An Adventure in Discovery



Simple activities for exploring nature with children

by Heather Hinam, Ph.D

Prepared for the 2012 Manitoba Nature Summit

MANITOBA NATURE SUMMIT

Second Nature
Adventures in Discovery

The First Steps of a New Adventure ...

I would first like to thank the organizers of the 2012 Manitoba Nature Summit for inviting me to play such a big part in this amazing event. When I first heard about the Summit, I was thoroughly excited by the concept and the enthusiasm the organizers have for a movement that has been near and dear to my heart for a long time: helping people reconnect with nature. It was encouraging to meet so many people who understood the urgent need to bridge the gap between today's western society and the natural world and wanted to do something about it.

The Manitoba Nature Summit is an especially powerful force in that movement because its effect will resonate well beyond the hundred or so people here for this weekend of fun and learning. The reach is nearly exponential and I'm so impressed by the amazing work the organizers have done in creating a program that is so rich and varied.

This booklet is part of my small contribution to this incredibly educational and inspiring weekend.

I am not an expert in early-childhood education. In fact, I have rather limited experience teaching children. However, between over 25 years of mucking around in the wilds of Manitoba and Alberta and almost just as many years as a nature interpreter, I'd like to think I have a few tricks up my sleeve. The next 20 or so pages are filled with ideas and insights gleaned from both my experience as a naturalist and formal training as a scientist and are the foundation for the four workshops that were offered at the Summit: Learning for the Future (Citizen Science), Looking for the Little Things, Nature Journaling and I Want to Talk with the Animals. Each section includes the background behind the workshop as well as instructions and any necessary handouts for a selection of activities.

Whether you had a chance to experience them first-hand at the Summit or not, I hope that you will find inspiration in these pages and that each activity will give you a foundation upon which to build your own learning experiences that best suit the children that you are sharing the natural world with.

All the best in your adventures,

Heather Hinam, Ph.D.

President
Second Nature, Adventures in Discovery Inc.

Learning for the Future - Citizen Science in the Classroom

Two-hundred years ago, most scientists had a day job. Audubon ran a general store; Darwin didn't get paid for his work on the *Beagle*. The full-time, professional scientist is a relatively modern creature. Still, even as science has become mostly a realm for professionals, the citizen scientist is alive and well, especially in the study of natural history. Their numbers, in fact, are growing, including ever more children. In this era of reduced funding for research and a growing need to reconnect children and their teachers with nature, the role of citizen science has never been more important or timely.

Getting your children or classroom involved in citizen science projects is a great way to start that reconnection and also learn about some of the important work that researchers are doing in Manitoba, nationwide and internationally. There are dozens of projects that you and your children can participate in, ranging from very simple to ones that are a fun challenge for high school students.

The benefits of these projects to school children are measurable. Children and their accompanying teachers learn a number of valuable skills: testing hypotheses, making and recording observations, observing trends and collaboration within their class and with other researchers. Beyond these basic skills, children enjoy an authentic, meaningful scientific experience in nature. By taking part in either projects that require regular observations over most of the school year or by engaging in many projects that happen at different times of year, students learn to tune into nature, to notice changes as the seasons roll by and begin to associate different details (like the arrival of the first robin or the slowing of a river by spreading ice) with those changes.

Before you Start your Journey ...

Do your homework
Spend time reading each project description carefully. Find out when observations are recorded and the level of involvement expected of each participant.

One size doesn't fit all
Project skill levels vary from expert to noivce. Keep the abilities and interests of your children in mind when picking a project.

Keep it Manegeable
While you may be wexcited to get your kids in tune with nature by taking on projects to cover the whole school year, take it a step at a time to give you and your students time to adjust to the habit of recording nature observations on a regular basis.

Integrate
Observing and appreciating nature doesn't have to be restricted to the realm of science. Having students keep a field log recording their observations, thoughts and impressions. is a great way to incorporate writing and artistic exercises into an already enriching program.

A Selection of Local and National Citizen Science Projects

Project	Website	Season	Level of Expertise	Description
Provincial				
Manitoba Breeding Bird Atlas	http://www.birdatlas.mb.ca/	May-Jul	High	Five-year project started in 2010 to map the occurrence of all breeding birds in Manitoba. Requires a relatively high working knowledge of bird identification
Manitoba Nocturnal Owl Survey	http://www.naturenorth.com/summer/creature/owl/owl_new/owl2005.html	Mar-Apr	Medium	An after-dark survey of owls, observers record owl calls, practice recordings provided
Manitoba Herps Atlas	http://www.naturenorth.com/Herps/Manitoba_Herps_Atlas.html	Spring-Fall	Medium	Observers record encounters with frogs, salamanders, snakes and lizards throughout Manitoba in an interactive map
Manitoba Dragonfly Survey	http://www.naturenorth.com/dragonfly/	May - Early September	Low-medium	Observers capture and photograph dragonflies. Although IDs are helpful, it is not necessary as species can be ID'ed later by survey organizers.
River Watch	http://www.oakhammockmarsh.ca/programs/educators/riverwatch/index.html	Ice-free season	High	Groups are trained through Oak Hammock Marsh Interpretive Centre in monitoring water quality in streams in the Red River Watershed
Manitoba Waterways Project	http://home.cc.umanitoba.ca/~lewthwai/mwp/intro.html	Ice-free season	High	Kits are loaned out from University of Manitoba professor, Brian Lewthwaite for monitoring water conditions at sites over several years. May also be used as a basis for a comparison study.
National				
Frog Watch	http://www.naturewatch.ca/english/frogwatch/mb/intro.html	April-June	Low-medium	Record the presence of calling frogs (ID help included) over the course of the spring at specific sites
Ice Watch	http://www.naturewatch.ca/english/icewatch/	Spring/Early Winter	Low	Record the date a water body ices up and when the ice comes off. Used as a measure of climate change
Plant Watch	http://www.naturewatch.ca/english/plantwatch/	April-June	Low-medium	Record the date of first flowering for a number of designated plants in your area. ID help included. A great activity to help children get a feel for the changing of the seasons and learn to identify common plants in their area.
Worm Watch	http://www.naturewatch.ca/english/wormwatch/	Snow-free season	Medium	Record and identify the presence of earthworms in a specific site to help map the distribution of worm species in Canada and get a better handle on soil quality.

