
Life in a Vernal Pool
Field Guide and Folktales created by the 2008 7th Graders of Four Rivers Charter Public School

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Front cover was designed by Morghan [redacted] and Luz [redacted] and features original artwork by the class of 2013.

Forward

Each year the students at Four Rivers Charter Public School spend the late winter and early spring creating a field guide to some part of the natural world around them. This year our study focused on vernal pools. These ephemeral bodies of water are often overlooked by people or are incorrectly identified as ponds or puddles. What many do not understand is that vernal pools play an important role in the ecosystem of a forest. For some animals they are a great source of water and nice place to visit for finding food. For others they are an essential breeding ground where eggs can be laid without the threat of fish eating them. There are even some species of animals that only live in vernal pools. There is a whole world waiting to be discovered in each one!

Part of our research of vernal pools included certifying one in the Highland Park area of Greenfield, Massachusetts. Starting in the winter months, when there was still a healthy amount of snow on the ground, the students began researching animals connected to vernal pools and began making regular trips to our nearby pool. We measured it dimensions. We identified sources of waterflow into the pool. We looked for signs of life – especially the kind that can only be found in a vernal pool. In short, we conducted extensive research in field and in the library and classroom. The students worked to get to know their animals and the vernal pool ecosystem.

Studying nature doesn't really start with *knowing*. It begins with *wondering,* and for many of us that sense of wondering begins at an early age with stories. Included in this book are original folktales written by our seventh graders about the very animals they studied so thoroughly. We created these stories to activate the imagination and instill that sense of wonder in the world that leads to investigation. The challenge in writing these tales was to combine facts about the animal with imaginative thinking about the origins of one of its features.

We would like to thank the seventh grade students (Class of 2013) for all of their hard work and perseverance throughout this project. We would also like to thank the students of King Middle School in Portland, Maine for the inspiration of writing an authentic field guide. Additional thanks goes to the late author and naturalist, Thornton Burgess, for providing such classic and much-loved storiess and examples of how fact and fiction can be playfully combined in the folktale format.

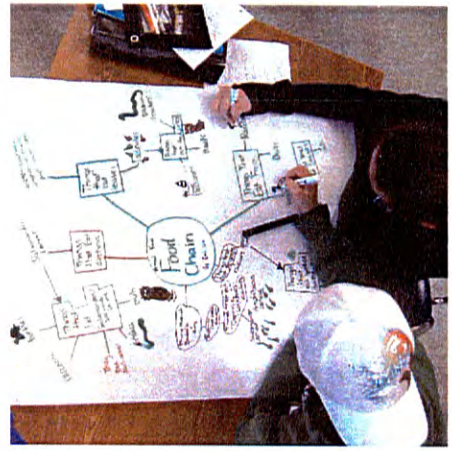
Sincerely,
Matt Leaf
Mandy Locke

Who We Are

Any animal that visits or lives in a vernal pool, we learned about. Whether it was painting watercolor versions of our animals or learning about its habitat, we worked hard (and long) to put together this book. We learned about their physical appearance, where they live, what they eat (and who eats them), and just about any other odd fact there is to know about our animals.

At Four Rivers Charter Public School, we're all about really getting involved in what we're learning about. We're not listening to lectures about the life cycle of a frog; we're out there seeing it. For this project, our goal was to learn everything we could about our assigned vernal pool animal. It could be anything from a Mallard duck or a Raccoon to a Fairy Shrimp and everything in between.

I think we'd all agree this expedition was a long and difficult one. The editing process can become pretty tiring when you're determined to get it just right. But I think we would also all agree that seeing this book finished and all our hard work coming together is very worth it.



We took a trip to the Great Falls Discovery Center to learn about the water cycle and vernal pools. We actually went to a real uncertified vernal pool and did fieldwork not only to learn lots of cool information about our animals, but also to certify as an official vernal pool.

What is a Vernal Pool?

The very first thing you need to know it that a vernal pool is a pool that comes and goes every year full of water that usually dries up in the summer. As the snow melts it collects in gully sometimes filling a vernal pool. They are sometimes called big puddles but this is wrong because puddles don't have animals.

Vernal pools come in every size shape and form. The one we went to in the pictures is 80 meters long, 15.8 meters wide, and 18 meters deep on average. Some are just the size of a rain puddle and a little deeper. You can recognize a vernal pool because that it has no rivers, stream, or lakes feeding it with water. The only thing that feeds a vernal pool is the rain and melting snow.

A vernal pool is the home to many different animals including the fairy shrimp which can only be found there. Frogs and salamanders usually lay their eggs here because it is a safe place and no fish will eat them while they are tadpoles. Animals, like the fish, that need water all year long cannot live in these pools.

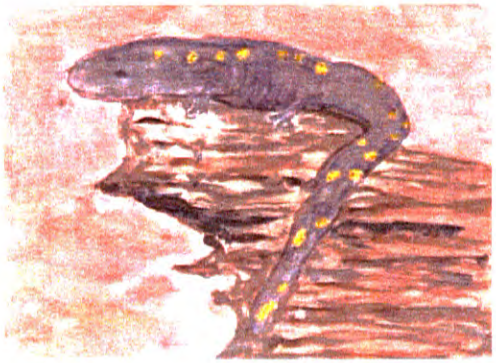
The two different kinds of animal that use vernal pools can be classified as either **obligate** or **facilitative species**. **Obligate species** are animals that need the vernal pool without it they would die. Fairy shrimp and wood frogs are **obligate species** because they need the vernal pool or they would die. **Facilitative species** are not dependent on vernal pools, but they do enjoy them.

Mammals

All mammals are **endothermic vertebrates**. **Endothermic** means that they have a four chambered hearts and fur or hair covering their skin. The young of most mammals are born alive and their mother produces milk to feed them. Mammals fertilize their eggs inside the female's body. The baby develops inside the mother until it is ready to live in the outside world. Since the animals need energy from the food they eat, mammals have different shaped teeth adapted to work for the food they eat.

Mammals have been around for a long time. The first mammals were small mouse-sized creatures that lived in habitats dominated by the dinosaurs. The fur and hair that grows from living cells below the surface of the skin helps the animal keep a stable body temperature in cold weather. Also, mammals have a layer of fat beneath their skin to help keep them warm. They have a nervous system and senses so they can sense the cold. If they didn't have them they would die.

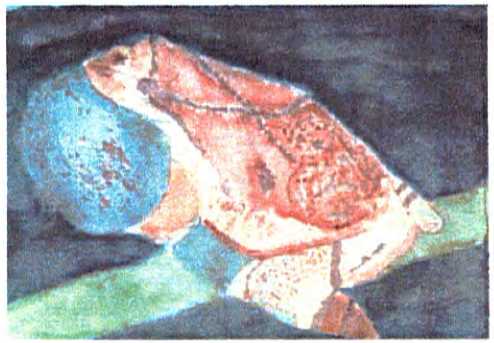
Amphibians



Amphibians are found mostly in rainforests and forests. However, they are also found in deserts, swamps, and of course, vernal pools!

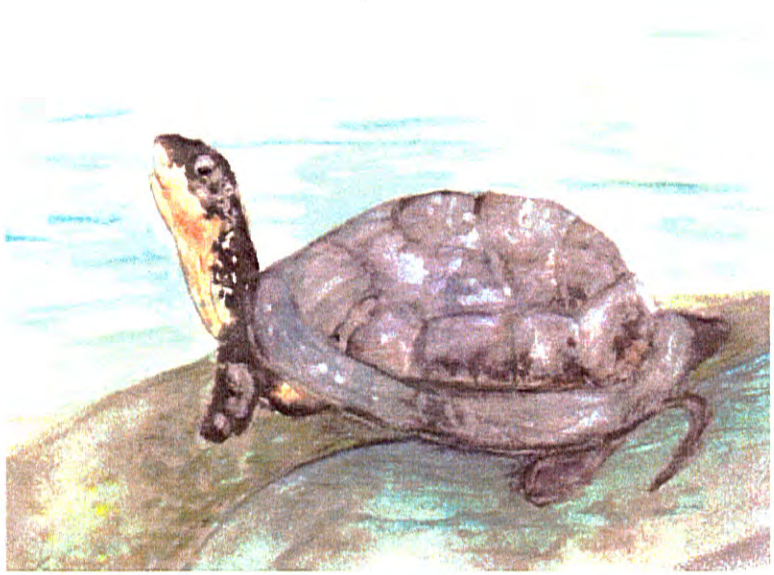
An amphibian:
- is a cold blooded animal
- is a vertebrate
- spends part of its life in water and the other part on land

The typical life cycle:
- They are first eggs are laid in the water.
- Then they hatch and are larvae for a couple of months.
- Next they metamorphose by growing legs and replacing gills with lungs.
- Finally after a couple years on land, and then are ready to return to the water and breed.



- There are about 6316 species of Amphibians.
- Inside the class Amphibia, there are three orders.
- The order Caudata contains Salamanders and Newts. There are about 566 species (9% of their class).
- The order Anura contains frogs and toads. There are about 5575 species (88% of their class).
- The order Gymnophiona contains caecilians which are legless amphibians. There are about 175 species (3% of their class).

Reptiles



Reptiles are animals with bodies that don't produce body heat on their own Instead they absorb heat from their surrounding environmnet. This adapatation is known as **cold-blooded**. Some common members of this taxonomic class are snakes, lizards, and turtles. All reptiles are vertebrates with lungs and scaly skin. Their eggs have a shell and multiple membranes that protect the developing embroyo, and help prevent it from completely drying out.

Birds

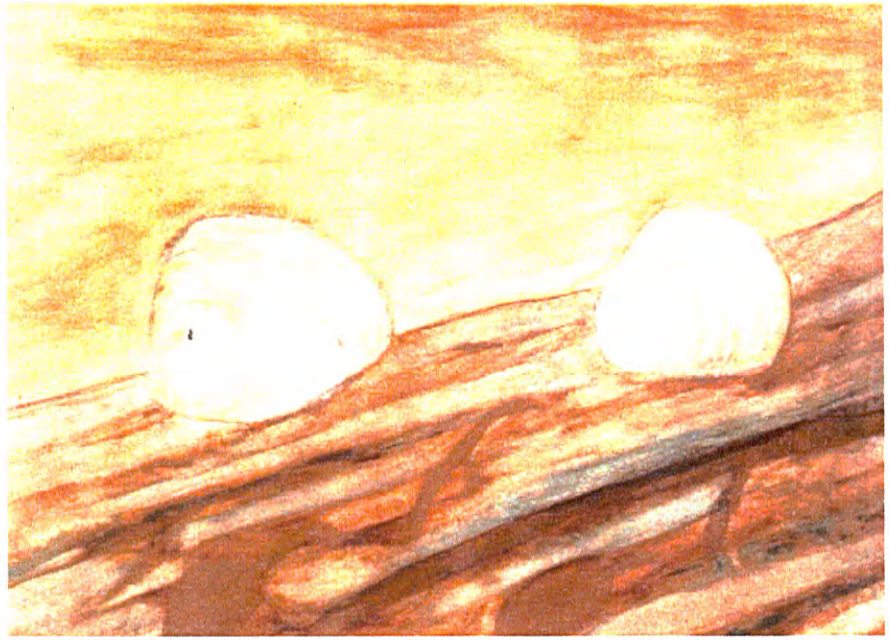
What makes a bird a bird?" you may ask. Well for one, all birds are in the phylum "chordate". This means that they have a nerve bundle that runs along the center of their body. The chorsdate is used to send messages throughout the birds system.

All birds have feathers, as well. Even though some birds don't use them to fly, to be a bird, you have to have feathers. Bird's feathers are hollow and have all sorts of uses. Some can be used for attracting a mate. Male Peacocks use this method what they want to find a wife. Some use them to stay warm, such as penguins. So feathers have lots of uses besides just flying.

Another characteristic that all birds share is that they have hollow bones. Even though all birds don't fly, all of them have hollow bones. This way, flying birds are light enough to get air born. Birds' light bones can also make them faster.

All birds lay hard-shelled eggs. Every single bird that you have and ever will see, was and will be born from an egg. Which came first is a bigger question, however.

Mollusks



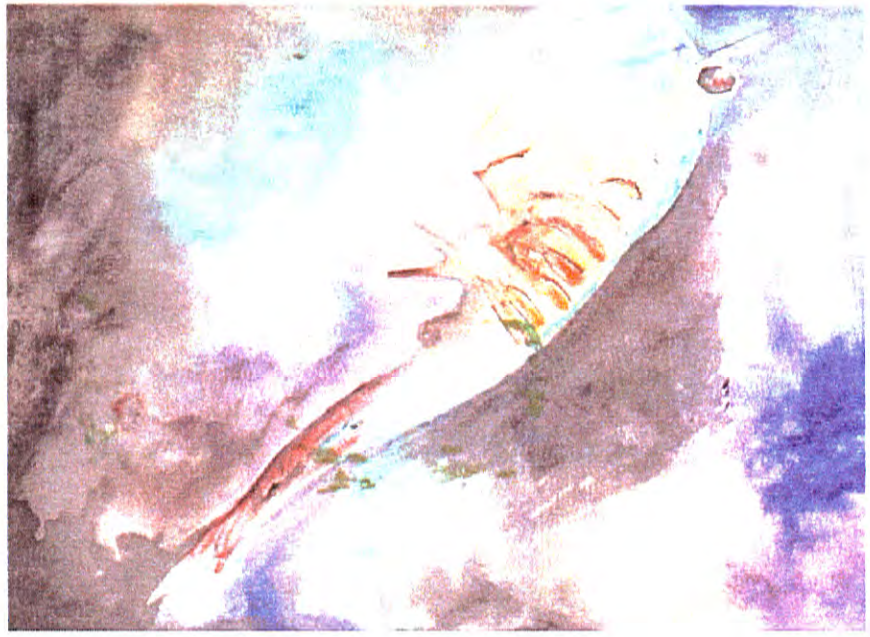
A mollusk is classified as any animal under the phylum mollusca. Molluscus in Latin means thin-shelled and mollis means soft. A mollusk is a marine **invertebrate** that usually has a soft body, a mantle, and a thin shell. A mantle is a fold of the outer skin that lines the shell of a mollusk. All mollusks have a digestive system similar to humans in the sense that it starts from the mouth and ends in the anus. Not all mollusks are live in aquatic environments, the class Gastropod (within Mollusca) has animals that live on land like the slug. There are 112,000 species of mollusks. Mollusks can be anything from a squid to an octopus to a snail. Malacology is the study of mollusks.

