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Dorn Creek Legacy Sediment Dredging
Dane County, WI

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Dorn Creek Legacy Sediment Dredging: Dane County, WI

- Project Partners
- Yahara WINs
- Suck The Muck
  - Overall Plan
  - Dorn Creek-Design
  - Dorn Creek-Construction
- Cost and Performance

Sediment depth probes by WDNR staff.
Project Partners

- **Dane County (OWNER)**
  - Joe Parisi-Dane County Executive
  - John Reimer-Assistant Director of Land and Water Resources Department
  - Kyle Minks-Land and Water Resources Scientist
  - Ryan Shore-Engineering Project Manager

- **UW-Madison**
  - Chin Wu-Civil and Environmental Engineering Professor

- **WDNR**
  - Michael Sorge-Fisheries and Land Management (Basin Supervisor)
  - Jim Amrhein-Water Resources Management Specialist
  - David Rowe-Fisheries Management (Region Team Supervisor)
  - Jim Killian-Water and Sediment Resources Management Specialist

- **Design Engineer-Strand Associates, Inc.**
- **Construction Contractor-PCI Dredging**
Yahara WINs-Watershed Adaptive Management

- **Program Administrator:** Madison Metropolitan Sewerage District (MMSD)
- **Broker For Ag BMPs with Farmers:** Dane County
- **Water Quality Monitoring:** USGS
- **Goal:** Point and nonpoint sources work collaboratively in protecting and restoring local water resources to meet the Rock River Basin TMDL TP and TSS load reductions.
- Members must achieve 40% TSS and 27% TP reductions before buy-in at $50/lb TP
Suck The Muck Concept-Phosphorus Leaching and Pilot Project

- Historical deposits of phosphorus-containing sediment in streams release phosphorus as baseflows and stormflows pass over.
- Without removal of this accumulated sediment, it is projected to take 99 years to achieve water quality goals.
- Pilot Project to Test Concept in 2016
  - Sediment Sampling
  - Permitting for Dredging
  - County crews with man operated floating hydraulic mini-dredge
  - Dredged Spoils pumped to adjacent County-owned land
  - Revealed soundness of concept and need for a larger, more efficient dredging operation.

Disposal Site-2017

"Suck the Muck" - Dorn Creek
**Process**

1. Dorn Creek
2. Sixmile Creek
3. Yahara River
4. Token Creek
5. Door Creek
6. Nine Springs Creek

- Test Concept Monitor

**Suck the Muck Concept**

**Pilot Project**

- Erosion Prone Areas
- Native Vegetation
- 100-Year Shear
- Ecological Assessment-WDNR

**Corridor Assessment**

- Dredging Spoils Dewatering Area
- Habitat Enhancements
- Dredging Feasibility Assessment
- Creek Plug/Meander Reestablish
- Restore Spawning Area
- Access
- Erosion Control
- Restoration
- Fast-Track Design

**Design**

- Erosion Prone Areas
- Native Vegetation
- 100-Year Shear
- Ecological Assessment-WDNR

**Construction**

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**Proposed Dane County streambed cleanup**

County Executive Joe Parisi is proposing a $12 million project to remove 870,000 pounds of phosphorus from 33 miles of streambed.

- Streambed to be cleaned

**Dane County launches ‘Suck the Muck’ project**

SOURCE: Dane County State Journal
Corridor Assessment

- 100-Year Shear Range: 0.04 to 0.24 lb/sf
- 100-Year Velocity Range: 0.74 to 1.99 ft/sec
- Erosion Severity: Small Areas of Moderate Erosion
- Native Vegetation: Intermittent Stands Along Route

Legend:
- Stream Alignment
- Creek/Stream
- Corridor Areas
- Floodplain
- Historic Quarry
- Dredging Spoils
- Dewatering Area
- Pilot

Historic Quarry
Dredging Pilot
Dredging Spoils
Dewatering Area-Pilot
Design

- Creek Plug
- Reestablish Historic Meander
- Protect Sedge Meadow
- Restored Spawning Area
- Dredging Spoils Dewatering Area

USGS Monitoring Station
Design

1. Top of sediment line represents top of sediment elevation at reference line at all cross sections.
2. Bottom of sediment line represents bottom of sediment elevation at reference line only at cross sections with sediment depth information (i.e., those shown in cross section sheets).