A Selection of International Citizen Science Projects and Nature-based Apps

Project	Website	Season	Level of Expertise	Description
International				
Project Feeder Watch	http://www.bsc-eoc.org/volunteer/pfw/index.jsp?lang=EN&targetpg=index	November-April	Low	Observers record the numbers and kinds of birds that are visiting feeders during the winter months. ID poster included
Christmas Bird Count	http://www.bsc-eoc.org/volunteer/cbc/index.jsp?lang=EN&targetpg=index	Dec 14 - Jan 5	Medium	Observers spend one day recording as many birds as possible in a designated area. To find a count, connect with local organizers.
eBird Canada	http://ebird.org/content/canada	All year	Low-medium	Observers record birds they see and hear wherever or whenever they want - a great way to maintain a bird journal and contribute to monitoring and mapping
Great Backyard Bird Count	http://www.bsc-eoc.org/volunteer/gbbc/index.jsp?lang=EN&targetpg=index	Feb 15-18	Low-medium	Participants count all the birds they see over whatever time-frame they'd like (15 min - all day) over a short time-frame in winter
Project Nest Watch	http://www.bsc-eoc.org/volunteer/pnw/index.jsp?lang=EN&targetpg=index	Spring	Low	Participants record the activity around an active bird nest. Great project for schools with swallow nests or bird boxes nearby.
World Water Monitoring Challenge	http://www.worldwatermonitoringday.org/	All year	Medium	Participants record water quality at the site of their choosing using test kits purchased from the organization or their own equipment.
Nature Observation Apps				
Project Noah	http://www.projectnoah.org/	year-round	Low	Participants take part in a world-wide inventory of nature with their ipods and smartphones by taking pictures and submitting spottings either with an ID or with a request for help with identification. Internet-based submissions also available
iNaturalist	http://www.inaturalist.org/	year-round	Low	A social media site for nature lovers where participants can share info and learn from others

Citizen Science Activity One - Worm Watching

This program is one of four run by Nature Watch, part of the non-profit organization Nature Canada. This monitoring program is an excellent start in citizen science activities that appeal to children. By participating, kids will learn about worm biology, biodiversity, soil ecosystems and ecosystem monitoring. It's also a lot of fun getting your hands dirty and playing with creepy crawlies. For more information and to sign up, go to: http://www.naturewatch.ca/english/wormwatch/

For today's exercise, we'll need:

- clothes and shoes that can get dirty
- soil thermometer* (optional)
- 2 well rinsed plastic containers
- wormWatch data forms - available at: http://www.naturewatch.ca/english/worm-watch/resources.html
- a sampling frame (25 x 50 cm)
- pen/pencil/clipboard
- the taxonomic key to adult earthworms (link to downloadable Taxonomic Key)
- a camera (optional)

Flip and Strip Protocol – modified from Worm Watch's Website

1. Layout your sampling grid on the ground. This can be done several ways, using stakes and string, a piece of cardboard or a quadrat made from PVC tubing and string.

• Layout the stakes in to a rectangle 25 cm by 50 cm, using the metre stick for exact measurements. Wrap the string around the stakes to show the sample frame or
• Take a flat piece of cardboard and cut out a rectangle in the centre that measures 25 cm by 50 cm. Lay on the area for sampling
• Make a quadrat by stringing one 50 cm piece of 0.25 in PVC tubing on 2.1 m piece of rope, then sting a 25 cm piece of tubing. Repeat with a second 50 cm piece and another 25 cm and tie off the rope to create a collapsible frame.

2. Keep in mind that rocks, pieces of wood, logs and old cow pats often have earthworms living under them in the cool moist soil. Rocks beside streams and lakes are also good places to look for earthworms. If you are looking under rotting wood, strip back the bark in moist areas and check for bark worms. Bark worms are usually small and very red.

3. Gently flip the rocks and strip the pieces of wood that are within your sampling frame. Even if you don't find any earthworms, be sure to carefully replace the rocks, wood and logs that you moved.

4. Sort the worms found into colour, and appearance (refer to the key supplied with this kit). Count the numbers of adults (clitellum), juveniles and cocoons in each group and record the numbers on the data sheet. Put the juveniles, cocoons and aestivating earthworms back in the soil. Be sure to keep your adults to identify by using the key provided on the web site.

5. After you have identified your adults, put one representative adult from each species and any unknown species into separate containers for preservation. Return all the other earthworms to the soil or place you found them and put all the rocks and litter back the way you found it.

6. Record the species, number of adults, number of juveniles (if any) and number of cocoons (if any) on your Observation Form. If you do not find any earthworms, that's important information too!

7. If you are unsure of your identifications in the field, you can bring the adults back with you and go through the key online to sort out which is which. If you need more help, instructions are available on the website for preserving specimens and sending them in with your data sheets for a more accurate ID.

