CHAPTER 9

IMPLEMENTING THE TENNESSEE SWAP: 2025-2034

THIS PLAN IS INTENDED TO SERVE AS A GUIDE AND RESOURCE for meaningful and impact-focused conservation action in Tennessee over the 10-year period spanning from 2025 to 2034. Planning means little without implementation, so the 2025 Tennessee SWAP revision has been designed to (1) provide data-backed support for funding requests, (2) guide organizations and individuals by showing them where to work, and (3) indicate where we have gaps in our knowledge and understanding of SGCN and the habitats vital to their survival.

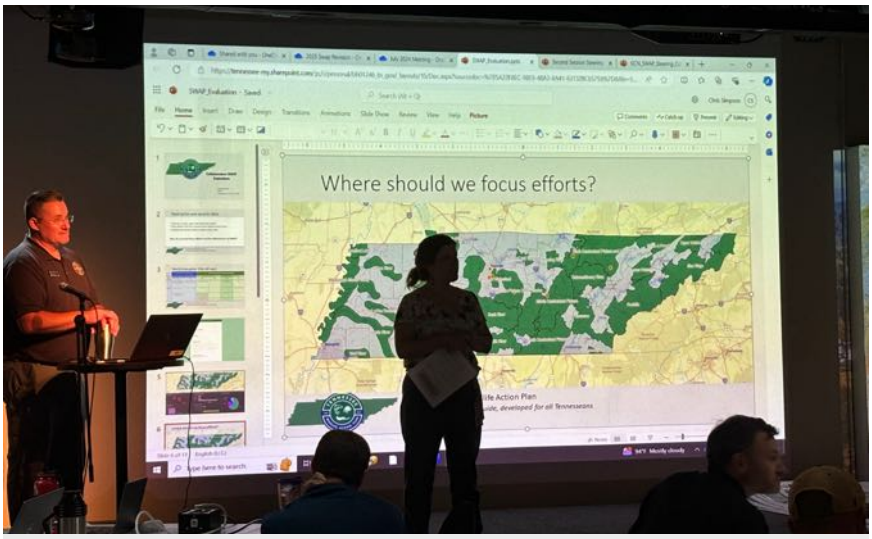
The materials and analysis within this plan can be used in project design and selection of appropriate conservation actions to fit a multitude of on-the-ground scenarios. It also can be used to support and justify funding and grant proposals. Users are encouraged to explore this guide and to revisit each section during the next decade to gain ideas that will aid project planning.

The SWAP has not been built to direct precise scheduling of action, but rather to take a high-level, large-scale look at the natural systems of this state and the myriad forces acting upon them. However, it is also designed to be operationalized and, to the extent possible, to be put to work by each conservation partner working in the Tennessee landscape. Readers are encouraged to use the guide to ingest the priorities (for species, habitats, landscapes, issues, and conservation actions) determined by the SWAP analysis, and apply them for on-the-ground work, for collaboration, for fundraising, and for public awareness.

Counting Gray Bats at a TWRA-owned cave / Daniel Istvanko, TWRA

Useful elements of the 2025 SWAP include:

- Historical and existing ecological conditions
- Analysis of the rich biodiversity in TN, and expert-selected lists of Species of Greatest Conservation Need—literally those that are already experiencing population decline or are forecast to decline without human intervention
- Projection of changes to land use, existing and emerging threats to SGCNs, and the habitats they require
- Methods of action to counter the damaging/destructive impact of these threats
- Tools to monitor and assess the success of conservation actions
- Where the efforts of the conservation community can be expected to see the most value through employing conservation actions
- Highlighting the resources in Tennessee available for conservation and the successes already achieved.
- An assessment of lessons learned to inform the process of SWAP review and revision (see Ch. 10).



At the Conservation Opportunity Area planning meeting in 2024. / Gregg Elliott, K. Gregg Consulting

A key feature of the 2025 SWAP development is the intentional, persistent inclusion of conservation partners. Successful implementation of a plan with the scope of SWAP requires each conservation partner to take ownership and responsibility for maximizing use of SWAP data and achieving SWAP goals across the state. This plan can be used to nurture existing partnerships, identify opportunities for collaboration, and creatively expand partnerships.

