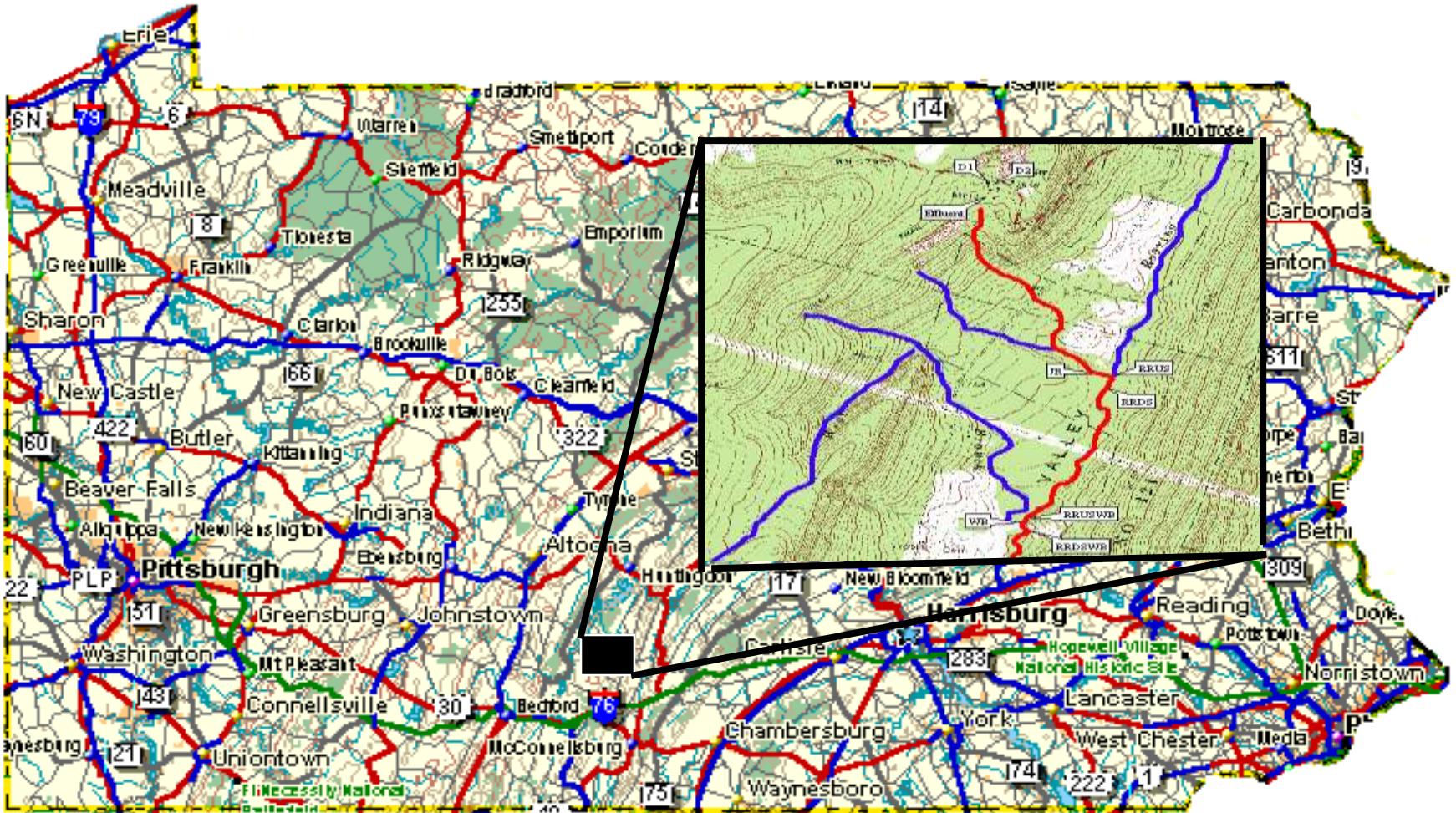


Fish and Macro Improvements Post Mine Drainage Remediation

Thomas J. Clark
Susquehanna River Basin Commission
Mine Drainage Program Coordinator

