CHAPTER 1

OVERVIEW OF TENNESSEE AND APPROACH TO THE STATE WILDLIFE ACTION PLAN

1.1. The State of Tennessee

WHEN IT COMES TO NATURAL RICHES, Tennessee is a state of superlatives. The geography of the state varies from the wetlands and bottomland hardwoods of the Mississippi River to the sheltered valleys and 6000-foot peaks of the Appalachians, where Southern Blue Ridge forests are considered one of the most biologically diverse temperate hardwood regions in the world (Stein et al. 2000). Tennessee is one of the most diverse inland states in the country, ranked by NatureServe as second in freshwater fish species diversity, fourth in amphibian diversity, and 13th overall compared with all other states (Stein 2002).

Tennessee's large expanses of limestone geology contribute to the development of thousands of cave systems, which are known to rank second in the U.S. for their number of obligate subterranean species (Niemiller and Zigler 2013). With 86 native crayfish found everywhere from caves and swamps to streams and lakes, it may top the list for crayfish diversity as well (Williams et al. 2014). Seven of the eight most ecologically rich rivers in the country are found in Tennessee (TWRA 2005), including the Duck River, recognized as **one of the most biodiverse waterways in the U.S.** (National Geographic 2010). Tennessee also has a rich floristic heritage: with 2,395 species, the state ranks 17th for its plant diversity (Stein and Gravuer 2008). The state's wide range of physiographic provinces and geology, temperate climate, and the fact that this region escaped the last glacial advance all contribute to the state's current species and habitat diversity. Six major terrestrial ecoregions are commonly recognized in Tennessee, from west to east (adapted from Bailey 1994; Keys et al. 1995):

Photo credit: Overlook Smoky Mountains - Ed Selby; Tennessee silhouette - Gograph.com

- Mississippi Alluvial Plain
- Upper Gulf Coastal Plain
- Interior Low Plateau
- Cumberland Plateau and Mountains
- Ridge and Valley
- Southern Blue Ridge

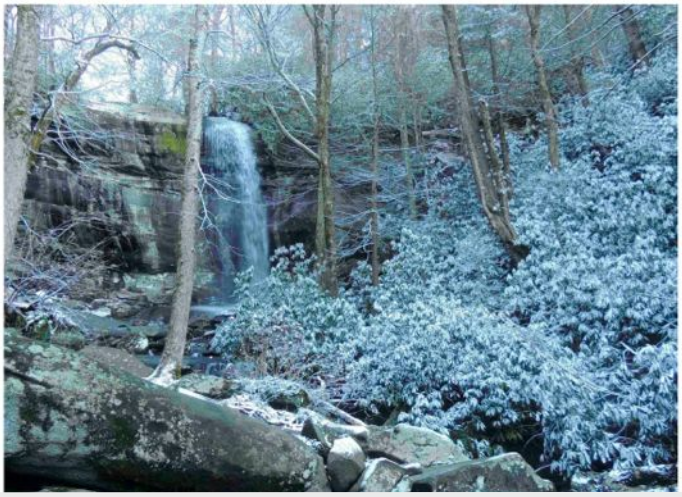
Tennessee also shares five major aquatic regions with neighboring states, defined by portions of five major river drainages:

- Mississippi River
- Tennessee River
- Cumberland River
- Barren River
- Conasauga River

