



Improving Watershed Health through Agricultural-Municipal Partnerships Webinar

July 15, 2021

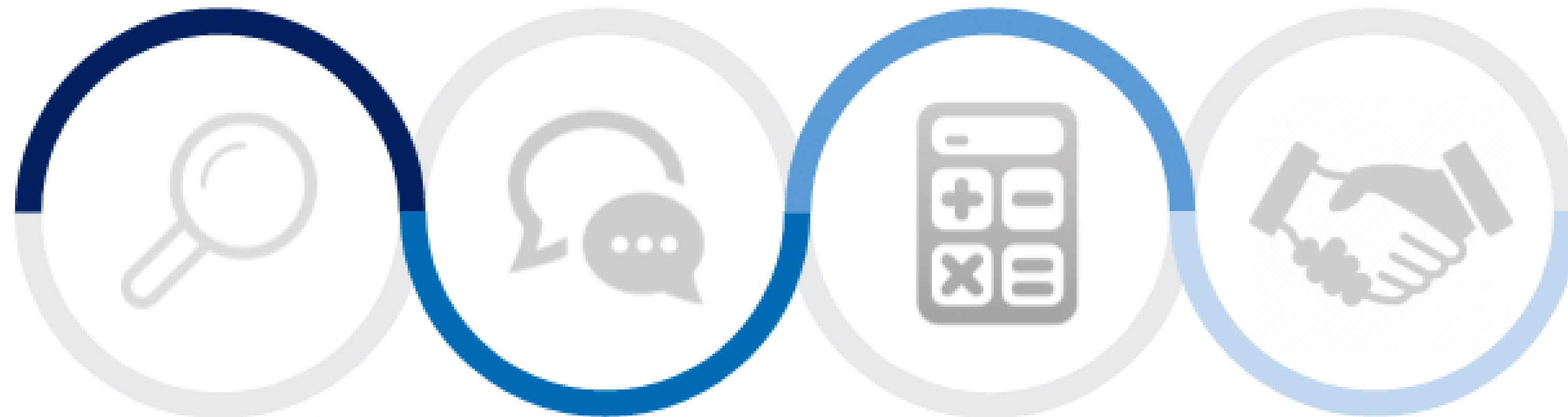


This webinar is sponsored by EPA's Office of Wastewater Management.

The opinions expressed in this webinar are those of the guest speaker(s). They do not reflect EPA policy, endorsement, or action, and EPA does not verify the accuracy or science of the contents of the presentation.

WATER INFRASTRUCTURE AND RESILIENCY FINANCE CENTER

EPA's Water Finance Center provides information that can be used to make **drinking water, wastewater, and stormwater** infrastructure decisions.



Research

Advise

Innovate

Network

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

AGENDA

July 15, 2021

1

Welcome, Agenda Overview, and Zoom Logistics

Speakers

- **Haley Falconer**, Environmental Division Senior Manager, City of Boise
- **Sarah Hippensteel, Ph.D.**, Manager of Watershed Partnerships, Miami Conservancy District
- **Ron W. Graber**, Central Kansas Watershed Specialist, Kansas Center for Agricultural Resources and the Environment

2

3

Today's webinar will be recorded and made available on the EPA website at a later date.

Questions and Answers

Zoom Controls



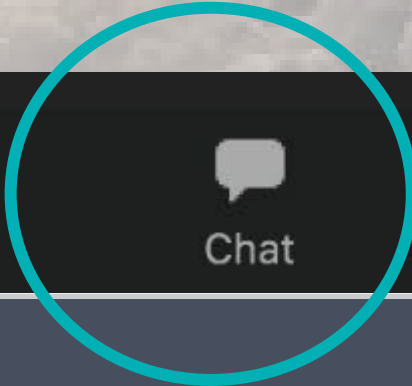
The Zoom menu bar appears at the bottom of the Zoom window once the meeting begins.

If you don't see the menu bar, move your mouse slightly and the bar will appear.

Please **chat** the host if you have any technical questions.

Please use the **Q&A window** to ask questions of the presenters.

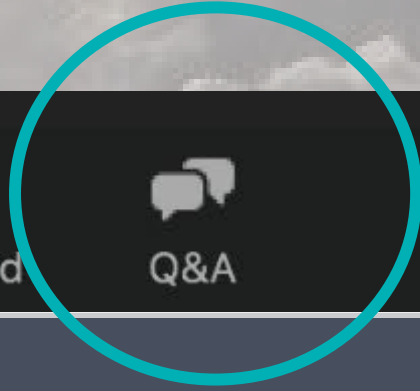
Audio Settings ^



Chat



Raise Hand



Q&A

Leave

Panelists



Haley Falconer

Environmental Division Senior Manager, City of Boise



Sarah Hippensteel, Ph.D.

Manager of Watershed Partnerships, Miami Conservancy District



Ron W. Graber

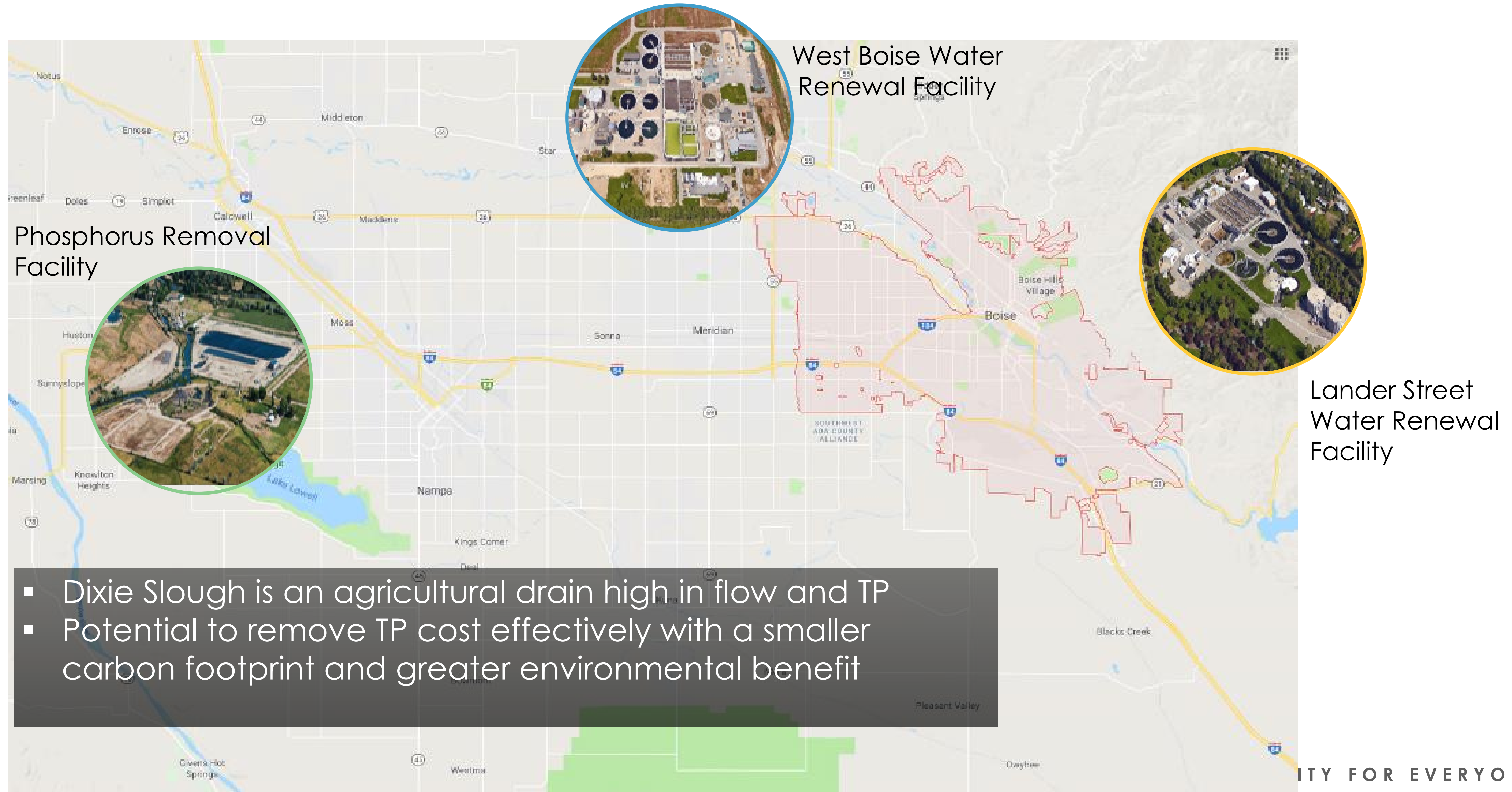
Central Kansas Watershed Specialist, Kansas Center for Agricultural Resources and the Environment



BOISE'S AG PHOSPHORUS REMOVAL FACILITY

Haley Falconer, P.E. | Environmental Division Sr Manager, hfalconer@cityofboise.org

HOW DO WE TREAT THE WATER WE USE?



