



Wetland Ecology & Macroinvertebrates

Wetland Ecology & Macroinvertebrates



NATIONAL
WILDLIFE
REFUGE SYSTEM



Wetland Ecology & Macroinvertebrates Field Trip

Summary of Lessons & Activities

Kindergarten-Second Grade: Wetland Discoveries

Wetlands are essential habitats that benefit many different forms of life. Learn about some of the unique creatures that depend on the Refuge's wetlands and witness them up-close while exploring the habitat.

Third-Fifth Grade: Healthy Wetlands & Watersheds

Watersheds and the wetlands within them serve as essential homes and resources to both wildlife and humans. Without clean and healthy water, all forms of life face many potential problems. Discover the importance of watersheds and the role that humans play through the up-close exploration of a real wetland habitat.

Table of Contents

Tab 1: Wetland Discoveries Field Trip

- State SEEd Standards
- Field Trip Supporting Activities & Questions

Tab 2: Healthy Wetlands & Watersheds Field Trip

- State SEEd Standards
- Field Trip Supporting Activities & Questions

Tab 3: Background Information

- Wetlands
- Watersheds
- Macroinvertebrates
- Aquatic Insect Life Cycle
- Water Quality

Season:

Spring, Summer,
& Autumn

Objectives:

Students will be able to...

- Explore a wetland habitat up-close and discover some of the living and non-living things that depend on it.
- Discover the stages of life cycles and determine the differences between the life cycles of insects and other species.
- Discover the many different forms of life that depend on healthy wetlands.
- Determine the importance of clean watersheds.
- Discover the impact humans have on water and think about solutions to pollution/runoff.

Key Concepts:

- Wetlands
- Habitats
- Life Cycles
- Macroinvertebrates
- Watersheds
- Water Quality
- Pollution/Runoff



Wetland Discoveries

(Kindergarten–Second Grade)





State (SEEd) Standards

(Kindergarten–2nd Grade)

Kindergarten

Standard K.2, Living Things And Their Surroundings

Standard K.2.2, Obtain, evaluate, and communicate information about patterns in the relationships between the needs of different living things and the places they live.

Standard K.2.3, Obtain, evaluate, and communicate information about how living things affect their surroundings to survive.

Standard K.2.4, Design and communicate a solution to address the effects that living things experience while trying to survive in their surroundings.

First Grade

Standard 1.2, The Needs Of Living Things And Their Offspring

Standard 1.2.2, Construct an explanation by observing patterns of external features of living things that survive in different locations.

Standard 1.2.3, Obtain, evaluate, and communicate information about the patterns of plants and nonhuman animals that are alike, but not exactly like, their parents.

Second Grade

Standard 2.2, Living Things And Their Habitats

Standard 2.2.1, Obtain, evaluate, and communicate information about patterns of living things in different habitats.

Standard 2.2.2, Plan and carry out an investigation of the structure and function of plant and animal parts in different habitats. Emphasize how different plants and animals have different structures to survive in their habitat.



Wetland Discoveries

(Kindergarten-2nd Grade)

Summary Of Lesson

Wetlands are essential habitats that benefit many different forms of life. Learn about some of the unique creatures that depend on the Refuge's wetlands and witness them up-close while exploring the habitat.

Theme

Wetlands are full of many unexpected but essential forms of life.

Outline Of Lesson Activities

1. Introduction (10 minutes)

- Introduce Bear River Migratory Bird Refuge and any important safety or logistical information.
- Ask students what they know about wetlands in general.
- Give a brief breakdown of the day's schedule.

2. Wetland Characteristics Discussion (10 minutes)

- Draw a wetland scene as a whole group and discuss plants and animals that are found within wetland habitats.
- Take a look at the Exhibit Hall's indoor wetland display.

3. Dip Netting (45 minutes)

- Explore wetland habitat and real macroinvertebrates up-close.
- Learn about life cycles and the differences between insects and other wetland species.

4. Wetland Habitat Hike (45 minutes)

- Visit different areas of the hiking trails to discover the different features and wildlife depending on wetlands.
- Search and listen for signs of wildlife.