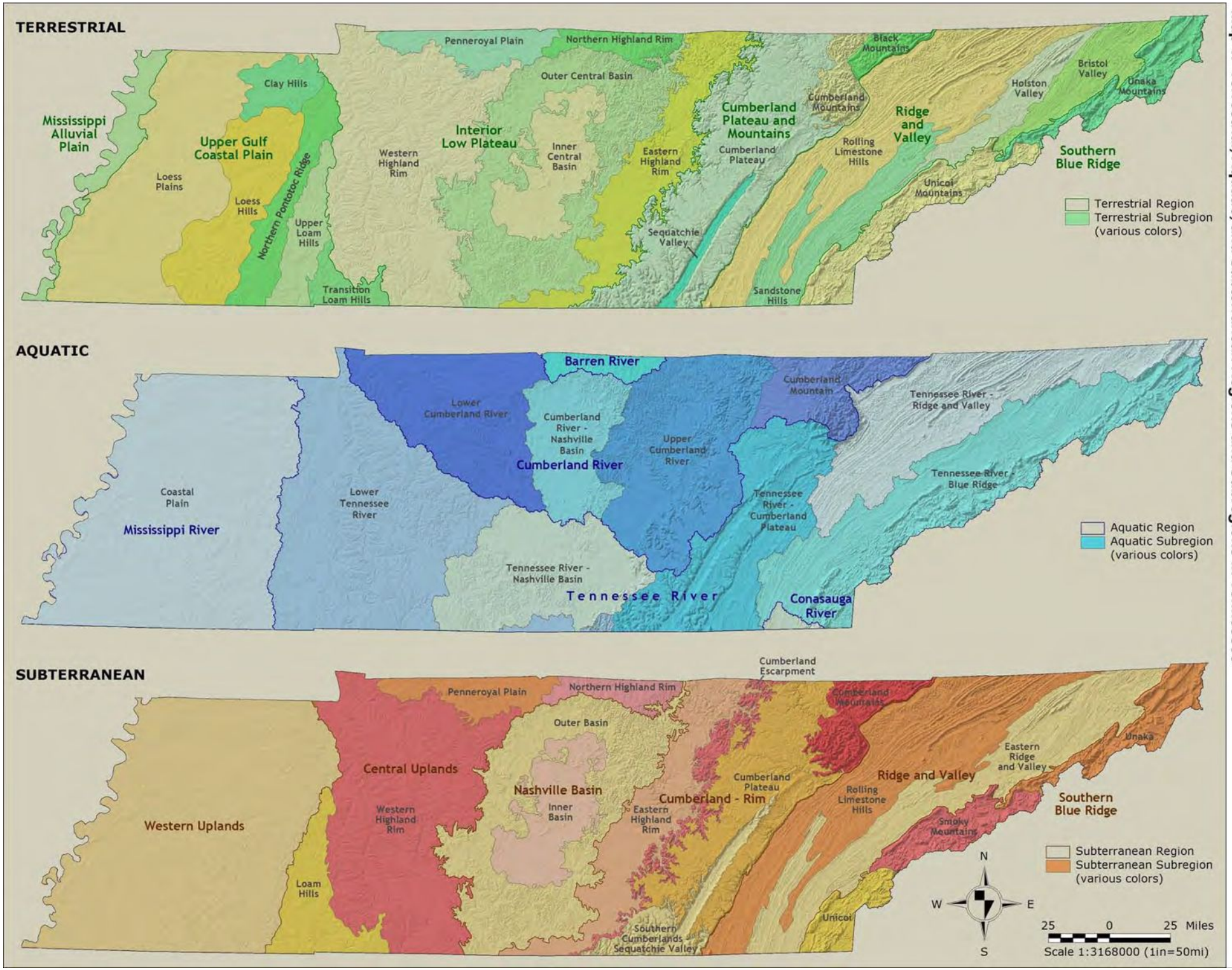
The subterranean landscapes of the state are also classified into regions and subregions in a fashion similar to terrestrial ecoregions, with more detail given to subsurface geological distinctions (TWRA 2005).

The State Wildlife Action Plan uses the classification of Tennessee's terrestrial, aquatic, and subterranean regions as the background for understanding the distribution of species of Greatest Conservation Need (GCN) and their habitats (Map 1). Chapter 1 of the 2005 TN-SWAP provides extensive detail of the dominant geology, vegetation, flora and fauna of each of these regions statewide (TWRA 2005).






Clockwise from upper left: Natchez Trace - Leigh Ann Fowler; Walls of Jericho amphitheater - Josh Campbell, TWRA; Sunset Rock on Lookout Mountain - Ron Jones; Rainbow Falls, Great Smoky Mountains National Park - Gregg Elliott, K Gregg Consulting



Map 1. Terrestrial, Aquatic, and Subterranean Regions and Subregions in Tennessee

