Treatment Success in a Heavily Mined Watershed in Ohio

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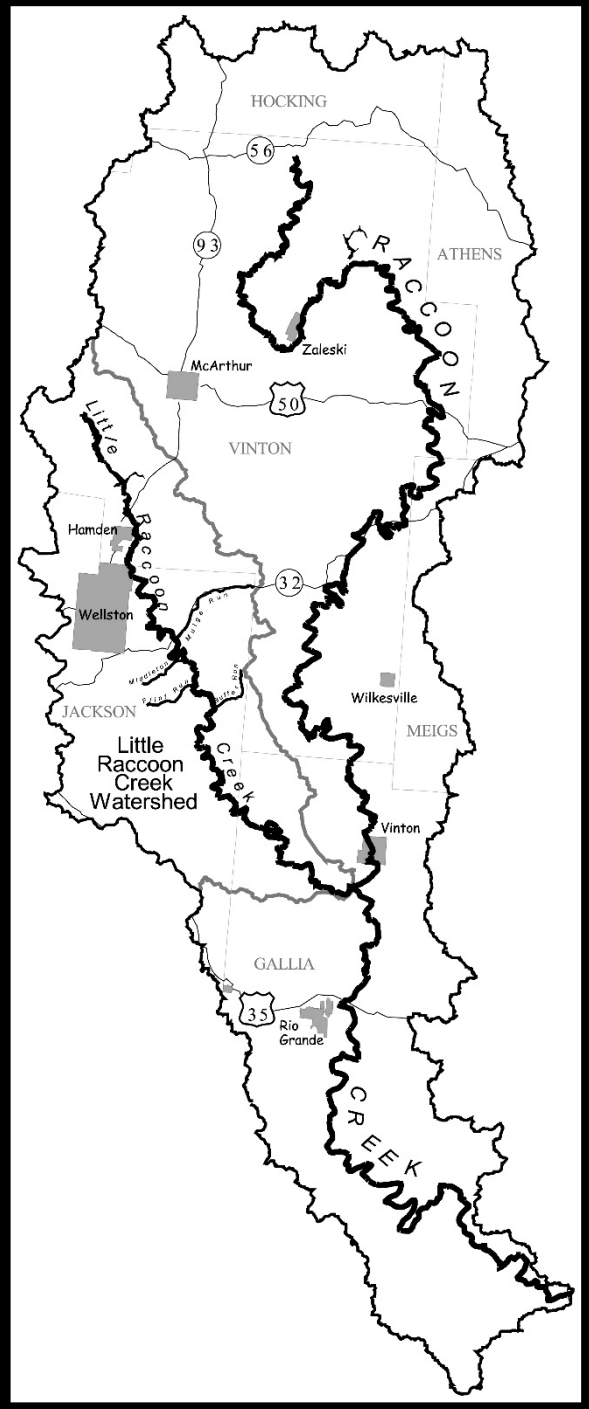
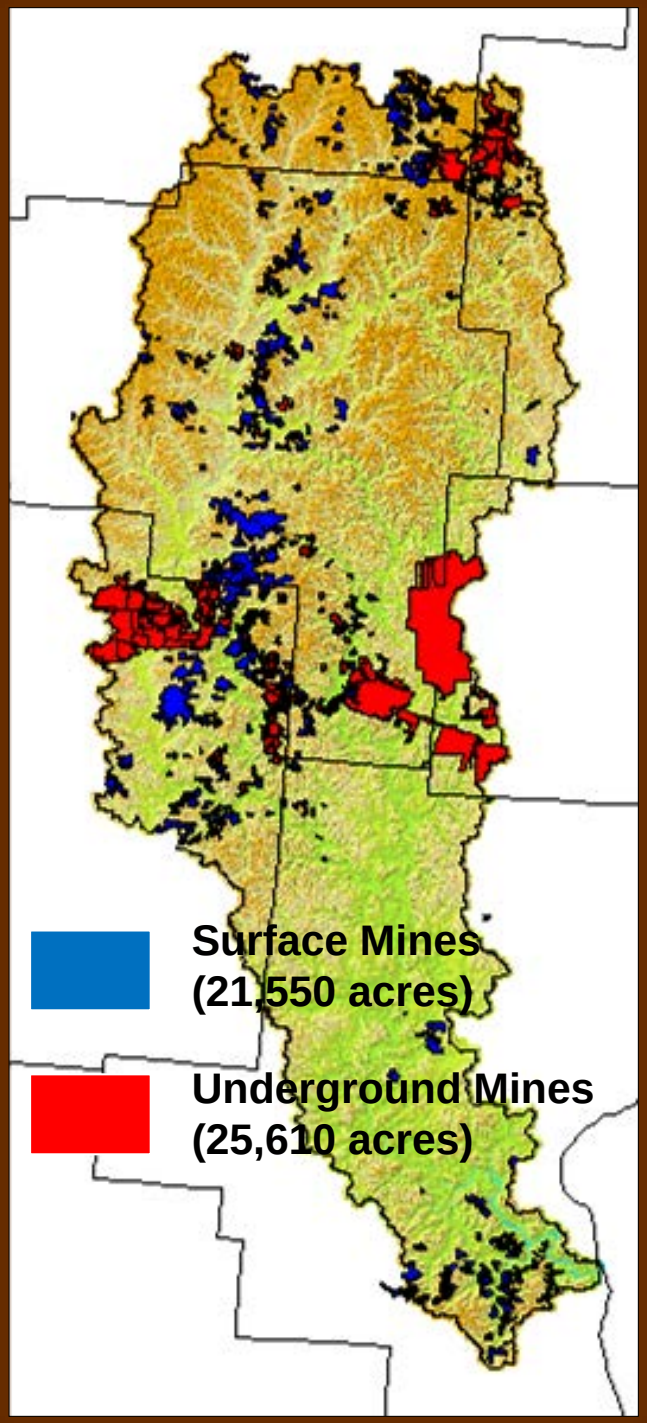


Where are we??

