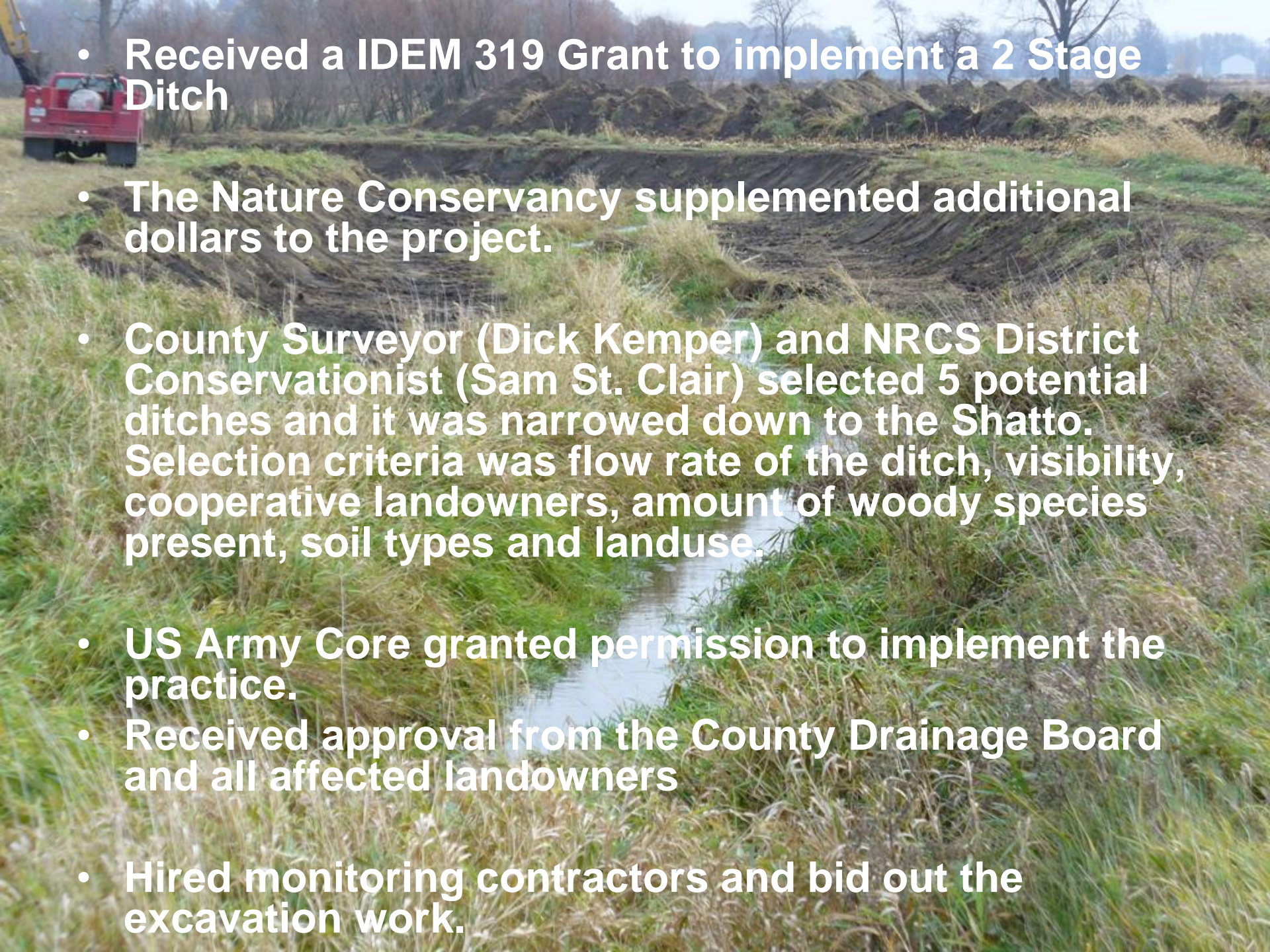


# Tippecanoe River 2 Stage Ditch Demonstration Site

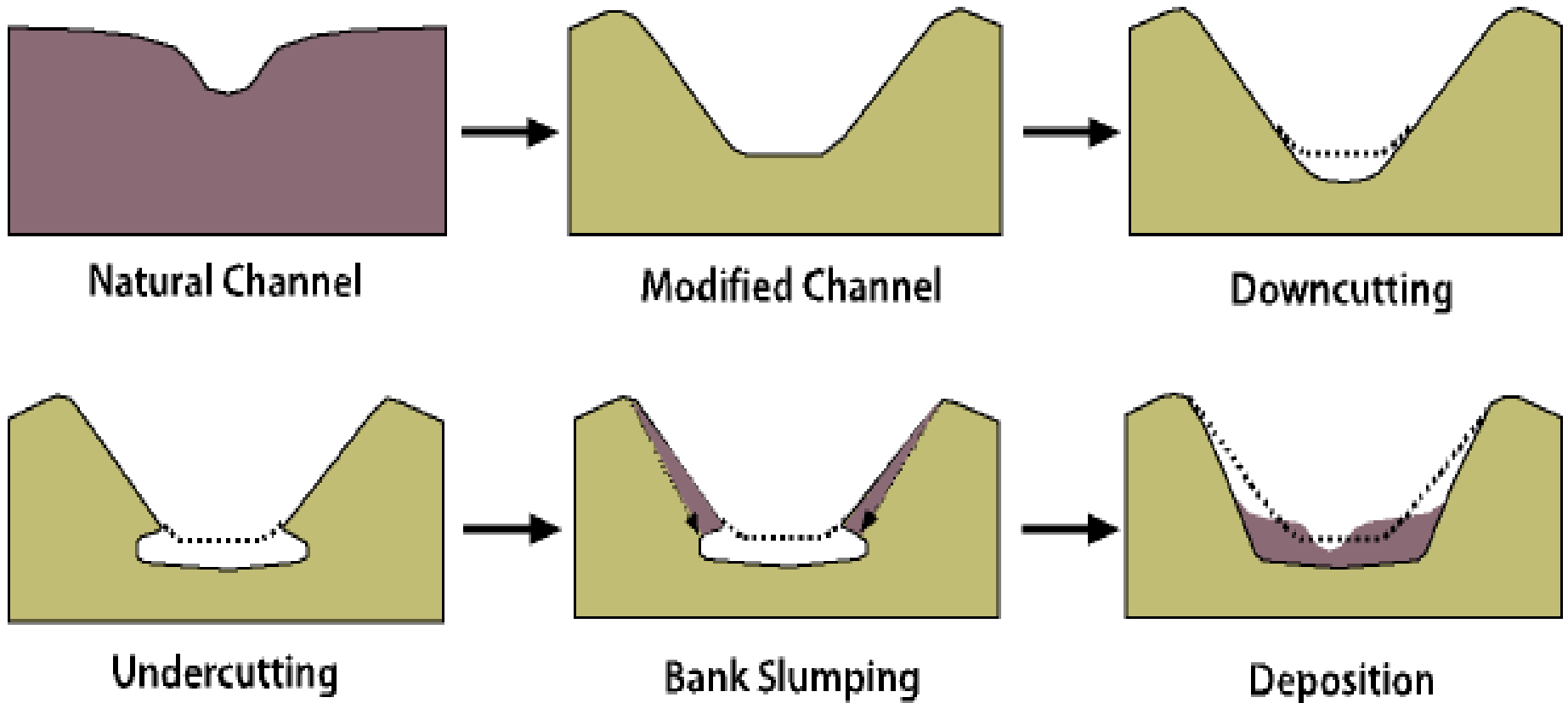
Improving the function of  
Agriculture drainage ditches





- 
- Received a IDEM 319 Grant to implement a 2 Stage Ditch
  - The Nature Conservancy supplemented additional dollars to the project.
  - County Surveyor (Dick Kemper) and NRCS District Conservationist (Sam St. Clair) selected 5 potential ditches and it was narrowed down to the Shatto. Selection criteria was flow rate of the ditch, visibility, cooperative landowners, amount of woody species present, soil types and landuse.
  - US Army Core granted permission to implement the practice.
  - Received approval from the County Drainage Board and all affected landowners
  - Hired monitoring contractors and bid out the excavation work.