Roaring Run Location



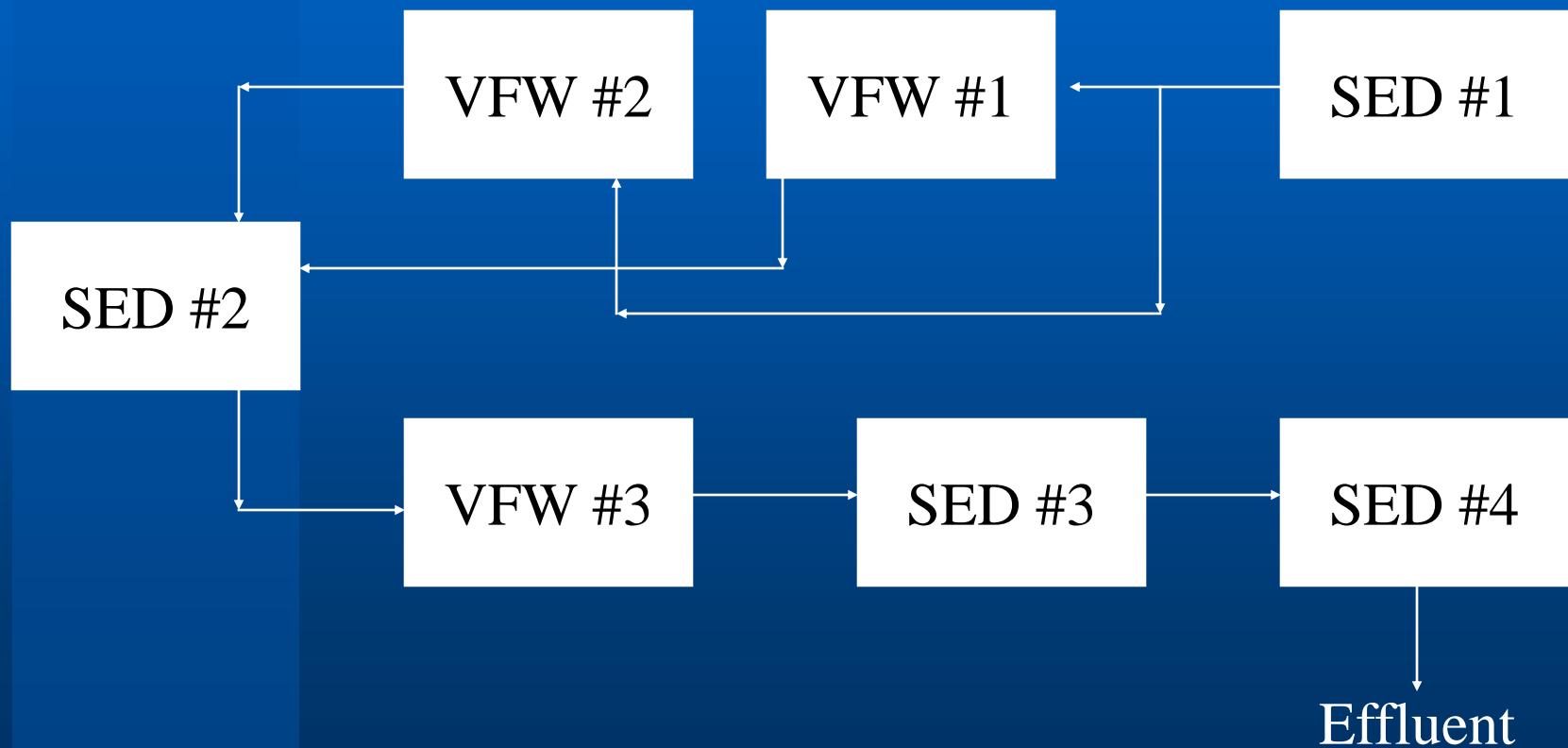


4/16/2001

Historical AMD Water Quality

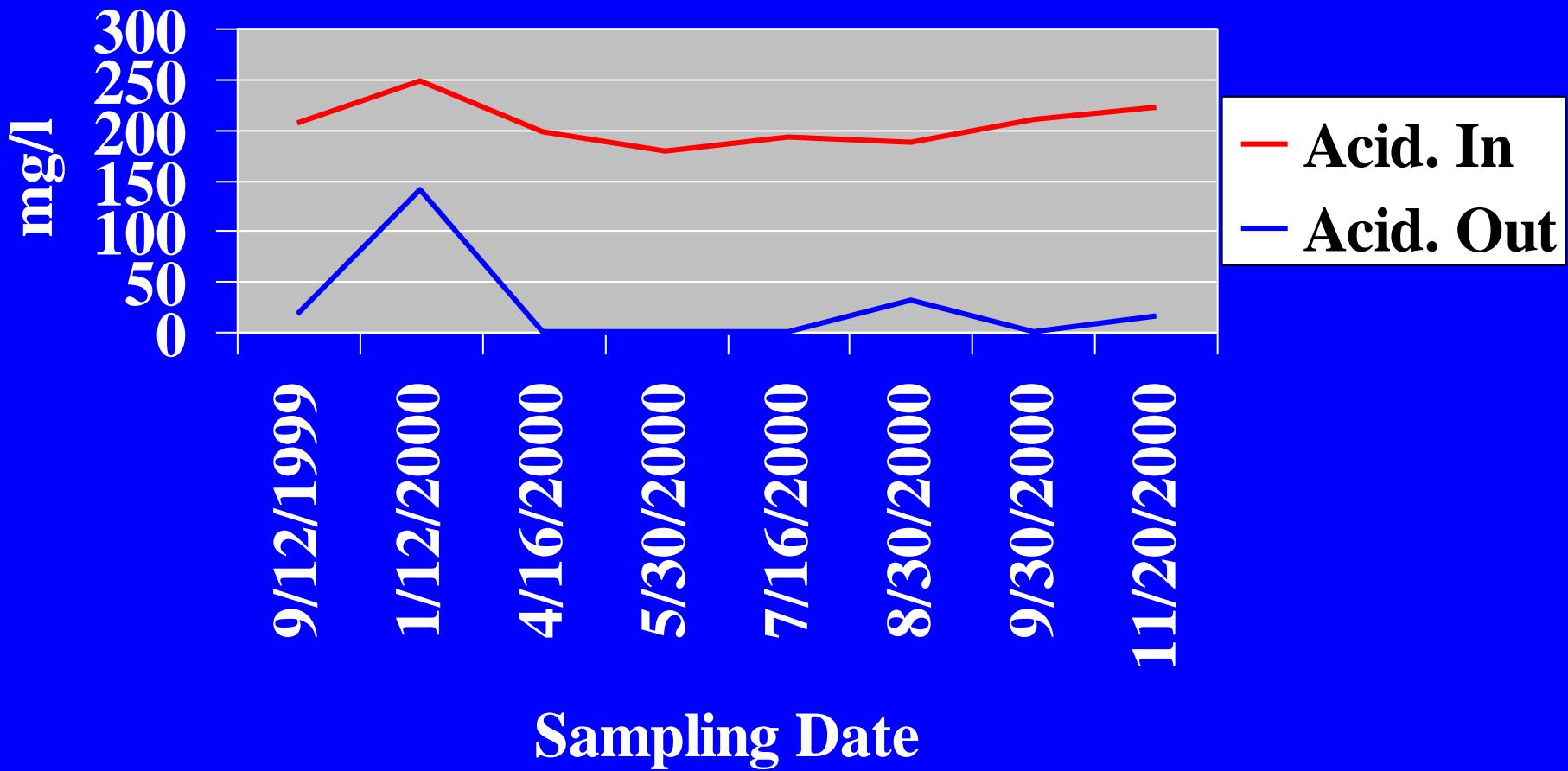
Location	Lab pH	Total Fe	Total Al	Total Alk.	Total Acid.
		mg/l	mg/l	mg/l	mg/l
Combined Discharges	2.8	50.00	40.00	0.00	250.00
Roaring Run US of JR	6.6	0.27	0.18	38.00	0.00
Joller Run	2.7	2.85	16.90	0.00	226.00
Roaring Run DS of JR	3.4	3.97	7.64	0.00	88.00

