Species Profile **

Spring Peepers and Winter Run-off

by Michelle Kelly

February 2011

Spring Peeper:

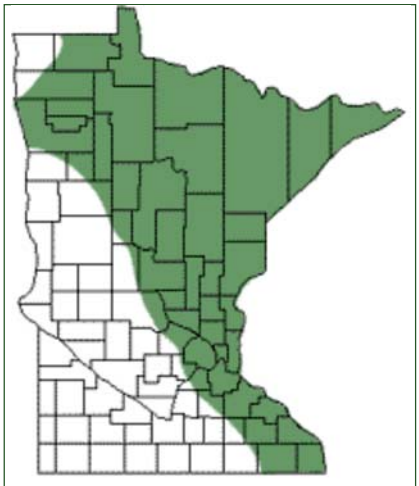
Pseudacris crucifer: *Pseudacris* - Greek: *pseudes* means false, *akris* means locust (the sounds of this frog family are similar to a locust); *cucifer*- Latin, means cross-bearer.

Spring Peeper

It's only January, and already I feel like I've shoveled a winter's worth of snow from my driveway! Winter came early to Minnesota this year – arriving in grand style with record snowfalls. Like me, you too may have almost forgotten what days without snow shovels, fuzzy mittens, boots rimmed in road salt and fishing without drilling a hole through the ice are like. We love winter in Minnesota, but there may be one or two of us who are thinking (just a little wistfully) about spring - when the Spring Peeper chorus will herald winter's end and all this snow melts away to wetlands, lakes, streams, rivers and distant memory... Could anything else be lurking in winter's wake? Spring Peepers might be able to give us a clue.

Introduction

Our featured species this issue is the northern **Spring Peeper** (***Pseudacris crucifer***). One of fourteen frog and toad species in Minnesota, it can be found in the northern and eastern regions of the state, and throughout the Eastern USA and Canada.



Range of the spring peeper in Minnesota

Identification

Spring Peepers are small chorus frogs, well-camouflaged and nocturnal. You are much more likely to hear than see them.

If you are lucky enough to see one it will be 3/4 to 1. 5 inches long, tan or brown in color, with a distinct darker X marking on its back. Males usually have dark throats, and are darker and slightly smaller than the females.

Vocalization

Each species of frog has a distinct sound, or call. The males do most of the vocalizing - to help them locate potential mates in the spring.

Spring Peepers create a high-pitched short peeping sound. The sound is similar to the trill of a young chicken, only louder and rising slightly in tone. They can be heard from as far as one mile to two and a half miles depending on the number of peepers in the chorus. A vocal sac located

by the throat inflates and deflates like a balloon to create the call. They typically vocalize during dusk and throughout the evening during the spring breeding season.

The songs of many male peepers often sound like jingling sleigh bells - calling from the bases of shrubs and grasses along the edges of the ponds, pools and marshes in which they breed.

When the density of frogs is high, the call becomes aggressive – a rising trill resembling the breeding call of the Southern Chorus frog. Sometimes crowded male Spring Peepers may be heard “complaining” in the fall.

Habitat

Spring Peepers are **amphibious**, living part of their lives in water and part on land. Marshes, ponds, or swamp areas are required to support the eggs and tadpoles. For successful springtime breeding, fishless temporary wetlands (also called vernal pools or ephemeral wetlands) associated with forest habitat (and sometimes grassy lowlands) are ideal.

Except during the spring breeding season, the adult peepers inhabit brushy undergrowth in forests and low grasslands throughout the rest of the year. With their large toe pads, they are good climbers, but you'll typically find them on the forest floor near permanent or temporary pools in wetlands and ponds and along marshy edges of slow streams and rivers.

Minnesota’s climate requires Spring Peepers to endure subfreezing temperatures throughout the winter when shallow wetlands and pools have less water and are covered in ice and snow making dissolved oxygen less available. Because they **hibernate** under logs or behind loose bark on trees and not in the water, they can better tolerate these challenging and chilly conditions. Spring Peepers are **cold-blooded** and as colder weather causes their body temperature to fall, some of their body fluids can freeze. To keep from freezing completely their bodies make their own type of antifreeze. Warmer temperatures in early spring signal the adults to return to the water to breed and lay their eggs.

Reproduction

Minnesota’s Spring Peepers breed between the months of March and June when the snow is melting and warm spring rains begin. Peepers generally prefer to breed closer to dusk and throughout the evening and morning hours.