Insects

We've all seen an insect; they are extremely common. An insect must be a member of the class insecta. Insecta is Greek for cut up into. This is because all insects have 3 body parts: the head, the thorax, and the abdomen. Humans also have a head, and a thorax and an abdomen. We all know what the head is, and the horax is around the area under your collarbone. Your abdomen is your stomach and chest area. Connecting areas of the 3 parts of an insect are very skinny, dividing the insect into very directly visible parts. Insects all have 6 legs, too. The legs are slender most of the time, and they are always jointed, meaning that they bend in more than one place. Antennae, or long appendages commonly on the insect's head, are always there, and there are always two of them. Another thing that insects have in common is that they have a very simple internal body structure.

Inside the insect, you will find a heart and a simple digestive system. You may find a couple blood vessels, but most of the body is a cavity that the body fluids just kind o f float around. Oxygen is not always inhaled. Sometimes it is taken in through holes in the exoskeleton. Insects also are part of the phylum Invertebrate. This means that they have an exoskeleton, or no bones. Instead they have a stiff outer structure that they sometimes shed. This process is called molting. However, not all of the insects that you will find molt. Some of them just go through **complete metamorphosis**.

Crustaceans



Crustaceans are very interesting creatures. They live in the sub-phylum crustacean, home to over 30,000 named species of crustaceans. The most familiar species are the crab, lobster, and crayfish. This leads us to their description.

As you may know, most crustaceans have claws or pincers to help eat and crawl around. Most also have many legs on each side of their body for movement as well. Crustaceans have to major body structures, the head and the abdomen. The abdomen holds all of the organs and body fluids that a thorax would (some crustaceans have a thorax, but not many). Crustaceans have two pairs of antennae on their heads, which are used for sensing and feeling things. An amazing thing about the head of the crustacean is that they have three pairs of mouthparts! That's like having three mouths as a human. You may not be able to see them depending on its size, but almost all crustaceans breathe through gills on the sides of their body and head, though they are not a kind of fish or amphibian.

Air Breathing Snail

(Stagnicola pilsbryi)

Why Snails' Eyes Pop Out

At first, all snails had eyes that sat inside of their head. Their eyes were as black as the night sky with no moon. The bright colors of their shells ranged from a glistening yellow all the way to a cobalt blue. Because of their beauty snails were respected by every animal that ever lived. Snails were so admired, they got more attention than Mother Nature herself. Angry, she sent some of her best workers to cause trouble for the snails. It was not long until the snails had their color taken away, and were left with colors of dirt. Their eyes, however, were the most beautiful eyes anyone had every seen. They were so black it seemed like nothing was there. They were hollow inside, they had no story to them.

Long ago there was a snail named Scott. Mother nature loved him for he looked after everyone. He made sure they and their eggs stayed safe and he made sure that no danger ever came to the vernal pool. There was just one problem. He was a coward. He was absolutely terrified of everything. Most of all he was petrified of the dark. Even the thought of the dark night made him shiver.

For a few weeks, a weasel had been hoping that he might be able to sneak into the protected vernal pool area and steal all of the eggs that he could find. There was just one problem, Scott would be woken up by the loud noise of the weasel turning over all of the leaves, splashing in the water and digging holes.

The weasel had a plan. He tricked the snail into thinking that the vernal pool had flooded. He told Scott all the eggs had washed away. When Scott tried to go check on the eggs, weasel said, "Oh, but wait you must not go back to see if anyone has been hurt. It will be dark soon, and you don't want to be stuck out in the dark all by yourself with no one else, lost in the woods. If something happens to you there will be no one there to save you. Go now!" Foolishly enough, Scott believed him, and he decided to stay put for the night. As he was settling in, Scott asked the wise old owl about finding a new vernal pool to live in. Owl informed him that there was no need to move. The vernal pool was fine. Scott then knew the weasel was lying and was up to no good. At this point it was getting dark, and Scott was terrified of the fact he had to get home in the dark with things lurking in the shadows of the cold, black night. He darted home as fast as he could, which was very sluggishly, on account of his being a snail. As he slid home he saw things in the shadows. Every time he saw something, he jumped and his eyes popped out farther and farther.

When he got there he found the weasel swimming through the dense undergrowth in the middle of the pool. "Help! Help! The weasel is stealing all of the eggs. Help!" Scott screamed as he watched the weasel swallow a huge mouthful of salamander eggs. All of the animals came. They tried to scare the weasel out of the water, but instead the weasel panicked. He had not though of the fact that he couldn't swim. He cried "NO! I am sorry please help me." Scott thought about it but he knew he was too little to save him, so no one helped him. The shifty weasel drowned.

Scott was proud of himself for what he had done. Every one was so happy that Scott had come and saved almost all of the eggs. He knew that it was a great thing to do. His fear of the dark was gone. Now snails always come out at night searching for animals that are trying to eat the eggs of others.

AIR BREATHING SNAIL

Physical Description

Have you ever seen a male snail or a female snail? I bet you haven't because there are no males or females. They are both! Even though snails are both male and female they still have to mate with another snail. They basically all look the same oddly enough because of this weird **adaptation**. There really is no difference between the young and old except the age and the size. These snails can grow from 1 mm when they come out of the egg to 4 inches wide. Snails are **cold blooded**, which means that they move very slowly when it is cold out, and when it is warm they move faster. This fact is why you don't see them out in the winter. They are also hiding in the winter to escape from predators. (In general cold-blooded means that an organism's temperature varies with the outside temperature.)

In addition to being both male and female, snails can live in and out of the water, which means that they breath air in their lungs instead of having gills. Also, they have a hard shell to protect them from predators. Like people, snails use a foot to get around. Their colors range from light brown to black.

Snails are **invertebrates** as you may assume because of the fact that they have no bones at all. Their soft bodies contain a kidney, stomach, lung, male and female reproductive organs, a mantle and a heart. The **mantle** is a membrane-like organ that builds the shell. All of these essential body parts are protected in their sturdy shell. They also have a liver just like us. Just outside the shell is **respiratory pore**, which is what they breath through. They have two long tentacles that function as their eyes, but they have bad "eye-sight" so they have two other tentacles used for smelling their food. They also have a mouth, and in the back of their throats they have **radula**, which are teeth. at the bottom of their "foot" they have their anus, which they use to go to the bathroom.

Habitat

Right now sitting in my classroom is a little woodland pond snail. it is probably scared to death right now, because it sees weird things other then the dark decaying leaves at the bottom of the vernal pool that it is used to. Pond snails are used to a habitat where there is either icy cold and dark area under the decaying leaves at the bottom of the vernal pool, or crawling around to find a nice cold damp place like under a rock, which is usually what happens in the summer when the vernal pool dries up. This snail is **nocturnal**, which means that they usually only come out at night. In the morning you might wake up go outside and see a glimmering path of slime.

Their range is all the way from here in Massachusetts to near the west coast of Canada, and from as far south as Ohio all the way up to the northernmost part of Canada.

Water temperature and depth, weather and seasons are some **abiotic factors** that they have to live with. Predator/prey population and other animals/insects are **biotic factors**. Some of this little snail's predators that it has to live are birds, frogs, salamander, raccoons, turtles and toads. Some other animal/insects they live with are dragonfly larvae, newts and fingernail clams.

These snails are a **facultative species (indirect indicator species)** this means that they could survive without a vernal pool. They can also live in ponds and freshwater lakes.

Diet & Feeding Habits

• **Predators:** birds, turtles, toads, frogs, shrews, salamanders and raccoons.

• **Prey:** algae, tree sap, lichen, fungi and little food particles that grow on rocks, plants and animals that are not moving.

•Snails are **herbivores**, which means that they only eat plants. They are also consumers, which means that they eat producers and are eaten by other consumers and in the end by decomposers. Also they are level 1 on the tropic level.

Natural History

Once there was a true story of a little snail that ran away. A museum worker at a museum found two snail shells that were empty. The snails were believed to be dead. They were glued to a piece of cardboard for a display. Four years later the museum worker put the cardboard in water and one of the snails literally got up off of the cardboard and crawled away. Because snails pull back into their shells when a predator comes near, like a turtle, they seem to "disappear". Also, they have a tight-fitting plate like a trap door on their foot, which fits tightly into the shell opening.

The pond snail's scientific name is either stagnicola pilsburyi, meaning "fish springs marsh snail" or stagnicola catascopium meaning "woodland pondsnail". They are part of the stagnicola genus which means that they are all air-breathing, fresh water snails. Some others snails that are in this genus are Arctic pondsnail and the Marsh pondsnail.

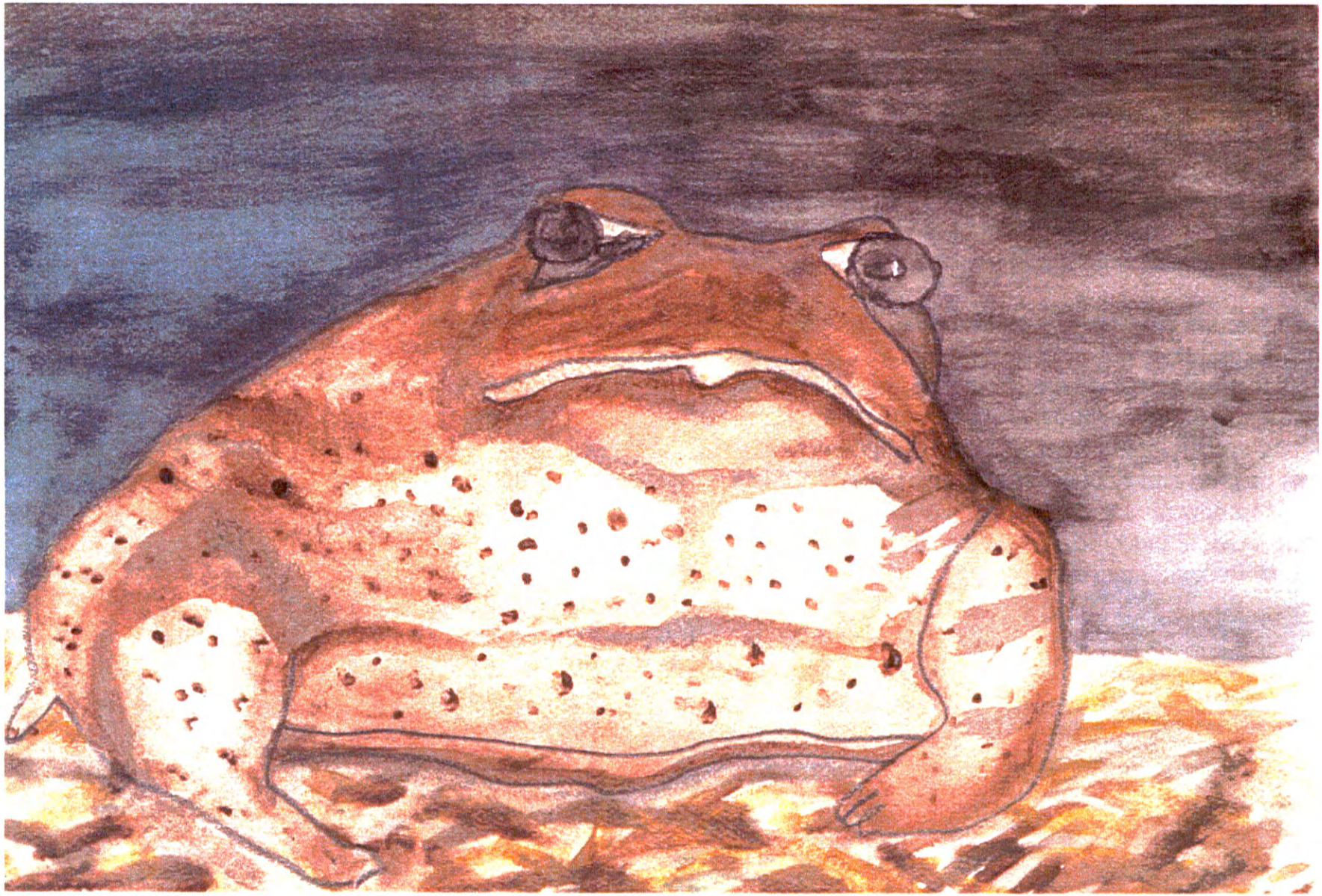
Snails reproduce by laying eggs, which means that they **sexually reproduce**. All they need to do is find another snail, and mate. They have **courtship** for 2-12 hours before they mate, and this is when they prepare for mating. They are "getting to know each other" during this courtship. One of the snails climbs on top of the other while mating. They are **internally fertilized**, and they can lay up to 100 eggs at a time. To protect their unhatched young they, dig a hole for the eggs, and cover them so that they are safe from predators.

