



Influencing Development and Drainage Management:

“Juday Creek” – The Decline, Death and Resurrection of an Urban Stream

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Director, Museum of Biodiversity
University of Notre Dame**

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Juday Creek ~12 mile long tributary of the St. Joseph River



Cold water stream with substantial ground water influence

Juday Creek – A tale of 2 streams: Drainage ditch – or – High quality trout stream?

- Officially classified as a “natural drain” (a.k.a. drainage ditch)
- Upper portion ditched and straightened
- Lower portion looks less disturbed
- One of only 3 streams in Indiana known to support a naturally breeding brown trout (*Salmo trutta*) population



Major Events in the History of Juday Creek

- **<1920** Agricultural drainage; upper portion ditched
- **1930s** Izaak Walton League develops trout fishery
- **1940s** Some development and diversions along stream
- **1950s** Creek name changed from Judy to Juday
- **1970s** Investigations of species biology & secondary production
- **1980s** Increased development, changes in land use, and start/end of stream “maintenance”
- **1990s** Construction of 2 “new” stream reaches for new Notre Dame golf course
- **2000s** Monitoring of stream restoration effectiveness
- **2010s**



Juday Creek near N.D. Campus ca. 1910

Studies of Juday Creek since 1978

Investigators*

- R. A. Hellenthal
- Bruce Schwenneker
- Marty Berg
- Gary Kohlhepp
- Jeff Runde
- Gary Lamberti
- Steve Silliman
- Limno-Tech, Inc.
- Jo Latimore
- Ashley Moerke
- Eric Strauss
- Kerry Gerard
- Patrick Shirey

Agencies

- USEPA
- US Army Corps of Engineers
- USF&WS
- USGS
- IDNR
- IDEM
- MACOG

Organizations/Groups

- Izaak Walton League
- Friends of Juday Creek
- St. Joseph River Basin Commission
- Juday Creek Taskforce
- River Watchers
- U.N.D. Classes
- High school river studies groups
- Jim New Associates (now Cardno)
- U.N.D. Warren Golf Course

***More than 150 Notre Dame students have participated in studies of Juday Creek during the past 40 years.**

Juday Creek Investigations

- Land use patterns
- Physical and chemical characteristics
- Hydrology
- Sediments
- Chemical pollutants
- Primary production
- Benthic species composition
- Aquatic insect species biology and phenology
- Secondary production rates for key species
- Monitoring of fish populations



**Until the mid-1980s
Hydropsychid
Caddisflies appeared to
dominate the insect
fauna of Juday Creek**

Major Caddisfly Species

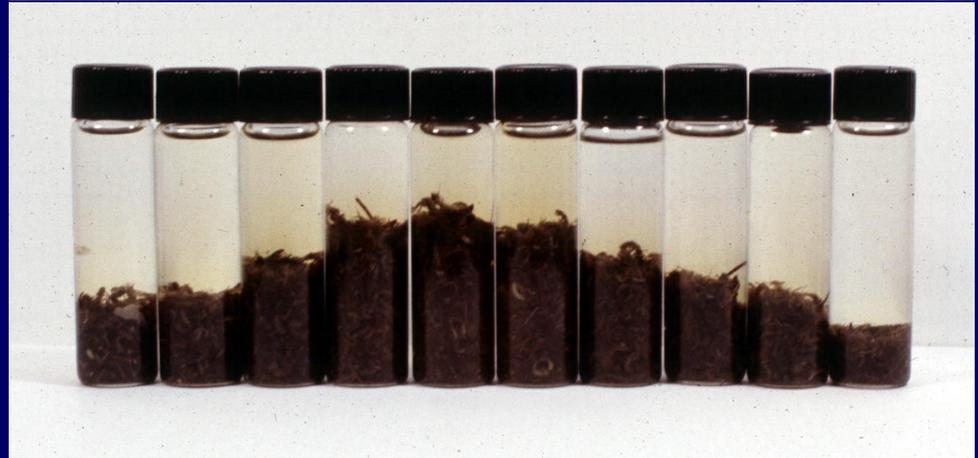
- *Cheumatopsyche pettiti*
- *Hydropsyche (Ceratopsyche) morosa*
- *Hydropsyche (C.) slossonae*
- *Hydropsyche (C.) sparna*
- *Hydropsyche (Hydropsyche) betteni*



