North Central Texas Water Quality Project

Richland-Chambers Reservoir Watershed Protection Plan
Stakeholder Meeting
Waxahachie, Texas

AGENDA

September 20, 2016

9:30 Refreshments and Sign-in

9:45 Welcome and Introductions
Tina Hendon, Watershed Program Manager, Tarrant Regional Water District

10:00 Watersheds 101 – Introduction to Watersheds
Morgan Buob, Education & Outreach Coordinator, Tarrant Regional Water District

10:20 Water Quality Management in Texas
Darrel Andrews, Assistant Environmental Director, Tarrant Regional Water District

10:35 Water Quality in the Richland-Chambers Reservoir
Mark Ernst, Environmental Manager, Tarrant Regional Water District

10:50 Break

11:00 Use of Water Quality Models
Dr. Srinivasan, Texas A&M Spatial Sciences Lab

11:15 National Water Quality Initiative - NRCS
Beau Brooks, District Conservationist, USDA Natural Resources Conservation Service

11:30 Lunch

12:00 Importance of Water Quality – The Miller-Coors Perspective
Lairy Johnson, Environmental and Sustainability Engineer, Miller-Coors

12:15 Watershed Protection Plans
Tina Hendon, Watershed Program Manager, Tarrant Regional Water District

12:30 Roles of Stakeholders and Agencies
Clint Wolfe, Program Manager, Texas A&M AgriLife Research

12:45 Next Steps/Facilitated Discussion
Clint Wolfe, Program Manager, Texas A&M AgriLife Research

1:00 Adjourn

North Central Texas Water Quality Project

Richland-Chambers Reservoir Watershed Protection Plan
Stakeholder Meeting
Corsicana, Texas

AGENDA

September 21, 2016

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Dr. Dianne Stroman, Collin College and Texas A&M University

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Richland-Chambers Watershed Partnership

Stakeholder Meeting
September 20-21, 2016

Introduction

TINA HENDON, TRWD

Richland-Chambers Reservoir

Richland-Chambers Reservoir

A little watershed history

1800's

- Onset of intensive agriculture
- Heavy erosion from the land surface
- Deposition in the foot slopes, channels, floodplains.
- Result: poorly drained valley bottoms, flooding, and loss of crops.

Richland-Chambers Reservoir

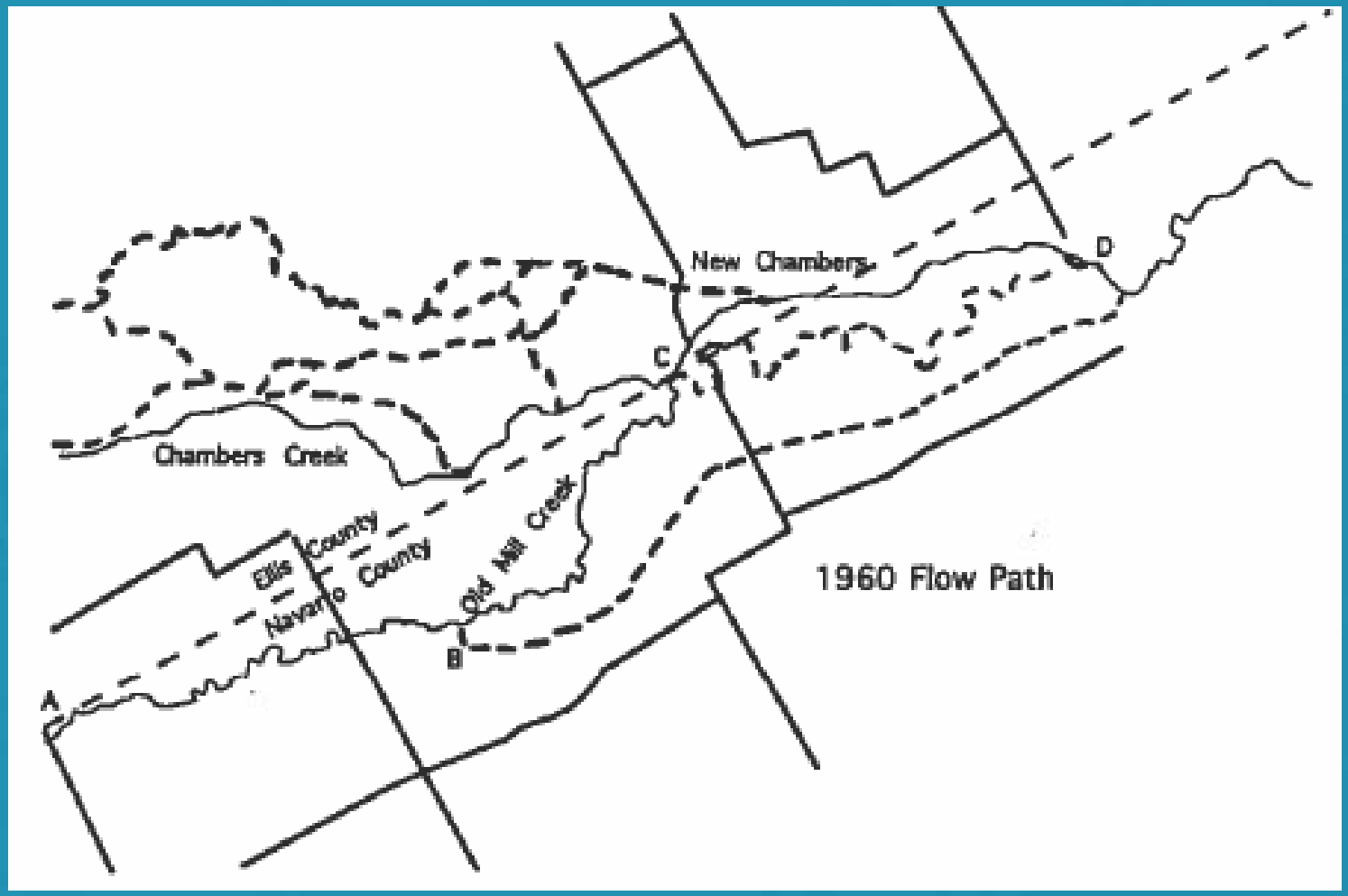
A little watershed history

1950's – 1960's

- Soil Conservation Service was called in to prevent loss of cropland due to erosion and alleviate flooding.
- Large scale implementation of structural practices including,
  - conservation practices, i.e. terracing, gully control,
  - construction of 100's of flood water dams (PL-566),
  - structural improvement of over 78 miles of channels to enhance drainage of valley bottoms.
  - Levees to protect agricultural land

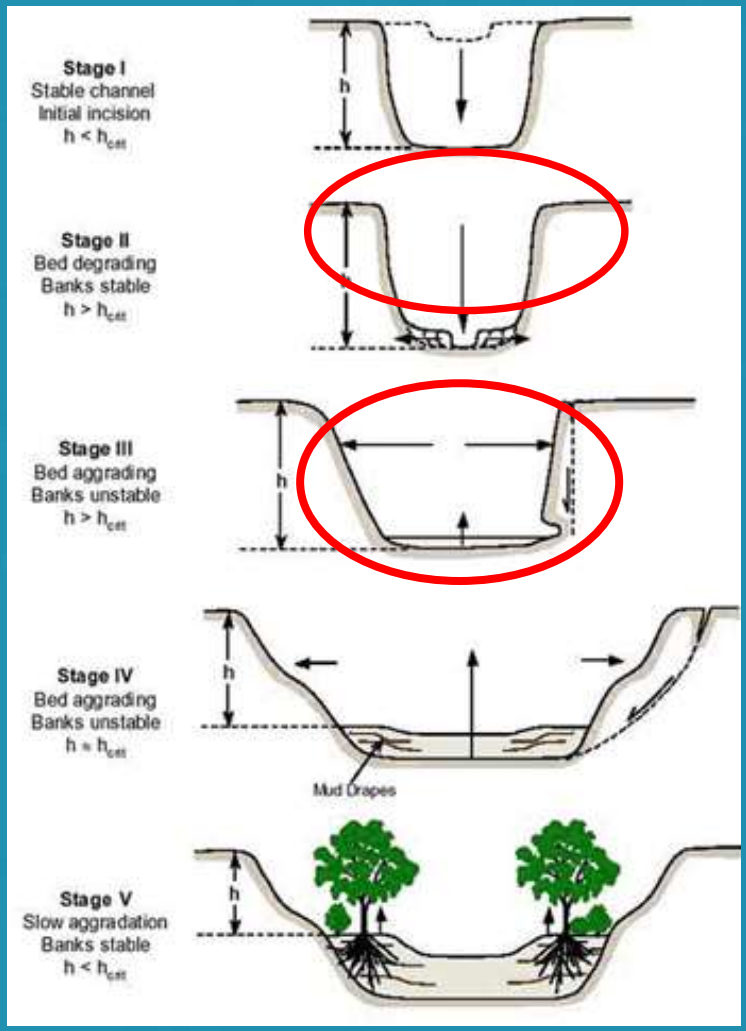
Richland-Chambers Reservoir

A little watershed history



Richland-Chambers Reservoir

A little watershed history



Richland-Chambers Reservoir

A little watershed history

NRCS Watershed Programs (PL-566)

- Watershed dam construction
- Upland conservation practices

Richland-Chambers Reservoir

A little watershed history

1980's

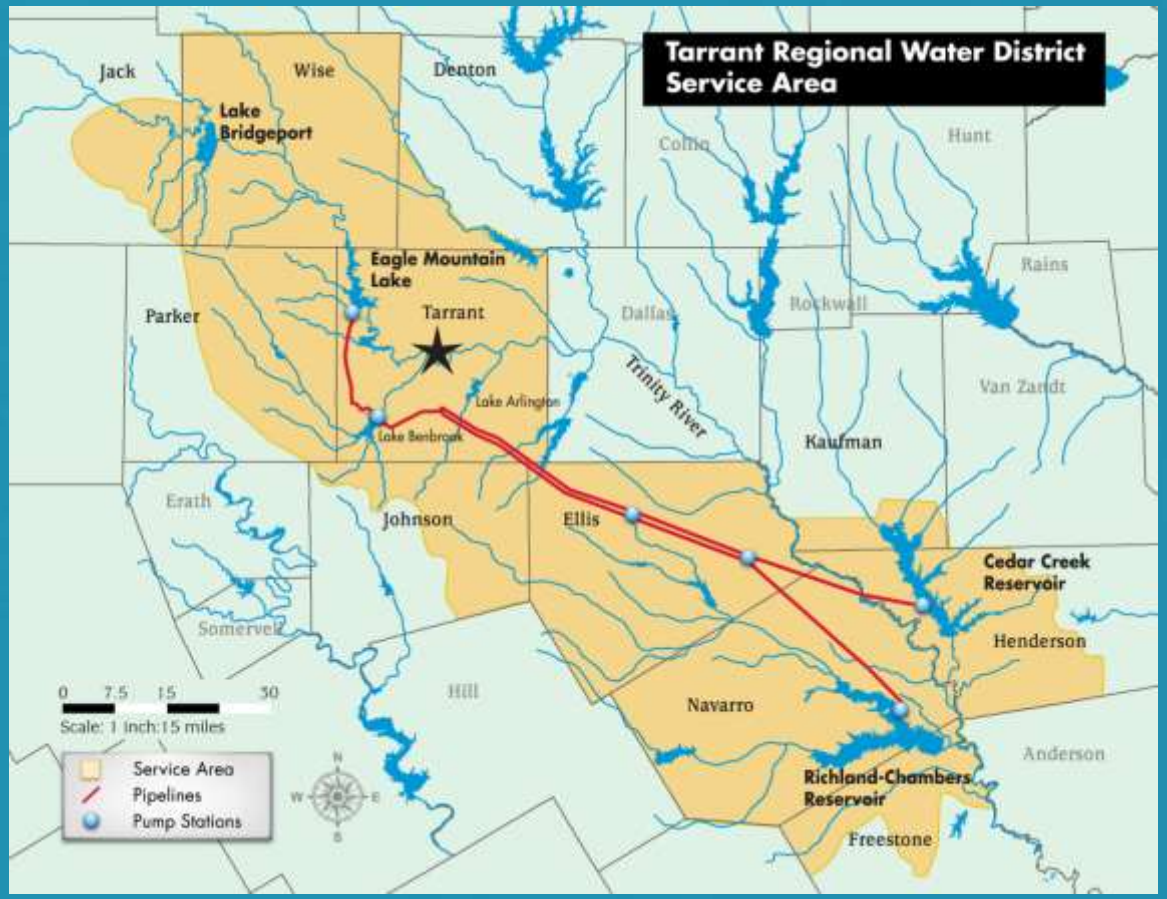
Statistics

Constructed	1982-1987
Surface Area	43,384 acres
Max Depth	86 ft
Shoreline:	330 miles
Watershed:	1,957 sq. mi

Richland-Chambers Reservoir

A little watershed history

1980's to now



Richland-Chambers Reservoir

A little watershed history

1980's to now

Richland-Chambers Reservoir

A little watershed history

Mill Creek Studies (1980's)

Address erosion and sediment

TRWD/SWCD Cooperative Agreement (1995)

Cost-share BMPs and conservation practices in targeted areas

North Central TX WQ Project (2003)

Watershed planning for TRWD supplies

Trinity River Restoration Initiative (2007)

Updated modeling and analysis to better target problem areas

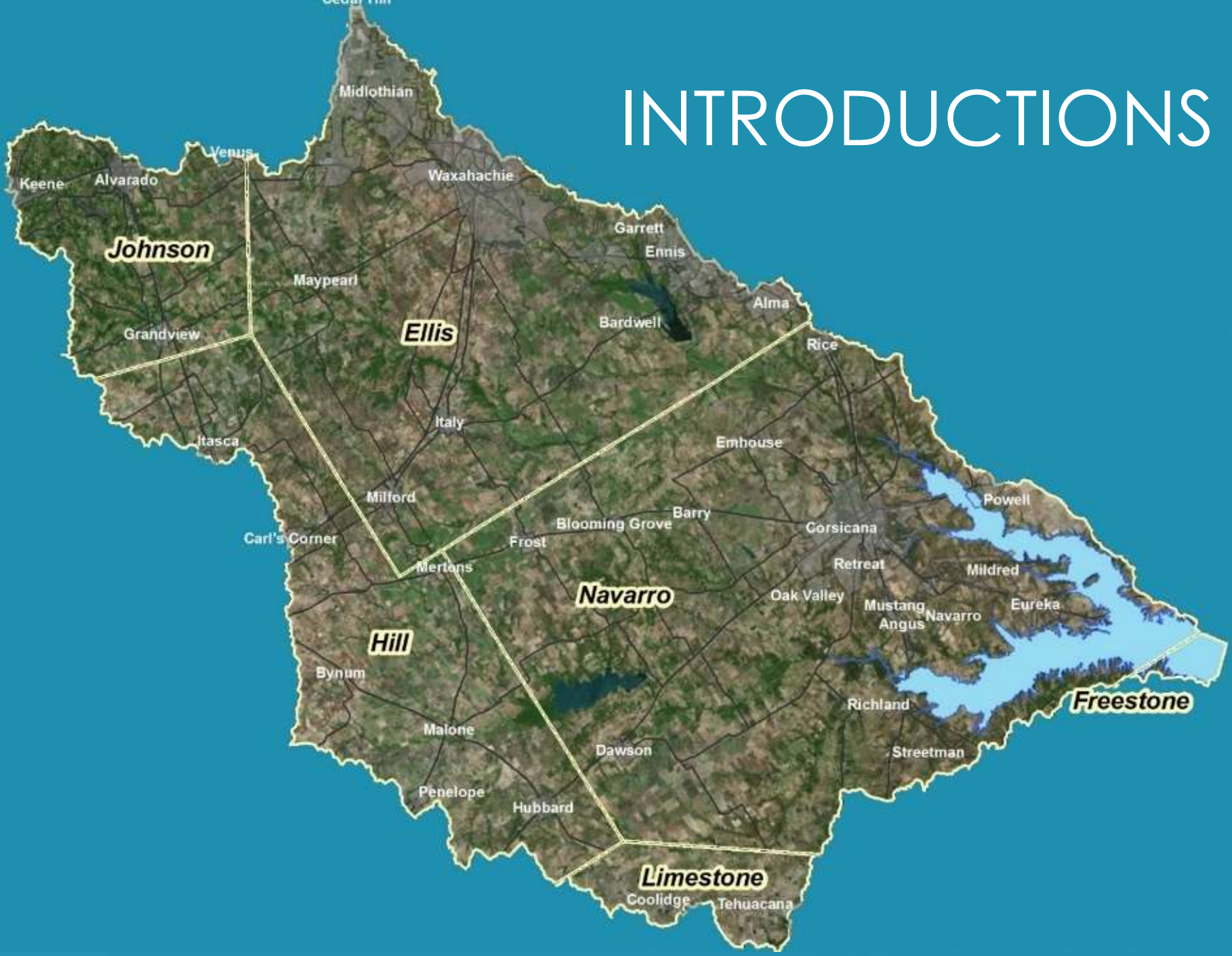
Long-Term WQ Trend Study (2011)

20 year trends to determine changes in reservoir nutrient and chlorophyll-a concentrations

National Water Quality Initiative (2012)

Targeted NRCS Funding

INTRODUCTIONS



Richland-Chambers Watershed Partnership

Stakeholder Meeting
September 20-21, 2016

Watersheds 101

MORGAN BUOB, TRWD

Watersheds 101

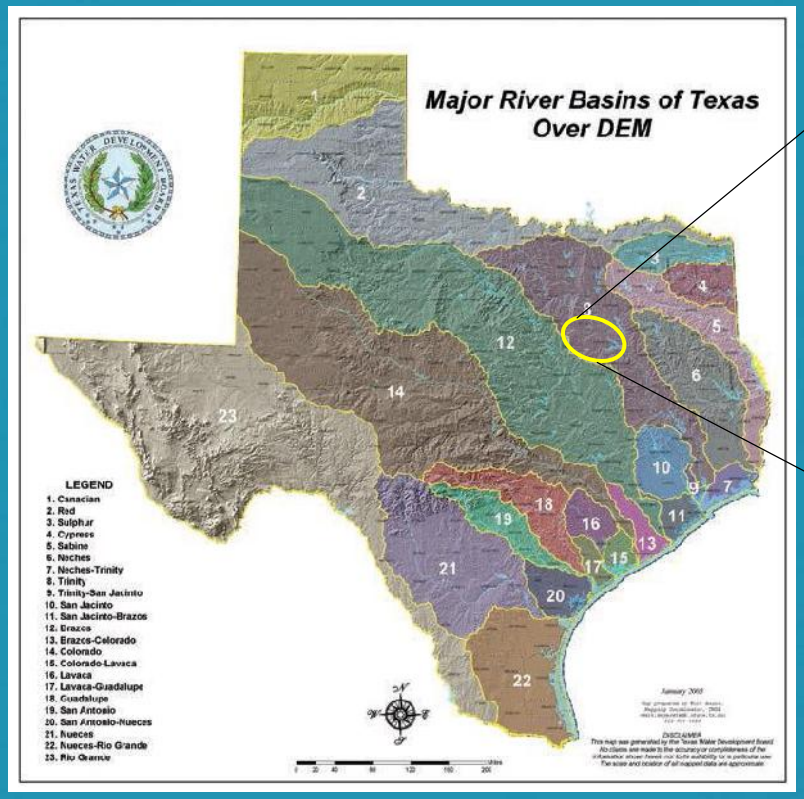
What is a Watershed?

- Land area that drains into a common water body
- Surface water
- Ground water
- Soils
- Vegetation
- Wildlife
- Livestock

Watersheds 101

Watersheds in Texas

Texas River Basins

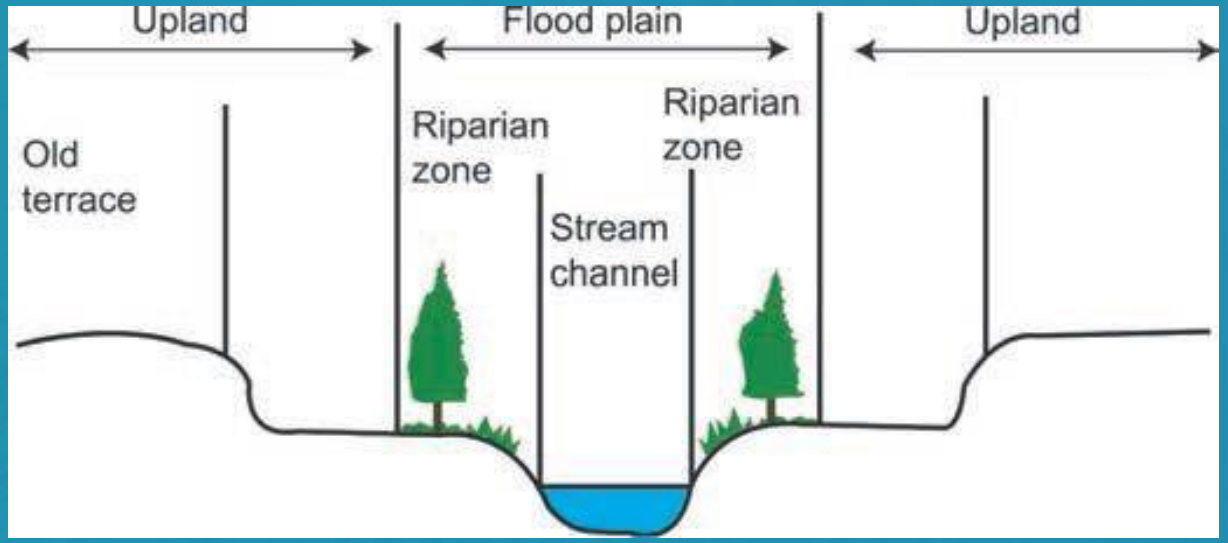


Richland-Chambers Watershed

Watersheds 101

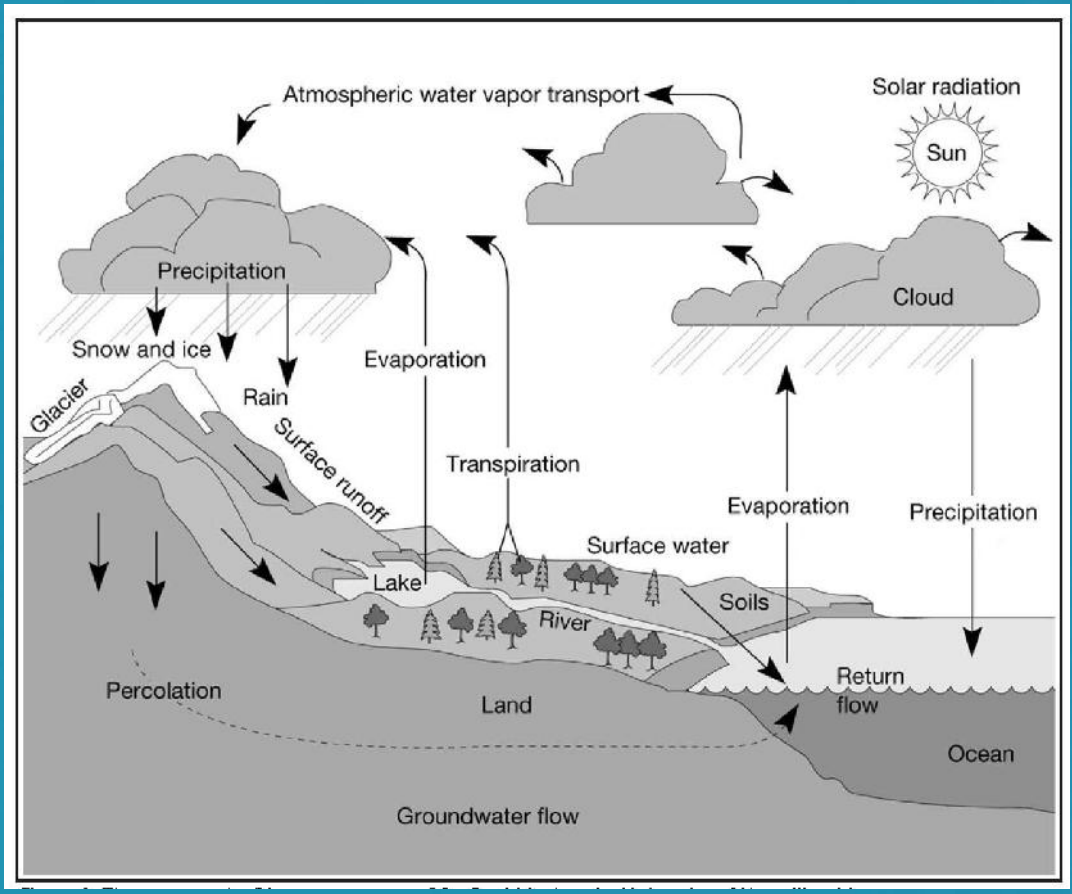
Natural Watershed Features

- Upland
- Floodplain
- Riparian Zone
- Stream Channel



Watersheds 101

Watershed Hydrology



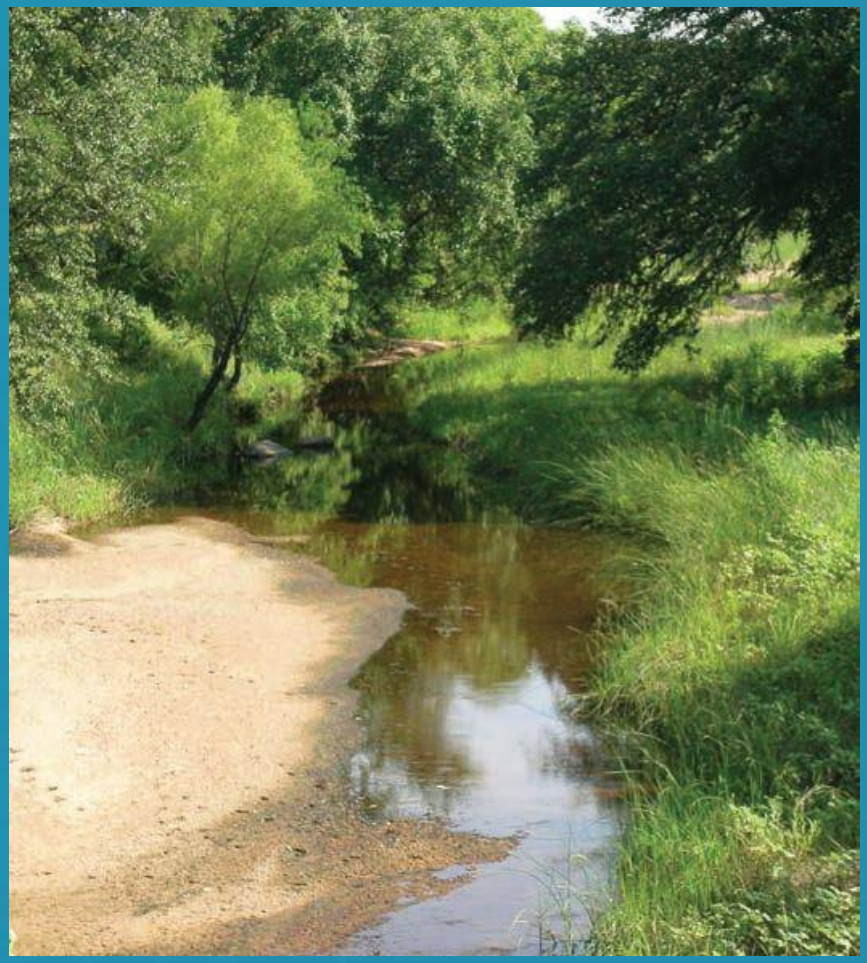
Watersheds 101

Hydrological Functions

- Water Capture
- Water Storage
- Water Release

Ecological Functions

- Habitat for plants and animals
- Supports nutrient cycling and chemical transformations