9.1. Monitoring for Adaptive Management

Much of conservation is about management of lands, waters, species, and human uses of the landscape, and monitoring is a key element of the adaptive management cycle. Species and habitat monitoring data help to (1) provide long-term understanding of trends in populations or ecosystem health, (2) provide greater understanding of species responses and needs relative to problems and changing environmental conditions, and (3) assess the results and effectiveness of conservation actions – the key to adaptive management. The first two purposes are collectively referred to as status monitoring, while the last is called effectiveness monitoring.

9.1.1. The Standards for Measuring Effectiveness of Actions

Summary: Monitoring and adaptive management goals in the 2025 SWAP

1. Continue to improve effectiveness monitoring in Tennessee. The 2005 SWAP provided an inventory of TWRA and partner status monitoring programs for species and habitats. The 2015 SWAP introduced effectiveness monitoring, and the 2025 SWAP outlines steps for integrating these monitoring approaches into existing agency programs and planning cycles.
2. Develop an effectiveness measures framework. TWRA will incorporate status monitoring objectives and effectiveness measures into its existing planning cycles through triennial SWAP reviews and updates beginning in FY 2029.
3. Maximize knowledge and conservation effectiveness through participation in shared monitoring databases.

TWRA has long conducted status monitoring programs to assess and track various wildlife populations (see TWRA 2005, Appendix H "Sampling Protocols for Select Faunal Groups"), both for purposes of management and to identify problems. The results of individual conservation projects are likewise tracked, although often final assessments may consist of cataloguing actions successfully completed. Indeed, almost all conservation organizations must track their progress and report results.

Drift fence trap installation. A drift fence stops animals and guides them until they fall into a bucket or funnel. This allows biologists to passively trap and monitor animals, such as lizards and salamanders, that otherwise would be difficult to catch. / Rob Colvin, TWRA

However, the Association of Fish and Wildlife Agencies in its 2011 *Measuring the Effectiveness of State Wildlife Grants* report notes that, "it has been much more difficult [for state agencies] to bring these two sets of data together to attribute changes in species or habitat status to the effects of any one action" (AFWA 2011). In Tennessee, much of the difficulty lies in ascertaining the status of resources at different spatial scales and the connection between different types of conservation actions and results, particularly at landscape scales that necessarily must include at least some private lands.

To assist states with making the connections between different types of monitoring, AFWA developed guidance on how to measure the effectiveness of conservation actions funded through the State Wildlife Grants (SWG), including recommendations for how to track and report that effectiveness. The importance of this tracking ultimately goes beyond a consideration of dollars and cents; it cuts to the heart of the stewardship

enterprise by providing insight into the overall effectiveness of planning, management, and adaptation to benefit species and habitats.

The Effectiveness Measures report developed a framework for use by states and their partners in evaluating the effectiveness of actions funded under State Wildlife Grants, as well as broader conservation strategies outlined in SWAPs (see Figure 9.1., taken from AFWA's 2011 Effectiveness Measures report). The report also provides comprehensive examples of connecting conservation actions to outcomes, including suggested objective statement formats and monitoring indicators for 11 generic conservation actions. All of these actions are identified in the 2025 TN-SWAP, and conservation partners are encouraged to use these examples as a resource to help design and implement successful conservation projects.

