

TENNESSEE WATERSHED MANAGEMENT APPROACH OVERVIEW

*Sherry H. Wang, Ph.D.
Environmental Fellow*

June 13, 2019
Division of Water Resources
Tennessee Department of Environment & Conservation

1

Tennessee Watershed Approach Implementation in 1996 23 Years

Past Present Future

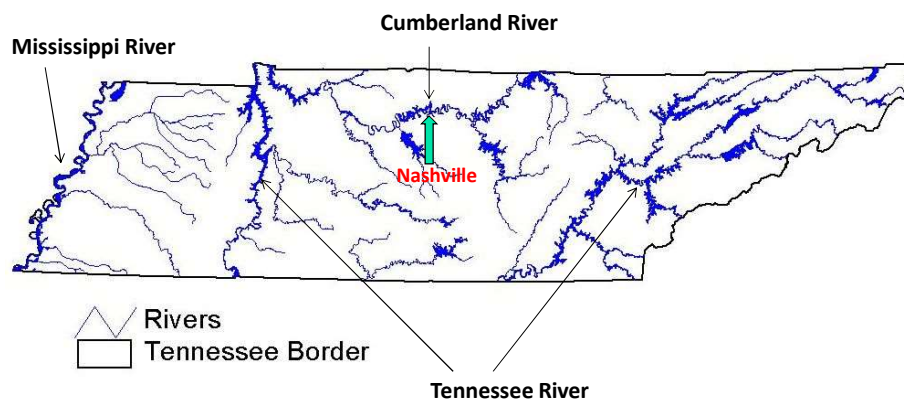
2

State of Tennessee



3

Tennessee's Major Rivers



4

Laws & Regulations

- Clean Water Act (CWA) 1972
- Tennessee Water Quality Control Act (TWQCA) of 1977

<https://www.epa.gov/laws-regulations/summary-clean-water-act>
[https://www.lawserver.com/law/state/tennessee/tn-code/
tennessee_code_title_69_chapter_3_part_1](https://www.lawserver.com/law/state/tennessee/tn-code/tennessee_code_title_69_chapter_3_part_1)

5

Tennessee Code 69-3-102. Declaration of policy and purpose

Recognizing that the waters of Tennessee are the property of the state and are held in public trust for the use of the people of the state,

it is declared to be the public policy of Tennessee that the people of Tennessee, as beneficiaries of this trust, have a right to unpolluted waters.

In the exercise of its public trust over the waters of the state, the government of Tennessee has an obligation to take all prudent steps to secure, protect, and preserve this right.

6

Tennessee Water Quality Standards

- Use Classifications for Surface Waters
- General Water Quality Criteria
- Anti-degradation Statement

[https://www.epa.gov/wqs-tech/
water-quality-standards-regulations-tennessee](https://www.epa.gov/wqs-tech/water-quality-standards-regulations-tennessee)

7

Use Classifications for Surface Waters 1200-4-4

- *Navigation*
- *Domestic water supply*
- *Industrial water supply*
- *Fish & aquatic life*
- *Recreation*
- *Irrigation*
- *Livestock watering & wildlife*

8

General Water Quality Criteria

1200-4-3

- **Numeric criteria**
5 mg/l dissolved oxygen;
100 ug/l total Chromium;
- **Narrative criteria**
free from toxic pollutants in toxic amounts;

9

Anti-degradation Requirements

- **Maintains** existing uses and level of quality necessary to protect the use
- **Protects** high quality waters-high quality water is that which exceeds levels necessary to support uses
- **Provides** special protection for Outstanding National Resource Water (ONRWs)

10

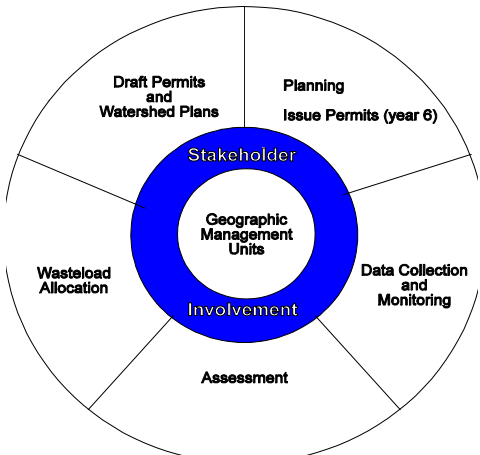
Guiding Principles

11

A healthy river is an ecosystem that is
sustainable and resilient,
maintaining its ecological structure
and function over time
while continuing to meet
societal needs and expectations

