

The logo for Ayres Associates, featuring the word "AYRES" in a bold, blue, sans-serif font. The letters are slightly shadowed to give a 3D effect. Below the text is a thin orange horizontal line.

RIVER ENGINEERING+
WATER RESOURCES

Onion River (Waldo) Dam Status Update

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Existing Dam



- Estimated hazard rating is *Significant*.
- *Significant*-hazard dams must pass the 500-yr flood without overtopping.
- The existing dam has a capacity of about 1,375 cfs.
- 500-yr peak flow rate is about 2,230 cfs.
- 500-yr flood overtops the existing embankment by about 1 ft.

WDNR Hazard Classifications

erty), low environmental damage, no significant disruption of lifeline facilities, and have land use controls in place to restrict future development in the hydraulic shadow.

(b) **Significant hazard.** A significant hazard rating shall be assigned to those dams that have **no existing development in the hydraulic shadow that would be inundated to a depth greater than 2 feet and have land use controls in place to restrict future development in the hydraulic shadow. Potential for loss of human life during failure must be unlikely.** Failure or mis-operation of the dam would result in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities.

(c) **High hazard.** A high hazard rating shall be assigned to those dams that have existing development in the hydraulic shadow that will be inundated to a depth greater than 2 feet or de

For Waldo, this was determined from the 2014 Dam Failure Analysis.

WDNR Directive



- Increase spillway capacity to pass the 500-yr flood without overtopping by April 1, 2026.
- Alternatively, the dam can be abandoned and removed by the same deadline.

Goals and Challenges

- Goal: Need to add about 900 cfs in spillway capacity to dam.
- Challenges:



Proposed Spillway Modification

- Two 8-ft x 8-ft stainless steel slide gates adjacent to dam's existing overflow spillway.



Plan View



Cost Estimate

| | DESCRIPTION | UNITS | QUANTITY | UNIT PRICE | TOTAL PRICE |
|----------------------------|---|-------|----------|--------------|------------------|
| 1 | Mobilization | LS | 1 | \$ 25,000.00 | \$ 25,000.00 |
| 2 | Dewatering | LS | 1 | \$ 40,000.00 | \$ 40,000.00 |
| 3 | Temporary Erosion Control | LS | 1 | \$ 2,500.00 | \$ 2,500.00 |
| 4 | Concrete Demolition | CY | 20 | \$ 175.00 | \$ 3,500.00 |
| 5 | 48" Lake Drain Removal | LF | 25 | \$ 40.00 | \$ 1,000.00 |
| 6 | Lake Drain Gate Removal | LS | 1 | \$ 2,000.00 | \$ 2,000.00 |
| 7 | Two 8' x 8' Stainless Steel Slide Gates | EA | 2 | \$ 93,000.00 | \$ 186,000.00 |
| 8 | Slide Gate Install | EA | 2 | \$ 30,000.00 | \$ 60,000.00 |
| 9 | Cast-in-Place Concrete Structure | CY | 105 | \$ 1,200.00 | \$ 126,000.00 |
| 10 | Precast Concrete Walkway and Handrails | LS | 1 | \$ 20,000.00 | \$ 20,000.00 |
| 11 | Upstream Dredging to Accommodate New Spillway | CY | 200 | \$ 55.00 | \$ 11,000.00 |
| 12 | Riprap | CY | 200 | \$ 80.00 | \$ 16,000.00 |
| 13 | Site Restoration | LS | 1 | \$ 5,000.00 | \$ 5,000.00 |
| Subtotal: | | | | | \$498,000 |
| Contingency of 20% | | | | | \$99,600 |
| Construction Total: | | | | | \$597,600 |
| Engineering Costs | | | | | \$90,000 |
| Construction Total: | | | | | \$687,600 |

Cost estimates based on Sheboygan Marsh Dam Replacement bid results.

WV DNR Municipal Dam Grant

- Village of Waldo applied in February 2024 for grant to offset cost of spillway improvement project.
- Village received grant commitment in May 2024
 - Total estimated project cost \$705,684
 - DNR will reimburse Village for 50% project cost up to \$352,842
 - Village share would be the total project cost minus the DNR reimbursement.
- Village has until July 1, 2025 to submit plans and specifications to the DNR.

Dam Removal

- Instead of the spillway improvement project, dam removal remains an option.
- WDNR reimburses 100% under the grant program for dam removals, however:
 - WDNR's current budget for Waldo is the \$352,842 share under the current grant commitment.
 - WDNR may be able to reimburse for more, but no guarantees.

Dam Removal Process

1. Pond survey and sediment sampling/testing.
 - How much sediment is impounded?
 - What's in the sediment?
2. Removal design and permitting.
 - How much of the structure needs to be removed?
 - How to manage the trapped sediment during/after removal?
 - How to stabilize the stream and lakebed following removal?
 - Regulatory floodplain permitting.
3. Permit review process.
4. Public bidding.
5. Dam removal.

