Some species of native ladybugs in North America are disappearing. In just the last 20 years, these beneficial predators of farm and garden pests have become extremely rare. This rapid decline is of great concern.

In completing this series of units, both age groups will learn about:

- Insect life cycles and the food web
- Biological control of insect pests
- The importance of biodiversity and the process of sampling
- Building their own sweep net
- Searching for, capturing, cataloguing and storing insects
- Submitting data to the Lost Ladybug Project

Students from both age groups will contribute to real scientific inquiry, and begin to explore their own scientific research questions.

All of these adventures call on students to predict what will happen, test their theories, then share their results. They’ll be introduced to ladybug vocabulary, gain an understanding of the life cycles of ladybugs and their importance in the food web and collect bugs themselves to identify, observe and report about to the Lost Ladybug Project.

The lessons in this unit were developed by the Lost Ladybug Project based at Cornell University in the Department of Entomology.

About the project:
The Lost Ladybug Project was set in motion at a small number of schools in New York State in 2004. Now it is active in many states in the U.S. It is a citizen science project that asks anyone of any age to look for any ladybugs they can find, and then send in pictures of each one. One of the first major discoveries came in 2006 when Jilene (age 11) and Jonathan (age 10) Penhale found a rare nine-spotted ladybug near their Virginia home. This was the first nine spotted ladybug seen in the eastern U.S. in 14 years. Their finding confirmed that the species was not extinct and that with enough people working together we can find even these rare species. With recent funding from the National Science Foundation the Lost Ladybug Project has expanded and now anyone in North America can participate. Both common and rare ladybugs, whether native or introduced, are important to find. They all contribute to understanding where different species of ladybugs can be found and how rare they really are. Once we know where the rare ladybugs can be found, we can try to protect their habitat and save them!

General information about ladybugs and their life cycle are on the following pages. This information may be useful for the activities as well.

To find out more about the Lost Ladybug Project, visit www.lostladybug.org. To find numerous resources related to the inserts, outdoor exploration and the environment, check out the 4-H Resource Directory at www.cerp.cornell.edu/4h.
All About Ladybugs

What are ladybugs?

Ladybugs are insects in the Coccinellidae family of the beetle order, Coleoptera. They are characterized by their oval-shaped body and distinctive coloring.

Is there a difference between lady beetles and ladybugs?

Although these insects are commonly called “ladybugs,” they are members of the beetle order, Coleoptera. The Coleoptera are unique from other orders in that they undergo complete metamorphosis (that is, have larva and pupa stages in their life cycle), and their forewings have modified into a hardened cover (elytra) that protects the insect. “True” bugs belong to the order Hemiptera, and include boxelder bugs, plant bugs, and squash bugs.

Immature True Bug

Though taxonomically incorrect, lady beetles are still commonly referred to as ladybugs. Other frequently used common names are ladybirds or ladybird beetles.

How did ladybugs get their name?

The most common legend as to how ladybugs got their name is that during the middle ages in Europe, swarms of aphids were destroying crops. The farmers prayed to the Virgin Mary for help — and help came in the form of ladybugs that devoured the plant-destroying pests and saved the crops! The grateful farmers named these insects “Our Lady’s beetles,” a name which had endured to present day.

What do ladybugs eat?

Both adult and larval ladybugs are known primarily as predators of aphids but they also prey on many other soft-bodied insects and insect eggs. Many of these are agricultural pest such as scale insects, mealybugs, spider mites and eggs of the Colorado Potato Beetle and European Corn Borer. A few ladybugs feed on plant and pollen mildews and many ladybugs supplement their meat diet with pollen.
What eats ladybugs?

Ladybugs are not commonly eaten by birds or other vertebrates, who avoid them because they exude a distasteful fluid and commonly play dead to avoid being preyed upon. However, several insects, such as assassin bugs and stink bugs, as well as spiders and toads may commonly kill lady beetles.

