

Salamanders of Anderson County, TN

There are at least 17 different salamander species in Anderson County, and depending on future availability of healthy habitats, more kinds may be discovered. The salamanders in this guide are classified into one of four families. Twelve of the species in our county, like the Green and Northern Red Salamander below, belong to the lungless family. Although this is a highly diverse family, they share certain characteristics— example, all species “breathe” mainly through their skin as adults. We hope readers will be excited by our local salamander diversity. They are beautiful and interesting critters and dedicated efforts are needed to safeguard their favorable habitats. By developing your identification skills you can help protect salamanders in our area. Resources for learning more about these fascinating amphibians are listed on page 11.



Green Salamander



Northern Red Salamander



Many salamanders require clean, cool streams which have rich layers of vegetation along the banks. The plants help keep sediment—our number one water pollutant—from entering the stream. Tiny dirt particles (silt) in water runoff clog the gills of larvae and cover over their food sources. Heather, a CRESO research student, is studying the diversity of salamanders found in an Anderson County stream.



The “mustached” Northern Red will alert you to fun facts and conservation concerns about salamanders.



Kids and Salamanders

We—editors JB and KF—introduced our kids to salamanders early in life. I (JB) gave my two boys rubber models of a Green and Red Salamander. Interestingly, they only referred to them by their scientific names, *Aneides aeneus* and *Pseudotriton ruber*. I remember their ecstatic faces when they rolled a log to discover a real red salamander as we all yelled “*Pseudotriton ruber!*” I was sure they were on their way to becoming herpetologists—scientists who study amphibians and reptiles. They are now grown and one is a mathematician while the other is a musician. At present, KF’s kids faithfully look for salamanders (below), but it is doubtful this behavior is a predictor of their future. The important point is kids find joy and wonder in exploring and discovering! Having opportunities to experience the mostly secret world of salamanders fuels curiosity which leads to new discoveries. As classroom teachers, we quickly learned that curiosity and questions are the elixirs of personal growth—a lesson we fear is often overlooked in many of today’s test driven classrooms. Although this ID guide is written for all ages, we are especially hopeful parents and grandparents will spend time outside with their budding herpetologist, fireman, artist, accountant, etc. searching for salamanders and other critters. Your kid’s future is a mystery, but we are confident they will be as thrilled as ours were when they come face to face with their first salamander—you might feel a little jubilant as well.



Ethics of Discovering Salamanders

Each species account offers habitat information on where different kinds of salamanders are likely to be found, but it is not necessary to plan special salamander outings. A relaxing walk in the woods or a visit to a nearby stream is a perfect time to turn a few logs or rocks and discover hidden treasures. But remember, each rock or log you turn is a potential “home invasion”! Please be respectful by limiting the number of homes you invade and carefully replace each log or rock back to its original position. Always inspect the ground around an object before rolling or lifting it. Stand behind the object and turn it toward you. Two kinds of venomous snakes (see Snakes of Anderson County, TN) occur in our area and while odds of encountering one are small, it is possible. Salamander skin, unlike scaly lizard skin, is moist and slippery. Most salamanders transport significant amounts of carbon dioxide and oxygen through their skin which must be wet for proper gas exchange. Holding them for more than a few seconds will cause stress by drying their skin which results in reduced oxygen uptake and removal of carbon dioxide. Instead, we suggest you coax the salamander into a clean zip-lock bag containing a wet paper towel. This will allow for close inspection and less stress on your captive. Never keep a salamander for more than a few minutes and always use a new bag for each capture. After your observations, replace the log or rock and allow the salamander to crawl back under it.



Lungless Salamander Family– The Most Diverse Group of Salamanders

True to their name, all species in this family lack lungs and exchange oxygen and carbon dioxide through capillaries in the skin and membranes of the mouth as adults. Another unifying feature is the nasolabial grooves. The grooves run from the nose to the lip (circled area) and help transport “informational” molecules from surroundings to the nostrils. Notice the row of white teeth in the photo on the right. These salamanders rarely bite, but individuals of a few species may defend themselves by biting when handled. The teeth are too small to present any danger. The gilled larval stage of most lungless species actually takes place inside the egg and the young hatch as tiny salamanders without gills. Thus they can lay eggs in moist places on land without returning to water. But nine of the lungless species in our area, as you will learn, require water for their gilled larvae.