DEP Vertical Flow Wetland



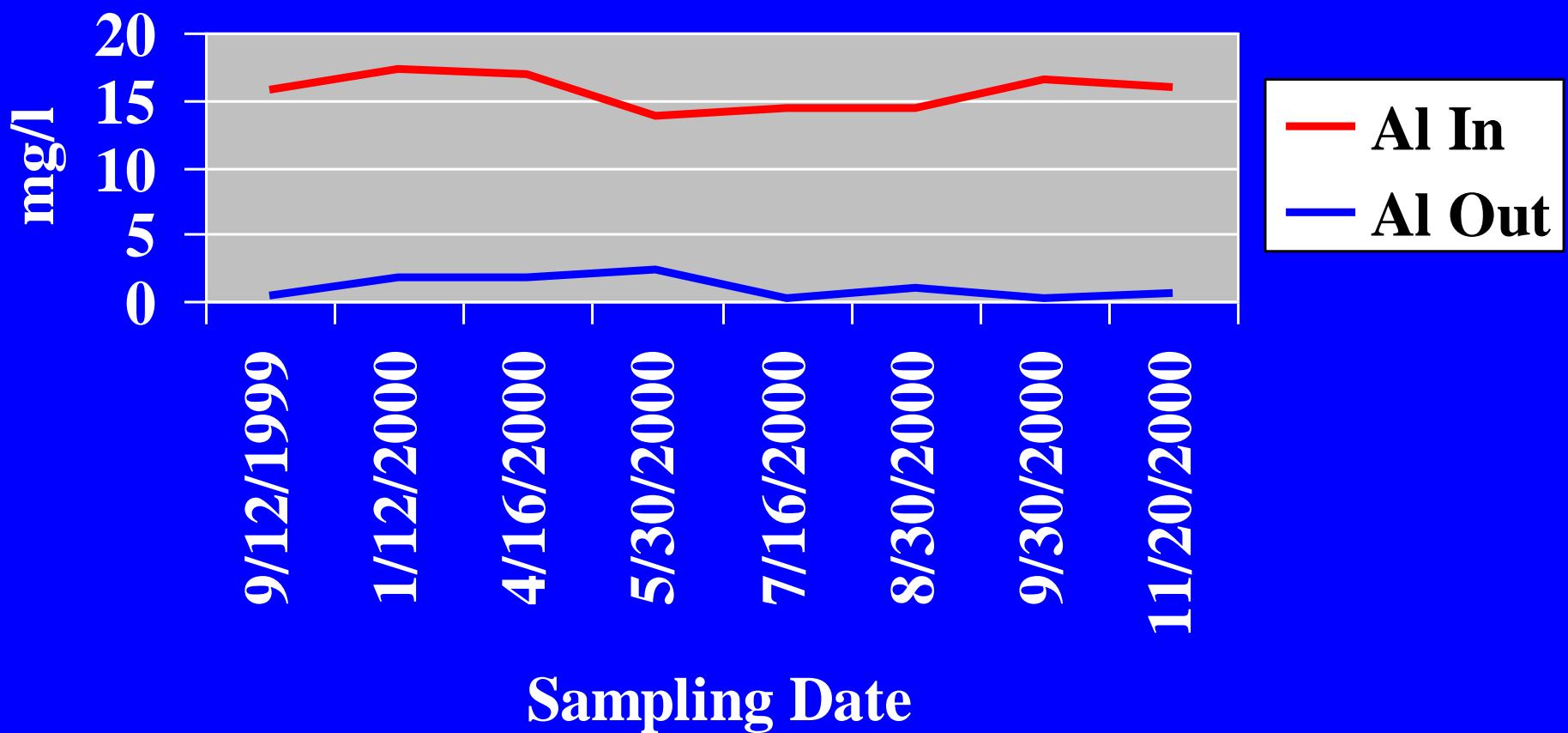


Vertical Flow Wetland Influent and Effluent Acidity



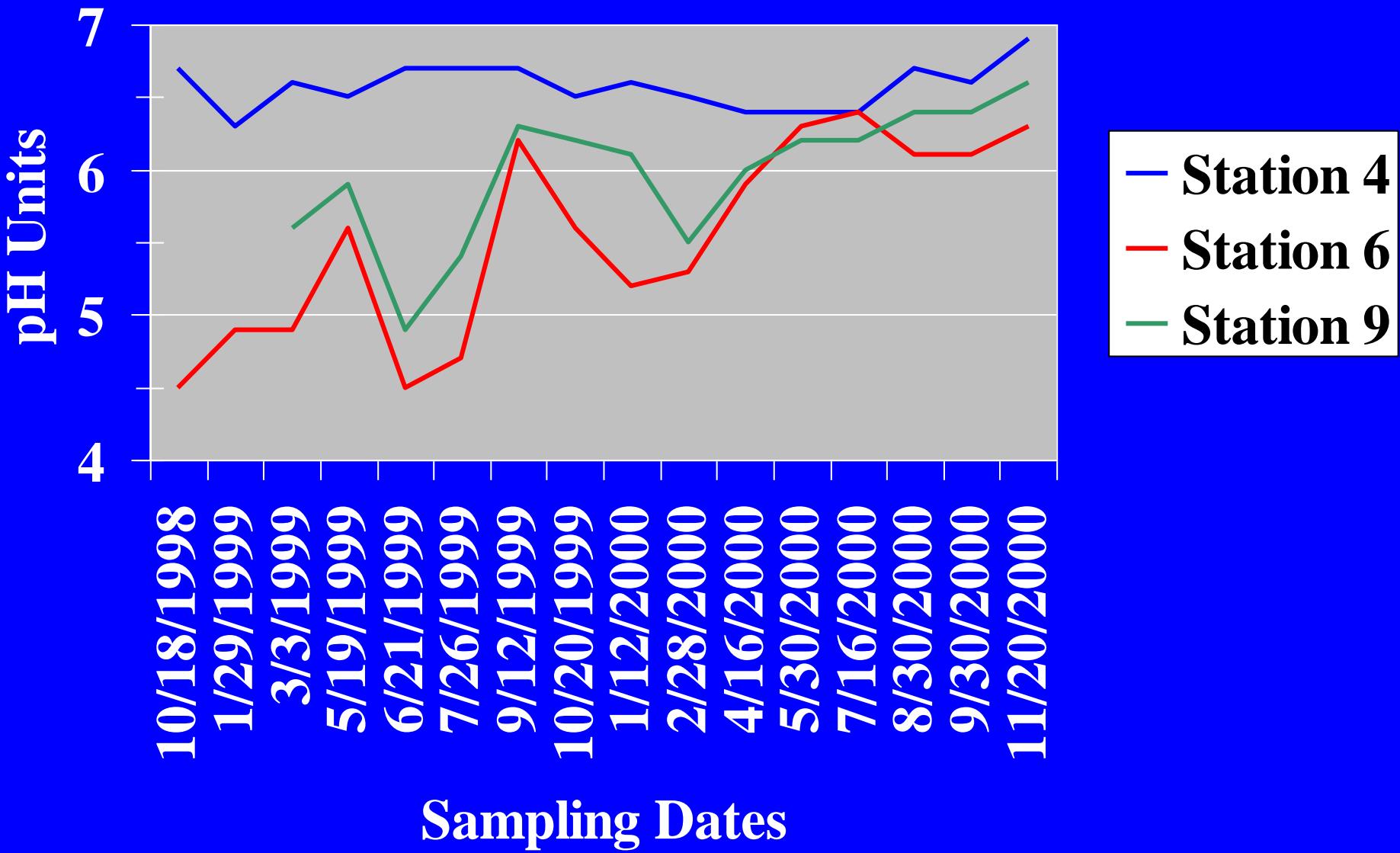
Significant decrease in acidity due to VFW. P<.001

