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## Partnering to Renovate a Pond Dam

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## My Goal

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# Mississinewa Dam and Emergency Spillway



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# Mississinewa Dam and Emergency Spillway





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## Recreation



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## Recreation





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## Recreation



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## Natural Resources





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## Natural Resources

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## Natural Resources

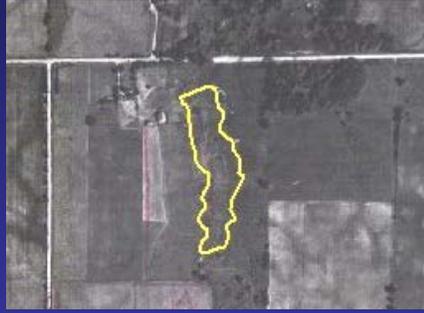
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## Pond – 1951 and 1957



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## Dam Overtopping





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## Erosion



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## 2004 Periodic Inspection





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## Concerns

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- Woody vegetation
- Steep slopes
- Inadequate spillway system
- Large drainage area



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## Additional Concerns

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- Inadequate erosion protection
- Reduced storage capacity
- No drawdown device or drain valve
- Beavers



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## Potential for Dam Failure

- Very real chance of failure
- No houses would be affected
- Flowage easement below spillway
- Damage –
  - Roads
  - Trees
  - Agriculture



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## Mississinewa Dam and Emergency Spillway





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## Three Main Options

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- No action – not feasible
  - Dam will continue to deteriorate
  - Failure endangering lives and property
- Breaching the dam – feasible
  - Remove chance of life and property loss
  - Lose natural resource and recreational value
  - Start study to remove – Planning - \$10,000
- Renovation of the dam – preferred



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## Pond Dam

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- Poorly designed in a bad location
- No construction designs and plans
- No visible signs of distress on the dam
  - Seepage
  - Cracking
  - Sinkholes
  - Boils



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## Objectives

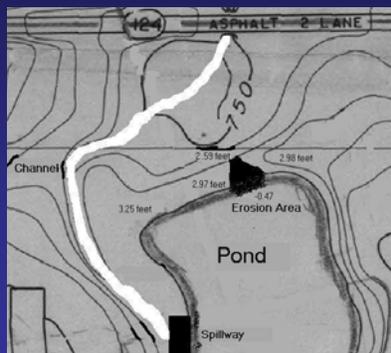
- Review circumstances of overtopping
- Improve stability and functionality
- Decrease chances of failing or overtopping
- Complete under limited resources
  - Fiscal
  - Staff
  - Equipment
  - Material



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## Dam Dimensions and Design

- 247 feet long
- East – west
- Height – 15 feet
- Freeboard – 3 feet
- Erosion area





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## Interim Repair



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## Woody Vegetation





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## Woody Vegetation



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## Woody Vegetation





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# Logging



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# Logging





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## Logging



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## Woody Vegetation Removal





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## Woody Vegetation Removal



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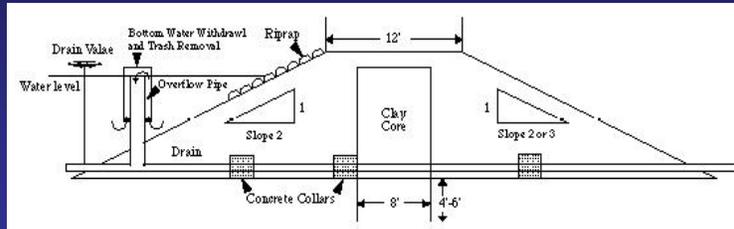
## Woody Vegetation Removal





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## Recommended Slopes



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## Downstream Slope





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## Upstream Beaching



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## Riprap





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## Mississinewa Remediation



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## Riprap Placement





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## Soil Placement



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## Soil Placement





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## Erosion Control Blankets



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## More Soil





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## More Soil



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## Final Slope





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## Seeding



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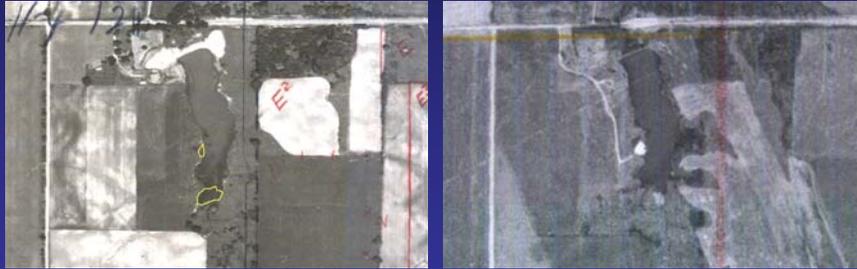
## Grass Cover