How many different species are there in the US? In the world?

There have been over 500 species of ladybugs identified in the United States, and over 4500 in the entire world.

How long do they live?

After a female lays her eggs, they will hatch in between three and ten days, depending on ambient temperature. The larva will live and grow for about a month before it enters the pupal stage, which lasts about 15 days. After the pupal stage, the adult ladybug will live up to one year.

What do the different stages of the life cycle look like?

Life Cycle Stages

Eggs are tiny, spindle-shaped, and arranged in clusters.

Larvae are usually elongated, “alligator” shaped, slightly pointed at the rear, and their body is covered in tiny bristles.

Pupae are slightly round and dark colored. You can find them attached to a surface by their hind ends.

Adults are sphere-shaped, smooth, and have easily recognizable colors and markings.
What about ladybug anatomy?

Ladybug Anatomy

Ladybug in Flight
Photo by Alex Wild, Champaign, Illinois, 2008

Why are they so brightly colored?

Ladybugs bright colors serve as a warning—they indicate any potential predators of the distasteful repellents the beetle will release if attacked. Ladybug spots are part of the bright warning pattern discussed in the previous question.

What’s with them in my house during winter?

During the winter months, ladybugs seek out a warm place to hibernate. Many seek out cracks around buildings, including people’s homes. They mass together to stay warm throughout the winter. Don’t worry, they will not harm you or any part of your home, and they will be gone by spring.

How did non-native species get here?

Non-native ladybug species may have been introduced to the United States by scientists as an attempt to control crop-damaging aphids, or they could have hitched a ride with any vegetation that was brought over from Europe, Africa, or Asia.
Main Idea
Learn about Food Webs and what can happen when they are disrupted, learn the value of biodiversity.

Motivator
A single ladybug larva will eat about 400 medium-size aphids during its development to the pupal stage. An adult female will eat about 300 medium-size aphids before she lays eggs. She can eat about 75 aphids in a day and may consume more than 5,000 aphids in her lifetime! What would happen if all the ladybugs were gone?

Pre-Activity Questions
Before you start the activity, ask the students:
- What do you think ladybugs use their antennae for? (A: to touch, smell, and taste).
- What do ladybugs eat and what eats ladybugs?

Activity
- A copy of the Food Web Game Plan (from www.lostladybug.org)
- The right number of printed or drawn owls, toads, ladybugs, aphids, and plants.
- A single hole punch
- Yarn

How the Food Web Game Works:
1. **Please look at the Food Web Game Spreadsheet as you read along.** Let’s start with Round ONE for a small number of participants. This would be shown in the upper left part of the spreadsheet.
2. To follow the sequence described in the spreadsheet, know that, for the sake of the game, predation begins at the top of this food chain. Let’s say:
   - You have one owl that eats two toads (Predation rate = 2, cell #D3).
   - After predation there is still one owl and now only one toad (cell #E4).
   - Each toad would eat two ladybugs. But now there is only one toad so this toad eats two of the four ladybugs (cell #C5), leaving two ladybugs (cell #E5).
   - Each of the two ladybugs (one of each species) eats two aphids, leaving only one aphid (cell #E6).
   - Each aphid eats six plants. But now there is only one aphid left and therefore 9 - 6 = 3 plants are left.

Supplies
- A copy of the Food Web Game Plan (from www.lostladybug.org)
- The right number of printed or drawn owls, toads, ladybugs, aphids, and plants.
- A single hole punch
- Yarn

Learning Standards
(See Matrix)

Common SET Abilities
4-H projects address:
- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate
- Compare

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www.lostladybug.org
That's the First Part of Round One.

3. Now each animal has time to recruit more members or reproduce. You have one owl that does not reproduce or "recruit" (call in more owls) very fast, so reproductive rate = 0 (cell #G3), so Generation 2 still has only one owl in it (cell #H3).