To take the experience beyond simply collecting worms for monitoring purposes, you could compare the number and type of worms found in different locations and speculate as to why differences exist (moisture, vegetation type, level of human disturbance). One interesting study would be to have plots along a transect running perpendicular to a water body and look at how the number and type of worms change with increasing distance from water (worms like moist soil).

Citizen Science Activity Two - Manitoba Dragonfly Survey

This locally-based survey is a fun activity for children of all ages and a great way to develop nature identification skills. It is an accessible project for even very young children (who love to chase bugs with nets) because you do not need to be able to identify each species, just take a photograph to send it for identification. It is also very meaningful. Dragonflies have been used as an indicator species for habitat and wetland health all over the world.

For today's exercise, we'll need:

- An insect collecting net, which can either be purchased or made.
- Specimen envelopes or packets, which can be purchased or made.
- Forms for reporting data.
- Colour or other field keys for identifying common or distinctive species, at least to family level.
- A field notebook.
- Camera
- Cooler with ice

Sampling Protocol

Today we're going to make a simple sweep of a 30 m area along the riverbank for any dragonflies we can catch. In groups, we will walk along the river's edge trying to catch any dragonfly or damselfly we can spot. Once caught, the specimens will be carefully stored in paper envelopes and cooled in the cooler before photographs will be taken for later identification.

For educators wanting to set up a regular monitoring site, instructions are available from: The Dragonfly Survey Handbook and Establishing a Survey Site at http://www.naturenorth.com/dragonfly/join.html An identification guide is also available to help you figure out what you've caught, but if you're unsure, take a clear photos from three angles: 1) the top side with wings spread, 2) the side with wings out and 3) head on to get a look at the eyes. You can then submit the photos for ID help.

Manitoba Dragonfly Survey Site Data

Site Name:
Coordinates:
Nearest Named Place:
Distance from Nearest Named Place:
Direction from NNP:

AQUATIC HABITAT

Type of water body:

Standing Water: lake/permanent pond/seasonal pond/marsh/bog

If standing: oligotrophic (nutrient-poor, deep, rocky lakes)/mesotrophic(healthy plant activity)/eutrophic (shallow, overly-enriched with nutrients, algal blooms)/ distrophic (polluted, full of chemicals)

Moving: headwater stream with no tributaries/small river with small tributaries/large river with many tributaries

Status: Natural/built

Water clarity: clear/murky

SHORE LINE AND TERRESTRIAL HABITAT

Is your site bordered by or composed of:
____ an open field (pasture or open yard),
____ a meadow (unmowed or ungrazed open area),
____ recently cleared or logged forest,
____ mature second growth forest (over 80 years since last clearing) or
____ old-growth forest (protected or undisturbed, not logged, mature trees)
____ urban setting

In the water right at the shoreline, are there:
____ emergent plants such as cattails and reeds,
____ floating plants, like lily pads and duckweed,
____ submerged plants that are rooted and upright in the water column, but which do not break the surface of the water,
____ algae or prostrate plants covering the bottom or substrate, or
____ is the bottom open?

Manitoba Dragonfly Survey Data Sheet

Common Name: _____

Scientific Name: _____

Collected by: _____

Collection Date: _____

Identified by: _____

ID Date: _____

Location: _____

Coordinates: _____ _____

Habitat:

Description/Behaviour:

Citizen Science Activity Three - Water Monitoring Programs

For teachers working with older students, citizen science projects can be a great way to not only encourage the understanding of scientific methods of hypothesis testing and data collection, but some projects also involve learning specific techniques that can be both interesting and fun.

Water quality monitoring programs are an excellent venue for students to learn about basic chemistry, geography and ecology all at the same time. There are three programs available to educators in Manitoba that vary in geographic scope, goals and the type of data collected.

This is a program from the Red River Centre for Watershed Education and is delivered in Manitoba by Oak Hammock Marsh Interpretive Centre. It engages teachers, students and citizens in monitoring the water quality of selected rivers and streams in the Red River watershed. Water sampling is done on a regular basis; usually once a month throughout the open water season. The information gathered is also added to the Interpretive Centre's interactive GIS community mapping project. Testing equipment is loaned out by the centre, but participants can also use their own equipment if they have it.

This world-wide initiative is an educational outreach program designed to collect data on world water quality while raising awareness of the importance protecting water bodies. Participants can register their site online and either purchase a kit to measure temperature, turbidity, pH and dissolved oxygen or use their own equipment to submit their data that is then viewable on a world map or downloadable as a spreadsheet to look at worldwide trends. www. http://dev.wwmd.org

Manitoba Waterways Project
Developed by the University of Manitoba's Faculty of Education, this program is designed to engage students in a province-wide freshwater analysis that also meets the curriculum needs of grades 6 and up. Equipment and instructions are available to borrow from Dr. Brian Lewthwaite: lewthwai@cc.umanitoba.ca

Today, we're going to use a combination of methods to collect data that can be added to the WWMC collection and give you a taste of what's possible for students to experience. While the Riverwatch program measures much of their data electronically, we will be doing ours by hand using equipment from the Manitoba Waterways Project.

Measuring Water Quality

As with all nature-based research, it is important to collect site data so that you and other researchers can go back later and understand the context in which you collected your information. We will collect our site data as one large group and then break off into teams to collect our water samples.

