

Removal of Two Watauga River Mill Dams

TN Environmental Conference
Kingsport, TN - October 25th, 2022

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WILDLANDS
ENGINEERING

Removal of Ward Mill and Shulls Mill Dams on the Watauga River



Presentation Outline

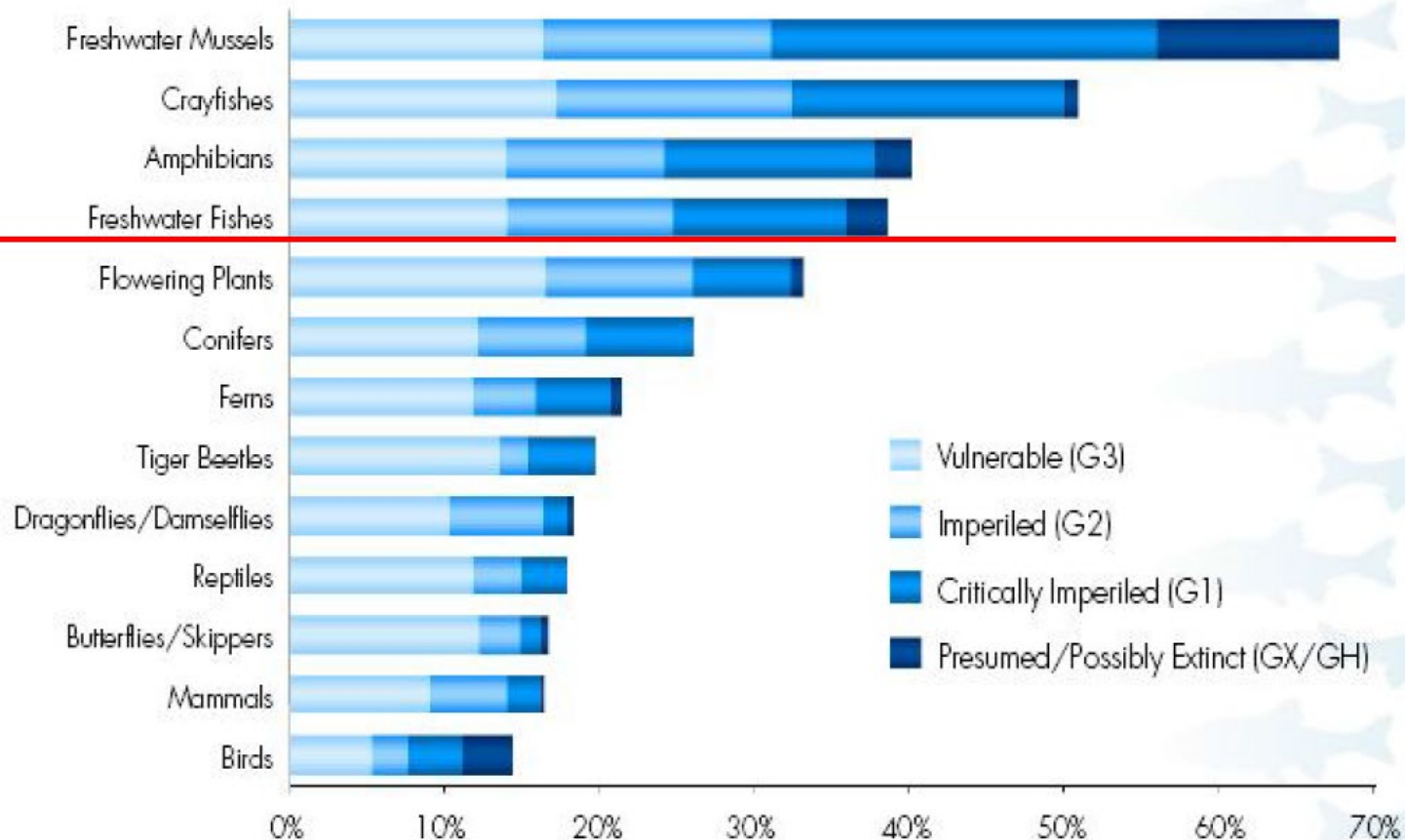
- Primer on Dam Removal: Why, Where, How?
- Removal of the Ward Mill Dam on the Watauga River
- Ward Mill vs. Shull's Mill – similarities and differences



Why Remove Dams

Figure 1. Proportion of U.S. Species at Risk

The species groups that are proportionately the most imperiled—mussels, crayfishes, and amphibians—consist entirely or primarily of freshwater species. (Source: 1997 Species Report Card²¹)