# Channel Evolution

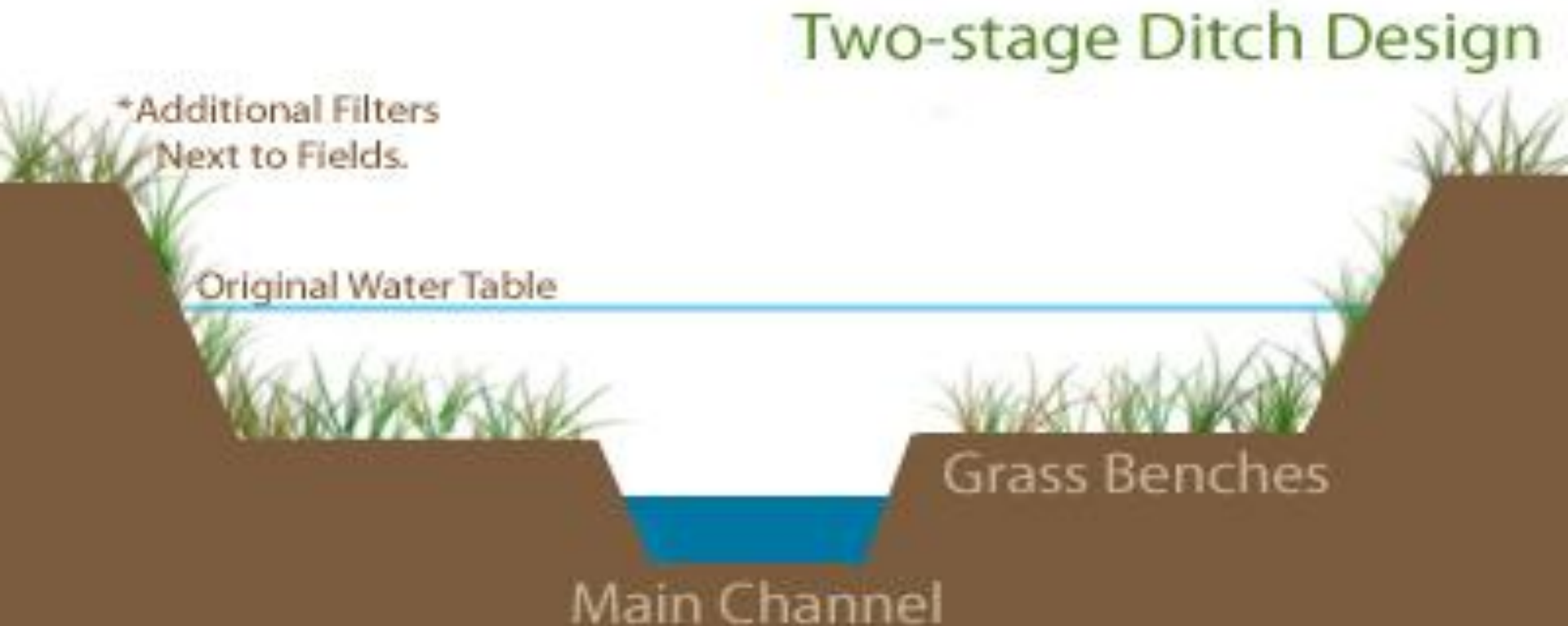


(Adapted from Simon 1989)



# Two-Stage Ditch Design

Benches a Minimum of 2X Channel width, with 3 or 4 times being more desired





## 2 Stage Ditch Example

- Benches on both sides = 10-14ft wide
- 5-6 foot wide channel width



# Current sampling design

- Every other month we measure
  - habitat cover
  - Transient storage
  - Denitrification
- Daily measurements include
  - Dissolved O<sub>2</sub>
  - Specific conductivity
  - Temperature
  - Turbidity
  - pH
- Fish and invertebrate sampling once a year

# Biological Response

- Improvement of invertebrate community diversity in the treatment reach of ditch
- Fish assemblages have increased in sensitivity, the treatment stretch is now holding more intolerant fishes.
- Habitat is beginning to diversify– riffle/pool
- Control still has no noticeable change