Equipment:

- Rubber boots
- Collecting jars
- Measuring tape
- Weighted rope - for measuring depth
- Thermometer
- Data sheets
- Clipboard
- Bucket and rope
- pH testing kit
- Dissolved O_2 testing kit
- Turbidity/Transparency Testing equipment - Secchi Disk

Optional equipment:

- Phosphates testing kit
- Nitrates testing kit
- Hip waders

As a group, we will measure site and environmental data as well as observations of stream condition and flow.

Each team will be responsible for collecting 6 variables from water samples taken as far into the stream as possible. Instructions for taking each measurement are included on cards with the testing kit. If teachers are interested in turning this experience into a proper scientific experiment, they can have their students hypothesize whether readings will be different between upstream and downstream samples.

The data sheet for this modified version of the project is included on the following page.

Water Sampling Data Sheet

FIELD INFORMATION		
Project name: Stream name:		Date: Time (military): GPS Coordinates:
MEASUREMENTS		**NOTES**
Group data		
Air temperature (°C)		
Wind direction and speed		
% cloud cover		
Stream width		
Precipitation in past 24 hrs (yes/no)		
Precipitation in past 3 days (yes/no)		
Stream condition		
Stream flow measurement (m/s)		
Team Data		
Water temperature (°C)		
Water level gauge (cm) – surface		
Water level gauge (cm) – bottom		
Water level gauge type		
pH		
Dissolved oxygen (mg/l)		
Transparency/Turbidity – first reading (to the nearest cm)		
Transparency/Turbidity – final reading (to the nearest cm)		
Appearance		
Recreational suitability		
Optional Data		
Phospates		
Nitrates		
Sampling device		
Sample type		
FIELD OBSERVATIONS		

What do you do with the data?

In this case, data on water temperature, pH, transparency/turbidity, and dissolved oxygen will be submitted to the World Water Monitoring Challenge. If groups decide to take part in the River Watch or Manitoba Waterways Project, they will collect a more complete suite of data and submit it as part of the program. To help students see how water changes with the seasons, you might want to take samples once a month.

Water quality sampling can also serve as the basis for lessons on geology, chemistry and ecology. Consider some of the following questions:

- Are cloudy streams necessarily polluted?
- How does temperature affect what kind of life can live in the water? Can water be too warm? Too cold?
- How does acidity affect water life? What can affect the pH level in a waterway?
- What does it mean when there are high levels of nitrates and phosphates in the water? Are there water bodies in Manitoba that are like this? What causes this?
- How do you think the landscape around the waterway affect the quality of the water?
- What sort of trends would you expect to see in a deteriorating waterway?
- How do water quality variables change from upstream to downstream?
- What can you do to protect your waterway?

Resources are available from all three projects to help answer these questions and get students thinking about the health of their water systems and how they can protect them.

Variable	Change from Upstream to Downstream	Explanation
Temperature	increase	Water has been exposed to the sun longer, lower altitudes, more particulates in the water, so it absorbs more solar energy
Oxygen Level	decrease	Water is slowing down = less aeration
Nitrate Level	increase	More fertilizers find their way into the waterway
Phosphate Level	increase	More fertilizers, decaying organic matter and man-made products (i.e. soaps) find their way into the waterway
pH	decrease	Carbon dioxide levels increase, organic acid levels increase
Velocity	decrease	Less of a slope, widening of the stream, everything slows down.
Transparency/Turbidity	increase	More ‘stuff’ accumulating in the stream, soil, organic matter, other products

Looking for the Little Things

Getting back in touch with nature doesn't have to be about grand vistas and big wildlife. However, many people seem to think it is, feeling like they need to go out on some back-country hike to a pristine lake to really experience nature.

That's really not the case. In fact, those hikers often miss some of the best nature moments as they march through the forest, intent on their goal. If they slowed down and took a look around at the stuff they passed along the way to that great vista, then they might have a sense of what it really means to reconnect with the world around you.

Getting back in tune with nature means noticing all that stuff that most people take for granted: the funny little plant sticking up between the cracks in the sidewalk, the swallow's nest tucked under the roof of that picnic shelter, the lichen growing on that rock, making it look like it's rusting. In fact, some of the best ways to reconnect with the world around you is by starting small.

The best part about that is it's easy and often doesn't require any equipment. All you really need is a little patience and the willingness to slow down and start looking. There are all sorts of ways that you can approach this with your children and aside for the activities we're going to be doing today, here are a few more to consider. Some do require special equipment.

- Dip-netting for aquatic creatures
- Examining life in a water droplet
- Discovering the multitude of plant species in small plot on the ground
- Cataloguing all the different life-forms you find on a large tree
- Discovering the abundance of life under a log

You can make your explorations as detailed or as general as you'd like, making most activities accessible for a wide range of age groups. All of these activities lend themselves well to comparisons between sites and the testing of hypotheses. So get out there and stop and smell the roses. You'll be surprised at how much richer you and your children's lives will be for it.

Looking for the Little Things
Activity 1 - Dip-netting

Every child loves to play in the water and dip-netting (or critter dipping, as it is often called) is a fun way of discovering the fascinating world that lives below the water's surface. It's also a easy and inexpensive way to spend an hour or so in nature with children of just about any age.

Pre-school and early elementary children simply enjoy swishing their nets in the water and marvelling at the critters they pull up from the depths. Older kids often set off after one particular organism (like leeches) and try and catch as many as they can. For junior high and high-school teachers looking for a way to make such an activity relevant to their curriculum and a bit more of a challenge can introduce the idea of a comparative study. Students can head out to sample different sites: (a small pond vs a moving creek, or a pristine lake vs a heavily-impacted lagoon). In fact, sampling water organisms is an important part of water quality monitoring done as part of citizen science projects.

