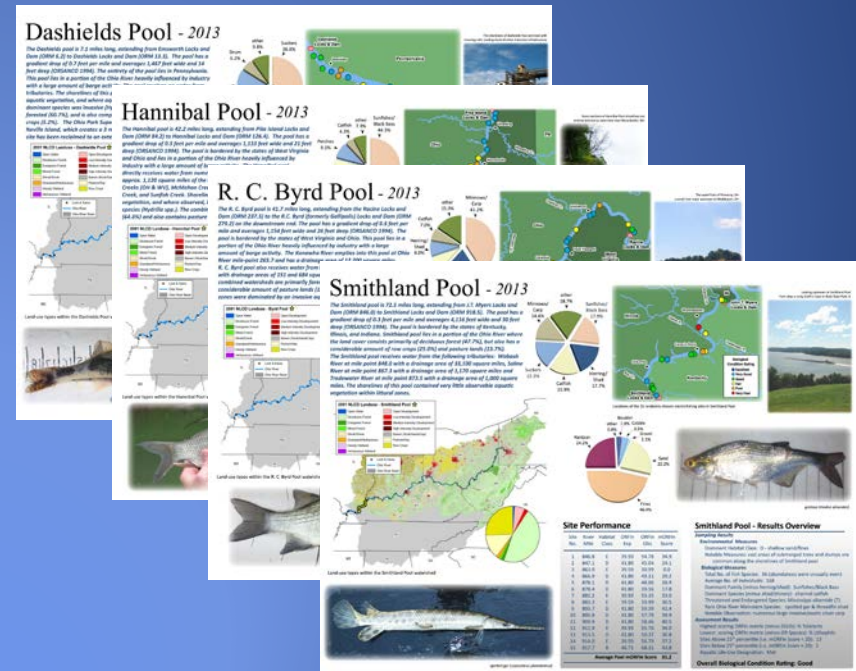


Chair



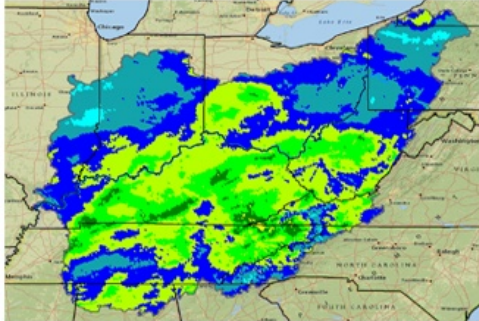


2013 Pool Survey Locations

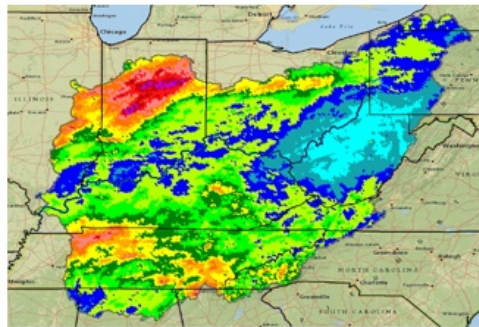


Abnormal Elevated Flow Conditions

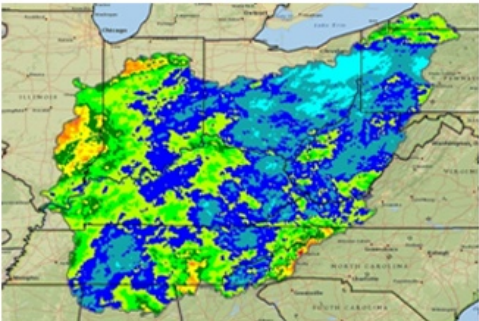
MARCH



APRIL



MAY



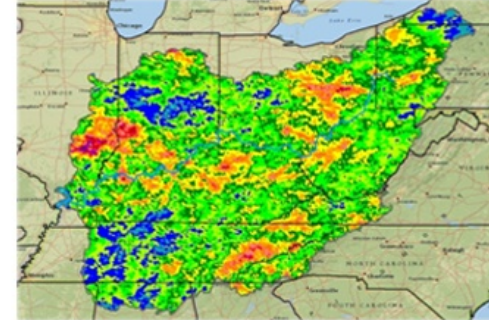
Above: Conditions experienced during summer sampling more closely resembled typical spring flow conditions
Below Left: Dashields Pool at the time of sampling
Map Key: Colored percent of normal monthly precipitation