Dusky Salamanders—Very Challenging to Identify

There are two documented species—Northern Dusky and Seal Salamander—in Anderson County. Three other Dusky species have been found nearby. A good identification marking for all Dusky Salamanders is the light line from the back of the eye to the back of the jaw (circled area). Here we highlight the Northern Dusky which is still a fairly common inhabitant of clean streams and seeps in our area. Adult color and pattern are highly variable, ranging from gray to brown body color with spots or an uneven stripe down the back. Their color and pattern darken with age. Markings on the base of the tail are lighter in color (see arrow below). Females lay 10 to 30 eggs in cavities along stream edges and stay with the eggs until they hatch. Removing adults from a population is especially damaging because of the small number of eggs laid. The Dusky species in our area inhabit streams and their larvae have white gills. Other members of this group which may occur in our county are listed on page 11. *The Amphibians of Tennessee* (see resources on page 11) is a great book for improving your Dusky identification skills.



The Northern Dusky on the left is under water where its body color matches the background. Notice how different the color pattern of this individual is from the one above. Identifying the species of an individual Dusky may require DNA analysis, but the light line behind the eye tells you it is some kind of Dusky.

Dusky Salamanders are often referred to as “spring lizards,” and were once common in our local streams. But over time, fish bait collectors, shoddy development practices, road run-off, and dumping resulting in stream contamination have degraded habitats and markedly reduced their numbers. Mountain-top removal mining destroyed countless salamander populations in our area.





Brook Salamanders: Two-lined, Long-tailed, and Cave Salamander

The adult Southern Two-lined Salamander is identified by the yellow color and dark spots on the back which are bordered by a dark line running down each side. The belly is solid yellow. They are found in streams year round, but a large percent may exit the water during the course of the summer and reside in nearby woodland habitats. They migrate back to streams in the winter months. When driving back roads on rainy winter nights we feel duty bound to slow down and look for individuals crossing the road. We often find females containing eggs and under safe traffic conditions will spend much time moving salamanders off the road. Females lay 15 to 100 eggs on the underside of rocks in streams and stay with them until they hatch which may take up to two months. How many eggs did this female lay? The Long-tailed and Cave Salamanders below are seemingly rare in our area, though not in other parts of the state. Being able to identify them is crucial for documenting their populations. Long-tailed Salamanders occur along stream margins in forested areas. Cave Salamanders favor the twilight zones of caves which are delicate environments and should not be disturbed without good cause. To distinguish the two species look at the tail markings. The Long-tailed has dark bars along the tail (see arrow below), while the Cave has scattered spots on the tail. Both species require clean underground water and brooks in which to lay eggs. Unlike the Two-lined Salamander, females of these two species lay eggs singly or in small clusters and do not remain with them. Specific areas in Anderson County where the Long-tailed and Cave occur need to be identified and protected!



Southern Two-lined



Long-tailed Salamander



Cave Salamander



Mud, Red, and Spring Salamanders—A Stunning Group of Amphibians

Mud Salamanders are challenging to find and very few have been documented in Anderson County. Look for adults in leafy, soggy, seeps adjacent to small streams. Developers and land owners are encouraged to be respectful of these habitats and keep disturbance to a minimum—seeps are precious salamander real estate! The larvae of Northern Red Salamanders are found in cool, clean streams, but the adults venture away from water. They can be found under rocks and logs in forested areas and along woodland edges. Several features distinguish the two species. Mud salamanders have fewer and better defined black spots – observe how the spots are separated on the Mud and run together on the Red. The Mud’s eyes are darker and bulge less than the Red’s, which also have a hint of gold in the irises. Body color darkens with age, especially in the Red. Both species have mildly toxic protective skin.