Raccoon Creek Watershed

- 683.5 square miles
- 112 miles long
- Flows through 6 southeast Ohio Counties
  - Hocking (headwaters)
  - Vinton (headwaters)
  - Athens
  - Meigs
  - Jackson
  - Gallia (mouth)

190 Stream Miles Affected by Historic Coal Mining

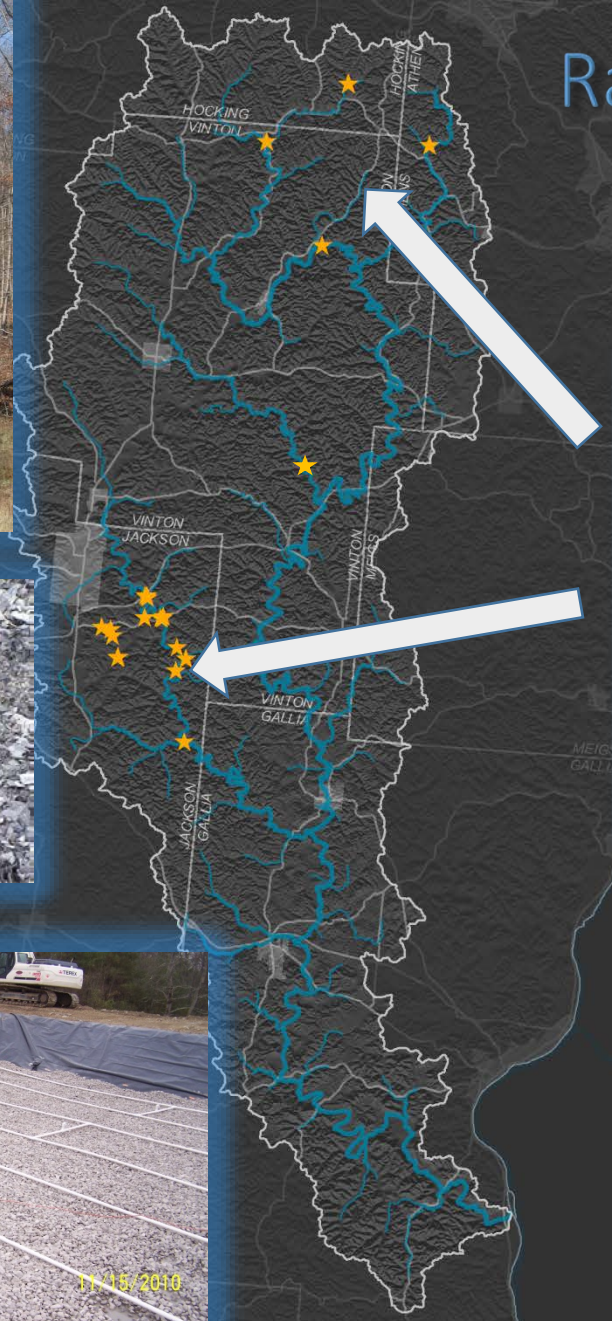


Our Focus: AMD / AML Reclamation & Treatment

Past and Current Projects

- 1st reclamation project (Buckeye Furnace) in 1998
- Over $14 million (AML fund, 319 grants, OSM Watershed Cooperative Agreement Program grants)
- 20 reclamation, treatment, and maintenance projects
  - Active treatment (doser)
  - Passive treatment (steel slag beds, limestone leach beds, SAPS, wetlands, limestone channels…)
  - Reclamation / Source Control

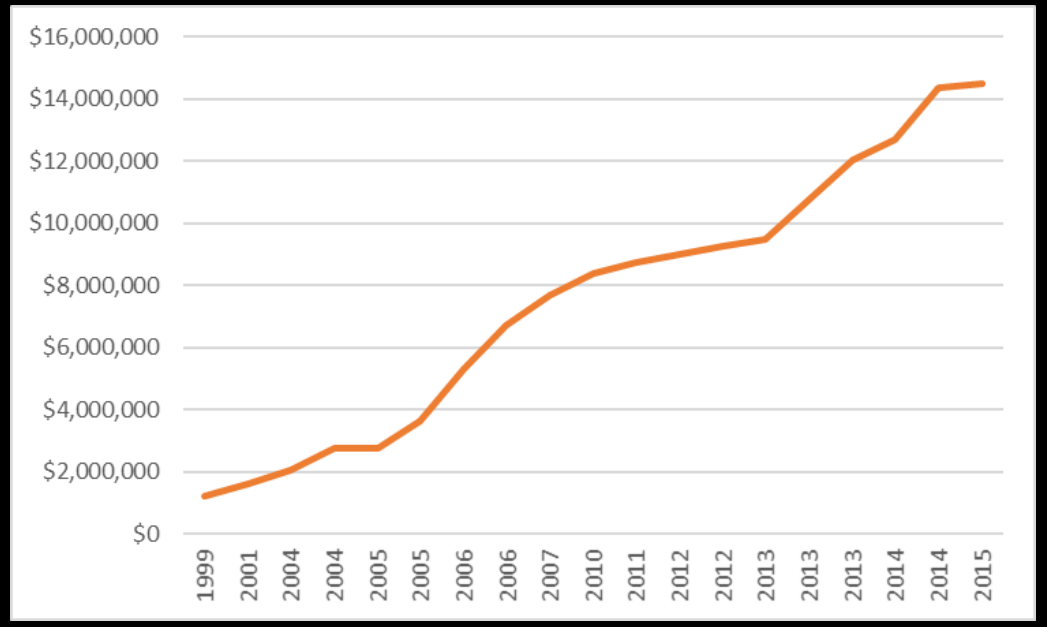
Raccoon Creek Reclamation & Treatment Projects



Projects located in the most impacted watershed areas: Headwaters & Little Raccoon Creek