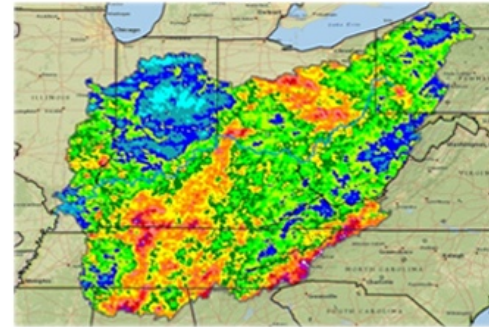
Percent of Normal

- 5.000 - 25.00
- 25.01 - 50.00
- 50.01 - 75.00
- 75.01 - 100.0
- 100.1 - 125.0
- 125.1 - 150.0
- 150.1 - 175.0
- 175.1 - 200.0
- 200.1 - 225.0
- 225.1 - 250.0
- 250.1 - 275.0
- 275.1 - 300.0
- 300.1 - 325.0
- 325.1 - 350.0
- 350.1 - 375.0
- 375.1 - 400.0

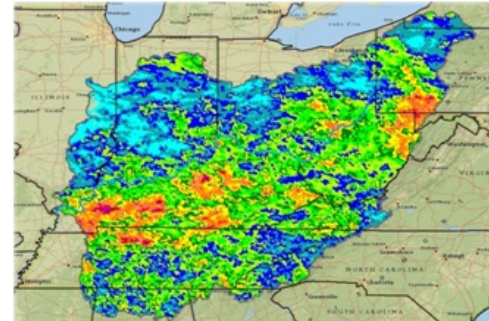
JUNE



JULY

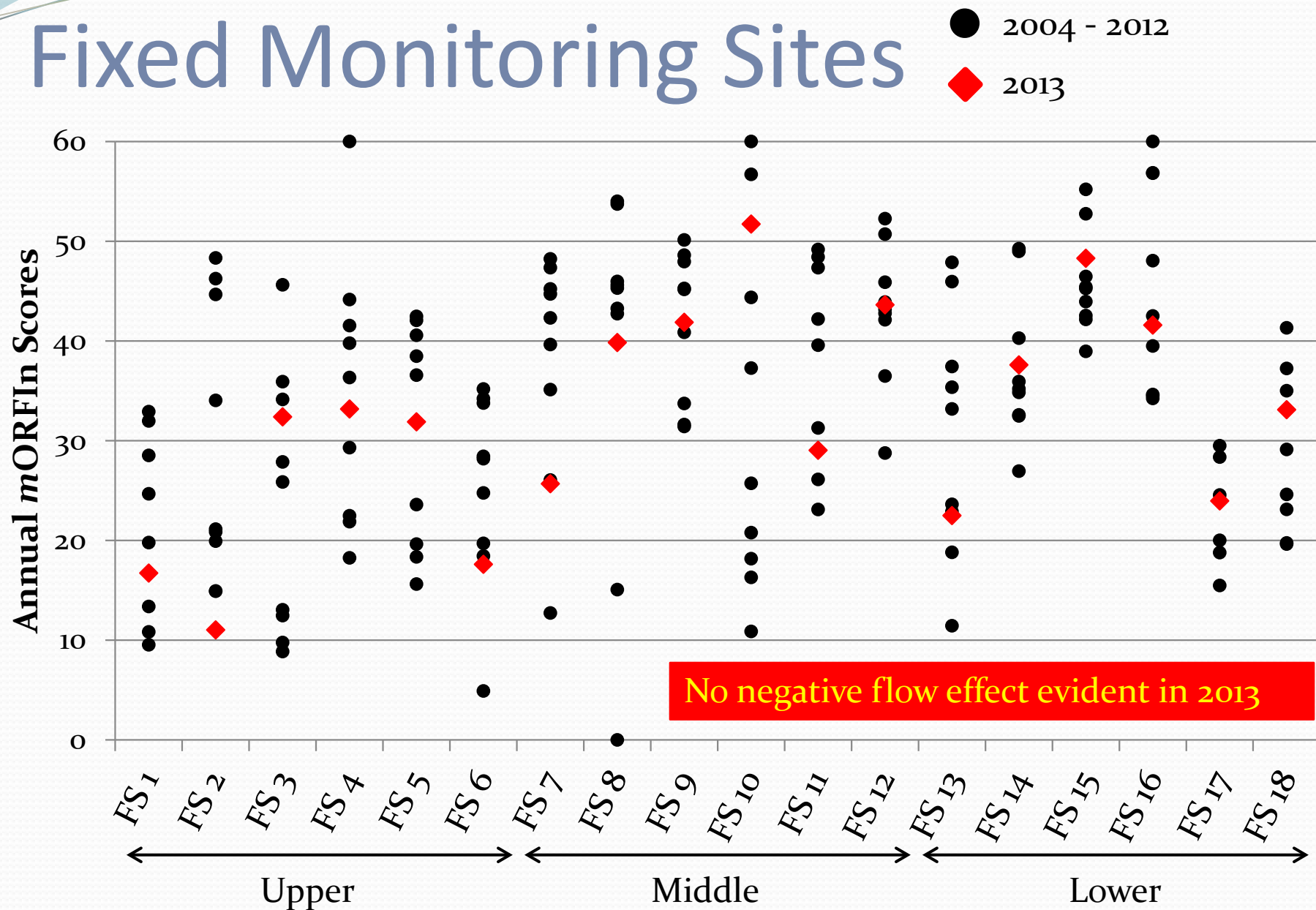


AUGUST





Fixed Monitoring Sites





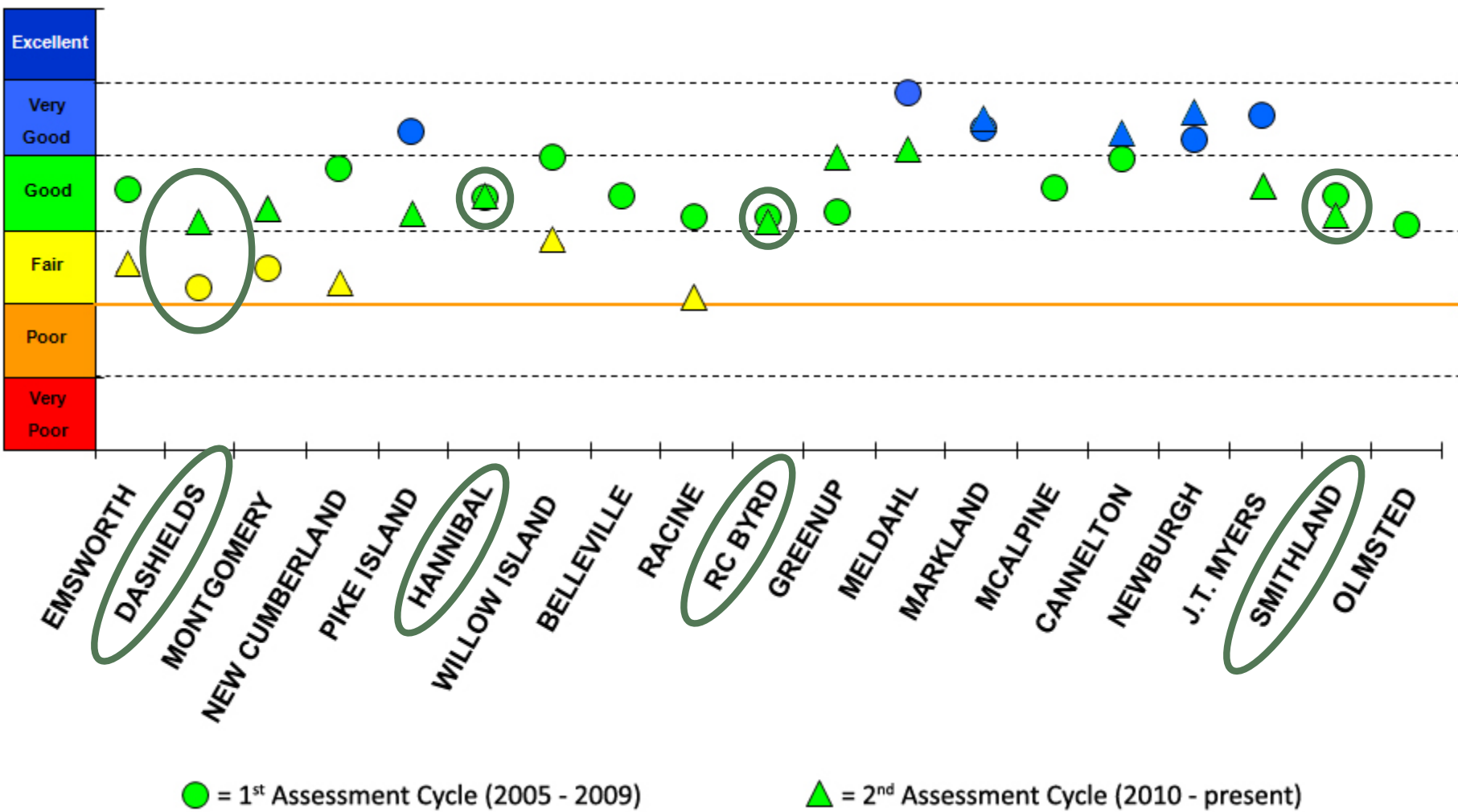
2013 Fish Survey Results

- 4 pools surveyed each year
- 15 random sites per pool (*mORFIn* scores averaged)
 - Collectively represent the condition of the pool
 - Biological criterion = avg. score of 20.0

Pool	Avg. <i>mORFIn</i> score	Condition Rating	ALU Designation
Dashiels	30.8	Good	Met
Hannibal	34.4	Good	Met
R. C. Byrd	30.8	Good	Met
Smithland	31.2	Good	Met