Mostly, it's just fun to get your hands and feet wet and explore the little things under the water than we rarely ever see.

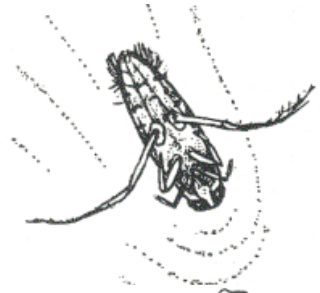
Equipment

Rubber boots
Dip net
Plastic pail or container to store your catch in
Magnifying Glass

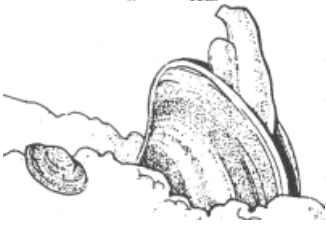
Important Nature and Safety Notes

- Be aware of the state of the shoreline. Keep an eye out for any loose or overly muddy areas where you may get stuck.
- Avoid damaging sensitive shorelines like those with cattails and other emergent vegetation.
- Don't forget these are living beings. It's sometimes easy to get detected from things like insects and other invertebrates, but they are delicate creatures that deserve respect.
- Be especially respectful of critters like frogs. Kids love to cart them around in buckets or shove them in other kid's faces. Frogs breathe through their skin and can absorb things like sunscreen, bug repellent and just the oils from your hands. Also handling them too long can dry them out and cause undo stress.

A Gude to Common Manitoba Dipnet Critters

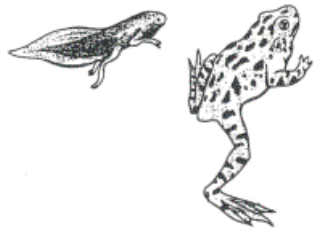


Backswimmers spend most of their time at the surface of the water waiting for a meal to come by. When a victim comes close, they dive after it, taking a bubble of air with them. They bring air because like humans they breathe with lungs, not gills. When they catch prey backswimmers bite it and suck out its body fluids.



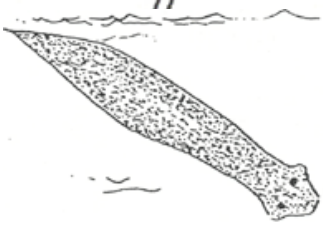
Clam's live underwater, within a shell, without eyes, with only one foot to get around, catching food with its nose. A clam's hard shells help protect it from animals like raccoons, turtles and muskrats who enjoy eating them. The rings on the Clam's shell each equal one year's growth. You can count the rings and guess a clam's age. They use their foot, which looks a lot like a human tongue, to pull itself along the bottom of rivers and lakes where they live.

Leeches avoid sunlight. They can be found on the bottom of calm waters where they are usually attached to rocks or submerged wood. When attached, leeches hold their bodies vertically. Most leeches are not blood-suckers, feeding instead on decaying matter that is floating in the water or settled on the pond bottom.



Frogs start out life swimming and end up hopping. After hatching from an egg, they spend several months as a tadpole, swimming with their long tail, eating algae, and hiding from hungry dragonfly nymphs, newts, fish and birds. Frogs slowly grow legs, and their tail gets smaller, and they start breathing with lungs instead of gills -- complete metamorphosis!

A Snail's eyes and mouth are on its foot, because they eat algae, which grows where they crawl. They feed by scraping off the algae with a row of teeth called a radula. Snails are attached permanently to their shell while alive and some even have a door to keep predators out. Look for spiral and ram's horn shaped shells.

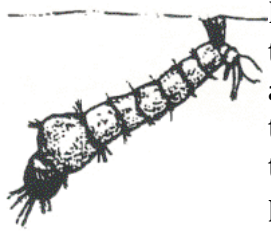


A Flatworm's mouth is on its belly. They crawl right onto their food, dead animals, and dine. Look carefully at their head. Those two little spots you see are the Flatworms eyespots. They can't see like humans, they use their eyes to detect light, which they avoid. Most animals breathe with either gills or lungs. Flatworms, however, breathe through their skin. You can find Flatworms where the water is clean.

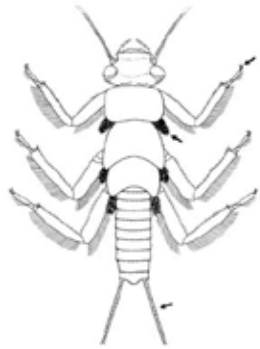
Water Scorpions spend much of their time hanging upside down from the water's surface waiting for a meal to come by. Other aquatic insects that come close enough become their meals. Just like humans, Water Scorpions breathe air with lungs. They get air with a long breathing tube, which is a lot like a swimmer's snorkel.

Dragonfly Nymphs can be found crawling about on the bottoms of ponds or on submerged plants and rocks. They are just as active predators as the adults they will turn into, feeding on just about anything that moves, from smaller insect larvae to tadpoles. They are important predators of mosquito larvae.

Water Spiders are found on the surface of the pond where they are supported by water tension. The move along the surface by swinging their long legs, scouring the waterline for dead insects that they feed from by puncturing with their rostrum and sucking up their juices.

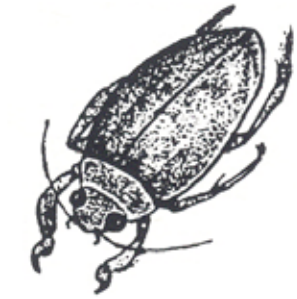


Mosquito larvae. Both Mosquito larvae and pupae are found just below still water surfaces. They will swim away to the bottom when threatened. Larvae are also called 'wrigglers' because they constantly curl and uncurl or wriggle when they move. Pupae are called 'tumblers' because they appear to tumble through the water. The larvae eat algae and protozoans (microscopic animals). The pupae do not eat. They are eaten by fish and by predatory insects such as dragonflies. The larvae usually hang upside-down from the water surface, breathing through tubes which break the water's surface.