1.2. Approach to the 2015 Plan Revision

1.2.1. Alignment with TWRA Strategic and Operational Planning

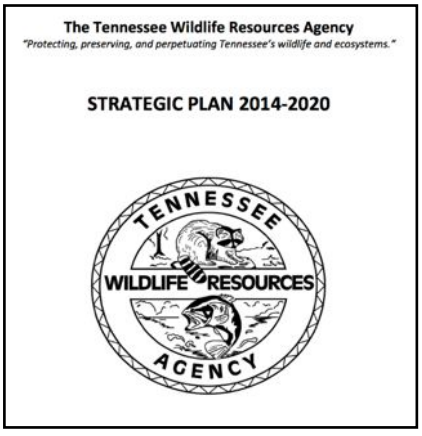
In 2005, Tennessee's planning team developed the first SWAP document in alignment with the guidance available from the U.S. Fish and Wildlife Service (USFWS) at the time. The next step after completing the SWAP was to develop a 2006-2012 Operational Plan (TWRA 2006) to align agency nongame species and habitat conservation activities with the Tennessee Wildlife Resource Agency's overall strategic planning approach. Many of the projects outlined in the 2006-2012 Operations Plan have been completed, and some are described in Chapter 2.

Tennessee's 2005 SWAP has guided wildlife conservation and the expenditure of State Wildlife Grants since 2005.

Highlights of Tennessee's first SWAP

- Identified 664 species of "Greatest Conservation Need" (GCN), representing birds, mammals, reptiles, amphibians, fish, mussels, crayfish, snails, and other invertebrates. These species inhabit all regions of Tennessee, including terrestrial, aquatic and subterranean habitats.
- Elevated knowledge of the state's biodiversity to an unprecedented level.
- Provided a solid scientific foundation for the state's future land conservation initiatives.
- Provided detailed information for federal agencies and Tennessee state agencies (e.g., Dept. of Transportation, Dept. of Environment and Conservation, etc.) to utilize in their own planning and operational activities.
- Provided detailed information for Tennessee counties and local communities to develop growth plans that consider the needs of Tennessee's fish and wildlife resources.

In 2014, TWRA completed its **2014-2020 Strategic Plan**, which provides an over-arching vision, broad-based goals, and strategies for achieving those goals in four main areas of operation: wildlife management, outdoor recreation, law enforcement, and information/education (TWRA 2014). To a significant degree, the operations of all four of these programs are essential to successfully managing Tennessee's GCN species. The planning approach of the 2005 SWAP, particularly the approach to using standardized habitat classification and species data, influenced the development of TWRA's 2014 Strategic Plan: for the first time, a habitat-based approach to defining priority management outcomes was used as the focus of the agency's Wildlife Resource Program.



For this reason, the 2015 SWAP Revision aligns with

TWRA's 2014-2020 Strategic Plan in the following ways:

- the plans use the same classification scheme for defining habitats;
- the plans focus on habitat conservation priorities to facilitate species management; and
- the plans are oriented toward achieving similar high-level outcomes.

The 2015 SWAP revision team worked intentionally with other divisions of TWRA to foster collaboration and identify shared conservation priorities using common understandings of habitats and problems affecting species and habitats statewide.

1.2.2. Revision Team Structure and Planning Objectives

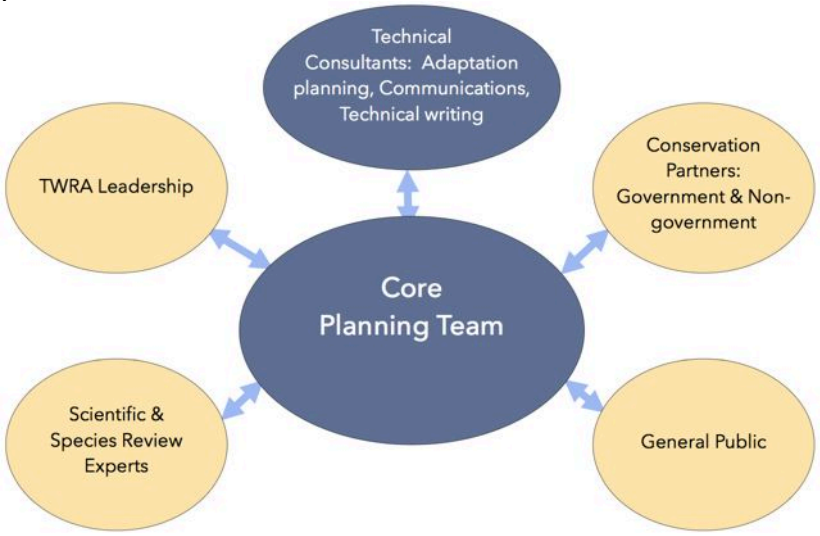
TWRA and The Nature Conservancy have made continuous investments in species monitoring data development and the SWAP relational database/GIS tool since the publication of the first SWAP in 2005. Chapter 2 of this report highlights many examples of on-the-ground conservation implementation as well as improvements to conservation data and planning methods. TWRA also completed an **internal revision of the 2005 SWAP** examining potential climate vulnerabilities of species and habitats statewide in 2009.