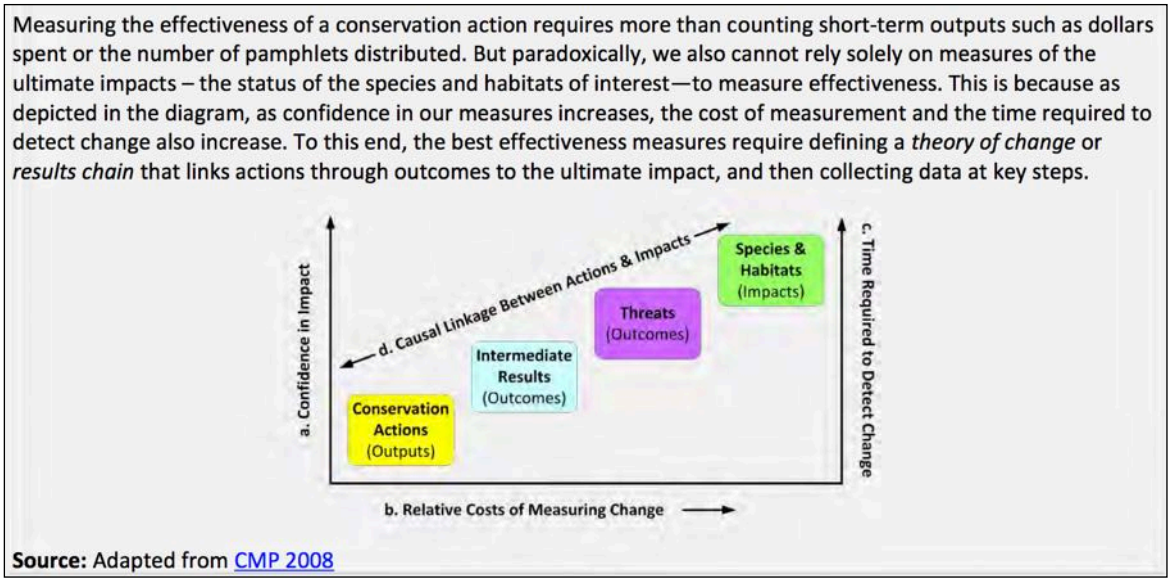


Figure 9.1. Measuring effectiveness requires linking conservation actions to impact

9.2 TWRA Adoption and Adaptation of Standardized Effectiveness Measures

The Effectiveness Measures report made several overarching recommendations to states, and TWRA has implemented the following:

- Adopted the proposed effectiveness measures framework to improve accountability and project management of State Wildlife Grants.

  The TN-specific actions are the result of combining conservation actions quantified in USFWS TRACS with the 11 categories of action suggested in the AFWA framework, then adapted to meet the goals of the Tennessee conservation community. Following a review of the most impactful stressors within each Conservation Opportunity Area, conservation actions were prescribed for each COA based on their suitability to address key stressors (Appendix I).

- Integrated the effectiveness measures framework into agencies' adaptive management, grant application, and reporting processes. For the 2025 SWAP, TWRA and conservation partners on the SWAP Steering Committee have agreed to supply data via an annual partner survey, which is based in part on measures listed in the 2011 AFWA report.

TWRA will incorporate monitoring objectives and effectiveness measures into its existing planning cycles through triennial SWAP reviews and updates.

TWRA also intends to incorporate status monitoring objectives and effectiveness measures into its existing planning cycle through triennial SWAP reviews and updates. These reviews will provide an opportunity to assess conservation achievements in COAs; to prepare and analyze monitoring results; to make adaptive management decisions; and to identify emerging issues and appropriate responses. These reviews will then influence allocation of SWG funds and development of new partnerships.

Development and implementation of an effectiveness measures framework is helping TWRA and its conservation partners in the following ways:

- Provides a means to evaluate conservation actions so that successful ones can be replicated and communicated while less successful ones are improved or abandoned
- Establishes a standardized and accessible body of project performance data to help guide current and future wildlife managers
- Provides a cost-efficient mechanism for reporting to Congress, other policy makers, conservation partners, and taxpayers about the value of the SWG program, SWAPs, and the conservation needs and efforts underway across Tennessee.

TWRA MOTUS tower at Massengale Mountain on North Cumberland WMA for monitoring migratory birds / David Hanni, TWRA

9.3. Regional-scale Monitoring Collaborations

Replicating project strategies and analyzing multiple sets of results over time allows scientists to assess wildlife responses to management. The projects serve, in essence, as multiple experiments testing the same management strategies. In addition, monitoring habitats and populations over a sufficient geographic area and timeframe can

provide insight into how wildlife populations are changing or responding to change. Both of these objectives can be achieved when agencies (1) cooperate to leverage one another's work and knowledge by using monitoring standards that make data comparable, and (2) consolidate and share data in formats that promote collaborative use.

