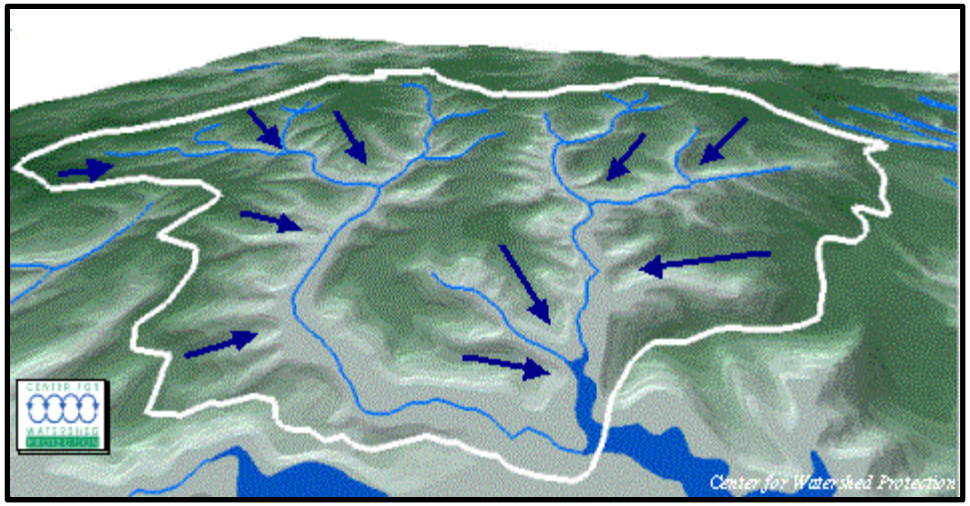
Watershed Management: Perspectives and Programs

Greg Kloxin
Oklahoma Conservation Commission
Water Quality Division

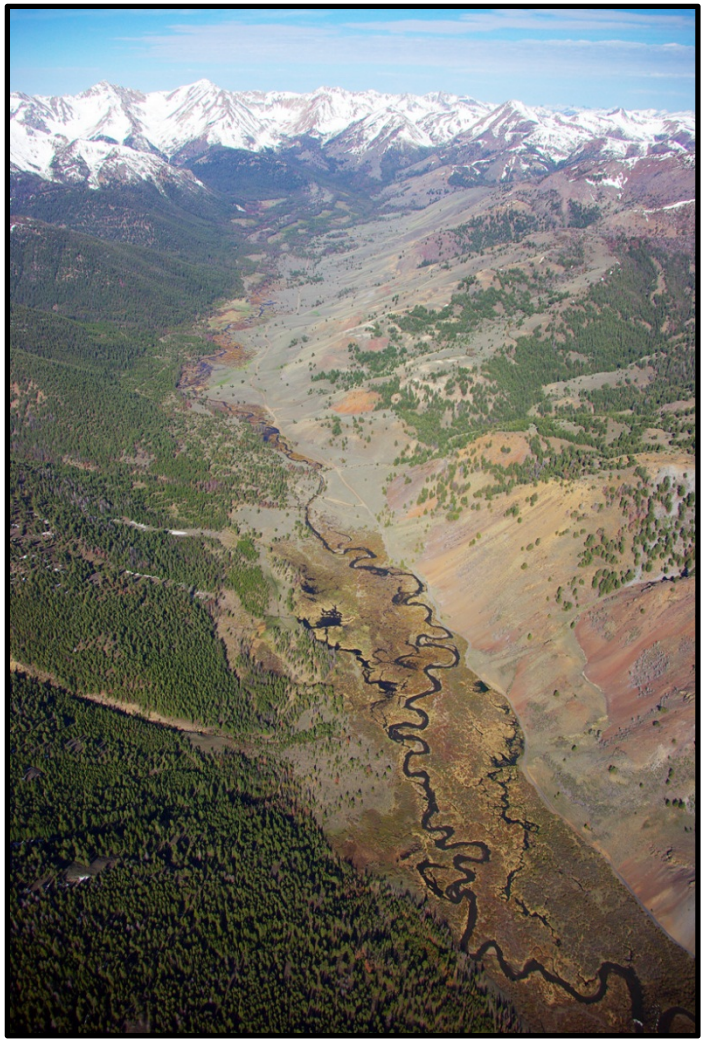
OKLAHOMA CONSERVATION COMMISSION

2014 OCLWA Conference
Wes Watkins Center, Stillwater, OK

What is a Watershed?