• Aqu

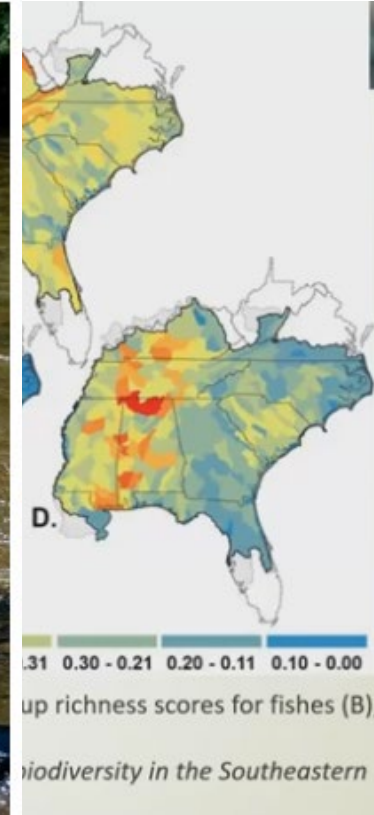
ndance

Where We Work

Education Matters:



Credit: Sou



Kids swim snorkel with Derek Wheaton of Conservation Fisheries Inc in the Little River during a snorkel school organized by the Little River Watershed Association on June 2, 2021 *Jon Michael Mollishy/TVA/Little River Watershed Association*

Economics Matter:

Fish population surveys show improved abundance and health of sportfish in restored free-flowing sections of river.

TNC, Freeing the Green River, 2021

How?...Partnerships

- Policy Work / Education
- Training and Information Sharing
- Identify and Prioritize Barriers
 - Reconnected River Miles and Priority Habitat
 - Obsolete and Failing Structures
 - Safety Hazards
- Willing Landowners
- Funding
- Preliminary Feasibility Studies
- Design and Permitting
- Construction Implementation
- Pre- and Post- Monitoring



Science-based conservation for the rivers of Tennessee



<https://connectivity.sarpdata.com/regions/southeast/teams/> ...and many more

How?...Feasibility & Funding

- Data and site history review
- Key considerations to removal approach, permitting and feasibility
- Consideration of potential fatal flaws
- Evaluation of design and permitting scope, project footprint, landowner agreement considerations, cost



Figure 5. Existing Bank Condition and Example of Geolift Bank Construction with Rock Toe

How?...Design & More

- Dewatering and safety considerations
- Evaluation of upstream sediment – quantity & quality
- Aquatic benefits & risks
- Historical & cultural considerations
- Permitting
 - Corps NW 53, and/or 13, 27
 - Dam Safety
 - FEMA Permitting
- Stakeholder and Landowner coordination



Resources for Dam Removal



- SC, GA, & NC Dam Removal Guidance Manuals
 - https://www.americanrivers.org/wp-content/uploads/2022/01/SC-Dam-Removal-Handbook_FNL.pdf
 - [https://ga-act.org/wp-content/uploads/2020/06/Georgia Dam Handbook 06012020.pdf](https://ga-act.org/wp-content/uploads/2020/06/Georgia_Dam_Handbook_06012020.pdf)
- Project Manager Guides
 - https://www.americanrivers.org/wp-content/uploads/2016/05/NatlDamProjectManagerGuide_06112015.pdf
 - [https://scrcog.org/wp-content/uploads/hazard_mitigation/background_material/dam_removal/Exploring Dam Removal-A Decision Making Guide.pdf](https://scrcog.org/wp-content/uploads/hazard_mitigation/background_material/dam_removal/Exploring_Dam_Removal-A_Decision_Making_Guide.pdf)
 - https://acwi.gov/sos/pubs/dam_removal_analysis_guidelines_for_sos_final_vote_2017_12_22_508.pdf
 - <https://www.ussdams.org/wp-content/uploads/2016/05/15Decommissioning.pdf>

