

Annual Duck River Symposium

“WORKING TOGETHER WORKS”

December 4, 2024

Duck River Agency Presentation

- Update: 2011 Duck River Comprehensive Regional Water Supply Plan
- DRA Updates
- DRA Projects and Programs in the pipeline

Regional Planning

Participants

Water Resource Council

- **Water Systems**
  - Bedford County Utility District
  - Columbia Power and Water Systems
  - Duck River Utility Commission
  - HB&TS Utility District
  - Lewisburg Water and Waste-Water
  - Manchester Water Systems
  - Maury County Water System
  - Tullahoma Utility Board
  - Shelbyville Water and Sewer
  - Spring Hill Water Systems
- **Federal Agencies**
  - Natural Resource Conservation Service
  - Tennessee Valley Authority
  - U S Department Agricultural
  - U S Fish and Wildlife Service
  - U S Geological Survey
- **State Agencies**
  - Tennessee Advisory Commission on Intergovernmental Relations
  - Tennessee Department of Environment
  - Tennessee Water Resource Technical Advisory Committee
  - Tennessee Wildlife Resource Agency
- **Non – Government Organizations**
  - Duck River Watershed Association
  - Friends of Short Springs
  - Tennessee Environmental Council
  - Tennessee Duck River Agency Board
  - Tennessee Farm Bureau Federation
  - The Nature Conservancy
  - World Wildlife Fund
- **Municipals**
  - Columbia
  - Lewisburg
  - Manchester
  - Tullahoma
  - Shelbyville
  - Spring Hill
  - Wartrace
- **Legislators**
  - Senator Bill Ketron
  - Senator Jim Tracy

Regional Water Supply Plan Goal 2010

"The project goal is to have a Comprehensive Plan that will provide direction to the Duck River Agency regarding the management of available water resources, including the implementation of specific water supply infrastructure projects."

50-Year Plan with a 100-Year Vision

Open Process

- Tools
- 6 Workshops
- 3 Public Open Houses
- www.duckriveragency.org
- Media coverage
- Civic Group Presentations
- Garden Club Presentations
- One-on-One meetings











Alternatives

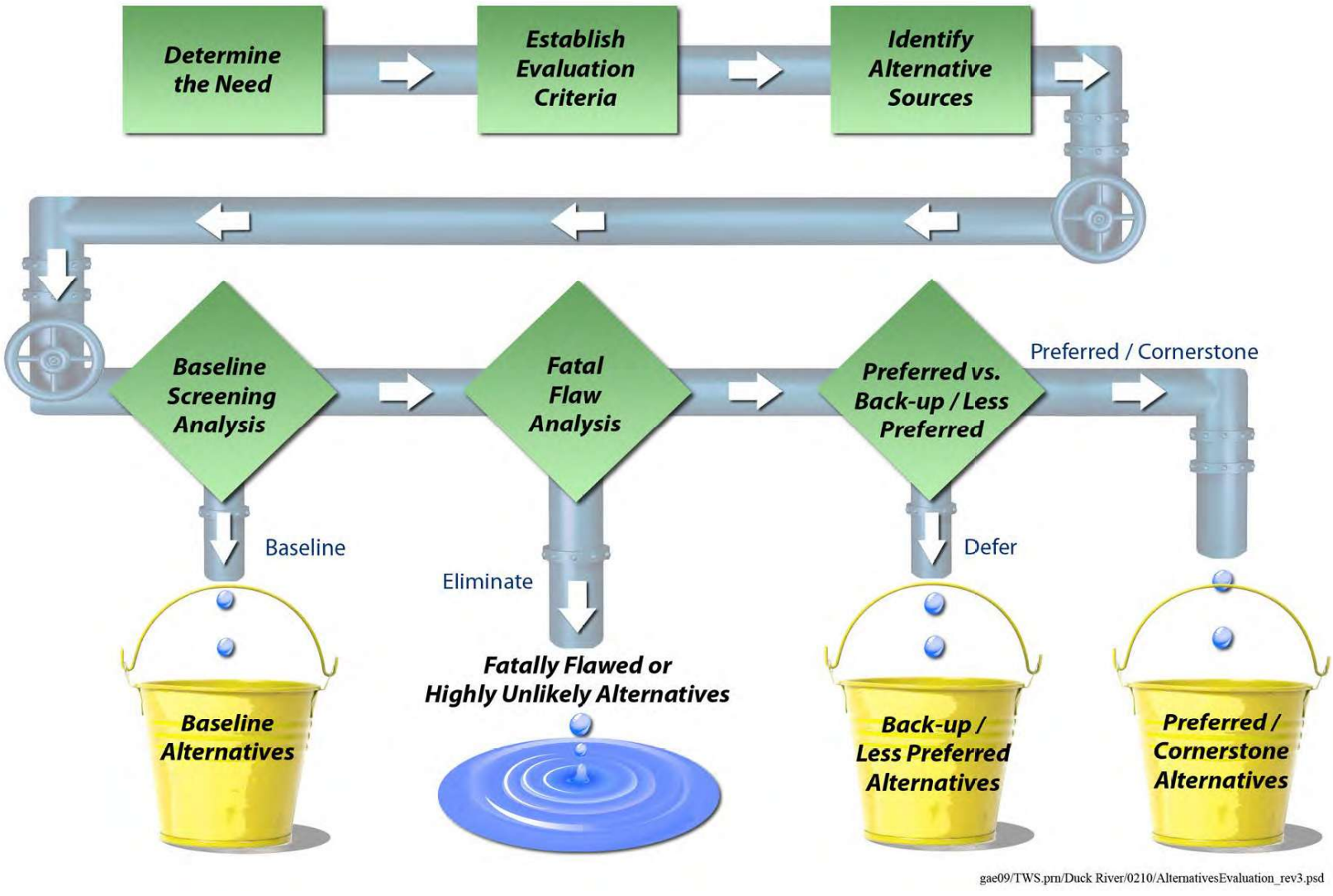
Started with over 40 non-structural and structural alternatives including:

- Implementing additional water efficiency measures
- Implementing a regional drought management plan
- Changing operation of Normandy Reservoir
- Modifying river constraints
- Constructing pipelines from reservoirs, rivers or other water systems
- Constructing tributary reservoirs (Fountain Creek Reservoir)
- Building off-stream storage reservoirs (pumped storage)
- Utilizing quarries
- Raising Normandy Dam

Alternative Analysis

- **Each alternative was subject to 7 criteria for review:**
  1. Reliable capacity
  2. Raw water quality
  3. Cost
  4. Implementablitiy
  5. Flexibility
  6. Environmental benefits
  7. Recreation
- **The alternatives were sorted into the following groups:**
  1. Baseline
  2. Fatally flaw
  3. Backup
  4. Cornerstone

Evaluation Process



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5 Regional Alternatives

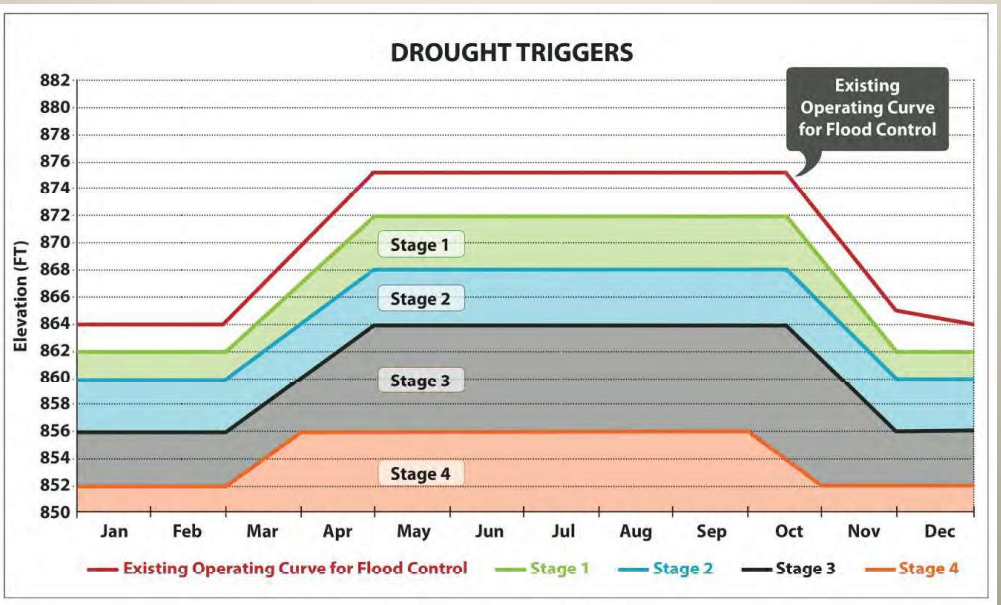
Duck River Regional Water Supply Programs and Projects

Programs/Projects	Purpose
Regional Drought Management Plan	Manage reservoir water for all uses during extended drought period
Optimizing Normandy Reservoir Releases	Provides efficient use of reservoir water
Water-Use Efficiency Program	A program identifying how we use water and recommending how we can be more efficient at managing our water resources
Williamsport/Natchez Trace New Downstream Intake for CPWS	Additional water supply to meet growth demands in Maury County and water demands during an extended drought period
Normandy Reservoir Capacity Improvements Project	Additional water insurance for all uses during extended drought period

January 2008



Regional Drought Management Plan Triggers and Stages



DROUGHT STAGES

STAGE 1	STAGE 2	STAGE 3	STAGE 4
Drought Monitoring	**Drought Alert**	**Drought Warning**	**Drought Emergency**
③ Initiate Drought Monitoring	③ Alert Drought Committee ③ Initiate Public Awareness	③ 10 cfs / week reduction of Shelbyville target (down to 120 cfs) ③ 10% reduction of public water use	③ 10 cfs / week reduction of Shelbyville target (down to 80 cfs) ③ 20% reduction of public water use

③ Impose 28 day waiting period between stages

③ Move out of stage if above trigger for at least 7 days

Regional Drought Management Plan (DMP)

- 2013 - Developed DMP
- 2014 – DRA requested TVA to adopt the DMP and ONRR Programs
- 2015 - Wetted perimeter and water quality models developed
- 2016 - Signed MOU with TVA to begin environmental review for DMP and ONRR
- 2018 - Signed agreement with TVA for Scope of Work
  - Signed agreement with Ramboll to write the EA
- 2022 - Third Party peer review of Oasis's Model
  - Draft EA sent to TVA for review
- 2023 - TVA conducted internal study "Drought Operations Alternative Analysis"
  - It was decided to pause the DMP EA and separate the ONRR and DMP EA

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Optimizing Normandy Reservoir Releases

Current Operating Flow Constraints

- Minimum **instantaneous** flow of 155 cfs for the period of June 1 through November 30
- Minimum **instantaneous** flow of 120 cfs for the period of December 1 through May 31

Proposed Operating Flow Constraints

- 7-day rolling **average** flow of 155 cfs for the period of June 1 through November 30 with a minimum flow of 145 cfs
- 7-day rolling **average** flow of 120 cfs for the period of December 1 through May 31 with a minimum flow of 110 cfs

Optimizing Normandy Reservoir Releases (ONRR)

- 2013 - Developed ONRR Program
- 2014 to 2023 -Same path as the DMP
- 2024 - ONRR EA separated
  - TVA held Public Meeting for ONRR EA
  - EA Team compiled comments and responses
  - Draft EA completed
- 2025 - USFWS review, and BO completed, hopefully

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Water-Use Efficiency Program

- A program designed to understand how we use our water
- Water-use efficiency/conservation education programs
- Model regional water demand trends
- Perform water audits and provide recommendations
- Reduce unaccountable water lost
- Reduce average gallons used per person

Water-Use Efficiency Program (WUEP)

- 2015 - Signed agreement with Maddaus Water Management, Inc (MWM)

- 2016 - Decision Support System Model (DSS) was developed
  - Customer Class Data Collected
  - Data baseline
  - Water-use report finished

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CPWS New Downstream Intake

- Downstream of the 100cfs flow-by constraint
- Near Maury/Hickman County Line
- Approximately 35 river miles, 20 land miles
- First phase of pipeline to TN River
- Removes CPWS reliance for water supply from Normandy Reservoir
  - Which would leave more water in the reservoir during drought periods
- Supports projected water supply needs
- CPWS is currently in the permit application process

CPWS New Downstream Intake Update

- 2014 - Completed the Maury County Water Supply Feasibility Study
- 2015 - Completed the Maury County Water Supply Strategic Plan
- 2017 - Completed the initial Water Supply Intake and Pumping Station Siting Study
- 2018 - CPWS took leadership role to complete permitting, engineering and finance strategy
- 2021 - CPWS asked DRA for $10 million for partial project funding
- 2022 - DRA CPWS signed agreement
- 2024 - CPWS asked for first disbursement according to agreement

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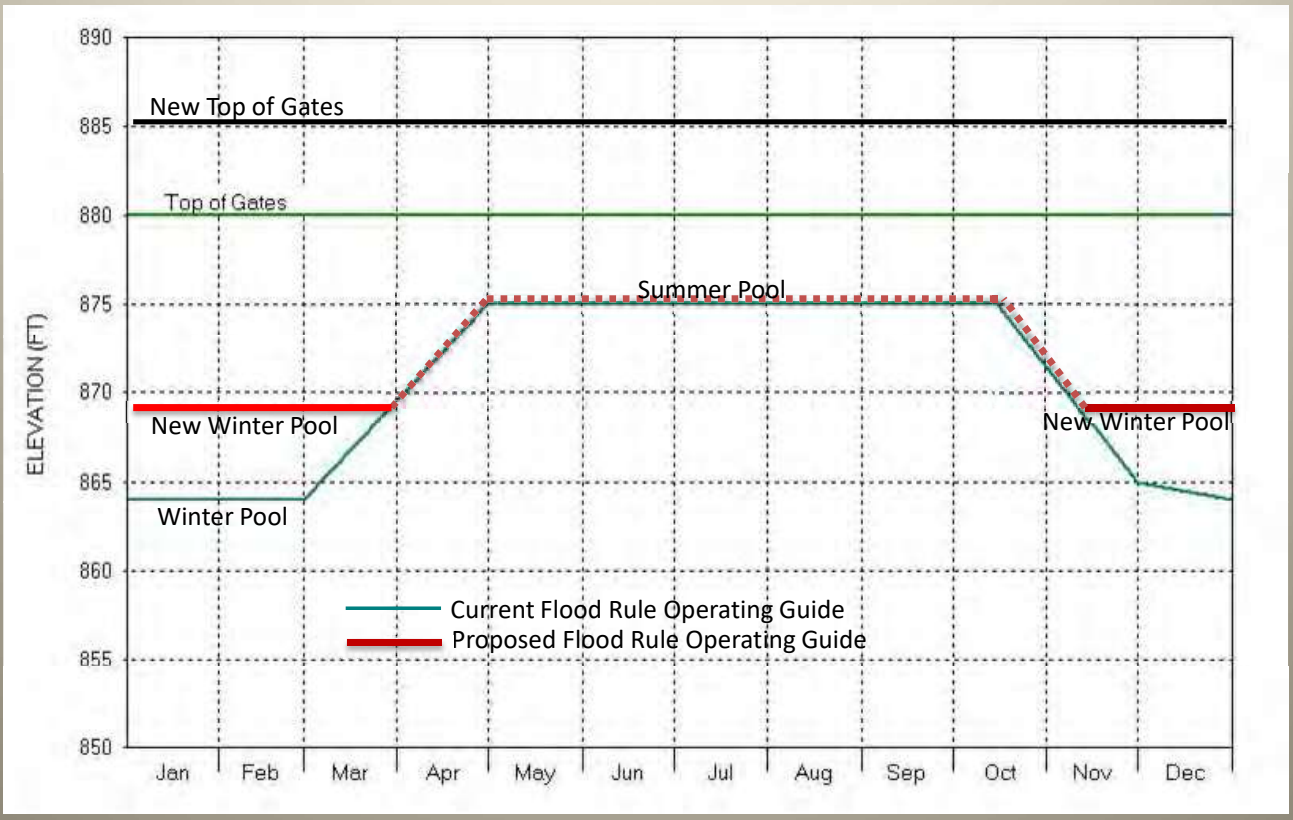
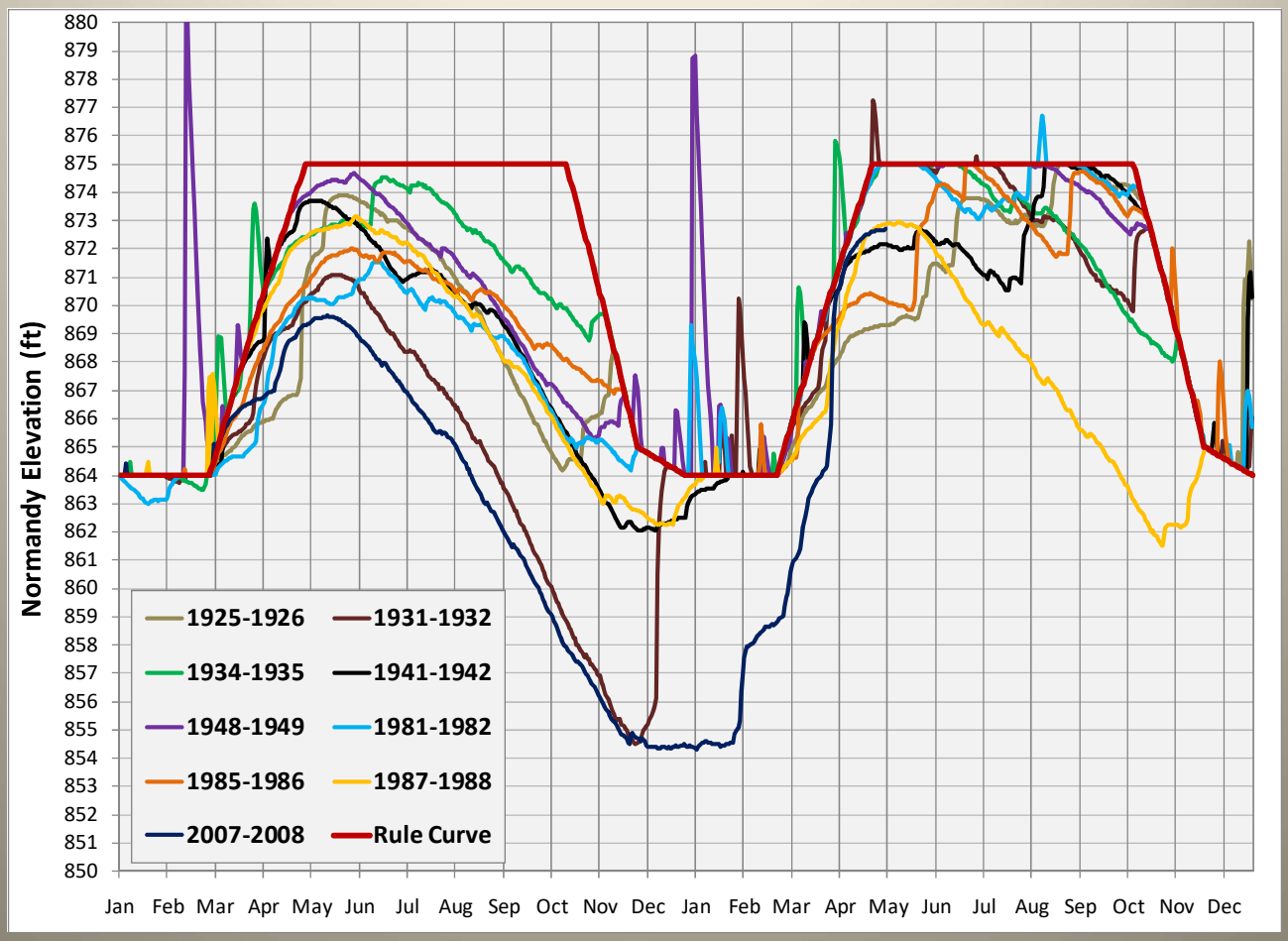
Normandy Reservoir Capacity Improvements: Proposed Changes to Flood Guide



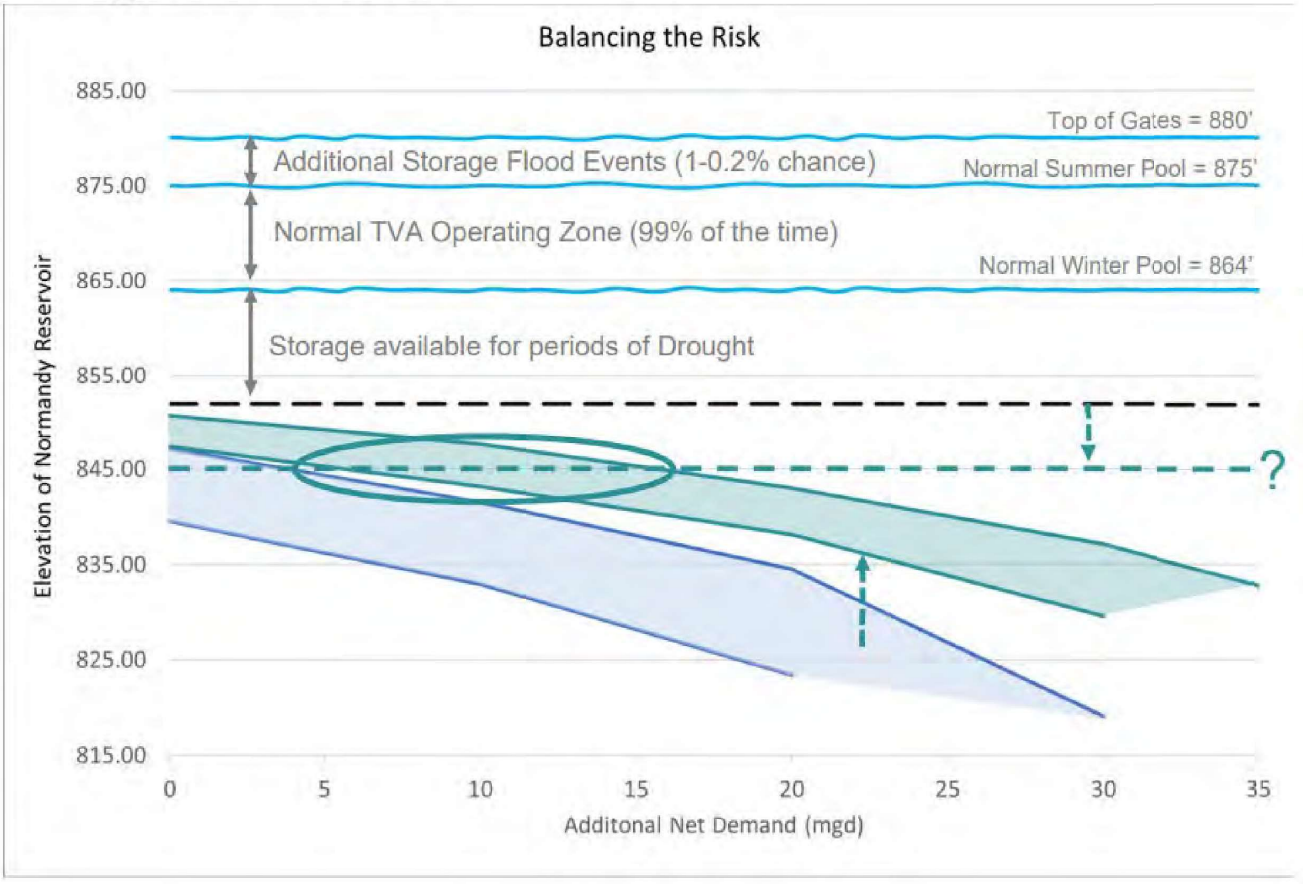
Major Normandy Droughts – Existing Rule Curve, 2020 Demands



Normandy Reservoir Capacity Improvement: Updates

- 2010 - DRA approached TVA with the NRCI project for implementation
- 2011 - Completed the Normandy Dam Pre-Preliminary Stability Analysis Calculations
- 2013 - Completed the Preliminary Stability Analysis Summary Report
- 2015 - Completed the NRCI report
- 2016 - TVA recommended a hold on the project
- 2023 - TVA's Net Water Demand Analysis for NR recommended available water below the DRUC pumping capacity
  - DRUC began engineering analysis for pumphouse renovations
- 2024 - DRUC received a grant from TDEC for $8 mil
  - DRUC signed agreement with DRA for $3 mil

Balancing the Risk



DRA Updates

Duck River Agency
Mission Statement

"To develop, protect and sustain a clean and dependable water resource for all citizens in the Duck River Region"

Bedford, Coffee, Hickman, Marshall, and Maury Counties

DRA Statute

TCA §64-1-601

- DRA was created in 1965 by the Tennessee General Assembly *"for the purpose of developing and effectuating plans and programs for comprehensive development, including the control and development of the water resources of those portions of the Upper Duck River watershed lying in Coffee, Bedford, Hickman, Marshall and Maury counties, and integrating plans, programs and development activities with the overall economic development of the area described."* TCA §64-1-601(b).