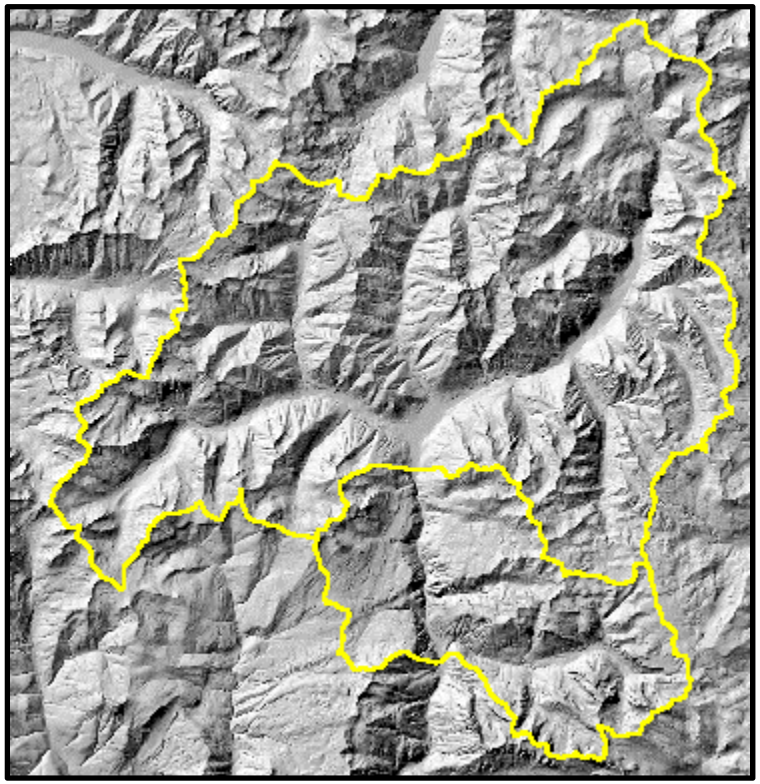


Land area where all draining water (both surface and ground) goes into the same place.