For the 2015 Comprehensive Review process, TWRA and TNC designed a team planning process (see Figure 1) focused on the following objectives:

1. Take advantage of core competencies within TWRA staff and meet capacity gaps with additional technical advisors (e.g., climate adaptation planning, communications, and technical writing);
2. Effectively engage all TWRA divisions and leadership at appropriate junctures in the planning process;
3. Achieve broad review of updated species list by technical experts;
4. Effectively engage government and non-government conservation partners to identify priorities for collaboration;
5. Develop the foundation for improved public communications, access and engagement with the State Wildlife Action Plan.

The core planning team designed a project approach to ensure comprehensive review of all Eight Elements from the 2005

Figure 1. **Conceptual diagram of the relationship between the core planning team, advisors, partners, and the general public.**



SWAP using the 2012 AFWA Best Practice Guidance recommendations wherever feasible. The overarching objectives of the 2015 revision process were to expand from the solid data assimilation and methodological approaches developed by the team in 2005, re-engage a diverse set of technical reviewers and collaborators, and apply the concept of Conservation Opportunity Areas as an additional strategic framework to inspire on-the-ground conservation delivery with a variety of partners.

Clockwise: Wood Thrush - Cynthia Routledge; Green Salamander - Josh Campbell, TWRA; Redline Darter - Todd Stailey, Tennessee Aquarium; Mud Snake - Rob Colvin, TWRA

1.2.3. Revision Process Timeline and Activities

The time schedule on the following page provides a summary of the major activities executed during the July 2013 through September 2015 comprehensive review period. Chapters 3 through 7 of this report provide detailed information regarding specific approaches, results, and outcomes of the revision process.

1.2.4. Summary of 2015 Planning Areas of Emphasis

The architecture of the 2005 SWAP database was designed to facilitate the incorporation of new and revised data over time. Since its initial development, various components of the database have been updated, revised, and expanded to support new planning and conservation mapping needs. One significant data development project led by Tennessee Department of Environment and Conservation Division of Natural Areas staff allowed for the addition of plant species to the SWAP database, along with their habitat preferences assigned to the same ecological systems as terrestrial animal GCN species.

Database improvements during the 2015 revision process also include the addition of thousands of species observation records, new standardized mapping units for terrestrial and aquatic priorities, updated landuse/landcover information, and the capacity to integrate spatial data on priority problems to understand the extent of potential impact to species and habitats across the state. The result is a comprehensive relational database management system and GIS platform for plant and animal species of greatest conservation need, their habitats, and the problems affecting them both.

SWAP Revision Time Schedule of Major Activities

July 1 – September 2013: Project Launch

- Notification to the Service of the formal revision process, including completed project management chart
- Core planning team defined. Species experts, Conservation Partners, and TWRA leadership groups identified and contacted
- Draft approach to public outreach completed
- Methods for assessing climate vulnerability reviewed

October 1 – December 2013: Species and Habitat Reviews

- Species and technical experts convened to review species of Greatest Conservation Need (GCN) list
- Core planning team assigns habitat preferences for GCN species added to list
- SWAP relational database updated with most currently available species observation data for all 2015 GCN species

January - March 2014: Problems and Action Reviews

- Core team review of 2005 hierarchy for problems affecting GCN species; selection of problems for 2015 mapping and focal strategies
- Core team review of 2005 priority actions to improve GCN species' habitat and status
- NatureServe Climate Change Vulnerability Index tool utilized to assess species vulnerability for a subset of GCNs across all faunal groups
- National Wildlife Federation engaged to assist with vulnerability summaries and ClimateSmart adaptation planning
- Communications program for general public and non-governmental organization partners developed