Securing DRA Future

HB375 SB1397

- Governor Lee signed legislation in June amending DRA Statute
  - General Assembly unanimously passed
- DRA became “Investment Worthy”
- Statute Amendment Points:
  - Secured funding
    - Membership fee on treated water delivered to the water system
    - DR water utilities with ARAP’s are the DRATAC Members
    - Encourages good stewardship “Hidden Reservoir”
  - Added a member from each water system to the DRA Board
  - DRATAC is now recognized as an entity formed by legislation

DRA 4-Yr Strategic Vision Plan

Goals

1) Outline and prioritize policy and project initiatives
2) Develop talent management practices
3) Enhance DRA communication strategies
4) Strengthen relationships with key stakeholders
5) Expand funding resources

Governor's Executive Order 108

- Recognizes the Duck River as a State natural treasure
- Affirms the State commitment to protect the Duck River
- Affirms the State commitment to support DRA's mission
- Establishes the DR Watershed Planning Partnership
- Challenges the DR Stakeholders to develop a program that can be implemented in other watersheds

Projects and Programs in the Pipeline

Updating the 2011 DR CRWSP

- Draft Scope-of-Work
  - Identify sources of additional water
  - Recommend solutions providing multiple benefits
  - Develop finance framework
  - Utilize credible process for decision making
- Share scope for comments on content
- Decide to advertise for RFP's or source out
- Begin project late 2025

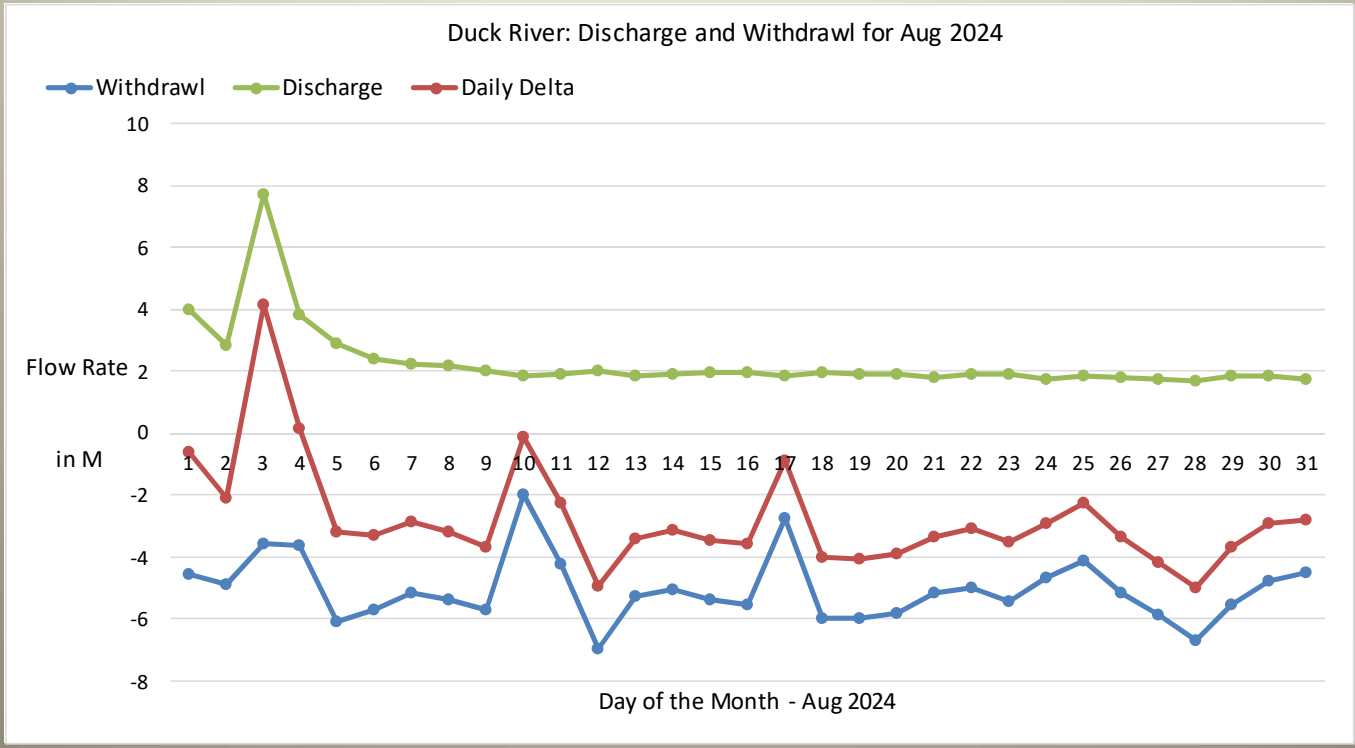
Water-Use Efficiency Program

- Draft Scope of Work
  - Define water use impacts
  - Document water use restrictions in drought events
  - Management of peak day water use
  - Water audits
  - Prioritize programs and projects for WUEP
  - Develop community awareness programs
  - Initiate TN Water-Use Efficiency Partnership Program
- Share scope for comments on content
- Decided to advertise for RFP’s or source out
- Begin project mid 2025

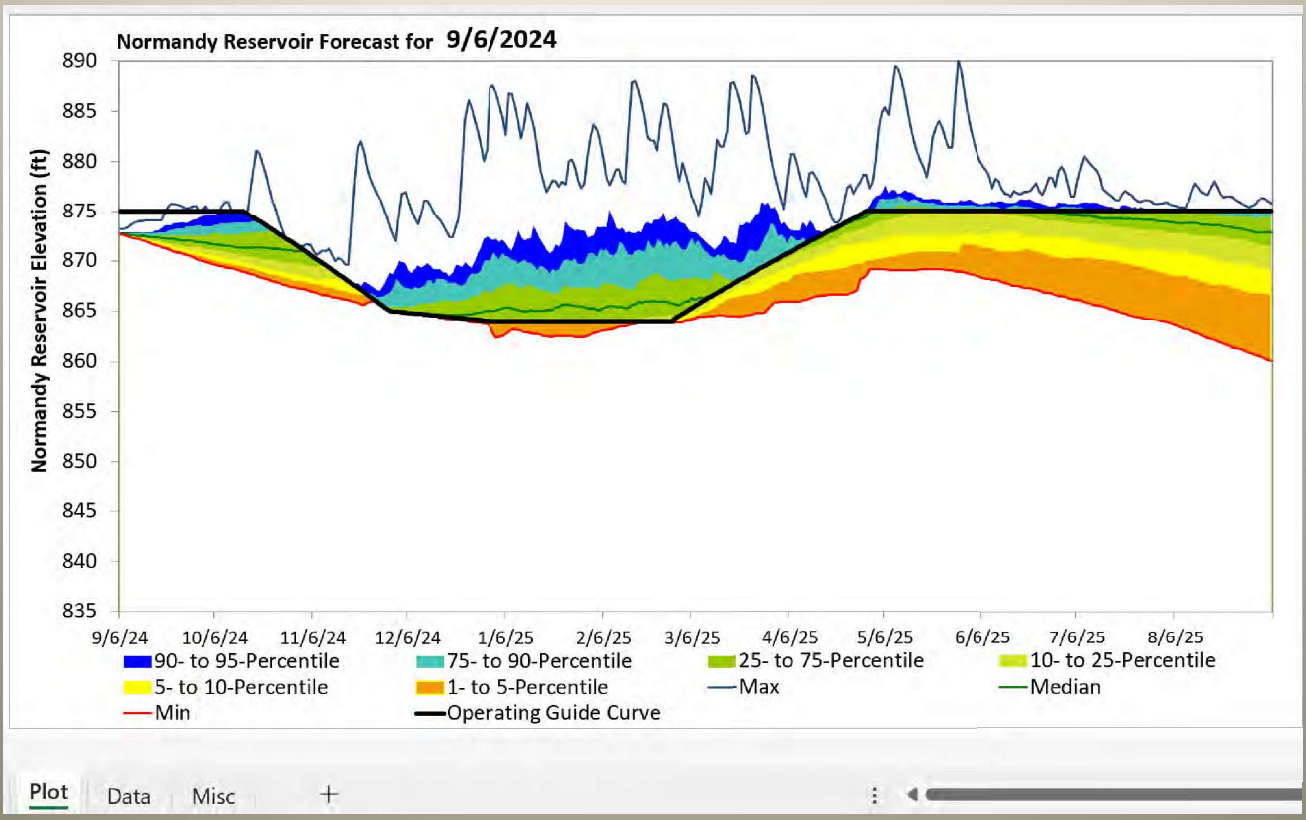
Modified DMP

- Population growth in the basin
- New and proposed withdrawal permits in the basin
- Feedback from stakeholders and advisory/regulatory agencies
- New data and tools available
  - Mussel studies
  - USGS ecological flows analyses for fish response
  - Updated demand growth projections
  - Climate change projections for hydrology
- Potential to utilize more of Normandy storage during extreme droughts
  - Improvements to DRUC intake and pumps
- Balance impacts on Normandy Reservoir, Upper and Lower Basin

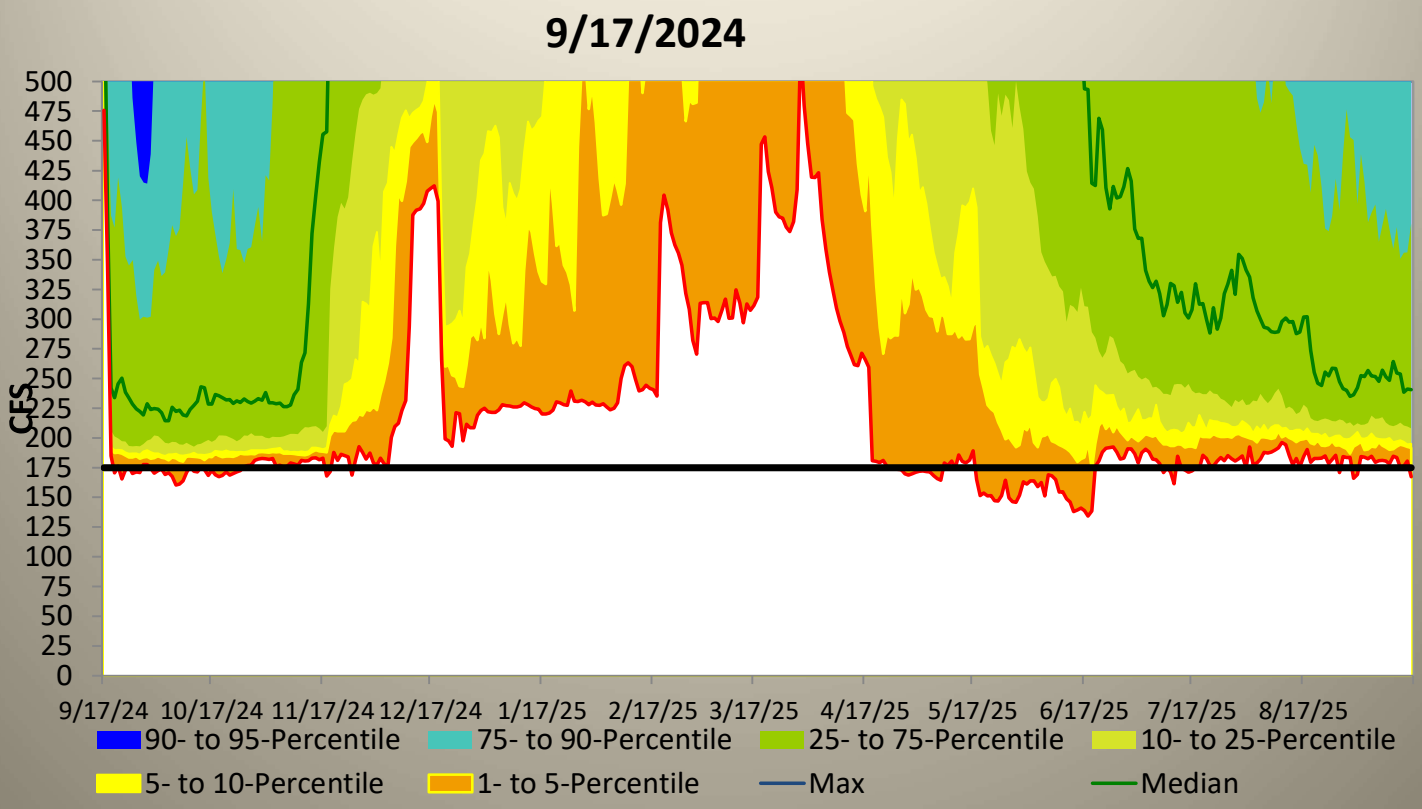
Water-Use Data Dashboard



Normandy Reservoir Forecast Model



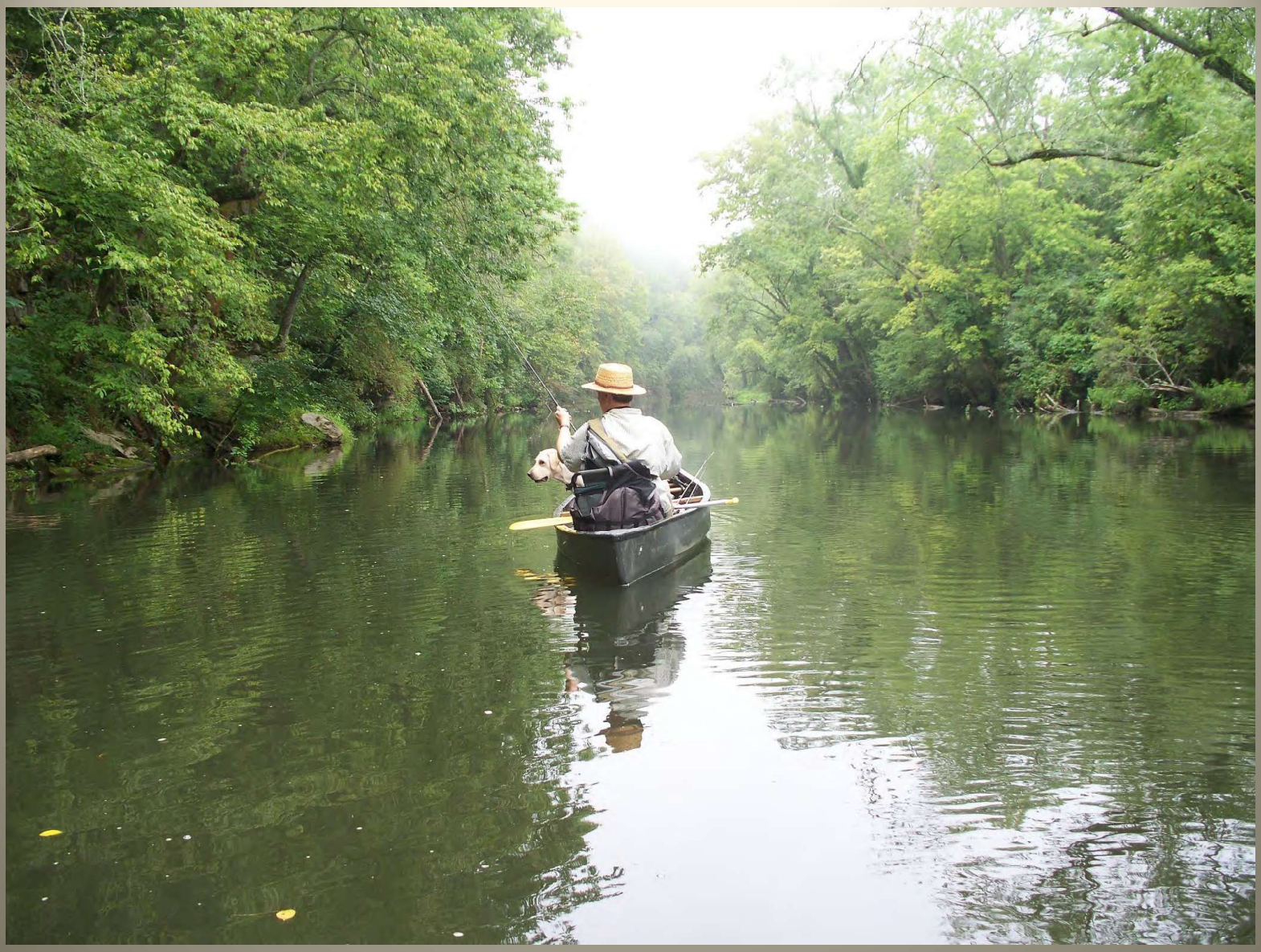
Milltown Gage Forecast Model





“Working Together Works”

doug@duckriveragency.org



An Introduction to Habitat Conservation Plans

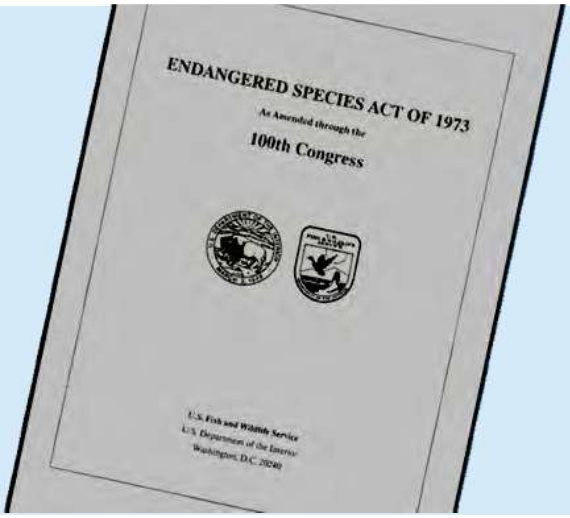
Jennifer Garland
USFWS – Atlanta Regional Office

The Habitat Conservation Plan Program

- The HCP program creates creative partnerships that allow public and private sectors to work with the Service to address listed and at-risk species in an ecosystem context, generate long-term commitments to conserve such species, and deliver regulatory assurances to project proponents.

- The Habitat Conservation Plan (HCP) program was developed by Congress as a process to reduce conflicts between listed species and economic development. Non-federal entities must develop a conservation plan that meets specific requirements as identified in the ESA, apply for an incidental take permit, and once issued, implement the project as specified in their permit.

01. The Endangered Species Act



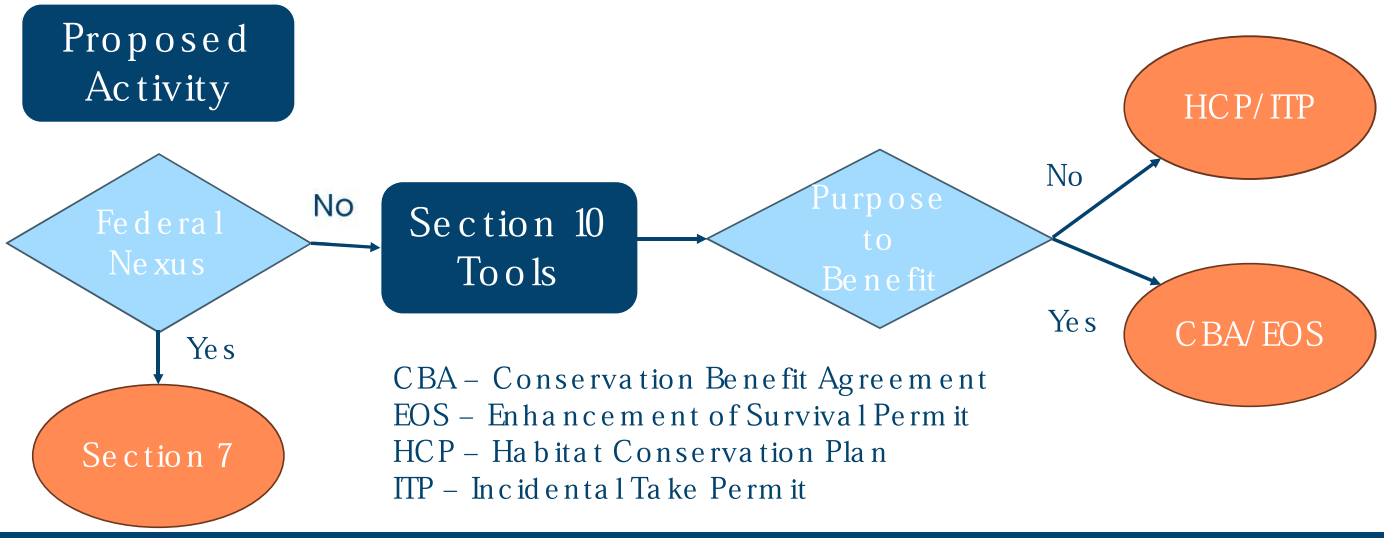
Section 2: Findings and Purposes
Section 3: Definitions
Section 4: Listing, Critical Habitat Designation, Recovery
Section 5: Land Acquisition
Section 6: Financial Assistance to States & Territories
Section 7: Interagency Cooperation
Section 8: International Cooperation
Section 9: Prohibited Acts
Section 10: Exceptions, including Permits
Section 11: Penalties and Enforcement
Sections 12-18: Misc

Section 10 - Exceptions

Section 10 includes several conservation tools that provide exceptions to Section 9 prohibitions, including:

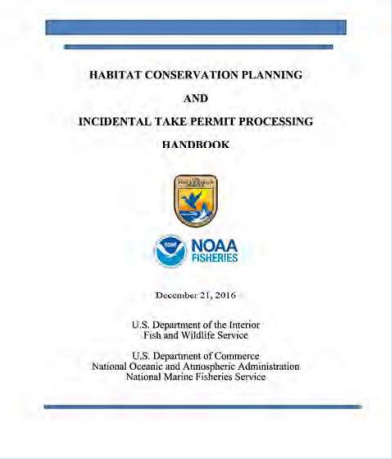
1. Section 10(a)(1)(A)
   - Research and Recovery Permits
   - Interstate Commerce Permits
   - Enhancement of Survival Permits
2. Section 10(a)(1)(B) Incidental Take Permits
3. There are other conservation tools in Section 10 but we will focus on Incidental Take Permits

How do I know what I need?