Raccoon Creek Treatment and Reclamation Projects

Project name	Year completed	Cost
Buckeye Furnace/ Buffer Run*	1999	$1,215,530
State Route 124 Seeps*	2001	$395,490
Carbondale Doser	2004	$437,660
Mulga Run*	2004	$687,910
Hope Clay*	2005	$5,000
Salem Rd/Middleton Run*	2005	$881,196
Flint Run East*	2006	$1,697,808
Lake Milton*	2006	$1,377,536
East Branch Phase I	2007	$983,859
East Branch Phase II	2010	$721,131
East Branch Phase III	2011	$349,744
East Branch Phase I Maint	2012	$240,378
Jackson Area Maint (FR,LM)*	2012	$270,770
Orland Gob Pile	2013	$232,475
Harble Griffith Reclaim	2013	$1,244,752
Pierce Run	2013	$1,275,058
Lake Morrow*	2014	$695,155
Middleton Run Reclaim II*	2014	$1,647,001
Flint Run Wetland Berms*	2015	$162,928
Raccoon Creek Maintenance (doser, FR, LM)*	2017	
Daniels Run Reclaim	2018	
Ilesboro Reclaim	2018	
East Branch Maintenance	2018/2019	



Raccoon Creek Project Details

(from 2016 NPS Report – does not include 2017 data)

Cost

Design = $1,905,243
Construction = $12,616,118

Total Costs through 2016 = $14,521,361

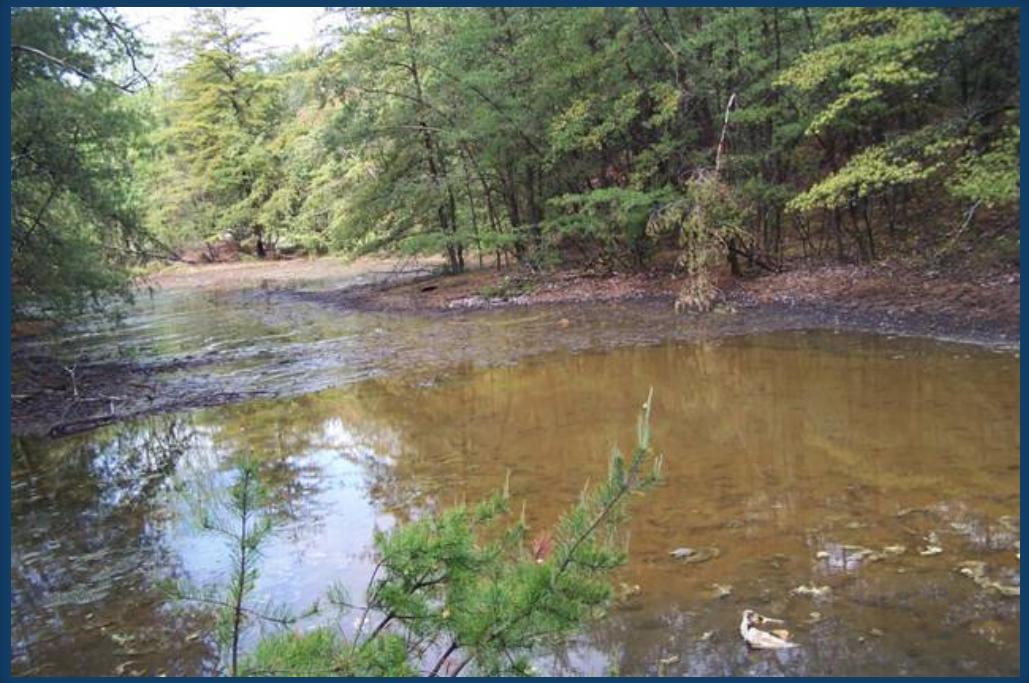
Reductions

Total acid load reduction = 4,267 lbs/day
Total metal load reduction = 968 lbs/day

Data derived using the Stoertz Water Quality Evaluation Method (Kruse et al., 2014)

Acid and metal load reductions based on projects monitored during 2016 listed here: Carbondale Doser, Mulga Run, Flint Run, Lake Milton, East Branch I, II, & III, Pierce Run, Orland Gob Pile, Harble Griffith, Lake Morrow, and Middleton Run II.

Reclamation / Source Control



Keep 3 components of AMD (pyrite, air, water) from coming in contact with one another. Good for surface mines. High initial cost, minimal maintenance.

Active Treatment

CALCIUM OXIDE DOSER

ACTIVELY putting an alkaline material into the water to buffer the acidity.

- Used for large underground mine discharges
- Low cost installation
- High cost/effort maintenance (weekly checks, filling silo, channel cleanout)
- If it's gone/empty, the creek is dead!