5. Reflection (10 minutes)

- Review the wetland scene as a whole group and discuss similarities/differences between real wetland habitat and the previously drawn scene.
- Review the theme and discuss reflection questions.

Time:
2 hours

Season:
Spring, Summer,
& Autumn

Objectives:
Students will be
able to...

- Explore a wetland habitat up-close and discover some of the living and non-living things that depend on it.
- Discover the stages of life cycles and determine the differences between the life cycles of insects and other species.

Key Concepts:

- Wetlands
- Habitats
- Life Cycles
- Macro-invertebrates



Introduction

(Kindergarten-2nd Grade)

Welcome students to Bear River Migratory Bird Refuge and introduce yourself. Discuss the importance of the Refuge and why it was created. Ask if any of the students have visited the Refuge before.

Explain to the students that you will be their teacher for the day and that the Refuge is their classroom, so it is important to respect the Refuge just as they would with their classroom at school. Discuss any important safety/logistical items and concerns before talking about the theme of the day.

Theme

Wetlands are full of many unexpected but essential forms of life.

Introduction Questions & Activities

- Ask students what a habitat is and if they can name some common habitat types.
- Ask students what habitat the bird refuge is within.
- Discuss and determine what a wetland is.
- Give a brief overview of the schedule for the day and some of the activities they will get to try out.

Assess Student Knowledge

Knowledge levels of a topic between different classes can greatly vary. Assess the knowledge level of your group at the beginning of the day in order to determine how deeply to discuss topics and what to teach the class.



Wetland Characteristics Discussion

(Kindergarten-2nd Grade)

This activity is a large group introduction to the theme of the field trip and many of the key aspects of wetland habitat.

All students are brought to a large gathering area (either outside or inside depending on weather). One large whiteboard or other portable drawing easel will be set up previously in the gathering area. This can also be substituted with chalk if there is enough space outside.

After introducing the Refuge and discussing what a wetland is during the Introduction activity, start discussing with students some of the living/non-living things that are found within wetland habitats.

Draw a basic wetland outline scene on the whiteboard/drawing easel. Ask students to name a living/non-living thing found at the Refuge. Depending on time, allow five to six student volunteers to come up to the front of the group to draw their living/non-living thing somewhere on the wetland scene.

After finishing the wetland scene drawing, ask students to think about some of the other wildlife species they may see while exploring the Refuge today. Tell them that at the end of the day, the whole group will return to this original drawing and reflect on what the group actually saw at the Refuge and if there were any surprises. If there is extra time, take a look at the wetland scene exhibit in the Exhibit Hall.

Assess Student Knowledge

This activity is a knowledge assessment. Ask the students questions, but do not tell them if they are right or wrong. The wetland scene **SHOULD** be missing things found at the Refuge, so that the students can later reflect on what they actually found while exploring the Refuge.



Dip Netting

(Kindergarten-2nd Grade)

Walk with students to the dock, boardwalk, or area where water is reachable without having to step in. Bring dip netting materials including...

1. Dip Nets (For Each Student)
2. Small Cup/Bowl (For Each Student)
3. Plastic Spoon (For Each Student)
4. Large Tub

Before distributing supplies to each student, review safety instructions and give a general overview of the activity.

Safety Instructions

- Always walk on the dock/boardwalk.
- When dip netting, make sure students are either sitting crisscross or laying on their stomachs at all times.
- Students may not crouch or sit up on their knees.
- If they cannot reach the water, they must move to a different spot.
- Students are welcome to move around and try different spots, but they must always follow the safety instructions.

Overview of Activity

Students will discover many of the different types of macroinvertebrates that rely on wetlands to survive. After discussing the safety instructions, describe each of the dip netting materials the students will get to use. Show students how to use the dip net, and how they must fill their individual cups/bowls with water before dumping their full dip nets into their cup/bowl. This is important for any creature they catch because many macroinvertebrates need water to breathe. Their cup/bowl will act as their own “tiny aquarium,” and they can use their plastic spoons to search for macroinvertebrates inside of it.