CBA – Conservation Benefit Agreement
EOS – Enhancement of Survival Permit
HCP – Habitat Conservation Plan
ITP – Incidental Take Permit

02. What is a Habitat Conservation Plan?



HABITAT CONSERVATION PLANNING
AND
INCIDENTAL TAKE PERMIT PROCESSING
HANDBOOK

NOAA FISHERIES

December 21, 2016

U.S. Department of the Interior
Fish and Wildlife Service

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

HCPs are voluntary planning documents with non-federal entities designed to accommodate economic development by authorizing the limited and unintentional take of listed species when it occurs incidental to otherwise lawful activities.

What is an HCP (cont.)

- It is the applicant's document.
- Demonstrates how the applicant will meet the permit issuance criteria, including minimizing and mitigating the impacts of the authorized incidental take.
- Legally binding agreement between the Secretary of the Interior and the permit holder.
- Can be tailored to meet the specific needs of the applicant.

03. The HCP Planning Process



Developing an HCP consists of four distinct phases:

1. Pre-application
2. Developing the HCP and environmental compliance documents
3. Processing the application, making a decision, issuing the permit
4. Implementation and monitoring

Phase 1: Pre-Application

Communicating and Coordinating

ProTip: Frequent and open communication is key to successfully planning, developing, and implementing an effective HCP.

- Getting Started (HCP Handbook Chapters 3 and 4)
- The Service works with the applicants work together to understand process, program, requirements, training, funding, consultants
- Build relationships for a successful plan

Consider the Value of Communication

HCPs are often multidisciplinary efforts that can involve people with varied backgrounds, disciplines, and motivations (e.g., biologists, engineers, investors, landowners, lawyers, neighbors).

Building trust, creating stakeholder involvement strategies, engaging groups in shared learning, negotiating, and planning all take time.

Investing time and money consulting, coordinating, and cooperating with key Stakeholders will save time and money in the long-run.

Effective communication can prevent administrative appeals, lawsuits, and other forms of protest that can take years to complete.

Phase 2: Developing the HCP

- **Applicant responsibilities:**
  - Understand ESA Section 10 purpose, criteria, and process
  - Choose to seek an ITP
  - Secure adequate funding for HCP (and often NEPA document)
  - Be a good partner and communicate with the Service
- **Service responsibilities:**
  - Providing technical assistance and negotiating the HCP
  - Conducting NEPA pre-planning
  - Early intra-service section 7 consultation
  - Initiating NHPA section 106 compliance
  - Initiating tribal consultation, if necessary

Phase 2: Developing the HCP

A complete HCP must meet the Service's issuance criteria and include the components required by regulation, including:

- Project description
- Covered species
- Goals and objectives
- Anticipated take
- Conservation program
- Conservation Timing
- Permit duration
- Monitoring
- Funding needs and sources
- Alternative actions

Minimizing and Mitigating

Conservation measures may take several following forms:

- avoiding through project design
- minimizing through best management practices
- Minimizing by reducing or eliminating other threats
- Mitigating/offsetting impacts, by, (a) restoration of degraded habitat, (b) enhancement of functional habitat, (c) preservation of habitat, (d) creation of new habitat, (e) trans-locating or repatriating species

Phase 3

1. Processing the application
2. Making a decision
3. Issuing the permit

- Begins with Service acceptance of application
- Public review
- Ends with permit decision
- Steps in between:
  - Review and Respond to Public Comments
  - Revise and finalize HCP and NEPA document
  - Intra-Service Section 7 Consultation
  - Decision Documents (ESA, NEPA)
  - Permit Decision

HCP Issuance Criteria (Sect. 10)

The Director will issue the permit if the Director finds:

(i) The taking will be **incidental to**, and not the purpose of, carrying out an otherwise lawful activity.

(ii) The applicant will, to the **maximum extent practicable**, minimize and mitigate the impacts of the taking.

(iii) The applicant will ensure that **adequate funding** for the conservation plan implementation will be provided.

(iv) The applicant has provided procedures to deal with **unforeseen circumstances.**

(v) The taking will not **appreciably reduce** the likelihood of the survival and recovery of the species in the wild.

(ii) The Maximum Extent Practicable Standard

The applicant must show that their HCP will minimize and mitigate the impacts of the taking to the maximum extent practicable because either:

The combination of minimization and mitigation in the HCP leaves no remaining impacts of the taking on the species that could be further mitigated or minimized, that is all impacts will be fully offset.

OR

If the applicant cannot fully offset the impacts of the taking, they must demonstrate that it is not practicable to carry out any additional minimization or mitigation.

(iv) Plan for Unforeseen Circumstances

The HCP must contain a conservation program, that explains the:

(C) Changed circumstances and the planned responses in an adaptive management plan; and

(D) Procedures for dealing with unforeseen circumstances.

Changed circumstances:

Adaptive measures provided for in the HCP will be implemented by the permittee as specified in the HCP.

Unforeseen circumstances:

If it's not in the changed circumstances section of the HCP, then it's an unforeseen circumstance.

Phase 4: Implementation & Monitoring



- Implementing the HCP
- Monitoring
- Adaptive management
- Changes and amendments
- Maintain the partnership

How Long Does an HCP Take?



- Quality of existing information
- Complexity of issues
  - Number of covered species
  - Scale of project/permit area
  - Number of applicants
  - Challenges of mitigation
- Amount of dedicated staff time
- Knowledge of staff and consultants
- Funding continuity

What Does an HCP Cost?

Permit issuance criteria – Section 10(a)(2)(B)(iii): *the applicant will ensure that adequate funding for the plan will be provided*

The applicant/permittee(s) provide HCP funding

- HCP development (grant opportunities)
- HCP implementation
- Voluntary NEPA/NHPA

Funding Assurance of the Plan may mean

- Writing a check
- Providing funding guarantees
- Assembling external funding
- Demonstrating a track record of providing similar funding

HCP Development Expenses

- Applicants may hire consultants to assist in developing
  - The Applicant's HCP
  - The Service's NEPA document (EIS or EA)
  - The Service's NHPA Sect. 106 PA

Non-Traditional Section 6 Grants

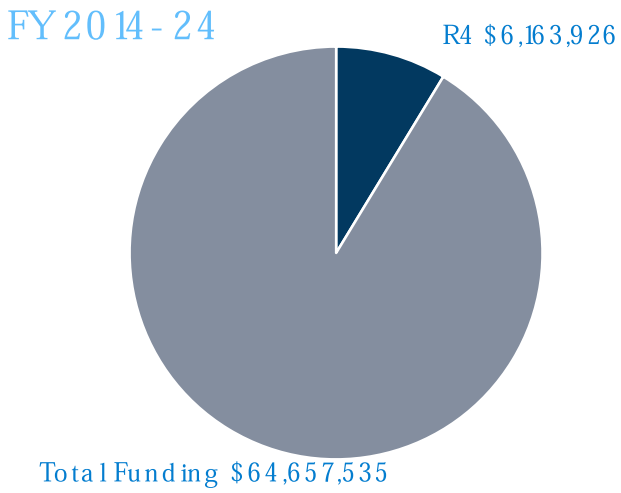


1. Conservation Planning Assistance Grants

Planning Assistance Grants

Available through the Cooperative Endangered Species Conservation Fund, provide federal financial assistance **to states and territories** to support the development of Habitat Conservation Plans (HCPs) & supporting documents (NEPA, Sect 106).

Funding may also be used to support the renewal or amendment of existing HCPs.



HCP Implementation Expenses

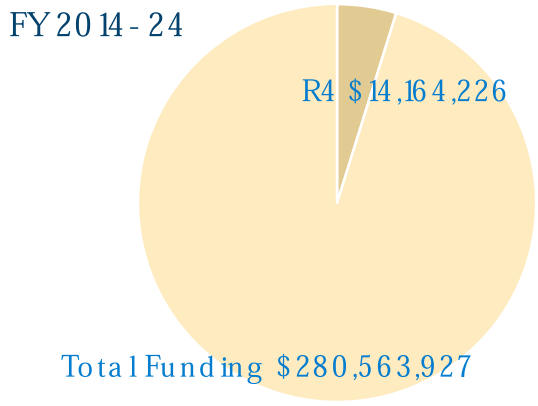
- Program administration
- Avoidance and minimization measures
- Monitoring and reporting
- Management and adaptive management
- Mitigation
  - Land or water acquisition
  - Habitat and species management
  - Habitat restoration
- Endowment for post-permit funding

Non-Traditional Section 6 Grants



1. Conservation Planning Assistance Grants
2. HCP Land Acquisition Grants

HCP Land Acquisition



Provides funding **to States and Territories** to acquire land **associated with approved and permitted HCPs**.

Grants do not fund the mitigation required of an HCP permittee; instead, they support land acquisition by the State or subrecipients that complement mitigation requirements.

Online Resources

Habitat Conservation Plans - https://www.fws.gov/service/habitat-conservation-plans

HCP Handbook (will be updated soon) - https://www.fws.gov/media/habitat-conservation-planning-and-incidental-take-permit-processing-handbook

Conservation Planning Assistance Grants - https://www.fws.gov/service/conservation-planning-assistance-grants

HCP Land Acquisition Grants - https://www.fws.gov/service/habitat-conservation-plan-land-acquisition-grants



QUESTIONS?

Freshwater Mussel Capture-Mark-Recapture on the Duck River

Where, when, and how we keep track of them all!

Brittany Bajo- Walker

Surveying Mussel Populations

Questions

- What is our goal?
- What are we trying to learn ?
- Is it species specific or system specific?
- Will it repeat?
- How often?
- How much effort?
- What method will we use?

Mussel Data for the Duck River

Contains about 60 species of mussels and numerous other snail and fish species

Historical Data

- Duck River Database by Kristin Womble and Amanda Rosenberger

Hatchery Monitoring

- Monitoring of released animals
- Collection of broodstock

Long Term Monitoring Effort

- Don Hubbs
- 5 Year repeat

Mark Recapture Effort

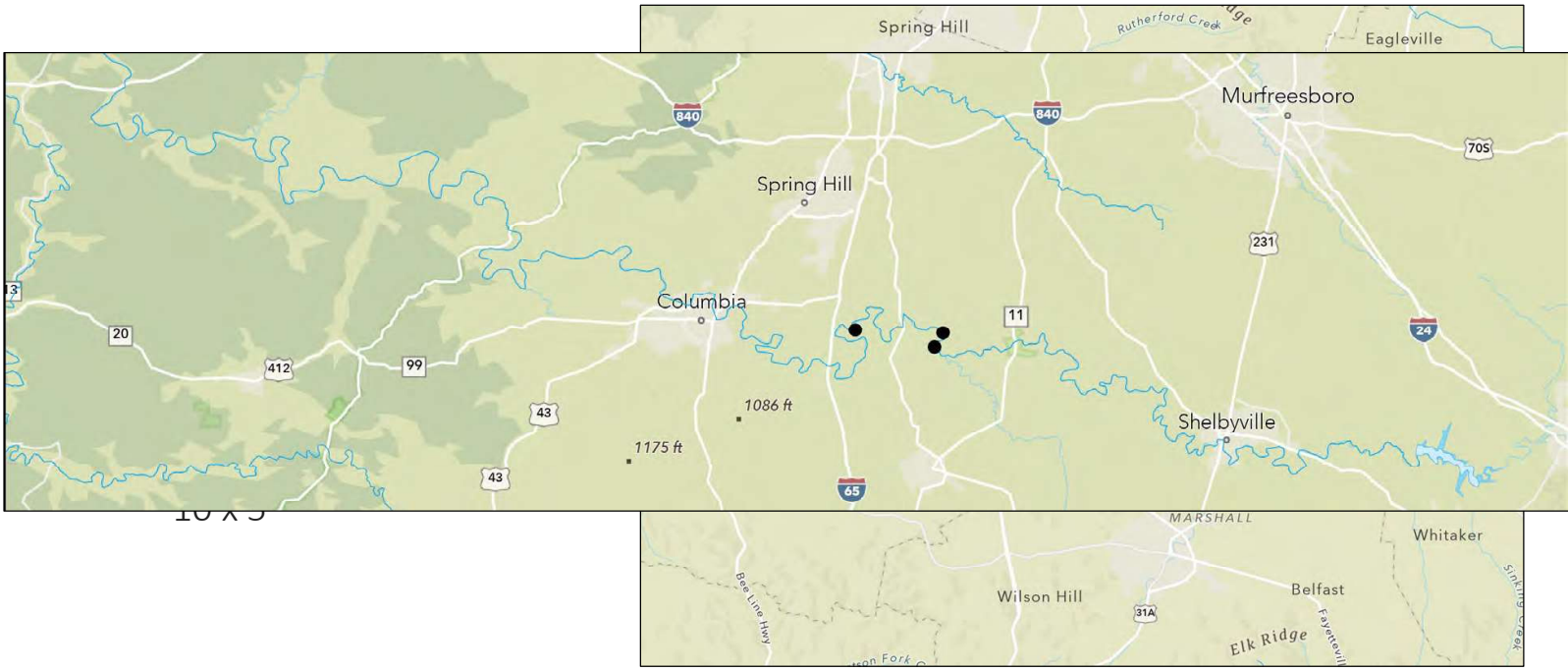
- Jason Wisniewski
- 3 Years complete for 2 Sites
- 2 Years complete for 1 Site
- 5 years total





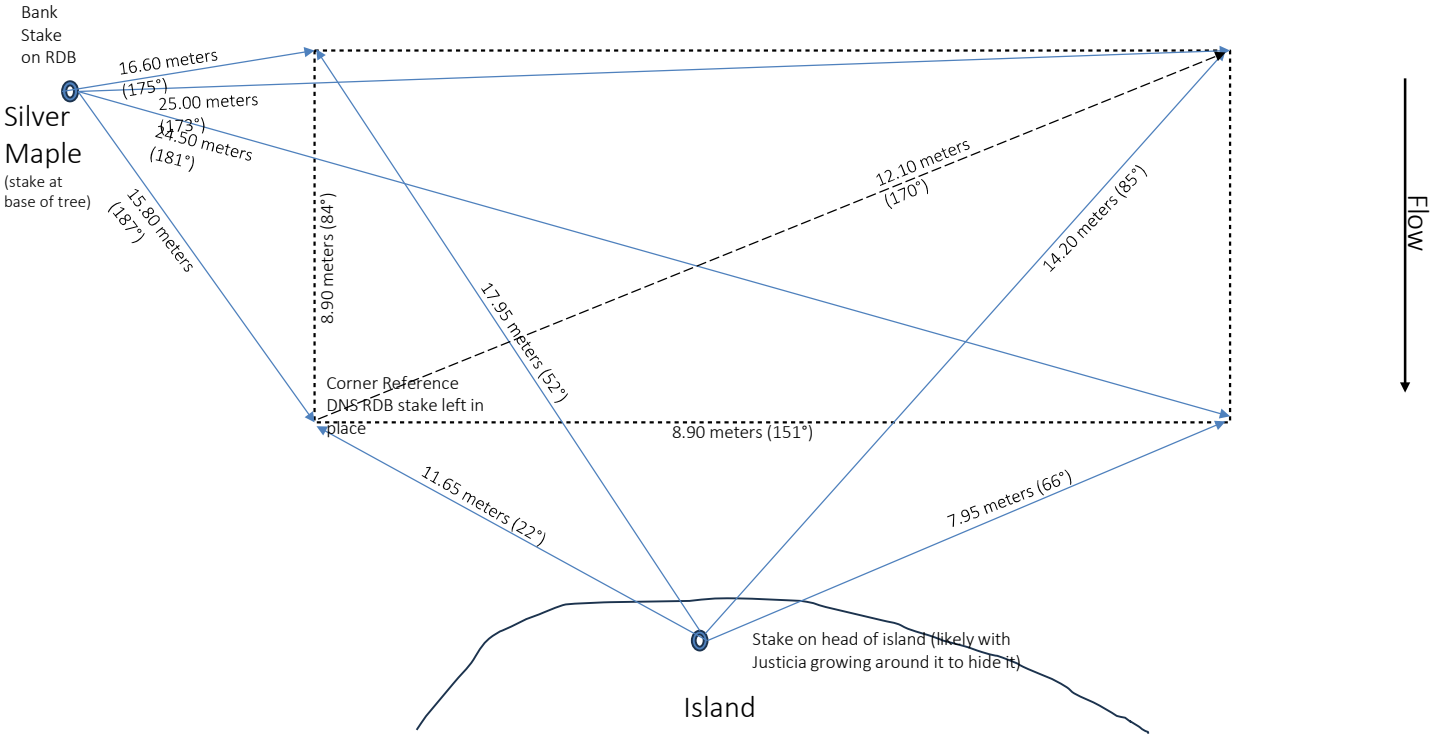
Goal: To have spatially confined data that accounts for unique individuals and can be used to predict trends, apparent survival, recruitment and rate of population growth.

Mark Recapture Sites



10 x 5

Define the Zone





Survey

























Results

Conducted additional surveys below the designated grids to look for washouts, dead shell and to look for any additional species diversity








F414


C471

Results

Tagged Species

35 Species at Lillard Mill

18 Species at Hooper Island

15 Species at Venable Springs

Black Dots

Black Glue was used at Hooper Island and Venable Springs to note common species that were not previously tagged in order to track cohorts