Ward Mill

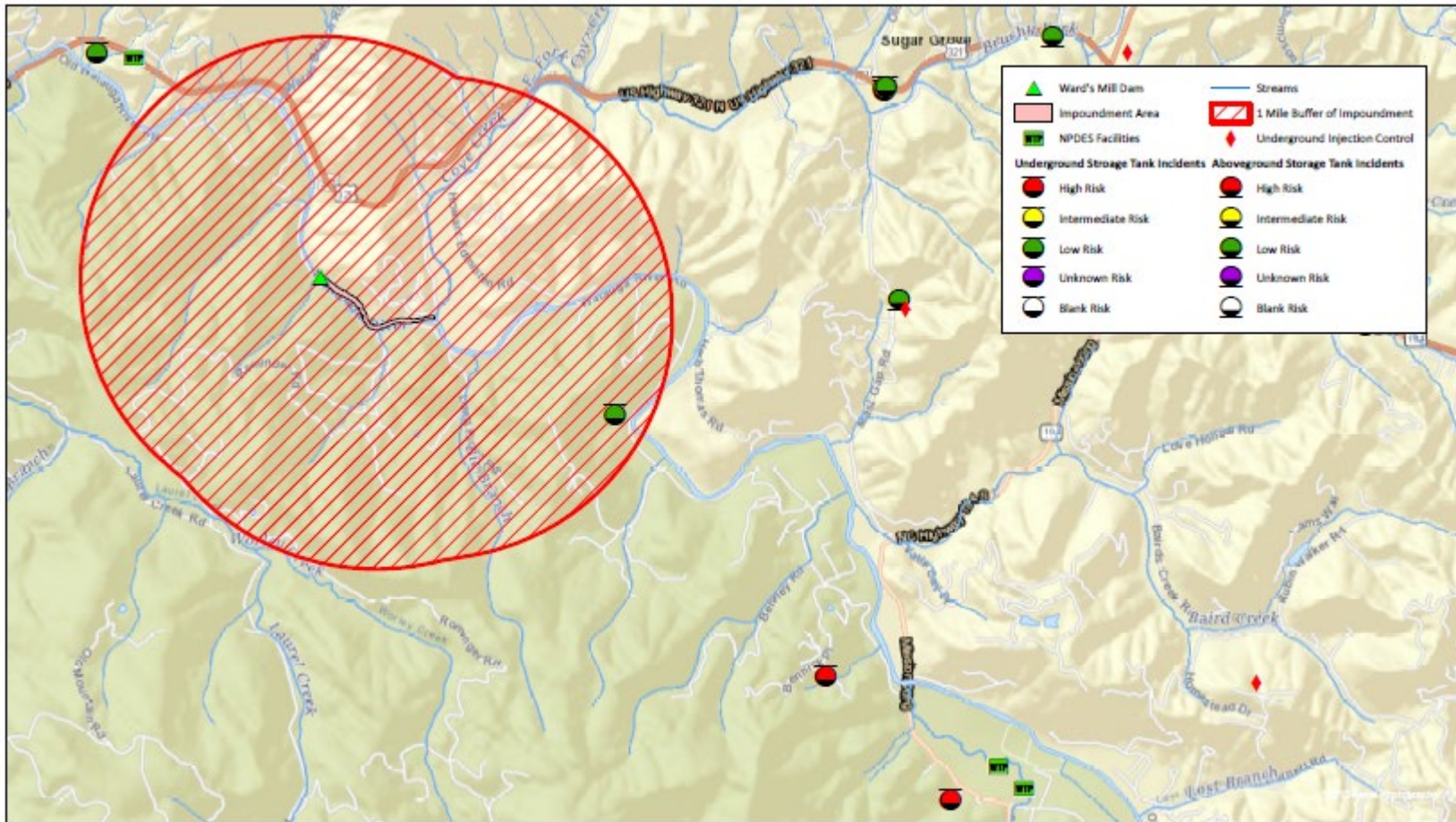


Dam Removal Team



Sediment Quality

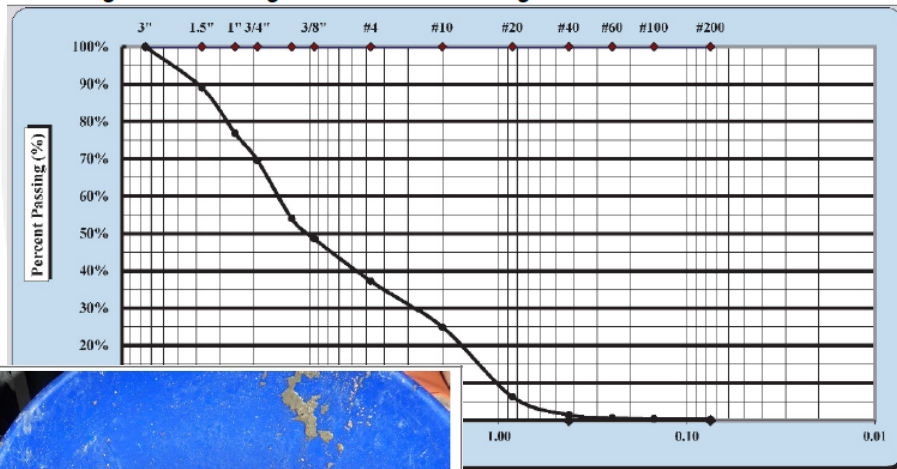
- Tier 1 Evaluation of watershed & sediment volume and texture, as well as mobility (EPA Inland Testing Manual)



Profiles and Sediment Wedge

- Preliminary profile based on FEMA bed profile from Flood Insurance Study & LiDAR
- Detailed bed and refusal profiles based on bathymetric & depth to refusal studies

Grain Size Distribution of Subpavement Sample Upstream of Ward Mill Dam Impoundment at Watauga River USGS Gage 03479000 above Rominger Road