If students discover a new creature or something that is interesting enough that the entire group should see it, they can put their findings in the large tub, which will act as the “large class aquarium.” Once students have had a good amount of exploration time, gather them into a large group and take a look at the large tub full of macroinvertebrates. Discuss some of their findings and talk about what some of the creatures are.

Discuss the life cycle of an insect. Bring life cycle pictures and images of some of the macroinvertebrates typically found within wetlands just in case students do not catch some of the common species.

After discussing students’ findings and life cycles, ask students to help clean-up. Have each student rinse out their own cup/bowl and dip net. Gather all clean materials before leaving the dip netting site.



Wetland Habitat Hike

(Kindergarten-2nd Grade)

Key Concepts:
Habitats &
Wetlands

You have 45 minutes to choose your own adventure on this hike. Depending on the season, try to hike to places on the trail where water can be seen. This will improve your chances of encountering wildlife within the wetland habitat. Listen and look for signs of insects, birds, and other wildlife that depends on wetlands along the way.

Suggestions For The Hike

- Talk about the bodies of water and plants growing alongside them.
 - Ask students why they may be important to wetlands.
- Search for signs of wildlife.
 - This may include bird songs, insect noises, mammal tracks, etc.
- Take a look at the Kestrel bird boxes along the trail.
- Hike to the Photo Blind on Marsh Meander Trail (1.5 miles).
- Hike to the boardwalk on Bulrush Bridge Trail (3/4 mile).
- Hike to the dock on Wetland Wonders Trail (1/2 mile).
- Hike to the Nature Play Area and spend some time exploring it.



Reflection

(Kindergarten-2nd Grade)

Return to the large group gathering area from the beginning of the day. Discuss what students learned and some of their favorite activities of the day. Review the overall theme of the day again and look back on the original wetland scene drawing that the group created. Talk through some of the reflection questions.

Theme

Wetlands are full of many unexpected but essential forms of life.

Reflection Questions

1. What is the most surprising thing you learned or discovered about wetlands today?
2. What surprised you about the drawing we created at the beginning now that we have been out and explored the wetland? Were there other creatures out there that you may not have expected?
3. What is your favorite thing you did today?

Thank the students for visiting the Refuge today and tell them about upcoming events. Let them know about other activities they can come back and try out with their parents (Jr. Ranger, Nature Play Area, Exhibit Hall, Auto Tour, Jr. Duck Stamp Contest).

Activities To Do With Extra Time/Longer Field Trip

- Explore Nature Explore Classroom
- Explore Exhibit Hall (Exhibit Hall Bingo)
- Puppet Show About Life In The Wetland
- Life Cycle Games



Healthy Wetlands & Watersheds

(Third-Fifth Grade)





State (SEEd) Standards

(3rd-5th Grade)

Third Grade

Standard 3.2, Effects Of Traits On Survival

Standard 3.2.1, Develop and use models to describe changes that organisms go through during their life cycles.

Standard 3.2.5, Engage in argument from evidence that in a particular habitat (system) some organisms can survive well, some survive less well, and some cannot survive at all.

Standard 3.2.6, Design a solution to a problem caused by a change in the environment that impacts the types of plants and animals living in that environment.

Fourth Grade

Standard 4.1, Organisms Functioning In Their Environment

Standard 4.1.1, Construct an explanation from evidence that plants and animals have internal and external structures that function to support survival.

Standard 4.1.2, Develop and use a model of a system to describe how animals receive different types of information from their environment through their senses.

Fifth Grade

Standard 5.1, Characteristics And Interactions Of Earth's Surface

Standard 5.1.1, Analyze and interpret data to describe patterns of Earth's features.

Standard 5.1.5, Design solutions to reduce the effects of naturally occurring events that impact humans.

Standard 5.3, Cycling Of Matter In Ecosystems

Standard 5.3.3, Develop and use a model to describe the movement of matter among the environment.



Healthy Wetlands & Watersheds

(3rd-5th Grade)

Summary of Lesson

Watersheds and the wetlands within them serve as essential homes and resources to both wildlife and humans. Without clean and healthy water, all forms of life face many potential problems. Discover the importance of watersheds and the role that humans play through the up-close exploration of a real wetland habitat.

Theme

Clean water and healthy wetlands are essential to all forms of life.