Results

Tagged Species Individual Counts

945 at Lillard's Mill

719 at Hooper Island

272 at Venable Springs

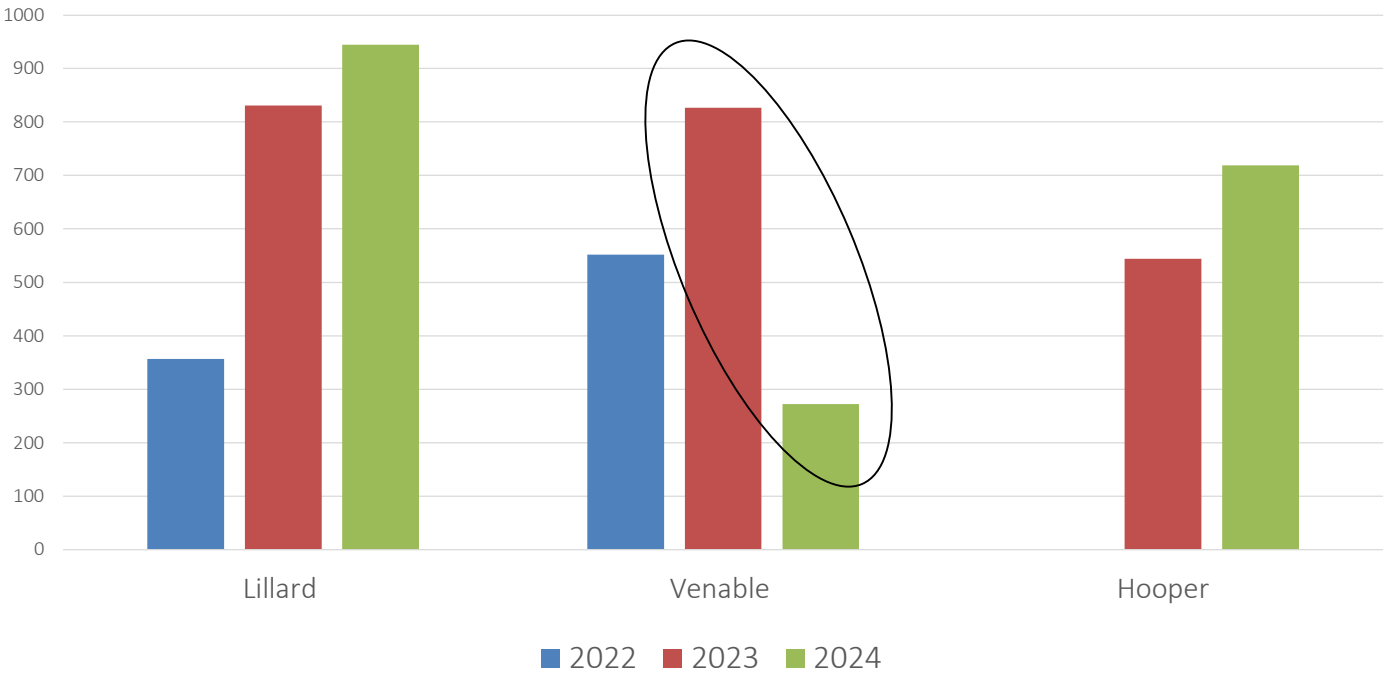
Black Dots

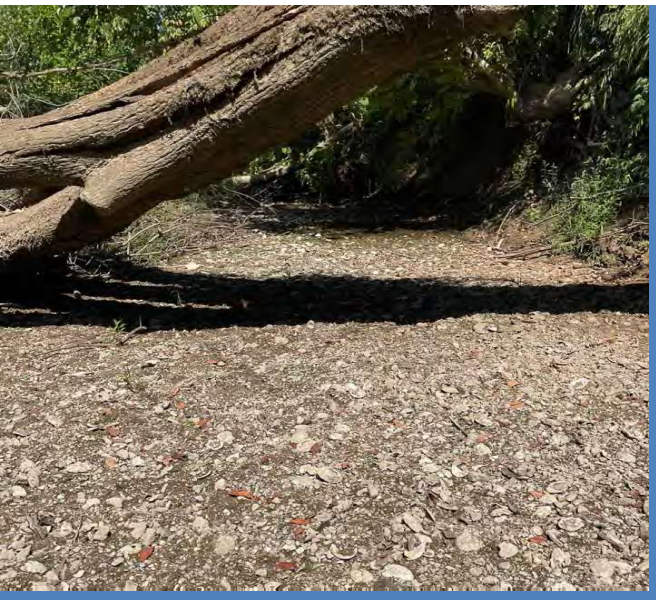
400+ individuals at Hooper Island

50+ individuals at Venable Springs



Total Tagged Individuals



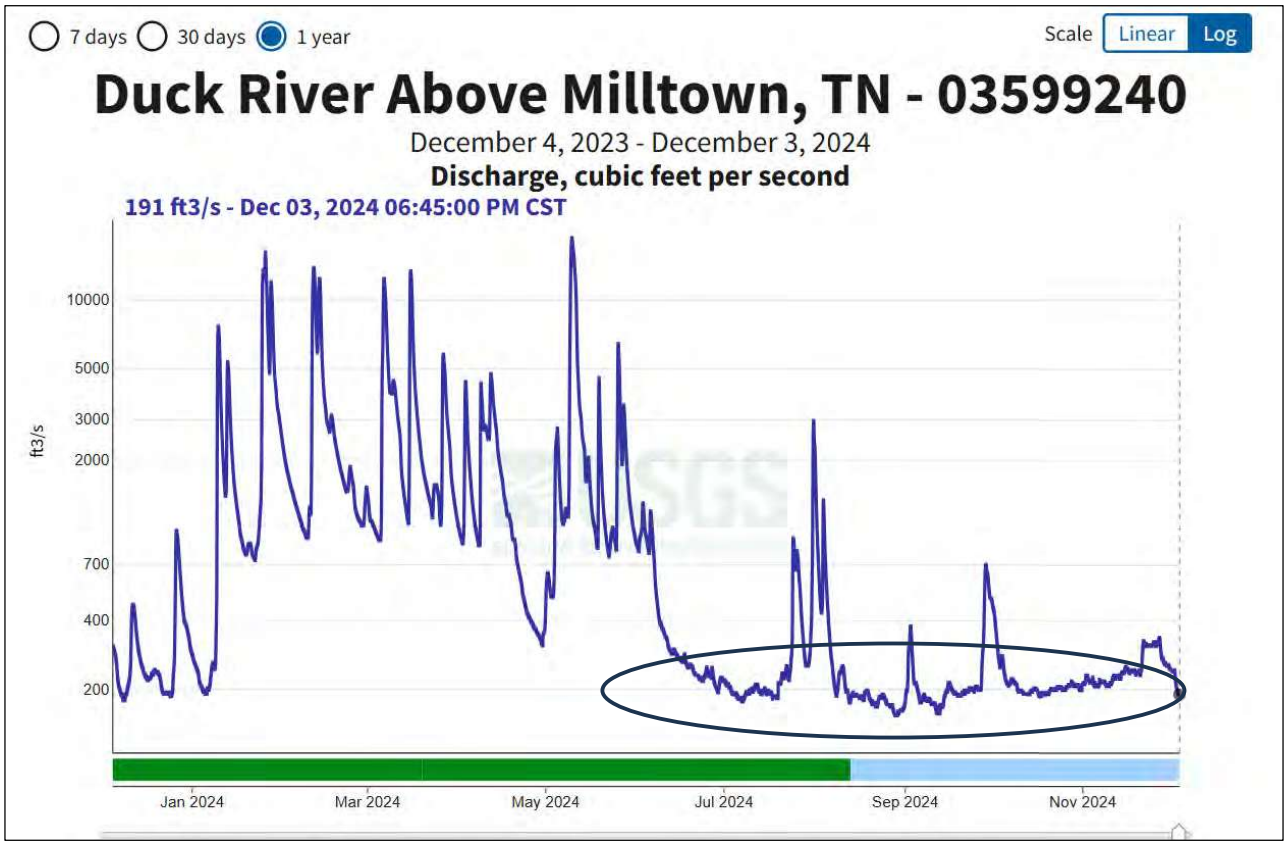


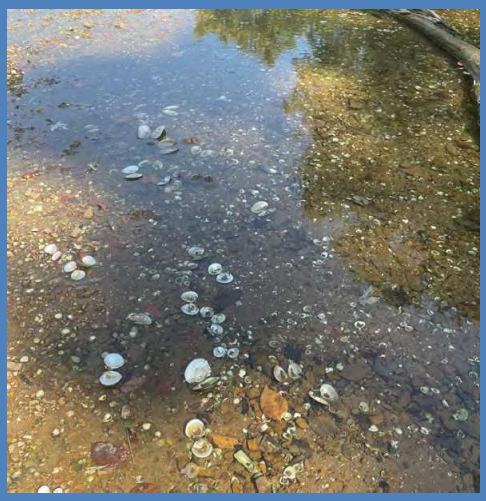






Venable Springs


7 days
30 days
1 year
Scale
Linear
Log
Duck River Above Milltown, TN - 03599240
December 4, 2023 - December 3, 2024
Discharge, cubic feet per second
191 ft3/s - Dec 03, 2024 06:45:00 PM CST
ft3/s
10000
5000
3000
2000
700
400
200
Jan 2024
Mar 2024
May 2024
Jul 2024
Sep 2024
Nov 2024


Impacts of Drought







Impacts of Drought





Hooper Island





Future Plans

- Data Quality Analysis and Quality Control
- Modeling
- Preparation for Mark Recapture 2025
- Development of the Drought Response Team

Thank you and Questions!





Department of
Environment &
Conservation

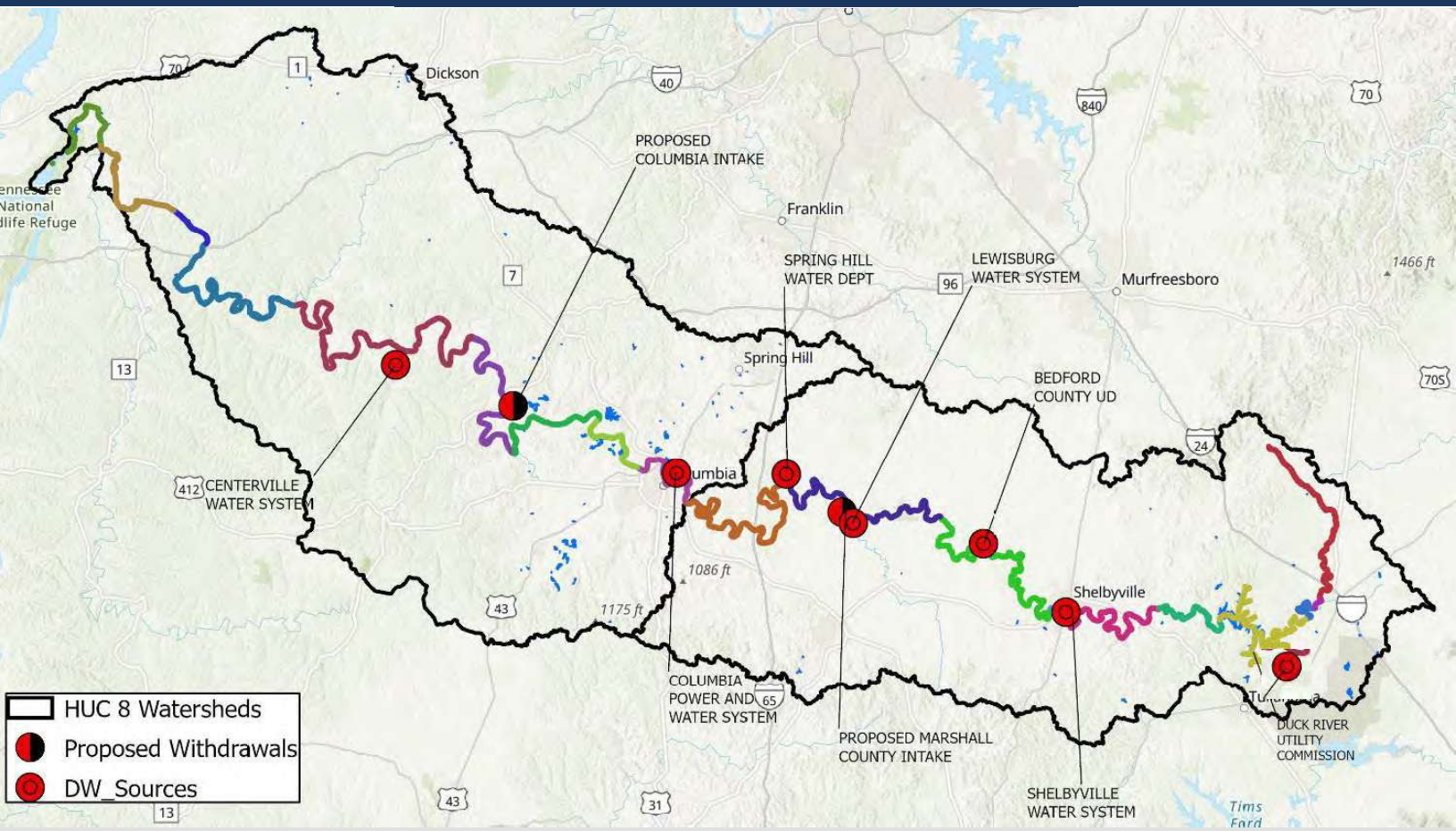
Comprehensive Water Withdrawal Permitting in the Duck River Watershed

The Need for Comprehensive Regional Permitting

TDEC met with eight water systems in 2019-2020 about new or expanded intakes

- Concerns about accommodating rapid growth in the area
- Questions about "grandfathering" immediate water availability and purchase options limiting growth potential
- TDEC has received multiple ARAP withdrawal permit applications for the same resource
- DWR believes we can authorize current withdrawals, allowing us to accommodate additional short-term (less than 5 year) needs
- Long-term needs (greater than 5 years) will require further analysis and cooperation to ensure an equitable water withdrawal permitting strategy

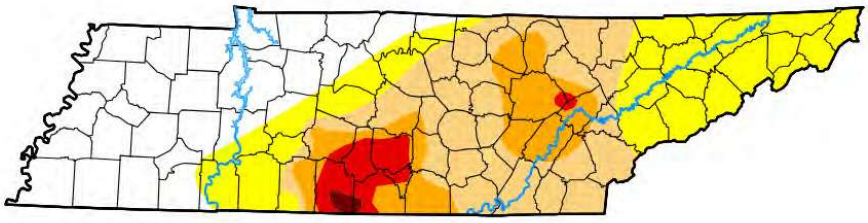
Duck River Watershed



Why start in the Duck River Watershed?

Duck River has unique water withdrawal challenges and opportunities:

- Number of public water system withdrawals
- Public interest in the river, known as the most biologically diverse river in North America with 50 documented species of freshwater mussels and 151 species of fish. T&E species include globally significant populations and some species found nowhere else in the world
- Exceptional Tennessee Water (ETW) designation
- There is an existing regional planning organization – the DRA as an established cooperative framework is an asset for this pilot project.
- Water systems' participation in DRA helps to set the framework for participate in the pilot study. TDEC will work with water systems in collaboration with DRA.
- Drought concerns



Map released: Weds. November 27, 2024

Data valid: November 26, 2024 at 7 a.m. EST

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors

United States and Puerto Rico Author(s):

David Simeral, Western Regional Climate Center

Pacific Islands and Virgin Islands Author(s):

Richard Heim, NOAA/NCEI

Overview

1. **Create a baseline of permitted withdrawals**

2. Consider new intakes and expansions and identify:
   - **areas for regional growth planning/regional water need**
   - regional interconnection and infrastructure opportunities and projects
   - endangered species analysis and mitigation (will involve other agencies)
   - how to better understand other designated uses such as recreation, agriculture
   - how to utilize ARP, BIL, or other funds to develop and implement collaborative plans

3. Based on this info, TDEC will be able to consider and apply such information as the **basis for renewal of the ARAP withdrawal permits**.

4. Ongoing/iterative process -continually go through steps 2 and 3 into the future as circumstances evolve in the watershed.

Current Status of ARAPs

Marshall County Board of Public Utilities

- Permit issued on August 6, 2021
- Includes a special permit condition that water withdrawal shall cease when flow at the Milltown USGS gage reaches a low of 175 cfs
- Appealed by MCBPU and DRA; cases consolidated
- TWF and TNC granted intervention
- Parties agreed to mediation; settlement reached in February 2022
- Revised permit issued

Columbia Power and Water Systems

- Permit issued on June 24, 2019 for existing intake 20 MGD
- New permit including additional intake with floating rate/volume limit of 32 MGD on public notice fall 2023; public hearing October 19, 2023
- Notice of Determination of Economic/Social Necessity January 9, 2024
- Permit issued on March 15, 2024
- Appealed by multiple parties

Current Status of ARAPs

Duck River Utility Commission

- Permit issued on March 15, 2024
- Appealed

Bedford County Utility Commission

- Permit issued on March 15, 2024
- Appealed

Current Status of ARAPs

Shelbyville Power, Water, & Sewerage Systems
- Draft permit fall 2023
- Public hearing October 30, 2023

Lewisburg Water System
- Draft permit fall 2023
- Public hearing October 30, 2023

Spring Hill Water System
- Draft permit fall 2023
- Public hearing October 30, 2023

Maury County Water System
- Draft permit fall 2023
- Public hearing October 30, 2023

Path Forward – Long-Term

ARAP permitting for all public water withdrawals

- Permits will be on a 5 year planning cycle
- Will use current withdrawal rates as baseline
- Will allow for regional water supply planning and regionalization
- Will allow for the Duck River to support ALL designated uses
- Habitat Conservation Planning to ensure ESA compliance

Habitat Conservation Plan

TDEC will lead development of a Habitat Conservation Plan (HCP)

- HCP described in Section 10 of Endangered Species Act (ESA)
- Multi-year effort to comply with ESA regulations
- Plan can be used to accommodate water withdrawals by authorizing limited and unintentional take of listed species
- Plan describes effects on listed species, how impacts will be minimized and mitigated, and funding for conservation measures
- Public outreach and stakeholder coordination

Governor's Executive Order 108



RECEIVED

STATE OF TENNESSEE

EXECUTIVE ORDER

BY THE GOVERNOR

No. 108

AN ORDER TO CONSERVE THE DUCK RIVER WATERSHED

WHEREAS, this Administration recognizes the importance of balancing economic growth, water resource management, and environmental and habitat conservation to ensure the long-term sustainability of our waters; and

WHEREAS, Tennessee is home to some of the most ecologically diverse river systems in North America that serve as critical sources of drinking water, habitat, agricultural water supply, and recreation; and

WHEREAS, the Duck River is not only a scenic treasure winding 269 miles through Tennessee, but also it is North America's most biologically diverse freshwater river and is globally significant for its wildlife diversity; the Duck River is a critical part of Tennessee's outdoor recreation economy; and the Duck River is the sole water source for approximately 250,000 Tennesseans in an area of this State that is experiencing rapid growth and development; and

WHEREAS, this Administration is committed to enhancing water management and water conservation practices while supporting economic growth, and the ongoing partnership between the Tennessee Department of Environment & Conservation ("TDEC") and the Tennessee Wildlife Resources Agency ("TWRA") promotes these priorities in the following ways:

- Ongoing planning and management of the Duck River Watershed through holistic solutions to reduce water loss, prioritize regionalization, conserve endangered species' habitats, provide watershed protection education, promote responsible and sustainable recreation use;
- Identifying opportunities to implement holistic planning and management for all Tennessee watersheds; and
- Prioritizing regionalization and interconnection of water systems as part of TDEC's

- Establishes 19 member Planning Partnership
- Directs TDEC to:
  - implement comprehensive permitting
  - Water loss 20%
  - Prioritize regionalization
  - Lead the HCP
  - Collaborate with DRA
  - Public education
  - Recreational access
  - Drought planning
  - Normandy Reservoir management planning
  - Large-scale engineering projects
- Directs statewide watershed management, preservation, and water supply planning work

Stakeholders

- stakeholders listed at https://duckriveragency.org/wrc.htm (plus Centerville)
- Water systems (DRATAC members)
- DRA
- Agencies – TDEC, TWRA, TVA, USACE, USFWS, EPA
- NGOs – TNC, SELC, HRC, TWF, Sierra Club, Duck River Conservancy
- Individual stakeholders from 9 TDEC stakeholder meetings since June 2020, drought meeting, Executive Order announcement

Questions?

Robby Baker, ARAP Permit Writer
Robert.D.Baker@tn.gov

April Grippo, Deputy Director, TDEC DWR
April.Grippo@tn.gov

Duck River Symposium: 2024

USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

Presented By:
Richard Hanson-EPR
Keith DeMell, Ph.D.-DRWS

Your Presenters:

Keith DeMell, Ph.D.-Duck River Watershed Society

- DRWS Board member
- Ph.D in Engineering
- Taught at the College Level for many years
- Member of the Coffee County Rescue Squad
- Married to his wife DJ
- Lives on Normandy Lake in Manchester

Richard Hanson-Ecosystem Planning & Restoration

- Resident of Coffee County, married, 3 kids and a great dane.
- Worked for EPR since 2022 developing stream mitigation projects.
- Prior to EPR, was a Soil Conservationist with NRCS for 7 years

About the Duck River Watershed Society

Kevin Vann-Our Founder



- Manchester, TN Native.
- Member of the Seven Summits Club, having climbed the highest mountains on all seven continents.
- Critical Care/ICU and Trauma Registered Nurse.
- Trek 8848 Guide Company-Founding Partner.
- Paddled the entire length of the Duck in 1999.



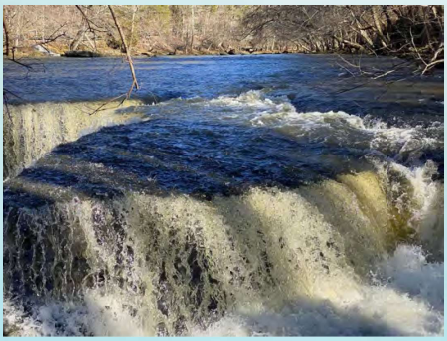
USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

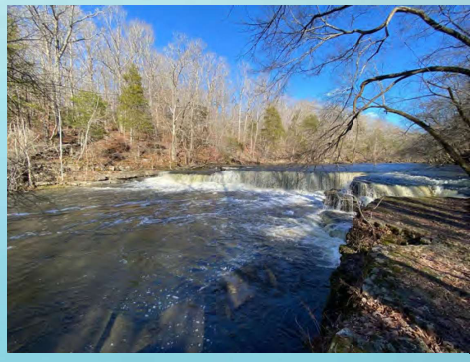
About the Duck River Watershed Society

Our Mission:

The Duck River Watershed Society is a membership organization that is focused on increasing the Watershed's overall health and sustainability for the betterment of all who rely on it.

We facilitate this through seeking out collaborative partnerships; educating those living throughout the Watershed, and engaging our members, and the public, in various recreational and ecological programming.



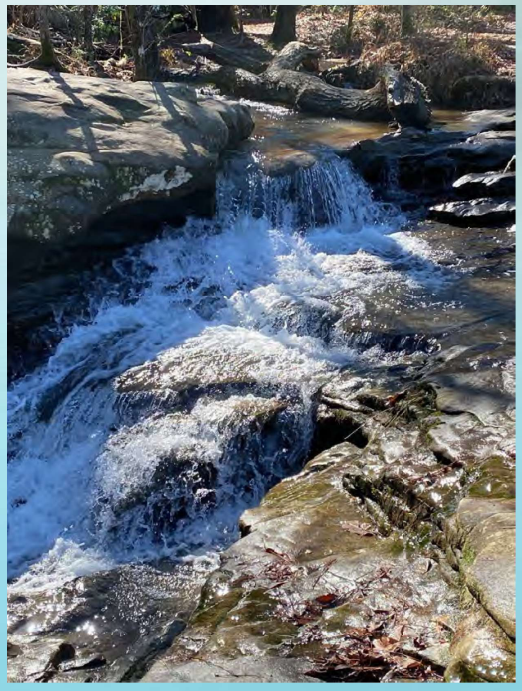


USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

About the Duck River Watershed Society

Our Vision:

Promote the uniqueness and sustain the health of one of the world's most ecologically diverse watersheds for the betterment of our river communities for generations to come.

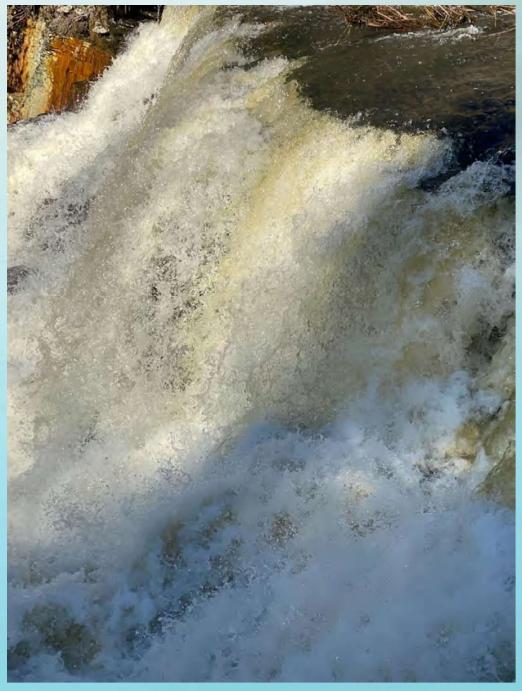


USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

About the Duck River Watershed Society

Our Values

- Ensure that access to the Watershed is maintained and enhanced to include diversity and inclusion for all populations.
- We will seek out collaborations with educational institutions and their students to garner greater understanding of the Watershed's ecology, foster and environment of the 'student scientist', and facilitate community awareness of the river's health.



