Illinois RiverWatch at Nachusa Grasslands: 2014-2018

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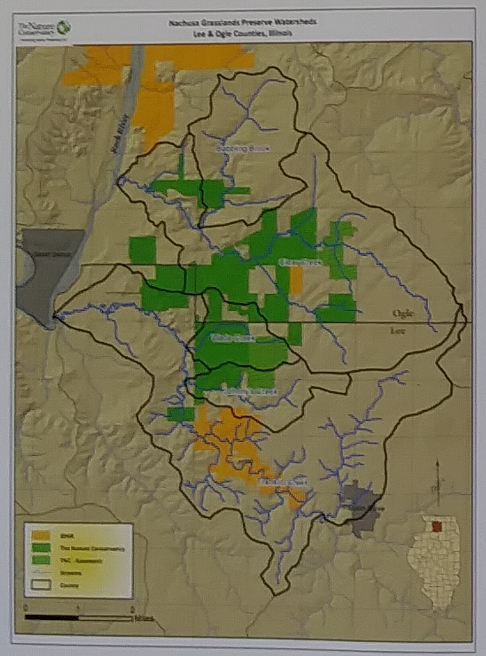
Abstract

Using the standardized protocol of the Illinois RiverWatch Program, annual biological and habitat surveys are being conducted on four streams flowing through Nachusa Grasslands. The water quality trend lines for the two streams with five years of collected data appear to be moving in opposite directions: Clear Creek's water quality may be deteriorating, and Wade Creek's water quality may be improving. Examining the sources of the water and what happens to it as it flows toward and through the preserve suggests two explanations for the difference. Preliminary data for the other two monitored streams may also support this two-fold hypothesis:

1) **When a large percentage of a stream's watershed is included within the restored boundaries of Nachusa Grasslands, the stream's water quality will tend to improve over time**

2) **Water quality in streams with a large percentage of their source water in agricultural land outside the preserve can be improved if containment ponds or wetlands can be strategically located upstream to allow sediment, fertilizers, animal wastes, and pesticide residues to settle out before flowing downstream through the preserve.**

Watersheds of Nachusa Grasslands



Watershed sizes

Babbling Brook:	2,765 acres
Clear Creek:	8,366 acres
Johnny's Creek:	1,332 acres
Wade Creek:	1,099 acres

RiverWatch Stream Monitoring

Habitat Survey

Weather, air and water temperature, water appearance and odor, turbidity, canopy cover, algal growth, siltation coverage, submerged aquatic plants, streamside vegetation, bottom substrate, stream discharge rate, land uses at site and upstream

Biological Survey

A sample of the benthic macroinvertebrate "indicator organisms" present in the stream is collected for identification under a microscope.

- Small (but visible) animals with no backbone living among the substrate materials at the bottom of the stream.
- Different types of organisms tolerate different stream conditions and levels of pollution, so their presence (or absence) provides information on water quality.
- **Thirty-seven** types of benthic macro-invertebrates are included in the Illinois RiverWatch protocol.

Examples of Indicator Organisms

Prefer cleaner water - low pollution, high dissolved oxygen

- Larva of mayflies and caddisflies, scuds

Tolerate higher pollution levels and lower dissolved oxygen

- Aquatic worms, bloodworm midges, left-handed snails, leeches

Measures of Stream Quality

Taxa Richness

Number of different organisms in the sample.

- Increases as nutrient pollution, sedimentation, and toxic pollution decrease.

EPT Taxa Richness

Number of pollution-sensitive mayflies, stoneflies, and caddisflies in the sample (Ephemeroptera, Plecoptera, Trichoptera)

- Increases as nutrient pollution, sedimentation, and toxic pollution decrease.

Macroinvertebrate Biotic Index (MBI):

Average tolerance to organic (nutrient) pollution of macro-invertebrates in the sample.

- MBI decreases as nutrient pollution decreases because higher quality streams have more sensitive macroinvertebrates with lower tolerance values.
- A stream with improving water quality will generally show a **declining MBI** over the years as the number of pollution-intolerant species increases.