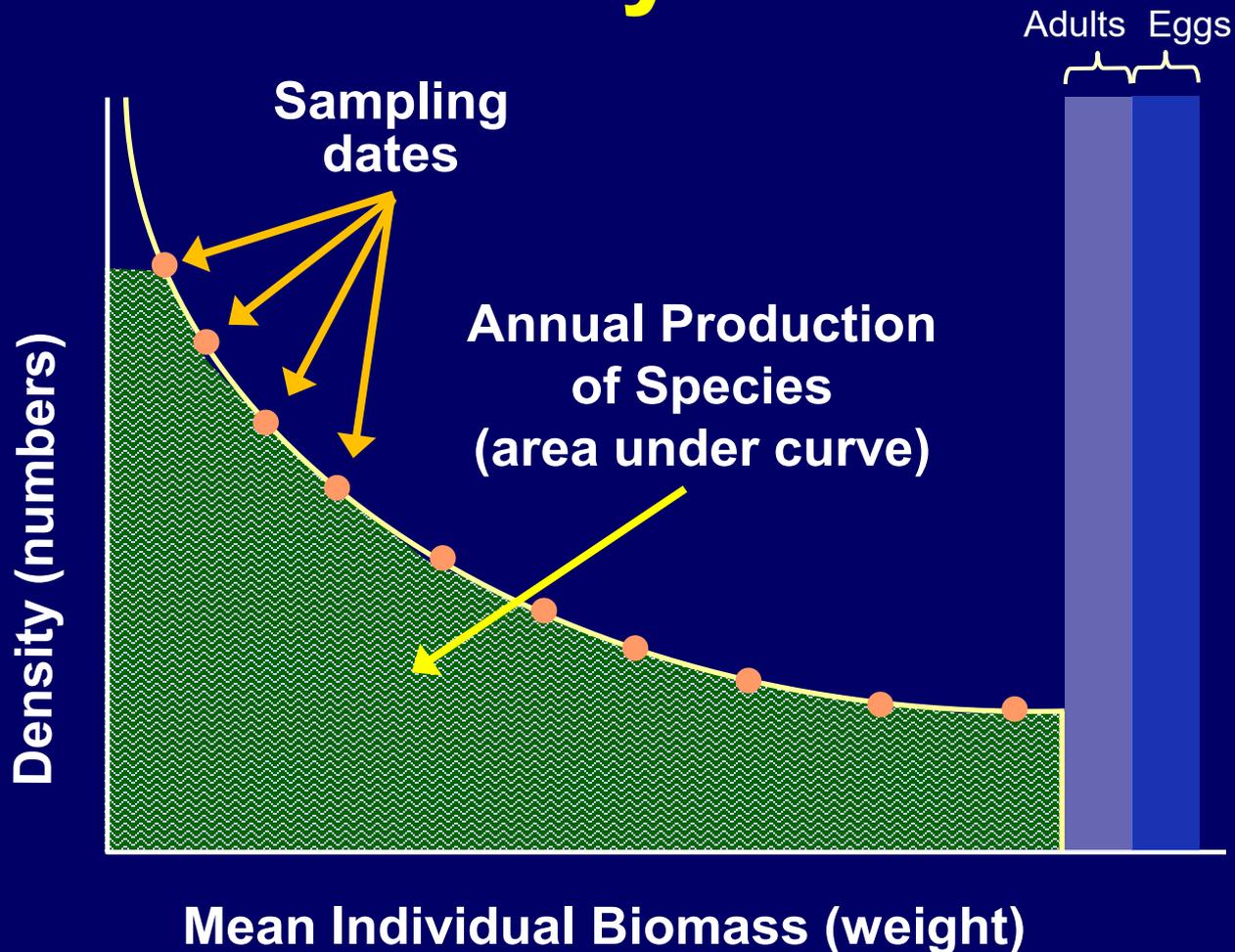
Hydropsychid caddisfly nets on rock from Juday Creek October, 1980

Filtering insects once
dominated, but have
declined by as much
as 90% in many areas
of Juday Creek