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

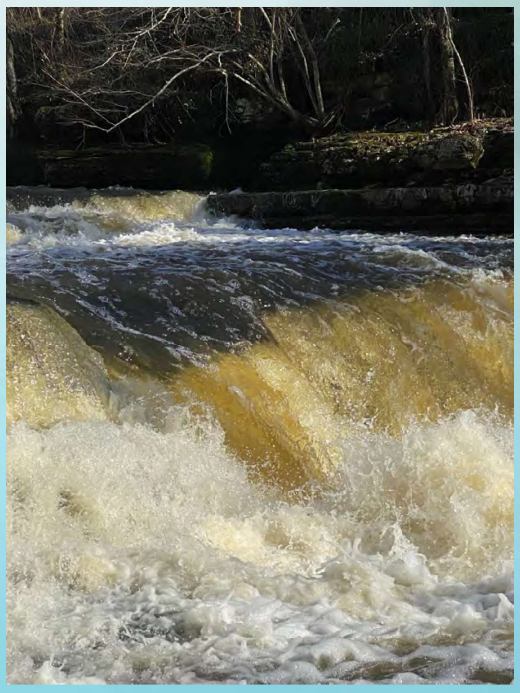
About the Duck River Watershed Society

Our Values

We will develop partnerships with like- minded organizations to create synergy related to advocating for the health and sustainability of the Watershed.

Foster a culture of transparency, with our Donors, Membership and Watershed communities, related to the operations and use of philanthropic dollars.

Promise to always strive to be a World-class organization advocating for a World-class resource.



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

About the Duck River Watershed Society

Registered with Tennessee Secretary of State's Office and Received IRS Non-profit 501 c 3 designation: April 2021



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

Duck River Watershed Society-Our Programs

Spring Clean-ups: 2022-24

- Held first Saturday in March at the Firelake Boat Launch in Manchester, TN
- 250+ volunteers, 2024 a record 100+ volunteers
- 1,000 total volunteer hours
- $31,000 in economic value





USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

Duck River Watershed Society-Our Programs

Spring Clean-ups: 2022-25

- Collected over 10,000 lbs of refuse from the Watershed
- Recycled 250 abandoned tires
- Nine partners working towards a common goal of increasing the health and sustainability of the Watershed.
- 2025 Spring Clean-up set for March 1, 2025, new location: Normandy Dam



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

Duck River Watershed Society-Our Programs

Corp of Discovery-Canoeing the entire length of the Duck River- 2022-24

- Canoeing the entire length of the Duck River over a four year period.
- Bringing awareness of the River's biodiversity and uniqueness.
- Have currently achieved 120 miles.
- 2025-plans to finish the remaining section.





USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

Duck River Watershed Society-Our Programs

Coffee County Middle School-6th Grade River Ecology Program

- Partnering with the Coffee Middle School sixth grader class to study its unique biodiversity and ecology.
- 2024-5 school will be our second year as partners for this program.





USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

Duck River Watershed Society-Our Partners

TVA

LKQ Keeping you moving

BONNAROO WORKS FUND

COMMUNITY FOUNDATION OF MIDDLE TENNESSEE

Tennessee Duck River Development Agency March 3, 1965

EPR

COFFEE COUNTY EST. 1836 TENNESSEE

COMMON JOHN BREWING Co

Coffee County MIDDLE

WEBB

USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

About the USDA RCPP Program:

From the NRCS site: Created in the 2014 farm bill, RCPP is a partner-driven approach to conservation that funds solutions to natural resource challenges on agricultural land. By leveraging collective resources and collaborating on common goals, RCPP demonstrates the power of public-private partnerships in delivering results for agriculture and conservation.



1.5 billion of funding for 92 projects in the last funding cycle, (FY-24).

RCPP takes applications for potential projects, projects must address a resource concern on agricultural land, results must be measurable.

USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

DRWS RCPP 2024 Award

- DRWS submitted a proposal to restore aquatic resources in the Upper and Lower Duck.
- RCPP title is: Stream Restoration in the Duck River Watershed: Protecting and Enhancing Aquatic Habitat for America's Most Biodiverse River.
- USDA provided $20 million dollars in funding for stream restorations in the watershed.
- This is not mitigation, these projects will not produce steam-credits, this is restoration.
- This project uses a unique funding mechanism called an "Alternative Funding Arrangement" aka "AFA"

USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

DRWS RCPP 2024 Award - AFA

- AFA allows the Lead Partner (DRWS) to develop, plan and fund conservation program delivery on private lands using NRCS practices and funds.
- AFA allows for alternative methods of program delivery that NRCS cannot undertake due to agency limitations.
- For example:
  - DRWS will complete projects at no cost to the landowner, no cost share required unlike traditional NRCS projects.
  - DRWS will absorb cost of implementing the practices for the landowner, landowners will not get hit with taxable income.
  - DRWS will evaluate stream restorations using the TN-SQT, Stream Quantification Tool.
  - Currently NRCS doesn't have a quantitative methodology to evaluate the success of a stream restoration, RCPP wants to track results!!!!!

USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award



The Stream Functions Pyramid, developed by Stream Mechanics, is the guiding framework for the SQT (Harman et al., 2012).

SQT MATH

- In the SQT a stream that is "perfect" scores a 1.0, a degraded stream scores < 1.0, FYI, the perfect stream doesn't exist.
- 1 linear foot of perfect stream equals 1 "functional foot" of stream.

For our example:

DRWS restores a stream on a farm that's 5,000 ft and scores .30 before restoration = **1,500 functional feet.**

The stream scores a .65 post construction = **3,250 functional feet.**

Restoration has more than doubled the functionality of the stream.

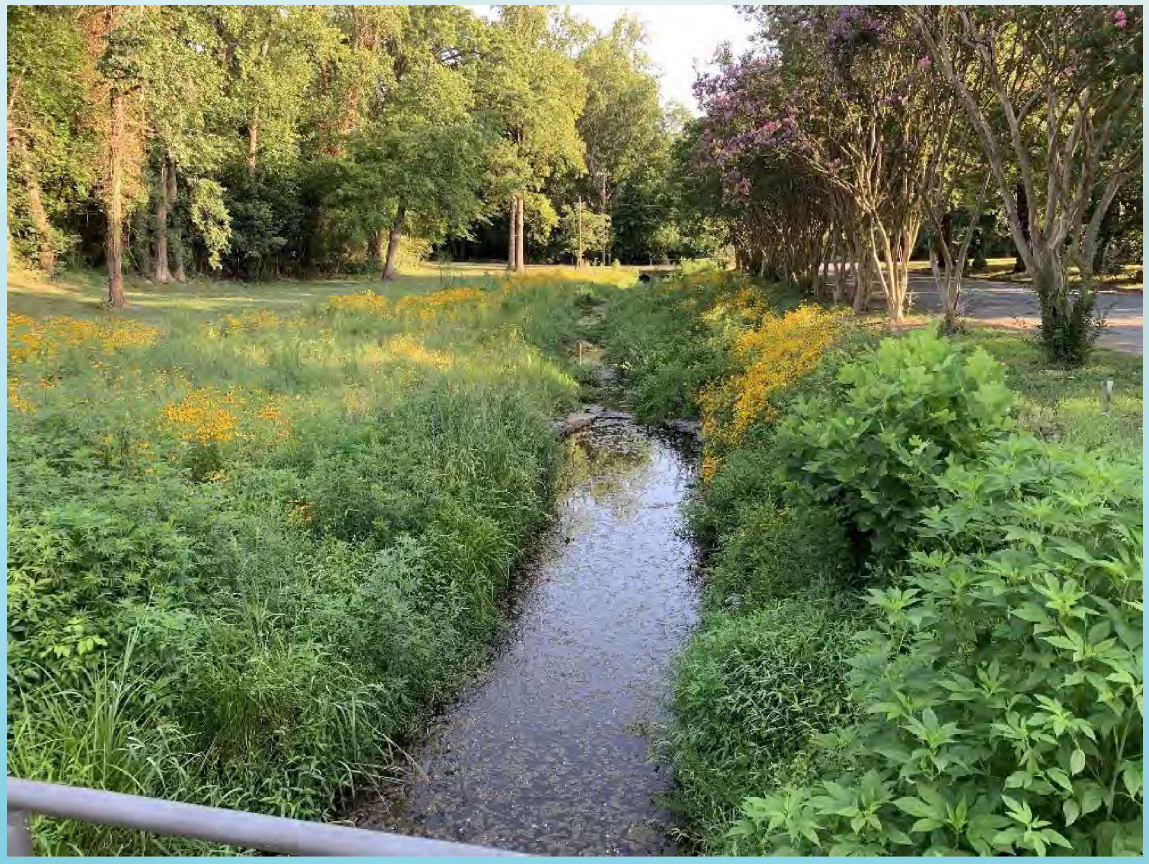




USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award



USDA/NRCS: 2024 Regional Conservation Partnership Program, $20 Million Award

How Can You Help??

We are looking for Projects in the Upper Duck and Lower Duck!

- Projects should be on agricultural or rural land capable of agriculture.
- Projects must have an aquatic resource on them; a wetland or a channel that carries water.

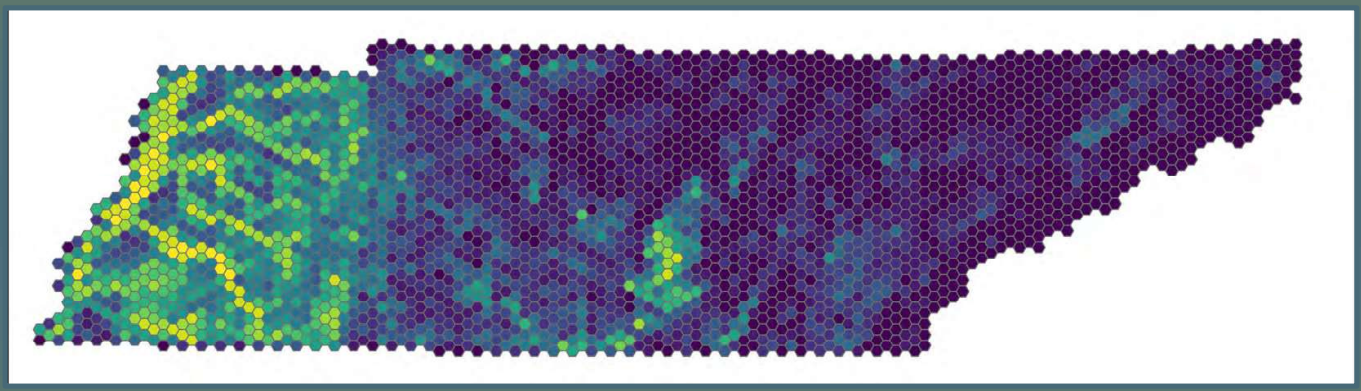
Contact DRWS: Christian Rieseberg: cfrccin@gmail.com,

Contact Rich Hanson: rhanson@eprusa.net Mobile: 615-278-0467

Questions?

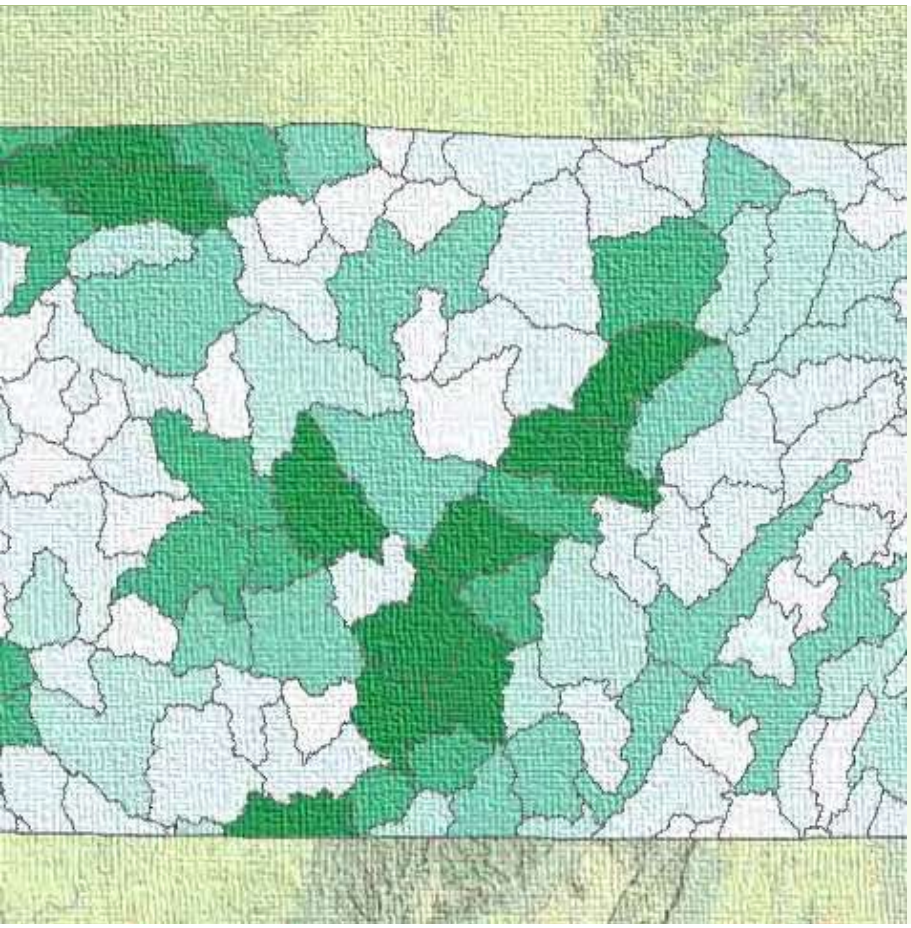
THE FUTURE OF WETLAND MAPPING IN TENNESSEE:

A Comparison Between The National Wetlands Inventory (NWI) And A New Predictive Model



Sarah Terpstra

Professional Science Master's - Capstone Presentation
Duck River Symposium
December 4, 2024



Outline:

- Introduction
- Legal History & Tennessee Regs
- The Science of Wetlands
- PURPOSE
- The Skytec Predictive Wetland Model
- Methods
- Results and Discussion
- Future Considerations

INTRODUCTION TO THE CLEAN WATER ACT

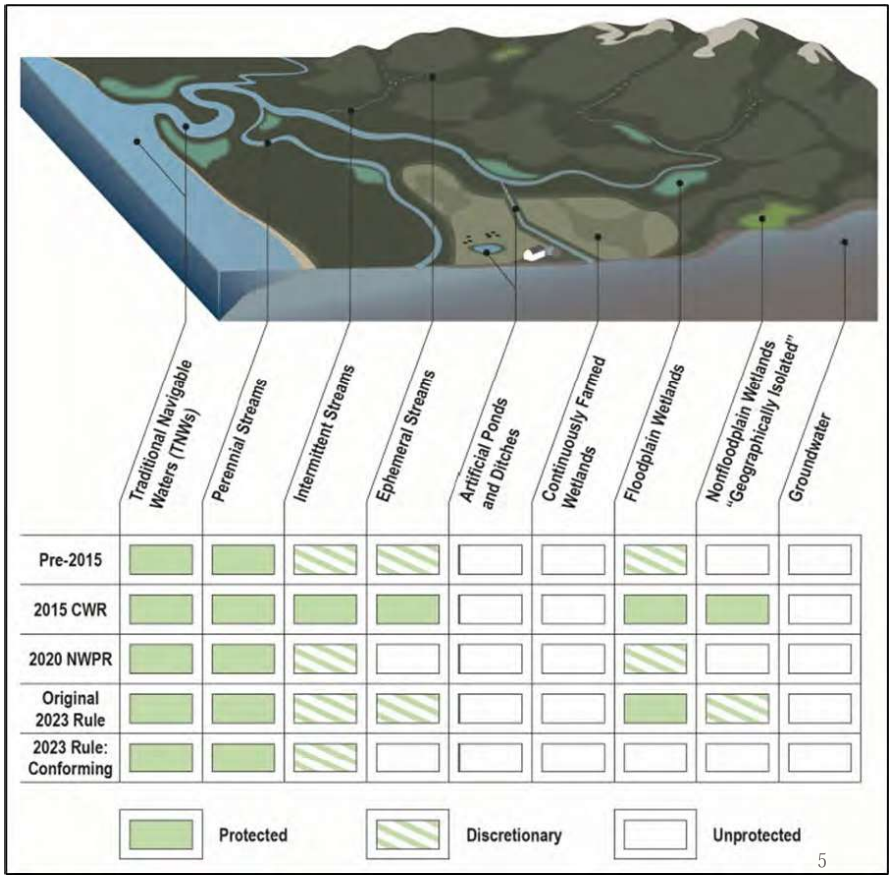
NOT THAT INTERESTING

- 1948 Federal Water Pollution Control Act; 1972 Amendments – Referred to as the Clean Water Act (CWA)
- Primary purpose: to control water pollution in the United States
- The CWA (statute) is implemented by the Environmental Protection Agency (EPA) & Army Corps of Engineers through rules and regulations
- Federal protections granted to Waters of the United States (WOTUS) defined as "navigable waters" (no protections for groundwater – however, recent Maui decision: discharges to groundwater that reach surface water = "functional equivalent" discharges)
- **How wetlands qualify has long been disputed**
- WOTUS has historically been interpreted as applying to wetlands through "Migratory Bird Rule" (overturned in 2001) and the *significant nexus* test
- *Significant nexus* based on chemical, physical, and biological connectivity to waters, rather than just obvious, above ground, surface water connections

INTRODUCTION TO THE CLEAN WATER ACT

- To attempt to establish the *significant nexus* argument, EPA & Corps published 2015 Clean Water Rule (CWR)
- 2015 Clean Water Rule sought to provide a more consistent & scientific interpretation/definition of WOTUS → essentially expanded protections by providing broader definition
- CWR overturned by Trump administration in 2019 & reverted to pre-2015 protections
- **2023 SACKETT DECISION**
  - Only wetlands with a continuous surface connection to jurisdictional waters are considered WOTUS
  - Rejected decades of scientific consensus
  - "geographically isolated" wetlands lose all federal protections
  - 2023 EPA Conforming Rule
  - Ostensibly left up to States
- Ripple Effects throughout the country, including in Tennessee

LEGAL LIMBO


Traditional Navigable Waters (TNWs)
Perennial Streams
Intermittent Streams
Ephemeral Streams
Artificial Ponds and Ditches
Continuously Farmed Wetlands
Floodplain Wetlands
Nonfloodplain Wetlands "Geographically Isolated"
Groundwater
Pre-2015
2015 CWR
2020 NWPR
Original 2023 Rule
2023 Rule: Conforming
Protected
Discretionary
Unprotected

TENNESSEE

Regulations & Challenges

- Tennessee implements state wetland protection through the Water Quality Control Act of 1977, T.C.A. 69-3-101 to -148
- TN Department of Environment and Conservation implements the Statute through Rules and Regulations (permitting)
- Prior to October 1, 2024, "Wetland" not defined in Statute, but historically defined in Rule. Now defined in Statute:

> **(49)** "Wetland" means:
> **(A)** An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions; and
> **(B)** A type of waters that are not wet weather conveyances, and generally include swamps, marshes, bogs, and similar areas;

- January 2023 – Rep. Kevin Vaughan (R-Collierville) introduced **House Bill 1054** to remove protections for wetlands *"not classified and regulated as a wetland under federal law".*
- Passed the House. Sent to Summer Study by Senate.