These snails can live in the wild anywhere from 1-7 years. When they are free from predators and life threatening conditions they can live about 15 years. The longest a snail has ever lived is 30 years. Snails can't leave their shell like hermit crabs can; instead it is a part of them. They are born with it and die with it, and their shell also grows with them. Snails go through no **metamorphosis**; instead they look the same from when they first come out of their egg to when they die (except for their size). Their **incubation period** is 6 to 8 months; just a little less then humans.

Snails are actually a great delicacy in Europe and many other places all over the world. People even enjoy eating snail caviar, which is snail eggs, served in the shell with garlic and parsley butter. It sounds really gross eating a snail, but I have tried one and they actually not that bad.

American Toad

(Bufo Americanus)



Why the American Toad has Warts

One day, Toad and Frog met each other near a road. Frog said, "I have green, smooth skin and you have bumpy, ugly skin. I am more beautiful." A week passed before toad and frog met again. The frog said, "My beautiful green skin blends into the green grass so I am safe in yards and meadows."

The toad answered back, "My brown, bumpy skin blends into the colors of fields, gardens and woods. I can go many places and not be seen. My skin is camouflage!" "Well" argued frog. "who can leap as fast as the wind?"

Toad had to admit that he is a slow mover. "But, but..." said Toad. "You know the warts on my back? They are full of poison that protects me from predators."

Frog had to admit that he has no poisonous warts on him. Frog quickly said, "yeah, but you're still ugly". A few weeks passed and Frog was eaten by a hawk because he wanted to show his beauty to the world and wouldn't take Toad's advice and hide. Toad was safe because he went and hid in some marshlands.

AMERICAN TOAD

Physical Description

The American toad sits by the water waiting for its prey. The American toad has brownish, dry bumpy skin and finds a background it can blend into. An American toad can last on land away from water because its thick skin holds in moisture. It'll be a long time before it needs water, giving it plenty of time to catch its prey. Without warning the toad shoots out its tongue and hits an insect dead on. After a successful hunt the toad heads back to the pond. It sees a dragonfly (Anax junius), but it doesn't taste good so the toad lets it fly off.

An American toad's body is 2-4 inches long and about the size of a fist. The average toad weighs about ¾ of a pound. It has short legs so it travels by walking or hopping. Toads do not jump as the long-legged frogs do. Toad's large eyes are at the top of its head for good vision. The female toad is slightly larger than the male and has a whitish throat, compared to the darkly colored throat of the male. The red and yellow "warts" on the skin of the toad contain a milky liquid that is poisonous to predators if swallowed or gets in the eyes. Another defense the toad has is burrowing underground. The strong back legs of the toad are good for digging through the dirt.

Habitat

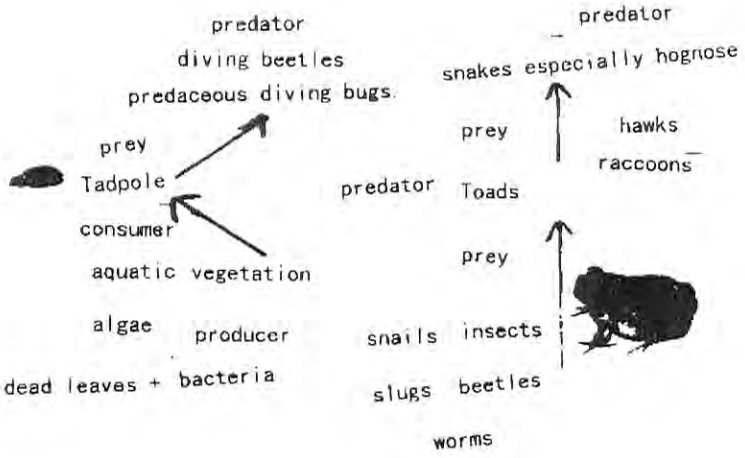
Toads cannot survive without water so they live near wetland **ecosystems**. American toads live all over North America, but usually not in the southern states. In the spring tadpoles are born in **vernal pools** and ponds. In the summer they live in shade and eat bugs and spiders. In the fall they can defend themselves by playing dead to fool predators like snakes, hawks, raccoons and herons. Then in the winter they **hibernate** by burrowing underground and waiting until spring.

After the toads wake up from hibernation they head to ponds, puddles and vernal pools. Female toads lay eggs in long strings in the water. The eggs hatch into tadpoles and tadpoles live in their fresh water habitat for 40 to 70 days. After a while they change into toadlets. The toadlets hop to shore to live on the land. They live in fields, gardens, and woodlands.

The things that are alive (**biotic**) in the American toad's ecosystem are grass, plants, flowers, squirrels, chipmunks, trees and snakes. The nonliving things (**abiotic**) in the American toad's ecosystem are water, soil, dead logs and dead leaves

Diet & Feeding Habits

Food chains of the American toad young and adult



- Adult toads eat only meat. (carnivores)
- Tongue is attached to front of mouth; it is long and sticky.
- Tongue flops out, insect gets stuck on end of tongue, tongue flops back in mouth, toad gulps down food.
- After molting, toads eat their shed skins.
- Second-level consumer. (eats smaller animals which eat smaller animals and plants)
- Tadpoles eat only vegetation. (herbivores)
- Tadpoles can swim in very shallow water to avoid predators.
- First-level consumer. (eats producers/plants)

Natural History

The American toad is a **cold-blooded amphibian**. During its life, it goes through a **metamorphosis**. The toad starts its life in the water of a small pool and then moves on to the land. In early spring when the days start to get warm, male toads gather at the vernal pool to sing in order to attract females. The throat sacs of the males inflate and vibrate to make hi-pitched trilling sounds. Female toads go to the pool and go to the best singers. After this courtship behavior the female lays 1000's of eggs in two long strings. As the eggs are laid, the male toad fertilizes them. **Sexual reproduction** is the result of **external fertilization**.

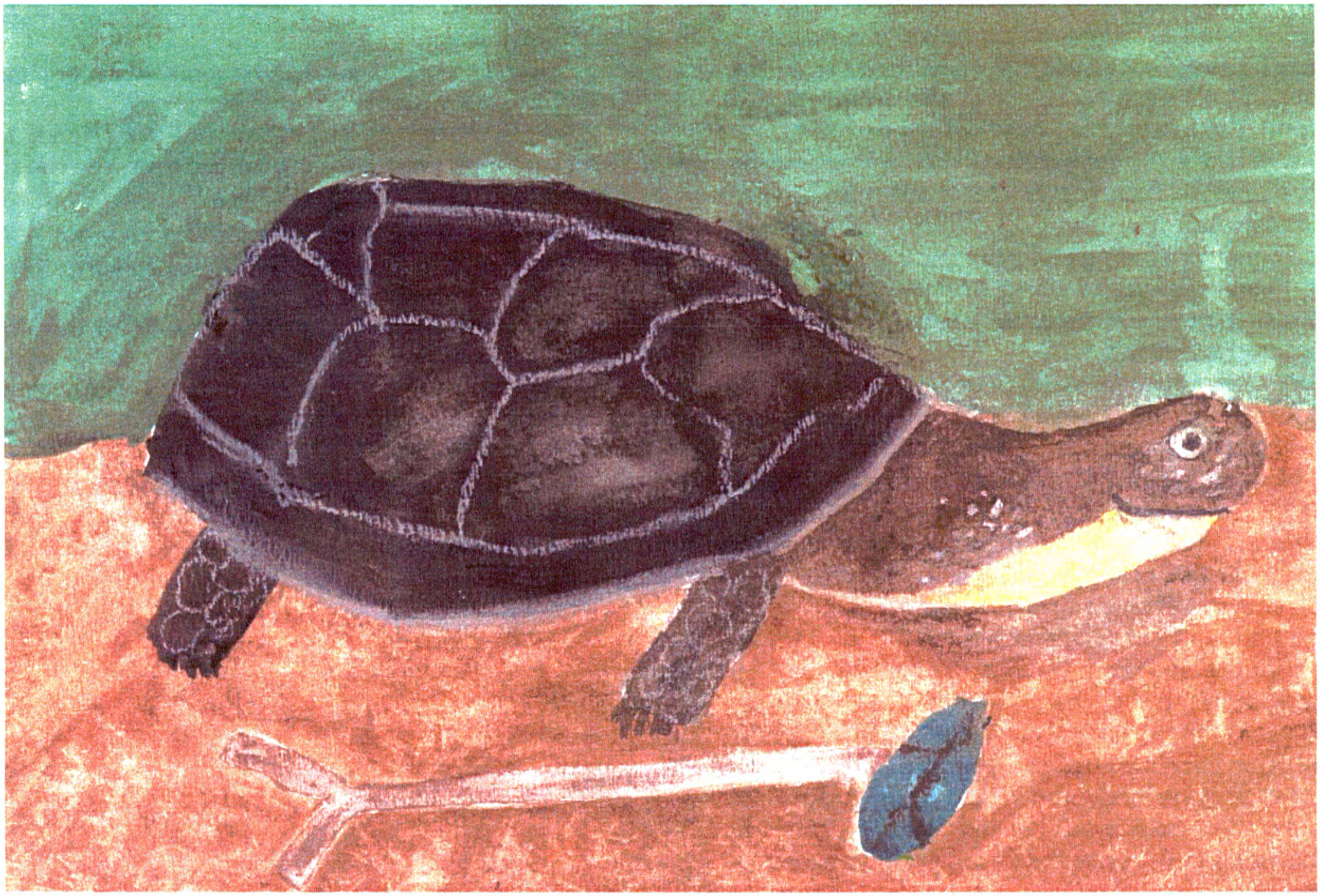
Tadpoles (larvae) live in a freshwater pool for 40 to 70 days. Tadpoles are long bodies that have tails and heads. They breathe with gills. The tadpoles are black on top and lightly colored underneath. Predators from above and below have a hard time seeing the tadpoles because from below the blend in with the sunlight and from above they blend into the water. After 70 days the tadpoles grow four legs and lose their tails. Also, they grow lungs. With these changes toadlets can walk up onto the land. Toadlets travel in groups called "knots" for safety. They live anywhere that insects do and stay close to a source of water. Toads can eat up to 1000 insects a day. If you see a toad in your garden, it is a good thing! Toads are mostly nocturnal because they don't like too much exposure to the sun. Building a small shelter of stones, sticks, or wood might attract a toad to live in your garden.

If you touch a toad, be sure to wash your hands because the poison from its skin tastes REALLY BAD and makes your salivary glands stop making spit so your mouth dries out. It's not true that you'll get warts from a toad, so don't believe people that say you do.

After 2 to 3 years toads are ready to reproduce. Then it starts all over again, beginning at the pool.

Blanding's Turtle

(Emydoidea blandingii)



Why the Blanding's Turtle Always Smiles

Once, there was a Blanding's Turtle named Paco. It seemed Paco always had something to make him sad. When anyone tried to help him feel better, he would take advantage of them. One sunny day when the rest of the Vernal Pool animals were frolicking in the water, Paco was moping about the loss of his Grandmother on the banks of the pool. When Flip the frog asked if there was anything he could do to make Paco feel better, Paco replied with a shocking response.

"Could you go hunting and get me 20 worms? Oh, and three handfuls of bugs? If you don't mind, could you also pick up some leeches and snails? I'm saving up for winter. You know?"

Next year, Paco's poor old Grandfather died. When the Vernal Pool animals heard this tragic news, they decided to throw a surprise party for Paco to make him feel better. They all hid among the reeds, and when Paco came by to rest at the waters edge, they jumped out and yelled "Surprise!" Paco had overheard them planning the party so he knew what was coming, but he pretended to fain from excitement. When he finally came to, Paco pretended that he had hurt himself. Marilyn the Air Breathing Snail came to check on Paco, and he ate her!

The year after that, Paco's Aunt got a disease. Now, this year, the Vernal Pool animals knew enough to stay away from Paco because they figured out how he took advantage of anybody who tried to help him. When Paco realized that no one was coming to comfort him, he went to his neighbor Connie the Wood Duck's house.

"Connie, my Aunt is terribly sick!"

Now, Connie didn't know how to respond, so she simply said "I'm sorry."

"Yes, it's very sad. I was wondering if I could spend the night at your house, for some company?"

"Um, of course you can Paco, what are friends for?" But, Connie didn't want Paco any where near her house. She had heard what happened to poor Marilyn, and was there to witness what Paco had done to Flip the frog. When Connie woke up the next morning, Paco was gone, and all of her valuables were, too!

After this, and all the other incidents, the Vernal Pool animals decided to file a complaint with Mother Nature because they felt like Paco was a threat to their community. When Mother Nature found what was happening, she was outraged! She decided to put a permanent smile on Paco the turtle's face, so he could never again take advantage of someone and get away with it because he was "sad". Now, all of Paco's children and Grandchildren smile constantly.

BLANDING'S TURTLE

Physical Description

When most people think of a turtle, they think of a slow little guy who paddles his way through warm Florida waters. Well, the Blanding's turtle is different. One special **adaptation** they have is that they are **cold blooded**, so they can stand very cold temperatures (they even live in Canada). An easy way to recognize the Blanding's turtle is from its smile. Yes, this turtle can smile. In fact, it can't stop! The Blanding's turtle has a permanent smile! Something else you can recognize the turtle is its bright yellow chin. The average Blanding's turtle is eight to ten inches long and weighs about three pounds. The length of the turtle's domed **carapace** (the shell that covers the top of the turtle's body) is about seven to nine inches, and it has small yellowish whitish dots all over it. Well, I hope this clarified how to recognize a Blanding's turtle if you ever find one!

Habitat

The Blanding's turtle doesn't need vernal pools to live in but it is where they are commonly found. They like to live in shallow waters with lots of plant life, making vernal pools a natural match for them.