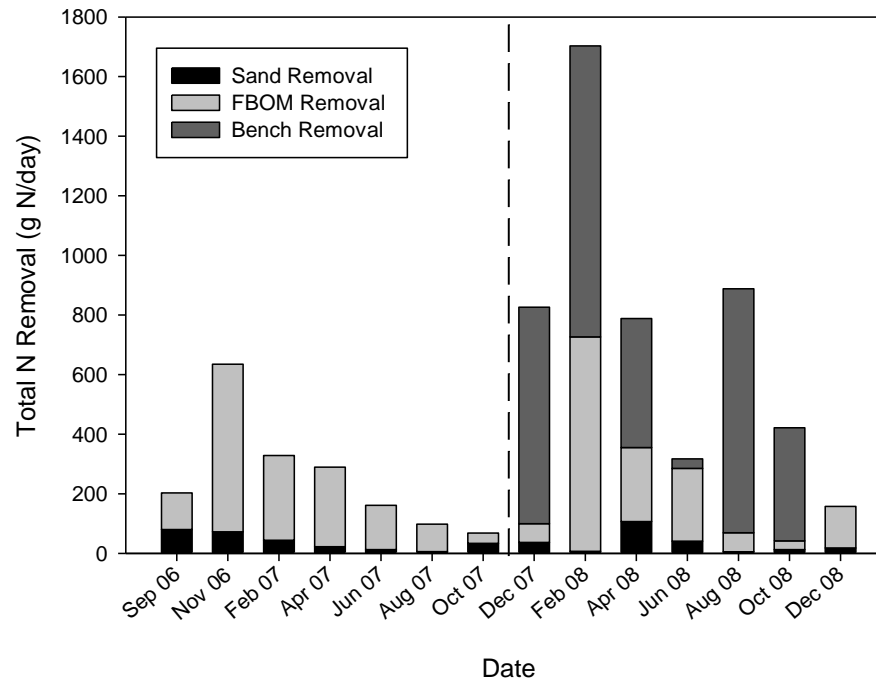
# Monitoring Conclusions

- 105,000 pounds of sediment removed from treatment reach each year.
- 350% increase in denitrification potential
- Isopods in 2 Stage Ditch segment went from 87% to 38% control section 79% to 58%
- Sunfish species went from 1 to 4 species pre to post construction, control stayed at 1 specie
- Total suspended solids (TSS) - control increased 4%, decreased 49% in treatment reach



# Updates

- Total reach N removal increases with 2 Stage Construction
- % of N removal is the most when loads are the lowest – most effective when coupled with other strategies such as nutrient management.