TENNESSEE

Summer Study

- Wetland Summer Study required TDEC to solicit input from diverse stakeholders:
  - State and local government
  - Mitigation providers
  - Consultants
  - Developers
  - Agricultural interests
  - Academic representatives
  - Non-profit organizations
- Two steering committee meetings
- August 5, 2024: Wetlands Summit
- October 3, 2024: 18 Commissioner Recommendations
  - Recommendation 14: Refine and maintain GIS mapping to be a more useful screening and planning tool for wetlands in Tennessee → Skytec Model



THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)



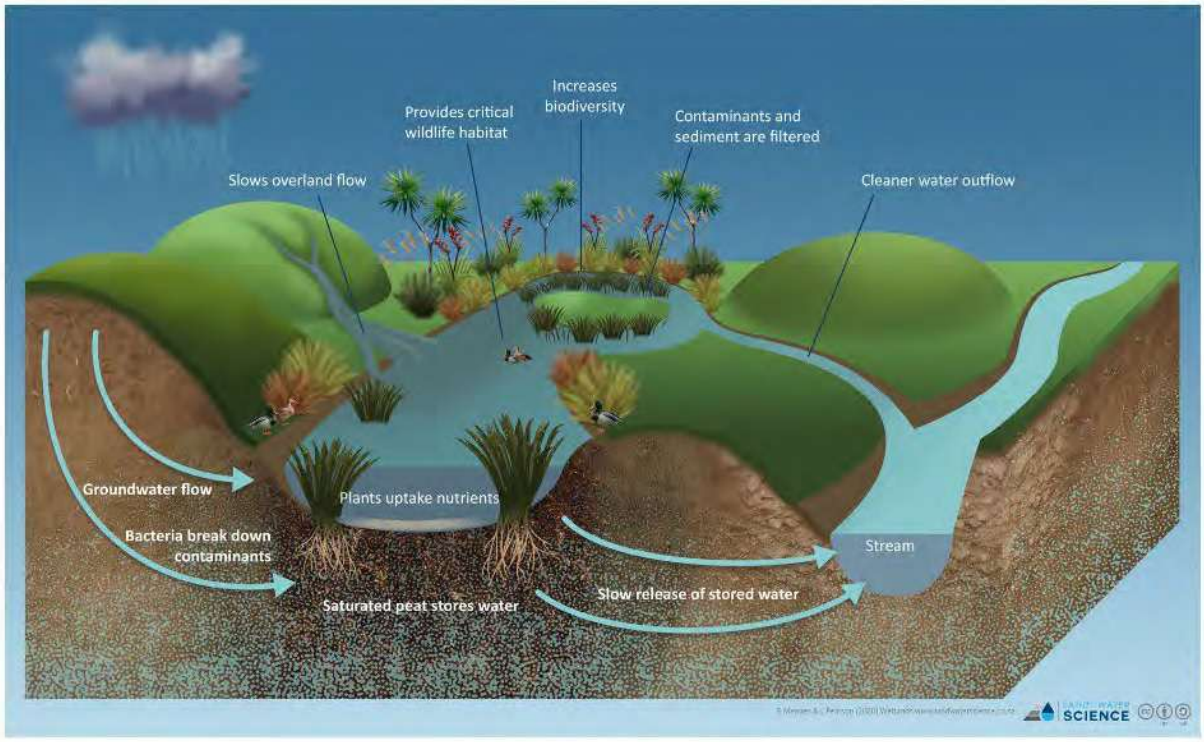
Wetland environmental characteristics:

1. *Vegetation:* adapted to growing in water or soils periodically deficient in oxygen as a result of excessive water content
2. *Soils*: hydric soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions
3. *Hydrology*: causing the soil to be saturated to the surface at some point during the growing season

(49) "Wetland" means:

(A) An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions; and

(B) A type of waters that are not wet weather conveyances, and generally include swamps, marshes, bogs, and similar areas;



https://www.landscapedna.org/actions/interception/wetlands/

THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)



- Considered Mother Nature's Kidneys, wetlands function as a natural water filter by removing pollutants such as:
  - Fertilizers
  - Pesticides
  - Sediment
  - Other agricultural or urban chemicals
  - Nutrients (TN/TP) that contribute to the hypoxic zone in the Gulf of Mexico (DO < 2.0 mg/L)
  - Emerging contaminants such as PFAS (new studies)

THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)

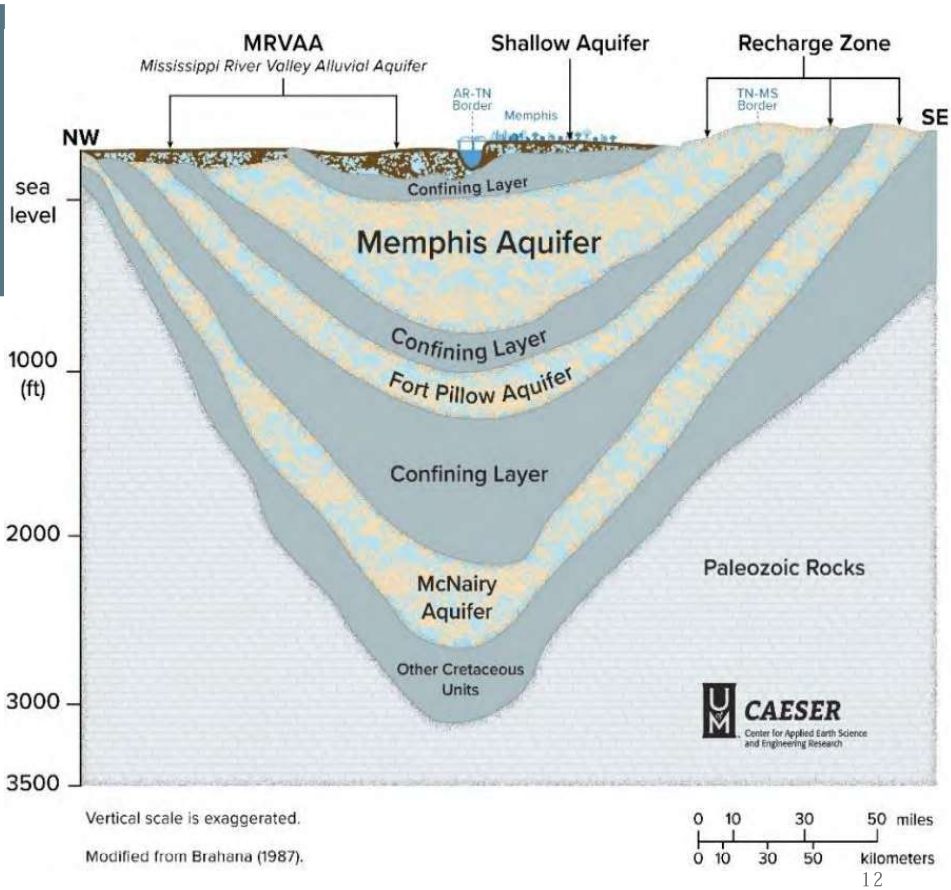


- Critical for recharging groundwater & underground aquifers with purified/filtered water.
- In West TN – Memphis Sand Aquifer
  - >7,000 sq. miles
  - >3,000 ft. depth
  - Across parts of eight states
  - Majority of TN wetlands are over recharge zone
  - City of Memphis relies 100%on Memphis Aquifer for DW
  - Completely underground resource; relies entirely on groundwater recharge to maintain supply.



THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)

Memphis Sand Aquifer

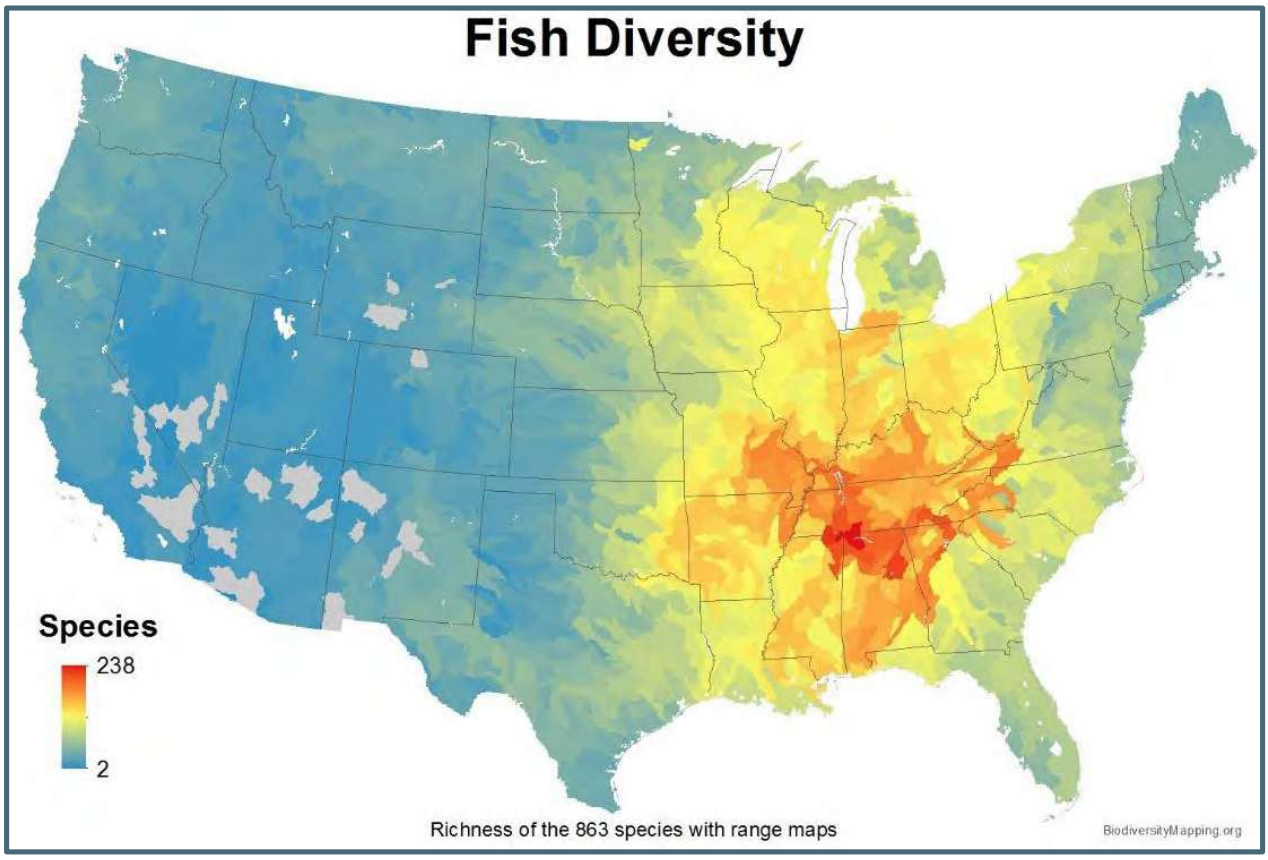


THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)



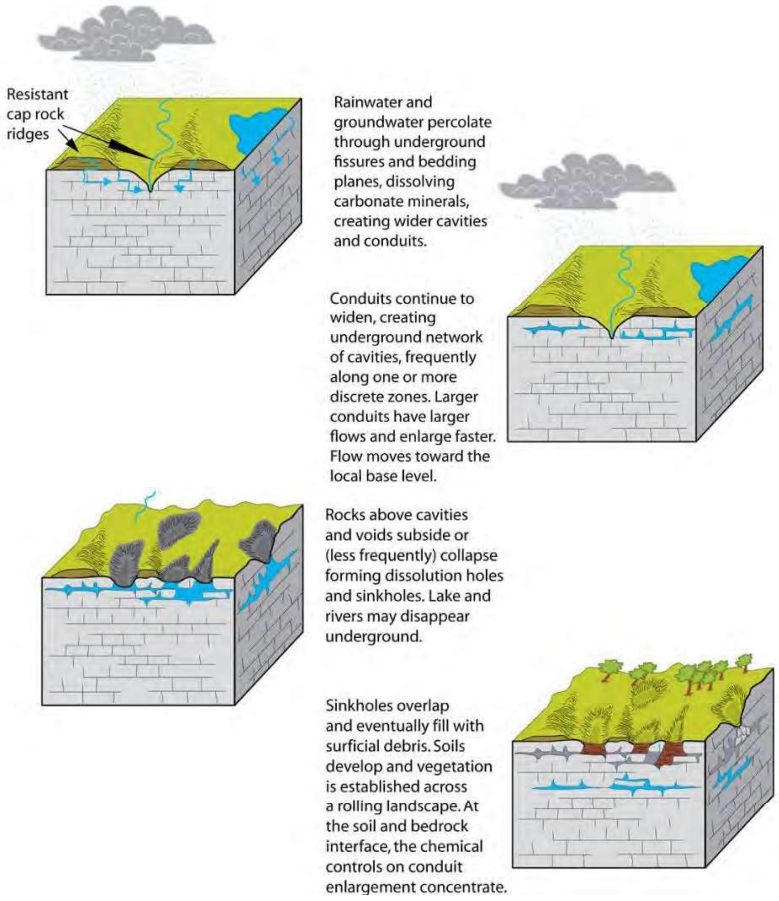
THE DUCK RIVER

- The Duck River is the most biologically diverse river in Tennessee (and likelythe country)
- Exceptional Tennessee Water designation by TDEC & Critical habitat designation by USFWS
- 60 freshwater mussel species & 22 species of aquatic snails
- North America's most biologically diverse freshwater river (151 species of fish - more fish varieties per mile than any other river in North America)
- Contains more fish species than all rivers of Europe combined
- Sole drinking water sources for 250,000 Tennesseans (and counting)
- **Executive Order No. 108: An Order To Conserve The Duck River Watershed (11/20/24)**
- Highly karst area of the state

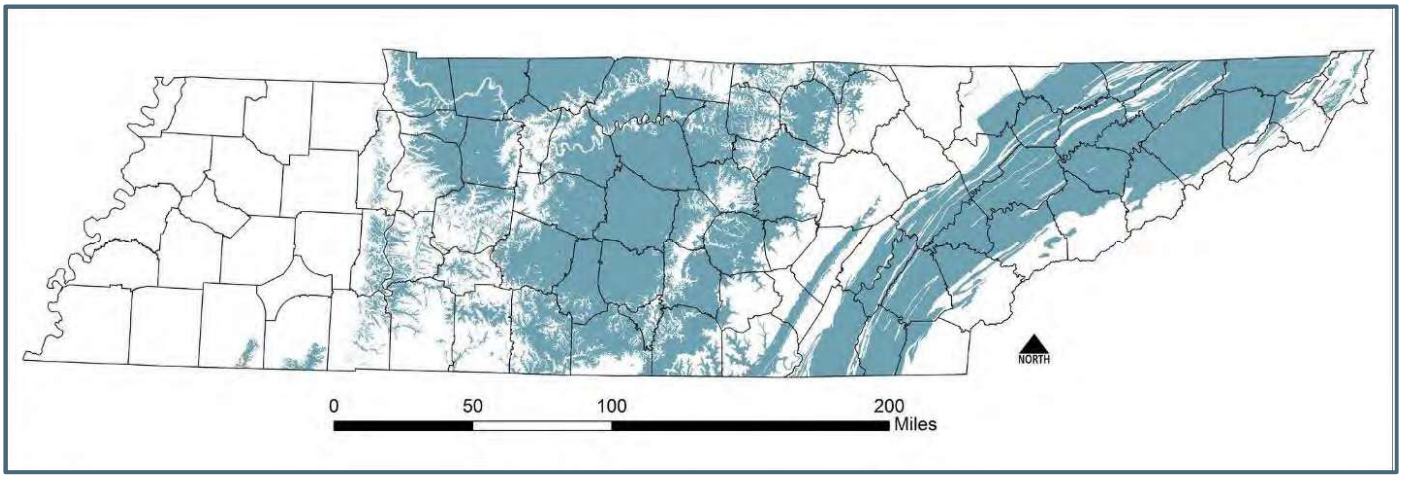

Fish Diversity
Species
238
2
Richness of the 863 species with range maps
BiodiversityMapping.org

THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)

- Tennessee landscape, especially Highland Rim (Duck River) heavily influenced by **karst geography**
- Underground hydrologic connectivity
- Duck River: flow *decreases* downstream by 12%(between Milltown and Columbia) demonstrating underground water connection
- Innacurate to assume "geographically isolated" wetlands in Duck River watershed (and other karst regions) are not hydrologically connected to downstream waters



THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)



Map by Jon Zetterberg

THE SCIENCE OF WETLANDS
(AND WHY THEY ARE IMPORTANT IN TENNESSEE)

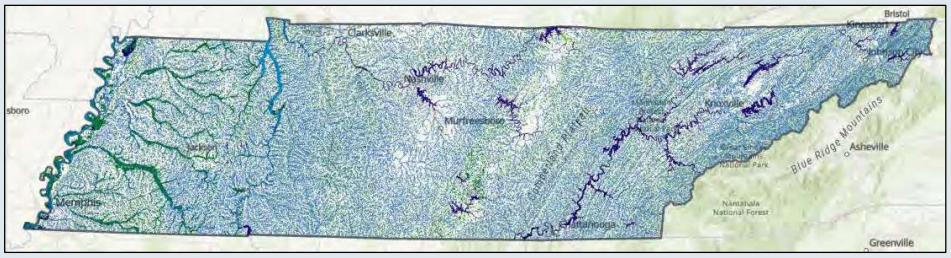


Habitat & Outdoor Recreation

- Critical habitat for aquatic life & migratory birds
- In 2022, Americans spent $394 billion in hunting, fishing, and wildlife activities
- Under a scenario with the highest levels of predicted wetland loss, annual recreation economic activity could decrease as much as $489 million
- TN is part of MS Flyway: Largest US bird migration route that follows Mississippi, Missouri, and Lower Ohio Rivers

Flood Control

- One acre of wetland can store between 1 and 1.5 million gallons of floodwater (EPA)
- FREE natural infrastructure/flood storage
- Loss of natural flood storage requires BUILT infrastructure
- For every acre of wetland lost, local economies can experience annual costs between $1,000 (rural) and $4,000 (urban) in flood damages



WETLAND MAPPING

National Wetlands Inventory

- Traditionally used for wetland mapping
- Imagery 40-50 years old
- Known to have failures and gaps in information
  - Occasionally identifies wetlands where there are none, or fails to identify wetlands
- Best available

New Skytec Predictive Model

- Utilized Wetland Identification Model (WIM)
- Current Imagery
- Hand-digitized TDEC hydrologic determinations to create training dataset
- Final Model predicted where wetlands were *likely to occur* across the state
- Can help predict potential geographically isolated wetlands

PURPOSE

To compare the historic **National Wetlands Inventory (NWI)** to the new **Skytec Predictive Model** and evaluate the differences in wetland prevalence, acreage, and distribution based on HUC 10 watersheds and County boundaries.

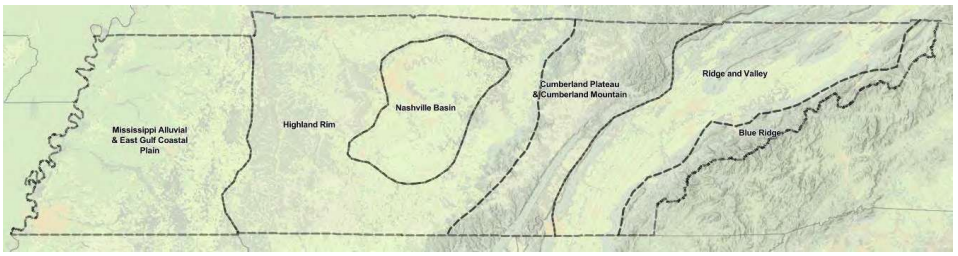
THE SKYTEC MODEL

- Skytec, LLC: company specializing in Geographic Information Systems (GIS) technology – Contact Chris Fleming
- Hired by TDEC to develop a predictive model for Tennessee using deep learning as part of Wetland Summer Study
- Goal was to develop a more accurate model for identifying the likely location for TN wetlands
- Utilized Wetland Identification Model (WIM) (Dr. Gina O'Neil of ESRI) & applied to TN
- Imagery from National Agriculture Imagery Program (NAIP) & used 3 LiDAR predictor variables: Topographic Wetness Index (TWI), Curvature, and Cartographic Depth-to-Water (DTW)

**** This model is not yet released to the public ****

THE SKYTEC MODEL

- Skytec team *manually* imported, extracted, and digitized delineated wetland boundaries from 5,100+ TDEC reports
- Sometimes biased by parcel boundaries, so each was individually examined & compared to recent LiDAR data; manually adjusted as needed
- Inappropriate/unverifiable features removed
- Supplemented with additional confirmed wetlands from: regional scientists/conservation orgs., updated NWI data from GSMNP, & remotely verified NWI data
- To reflect diverse topography, geology, and ecological landscape of TN, individual training datasets were used for each of 6 broadly defined ecoregions – model took 2.5 weeks to run



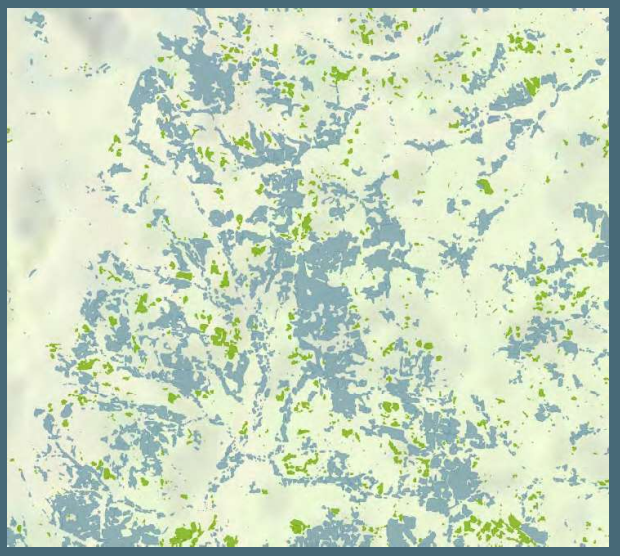
Training dataset ultimately included 2,558 confirmed features over 77,515 acres

THE SKYTEC MODEL



The final product yielded a map layer identifying areas where wetlands were likely to occur across the state.

THE SKYTEC MODEL

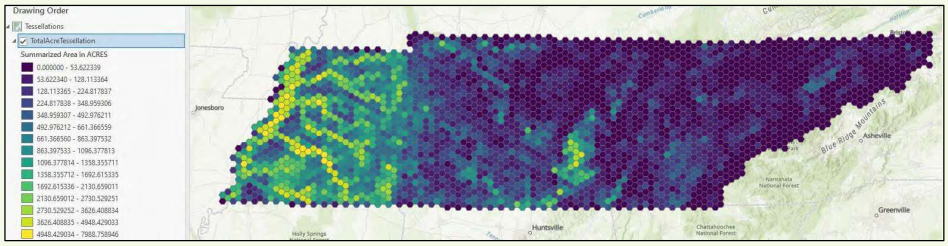


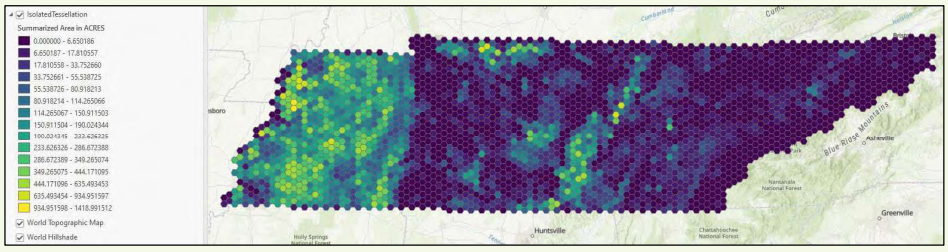
Geographically Isolated Wetlands

- Subset of larger predicted wetland dataset; at risk
- Skytec performed connectivity analysis on predicted wetlands by applying a conservative 350 ft buffer to the edge of polygons and the centerline of National Hydrography Dataset (NHD) polylines (aka surface waters) & performed GIS intersect
- Predicted wetland features that did not intersect with NHD surface waterbodies were considered "geographically isolated"
- *Note*: because of the large buffer, likely under-predicts presence of isolated wetlands according to WOTUS
- Precision assessment: random values assigned to wetlands >0.05 acres by ecoregion, visually determined whether each predicted wetland actually possessed wetland characteristics
- Highest accuracy: Blue Ridge ecoregion (85% accurate, 8% unknown)
- Lowest accuracy: Nashville Basin (70% accurate, 17% unknown)
- Accuracies will improve as TDEC staff (or other professionals) ground-truth predicted wetlands

METHODS

- Analyzed total wetland acres & percentage acreage on HUC 10 and County polygons ("Summarize Within" tool GIS). Visualized using same scale for NWI & Skytec model
- Performed same analysis on **county** basis for both historic NWI layer and Skytec Model
- Additional analysis:
  - Economic considerations are often a driving force for decision-making
  - Added new fields for County maps to estimate low & high annual economic costs per acre of wetland lost
  - Calculated using only geographically isolated acreage, since those are the wetlands that could lose protections
- Used Create Tessellation tool to provide alternative (standardized) visualization according to total wetlands (above) and isolated wetlands (below)
  - Not as useful for quantifying on a real-world basis, but helpful for visualizing presence and distribution of wetlands statewide





RESULTS AND DISCUSSION

BY THE NUMBERS*

* These numbers are not yet finalized *

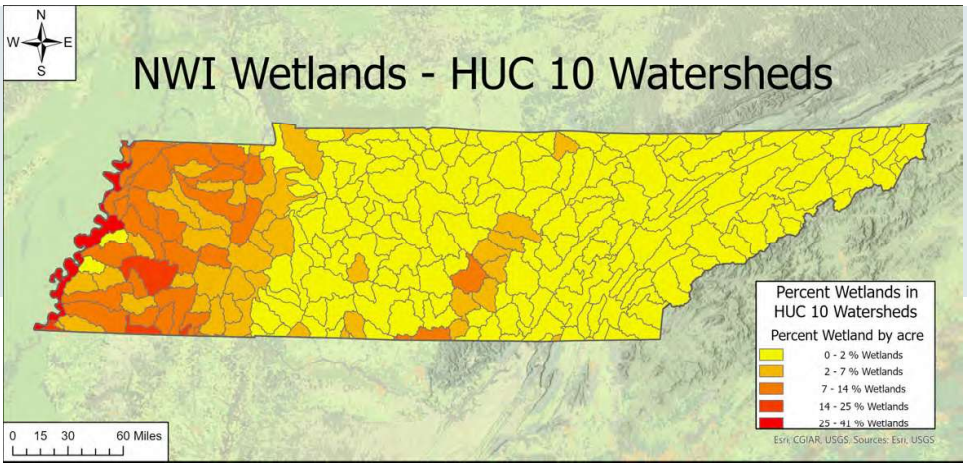
NWI

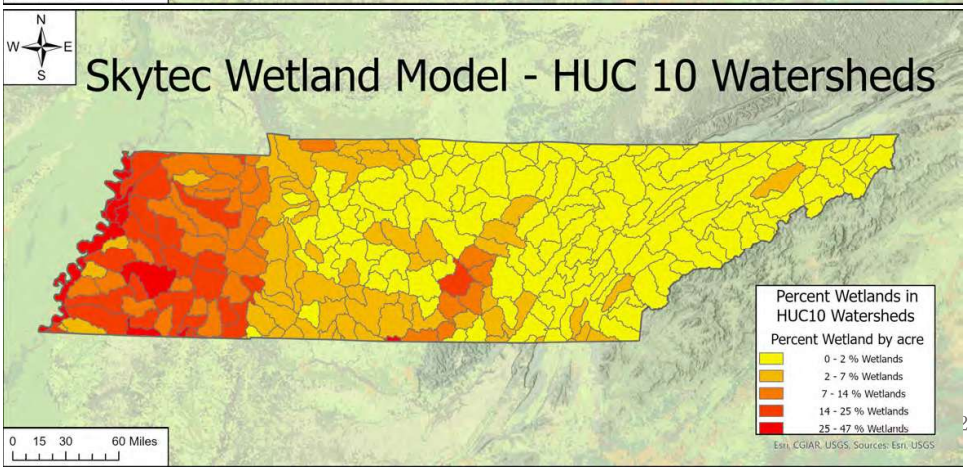
- Between 780,000 – 850,000 total acres of wetlands

Skytec Model

- Greater than **1.5 million total acres** of *predicted* wetlands
- Nearly 2x the historic NWI
- Between **210,000 - 230,000 acres** (~14%) are **"geographically isolated"** & at risk
- *Note*: because of the large 350 ft buffer used to determine intersect with surface waters, the Model likely significantly under-predicts presence of isolated wetlands according to WOTUS

Predicted Percentage – Total Wetlands





HUC 10 - Predicted Percent Total Wetlands -...