Some of the **Abiotic Factors**, or the nonliving parts of the **ecosystem** that affect the Blanding's Turtle are the water, which it needs to live and the soil. The **Biotic Factors**, which are the living parts of the ecosystem that affect the turtle, include the crustaceans, which they eat. Another living part of their habitat that affects them are the animals that hunt them. These animals include foxes, skunks and raccoons.

The Blanding's Turtle enjoys cold temperatures between 24 and 60 degrees, and they are only found in North America. They are **diurnal** and they usually hibernate from late October until early April. Sometimes, they are seen in the winter, but that is rare.

As I mentioned before, the Blanding's Turtle lives in North America, but they are endangered in Canada because people are building over vernal pools or emptying the ponds that they live in. Blanding's Turtles are also protected or rare in some parts of the United States.

Diet & Feeding Habits

• **Diet:** Blanding's Turtles eat insects, leeches, snails, and frogs. They also occasionally eat vegetation.

• **Predators:** The eggs are hunted by raccoons, skunks and foxes. Snakes, herons, and crows hunt young Blanding's Turtles.

• **Trophic Level:** The Blanding's Turtle is a secondary level consumer because it eats insects and they eat plants

• **Feeding Habits:** Blanding's Turtles prefer eating their food in water and if they catch something out of water, they drag it into the water to eat it. If their prey is small, it is swallowed whole. If it is too large, the turtle holds it by its jawbone and shreds it to pieces so it is easier to eat.

Natural History

Did you know that once a Blanding's turtle is about fourteen years old, they start looking for a mate? Actually, the female has no say in who her partner is. For this reason, they don't really have distinguishable **courtship behavior**. The male decides which female he thinks looks the strongest and would produce healthy offspring. Blanding's turtles mate in April and May and once the eggs **incubation** begins, the females travel all over to find the ideal spot to lay their eggs. They dig deep nests in sandy soil and then lay six to twenty-one eggs that are about four centimeters long. They leave the nest and the eggs are left to fend for themselves against things that enjoy eating turtle eggs, such as foxes and skunks. Once Blanding's turtles are forty, they stop reproducing. Usually they only live to the age of sixty, but sometimes they can live to be up to one hundred years old.

Do you know what **taxonomy** means? It's how an animal is **classified** in the animal kingdom. All animals are in the kingdom Animalia. The next step in the classification is Phylum, where the Blanding's turtle is in the chordata group. A chordate is an animal with a notochord, which is like a spine. Some only have it for part of their life, while some, like the Blanding's turtle, keep it their whole life. The next smaller group is class, where the Blanding's turtle is in the Reptilia group. This covers reptiles which are grouped together because they are cold-blooded and covered in scales. Next is order where the Blanding's turtle is in the testudines group which is a group with all tortoises and turtles. Something all tortoises and turtles have in common is that they all have shells to carry on their back! Family is next, where the Blanding's turtle is in the group Emydidae which is just pond turtles. The last part of the classification is species. The species is the Blanding's turtle, but scientifically it is Emydoidea blandingii. Blanding's turtle is currently a species of concern in Illinois, Iowa, Massachusetts, Minnesota, New York, Wisconsin, Ontario and Quebec. The Blanding's turtle is endangered in Maine, South Dakota, Missouri, and Nova Scotia. The Blanding's turtle is protected in Michigan because it is a species of special concern.

Blue Spotted Salamander

(Ambystoma laterale)

Why Blue Spotted Salamanders have their Spots

Once upon a time there was a cluster of eggs in a vernal pool. Out of these eggs hatched a bunch of little salamanders. They all were very small and very cute. However, one salamander was really conceited. This salamander thought that he had the most elaborate skin in the whole pool, and he bragged all the time about it. Whenever he walked to the vernal pool, he held his head up high and scoffed at every one else's skin. "I am the most handsome salamander ever to live" he thought. The stuck-up salamanders name was Peter. After a day of being hatched, all salamanders get to pick what color spot they get to have on their body. This is so that they can be classified. If you pick yellow spots, you are a spotted salamander. If you pick black ones, you are a Tiger salamander, and so on. Peter thought that it was ridiculous that he was going to have to put spots all over his back. "I don't want to ruin my skin by putting spots all over it!" he exclaimed. "Then no one will be able to admire my beautiful skin."

"I'm sure that you will find a color that you will like," said his mother.

When the young salamanders lined up to pick up their spots, Peter had a wonderful idea. "I shall chose the color spot that is the same as my skin, then I will still have a beautiful coat and no one will know the difference!" So when peter went up to chose his color, he chose a blue that was the exact same color as his skin. When the king of all salamanders heard about this he got angry. "All salamanders must fall into a category! You have disturbed the natural order of things." With that, he then made Peters spots go an ugly dark blue shade. From this day on, all salamanders born with the same beautiful skin as Peter, also have dark blue spots all up their back.

BLUE SPOTTED SALAMANDER

Physical Description

If you get you're leg cut off, will it grow back? It will in the case of the blue spotted salamander. These interesting critters can re-grow lost limbs, including arms, legs and even their tails! Needless to say, the blue spotted salamander has a very interesting physical description.

The way that you know that you have found a blue spotted salamander is because of its dark blue body and its white/blue spots. It is 47-55 mm. long, and it varies in weight. They are always damp because they need water to help them breathe through their skin. You can tell if they are adults or not because their external **gills** have receded back into their body. Be careful; if you make it sense danger, two glands from behind and under the tail produce a nauseous gas that is very pungent. Aside from regeneration, this is probably its most interesting defense **adaptation**.

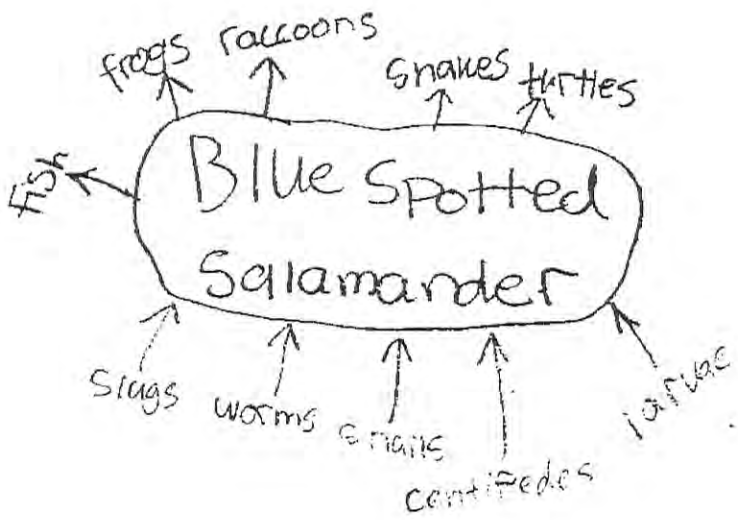
Oddly enough, there is almost no distinction between male and female blue spotted salamanders. During mating season, (spring), the males legs are extended a little longer than the female. This is so that he can get into the required mating position. Apart from that fact however, if you find a blue spotted salamander staring you in the face from the top of a molding log in a swamp, you will have a rough time telling whether it's a male or a female.

Habitat

The blue spotted salamander's whole existence depends on vernal pools. Every spring, when vernal pools are created by rain and melted snow water flowing into wetlands, blue spotted salamanders go down to them and mate. They can only mate in vernal pools, not just any water will do! This means that they are an **obligate species.** The eggs stay in the pool for a month. Then, they hatch into larvae, and stay around while they grow arms and legs. Once they leave the pool, they wait a whole year, and go down to the next vernal pool to continue the cycle.

During the rest of the year, the blue spotted salamanders don't have a "home". They take refuge under trees, rocks and other parts of the **ecosystem**. However, they have to live in a habitat near water, and can usually be found in swampy areas. They depend on water to survive, and all of their prey, such as: insects, arthropods, annelids, centipedes and worms are plentiful around these kinds of areas. The blue spotted salamanders are **endemic** to climates with four seasons. This is because the change in heat and cold causes there to be enough water to create vernal pools If blue spotted salamanders aren't in that specific **climate**, then they won't be able to mate in vernal pools, and their entire population would go extinct.

Diet & Feeding Habits



Natural History

The blue spotted salamander has a lot more in common with other salamanders then you might think. Its **genus**, Ambystoma, means mole salamander. This means that all mole salamanders are related to the blue spotted salamander. What they all have in common is that they are shaped to burrow through and under things. This is why they call it "Mole" salamander. Apart from this digging, however, the only thing that salamanders have with moles is that they both have babies through internal fertilization.

The male blue spotted salamander finds it mate by depositing its sperm into a little pile on the bottom of the shallow water. Then he stands over it until a mate that likes the look of him goes over to him and picks up the sperm. This means that they never know their mate until they have children. WOW! Then, she deposits her eggs and puts the sperm on them and the process begins.

Once the **fertilization** happens, there is no gestation period inside the mother. She lays eggs that develop outside her body. Since she put the sperm inside her this is called **internal fertilization**. Then they mature like this: they are first eggs for about 1 month. Then they hatch and live as larvae for 16-20 weeks. **Larvae** is the stage when they are still maturing, but aren't in the eggs any more. They resemble tadpoles, but soon grow arms and legs. You know when they aren't larvae anymore because their external gills have receded back into their neck. This means that they are ready to go on land because they can breathe while out of water. Once this period is up, they are fully matured, ready-to-mate, blue spotted salamanders.

Eastern Screech Owl

(Otus asio)

Why the Eastern Screech Owl is so Small

At the vernal pool there was an eastern screech owl named Luz. She ate too many small creatures like mice, crayfish and snails. She ate all the small creatures because she wanted to make herself small. She wanted to get into small places. She ate more small animals to get smaller.

EASTERN SCREECH OWL

Physical Description

The Eastern Screech Owl is born thirty- one days after an egg is laid. The chick breaks out of its eggshell. Owlets are tiny and helpless. Their eyes are closed. Their bodies are covered with fuzzy feathers. An egg tooth helps them hatch .It has a knob at the front of the beak .It is like a tooth. Nine weeks after the owlets born they can fly.
Did you know the Eastern Screech Owl has 2 calls? One is a trilling call on one pitch. It is used to communicate with family or mates. The scientific name of the Eastern screech Owl is Otus asio. Otus means ears asto means horned owl.

The vernal pool is a food source for the screech owl. It likes to eat insects, crayfish, and worms. These are the biotic (living) factors in the screech owl's habitat: tree hole or tree cavity to live in. Prey includes birds and rodents. Abiotic (not living) factors at the vernal pool are the water, the air, the depth of the water, the temperature of the air, the season, and the weather. The owl will use nesting box parks, houses, cars, roads urban and suburban areas with trees. The owl breeds early in the year to late winter. It hunts during evening and night, occasionally during the day.

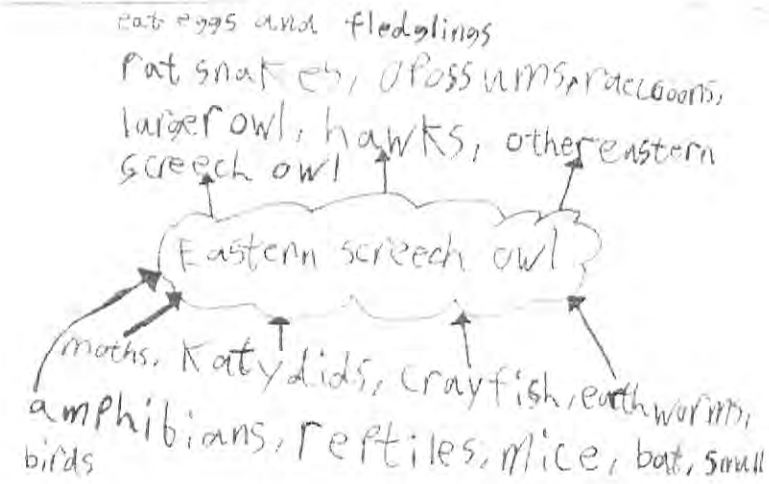
Habitat

The Eastern screech owl:

- Lives where there are a lot of trees
- Doesn't like to be in crowded woods because that is where the great Horned owls live. They are afraid they'll be eaten by the great horned owl. Like to make homes in a really old trees that have holes in them.
- Lives in the eastern half of the U.S, in part of Canada.
- Is NOT afraid of humans, and even use nest boxes.
- They don't migrate.