Several examples of monitoring efforts and information sharing include the Tennessee River watershed Index of Biotic Integrity (IBI) work conducted by the Tennessee Valley Authority (TVA); the Great Smoky Mountains National Park All Taxa Biotic Inventory (ATBI); inventory and monitoring conducted by the US Forest Service on federal forest lands; stream flow and biological monitoring managed by the US Geological Survey; and multi-state freshwater mollusk recovery and monitoring activities with the US Fish and Wildlife Service and academic institutions. Table 9.1

Table 9.1. Regional-scale monitoring efforts that include Tennessee

Regional Scale Monitoring Efforts that include Tennessee (not an exhaustive list)			
SGCN Focus	Initiative Name	Lead Agency/Lead in Tennessee	States Included
Lake Sturgeon	Lake Sturgeon Reintroduction Working Group	USFWS/TWRA	GA, KY, NC, TN (WI is the source for fertilized sturgeon eggs)
Bats (all species occurring) -includes winter cave surveys and summer bat monitoring	North American Bat Monitoring Program	USGS/TWRA	nationwide
Eastern Hellbender	Giant Salamander Network	North Carolina Wildlife Resources Commission/ TWRA	GA, NC, SC, TN, VA
Eastern Spotted Skunk	Eastern Spotted Skunk Collaborative Study Group	SEAFWA/TWRA	TN and 23 additional southeastern states
Alligator Gar	Southern Division of the American Fisheries Society Alligator Gar Technical Committee	USFWS/TWRA	AL, AR, FL, IL, LA, MS, MO, TN, TX
Migratory Birds	Breeding Bird Survey, Christmas Bird Counts	USGS/Audubon	All 50 states
Colonial Waterbirds	Cross-Flyway Double Crested Cormorant Monitoring Team	USFWS/TWRA	Contiguous United States
Passive Monitoring of Migratory Birds	Southeast Motus Collaborative	American Bird Conservancy/TNC/Bird Studies Canada	TN + 24 eastern states and Canada, with overwintering areas in Central and South America
Bog Turtle (southern population)	Southern Bog Turtle Working Group	TWRA/TNC	GA, NC, SC, TN, VA

lists additional multi-state monitoring efforts that include Tennessee partners. These program activities, as well as those of many other partners, provide foundational habitat and species population status information that is instrumental to making sound management decisions over time.

Bat Blitz organized by the Tennessee Bat Working Group (2023). Biodiversity blitzes involve an intensive effort to count species over a short period of time, often heavily supported by volunteers. A blitz is a cost-effective way of cataloguing a relatively comprehensive list of the species in an area at a given time. In 2024, the Bat Blitz captured 268 bats of 7 species. / Dustin Thames, TWRA

For wide-ranging species such as many birds and bats, TWRA recognizes that regional, national, or flyway-wide databases enhance each state's ability to manage and conserve these species across broad and biologically meaningful geographic areas. Specifically, the **Avian Knowledge Network** (AKN) is currently in use and becoming more widely adopted by many federal, state, and non-profit organizations. The AKN is extremely effective in providing secure data storage capabilities, facilitating the application of monitoring standards to make datasets comparable across institutions and political boundaries, and developing shared tools for data analysis. As a result, it has become more widely adopted, and the network's shared data has become even more powerful, providing an incentive for greater participation.

A Brown Thrasher (*Toxostoma rufum*) about to be banded / Gregg Elliott, K Gregg Consulting

Biologist Michaela Bass holding a Garter Snake (*Thamnophis sirtalis*) / Mathew Alexander

The AKN's Eastern Avian Data Center is an online node that now serves as Tennessee's data entry, storage, and retrieval website. TWRA considers the exchange and integration of avian data into a permanent centralized

data management system a priority action that is occurring via programs such as colonial waterbird monitoring and Partners in Flight, under the guidance of TWRA's Bird Conservation Coordinator.

Since 2005, TWRA has also invested in the reorganization of its internal data management systems. Currently, database portals allow consolidation of a variety of project and monitoring data managed internally by TWRA.

In 2024, TWRA developed an ESRI-based SWAP conservation project reporting tool, which will be shared annually among cooperating partners to allow consolidation of a variety of project and monitoring data. Compilation of these data will ultimately improve TWRA's ability to use and communicate information to partners and to participate in or promote regional and landscape-scale monitoring and restoration efforts.