Passive Treatment

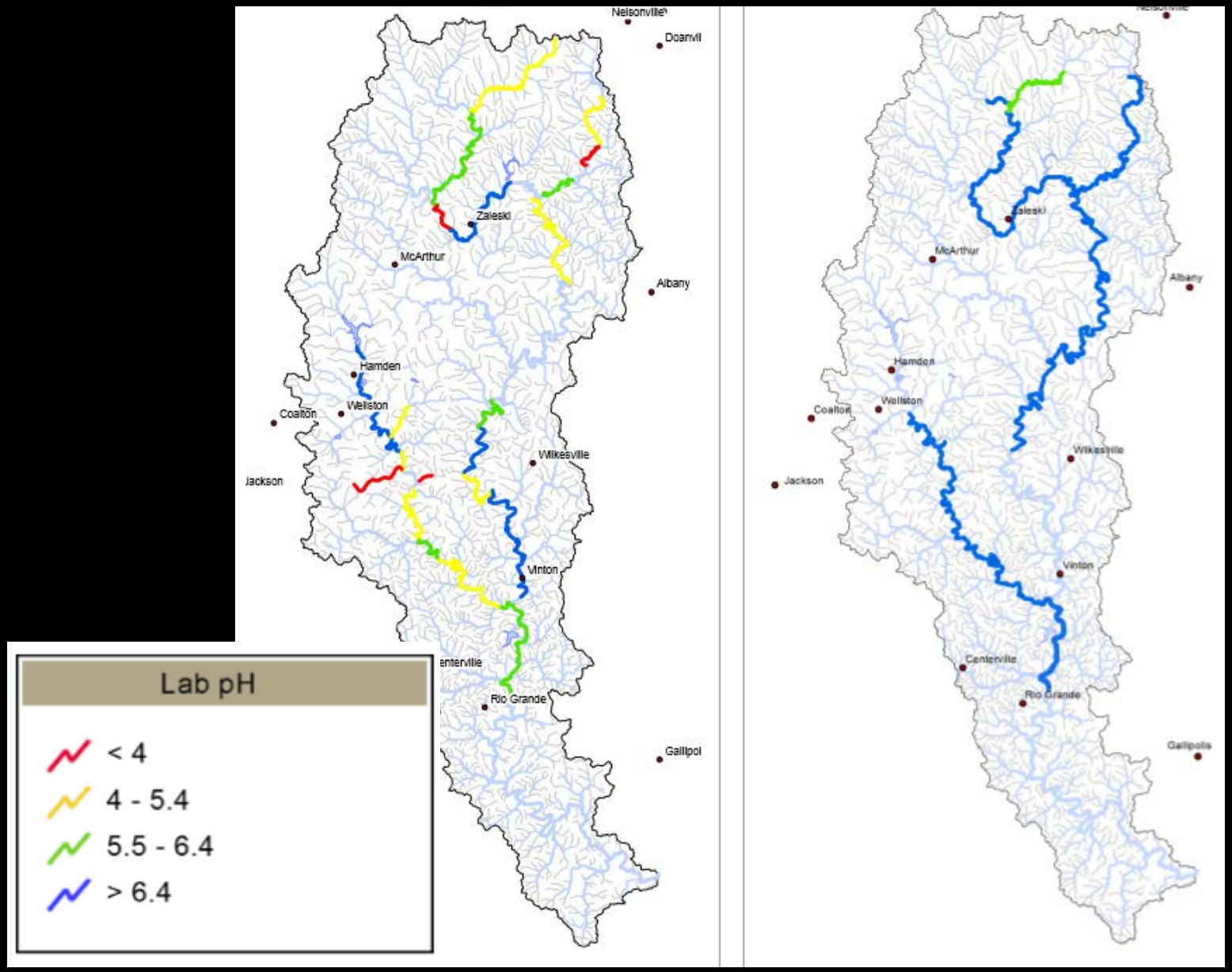
High initial installation cost, less continual monitoring and maintenance

- Limestone Leach Bed
- Open Limestone Channel
- Steel Slag Leach Bed
- Wetland
- Successive Alkaline Producing System

