

The Springs and Seeps of Tennessee



What are Springs and Seeps?

Below the Earth's surface, sometimes just inches, sometime miles, deep, lies 97 percent of our freshwater. This water may have come from the last rain- or snowfall, or it could have been hidden deep in the earth for a million years. Occasionally, rock formations intersect this vast underground network of reservoirs, permitting these hidden pools of water to once again see the light of day. The spots where water flows back to the surface are typically known as seeps or springs.

Springs usually emerge from a single point, while seeps emerge over a larger area, having no well-defined origin. Whether the surface water flow is a seep or a spring is determined by the geology of the site and the water pressure below the surface. Seeps generally have a lower flow rate than springs and only rarely have a volume large enough to form a stream. Springs, on the other hand, can be the source of a small trickle, a stream, or even a sizable river. The point where a spring's water meets the surface is called an emergence, a rise, or a boil. The flow directly below this point is called a run. Just as on the surface, underground water flows downhill. The force of this flow depends on the elevation difference

between the point where the water enters the ground and the point where it comes to the surface. These reentry points are usually through porous layers of sand or gravel sandwiched between harder, less permeable, layers of soil or rock or through cracks and fissures in the underlying rock. Seep and spring water may remain underground for many years, or even centuries, before it resurfaces. During this time underground it reaches a temperature much cooler than typical surface waters in the summer and much warmer in the winter. This is a significant characteristic of springs and seeps that is important to the plants and animals that depend on them.

Why Are Springs and Seeps Important?

Springs are vital headwaters of many of our rivers. They provide important habitat for wildlife and plants. Their protection and maintenance ensure clean water for wildlife, plants, and us. Springs are important to wildlife during the winter because their movement often keeps the water from freezing. Springs often may provide the only available source of drinkable water. Seeps are an important wetland type in Tennessee. They provide habitat for many wetland plant and animal species. Only

3 percent of the Earth's fresh water is found in streams, lakes, and reservoirs. The remaining 97 percent is underground. Ground water is the safest and most reliable source of available freshwater. It is the primary water source for 50 percent of the American population. In rural areas, 95 percent of the people depend on ground water for their water supply.

Rare and Unique Plants and Animals

Springs vary by their rate of flow, whether the water is acidic or basic, whether it is hard or soft, and the surface factors into which they emerge. One of the major factors influencing plants and animals at these sites is the amount of sunlight that reaches the springs. Shaded springs are relatively unproductive, and the food chain in them is based on detritus. Open, sunny springs, on the other hand, can be very productive, supporting a variety of algae and aquatic plants; many snails, crustaceans, fishes, turtles, and frogs; and a plethora of invertebrates.

Seeps also are quite variable, primarily with respect to slope, soil type, and volume of flow. As with springs, the amount of sunlight reaching the seeps has a major effect on the plant and animal communities that live there. Shaded seep

communities are also mostly detritus-based, with the primary energy input coming from the leaves and other organic matter that falls into the seeps. The typically permeable and saturated soils can support some plant life and often support some crustaceans, such as crayfishes, and occasionally a frog or salamander.

Open seeps support a greater variety of plant life, including grasses, sedges, and club moss. Given the proper conditions, they can also support carnivorous plants, such as pitcher plants and sundews. The greater the diversity of plant life in the seep, the greater the diversity of animal species that can be supported by the seep ecosystem.

Several rare, threatened, and endangered species are found only in seeps and springs. Species like the federally endangered royal snail, which is found in only two spring runs in the entire world, are dependant on the water quality and constant flow and temperature of the springs that support them. The federally endangered Tennessee yellow-eyed grass and the State's rare large-leaved grass-of-Parnassus both depend on limestone-rich seepage water from the calcareous rocks and basic soil particular to this seep type. Other rare species, such as the blackwater darter, Barren's topminnow, flame chub, and trispot darter, are all similarly dependent on the unique conditions of the seeps, springs, and spring runs they inhabit. In addition, many species of salamanders are found in springs and seeps; some of them, like the spring salamander, are not found in any other type of habitat.