4. There is one toad with a recruitment rate of 2 (by reproduction or calling in). So, \(1 + 2 = 3\) toads in Generation 2 (cell #H4).

5. There are two ladybugs (one of each species) with a recruitment rate of one each. So, \(2 + 2 = 4\) ladybugs (2 of each species) in Generation 2 (cell #H5).

6. There is one aphid with a recruitment rate of 4. So \(1 + 4 = 5\) aphids in Generation 2.

7. There are 3 plants with recruitment rates of 2. So, \(3 + 6 = 9\) Plants.

8. Voila! This is a STABLE Population!

9. Round Two is played the same way except that the ladybugs have all been eliminated by something other than the toads. Aphids take over for a while. Disaster for the plants.

10. Round Three allows for only ONE species (half the number) of ladybugs to participate. In real life, predation and reproductive rates do not stay exactly the same with changes in population numbers. So, here we have also slightly changed these rates. The predation rate for toads is less because now it is harder to find ladybugs. The predation rate for ladybugs is higher because there are more prey available to fewer ladybugs. The result, by the second generation, looks almost stable. But one difference is that there are fewer species of ladybugs, so the possibility for one factor (e.g. disease) to drastically reduce the population is greatly increased. This would lead to the same results as Round Two.

11. If any trophic level contains only a single species, it can be vulnerable to a sudden decline and a loss of stability. Different species are more likely to have varying vulnerabilities to disease or weather conditions, so they will not decline at the same rate due to a single mortality source. In other words: DIVERSITY = STABILITY.

How to Play the Food Web Game:

1. Determine the size range of your group based on the excel spreadsheet.
2. Calculate the right number of owls, toads, ladybugs, aphids and plants by using the spreadsheet and print or draw these on paper or cardstock. If the group is small, the aphids and plants can be manipulated by the students without anyone wearing them.
3. Students should put one hole punch on either side of the pictures and string yarn through these so that they can wear the pictures around their necks.
4. Designate individuals to be the plants and animals in the Initial population.
5. --- If you have fewer participants than the total number of plants and animals in the Initial population, represent some animals or plants with pictures or other objects (e.g. toy toads).
6. --- If you have more participants than the total number of plants and animals in the Initial population, allow some to be observers in the first round of predation. They can join in during the first round of reproduction.
7. --- Note that you should start with equal numbers of two species of ladybugs.
8. OBSERVATION: What do you observe about the shape of the web and the numbers in each level? Why do you think the web has this particular shape?
9. Starting with the highest trophic level (an owl in our example), let predation begin. In our example the owl starts by "eating" the number of toads specified in the predation rate column (for example, two for the small group size). Toads that are eaten should stand off to the side and surrender their roles to any observers that have not yet been part of the web.
   - The uneaten toads then prey on ladybugs and the game continues on through to the lowest predation level (e.g. aphids eating plants).
Science Checkup - Questions to ask to evaluate what was learned
(note that there are answers in the intro to this series if needed)

- What do ladybugs eat?
- What eats ladybugs?
- How many different species are there in the US? In the world?
- Can you think of some other "predators" and other "prey"?

Extensions
For a demonstration of the importance of density dependence for stable population regulation check this flash graph made by John Losey in his teaching at Cornell University: (http://instruct1.cit.cornell.edu/Courses/ipm444/movies/pred_prey_curves.html).

Vocabulary

- **Predator**: An animal that eats other animals in order to survive.
- **Prey**: An animal caught, killed and eaten by another animal as food.
- **Herbivore**: An animal that feeds only or mainly on grass and other plants.
- **Trophic Level**: A stage the a food chain that reflects the number of times energy has been transferred through feeding. For example, plants are on the first level and predators are on higher levels.
- **Ecological Stability**: When conditions are appropriate so that a habitat can support a number of species.

Background Resources

- www.lostladybug.org
Lost Ladybug Project:
Ladybug Sampling

Main Idea
Ladybugs can be found all over the world and can move between continents. But introducing new species can affect natives. We will learn about and sample the ladybugs in our habitats.