Life, for peepers begins in the water. Females typically lay from 800 to 1000 eggs at a time attached to underwater plants or bottom debris. The eggs are single or in clusters of two or three, each with its own jelly-like coat. In about two or three days of rapid cell division the eggs hatch into tadpoles with a head, feathery gills for breathing, a body and tail for swimming. The tail is a storage reservoir for fat. If bitten off by a predator, a tadpole’s tail can regenerate.

A chemical called **thyroxine** causes a dramatic transformation in the bodies of the tadpoles over a period of about 8 weeks. Lungs grow to replace gills; teeth and a tongue form, and intestines shorten and become more complex for accommodating a diet change from algae to insects. The tail is absorbed as legs grow enabling them to hop from the water to land. On land they continue to mature becoming adult frogs within one year and can continue to go on to live for an estimated 3 years.

Frog Metamorphosis for Inquiring Minds

- Before providing any factual information about frogs in your aquatic ecology unit, have your students make daily observations of tadpole metamorphosis, recording their information and drawings and creating a metamorphosis timeline in a “naturalist’s journal” or notebook.
- Conduct a survey to find out student’s existing knowledge of frogs whether factual or anecdotal, and write the list on a large sheet of paper to review and compare to what students learn by the end of your unit.

Predators

Spring Peepers are active at night when fewer predators are active and darkness provides cover.

Even so, many predators including birds, fish, mammals, reptiles, other amphibians, leeches, water spiders, insect larvae, water beetles and dragonflies will gobble Spring Peeper eggs and tadpoles. Most eggs will not survive to adulthood. Those that do are not off the hook.

Some animals that eat adult frogs include fox, snakes, rats, badgers, weasels, owls and other raptors, herons, gulls, turtles, otters, and fish such as pike, largemouth bass and perch/walleye.

Natural Connections

Spring peepers with other amphibians make up an integral part of the **food web**. Many aquatic species eath frog eggs and tadpoles. The surviving tadpoles eat large amounts of algae and plankton, storing excess nutrients that could otherwise put a wetland out of balance. Later, they emerge from the wetland, moving nutrients obtained in the aquatic environment onto land.

The adult frogs eat many insects and, in turn, are also eaten by other predators, as noted above.

Winter Run-off, Road Salt, and Peepers

As I look outside the window, it's snowing again. Soon the salt trucks will be out keeping the roads safe for drivers. In a few months, winter will fade into spring, teh snow will melt. We may not yet know whether to be expecting significant floods in the spring, but it is certain that the melting snow will flush much of the winter road salt through wetlands about the same time Spring Peepers will be breeding and laying their eggs.

Salt (granular sodium chloride) was first used in the United States to deice roads in New Hampshire on an experimental basis in 1938. By the winter of 1941-1942 a total of 5,000 tons of salt was spread on highways nationwide. Currently, more than 22 million tons of road salt is used in this country every year. Here in the Twin Cities trucks spread an astounding 260 pounds of road salt per person every winter.

A 2009 University of Minnesota **study** showed when the snow and ice melts, the road salt is dissolved and runs into wetlands, ponds, lakes and streams.

Increases in sodium and chloride have been shown to decrease biodiversity in wetland areas and increase mobilization of nearby metals in the soil along major highways. And in Minnesota, where approximately 500,000 tons of salt is used to melt ice off roadways each year, the salinity of our wetlands, lakes, rivers and streams seems to be on the rise.

Spring peepers are freshwater species and cannot live in the sea or any salt water. Moist, permeable skin allows absorption of water and needed solutes. Frogs absorb oxygen through their skin as well as through their lungs. A permeable skin- and a dual life existence in both water and on land make Spring Peepers and other amphibians highly sensitive and vulnerable to pollution from run-off.

Because of this sensitivity, Spring Peepers and other amphibians are good **indicators of the health of their surrounding environment**. Currently we are experiencing a loss of toad and frog populations in various areas of the world and it could be a red flag that their ecosystems may be imperiled.

More information is needed to determine just how road salt and other run-off pollutants may impact Spring Peepers and other aquatic species. They may be sending us an early warning signal of pollution or ecosystem degradation - in addition to the springtime serenade that helps them sustain their numbers.

Fun Facts

- Frogs absorb water through their skin so they don't need to drink.
- The eyes and nose of a frog are on top of its head so it can breathe and see when most of its body is under the water.
- Frogs need both water and land to live.
- A frog can change the color of its skin depending on its surroundings.