Watersheds 101

Land Use = How land is used by humans

- Agriculture
- Industry
- Urban-Residential
- Recreation

Land Cover = biological or features of land

- Forests
- Grasslands
- Agricultural fields
- Rivers, lakes
- Buildings, parking lots

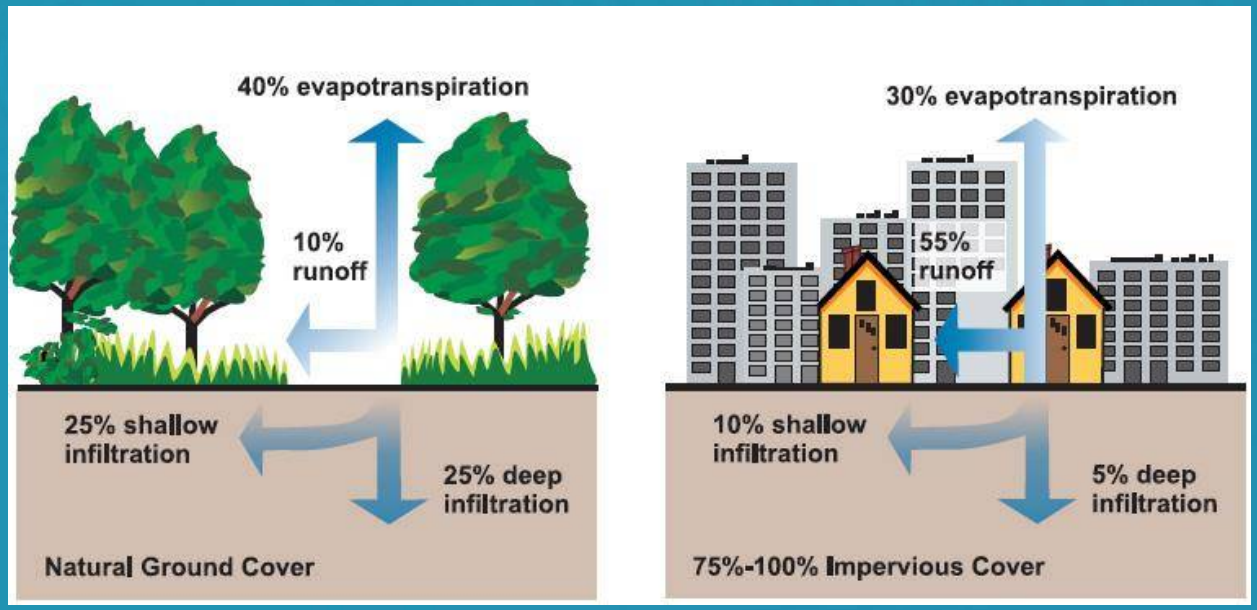
Watersheds 101

Where does rainfall go?

- Run off
- Infiltrate
- Taken up by plants
- Evapotranspiration
- Stored

Human impacts

- Increased run off
- Less Infiltration
- Fewer plants
- Less evapotranspiration
- Less storage



Watersheds 101

Pollution:
Contamination of air, soil, or water with harmful substances.

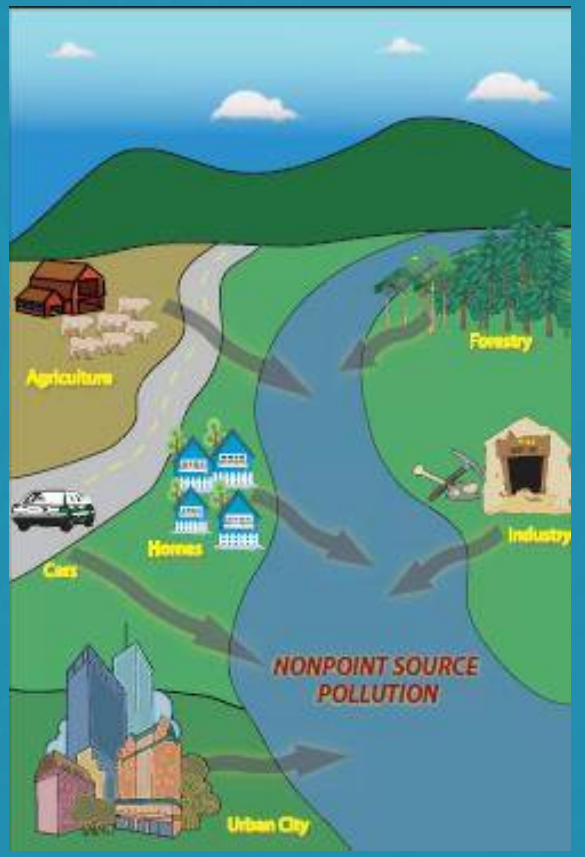
Human Impacts to Water Quality

Point Source Pollution

- discharged from a clearly defined, fixed point such as a pipe, ditch, channel, sewer or tunnel

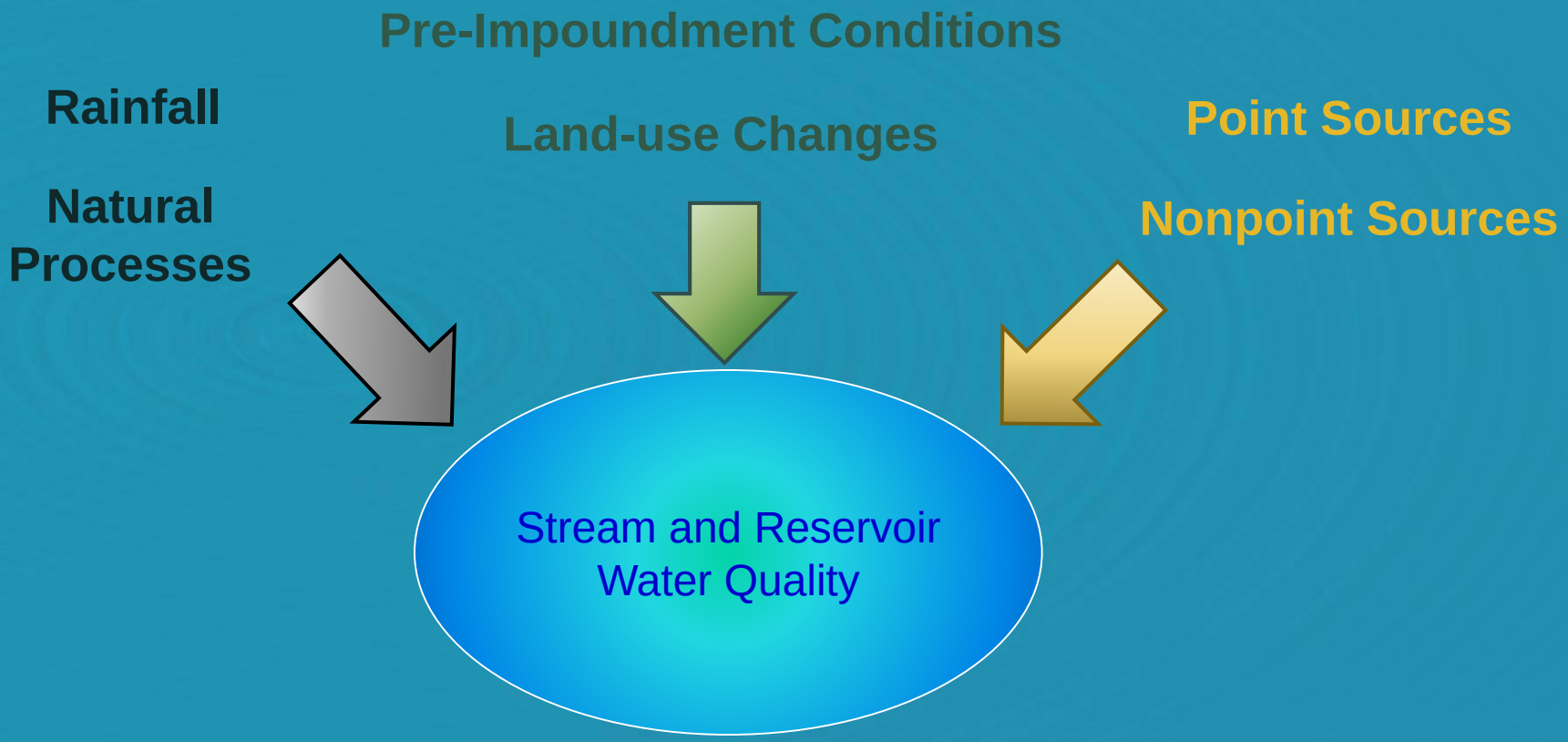
Non-Point Source Pollution

- originates from many different places across the landscape, most of which cannot be readily identified.



Watersheds 101

Watershed Effects on Water Quality



Watersheds 101

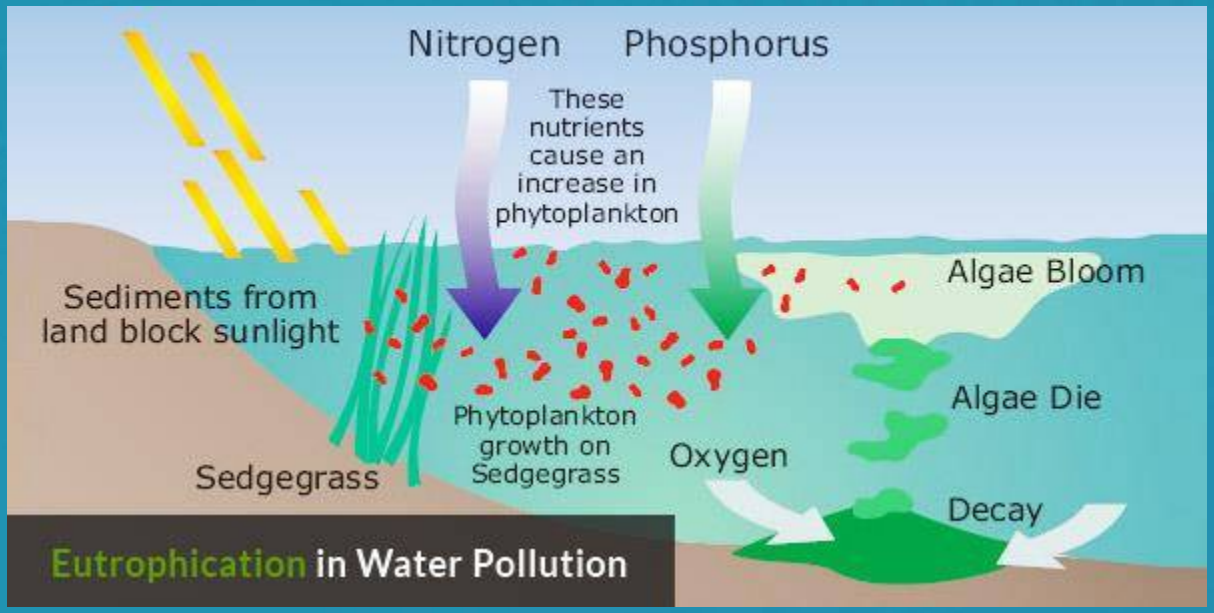
Impacts of typical Nonpoint Source Pollutants

POLLUTANT	NONPOINT SOURCE	IMPACTS
Bacteria	Livestock, pet waste, septic systems, and boat discharge.	Introduces disease-bearing organisms to surface water and ground water, resulting in shellfish bed closures, swimming restrictions, and contaminated drinking water.
Nutrients (phosphates & nitrates)	Fertilizers, livestock, pet waste, septic systems, suburban/urban development, and soil erosion.	Promotes algae blooms and aquatic weed growth which can deplete oxygen, increase turbidity, and alter habitat conditions.
Sediment (soil)	Construction, driveways, ditches, earth removal, dredging, mining, gravel operations, agriculture, road maintenance, and forest operations.	Increases surface water turbidity which in turn reduces plant growth and alters food supplies for aquatic organisms, decreases spawning habitat and cover for fish, interferes with navigation and increases flooding risk.
Toxics and Hazardous Substances	Landfills, junkyards, underground storage tanks, hazardous waste disposal, mining, pesticides/herbicides, auto maintenance, runoff from highways and parking lots, boats, and marinas.	Accumulates in sediment posing risks to bottom feeding organisms and their predators; contaminates ground and surface drinking water supplies; some contaminants may be carcinogenic, mutagenic and/or teratogenic and can bioaccumulate in tissues of fish and other organisms including humans.

Watersheds 101

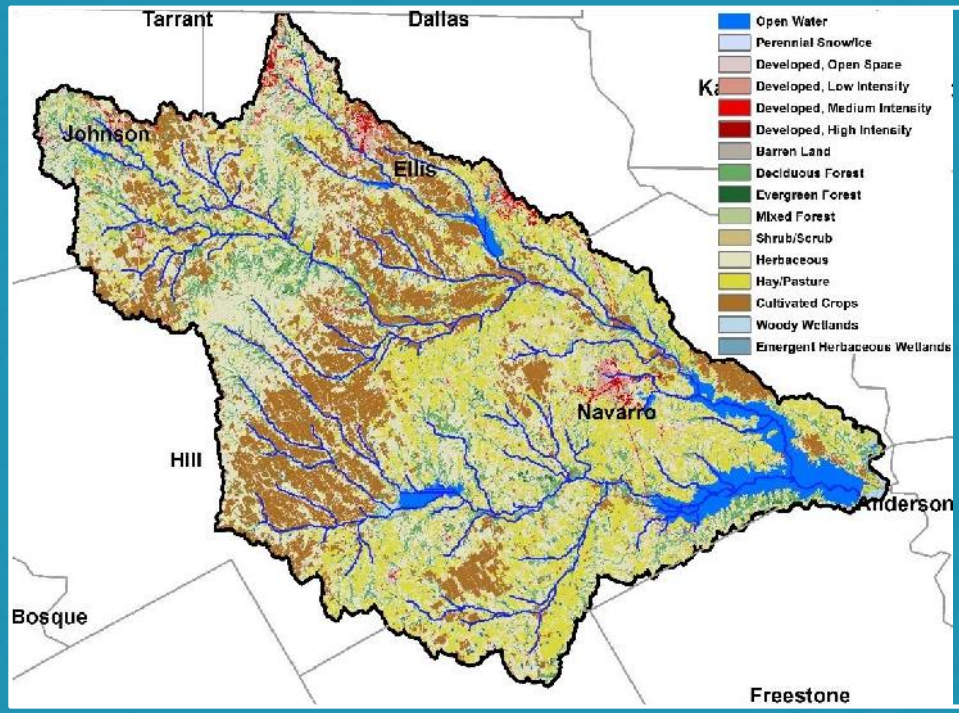
Eutrophication

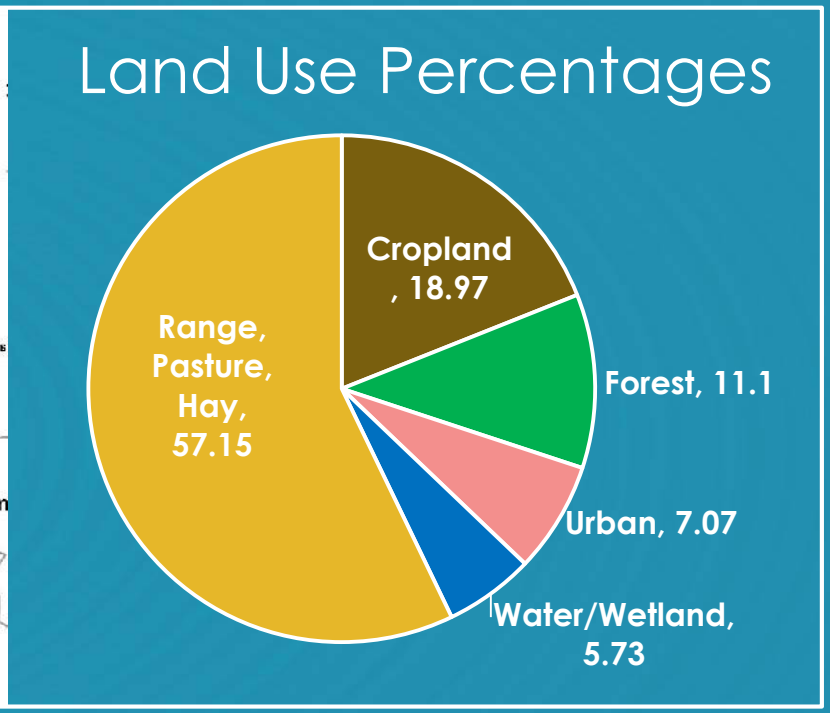
- Runoff of nutrients - typically nitrogen or phosphorus
- Promotes excessive plant growth and decay
- Causes water quality problems
  - Algae blooms
  - Taste & odor problems
  - Low dissolved oxygen



Watersheds 101

Richland-Chambers Watershed





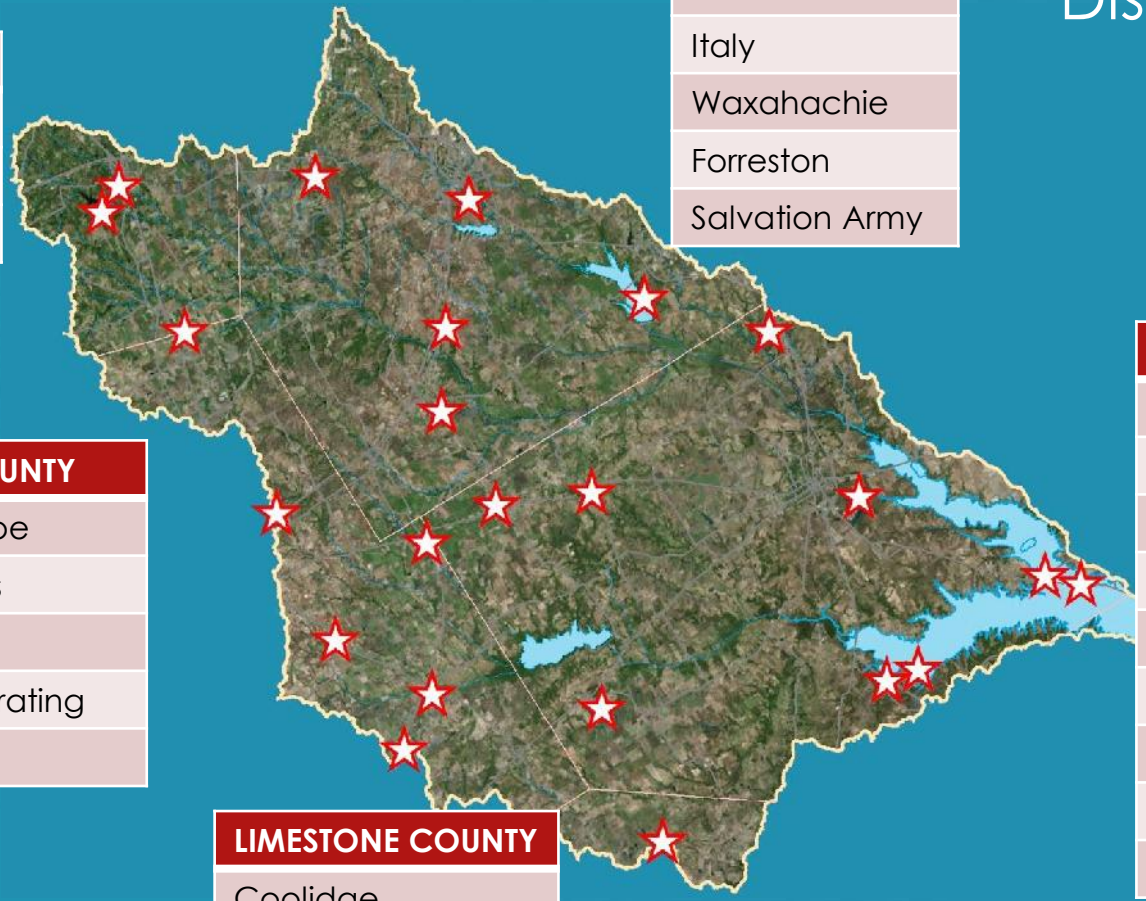
Watersheds 101

Richland-Chambers Watershed

Permitted Discharges

JOHNSON COUNTY
Grandview
Alvarado
Blue Water Oaks

ELLIS COUNTY
Ennis
Italy
Waxahachie
Forreston
Salvation Army



HILL COUNTY
Penelope
Mertens
Bynum
TA Operating
Malone

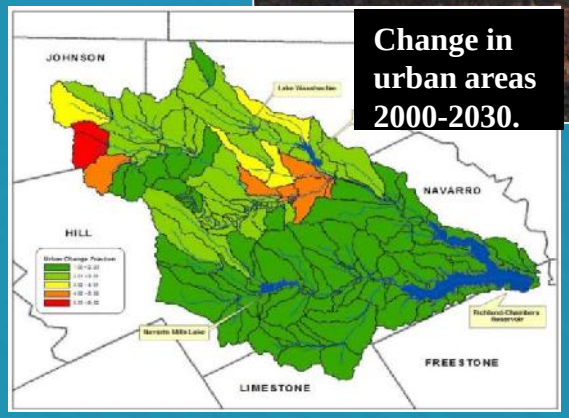
LIMESTONE COUNTY
Coolidge

NAVARRO COUNTY
Dawson
Frost
Corsicana
Blooming Grove
Bosque Utilities
Rice
White Rock HOA
TXI Operations LP
Tx DOT

Watersheds 101

Challenges

- Increasing urbanization
- Intensive agricultural use
- Erodible soils



Change in urban areas 2000-2030.

Impacts to Water Bodies

- Nutrient runoff - Eutrophication
- Erosion - Sedimentation

Watersheds 101

Questions?

Richland-Chambers Watershed Partnership

Stakeholder Meeting
September 20-21, 2016

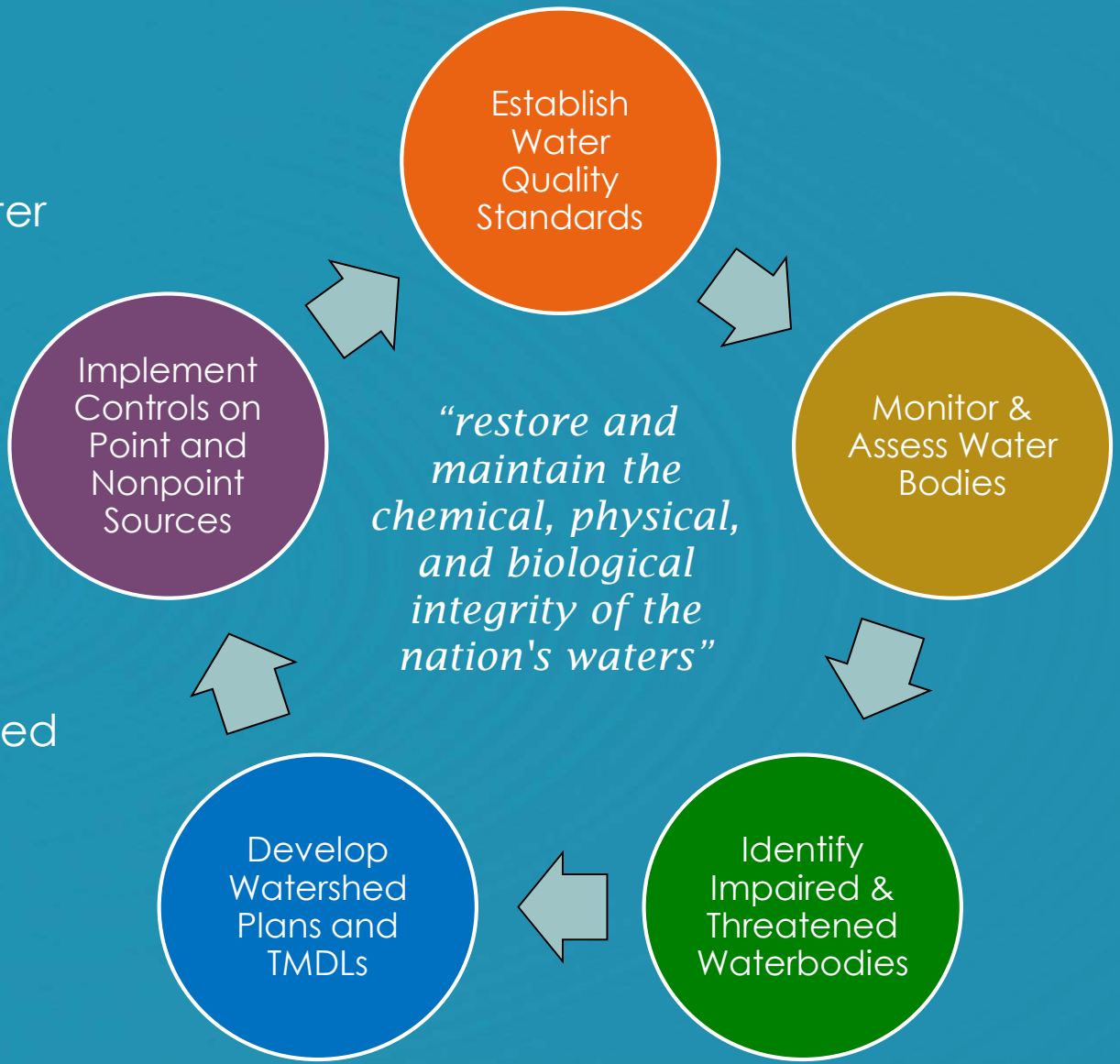
Water Quality Management in Texas

DARREL ANDREWS TRWD

Water Quality Management

Clean Water Act

- Applies to surface water
- Uses regulatory and non-regulatory tools
- reduce pollutant discharges (PS),
- manage polluted runoff (NPS)
- Many water quality programs are delegated to states



Water Quality Management

Water Quality Standards

- State rules, defining how water bodies will be used and the acceptable quality
- Re-evaluated every 3 years
- Reviewed by EPA

✓Designated Uses

✓Criteria

✓Antidegradation Policy

Water Quality Management

Water Quality Standards

Designated Uses

- Each waterbody is assigned one or more "designated uses."
  - Aquatic life
  - Contact Recreation
  - General
  - Fish Consumption
  - Domestic Water Supply
  - Other Uses

Water Quality Management

Water Quality Standards

Water Quality Criteria

Each designated use is supported by one or more "criteria."