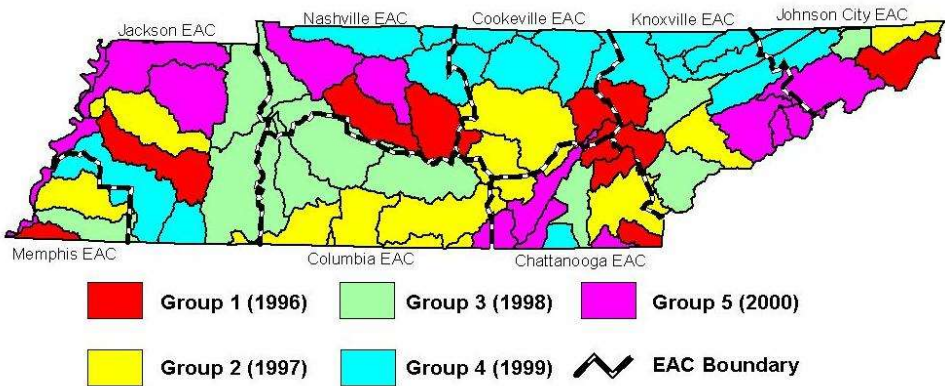
12

Watershed Management Cycle



13

Watershed Management Groups



14

Watershed Management **Short-Term Objectives**

Point Source

- Issuance of watershed-based discharge permits
- Watershed-based wasteload allocation

Nonpoint Source

- Coordination with Department of Agricultural & other agencies on nonpoint source issues

15

Watershed Management **Long-Term Objectives**

- Conservation
- Pollution prevention
- Innovative treatment technologies
- Best management practices
- Pollution trading

16

Watershed Management

Expected Benefits

- Efficient-administratively;
- Effective-ecologically;
- Equitable and consistent;

17

Watershed Management

Top Ten List

10. Think small
9. Bring everyone to the table
8. Great leaders plant seeds and nurture them
7. Ask for free advice and in-kind services
6. Encourage teaching
5. Seek common interests, not positions
4. Celebrate your successes
3. Ask not “do you like it?” but ask “can you live with it?”
2. Conflict can be healthy - if managed positively
1. Patience. Patience. Patience.

18

Eco-Region Based Reference Stream Concept

19

Eco-Regions

relatively homogenous areas
defined by similarity of
climate, landform, soil,
potential natural vegetation,
or other ecologically relevant
variables

20

Reference Streams

A least impacted, but
representative waterbody within an
ecoregion that can be monitored
to establish a baseline
to which other waters can be compared

21

Tennessee



West



Ghost Creek

Middle



South Harpeth River

East



Clear Creek

22

**Tennessee's Level III Ecoregions
from West to East**

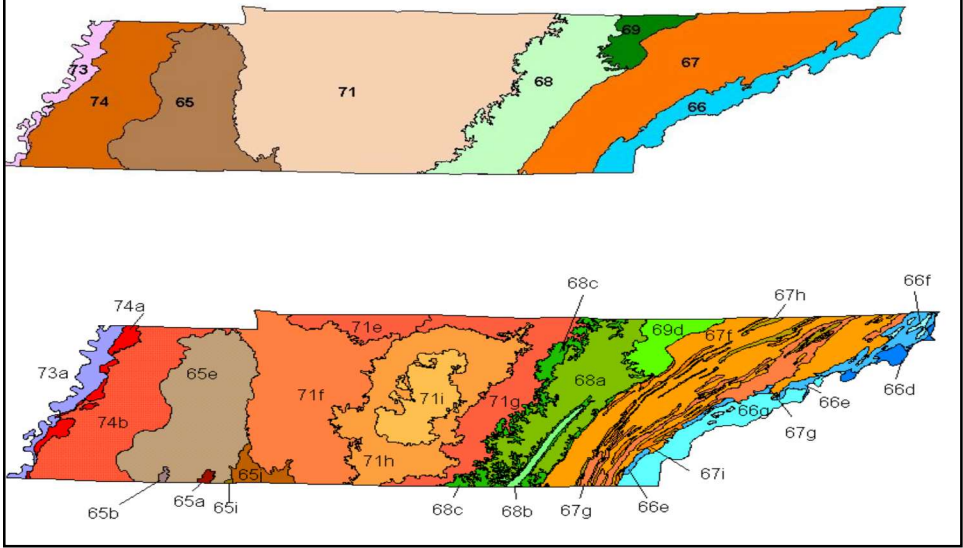
73 Mississippi Alluvial Plain
74 Mississippi Valley Loess Plains
65 Southeastern Plains
71 Interior Plateau
68 Southwestern Appalachians
69 Central Appalachians
67 Ridge and Valley
66 Blue Ridge Mountains

