Eastern Brook Trout
Salvelinus fontinalis

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DESCRIPTION

Taxonomy and Basic Description

The Eastern Brook Trout is a member of the family Salmonidae. Although its common name identifies this fish as a trout, it is actually a char from the genus *Salvelinus*, which contains 7 to 10 species (Behnke 1980; Cavendar 1980; Kendall and Behnke 1984). However, it has been suggested that this genus may contain as many as 16 species (Behnke 1990). The Eastern Brook Trout is the lone living member of the subgenus *Baione*, as its only other member, the Silver Char (*Salvelinus agassizi*), has become extinct (Jenkins and Burkhead 1994). Native Southern Appalachian populations south of the New River in Virginia are genetically distinct from northern populations at subspecific levels (Stoneking et al. 1981; McCracken et al. 1993; Danzmann et al. 1998; Guffey et al. 1999). In South Carolina, only 4 populations of the genetically pure Southern Appalachian genotype are known to occur out of more than a dozen documented stream populations (Guffey 1995). Two additional populations possess low levels of introgression of northern alleles.

The brilliantly marked char range in adult length from 130 to 508 mm (5.1 to 10.0 in.) (Rohde et al. 1994); however, in the Southern Appalachians, Eastern Brook Trout rarely exceed 250 mm (9.8 in.) (Jenkins and Burkhead 1994). This char is identified by a white leading margin on a black sub-margin or streak on the ventral fins; yellow and olive pale spots and red spots with a pale blue halo on an olive background along the side; and a vermiculate (wormlike) back. The belly is brilliant orange-red bordered by black at the ventrolateral margin, especially in breeding males. Larger breeding males develop a distinct kype (hook) on the lower jaw.

Status

Eastern Brook Trout are considered currently stable by Warren et al. (2000) and secure (G5) by NatureServe (2013). NatureServe (2013) lists Eastern Brook Trout in South Carolina as imperiled (S2). South Carolina is the only state in the species' range where it is considered imperiled and has received the legal status as a fish of concern.

POPULATION SIZE AND DISTRIBUTION

The native range for Eastern Brook Trout extends from Canada south and east to Hudson Bay, and southward through the northern states from Eastern Minnesota and Northeastern Iowa eastward to Pennsylvania. The native range also includes the Appalachian uplands—particularly the Blue Ridge—south to Georgia. Drainage changes in the region, stream captures and piracies

(Ross 1970) likely explain the occurrence of Eastern Brook Trout in Atlantic slope drainages of the Southern Appalachians, south of the New River, Virginia. These drainage changes in headwaters of the Savannah River drainage and Saluda River system in South Carolina, coupled with the occurrence of pure southern Appalachian genotypes in both systems (Guffey 1995), are indicative of native heritage for South Carolina brook trout. The Eastern Brook Trout has been widely introduced outside its native range in North America and is established on all continents except Australia and Antarctica (Jenkins and Burkhead 1994).

The Eastern Brook Trout is widespread and seemingly stable across much of its range; however, a troubling decline in miles of stream occupied in the Southern Appalachians has occurred over the last century (Etnier and Starnes 1993). The range for Eastern Brook Trout in Great Smoky Mountains National Park (Moore 1981) was estimated to have declined approximately 70 percent since monitoring efforts began. Factors resulting in this decline are deforestation (King 1937; Jenkins and Burkhead 1994) which causes excessive siltation and water warming, acidification, competition from non-native introductions ,and global warming (Etnier and Starnes 1993; Larson and Moore 1985; Moore et al. 1986). A similar level of decline appears to have taken place in South Carolina and likely other regions of the Southern Appalachians. Wild Brook Trout inhabit over 3,000 km (1,864 mi.) of streams across the Southern Appalachian region (Habera and Moore 2005). Southern Appalachian Brook Trout populations are distributed from the New River drainage in Virginia southward into Tennessee, North Carolina, South Carolina and Georgia. The Southern Appalachian genotype (subspecies) comprises only about 17% of these streams. Most populations are located in the upper Tennessee River (Mississippi River) system; however, a few also occur in 3 Atlantic Coast and 2 Gulf Coast drainages. About 50% of Brook Trout streams in the Tennessee River system are the pure Southern genotype, while only about 5-10% of stream populations in the Atlantic Slope are pure. Of the 70% known Brook Trout resources in the Southern Appalachians, 88% occur on public lands (Habera and Moore 2005). The Eastern Brook Trout was not collected at any randomly selected wadeable stream sites in the South Carolina Stream Assessment (2006-2011).

