

BROOK TROUT OF THE COWPASTURE RIVER AND ITS TRIBUTARIES

by Paul Bugas, Aquatics Manager for Region IV
Virginia Department of Game and Inland Fisheries

Editor's note: The following essay is the ninth in a five-year series on water resources stewardship in the Cowpasture River Watershed, sponsored by the Cowpasture River Preservation Association and published by The Recorder. The goal of the series is to create awareness among students, citizens and officials of the critical need to protect our surface and ground-water resources, and to stimulate interest in progressive stewardship.

VERONA – As the glaciers made their slow retreat northward 10,000 years ago, Virginia was left untouched by their dramatic impact on our continent's landscape. Natural lakes are often formed by glaciation, so it makes sense that the Commonwealth only boasts two of them, Mountain Lake and Lake Drummond. Both of these lakes were formed by separate events that had nothing to do with our last Ice Age. What Virginia lacks in natural lakes, it surely makes up for in surface water with its 2,300 miles of wild trout streams and 25,000 miles of fishable warmwater rivers and streams. The Cowpasture River is an important tributary to the James River and, within its watershed, flow at least 17 wild trout streams. Most of these streams continue to support strong populations of native brook trout (*Salvelinus fontinalis*), while others contain naturalized rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), or combinations thereof.

Cowpasture Tributaries – The Cowpasture River proper does not harbor native brook trout, but several of its major tributaries do. Shaws Fork, and Benson Run in Highland County, Dry Run, Jordan Run, Mare Run, and Lick Run in Bath County, and North Fork Simpson Creek in Alleghany County are all native brook trout waters. What about the Cowpasture's largest tributary, the Bullpasture River? The upper Bullpasture River supports pockets of wild rainbow trout and some small brook trout tributaries, but the main river is a bit too warm in the summer to hold a year-round population of natives. Davis Run and Crab Run, both Bullpasture feeder streams, are renowned for their native brook trout populations. All of the tributaries mentioned above are found, at least in part, in the George Washington National Forest. A well-forested environment with a good stewardship plan are critical in maintaining native brook trout streams by keeping summer water temperatures no higher than 70° F most of the time. All of these streams are found above 1,000 feet in elevation, capturing cold groundwater largely from karst springs for trout survival.

State Fish – Brook trout are Virginia's state fish. Due to their stringent habitat requirements, they are only found in the cleanest of aquatic environments. Cold water, high dissolved oxygen, clean substrate, and unspoiled surroundings are common features of our native trout waters. Steep mountain gradients force the churning, grinding channel scouring that forms the deep pools,

which are an integral part of brook trout habitat. Connecting the pools are waterfalls, swift runs, or shallow riffle areas that are key habitat features for Virginia's coldwater streams. These montane waters eventually drain to lower elevations, leaving forest environments and cold groundwater input. When this happens, brook trout naturally "disappear" and biologists note subtle shifts in fish assemblages. In Virginia, blacknose dace (*Rhinichthys atratulus*), mottled sculpin (*Cottus bairdi*), and fantail darter (*Etheostoma flabellare*) are often associated with healthy brook trout populations. Where chubs, suckers, and shiners begin to thrive, you know you've reached the transition zone between coldwater and warmwater fisheries.



A Spectacular Native Brook Trout. Photograph Courtesy of the Virginia Department of Game and Inland Fisheries

Family Salmonidae -- Brook trout are a part of the family Salmonidae, which includes the trouts and salmon. Within Salmonidae, they are part of a group called chars. Chars are of the genus *Salvelinus* and include such fish as Arctic char, bull trout, Dolly Varden, and lake trout. The chars have common coloration with dark sides and backs with lightly-colored spotting. Rainbow and brown trout tend to have light-silvery backgrounds with black spotting. Our brook trout, particularly the male in spawning "dress", is one of nature's visual feasts: olive sides and back with a light vermiculation pattern and pale spots. Its lateral line spots are halos of pale blue around red, each looking as if painted by hand. The undersides are often flame-orange and the

anal, pectoral, and pelvic fins are blood-red with black and white margins. A brook trout's coloration will simply take your breath away.

Environmental Threats – Now that we understand some of the basic needs for a native brook trout stream, what are some of the threats that might reduce their numbers? Increases in summer water temperatures and heavy sedimentation are two sure-fire ways to eliminate this species from a mountain stream. Forestry BMP's (Best Management Practices) are voluntarily followed when timber is harvested from a mountain slope. Care is often taken to ensure logging deck, road construction, and stream crossing impacts are kept to a minimum. When BMP's are followed, little damage is done to our high-elevation waters. It is critical to maintain undisturbed riparian (streamside) corridors when logging to buffer any unforeseen impacts during and after a timber operation such as erosion and sedimentation.