23

*Ecoregion Level III
&
Sub-Ecoregion Level IV*

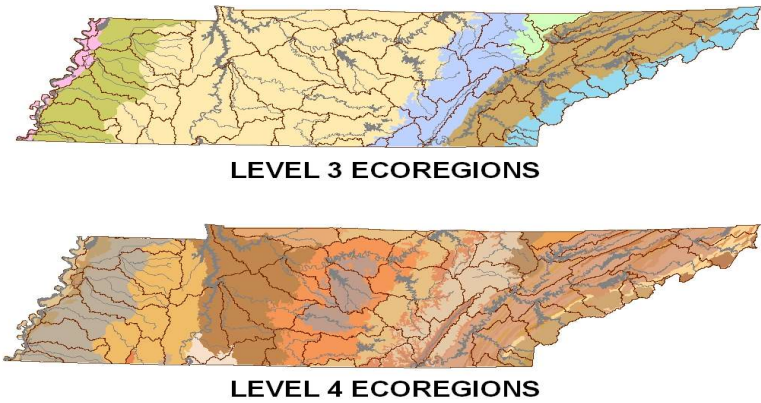
24

Level III & Level IV Ecoregions



25

Watershed-Ecoregion Boundary



26

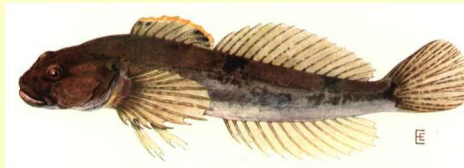
Some Sensitive Organisms in Streams



Stoneflies



Slimy Sculpin



27

Some Tolerant Organisms in Streams