Threats to Springs and Seeps

There are many threats to these rare Tennessee ecosystems. Spreading urbanization has left many springs and seeps buried below housing and industrial development. Logging and road construction, without the proper control of erosion, have led the once productive springs and seeps to become choked with sediment. Clearing vegetation from around a spring not only increases the sediment but also can result in the temperature of the water going up to the point where the unique creatures it supports can no longer live there. Many seeps and springs are also lost

to impoundments, like farm ponds, which alter the flow of water. The introduction or invasion of exotic pests, such as the noxious weed Hydrilla and the zebra mussel, also threatens spring and seeps and their distinctive inhabitants.

Often the water source itself is in jeopardy. Excessive water withdrawal can lower the water table to a point where seeps and springs no longer flow. We are increasingly seeing our ground water, which includes springs and seeps, degraded by toxic pesticides, fertilizers, and other waste to the point where the water is no longer safe to drink and is lethal to many plants and animals. Often the pollutant sources are many miles away from where the problem "surfaces."

What is Being Done to Protect These Rare Places?

Federal, state, and private agencies are working together to protect and conserve these rare places. The Nature Conservancy is working to protect the headwaters of Kelley Creek in Williamson County, Tennessee. This pristine Highland Rim stream harbors a number of sensitive species and natural communities, including a highly imperiled calcareous seep; its limestone-rich ground water provides habitat for rare species like the large-leaved grass-of-Parnassus.

You Can Help Protect and Restore Springs and Seeps

Protect springs and seeps from chemical pollution, erosion from roads and other construction, and dredging and filling. Support the organizations that are working to protect and restore them. Tell your friends and family about the importance of springs and seeps.

Seeing is Believing!

Springs and seeps are found across the state. An excellent example of springs exist within the Short Springs State Natural Area in Coffee County. You can also visit the Great Smoky Mountains National Park or the Big South Fork National River and Recreation Area.

Royal Snail

(*Pyrgulopsis ogmorhapha*)

You Can Help!

Remember, what we put on the land may eventually enter the streams! Tell a friend about the royal snail. Protect water quality. Participate in a local stream cleanup. Use biodegradable soaps. Plant or maintain native vegetation alongside springs and streams. Conserve water. Take pride in Tennessee's wildlife!

Status

The royal snail was listed as endangered on May 18, 1994.

Description

The royal snail is a tiny creature, smaller than a pea, usually less than 5 millimeters long. Its thin, pale shell is whorled and cone-shaped and blends in well with the surrounding environment.

Habitat

The royal snail is dependent on spring ecosystems; it is known from only two spring runs on public land in Marion County, Tennessee. Both springs flow out of caves and are part of the Sequatchie River system. Royal snails are usually found in moist calcium-rich ooze and on leaves and twigs in quiet pools downstream from the spring source.

Role in the Ecosystem

Very little is known about this rare snail; its reproductive behavior and food requirements are a mystery. Snails are used as food by other animals, including rodents and other snails.

Life History

Royal snails are believed to have a 1-year, or annual, life cycle, meaning that an individual snail reaches maturity, reproduces, and dies all in 1 year.

Threats

The royal snail is threatened by the potential degradation and alteration of the water and/or habitat of the spring runs it inhabits. Water quality

in the spring runs may be impacted by siltation, poor land-use practices, increased development, logging, stream alteration, contamination from coal mines and septic systems, road and bridge construction, other forms of nonpoint source pollution, and the lowering of the water table. Because the snail inhabits such a limited area, a toxic spill or vandalism could easily cause its extinction. The invasion of nonnative species into either of the spring runs it inhabits is also a threat, as nonnative weeds and zebra mussels could reduce suitable habitat and disrupt the natural food chain.

Recovery

Recovery goals include protecting and maintaining populations of the royal snail and its habitat.



Tennessee Yellow-eyed Grass

(*Xyris tennesseensis*)

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Status

Tennessee yellow-eyed grass was listed as endangered on July 26, 1991.