Existing top of bank
Existing toe of bank
Cross section location shown in cross section sheets
Cross sections of existing ground and creek surface only

Lake Mendota target maximum elev. = 850.00
Lake Mendota target summer max. elev. (March 1 to October 30) = 849.60
Lake Mendota target winter min. elev. (November 30 to March 1) = 849.20

Notes:
- Top of sediment line represents top of sediment elevation at reference line at all cross sections.
- Bottom of sediment line represents bottom of sediment elevation at reference line only at cross sections with sediment depth information (i.e., those shown in cross section sheets).
Design-Dredging Typical Section & Streambank Restoration

1. Use 12" max. dia. hardwood tree trunks for woody debris.
2. Tree trunk with root system intact will be harvested from areas cleared at dredging spoil dewatering site.
3. Plant live stakes, live cuttings, and plugs per specification section 02299.
4. Clear overbank area only as necessary to install woody debris restoration detail.
5. Live stakes, 10-12 ft long, spaced @ 10 ft.
6. Remove minimum of 70% of sediment in channel flank (typ. of both sides).
7. Maximize disturbance to banks (typ. of both sides).
8. Restore any creek banks disturbed by dredging operations per specification section 02285.

PLAN VIEW

SECTION VIEW

WOODY DEBRIS RESTORATION DETAIL

DREDGING WORK ZONE

ACCESS BETWEEN DREDGING AND SUPPORT WORK ZONES LIMITED TO EVERY 500 FT ALONG CREEK IN A 20-FOOT WIDE CORRIDOR.

SUPPORT WORK ZONE

- CLEARING ONLY - NO GRABBING
- AVOID OAK TREES AND AREAS IDENTIFIED ON DRAWING
- <10,000 LB EQUIPMENT ONLY OR MARSH MATS REGS. FOR >10,000 LB EQUIPMENT.
Design-Creek Plug

Photo By Mark Petersen, PCI Dredging

Photo By Ryan Shore, Dane County
Design

- Performance Based Specifications (To Maximize Contractor Flexibility)
  - Hydraulic Dredging Plan Submittal
    - Hydraulic Dredge Details (pumping capacity, dredge launch, traffic control)
  - Pumping System Plan
    - Pumping System Layout
    - Pumping System Controls, Booster Pumps, Pump Curves, Piping Type/Size
    - Stable Return Water to Creek
    - Pumping System Capacity Analysis (30 feet of elev. change, 2.3 mile corridor)
    - Pumps and Forcemain Variables (Pipe pressure rating, valving, non-overloading pumps, pass 3” solid, watertight pipes, velocities from 2 to 6 ft/sec)
    - Designated Operator of Pumping System
    - Forcemain drain down
  - Dewatering Method and Polymer Rates
  - Sampling/Testing/Reporting Plan
  - Emergency Action Plan For Flooding Event

- Low-Ground Pressure Spec.

"Contractor shall utilize low-impact methods for construction access within the Support Work Zone and between the Dredging Work Zone and Support Work Zone as further defined below. Acceptable low-impact methods for construction access include use of low ground contact pressure equipment (maximum ground bearing contact pressure of 4 pounds per square inch), standard equipment with marsh mats, and standard equipment with rubber matting over frozen ground. Frozen ground is defined as a minimum of 2 feet of frost which must be verified by CONTRACTOR and witnessed by OWNER staff at the start of each work day. CONTRACTOR work in the Support Work Zone and between the Dredging Work Zone and Support Work Zone is expected to minimize damage to underlying vegetation including but not limited to no tire or track spinning, tire and tracks must be moving at all times while maneuvering equipment, and maximum depth of rutting shall be 3 inches. CONTRACTOR’s operations shall be suspended if experiencing greater than 3 inches of rutting or an alternate low-impact method for construction access shall be utilized."
Design-Mechanical or Hydraulic Dredging