Motivator
There are more than 4,500 species of ladybugs in the world and more than 500 identified in the U.S. Only about 70 of these are the cute red, yellow and black ones we think of most.

Pre-Activity Questions
Before you start the activity, ask the students:
- Do you think you will find ALL of the ladybugs in your habitats in only ½ hour?
- About how many different kinds do you think you might find in one place?
- How many of these will be natives?
- How many of the total number of ladybugs your group finds will be natives?

Objectives
- To understand how sampling can show biodiversity
- To understand the impacts of introducing non-native species

Learning Standards
(See Matrix)

SET Abilities
4-H projects address:
Predict
Hypothesize
Evaluate
State a Problem
Research Problem
Test
Problem Solve
Design Solutions
Develop Solutions
Measure
Collect Data
Draw/Design
Build/Construct
Use tools
Observe
Communicate
Organize
Infer
Question
Plan Investigation
Summarize
Invent
Interpret
Categorize
Model/Graph
Troubleshoot
Redesign
Optimize
Collaborate
Compare

Activity 1: Bead Game “Sampling”

Supplies
- 3 big bowls
- About 30 each of several different colored beads
- Paper and pencil for data collection

Scientists go out and count the different kinds of insects. This is called sampling. This is done to understand species richness and how the role of each insect fits into the bigger picture. Many non-native lady beetle species have been introduced to the United States by scientists as an attempt to control crop-damaging aphids, or they could have hitched a ride with vegetation that was brought over from Europe, Africa, or Asia. They serve a unique role, perform a special “job”. We are going to take a sample to figure out how diverse our beetle (bead) population is.

1. Explain the game: We have different color beads in each bowl. We can pretend each color is a different kind of insect. We can take a scoop or sample from a bowl and find out if the bowl has enough different kinds of pretend-insects.
2. Each group’s bowl will have a very different ratio of colors, one with equal numbers of all colors (Bowl A), one with lots of one color and very few of the other three colors (Bowl B), one with only two colors (Bowl C).

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www.lostladybug.org

4-H Youth Development is the youth program of Cornell Cooperative Extension
3. Divide children about equally next to bowls of beads and have each child take one spoonful of beads and put it on their plate.
4. Have each child divide their beads by color and count each color.
5. Leader or small group reports their data to the blackboard or large paper. (Put bowls as columns and colors as rows.) Direct entire group to look at results as they are being put up. “What do you notice about these numbers? How many different kinds of insects are in bowl A? bowl B? bowl C?”
6. Discuss how the numbers of different kinds of pretend-insects differed between the bowls, adding that different kinds of insects have different jobs. A ladybug, for example, eats aphids, but a bee pollinates plants, so it’s important to have a mixture of insects of equal numbers.
7. Discuss how you could improve the populations of bowls B and bowl C so that they would have a mixture of insects?

Activity 2: Lost Ladybug Bingo

- Lost Ladybug Bingo cards (downloaded from the lostladybug.org Web site)
- Chips or markers

1. Learn the common varieties of ladybugs and prepare for the sweep net survey by playing a game or two of lost ladybug bingo.

Science Checkup - Questions to ask to evaluate what was learned

- Why is it important to have a variety of insects in a sample?
- What would happen in a habitat if one kind of insect wasn’t present?
- How does sampling help you to understand population health?

Extensions

Visit lostladybug.org and print out the Lost Ladybug Field Guide (under Lost Ladybug pdfs). This will help students identify eight types of ladybugs. There’s also a ladybug matching game at this site.

Vocabulary

- Common versus rare: Common items are widely found; rare are less likely to be found.
- Native versus introduced: Native species were original to a specific place, while introduced species were brought into a new habitat.
- Biodiversity: The range of organisms present in a particular ecological community or system.
- Conservation: The preservation, management, and care of natural and cultural resources.