Caddisfly larvae taken
from 1 sq. ft. areas of
Juday Creek in 1980

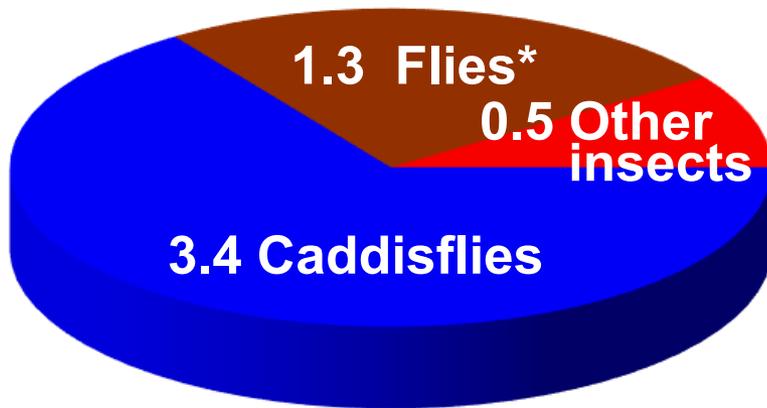


Secondary production integrates growth, density, and age-specific mortality rates

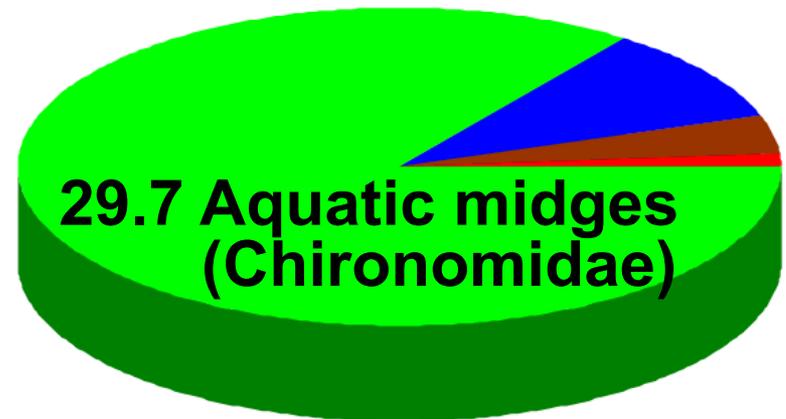


Aquatic Insect Production in Juday Creek

“The Standard Error of the Midge”



*excluding midges



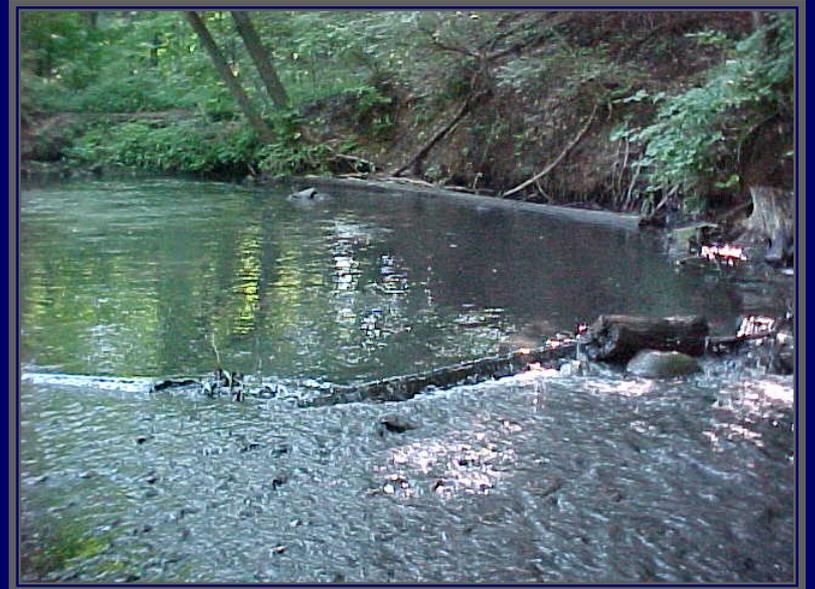
Values shown as g/m²/yr



Midge larvae are among the smallest, but most abundant and energetically important insects in Juday creek