Mud

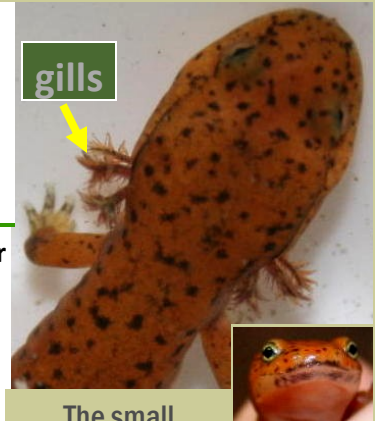
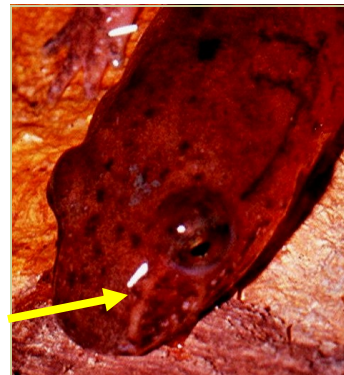
Northern Red



Spring Salamander

chevrons

Spring Salamanders have salmon to pink body color with traces of black streaks or spots. They often have a reticulated pattern (chevrons) on the back. Look for a white to yellowish line which runs from the front of the eye to the nostril (see arrow below). This line is absent on the Mud and Red. Their habitat includes streams, associated seeps and springs, and caves. Spring Salamanders, like Northern Reds, will move over land to feed, especially on rainy nights. The three species on this page lay from 30 to more than 100 eggs. The eggs hatch into aquatic larvae which may require several years to mature into adults. Prey includes insects and spiders, but they also dine on smaller salamanders as well.



gills

The small, feathery gills on the Northern Red larva above extract oxygen from the water thus allowing the salamander to “breathe.” Some land owners in our area clear cut the vegetation along stream banks or allow livestock into “their” streams. These actions result in erosion and stream contamination from animal waste. Silt from the erosion impairs gill function and combined with animal waste, degrades water quality for all aquatic life.



Four-toed Salamander—Requires Seasonal Wetlands for Reproduction

Most salamanders have four toes on the front feet and five on the back. The Four-toed has four toes on all four feet. Other features include a creamy white belly with large black spots (yellow arrow) and a distinct constricted area at the base of the tail (orange arrow). Glands in the tail release distasteful chemicals when the salamander is attacked. The tail may also break off at the constricted point. The wiggling tail hopefully attracts the attention of the predator while the salamander escapes. The Four-toed, like several other species in this guide, is dependent on seasonal wetlands for successful reproduction. Seasonal wetlands often undergo dry periods in late summer which eliminates fish and other predators that would feed on salamander eggs and larvae. Females move from their forest habitat to seasonal pools in late winter. They lay up to 80 eggs under moss or bark around the edge of the pool. Several females may deposit eggs together in collective clusters of more than 1,000 eggs.



Green Salamander—Marvelously Adapted for Living in Rock Crevices



Green Salamander colors are a black and green mosaic which resemble the lichens on rock faces or tree bark where these skilled climbers are found. The large feet and squarish toe tips increase surface contact for climbing. The flattened head and body are adaptations

for hiding in dark rock crevices which makes them a challenge to see. A flashlight helps reveal their presence, but we discourage dislodging them for fear of injuring their legs or toes. Reproduction (10-25 eggs) is on land and hatchlings are small versions of the adults. Protecting rock outcrops is a priority for sustaining populations. A friend shared a fascinating story about Green Salamanders. In the fall when moving his 10 to 12 orchids from outside into warmer indoor conditions he discovered Green Salamanders in the plastic pots. Over a 10-year span of caring for orchids he found a total of 20 adult salamanders. The pots were actually located on a deck which means the salamanders had to climb a six foot brick wall in order to find them. Over the years we have had fun speculating on why the pots are used as refuges. Our best guess is Green Salamanders feeding on misty nights would have no problem scaling a brick “cliffside” and discovering the pre-packaged “orchard bark” in the pots. The bark pieces provide good hiding places and suitable moisture conditions. Arthropods in the bark may also serve as a food bonus. Potential for gaining insight into Green Salamander populations using microhabitat arrays of orchid pots is appealing. How might you design this experiment? The Green Salamander above was photographed after being discovered in an orchid pot.