Past vs. Present Surveys





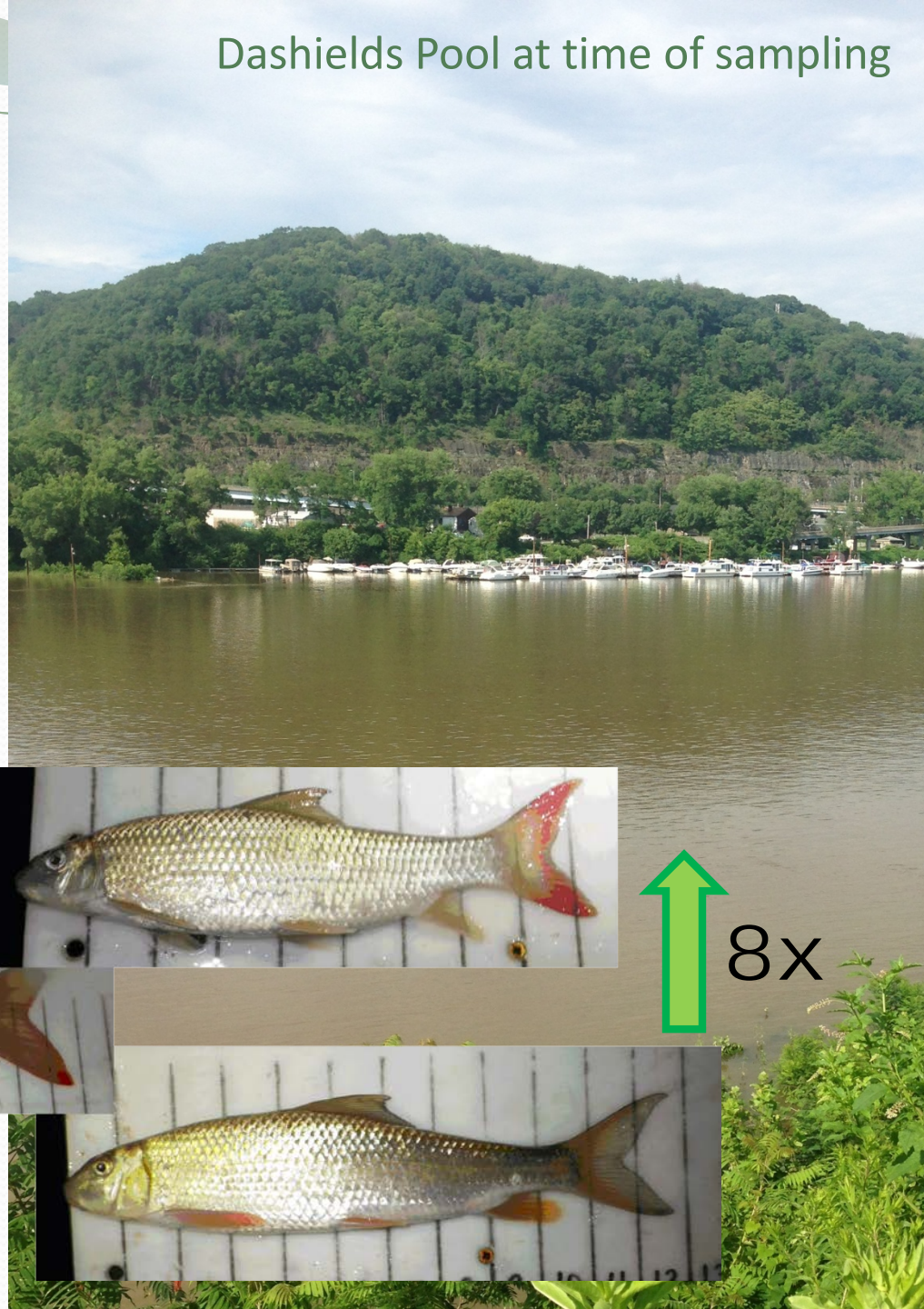
Conditions Likely Helped Dashields

- Under normal conditions
 - Few gravel shoals mostly in back channel
 - No significant tributaries
 - Most shoreline is modified
- Add some consistent flow
 - Access to high gradient tributaries
 - Access to gravel tributary washes
 - Suckers greatly increased



↑
8x

Resulted in higher scores for several metrics





Macroinvertebrate Program

- Sampled at all Fish sites in each pool using two methods
 - Index scores averaged as with fish
 - 4-6 month return time for samples
 - Staff working with lab to minimize
- USACE Louisville co-op
 - Newburgh (2012), Smithland (2013)
 - Oversampling study (30 sites in Smithland)
 - Confirm # of Sites required to assess each pool
 - Additional paired abiotic data allows for continued index validation
- Nutrient Criteria Development
 - Correlating Nutrients to macroinvertebrate metrics



Newburgh Pool - 2012

Prepared for the USACE, Louisville District by Ryan Argo - Senior Biologist, ORSANCO

Newburgh pool is 55.4 miles long, extending from Cannelton Locks and Dam (ORM 720.7) to Newburgh Locks and Dam (ORM 776.1). The pool has a gradient drop of 0.3 feet per mile and averages 2,477 feet wide and 28 feet deep. The pool flows adjacent to the states of Indiana and Kentucky. The Newburgh pool receives water from three tributaries with a combined drainage area of 815 square miles: the Anderson River, Blackford Creek, and Little Pigeon Creek. The shorelines of this pool support a slight degree of aquatic vegetation in the littoral zones. Newburgh pool lies in a portion of the Ohio River where the land use consists primarily of deciduous forest (53.9%), but also has a considerable amount of row crops (13.1%) and pasture lands (14.9%).