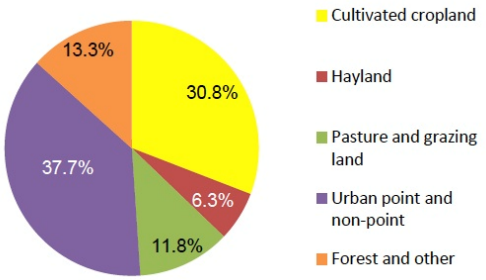
General Watershed Characteristics

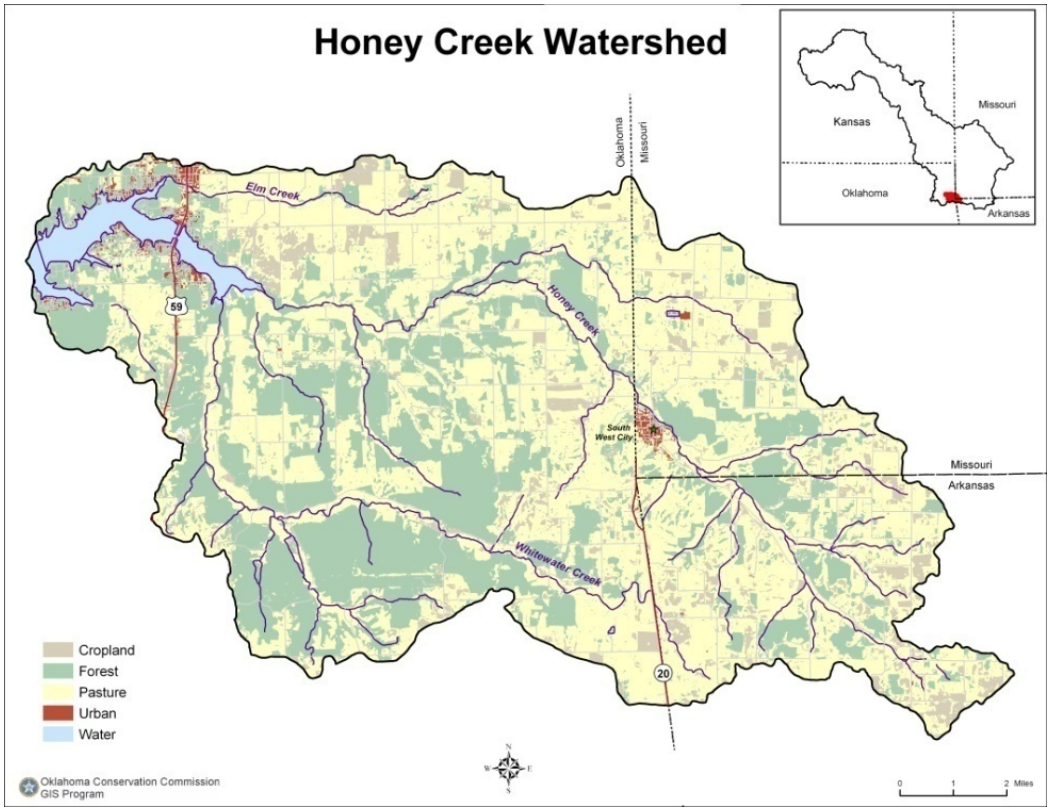
- Topography



General Watershed Characteristics

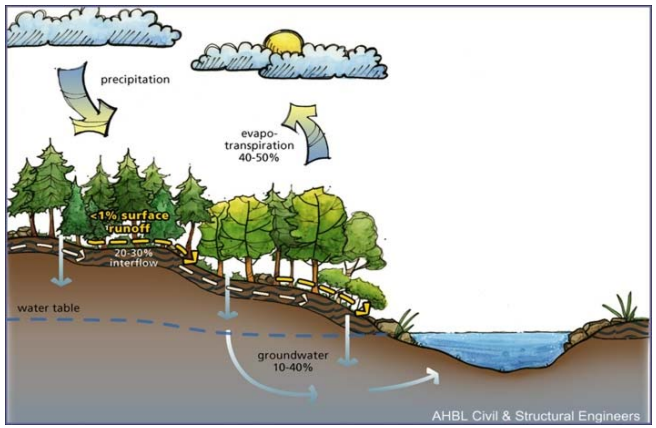
- Land Cover/Land Use

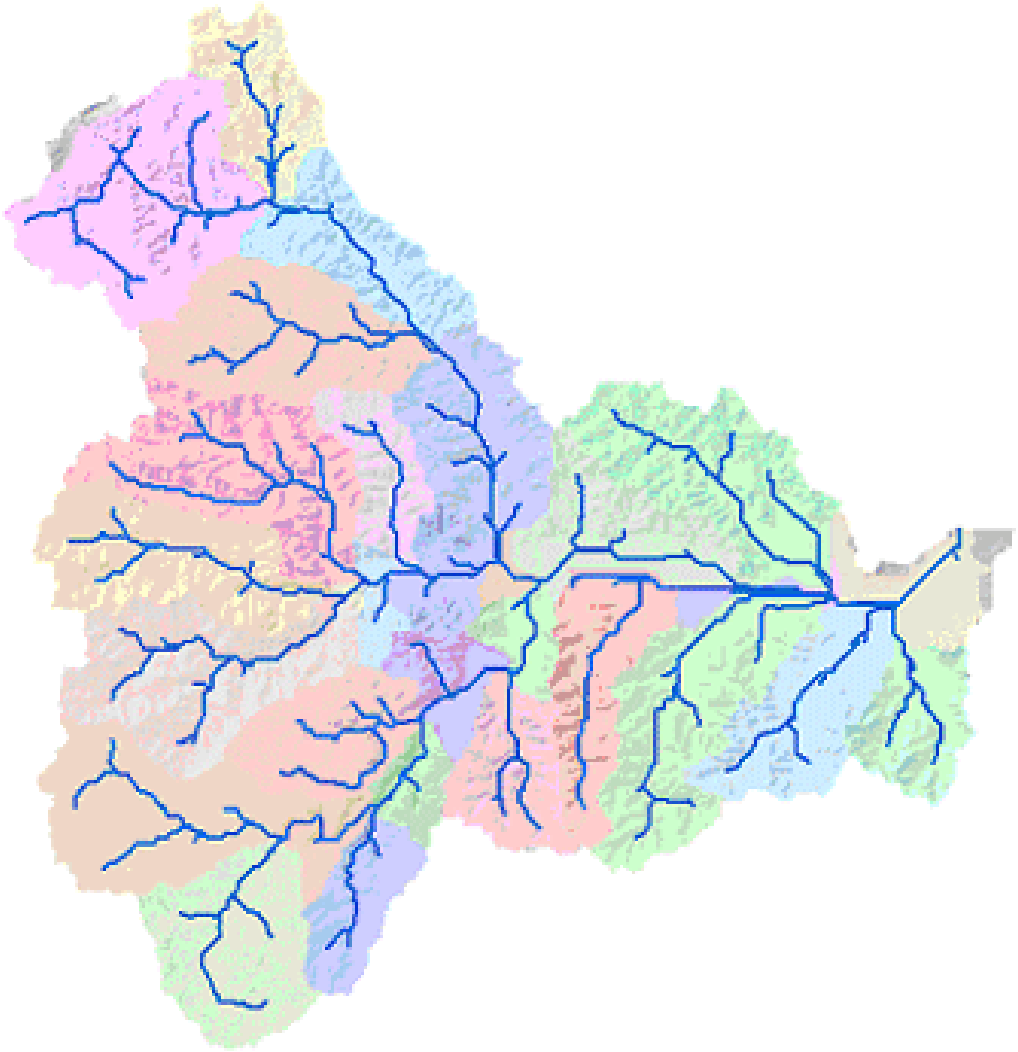




General Watershed Characteristics

- Hydrology





General Watershed Characteristics

- Ecology

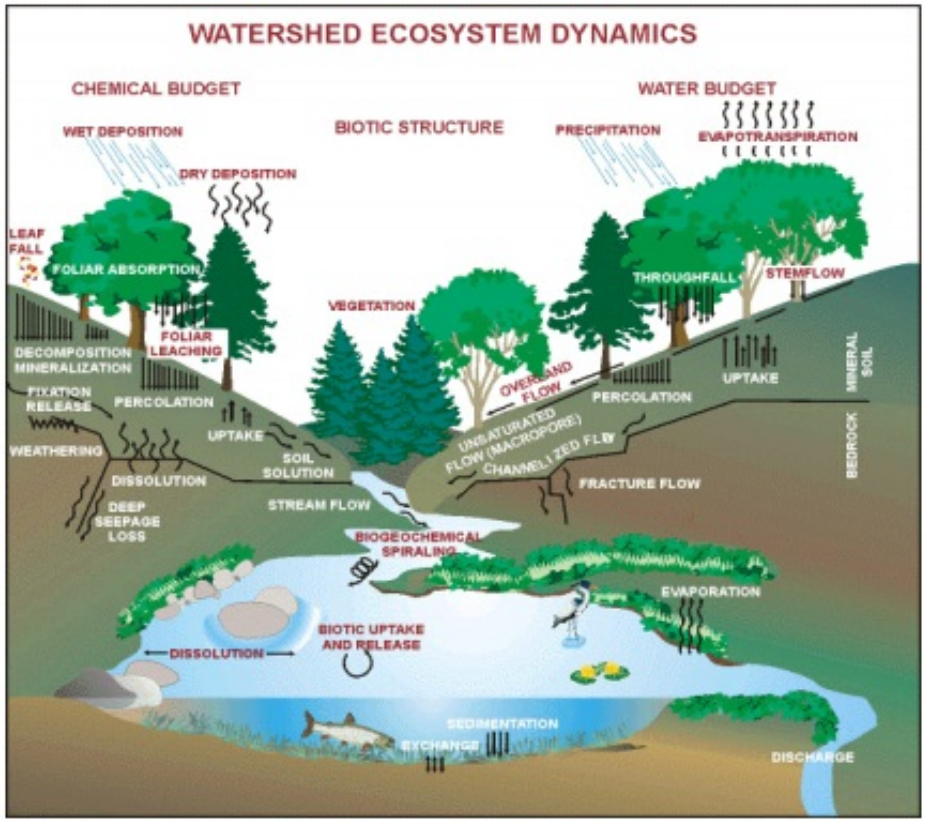
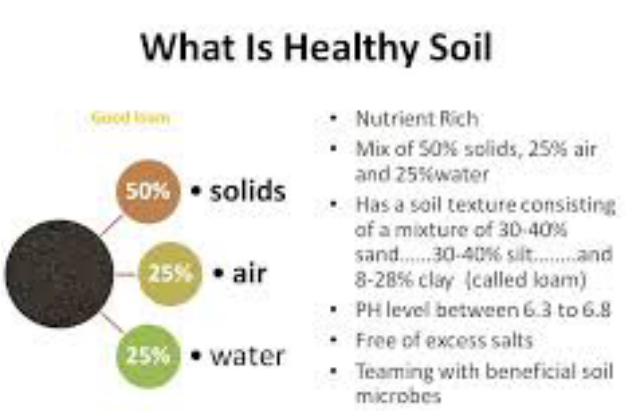
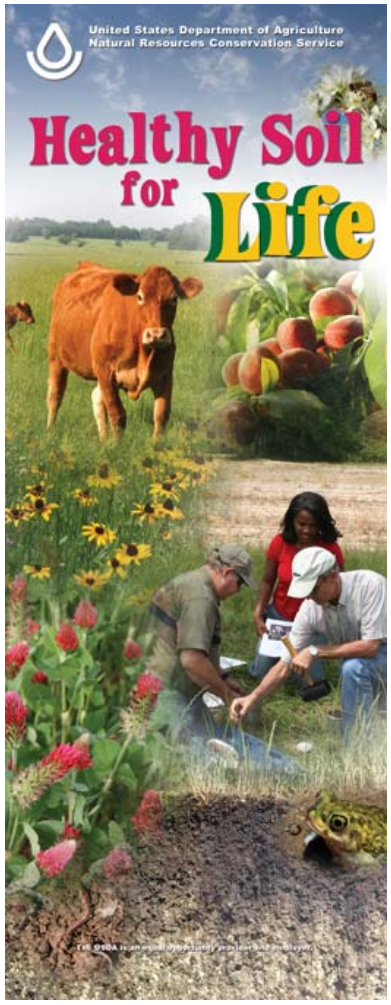


Figure 35. Watershed ecosystem dynamics summary (*redrafted from Johnson and Van Hook, 1989. Analysis of biogeochemical cycling processes in Walker Branch Watershed.*)

General Watershed Characteristics

- Soils





Watershed Management