April – June 2014: Completion of Problem and Action Assessments, Draft Habitat Priority Maps

- Completion of selected GCN species Climate Change Vulnerability Index assessments
- Updated maps of habitat priorities statewide completed
- Core team begins consideration of Conservation Opportunity Area (COA) development and priority actions within COAs

July – September 2014: Development of Draft COAs and TWRA Leadership Engagement

- Draft Conservation Opportunity Areas assigned by core planning team
- Determination of high-level desired outcomes for COAs and assignment of draft primary conservation actions
- TWRA Leadership workshop held to gather feedback on process, COAs, and partnership recommendations

October - December 2014: ClimateSmart Team Workshop and Draft Revision Document Review

- Presentation to the **Organization of Fish and Wildlife Information Managers** on SWAP GIS habitat priorities
- NWF workshop on key climate vulnerabilities/determination of climate-smart strategy development approach
- Core team review of initial update document draft to approve format and primary content

January - July 2015: Conservation Partners Engagement and Strategy Alignment

- Refinement of draft COAs by core team
- Alignment of primary conservation actions with Wildlife TRACs framework
- ClimateSmart vulnerability report and strategy recommendations completed
- Incorporation of climate-smart strategy considerations into COA framework and conservation action selection
- Government agency and non-government organization partner workshops/comments incorporated into COAs
- SWAP presentation made before **Tennessee Geographic Information Council**

August 2015: Public Review of Draft Plan

- 2015 Update document available for TWRA Leadership comment
- 2015 Update document draft posted on website for public comment and publicized
- Public comments and additional Conservation Partners feedback collected

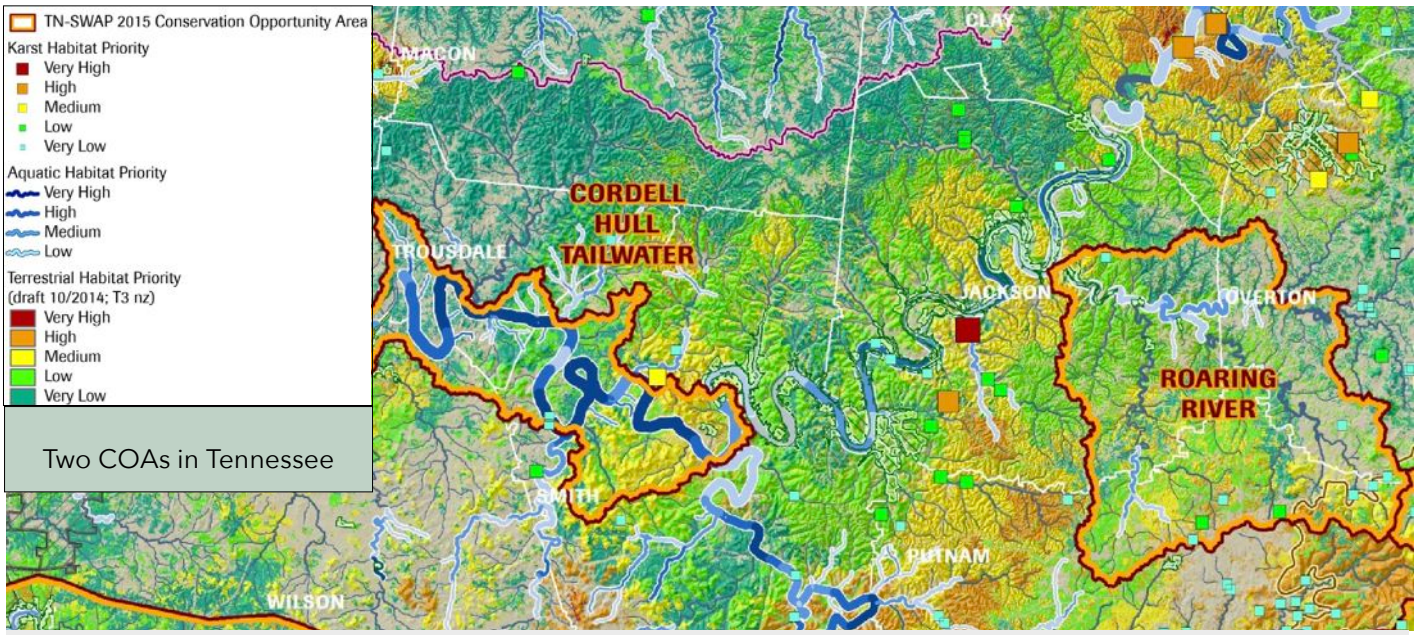
August – September 2015: Revision and Submission