Mayfly Nymph. This insect is also more commonly known as the fishfly here in Manitoba, Found on the bottom of ponds and creeks clinging to rocks, where they can live for up to two years filtering the water for algae and other microscopic organisms. They are an indicator of healthy oxygen levels in the lakes in which they live. Mayflies are eaten by trout, dragonfly and stonefly nymphs and predacious diving beetles.

Water Flea. Also be known as Daphnia. Water fleas are found at all depths of a pond. They swim with jerky movements using an enlarged second pair of antennae to propel themselves. Water fleas eat algae, microscopic animals, and other bits floating in the water.



Predacious Diving Beetles. These beetles are quite common in Manitoba waterways and can even be found on land, flying from one wetland to another. They are large, with hard carapaces that hide their wings and sharp pincers for eating prey up to the size of small fish.

Water boatmen often cling to submerged vegetation, although they can be found anywhere in the water. The adults use their fan shaped middle or hind legs for swimming. They are easy to identify because of their whirling motion on the surface of the water. They can be found in large numbers. The adults are scavengers, eating dead plant and animal material. The whirligig beetles take air bubbles below the surface as a supply of oxygen. The beetles have two sets of eyes which enable them to see above and below the water at the same time.

A Water Mite has a body as round as a ball, and as small as a pinhead. They have eight legs however are not very good swimmers. They get around most of the time by crawling. They crawl on aquatic plants where they can hide from predators and search for animals smaller than themselves to eat. Water Mites don't chew their food at all, not even once. They just suck out their victim's body fluids with their jaws. Water Mites don't even have gills or lungs to breathe with, they just breathe through their skin.

Freshwater Shrimp are common in the silty bottoms of Manitoba ponds and creeks. They are important food for fish and even some birds.

Looking for the Little Things - Activity Two - The Art of Seeing

The Art of Seeing will challenge you to stop and really look at the world around you, to take a moment and discover the details in ways you may never have before. It's like a game of BINGO but with a twist. To fill your squares, you need to collect pictures that represent the description in each square. However, we're not asking you to find a leaf or a pinecone. These descriptions are open-ended and encourage you to think creatively and look at nature in a different way. Take time to notice the details and be prepared to defend your finds.

Your mission: collect photos of natural things that fit each description to fill a square and complete as many lines as you can in the allotted time. Be prepared to defend your discoveries once everyone returns to the start point. The team with the most points wins. (Completed line = 6 pts, single filled square not part of a line = 1 pt, Blackout = 50 pts). You can venture as far as you'd like just be sure to be back by the deadline. You'll lose 1 pt per minute late.

*You may not use the same thing for two different squares; but you may use different parts of one organism to fit different descriptions. You also may not use humans or human-created objects.

It is a race and in all the excitement, there are a few things to keep in mind in order to respect the natural space we're in while we enjoy ourselves.

STAY ON THE TRAILS - feel free to explore far and wide for discoveries that will help you complete your score sheet; but try not to forge new paths while doing it. In addition to the designated trails, you will find all sorts of unofficial paths carved out of the forests and fields by wildlife and people. You are welcome to use those to improve your chances of finding what you're looking for.

TAKE ONLY PICTURES - This isn't a scavenger hunt and the only treasures you need to bring back with you are digital. Please take care of our wild spaces and let your discoveries continue to thrive in their habitat.

LEAVE ONLY FOOTPRINTS - You likely aren't carrying much with you as you explore the trail; but please be sure not to leave any wrappers or water bottles along your path. In fact, we encourage you to bring your own re-usable water bottle to keep your footprint even smaller.

REMEMBER YOU'RE IN SOMEONE ELSE'S HOME - If you're lucky enough to encounter wildlife along the trail from the smallest bug to the biggest buck, please remember that this is their home. Take a picture to record the moment and then let them enjoy their day in peace.

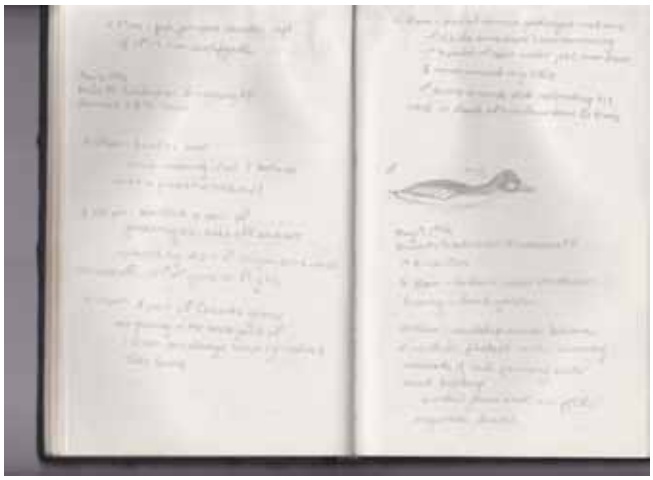
Ensuring the next Generation	Something Lived Here	A plant with no veins	Something airborne	Something ancient
Yellow	Something with scales	Putting nutrients back into the system	It makes noise	It's mostly water
Signs an animal passed by here	Something Edible	Something Amazing	Something symmetri-cal	Only an animal would eat it
It has a strong scent	Signs of Fall	It can fly	You can use this for what ails you	Texture
Something Beautiful	A plant that doesn't need seeds	Something with more than 4 legs	Red	This makes you Happy

The Art of Seeing Game Sheet

Feel free to modify/simplify to meet your student's needs and ability levels.