- Two principal modes:
  1. Water volume management
     - OCC's Upstream Flood Control program
     - US Bureau of Reclamation
  2. Water quality management
     1. OCC's Priority Watershed Implementation program
     2. Illinois River Watershed Partnership

Watersheds and Water Quality

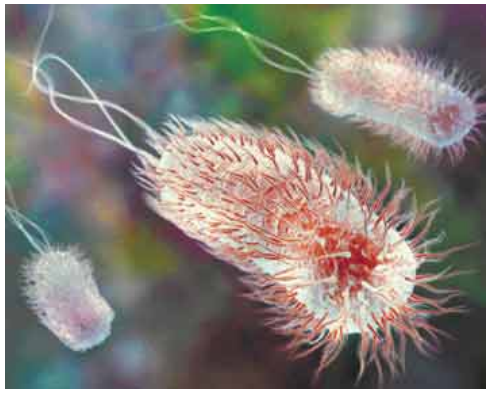
- Take Home: Pollution Source!
  - "An ounce of prevention is worth a pound of cure." – Ben Franklin
  - "Pollution prevention, not pollution treatment" – GAK
  - E.g., Phosphorus – (City of Fond du Lac, WI)
    - POTWs needing to meet TP around 0.1 mg/l
      - $240 to $304/lb of P to remove
      - $10 to $45/lb of P for measures to prevent (e.g., common crop buffer)

"I'll have an ounce of prevention."