- Response to public comments and completion of final 2015 Update report
- Submission of update report to USFWS for review prior to October 1

Conservation Opportunity Areas

One of the best practices for revising SWAPs is designation of Conservation Opportunity Areas, or COAs. Conservation Opportunity Areas are areas with the greatest opportunity for conserving, preserving, or restoring habitat critical to GCN species, and they will facilitate outreach and coordination with partners, extending the reach and effectiveness of state resource agencies.

Agricultural runoff - Lynn Betts, USDA NRCS

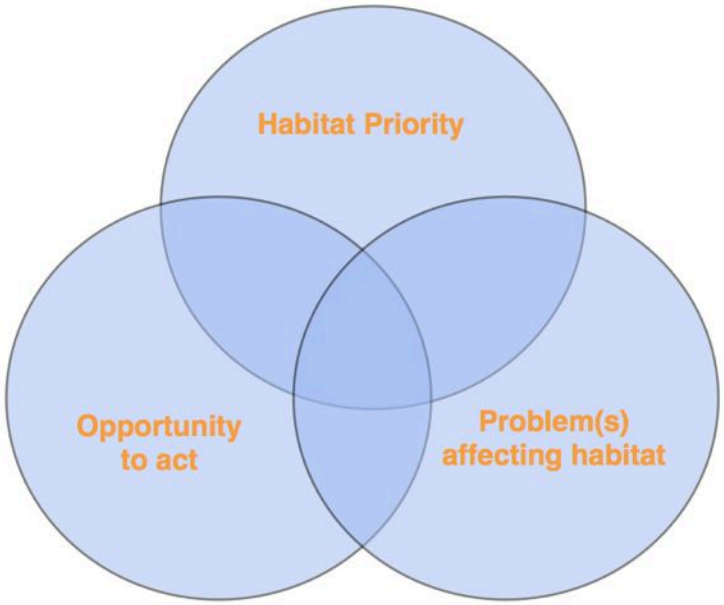


Two COAs in Tennessee

Example of a Conservation Opportunity Area

The identification of Conservation Opportunity Areas does not create nor presume to create new jurisdictional boundaries, regulatory authorities, or land use restrictions. COAs are intended to provide a framework for guiding voluntary and partnership-focused conservation action to address priority problems and achieve improved outcomes for species and habitats. Figure 2 depicts the general approach for the selection of Conservation Opportunity Areas. Chapter 5 gives more detail on the identification of COAs during the 2015 revision process.

Figure 2. Conceptual design of Conservation Opportunity Area selection



Climate Change

Nationwide there is growing recognition that without attending to the future impacts of climate change, it will become increasingly difficult to achieve the goals of protecting priority habitats and preventing wildlife and plant species from declining to the point of endangerment (National Fish, Wildlife, and Plants Climate Adaptation Partnership 2012). In particular, relying on historical conditions for factors such as average annual and seasonal temperatures, timing of streamflows, vegetation distribution, and species ranges will no longer be sufficient as a benchmark or goal for conservation decisions.

To meet this challenge and to follow the guidelines laid out by the Association of Fish & Wildlife Agencies in its report *Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans,* TWRA contracted with the National Wildlife Federation - a leader in **Climate Smart conservation planning** - to prepare both a vulnerability assessment

Reelfoot Lake cypress swamp, dry during 2010 drought - Gregg Elliott, K. Gregg Consulting

summary for the state and guide the core planning team on selection of appropriate adaptation strategies.

