CHAPTER 2

TENNESSEE STATE ACCOMPLISHMENTS UNDER THE 2005 SWAP

2.1. How the 2005 SWAP Guided Conservation Efforts

OVER THE PAST DECADE, the State Wildlife Action Plan has guided many agencies and organizations in conducting habitat and nongame species conservation throughout Tennessee. The State Wildlife Grant program (SWG) in particular has also influenced conservation investments across Tennessee. These grants were created by Congress to help keep species off of Threatened and Endangered (T&E) Species Lists, but to do so, they must be applied strategically; that is the role of the State Wildlife Action Plan. The 2005 SWAP identified 37 potential sources of stress affecting species of Greatest Conservation Need (GCN) and their habitats. Incompatible land use and development was identified as the primary problem facing the widest variety of species and habitats statewide (TWRA 2005). Alteration of streams and river habitats, degraded water quality, poor land management practices, natural fire suppression, and invasive exotic species were other priority problems linked to species and habitat declines in the 2005 SWAP.

To meet these challenges, SWG funding has supported habitat restoration, dam removal, and species reintroductions aimed at increasing populations of key GCN species. SWG funds have also helped to leverage the conservation expenditures of other organizations. Research and monitoring of a wide variety of species has resulted in vastly improved understanding of the distribution and needs of Tennessee's GCN species, which in turn results in improved management and conservation planning.

Photo credit: Early successional habitat, Bridgestone WMA, White Co. - Greg Wathen, TWRA

Research projects are also tracking the status of emerging threats such as White-nose Syndrome – a disease that is ravaging bat populations across the eastern U.S. – and the chytrid fungus and ranavirus, both of which threaten the state's diverse amphibians. Finally, the extensive spatial data upon which the SWAP is built, combined with strategic granting of SWG dollars, have informed local community planning aimed at promoting ecotourism and protecting local heritage and natural areas.

A major goal of State Wildlife Action Plans is to "keep common species common."

2.1.1. Restoring and Managing Habitat to Benefit Wildlife

The 2005 SWAP identified "Priority Terrestrial Restoration Portfolios" for the six ecoregions of Tennessee. Recommendations generally focused on bottomland hardwood forest restoration in western Tennessee, and dry oak forest and woodland restoration in eastern Tennessee. The SWAP also consistently recognized that the restoration of natural grassland systems would increase overall value to GCN species, since very few examples of natural grasslands remain (TWRA 2005, pp. 127, 131, 142). A recommended strategy was to address areas degraded by altered fire regimes through the application of prescribed fire management.

Bringing back oak savannah

At Catoosa Wildlife Management Area (WMA), a project to restore oak savannah and open woodland habitats has been ongoing since 1999. Canopy reduction plays a crucial role in the restoration process. To date, more than 3,100 acres of mixed pine forest has been cleared or thinned. Prescribed fire is applied regularly in the understory to promote native grasses such as big bluestem and wildflowers such as rattlesnake master and blazing star – species that thrive in more open conditions. The new growth provides abundant food in the form of seeds, sprouts, and legumes for birds, deer, and many other species. Native grasses benefit Bobwhite Quail, a GCN species whose populations have been in decline for decades, and the scrub-shrub habitat attracts songbirds such as Hooded Warblers, Common Yellowthroat, Yellow-breasted Chat, Eastern Towhee, Field Sparrow, and Red-headed Woodpeckers. This project has received support from at least 14 different agencies, organizations, and funders,

Top: Catoosa WMA 1 month post-burn in spring; Bottom: Catoosa 2.5 years post-burn - Clarence Coffey

while also hosting a wide variety of researchers helping to catalog the response of wildlife and plants to the restoration (Woody 2011).

Aquatic restoration through small dam removal

The 2005 SWAP highlighted existing impoundments and dam construction as a priority source of stress affecting aquatic habitats throughout much of Tennessee. Since 2005, State Wildlife Grant (SWG) funds and other partnership efforts have focused on piloting small dam removals to improve stream habitat, water quality, and recreational opportunities.

Removing Brown's Mill Dam, inset: dam before removal - Pandy English, TWRA

Multiple government agencies and the nonprofit Harpeth River Watershed Association removed a **lowhead dam on the Harpeth River** near Franklin, TN in 2012 – the state's first – eliminating a recreational hazard while improving and increasing habitat for a wide diversity of native fish and mussels.

On September 19, 2014, the Tennessee Wildlife Resources Agency (TWRA) took down remnants of the **Brown's Mill dam** on the East Fork of the Stones River. This project resulted in 25 miles of improved free-flowing stream, providing habitat for scores of aquatic species, including three GCN species.