Nature Journaling
Cementing a relationship with nature

Keeping a journal is the cornerstone of nature study. The more time you spend with nature, the more likely you are to want to remember your experiences, what you saw, when and how you felt at the time. It's also a way to keep track of things that you don't recognize so that you can go back and sort out identifications back home. Keeping a journal is also the first step to learning how to make observations in a scientific way and is a terrific way to take note of changes and trends over time.



By encouraging children to keep a nature journal, you are cementing a long-term relationship with nature that with grow and evolve not only over the course of a school year, but over their lifetime. I look at my old journals and can see the transition from fascinated teenager to budding scientist and I still keep a form of a journal today.

Nature journaling fulfills several objectives and meets a number of curriculum needs.

English/Language Arts
Improving writing skills
Creative self-expression
Foster communication
Oral learning and group communication/sharing

Social Studies
Local history
Map making
Natural and human communities

Science
Recording observations
Natural history
Earth sciences
Recording habitats and seasons
Creating hypotheses and predictions
Mapping exercises
Observing details
Fostering good scientific habits of data management
Noting long-term trends and changes

Art
Recording details
Improving realistic drawing skills
Colour impressions

Activity 1: Personalizing your journal

There are dozens of different blank books out there and there are really no rules as to what makes a good nature journal. It really is a case of what speaks to you. I would recommend a book with unlined pages, preferably of heavier drawing weight. This will give you the freedom to write in any direction, to fill the page and draw diagrams and sketches of the things you observe. A heavier weight paper will allow for the application of watercolour if you so desire.

Once you have your book, it's time to personalize it. Again, there are not rules. Use whatever method you enjoy most. For the purposes of this workshop, we will be making our own hand-made journals and decorating them. This is a great way of incorporating art into the study of nature.

Activity 2: How we Observe the Natural World
Everyone takes in the world differently. We each have senses that we use preferentially. To kickstart observations in your group, try this simple exercise.

1. As a group, have your students sit down in a spot outside, facing different directions.
2. Each student, working in silence, should take 5 minutes to record what they see, hear, smell, etc. (using words and drawings) on a new journal page.
3. Take 5 to 10 minutes to have each member of the group share their observations.
4. Talk to the students about how we all observe the world in different ways. Did other students hear, see, and smell things the others may not have recorded? What senses were they focusing on? Which senses did they not pay attention to as they were recording their observations?

Activity 3: Mental Map
Journaling is a helpful tool for students to get a better sense of their place in the world. When describing locations and moments it nature, many people find it helpful to make a basic map of the area to help sort out your thoughts. Making a map of the area you are journaling in also helps to stretch the senses and improve your awareness of what is around you and how you fit into the picture.

1. If you are doing this activity as a follow up to number 1, ask your students to face in a different direction.
2. Begin the exercise by asking them to write down what direction they think they are facing (North, South, East or West).
3. Ask students to write down a few notes about the weather. Is it windy or calm? Sunny or cloudy? What do they think is the temperature? Any other observations?
4. Take 5 minutes to draw a map of the immediate area around them, noting the landmarks that are important to them.
5. After the 5 minutes are over, everyone returns to the group to share their maps. Are they all the same? How are they different? What landmarks did people find important? How would doing thing be helpful in observing the natural world?

The Journal Page

If you and your group are going to get into nature journaling on a regular basic, it is important to follow a few simple conventions when you start each new experience. Naturalists, both old-school and modern field scientists all have the habit of recording a few important things at the start of each new page:

Date
Time
Location
Weather conditions (temperature/sky/wind)

Why do this?

It's a useful habit for a number of reasons. It gives you and your students a chance to look at the change in conditions of a place or places over time. It also gets you into the practice of recording scientific information. Probably more importantly, however, it tethers you to that place and time in a way that is memorable, enhancing your experience and giving it depth.

Activity 4: Your quiet place

It's amazing how much the world wakes up around you when you take the time to sit still and really start to notice it.

1. Have your students head out and find a spot in nature that calls to them and sit down there.
2. Once settled, have them start a new journal page with the appropriate information and then simply 'be' in nature for 15-30 minutes (or even longer if their attention span will allow), jotting down observations as they come to them. While there, encourage them to pick out two or three objects that catches their eye and spend time drawing them. They don't have to be good at drawing. It's about translating what they see onto paper in a way that makes sense to them. You could also encourage them to write their thoughts about the objects or how it makes them feel. Have them face different directions during that time to take in as much as possible.

3. Once back in the group, ask students to describe their objects or any other interesting observations they made.

Talk With the Animals - Activity One - Chickadee Feeder Experiment

Working with animals is never easy and usually out of the range of most children's educators due to budgets, training and animal care requirements. However, there are still plenty of opportunities to observe animal behaviour without interfering with the wildlife. With a bit of creativity, you can even design a few experiments. For example:

- At the zoo, let your kids pick one animal to observe and have them keep an activity diary on that animal over a set amount of time (30 min - 1 hour) and then compare diaries of different species.
- Delineate a plot in the woods and have your class walk through it systematically, looking for evidence of deer browsing. Using plant guides, identify and count the different plants the deer are feeding on to come up with a diet profile. If you want to take it further, compare diets in two types of woodlots.