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## Pond – 1957 and 1971



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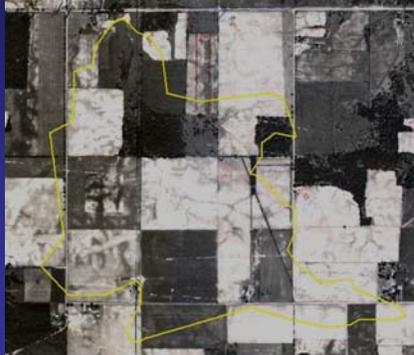
## Current Pond





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## Original and Current Drainage Areas



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## Original Drainage Area - 1957





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## Original and Current Drainage Area - 1964



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## Current Drainage Area





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## Drainage Area Size

- Variables produce a range of sizes
- Precip., soils, cover/land use, pond size
- Indiana recommended sizes
  - Original 4.65 acre pond – 28 to 116 acres
    - 413 acres – 4 times too large
  - Current 4.31 acre pond – 26 to 108 acres
    - 234 acres – 2 times too large



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## Sediment in Pond

- No erosion control measures
- Farming practices
- Improving cover reducing erosion
- Most sediment deposited in first 15 years
- Sediment depth – 0 to 4 feet
- Average sediment depth – 2 feet



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## Cover Comparison

- Original cover - 1957
  - 373 acres – rowcrops – 90%
  - 20 acres – grasslands – 5%
  - 20 acres – woodlands – 5%
- Current cover
  - 82 acres – rowcrops – 35%
  - 111 acres – grasslands - 47%
  - 41 acres – woodlands – 18%



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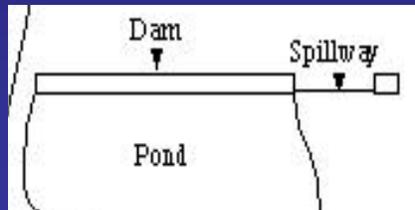
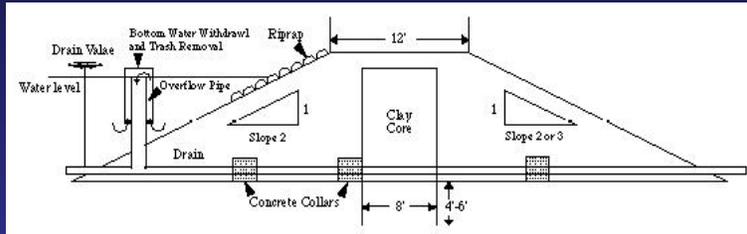
## Loss of Water Storage

- Water storage lost – 8.8 acre-feet
- Original maximum depth – 12 feet
- Current maximum depth – 7 feet
- Pond elevation lowered 1 foot from 8 feet during renovation



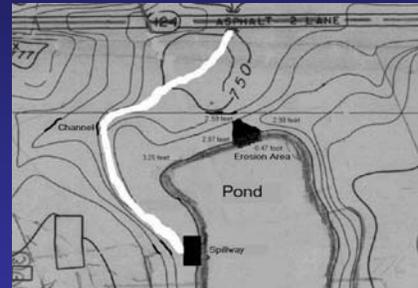
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# Current Pond Dam Designs



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# Concrete Spillway





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## Beaver Dam



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## Spillway Size

- Min. design storm of 25 year frequency
- 24 hour minimum duration rainfall
- 4.83 inches of precipitation
- Original drainage area – 409 cfs
- Current drainage area – 270 cfs
- Original concrete spillway – 55 cfs