HABITAT OR NATURAL COMMUNITY REQUIREMENTS

The Eastern Brook Trout inhabits rocky, often high-gradient, well-shaded, pristine coldwater mountain creeks (Rohde et al. 1994), generally above 600 m (1,969 ft.) in elevation but also occasionally down to 490 m (1,608 ft.) in streams with north-facing aspects (Etnier and Starnes 1993). Brook Trout require high dissolved oxygen levels and cannot tolerate temperatures regularly above 20°C (68°F). This trout also occurs in high elevation beaver ponds and lakes. Brook Trout are the most tolerant of the salmonids with regard to acidity, tolerating pHs from 4.5 to 9.5 (Jenkins and Burkhead 1994).

CHALLENGES

The Eastern Brook Trout is challenged by deforestation; specifically the associated water temperature rises as shade trees are removed, and siltation from timber harvesting practices (King 1937; Jenkins and Burkhead 1994). Additionally, impoundments, acid deposition and displacement by non-native salmonids adversely affect this species (Etnier and Starnes 1993;

Larson and Moore 1985; Moore et al. 1986). Climate change threatens the species in southern portions of its range (Meisner 1990).

CONSERVATION ACCOMPLISHMENTS

Many conservation practices have been accomplished for the Eastern Brook Trout. Range and population levels have been monitored across the species' range, and taxonomic characterization of the Eastern Brook Trout is well advanced. Further, water quality designations designed to protect the species have been implemented. The American Fisheries Society–Trout Committee's Position Paper (Management Plan) is a valuable tool for management of the Southern Appalachian Brook Trout.

Additionally, the recent development of a state, federal and non-governmental organizations (NGOs) "Eastern Brook Trout Joint Venture" is focusing on protection and restoration of Eastern Brook Trout across its range in the US. To assist in this restoration, successful biological restoration techniques have been developed for this species. For the past 10 years, the South Carolina Department of Natural Resources has partnered with the USFS, Trout Unlimited, and others to restore Eastern Brook Trout populations to 7 streams in South Carolina. SCDNR also recently completed a comprehensive assessment of in-stream habitat, water quality, and longitudinal fish distribution in all streams of the Jocassee Gorges. This assessment will guide restoration of the species in coming years. Education and outreach efforts regarding conservation of this species have been successful; however, these efforts need to be intensified.

CONSERVATION RECOMMENDATIONS

- Continue to monitor the distribution and population status with stream surveys for Eastern Brook Trout.
- Describe life history and habitat requirements for Eastern Brook Trout.
- Refine distribution information for Eastern Brook Trout, primarily on privately owned lands.
- Assess water quality and habitat in Brook Trout streams to identify threats and deficiencies; establish long-term water quality and habitat monitoring programs in those streams.
- Protect critical habitats from future development and further habitat degradation by following best management practices and protecting and purchasing riparian areas.
- Promote land stewardship practices through educational programs both within critical habitats with healthy populations and in other areas that contain available habitat.
- Encourage responsible land use planning.
- Consider this species' needs when participating in the environmental permit review process.
- Educate motor vehicle operators of the negative effects of crossing streams at multiple locations and using stream bottoms as trails.
- Aggressively seek protection of Brook Trout habitat through land acquisition, conservation easements, agreements and other methods.
- Seek protection of Brook Trout populations from over-harvest through a creel limit reduction and minimum size limit to protect spawning stocks.

- Where feasible and appropriate, implement Brook Trout restoration in headwater streams.
- Conduct water quality monitoring and habitat enhancement in Brook Trout streams where habitat is determined to be impaired.

MEASURES OF SUCCESS

Determining the distribution, life history, habitat needs, and Southeastern population structure and trends would represent a measure of success for this species. Methods that protect water quality are also likely to protect this species and others. In the event that more protective BMPs are implemented, population studies for this fish could assist in determining the effectiveness of those measures. An increase in native Brook Trout populations within the State would also indicate that restoration and habitat protections were successful.

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