EASTERN SCREECH OWL

Diet & Feeding Habits



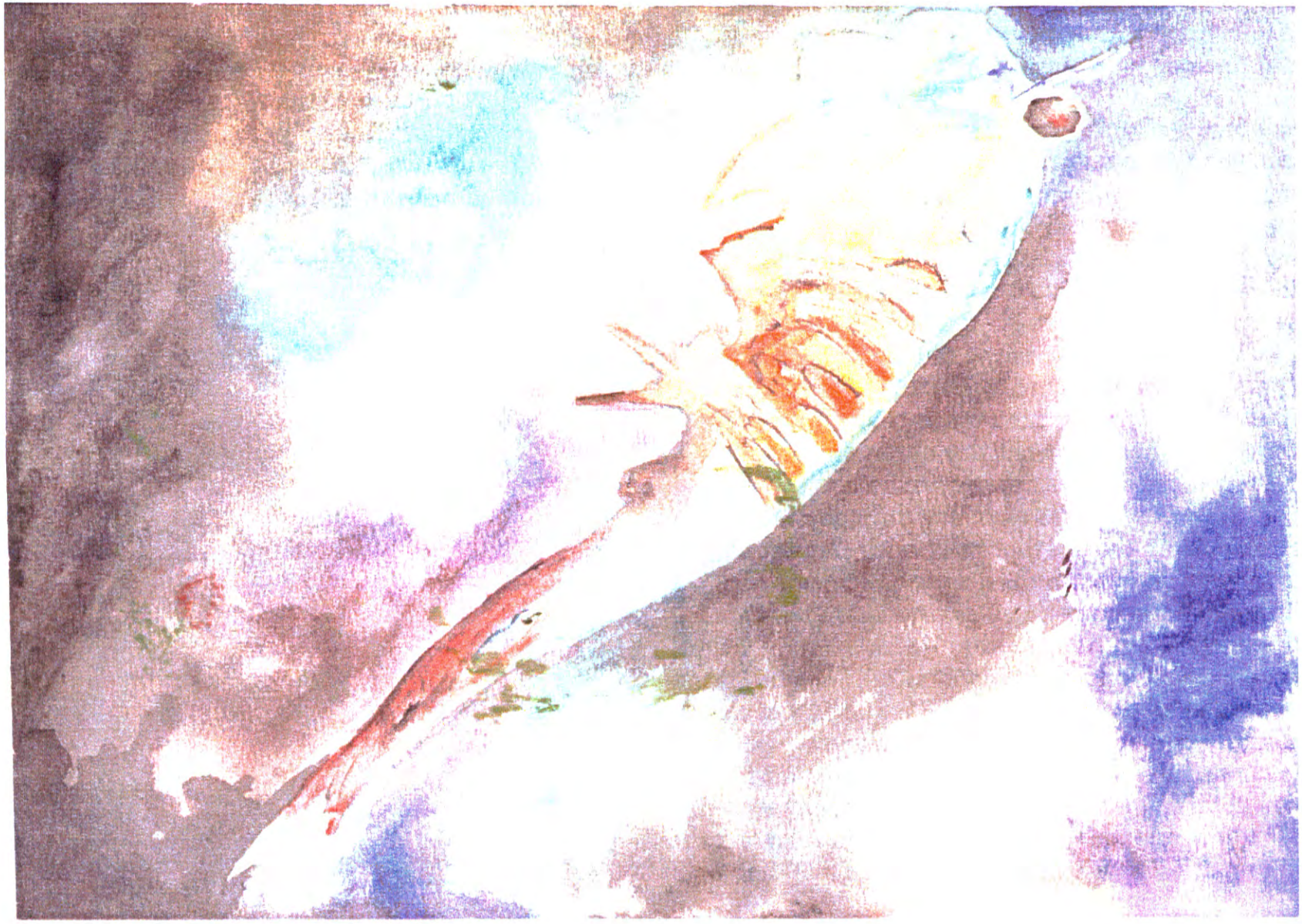
- **Food Source:** The Eastern Screech Owl eats moths, katydids, crayfish, earthworms, amphibians, reptiles, mice, bats, and small birds.
- **Predators:** The Eastern Screech Owl's predators are rats, snakes, opossums, raccoons, larger owls, hawks, and other Eastern Screech Owl.
- **Food Web:** This species is a second level consumer because although it is a predator, it is also prey to some larger animals.

Natural History

The genus of the Eastern screech owl is Otusande. Other animals in that genus are the Slops Owl and the Screech Owl. The Eastern Screech Owl belongs to the Strigidae Family. The Great Horned Owl is also in this family. The order is Strigiformes which also has the Dusky Eagle Owl. The class of the Eastern Screech Owl is Aves. The Bald Eagle is in this class. The Phylum is Chordate which also has fish. The Kingdom of the Eastern Screech Owl is Animalia. The eastern Screech owl looks really cool. It ears pointy and have tuft. The eyes are big and make it look mad. The feathers are a mix of color like red, brown and grey, the colors of the body make the owl blend in with the dark on a tree (camouflaging). If an owl stays in the shade, the predator would not be able to find it. This owl can hide in small places because it is only 6-10 inches tall. The wingspan is 19-24 inches. Their weight is 4-9 ounces. Their feet are big and covered with feathers, but are deadly weapons with their sharp talons. They use their talons to grab their food. The screech owl's bill is greenish and shaped like a hook. When screech owls hatch from their little white eggs, hatchlings are covered in white down. The hatchlings eyes are closed. When they grow older, their eyes open, their beaks grow, their talons grow, and they get different colored feathers. They keep these same feathers as adults. The males and females are the same color, but females are taller. Owls are warm blooded.

Fairy Shrimp

(Eubranchipus Vernalis)



Why Fairy shrimp Swim Upside Down

Many, many moons ago there was a little fairy shrimp whose name was Moses. Now Moses, see, was one child of 110.He tried to steal attention in whatever way possible, but one day he got himself "head over legs" in trouble.

During the time when the Earth was peaceful and the far mountains were painted with the sunset skies, Mr. Coyote lurked around with hunger prowling inside his rascally eyes. Sneaking and creeping, Mr. Coyote quietly roamed the open fields, until he reached "High Hopes" vernal pool where the animals trollop, creatures dance and trouble was about to bloom.

One day Mischievous Moses was looking for a mate, not just any mate but the most beautiful of them all. "What better way to attract a mate than to dance?" thought Moses. So there he went day after day dancing, but he soon found that his dance wasn't as good as the other fairy shrimp. Moses was very disappointed and wanted to pocket the spotlight yet again, he began thrusting, busting, and bouncing on springs of some sort. The next moment Moses the fairy shrimp flew up with a great leap, splashing out of the water! "How's that for an impressive dance?" he exclaimed boastfully "I, Moses am the best dancer in all of High Hopes." Just as Moses was in the middle of his gloating, Mr. Coyote came scrambling around the corner and with one quick motion, tried to scoop Moses up in one gulp! "Owe my back! I can't move it or swim right!" he cried in agony. "How will I ever attract a beautiful mate now that I can't swim correctly?" he kept asking himself. "Oh Moses, what will the world ever do with a boastful shrimp like you?" called an unknown voice, so soft and sweet. It was the mother of all good nature. "Moses, because of your attitude, you and your ancestors must forever swim on your backs."

So from the time of Moses until now and forever more all Fairy shrimp shall swim on their backs because of the one who's been taught a lesson he would never forget.

FAIRY SHRIMP

Physical Description

Is it yellow, green, blue, or red? It's all of them. The Fairy shrimp has a body that is **translucent**, which results in refraction or bending of surrounding light and colors. This act creates an illusion of colors to appear on the fairy shrimp where it actually is not present. The average size of these mysterious critters is about 2.5 cm, about the length of a zipper, but believe me you'll need a magnifying glass to catch a glimpse of these "torpedo-like" shrimp.

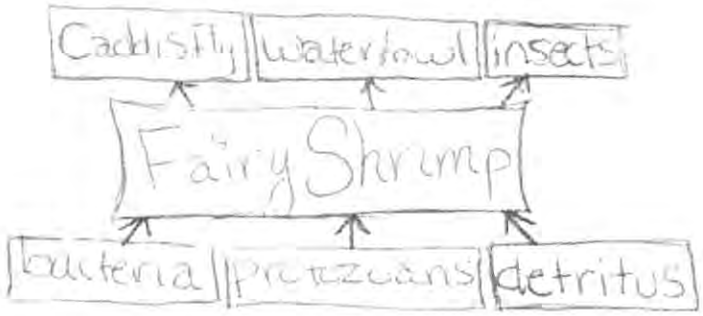
Torpedo? Yes, I said torpedo. Fairy shrimp have a unique part called a **trunk limb** which enables them to shoot forward from the "jets" of water that burst away from their rhythmic movements. Cool right? Yet that isn't the only interesting fact about this tiny fella. Not only does it shoot "jets", but it commonly changes gender as it matures to an adult! These facts are just more reasons for you to go out and investigate for yourself! You'll know you've caught one at the vernal pool when you see an **exoskeleton** critter with its eleven little legs squirming upside down, and stalked eyes

Habitat

When your playing outside, tromping on the freshly frozen ice, beware of our little critter friends, the fairy shrimp beneath. Their winter eggs are drying out and soon their whole life and **population** will depend on the one vernal pool that you're disturbing inadvertently. The **habitat** in which they thrive is mostly shaded, leaf-like and marshy, but like you and me, they like to get that taste of peeping sun every now and then. A canopy cover which serves as a productive **biotic factor** in the **ecosystem** usually keeps the harmful things out and the safe factors in. While the leaves fall from the canopy they contribute to the energy cycle within the habitat.

Often, fairy shrimp try to stay away from vibrations of our "giant" bodies or anything else that may serve as a hazard in the neighborhood that they are **endemic** to. The Eubranchipus species **ranges** from Europe, Central Asia, Africa, and Western North America.

Diet & Feeding Habits



• Fairy shrimp scrape up their food with their feet and trunk limb.

• The trunk limb is used as a filter to receive only necessary particles.

• Fairy shrimp are considered omnivores because they consume plankton and plant algae such as protozoan, detritus, and bacteria.

• Predators of the Fairy shrimp include Caddisfly, waterfowl, and some larger insects.

Natural History

Observing little creatures such as fairy shrimp may be a hard task sometimes, yet if you're lucky enough you may find just how interesting they really are! During a usual winter egg-laying season there is a large population of males. This means that the females do not have to resort to **asexual reproduction.** While **incubation** is in process male fairy shrimp are separated from their mates unless they want to produce another batch of eggs. In that case they would swim clasped together for several days. As the tiny fellas await their arrival in this world their eggs are burrowed in the mud or attached to debris. Often this causes competition within the ecosystem for the hungry **scavengers** looking for food.

Fingernail Clam

(Sphaerium)

Why the Fingernail Clam is so Small

A long, long, long, time ago in a place far far away, that you never heard of lived a giant clam in a vernal pool. They weren't called vernal pools then. They were called enchanted aqua ditches. This clam had much pride in having the biggest, shiniest shell in the entire enchanted aqua ditch. He was the one that changed the name of vernal pools because he felt that he controlled everything and to prove it, he named the place he lived. When the sun was out, the giant clams shell gleamed and you could barely see because of its reflection. Jimmy the turtle was extremely jealous because his shell was more beautiful but couldn't be seen because the giant clams shell was so huge. Not only that, but the giant clam would always tease Jimmy by calling him "Melvin", his real name.

One day Jimmy and the giant clam were having an intense argument about who had the better shell. "My shell has enhanced designs and is gorgeous" said the turtle. "But mine is larger and glistens so nobody sees yours!" teased the giant clam. They shouted insults the whole day as the other curious enchanted aqua ditch creatures watched. Most if them had seen the two animals quarrel before but not to this extent. Jimmy was furious with the giant clam and plotted revenge. He had had enough of this argument and ran (as fast as a turtle can "run") home. Unfortunately for the giant clam, Jimmy's mother was mother earth herself. "Momma, nobody sees my beautiful shell because the stupid giant clam is enormous!" pleaded Jimmy. So mother earth took pity on Jimmy and cursed the giant clam so his shell would be the size of your fingernail, and that the species would not be very well known. Fingernail clams are also endangered as part of the punishment. The turtle never forgave the fingernail clam so turtles eat fingernail clams. The moral of the story is, don't boast or make fun of people.

FINGERNAIL CLAM

Physical Description

A fingernail clam emerges from the sand it has slept in all winter. As it surfaces it realizes it's in danger of becoming a morning snack. The bivalve has **adapted** to dealing with predators by having a muscular foot. It quickly scurries under the cover of an underwater plant. All the while, this **cold-blooded** creature is filter feeding which means it absorbs food through its gills, as the water passes through them.

The fingernail clam is a sandy-colored **invertebrate** with a soft body that is usually has a slimy, wet texture. There are many different types of fingernail clams so their size and shape varies except for one important fact: they are about the size of a fingernail. This soft body is covered by two shells which is why it falls in the family of Bivalve, ("Bi" means 2 and "valve" means part). A ligament connects the two shells like it connects the bones on a human body. Another vital part is its gills that hang in the mantle cavity to help it obtain oxygen and filter its food with the cilia on the gills, that trap the food and send it to the mouth.

The male and female fingernail clams look generally the same as the description above except that the female gives birth. The reproductive process goes like this: Fingernail clam eggs are fertilized in the reproductive tract. They then develop in the mantle cavity and brood sacs of gill filaments, which is where the shell develops. The baby clam comes out looking like an exact replica of the parent; except, of course, for its size.

Habitat

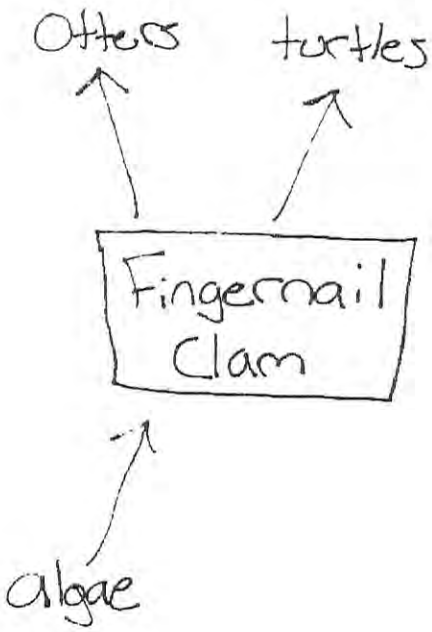
You can see a little movement. Something is breaking through the leaf litter at the bottom of a vernal pool. You can now tell that it is a small clam and it is lumbering on the vernal pool floor. It buries itself under the sediment. It is invisible to all predators waiting for it to show itself again. They wait patiently but give up when they are distracted by another easy meal. Vernal pools are just one of the many places you can find a fingernail clam in the world. Their **habitat** also can consist of small streams and lakes. Fingernail clams have the ability to live in vernal pools all year long because they sleep in the sediment in the winter.