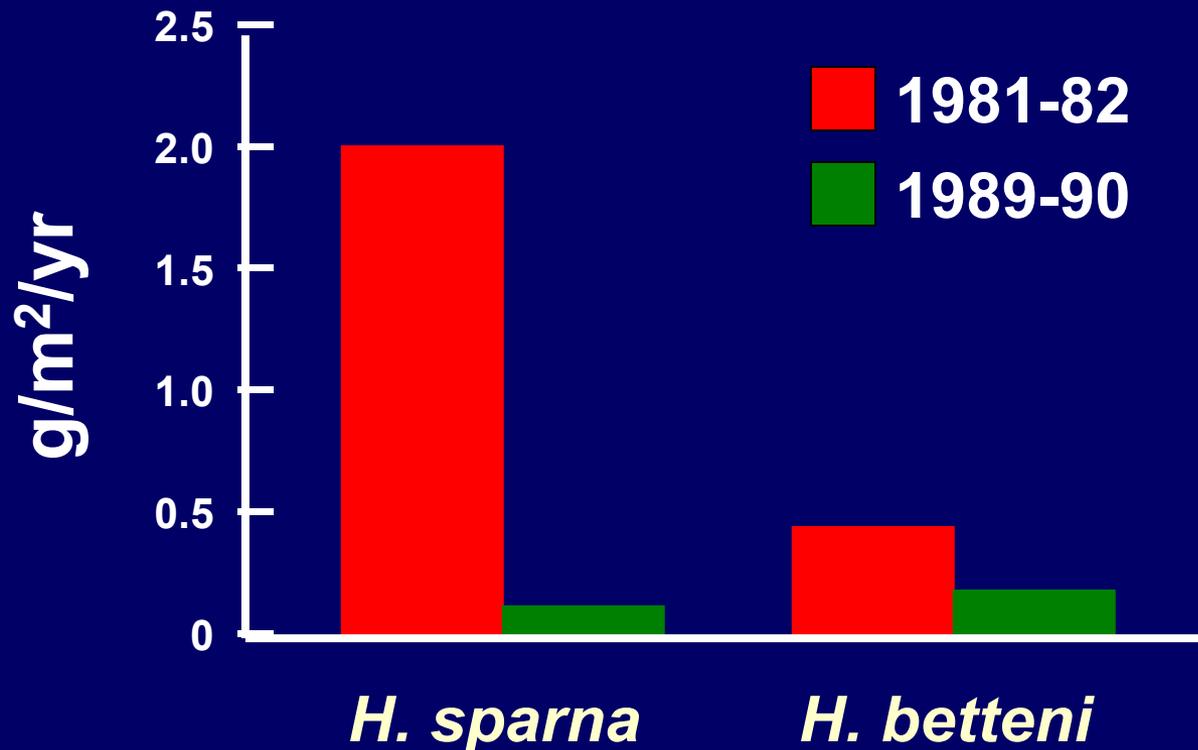
Decline and “Death?”

- 1980s
 - Corps of Engineers investigates stream for flood control
 - Confirmation of small breeding brown trout population by IDNR
 - St. Joseph County Drainage Board begins property assessments.
 - Stream “maintenance” begins
 - Secondary production of stream insects drops precipitously – brown trout fry no longer found



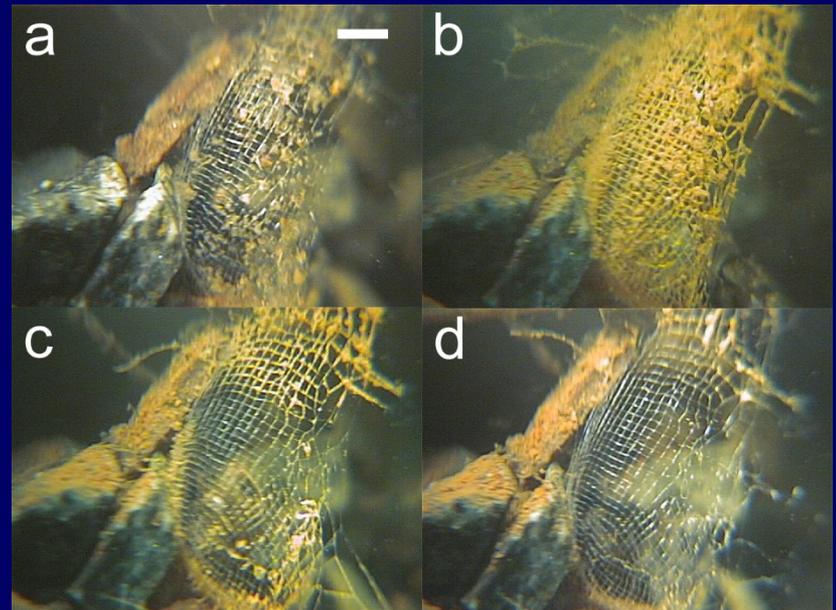
Cleaning Juday Creek silt trap at
Izaak Walton League Preserve

Production rates of hydropsychid caddisfly species 1981-82 vs. 1989-90



Searching for Causes

- Juday Creek water quality is high for mid-western streams
- Water temperatures in lower reaches are cool and largely decoupled from upper reaches
- Greatly increased sediment loads due to stream maintenance and changing land use