Conceptual Dam Removal Scenario

1. Slow pre-construction drawdown starting the Fall before dam removal.
 - Allows the river to form a channel “where it wants to”
 - Lakebed sediments naturally dry and consolidate.
 - Lakebed sediments contain lots of seeds – these will naturally germinate in the spring.
2. Remove accumulated sediment upstream of dam
 - Simplest case assumes sediment removal only needed immediately upstream of dam and sediment can be disposed of nearby.
 - Remaining sediment passively managed.
3. Remove concrete spillway structure
 - Simplest case assumes most of the embankment can remain as is.
4. Bank stabilization
 - Simplest case assumes stabilization only needed near where dam was.

Conceptual Dam Removal Scenario



Opinion of Probable Cost - Concept Level
Onion River (Waldo) Dam Removal

Village of Waldo
Sheboygan County, WI

October 2024

| | DESCRIPTION | UNITS | QUANTITY | UNIT PRICE | TOTAL PRICE |
|----------------------------------|--|-------|----------|---------------|------------------|
| 1 | Mobilization | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| 2 | Temporary Erosion Control | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| 3 | Concrete Demolition and Disposal | LS | 1 | \$ 150,000.00 | \$ 150,000.00 |
| 4 | Sediment Removal | CY | 10000 | \$ 30.00 | \$ 300,000.00 |
| 5 | Earthwork | CY | 1000 | \$ 15.00 | \$ 15,000.00 |
| 5 | Riprap Bank Stabilization near Former Dam Site | CY | 300 | \$ 80.00 | \$ 24,000.00 |
| 6 | Site Restoration | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Subtotal: | | | | | \$559,000 |
| Contingency of 20% | | | | | \$111,800 |
| Construction Total: | | | | | \$670,800 |
| Engineering and Permitting Costs | | | | | \$120,000 |
| Project Total: | | | | | \$790,800 |

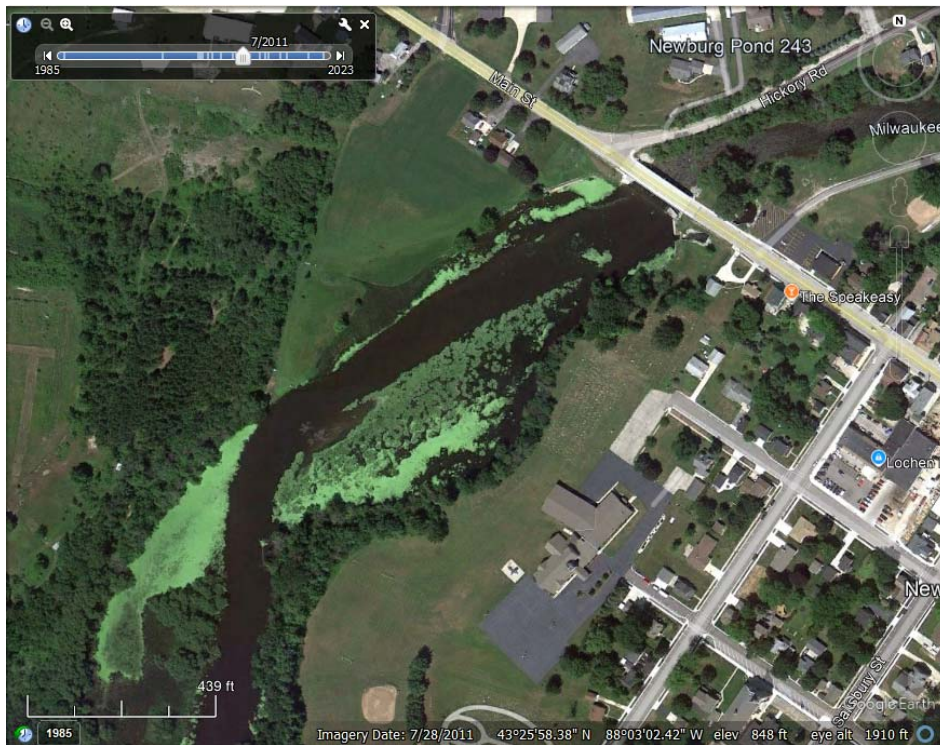
Note: Cost assumes minimal restoration needed and sediment managed passively

Online Dam Removal Cost Estimator:

- Predicts \$993,000 removal cost for Waldo Dam
- 50% prediction interval: \$870,000 to \$1.3 million

[\(https://wris.es.shinyapps.io/DamRemovalCostPredictiveModel/\)](https://wris.es.shinyapps.io/DamRemovalCostPredictiveModel/)

Example: Newburg Dam Removal (2012)



2011



2023

Example: Campbellsport Dam Removal (2011)



2011



2022

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Things to Consider

- Lot of unknowns:
 - Sediment volume.
 - Extent of demolition needed.
 - Extent of restoration needed.
 - Regulatory floodplain concerns.
 - Long-term maintenance needs.
 - Who will own the land?
 - Additional funding sources.
- Uncertainty in dam removal cost can't be reduced without further investigation.

Recap

- Village of Waldo has a WDNR directive to increase spillway capacity.
- Alternatively, the dam can be removed.
- Village has up to about \$353,000 in grant funding coming from the WDNR (50% cost share).
 - Can be used for either dam improvement or dam removal.
- Estimated cost for dam improvement: \$688,000
- Estimated cost for dam removal: \$791,000 (very rough)
- Additional funding sources may be available, especially for dam removal.

Questions?



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