Outline of Lesson Activities

1. Introduction (10 minutes)

- Introduce Bear River Migratory Bird Refuge and any important safety or logistical information.
- Ask students what they know about wetlands in general.
- Give a brief breakdown of the day's schedule.

2. Dip Netting (35 minutes)

- Explore wetland habitat and real macroinvertebrates up-close.
- Learn about the status of the water quality based on what macroinvertebrates are found.

3. Wetland Habitat Hike (35 minutes)

- Visit different areas of the hiking trails to discover the different features and wildlife depending on wetlands.
- Search and listen for signs of wildlife.
- Introduce watersheds.

4. Enviroscope Watershed Table (30 minutes)

- Demonstrate how water travels in a watershed.
- Discuss pollution/runoff and how that impacts water health.
- Explore the human impact on watersheds.

5. Reflection (10 minutes)

- Review the theme and discuss reflection questions.

Time:
2 hours

Season:
Spring, Summer,
& Autumn

Objectives:
Students will be
able to...

- Discover the many different forms of life that depend on healthy wetlands.

- Determine the importance of clean watersheds.

- Discover the impact humans have on water and think about solutions to pollution/runoff.

Key Concepts:

- Wetlands
- Watersheds
- Macro-invertebrates
- Water Quality
- Pollution/Runoff



Introduction

(3rd-5th Grade)

Welcome students to Bear River Migratory Bird Refuge and introduce yourself. Discuss the importance of the Refuge and why it was created. Ask if any of the students have visited the Refuge before.

Explain to the students that you will be their teacher for the day and that the Refuge is their classroom, so it is important to respect the Refuge just as they would with their classroom at school. Discuss any important safety/logistical items and concerns before talking about the theme of the day.

Theme

Clean water and healthy wetlands are essential to all forms of life.

Introduction Questions & Activities

- Ask students what a wetland is and what types of living things depend on wetlands.
- Discuss different types of wildlife found in wetlands but also mention that humans depend on wetlands as well.
- Give a brief overview of the schedule for the day and some of the activities they will get to try out.
- Take a look at the wetland scene exhibit in the Exhibit Hall.

Assess Student Knowledge

Knowledge levels of a topic between different classes can greatly vary. Assess the knowledge level of your group at the beginning of the day in order to determine how deeply to discuss topics and what to teach the class.



Dip Netting

(3rd-5th Grade)

Walk with students to the dock, boardwalk, or area where water is reachable without having to step in. Bring dip netting materials including...

1. Dip Nets (For Each Student)
2. Small Cup/Bowl (For Each Student)
3. Plastic Spoon (For Each Student)
4. Large Tub

Before distributing supplies to each student, review safety instructions and give a general overview of the activity.

Safety Instructions

- Always walk on the dock/boardwalk.
- When dip netting, make sure students are either sitting crisscross or laying on their stomachs at all times.
- Students may not crouch or sit up on their knees.
- If they cannot reach the water, they must move to a different spot.
- Students are welcome to move around and try different spots, but they must always follow the safety instructions.

Overview of Activity

Students will discover many of the different types of macroinvertebrates that rely on wetlands to survive. After discussing the safety instructions, describe each of the dip netting materials the students will get to use. Show students how to use the dip net, and how they must fill their individual cups/bowls with water before dumping their full dip nets into their cup/bowl. This is important for any creature they catch because many macroinvertebrates need water to breathe. Their cup/bowl will act as their own “tiny aquarium,” and they can use their plastic spoons to search for macroinvertebrates inside of it.

If students discover a new creature or something that is interesting enough that the entire group should see it, they can put their findings in the large tub, which will act as the “large class aquarium.” Once students have had a good amount of exploration time, gather them into a large group and take a look at the large tub full of macroinvertebrates. Discuss some of their findings and talk about what some of the creatures are.

Discuss how water quality impacts the types of macroinvertebrates found in the wetland. Bring images of some of the macroinvertebrates typically found within wetlands just in case students do not catch some of the common species, and bring a chart demonstrating what types of creatures are found vs. the current water quality.