As part of a cooperative agreement between the U.S. Army Corps of Engineers, Louisville District and the Ohio River Valley Water Sanitation Commission (ORSANCO), 15 random (and one targeted) sites were sampled within Newburgh pool for macroinvertebrates during the fall of 2012. Two sampling methods were used in the study: Deep Hester-Dendy (HDD) samplers & multihabitat (MH) kicks. This is a summary of the project results.



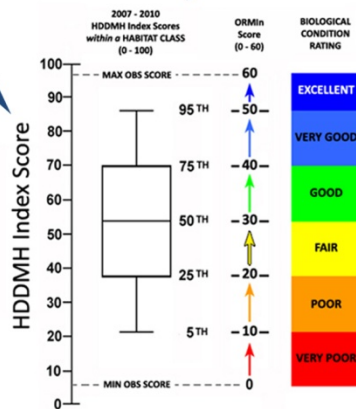
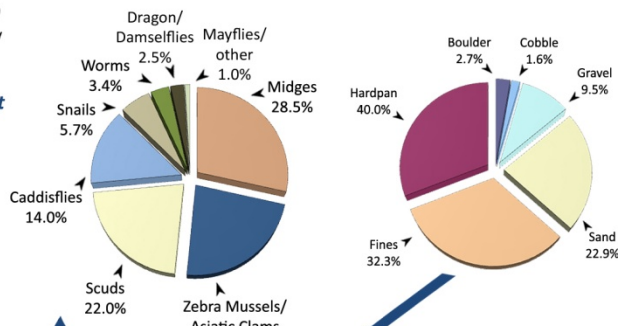
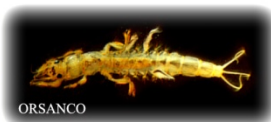
Common species sampled from Newburgh Pool
Top Left: Non-biting midge (*Tribelos fuscicornis*)
Top Right: Freshwater shrimp or "scud" (*Gammarus fasciatus*),
Bottom Left & Right: Long-Horned caddisflies
(*Oecetis* sp. & *Nectopsyche candida*, respectively)



Two methods were used to collect macros in Newburgh Pool: Deep Hester-Dendy (HDD) Samplers (left), and multihabitat (MH) kicks (right). HDDs were retrieved after a 6 week colonization period (bottom), MH kicks were conducted at the time of retrieval.



Uncommon species sampled from Newburgh Pool
Left: Black-shouldered Spinyleg dragonfly (*Dromogomphus spinosus*)
Right: burrowing mayfly (*Hexagenia limbatia*)



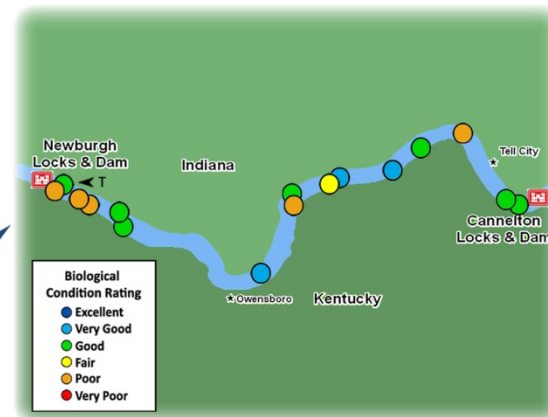
Site Performance

Site No.	River Mile	Habitat Class	Index Exp	Index Obs	ORMin Score
1	722.4	D	35.20	47.15	34.7
2	723.4	E	39.18	58.71	31.0*
3	730.6	B	36.78	56.63	27.9*
4	734.4	D	35.20	44.48	31.6
5	737.5	D	35.20	55.28	42.6
6	741.3	D	35.20	61.22	47.1
7	742.6	D	35.20	40.47	26.7
8	745.5	D	35.20	46.78	34.2
9	746.4	D	35.20	34.99	19.8
10	754.4	C	35.24	52.06	41.0
11	768.1	E	35.20	49.64	37.5
12	769.5	D	35.20	48.71	36.4
13	772.1	D	35.20	30.01	14.9
14	772.4	D	35.20	29.21	14.1
Target	774.1	D	35.20	44.13	31.2
15	774.6	D	35.20	29.25	14.2
Average Pool ORMin Score					30.3