Description

Tennessee yellow-eyed grass grows from 2 to 3 feet in height. Twisted, deep green leaves grow from the base of the plant and range from 5 to 17 inches long. Long, slender stalks grow from the middle of these leaves and support conelike clusters of small, pale yellow flowers. The flowers unfold in the morning and wither away by the afternoon. Flowering occurs from August through September.

Habitat

Tennessee yellow-eyed grass depends on the spring and seep ecosystems along Tennessee's western highland rim in Lewis County. The plant occurs in seepslopes, springy meadows, or on the banks of gravelly shallows of small streams. It requires soils that are moist year-round, where calcium-rich rocks are at or near the surface. Tennessee yellow-eyed grass is found living alongside ferns, grasses, and sedges. The surrounding forests include oak, pine, willow, alder, and hickory trees.

Role in the Ecosystem

It is an important component of the biodiversity of the spring and seep ecosystem. The greater the diversity of species in an ecosystem the healthier the ecosystem.

Threats

Tennessee yellow-eyed grass is threatened by habitat destruction, competition with other plants, diversion of seeps or groundwater, development, road construction, and road improvement measures. This rare plant is also threatened by poor water quality caused by increased erosion and nonpoint source pollution (pollution that comes from a variety of sources).

Recovery

Most populations of Tennessee yellow-eyed grass are found on privately owned land. The Tennessee Department of Environment and Conservation and The Nature Conservancy work with landowners to help them protect and manage this rare plant. The National Park Service protects a small population on federal property with assistance from the Tennessee Department of Environment and Conservation.

Slackwater Darter

(*Etheostoma boschungii*)

You Can Help!

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Status

The slackwater darter was listed as threatened on September 9, 1977.

Description

The slackwater darter is a small fish that grows to be about 3 inches long. It has a large head and a blunt snout. Its back and sides are brown with many dark specks, and three dark saddlelike markings run across its back. The undersides of female slackwater darters are white, while males have yellow undersides. A blue-black stirps runs downward from each eye. The fins are dusky yellow. Males become bright orange during the breeding season, and their dorsal (or top) fin becomes bright blue.

Habitat

The slackwater darter is dependent on the spring and seep and riverine ecosystems. It is currently known from only five streams that feed into the southern bend of the Tennessee River in Lawrence and Wayne Counties, Tennessee. It is also found in several Alabama counties. The slackwater darter requires two types of habitat to survive. Nonbreeding habitat consists of streams from 2 to 40 feet wide. Here, the fish is found in areas of slow current near the stream bank over decaying leaves, twigs, or silty gravel, silt or mud. Ideal breeding habitat consists of small seepage streams where shallow water flows gently through open fields or woods near the nonbreeding habitats.

Life History

Adult slackwater darters move into breeding habitat from early February through mid-March. In March, females will have as many as 1,000 eggs, which become attached to the spring and seep vegetation. Male slackwater darters guard the eggs until they hatch; the adults and their young return to nonbreeding habitat in May. Slackwater darters feed on small insects and crustaceans.

Role in the Ecosystem

Nongame fish species like the slackwater darter are a critical ecological link in the food chain. They feed on insects and serve as prey for sport fishes, birds, and other wildlife. They are also important indicators of water quality and ecosystem health.

Threats

Slackwater darters once likely existed in many streams that flow into the Tennessee River. Extensive clearing of forests for agriculture and other purposes has drastically altered the quality of the streams in this region. Pollution affects many stream reaches, and silt levels in the water have increased. Silt can smother fish eggs and kill the insects that are an important food source for the fish. Because these fish occur in only a few streams, they can be easily lost to pollution. Habitat destruction has also affected the slackwater darter, as many small seepage streams that once served as breeding habitat for this tiny fish have been ditched, drained or buried.

Recovery

Protection of the slackwater darter's breeding habitat is critical to recovery. The National Park Service, the U.S. Fish and Wildlife Service, the Tennessee Department of Environment and Conservation, and the Tennessee Wildlife Resources Agency have joined forces to protect important breeding sites.