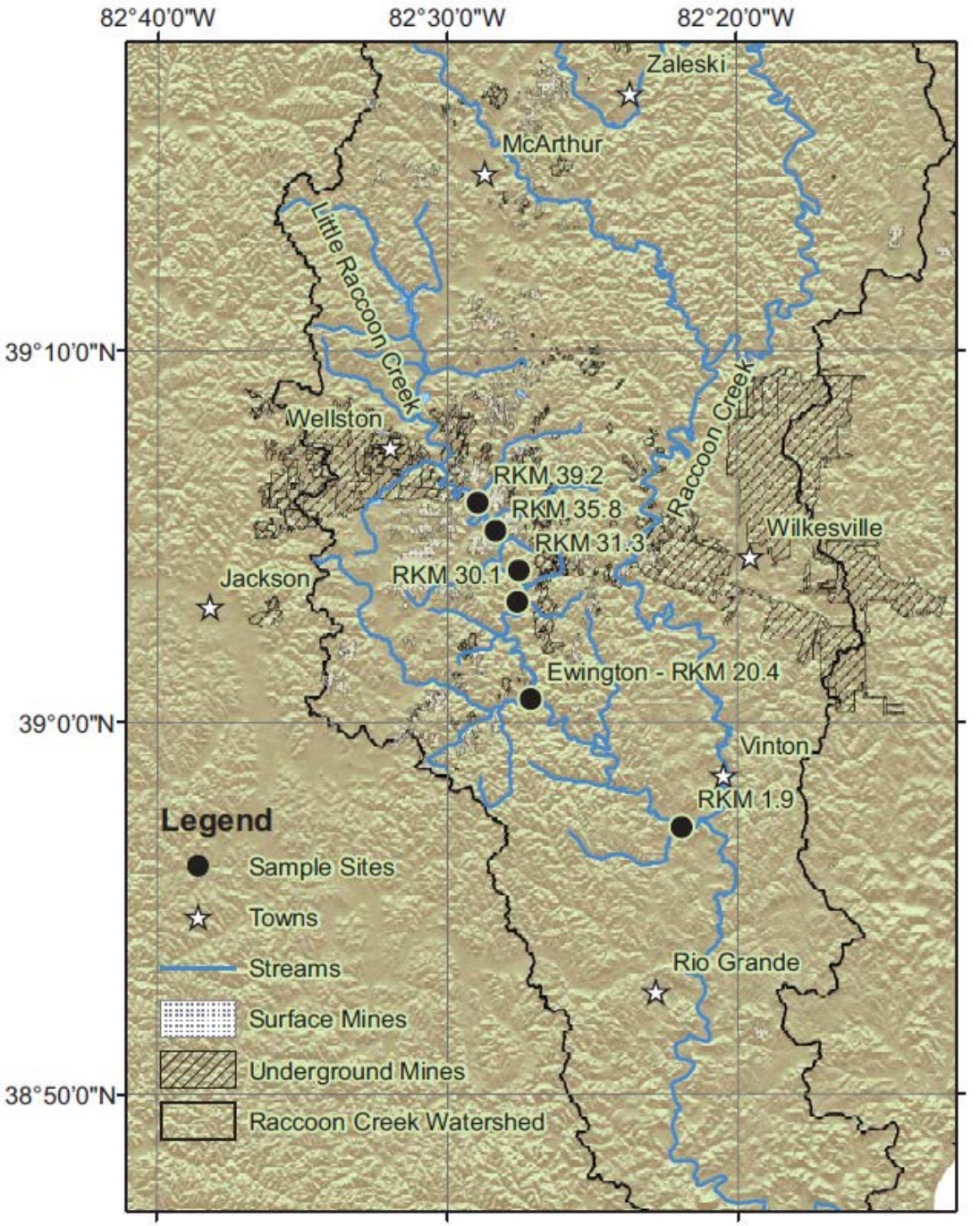
2016 EPA Watershed-wide Sampling

- Last EPA sampling was done in late 1990's early 2000's BEFORE most of our projects were constructed.
- At that time most sections were considered unrecoverable.
- ***PRELIMINARY DRAFT*** data from 2016 sampling shows many sections ***meeting or exceeding Warm Water Habitat and some sections meeting Exceptional Warm Water Habitat!***
- Over 70 fish species documented in the watershed
- Final report won't be out until mid-2018