Vertical Flow Wetland Influent and Effluent Aluminum

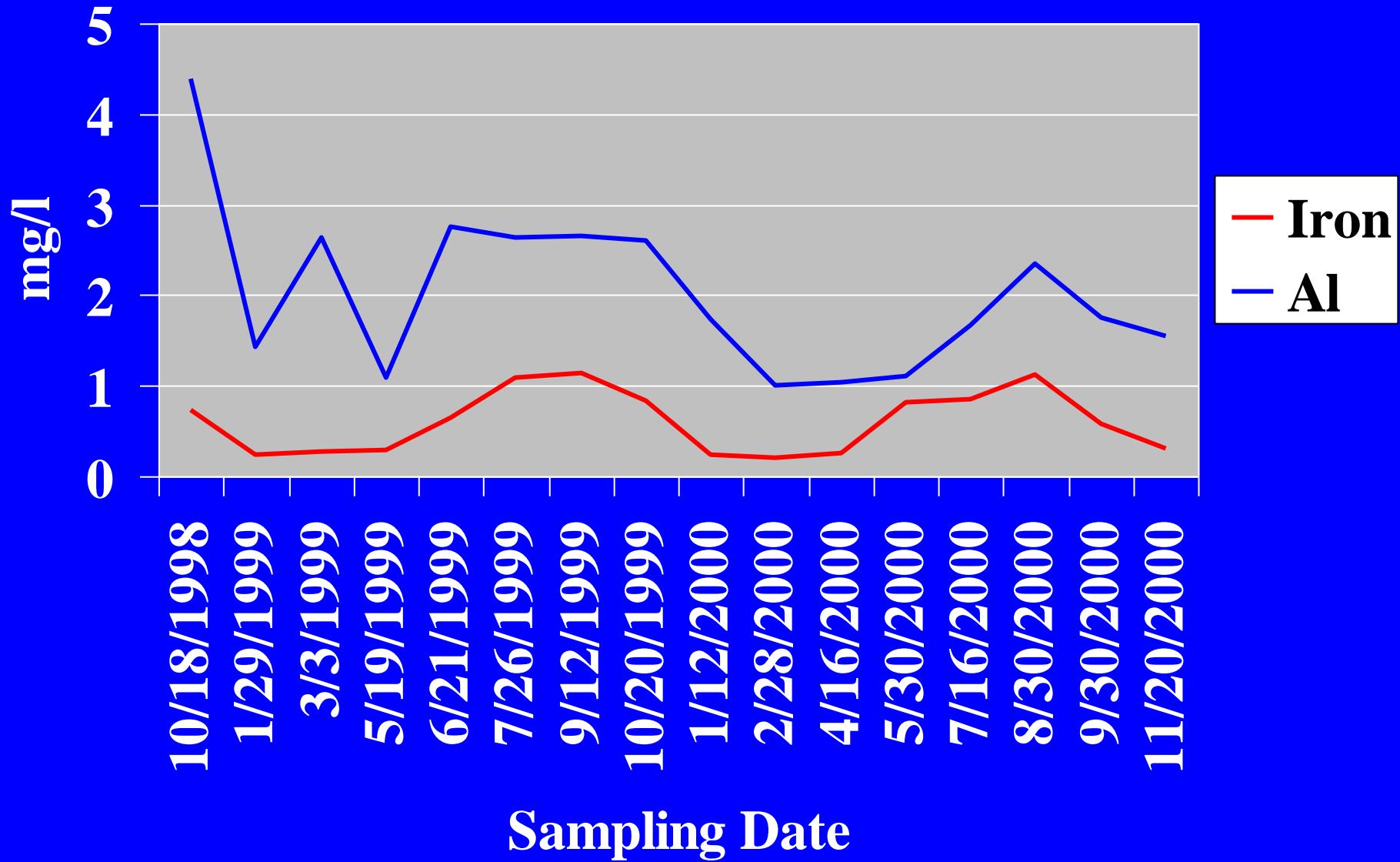


Significant decrease in Al due to VFW. P<.001

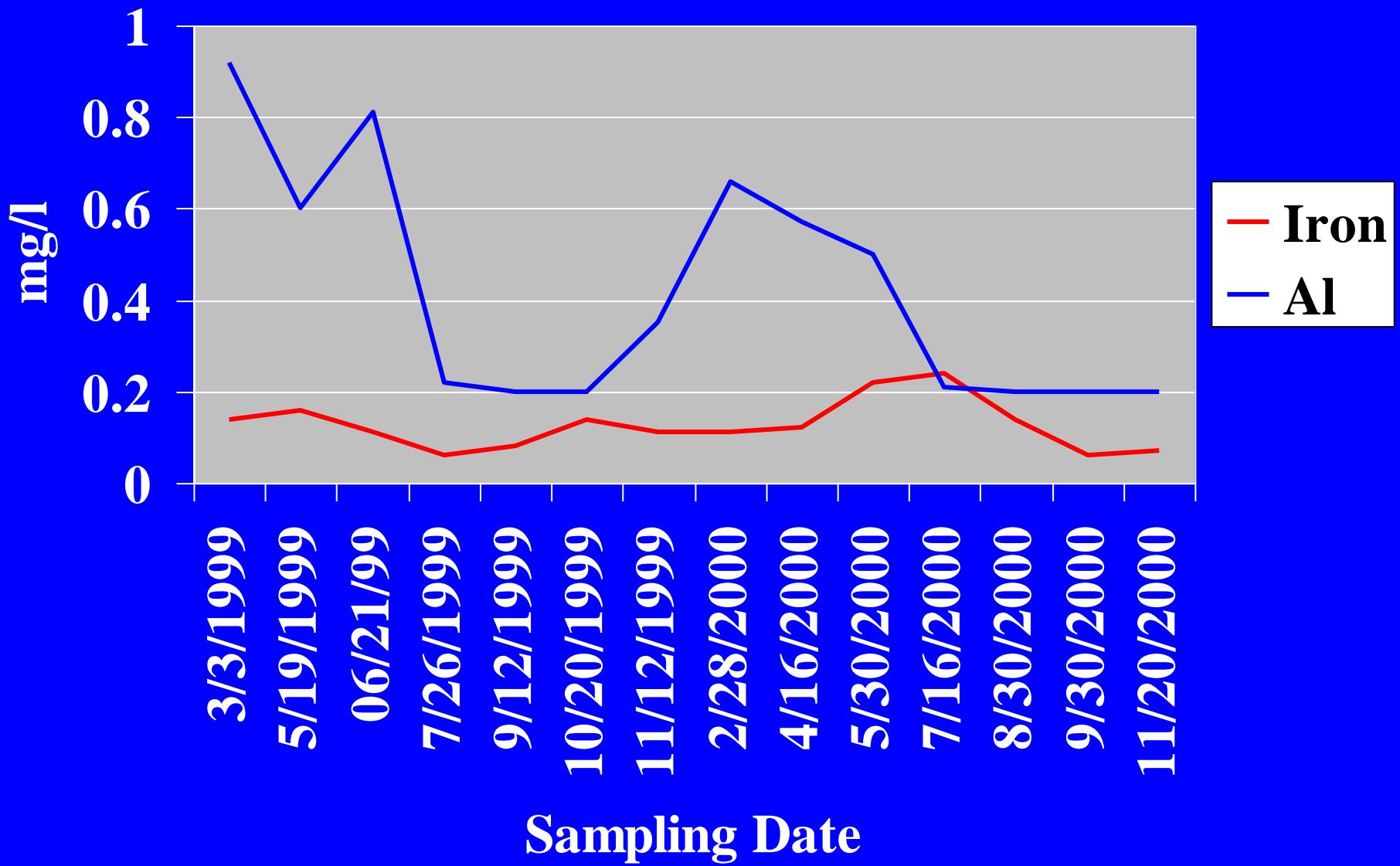
Temporal pH Behavoir



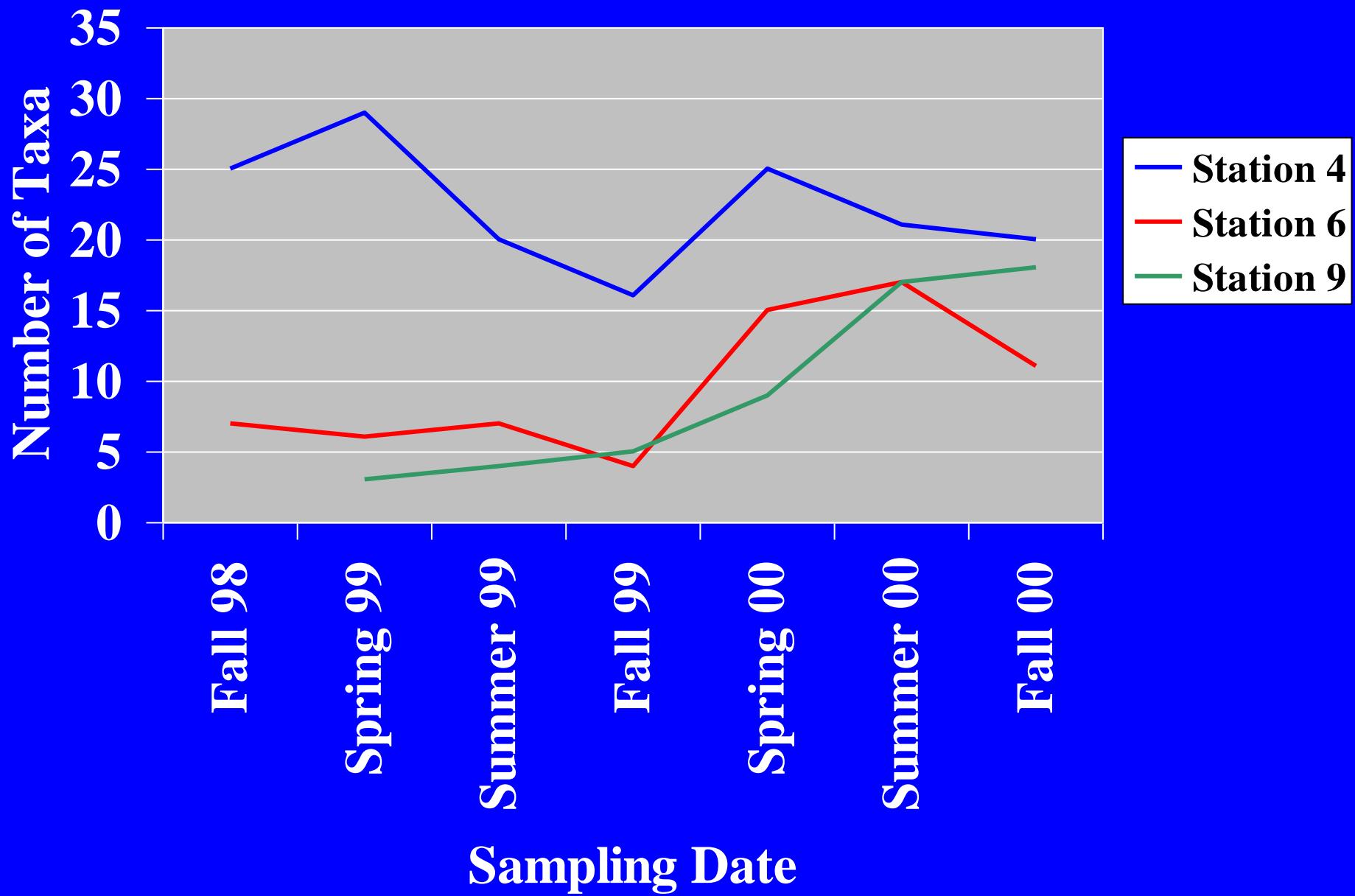
Iron and Aluminum at Station 6



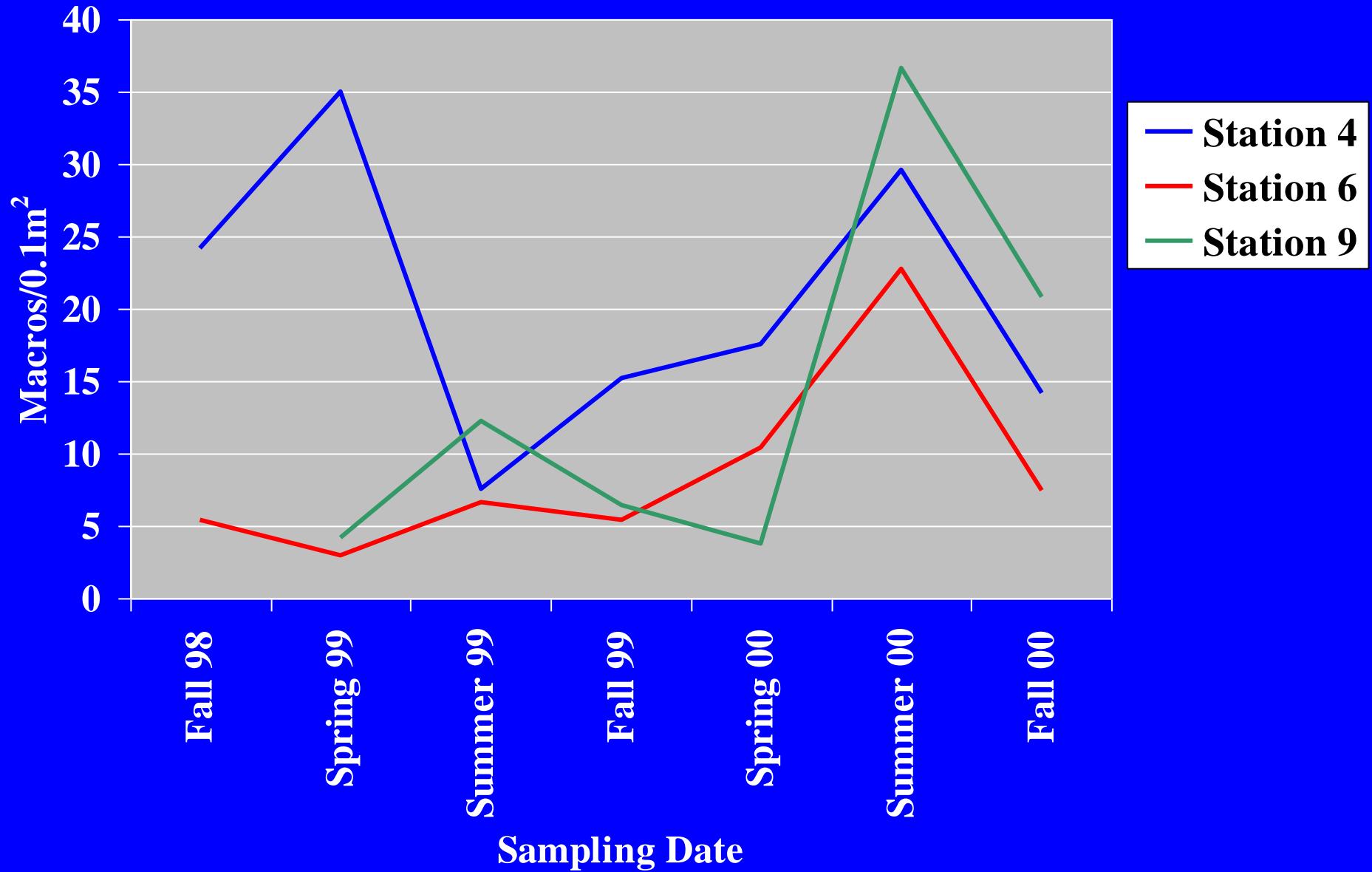
