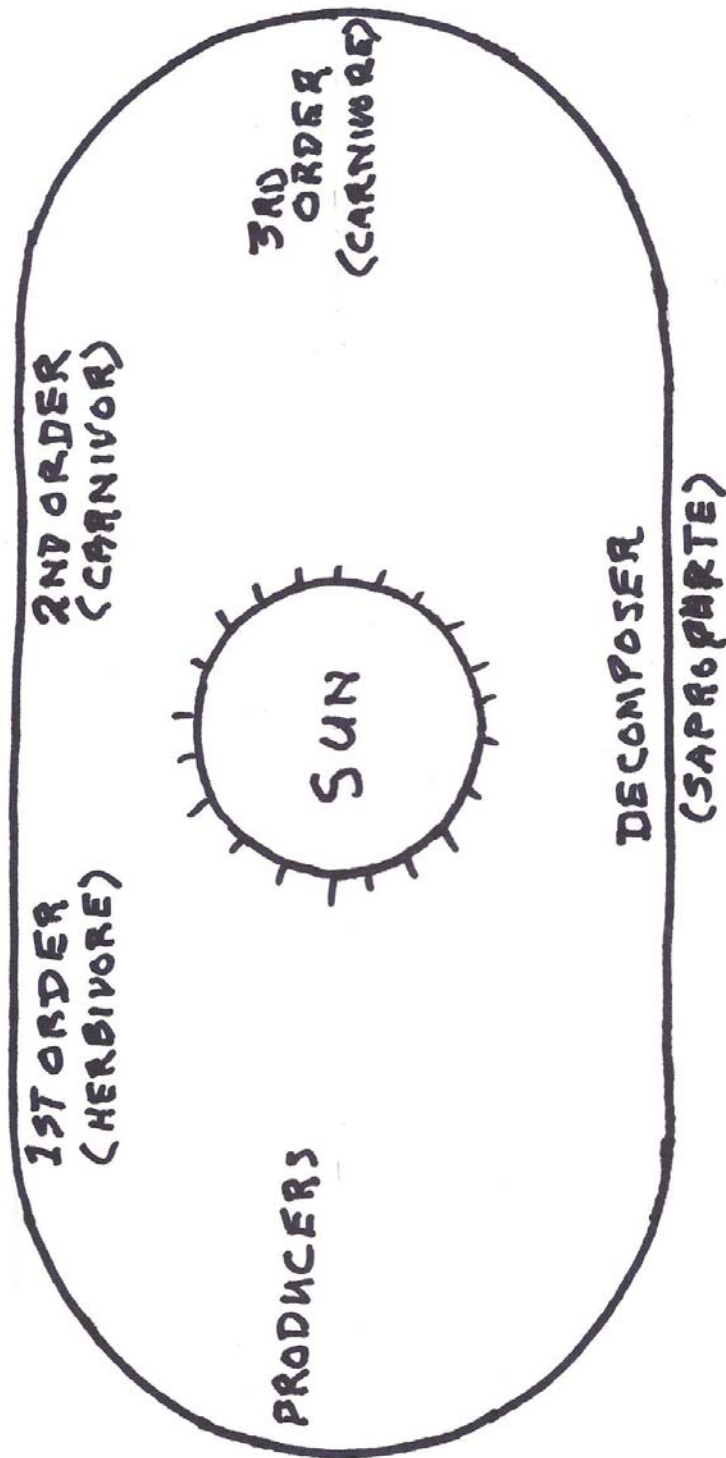
FOOD CYCLE

FOOD/ENERGY PYRAMID

FOOD WEB

TOTAL POINTS: _____

TEAM MEMBERS:



SUGGESTED OVERHEAD TRANSPARENCY

OUTDOOR CANOEING/SHORELINE SCAVENGER HUNT LESSON PLAN

Team Members:

Subject Area: Aquatic/Shoreline Culminating Activity

Grade Level/s: Middle School Science

Season/Instructional Time: Spring/45 minutes

I. Learner Goals: Learners will “put together” previous learnings into a meaningful and enjoyable activity

II. Objective: Learners will experience an adventuresome competitive outdoor activity while learning more about the aquatic/shoreline environment.

III. State Standards:

- **A.8.2** Collect information from a variety of resources, conduct experiments, and develop possible solutions to their investigations
- **A.8.4** Use critical-thinking strategies to interpret and analyze gathered information
- **A.8.5** Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding

IV. Setting/Area: Safe outdoor lake area with adequate canoe embarking/disembarking area.

V. Materials/resources:

- Canoes/paddles/life preservers
- Clipboards/pencils/lab sheets/map of land and water areas used
- Plastic bag to collect items
- Plant Identification materials
- Macro Invertebrate identification materials
- Ice cube trays/forceps
- Small plastic garden rake for each canoe
- Disposable digital cameras for each canoe pair

VI. Safety Considerations:

- Students should have already had some canoeing experience with previous activities- review
- Students are directed to keep properly fitting life preservers on whenever in the canoes.
- Emergency boat/pontoon in area to monitor students and prevent major mishaps
- Students work in “sister” canoe pairs
- All canoes/students visible to shoreline/emergency boat/pontoon/instructor
- Canoe partners determined by classroom teacher