There are many different **abiotic** and **biotic** factors for the fingernail clam living in a vernal pool. One of the abiotic factors is the sediment in a vernal pool. A fingernail clam can bury itself there in the winter when the pool dries up. That way it can endure the frigid **climate** during the winter. Underwater plants in a vernal pool would be an example of a biotic factor because the fingernail can climb on it with its foot and use it as cover from predators, parts of it can also be filtered into its gills as food. Oxygen is another factor because the fingernail clam also filters this in its gill for it to survive. The temperature is another factor it can **adapt** to because of its ability to withstand the winter with the absence of liquid water.

Any fingernail clam can adapt to the different seasons, climates, and temperatures of a vernal pool. They are submerged in sediment (leaf litter, etc...) when the pool dries up in fall and winter and when the snow melts and spring comes, they surface and reproduce.

FINGERNAIL CLAM

Diet & Feeding Habits



- **Diet**: The fingernail clam eats small things like algae floating in a vernal pool or stream. They also eat other particles of underwater vegetation. This would make them first level consumers and herbivores.
- **How they eat**: this species filter feeds which means that the **cilia** on its gill trap food particles (and oxygen) and sends it to the mouth to be digested. This way it can eat while doing other things.
- **Predators**: most predators find it hard to open the clams shell but some turtles and otters find their way through like the Diamondback Terrapin (turtle) and the River Otter.

Natural History

Fingernail clam eggs are **internally fertilized** in the reproductive tract. They then develop in the mantle cavity and brood sacs of gill filaments, which is where the shell develops. This **gestation period** lasts from fall - spring and ends with the miniscule clam is released by its mother into the water. The **larvae** clam, or glochidia, floats around for a while until it finds a host. Imagine floating aimlessly until you can find something to cling onto. The young clam **parasitizes** the host for 2 weeks until it grows to be adult size, which probably isn't the greatest experience for the host because in a parasite relationship the host doesn't benefit. Fingernail clams go through **gradual metamorphosis** which means that the offspring is an exact replica of the mother even though clams have **sexual reproduction**. The clam lives for the rest of the year and mates in the fall.

How do you know what a Fingernail clam is related to? Well, you could find out what the **taxonomy** is. Taxonomy is how the animal is classified. Fingernail clams are in the phylum Mollusca. "Molluscus" in Latin means thin-shelled. Mollusks are marine invertebrates ranging from a squid to a mussel. The class of Fingernail clams is "Bivalvia" which means two-part. Obviously, this means when you look for a Fingernail clam in a vernal pool, you should search for a two-shelled fingernail-sized clam. Bivalves are classified as two shelled mollusks.

Fowler's Toad

(Bufo Fowleri)

Why the Fowler's Toad got it's Poisonous Warts

This story begins in a forest. Deep down, way back in the forest, there was a vernal pool that was so full of animals that there was barely enough space for the animals to get away from their predators. Somewhere in the water, there was a Fowler's toad named Uno. Uno was about 11 years old. He knew all the ways to get away from predators. He knew what to eat, and he also knew how to get to safe spots where no other animal would think of going.

There was also one Fox named Freddy. Freddy really wanted to eat Uno, but Uno always managed to get away from Freddy. One time, Uno was sitting on the highest rock; just above the vernal pool. This was where all the bugs went to fly around. Freddy came right out from behind him and swooped at Uno, but luckily Uno was a toad, so he jumped right into the water.

Freddy always wondered how Uno got away so fast, so one day he followed Uno around all day long. During that time, he caught some glimpses of how he managed to do it. He did it by hopping around, leaping diagonally; because he always jumped like this he always got away. Uno had another defense that Freddy didn't know about.

Mother Nature gave Uno poison warts because when Uno was really mean to his parents. He called them ugly because he thought he was so perfect with his smooth skin. Mother Nature and decided to do something about it. One morning, he woke up, went to the pool and looked down at the water. HE SCREAMED! He saw that he had warts just like his parents.

Uno wanted to find something better to do. He wanted to see what would happen if something ate his warts. So one day he was outside on his rock, and another toad came up, and it was mad. The other toad kept biting things, like rocks and twigs, and accidentally bit one of Uno's Warts. The toad mumbled and grumbled saying "I can't feel my mouth!"

One day, Uno was out on his rock. Swoop! came Freddy and Uno was a goner. Uno has really terrible hearing. He was really good at everything else, but he didn't see that fast one. The moral in this story was to always check your surroundings before letting your defenses down. But since Freddy ate a Fowler's toad he can't taste anything for a couple weeks, because the warts on his back are partly poisonous and affected his mouth after eating them.

FOWLER'S TOAD

Physical Description

It's brown, tan, black, and partly poisonous. What could it be? It's not a snake, it's not a salamander, oh, it's just the Fowler's Toad!

The adult size of the fowler's toad is 5 – 9.4 centimeters long, just about the same size as your pinky! The size of the tadpoles is 1 – 1.4 centimeters long, almost the same size as your thumb nail. As a tadpole, they use their mouths as little vacuums and suck up algae on the rocks around them.

The adult Fowler's Toad is usually brown, gray, or olive green. They use these kinds of colors for them to blend into their habitat. The most interesting thing about fowler's toads is that they can hide pretty much anywhere, except artic places. This is because nothing in their color is white. They usually have black edged dark spots on their back. This is so there is warning sign for predators not to eat those toads. In every dark spot on its back are 2 – 4 warts, which tell other animals that the fowler's toad is very bad tasting and hurts our mouths after eating them.

The Fowler's toads eat mostly insects. Other things it might eat are small invertebrates. Don't confuse this animal with an American Toad, these eat earth worms and don't live in the same habitats of the Fowler's toad, but they are considered family members of the Fowler's Toad.

The fowler's toad has many different ways to defend itself, one of them is to lie on its back and pretend to be dead. Another defense is to blend in with its surroundings. Another adaptation to protect itself is that the warts on its back have some secretion, therefore the warts are poisonous and when ingested the warts can injure the other animal but only small mammals.

The Fowler's toad has many differences between genders. The male doesn't have little dots on its belly; but the female does. The male has 2 – 3 warts in each dark spot on its back; the female has 3 – 4 warts on each dark spot.

The fowler's toad is a **cold – blooded** animal. This means that its body temperature changes with the temperature of its environment. It is also **vertebrate**. This means that it has a backbone. The Fowler's toad also has something inside of its heart, called a ventricle. This pumps blood into different sections of the toad. It also has something called an atria, this receives blood (oxygen-rich and oxygen-poor) and it sends it to the ventricle.

Habitat

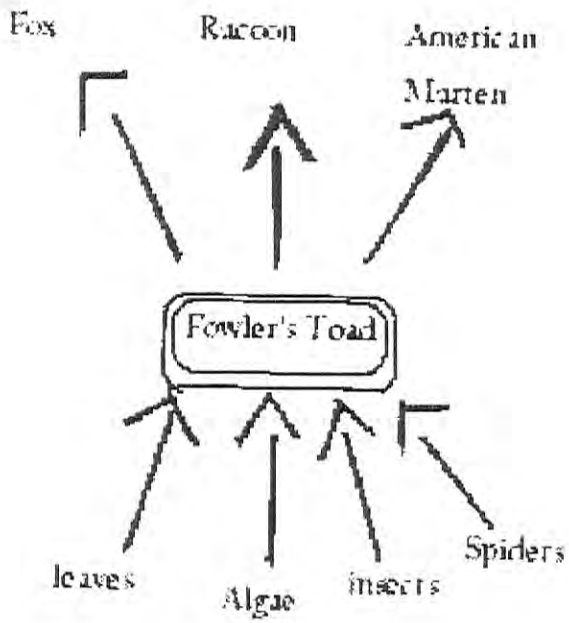
The fowler's toad is not the only thing that goes to the **vernal pools**, salamanders, frogs, other toads and even turtles go to these vernal pools. Plants and moss are usually around those vernal pools so that the animals around it have a place to eat and rest.

The fowler's toad has many different places to live, it doesn't really need the vernal pools, but they offer a safer place to lay eggs. A lot of fish live in ponds, but not in vernal pools. The fish would eat the toad eggs, but they can't live inside of the vernal pool because it dries up eventually, so it lets the Tadpoles hatch. They like warm places to live, and they also live in open woodlands, sand prairies, meadows, and beaches. The fowler's toad is also part of the vernal pool **ecosystem**. It lays its eggs in the vernal pools. This specimen can lay up to 8,000 eggs per breeding season! Isn't that a lot? It usually comes out in the night to lay its eggs, and it comes out day and night. The fowler's toad also likes the beaches and places with nice, loose soil, for digging **burrows**.

The Fowler's toad is actually protected, because of Off-road vehicles often "squash" them, or bury and suffocate them inside their own holes. Some types of agricultural chemicals are also killing this species. A lot of places are trying to keep off-road vehicles out of the habitats of animals. The off-road vehicles are also a way of polluting the air, which all the animals breathe.

FOWLER'S TOAD

Diet & Feeding Habits



- Diet: the adults mostly eat insects And sometimes leaves. The tadpoles Eat algae (the use their mouths as Little vacuums to suck up the algae Off the rocks) and bits of leaves

- Place In Food-Web: The Fowler's Toad is a second level consumer Because it eats leaves and insects Making it an omnivore.

Natural History

The breeding season of the fowler's toad is usually late April to late June. The adults are diurnal, and mate usually in the night. Eggs usually look like long strings, just like the American toad's eggs. The embryo usually turns to a tadpole in a week or so. They develop (otherwise they transform from tadpole to toad) from June to July.

The call of the fowler's toad sounds like a W – A – A – A – H. When it tries to call for a mate, and when it gets a mate they lay around 6,000 – 9,000 eggs (2 string like strands of eggs). There is a dark coloring on there vocal pouches, but only depending on what the original color of the toad is.

Garter Snake

(Thamnophis Sirtalis)

Why The Garter Snake Has Stripes

The sun was rising around the vernal pool and all around there was the sound of hustle and bustle of all the creatures scampering about getting ready for the day ahead of them. One creature in particular was already roaming about the grasses along the vernal pool: the garter snake named Huey. He was just a plain ordinary snake who lived a plain and ordinary life. Huey knew his ways around the vernal pool finding food and visiting his kind loyal friends.

One day he was going to visit his friend Louie the skunk. He was slithering along when he saw squirrel a couple of yards ahead, wobbling and trying to carry all of the nuts he had gathered for the winter. Huey thought to himself, 'I'll go see if squirrel needs any help." When he made his way to squirrel, he got half way through saying "Hello squirrel" when squirrels nuts flew into the air and landed with a thump on the ground! Squirrel was very upset. "Huey you can't scare me like that", said squirrel. 'You blend so well into the ground that I didn't have any sign that you were there." Huey tried to help pick up the dropped nuts but squirrel just shooed him away and he sulked, off feeling bad about his plain brown appearance. Sulking, Huey continued on his way.

He was mingling along the banks of the vernal pool when he saw Frankie frog concentrating very hard. Maybe if I sneak up really quietly I won't bother him. So Huey did that. He crept up to where Frankie was and noticed that he was about to catch a fly. Huey couldn't help but scream "GO FROG! YOU CAN CATCH THAT FLY!" Frog was so startled that he fell into the water and the fly flew away. 'Uh oh" said Huey. Frog jumped out of the water and started to yell at him "you just ruined a meal I've been trying to catch forever!" "Sorry" said Huey. "Sorry is not enough", yelled frog and he dove back into the water. Again, feeling horrible and embarrassed Huey lumbered on.

Now Huey was feeling very bad about the events that had happened today. So he asked the advice of Mother Nature. "Mother Nature I need your help, I keep scaring everybody on accident and then they get wicked mad at me." 'I see", said mother nature. "I have a solution. I am going to put bright yellow stripes on your back so that your friends will notice you before you scare them." "Thank you so much Mother Nature!" So garter snake had no more trouble with scaring his friends

GARTER SNAKE

Physical Description

It's long, sleek, and scaly. What is it? It's a garter snake! These creatures are covered from head to tail in little scales. These scales feel very rough and act as the snake's skin and have a design on them that consist of three stripes that run down their back. One especially bold stripe runs straight down the middle while two fainter ones run down either side. The stripes come in several different colors; the most common are yellow, tan and orange. In between the stripes there's a brown and black checkered pattern. There are exceptions to this description though; some garter snakes appear to have no checkered pattern at all. Typically the underside or belly of the garter snake is green or yellow.

You might not think there's much of a difference between male and female garter snakes, but there is. Females are usually 18-54 inches long, while males are much shorter and thinner. Since they are **vertebrates** males have smaller backbones too. Males also have longer tails. When garter snakes are born they are about 5-9 inches long. They definitely grow a lot from when they were little!

Ever wonder how garter snakes defend themselves? Well, they have an extraordinarily large mouth that they can open up to two times bigger then they are! They do this by popping their jaw bone out of its socket and then stretching their mouth wide open. Immediately after they do this, they then show off there long pointy fangs, scaring any predators away. If for some reason that does not work they can then fiercely bite the prey. Have no fear though, they are harmless to humans.

Garter snakes have a couple of big **adaptations** they use to survive in their habitat. First, they are **cold blooded** so they adapt to the warmth of the object they are making contact with. If they become too hot they cool down by moving into a cooler place. If they're cold they use the warmth from surrounding objects to correct their temperature. They also have a body part that lets them keep heat in. If you were wondering what body part it is it's the scales. Scales keep in or store body heat for the snake. Have you ever considered how snakes slither around things that are in there way? The process takes place inside their body. Two muscles tighten and contract letting the snake move in a slithering motion. (So if I were you I wouldn't take any risk of egging the snake on.)