Iron and Aluminum at Station 9



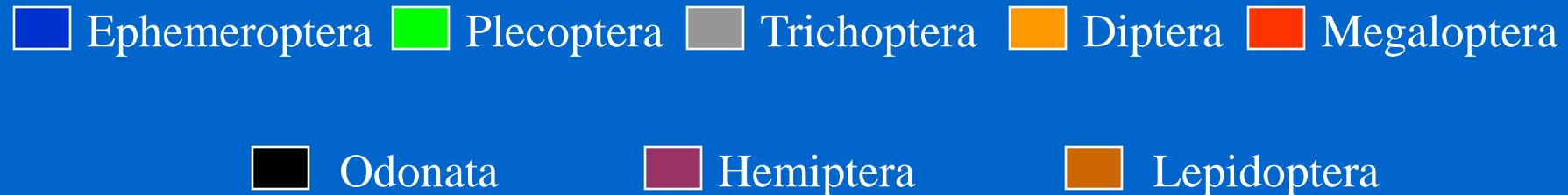
Macroinvertebrate Taxa



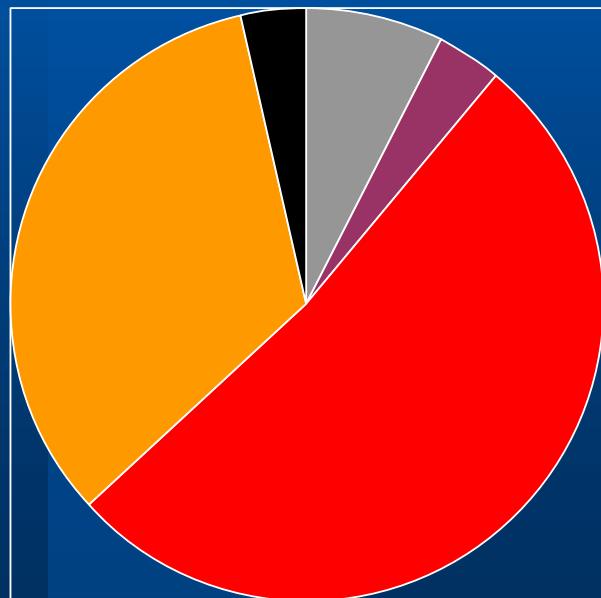
Macroinvertebrates/0.1m²



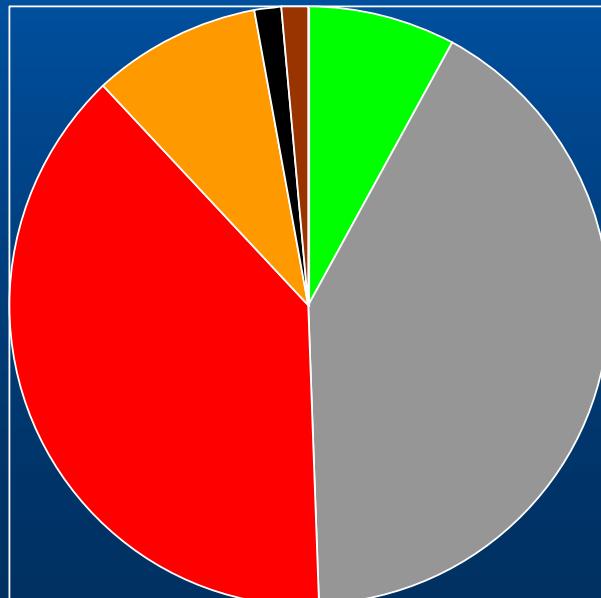
Macro Composition at Station 6



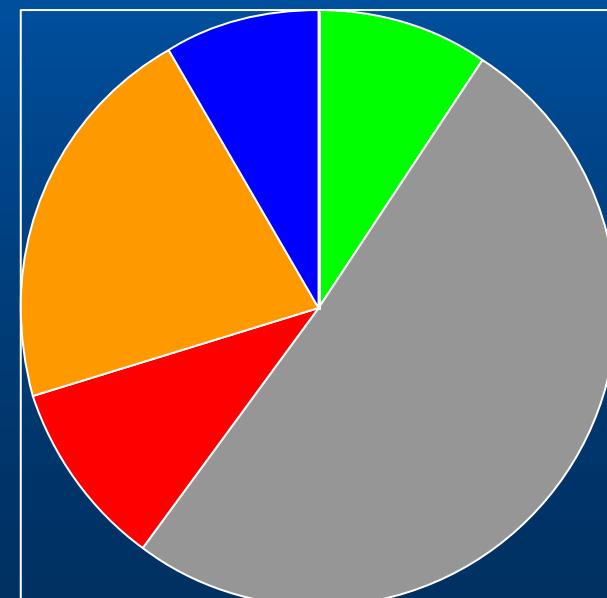
Pre-treatment



Post-treatment(1)



Post-treatment(2)