Benefits to species of greatest conservation need identified in the SWAP provide a rationale for large projects such as these. In addition to a SWG, the Brown's Mill dam removal was supported by funding from the **Tennessee Healthy Watershed Initiative**.

2.1.2. Controlling Destructive Invasive Species

Wild Hogs

Wild Pigs, also called Wild Hogs, wreak havoc in natural habitats and rural communities through habitat destruction – which occurs when they dig up the ground rooting for food – and directly through predation of native species. It is likely that Wild Hogs pose a significant threat to Tennessee's native amphibians and reptiles, many of which are GCN species (Jolley et al. 2010), as well as native plant communities, including some GCN plant species. TWRA conducts an ongoing statewide Wild Hog eradication program, using trapping equipment that was originally purchased with SWG funding. Tennessee is a leader among state

Trapped Wild Hogs - Scott Dykes, TWRA

agencies in developing its hog trapping methodology.

TWRA has taken a rare stance by closing Wild Hog hunting in favor of other methods of control, a decision made to reduce the likelihood of the spread of Wild Hog populations for recreational purposes.

2.1.3. Improving Decisions through Data Collection and Analysis

Two Strategic Plans issued subsequent to the 2005 SWAP identified the lack of information on (1) the status of nongame species populations, (2) their ecological limiting factors, and (3) needed management as priority issues. Since implementation of the 2005 State Wildlife Action Plan began, TWRA Wildlife Diversity staff have conducted surveys on 41 Wildlife Management Areas (WMAs), 1 refuge, 6 wetlands, and 6 state natural areas/state parks, as well as other key areas across the state.

These surveys have determined the presence, absence, and habitat preferences of GCN species and have produced over 68,000 observations of herpetofauna and mammals (both volant and non-volant), including 2,735 captures of GCN species. TWRA maintains all survey data, and these data have significantly increased occurrence records in the 2015 SWAP GIS relational database. Data collected through these and partner survey efforts are incorporated into management plans developed for WMAs and help to inform the development of habitat management or restoration projects to directly benefit GCN species. Additional monitoring projects have incorporated the ability to track species' response to management activities, such as the Golden-winged Warbler's response to habitat restoration at Hampton Creek Cove (see Golden-winged Warbler Case Study, Ch. 5).

New bat maternity colonies discovered

Bats are now widely recognized for their role in insect control, yet many species are declining or already rare. Tennessee has 16 insectivorous bat species, of which 9 are GCN species. TWRA initiated a migration study of the federally **endangered Indiana Bat** in 2009, which continues annually with the support of SWG and other federal funds. The project has resulted in the discovery of six previously unknown Indiana Bat maternity colonies in Tennessee and improved knowledge of cave habitat use by other bat species. Four of the colonies are in Wilson County, one in McNairy County, and another spans Benton and Henry counties.

Indiana Bats - Dustin Thames, TWRA

Maternity colonies were also discovered in other states, including a colony discovered in 2013 on Holly Springs National Forest in Mississippi, which represents the first Indiana Bat maternity colony ever discovered in that state. Understanding the range, roosting, and maternity needs of all GCN bat species is important for informing bat conservation, targeting habitat management, understanding the effects of weather on bat migration and stopover habitat needs, and tracking the progress and impacts of White-nose Syndrome.

Tracking the effects of a deadly disease

White-nose Syndrome (WNS), a devastating disease of bats caused by the *Pseudogymnoascus destructans* fungus, was first identified in Tennessee in 2010 and has begun to negatively impact many cave-hibernating bat species. The ecosystem role of bats in controlling insect pests is extremely valuable to society; therefore, TWRA will continue to partner with universities and NGOs to better understand and mitigate impacts of WNS in Tennessee. Since 2010, and as a result of WNS, TWRA has worked to improve bat monitoring protocols, which include use of acoustic call surveys in key areas and increased thermal imaging of Gray Bat maternity sites to better understand the impacts of WNS on bat populations. Acoustic data collection efforts have been expanded from summer months to winter months to determine bat activity levels during the coldest portions of the year – a key to understanding potential impacts of WNS.

Hibernating Gray Bats at Bellamy Cave - Josh Campbell, TWRA

2.1.4. Protecting Lands and Waters in Perpetuity

Priority bat caves in Tennessee

Priorities identified in the SWAP consistently guide land acquisition to protect sites critical to GCN species across Tennessee, in some cases with SWG funding leveraging additional sources of support. For example, since 2005 TWRA has purchased property surrounding two of the three largest bat caves in Tennessee: Bellamy Cave in Montgomery County (34 acres in 2007, and 5 acres added in 2013 with a State Wildlife Grant) and Pearson Cave in Hawkins County (102

acres in 2009, and 46 acres added in 2013 with SWG funding).