After discussing students’ findings and life cycles, ask students to help clean-up. Have each student rinse out their own cup/bowl and dip net. Gather all clean materials before leaving the dip netting site.



Wetland Habitat Hike

(3rd-5th Grade)

You have 35 minutes to choose your own adventure on this hike. Depending on the season, try to hike to places on the trail where water can be seen. This will improve your chances of encountering wildlife within the wetland habitat. Listen and look for signs of insects, birds, and other wildlife that depends on wetlands along the way.

While you are walking start discussing what a watershed is and how large of an impact one small action at the top of a watershed can impart upon a wetland at the bottom of the watershed.

Suggestions For The Hike

- Talk about the bodies of water and plants growing alongside them.
 - Ask students why they may be important to wetlands.
- Discuss watersheds and what role this wetland plays in the overall Bear River Watershed.
- Search for signs of wildlife.
 - This may include bird songs, insect noises, mammal tracks, etc.
- Take a look at the Kestrel bird boxes along the trail.
- Hike to the Photo Blind on Marsh Meander Trail (1.5 miles).
- Hike to the boardwalk on Bulrush Bridge Trail (3/4 mile).
- Hike to the dock on Wetland Wonders Trail (1/2) mile.
- Hike to the Nature Play Area and spend some time exploring it.



Enviroscape Watershed Table

(3rd-5th Grade)

Maintaining a clean watershed is essential to the health of all living things. With that said, Bear River Migratory Bird Refuge, which is located towards the bottom, or at a lower elevation, of the larger Bear River Watershed, depends on clean water to successfully sustain life.

However, one small action at the top of a watershed can create a large rippling effect, and in turn, greatly impact the status of water at the bottom of a watershed. Therefore, the Refuge is largely dependent on humans practicing clean water actions in order to keep the Refuge sustainable for all life forms.

In this activity, students will discover the role humans play in determining the health of a watershed and how life and water are connected.

Materials Needed

- Enviroscape Watershed Table
- Table Props/Decorations (Buildings, Trees, Cars, People)
- Fertilizer (Bird Seed)/Dirt Bottles
- Spray Bottles
- Container To Drain Liquid
- Kool-Aid/Food Coloring (Polluted Water)

Watershed Table Set-up

1. Find a large open space to set-up the table so that all students will be able to see.
2. Fill lake with water and place table props/decorations on table.
3. Place dirt/fertilizer (bird seed) on table.
4. Use food coloring/Kool-Aid to prepare a different colored liquid to demonstrate how pollution also moves through the watershed. You may also want to prepare a darker color in order to replicate "oil" on the road underneath the cars.
5. Fill up the spray bottles.



Enviroscape Watershed Table

(3rd-5th Grade)

Activity Instructions

1. Ask students to define what a watershed is and explain that the table demonstrates the Bear River Watershed and how all living/non-living things within the area are connected. Show students a map of the actual Bear River Watershed and point out where the Refuge is located.
2. Ask students to point out on the table where they think the Refuge would be located within this small map. Ask students which direction they think the water will flow and why it flows that direction.
3. Ask for 2 volunteers to demonstrate a typical rainstorm. Give each of the volunteers a spray bottle and ask them to spray wherever they like within the watershed. Ask students to observe what they see.
4. Ask students to think about if the watershed is missing something. Talk to them about the fertilizer (bird seed) in the farm fields. Is fertilizer good for water? What about other types of pollution?
5. Have students name places or items in which pollution comes from.
6. Add “oil” and “runoff” from the factory to the watershed table. Ask students where all of this pollution may go to if it rains again.
7. Now ask students how this would be different if there was a flood rather than just a typical calm rainstorm. Demonstrate a flood, yourself, by dumping a large amount of water on the watershed table. Ask students what they noticed this time.
8. Ask students where all of the pollution went (The Refuge). Ask students if they would want to swim in this water or drink from it. Ask students to think about how the macroinvertebrates/other wildlife from earlier may be impacted by pollution.
9. Ask students how they can help reduce the impact of pollution (Drive less, use less fertilizer/pesticides, plant more trees, fence farmed animals, clean up litter, educate others...).