Subpavement Sample - Watauga River

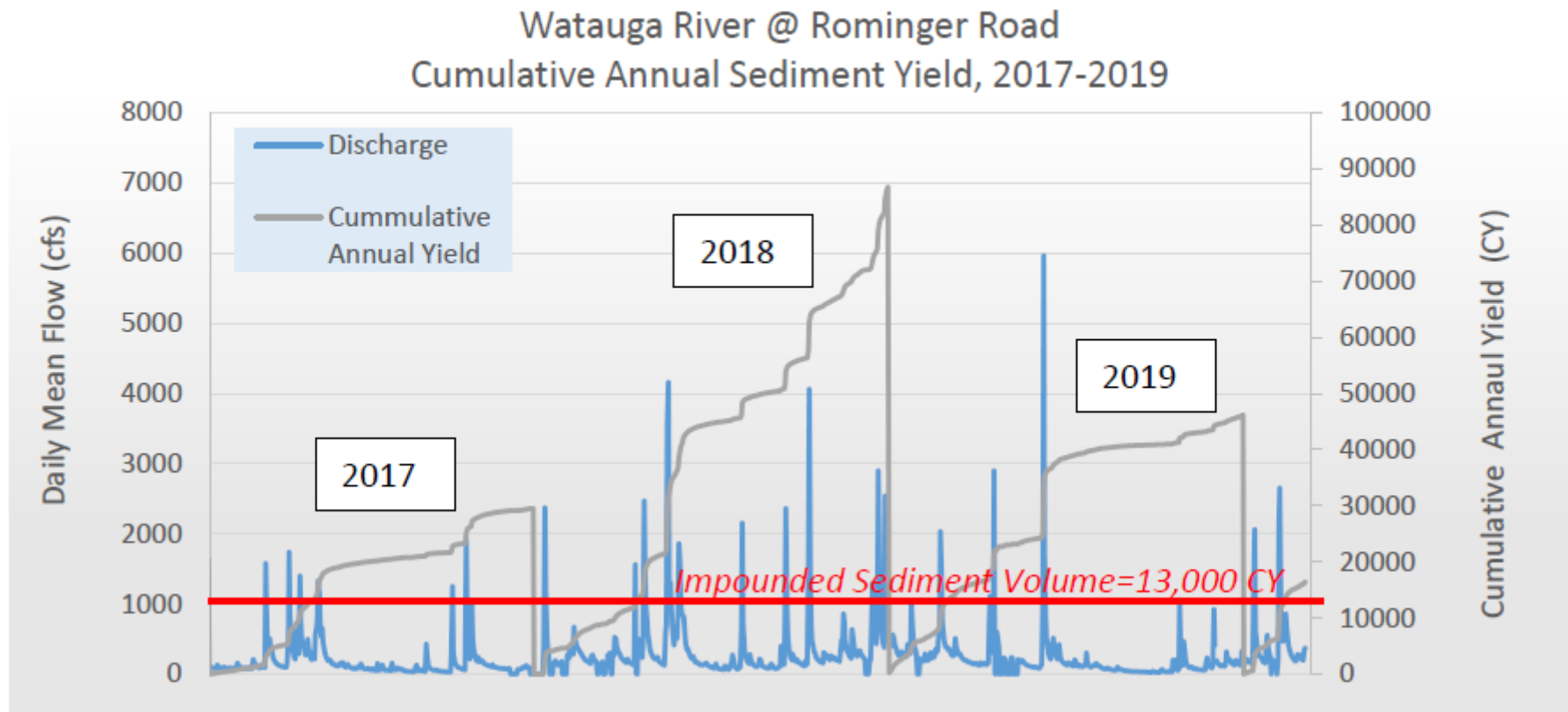
Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	< 0.005 mm
Colloids	< 0.001 mm