Northern Slimy and Zigzag Salamanders—True Woodland Species



Slimy

The Slimy is a fully terrestrial species identified by its black color with a liberal sprinkling of white spots. The belly is a solid dark gray. As noted on page three, most lungless species do not need to return to water to lay eggs. Slimy females lay 10 to 30 eggs in underground cavities or rotting logs and stay with them until hatching. The young go through the larval stage inside the egg and hatch out as mini salamanders without gills. Slimy Salamanders secrete a sticky mucus which has an anti-predator function. The species part of the scientific name, *glutinosus*, is Latin for “full of glue.” For those curious individuals wanting the “slimy” experience, the secretions are not toxic, but expect to have gooey hands for awhile. Be sure to read the “Slimy And The Garter Snake” on the right.

Zigzag Salamanders usually have one of two patterns—a wavy stripe down the back or those without a stripe. Although we have observed individuals with hints of a stripe, we have never seen the clearly striped form in our area. The dark gray form, having some brown or red down the middle of the back and sprinkled with white flecks, is typical of the color and pattern of Zigzag Salamanders in Anderson County. But we still hold out hope of finding one with a well-defined stripe. Zigzags reside under rocks and logs in forested areas. They are active from fall to spring, but retreat underground during the warmer, drier weather of summer. Females lay 1 to 10 eggs in caves and likely use other types of underground cavities. As with the Slimy, there is no aquatic larvae stage and the young hatch looking like tiny adults. Forest clearing has a grim impact on woodland salamanders like the Slimy and Zigzag. Protecting moist ravines and preserving broad buffer zones can help reduce mortality.



Zigzag



The Slimy And The Garter Snake

We were out walking during a light rain when we spied a Slimy Salamander next to the trail. Suddenly, an ecstatic 7th grader in our group shouted “there’s a snake.” Sure enough, a Garter Snake and a Slimy Salamander were about to meet head on. We all lay on our bellies in the wet leaves to watch the drama unfold. As seen from the inset above, the snake proceeded to eat the slimy tail first. The close-up photo above reveals that it may not have been a “happy meal.” The eye of the snake is “slimed” and the mouth is “full of glue.”



Mole Salamander Family—Have Lungs & Use Wetlands For Breeding

Marbled Salamander—Mate on Land Instead of in the Water



Larva



Adult

As the family name suggests, mole salamanders spend most of their time in small mammal burrows and root tunnels. Discovering one of the three species of mole salamanders found in our area is a special treat. Knowing when they move to breeding sites will increase your odds of seeing one. Adult Marbled Salamanders migrate to breeding sites during fall rains. Unlike other members of this family, they mate on land instead of in the water. Females lay 40 to 200 eggs in low areas around dry to partially filled wetlands which will be flooded by winter rains. They usually remain with the eggs and can be found under logs or in leaf material at the edge of the pool before the water rises. If you discover a Marbled breeding pool we stress the importance of future protection of the site. Adults of this species are black and usually have white cross-bands down the back. Notice the bushy gills on the larvae above. Wetland pools are normally lower in oxygen than streams, thus requiring larger gills for oxygen uptake. The persistent filling of floodplain pools in our area shrinks breeding habitat for Marbled salamanders.

Tiger Salamander—Please Report Any Known Locations



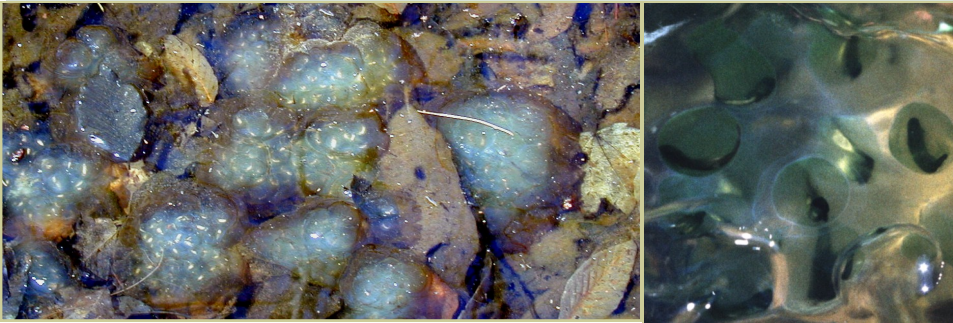
Rare in Anderson County

Tiger Salamanders are rarely observed in our county and more information on their status is needed. These are especially large, plump salamanders that may grow up to a foot long! The body color is variable—ranging from yellowish brown to a much darker background color. The number and shapes of the dark spots are variable, but the large head and body length are good identification clues. Look for Tiger Salamanders around ponds during winter rain episodes starting in late December. They have actually been observed mating in wetland pools having ice on the surface. Because of the rarity of sightings of this species in Anderson County, we encourage you to report any known Tiger Salamander locations. Please use the CRESO website on page 11.