CITY OF BOISE PHOSPHORUS REMOVAL STRATEGY





Parma

Notus

Middleton

Star

Eagle

Wilder

Greenleaf

Caldwell

Snake River

Meridian

Garden City

Boise

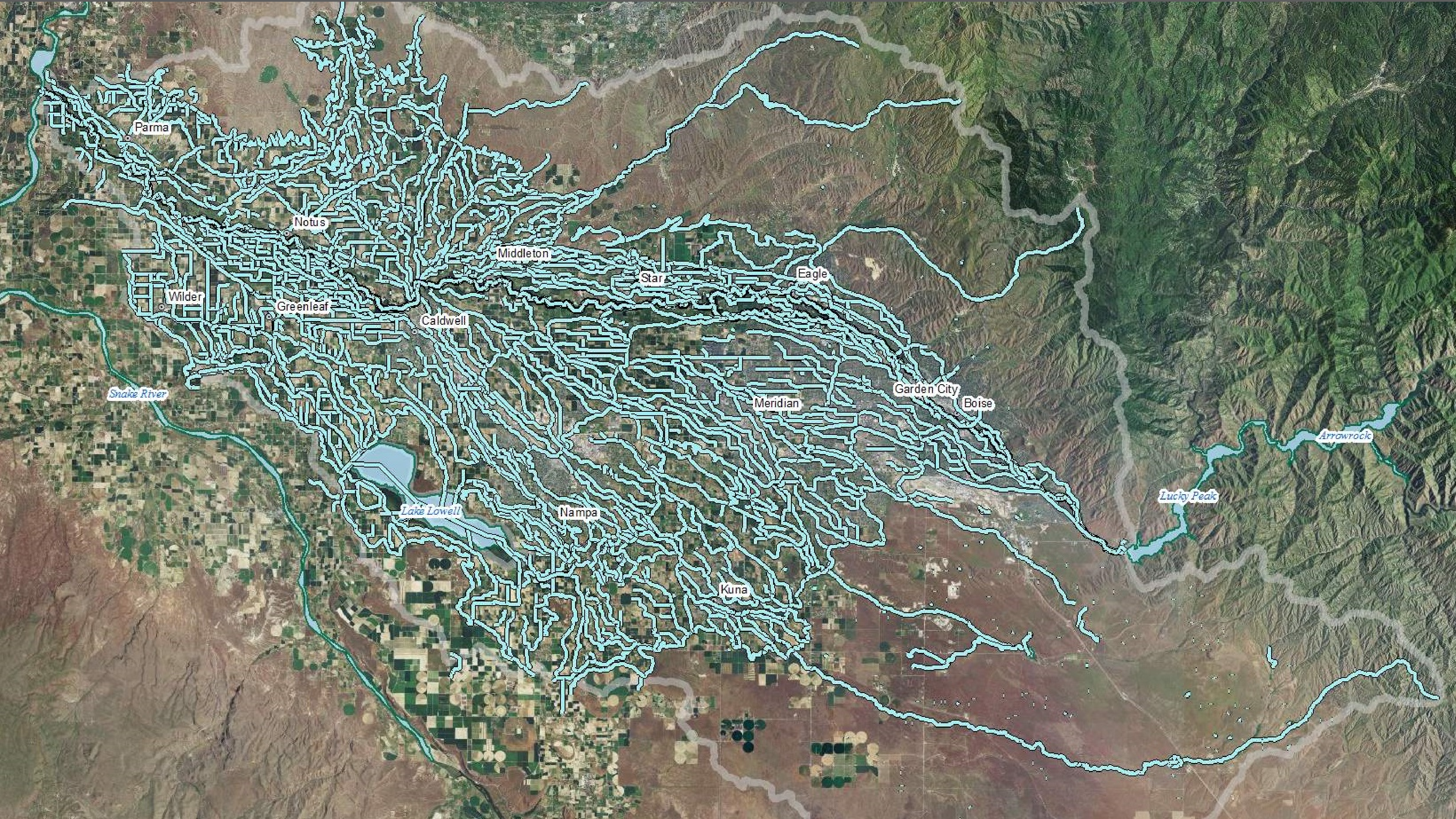
Arrowrock

Lake Lowell

Nampa

Lucky Peak

Kuna



Parma

Notus

Middleton

Star

Eagle

Wilder

Greenleaf

Caldwell

Meridian

Garden City

Boise

Snake River

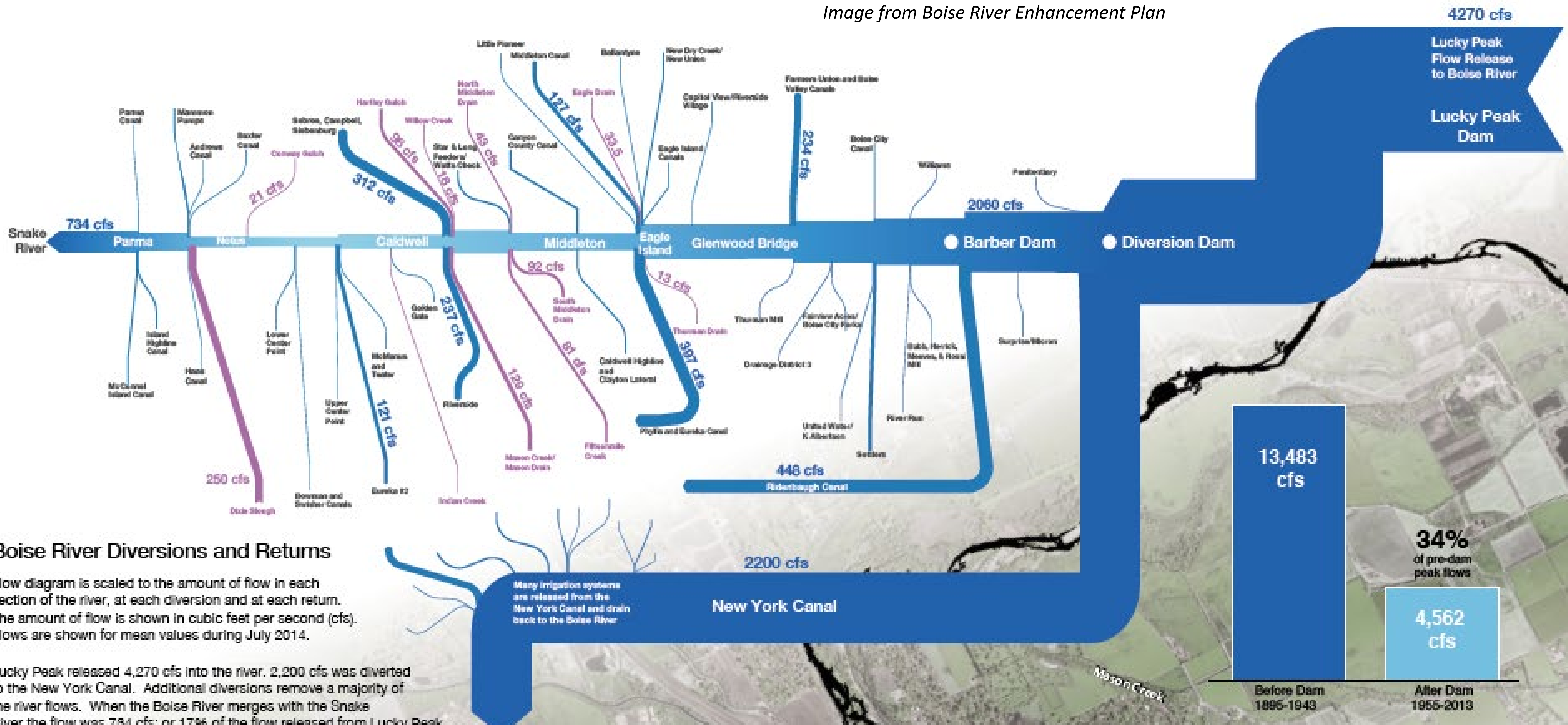
Arrowrock

Lake Lowell

Nampa

Kuna

Lucky Peak



Boise River Diversions and Returns

Flow diagram is scaled to the amount of flow in each section of the river, at each diversion and at each return. The amount of flow is shown in cubic feet per second (cfs). Flows are shown for mean values during July 2014.

Lucky Peak released 4,270 cfs into the river. 2,200 cfs was diverted to the New York Canal. Additional diversions remove a majority of the river flows. When the Boise River merges with the Snake River the flow was 784 cfs; or 17% of the flow released from Lucky Peak.

76 diversions, 16 returns

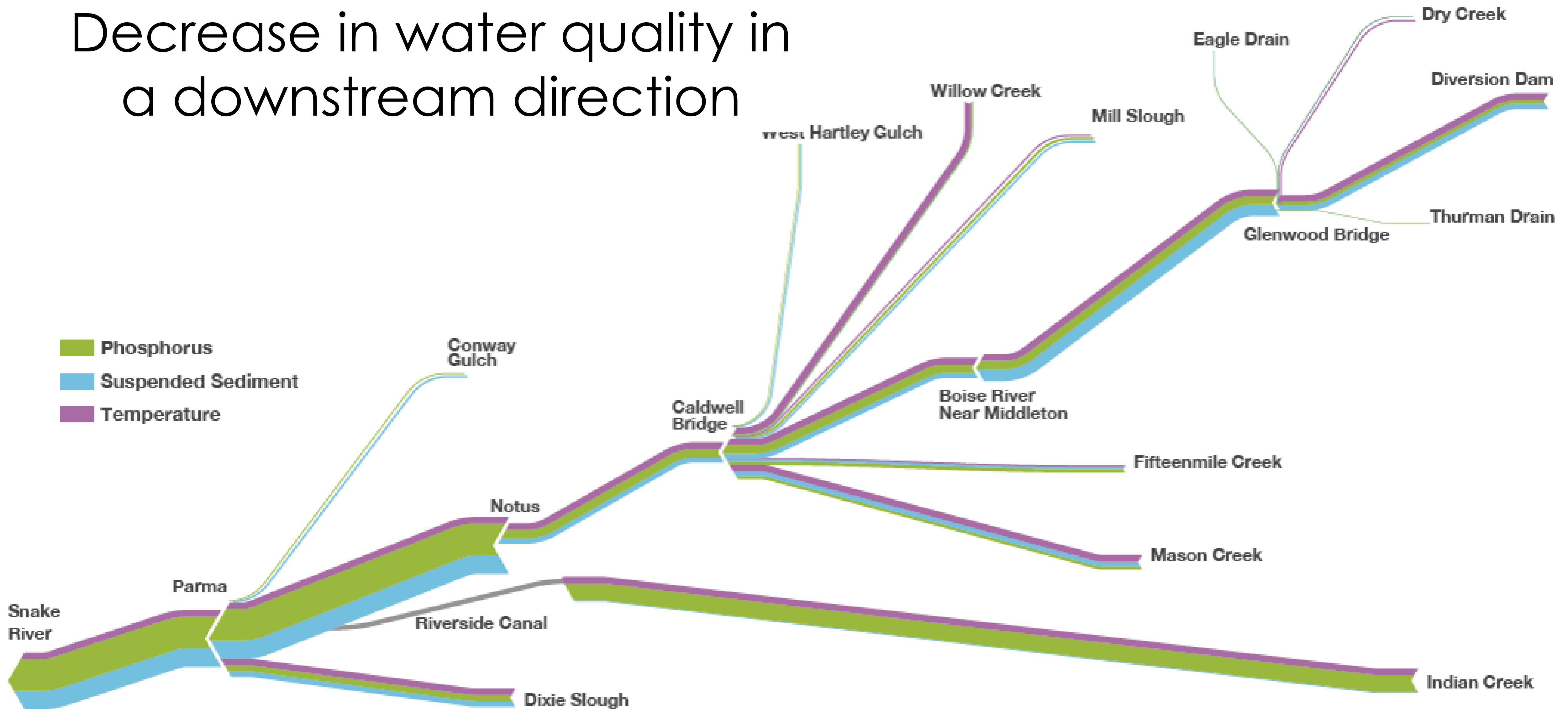
← FLOW cfs ← RETURN cfs

Mean Peak Flow in Boise River Before and After Lucky Peak Dam

(Data from Susan Stacy "As the River Rises" and USGS.)