The *Climate Change Vulnerability Assessment for Tennessee Wildlife and Habitats* (see Glick et al. 2015) provides an overview of current and projected climate change across the southeastern United States, including Tennessee, and summarizes recent efforts to assess the vulnerability of the state's wildlife species and habitats. The vulnerability assessment focuses on three main areas: species vulnerability, potential vegetation change, and landscape feature resiliency. Resources used to complete the assessment included NatureServe's Climate Change Vulnerability Index for species (Young et al. 2011), the Terrestrial Climate Stress Index for vegetation developed by the U.S. Forest Service (Joyce and Flather, personal communication, 2015), and The Nature Conservancy's resilient sites for terrestrial conservation in the Southeast U.S. (Anderson et al. 2014).

Measuring Progress

Wildlife TRACS is the tracking and reporting system for conservation and related actions funded by the U.S. Fish and Wildlife Service (USFWS) Wildlife and Sport Fish Restoration (WSFR) Program. Beginning in 2015, all State Wildlife Grant-funded projects must also be tracked and reported through this system. In developing the 2015 SWAP, TWRA decided to align the major conservation actions in the plan with the format of TRACS conservation reporting measures as an overarching classification method for tracking and reporting on effectiveness measures for conservation projects. This will improve the agency's results accounting, project monitoring, grant reporting, and ultimately the assessment of success in

Wildlife TRACS Project Action Levels with Indicators 8/20/14

Project Level	Action Level 1	Action Level 2	Action Level 3	Level 2 and Level 3 Output Measures	Description/Examples/Notes
Project Catagories	**Category**	**Strategy**	**Activity**	**Units**	
Administration and/or Conservation / Management and/or Recreation	Coordination and Administration			Number	Coordination and administration necessary for effective agency operations and program/project management
		Coordination and Administration	Agency administrative support	Number	Administration necessary for effective agency operations (e.g., acquisition of goods and services, human resources tasks)
			Program/project administrative support	Number	Administration necessary for effective program/project management (e.g., staff support and training, monitoring progress of grant proposal and reporting processes)
		Incentives	Incentives	Number	Development and delivery of economic incentives to private landowners to influence responsible stewardship of land/water and specific species
	Direct Management of Natural Resources				
		Create new habitat or natural processes		Acres	Creation of new habitat or natural processes for the benefit of fish and wildlife and recreational users
			Habitat conversion	Acres	Conversion of one type of habitat into another (e.g., creating bottomland forest from agricultural land, wetland creation) Note: Forest and wetland would be the appropriate broad habitat types to code for these two examples
			Public fishing lake construction	Acres	Construction of new public fishing lakes
			Waterfowl impoundment creation	Acres	Creation of shallow water impoundments for the primary benefit of waterfowl
				Structures	Removal of barriers to maintain aquatic species populations and restore ecological functions in streams (e.g., dam or dike removal, notching of dams)

Examples of TRACS Conservation Reporting Measures

implementing State Wildlife Action Plan conservation strategies.

1.2.5. Conservation Partners Engagement

The Tennessee State Wildlife Action Plan is not intended solely for the Tennessee Wildlife Resources Agency, but rather for all stakeholders – large and small – within Tennessee who care about wildlife or make decisions affecting the state's land and water resources, including TWRA. As such, the agency recognizes the importance of partner and public involvement in the plan development process. Following best practices for state conservation programs (AFWA 2012), TWRA reached out to the biological research community to aid in reviewing and updating the GCN species list. Workshops were held and presentations made for conservation partners from other programs within TWRA itself, key state and federal agencies, academic and research institutes, nonprofit organizations, and interested citizen stakeholders.

1.2.6. Public Outreach and Communications: process, website, press release, e-newsletter

Early in the project planning phase, the core team recognized the need for improving the overall approach to engaging conservation partners and the general public. A communications expert was hired specifically to manage outreach. Techniques involved the overhaul of Tennessee's Teaming With Wildlife distribution list, development of quarterly electronic newsletter updates to partners, coordinated press releases sent out to statewide media, and the redesign of the Tennessee State Wildlife Action Plan website (**www.tnswap.com**). The SWAP webpage provided the capacity to receive, collect, and archive comments on the draft SWAP from any and all interested citizens during the official public review period. Comments were sorted according to category or topic, then considered and answered by the appropriate experts on the SWAP team. Appendix B provides an explanation of what actions, if any, were taken in response to comments raised during the review period.

Example of a quarterly e-newsletter sent to SWAP stakeholders.