Spotted Salamander—Look for Their Large Jelly Egg Masses in Late February

Like the other two species of Mole Salamanders in our area, the Spotted Salamander depends on fish-free seasonal pools and adjacent forest habitats for survival. The large adult size (9 inches), black body, and yellow to orange spots make them easy to identify. In our area they migrate on rainy nights from their forest refuge to nearby wetlands in mid to late February. If you fail to spot adults around the wetland edge, look for their softball-sized egg masses attached to the ends of branches in the water or deposited in leafy shallow areas—positive evidence they have been there. Each mass may contain over 200 eggs. Some egg masses take on a greenish color resulting from a symbiotic alga which provides the developing embryos with oxygen. The algae may benefit from the nitrogen waste given off by the embryos. All three species of Mole Salamanders in our area are on the decline because of deforestation and loss of wetlands.



The clear egg masses on the far left show no algae growth. The near egg mass has obvious algal growth which helps provide oxygen to the embryos.

Newt Salamander Family—Have A Unique Life Cycle



Red Eft displaying unken reflex



Male Red-Spotted Newt

The Eastern Red-Spotted Newt is the only member of the newt family in our area. Unlike many salamanders which have an egg > aquatic larva > adult life cycle, the Red-Spotted Newt goes from egg > aquatic larva > red eft > aquatic adult. Red efts spend several years on land and often fully expose themselves by walking in open wooded areas. Their skin is rough and they resemble little red “lizards,” but unlike lizards, they have no body scales or claws on their feet. When efts return to water they undergo an amazing transformation as seen in the above photo.

Their color goes from bright red-orange to olive green. The tail of breeding males becomes paddle shaped for efficient swimming and courtship. Newt skin contains a neurotoxin which is nearly identical to the deadly poison found in pufferfish. Bright warning colors, sometimes combined with an unusual display known as the “unken reflex” (see red eft above), inform potential predators of newt toxicity. An unken reflex is characterized by a U-shaped posture with the tail and chin lifted high into the air. This exaggerated pose may better signal danger to an offending predator. It is okay to hold newts. The toxin does not harm skin, but avoid touching your eyes or mouth before washing your hands. Newts are commonly found in ponds and wetlands.



Hellbender Family—Can Grow Over Two Feet in Length!

Eastern Hellbenders live in clean rivers and large rocky streams. Having the privilege of seeing one of these giant salamanders in the wild is a truly memorable experience. As shown by the photo below, they are wonderfully adapted for hiding under and around rocks. The large size, broad flattened head, paddle-shaped tail, and wrinkled folds on the sides of the body make for easy identification. Their fleshy skin folds on the sides likely help with oxygen uptake. They are “snot” slick and have teeth sharp enough to break the skin, and may bite when handled. Hellbenders have external gills as larvae, but the gills become hidden under the skin as adults. The male makes a depression under a rock where the female lays 200 plus eggs. Unlike most salamanders, the eggs are fertilized by the male after being deposited. The male guards the eggs until they hatch. Unfortunately, Hellbenders have been bombarded with habitat insults ranging from impounding rivers to shameful water quality conditions. This pollution sensitive species is endlessly faced with a vile mixture of cigarette butts, pesticides, car motor products, etc. These toxins are flushed into storm water systems which carry them into our streams during rain events. There is a pressing need for an improved educational curriculum which stresses quality land-use and water management techniques. See EPA website “Stop Pointless Pollution” for ways to help.