Image from Boise River Enhancement Plan

Decrease in water quality in a downstream direction



PROJECT DRIVERS

- Snake River Hells Canyon TMDL – 0.07 mg/L TP at Parma
- NPDES permits issued in 2012 contained final effluent total phosphorus limits of 0.07 mg/L.
 - 10 year schedule of compliance
- Lower Boise River Total Phosphorus TMDL
- Cash Flow

LEADERSHIP & PARTNERSHIPS

- City
- EPA & IDEQ
- Idaho Conservation League
- Idaho Congressional Delegation

Everyone agreed on the better water quality outcome – then it was a matter of figuring out a path to get there



NPDES PERMIT

- Issued May 2012 with reopener clause
- Modification September 2012 to allow Dixie Drain TP Offset on West Boise Permit
- 1.5:1 Trading Ratio

TABLE 2A – Total Phosphorus Effluent Limitations at West Boise Wastewater Treatment Facility May 1 through September 30 with the Dixie Drain Offset (in µg/L)¹

Average Monthly Effluent Flow:		Average Monthly Flow in South Channel of Boise River ² :				
		≥ 340 cfs	≥ 310 cfs, but < 340 cfs	≥ 280 cfs, but < 310 cfs	≥ 250 cfs, but < 280 cfs	< 250 cfs
≤ 26 mgd	AML	350	350	350	350	343
	AWL	702	702	702	702	689
> 26 mgd, but ≤ 28 mgd	AML	350	350	350	350	324
	AWL	702	702	702	702	650
> 28 mgd, but ≤ 30 mgd	AML	350	350	350	339	307
	AWL	702	702	702	681	616
> 30 mgd, but ≤ 32 mgd	AML	350	350	350	322	292
	AWL	702	702	702	647	586
> 32 mgd, but ≤ 34 mgd	AML	350	350	336	308	279
	AWL	702	702	674	617	560
> 34 mgd, but ≤ 36 mgd	AML	350	348	321	294	267
	AWL	702	699	645	591	537
> 36 mgd, but ≤ 38 mgd	AML	350	334	308	283	257
	AWL	702	669	618	567	516
> 38 mgd	AML	350	327	302	277	252
	AWL	702	656	606	556	506

AML = Average Monthly Limit
AWL = Average Weekly Limit

¹This effluent limit table is based upon the total assimilative capacity of the south channel of the Boise River but does not reserve this total assimilative capacity to this facility. This table may be re-opened and modified upon either completion of an EPA approved total phosphorus TMDL of the lower Boise River or approval of NPDES permit(s) for other discharger(s) which impact the assimilative capacity of total phosphorus in the south channel of the Boise River.

² The average monthly flow must be calculated based on continuous flow monitoring in the south channel of the Boise River.

WATER RIGHTS FOR NON-CONSUMPTIVE USE



- Summer Water Right
 - Water quality beneficial use
 - 200 cfs, 70% TP removal efficiency
 - April through October
- Winter Water Right
 - Water quality beneficial use
 - 200 cfs, 40% TP removal
 - October through April



Diversion and
Screening

Intake Pumping

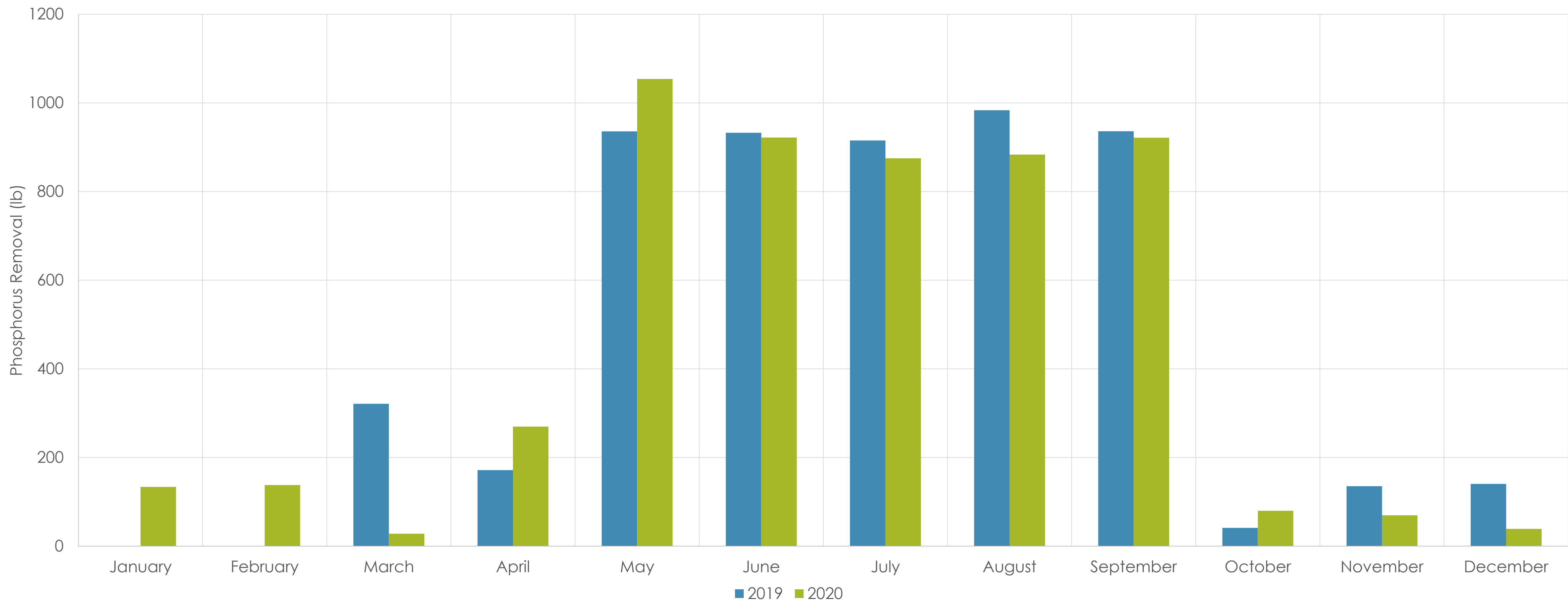
Flash Mix
Facility

Sedimentation Basin

Settling
Pond

Outlet
Structure

PHOSPHORUS REMOVAL



THANK YOU

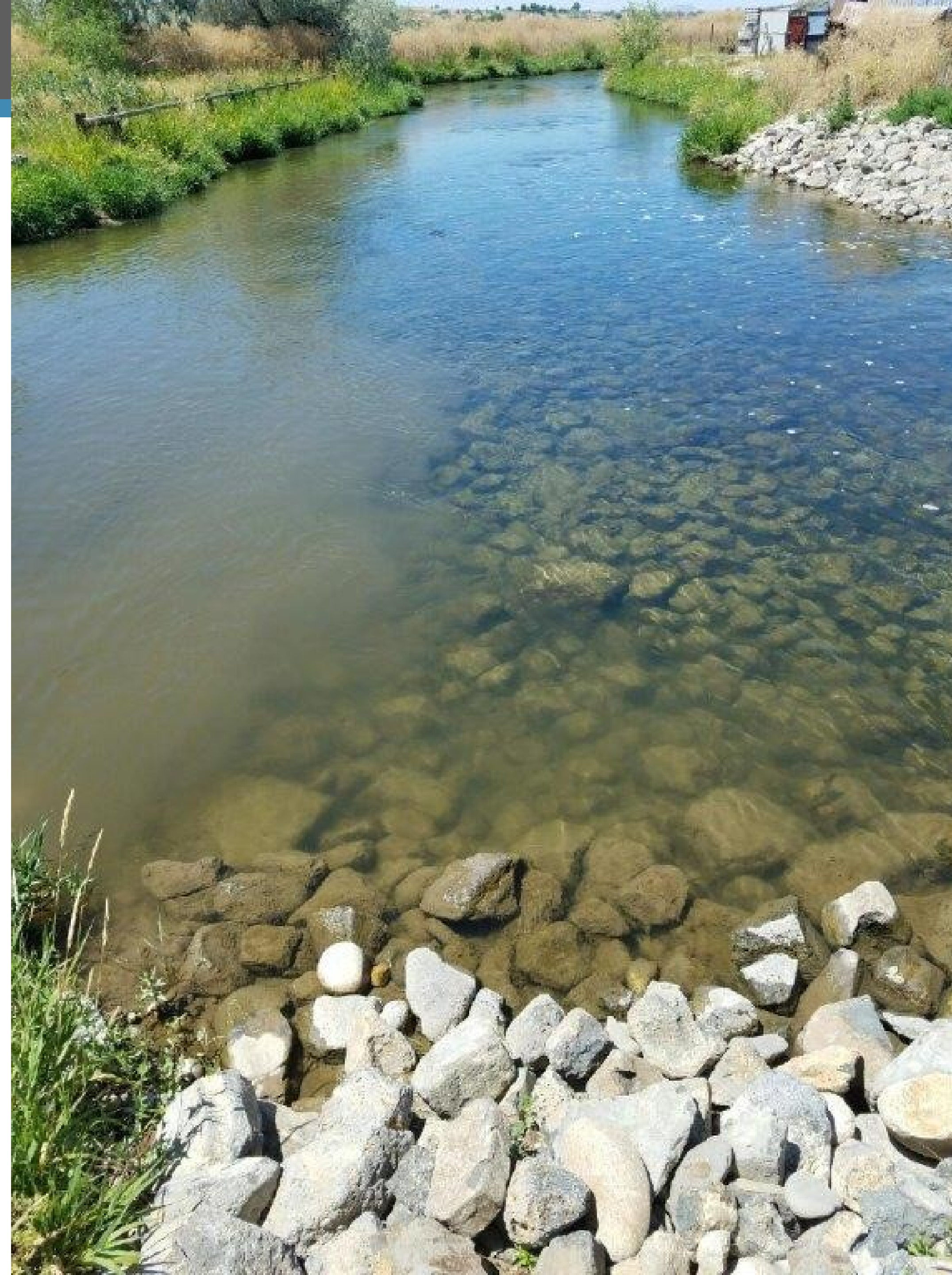
Haley Falconer

City of Boise

hfalconer@cityofboise.org



[Watch: City of Boise - Dixie Drain](#)





Nutrient Pollution in the Great Miami River

Presented By: Sarah Hippensteel Hall, PhD
July 15, 2021

PROTECTING. PRESERVING. PROMOTING.