Macro Composition at Station 9

Ephemeroptera

Plecoptera

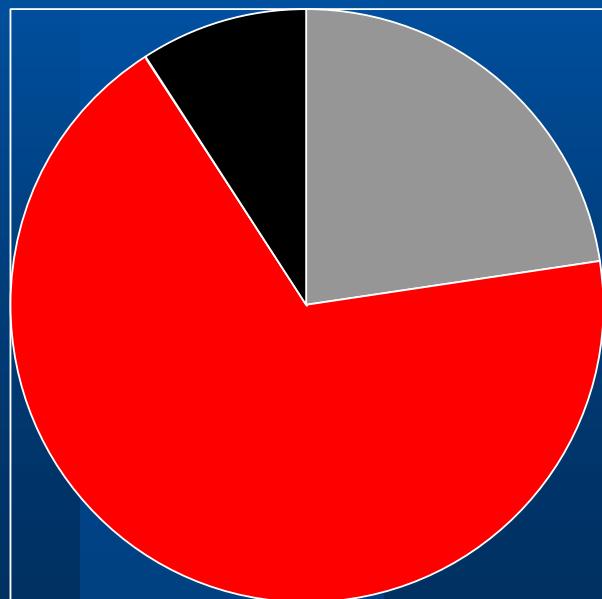
Trichoptera

Diptera

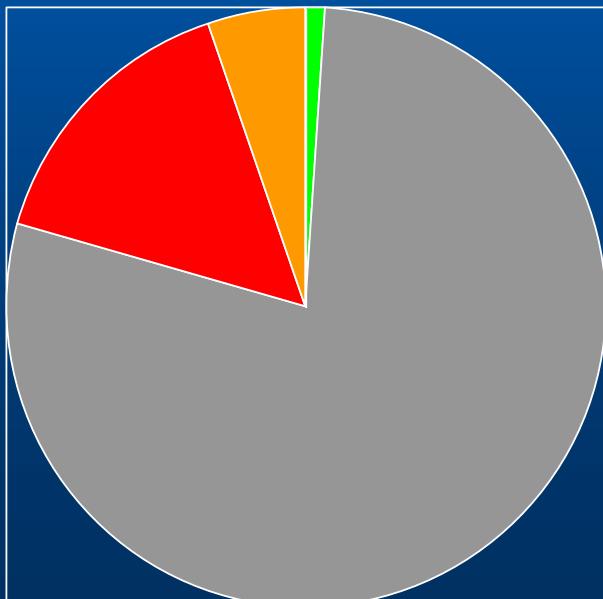
Coleoptera

Megaloptera

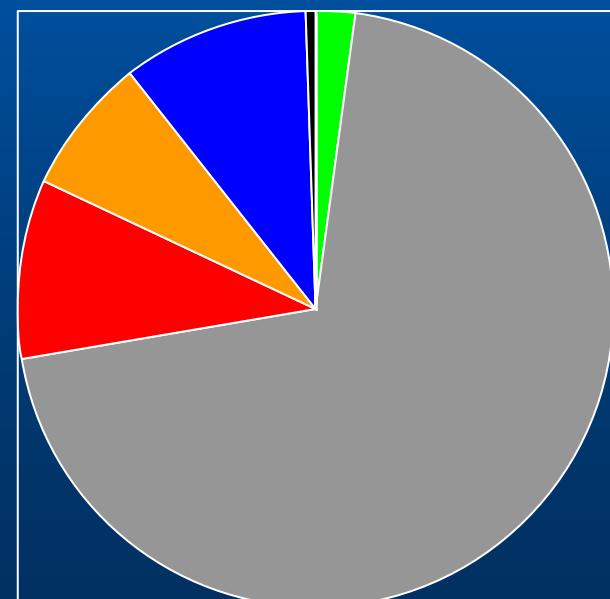
Pre-treatment



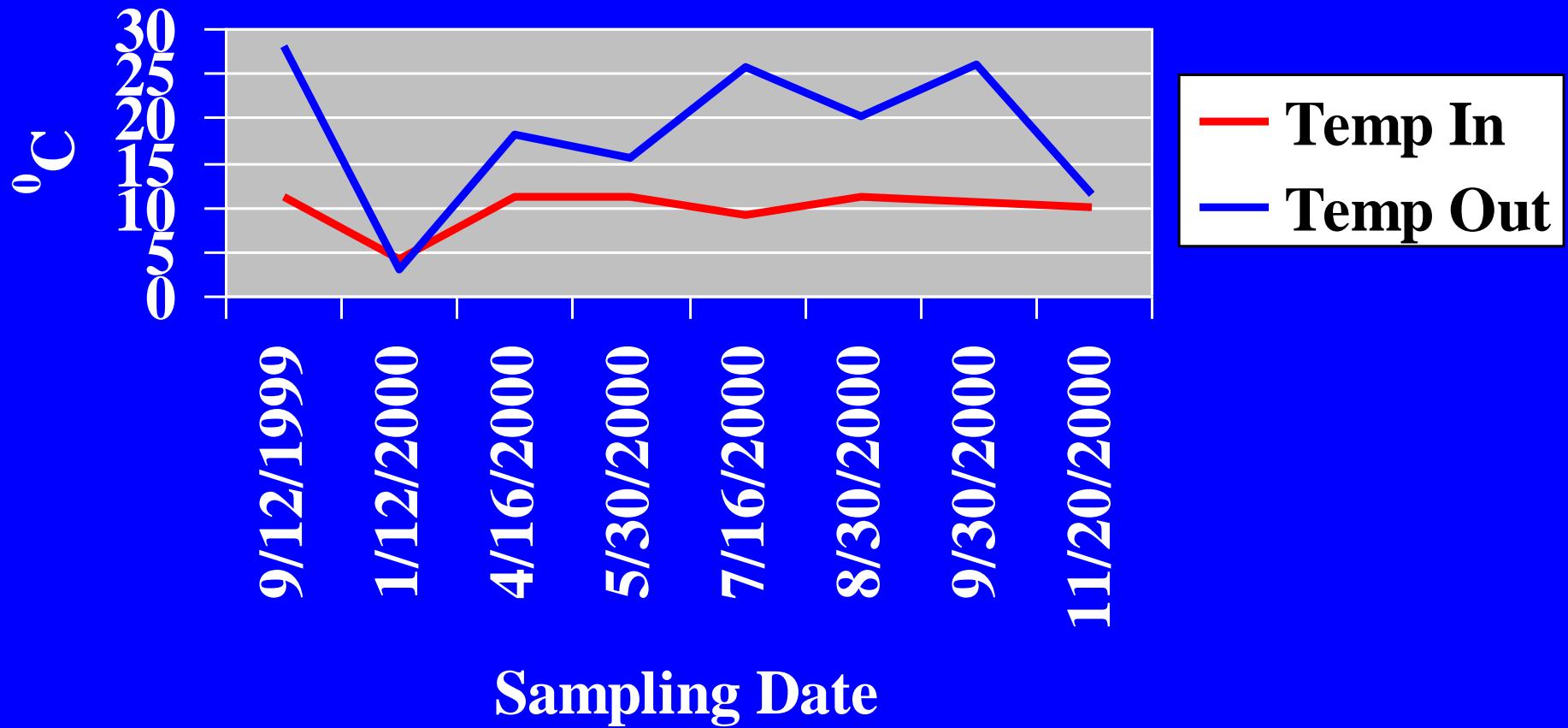
Post-treatment(1)



Post-treatment(2)



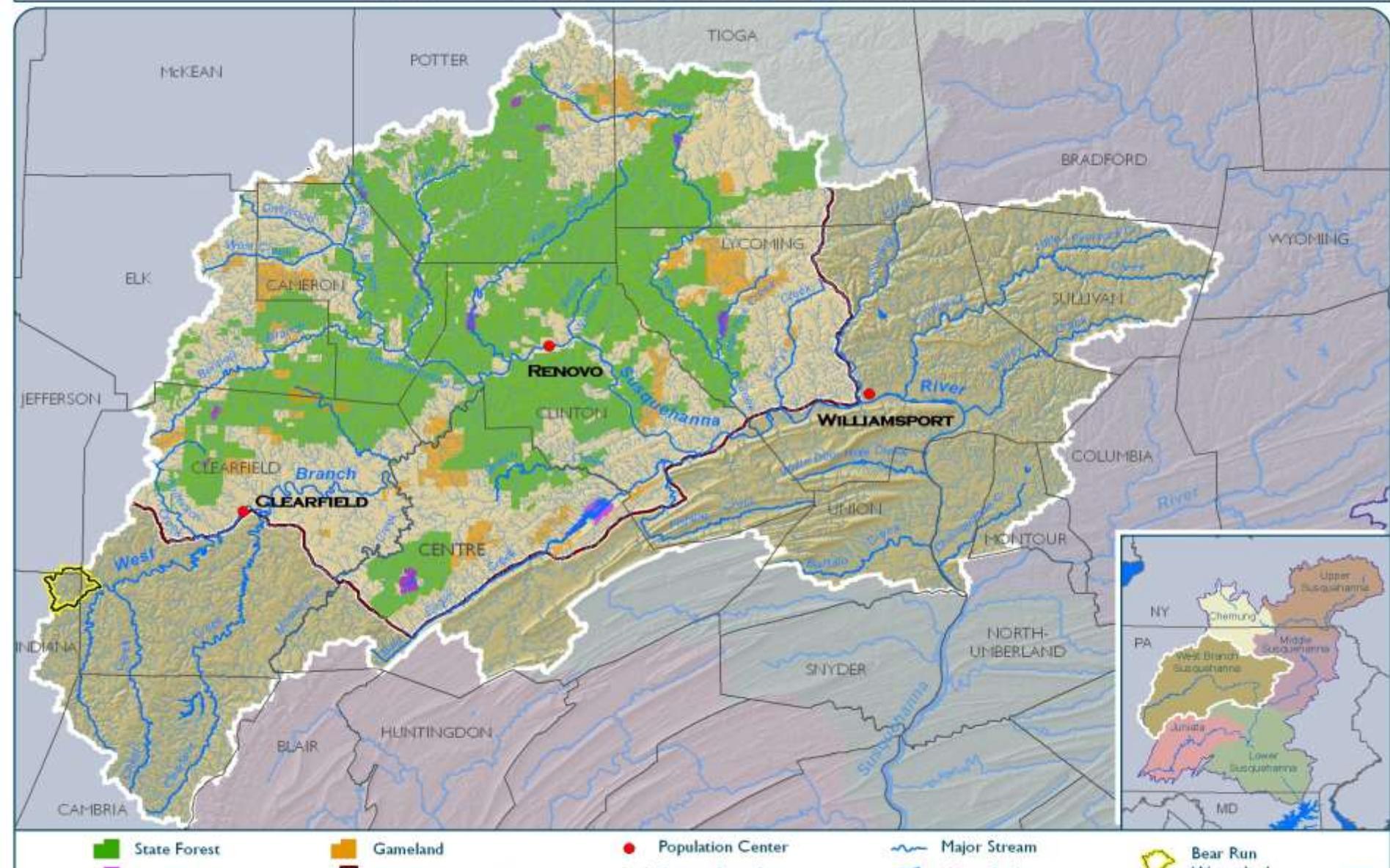
Vertical Flow Wetland Influent and Effluent Temperature