Reflection

(3rd-5th Grade)

Find a quiet spot to discuss what students learned and some of their favorite activities of the day. Review the overall theme of the day again and talk through some of the reflection questions.

Theme

Clean water and healthy wetlands are essential to all forms of life.

Reflection Questions

1. What is the most surprising thing you learned about wetlands or watersheds today?
2. How big of an impact do humans play in the health of a watershed?
3. What is your favorite thing you did today?

Thank the students for visiting the Refuge today and tell them about upcoming events. Let them know about other activities they can come back and try with their parents (Jr. Ranger, Nature Play Area, Exhibit Hall, Auto Tour, Jr, Duck Stamp Contest).

Activities To Do With Extra Time/Longer Field Trip

- Explore Nature Explore Classroom
- Explore Exhibit Hall (Exhibit Hall Scavenger Hunt)
- Watch "Wings Of Thunder"



Background Information





Wetlands

Wetlands are defined as areas where water covers the soil, or where water is present either at or near the surface of the soil all year or for varying periods of time.

The wetland in which Bear River Migratory Bird Refuge is located on is considered an **inland/non-tidal wetland habitat**. These wetlands are often found along the floodplains of river and streams or along the edges of larger inland bodies of water.

Many wetlands found inland are not wet or filled with water year-round. This is due to changing water levels throughout the seasonal changes of the year. This is an important function of wetlands because during months where there is a large amount of rain, wetlands are able to absorb and slow rushing waters which reduces the possibilities of floods. This is important for both the wildlife that depends on wetlands as well as humans living near wetland habitats.

Wetlands play many essential roles that benefit entire ecosystems. One of their most important roles is **water filtration**. Wetlands provide essential flood and erosion control by holding and storing water. They also serve as important water purifiers. Furthermore, wetlands serve as important habitats for many different species of wildlife. Here at the Refuge, wetlands play a large role in determining the health of bird and insect species.

Because the Refuge was originally built around the protection of important migratory and resident bird species, the wetland habitat at the Refuge serves the paramount purpose of providing essential nesting and foraging habitat for birds. The Refuge serves as the largest source of freshwater within the entire Great Salt Lake ecosystem. Therefore, this source of freshwater is vital to birds searching for a place to raise their young and find food resources.

Wetlands are one of the most **productive habitats** on Earth when it comes to raising young and providing shelter. They also serve the important purpose of providing migratory birds with wintering habitat. Finding ways to protect and conserve wetlands is essential when looking towards the future as many of these critical habitats are under threat of wetland draining and vegetation removal due to human activities.



Watersheds

Watersheds are defined as areas of land that channel rainfall and snowmelt to creeks, streams, and rivers which eventually flow to outflow points such as reservoirs and bays.

The wetlands at Bear River Migratory Bird Refuge, along with the Bear River itself, are all part of the larger Bear River Watershed. The Bear River Watershed, comprised of over 3,300 square miles and ranging in elevation from 4,200 feet to 12,600 feet, covers land in Utah, Idaho, and Wyoming. Each year, almost 1.2 million feet of water travel throughout the watershed and eventually drain into the Great Salt Lake.

Like all watersheds, water within the Bear River Watershed travels from higher mountainous elevations to lower elevations resulting in a large portion of the water to travel through the wetlands of Bear River Migratory Bird Refuge into the Great Salt Lake.

Because this is a highly urbanized area, **pollutant-based issues** are present including agricultural runoff, wastewater runoff, and municipal and industrial runoff. All of these sources of pollution endanger the overall water quality status within the watershed. This can lead to bacteria growth within bodies of water which can be detrimental to both wildlife and humans that depend on the water. With that said, because all of the water within a watershed is connected, just one small action taken at the top of a watershed can lead to detrimental effects at the bottom.