Watersheds and Water Quality

- WQ Issues:

Pollutant type	Pollutant	Issue	Source
Sediment	sediment	stream/lake fill, turbidity, habitat destruction	county roads, agriculture, construction, unstable streambanks
Pathogens	*E. coli*, Enterococci, viruses	disease vector, beach closures	livestock, wildlife, stormwater
Nutrients	nitrogen, phosphorus	eutrophication, HABs, taste and odor, disinfection by products	POTW, agriculture, stormwater, atmosphere

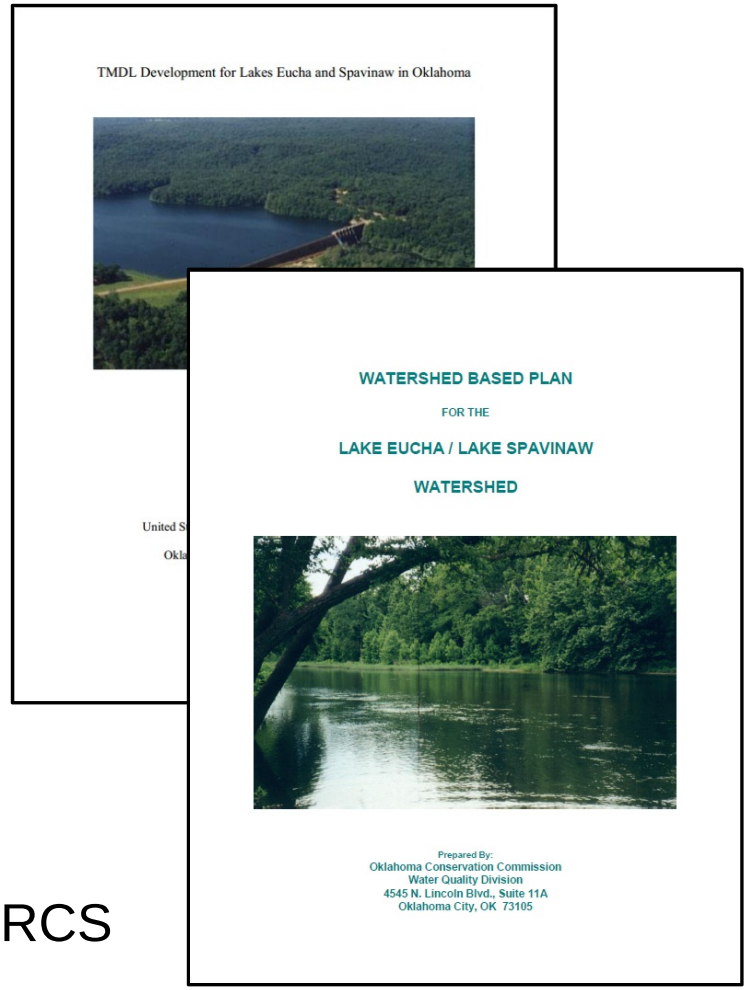


Watershed Management

- Management Issues:
  - Multitude of stakeholders
  - Multiple boundaries
  - Multiple programs
  - Data
  - Funding

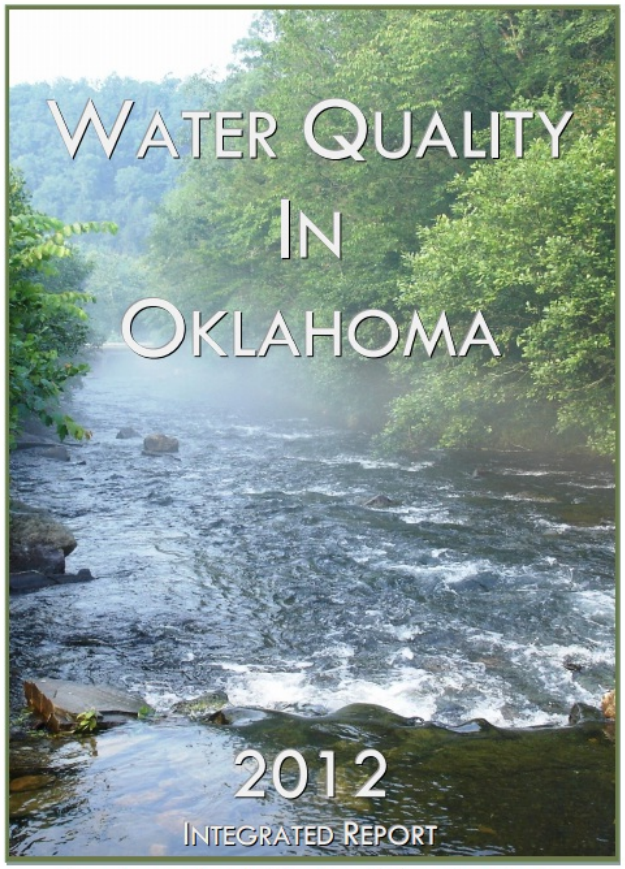
Watershed Management

- General Process
  - Monitor and assess waterbodies
  - Determine support/nonsupport of standards
  - Conduct Total Maximum Daily Load (TMDL) analysis
  - Develop plan to meet standards (e.g., Watershed Based Plan)
  - Implement to restore attainment
    - Permit limits – ODEQ, ODAFF
    - Conservation measures – OCC, NRCS



The "List"

- Surface waters not meeting one or more "beneficial uses"
- Appendix C of OK's Integrated Reported
- Public document



Who, What, When, and Why?