Normandy Lake-Duck River

HUC ID: 0604000201

Percent Total Wetlands in HUC 10 Watersheds

HUC10	0604000201
NAME	Normandy Lake-Duck River
HUC 10 Acres	149973
Sum Wetland Acres	24217.660779
Percent Wetland in acres	16

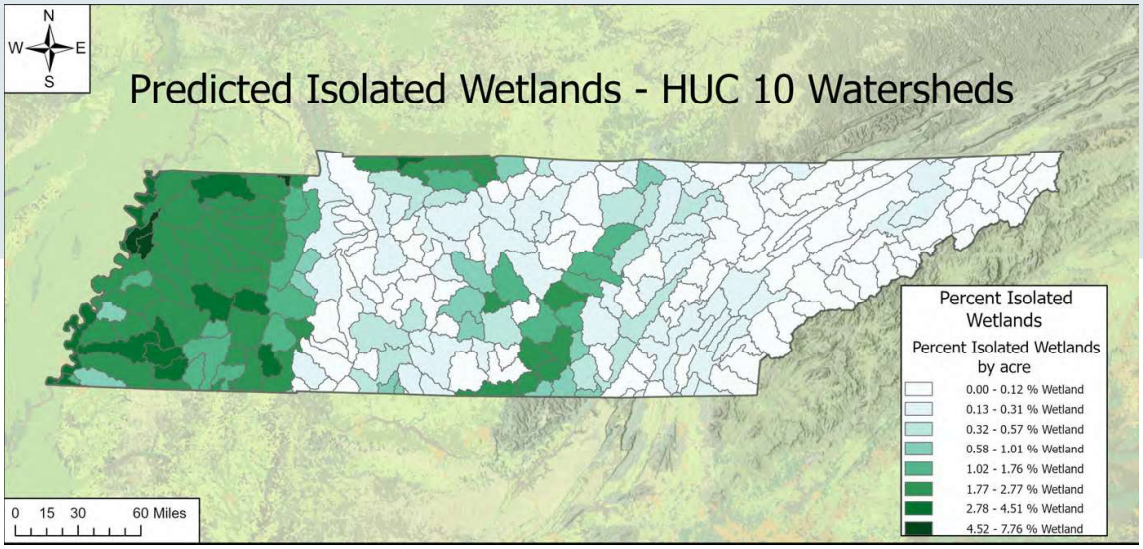
Predicted Percentage – Isolated Wetlands

HUC 10 - Predicted Percent Isolated Wetlands -...

Normandy Lake-Duck River

HUC ID: 0604000201

OBJECTID	12
HUC10	0604000201
NAME	Normandy Lake-Duck River
Huc 10 Acres	149973
Summarized Area in ACRES	2644.759579
Percent Isolated Wetlands	1.7635





Predicted Acreage – Isolated Wetlands

HUC 10 - Predicted Isolated Wetland Acres - Nor...

Normandy Lake-Duck River

HUC ID: 0604000201

OBJECTID	12
HUC10	0604000201
NAME	Normandy Lake-Duck River
Huc 10 Acres	149973
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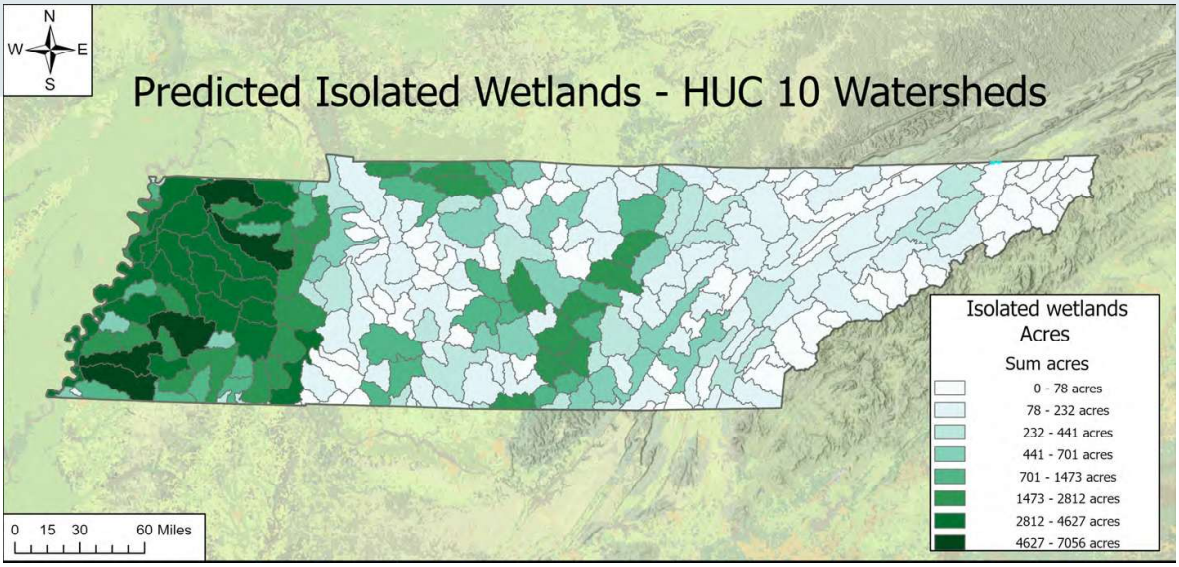
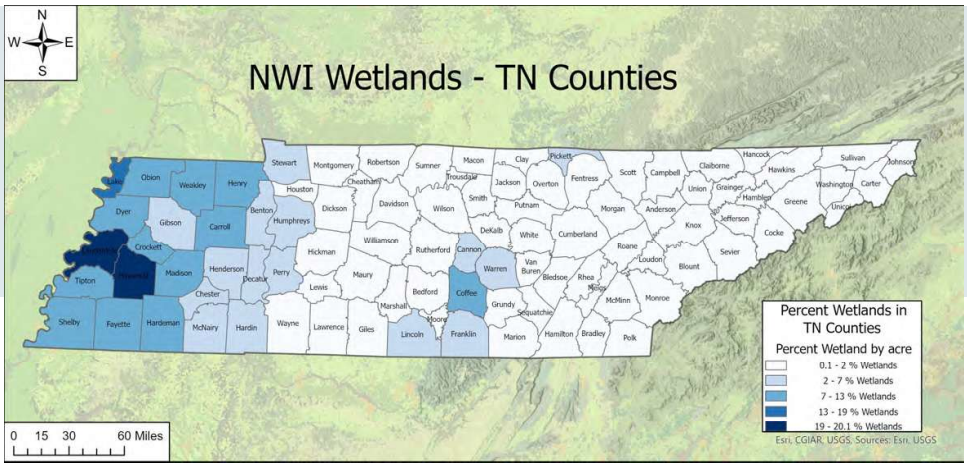
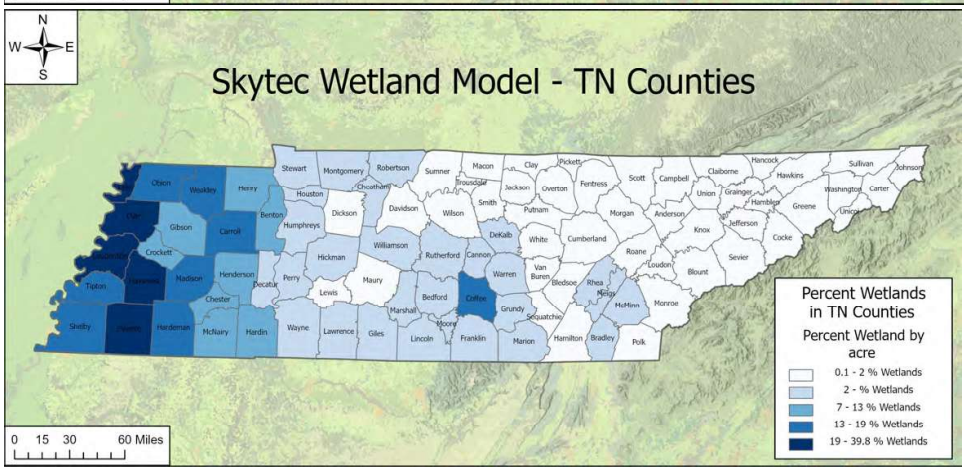


Predicted Percentage – Total Wetlands





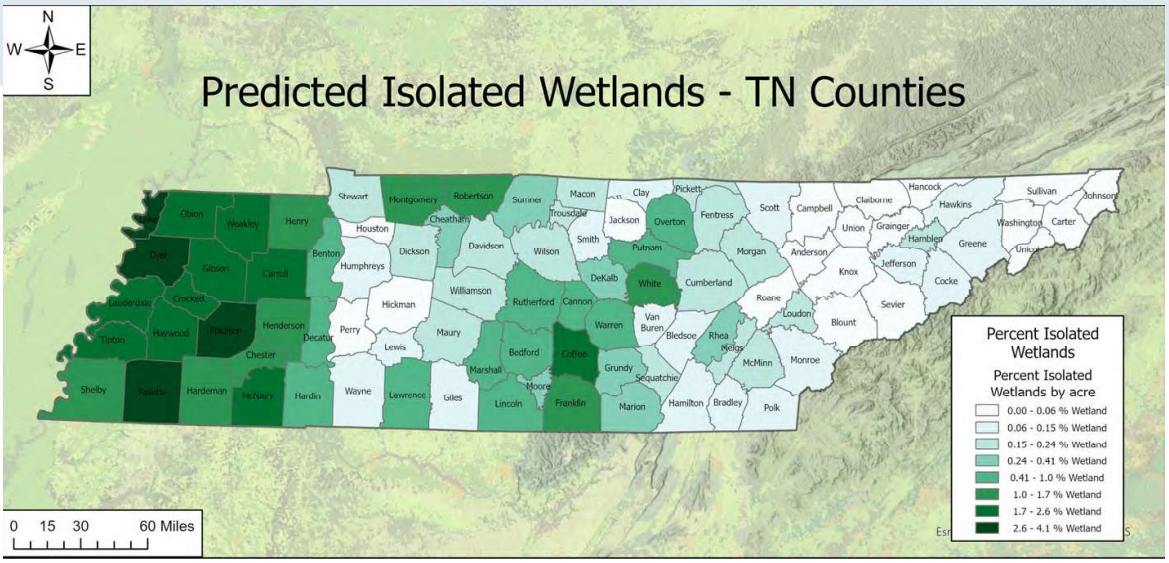
TN Counties - Predicted Percent Total Wetlands -...

COUNTY_NAME	Coffee
TDEC_EFO	COLUMBIA
County Acres	278121
Sum acres	41161.806211
Summarized Area in ACRES	41161.970949
Count of Polygons	24722
Percent Wetland	14.800023

Predicted Percentage – Isolated Wetlands

TN Counties - Predicted Percent Isolated Wetland...

COUNTY_NAME	Coffee
TDEC_EFO	COLUMBIA
County Acres	278121
Summarized Area in ACRES	5408.110815
Count of Polygons	12597
PercentWetland	1.944517



CONCLUSION

- New Skytec Model can be a *tool* to help regulatory agencies, developers, mitigation banks, conservation groups, & the public visualize where wetlands have the *potential* to exist
- Still requires ground-truthing & continued data management; not a silver bullet
- Both the NWI & Skytec Model demonstrate the startling abundance of wetlands in the Duck River watershed and on the Highland Rim

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- Justin Murdock, TTU, Wetlands Summit presentation
- Chris Fleming, Skytec

TENNESSEE VALLEY AUTHORITY

TVA River Management and Normandy

Duck River Symposium 2024

Jenny Sharkey, PE
December 4, 2024



Agenda

TVA River Management Overview

Helene Overview and Summary

Normandy Operations Overview

Normandy 2024 Summary

Proposed Normandy Reservoir Optimization of Water Releases

TVA River Management

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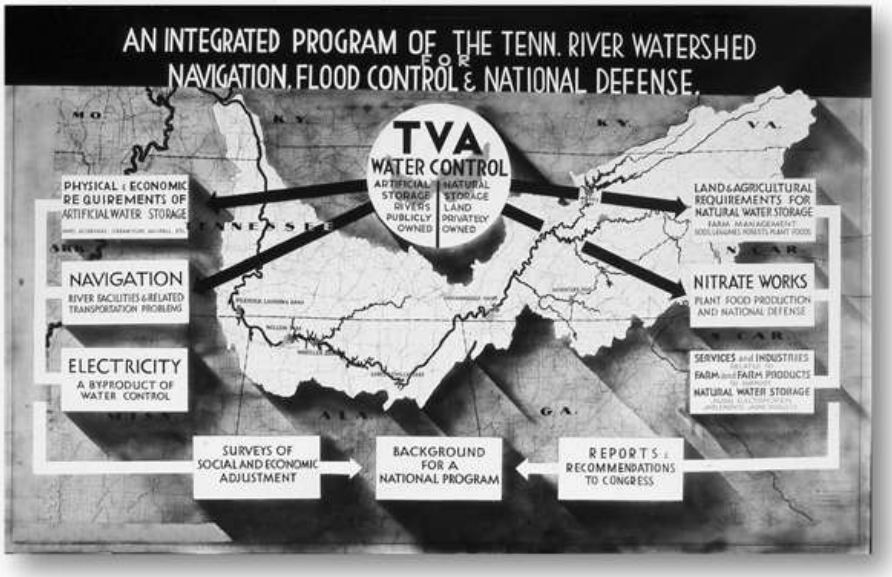
Integrated Resource Management

River system assigned multipurpose role through TVA Act in 1933.

(section 9a) …to regulate the stream flow primarily for the purposes of promoting navigation and controlling floods. So far as may be consistent with such purposes, …for the generation of electric energy…



TVA TENNESSEE VALLEY AUTHORITY

Integrated Tennessee River System Overview



Flood Control



Navigation



Power Generation



Water Supply



Water Quality

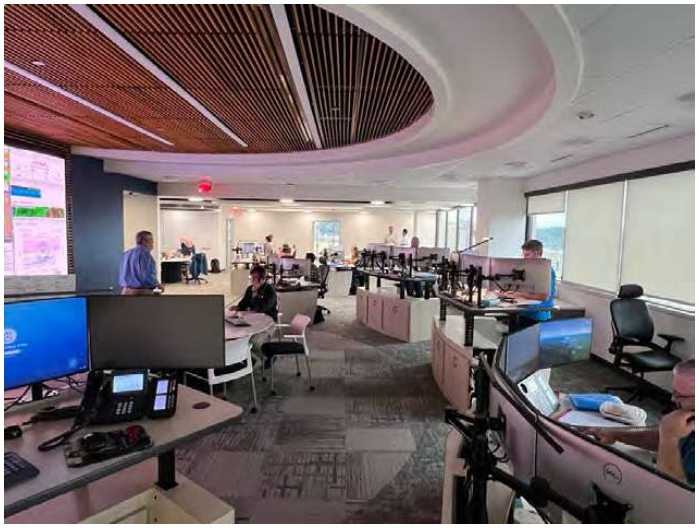


Recreation

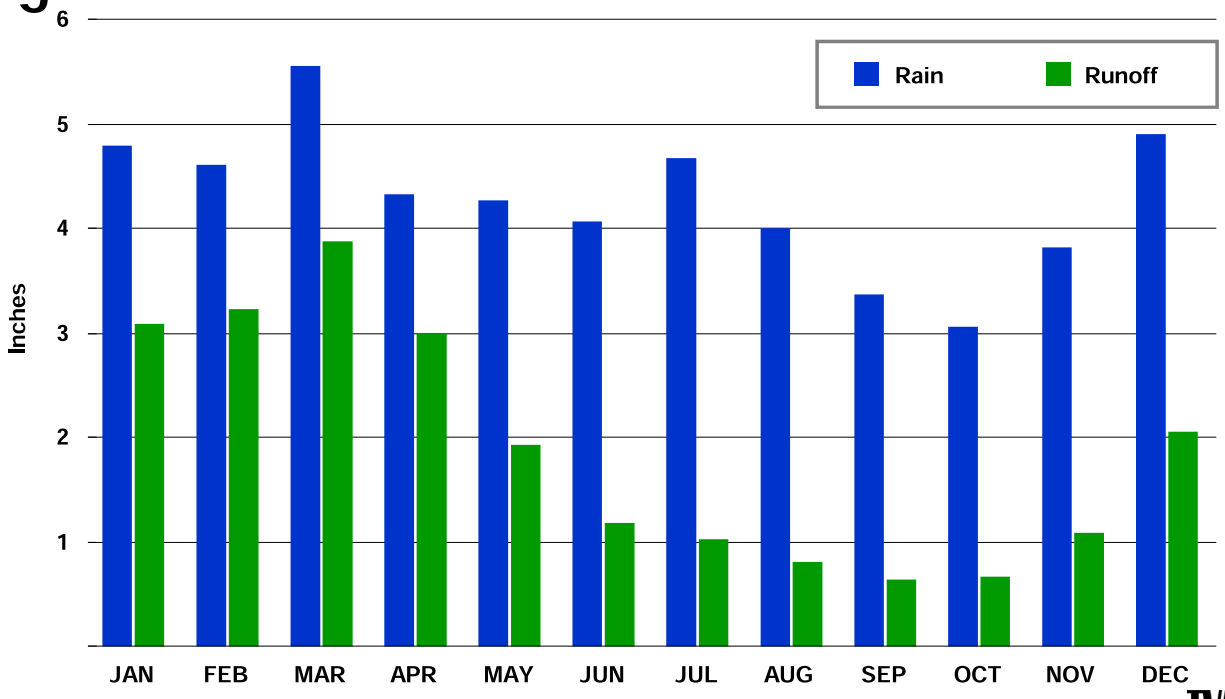
TVA TENNESSEE VALLEY AUTHORITY

River Forecast Center

- Staffed day and night
- Issue 2 - 4 river forecasts per day
- Model and scheduling of non-power reservoirs (such as Normandy)
- Coordinate and schedule hourly generation schedules with system schedulers
- Monitor water levels in real-time
- Provide data management, modeling and dissemination
- Provide stakeholder notifications
- Coordinate operations with U.S. Army Corps of Engineers