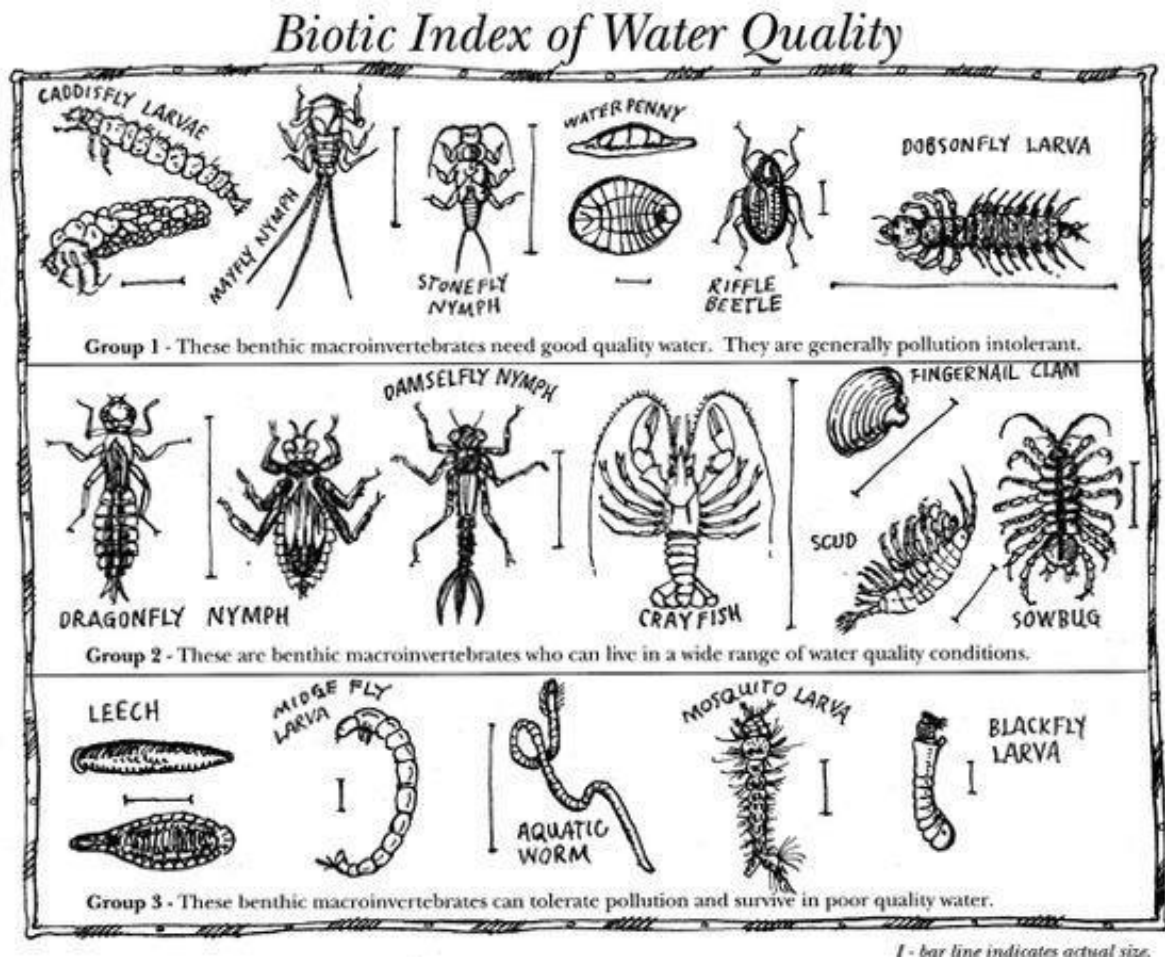




Macroinvertebrates

Macroinvertebrates are organisms that lack a backbone and are large enough to see without the use of a microscope. These organisms are cold-blooded, or exothermic, and can be either aquatic or terrestrial. Typically, the **aquatic macroinvertebrates** are the **larval or nymphal** forms of the organism in its adult terrestrial form.

Macroinvertebrates vary widely in their appearances. For example, some organisms, such as snails, contain a shell, while others, such as crayfish, have an exoskeleton. While each macroinvertebrate sports its own appearance, all macroinvertebrates serve an important role within the food chain of their aquatic ecosystems. Furthermore, depending on the types of macroinvertebrates found within an area, the **water quality** of an aquatic ecosystem can also be determined.