Today we are going to use bird feeders to test decisions made by chickadees in terms of what kind of food they prefer to eat and how far from the safety of the forest are they willing to go and get food.

Goal: To introduce students to decisions faced by animals and how it affects their behaviour.

Lessons Learned:

- Testing a hypothesis
- How to set up a comparative experiment
- Observing animal behaviour
- Chickadee ecology
- How to analyze information graphically
- Making conclusions based on your results

Every moment of their lives, animals are faced with decisions. Where and in what types of habitats should they search for food? How long should they stay in one place eating before moving on somewhere else? What kinds of food should they eat? How much time should they devote to finding food vs. other activities such as breeding, resting, and avoiding predators? At what times of the day would searching for food be most profitable? These are only some of the behavioral decisions that animals must make on a regular basis. How do they make these choices? What are the ecological factors that affect their decisions?

Also, how do researchers figure out what choices animals are making and why? They often do this simply by observing wild animal behaviour in their own habitats; but a more powerful way to answer questions about animal behaviour is to actually give an animal a choice. An easy choice to give them is about food. What kind of food do they prefer and what are they willing to do to get it?

To answer those questions, we will set up a simple experiment using wild Black-capped Chickadees. The black-capped chickadee is a small gray bird with a distinctive and unmistakable black cap and bib. During the early fall, these birds are easily attracted to bird feeders, where sunflower seeds are one of their favorite foods. After grasping a sunflower seed in its bill, a chickadee will fly to a sturdy perch in a nearby tree and, using its feet to secure the seed to the perch, peck at the seed until it manages to crack the nutritious kernel from the shell. During the brief feeder visits, a bird typically takes a single seed or kernel in its bill and carries it to a nearby tree for eating or storage. The number of feeder visits therefore is usually a reliable indicator of the number of seeds taken.

However, it's possible to feed chickadees just the sunflower kernel without the shell, giving them the same amount of food for much less work. So, the first choice, we're going to give them is between sunflower seeds with the shell or just the kernel.

Although bird feeders provide chickadees with a readily available source of food, visiting feeders can be dangerous. Predators like sharp-shinned hawks, Cooper's hawks and domestic cats have learned that bird feeders can a good place to find prey and will take advantage of that. So, chickadees have to balance their need to get food against their need to stay safe and so might not venture too far out into the open if they don't have to. The second choice we're going to give them, then is between feeders that are close to the forest and relatively safe and feeders that are more out in the open. With two variables (distance and food type), we can come up with four different types of feeders:

Near/shells on
Near/shells off
Far/shells on
Far/shells off

To complete this experiment, we'll need the following equipment:

8	1.5 m long sharpened wooden stakes
8	0.3 m square plywood platform
1	25 kg bag of sunflower seeds with shells
1	25 kg bag of sunflower seeds without shells
2	0.3 m lengths of 2 by 4 boards (for pounding in stakes)
2	buckets (for water to soften ground so stakes can be pounded in)
1	hammer
8	7.5 cm nails
8	metal pie plates

To set up the experiment, find a clearing next to a woodlot that you know to have chickadees living in them. Then, drive 4 stakes into the ground about 1 m away from the forest about 10 m apart. Drive the remaining 4 stakes in line with the first four about 5 m from the forest.

Place one pie plate on top of a plywood square and nail them into the top of each stake to create the feeding stations.

Randomly assign the 4 near stations as having seeds with shells or without (2 of each type) and do the same with the other 4 far stations.

Set the experiment up several days before you are ready to go and keep the feeders filled to ensure that the birds will find them.

At the time of the experiment, empty out all the feeders and replace the contents with a set amount of seed (i.e. 500 g of seed/pie plate).

Station observers to watch each pair of near and far feeders from a distance and record the number of times a chickadee comes to take a seed from each feeder. Keep watching for a hour or another easily-measurable amount of time.

The final measurement will be **number of feedings/hour**

After the observation time is up, collect data from all feeders and come up with an average for each feeder type. Enter it into a spreadsheet and produce a graphical representation to compare which combination chickadees would like best?

Questions for Interpretation

Before you begin the experiment, which feeder do you expect the chickadees to like best?

Upon looking at your results, did you predict correctly?

Why do you think did they choose they way they did?

Why did some chickadees go to other feeder types?

Did nuthatches or other bird species show a different pattern? Why or why not?

Variation: Instead of chickadee feeders, you could try hummingbird feeders and vary both the distance and the amount of sugar in the feeder solution.

Chickadee Feeder Data Sheet

Date: Obervers:
Location:
Time:
Temperature:
Wind:
Cloud Cover:

Chickadees

	Feeder Station		
Treatment	**1**	**2**	**Average**
Near/Shells			
Far/Shells			
Near/No Shells			
Far/No Shells			

Nuthatches

	Feeder Station		
Treatment	**1**	**2**	**Average**
Near/Shells			
Far/Shells			
Near/No Shells			
Far/No Shells			

Final Thoughts...

The workshops and activities in this booklet only begin to scratch the surface of the possible ways you can explore nature with your children and students. The best advice I can give you is to be creative and don't be afraid to fail. As any scientist will tell you, no result can still be very interesting and something trying something that doesn't work may lead to new and exciting ideas.

So, get out there and explore. Use this workbook as a guide to get you started and once you take your first steps back into nature, the possibilities are really endless.

If you're looking for more guidance in your studies and for your classes, custom-designed teacher training workshops, education kits and interpretive products are available through Second Nature, Adventures in Discovery. (www.discoversecondnature.ca). I would be happy to help you on your next adventure.

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