VII. Delivery:

- Review above safety considerations and establish “sister” canoe partners
- Hand-out clipboards/labs/pencils/cameras/maps
- Inform students about search parameters and time limitations. Some students will be working on shore while others are in canoes and switch in orderly fashion
- Students disembark orderly and free to roam and search in predetermined area
- After allotted time students return to share and complete their shoreline search
- Students verify their “findings” with the instructor/s

VIII Assessment: Each canoe team “show-and-tell” about what they found and how their “items” fit into the “quality” of lake/shoreline

AQUATIC/SHORELINE SCAVENGER HUNT LAB

Team Names:

You should have established canoe partners and “sister” canoes. *Please do not disturb any plants/animals/nests* while doing this activity. Keep safety in mind and *keep your life preserver on at all times* when doing this lab. You will be on shore for half this activity and in the canoe for the other half. Keep your score as you go unless you have to verify an item with your instructor. Get the following materials from your instructor:

Canoe Segment:

- Canoe/paddle/properly fitted preserver/map of area
- Small plastic rake for each canoe pair
- Oxygen/temperature meter (tied with cord in one of the canoe pair)
- pH paper

Canoe Directions:

Canoe to area selected by your instructor and collect the following data/materials to earn points:

- Surface water temperature in middle of area _____ 5 pts
- Surface dissolved oxygen in middle of area _____ 5 pts
- Surface pH in middle of area _____ 5 pts
- With the rake, carefully collect and identify aquatic plant/s. Bag the plants and have them verified by your instructor. 5 pts for each plant _____ ?

Shoreline Directions:

Work with your canoe sister team to find the following items in the designated area. You may have to enter the water to collect macro invertebrates.

- Carefully collect macros and place them separately in the ice cube tray and identify. Verify the macros with your instructor. 5 pts for each macro _____ ?
- On shore, collect different pine cones of the ground. Bag the pine cones. 5 pts for each different kind collected. Have instructor check them _____ ?
- Collect the three different tree leaves and bag them. Identify them with the instructor.
 1. Maple _____ 5 pts
 2. Oak _____ 5 pts
 3. Popple _____ 5 pts
- Collect/take a picture of the following:
 1. Producer (description: _____) _____ 5 pts
 2. Carnivore (description: _____) _____ 10 pts
 3. Decomposer (description: _____) _____ 10 pts

TOTAL _____

What category is your team:

75 pts Ranger	_____
65 pts Naturalist	_____
55 pts Tree Hugger	_____
45 pts City Slicker	_____

Show your collection to your instructor and return/release the materials about where you collected them.

ECO DAY EVALUATION

Please help us improve *Eco Day* for next year's students by answering the following questions. If asked to rate, 4 is best:

Name:

On the whole, how would you rate the *indoor* activities?

Critical Habitat 4 3 2 1

Comment:

Water Quality 4 3 2 1

Comment:

Invasive Species 4 3 2 1

Comment:

Other than the weather, how would you rate the *outdoor* activities?

Critical Habitat: 4 3 2 1

Comment:

Water Quality 4 3 2 1

Comment:

Aquatic plants 4 3 2 1

Comment:

Canoeing 4 3 2 1

Please rate and answer the following questions/comments:

I am going to use what I learned during **Eco** classes.

Yes _____ No _____

Comment:

I enjoyed the "hands-on" laboratory/outdoor activities.

Yes _____ No _____

Comment:

This experience raised my awareness of water related environmental problems.

Yes _____ No _____

Comment:

In your own words, please answer the following questions:

What do you think was the **most** important thing you learned about our lakes?

What do you think was the **least** important thing you learned about our lakes?

What activity did you enjoy the **most**?

What activity did you enjoy the **least**?

Did the **Eco Day** experience change your attitude toward our lakes? How?

How can we improve the activities for next year?

What else would you like to learn about our lakes?

What activities should we add/include or extend next year that would help you understand more about the lakes and how to respect and enjoy them more?

OPTIONAL ECO-DAY PRE AND POST TEST PROCEDURES

RATIONALE: The Pre and post tests have several functions that will be helpful in conducting the *Eco-Day* program and determining its success and modifications.

PRETEST

- Should be conducted *before* any instruction on the first day after initial introduction of instructors and volunteers.
- No prompts or instruction other than letting the students know that the function of the pretest is only to “*determine what they know about the water environment/biome.*”
- Be sure students put their names on both pre and post tests.
- The pretest will not be graded, but they should take it seriously because it will help to determine the *focus* of the activities.
- The pretest should be collected and examined/corrected after the class and retained until the *posttest* is complete.
- There should be a numerical value (number of correct answers) on each test.
- The pretest will “prepare” the students for learning and activities.

POSTTEST

- Should be conducted on the “wrap-up” last day *before* the final student evaluation and discussion.
- No discussion or “review” should be conducted before the posttest. Simply explain that it will be “*compared to the pretest to determine what they have learned.*”
- Again, make sure the students put their names on both the pre and post tests.
- Posttests may be self-corrected in the classroom and part of the discussion.
- Explain that it will be the classroom teacher’s discretion to use the post test to grade.
- After they have completed/corrected their posttests, pass out the pretests and have the students put down their pencils and compare their pre and post tests.
- Ask the students to summarize their learning on the back of the posttest.