Clay particles on nets of caddisfly *Hydropsyche sparna*

The “Resurrection”

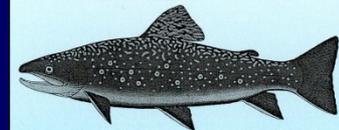
- **1990s and beyond**
 - Stream “maintenance” stops
 - Public interest and support to “save” stream (e.g., “Friends of Juday Creek”)
 - St. Joseph River Basin Commission obtains Clean Water Act 319 grant to study Juday Creek Watershed (1992)
 - Management Plan prepared by Cole Associates for Drainage Board and St. Joseph River Basin Commission (Oct. 1995)
 - Stream restoration projects begin
 - New N.D. Golf Course constructed along stream; two stream reaches diverted into new channels
 - Intensive monitoring (habitat quality, cover, silt, chemicals, invertebrates, fishes)

Juday Creek Management Plan

- **Goals:**

- **Preserve and improve the creek's fish and other aquatic species populations to pre-1986 levels**
- Reduce frequency and severity of flooding of properties
- **Eliminate stream bank erosion**
- Prevent groundwater contamination
- **Restore sediment movement to natural levels**
- **Develop master planning process to address future development***
- Reduce E. coli concentrations
- Strictly adhere to regulations governing creek activities
- Establish filter strips along sides of creek in agriculture areas
- Preserve and protect creek's natural wetlands