Salamanders of Anderson County, TN—Species List and Resources

Salamanders documented in Anderson County

Family Plethodontidae (Lungless Salamanders)

- Northern Dusky Salamander (*Desmognathus fuscus*)
- Seal Salamander (*Desmognathus monticola*)
- Southern Two-lined Salamander (*Eurycea cirrigera*)
- Cave Salamander (*Eurycea lucifuga*)
- Long-tailed Salamander (*Eurycea longicauda*)
- Mud Salamander (*Pseudotriton montanus*)
- Red Salamander (*Pseudotriton ruber*)
- Spring Salamander (*Gyrinophilus porphyriticus*)
- Four-toed Salamander (*Hemidactylium scutatum*)
- Green Salamander (*Aneides aeneus*)
- Northern Slimy Salamander (*Plethodon glutinosus*)
- Zigzag Salamander (*Plethodon dorsalis/ventralis*)

Family Ambystomidae (Mole Salamanders)

- Marbled Salamander (*Ambystoma opacum*)
- Tiger Salamander (*Ambystoma tigrinum*)
- Spotted Salamander (*Ambystoma maculatum*)

Family Salamandridae (Newts)

- Eastern Red-Spotted Newt (*Notophthalmus viridescens*)

Family Cryptobranchidae (Giant Salamanders)

- Eastern Hellbender (*Cryptobranchus alleganiensis*)

Salamanders Likely Occurring in Anderson County

(but have yet to be documented)

Family Plethodontidae (Lungless Salamanders)

- Spotted Dusky Salamander (*Desmognathus conanti*)
- Black Mountain Dusky Salamander (*Desmognathus welteri*)
- Allegheny Mt. Dusky Salamander (*Desmognathus ochrophaeus*)

Family Proteidae (Waterdogs and Mudpuppies)

- Common Mudpuppy (*Necturus maculosus*)

Scientific and common names primarily follow Crother (2008.)

Resources for Learning more about Salamanders in Tennessee

- TWRA <http://www.tn.gov/twra/tamp/salamanders.shtml>
- Frog Haven Farm www.froghavenfarm.com
- Atlas of Amphibians in Tennessee www.apsu.edu/amatlas
- CRESO www.cresosnake.com



B. Reed

Salamander enthusiasts will want to acquire copies of the three books listed below.

- *The Amphibians of Tennessee* by M. Niemiller and R. Reynolds (2011). This comprehensive work is complimented with “Field Notes” which reveal the fun and excitement of discovery by the authors.
- *Salamanders of the Southeast* by J. Mitchell and W. Gibbons (2010). These two extraordinary researchers and educators provide interesting and high quality information for all ages. The reader will be rewarded with a deep appreciation for salamander diversity in the Southeast.
- *A Natural History of Amphibians* by R. Stebbins and N. Cohen (1995). For those that desire a detailed understanding of how amphibians interact with the living and nonliving elements in their world.

Editors John Byrd and Kristie Fox (2013) - Clinch River Environmental Studies Organization (CRESO); a field research program for middle and high school students and teachers. Photos taken by CRESO staff or students unless otherwise noted.

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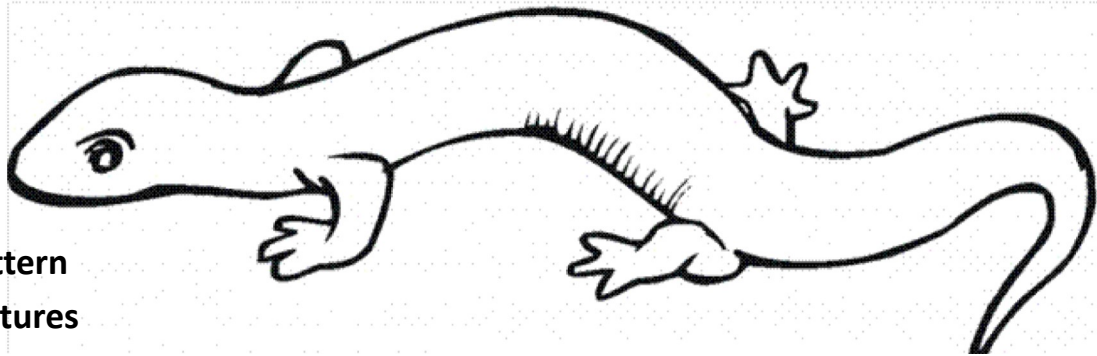
Salamander Observations