Background Resources

- www.lostladybug.org

Find this activity and more at: http://nys4h.cce.cornell.edu
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Lost Ladybug Project:
Nothing but Net

Main Idea
Prepare a ladybug collection chart and make a good strong sweep net for collecting in the next unit.

Motivator
If ladybugs fall from a plant or fall into your net, they may play dead! Watch them closely!

Pre-Activity Questions
Before you start the activity, ask the students:
- What are the differences between a butterfly net and a sweep net?
- How many different kinds of ladybugs do you think you will find?

Objectives
- To create a sweep net to be used in collecting.
- To learn how to organize sample data in a chart.

Supplies
- Ladybug Field Guides (from www.lostladybug.org)
- Pillowcases
- Two wire coat hangers per pillowcase
- A piece of wood or dowel 2-3 feet long for handle
- Scissors
- Duct tape
- Pliers
- A piece of poster board
- Crayons or markers

Activity:
Making a homemade sweep net

1. Turn your two wire hangars into similar circles.
2. Then tape them together in several places, leaving the open end opened.
3. Now cut holes on either side of the seam where there are two layers of pillowcase fabric. Feed the wire through the pillowcase hem.
4. Straighten out the ends that are left so that they can be taped to the handle. Heavily tape the four wire pieces that are out of the pillowcase to the handle. Make sure it is sturdy because it’s going to bump into thick grass, alfalfa, clover and other plants!
5. Set up a poster board chart like this, with different ladybug species at the top.

<table>
<thead>
<tr>
<th>Species</th>
<th>Species</th>
<th>Species</th>
<th>Species</th>
<th>Species</th>
</tr>
</thead>
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<tr>
<td>Species</td>
<td>draw pic</td>
<td>Species</td>
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<td>Species</td>
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<td>here</td>
<td>here</td>
</tr>
</tbody>
</table>

Date, location # # # # #
Science Checkup - Questions to ask to evaluate what was learned
(note that there are answers in the intro to this series if needed)

- Recall species richness and species evenness. Do you think you will find the same number of different species or the same evenness of species in the two habitats you will visit?
- How many species will be natives? Will you find more natives or introduced species?

Extensions
Check out the Minnesota Dept. of Agriculture’s Web page, www.mda.state.mn.us/kids/actionkit.htm, for cool activities, including a sweep net safari you could do with your students.

Vocabulary

- **Sweep net:** A strong net without holes for collecting insects.
- **Species:** A basic biological classification containing individuals that resemble one another and may interbreed.

Background Resources

- www.lostladybug.org

Find this activity and more at: [http://nys4h.cce.cornell.edu](http://nys4h.cce.cornell.edu)

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Lost Ladybug Project: Collecting

Main Idea
Go outside and collect ladybugs to see what kinds you find and how many. All ladybugs are important to the Lost Ladybug Project and help scientists figure out where different species are – both rare and common varieties. The children become citizen scientists themselves!

Motivator
Some ladybugs are found alone while others are found in huge groups of thousands. Some are swept out of the air and wash ashore beside large lakes!

Pre-Activity Questions
Before you start the activity, ask the students:
- What makes a good habitat for ladybugs? (answers below)
- What kind of weather or what time of day do you think would be best for collecting ladybugs?
- How many different species do you think you will find?

Activity
- Your own sweep nets
- Your poster board chart
- Large plain cloth or sheet
- High-sided wash basin or box
- Jars, vials or ziplock bags
- Cooler w/ cold pack or ice

First, locate a collecting site(s). In general, the best sites will be areas of more than 100 square meters (120 yards) that contain herbaceous (not woody or tough) plants that are at least 20 cm (8 in) high. Plants that are too tough cannot easily be swept through and plants that are too short do not host many of the prey insects that ladybugs need, so they don’t usually support very large populations of ladybugs.