Significant increase in temp due to VFW. p=.009

BEAR RUN WATERSHED & THE PENNSYLVANIA WILDS

In Reference to the West Branch Susquehanna Subbasin



Sources:

Major Water Features: National Hydrography Dataset (NHD), USGS, Subbasins: SRBC, 2006. Population Centers: Environmental Systems Research Institute.

County Line: PA Department of Transportation, Cartographic Information Division, 1997. PA Wilds, State Parks, State Forests: PA Department of Conservation & Natural Resources; Gamelands: PA Game Commission, 2004.

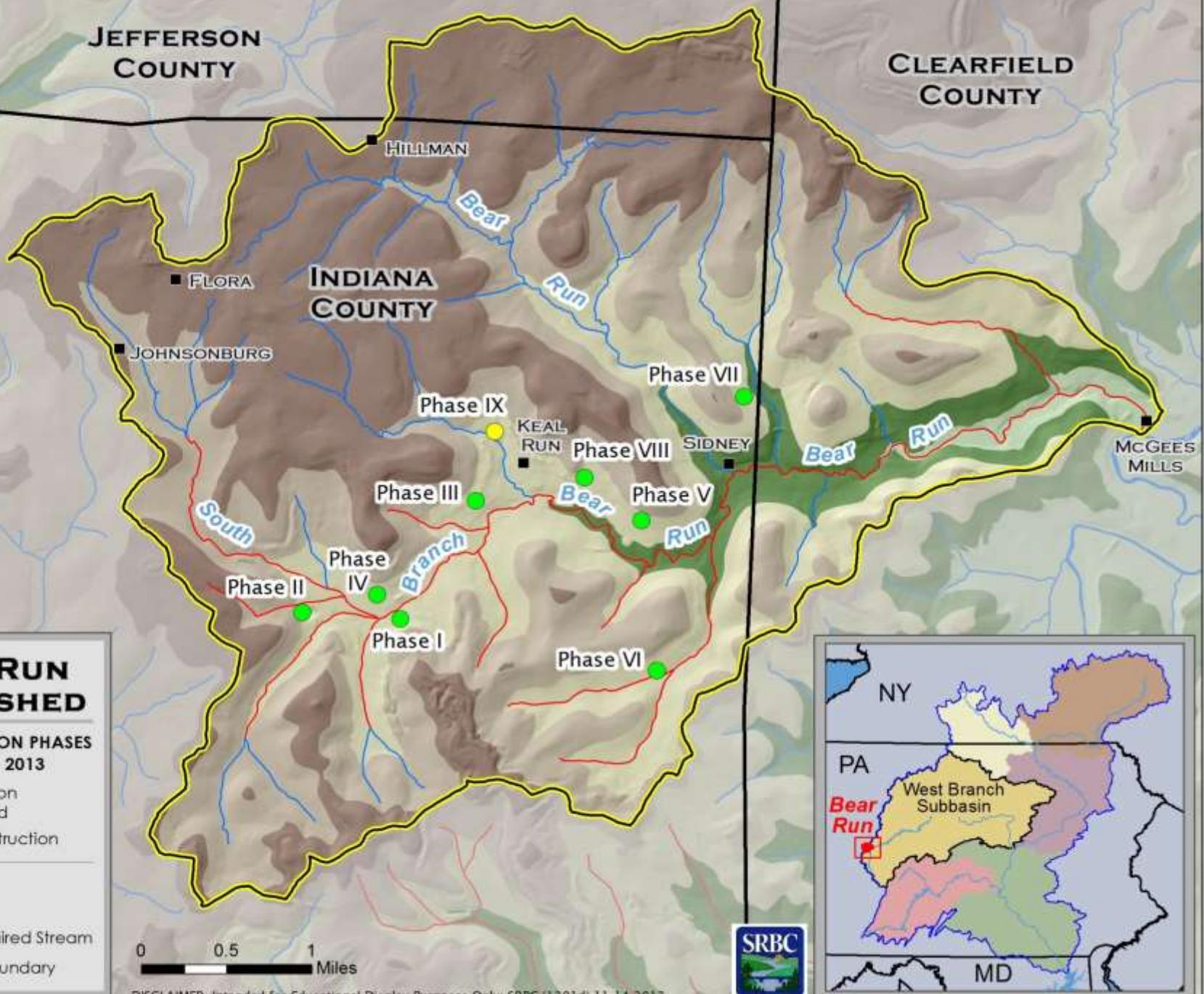
0 5 10 20 Miles

Susquehanna River Basin Commission
Disclaimer: Intended for Educational Display Purposes Only
SRBC (1291a) 03-13-2007