Average Annual Rainfall and Runoff



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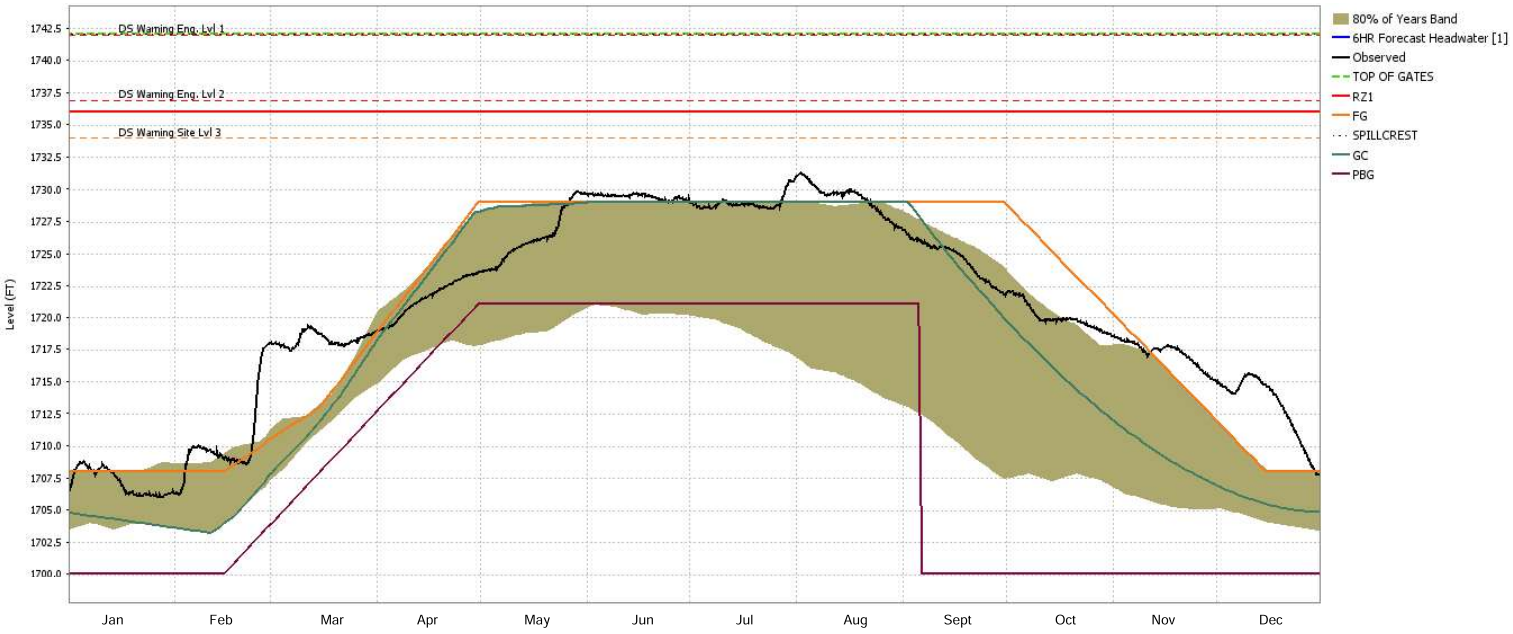
Seasonal Operating Guide Example



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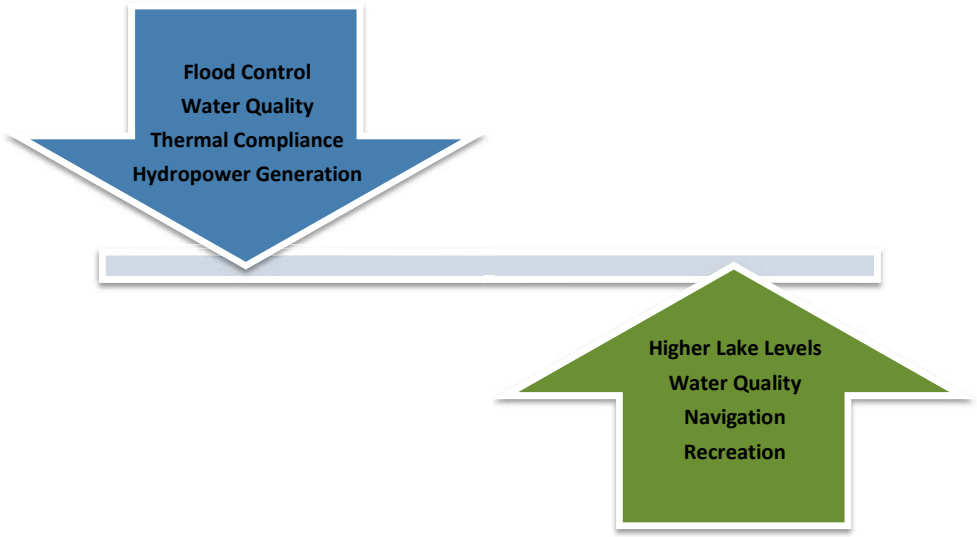
Challenges

- Balancing the competing demands on the system and the overall value to the public
- Understanding of the trade-offs associated with various scenarios
- Example: Can you keep my reservoir higher, longer?



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Helene Response Overview

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Rainfall and Streamflow (September 23-29)

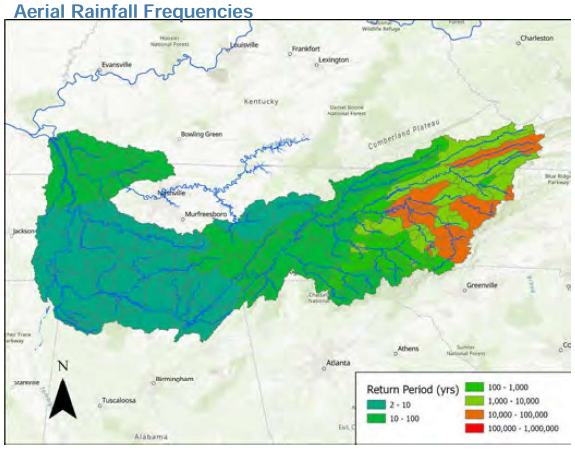
RAINFALL IN THE EASTERN TENNESSEE VALLEY

7.67 inches

1,029% of normal

10 times normal

Aerial Rainfall Frequencies



Crest Levels

Nolichucky River
- Highest flood of record for the dam, exceeding previous record from 1977 by 9.5 feet

French Broad River
- Crested 13.3 feet above Flood Stage
- Largest flood on the French Broad in Newport since 1867

Pigeon River
- Crested 21.7 feet above Flood Stage, a new record
- Largest flood on the Pigeon in Newport since 1902

Watauga River
- Crested 4.9 feet above Flood Stage
- Largest flood on the Watauga in Elizabethton since 1940

Doe River
- Crested 2.8 feet above Flood Stage
- Largest flood on the Doe in Elizabethton since 1998

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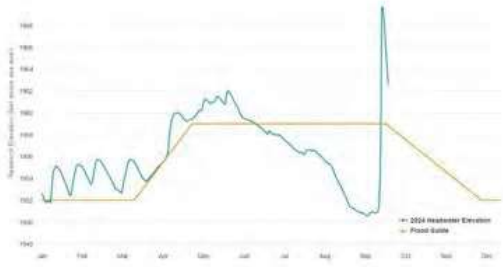
Helene Overview

Preparation

- Based on forecasts, lowered mainstem reservoirs to create **flood storage capacity**
- Had 160% of flood storage allocation
- Began communicating early with **stakeholders and the public**
- Significant stakeholder coordination

Watauga Reservoir Guide Curve & Headwater Elevations



Response

- Transitioned to 6-hour forecasting
- Continuous monitoring and adjustments
- Loss communications and equipment damage led to unique Unmanned Aircraft Systems (UAS) usage



Douglas Reservoir Debris

Recovery

- Prioritize flood storage capacity
- Debris boom on Douglas with ongoing coordination with recovery efforts
- Nolichucky powerhouse removal and interim remediation to repair damage and scour



Nolichucky Powerhouse Demolition

Normandy Operations

TVA TENNESSEE VALLEY AUTHORITY

Normandy Dam - Purpose and Background

Purpose:

- Normandy Reservoir provides recreation, economic development, water supply and the support of water quality for aquatic habitat along the Duck River.
- Normandy Dam provides flood protection downstream to communities along the Duck River, primarily for areas immediately below the dam and at Shelbyville.

Background:

- Normandy Dam serves a drainage area of 195 square miles.
- TVA's largest non-power tributary storage reservoir.

Normandy Dam – Operational Challenges

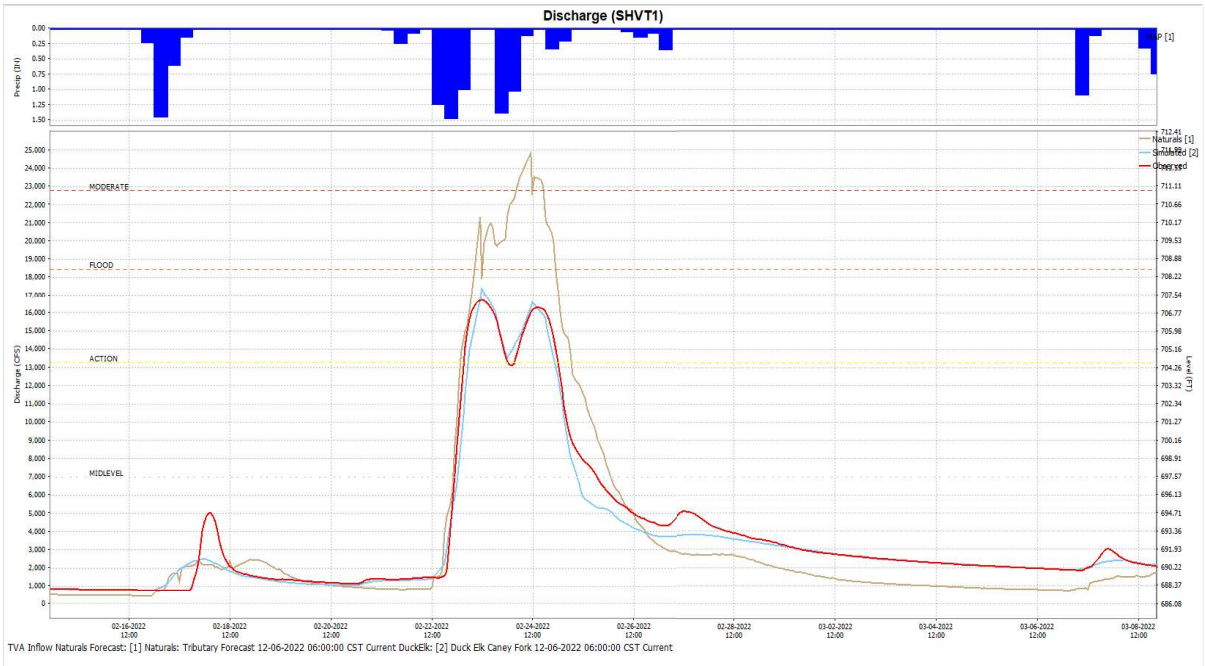
Flood Events

- The January 1 flood guide elevation provides just over 4.5 inches (runoff) of flood storage space to the top-of-gates elevation of 880′.
- Timing of reducing releases and beginning to hold back runoff in the reservoir is challenging due to the lag time to Shelbyville.

Droughts

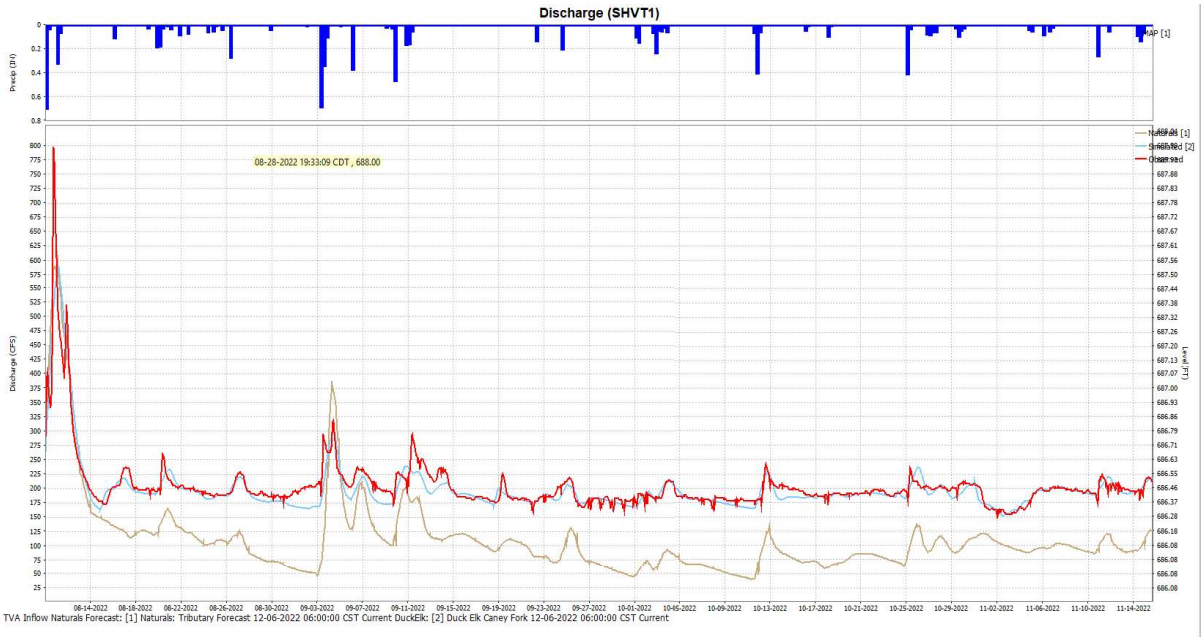
- Minimum flow requirements for water supply and water quality have evolved over time to be a good steward of the natural resource while maximizing the benefits to the area.
- It can be challenging to meet the minimum flow requirements and be as efficient as possible due to the long lag time to Shelbyville and the variability in the weather forecast.

Shelbyville Flows vs Naturals Model – Flood Operations



TENNESSEE VALLEY AUTHORITY

Shelbyville Flows vs Naturals Model – Drought Operations



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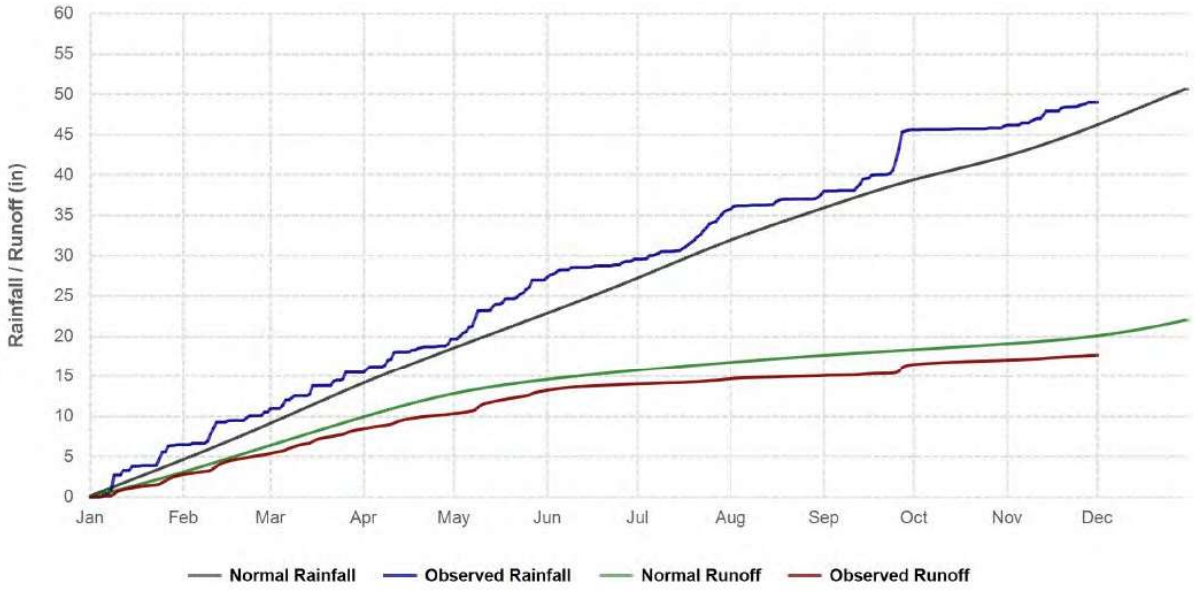
Normandy 2024 Operations

TVA TENNESSEE VALLEY AUTHORITY

2024 Rainfall and Runoff



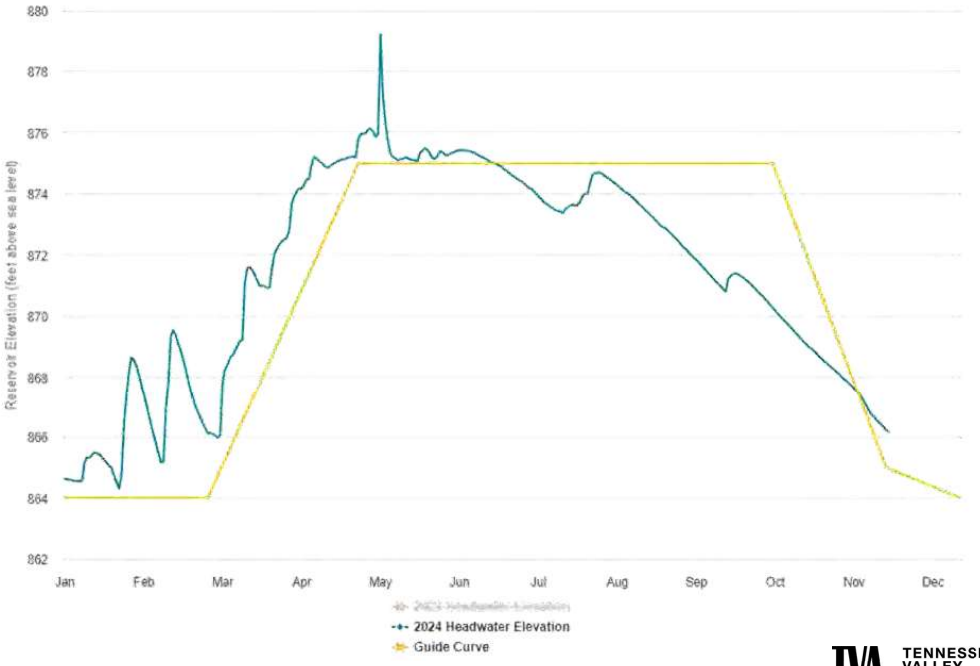
Location	Observed (in)	Normal (in)	Normal (%)	Location	Observed (in)	Normal (in)	Normal (%)
System	49.03	46.11	106.34%	System	17.68	20.05	88.21%

TVA TENNESSEE VALLEY AUTHORITY

2024 Normandy Operating Guide

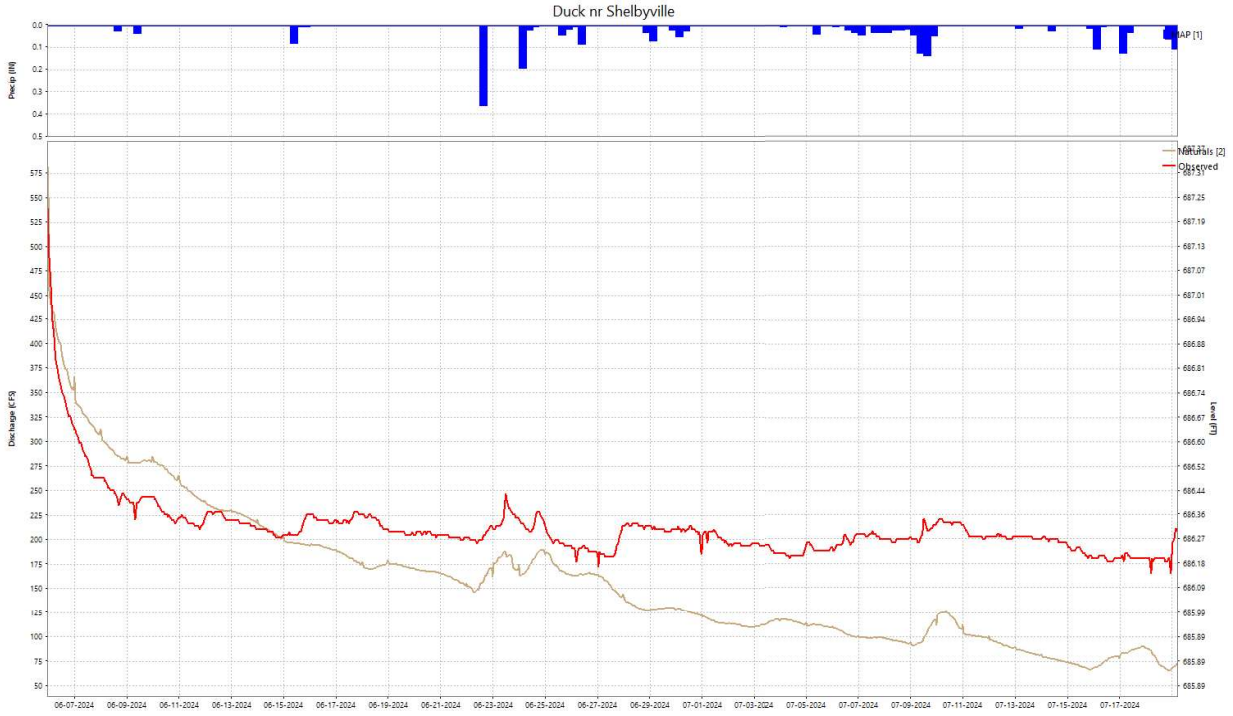
Operating Constraints

- Minimum Flows at Shelbyville
- Normandy Dam Minimum Flow
- Limited flood storage at summer pool
- Lag time from the dam to Shelbyville is 18 hours
- Accuracy of the weather forecast



TENNESSEE VALLEY AUTHORITY

Shelbyville Flows vs Naturals Model – Summer 2024



TENNESSEE VALLEY AUTHORITY

Proposed Normandy Reservoir Optimization of Water Releases

TVA TENNESSEE VALLEY AUTHORITY

Normandy Reservoir Optimization of Water Releases

TVA is proposing to modify how they measure flow targets of water releases from Normandy Dam into the Duck River by meeting a target at the Shelbyville, TN gage based on weekly average flows rather than instantaneously.

Optimization is a tool TVA can use for greater flexibility while continuing to meet key operational goals related to water supply, water quality, and sensitive aquatic habitat.

The Duck River region has experienced severe droughts. As a result, TVA has been working collaboratively with numerous agencies and stakeholders to determine an optimal way to manage the storage of Normandy.



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What the Proposal Does

Normandy Reservoir – Optimization of Water Releases proposes:

- TVA would revise its flows as follows:
  - December 1 – May 31
    - Weekly average flow of 120 cfs†
    - minimum instantaneous flow of 100 cfs
  - June 1 – November 30
    - Weekly average flow of 155 cfs†
    - minimum instantaneous flow of 135 cfs

Normandy Reservoir – Optimization of Water Releases DOES NOT propose:

- Modify the Normandy Reservoir Operating Guide
  - Found at: https://www.tva.com/environment/lake-levels/Normandy/Operating-Guide
- Modify the minimum flow (40 cfs) released from Normandy
- Change how we perform real-time reservoir management which balance competing demands based on rainfall informed forecasts

†measured at midnight Sunday night

Summary

- TVA's management of Normandy Dam and the Tennessee River system is a balancing act, driven by weather, operating policy, and stakeholder feedback and engagement.
- The integrated reservoir system provides a host of benefits, and the priority of those benefits can vary season to season.
- Rainfall extremes have been challenging but also allow us to highlight the benefits the system provides.
- Active and continuous stakeholder engagement is a critical part of maintaining partnerships, building public trust, and obtaining feedback.

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Questions?