Sediment Modeling

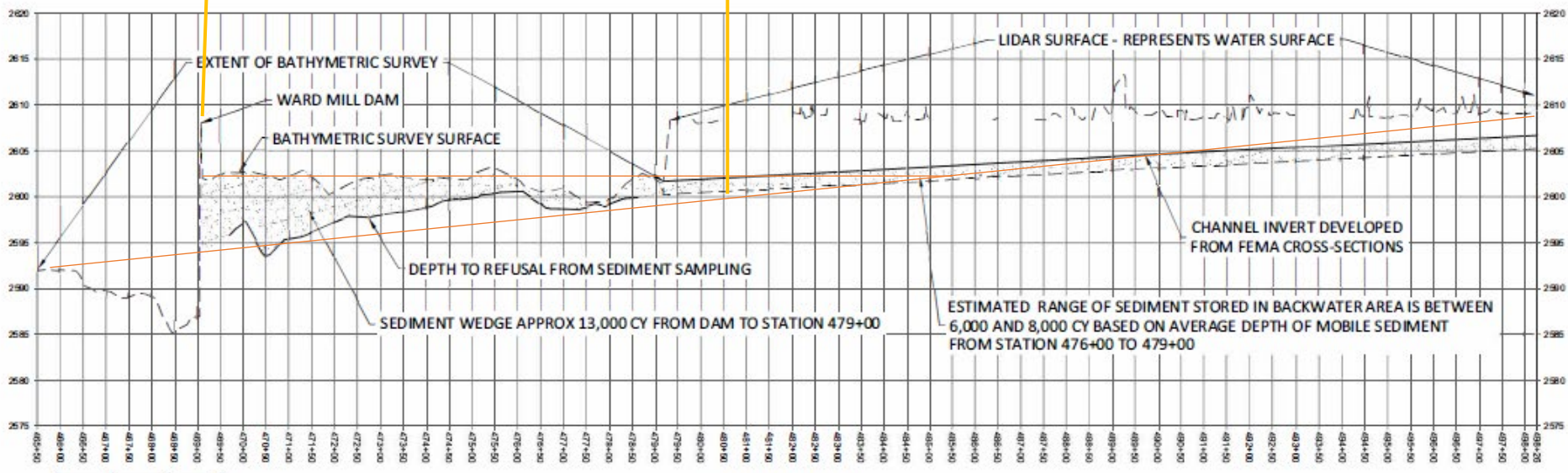
- Data used to model sediment transport
- Compare annual yield based on flow hydrograph to Impounded sediment volume behind dam

Figure 7. Cumulative Annual Sediment Load (Yield), 2017-2019





PLAN VIEW



PROFILE VIEW

Ward Mill Dam

FERC Information



9 We were talking yesterday and they were thinking
10 I'm not sure that the lower one has never been completely
11 taken out since they put in the trash racks, after the
12 initial one. It turns out while we were in there, we
13 referred to them or had they been referred to as sand gates,
14 it turns out that floods like we just had ended up sort of
15 washing out any sand, and there doesn't tend to be an
16 accumulation. They haven't needed to be opened since sand
17 removal, since the dam was built.