Midges



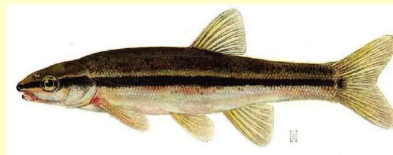
Snails



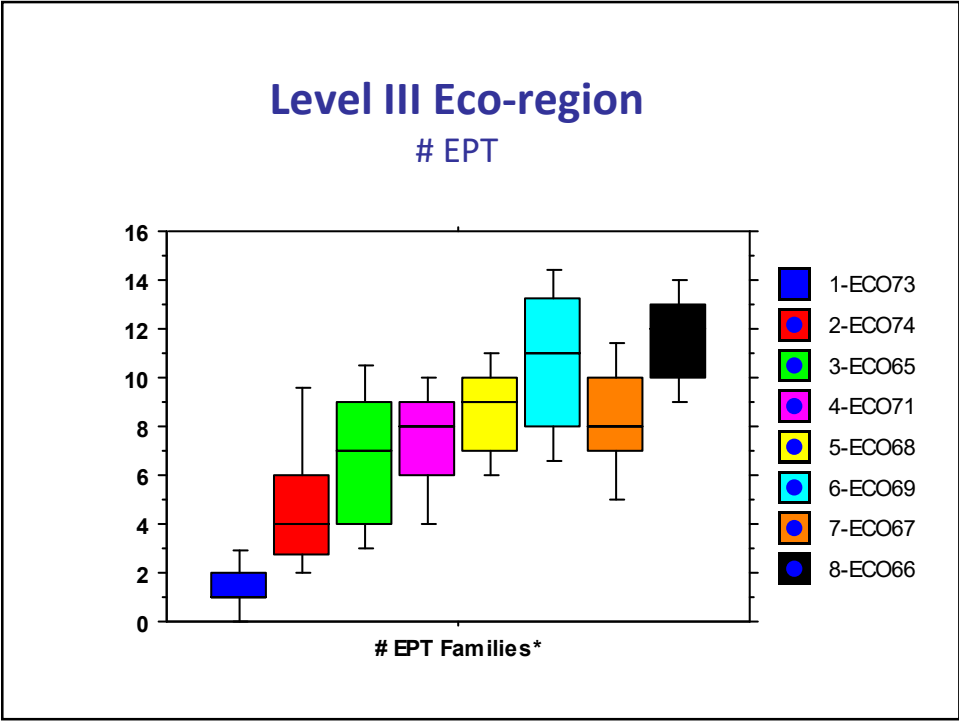
Blacknose dace



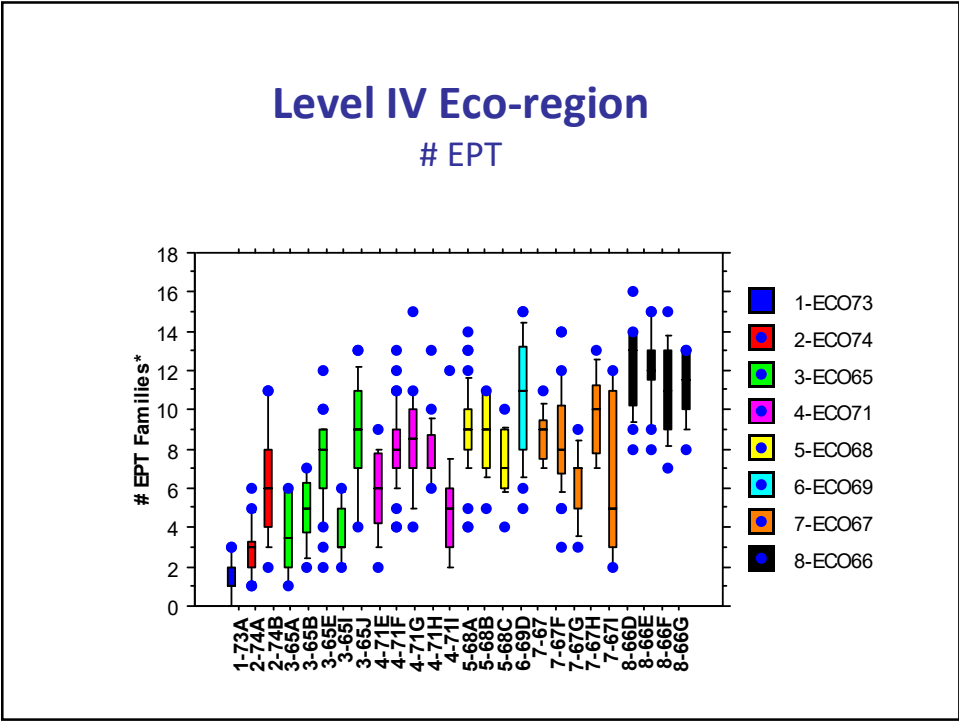
Leeches



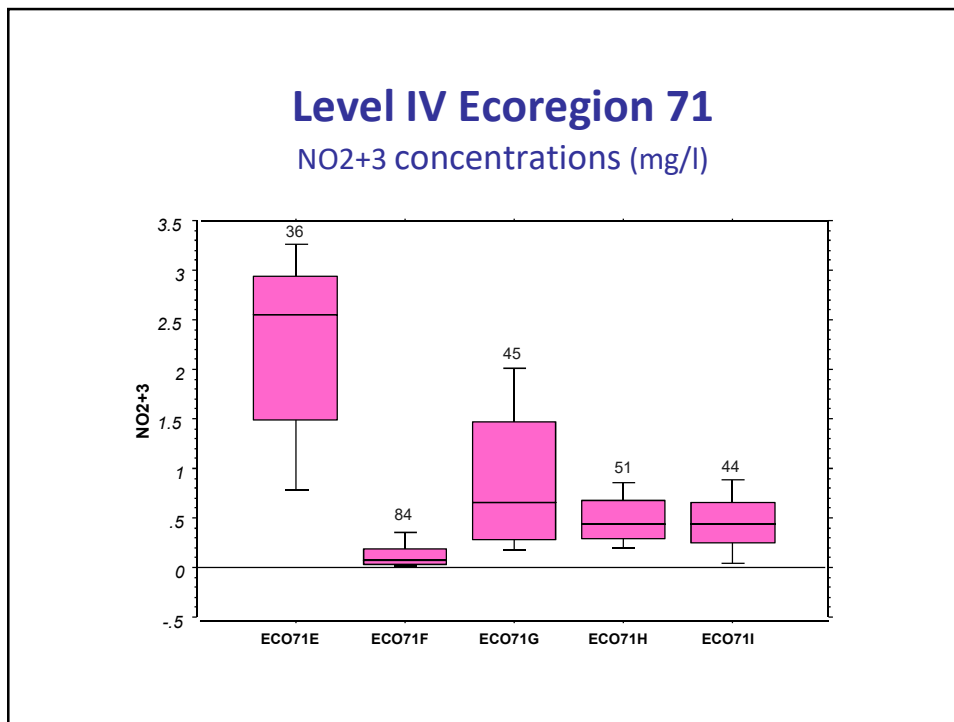
28



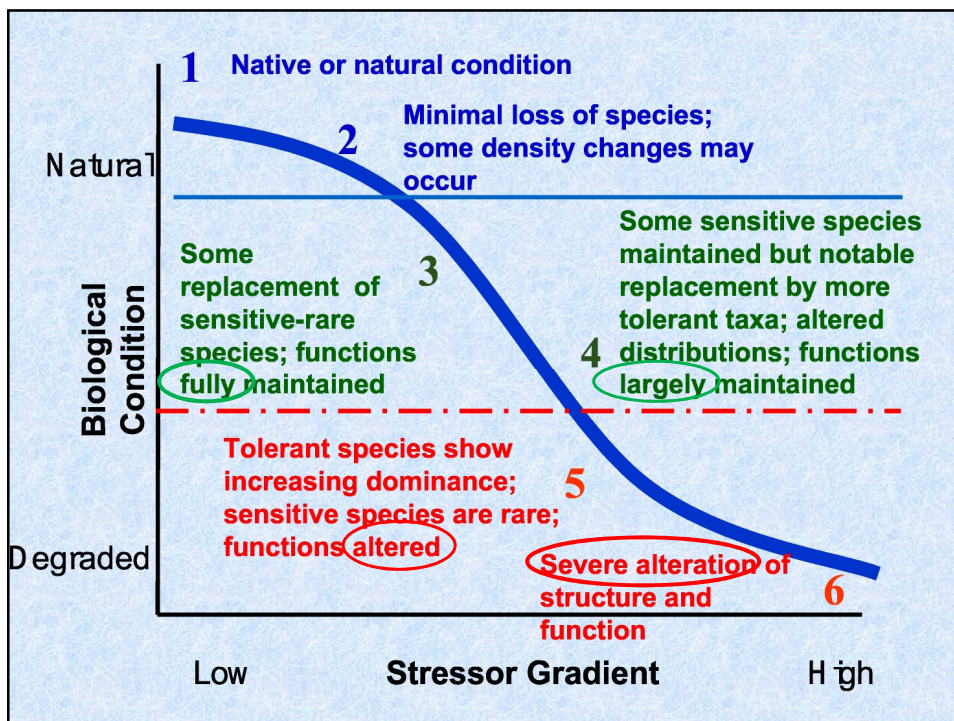
29



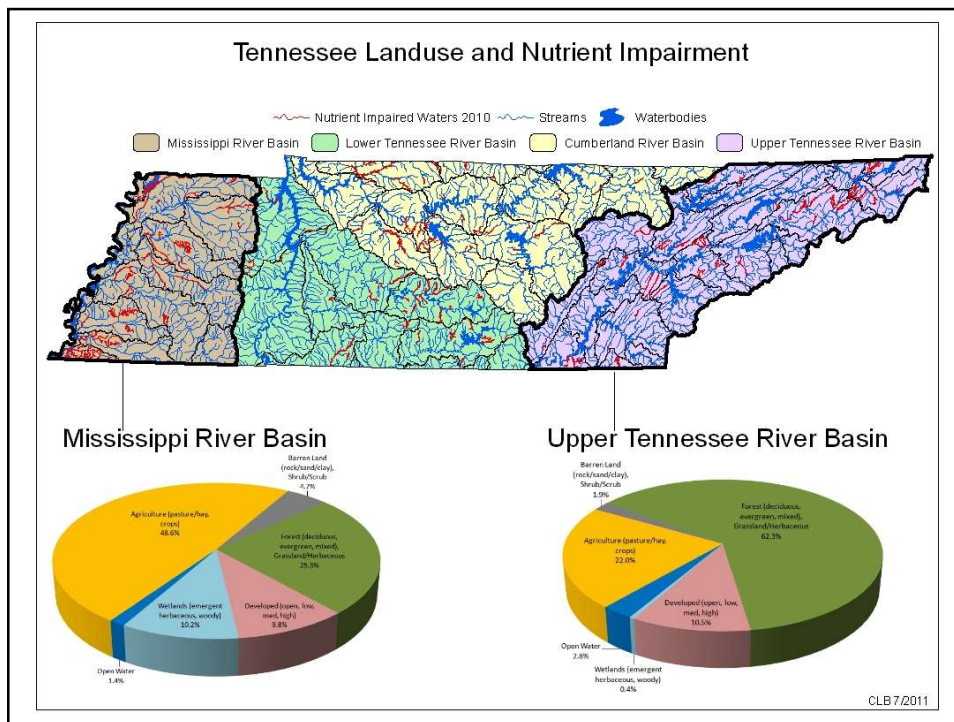