- **"Who"** State, municipal, tribal and other agencies. OCC and OWRB are primary contributors
- **"What"** Compile and assess water quality and related data
- **"When"** Biennially on the even year
- **"Why"** National mandate

OKLAHOMA CONSERVATION COMMISSION

Waterbody Assessment

- Requires monitoring data
- Data analyzed to see if stream or lake is "making the grade"


Collecting fish by seine

- "Grades" posted in two lists
  - App. B – *Comprehensive Waterbody Assessment*
  - App. C – *303(d) List of Impaired Waters* (i.e., "The List")

App. B - How are they doing?

Waterbody ID	Waterbody Name	Size (Lake Acres or Stream Miles)	Type	Category	Monitoring Date	Aesthetic	Agriculture	Cool Water Aquatic Comm	Habitat Limited Aquatic Comm	Trout Fishery	Warm Water Aquatic Comm	Fish Consumption	Navigation	Primary Body Contact Rec	Secondary Body Contact Rec	Public & Private Water Supply	Emergency Water Supply	High Quality Water	Outstanding Resource Water	Sensitive Water Supply
OK620900010280_00	Tydol Lake (Tidal)	5.0	L	3	2016	X	X				X	X		X						
OK620900010290_00	**Euchee Creek**	**9.6**	**R**	**5a**	**TMDL**	I	F				**N**	X		**N**			F			
OK620900010290_10	Euchee Creek	12.4	R	2	2011	X	X				X	X			X		F			
OK620900010300_00	Sand Creek	8.4	R	3	2011	I	I				I	X		X		I				
OK620900010310_00	**Cottonwood Creek**	**6.3**	**R**	**5a**	**TMDL**	I	X				**N**	X		**N**			F			
OK620900010320_00	Wildhorse Creek	8.1	R	2	2011	I	I				I	X		X		I	F			
OK620900010330_00	Turkey Creek	6.0	R	3	2016	X	X				X	X		X						
OK620900010340_00	Rattlesnake Creek	4.2	R	3	2016	X	X				X	X		X						
OK620900010350_00	Turkey Creek	3.9	R	3	2016	X	X				X	X		X						
OK620900010360_00	Skull Creek	8.7	R	2	2011	I	I				I	I		X			F			
OK620900010370_00	Cross Bones Creek	2.3	R	3	2016	X	X				X	X		X						
OK620900010380_00	Mud Creek	6.5	R	3	2016	X	X				X	X		X						
OK620900010390_00	Yale Creek	3.2	R	3	2016	X	X				X	X		X						
OK620900020010_00	Cimarron River	20.7	R	2	2016	I	F				I	X		X			F			
OK620900020020_00	**Salt Creek**	**14.7**	**R**	**5a**	**TMDL**	F	F				F	X		**N**		I				

App. C – Why did they fail?

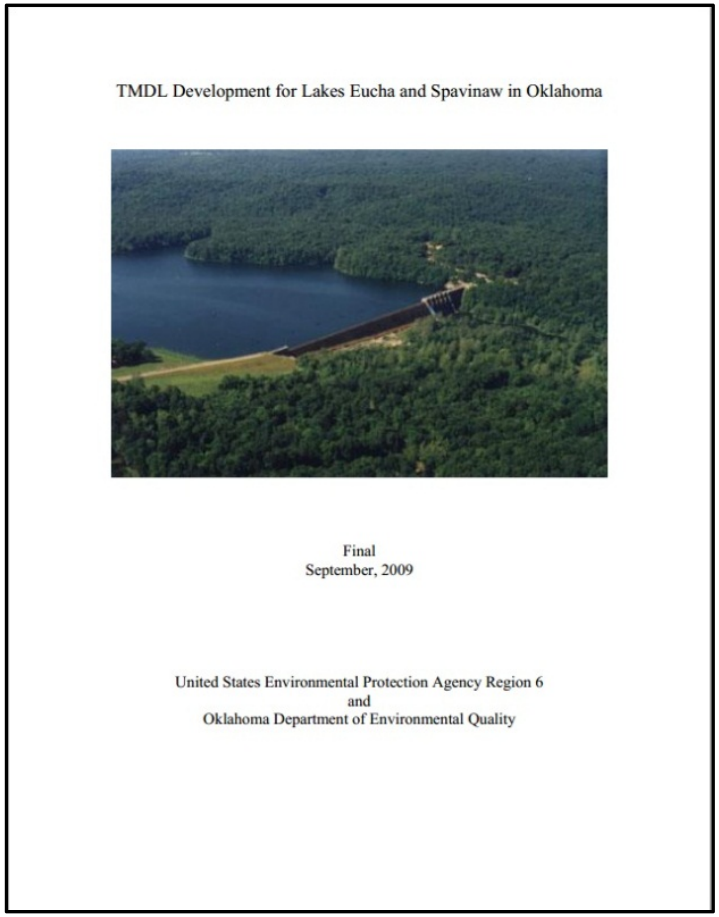
2010 OK Integrated Report
Appendix C - 303(d) List of Impaired Waters