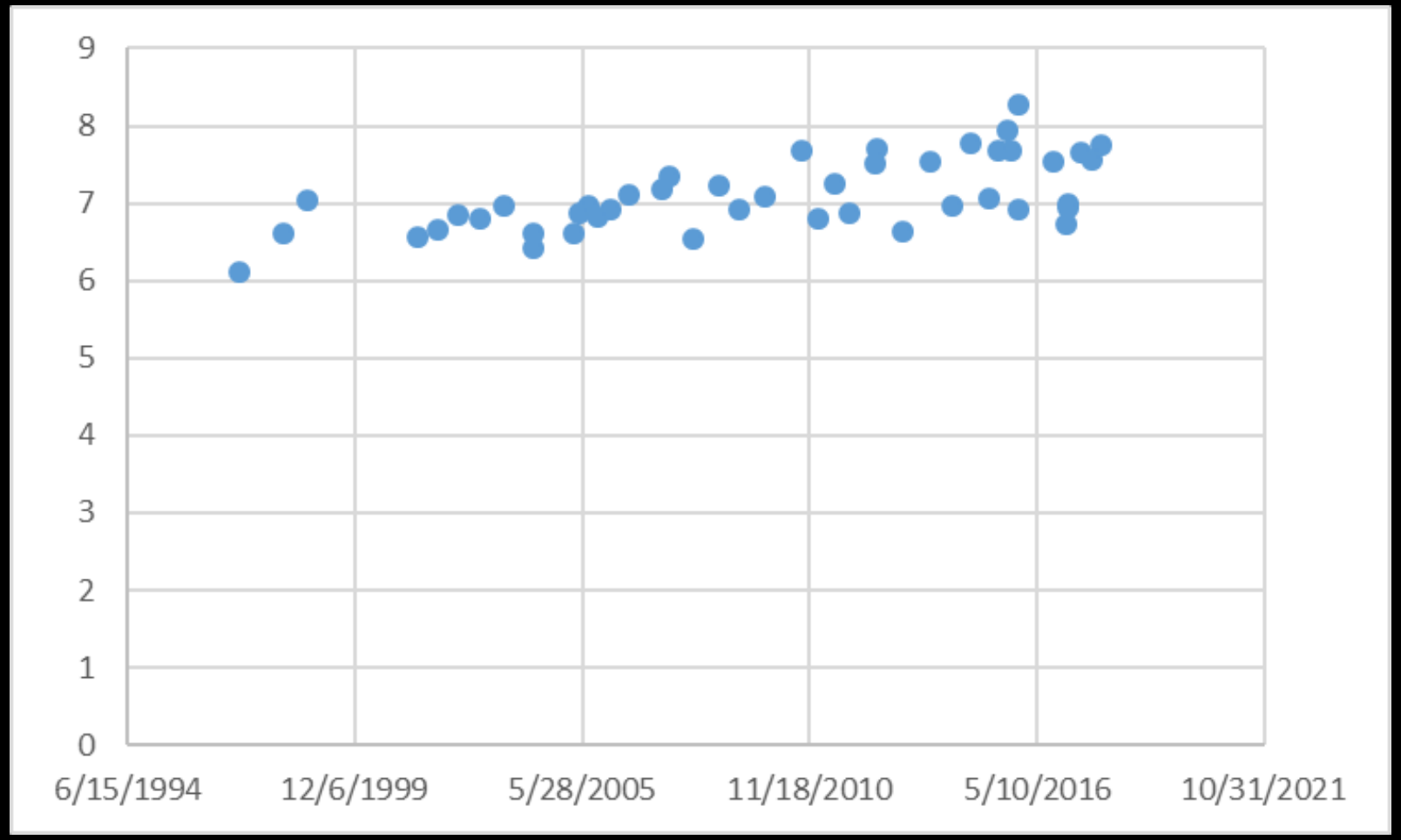
pH Change: Baseline – 2016

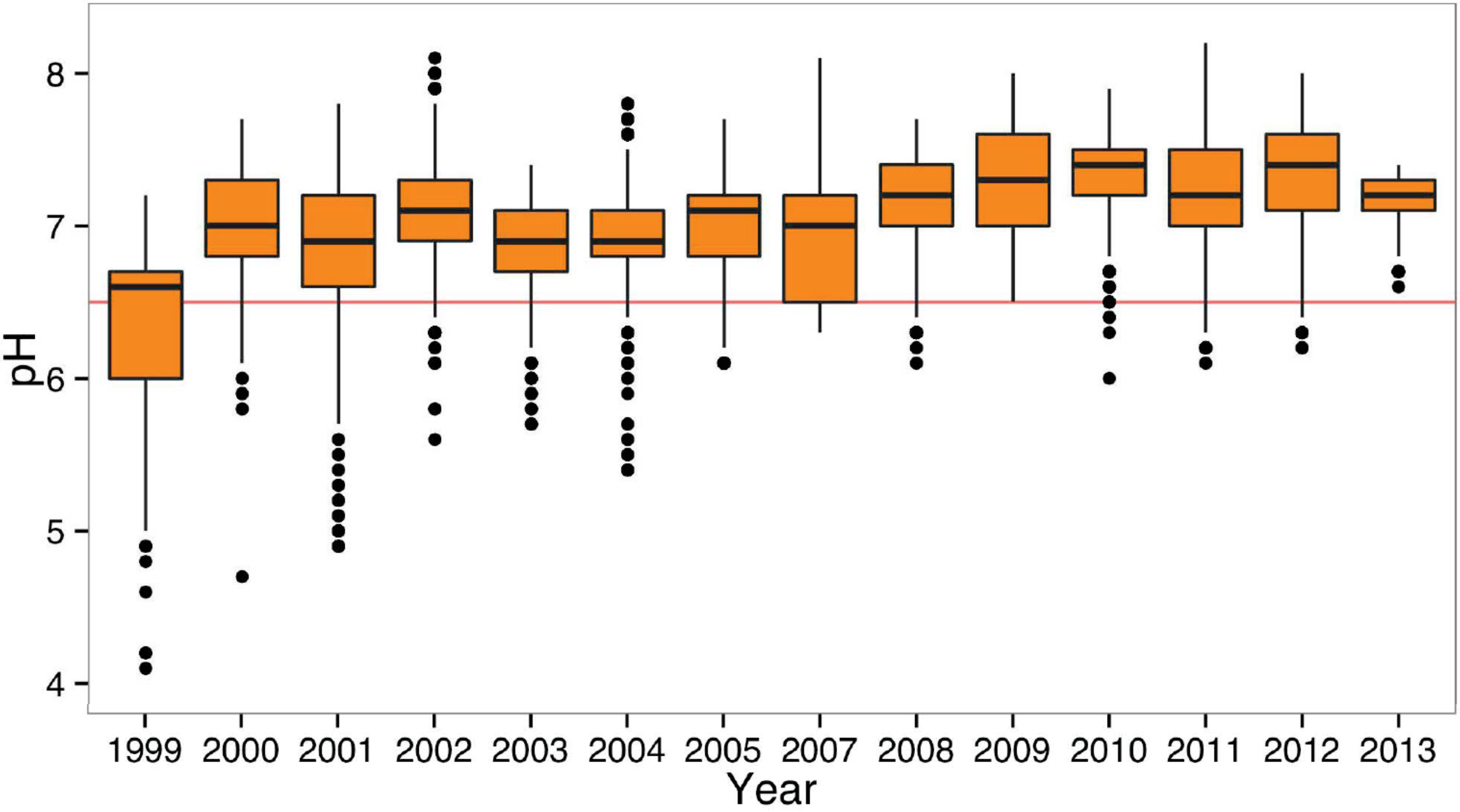


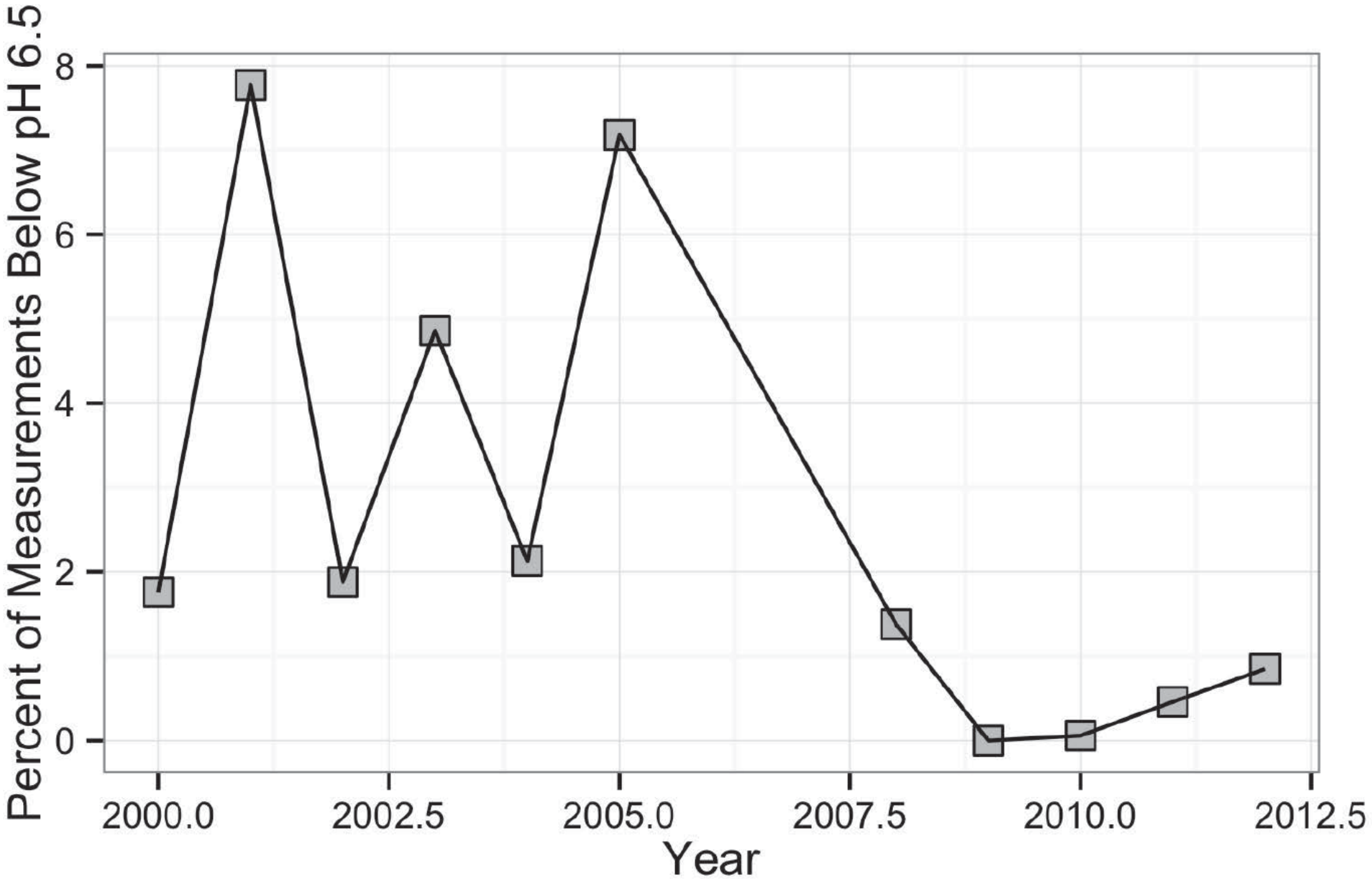
Focus on highly impacted Little Raccoon Creek