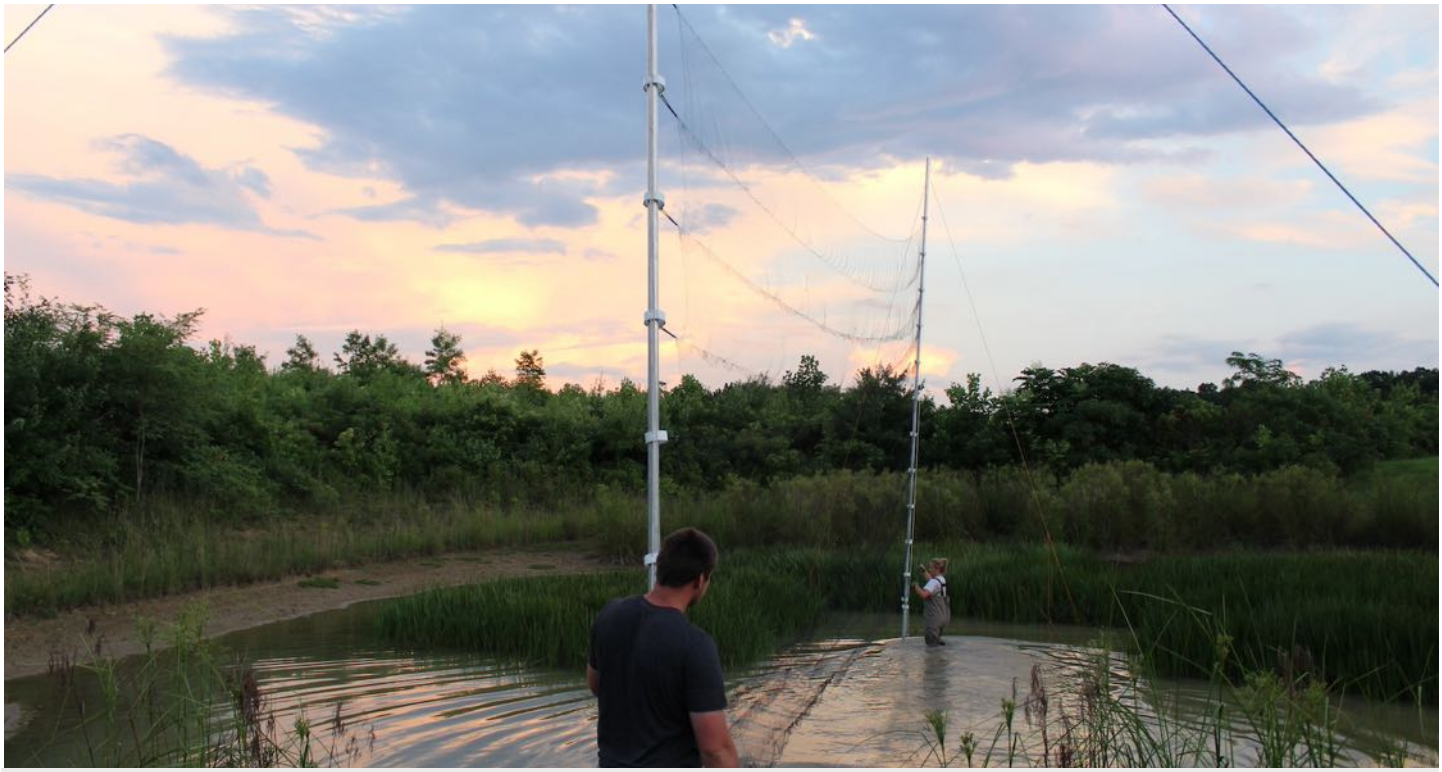
Initial entries into TWRA's Esri-based SWAP conservation reporting tool.

9.4. Improving Tennessee's Partnerships Through the SWAP

To further regional-scale collaborations, the Steering Committee first formed to assist with the 2005 SWAP was relaunched and retooled for the 2025 revision. Comprised of over fifty biologists and conservationists from federal and state agencies and NGOs operating in the state, the Steering Committee will continue to meet past the approval of the 2025 SWAP. It will function to increase communication throughout the conservation community and to foster collaborations across different agencies, organizations, and jurisdictions to achieve shared conservation goals in Tennessee. To date, Steering Committee members have agreed to report all species-specific and landscape management projects being implemented by their respective agency/organization

annually. The Steering Committee will use this information, updated annually, to further conservation efforts across the state by:

- Identifying where conservation capacities can be increased in areas where individual projects are ongoing
- Determining common objectives for partners with landscape-scale projects that span agencies and organizations with differing missions
- Pinpointing successes and failures of past projects to increase successes of future projects
- Identifying critical data gaps for species and habitats
- Leveraging funding across all partners to increase the scope and geographic scale of conservation projects.