# Before Construction





# After Construction – Nov. 2007





Just after the first of the year we had 2  
bank full events – Jan/Feb 2008

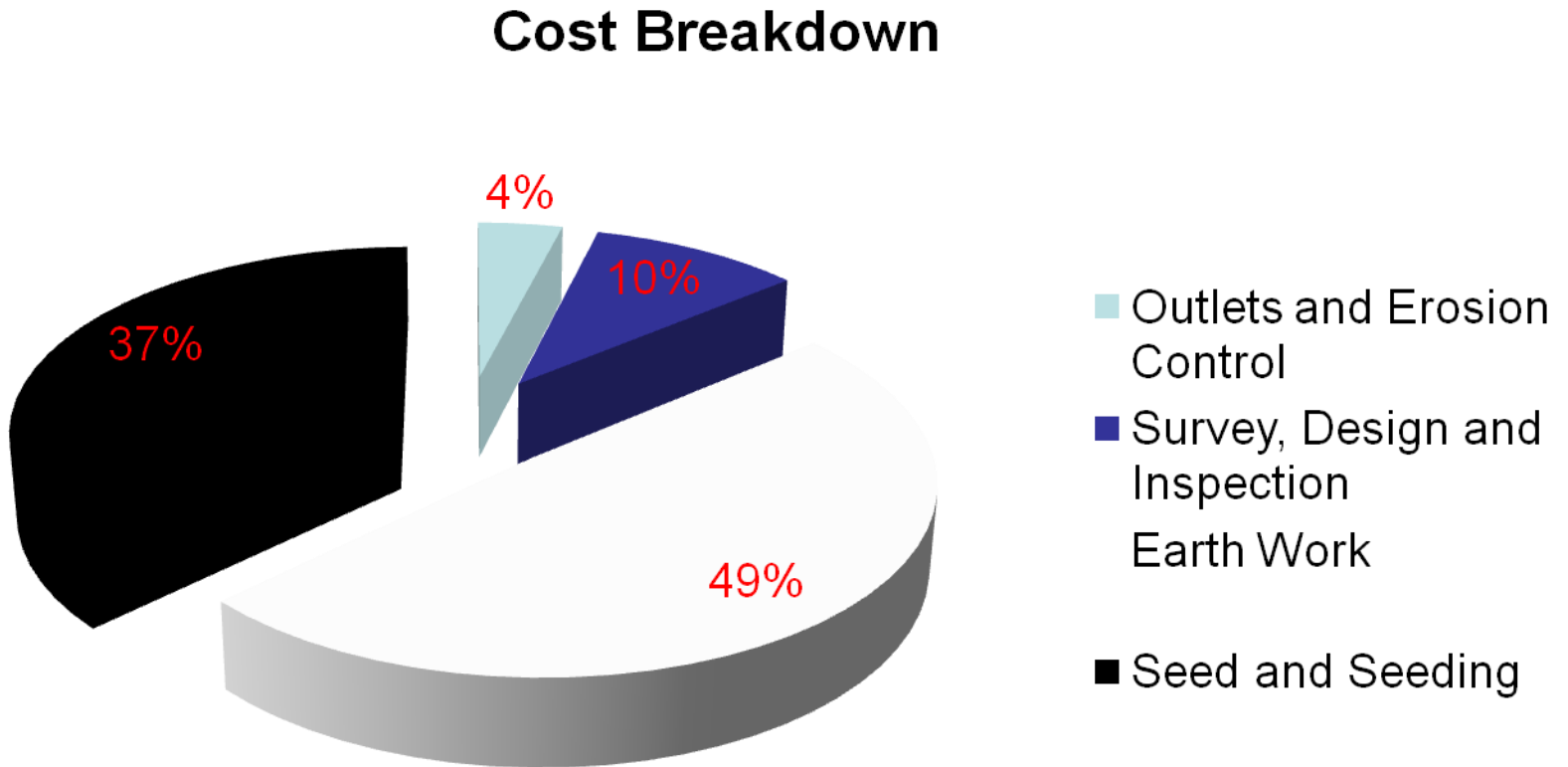




# 2-Stage Ditch Costs

- Typical cost of 2-stage Construction
  - \$8 - \$ 12 per linear foot
- Factors that affect your cost of Installation
  1. Depth of the ditch (top of bank to waterline)
  2. Width of ditch channel (and benches)
  3. Amount of natural benches already starting to form
  4. Absence of adequate area to spread spoil
  5. Number of tile outlets to be addressed