Numeric Criteria

- Upper and/or lower limits for specific parameters, e.g. Dissolved Oxygen for Aquatic Life Use

Narrative Criteria

- Narrative description to protect aesthetics and designated uses
- Screening levels are numeric values used to evaluate narrative criteria, e.g. Chlorophyl-a for General Use

Water Quality Management

Monitor & Assess

Monitoring

- Samples are collected by TCEQ and others under various programs.
- Data are included in centralized database

Assessment

- Conducted every 2 years – **305(b) Report** includes:
  - Statistics for each waterbody
  - Sources of pollution
  - Methods used in assessment
  - Groundwater Assessment

  - List of water bodies with "concerns"
  - List of ***impaired*** water bodies - those with samples that exceed the assigned criteria – also known as the **303(d) List**

Identify Impaired & Threatened

Water Quality Management

WPPs and TMDLs

Total Maximum Daily Load - TMDL

- the amount, or load, of a specific pollutant that a water body can receive on a daily basis and still meet the water quality standards
- Allocates load between nonpoint sources and point sources
- Single parameter per segment/water body
- Regulatory, must be approved by EPA
- Separate Implementation Plan recommends measures needed to restore water quality

Watershed Protection Plan

- Voluntary project to address complex water quality problems that cross multiple jurisdictions.
- Holistically address multiple sources of threats and impairments to surface and groundwater.
- Not regulatory

Water Quality Management

Implement Controls

Point Source Controls

- Discharges to waterbodies regulated and permitted by TCEQ
- Municipal, Industrial, and Confined Animal Feeding Operations
- Municipal stormwater from "Urbanized Areas"
- Limits may be tighter in watersheds with impaired or threatened water bodies

Nonpoint Source Controls

- The Texas State Nonpoint Source Management Program encourages pollution control practices through educational, technical, and financial assistance provided by state and federal programs.

Water Quality Management

Other Agencies

Each agency has specific missions, goals, policies, and regulations that help protect water resources.

Natural Resources Conservation Service (NRCS)

U.S. Army Corps of Engineers (USACE)

Water Quality Management

Other Agencies

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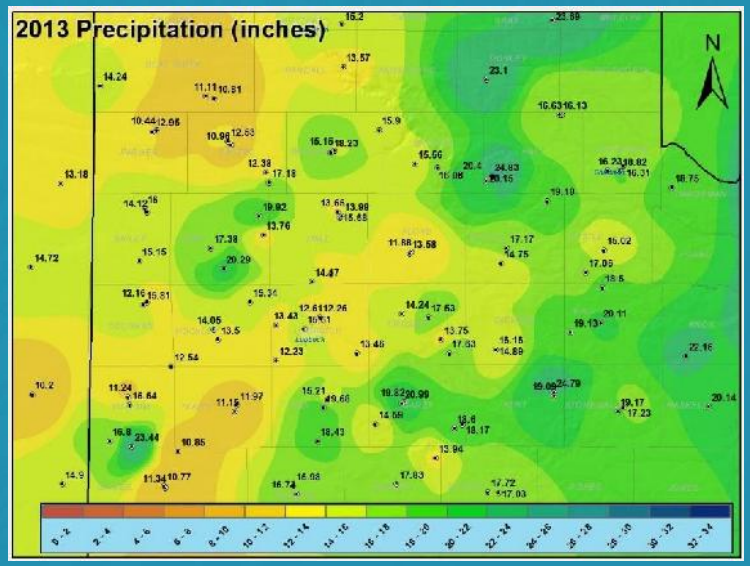
U.S. Geological Survey (USGS)

National Oceanic &Atmospheric Administration (NOAA)



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Texas Commission on Environmental Quality (TCEQ)

Texas State Soil & Water Conservation Board (TSSWCB)

Water Quality Management

Other Agencies

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Texas Water Development Board (TWDB)

Texas Parks & Wildlife Department (TPWD)

Water Quality Management

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Railroad Commission of Texas (RRC)

Texas Department of Agriculture (TDA)

Water Quality Management

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Texas A&M Forest Service (TFS)

Texas Dept of State Health Services (DSHS)

Water Quality Management

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Texas A&M AgriLife Research
Texas A&M AgriLife Extension

River Authorities

Water Quality Management Questions?

Richland-Chambers Watershed Partnership

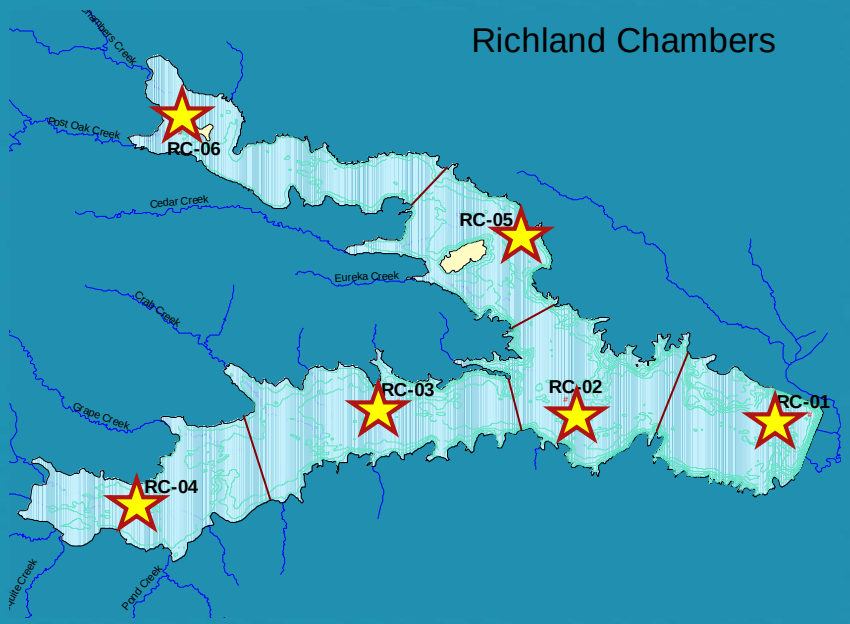
Stakeholder Meeting
September 20-21, 2016

Water Quality in Richland-Chambers Reservoir

MARK ERNST, TRWD

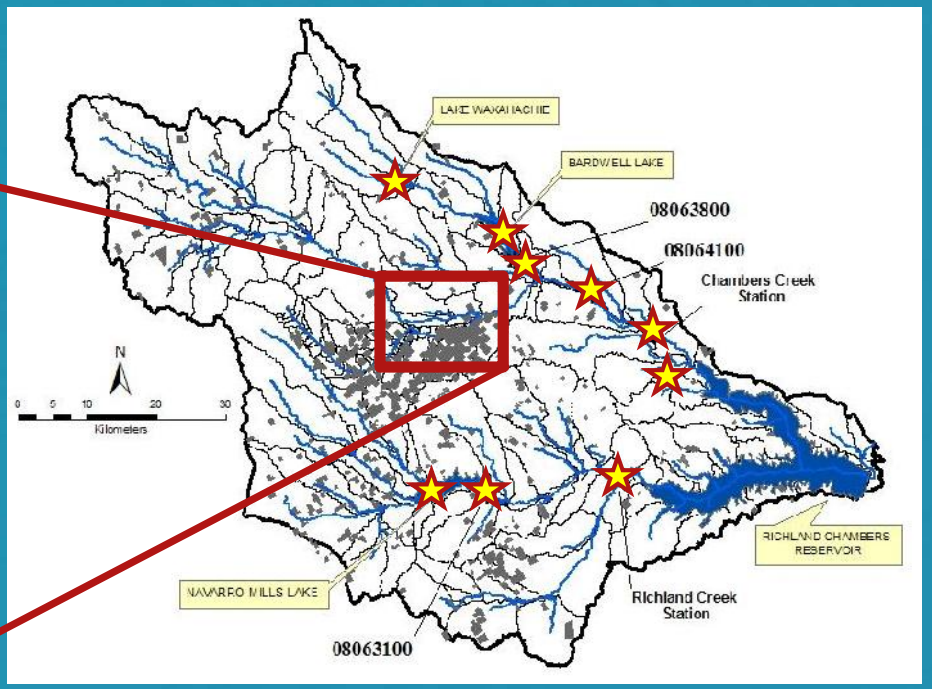
Water Quality

Monitoring Program



Sampling Sites

- Reservoir
- Tributaries



Water Quality

Monitoring Program

Sampling Objectives

- Reservoir quality
- Model inputs
- Capacity

	Reservoir	Tributaries	WWTP outfalls	Rainfall
Reservoir Modeling & WQ Criteria				
Chl-a	X	X		
NH3-N	X	X	X	X
NO3-N+NO2-N	X	X	X	X
TKN	X	X	X	X
TP-P	X	X	X	X
OPO4-P	X	X	X	X
E. Coli	X	X		
TDS	X			X
Atrazine	X	X		
TOC	X	X		
DOC	X			
Alkalinity	X			X
Chloride	X	X		X
Lake Sedimentation Rates				
TSS	X	X		X
VSS		X		

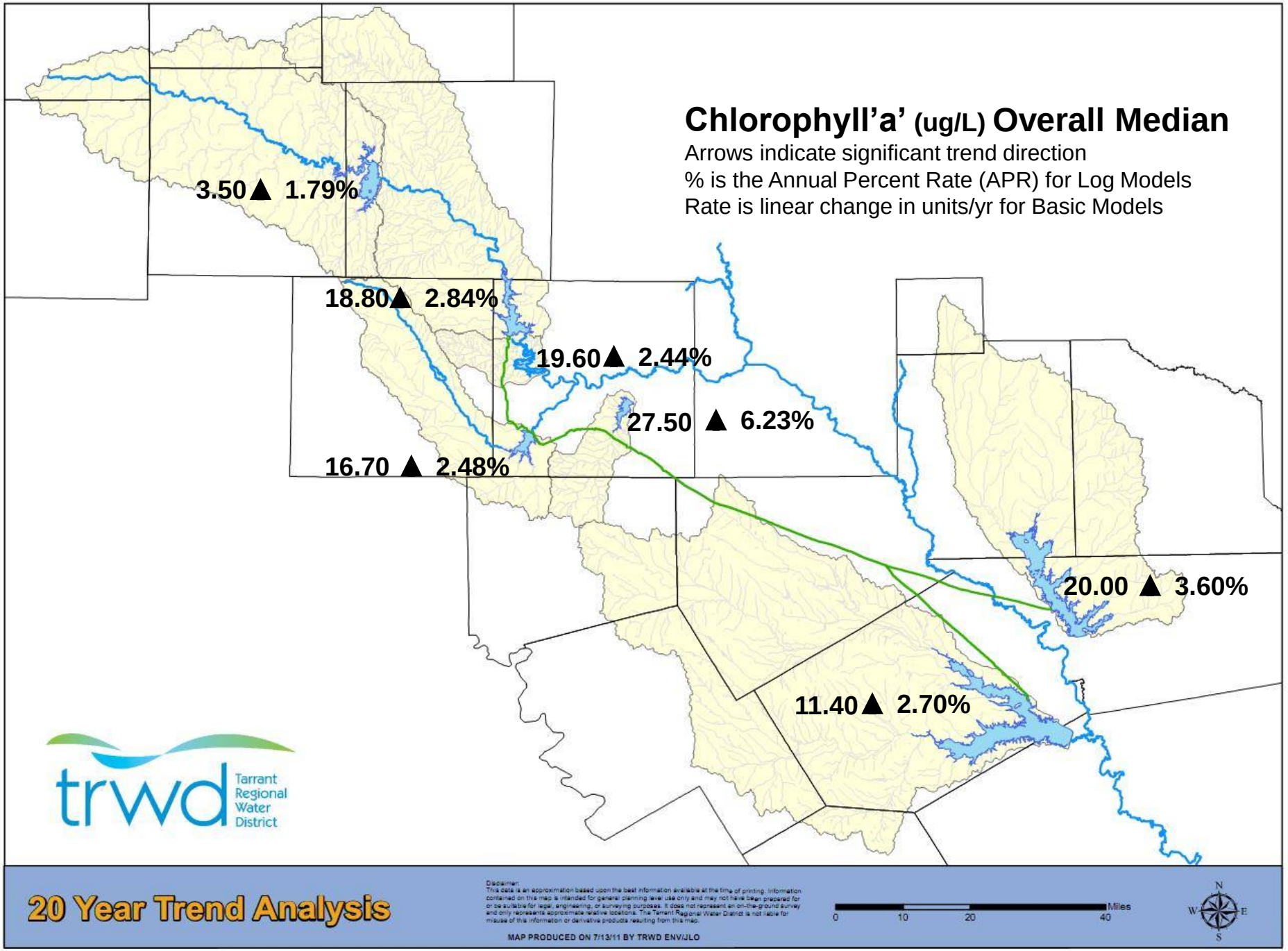
Water Quality

Monitoring Program

Sampling Objectives

- Customer water quality
- WWTP discharges

	Pipeline Intakes	WWTP outfalls
Water Treatment Plants		
Fe	X	
Mn	X	
Calcium	X	
Magnesium	X	
Sodium	X	
Potassium	X	
Sulfate	X	
Chloride	X	
Bromide	X	
Algae	X	
Total Arsenic	X	
Permit Compliance		
CBOD5		X
TSS		X
VSS		X
TOC		X
E. Coli		X


Chlorophyll'a' (ug/L) Overall Median
Arrows indicate significant trend direction
% is the Annual Percent Rate (APR) for Log Models
Rate is linear change in units/yr for Basic Models
3.50▲ 1.79%
18.80▲ 2.84%
19.60▲ 2.44%
27.50 ▲ 6.23%
16.70 ▲ 2.48%
20.00 ▲ 3.60%
11.40▲ 2.70%
trwd
Tarrant Regional Water District
20 Year Trend Analysis
Disclaimer:
This data is an approximation based upon the best information available at the time of printing. Information contained on this map is intended for general planning level use only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and only represents approximate relative locations. The Tarrant Regional Water District is not liable for misuse of this information or derivative products resulting from this map.
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0 10 20 40 Miles
N
W E
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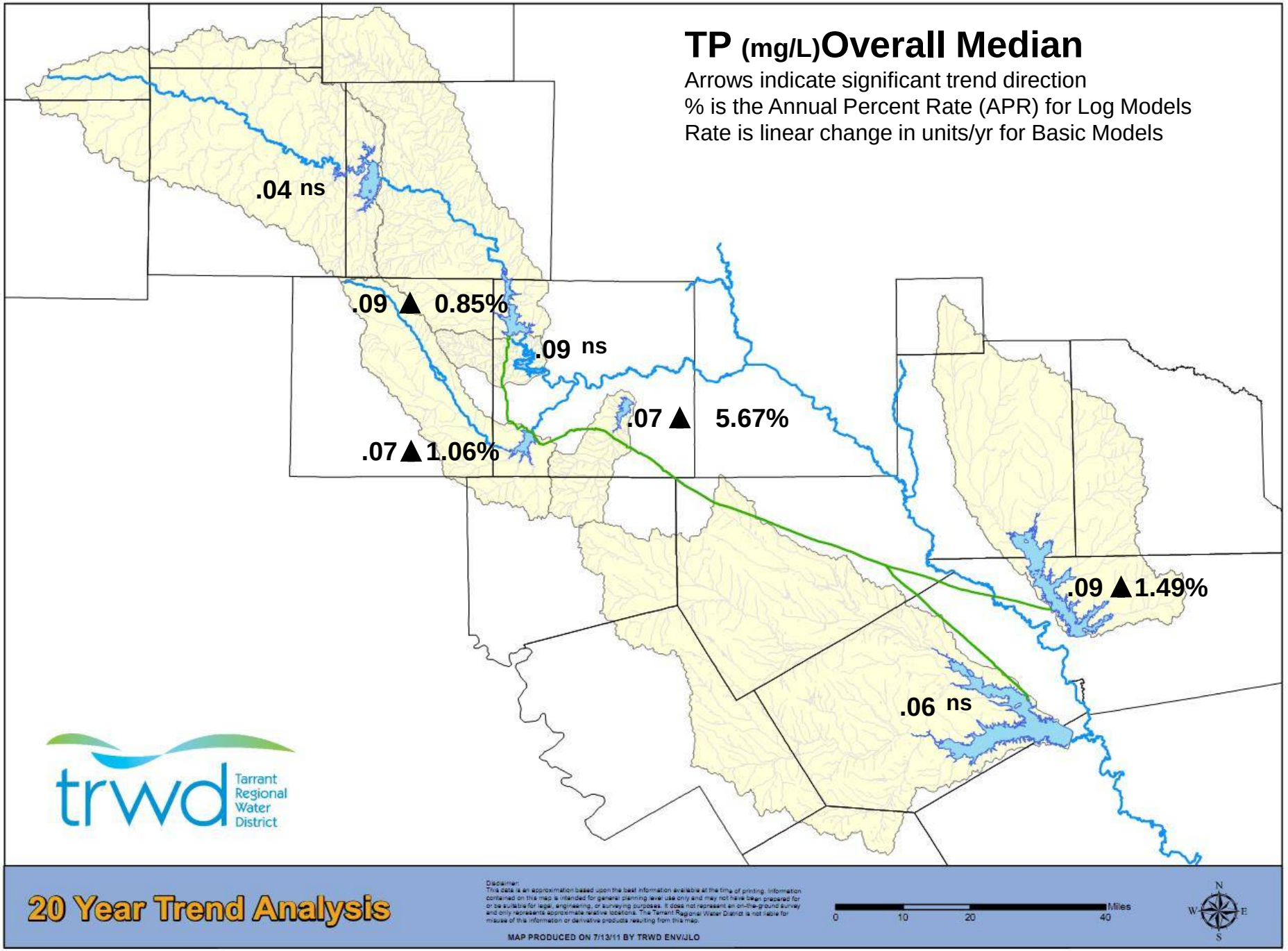
TP (mg/L)Overall Median
Arrows indicate significant trend direction
% is the Annual Percent Rate (APR) for Log Models
Rate is linear change in units/yr for Basic Models
.04 ns
.09 ▲ 0.85%
.09 ns
.07 ▲ 5.67%
.07 ▲ 1.06%
.09 ▲ 1.49%
.06 ns
trwd
Tarrant Regional Water District
20 Year Trend Analysis
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0 10 20 40 Miles
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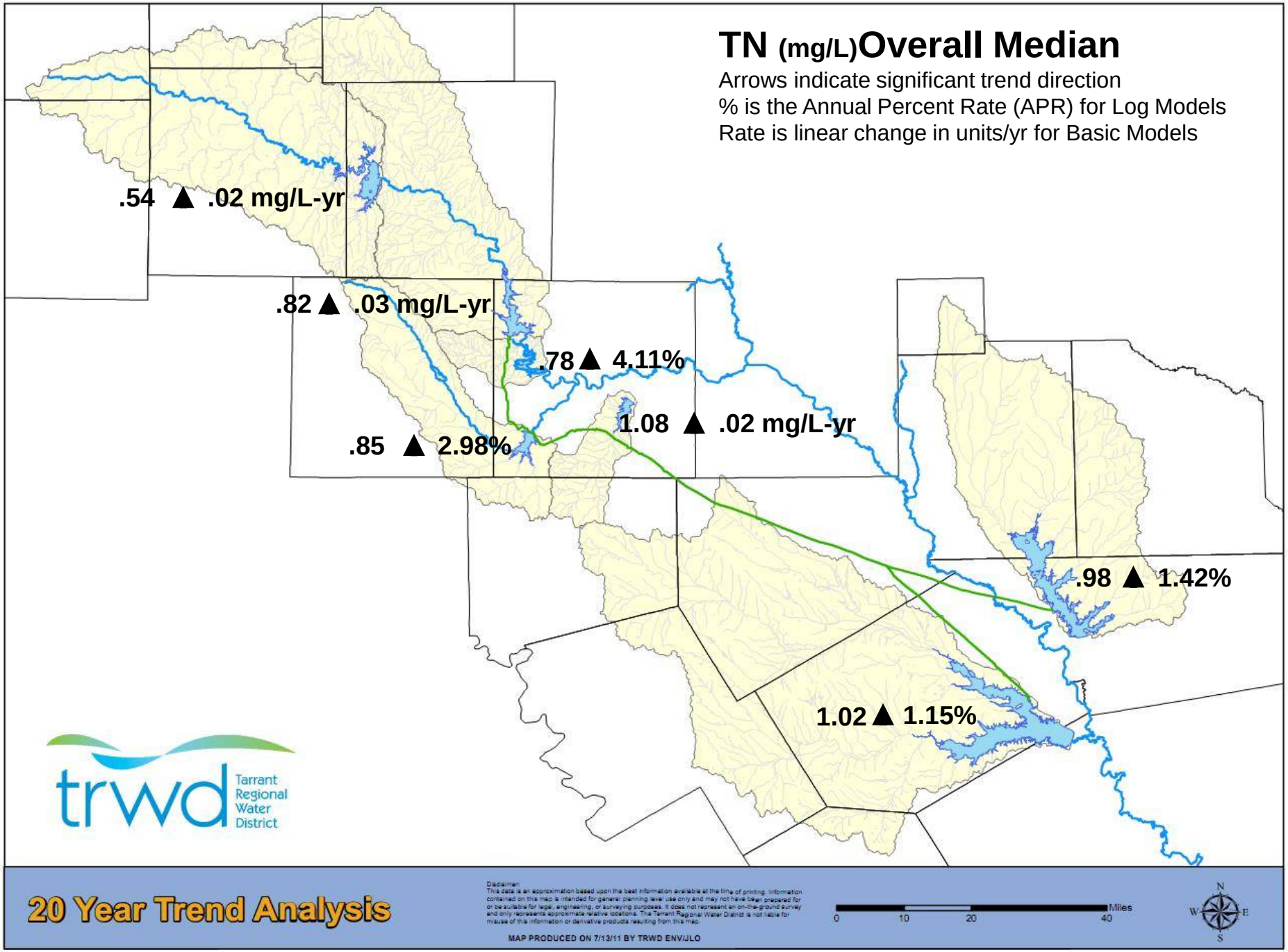
TN (mg/L)Overall Median
Arrows indicate significant trend direction
% is the Annual Percent Rate (APR) for Log Models
Rate is linear change in units/yr for Basic Models
.54 ▲ .02 mg/L-yr
.82 ▲ .03 mg/L-yr
.78 ▲ 4.11%
1.08 ▲ .02 mg/L-yr
.85 ▲ 2.98%
.98 ▲ 1.42%
1.02 ▲ 1.15%
trwd
Tarrant Regional Water District
20 Year Trend Analysis
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MAP PRODUCED ON 7/13/11 BY TRWD ENV/JLO
0 10 20 40 Miles
N W E S