30



31



32



33



34

EPA BASINS

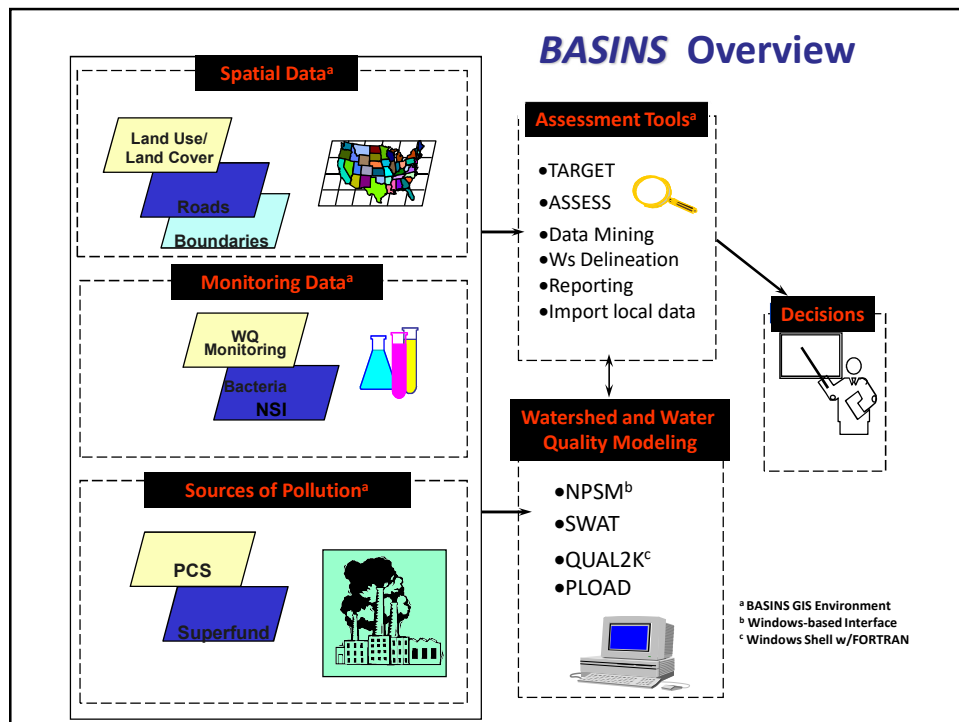
**BBETTER ASSESSMENT SCIENCE
INTEGRATING
POINT AND NONPOINT SOURCES**

35

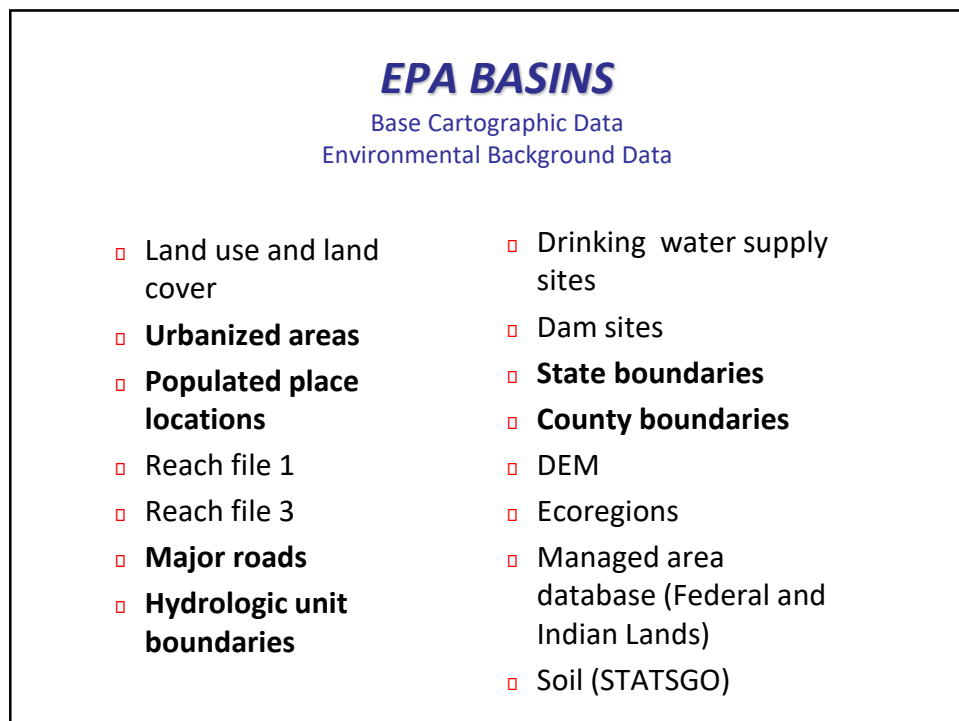
Integrated
GIS, Data Analysis & Modeling System
designed to support
watershed-based analysis

[https://www.epa.gov/ceam/
better-assessment-science-integrating-point-and-non-point-sources-basins](https://www.epa.gov/ceam/better-assessment-science-integrating-point-and-non-point-sources-basins)

36



37



38

Watershed & In-stream Models

- QUAL2K
 - WASP
 - HSPF/LSPC
 - SWAT
 - GWLF
- Data input through the GIS Interface