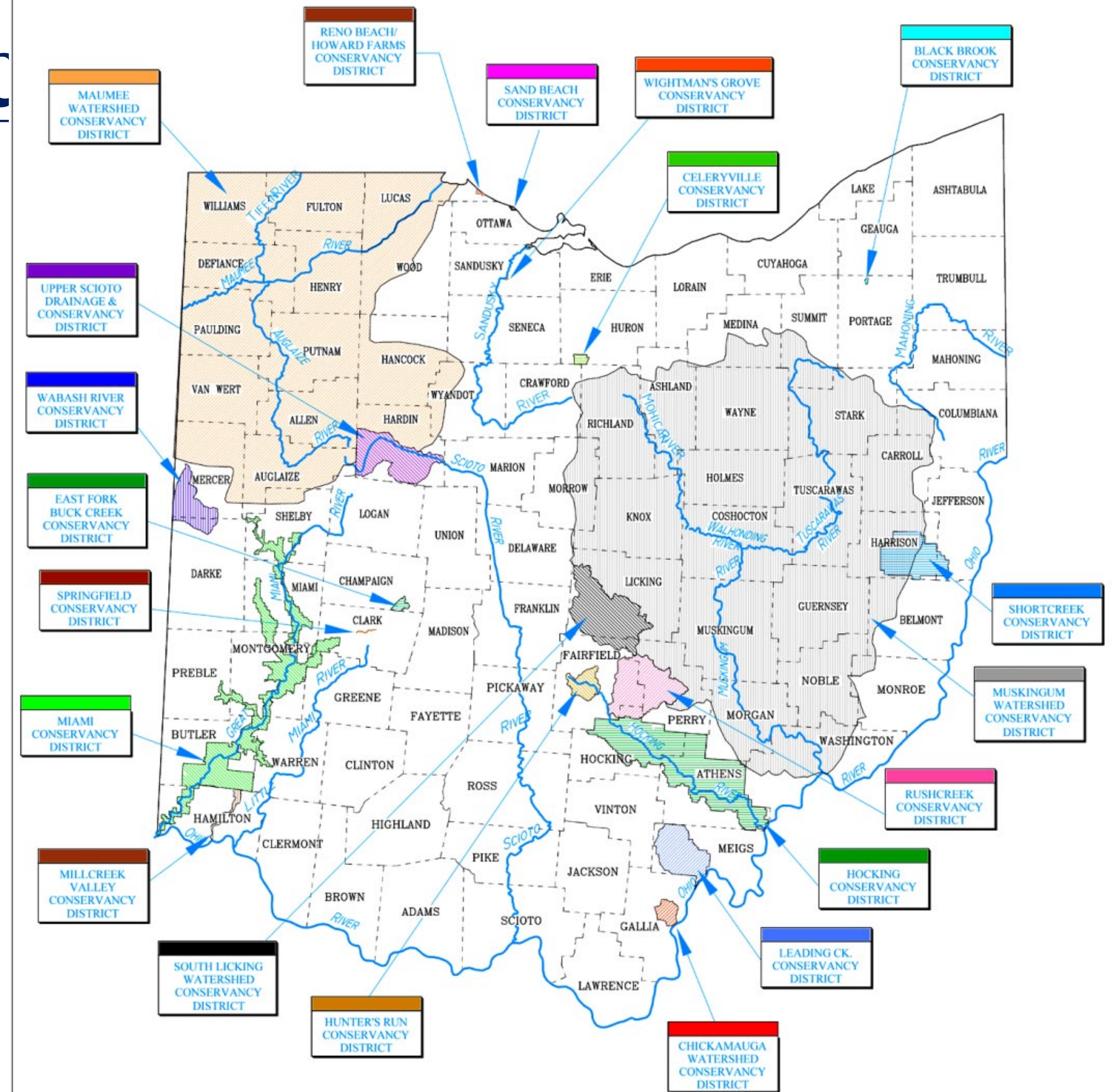
Miami Conservancy District

- Watershed-based regional agency
- Flood Protection
- Water Stewardship
- River Recreation



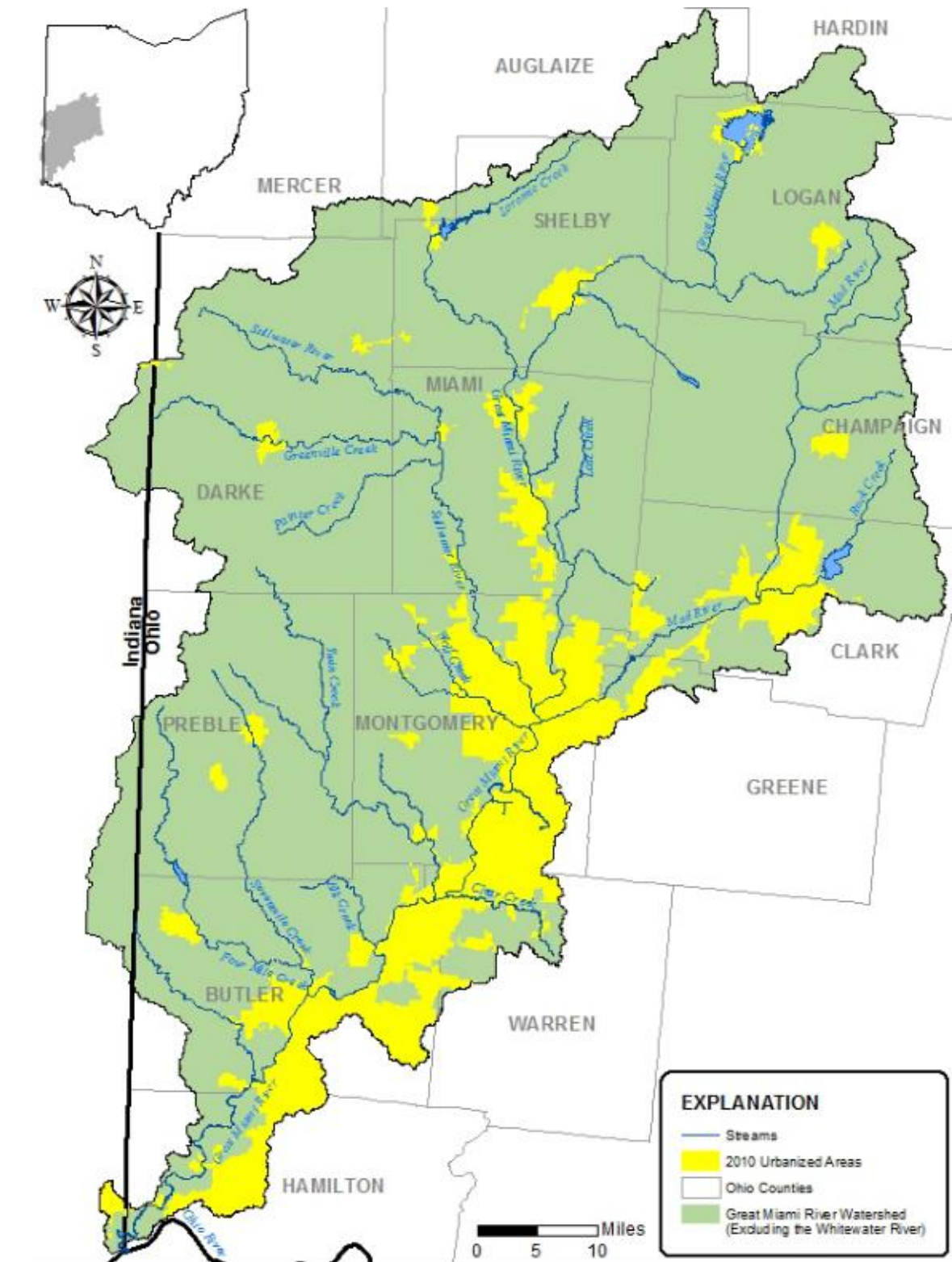
Ohio Conservancy Act

- Signed into law in 1914 by Governor James Cox
- Watershed-based political subdivision
- Broad authority primarily for water-related purposes



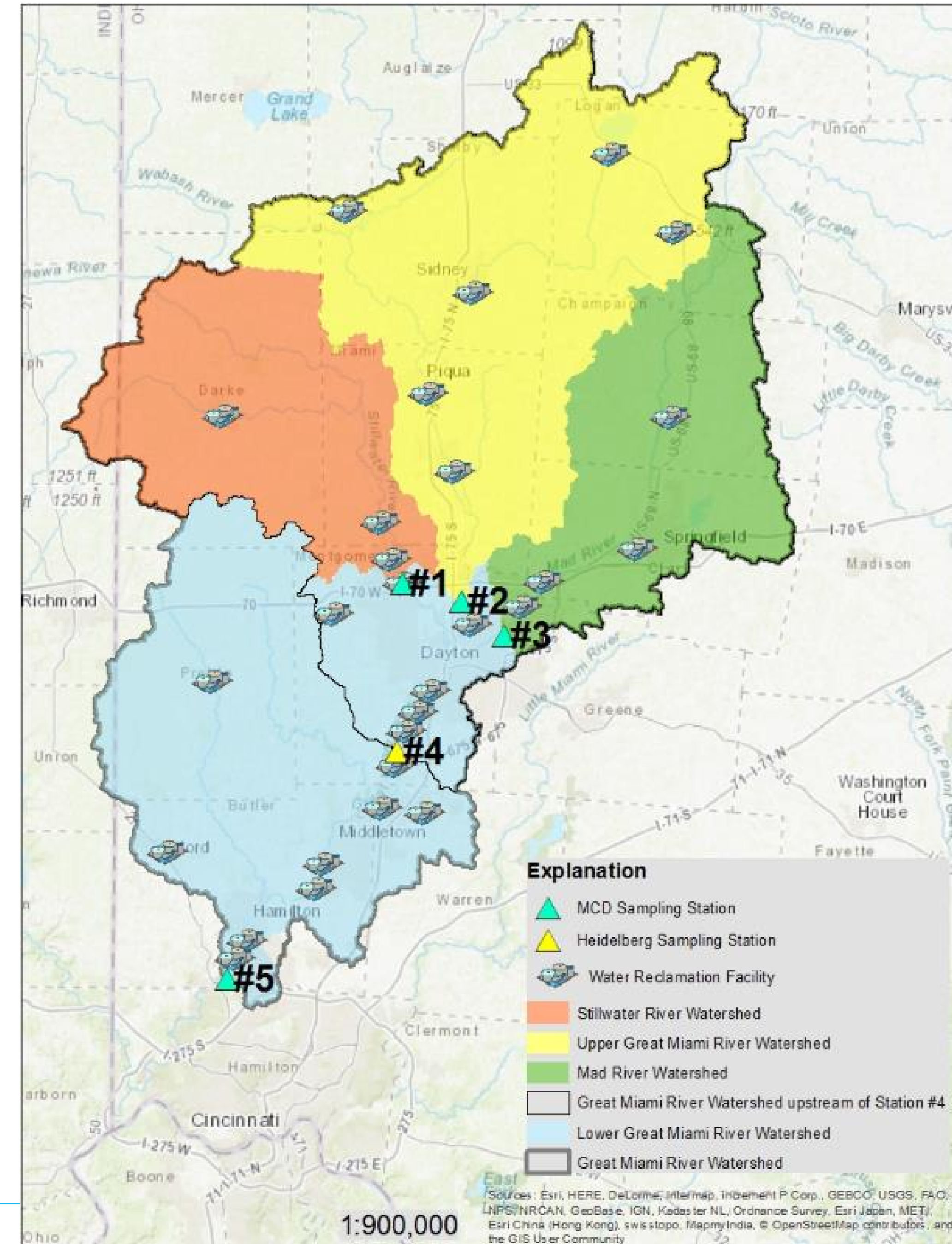
Ohio's Great Miami River Watershed

- 6500 miles of rivers and streams
 - Some of Ohio's healthiest
- 1.5 trillion gallons of groundwater
 - Buried Valley Aquifer
- 1.4 million residents
 - Drinking water for 2.3 million people
- More than 70% of land is in agriculture



Nutrient Conditions

- Exports 20,000+ metric tons of nitrogen
- Exports 1,700+ metric tons of phosphorus
- Nutrient loads are highly dependent upon the amount and timing of runoff
- Concentrations of TP increase from upstream to downstream
- Mean annual TN and TP yields rank among the highest nutrient yields in the Midwest



USGS rankings

For 818 subwatersheds (HUC8s) of the Gulf of Mexico

Watershed	Total Nitrogen	Total Phosphorus
Upper Great Miami	27th	289th
Lower Great Miami	31st	58th

From:
Supplement to Robertson et. al., 2009
Journal of the American Water Resources Association

Partners in program development

- **More than 100 meetings – 2003/2005**
 - Cities/counties with WWTPs
 - County soil and water conservation districts (SWCDs)
 - Agricultural producers
 - Ohio EPA and USEPA
 - Ohio Department of Natural Resources
 - Ohio Farm Bureau Federation
 - Chambers of commerce
 - USDA's Natural Resource Conservation Service
 - Ohio Environmental Council

What is a “credit”

- A pound of phosphorus or pound of nitrogen prevented from being discharged.
- **New** agricultural practices - **YES**
- Agricultural practices under contract with state & federal conservation incentive programs - **NO**
- Any other required agricultural practice - **NO**



Trading Program driver

- Pending statewide regulation
- Nutrient criteria
- Consistent with other policies
 - Watershed based permitting
 - TMDLs
 - Headwater habitat
 - Nonpoint source

Ohio | Environmental
Protection Agency
John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

November 15, 2011

Tinka Hyde, Director
Water Division (W-15J)
U.S. EPA Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604-3507

Dear Ms. Hyde:

I am pleased to transmit herein a document entitled *Nutrient Reduction Strategy Framework for Ohio Waters – DRAFT*.