# Breakdown of Project costs

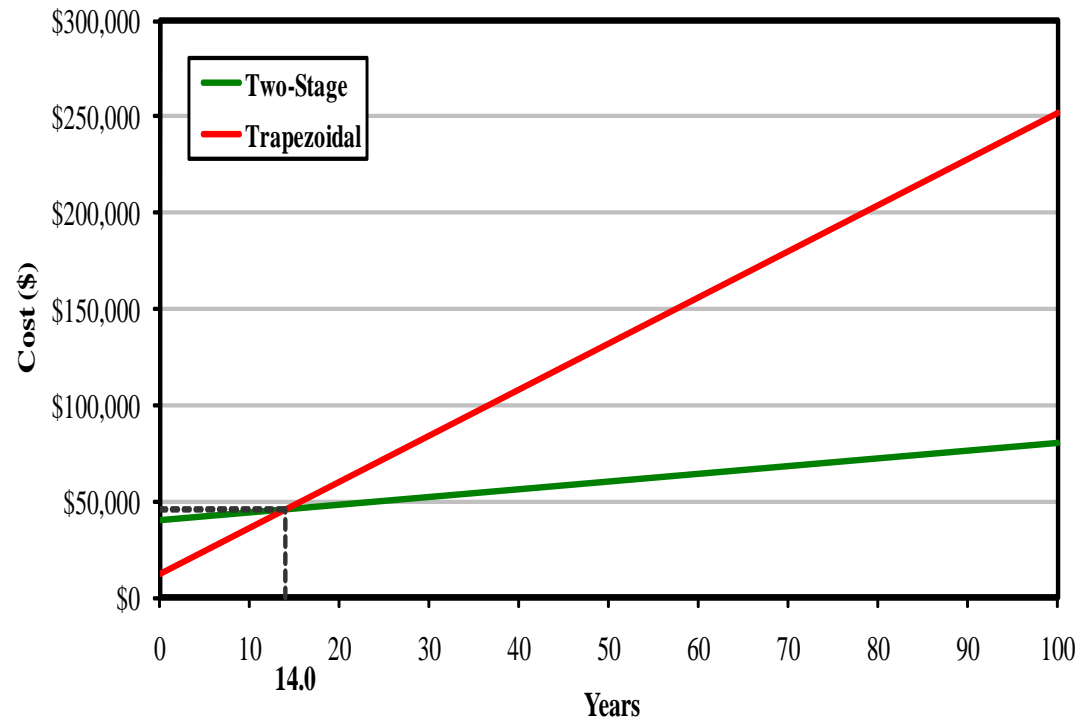




# Expected Payback Period

Two-Stage Costs	
<b>\$39,932</b>	Two-Stage Construction Cost (\$)
<b>4,000</b>	Project Length (feet)
<b>30.0</b>	Maintenance Frequency (yrs)
<b>\$3.00</b>	Maintenance Cost (\$ per linear foot)

Traditional Maintenance	
<b>5</b>	Maintenance Frequency (yrs)
<b>\$3.00</b>	Maintenance Cost (\$ per linear foot)

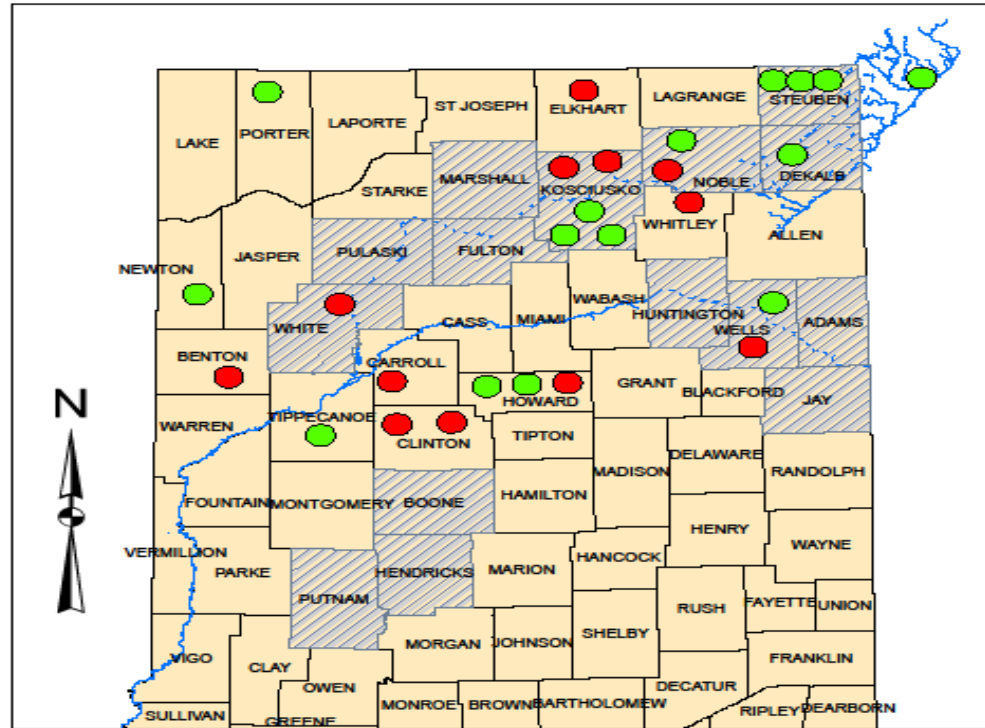


Solve

The payback period is 14 years

# Implemented and Planned Projects

## Indiana 2-stage Ditches by County



Installed 2-Stage



Planned 2-Stage



Counties with 2-stage  
in Watershed Plans



The Nature  
Conservancy   
Protecting nature. Preserving life.

February 2010



## *Closing Thoughts*

- When managed for water quality, headwater streams and ditches have tremendous potential to improve downstream health of rivers.
- Many times ditches do not need maintenance performed but are viewed as functioning poorly because they “look bad”
- As stream (ditch) habitat improves, fish and invertebrate communities improve.
- Presence of vegetation is more essential than actual species type