Collecting sites could include:
- Any area that has not been mowed recently, preferably with some weeds;
- Plants at the edge of a wooded area, mowed area or field (e.g. a hedgerow);
- Orchards, if not too recently mowed; trees themselves are excellent habitat for ladybugs, and while they clearly cannot be swept, lower branches can be shaken or beaten vigorously onto sheets. Note that many orchards are treated frequently with insecticides, so be sure to check on the treatment schedule.

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The Lost Ladybug Project
www.lostladybug.org
Lost Ladybug Project: Collecting

Science Checkup - Questions to ask to evaluate what was learned
(note that there are answers in the intro to this series if needed)

- How many ladybugs did you find?
- How many different species did you find?
- How many different ladybug species did you recognize?
- Did you find them all in the same kind of habitat?

Extensions
Find out more about the ladybugs you have found so far at www.lostladybug.org

Vocabulary

- **Habitat**: The natural conditions and environment in which a plant or animal lives, e.g. forest, desert, or wetlands
- **Microclimate**: the climate of a confined space or small geographic area
- **Sampling**: Taking a small part, number, or quantity of something as a sample and using it to make observations about the whole group or area.
- **Collecting “Effort”**: A way of measuring the number of people and time put into collecting so that densities (of ladybugs) can be compared between different trips.

Background Resources
- www.lostladybug.org

Find this activity and more at: http://nys4h.cce.cornell.edu
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Lost Ladybug Project: Collecting-Part 2

Main Idea
Go outside and collect ladybugs again and compare results from two different habitats. For the Lost Ladybug, having repeat collections from nearby locations and by the same “spotters” is especially valuable. The children become SUPER citizen scientists themselves!

Motivator
We still don’t know why certain ladybugs live on certain plants and in certain areas. Let’s try to learn more about this.

Pre-Activity Questions
Before you start the activity, ask the students:
- How and why do you think your second ladybug collection may be different from your first?
- How many different species do you think you will find?

Activity
- Your own sweep nets
- Your poster board chart
- Large plain cloth or sheet
- High-sided wash basin or box
- Jars, vials, or ziplock bags
- Cooler w/ cold pack or ice
- Camera (preferably digital with a close-up function.
- Printed page of “the perfect grey” (downloaded from www.lostladybug.org)

Locate a second collecting site, somehow different in habitat than the first. The difference could be related to what surrounds the fields (surrounding vegetation versus neighborhood housing) or differences in the fields themselves (types of plants, etc.). Note recommendations from “Collecting.”

1. If you will be comparing ladybugs in two different habitats (two consecutive units), this time you should plan to go out fast and come back with time to take photographs.
2. Gather your sweep nets, cloths, wash basins, jars and cooler.
3. Go out and sweep, search and beat for a defined period of time.
4. Empty sweep nets onto open sheets or into wash basins and boxes.
5. Collect all ladybugs into jars, vials or bags.
6. Put the second collection of ladybugs into a chilled cooler. Cooling will slow them down and make them easier to photograph.

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www.lostladybug.org

Objectives
- Learn differences between habitats
- Learn to store and photograph insects

Learning Standards
(See Matrix)

Common SET Abilities 4-H projects address:
- Predict
- Hypothesize
- Evaluate
- State a Problem
- Research Problem
- Test
- Problem Solve
- Design Solutions
- Develop Solutions
- Measure
- Collect Data
- Draw/Design
- Build/Construct
- Use tools
- Observe
- Communicate
- Organize
- Infer
- Question
- Plan Investigation
- Summarize
- Invent
- Interpret
- Categorize
- Model/Graph
- Troubleshoot
- Redesign
- Optimize
- Collaborate
- Compare

4-H Youth Development is the youth program of Cornell Cooperative Extension
Lost Ladybug Project: Collecting-Part 2

Science Checkup - Questions to ask to evaluate what was learned
(note that there are answers in the intro to this series if needed)

- On which day did you find more ladybugs?
- On which day did you find more species of ladybugs?
- If you found differences, do you think they may be due to habitat, date or weather?
- How many different ladybug species did you NOT recognize?