Biological, Geomorphic & Habitat Monitoring

- Confirmed no green floater mussels, hellbenders above or below dam

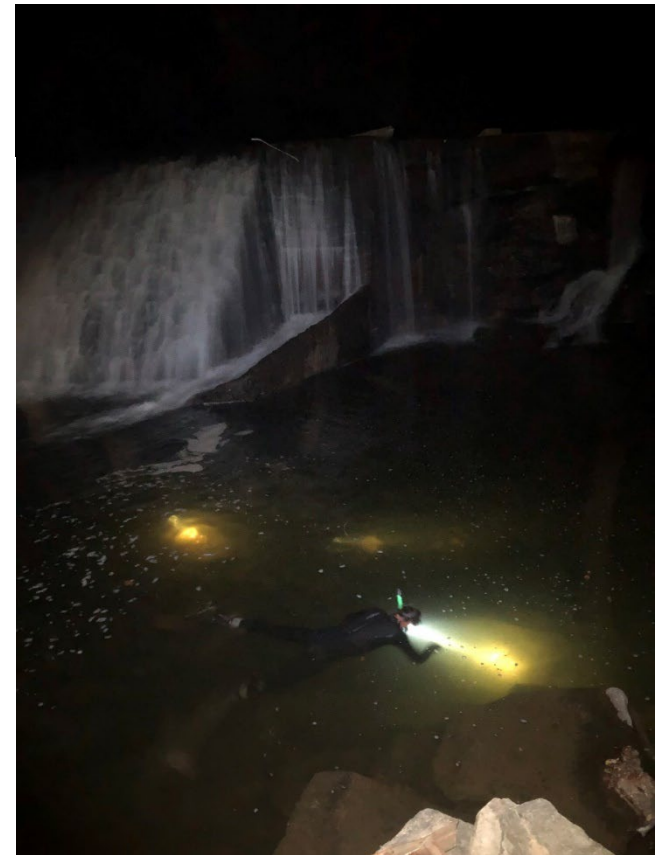
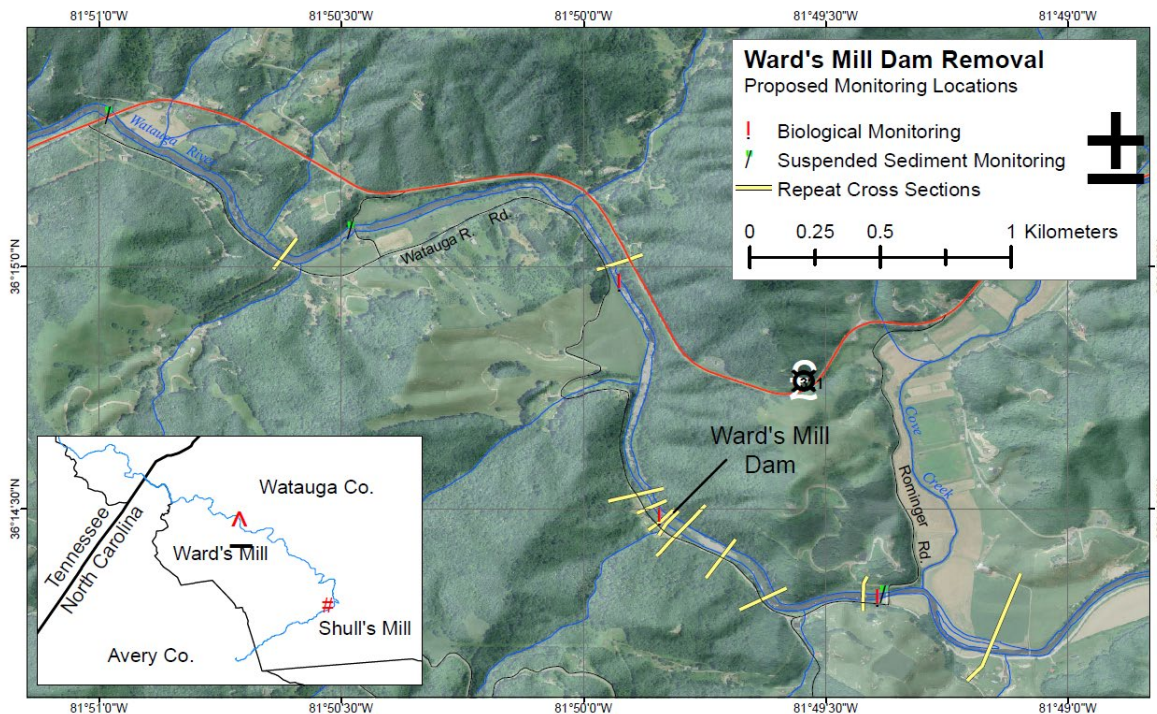
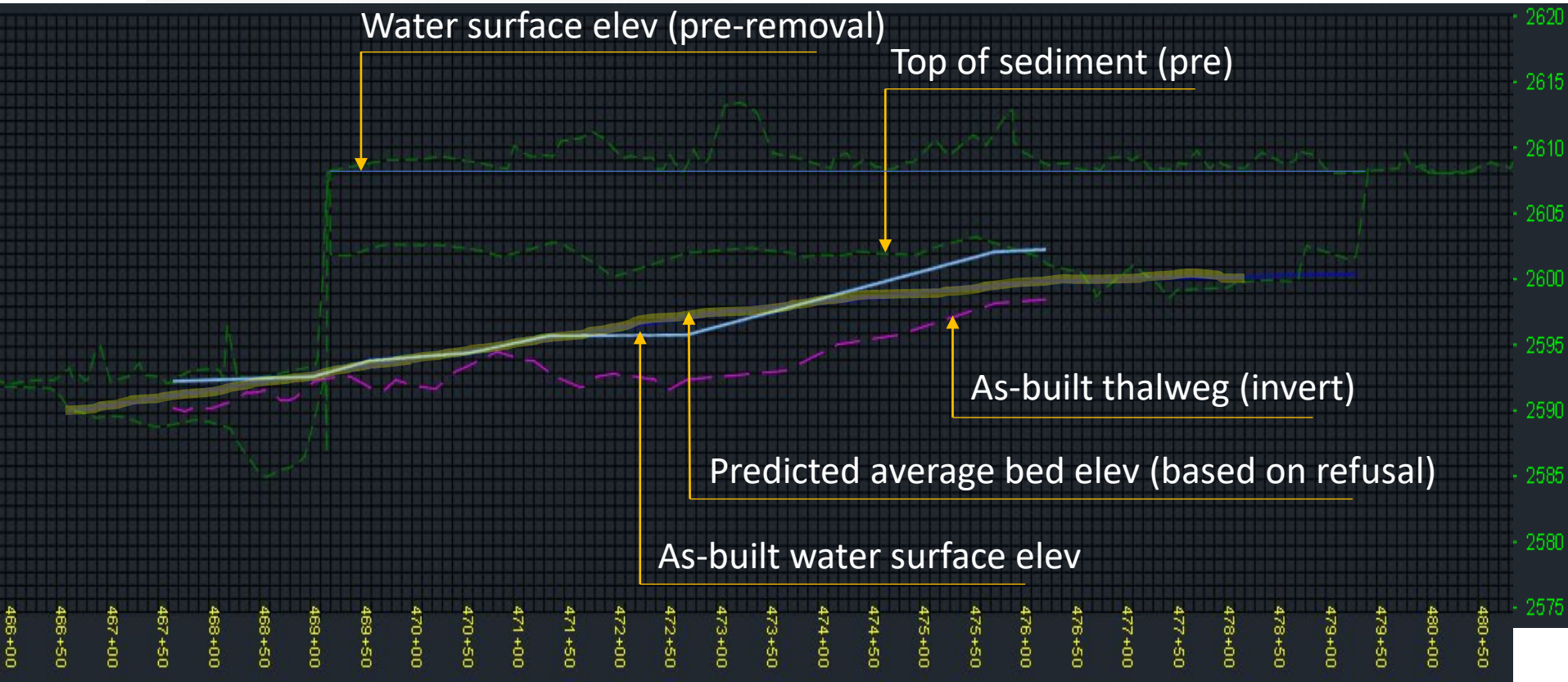