Bellamy Cave is a top priority Gray Bat hibernaculum (overwintering site) whose population increased dramatically following protection through gating, from 91,000 in 2002 to over 381,000 in 2014. This increase occurred despite the discovery of WNS at the cave in 2012.

Pearson's Cave is an important Gray Bat hibernation and summer roosting site. The Gray Bat Recovery Plan identifies the acquisition of Pearson Cave as essential to prevent extinction of Gray Bats. Winter surveys at Pearson Cave have shown just how wintering populations may vary and move between caves. Surveys have indicated population sizes of over 365,000 (2002), over 147,000 (2013), and over 331,000 (2014). Populations have remained stable despite the discovery of WNS in 2012.

Cerulean Warbler - Ed Schneider

Golden-winged Warbler - Greg Levaty, USDA; Bog Turtle with tracking transmitter, showing characteristic yellow neck marking - Scott Dykes, TWRA

Specialized habitats for GCN species

Other acquisitions of land include 49 acres adjoining a conservation easement in Roane County (purchased with SWG funds in 2013), which provides critical habitat for Cerulean Warbler, Swainson's Warbler, Southeastern Shrew, Meadow Jumping Mouse, Woodland Jumping Mouse, Northern Pine Snake, and Tennessee Dace. Six acres purchased in Johnson County (with 2012 SWG funding, leveraging state wetland acquisition funds), expanded a southern cranberry bog preserve managed by The Nature Conservancy. This rare habitat type benefits several GCN species, including Golden-winged Warbler and Peregrine Falcon, Meadow Jumping Mouse, Southern Bog Lemming, and Bog Turtle. All of these

acquisitions address threats to the species posed by development, incompatible forestry, and placement of new utility infrastructure.

2.1.5. Data-driven Planning

The 2005 SWAP recognized sprawl as the single greatest threat to Tennessee's remaining natural landscapes. To address this threat, it provided maps and data that could be used to identify critical watersheds for protection.

Improved agency planning and coordination

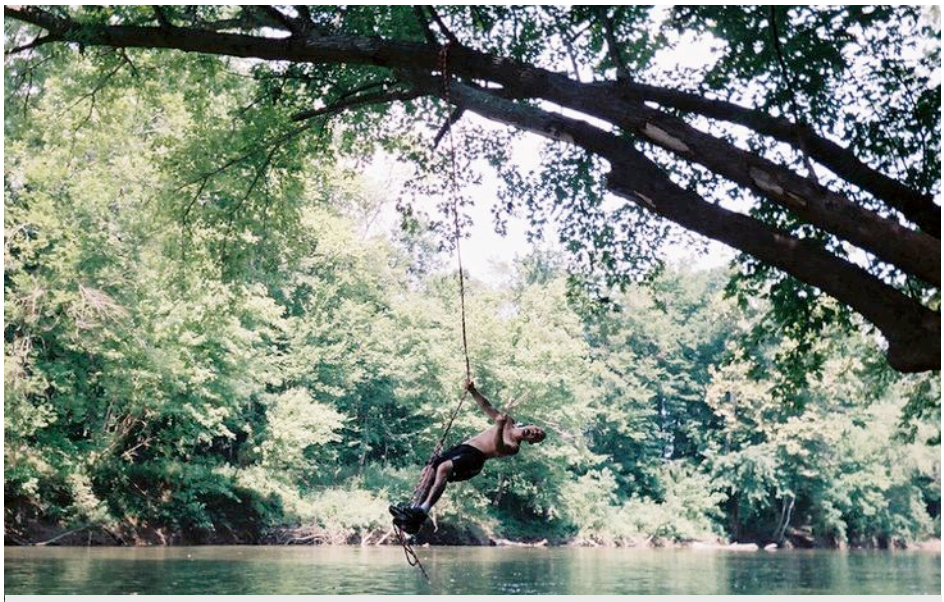
Beyond TWRA, organizations and agencies that protect or manage land in perpetuity, such as land trusts, Tennessee Department of Environment and Conservation, U.S. Fish and Wildlife Service, National Park Service, and the USDA Forest Service use the SWAP to identify and justify the protection of critical wildlife tracts. By working with TNC and TWRA GIS staff, species and their associated habitats can be identified for potential protection. Other agencies such as the USDA Natural Resources Conservation Service and Tennessee Division of Forestry can use the current and future Plans to identify watersheds and specific sites where improved land management will benefit GCN species and their habitats.

Community plans: protecting habitat and growing sustainably

Community planning is another arena that has benefited by incorporating data from Tennessee's SWAP. TWRA has supported local planning initiatives in several regions across the state:

✦With SWG funding, Cumberland Region Tomorrow (CRT) used the SWAP GIS database to create **"GIS Greenprint Tools"** for the Middle Tennessee Region; it has been used in the comprehensive planning process for four counties and two cities. The tools highlight critical lands for conservation to assist in strategic open space conservation and transportation planning in the 10-county CRT region (Elliott 2010).