- Creek Dimensions: typical 10 feet to 12 feet, up to 25 feet (highly sinuous)
- Dredging Method

<table>
<thead>
<tr>
<th>Dredging Method</th>
<th>Typ. Dimensions</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic: Large-Scale</td>
<td>8.5’ x 25’, 8.5’ x 32.5’, 11’ x 35’</td>
<td>High production rate.</td>
<td>Large footprint, maneuverability, potential bank damage.</td>
</tr>
<tr>
<td>Hydraulic: Small-Scale</td>
<td>8.5’ x 16’, other sizes</td>
<td>Small footprint, highly maneuverable.</td>
<td>Low-production rate.</td>
</tr>
<tr>
<td>Mechanical (Marsh Mats and/or Low Ground Contact Pressure)</td>
<td>NA</td>
<td>Creek width non-factor, high production rate.</td>
<td>Environmental damage, access, cost for marsh mats, disposal via truck</td>
</tr>
<tr>
<td>Hybrid (backhoe with hydraulic dredging pump)</td>
<td>NA</td>
<td>Creek width non-factor, high production rate, minimized environmental damage</td>
<td>access</td>
</tr>
</tbody>
</table>

- Permitting
Schedule

August 2017

Design & Bid

Site Prep.

Construction-Original

Construction-Revised

Dewater & Restore

Dewater & Restore

2018

2019

Late-Summer 2018 Flood Event

Photo By Ryan Shore, Dane County

Photo By Ryan Shore, Dane County
Construction

**DANE COUNTY LEGACY SEDIMENT REMOVAL PROJECT**
A project to improve water quality in the Yahara River Watershed

**Background:**
Thick layers of eroded soil cover the natural stream bed in Dorn Creek. These sediments contain excessive amounts of phosphorus which contribute to algae blooms in Lake Mendota. Dorn Creek is the first stream out of six total to have to have old or “legacy” sediments removed.

**Goals:**
- Rehabilitation of water quality
- Restoration of streambank habitat
- Realignment of stream channel to historical location
- Reclamation of former gravel pit to prairie / wildlife habitat

**Proposed Sediment Removal Locations:**

Thank you to our partners:

For more information:
Dane County Land and Water Resources Department
(608) 224-1761
https://lwrdepartment.co/dane-wi/legacy-sediment-project
Construction-Dewatering Area Clearing
Construction-Dorn Creek Dredging (June 5, 2018)
Construction-Dorn Creek Dredging

Reestablish Historic Meander

Restored Spawning Area

Photo By Mark Petersen, PCI Dredging
Construction-Dorn Creek Dredging

Photo By Mark Petersen, PCI Dredging
Construction-Dewatering Area
Construction-Dewatering Area
Cost and Performance

• 2.97 miles of dredging
• 23,600 CY of dredging
• Approximately 75,000 lbs of phosphorus removed.
• Low Bid $1.8 million (Only 1 bidder-PCI Dredging)
• County negotiated a $1.25 million cost with concessions
  • No winter construction (extend completion date from May 15 to Aug. 15)
  • Pit dewatering rather than bag field dewatering.
Lessons Learned/Project Challenges

- Survey at sufficient frequency to develop accurate quantities.
- Seek synergistic opportunities for dredged spoils.
- Keep flexibility in contract documents and permits to allow for hydraulic, mechanical, or hybrid dredging methods.
- Have provisions for flooding events.
  - Upstream watershed stabilization/forebay.
  - Re-dredging of sediment influx from flood events.
- Seek contractor input on project specifics
  - Winter Construction Pros/Cons/Feasibility
  - Payment Method/Quantity Checks
Questions