Figure 1. Location of Ward's Mill dam on the Watauga River in Watauga County, NC and proposed monitoring locations.

Geomorphic Predictions



Section 106 Consultation



2-Stage Removal



2-Stage Removal



2-Stage Removal











Shulls Mill



Shulls Mill Dam – Site Conditions

- Ecologically Sensitive
- Breached
- Access restricted
- Narrow valley – more defined impoundment reach
- Less likely to have Section 106 concerns
- Popular swimming hole



Shulls Mill Dam – Sediment Concerns

- Wedge Sediment (sand/gravel/cobble) is mobile gravel and sand
- Possibility of worsening bank erosion post project
- Hellbender population, known multi-age class active breeding population immediately downstream
- Are individuals in pool at dam?



Shulls Mill Dam – Preliminary Work



- Estimate of:
 - Wedge sediment volume
 - Sediment waste/storage areas
- Does the site balance? How much haul off?
 - Floodplain permitting - timing
- Realistic access / sequencing / process for haul off

View Structure Data - Existing Conditions

File Edit View Help

Structure List: [Structure Name] [Status] [Type]

Head (ft): [Value] [Unit]

Structure ID: [Value] [Status] [Type]

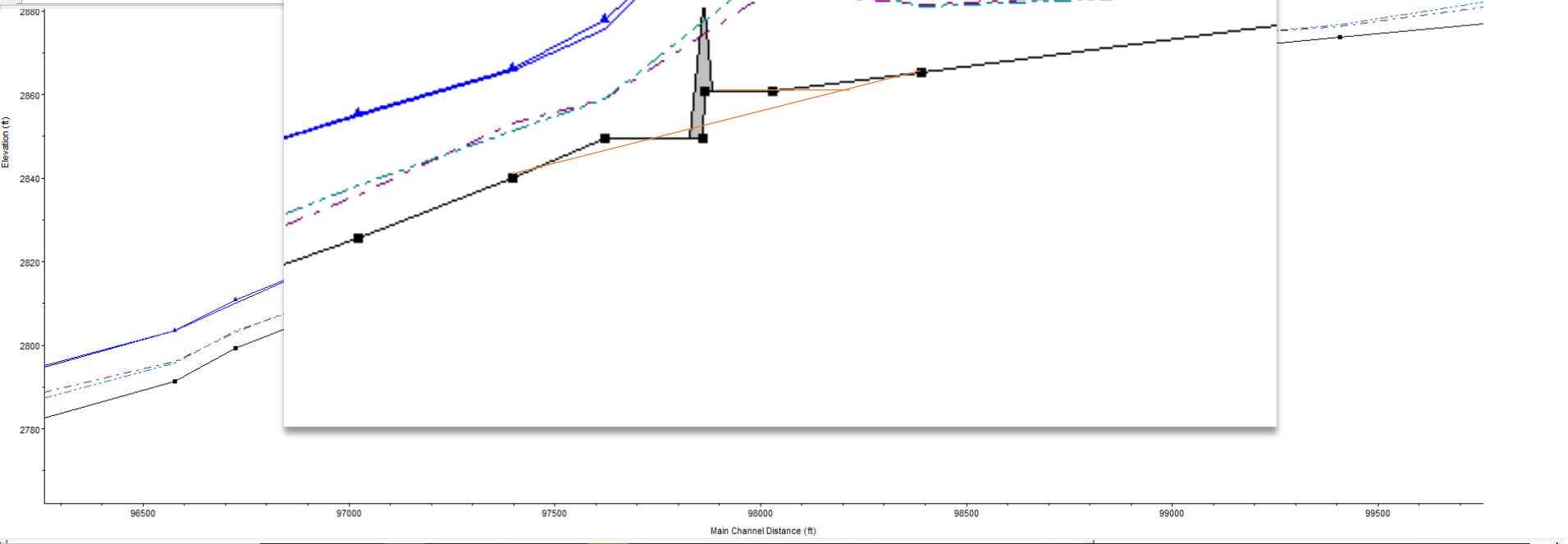
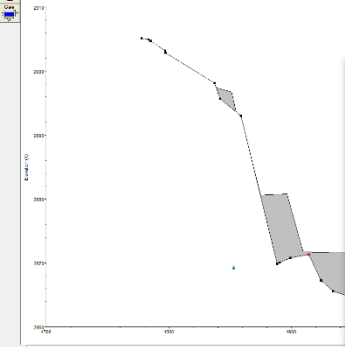
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Structure Date: [Value]