JUDAY CREEK WATERSHED MANAGEMENT PLAN



OCTOBER 1995

***Juday Creek Taskforce established Oct. 1995**

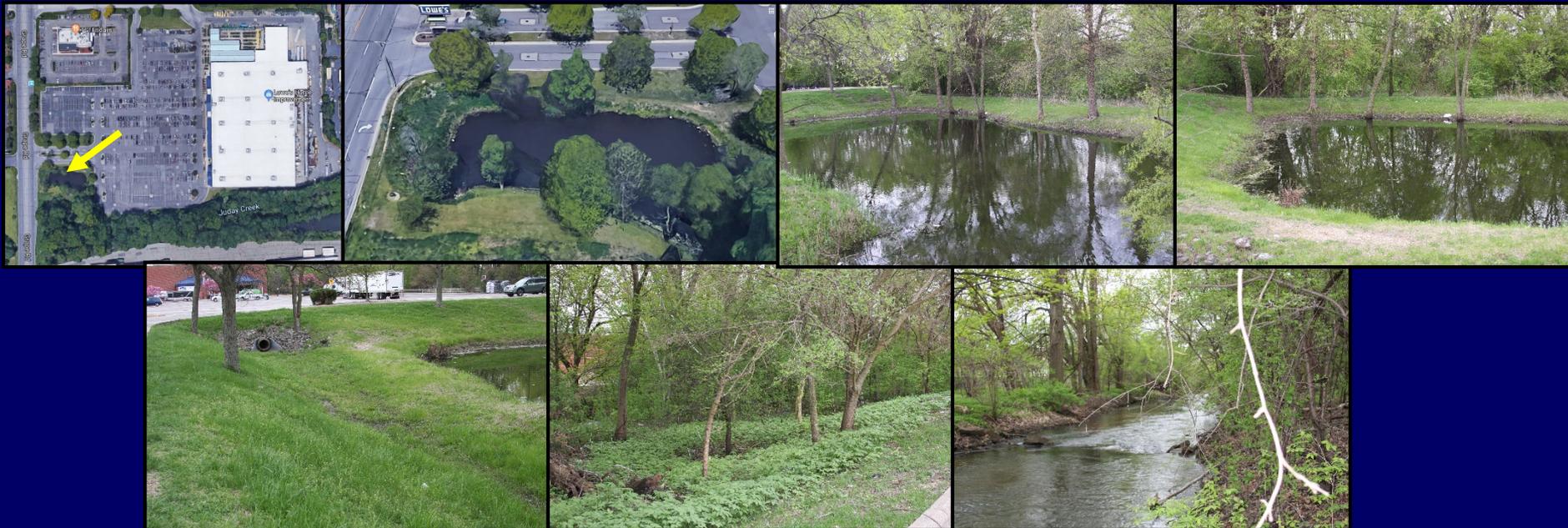
Juday Creek Taskforce

- **Advisory to St. Joseph Co. Drainage Board and County Surveyor's Office – no regulatory authority**
- **Works with developers, architects, engineers, planners to minimize the impact of projects on Juday Creek**
- **Membership (as of April 2019):**
 - Adam Bowden – City of Mishawaka
 - Jessica Clark – St. Joseph County Engineering
 - Mark Espich – St. Joseph County Health Dept.
 - ***Ron Hellenthal** – N.D. Biology
 - ***John Law** – St. Joseph County Surveyor's Office
 - Sarah Longenecker – St. Joseph County Soil & Water Conservation District
 - Matt Meersman – St. Joseph River Basin Commission
 - Judy Rosheck – Friends of Juday Creek
 - ***J.C. Sporleder** – Izaak Walton League
 - Jordan Wyatt – St. Joseph County Planning Dept.

***Original taskforce members (since 1995)**

First Taskforce Project

- **Lowe's Mishawaka Store (Grape Road)**
 - Site developed to minimize impact on creek both during and after construction
 - No runoff to stream from parking area
 - Parking lot runoff retention pond drains from below surface to minimize thermal effects and contamination, and to maximize storm water retention capacity
 - Vegetation buffer strip between pond and stream
 - ~ 25 years later – system still functions as designed



1997 Warren Golf Course Juday Creek Restoration

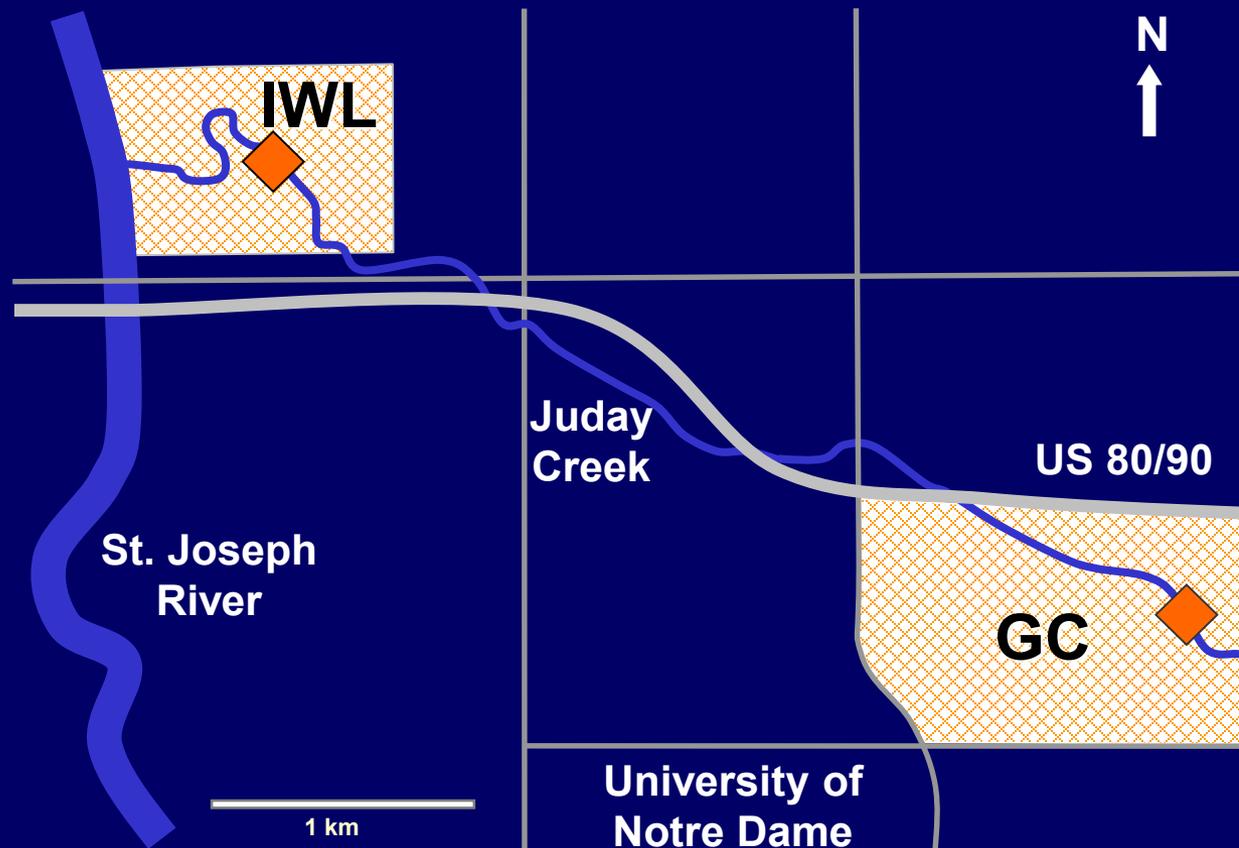
- 800 meters of new stream channel constructed for two reaches
- Bank stabilization and re-vegetation
- Addition of substrate
- Sinuous channel design
- Creation of pool-riffle sequences
- Installation of upstream sediment trap
- Water first flows into new stream reaches Oct. 1997
- Cost ~\$250,000