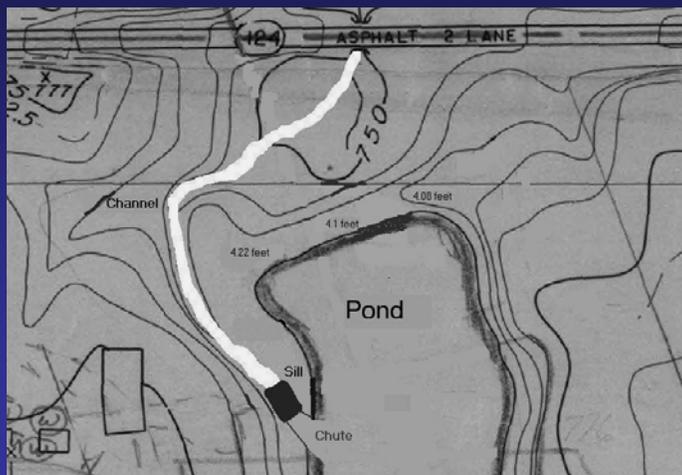
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## Concrete Spillway Removed



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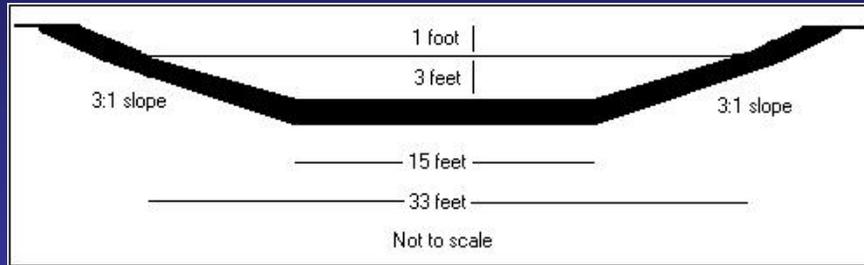
## New Spillway





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## Cross Section



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## Earth Chute and Riprap Sill





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## New Spillway Flow



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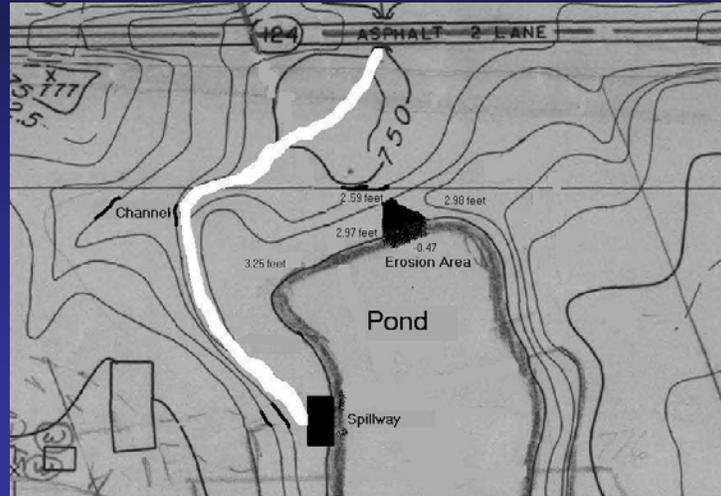
## Nuisance Beavers Removed





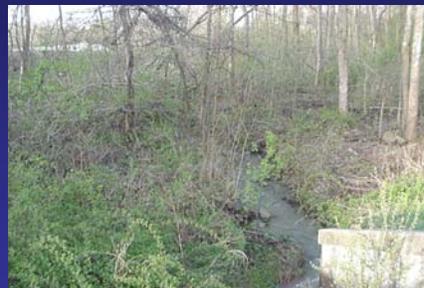
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# Spillway Channel



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# Spillway Channel





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## Water below Dam



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## Spillway Channel





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## Spillway Channel Under Flow



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## Renovation

- Dam – surface erosion repaired
- Vegetation – trees removed
- Slopes – decreased
- Spillway system – enlarged
- Drainage area – not changed
- Sediment – not removed



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## Special Areas of Concern

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- Piping/settlement - decomposition of roots
- Uneven erosion to spillway - high outflows
- Erosion - toe of dam by channel
- Beavers



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## Pond Dam Overtopping

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- Many factors contributed
- Most impact
  - Oversized drainage area
  - Inadequate spillway system
- Compounded by water storage lost
  - Sedimentation
  - Filling



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## To Compensate

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- New spillway system
  - Enlarged
  - Constructed lower
- Providing
  - More water storage
  - Higher outflows