✦The Tennessee Wildlife Federation developed a rural county planning document, also with SWG support, to better understand issues surrounding conservation planning in rural counties of the Southern Cumberlands (Elliott 2010).



Harpeth River at Pegram, TN in Cheatham County - Jason Nelms

✦Rural and scenic Cheatham County, located adjacent to the growing metropolis of Nashville, created a Sustainable Tourism Plan by assessing its natural and cultural resources to highlight, among other values, its ecotourism potential (Tennessee Regions' Roundtable Network 2013).

2.1.6. Saving Species through Reintroductions

Species reintroductions occur both as a means of preventing listing under the Endangered Species Act and to bring back populations of rare species where they have declined or disappeared. Stocking programs in Tennessee are part of a long-term program designed to restore reproducing populations of native species to Tennessee waters.

Alligator Snapping Turtle

With weights often in excess of 50 pounds, the Alligator Snapping Turtle is credited as being the **largest freshwater turtle in North America**. In contrast to Common Snapping Turtles, Alligator Snapping Turtles are listed in Tennessee as In Need of Management and are illegal to take. The restoration program for this largely aquatic species involves the release of live Alligator Snapping turtles, both adults and juveniles, focusing on the major river systems in west Tennessee that drain directly into the Mississippi River (the Hatchie, Obion, Forked Deer, and Wolf).

Alligator Snapping Turtle - James St. John

Alligator Gar

Alligator Gar are large apex predators that have been **extirpated from parts of their range** throughout the lower Mississippi River and tributaries, as well as rivers flowing into the northern Gulf of Mexico. In Tennessee, they are listed as species In Need of Management. With a reputation that has been rehabilitated from "trash fish" to "sport fish," they are also increasingly popular among sportsmen. Thus, the goal of Tennessee's Alligator Gar management plan is to restore populations by stocking Alligator Gar within their historic range in west Tennessee in cooperation with the U.S. Fish and Wildlife Service and to establish a sport fishery when population abundance and structure allows (Todd 2005). From 2006 through 2015, TWRA stocked 51,238 alligator gar fingerlings in various rivers and oxbows in west Tennessee, primarily the Hatchie River – a program that continues today. Gar were hatched at Private John Allen National Fish Hatchery (NFH), then reared at Humboldt and Springfield State Fish Hatcheries, the TWRA Cumberland River Aquatics Center (C-RAC), Warm Springs NFH, Natchitoches NFH, and Mammoth Spring NFH.

Freshwater mussels

Tennessee has tremendously rich aquatic fauna, particularly when it comes to

freshwater mussels. Except for Alabama, the lakes, streams and rivers of **Tennessee once harbored the most diverse and abundant assemblage** of mussels known: 130 of 300 mussels species recorded in the country are or were known to occur here. However, mussels make up **almost half of the state's federally listed threatened and endangered species.** The current level of imperilment of Tennessee's mussel fauna adds greater importance to conservation efforts for species not yet designated in federal listings.

Mussels are important biological water filters for rivers, are used in research, and provide food for other wildlife. Their **shells are sought commercially** for nuclei used in the cultured pearl industry. The Tennessee Freshwater Mollusk Strategic Plan (Medlock et al. 2013) calls for the propagation and reintroduction of important mussel species into priority streams; this program has been augmented through SWG-funded equipment and facilities. An outstanding example is the C-RAC, a unique facility built with the partial support of SWG grants, the full dedication of TWRA staff, and partnerships with Tennessee Valley Authority (TVA) and the U.S. Army Corps of Engineers. The C-RAC focuses on propagation and reintroduction of aquatic species into the Cumberland River.

There are 11 rare mussel species housed at C-RAC, including the Tier 3 GCN species Pink Mucket, Orangefoot Pimpleback, Fanshell and Birdwing Pearly Mussel, along with 41 additional species that are not federally listed. Since the late 1990s, this facility has raised 18,000 endangered Pink Muckets from glochidia (the larval stage of mussels) as well as another 8,000 from 60 days old. It is also one of the few places in North America where a warm water discharge (from a nearby power plant) is used to help grow GCN species; the warm water provides an extended growing season, allowing greater growth of species prior to release time.

Left: Oyster Mussel traps fish host to deposit tiny young in fish gills to aid dispersal, Clinch River - Dave Herasimtschuk, Freshwaters Illustrated; Right: Wavy-rayed Lampmussel uses its lure to bring fish close, Clinch River - Jeffry Basinger, Freshwaters Illustrated