Invasive Species – Both plants and animals can have devastating consequences on our trout populations. For example, within the last 10 years, an aphid-like insect called the hemlock wooly adelgid (*Adelges tsugae*) has destroyed most of the Eastern hemlock forest in Virginia. Eastern hemlocks are an important part of riparian areas next to our native trout streams. They provide long swaths of shade, protect stream banks from erosion, and form overhead cover with their expansive root systems. When you see a tall, healthy Eastern hemlock in the mountains, you can be assured that brook trout lurk nearby. At this point it is unknown whether stream "daylighting" will have long-term negative consequences for our brookies, so scientists are keeping an eye on both fish and tree.

Climate Change -- Unless you live under a rock, the term "climate change" has been all over the news and you have an opinion on the subject. While it is clear that our planet is warming, the debate rages on whether this phenomena is anthropogenic (man-caused) or part of a natural cycle. That argument aside, the slow upward creep of air temperature can, and will, have an impact on our coldwater streams. In Virginia, most of our wild trout waters will reach a daily maximum temperature of 70°F in the summer. When the diel (24-hour) upswing hits 70°F for a short period, brook trout adjust and their cool comfort zone soon returns. When this upper limit is sustained for longer periods of time (early morning to late afternoon), it will create an environment that will support other fish species, but not brook trout. Biologists are monitoring the effects of climate change, coupled with hemlock wooly adelgid deforestation, with long-term temperature monitoring devices. No two mountain trout streams are the same so, in the future, some will be stressed worse than others.

Acid Rain -- Acid precipitation was the environmental focus for saving brook trout in the 1970's and 1980's. During those decades and many more before it, environmental scientists were able to detect and measure the effects of burning coal and how this process affected our local watersheds. Naturally occurring carbonic acid was enhanced by nitrogen oxides (NO_x) and sulfur

dioxide (SO₂) in the atmosphere to reach earth in the forms of nitric acid and sulfuric acid. Their synergistic impacts were significant and widespread. Brook trout streams that poured over poorly-buffered geologic formations suffered dramatically. Entire food webs were altered and its effects eventually affected aquatic insect and fish populations. Certain streams on the George Washington and Thomas Jefferson National Forests were selected to be treated with limestone sand and the impact was immediate. Debate raged within the environmental community as to whether this was a good tool to save these streams or if it were best to let them dwindle away and make them examples for change. Today, many of the old coal-fired power plants are being “scrubbed” or retrofitted with natural gas; our region is already showing improvements in the atmospheric environment and a lessening of acid precipitation. Liming streams every 5-7 years still remains a valuable tool to mitigate selected streams that are poorly buffered.

Spawning Season -- When mid-October rolls around, you can expect brookies to go through their annual spawning ritual. With this species, the female will “cut” a round nest with her caudal (tail) fin in the gravels at the tail end of a pool. A dominant male will pair up with her then go through a courtship of sorts. They will release eggs and milt, at the same time, into the cavity, then she will brush gravel over the eggs for protection. The male soon departs and, after a few days of nest-guarding, the female departs as well. The eggs stay in the nest, called a redd, all winter and hatch in the spring. By the end of the following summer, most of the fingerlings are 3-4 inches in length. Brook trout have a short life span of about 4 years and only grow up to 8-10 inches if they live through adulthood. Juvenile brookies retain parr marks, which are dark, oval shaped blotches on their sides, but they disappear once they become adults.

Sport Fishing -- East coast trout anglers love to fish for “natives”. In fact, Virginia boasts the largest assemblage of wild brook trout streams in the Southeastern United States. The size of the fish is not the end-game for mountain anglers; it’s simply the experience of spending a day in some of Virginia’s most remote, beautiful mountain settings. Most anglers don’t even bother to take home a few fish for dinner; catch-and-release fishing for our state fish is almost universally practiced. Fisheries managers stocked brook trout into western alpine lakes in the early 20th Century with disastrous results. Although brook trout liked the ice-cold environments into which they were dropped, they quickly ate through the food items in those lakes and began to “stunt” or overpopulate and grow very slowly. In short, our beloved brook trout is not a popular quarry for anglers or biologists in the Rocky Mountains.

Karst Waters -- As you may have read in a previous essay by Phillip Lucas, the Cowpasture-Bullpasture River Valleys are rife with pirated streams, sinkholes, caves, and springs. Most of the springs in this watershed emerge as a cold water sources and can be ideal for trout management. One such spring is Coursey Springs, located near the tiny hamlet of Williamsville in Bath County. The Cowpasture River sinks about six miles northeast of the Virginia Department of Game and Inland Fisheries’ (DGIF) newly renovated Coursey Springs Fish Cultural Station, then

emerges as a massive 4,000 to 16,000 gallon-per-minute spring at the facility. DGIF directs the water from Coursey Springs into series of circular tanks that are used for rearing 500,000 brook, rainbow and brown trout for stocking into public waters across the Commonwealth.

As you can probably surmise, our state fish holds a special place in my heart. Its strong presence in the Cowpasture River system is testimony to the healthy condition of the watershed. Collectively, we need to keep an eye on the river's status because it is, indeed, a bellwether to our quality of life in the Alleghany Highlands and beyond.

Internet Research URLs:

<http://easternbrooktrout.org/>

<http://www.nps.gov/shen/learn/nature/brook-trout.htm>