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## Partners

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- Quality Hardwood Products Incorporated
- Bencor-Petrifond Joint Venture
- E & B Paving Incorporated
- Fox Contractors Corporation
- Emporia State University
- Natural Resources Conservation Services



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## Quality Hardwood Products

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- Removed merchantable parts of 31 trees
- Timber Harvest Contract for \$1
- Value of trees equaled labor costs - \$600
- Lose loggers if not kept working
- Other option was to pay for tree removal
- Estimated value = \$5,000



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## Bencor-Petrifond

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- Mississinewa Dam Foundation Remediation
- 270 cubic yards of riprap, 473 tons
- Dump trucks and trackhoe/operators
- Estimated value = \$7,000



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## E & B Paving

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- Highway 124 Road Project
- INDOT contractor
- 1500 cubic yards of soil, 2625 tons
- Dump trucks, trackhoe, and dozer/operators
- Estimated value = \$27,000



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## Fox Contractors

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- 550, 675, & Mississinewa Dam Road Project
- INDOT contractor
- 900 cubic yards of soil, 1575 tons
- Seed, fertilizer and straw placement
- Dump trucks, trackhoe, and dozer/operators
- Estimated value = \$18,600



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## Emporia State University

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- Graduate student finishing M.S.
- Research conducted on property
- Design and engineering
- Input and direction - Research Committee
  - Dr. James Aber
  - Dr. Marcia Schulmeister
  - Dr. Marshall Sundberg
- Estimated value = \$5,000



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## Natural Resources Conservation Service

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- Pond experts in Federal government
- Provided advice and guidance
- Provided literature and access to special computer software
- Loaned aerial photographs



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## Volunteers

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- Removal of 4 nuisance beavers
  - Local trapper
  - Estimated value - \$400



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## Inhouse Labor

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- Removal of tree tops and smaller trees
- Placement of riprap
- Seeding and fertilizing – 1st soil placement
- Placement of erosion control mats
- Maintenance to new spillway



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## Total Benefits Received

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- Quality Hardwood Products Inc = \$5,000
- Bencor-Petrifond Joint Venture = \$7,000
- E & B Paving Incorporated = \$27,000
- Fox Contractors Corporation = \$18,600
- Emporia State University = \$5,000
- Volunteer = \$400
- Total = \$63,000



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## Costs of Renovation

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- Operations costs - \$7,000 + inhouse labor
- Based on drainage area size and cost of construction, a new dam would not be constructed in the same location today
- Without the partners, the dam would not have been renovated



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## Parting Thoughts

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“...use partnering initiatives to their fullest potential.”

Challenge Partnership Handshake Program



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## Parting Thoughts

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“Git ‘R’ Done”

Chief of Engineers LTG Van Antwerp  
(Summer Leaders Conference 2007)  
borrowed from Larry the Cable Guy.



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# Thanks

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# The End

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## Timeline

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- July 2003 – First observed overtopping
- April 2004 – Mississinewa Lake P.I.
- June 2005 – Contractor created temporary enlarged spillway and repaired erosion
- September 2005 – Logger removed trees
- January 2006 – Staff removed remaining woody vegetation from dam



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## Timeline

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- April 2006 – Contractor removed trees below dam and sediment from spillway channel
- August 2006 – Constructed new spillway and removed concrete spillway
- August 2006 – Placed material on downstream side of dam
- September 2006 – Placed riprap



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## Timeline

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- January 2007 – Removed 4 nuisance beaver that clogged spillway
- May 2007 – Regraded spillway because of high outflows and beavers
- July 2007 – Placed more material on downstream slope
- August 2007 – Seeded and placed straw on downstream slope



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## Timeline

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- September 2007 – Regraded and reseeded downstream slope because of erosion caused by 4.70 inches of rain received on 21 August



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## Laws

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- ARPA
  - area was previously disturbed
  - INDOT construction zone – ARPA review
- Wetlands
  - did not have three components: hydrology, vegetation, and soils downstream of dam
  - INDOT construction zone – wetlands review



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## Laws

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- ESA, NEPA
  - Indiana Bat reproductive season
  - No timber harvests from 15 Apr to 15 Sep
- Safety
  - INDOT safety regulations
- Dam Safety
  - IDNR, Division of Water, Dam Safety Section
  - Landowner responsibility