DRAFT

Waterbody ID	Waterbody Name	Waterbody Size	Category	TMDL Date
OK620900010290_00	**Euchee Creek**	**9.56 MILES**	**5a**	**2021**
Cause of Impairment	Impaired Use	Unconfirmed Potential Sources		
Enterococcus	Primary Body Contact Recreation	46, 59, 85, 92, 108, 111, 133, 136, 140		
Escherichia coli*	***Primary Body Contact Recreation***	***46, 59, 85, 92, 108, 111, 133, 136, 140***		
Turbidity	FWP - Warm Water Aquatic Community	21, 46, 49, 87, 97, 108, 140		
OK620900010310_00	**Cottonwood Creek**	**6.26 MILES**	**5a**	**2021**
Cause of Impairment	Impaired Use	Unconfirmed Potential Sources		
Fecal Coliform	Primary Body Contact Recreation	85, 140		
Oxygen, Dissolved	FWP - Warm Water Aquatic Community	46, 85, 87, 108, 140		
Escherichia coli	Primary Body Contact Recreation	85, 140		
Enterococcus	Primary Body Contact Recreation	85, 140		
OK620900020020_00	**Salt Creek**	**14.71 MILES**	**5a**	**2018**
Cause of Impairment	Impaired Use	Unconfirmed Potential Sources		
Escherichia coli	Primary Body Contact Recreation	46, 92, 108, 136, 140		
Enterococcus	Primary Body Contact Recreation	46, 92, 108, 136, 140		

Watershed Management

- TMDL
  - Gather data
  - Analyze to verify impairments
  - Conduct modeling to determine load reductions to meet standards
  - Set percent reduction targets

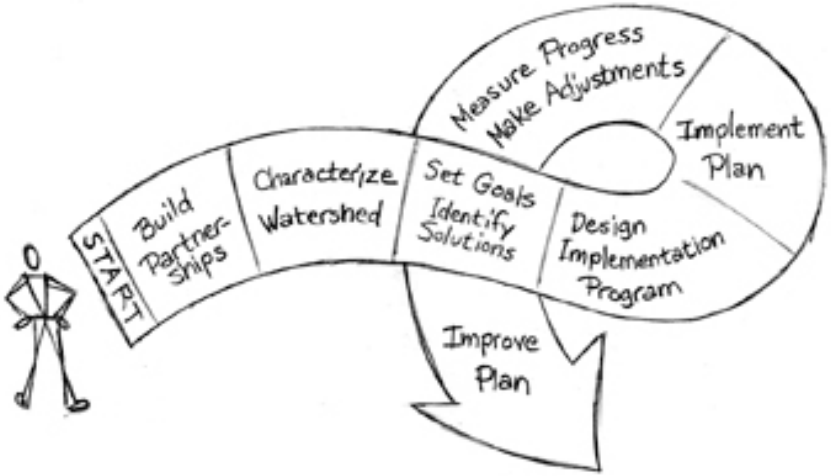

TMDL Development for Lakes Eucha and Spavinaw in Oklahoma

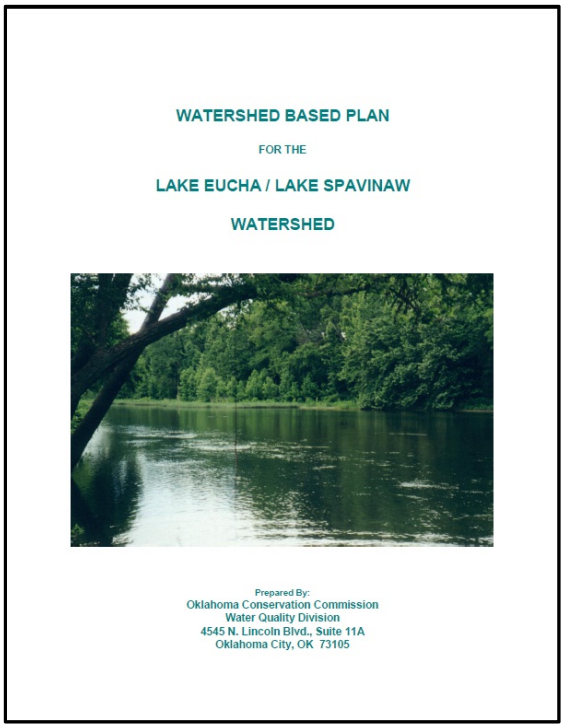
Final
September, 2009

United States Environmental Protection Agency Region 6
and
Oklahoma Department of Environmental Quality