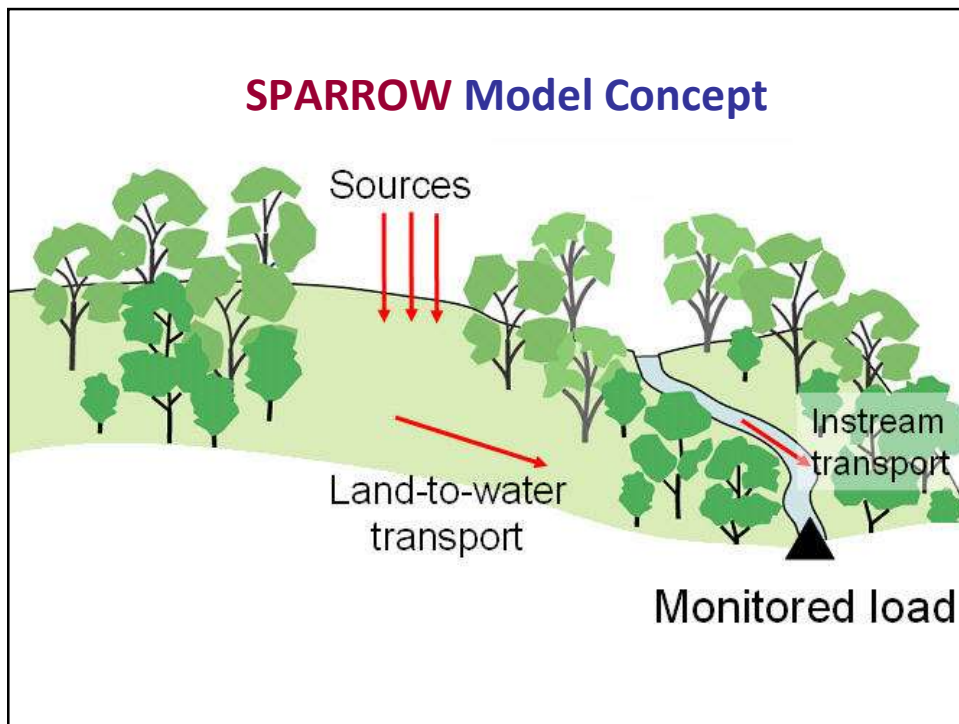
39

USGS SPARROW

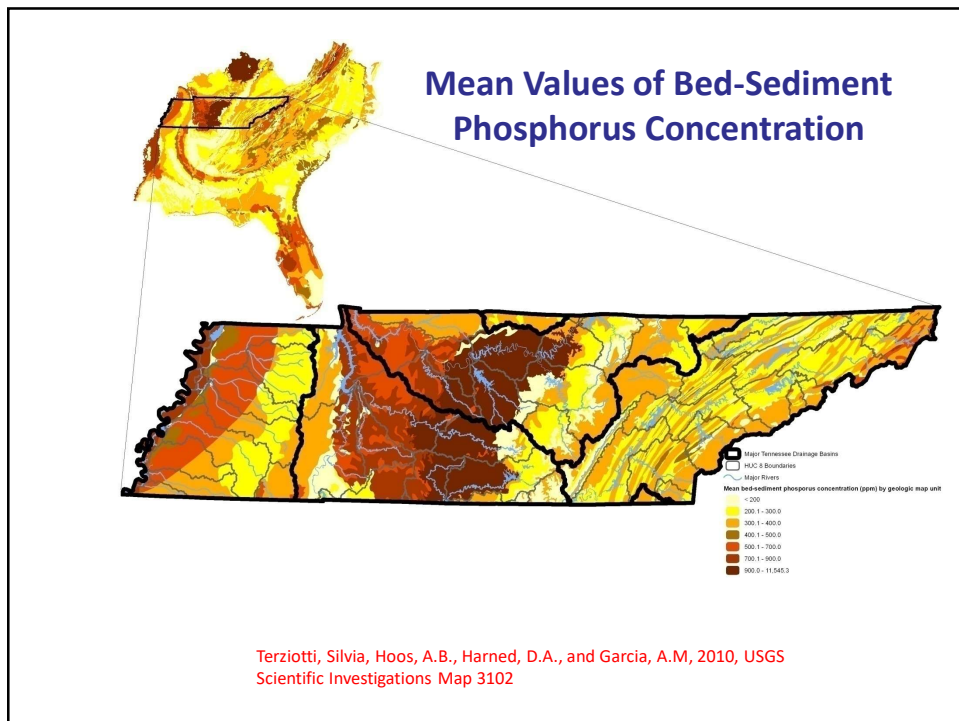
SPAtially Referenced
Regression On
Watershed Attributes

<https://www.usgs.gov/mission-areas/water-resources/science/>

40

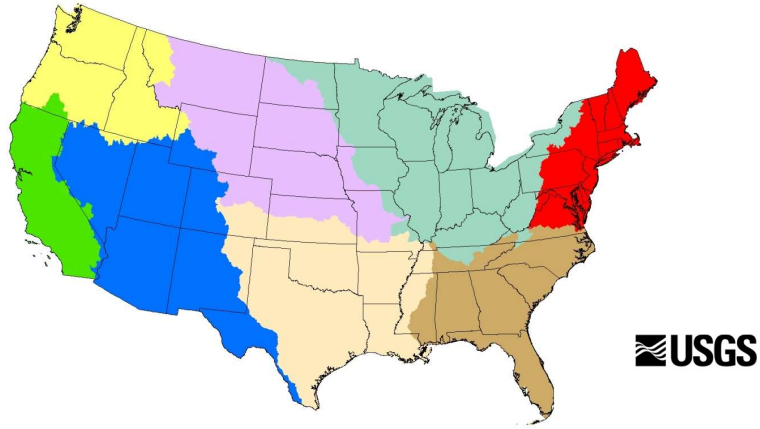


41



42

Regional SPARROW Models



<https://pubs.er.usgs.gov/publication/70202393>

43

Recovery Potential Screening Tool (RPST)

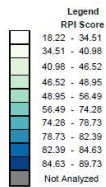
Watershed Assessment
for
Prioritization & Restoration