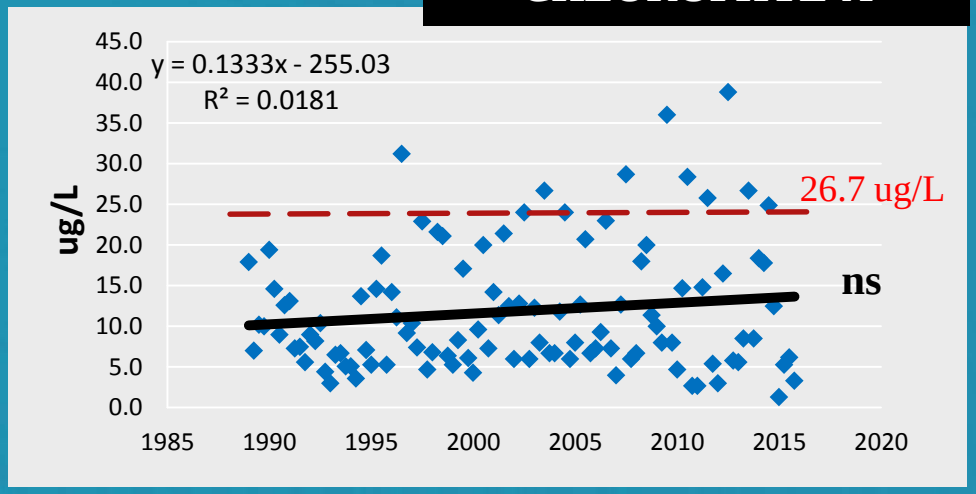
Water Quality

Reservoir Trends

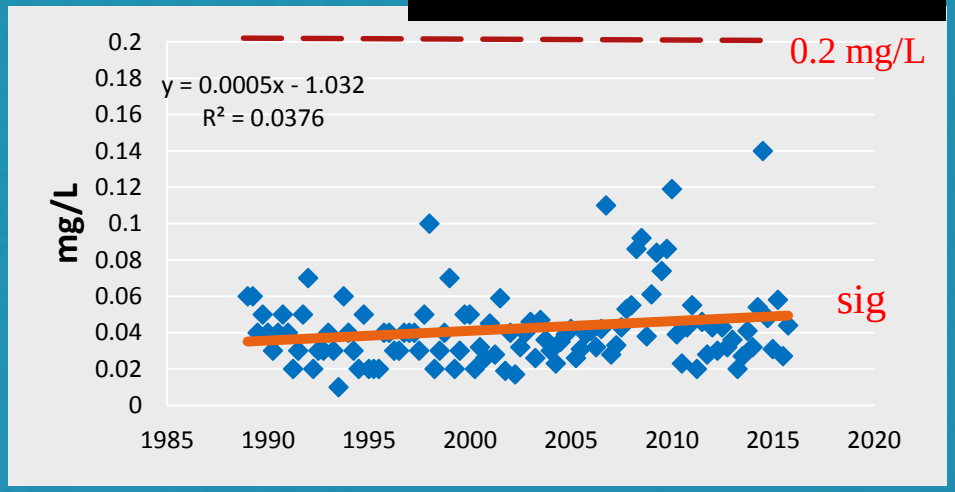
- Sampling site near dam
- 1990 – 2015

- TCEQ Screening Levels
  - Chlorophyl-α = 26.7 µg/L
  - Total-P = 0.20 mg/L

CHLOROPHYL-A



TOTAL PHOSPHORUS



Water Quality

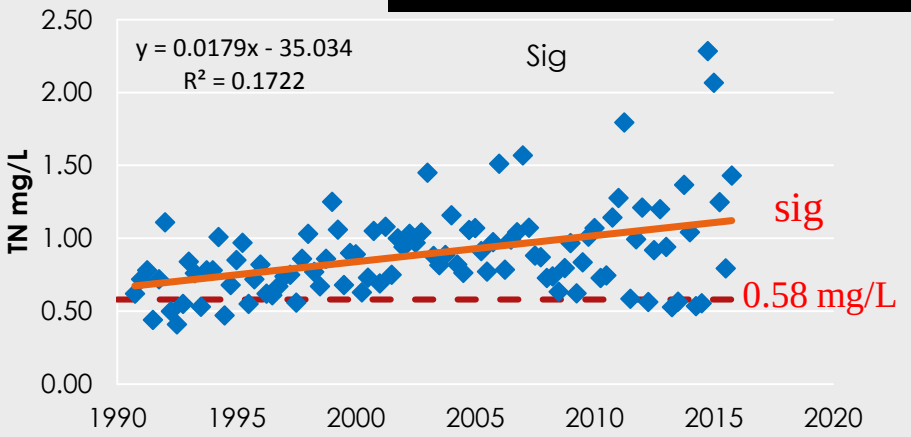
Reservoir Trends

- Sampling site near dam
- 1990 – 2015

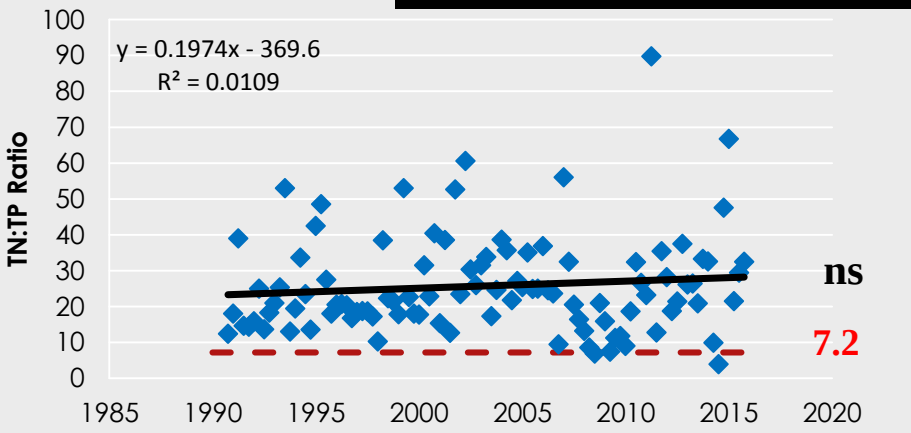
- TCEQ Screening Levels
  - Total-N = 0.58 mg/L

- Limiting Nutrient Ratio
  - TN:TP = 7.2

TOTAL NITROGEN

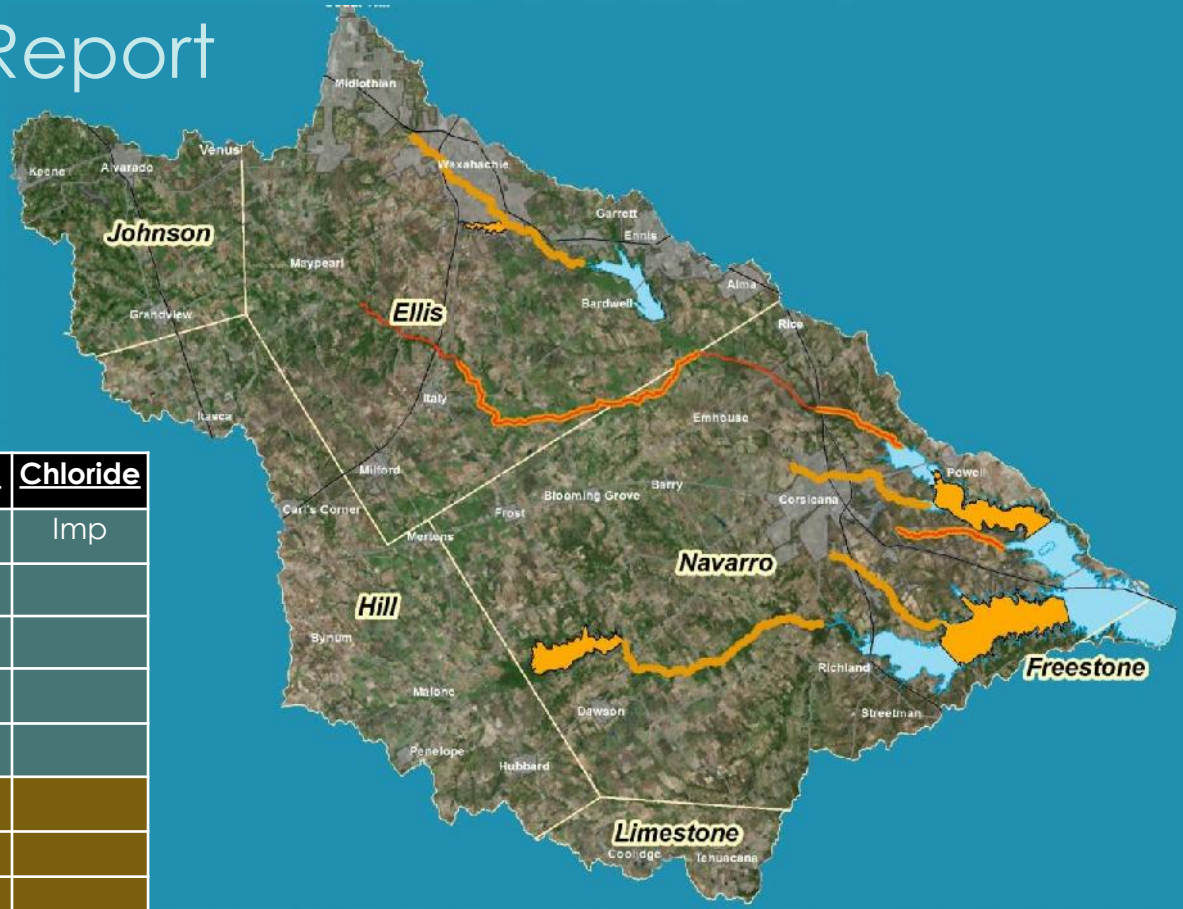


TN:TP RATIO



Water Quality

TCEQ Assessment Report



Water Body	N	DO	Chl-a	Chloride
Chambers Creek			CS	Imp
Waxahachie Creek	CS			
Lake Waxahachie			CS	
Cedar Creek		Imp		
Post Oak Creek		CS		
Richland Creek		CS	CS	
Navarro Mills Lake		CS		
Grape Creek		CN		
Richland-Chambers Lake			**CS**	

2014 TCEQ 305(b) Report;
Imp = Impairment;
CS = Concern based on screening levels
CN – Concern based on criteria

Water Quality

Questions?

Watershed Model
Richland-Chambers Watershed

R. Srinivasan and Essayas Kaba
Texas A&M University

Stakeholders meeting

(September 20-21, 2016)

Outline

- What is a model?
- SWAT model
  - *What it is does*
  - *Input requirement*

- Accounting for BMPs in Richlands-Chambers
  - *Field level*
  - *Watershed level*

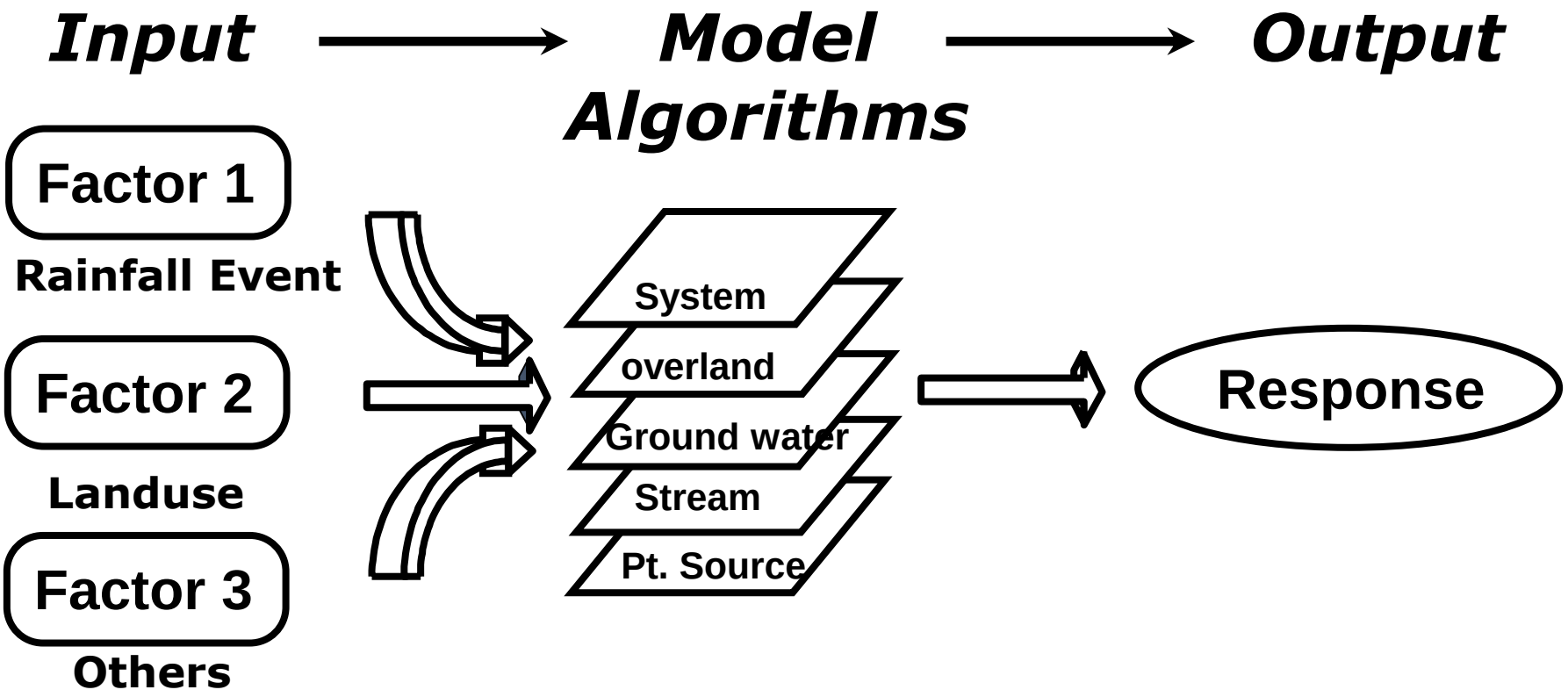
- Evaluating our model

What is a Model

- A theoretical construct,
- Together with assignment of numerical values to model parameters,
- Incorporating some prior observations drawn from field and laboratory data,
- and relating external inputs or forcing functions to system variable responses

* Definition from: Thomann and Mueller, 1987

Nuts and Bolts of a Model

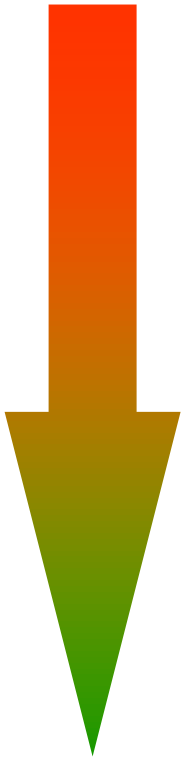


Source: Quantify pollutant load: State of Michigan (Es-nps-quantifying-pollutant-loads_195909_7.ppt)

Is a Model Necessary?

It depends on what you want to know…

Probably Not



Probably

- What are the loads associated with individual sources?
- Where and when does impairment occur?
- Is a particular source or multiple sources generally causing the problem?
- Will management actions result in meeting water quality standards?
- Which combination of management actions will most effectively meet load targets?
- Will future conditions make impairments worse?
- How can future growth be managed to minimize adverse impacts?

Models are used in many areas…

TMDLs, stormwater evaluation and design, permitting, hazardous waste remediation, dredging, coastal planning, watershed management and planning, air studies

Source: Quantify pollutant load: State of Michigan (Es-nps-quantifying-pollutant-loads_195909_7.ppt)

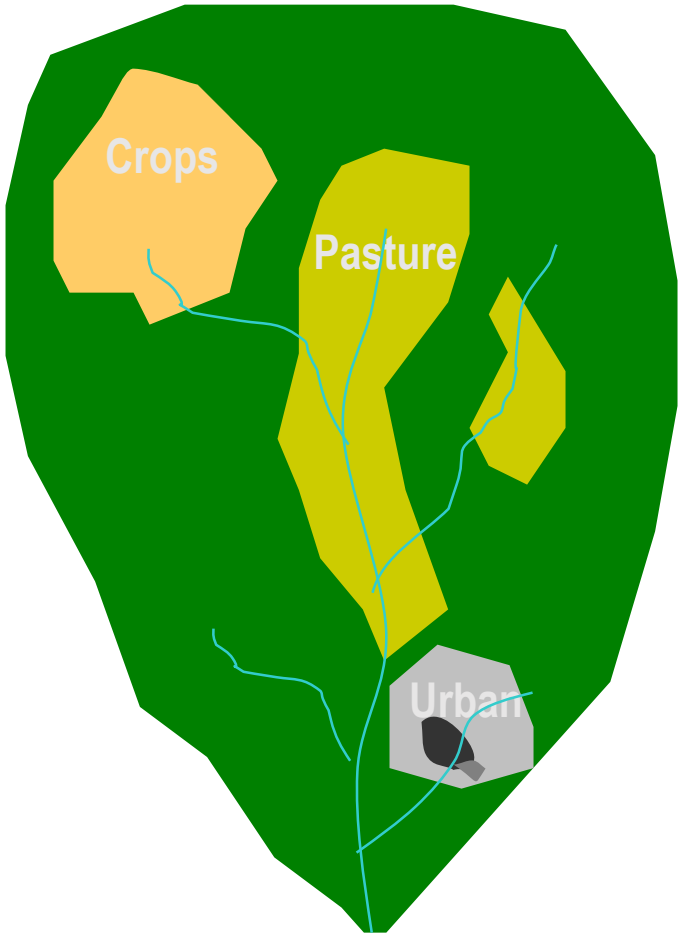
What models do:

- Watershed models use a set of equations or techniques to analyze
  - ***Rainfall/runoff:*** The description of precipitation, infiltration, evaporation, and runoff
  - ***Erosion and sediment transport:*** The description of soil detachment, erosion, and sediment movement from a land area
  - ***Pollutant loading:*** The wash-off of pollutants from a land area
  - ***Stream transport:*** description of deposition, re-suspension, decay, and transformation within streams
  - ***Management practices:*** A management practice can be land-based (e.g., tillage or fertilizer application), constructed (e.g., stormwater ponds), or input/output to a stream(e.g., wastewater treatment).

Source: EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters (http://water.epa.gov/polwaste/nps/handbook_index.cfm)

Type of Models

- Receiving water models
  - Flow of water through streams and into lakes and estuaries
  - Transport, deposition, and transformation in receiving waters
- Watershed models
  - Includes Stream and landscape routing capabilities
  - Runoff of water and materials on and through the land surface and in streams

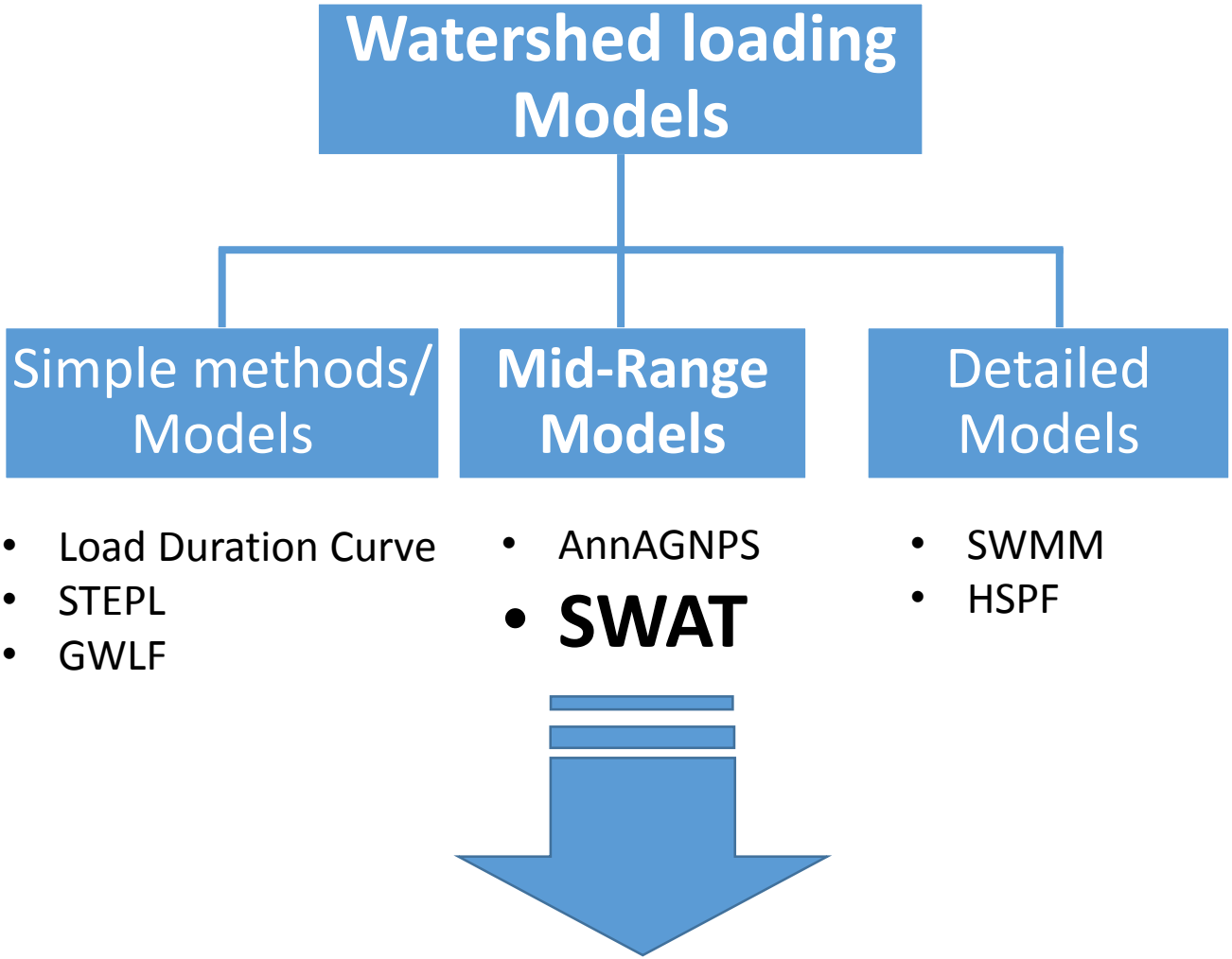


Source: Quantify pollutant load: State of Michigan (Es-nps-quantifying-pollutant-loads_195909_7.ppt)

Who develops these models:

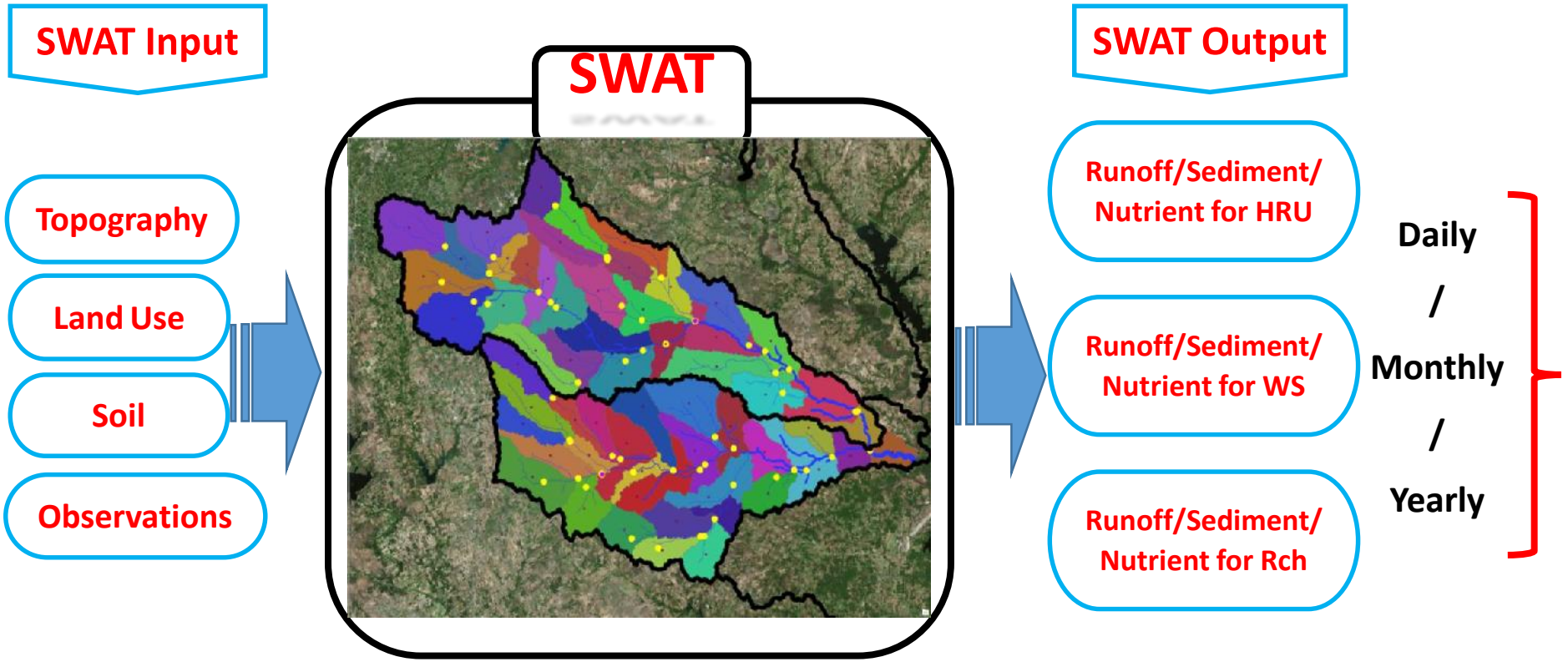
- USDA-ARS
- USCOE
- USGS
- US EPA
- Other Federal Agencies
- Universities
- Local state agencies

Watershed Models



SWAT in a Nutshell

- A river basin model used to predict
  - impact of land management practices on
    - Water/sediment/agricultural chemical yields



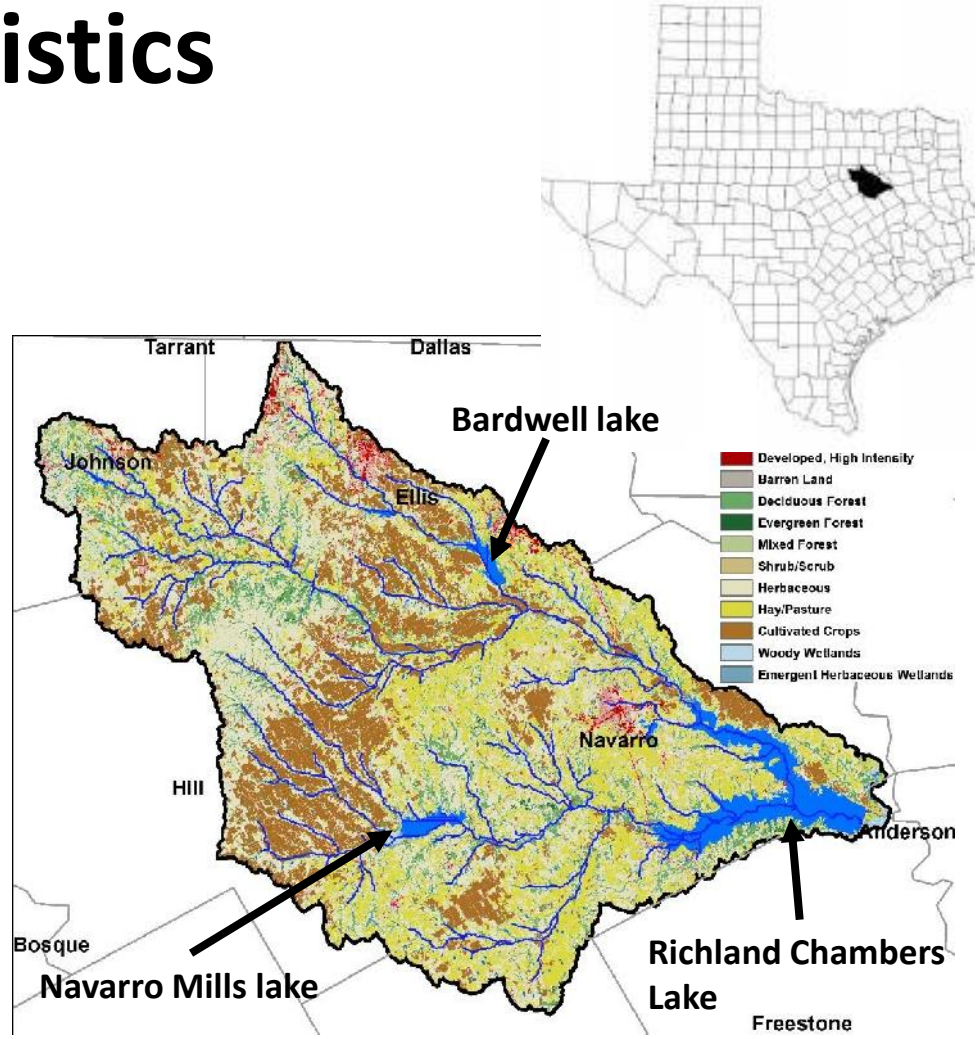
World_Imagery - Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Watershed characteristics