Watershed Management

- Planning/Implementation
  - Plan efforts as necessary



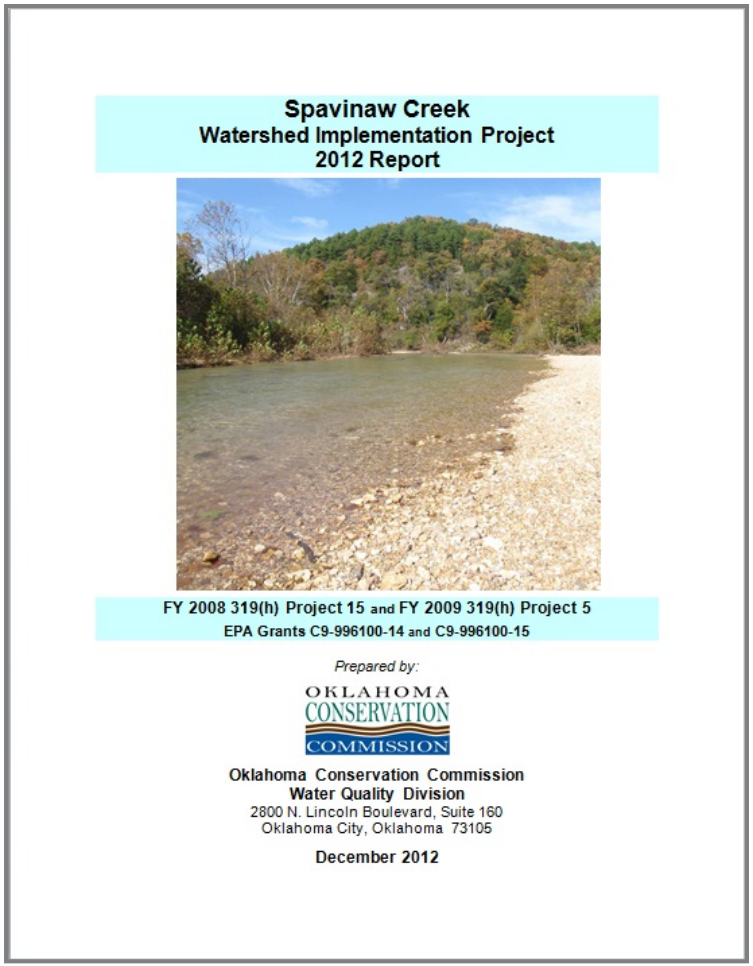


  - Conduct implementation (leverage programs)

Watershed Management

- Programs
  - Technical Assistance
    - OCC, NRCS, Cons. Districts
  - Financial Assistance
    - OCC - 319 Watershed Projects
      - Locally Led Cost Share
    - NRCS- Environmental Quality Incentive Program (EQIP)
      - Conservation Stewardship Program (CSP)
      - Emergency Recovery Program (EWP)
      - National Water Quality Initiative (NWQI)
    - OERB- abandon oil and gas well restoration

Examples


Spavinaw Creek
Watershed Implementation Project
2012 Report

FY 2008 319(h) Project 15 and FY 2009 319(h) Project 5
EPA Grants C9-996100-14 and C9-996100-15

Prepared by:

OKLAHOMA CONSERVATION COMMISSION

Oklahoma Conservation Commission
Water Quality Division
2800 N. Lincoln Boulevard, Suite 160
Oklahoma City, Oklahoma 73105

December 2012

2003 to 2012:

- Approximately $5 million in BMPs implemented in Spav watershed (40% from landowners)
- Data collected from paired watershed (control/treatment) autosamplers indicates positive WQ trends:
  - 37% reduction in expected total phosphorus load
  - 64% reduction in expected orthophosphorus load
  - 46% reduction in expected nitrate load
  - Reduced bacteria levels

Examples

Honey Creek
Watershed Implementation Project
Final Report

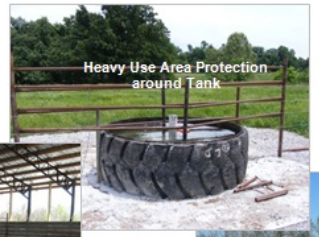
FY 2006 §319(h), EPA Grant # C9-996100-13, Project 9, Task 9.5.5
FY 2007 §319(h), EPA Grant # C9-996100-14, Project 5, Task 5.5

Prepared by:

OKLAHOMA CONSERVATION COMMISSION

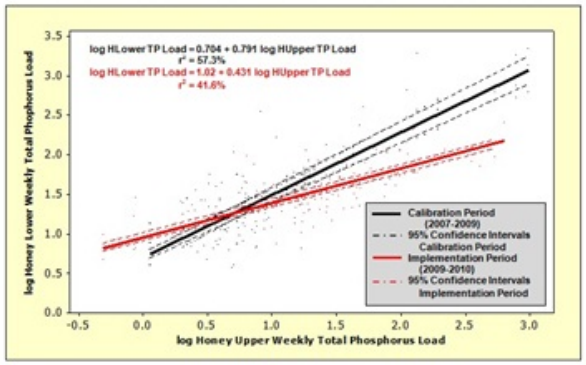
Oklahoma Conservation Commission
Water Quality Division
4545 N. Lincoln Boulevard, Suite 11A
Oklahoma City, Oklahoma 73105

October 2011



Some of the BMPs installed on the Demonstration Farm

- Total phosphorus loads



Source	df	MS	F	p
Regression	3	7.69	63.57	0.000
Residual Error	167	0.12		
log HU TP load (overall)	1	18.37	151.86	0.000
periodn (intercept)	1	0.87	7.21	0.008
int log HU TP load (slope)	1	1.77	14.62	0.000

Mean values by period and watershed.

	Weekly Load (lbs)
Calibration	
HC Upper (monitored)	33.6
HC Lower (monitored)	96.3
Treatment	
HC Upper (monitored)	39.5
HC Lower (monitored)	59.1
Predicted (modeled)	78.3
% difference (7% min. detectable)	-24.5%

OKLAHOMA CONSERVATION COMMISSION

NRCS Natural Resources Conservation Service

Oklahoma's nationally recognized Water Quality successes can be viewed at

http://www.epa.gov/nps/success/

"…delusion is the solution to pollution"

as quoted from *Water Controversy Still Simmering* (The Oklahoman, September 20, 2004)