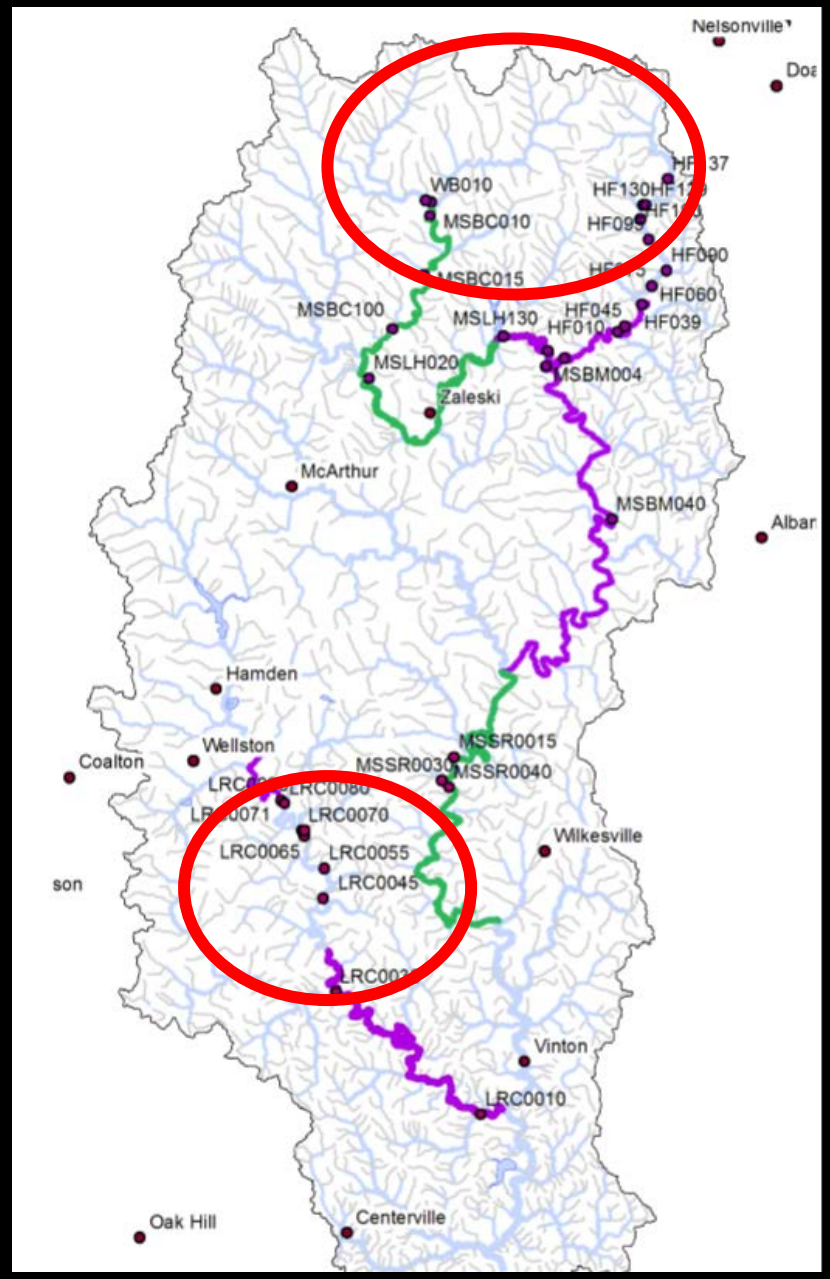
pH downstream of treatment systems shows improvement




8
7
6
5
4
pH
1999
2000
2001
2002
2003
2004
2005
2007
2008
2009
2010
2011
2012
2013
Year


Percent of Measurements Below pH 6.5
8
6
4
2
0
2000.0
2002.5
2005.0
2007.5
2010.0
2012.5
Year

Biological Recovery Downstream of Projects



Raccoon Creek Mainstem & LRC Priority – Project Focus Area

Total stream miles improved in 2005/2010/2016 to meet IBI & MAIS Biological stream health targets

23.3/18.4/40.3 (82.0)