Aquatic Insect Life Cycle

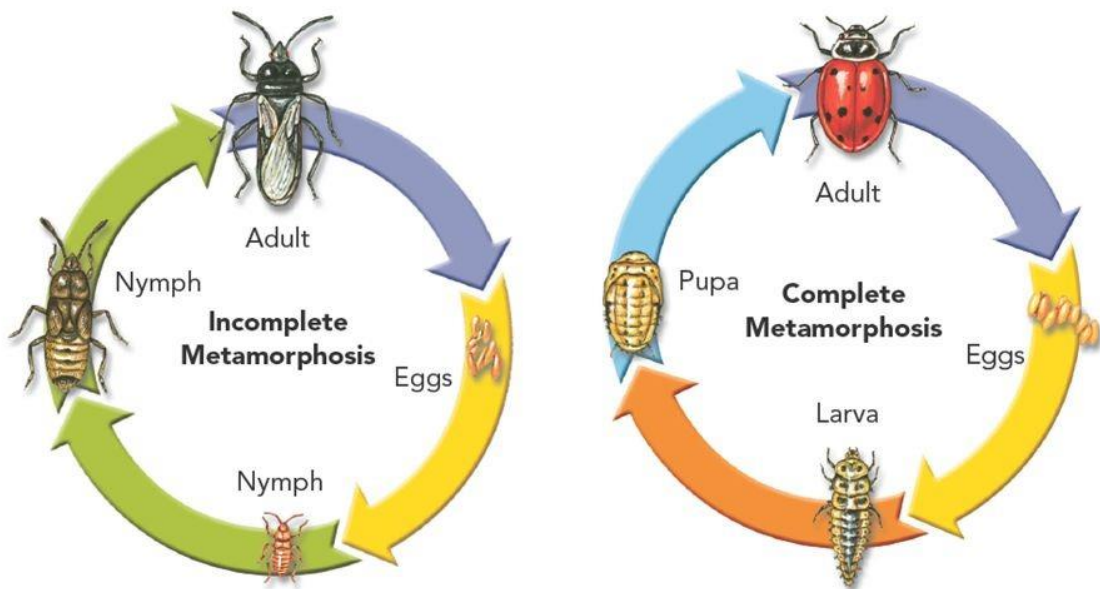
All insects undergo the process of **metamorphosis** or life cycle changes. However, metamorphosis does not look the same for every insect. Some insects go through **complete metamorphosis** which contains four different life stages: egg, larva pupa, and adult. This differs from insects that go through **incomplete metamorphosis** which is completed in three stages: egg, nymph, and adult.

One way to tell if an insect goes through complete or incomplete metamorphosis is to compare the larva or nymph with the adult. **Nymphs** will often appear as a miniature version of their adult form while **larvae** looks completely different than their adult form.

Complete Metamorphosis Aquatic Insects: Beetles, Dobsonflies, Caddisflies, Mosquitos.

Incomplete Metamorphosis Aquatic Insects: Dragonflies, Damselflies, Mayflies.

Complete vs. Incomplete Metamorphosis





Water Quality

Water quality is one of the most important components in an ecosystem. Healthy water provides local communities with clean drinking water and allows for wildlife to prosper.

When **pollutants or runoff** gets into ground or surface waters, waters that flow through a watershed into wetlands and important bay areas can become dangerous with toxicity and can accumulate in sediments of these areas.

With increasing urbanization, pollutants and runoff can come in many forms. Some of the main causes of contaminated water are due to...

- 1) Agriculture and livestock farming
- 2) Wastewater dumping
- 3) Oil spills (including oil from cars)
- 4) Deforestation
- 5) Industrial runoff

The impacts of contaminated water can be dangerous for both humans and the wildlife that depends on natural sources of water. Some of these impacts include...

- 1) Destruction of biodiversity
- 2) Contamination of the food chain
- 3) Lack of potable water
- 4) Diseases and bacteria growth

While these causes and impacts feel large, there are ways to reduce impacts, on an individual scale, to assist with improving water quality within local wetlands and watersheds. This can include...

- 1) Conserving or using less water in your own home
- 2) Supporting and practicing green agriculture
- 3) Composting and recycling rather than throwing things away
- 4) Pick up pet waste
- 5) Reduce your use of fertilizers and pesticides