Ohio EPA Division of Surface water staff have worked in collaboration with John Kessler, Ohio Department of Natural Resources, and Kevin Elder, Ohio Department Agricultural, to compile this framework on what we know about water quality problems in Ohio caused by nutrients, what we think needs to be done in very broad terms, and how we as a State intend to develop specific implementation strategies that will reduce nutrient loadings and bring about water quality improvements.

If you have any questions, please contact Dan Dudley at (614) 644-2876 or via email at dan.dudley@epa.state.oh.us. I look forward to your review of this framework.

Sincerely,



George Elmaraghy, P.E., Chief
Division of Surface Water

Enclosure

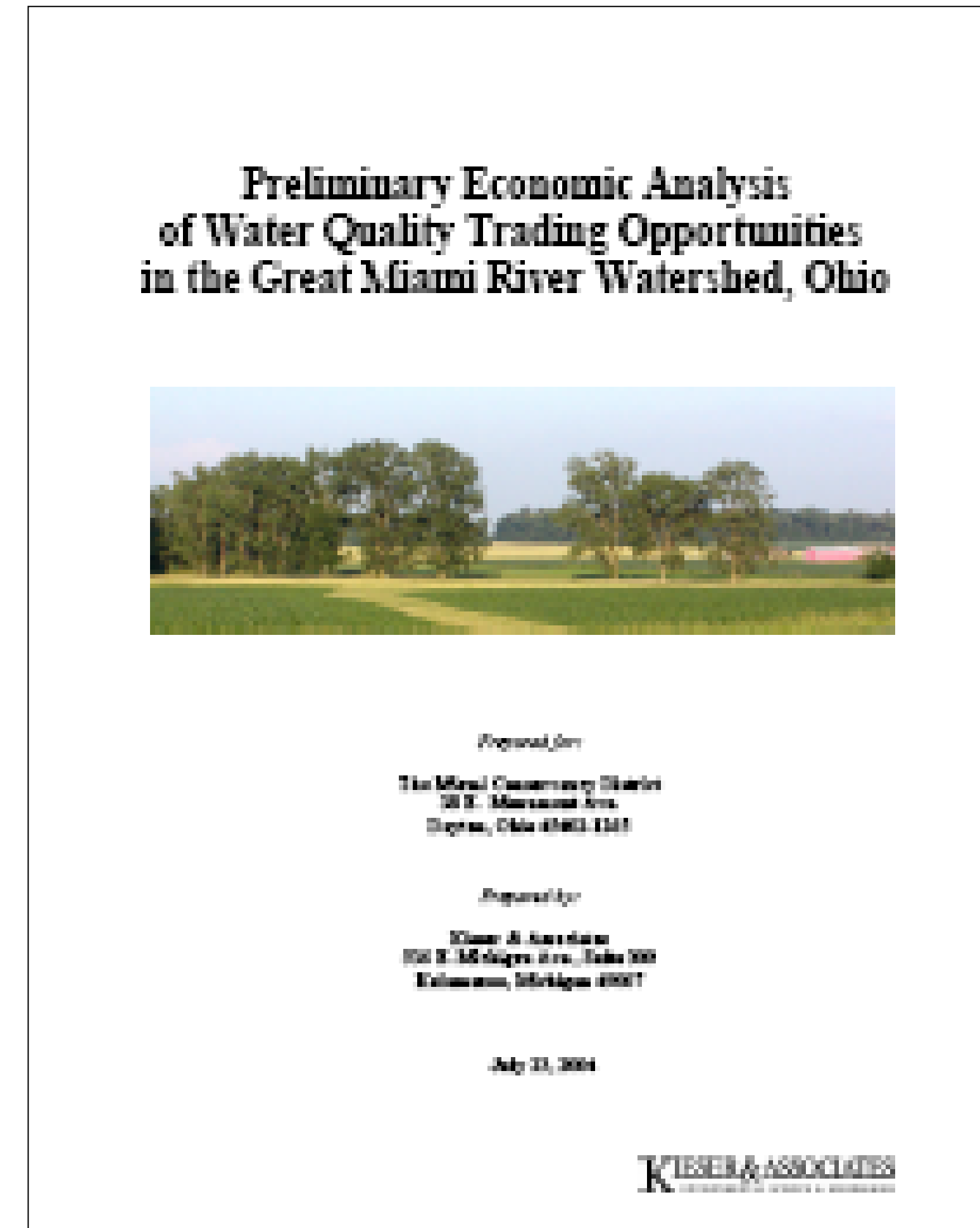
cc: Tim Henry, U.S. EPA Region 5
Tom Davenport, U.S. EPA Region 5
John Kessler, Ohio Department of Natural Resources
Kevin Elder, Ohio Department of Agriculture
Russ Gibson, Division of Surface Water
Dan Dudley, Division of Surface Water

50 West Town Street, Suite 700
P.O. Box 1049
Columbus, OH 43216-1049

614 | 644 3020
614 | 644 3184 (fax)
www.epa.ohio.gov

Are there enough buyers, sellers, and a commodity?

- WWTP upgrades = \$422.5 M
- Trading = \$46.5 M
 - Ag. practices = \$37.8 M
 - Data collection & transaction costs = \$8.7 M
- Citizens save \$376 M
- Better environmental results!



Better environmental results

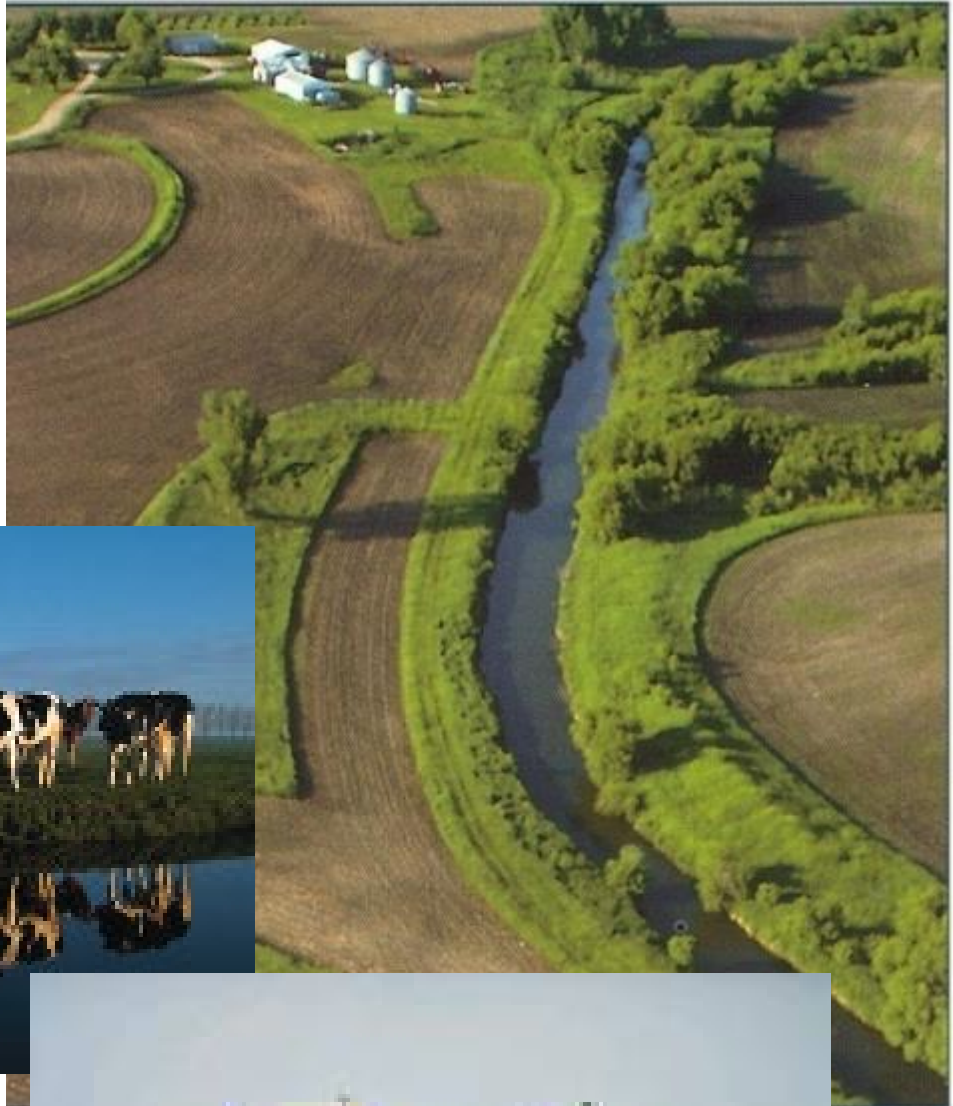
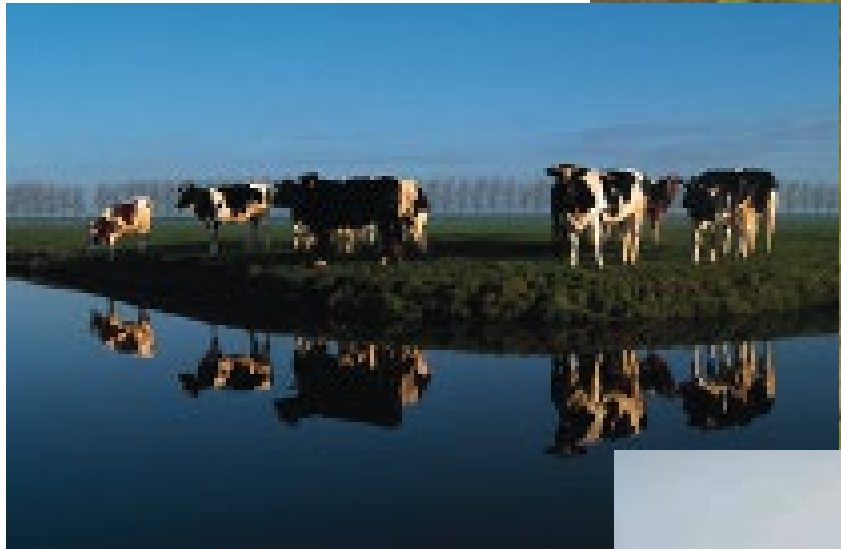
	WWTP Upgrade	Ag. Practices
Pollutant of concern	Yes	Yes
Other pollutants reduced	?	Yes
Habitat created	No	Yes
Canopy/shade/cooling provided	No	Yes
Stream bank stability enhanced	No	Yes
Flow velocity decreased	No	Yes
Wetlands created	No	Yes
Floodplains protected	No	Yes
Assimilative capacity increased	No	Yes
Energy/GHG benefited	No	Yes

Program features

- Build on strengths
 - SWCDs relationship with Ag producers
- Minimize new bureaucracy
 - Utilize existing knowledge and
- Avoids hot spots
 - All trades upstream
- Incentive for early participants
- Quantify using Region 5 Load Reduction Spreadsheet
- Insurance pool of credits



OhioEPA



County SWCDs



Founding Investor's Group

- City of Dayton
- Butler County
- Tri-Cities (Huber Heights, Vandalia, and Tipp City)
- Englewood
- Union



How are projects selected?