<https://www.epa.gov/rps>

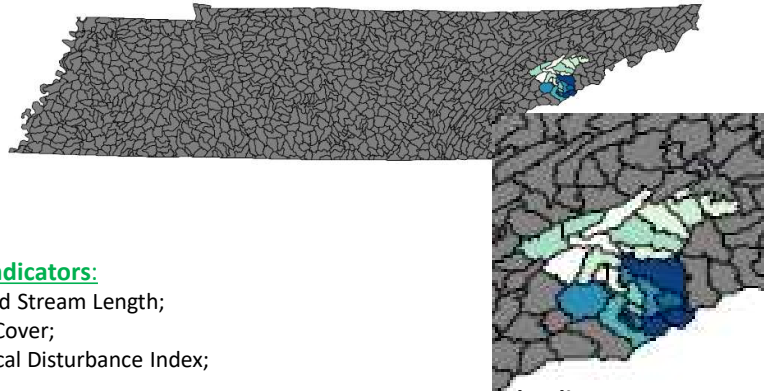
44

Recovery Potential Screening Tool

Index Scores



RPI Score For Tennessee HUC12 Watersheds



Ecological Indicators:

- Unimpaired Stream Length;
- % Nature Cover;
- NFHAP-Local Disturbance Index;

Stressor Indicators:

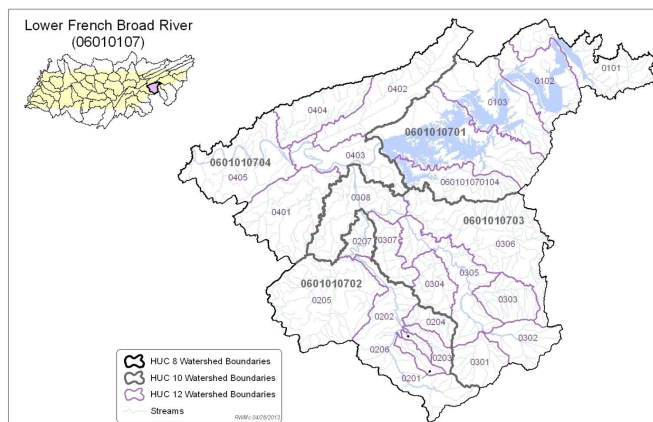
- Stream Corridor-% U-Index;
- Empower Density;

Social Indicators:

- % Area not in MS4;
- Jurisdictional Complexity;

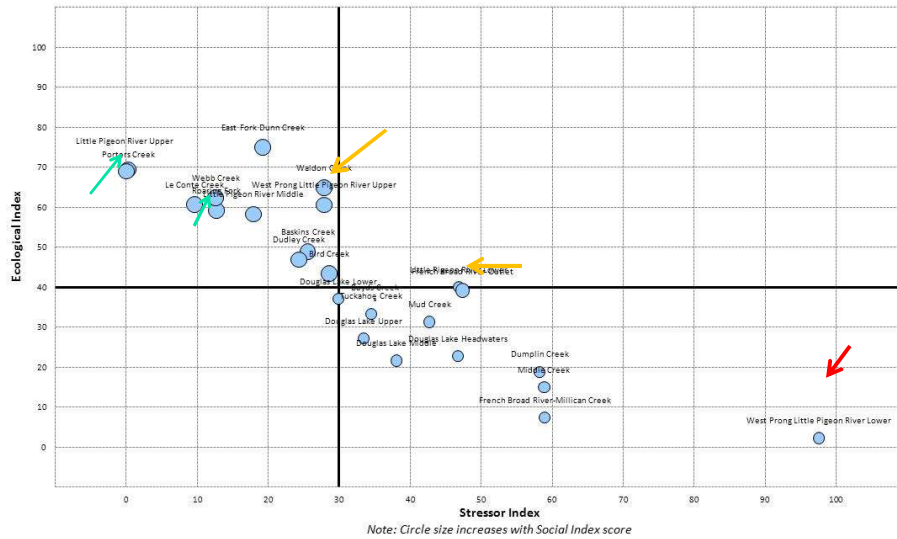
45

Lower French Broad River Watershed



46

Recovery Potential Scores Bubbles Plot



47

Watershed Approach

Partnership
Partnership
Partnership

48

Where is the Water

- 97% Saltwater
- 2% Trapped in icebergs
- 1% Fresh water

49

Water

Liquid Asset



50

New Vision

One Water

is the future of the water industry.
Many benefits are realized when the barriers
traditionally separating water, wastewater,
stormwater and reuse are broken down

*-Robert C. Renner
CEO Water Research Foundation*

51

Current Thinking

- Drinking Water
-most essential use
- Wastewater
-most hidden resources
- Stormwater
-rain today, drinking water tomorrow

52

*The pessimist complains
about the wind;
the optimist expects
it to change;
the realist adjusts the sails*

-William Arthur Ward

53

THE END

sherry.wang@tn.gov

615-532-0656

54