Mist-netting for bats as the sun sets in Franklin County / Dustin Thames, TWRA

To achieve its objectives, the Steering Committee will be comprised of the following six working groups with differing objectives and goals.

Landscape Scale Management

This working group will focus on identifying recommendations based on landscape objectives and initiatives ongoing in the state (e.g., bottomland hardwood forest and grassland restoration) and current multi-agency projects being implemented in the state. Assessing current work being implemented will allow this working group to prioritize areas where future projects may be implemented. Annual products will include an annual report with recommendations, acres managed and restored, etc. which will include an evaluation of the effectiveness of completed and ongoing projects, as well as challenges associated with implementation.

Species Driven Management

While landscape-scale management impacts habitats for a number of SGCNs, there are species that will require a finer scale approach to increase conservation. This working group will assess the adequacy of species-specific projects being implemented within Tennessee to ensure such conservation actions are not too focused on one group of SGCNs (i.e. savanna restoration compared to minimal work occurring for aquatic species). Additionally, this working group will strive to identify species-specific projects needed in future years, as well as species-specific research necessary to address data gaps and effective monitoring techniques. Annual products will include an annual report with recommendations, acres managed, focal species, etc. which will include an evaluation of the effectiveness of completed and ongoing projects, as well as challenges associated with implementation.

Hoary Bat (*Lasiurus cinereus*) / Daniel Istvanko, TWRA

Climate and Resilience

The effects of changing climate in Tennessee will be vastly different as one moves from west to east in the state, and it will impact species differently, increasing the challenges associated with addressing these threats. This working group will work to update current climate models for the state, assess CCVIs for individual species, and identify climate-specific threats and impacts within the state. Annual products will include an annual report summarizing the work accomplished, with recommendations for future land acquisitions based on resiliency models, locations of climate resilient landscapes in the state, and where landscape-scale management actions can benefit from climate-informed action.

Eastern Milk Snake (*Lampropeltis triangulum*) caught in a funnel trap used for monitoring / Jesse Eaker, TWRA

Data/Trend Tracking and Analysis

This working group will work to synthesize large data sets to determine population trends for SGCNs in the state. To effectively perform, this working group must also work to identify mechanisms that will aid in overcoming significant data sharing gaps amongst all partners. Annual

products will include an annual report summarizing all work performed; identifying annual trends in habitats (i.e. grasslands, wetlands) and species; and making recommendations to all partners concerning data gaps identified and data that is not being incorporated into decision-making processes.

TWRA Biologists taking measurements from a sedated Eastern Woodrat (*Neotoma floridana*) / Mallory Tate Cogburn, TWRA

Outreach, Education, and Engagement

After 20 years of SWAP, many Tennesseans are still not familiar with SWAP and how it can benefit the resources of the state. This working group will work to educate the public on SWAP and how it can be used. Most importantly, this working group will identify ways to communicate SWAP to the non-science public. Additionally, the working group will work to increase communication of SWAP goals and conservation results with stakeholders and communities throughout the state. Annual products will include an annual report summarizing all work performed, identifying communications and outreach successes, and providing updated information for the TNSWAP website.

Tricolored Bat roost in Franklin County, with only transmitter and antenna visible! / Dustin Thames, TWRA

Identified Needs and Ideas for Future Development by Steering Committee Working Groups

Landscape scale management needs

- Enhance outreach and land stewardship education targeted at private landowners, aiming to improve communication and engagement with this segment of Tennesseans.
- Categorize landscape-scale conservation projects according to priority benefit for SGCN and feasibility.
- Foster cross-boundary regional partnerships with neighboring states to collaborate within RCOAs identified in the TN SWAP.
- Develop incremental goals to measure progress of landscape scale initiatives.