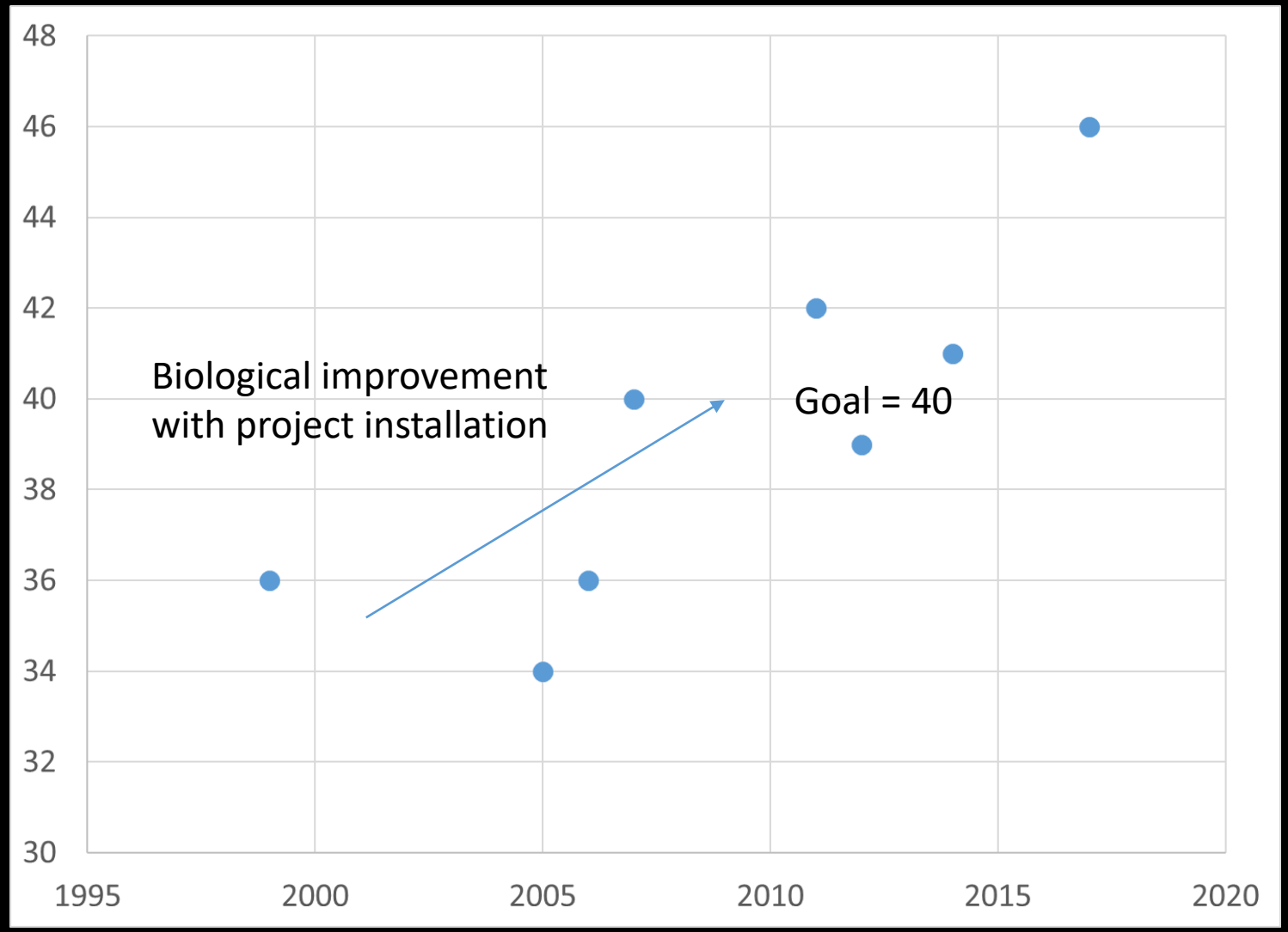
Biological Recovery In LRC

Little Raccoon Creek - Fish Community Recovery

Average fish per site increased from 20 in the 1980s (some sites had zero fish) to 96 in the 2000s!

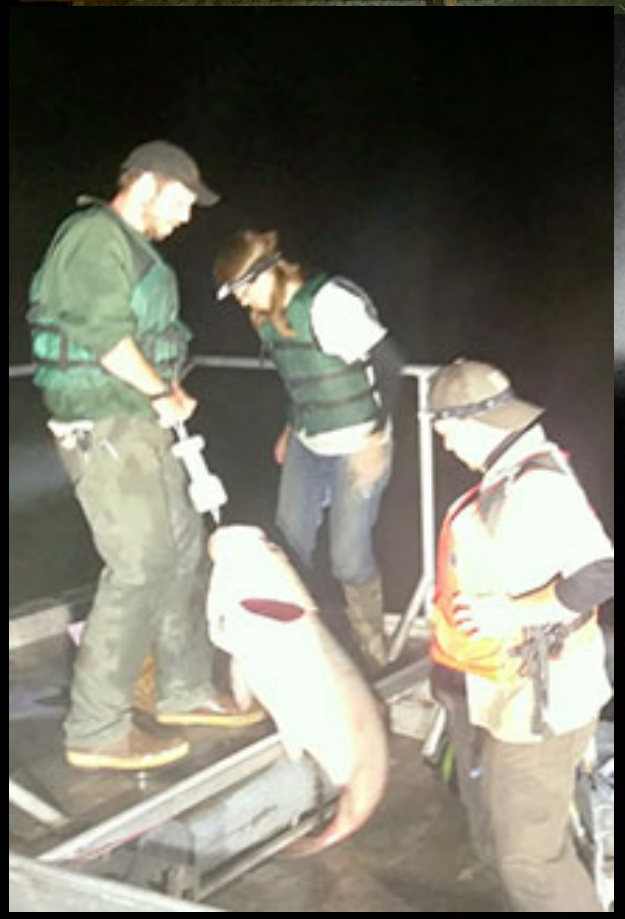
Index of Biotic Integrity downstream of treatment systems

2016 – meeting warm water habitat use designation



2016 Asian Carp Sampling

- PROBLEM!!! Asian Carp breed fast and eat LOTS of tiny plants and animals that our native species depend on.
- August 2016 – silver carp found by ODNR
- September 2016 – RCP assist USFWS with sampling at the mouth of Raccoon Creek and in the RC Byrd Pool of the Ohio River
- Netted 10 big head carp, largest was 78.5 lbs.
- Carp downstream of RC Byrd Pool are being tagged to study movement, fish upstream are being removed.
- BONUS!!!! Found lots of paddlefish!



Questions?

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