- Richland-Chambers Watershed
  - Area 5700 sq.km
  - Two HUC 8 watersheds

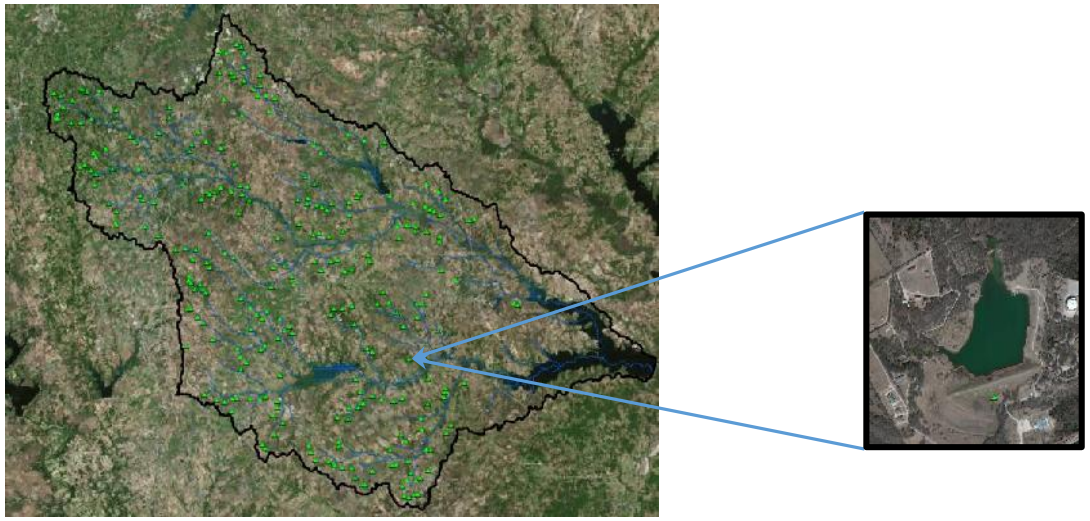
Agriculture	96222	19%
Forest	56390	11%
Water	29113	6%
Builtup	35872	7%
Range-Grasses	154222	30%
Pasture	121564	24%
Range-Brush	2689	1%

- Several BMPs implemented by USDA-NRCS to improve water quality



Data requirement

- Watershed characterization
  - USGS predefined Sub-watersheds and streams
- Land use land cover
  - USGS-NLCD and USDA-NASS combined
- Soils
  - NCRS-SSURGO soils
- Ponds and reservoirs
  - USDA-NRCS
    - Surface area
    - Volume



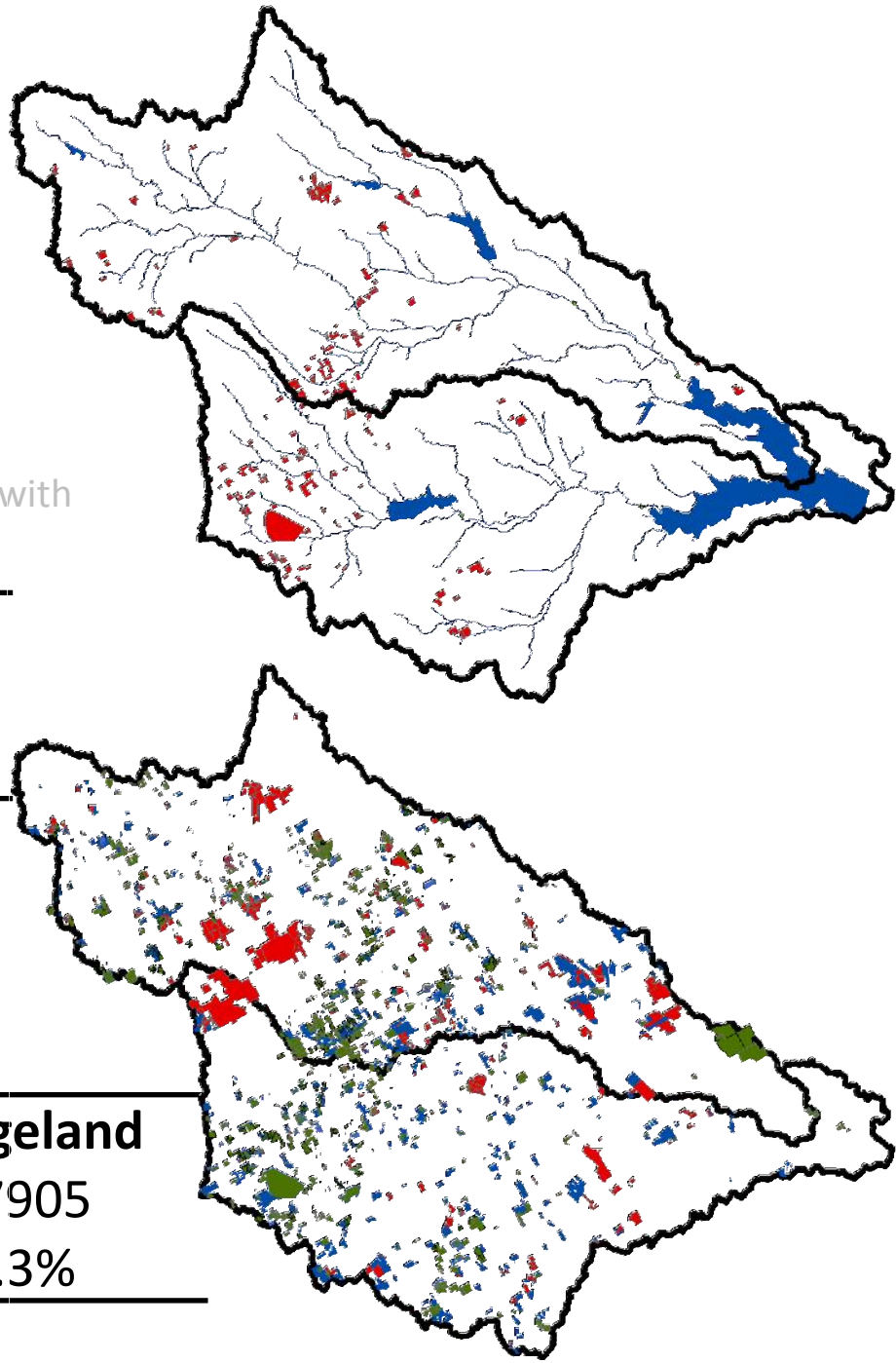
Accounting for BMPs

- Total BMPs applied on 20% of watershed
- Structural BMPs (in ha)
  - Contour Farming; filter strips; Grassed Waterways; Terraces; Terraces with Contour Farming; Terraces with Grassed waterways

	Area	%
Total watershed	507792	
Total BMPs applied	6767	1%

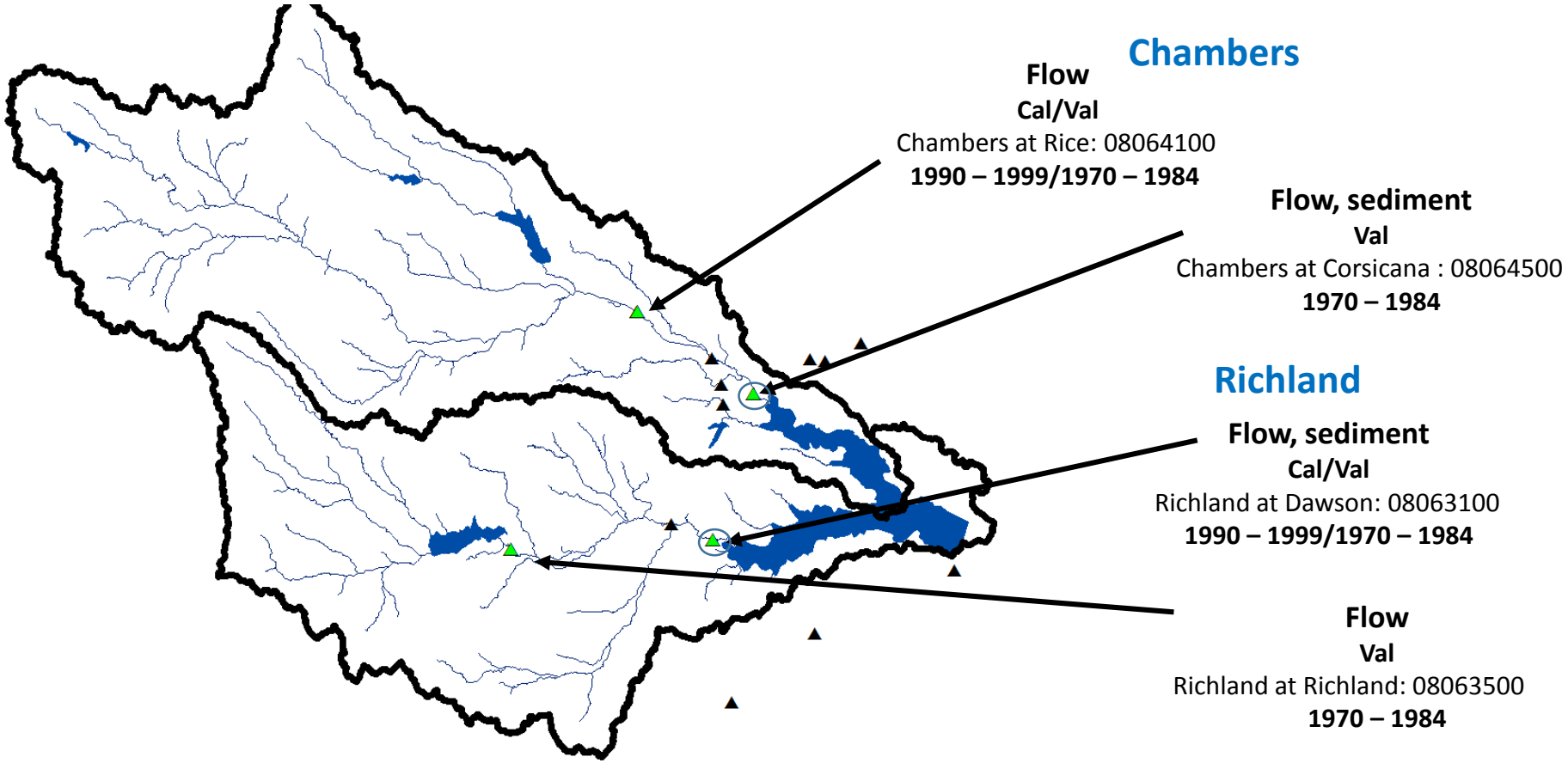
- Non Structural BMPs
  - Residue Management; Conservation crop rotation; Nutrient management; Prescribed grazing; Brush management; Integrated pest management

	Cropland	Pasture	Rangeland
BMP applied	43107	24228	27905
% Watershed	8%	4.6%	5.3%



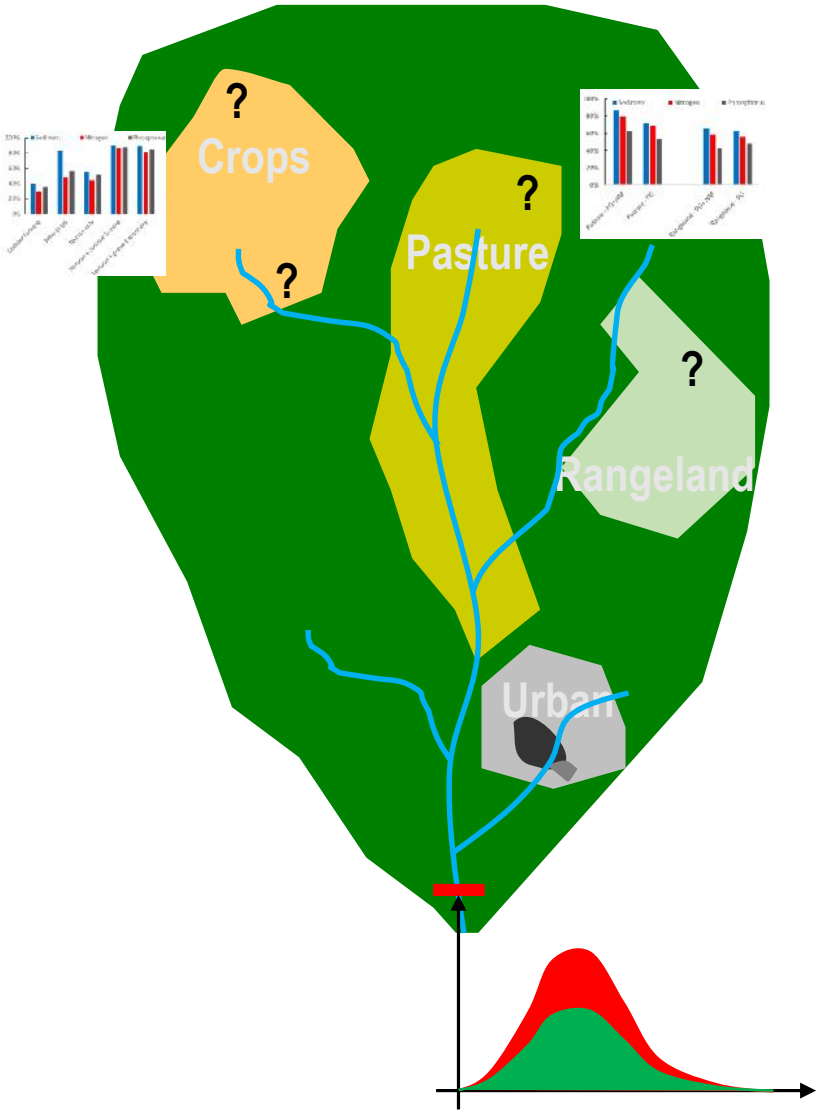
Model evaluation

- A model verification step
  - How good is the model to represent a process on interest in our watershed?
  - Can the model be used to tell about the future?



Use on Richland-Chambers

- Can be used to
  - Evaluate how BMPs impact watershed process
  - Identify which BMPs are efficient
  - Assess cost effectiveness
  - Decide where to locate BMPs



Thanks

USDA
United States Department of Agriculture

Partnering for Progress

Beau Brooks

NRCS District Conservationist

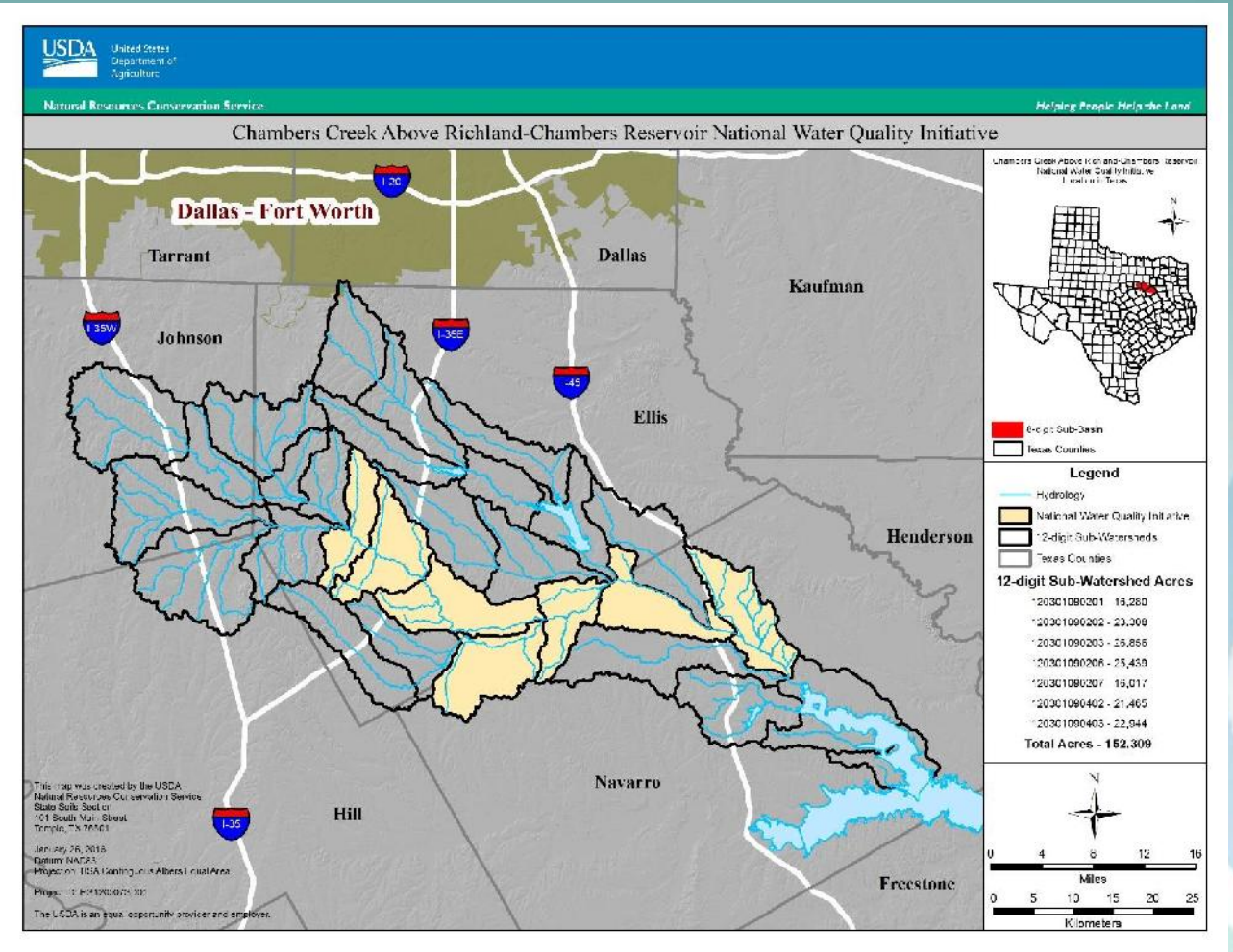
Waxahachie, Texas

USDA
United States Department of Agriculture

Working Together to Achieve More

USDA United States Department of Agriculture

National Water Quality Initiative (NWQI)

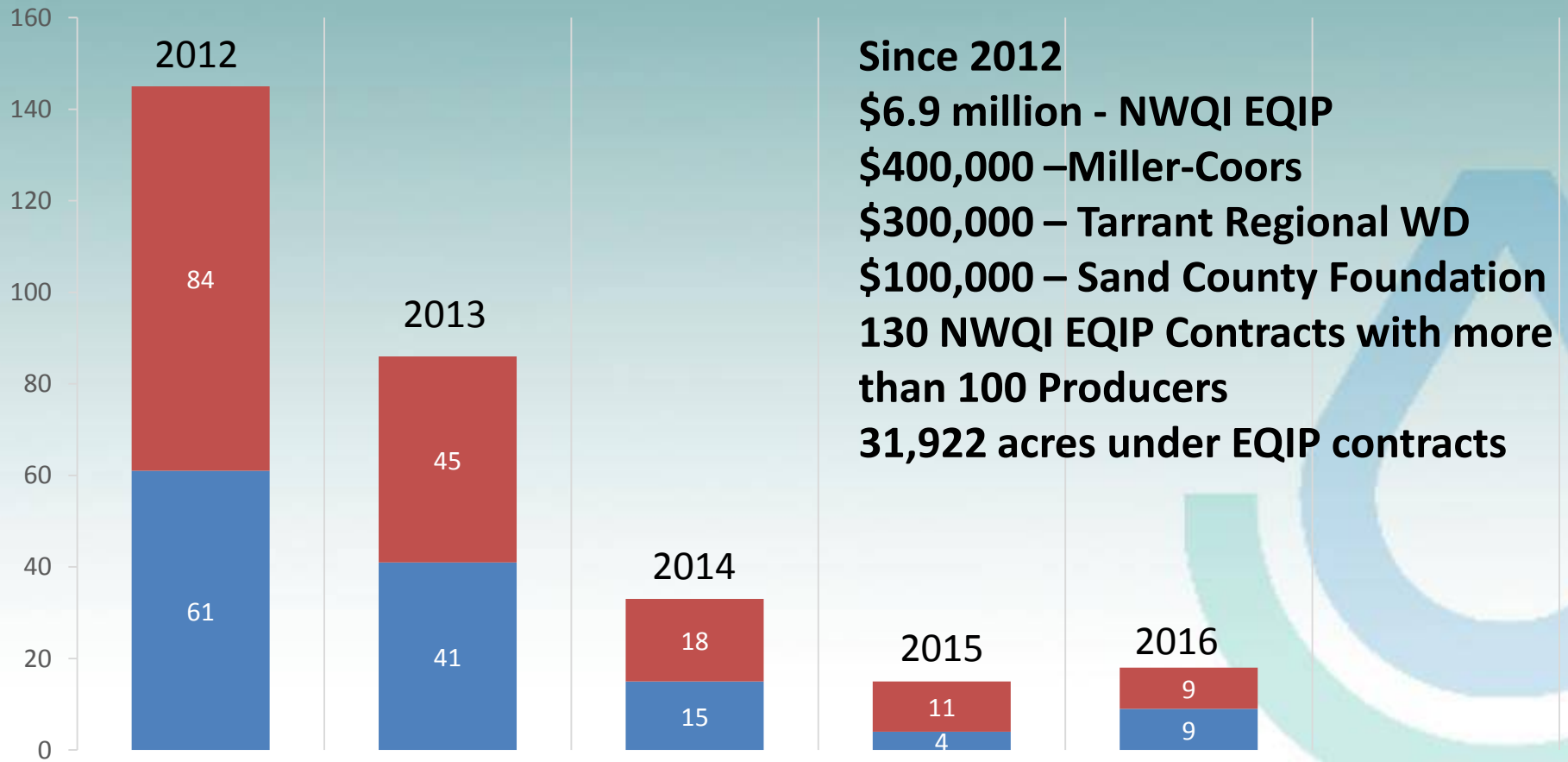


Success through Partnerships

USDA
United States Department of Agriculture

National Water Quality Initiative

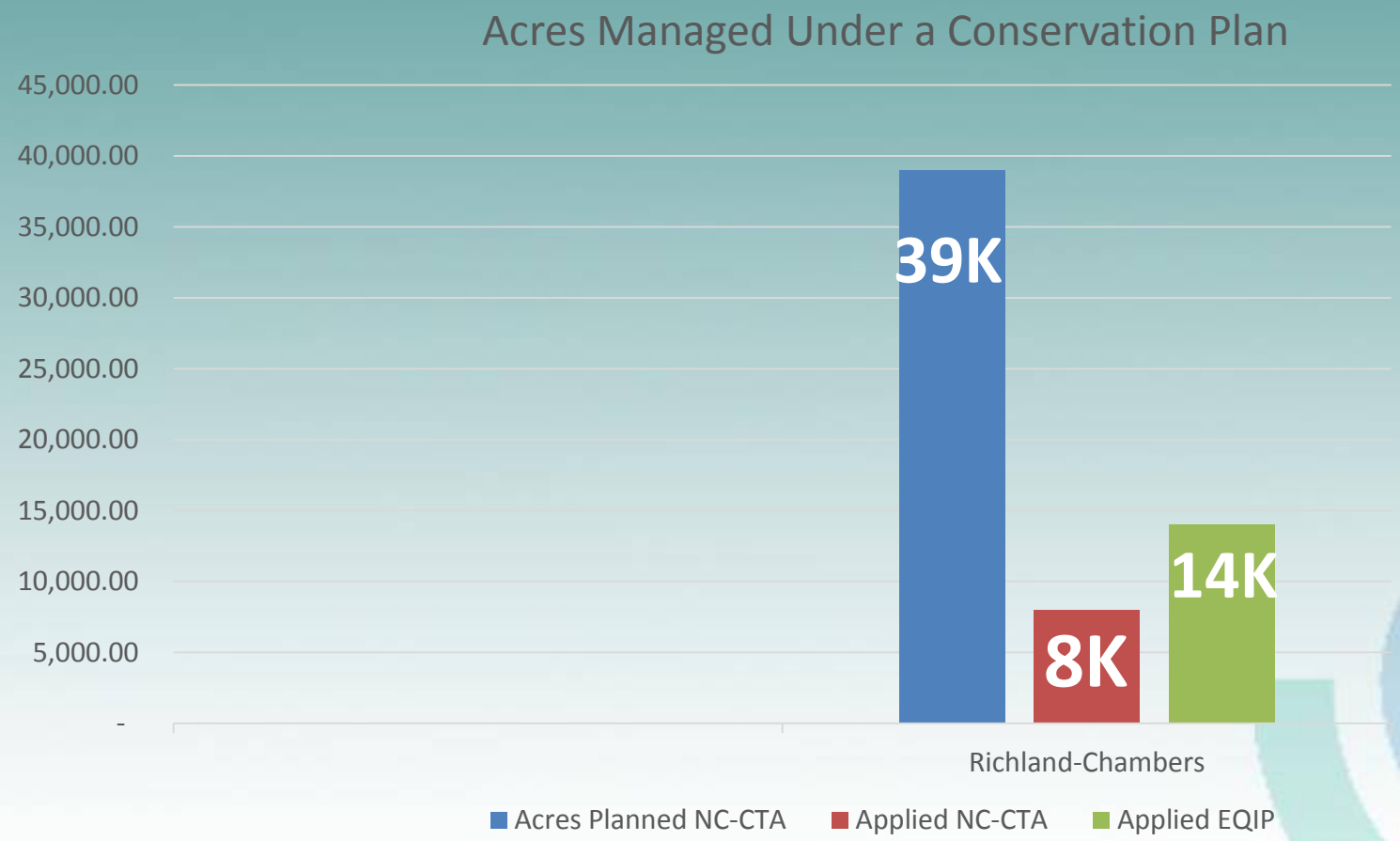
CONTRACT APPLICATIONS VS. CONTRACTS FUNDED



Since 2012
$6.9 million - NWQI EQIP
$400,000 –Miller-Coors
$300,000 – Tarrant Regional WD
$100,000 – Sand County Foundation
130 NWQI EQIP Contracts with more than 100 Producers
31,922 acres under EQIP contracts

USDA
United States Department of Agriculture

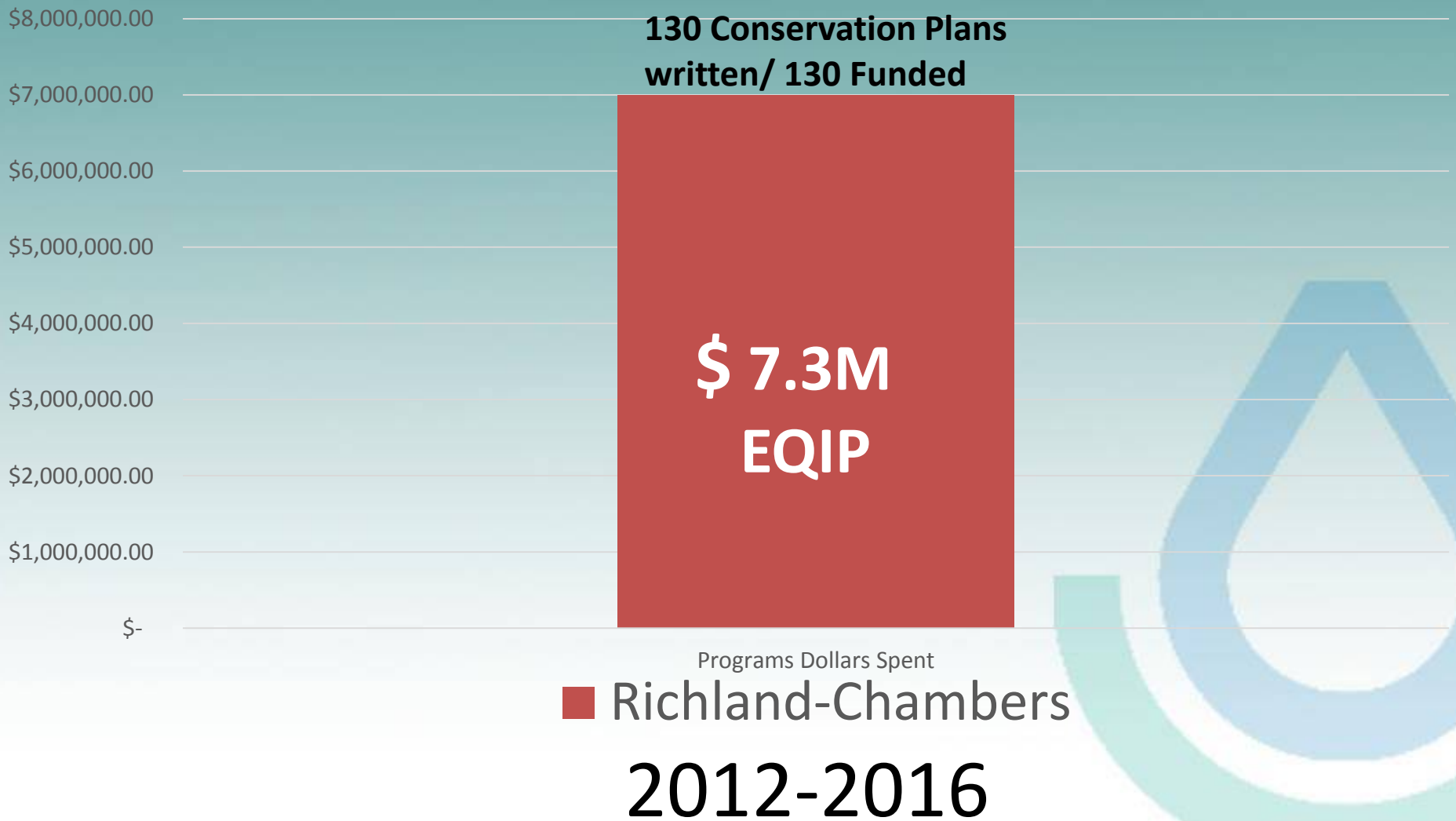
Conservation Planning Assistance at Work



2012-2016

USDA
United States Department of Agriculture

Financial Assistance at Work



2012-2016

Chambers Creek NWQI (2016)

At-a-Glance

- Contracts – 9
- $320,000 in EQIP funding
- Acres - 922

Typical Conservation Practices:

- Prescribed Grazing
- Residue & Tillage Management
- Cover Crop
- Forage & Biomass Planting
- Livestock Pipeline
- Herbaceous Weed Control
- Range Planting

Why Soil Health?