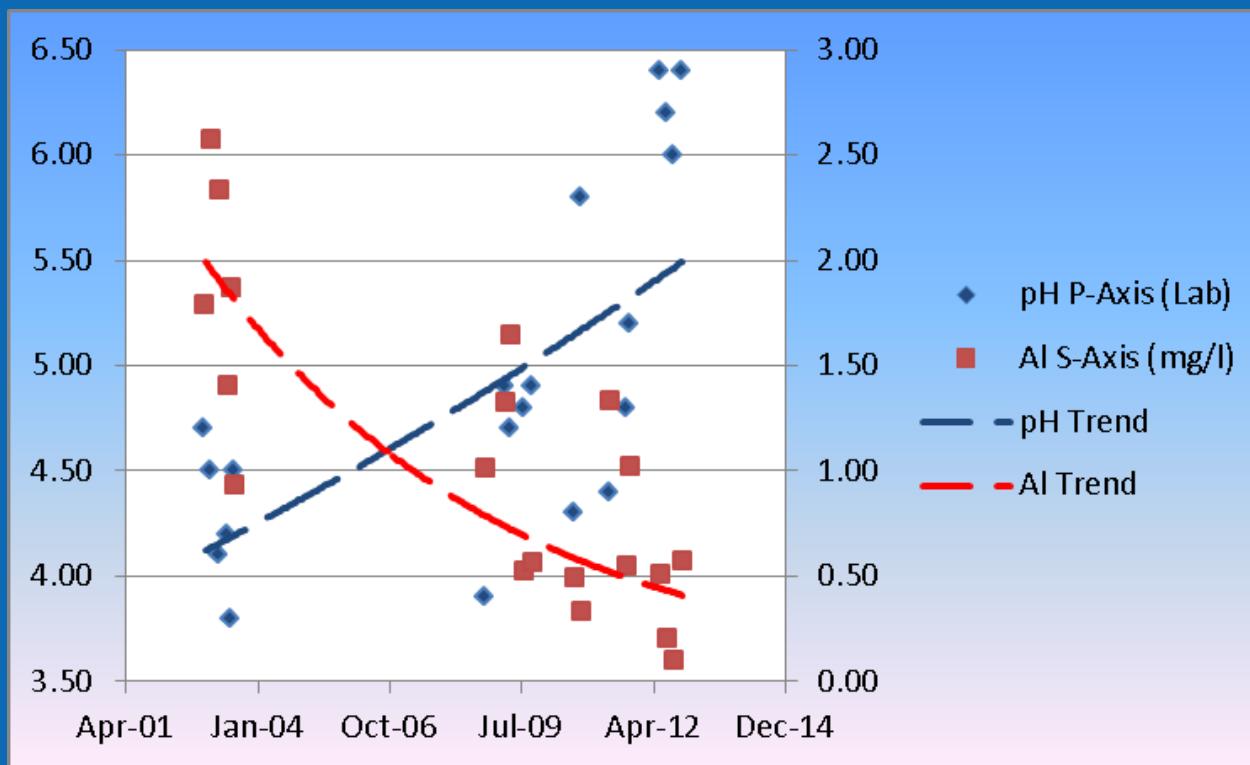
JEFFERSON
COUNTY

CLEARFIELD
COUNTY



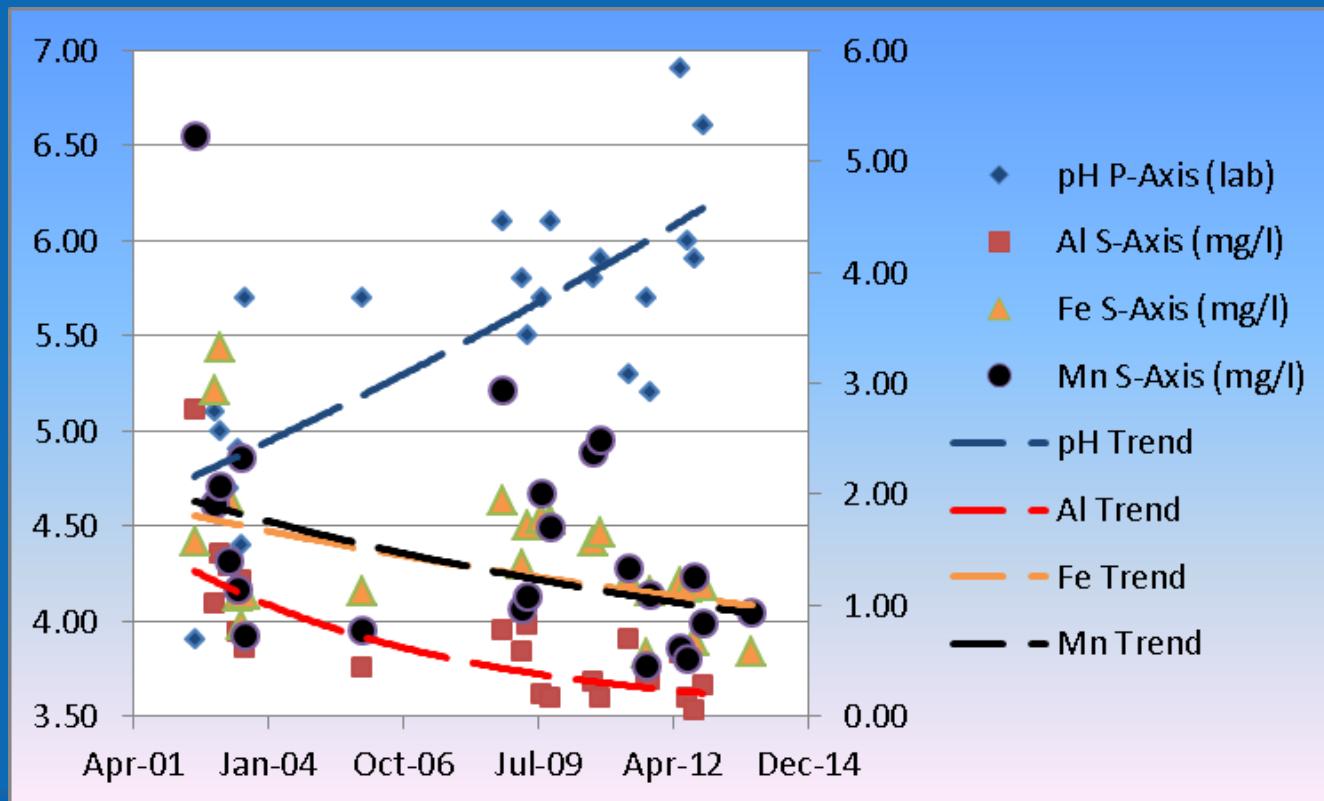
South Branch Improvement

- Acidity Reduction: 87%
- Iron Reduction: 61%
- Manganese Reduction: 31%
- Aluminum Reduction: 81%



Bear Run Improvement

- Acidity Reduction: 69%
- Iron Reduction: 50%
- Manganese Reduction: 62%
- Aluminum Reduction: 75%



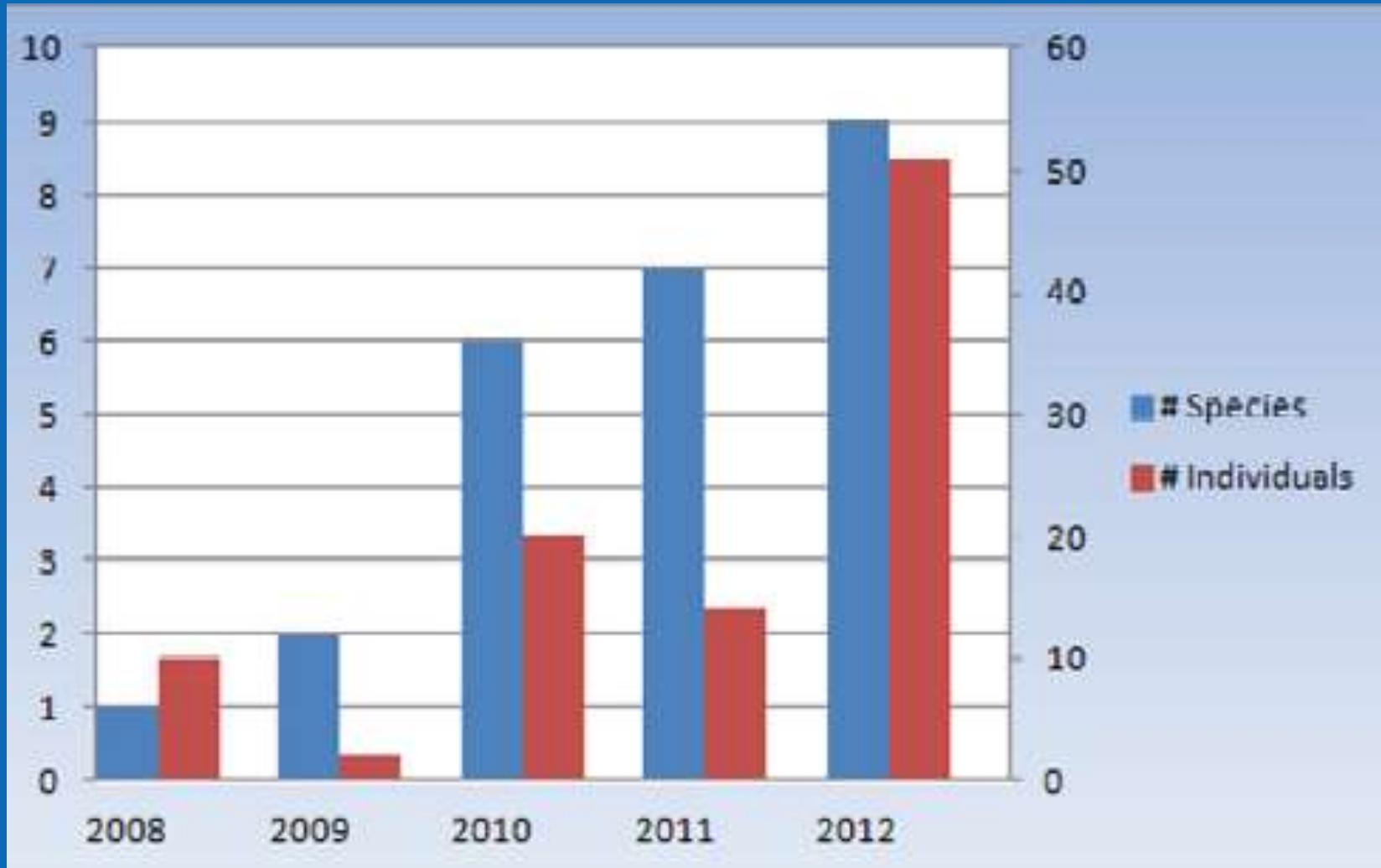
Bear Run Mouth Wild Brown Trout



Bear Run Interior Native Brookies



Bear Run Fish Population



Conclusions

- In my experience, acidity (pH) and aluminum concentrations directly influence fish and macro recolonization more than any other WQ parameter.
- If nearby populations of potential colonizers are present, rapid recolonization may occur concomitant with improving water quality.
- In my experience, elevated Mn concentrations do not seem to have a real influence on biology.
- Potential for temperature increases as a result of heated discharges from these treatment systems emptying into cold water streams should be a consideration.