* Calculated using only MH data, all other scores use HDD and MH data

Assessment Approach

The Ohio River Macroinvertebrate Index (ORMin), measures various aspects of macro assemblages (left pie chart), using numerical metrics (Results Overview). The sum of these metrics are standardized by the habitat type (right pie chart) present at each site. Once accounting for habitat, the resulting ORMin scores and associated condition ratings can be compared across sites (Site Performance), averaged at the pool level (Average Pool ORMin Score), and ultimately used in aquatic life use assessments of each pool (Results Overview). The map below shows the assessment of Newburgh using the 2012 data.



Locations of the 15 random and 1 targeted (T) sampling sites in Newburgh Pool

Newburgh Pool - Results Overview

Sampling Results

Environmental Measures

Dominant Habitat Class: D - shallow sand/fines
Water & Sediment Quality: no site classified as highly disturbed
Additional Comments: higher water velocities in the upper reaches

Biological Measures

Total No. of Macroinvertebrate Taxa sampled: 33
Average No. of Individuals/site (minus Zebra Mussels): 1403
Dominant Family (minus ZM/Asiatic Clams): Midges
Dominant Taxa (minus invasives/exotics): *Gammarus fasciatus*
Common Taxa: *Cyrtolus fraternus*, *Dicrotendipes* sp.
Uncommon Taxa: *Stenacron interpointatum*
Notable Presence: *Hydra* sp., *Ligumia recta*

Assessment Results

Highest scoring ORMin metric: % Oligochaetes
Lowest scoring ORMin metric: % Intolerants
Sites Above 25th percentile (i.e. ORMin Score = 20): 12
Sites Below 25th percentile (i.e. ORMin Score = 20): 4
Fish (ORFin) Biological Condition Rating: Very Good

Macro (ORMin) Biological Condition Rating: Good

How should we treat multiple indicators?

Pool	Year	Fish Surveys		Macro Surveys	
		Score	Rating	Score	Rating
New Cumberland	2011	23.9	FAIR	35.5	GOOD
Willow Island	2011	27.7	FAIR	54.6	EXCELLENT
Greenup	2011	38.0	GOOD	39.2	GOOD
Cannelton	2011	43.6	VERY GOOD	25.8	FAIR
Emsworth	2012	26.6	FAIR	25.7	FAIR
Pike Island	2012	31.6	GOOD	41.6	VERY GOOD
Meldahl	2012	39.9	GOOD	<div>What if...</div> <div>9.8 VERY POOR</div>	
Newburgh	2012	46.0	VERY GOOD		



States use of Multiple Indicators

State	Fish IBI	Macro IBI	Consider Additional Info.	Process
PA		✓		Currently only one indicator
WV	✓	✓		On Hold, IBIs require additional refinement
OH	✓	✓	✓	One IBI Fails = Partial Attainment Still listed as impaired
KY	✓	✓	✓	One IBI Fails = Partial Attainment Still listed as impaired
IN	✓	✓		One IBI Fails = Impairment
IL	✓	✓	✓	One IBI Fails = Partial Attainment Still listed as impaired

**Overall, if one IBI says impaired then the unit is listed as impaired
Though some states will consider additional abiotic data before final listing**



BWQSC Recommendations

- Accept all 4 pool assessments from 2013 as meeting their designated Aquatic Life Use.
- For 2015 surveys, consider implementing a new probabilistic design to minimize “clumping” of sites within a pool.
- Target 4 pools for 2014 fish and macroinvertebrate surveys:
 - Belleville, McAlpine, Olmsted/Open Water, & Markland



BWQSC Recommendations

- For 2016 305(b) Report:
 - Consider including Ohio River Macroinvertebrate Index based on results of continued validation using 2014 data.
 - Exclude 2015 fish & macro data due to lag time of not receiving 2015 macro data until early 2016.
 - After considering available abiotic data, consider any pool with failing fish OR macro indices to be impaired.