- Competitive = most pounds for least cost
- Project Advisory Group
 - Wastewater Treatment Plant
 - Agricultural Producer
 - Ohio Water Environment Association
 - Ohio Farm Bureau Federation
 - County Soil and Water Conservation District
 - Ohio Department of Natural Resources
 - United States Department of Agriculture
 - Certified Crop Advisor

BMPs on-the-ground

- ✓ Cover Crops
- ✓ Tillage
- ✓ Rotation
- ✓ Cover crops
- ✓ Milk house/cow lot
- ✓ Pasture seeding/prescribed grazing
- ✓ Sod
- ✓ Hayland
- ✓ Manure storage
- ✓ Filter strips
- ✓ Grid sampling/VRT

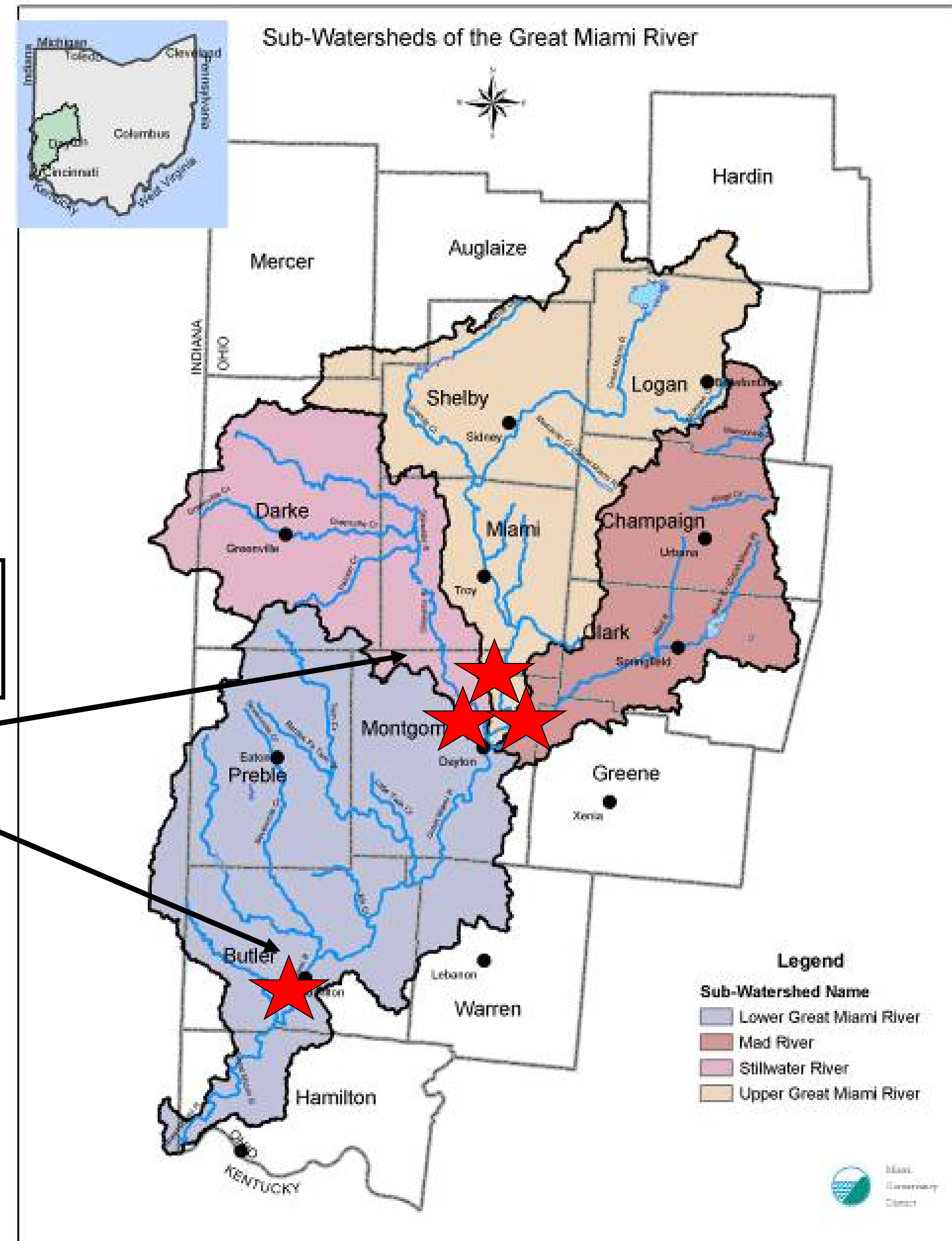


MCD's role

- Collect water quality data
- Issue RFPs
- Facilitate stakeholder review of proposed projects
- Contract with SWCDs for projects
- Manage credits
 - Allocate to WWTPs
 - Maintain Insurance Pool
- Serve as liaison
- Promote the trading market

How will we know it's working?

Continuous flow and nutrient monitoring



Years 1-7

- Pre-compliance phase
 - \$1,200,000 WWTPs
 - \$ 500,000 Non-Federal
 - \$ 937,000 USDA/NRCS
 - \$ 753,900 USEPA
- \$3,390,900**

Founding Investor's Group



Project status

- 11 reverse auctions (“rounds”)
- Projects = 397
- Nutrient reductions > 572 tons
- Payment total = \$1.697 million
- Cost < \$1.48 per lb.



And now?



shippensteel@MCDwater.org

@sarahhippensteel

@MCDWater

@greatmiamiriverway





#MCDHereForYou

WWW.MCDWATER.ORG

Bringing Urban and Rural Communities Together to Improve Water Quality

Ron Graber

**Kansas Center for Agricultural Resources and the Environment
K-State Research & Extension**

July 15, 2021



KCARE
Kansas Center for Agricultural
Resources and the Environment

K-STATE
Research and Extension

Water quality is a big challenge, and requires partnerships to solve

Kansas State University

Watershed Restoration & Protection Strategy (WRAPS)

KS Dept of Health & Environment (KDHE)

Agricultural Players

Rural landowners

Farmers & ranchers

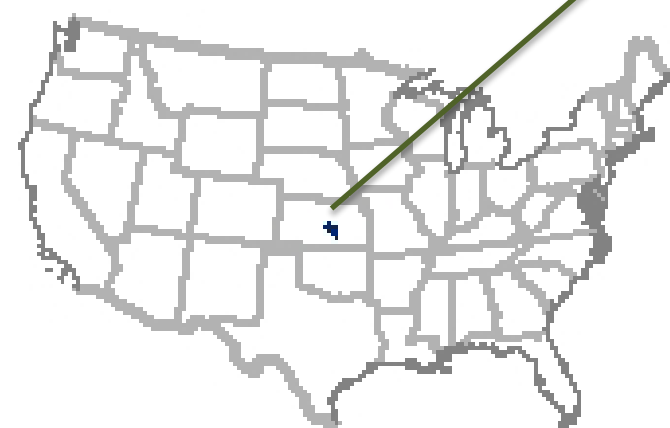
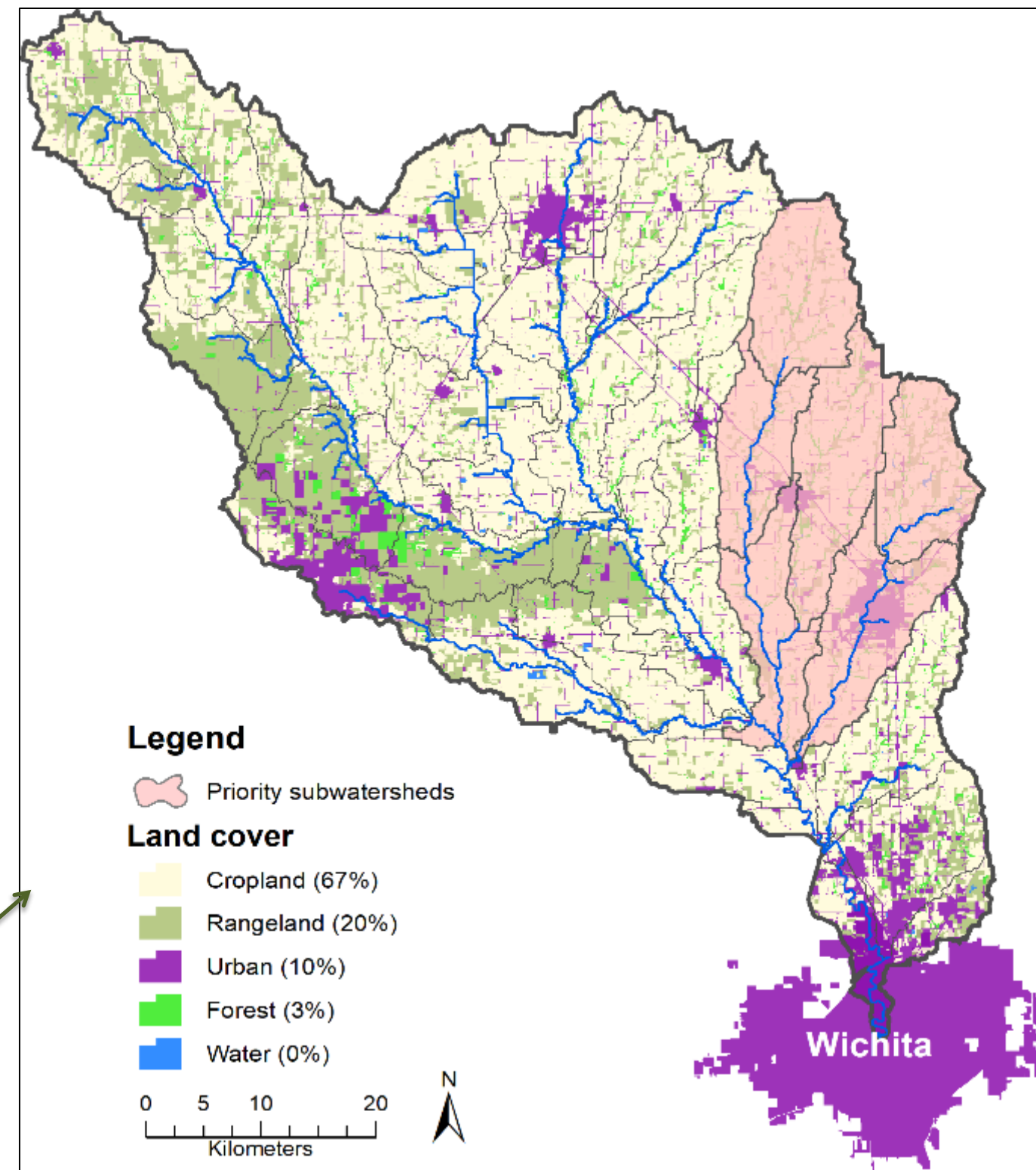
Urban players