N.D. Golf Course Monitoring 1997-2003 (fishes through 2016)

- **Biotic**
 - Benthic invertebrates (density, diversity, %EPT, functional feeding groups)
 - Fishes
- **Habitat**
 - Canopy cover
 - Habitat quality (QHEI)
- **Abiotic**
 - Sediment
 - Dissolved oxygen
 - Conductivity
 - pH
 - Temperature
 - Stream flow
 - Pesticides and other likely chemical contaminants

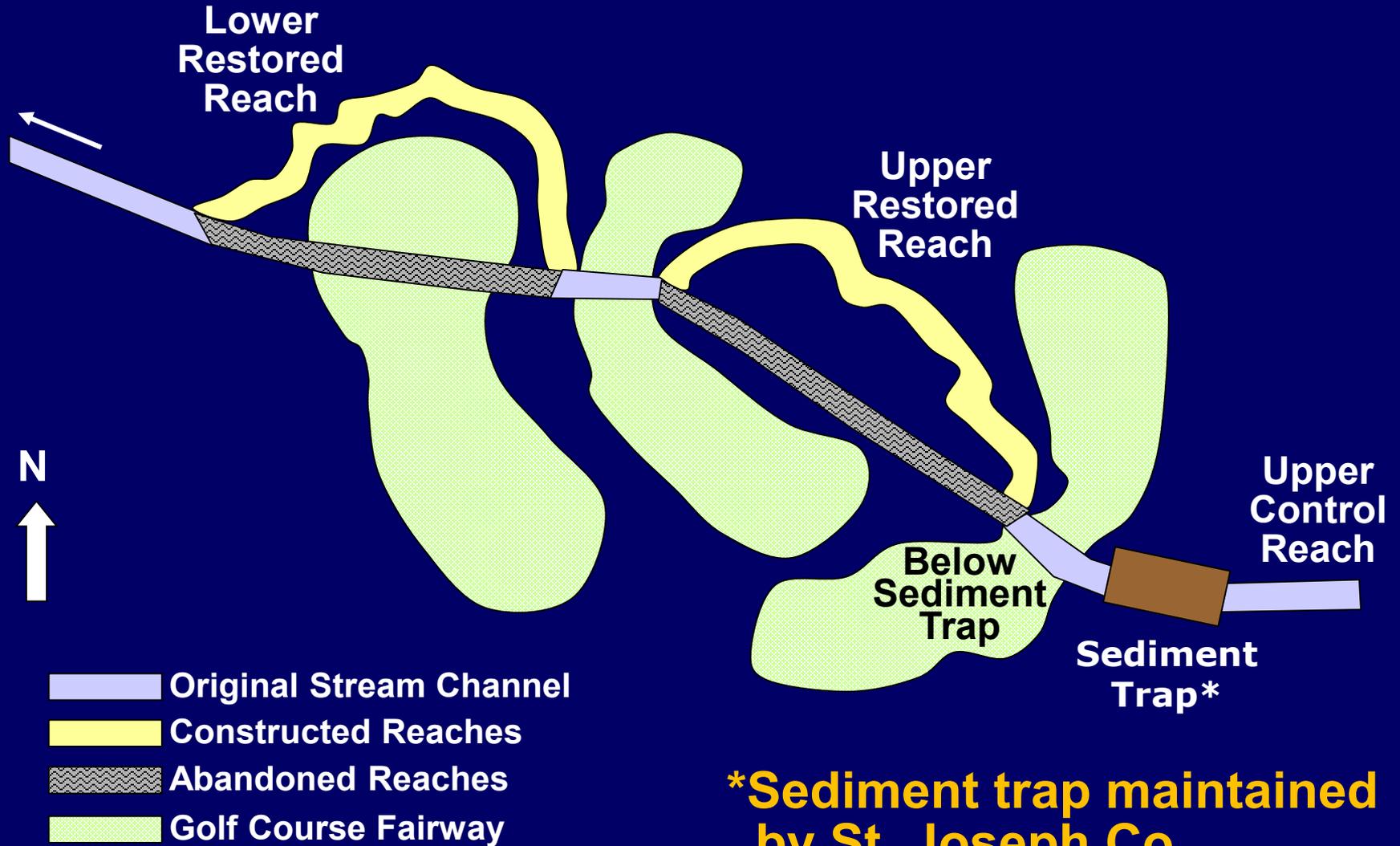
N.D. Golf Course and Izaak Walton League sites sampled