Habitat

It's a spring evening and the sun is setting in a sequence of bright colors flashing on the horizon. A slithering sound fills the air, something is approaching. As you look down you see a sleek male garter snake gliding on top of the grass and **leaf litter** that surrounds the vernal pool. Since he is a **diurnal** reptile, he is looking for a place to stay away from the vernal pool for the night, like in a log or under a rock. In a way, he has a different house for every day of the week. He is coming back from a day filled with anticipation for some small mammal to come by so he can seize it up and gobble it down.

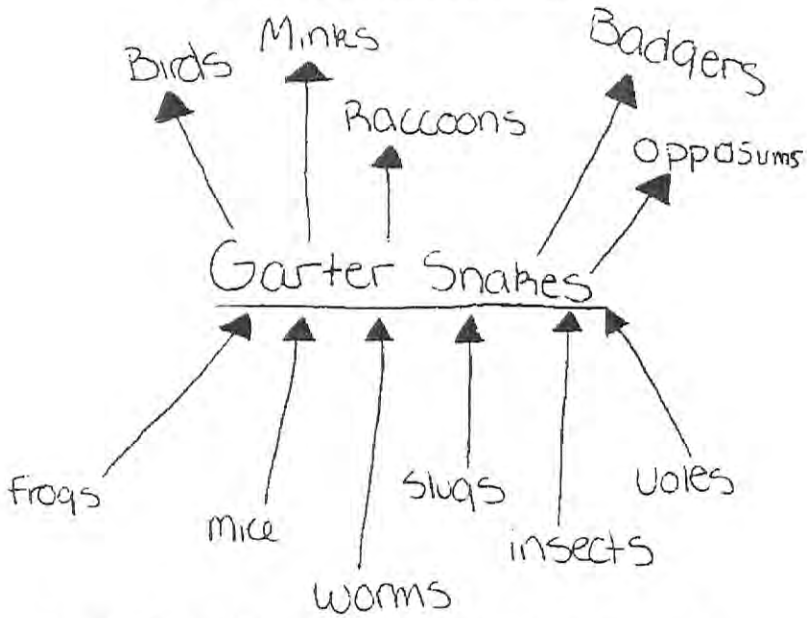
This sneaky garter snake lives around the vernal pool (sometimes), using it for a food resource and for a habitat that supports its needs for living. The garter snake lives around the **vernal pool** spring through fall. In the winter they **hibernate** in small dens in the ground that they make by themselves. They start migrating to these dens in late September. Throughout the winter this den is usually kept above freezing, letting the snake survive throughout the frigid winter. One requirement that this den must have is a water resource because garter snakes can not hold water for long. They need something in the winter weather to drink even in the winter weather.

Since garter snakes are vernal pool **facultative** species you might also find them in and around gardens, ponds, swamps, cities, parks, drain ditches, brooks, streams and marshes. You might even see one on your lawn! All of these places have a couple things in common that the garter snake needs. For example, all of the **habitats** have water and food sources. They also provide a safe environment for the snake to live. The **range** of the garter snake is Southern Canada to Central America, but they are most common in the United States.

Some things in its habitat and **ecosystem** that help it survive are the sunlight because they are **cold blooded** animals and they need warmth to stay alive. He also needs leaf litter. If the leaf litter wasn't there, neither would the food and most of the resources the snakes need. He has a small **niche** with a big impact. His niche is eating prey (small mammals; mice and rodents) and **reproducing**. So that all of the rest of the critters can find food and the vernal pool lives on.

GARTER SNAKE

Diet & Feeding Habits



- The Garter Snakes trophic level is a two or a secondary **consumer** because they are carnivores. (They eat meat).
- Garter snakes are **scavengers** so a lot of the food that they eat has previously been killed by another animal.
- Garter snakes hunt in an unusual way. They hunt with their tongue; which acts like our nose. So they can scent out their prey.
- When garter snakes swallow something they usually don't chew they just swallow there food whole. They do this by opening up their mouth really big.
- There is a lot of competition in the garter snakes world for food so garter snakes hunt most of the day.

Natural History

Have you ever heard of a snake that doesn't lay eggs? Well, now you have. Garter snakes are one of the few snakes that actually bear their young alive. They breed and find a mate in the early spring and then have a **gestation** period that is about 5 months long. When the time comes in late summer, they give birth to their children. Females can have anywhere from about 7 to 80 offspring, but in some peculiar cases the mother could have less then seven. For example, something could go wrong when she's pregnant or she could get sick.

There are a couple mating or **courtship** strategies that garter snakes have. One of them is called mating balls. Mating balls is when a hundred or more garter snakes come from far and wide traveling across a field or big piece of land and then, make themselves intertwined in a big mass and start writhing. One more is a strategy that the males perform to catch the female's attention. Believe it or not, the males mimic the females. This unusual behavior captures the female garters attention and earns the male a mate. Garter snakes reproduce through **internal fertilization.**

Garter snakes have an enormous **territory** if you look at their size. It is usually two acres big. They live in this territory pretty much until they die, unless it's impossible for them to find a mate, in which case they may move to a new area in order to survive. Their offspring will most likely stay in the same territory that they were born in.

Garter snakes have a few snakes that are very closely related to them. These snakes are the ribbon snakes, and all other types of snakes that are in its genus/ thamnophis. An easier way to think about it is that the snakes I just named are so closely related that they are like cousins to the garter snake. The garter snakes scientific name (thamnophis sirtalis) means something like garter serpent. As you can see the garter snake is one special snake!

Great Blue Heron

(Ardea herodias)

Why the Great Bue Heron's Beak Changes Color

Long, long ago in the great swamps there lived a beautiful great blue heron named Herrietta. She one day was asked by her great-great-grandchildren why their beaks were only orange during the period of mating season, and She told this story:

When I had just changed feathers and started to fly it was known to everybody that I had the brightest orange beak in all the swamps. Everyday I used to fly over the sky showing my beak off and bragging about its bright color.

Mr. Sun kept thinking of ways to get rid of me and then one day he did finally get rid of me. You know, as well as I, that we eat fish and Mr. Sun accused me of murder.

He said I was hunting too many of the fish. In other words I was killing them for pleasure.

Now then, where was I, yes I was killing them for pleasure, instead of survival. So I was banned from the great swamps never to return. Then something terrible happened here. The fish became over populated.

Everyone started blaming Mr. Sun for the over populated fish and they all agreed to let me come back on one condition no more bragging.

Well with such a beautiful beak it was very difficult: some of the creatures at the vernal pool would try and trick me into bragging. They would tell me how gorgeous I looked and how much my beak glittered in the sunlight. It was not to brag but I did not want anything terrible to happen again.

Then it slipped. The one thing I never wanted to do again happened. A nasty fox was telling we how beautiful my beak was and I said, "I know it is the most bright beak in all the swamps" at that moment I realized what I had done. I had forgotten the promise I made with the sun. Mr. Sun was furious but he said something unusual to me. He said, "Herrietta, I am in a good mood right now because my job lighting the sky is almost over so I will give you one last chance to redeem yourself." I was thrilled

I was never manipulated to brag again and I always thought before I spoke. One day around mating season when we were checking out guys some cute guys were fighting over who gets me to be their wife. I said, "Why are you fighting over me is it because of my glorious orange beak." They replied "yes" as the sun started to boom, "Herrietta I gave you three chances to prove yourself worthy but you have lost them all. Since we cannot banish you, I will make yours and every other great blue heron's beak male or female an ugly dull yellow until mating season. During that time it will return to a bright orange." I was extremely sad after that incident but people seemed to like me better. So I humbled myself and then became very wise.

GREAT BLUE HERON

Physical Description

Have you ever tried to be really quiet but failed because your breathing gave you away? Well if your survival depended on stalking, you probably would not make it. The great blue heron has to be able to be that quiet, otherwise it would starve!

Before it becomes a mighty hunter the great blue heron has to go through a lot of changes. Just like when we are growing up and our bodies' changes, so does a heron's. First it starts out as just an egg for about 3 to 4 weeks then it hatches into a beautiful baby bird covered in **down** feathers. As it grows older the great blue heron looses its **down** to grow its regular blue and gray feathers.

Imagine having a long neck, and relaxing meant holding it in the shape of an "S". Ouch! This odd fact a very important **adaptation**, the heron's long neck makes it so it does not have to move its leg while hunting and scare fish away. It stands extremely still only to suddenly, pluck a fish out of the water. You might also be wondering why it has such long legs. The answer to that question is that since they stand in shallow water all the time their feathers would get wet then they would not be able to fly. The heron, like all birds, is **warm blooded**. This adaptation keeps it warm even when a cool spring breeze comes blowing through its hunting grounds.

The great blue heron is a **vertabrate** and has some relatives it can easily be confused with. Have no fear these are important features to look for. First, the great blue heron is a huge bird; a remarkable three to four feet tall from head to tail. The outstanding wingspan is nearly six feet long. The heron usually lives by itself so if you see two; you probably have the wrong kind of bird. They have gray blue feathers, a curved neck, long legs, and a dull, yellowish, sharp, pointed beak. Above the eyes there are two black plumes. Their thighs are a reddish brown. Both male and female look alike except for their internal reproductive organs. The great blue heron is one of the most treasured sights in all of New England. To look for it would be worth your while. I have seen one. Have you?

Habitat

The great blue heron is a beautiful bird that lives near fresh water, specifically places like vernal pools, rivers, and swamps. Herons only use vernal pools for eating animals like snakes bugs and other small critters. They have to go elsewhere to find fish because a vernal pool cannot support year round animals. The heron is neither an obligate nor a facultative species of the vernal pool. Actually, great blue herons do not even really need vernal pool, but the "puddle" does offer a great resting spot, maybe a snack like a garter snake or gray tree frog and a nice sip of clean drinking water.

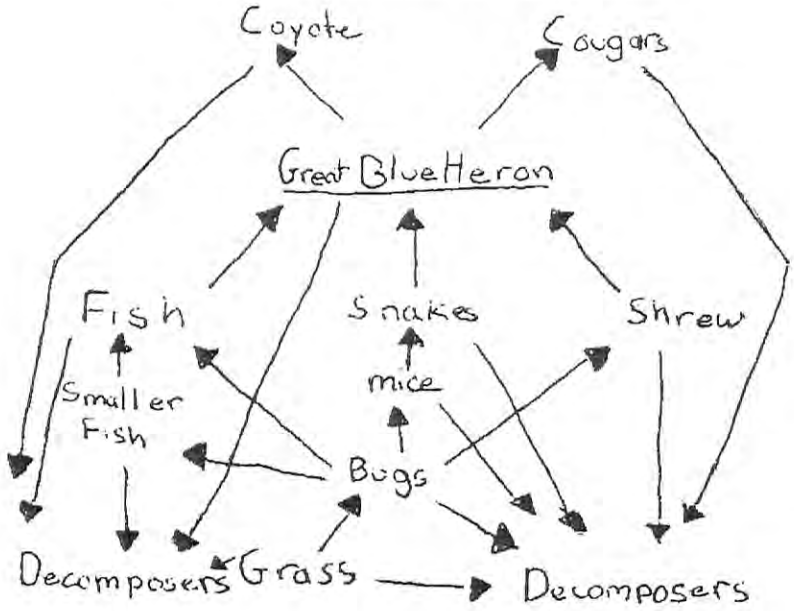
A smooth running ecosystem is made up of **biotic** and **abiotic factors**. To find out about the heron's **biotic** surroundings we look at all the living things. For example, their prey (frogs), predator (coyotes), and trees are all considered **biotic**. If we looked at all the non-living things, or **abiotic factors**, we would see dirt, water, sunlight, and mud. All of these surroundings make up the beautiful bird's habitat. You might be wondering why these are needed. They are there because with out them the bird's species would not be able to sustain life.

If we followed it home we would see its nest way up high in a tree. It is about three feet in diameter. Do you want to know the most amazing fact of all? She lives in North America. Of course during the winter many birds go down south to warmer **climates**. The great blue heron likes warm wet areas and can be found in our area typically in spring, summer, and early fall. She lives in these areas because her food is mostly creatures that live by water.

What is your **niche** or "way of life"? The great blue heron is predator because it has to hunt to survive. Are you awake during the day? This means you are **diurnal**. Guess what else is **diurnal**? Yup, you guessed it, the great blue heron; who stays awake during the day just like us.

GREAT BLUE HERON

Diet & Feeding Habits



The great blue heron…

- is a 3rd level consumer. They eat consumers that eat others that eat producers.
- hunts by plucking fish out of the water with its sharp pointed beak
- is a carnivore
- is a predator to fish snakes and shrews, coyotes eat herons
- eats other things that live around water.

Natural History

Great blue heron eggs are a beautiful faded blue. Heron are born from **amniotic** eggs fertilized by **internal fertilization**. The eggs are then laid in a nest and typically incubate for 3 to 4 weeks. The heron usually lays 3 to 6 eggs. The male and female take turns incubating the eggs. This is the only time the heron has contact with its young. This makes them "k-selected" species meaning these birds are good parents. Like humans, they take care of their babies until they mature and can take care of themselves.

To answer the question of what is inside the egg we would first have you travel through microscopic pores of the shell. Next, you might think you are in a cushion and you are partly right. You would be in the air sack in which gives the **embryo** oxygen and a cushion when it drops from its mother. If you have ever cracked a chicken egg you know about all that clear gooey stuff. That is called the **albumen** or the egg white. It provides the **embryo** with water and protein. I am sure you are wondering what the yolk does. There are two parts to the actual **yolk** which provide nutritious food for the **embryo**, and the **allantois** which stores waste and takes in oxygen for the **embryo** from the air space and pores.