Observer Name: _____ Date: _____ Location: _____

Weather (i.e. Rainy): _____ Temperature: _____

Name or Description: _____

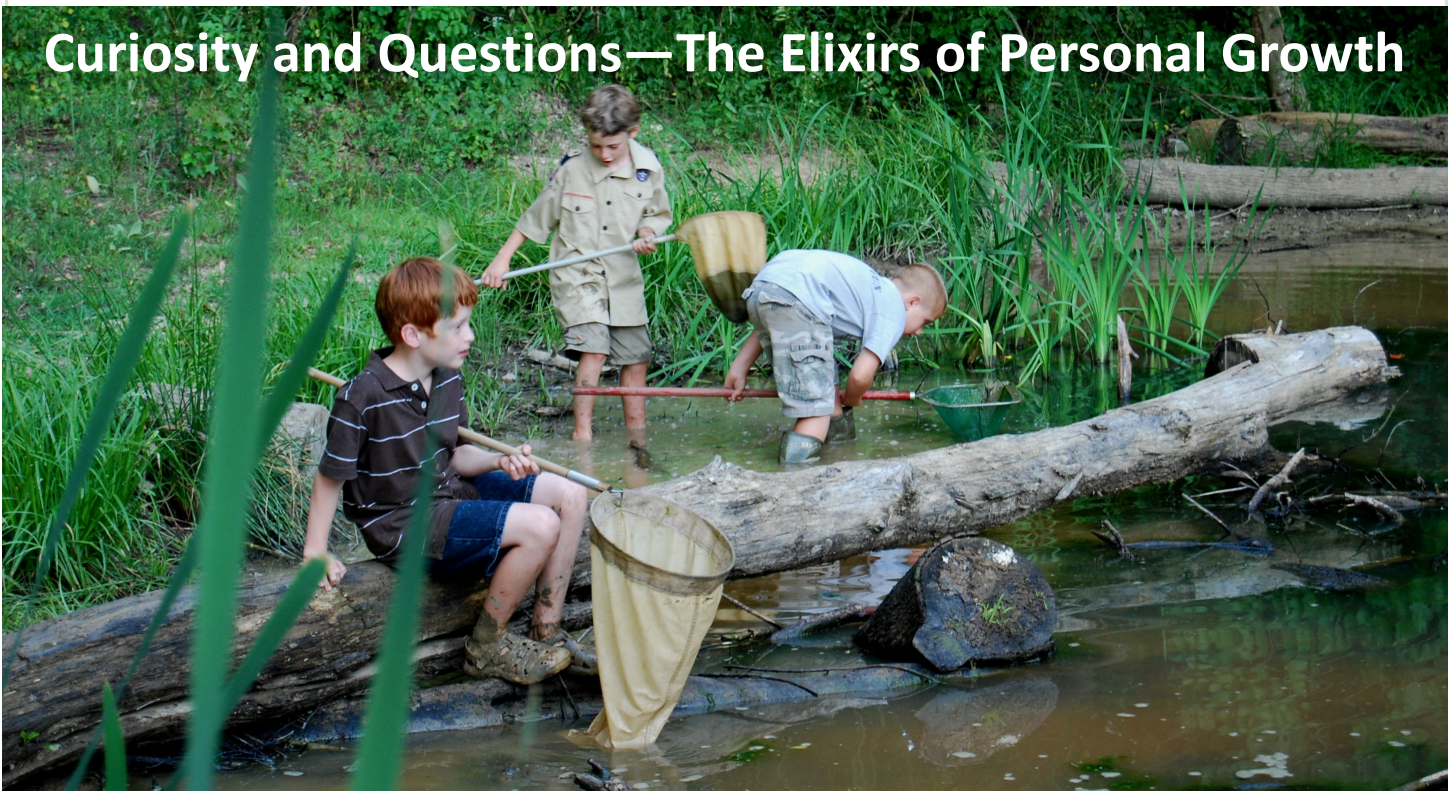
sketch of pattern
or special features



Where found (e.g., Under rock, in woods behind my house) _____

Notes: _____

Curiosity and Questions—The Elixirs of Personal Growth



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