IWL = Izaak Walton League
GC = Warren Golf Course

■ Silt trap locations

N.D. Golf Course Study Sites



***Sediment trap maintained by St. Joseph Co.**

Warren Golf Course Restored Sites after 5 years

- Meandering channel
- Cobble/gravel substrate
- Reduced sediment load
- Riffles & pools
- Stabilized banks
- Overhanging vegetation (by 2003)
- Return of native fish species (incl. rock and smallmouth bass)
- Restoration basically successful



**“If you build it, they
will come.”***

**...and if you maintain it
they will stay!**

***“The voice” speaking to Ray Kinsella,
Field of Dreams (1989)**



Jeff Runde



Steve Silliman



Ron Hellenenthal



Gary Lamberti



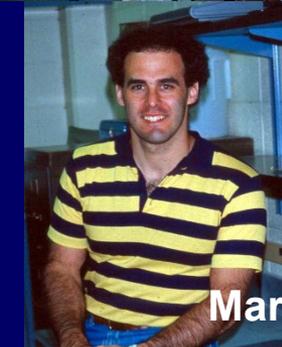
Eric Strauss



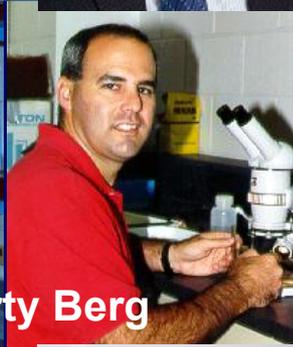
Ashley Moerke



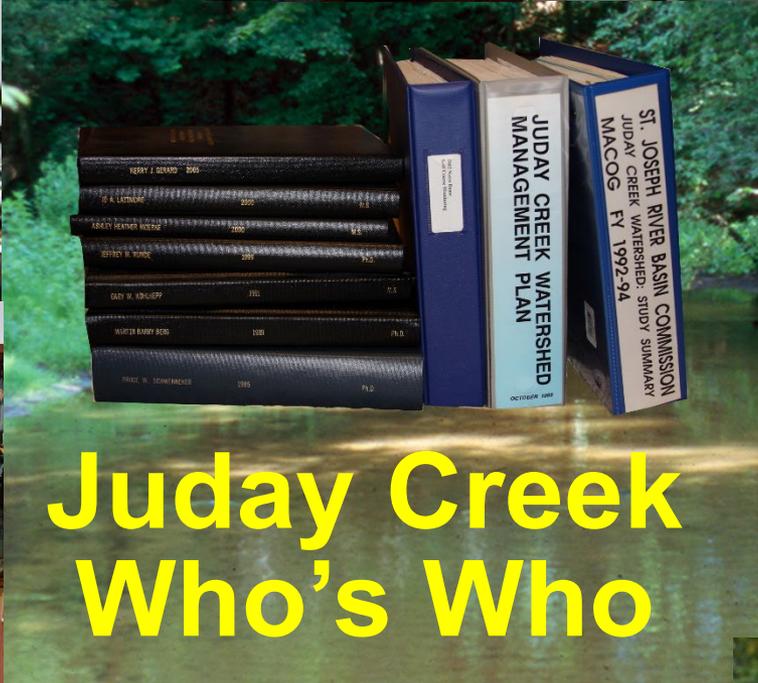
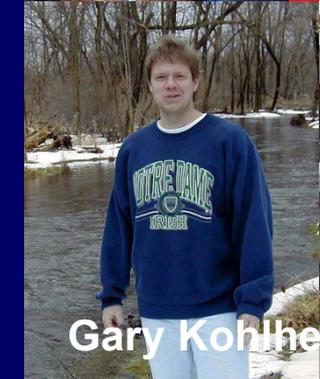
Patrick Shirey



Marty Berg



Gary Kohlhepp & Son



Juday Creek Who's Who



Jo Latimore



Kerry Gerard Muldoon



Bruce Schwenneker