Extensions

- Think of all the ways your two collecting expeditions differed. Do you have any hypotheses about where or when you can expect to find more ladybugs?
- Find out more about the ladybugs you have found so far at www.lostladybug.org.

Vocabulary

Habitat: The natural conditions, environment where a plant or animal lives, e.g. forest, desert, wetlands
Microclimate: The climate of a confined space or small geographic area.
Sampling: Taking a small part or quantity of something as a sample and using it to make observations about the whole group or area.
Collecting "Effort": A way to calculate the effort spent collecting insects. For example, one person collecting for four hours equals a collecting effort of 4 (1x4). Four people collecting for one hour also equals a collecting effort of 4 (4x1). It's important to know if the 10 ladybugs were found by one person in one hour (an effort of 1, which means the ladybugs were relatively easy to find) or by five people searching for two hours (an effort of 10, or relatively difficult to find).
Species Richness: The number of different species in a given area.
Species Evenness: A way to quantify how equal the community is numerically. So if there are 10 two-spotted ladybugs, and 1,000 convergent ladybugs, the community is not very even. But if there are 10 two-spotted ladybugs and 12 convergent ladybugs, the community is quite even.

Background Resources

- www.lostladybug.org

Find this activity and more at: http://nys4h.cce.cornell.edu
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Lost Ladybug Project: Submitting your Data

Main Idea
Complete the process of giving your ladybug images to the Lost Ladybug Project and begin to explore how your data relates to all the other data collected for the Lost Ladybug Project.

Motivator
Lost Ladybug project received more than 1,000 ladybug photo submissions in 2008. We would love to receive 10 times that many in 2009 and 100 times that many in 2010! Your data is important to us!

Pre-Activity Questions
Before you start the activity, ask the students:
- How and why do you think your two ladybug collections were or were not different?
- Do you think your collections were similar or different from collections in other parts of North America?

Objectives
- Learn how to submit data to the project
- See the bigger picture of ladybug diversity across the U.S.

Activity
Note: This activity involves the computer and is best suited for only a few members to submit data at a time. The rest of the group could move on to #3.

- A computer with online access
- The camera with the ladybug photos in it
- Your data from the two collection times

1. Download your ladybug photos from your camera and submit them online through www.lostladybug.org by following instructions. You will be asked for the names and ages and number of "spotters." You will be asked for date, time, habitat data as well as the length of time spent searching, etc.
2. Congratulations citizen scientists!
3. If you have time, you can access the currently submitted data to the Lost Ladybug Project through www.lostladybug.org. You can ask and even map questions like:
   - Where have all the _____ species been found so far?
   - Where have all the native ladybugs been found so far?
   - Where have all the exotic ladybugs been found so far?
   - In what month of 2008 were the most _____ species found?
   - In what habitats were _____ species found in 2008?

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The Lost Ladybug Project
www.lostladybug.org
Science Checkup - Questions to ask to evaluate what was learned

- How did your collections compare with the ladybugs already submitted to the Lost Ladybug Project?
- Did you find about the same proportion of native and introduced species?
- Did you find any of the newly rare species? Can you tell from the data in the Lost Ladybug Project where you might expect to find them?
- Be sure to keep in mind that all ladybugs provide good information to scientists. Without pictures of all the ladybugs you find they will not be able to tell how common the common species are or, in turn, how rare the rare ones are.
- Which of your collections had greater species richness?
- Which of your collections had greater species evenness?

Extensions
Test your own ladybug hypotheses using the mapping and graphing features found at www.lostladybug.org.

Vocabulary
Native species: Native species are plants or animals that were original to a specific place
Introduced species: Introduced species are brought into a new habitat from another location. They are not original to the area.

Background Resources
- www.lostladybug.org

Find this activity and more at: http://nys4h.cce.cornell.edu
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