Herons go through very few changes as they get older, but they do go through some change as they mature. After a heron hatches from its egg, it looks a little wet. Eventually it dries out and reveals its **down** feather. When they are at this young stage, before they can hunt, the babies are fed from their parents by **regurgitation**. Gross! As they grow up to look more like their parents they molt and grow **contour feathers**. When they become more mature, the birds will reproduce. The great blue heron's dull yellowish beak turns into a bright orange to be much more attractive. This color is just how some people put on make up. The Native Americans were amazing stalkers and they learned it from watching the heron's walking movements. A great blue heron hunts by stealthily lifting one leg and very gracefully and slowly setting it down. They repeat this action over again until they reach their destination. The Indians copied this action, enabling them to come closer to animals. Another cool fact about them is that they fly around with rocks in their stomachs. This way they can grind their food in their gizzard because they do not have teeth. Can you imagine that, purposely swallowing rocks to help you "chew" your food? Herons sure are unique.

Green Darner

(Anax junius)

How the Green Darner got Legs

This is a tale about a Green Darner named A.J., a frisky little dragonfly, who wanted nothing more than to have six legs. He could do anything with these legs, he thought. A.J. was so busy thinking about six marvelous legs that he absentmindedly flew into toad territory.

He was so caught up in his imagination that he did not notice Toad creeping up under him. SWISH! a toad tongue flew past his ear. A.J. was brought rudely back to reality. He whirled upon Toad and said "Brother Toad, why have you attacked me?" Toad replied, "Because you are food. A lesser life form, you do not even have legs. Not even the tiny legs of cousin mosquito, which we both hunt. You can not fly forever without being able to land, so, I will catch you, and eat you." A.J. became outraged, and attacked Toad, trying to take Toad by surprise. But Toad had anticipated this, and had sharpened six short grass stems, as a trap. A.J. was stuck on the sticks. He was angry at being tricked and so determined to escape that he pulled hard and ripped the stems out of the ground.

Eventually, the stems turned brown and flexible. As the stems aged they changed into part of his body and he was able to bend them inward into the shape of a basket. With his basket shaped legs he could catch small insects more easily, but still A.J. could not walk with them at all, only perch.

So A.J. had legs, but they were ugly things, not the pair he wanted. That is why all Green darners now have short brown legs. They now fly around everywhere, because they are still looking for those perfect legs.

GREEN DARNER

Physical Description

The Green darner is a **cold blooded** killer, rising from the bushes in the morning to exterminate another population of pesky bugs. Anax's four, five-inch wings beat with a buzz in unison, lifting the speedy killer into the morning air. His blue green colors shine in the morning sun as he zones in on his target, a small, young mosquito, just out of the water. The mosquito senses Anax coming, and puts on a series of miniature evasive maneuvers. They are in vain; the darner puts on a counter burst of speed, catching the mosquito in his basket of six legs. The hunter devours the mosquito with his **toothed jaw** while still remaining in mid air, a feat only some dragonflies can do. The Green Darner flies to the pond, looking for another meal, maybe even a damselfly. Anax spies one, but someone else has spotted it too, the American Toad. He sees it and veers off, as the toad could easily eat Anax.

The Green Darner is a **chordate**, which means it has a nerve cord running along its back. Even though the Green Darner has this nerve column, it is an **invertebrate**, which means that it has no spinal column to protect the nerve chord.

The only visible difference between the male and female is a small incisor on the tail of the female, which she uses to cut slits in **aquatic** plants where she lays her eggs. The main difference between the **larvae** and adults is the huge dissimilarity in body shape; the larvae have short streamlined bodies, with two small eyes and no wings, while the adult Green Darner has a longer body, two large eyes, and most importantly, wings. Another smaller difference is that the larvae are totally **aquatic**, only coming above water for their final molt. The Green Darner **nymphs** have a strange and interesting "attachment", a long triple jointed "clasper", with which it grabs its aquatic prey. The clasper acts as a table, napkin, and fork, for cleaning up the nymph's meal.

Habitat

The **niche** of Anax junius is usually near a clean pond, stream or vernal pool, where the Green Darner can mate, and feed on tiny insects that inhabit these places. Vernal pools are important to the Green darner because they provide a safe place to mate and lay their eggs. The vernal pools are safe because there are no fish in them, only bugs and frogs. Fish are a problem because they eat dragonfly larvae.

Anax junius's habitat's **abiotic** factors are: dirt, water, oxygen, and sunlight. The **biotic factors** are: birds, plants, bugs, and frogs. Without these, the Anax junius would not be able to survive. This is because abiotic factors mean non-living, the Green Darner needs dirt, water, oxygen, and sunlight to live. The Green Darner needs these things to live because they are the foundations of life. Biotic factors are the living parts of its **environment**, and while the Green darner could probably live happily without frogs and birds (predators), it would die off VERY fast without plants for shelter and bugs for food.

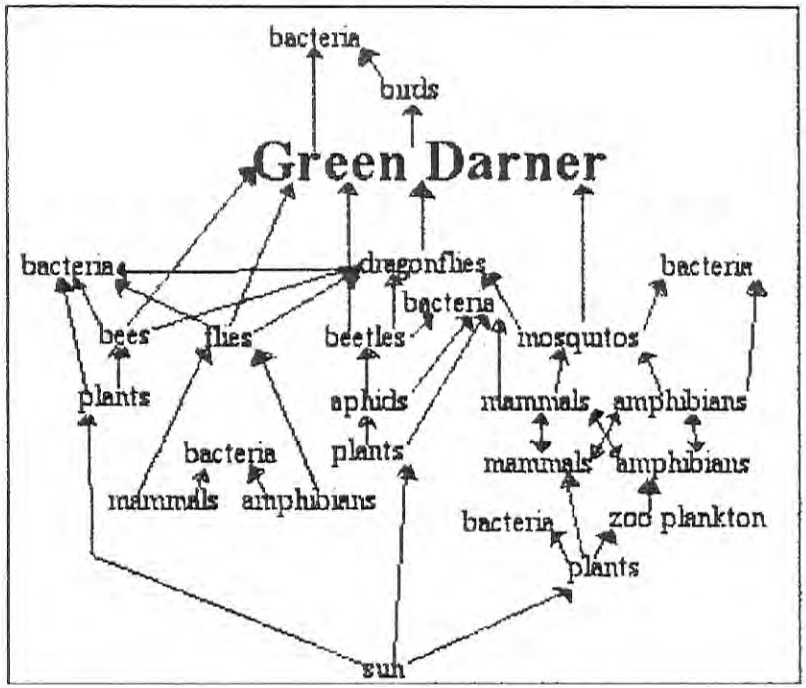
The range of the Green Darner is Southern and Northern climates; they live everywhere in North America. Green Darners regularly use vernal pools for breeding because there are no fish to eat their young when they are in the nymph stages, which can last up to five years. When living in a vernal pool, the larval stage usually lasts for a few months instead of years, it mostly depends on the water temperature, and how quickly the pool will dry up over the year.

Anax junius is usually active from sun up to sun down, depending on the air temperature. They have undergone their final molt by June, this is most likely why they are called "The King of June", a literal translation from Anax Junius.

The habitat of the Green darner's larvae is only different in a few ways from the adult Green darners; the differences between the habitats are that in the larval stage they are in water, not air, and that they can be eaten by other bugs in the larval stages.

GREEN DARNER

Diet & Feeding Habits



- This animal is **Heterotrophic**.
- This animal is a carnivore, because it only eats "bugs".
- The Green Darners larval diet is aquatic bugs, in the adult stage they only eat flying insects.
- Their diet mainly consists of: mosquitoes, bees, damselflies, other dragonflies, and beetles.
- The Green Darner catches its prey, instead of trapping it, trapping is usually done with a web or a trap door. catching is usually done with the legs or mouth.
- The Green Darner catches its prey with its six legs in the adult stage, in the larval stage it uses its labium.
- The way the Green Darner catches it prey with its six legs is by forming a basket out of them and then overtaking the insect and catching it in its basket of legs.
- The Green Darners main predators are birds, and eventually bacteria.

Natural History

Slowly two Green darners connected in a heart-shaped loop, buzz down through the leaves to a plant growing in a swamp, they settle on the plant, and the female lays her eggs underwater in the plant's stem. The Green darner reproduces using **sexual reproduction** which is **internal fertilization**. In three weeks the eggs will hatch, and the Green Darner's **nymphs** begin their life. These immature darners use **metamorphosis** to grow. The Green Darner grows in **molts**, which doubles their size each time. In each molt, they grow larger, and their wings become slightly more defined, only in the final molt will the Green Darner really look like a dragonfly. The Green Darner by pumping water or air into its **abdomen** and splitting open their skin with the pressure of the water or air. Then they crawl out of their old skin with their new legs.

The reason these Dragonflies are called Anax Junius is because their name broken down into Latin is: June King, or, the King of June. This is because they emerge as adults around June.

A common myth is that dragonflies can hurt you. Another myth is that dragonflies are descendant from dragons, neither of these myths being true. The reason for the first myth is most likely because the tails resemble darning needles, which can hurt. The second myth is most likely from medieval times, when dragons were rumored to be about. These flashing insects probably resembled the dragons in the stories, and therefore were named "dragonflies."

GLOSSARY

Abiotic factors: Non-living factors in an ecosystem.

Adapted: A state of being that allows an organism to live in its environment.

Albubem: Clear part of the which provides the embryo with water and protein.

Allantois: Part of the yellow part of the egg that stores wasteand gives oxygen.

Aquatic: Of/in water.

Arthropod: An invertebrate with a segmented body, jointed appendages, and usually a shell.

Biotic factors Living variables to the ecosystem.

Brackish: Slightly salty.

Buoyancy: The ability to float.

Camouflauge: Colors to further help protection from predators.

Carnivore: An animal that only eats other animals.

Cilia Minute hairlike "sensers" located on a creatures gills that catch food particles and send them to the mouth to be digested.

Climate: The typical weather pattern in an area over a long period of time.

Cold-blooded: An organism that is the same temperature as its environment.

Complete metamorphosis: A type of metamorphosis with four dramatically different stages: Egg, larva, pupa, and adult.

Consumer: An animal that gets its energy by feeding on other organisms.

Contour feathers: A bird's adult feathers that grow in after the down. A contour feather is a large feather that makes up the main shape of a bird and extends to the tip of its wing.

Diffusion: How molecules move from a place where there's less to where there's more.

Diurnal: Active in the day time.

Ecosystem : The combination of a community of organisms and its environment functioning as an ecological unit.

Embryo: An unborn animal inside an egg.

Endemic: Restricted or peculiar to a locality or region.

External fertilization: Sperm and egg joining outside of the female.

Family: One of the seven levels of taxonomy, which is placing organisms into groups split up by similar features. The levels of taxonomy, biggest to smallest, are Kingdom, Phylum, Class, Order, Family, Genus, and Species.

Food chain: A series of events in which one organism eats another.

Food web: All the overlapping food chains in one ecosystem.

Gestation period: The time between fertilization and birth.

Gradual metamorphosis: A type of metamorphosis where the egg hatches into the nymph stage that look a lot like an adult.

GLOSSARY

Guard hair:	The long, usually stiff outer hair that covers the underfur.
Habitat:	The natural environment of an organism. Where it lives.
Herbivore	An animal that only eats plants.
Incubation	The time between fertilization and hatching of an egg.
Internal fertilization:	Sperm and egg joining inside the female.
Invertebrate	Not vertebrate; without a backbone.
Larva	A juvenile form of animal that undergoes metamorphosis (for example, insects or amphibians). The larva can look completely different from the adult form.
Lifecycle	The various stages through which a living thing passes as it grows and develops
Mantle:	The organ in a snail that builds the shell.
Metamorphosis:	A process in which an animal's body changes dramatically in shape.
Migrate:	When birds fly south when the weather gets too cold and they can no longer find food.
Niche:	An organisms particular role in an eco system or how it makes its living.
Nocturnal:	Only active at night.
Nymph:	A young form of an animal that resembles the adult.
Omnivores:	An animal that eats both animals and plants.
Palps:	Appendages used for sensing the surrounding environment. Antennae are one form of palps.
Parasite:	An organism that lives by harming another.
Placental mammal:	A mammal that develops inside its mother until it can function on its own.
Population:	All the members of one species in a particular area.
Poults:	Baby turkeys.
Predator:	An organism that kills and eats its prey.
Prey:	An organism that is eaten by a predator.
Producers:	Organisms that use the suns rays to make their food. Mainly plants.
Pupa:	An intemediate stage of metamorphasis of insects between larva and adult, insects are usually enclosed in a chrysalis or cocoon as they transform from their larval stage to their adult stage.
Radula:	Teeth in the back of the snails mouth that helps "chew" the food.
Range:	The geographic area(s) of where a species can be found.
Regurgitation:	Bringing food that has been swallowed back up out of the stomach in other words throwing up food.
Respiratory pore:	The hole near a snail's shell, which they breath through.
Scavenger:	An animal that eats already dead bodies.
Sexual reproduction:	Reproductive process in which two organisms create young by the joining of two sex cells.

GLOSSARY

Stridulate: To make a chirping sound, like a cricket.

Tarsi: Huge segmented night-vision eyes.

Temperate: Mild climate; the climate that extends from between the tropic of cancer and the arctic circle to between the tropic of capricorn and the antarctic circle.

Territories: Areas controlled by an individual.

Underfur: The fine, soft and thick coat that is covered by the guard hair.

Vertebrate: An organism with a backbone.

Warm blooded: A animal that can regulate it's own body temperature.

Wattle: Fleshy part on a turkeys' neck.

Weaned: When a kit does not need to breast feed from their mother's milk anymore.

Yolk: Yellow part of the egg that gives the embryo nutrious foods.