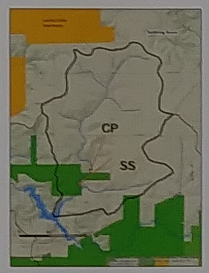
Stream Quality Rating Values[1]

	Taxa Richness	EPT Taxa Richness	MBI
Excellent	≥ 14	≥ 5	≤ 4.35
Good	12-13	4	≥ 4.36 - ≤ 5.00
Fair	9-11	3	≥ 5.01 - ≤ 5.70
Poor	7-8	2	≥ 5.71 - ≤ 6.25
Very Poor	≤ 6	0-1	≥ 6.26

RiverWatch Data Collected at Nachusa Grasslands

Babbling Brook

Sampled for the first time in 2018

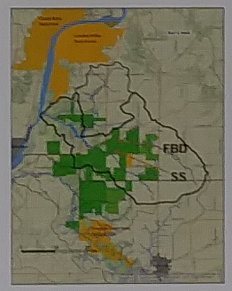


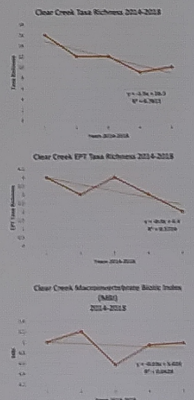
Habitat notes: Although this stream is heavily channelized to the north and runs almost entirely through agricultural land (including a cattle operation), the water quality at the sample site **(SS)** as indicated by this initial monitoring is "very good". The large containment pond **(CP)** just north of the preserve boundary likely plays an important role by providing a "sink" where pollutants can settle out before the water flows downstream to the sampling site.

Taxa Richness = 15 (Excellent)
EPT Taxa Richness = 4 (Excellent)
MBI = 5.04 (Good)

Clear Creek

Sampling 2014-2018





Analysis: Decreases in Taxa Richness and EPT Taxa Richness over the last five years suggest that the water quality at this sampling site **(SS)** is deteriorating. The trend line for MBI is not definitive.

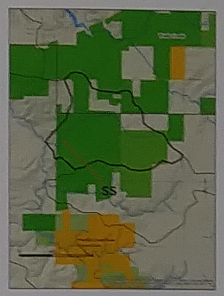
What has changed over the past five years?

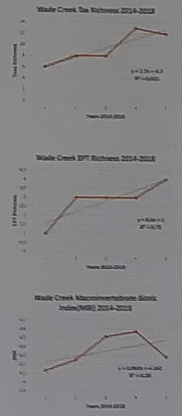
1. A former beaver dam **(FBD)** upstream had created a pond and wetland that may have acted as a "sink" for sediment and agricultural pollution flowing downstream. That dam no longer exists.
2. Numerous trees in the immediate site area and upstream have been removed during ongoing habitat restoration efforts which may have had an impact on erosion rates at least in the short term. Siltation levels are the highest of all four monitored Nachusa streams.
3. As part of habitat restoration efforts in the immediate site area and along upstream shorelines, herbicide use has been widespread and may have had deleterious effects on macroinvertebrate populations.

The overall water quality at this site along Clear Creek is still "good". Additional data collected in future years should strengthen the statistical significance of the trend lines.

Wade Creek

Sampling 2014-2018





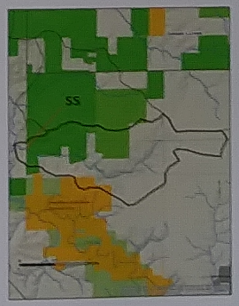
Analysis: Measured by Taxa Richness and EPT Taxa Richness, Wade Creek has the highest stream quality of the three streams monitored for multiple years, and it appears to be improving over time.

In a stream with improving water quality, MBI values would be expected to decline. The correlation coefficient (R^2) of the trend line is not high indicating that the relationship between the trend line and the data is not strong. Additional years' data may clarify any trend in MBI.

Habitat notes: The Wade Creek watershed lies almost entirely within Nachusa Grasslands. Much of the watershed is wetland which is a natural sink for both organic and inorganic pollutants.

Johnny's Creek

Sampling 2015-2018



Range of **Taxa Richness** values: 9-12 (Fair to Good)

Range of **EPT Taxa Richness** values: 1-2 (Poor)

Range of **MBI** values: 4-4.8 (Good to Excellent)

Analysis: Four years of data collection have revealed no changing trends in the water quality of this stream. More than half of the watershed is outside of the preserve but the land use is not heavily agricultural in nature and has not changed significantly during the period.

Conclusions

RiverWatch sampling protocol is providing data useful for monitoring stream water quality trends at Nachusa. Thus far, data suggests that:

1) **Watershed acreage land acquisition should be an important goal for The Nature Conservancy.**
2) **Thoughtful placement of wetlands and containment ponds can improve stream water quality downstream.**
3) **Future years' data should clarify water quality trends.**

Acknowledgments: Aaron Lange, The Nature Conservancy-IL; Charlie Baker, Illinois Riverwatch; Bill Kleiman, Nachusa Grasslands Preserve Manager; The Nachusa Riverwatch Volunteer Stewards

References: [1] Illinois RiverWatch Stream Monitoring Manual (9th edition, December, 2013); http://www.ngrrec.org/Riverwatch/