Grove EPA National Non-Point Pollution Monitoring Project

1. Floodwater detention
2. Sediment Transport
3. Nitrate Runoff
4. Fishery enhancement
5. Prairie/wetland complex

East Branch natural stream/slough with wetland complex

Grove Restorations are funded by city, state, and federal agencies
Oakland Rd Gage and 2100 Rd Gage measure sediment and nutrients moving into the Grove from West and East Branch drainage ditches.

Ireland Grove Rd Gage measures what leaves the Grove.
Before restoration at 2100 Rd, East Branch ditch revealed sedimentation, reed canary grass, and filamentous algae.
BMP’s to improve water quality in the Grove restoration
Prairie and Wetlands are 4+ years old in Phase 1 and 2.
Tim Straub - stream/slough restoration on the East Branch
Sept 12, 2012
IEPA upstream control
East Branch, Oakland Rd
DO – 0.7 mg/l
Conductivity – 636 umhos/cm
Hydrogen sulfide odor
Black organic sediment
Animal waste
IEPA field staff monitored dissolved oxygen in the Grove after the severe drought in early September 2012.
IEPA at E8 riffle/pool
East Branch, 2100 Rd
DO – 4.0 mg/l

IEPA at E1 riffle/pool
DO is 6.8 mg/l

East Branch control
and two restoration sites

IEPA upstream control
DO – 0.7 mg/l
Hydrogen sulfide odor
Black organic sediment
Even during 2012 drought, fall fish numbers are high in the upper East Branch fish survey pool below the E8 riffle.
Fish abundance continues to increase after Phase 2 East Branch Restoration

Initial dip in Fall Treatment abundance (with corresponding jump in Control abundance)

Fall samples are consistently higher than Spring samples

-4 -3 -2 -1 0 1 2 3 4

Time From Restoration

Abundance (Fish / 91 m)

Control
Restored

Fall 2012 drought

Fall East Branch Restoration Phase 2
Significant increase in fish abundance

Before   | During | After
-----------|--------|--------
Avg. No. of fish/sample

PRE        | DURING | POST
330.7      | 271    | 968.4
The Drought of Aug 2012

E1 Riffle is dry

Snails are dead
High flows scour deep hole

2012 drought did not affect fish in deeper pools

Population similarity after restoration before restoration

Pre: 12.5 species 303.7 fish
During: 10 species 56 fish
After: 17.8 species 1232.7 fish

Top 55%
-- Striped Shiner
+ Bluntnose Minnow
+ Green Sunfish
+ Bigmouth Shiner
-- Central Stoneroller
+ Bluegill
-- Johnny Darter
In 2012 drought, E8 pool is deeper than staff are tall
– stay on steep banks below E8 riffle
The aquatic vegetation in the Grove prairie slough improved water quality and provided plentiful forage.
Stream flow through narrow leaf pondweed increases DO, increases fish forage, and reduces NO$_3$ in the East Branch during normal stream flows.
8.4 - 6.7 = 1.7 mg/l NO₃
20% reduction
The larger East Branch existed as a slough while the steeper West Branch had large stream meanders.

Why is the Grove Restoration so effective for nitrate reduction in the East Branch flows??

Grove streams in the 1800’s

West Branch had large meanders

The Grove Housing Development Area

More wetland soils

East Branch slough without defined channel

The larger East Branch existed as a slough while the steeper West Branch had large stream meanders.
Quick and Intense Rain Storm

1.64 inches in one hour
East Branch watershed flows respond slowly to rainfalls that rise the West Branch flow quickly. 2100 Rd East Branch, Oakland Rd West Branch, Ireland Grove downstream gage.

Discharge (cfs)

Surface runoff

2100 gage slight Increase in flow

Tile flow only

East Branch had low flow but large increase in nitrate tile flows – not surface runoff

Clean probe

Nitrate-N, mg/l

Legend

2100 Rd - East Branch
Oakland Rd - West Branch
Ireland Grove downstream outlet

6 / 25 = 24 % reduction

6-8 mg/l decrease in normal stream flows in East Branch
Flow, sediment, WQ gaging stations

2013 Nitrate Loads at
Grove WQ Gaging stations

- Oakland Rd
  - 80,947 lbs –NO₃

- 2100E Rd
  - 160,071 lbs –NO₃

- Natural stream with wetlands
  - 2009

- 2 stage ditch
  - 2011

- Detention Basin
  - 2008

- Grove Rd
  - 241,018 lbs –NO₃
2013 Nitrate Yield per Acre For Grove Gages

East Branch and West Branch nitrate yields are mainly from tile inputs during low stream flows.
At low flows, incoming nitrate load is 320,400 lbs. Outgoing nitrate load is 221,000 lbs so that 79,400 lbs nitrate uptake - @ 24.8 percent removed.
Phase 3 prairie and one wetland

rock chute

Phase 3 prairie and one wetland

two stage ditch with 11 rock riffles

floodplain
Rowcrop fields adjacent to the lower end of the Grove two stage ditch

October 2010

East wetland

Floodplain and sediment bench

Rock chute
Two stage ditch
2012
West Branch --- Two Stage Ditch

2-Stage Ditch

Top 52%
+ Bigmouth Shiner
+ Central Stoneroller
+ Blackstripe Topminnow
-- Creek Chub
-- Striped Shiner

No effect from 2012 drought or 2011 construction

Pre: 8.8 species
305.7 fish

During: 11 species
582 fish

After: 12.5 species
1121 fish

11 rock riffles

Bloomington

Standardise Samples by Total
Transform: Square root
Resemblance: S17 Bray Curtis similarity

Time
▲ Pre
▼ During
■ After

Similarity
72

2D Stress: 0.12
East Branch slough

Phase 1
Nov 2008

Phase 3
2 stage ditch constructed
Sept 2011

Oakland Rd Gage
NO₃ – 11.0 mg/l

Ireland Rd Gage

2100 E Rd Gage
NO₃ -- 8.4 mg/l

E1 - 6.7
Narrow leaf pondweed has had slow growth in the two stage ditch.
W10 fish riffle pool -- Two stage ditch
Too much shade in narrow original channel