- Helps the bottom line
- Water cycle
- Nutrient cycle
- Harvesting solar energy
- Utilizing soil biology
- Building resilience

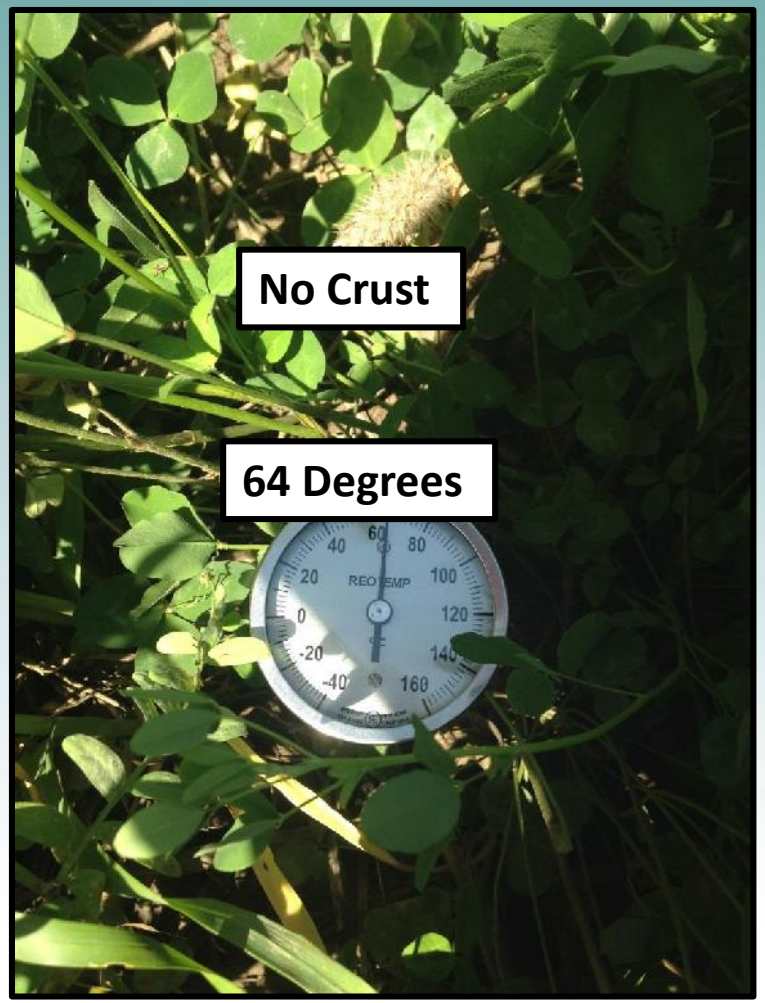
The Big Five

5 *Principles to Improve Soil Health*

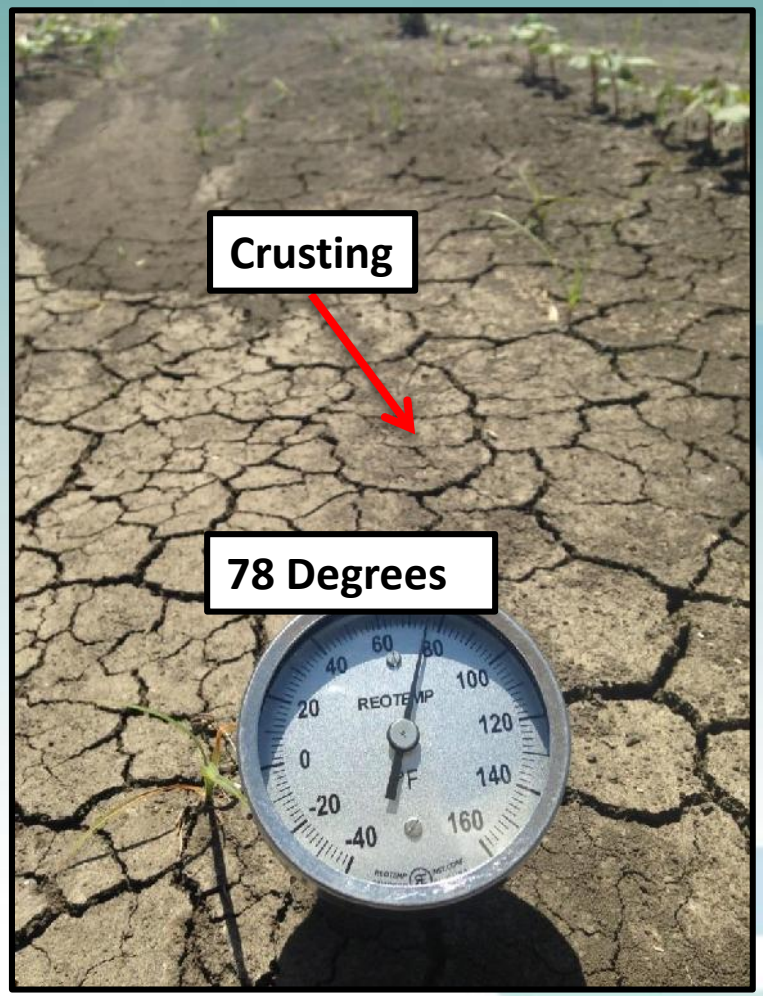
1. Armor the soil
2. Minimize disturbance
3. Plant diversity (4 crop types)
4. Keep a living root year round
5. Proper livestock integration

Armor vs No Armor

Good Residue



No Residue



Minimal Disturbance
Why is it important?

- Healthy Soils have “good” structure, balanced fungal/bacteria populations, plentiful earthworms, and organic matter.
- Tillage is like adding oxygen to a fire-the microbes burn-up organic matter fast n’ hot!

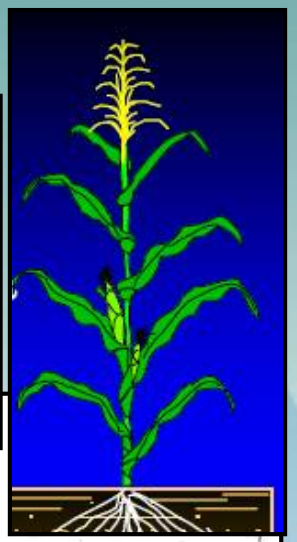
Large Blocks

Small Blocks

Crumb!

Plant Diversity-What is it?

- 4 Components to Plant Diversity
  - Warm season grasses
  - Warm season broadleaves
  - Cool season grasses
  - Cool season broadleaves



Living Root Year Round-What is it?

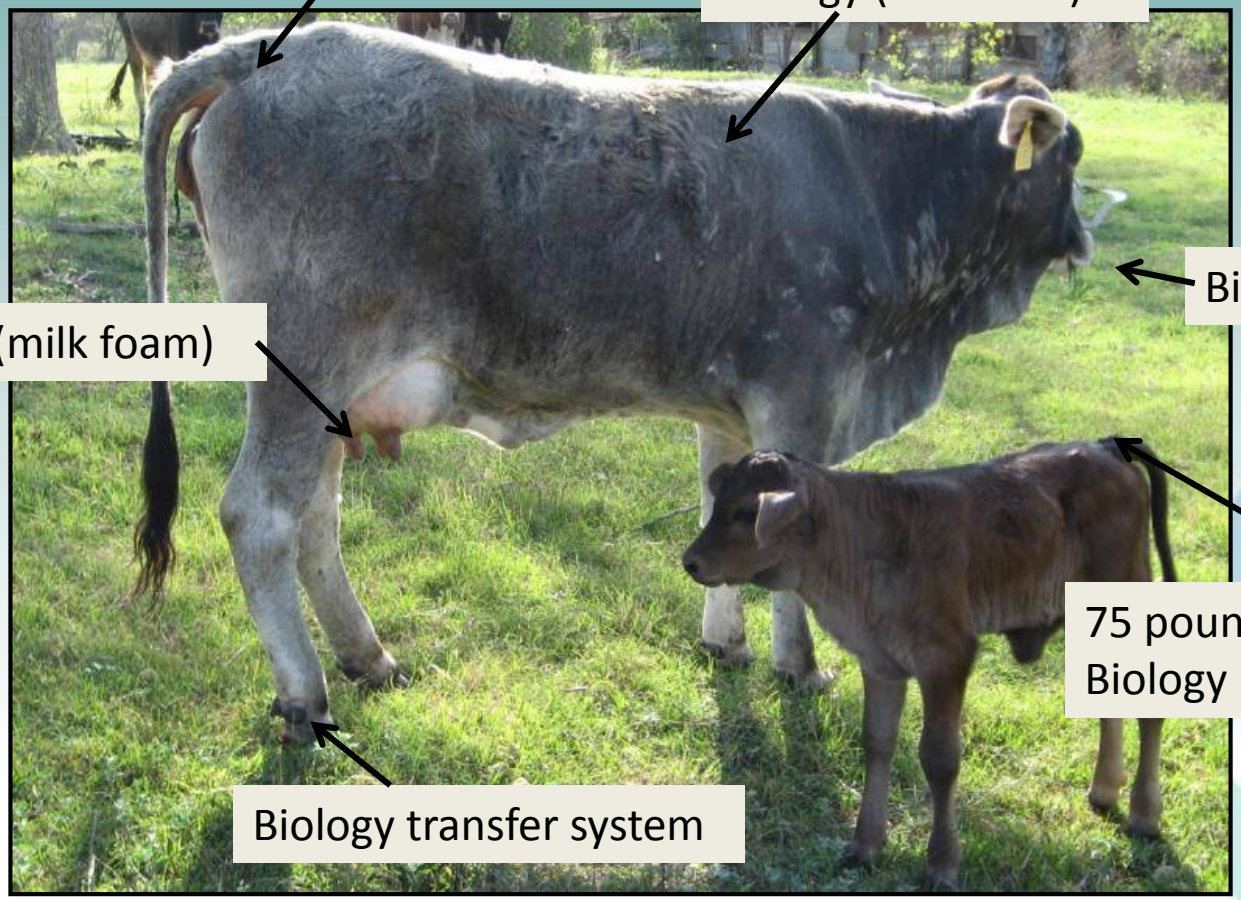
- Healthy Soils need living plants with Actively growing roots 365 days a year.

Nodulated Legume roots to fix Nitrogen

Fibrous Grass roots to build Structure

Brassica Tap roots to increase Porosity

Livestock Integration
Why is it important? Biology!



Challenges for Implementing Successful Projects in the Future

- The soil in the Blackland Prairie
- Staff to Monitor/Evaluate Projects
- Education for Land Owners
- Time to Build Relationships with Producers

Questions ?

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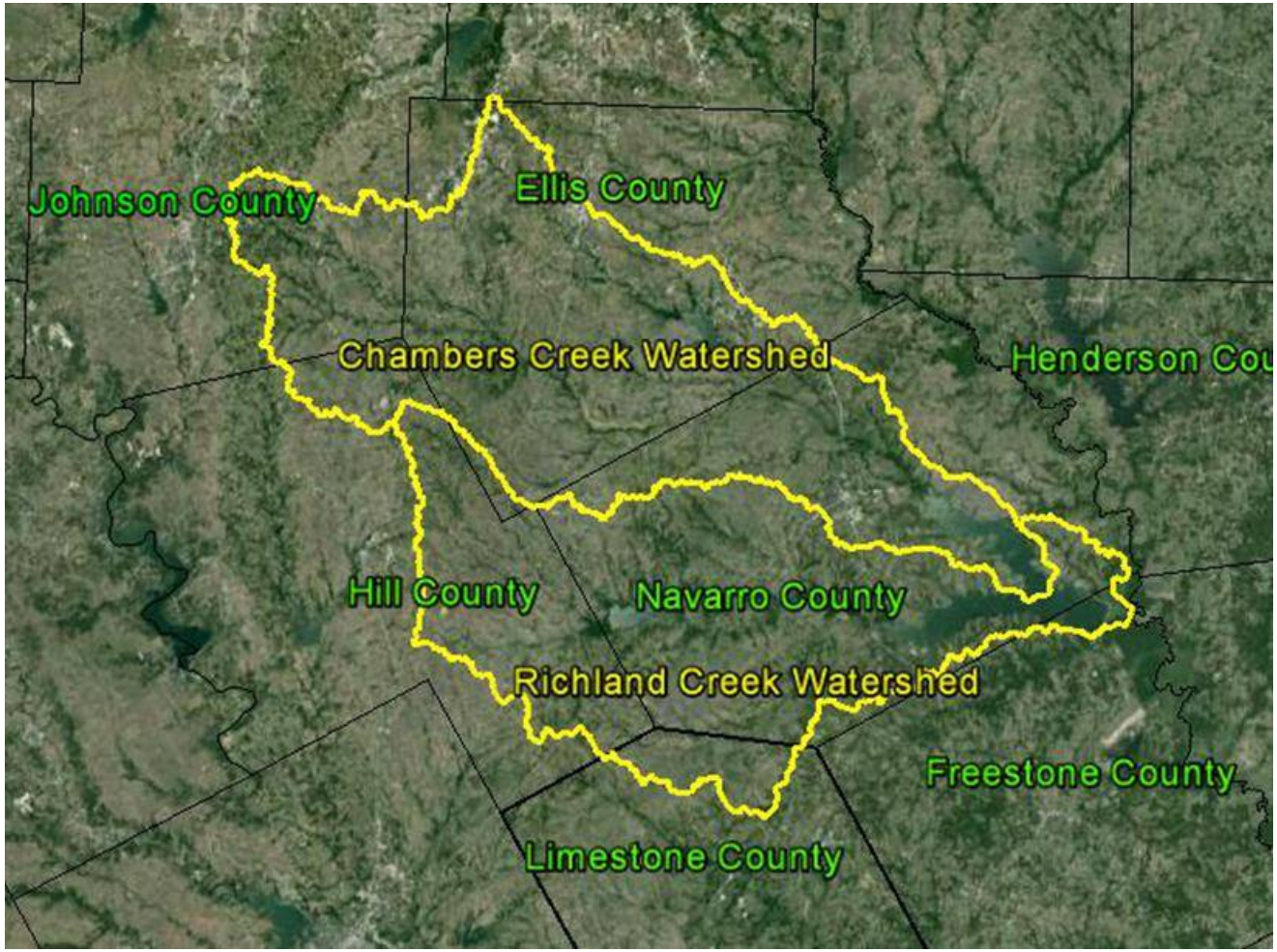
Land Management in the Richland-Chambers Watersheds: Understanding the Landowner Perspective

Dr. Dianne A. Stroman
Texas A&M, College Station, TX
Department of Ecosystem Science and Management

Study Area



5 County Area

Ellis
Navarro
Hill
Johnson
Limestone

2 Watersheds

Richland Creek
Chambers Creek

~1.25 Million Acres

Methods/Materials

Survey Design

✓ 11 page mail survey, 113 questions

✓Survey was divided into 4 main sections of inquiry

- ✓ Land management practices
- ✓ Land management information sources and conservation incentive programs
- ✓ Managing for species of special concern (Monarch butterflies and grassland birds)
- ✓ Landowner Characteristics

➢ Survey administered over 5 months (January-May 2016)

➢595 Surveys mailed out

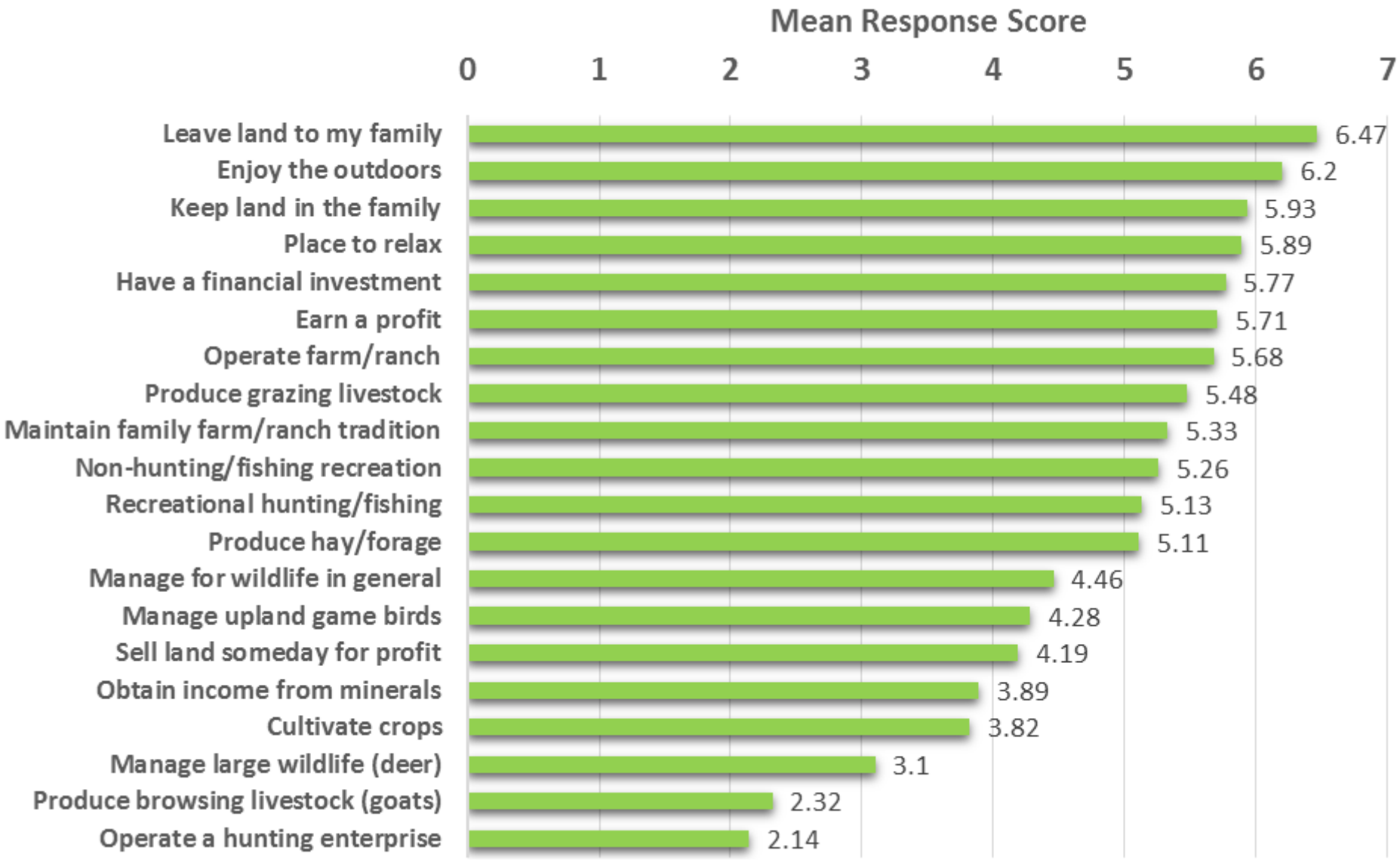
- ➢ Sent to landowners owning 50+ acres in 5 county study area

➢Received 242 returned questionnaires (196 useable)

Participant Landowner Demographics

Demographic Variable	Survey Respondents
Age (years)	M=67 years;
Gender	
Male	77%
Female	23%
Formal education	
Some high school	< 1%
High school graduate/GED	13%
Some college	24%
Bachelor's degree or higher	62%
Residency on property	
Full-time resident	47%
Weekend/occasional resident	11%
Do not reside on property	42%
Proportion of income derived from rural property in 2015	
0%	16%
1-25%	64%
26-50%	7%
51-100%	13%
Location of rural property (% of landowners reporting having property within the county)	
Ellis County	35%
Navarro County	45%
Hill County	7%
Johnson County	10%
Limestone County	9%

Participant Landownership motivations



Mean response scores 1=not at all important, 4=moderately important, 7=very important

Participants Primary Management Objectives

50% raising livestock

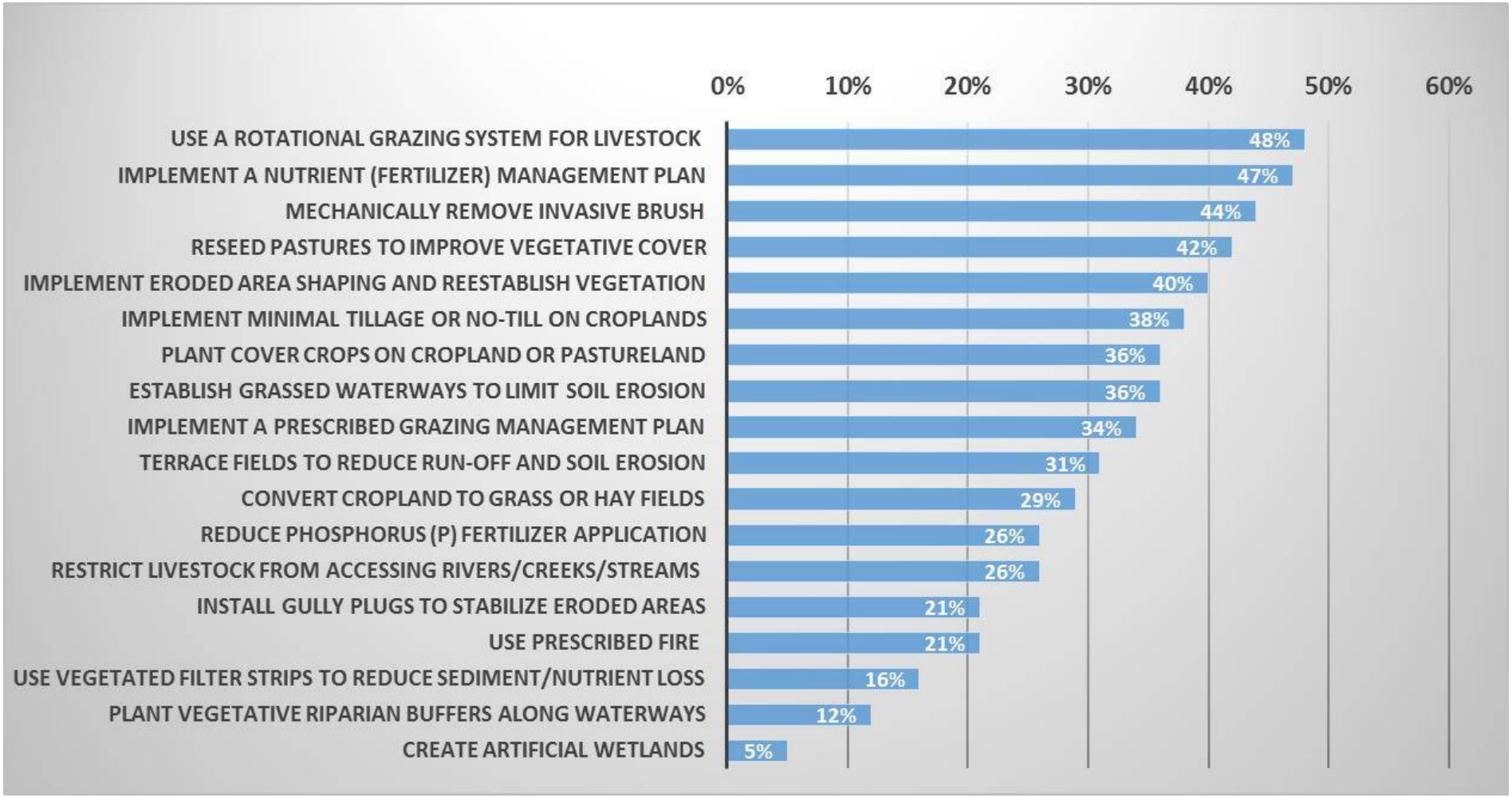
23% Raising crops

23% Running a mixed operation

Preferred sources of land management information

Information Source	Helpful?		Trustworthy?		Do Not Use Source
	Yes	No	Yes	No	
Friends	82%	7%	85%	2%	11%
Neighbors	80%	8%	81%	6%	12%
Family	71%	12%	78%	3%	17%
Agricultural retailers	64%	17%	58%	18%	19%
Internet sites	66%	11%	60%	13%	23%
News media/advertisements	42%	34%	30%	41%	24%
Texas A&M Agrilife Extension	65%	10%	67%	4%	25%
Natural Resources Conservation Service	64%	11%	65%	6%	25%
Public Meetings	57%	17%	59%	11%	26%
Texas Parks and Wildlife Department	44%	17%	50%	7%	39%