- Frogs usually eat meat (bugs and worms) and swallow their food whole.
- Frog bones form a new ring every year when the frog is hibernating- just like trees and the bones and scales of fish. Scientists can count these rings to discover the age of the frog.
- People who study frogs and toads are called herpetologists. Herpetology is the study of amphibians and reptiles.
- Because frogs come out in the rain, people used to think that they fell to earth in the rain! And in nineteenth century England, people tried catching them to prove it.
- Frogs have been associated with witchcraft and magic, and used to cast spells as well as cure ills. Evil witches regularly turned their victims into frogs.
- An ornamented button loop used to fasten the front of a garment is called a frog.

References:

Hear the frogs and toads of Minnesota!

1. **Listen** to Minnesota's spring chorus.
2. **Take** the Minnesota frog and toad calling quiz (select "Minnesota" to start).
3. **Join** the DNR's Frog and Toad Calling Survey

Books

1. Oldfield, B. and J.J. Moriarty. 1994. Amphibians and Reptiles Native to Minnesota. University of Minnesota Press, Minneapolis. 237 pp.
2. Conant, R. and J.T. Collins. 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Company, Boston. 450 pp.
3. Tyning, T.F. 1990. A Guide to Amphibians and Reptiles. Little, Brown and Company, New York. 400 pp.
4. Mattison, C. 1987. Care of Reptiles and Amphibians in Captivity. 2d ed. Blanford, London. 317 pp.
5. Karns, D.R. 1986. Field Herpetology: Methods for the Study of Amphibians and Reptiles in Minnesota. Bell Museum of Natural History, Occasional Paper No. 18: 1?88.
6. Vogt, R.C. 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee. 205 pp. OUT OF PRINT
7. Wright, A.H. and A.A. Wright. 1949. Handbook of Frogs of the United States and Canada. Cornell University Press, Ithaca. 640 pp.

CD's

1. Voices of the Night: the Calls of the Frogs and Toads of Eastern North America. Produced by the Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, NY.
2. Calls of Minnesota's Frogs and Toads: Reference and Training Tape and CD

The Calls of Minnesota's Frogs and Toads: Reference and Training CD *is a high quality CD produced by Minnesota Frog Watch. The recordings are clear and will help you learn the calls of the state's frogs and toads. Cost is $12.00 (this includes sales tax, shipping and handling). Send a check to A Thousand Friends of Frogs, Hamline University Center for Global Environmental Education, 1536 Hewitt Avenue, St. Paul, MN 55104.*

Websites

1. MN DNR Frogs and Toads **webpage**
2. MN DNR Young Naturalists: **Spring-to-Life PONDS**
3. **Amphibian Research and Monitoring Initiative**
4. **Deformed Frogs in Minnesota** - Minnesota Pollution Control Agency
5. **Minnesota Herpetological Society**
6. **North American Amphibian Monitoring Program**
7. **Society for the Study of Amphibians and Reptiles**
8. **Minnesota Frog Watch/1000 Friends of Frogs**

9. Hamline University CGEE "**A Thousand Friends of Frogs**" Connecting children, parents, educators, and scientists to study and celebrate frogs and their habitats
10. **More - Frogs on the Net**

Poster

Toads and frogs of Minnesota and their habitats. 1997. Poster produced by the Minnesota Department of Natural Resources and available at 1-888-MINNDNR (1-888-646-6367).

Video

J. J. Moriarty. 1999. The Amphibians of Minnesota. Minnesota Department of Natural Resources. Includes Frog & Toad Survey Protocol

PowerPoint Presentations

From the National Science Teachers Association (NSTA) Conference 2000:

1. **Frog Malformities—How can my students help?**
2. **Frogs as Bio-Indicators**

Curriculum Guide – NSTA Press

Hop Into Action: The Amphibian Curriculum Guide for Grades K-4 by David Alexander. NSTA Press Book. 2010, 132pp. Stock No. PB287X. ISBN 978-1-936137-07-7.

Teachers, homeschoolers, camp leaders, and naturalists will find the 20 standards-based lessons in this volume the perfect introduction to environmental science for young learners. *Hop Into Action* helps teach children about the joy of amphibians through investigations that involve scientific inquiry and knowledge building. The hands-on learning lessons are designed to take advantage of and exercise children's natural curiosity about the environment using observation, photographs, games, and direct instruction and can be used individually or as part of a yearlong curriculum, and are easily integrated into existing science curricula or other disciplines.

Lessons also provide students with an understanding of career pathways as they act as biologists, herpetologists, ecologists, reporters, and park naturalists to investigate frog ponds.

Included are reference materials such as field guides, websites, and storybooks that complement lessons and allow for study of species found in your own region.