Wildlands River Detailed Study - Plan / Elevation Plot - 2/15/2007

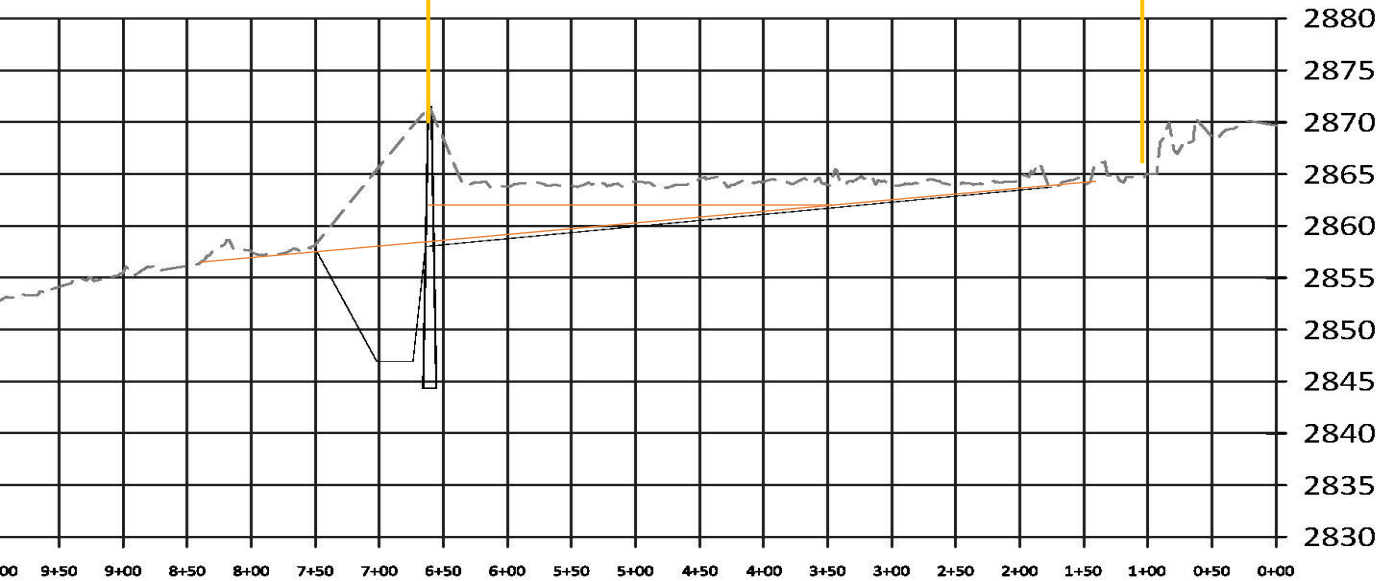
Plot Initial Conditions [] Reload Data []

Over Detailed Study - Plan / Elevation Plot - 2/15/2007



Legend

- WS 100-FW
- WS 100-year
- Ground
- LOB
- ROB



Shulls Mill Dam



[Top][2D Wireframe]



1+50

2+00

Evaluation

- 3,000-3,500 CY of sediment in wedge
- 15,000 SQ FT of area to waste sediment
- +/- 6 FT average fill depth (waste 100% onsite)



Watauga River Dams



Ward Mill

- Combination of wedge volume and aquatic surveys -> allow release
- Historic significance of mill complex
- No dewatering, full pond start condition
- Bank restoration work and 2-phase approach
- Project timing a concern but not critical
- Sediment tracking by ASU \$

Shulls Mill

- Combination of wedge volume and aquatic surveys -> remove sediment. Site access and flood study.
- Historic significant likely limited
- Dewatered, good access for assessment & removal
- Bank restoration work and 1-phase approach
- Time to avoid impacts during mating/breeding
- Sediment haul \$\$\$

Scope for Shulls Mill



Design

- Add Geotech/test pits to better understand material composition/volume, channel invert for bank work
- Wooded site plan access and staging / tree removal
- Coordination with NCDOT
- Iterative flood study and onsite disposal evaluation
- Controlling flow release to control sediment movement
- Waste site identification and permitting

Construction

- No initial dewatering needed
- Adjacent NCDOT highway construction and offsite haul
- Work area flow isolation strategies



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