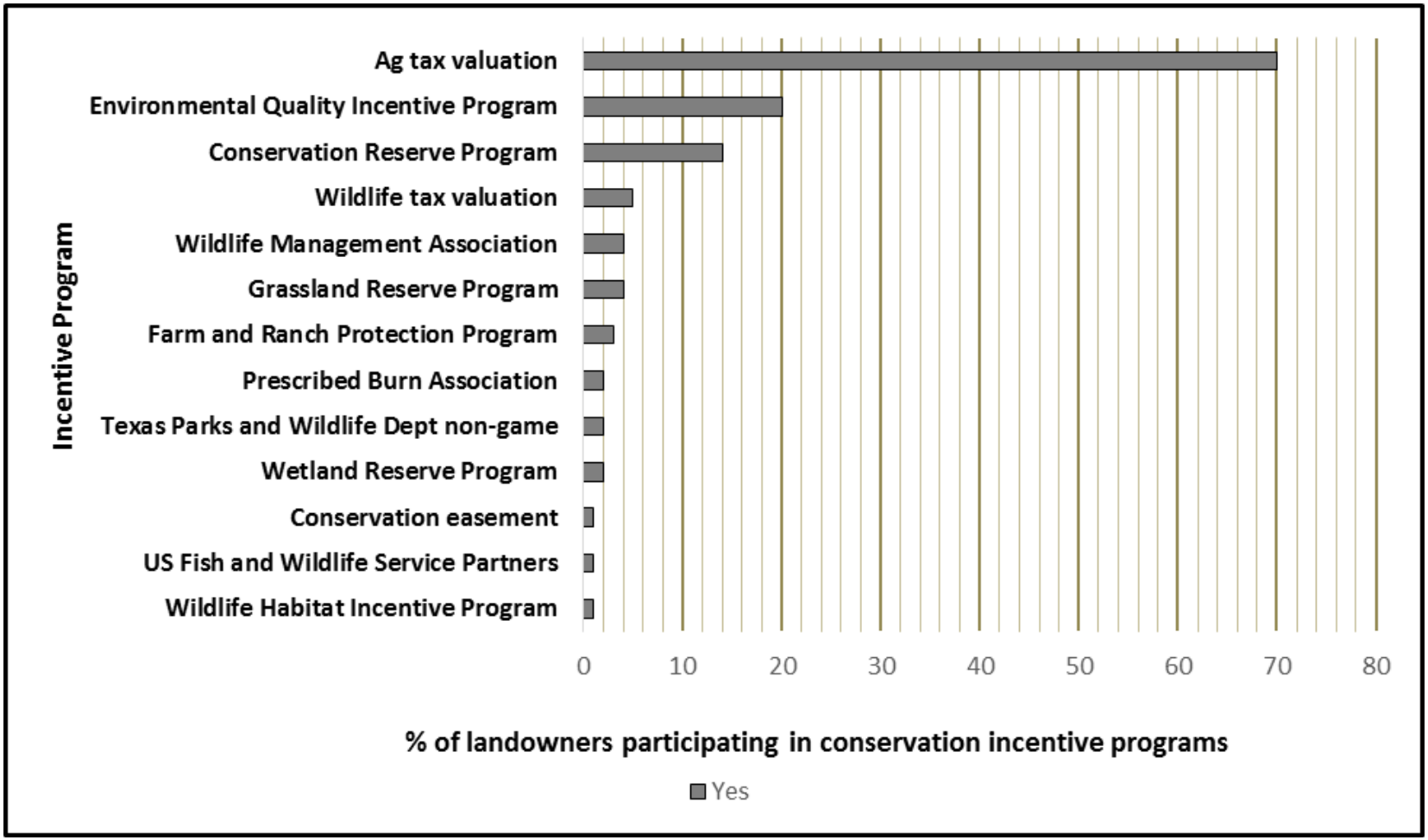
Reported land management activities in watershed benefitting water quality



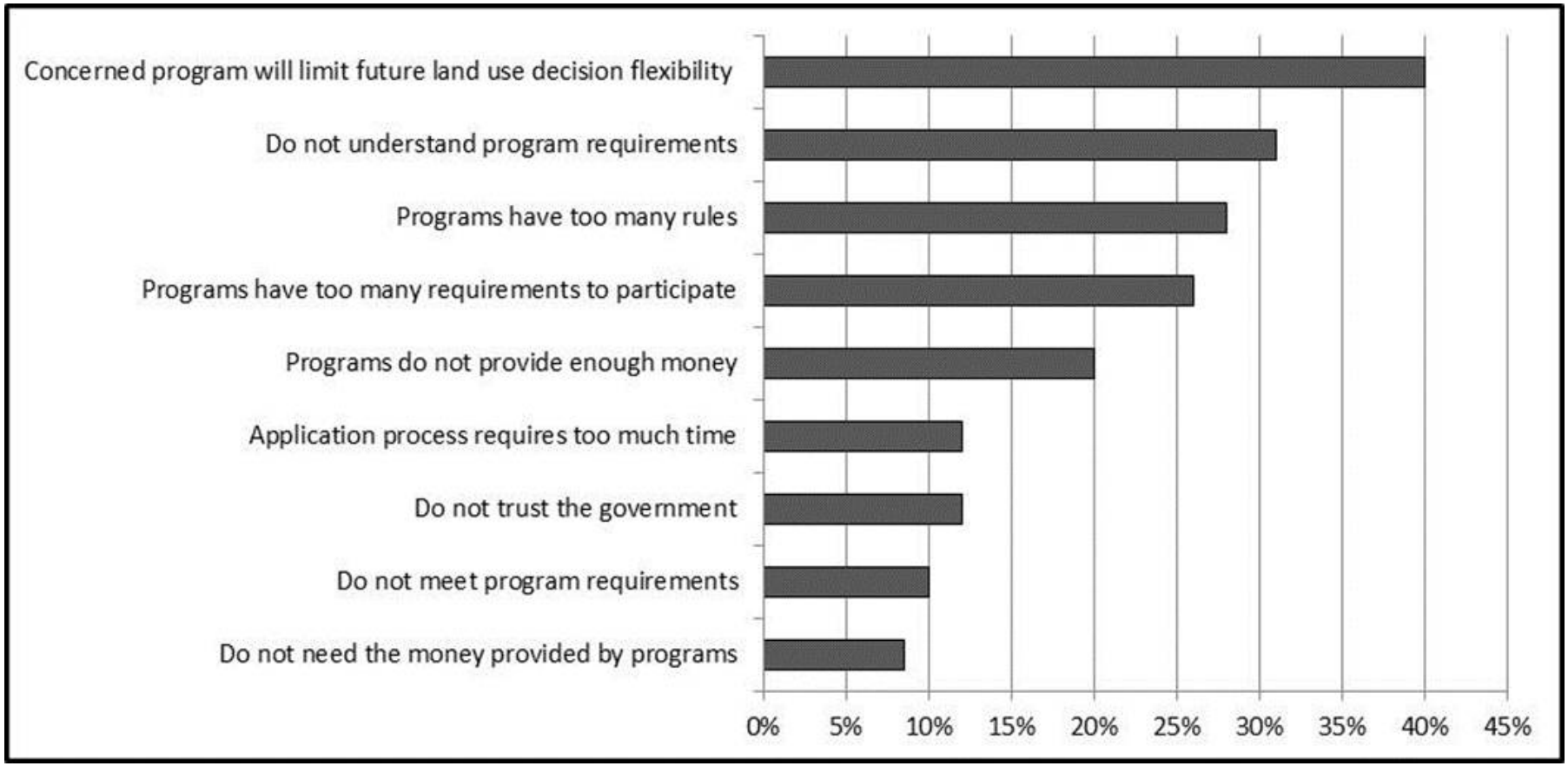
Barriers to Land Management

Lack of Financial Resources	Lack of Knowledge
Implementing a nutrient management plan	Using rotational grazing system for livestock
Reducing Phosphorus	Implementing a prescribed grazing plan
Reseeding pastures to improve soil cover	Using gully plugs to stabilize eroded areas
Shaping/re-vegetating eroded areas	Applying prescribed fire
Cover cropping	Establishing riparian buffers
Planting grassed waterways to limit erosion	
Terracing fields to reduce erosion	
Establishing riparian buffers	
Planting filter strips	

Conservation incentive program participation in the Richland and Chambers Creek watersheds



Why would you choose **NOT** to participate in a conservation incentive program?



Suggestions

→ Promote land management incentive and cost-sharing programs through social networking associations (WMA's and PBA's) and through local ag retailers

→ Connect landowners with locally-available technical guidance. Particularly about managing livestock and using prescribed fire

→ Facilitate landowner-driven social capital networks (e.g. wildlife management associations and prescribed burn associations) to increase collaboration and land management

Acknowledgements

TEXAS A&M UNIVERSITY

SAND COUNTY FOUNDATION

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Tarrant Regional Water District

trwd Tarrant Regional Water District

COLLIN COLLEGE

September 20, 2016

MillerCoors Water Stewardship and Sustainability Programs

MillerCoors™

It Takes Great Water to Make Great Beer

MillerCoors™

To Make Great Water Takes Great Responsibility

MillerCoors™

SUSTAINABILITY AT MILLERCOORS DEFINED:

MAKE A POSITIVE AND MEANINGFUL IMPACT ON THE SOCIAL, ENVIRONMENTAL AND ECONOMIC ISSUES THAT AFFECT OUR BUSINESS, EMPLOYEES AND OTHER STAKEHOLDERS

GREAT TIMES

PROMOTE AND PROTECT THE RESPONSIBLE ENJOYMENT AND MARKETING OF OUR PRODUCTS

GREAT ENVIRONMENT

EMBED ENVIRONMENTAL STEWARDSHIP IN THE WAY WE OPERATE

GREAT PEOPLE & COMMUNITIES

EMPOWER OUR EMPLOYEES, SUPPLIERS AND COMMUNITIES

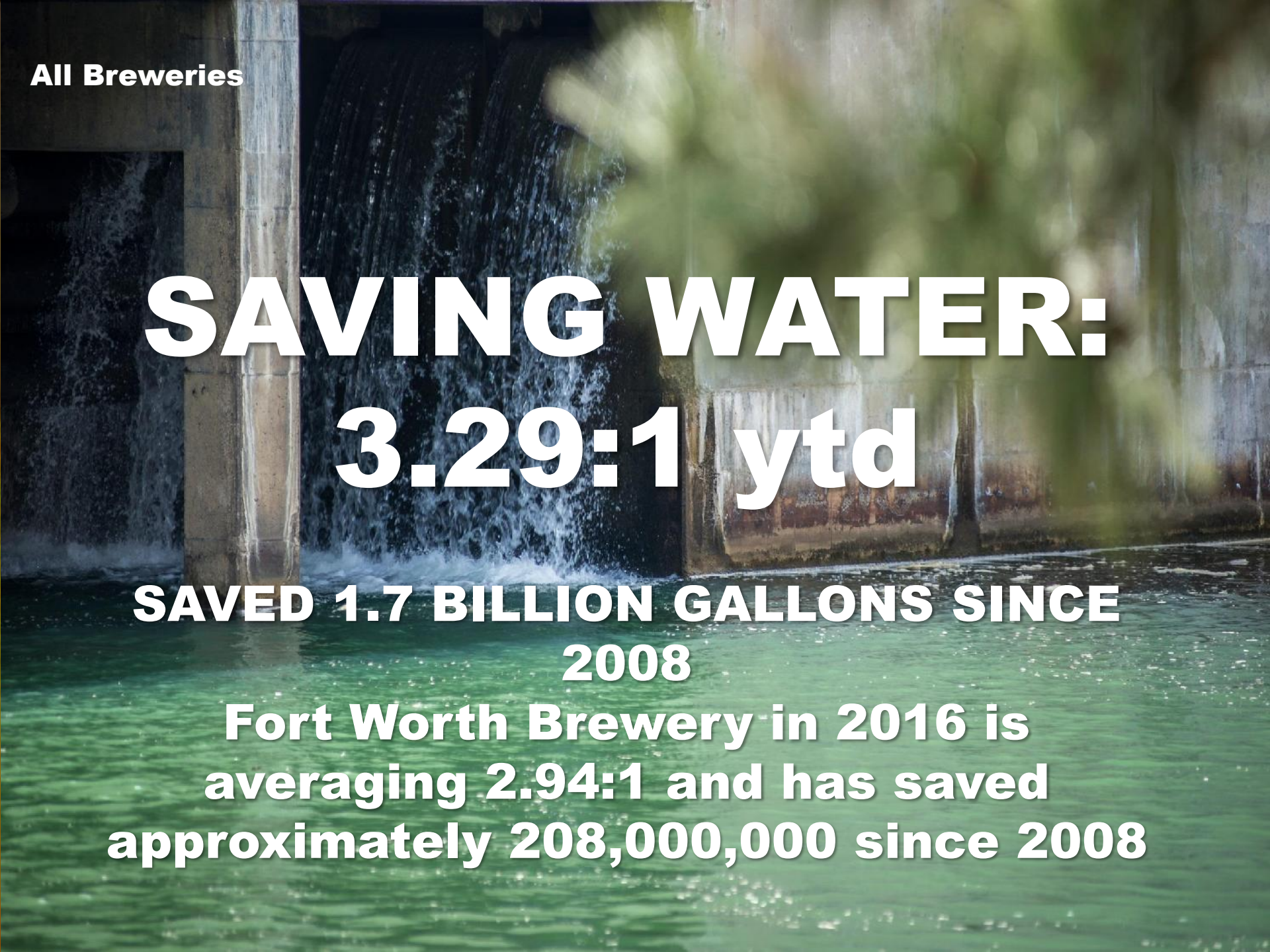
Corporate Goals - 2020

- Establish Local Water Conservation Programs that return more water annually back to the Environment than the brewery will use during the year.
- Drive water use numbers to 3.0 barrels of water to produce 1.0 barrel of beer at All Large Breweries (8)
- All Large Breweries (8) become third party certified “Landfill Free”

MillerCoors™

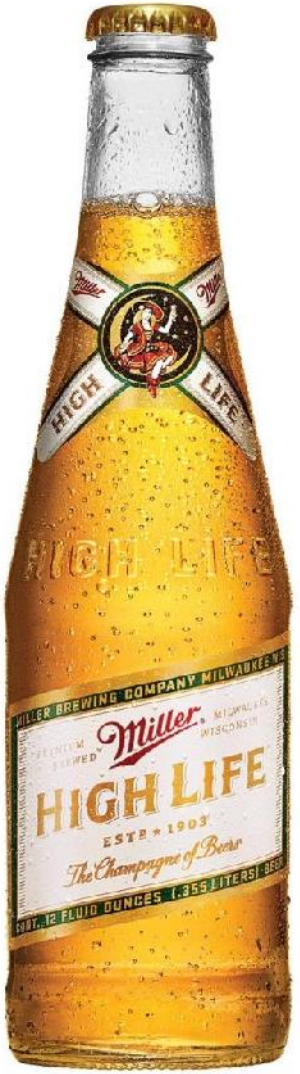

BY 2020:
RESTORE 100%
OF THE WATER USED
IN OUR FINAL PRODUCTS
IN WATER-STRESSED WATERSHEDS


BY 2020:
IMPROVE WATER-TO-BEER RATIO OF
3:1


All Breweries
SAVING WATER:
3.29:1 ytd
SAVED 1.7 BILLION GALLONS SINCE 2008
Fort Worth Brewery in 2016 is averaging 2.94:1 and has saved approximately 208,000,000 since 2008

WHY IS WATER IMPORTANT TO US ?

- It is a natural resource and requires an appropriate level of respect by the user
- It is becoming increasingly shorter in supply with each year
- Significant financial impact for both raw water purchases and waste water treatment
- It makes up roughly 96% of our product
- In addition, of all the water used by MillerCoors – 96% is for growing the Barley and Hops



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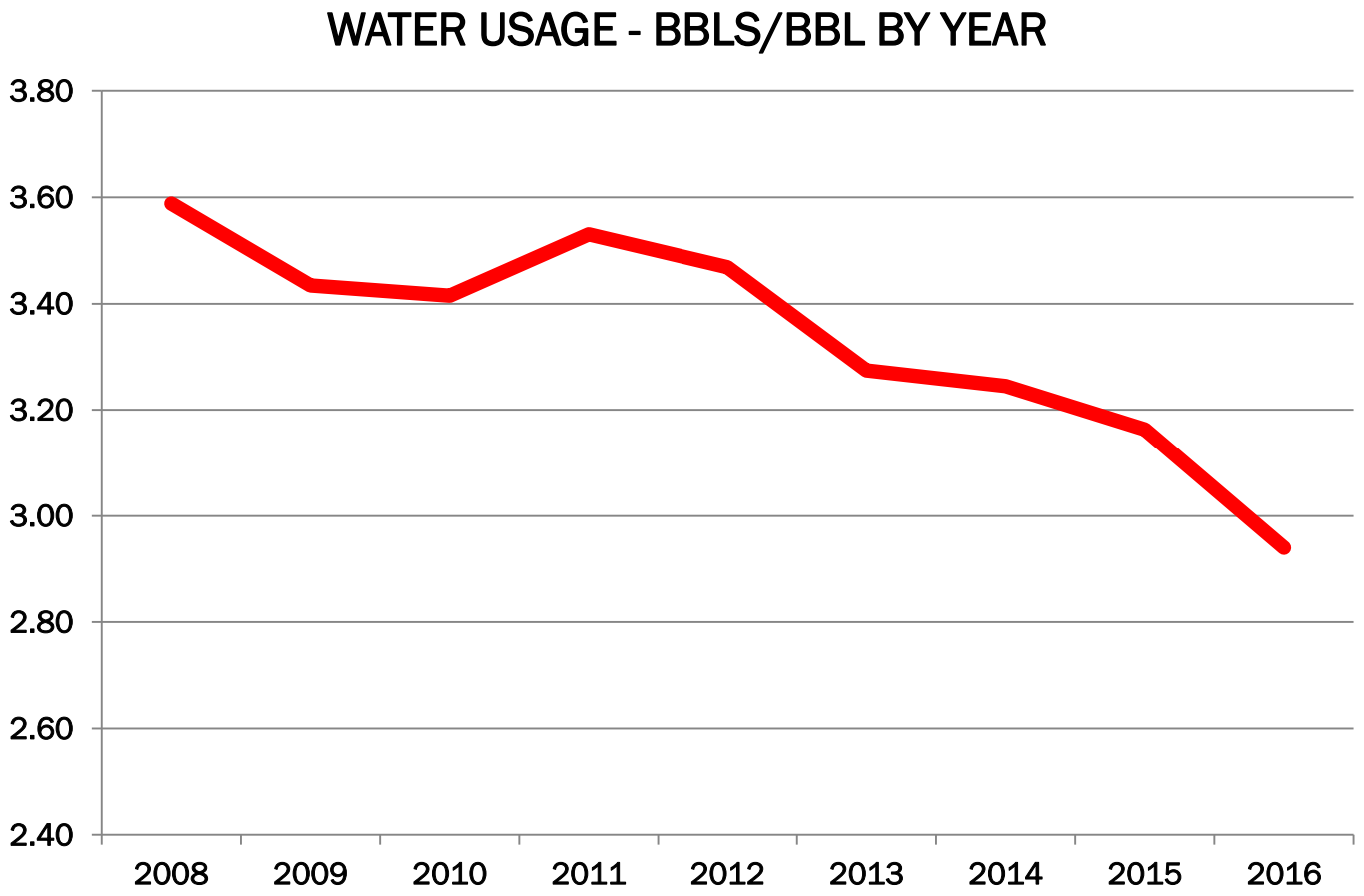
City Water

- The Fort Worth Brewery purchased 687 million gallons of water last year (2015)
  - Compare to 900 million gallons in 2008
  - Down from 750 million gallons in 2014
- We return 63% of the water purchased back to the City after pretreatment to be reused.
- We understand our place and role in the community.

MillerCoors™

Brewery Numbers

- Approximately 24% Reduction in Water Purchased since 2008



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How Much Water Does It Take To Produce One Barrel of Beer ?

???

- For the Domestic Brewing Industry as a whole: **6 barrels of water**
- The European Beer Industry: **Between 8 -10 barrels of water**
- The Fort Worth brewery: **Currently at 2.94 barrels of water (Sept 2016)**
  - NOTE: 2016 Plant KPI is 2.98 barrels of water

MillerCoors™

Waste Water

- Waste Water is pre-treated by brewery before return to the City of Fort Worth
- Waste Water is processed through a biological treatment system (anaerobic) to reduce overall “strength” of waste stream and lessen the load for the City’s Village Creek Treatment Plant.
- We Return to the City 63% of the water we purchase.
- Biogas produced is utilized as gas makeup for boiler operations (Represents 15 to 25% of total gas needs.)
- After final treatment by the City, water can be reused or returned to the Trinity River.

MillerCoors™


BY 2020:
ACHIEVE
LANDFILL-FREE
OPERATIONS AT
ALL MAJOR MANUFACTURING FACILITIES

Other Brewery Sustainability Successes

- **First Large Brewery – Certified Landfill Free by NSF International.**

- Energy usage at the brewery has been reduced approximately 20% since 2010.
  - The Brewery has reduced energy usage by 11.8% YOY for 2016

MillerCoors™

HIGHLIGHTS

ALL 8 MAJOR BREWERIES ARE LANDFILL FREE

“Look Beyond the Pipe”

Our Strategy

“Look Beyond the Pipe”- To work outside the four walls of brewery to develop and implement water conservation programs at our water source

Our Plan

- Identify and engage public and private stakeholders in implementing water stewardship programs in the Trinity River basin
- Work with local and state government bodies/officials to gather information, share best practices, become a resource they can come
- Help develop, promote and adopt public policy measures in support of our water stewardship efforts

MillerCoors™


131 LANDOWNERS
31,000 ACRES
7.9 BILLION
GALLONS
Since 2012

Chambers Creek Water Quality Initiative

- **Joint project with NRCS and local SWCDs announced May 2012**
- **$9 million + in financial assistance**
- **There are 131 different land owners and over 31,000 acres**
- **Conservation practices that benefit water quality and soil health**

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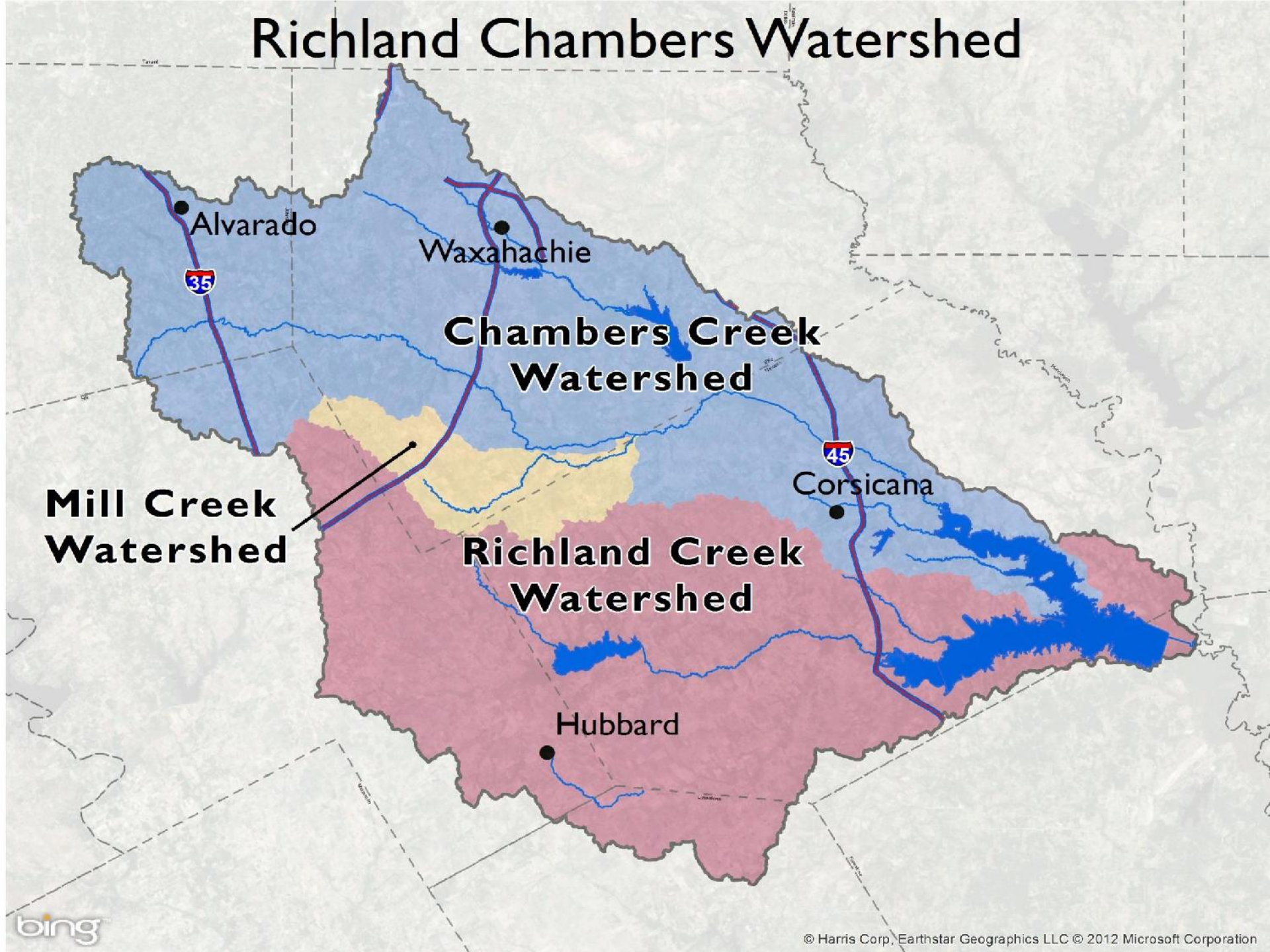
Richland Chambers Watershed
Alvarado
Waxahachie
35
Chambers Creek Watershed
45
Corsicana
Mill Creek Watershed
Richland Creek Watershed
Hubbard
bing
© Harris Corp, Earthstar Geographics LLC © 2012 Microsoft Corporation

National Water Quality Initiative/MillerCoors

- In 2014, MillerCoors began to quantify the impact of these best practices.