City of Wichita

- Stormwater
- Drinking water
- Wastewater

Developers

Rate payers (citizens)



One water resource: the Little Arkansas River

- Drinking water source
- TMDL-regulated for sediment, bacteria, nutrients, pesticides

Two programs aimed to unify watershed management goals

1. Driven by drinking water quality concerns and treatment costs
 - Primary concern: *atrazine*
2. Driven by stormwater MS4 permit requirements
 - Primary concern: *sediment*





Two programs, similar bridge- building materials

- Education
- Local input
- Trust between partners
- Time





A to Z Topic Listing

- Watershed Management Home
- Local Environmental Protection Program (LEPP)
- Kansas Source Water Assessment Program (SWAP)
- Watershed Restoration and Protection Strategy (WRAPS)
- Section 401 Water Quality Certification
- Grant Application/Grant Management Information
- Watershed Condition Reports
- Planning, Management, & Reports
- Maps
- Water Quality Information and Resources
- Related Information
- Contact Us

Watershed Restoration And Protection Strategy



KANSAS wraps

A Watershed Restoration and Protection Strategy (WRAPS) is a planning and management framework intended to engage stakeholders in a process to:

- Identify watershed restoration and protection needs

- Little Ark WRAPS was completed in 2004
- Revised Plan Addressing EPA 9 Elements in 2011
- Revised Goals in 2016
- Revised Strategy in 2019
- Working with Little Ark producers since **2005** to implement water quality BMPs

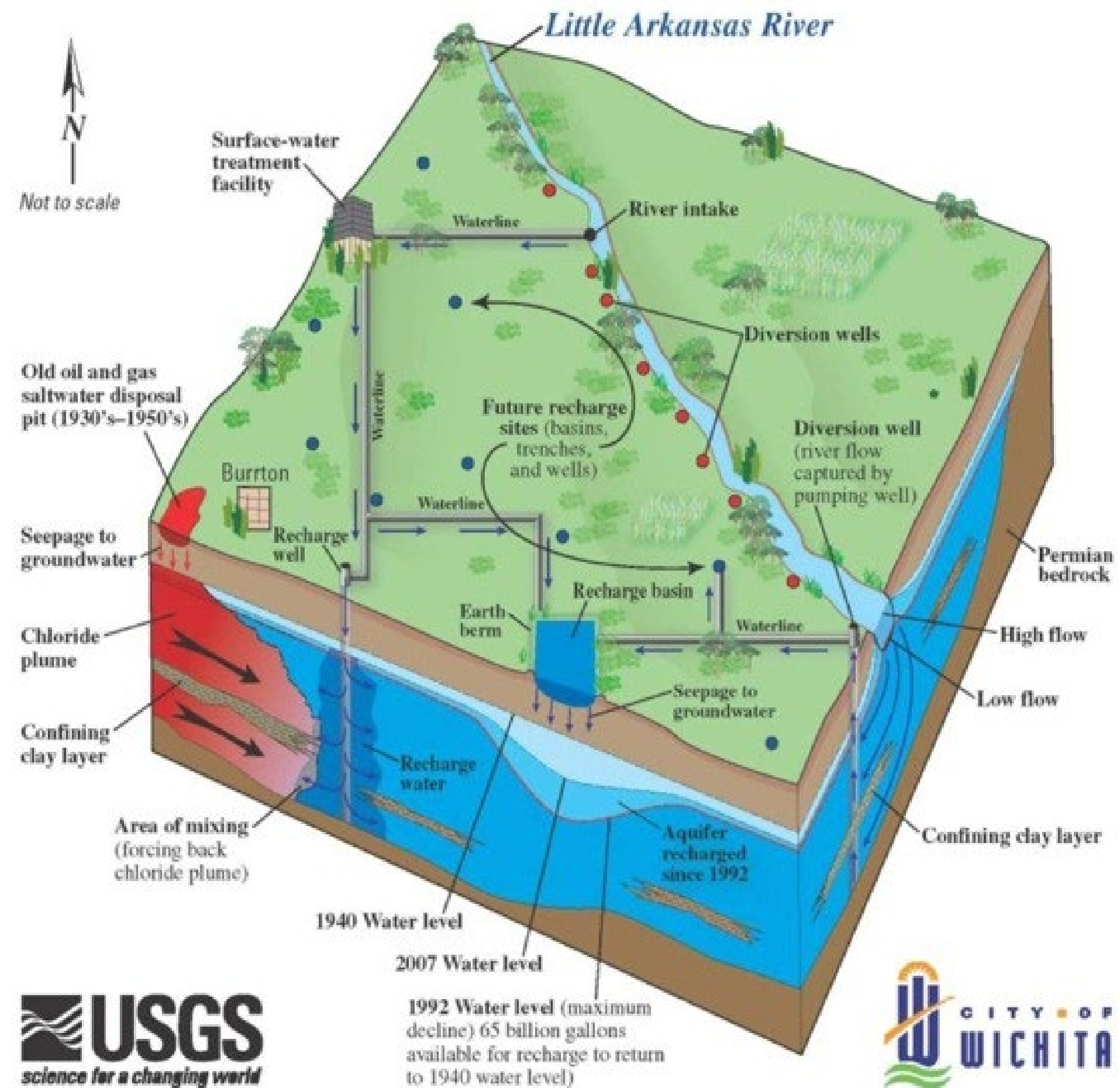
1. Development: Recruit stakeholders, determine local

- WRAPS 9-Element Watershed Plans



Urban and rural communities partnering to improve drinking water

Equus Beds Aquifer—Artificial Recharge Process



Atrazine removal from river	\$\$\$\$\$ \$\$\$
Atrazine runoff prevention	\$



Managing atrazine for drinking water quality

- Partnered with the city of Wichita to reduce atrazine runoff from corn and grain sorghum fields.
- Education and awareness campaign with growers, pesticide dealers and crop consultants.
- **Targeted watersheds** for rapid implementation of atrazine herbicide BMPs.
- Installation of a surface water quality monitoring system to evaluate the effectiveness of BMP's implemented.



Form Used To Calculate Incentive Payment

<u>Atrazine BMPs Utilized</u> (Check all that apply)	<u>Reduction in Runoff Factor</u>
Incorporate atrazine into the first 2 inches of soil prior to planting	.70
Apply atrazine in the fall or prior to April 15	.50
Apply atrazine as part of a postemergence premix	.60
Reduce soil-applied atrazine rates based on 1.6 lb ai/acre or less	--
Use split applications of atrazine, e.g. 2/3 prior to April 15 and 1/3 at planting	.25
Band apply atrazine at planting	.50
Use no atrazine	1.00
Establish buffer strip	.25
Incorporate atrazine with ½ inch sprinkler irrigation	.60
TOTAL ATRAZINE BMP RUNOFF EFFECTIVENESS (TABRE)	_____
Add Reduction in Runoff Figure	
 Incentive Payment Per Acre \$6.00 (GS) or \$3.00 (C) X TABRE	 \$_____



Summary 2006-2020

- 1238 growers implemented BMP's - **91%** of those contacted
- **265,185** acres of corn & grain sorghum implemented Atrazine BMP's
- **\$3.01** per acre average incentive
- Using KSU effectiveness data – **49.75%** reduction in atrazine runoff predicted
- Actual water quality monitoring – **41.4%** reduction
- Annual load reduction – **840 lbs a.i.**

Urban and rural communities partnering to reduce sediment pollution

City of Wichita, Kansas | Return to wichita.gov

Public Works & Utilities

Water Customer Care - Utilities - Environment - Projects - Traffic Streets - Staff Directory

Post Construction BMPs

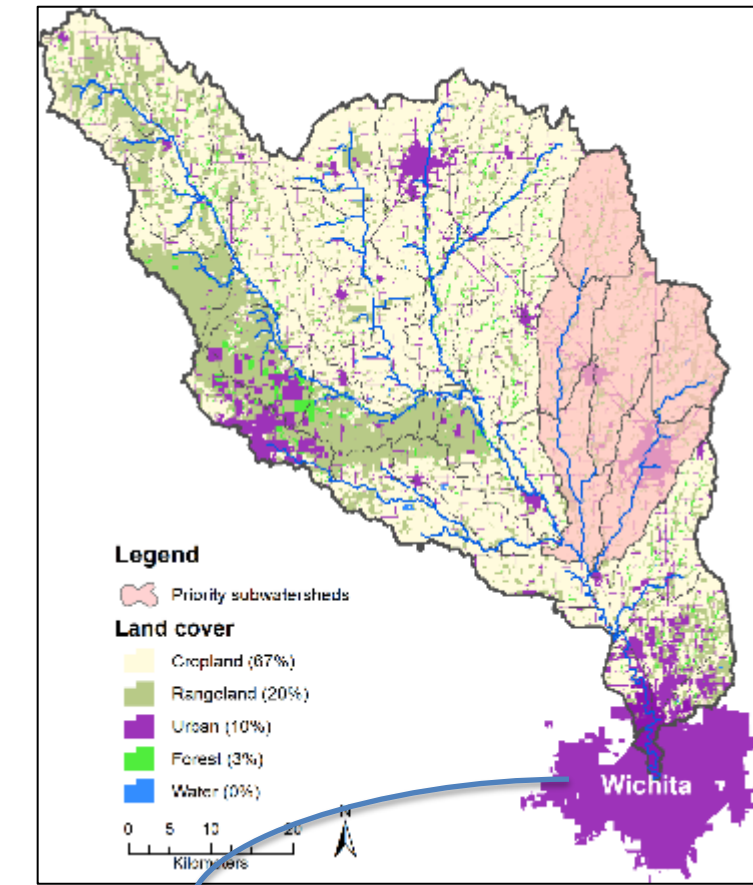
Your post construction BMP helps keep my water clean.

[Download the brochure](#)

YOUR POST CONSTRUCTION BMP HELPS KEEP MY WATER CLEAN

The best way to mitigate stormwater impacts from new developments is to follow best practices to treat, store and infiltrate runoff onsite before it can affect water bodies downstream.