Species driven management

- Publish SGCN highlights on the SWAP website quarterly. Highlight content should focus on public education, species' needs, relevant legislation, and funding opportunities.
- Develop and manage resource lists of subject matter experts by SGCN, identifying those with the greatest familiarity with individual species and taxa groups.
- Convene Subject Matter Experts by taxa group biannually between SWAP revision cycles and report a summary of updates to the SWAP Steering Committee.
- Explore wildlife crossing opportunities to mitigate habitat fragmentation of wide-ranging SGCN and to preserve the function of priority habitat corridors.
- Partner with neighboring states to develop a comprehensive list of Tennessee SGCN that have also been ranked as SGCN in neighboring states within the most recent SWAP assessments to guide collaborative opportunities. Include RSGCN in the analysis.
- Seek expertise to better understand the status and conservation needs of insect populations in TN.
- In coordination with the Outreach, Education, and Engagement Workgroup, identify specific conservation actions to benefit a selection of SGCN, including "flagship" species, to use as a public outreach tool.

Climate and resilience

- Coordinate with USACE to regulate in-stream flow rates through dams.
- Continue to target removal of in-stream barriers, cooperating across state and jurisdictional boundaries to reduce impacts of an increase in extreme precipitation events and to improve connectivity.
- Work with partners to increase public awareness of the values of floodplain conservation and restoration in terms of both habitat value and extreme weather mitigation.

- Promote studies and modeling to fill data gaps needed for long-term resiliency planning in key areas (e.g., shifts in vegetation phenologies and composition affecting SGCN, long-term streamflow data, increased monitoring of trends in temperature, storms, drought, fire events, etc.).

Data trend tracking and analysis

- Create a list of existing datasets (species population monitoring, foraging and breeding habits, other trends, etc.) and data flow (how it gets into the SWAP and throughout the conservation community).
- Clarify the myriad SGCN datasets utilized for creating SWAP priority areas and the extent to which such data are curated before export between partner agencies including for aggregate analyses.
- Work closely with other SWAP Workgroups and conservation partners to acquire and incorporate new data into existing databases.
- Develop improved procedures for data-sharing among partners, such as shared versions of field maps and an ArcGIS tool.
- Create an interactive online SWAP dashboard to showcase projects, SGCN news, and educational resources.
- In coordination with the Outreach, Education, and Engagement Workgroup, develop/promote citizen science initiatives tied to SWAP awareness.

Outreach, education, and engagement

- Engage multiple SWAP partners whenever possible to underscore Tennessee's collaborative conservation community.
- Prioritize routine contact with organizations such as Tennessee's Heritage Conservation Fund and non-profit land trusts, and professional collectives focused on conservation management of water, forests, grasslands, karst, taxa groups, and location-focused partners, to provide education and awareness of the analyses and resources available in the SWAP that can help them to meet their own specific goals.
- Specifically, engage with MS4s in each TWRA Region so that the goals of the SWAP and relevant SGCN in each MS4 are communicated to local county/municipal personnel engaged in land use decisions at the local level. This should also include training for local staff in how to recognize "their" SGCN and potential SGCN habitats under their jurisdiction. Provide them with the means to supply the TWRA and SWAP working group members meaningful SGCN data in a timely manner.
- Develop a media plan to engage and educate Tennesseans about SGCN, their diverse habitats, and how SWAP is used to guide conservation.
- Highlight Tennessee's large number of endemic species with a storymap.
- Select terrestrial, aquatic, and karst flagship SGCN to elevate public awareness of SGCN, the state's rich biodiversity, wide-ranging and unique habitats, and how to use the SWAP to understand more about conservation needs and actions.

- Create SWAP presentation template and use to introduce to new audiences.
- Create factsheets to highlight key metrics gleaned from annual conservation partner survey.
- Engage leaders at the local level. Create county-specific maps with SWAP habitat prioritization to share with counties, municipalities, as well as locally-focused educators (e.g., UTU/TSU Extension, NRCS, etc.) and conservation organizations.
- Develop SWAP-based curriculum tools for K-12 students.

Art by Lucas Antoniak, part of a series intended to increase awareness of SGCN animals and the under appreciated roles they play in our environment. Clockwise from top left: Barrens Top Minnow, Gray Bat, Berry Cave Salamander, and Eastern Woodrat.