- Utilizing a Replenish Benefit Calculation
  - Curve Number Runoff method – Soil and Water Assessment Tool (SWAT)

- In the four (4) years we have been a part of a program that returned almost 8.0 Billion gallons of water back to the watershed.

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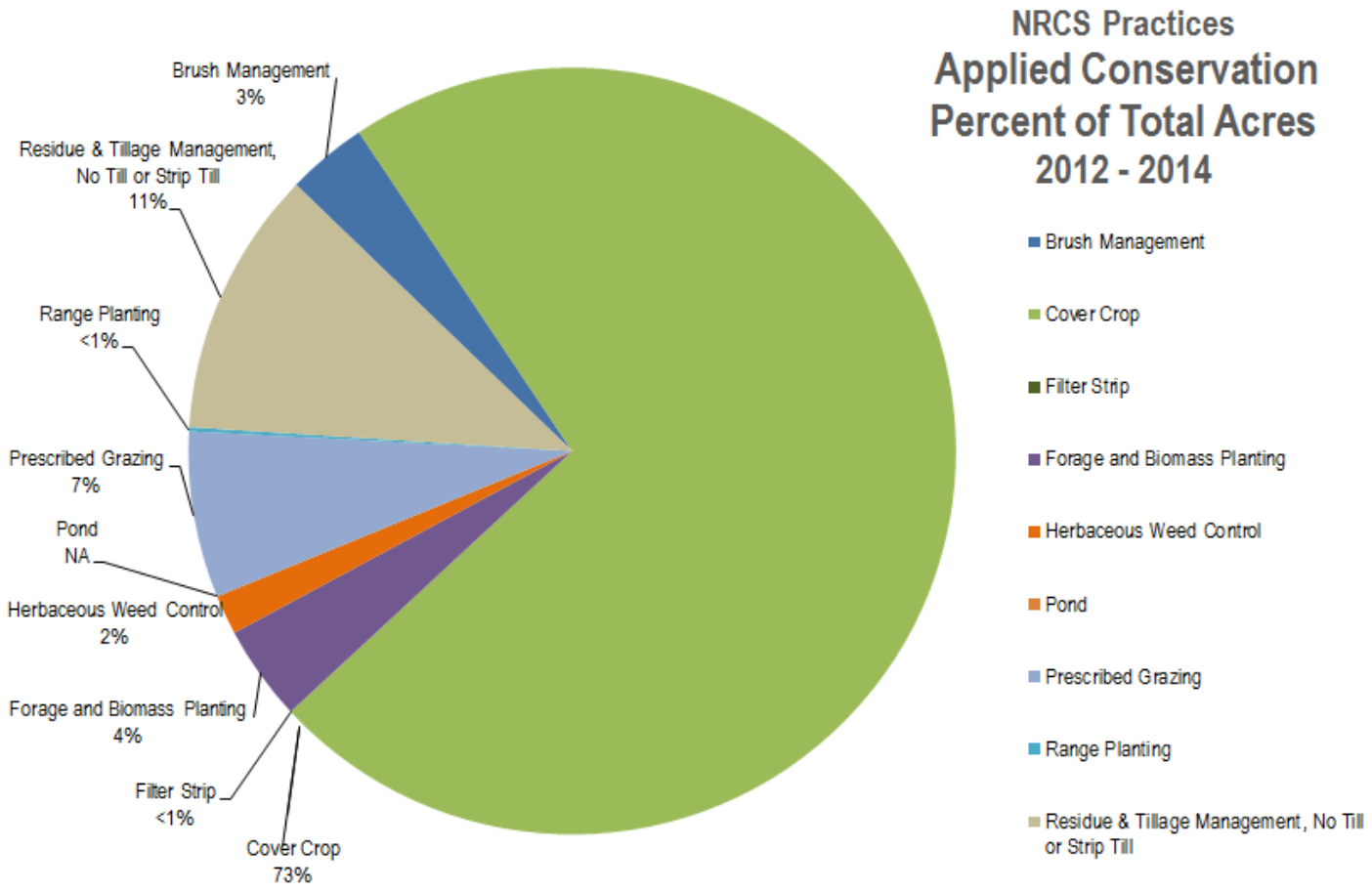
NWQI - Applied Conservation Practices



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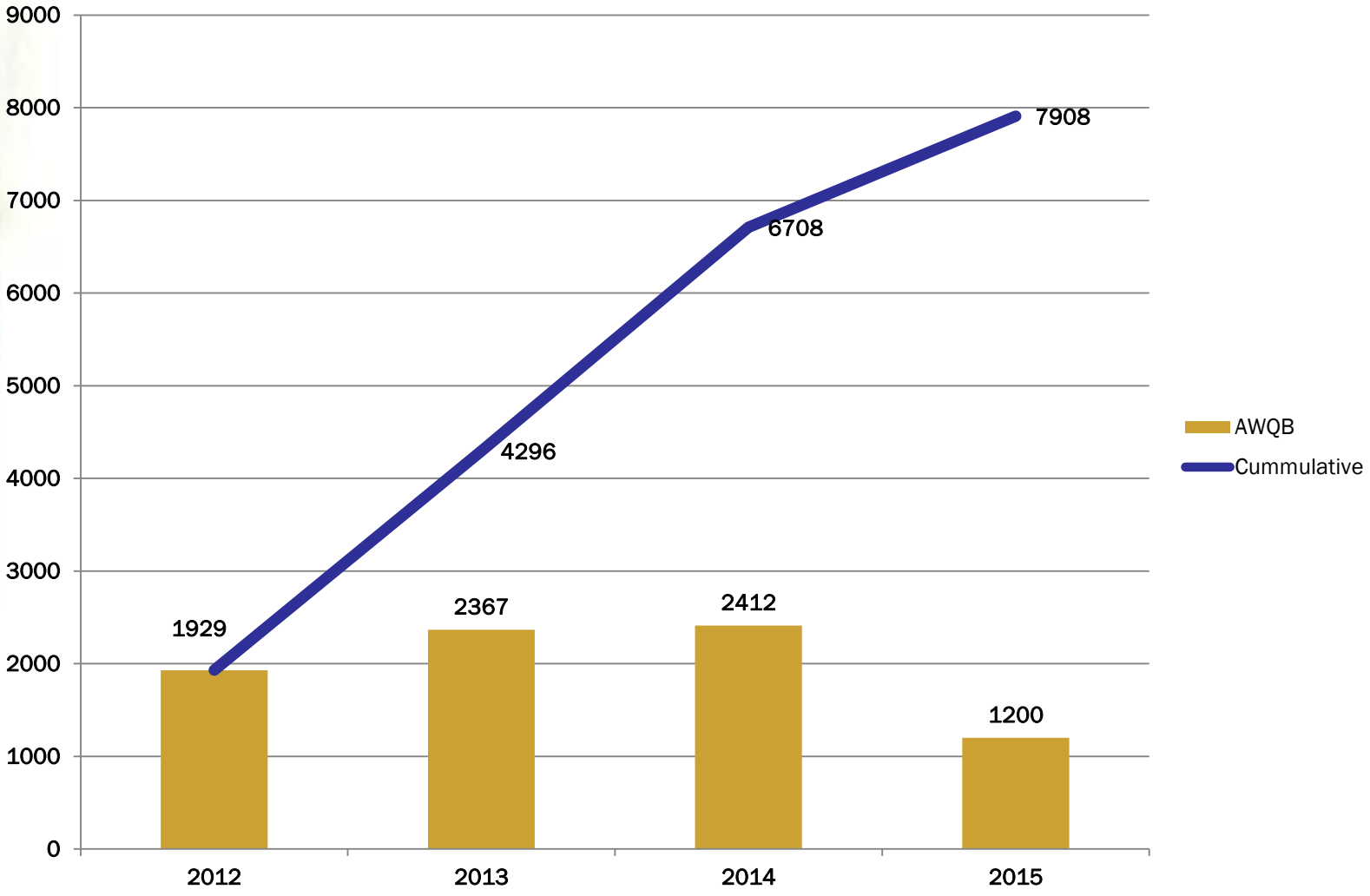
National Water Quality Initiative

Annual Water Quantity Benefit (Mgal/yr)



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Trinity River Trash Bash

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Watershed Happy Hour

- Once per year the Brewery hosts a Watershed Happy Hour.
- The invite list is extensive.
  - NGOs
  - Local, State and Federal Agencies and Officials
  - Soil Conservation and Water Districts
  - Volunteers
  - Landowners
  - Business Representatives
- Last year's attendance was approximately 116
- Great time to share and make new connections.
- **Listen – Learn – and Collaborate over a beer**

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Watershed Happy Hour

MillerCoors™

Richland-Chambers Watershed Partnership

Stakeholder Meeting
September 20-21, 2016

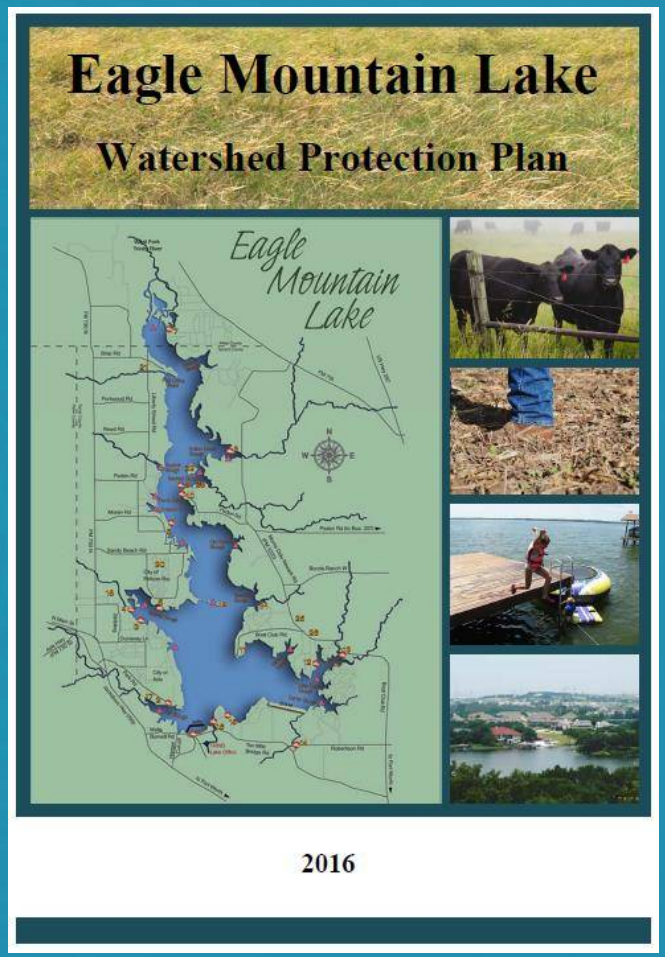
Watershed Protection Plans

TINA HENDON, TRWD

Watershed Protection Plans

A strategy that provides assessment and management information for a defined watershed.

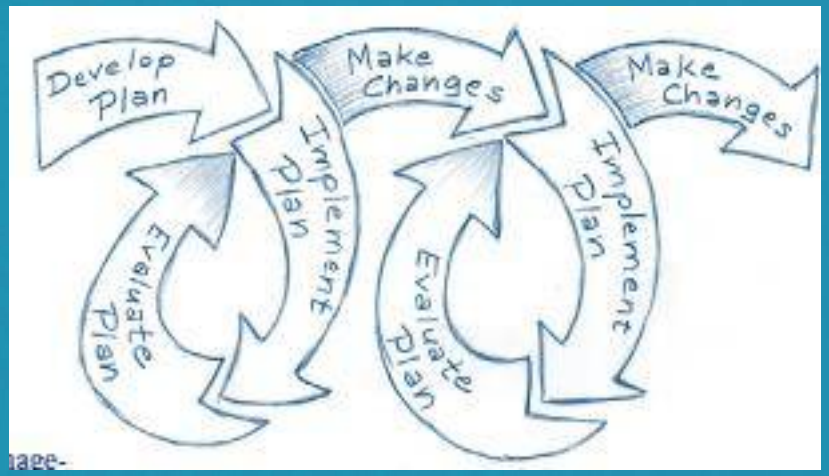
- EPA Framework
- Clean Water Act §319
- Stakeholder involvement
- Actions supported by sound science
- Technical expertise
- Diverse skills & knowledge
- Focus on water quality goals



Watershed Protection Plans

Steps to Effective Watershed Management

1. Build partnerships
2. Characterize your watershed
3. Establish goals & identify solutions
4. Develop an implementation program
5. Implement your plan
6. Measure progress & make adjustments

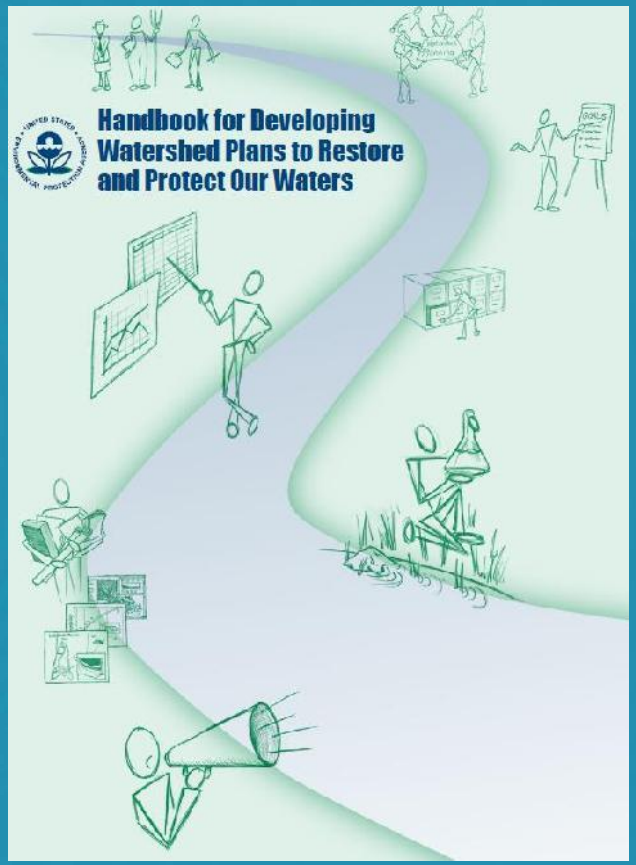


The outcomes of this process are documented or referenced in a watershed plan.

Watershed Protection Plans

Nine Elements of a Successful Watershed Plan

A. Identify problem & sources
B. Reductions needed to reach goals
C. Identify measures needed to achieve reductions
D. Assistance needed
E. Education & outreach plan
F. Schedule
G. Milestones
H. Criteria for measuring progress
I. Monitoring Plan

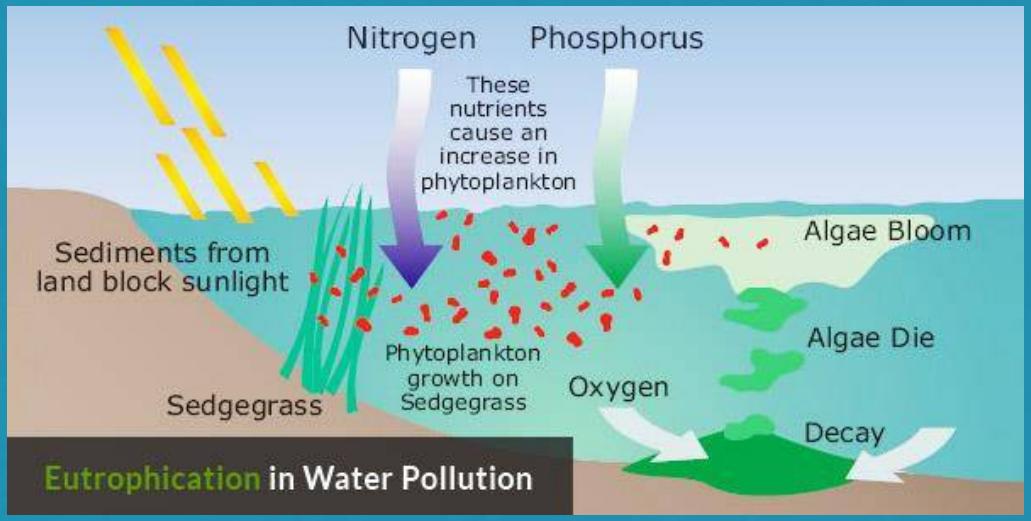


		"Nine Elements"								
		A	B	C	D	E	F	G	H	I
Planning process	Build Partnerships									
	Characterize Watershed	X								
	Goals and Solutions		X	X						
	Implementation Program				X	X	X	X	X	X
	Implement the Plan									
	Measure Progress & Make Adjustments									

Watershed Protection Plans

Element A: Watershed Characterization

- Possible causes of problem
- Possible sources of pollutants
- Quantify pollutants

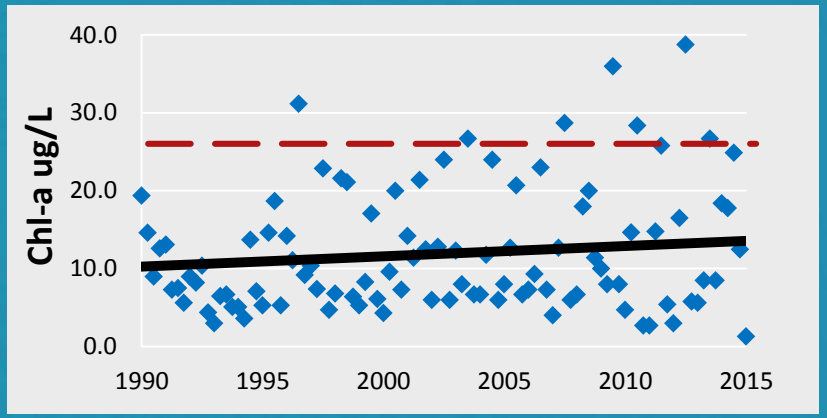


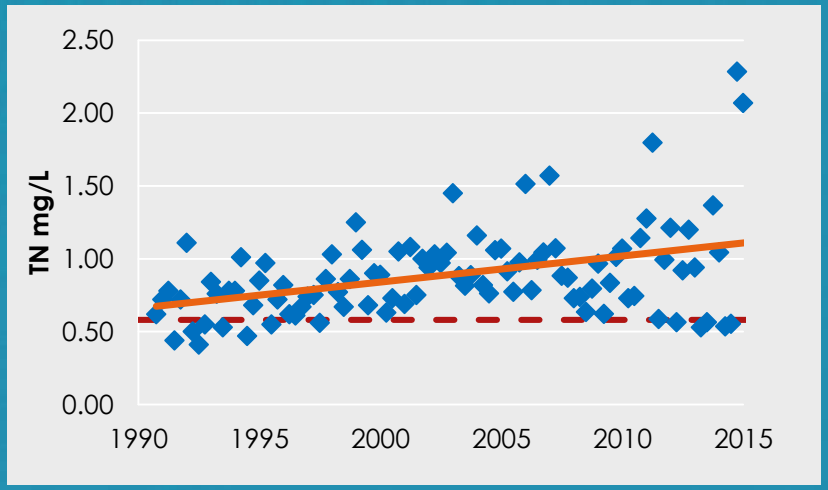
Watershed Protection Plans

Identify Goals and Solutions

Element B:
Pollutant Reductions

- What is the water quality goal?
- How much of the target pollutant is acceptable?
  - "Impaired" waterbody
  - healthy waterbody
- How much can be reduced by the recommended actions?





Watershed Protection Plans

Identify Goals and Solutions

Element C:
Management Measures

- Related to sources identified in previous steps
- Identify critical areas
- Economically feasible

Watershed Protection Plans

Implementation Program

Element D:
Assistance Needed

- Technical
  - Sources and types
- Financial
  - Cost of the project
  - Potential sources
  - Estimated contributions

Watershed Protection Plans

Implementation Program

Element E:
Education & Information

- Target relevant audiences
- Inform and engage
- Support management activities

Mass Media

Demonstration sites

Meetings and workshops

Onsite technical assistance

Citizen monitoring programs

Training and certification programs

Watershed Protection Plans

Implementation Program

Element F: Schedule

- Project timeline
- Relate tasks to goals
- Responsible organizations
- When goals will be met

Element G: Interim Milestones

- More detailed than Schedule
- Management activity-specific
- Allows closer monitoring of progress

Management Measure	Jurisdiction	Unit Cost	Number Implemented			Total Cost
			Year			
			1-3	4-6	7-10	
Urban Stormwater Management Measures						
Pet Waste Collection Stations	Bellville, Burton, Brenham, Industry	$620/station $85 annual/station	6	3	3	$17,640

Watershed Protection Plans

Implementation Program

Element H: Criteria for Load Reductions

- Assess progress toward water quality goals
- Assess effectiveness of mangement measures
- Adaptive management

Element I: Monitoring

- Sampling & analysis plan
- Supports decision-making
- Reporting schedule

		"Nine Elements"								
		A	B	C	D	E	F	G	H	I
Planning process	Build Partnerships									
	Characterize Watershed	X								
	Goals and Solutions		X	X						
	Implementation Program				X	X	X	X	X	X
	Implement the Plan									
	Measure Progress & Make Adjustments									

Watershed Protection Plans

Questions?

Richland-Chambers Watershed Partnership

Stakeholder Meeting
September 20-21, 2016

Role of Stakeholders

CLINT WOLFE

The Role of Stakeholders

Who is a Stakeholder?

People and organizations that have a stake in the outcome of the watershed protection plan

- General Public
- Municipalities and Counties
- Regulated Entities
- Industry

- Resource Managers
- Agriculture
- Environmental
- Developers
- Landowners

The Role of Stakeholders

Stakeholder Groups

- Balanced representation from groups
- Manageable size for decision-making purposes
- All stakeholders provide input

The Role of Stakeholders

Stakeholder Roles

- Represent Respective Constituencies
- Participate in the analysis of water quality issues
- Contribute ideas to WPP creation and implementation
  - Evaluate options for managing pollutants offered by research team
  - Suggest alternative management measures
  - Integrate existing programs or plans into the WPP
  - Provide input on various other components

The Role of Stakeholders

Stakeholder Responsibilities

- Assist in the development of recommendations to reach water quality goals
- Make recommendations of management practices that can be implemented to correct nutrient and sediment loading into the reservoir
- Implement best management practices outlined in the WPP in order to preserve/improve water quality and accomplish the goals of the WPP

The Role of Stakeholders

Agency Roles

- **Texas AgriLife Research**
  - Recruit and organize stakeholders
  - Organize funding structure for development and implementation
  - Write Watershed Protection Plan document
- **Texas AgriLife Extension Service**
  - Provide technical support to stakeholders
  - Develop and deliver educational programming
- **Tarrant Regional Water District**
  - Technical support for reservoir/watershed issues
  - Conduct water quality modeling and monitoring

The Role of Stakeholders

Agency Roles

- **Texas Commission on Environmental Quality (TCEQ)**
  - Regulates/ permits point source pollutants
  - Funding for planning/educational & implementation programs
  - Review watershed protection plans
- **Texas State Soil and Water Conservation Board (TSSWCB)**
  - Responsible for managing programs for the abatement of agricultural, and silvicultural non-point source pollutants
  - Technical Support for agricultural producers via local Soil and Water Conservation Boards
  - Funding for planning/educational & implementation programs
  - Review watershed protection plans

The Role of Stakeholders

Agency Roles

- **USDA- Natural Resource Conservation Service**
  - Technical Support for agricultural producers
  - Funding for implementation of best management practices

- **US Environmental Protection Agency (USEPA)**
  - Provides funding
  - Guidance for planning
  - Review of Watershed Protection Plan

The Role of Stakeholders

What is expected?

Successful development and implementation of the watershed plan will depend on the involvement of the community.

The Role of Stakeholders

What is expected?

1. Be part of the Partnership

- *The Richland-Chambers Partnership is the forum for public participation in the planning process.*

2. Serve as a Steering Committee member

- *The role of the Steering Committee is to affirm the consensus of the Partnership and facilitate the development and implementation of the watershed plan.*

Next Steps

CLINT WOLFE

Next Steps

Stakeholder input

Brainstorming ideas about water quality priorities, threats, existing programs, etc.

Next Steps

Stakeholder input

- What programs do you, or your organization, help with that protect water quality?
  - Agricultural, Urban…
  - Clean-ups…
  - Volunteering…
  - Education…

What others do you know about?

Next Steps

Stakeholder input

- Besides drinking, why is water important to you?
  - Swimming, boating…
  - Fishing, wildlife viewing…
  - Economic importance, industry, agriculture…
  - General environmental health
  - Aesthetics, makes you feel good

Other?

Next Steps

Stakeholder input

- Have you observed activities in your community that you think might threaten water quality?
  - Construction/land disturbance
  - Farming/grazing practices
  - Dumping/littering

  Other?



Next Steps

Stakeholder input

- What are your water quality priorities?
  - Improving only the worst water bodies…
  - Meeting regulatory requirements…
  - Protecting good water from going bad…

  Others?