Tad Stormwater Spokesfrog



Hydrodynamic separator



Constructed ponds

Economic efficiency of sediment removal in rural vs urban BMPs

Little Ark Watershed Cropland BMP Effectiveness

BMP	\$/Ton TSS, BMP life
Streambank stabilization	\$2.30
No-Till	\$2.87
Conservation Tillage	\$2.87
Intensive Crop Rotations	\$4.30
Nutrient Management	\$4.88
Vegetative Buffers	\$7.17
Grassed Waterways	\$8.60
Ponds	\$13.44
Terraces	\$18.28
Permanent Vegetation	\$28.30
Cover Crops	\$43.01

Urban stormwater BMP Effectiveness

BMP	\$/Ton TSS, BMP life
Vegetative Buffers	\$475
Grass filter strip	\$930
Extended detention basin	\$2,120
Bioretention	\$4,440
Hydrodynamic separator	\$5,425
Pervious pavement	\$19,130

Bringing rural and urban communities together through a stormwater program

KDHE

- Regulatory oversight

City of Wichita

- Raise program awareness
- Tracks new, redevelopment projects
- Collects sediment credit fee from properties opting for offsite program
- Transfers fees to KSU-WRAPS
- Reports to KDHE

KSU-WRAPS

- Recruit producers from high priority sub-basins to program
- Execute payments for contracted BMPs
- Track offsite BMP sediment credits through time
- Report to City

Developers

- Choose onsite or offsite BMPs
- Pay fee to CoW for offsite credits
- Maintain peak flow standards

Producers

- Implement contracted BMPs
- Maintain contracted BMPs



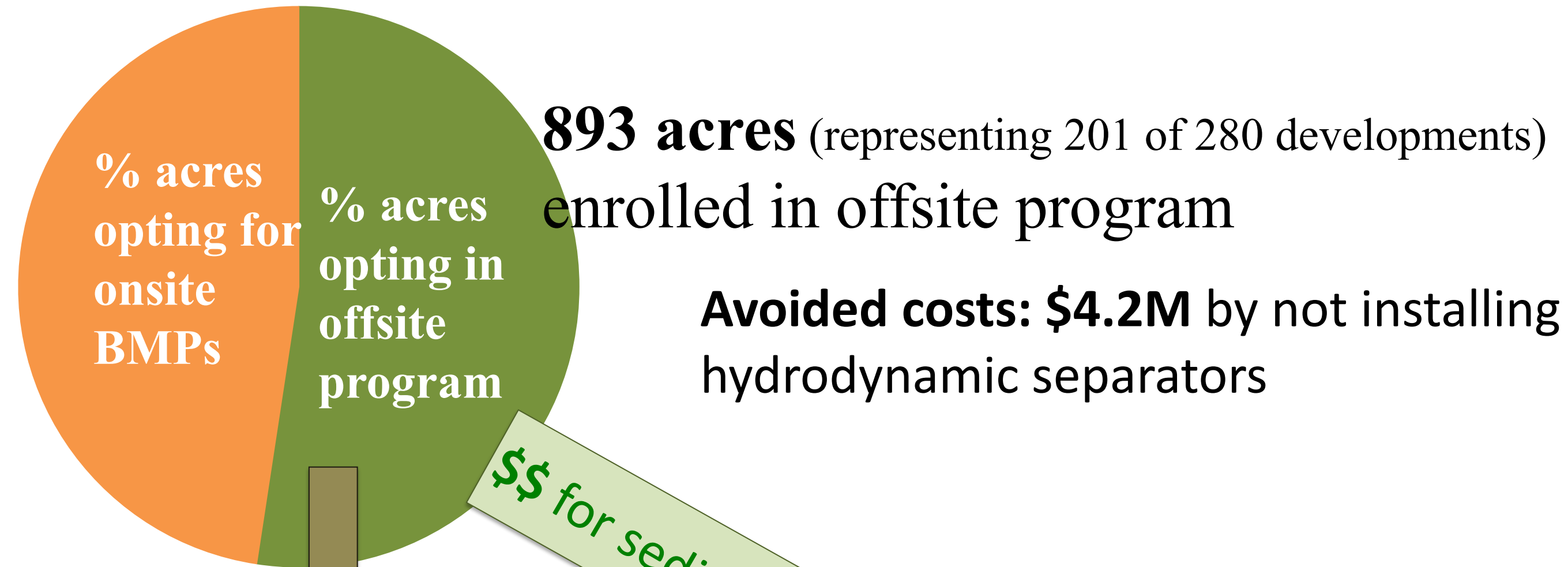
Sediment credit fee based upon...

- *Sediment credit ratio*: Required to purchase 2 offsite sediment credits for every 1 unit of sediment production onsite
- *Most-likely offsite BMP costs*: Cost to producer to adopt AND maintain no-till with intensive crop rotations
- *Replacement costs*: Cover cost to enroll replacement offsite BMPs if previous BMPs are discontinued
- *Technical assistance*: costs to enroll and track offsite BMPs

USER INPUTS					
Onsite Sediment produced		0.4	tons/ac/yr		
Offsite:onsite credit ratio		2	:1		
% no-till fields replaced		100%	every 5 years		
No-till sediment credit "cushion"		1.1	(affects pace at which no-till implemented to remain ahead of onsite sediment demand)		
Starting fee all acres to date, \$/ton sed.	\$	48.00		\$	38.40
Reduced fee for all subsequent years, \$/ton sed	\$	10.00	Year of fee reduction	8	\$ 8.00
Inflation rate, annual program costs		3.00%			
Inflation rate, annual fee		3%	per year		
City growth rate, year 1		200	acre	Avg annual growth, ac/yr	200
				City participation rate	100%
Interest rate on start-up funds		0%	annual	# compounded/yr	12
				payback period (yrs)	7

Spreadsheet tool developed to assist City in setting sediment credit fee

2016-2020 implementation: by the numbers



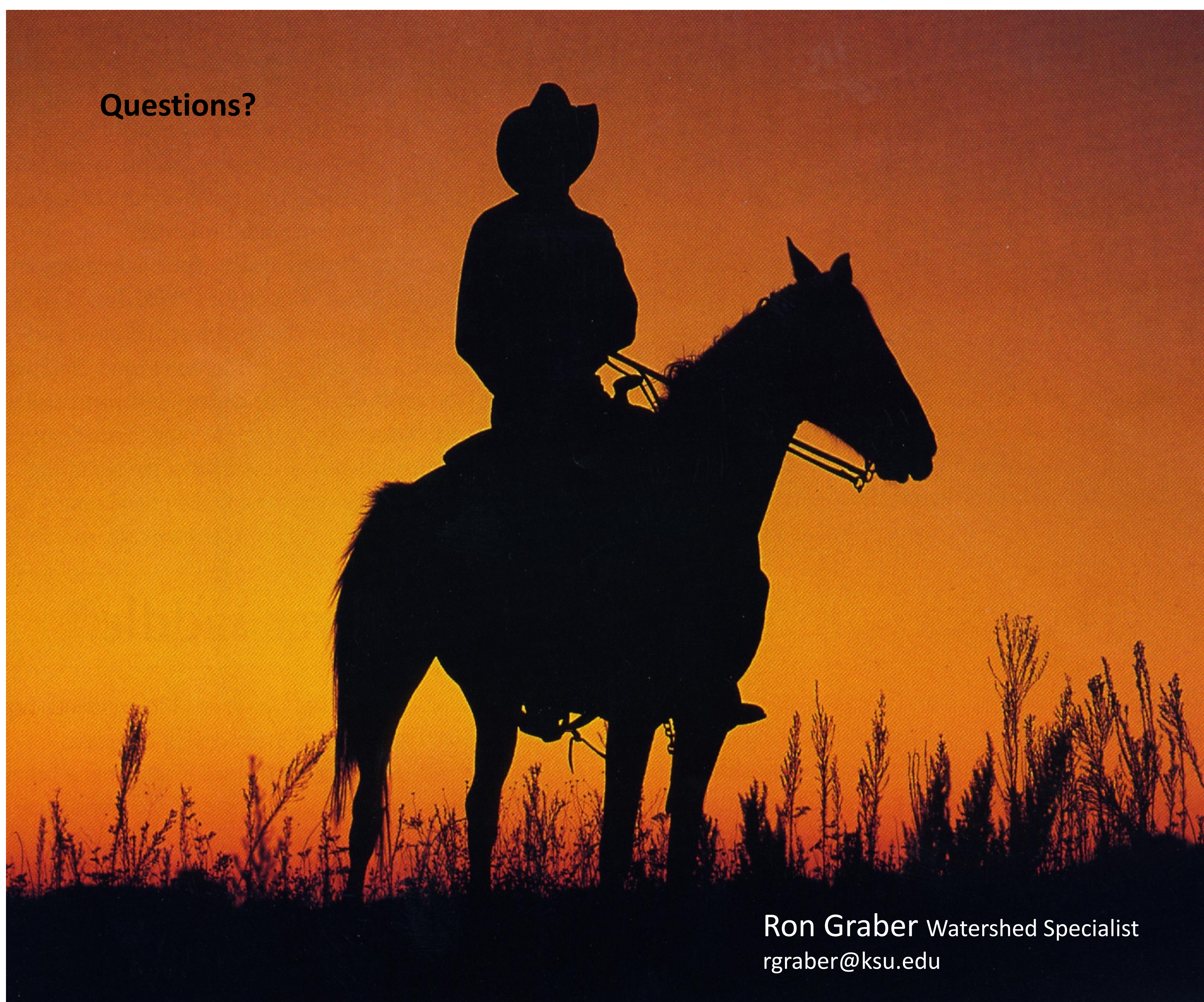
Sediment generated from urban developments: **357 tons TSS yr⁻¹**

2:1 credit ratio



~ **1590 tons TSS yr⁻¹** offsite sediment credits enrolled (496 ac of no-till)

Questions?



Ron Graber Watershed Specialist
rgrab@ksu.edu

K-STATE
Research and Extension



KCARE
Kansas Center for Agricultural
Resources and the Environment

Keys to Success

- Local Input
- Trust
- Education
- Partnerships between the agricultural community and their urban neighbors (WRAPS)
- Non-traditional marketing of BMP implementation
- Flexibility
- Time
- Monitoring/assessment





Offsite BMPs targeted to priority subwatersheds; 5- year contact based on sediment reduction



Little Ark WRAPS Watershed Field Sign Up Sheet



City of Wichita off site BMP Sediment Reduction Program

SD 01

	Best Management Practices	Erosion Reduction Efficiency (%)
___	Establish riparian vegetative buffer (check width)	
	___ less than 30' wide	.25
	___ 30' to 60' wide	.40
___	___ greater than 60' wide	.50
___	No-till	.75
___	Crop rotations	.25
___	Conservation till (>30% residue following planting)	.30
___	Farm on the contour	.35
___	Establish new terraces	.30
___	Establish contour grass strips	.50
___	Establish grassed waterways	.30
___	Establish permanent grass	.95
___	Other	
	Total Erosion Reduction (TER) (accumulative effect of BMP's)	

Field Legal Description & HUC 12: _____

Land Operator/Manager _____

Address and Telephone Number _____

Total Payment = ERE% x acres _____ x \$50 = \$ _____

Payments will be split over 4 years. Payments BMP Atr. # or crop Inspection date

Payment each year will be made year 1) \$ _____ year 1) _____ year 1) _____

after inspection by KSU agronomist. year 2) \$ _____ year 2) _____ year 2) _____

I agree to implement this practice(s) year 3) \$ _____ year 3) _____ year 3) _____

and maintain it for 5 years. year 4) \$ _____ year 4) _____ year 4) _____

year 5) _____ year 5) _____

Participant(s) must agree to utilize Best Management Practices for Atrazine for crops labeled for Atrazine use on the above location for the duration of the 5 year agreement period. BMP Atrazine agreement work sheet number and or crop is listed above.

Land Manager/Operator _____ Date: _____

Agronomist _____

Questions and Answers

Please use the **Q&A window** to ask questions of the presenters.



Send a **chat to the host** if you have a technical issue



U.S. EPA Water Finance Center
www.epa.gov/waterfinancecenter

U.S. EPA Water Resilience
www.epa.gov/waterresilience

U.S. EPA Water Finance Center Forest
Resilience Bond Report
<https://www.epa.gov/waterfinancecenter/forest-resilience-bond>