PRETEST AND POSTTEST AS A CURRICULAR EVALUATION TOOL:

Subjective Analysis: By simply looking at what the students learned from before to after the Eco-Day curriculum, the instructors can rationalize what worked and what didn’t work and how the curriculum could be improved. The students and classroom teacher can also be instrumental and helpful in improving the curriculum.

Objective Analysis: A statistical model may be utilized, comparing individual pre and post test scores to ascertain the level of learning and (in the case of Fall classes) retention.

Modifications: By looking at the results, the curriculum can be changed and improved to better meet the needs of students, outcomes and objectives.

ECO-DAY AQUATIC TEST

PRETEST **POSTTEST** **(CIRCLE ONE)**

Name: _____ Hour _____ Score _____

Directions: Please answer the questions the best to your ability. You may guess. This test is to determine what you know about aquatic environment and help to guide our teaching.

_____ 1. What is the most important thing to do when you go canoeing?

- a) Sit high so you can see better
- b) Keep facing upstream
- c) Know your strokes
- d) Keep life preserver on

_____ 2. How do you know your PFD fits right?

- a) Won't slide off over your extended arms
- b) Loose enough so you can breath
- c) Big enough so you can tuck your knees under
- d) All the above

_____ 3. Which is not a paddle stroke?

- a) "C" stroke
- b) "J" stroke
- c) Cross-bow stroke
- d. Back stroke

_____ 4. Where do most of the aquatic plants/animals live?

- a) Deep part of lake
- b) In clearest water
- c) Shallow margins and shores
- d) Two feet below surface

_____ 5. What does "Critical habitat" mean?

- a) Important for organisms to live
- b) Deadly
- c) Something you can't stop
- d) Relatively unsustainable

_____ 6. Which is NOT a critical habitat designation?

- a) Woody Habitat
- b) Extensive Riparian Wetlands
- c) Macroinvertebrates
- d) Emergent and Floating Leaf Vegetation

_____ 7. What does turbidity mean?

- a) How fat the fish are
- b) How healthy the lake is
- c) How acidic the lake is
- d) How clear the water is

_____ 8. What is dissolved in the water that fish need?

- a) Sugar
- b) Oxygen
- c) Minnows
- d) Carbon Dioxide

_____ 9. How do you measure how acidic the water is?

- a) Barometer
- b) pH paper
- c) Secchi Disk
- d) Sling psychrometer

_____ 10. Which is an aquatic invasive plant?

- a) Eurasian Water Milfoil
- b) Northern Milfoil
- c) Coontail
- d) Lilly Pad

_____ 11. Which is not a type of aquatic plant?

- a) Noxious Americanis
- b) Submerged
- c) Free Floating
- d) Emergent

_____ 12. What is characteristic of an invasive plant?

- a) Often takes over native plant habitat
- b) Usually accidentally introduced
- c) Usually difficult to eradicate
- d) All of the above

_____ 13. What is a “Benthic Macroinvertebrate?”

- a) The larva/nymph stage of an aquatic insect
- b) Small insect with a backbone
- c) Small animal with a bent backbone
- d) Butterfly is an example

_____14. Macroinvertebrates:

- a) Nymphs “fly” around lakes
- b) Indicate the “health” of a lake
- c) Primarily eat minnows
- d) Leech is not an example

_____15. Which one is not a macroinvertebrate

- a) Small minnow
- b) Mayfly
- c) Caddis fly
- d) Water Penny

_____16. What is the “Littoral” lake zone?

- a) Where fishermen throw their litter
- b) Deeper part of the lake
- c) Where there are no plants
- d) Where most of the rooted plants grow

_____17. What does “Slope” mean?

- a) Place where most of the woody plants grow
- b) Area around cabin where flowers are
- c) How “steep” the shoreline is
- d) Desert-like area near road

_____18. Which is not a woody plant?

- a) Oak
- b) Cattail
- c) White Pine
- d) Willow growing in shoreline

_____19. Where does most of our energy ultimately come from?

- a) Atomic power plant
- b) Coal generators
- c) Geothermal
- d) Sun

_____20. Which is a producer?

- a) Fungus
- b) Any animal with sharp teeth
- c) Any green plant
- d) Any “working” animal including people

_____21. What is a 2nd Order Consumer?

- a) Animals that eat other animals
- b) Mushrooms
- c) Cactus plant
- d) Cow

PRE/POST TEST ANSWER SHEET

Three questions from each segment of the curriculum

Canoeing:

1. d.

2. a.

3. d.

Critical Habitat:

4. c.

5. a.

6. c.

Water Quality:

7. d.

8. b.

9. b.

Plants/Invasive Species:

10. a.

11. a.

12. d.

Macroinvertebrates:

13. a.

14. b.

15. a.

Restoration:

16. d.

17. c.

18. b.

Food Energy Chains/Pyramids

19. d.

20. c.

21. a.