Suncook River – Providing Resiliency Following a Channel-Changing Flood Event

New Hampshire Water & Watersheds Conference
March 18, 2016
Outline

• Study area and avulsion
• Project initiation and fundraising
• Designs, construction, costs
Study Area – Epsom, NH
2006 – Day after Flood

Suncook River Flow

Avulsion Site

Former Channel
2006 – Day after Flood

Sand Pit

Suncook River Flow

Suncook River Flow
2006 – Day after Flood

Downstream Deposition
Incision and Widening on Leighton Brook

Former Channel Elevation
Project Goals

• Protect bridge infrastructure
  – Rt 4 bridge over Suncook River
  – Black Hall Rd bridge over Leighton Brook

• Control upstream migration of knickpoints on Suncook River and tributaries

• Control channel widening
Project Initiation and Fundraising
Project Initiation and Fundraising
Project Initiation and Fundraising
Project Initiation and Fundraising
2006

• NHDES Geological Survey conducts post-avulsion baseline survey

• $8,000
2007

- NHDES and U.S. EPA Section 319 Grant - $24,000
- Non-federal match of $16,000 from Town of Epsom
- FEMA awards $275,000 to USGS for flood recovery mapping
- FEMA awards $134,424 to DES for 2’ contour aerial mapping
- USGS commits $13,800 to install new stream gage
2008

• FEMA commits $37,360 for 4’ aerial imagery from Epsom to the Merrimack River

• FEMA awards $2,000,000 for home acquisition applications in Allenstown
2009

• DES works with Town of Epsom on grant application for NHSCC Moose Plate program - $100,000 SECURED

• DES applies for $3.8 million to FEMA for Pre-disaster Mitigation Grant – DENIED

• Moose Plate Grant withdrawn from Town due to PDM grant award denial.
2010

- State of NH Capital Appropriation - $850,000 Design/Engineering/Permitting/Construction
- State of NH Capital Appropriation - $185,000 Fluvial Erosion Hazard Zone Delineation and mobile wood inventory by DESGS
• Department of Safety award of $55,000 to Central NH Regional Planning Commission.
2010

• 2\textsuperscript{nd} PDM grant request of $2.4 million denied
• DES secures $200,000 to remove Buck Street Dam
• $336,000 SEPP penalty mitigation secured for Suncook
2011

- State of NH Capital Appropriation - $2,000,000 for property acquisition and hazard mitigation secured
- Dept. of Safety awards $450,000 for geotechnical survey, design, and permitting
- Inter-Fluve Inc. under contract!
- USGS publishes Sediment Transport Study
• $1.7 million NFWF grant request from DES denied
• Capital appropriation of $1.8 million secured by DES
• Designs from IFI lead to all permits being secured for proposed work on Suncook and Leighton Brook
2015

- SumCo EcoContracting contract with DES for Leighton Brook stabilization - $260,000
- Work completed December 2015
- NHDOT commits $900,000 for Suncook construction
• Finalize designs for Suncook River
• Issue bid packages and select construction contractor
• Secure $500,000 contingency funds (if necessary)
**Project Initiation and Fundraising – Suncook Saga Summary**

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**Months after floods, residents struggle**

**Waters swamped many in Suncook Valley twice**

To: **WALTER ALARKON**

From: **Ethan Wilenkny-Lanford**

April, 2000

Waters swamped many in Suncook Valley twice. In the past two years, the river has flooded the valley twice, causing significant damage to homes and businesses. The floods have left residents struggling to recover.

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**I wish Gov. Lynch’s house was right here. Then the problem would be taken care of**

Tom Searles

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**Stabilizing The Suncook: Pacifying A River Run Amok**

By: **Ethan Wilensky-Lanford**

**River’s new path is likely to stay**

Epsom residents eye transformed Suncook

Engineers gave 100 Epsom residents little hope Wednesday that the Suncook River would return to its former course. They presented four options for how the region could respond to the river’s changing.

None of the options would protect the river from potential flooding this spring. Construction proposals require millions of dollars. Federal funds might be available, according to state Department of Environmental Services officials, but only with matching local or state spending. Epsom, meanwhile, is on its fourth default budget.

Before the meeting, many residents said they wanted the river back where it was. A quarter-mile-long diversion dam to steer the water into its former channel would cost $3.5 million, said Peter Walker of the engineering firm Vanasse, Hangen Brustlin Inc. Even with the money, the Suncook River study area.

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**On the Suncook River, a slow, rolling disaster response**

I have sponsored a bill to fix the Suncook River problem.

To: Editor

From: Rep. Brandon G. R. Pembroke, and myself have sponsored a bill regarding the remediation of the Suncook River. We will be working closely with Representative Dan and Carol McGuire (D-Epsom), Rep. Richardson (R-Barnstead), Rep. Steve Rumpel (R-Barnstead) and Rep. Jack Barlow to move the legislation through the House and Senate as much support as we can for its passage and implementation.

The existing capital budget for 2012-13 incorporates a total sum of $250,000 to state and federal money for this project, a small portion of which has already been approved. Money is tight and we must remain vigilant. As most of you know, I detest kickbacks and other money which is offered by lobbyists to people who have any business before the House. The general legislators themselves must carry nearly $100,000 per year to pay national lobbying organization of legislators which could best be described as a money-gathering scheme. This organization would take the money from the state legislators and recycle it by offering kickbacks to members of study committees and the fees that are paid out to people who have any business before the House. This organization has spent approximately $100,000 per year in recent years.

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**Environment**

3:28 PM Thu, April 21, 2011

Stabilizing The Suncook: Pacifying A River Run Amok

On its new course, the Suncook threatens his longtime home

By: **Walter Alarkon**

**Flood victims demand answers on plans**

State officials draw residents’ frustration

By: **Maddie Hanna**

**On its new course, the Suncook threatens his longtime home**

Date: Wednesday, June 20, 2007 9:44:16 AM

**Flood victims demand answers on plans**

State officials draw residents’ frustration
Project Initiation and Fundraising – Suncook Saga Summary

Since 2006, $23 million in grant/appropriation requests denied - $9.4 million secured
SO, ARE YOU THE GUY WHO WANTS TO REROUTE THE SUNCOOK RIVER?
WARNING

RIVER RESTORATION PROJECT AHEAD
CREWS AND HEAVY EQUIPMENT IN RIVER
PLEASE PROCEED WITH CAUTION
A SHORT PORTAGE MAY BE NECESSARY
Use our geomorphic understanding of the Suncook River to provide protection for infrastructure (grade control and bank stabilization) while maintaining geomorphic form and function.

At the same time, attempt to improve fish and aquatic organism habitat.
• Topographic survey
• Geomorphic assessment
• Meander bend analysis
• HEC-RAS 1-D hydraulic model
• TUFLOW 2-D hydraulic model
• Geophysical surveys
• Scour analysis
• Potential is there for increased meandering
• May continue SW away from Leighton
• Other bends may cause changes at Leighton
High shear stresses and velocities
Shears necessitate large rocks for stability
16 psf
Geophysical survey – borings and seismic survey

- Lag deposits in channel – not necessarily under floodplains
- Mostly sands and silts
- Hard material lies ~30 ft below the ground surface in the floodplains

- Geology is not helpful for this project

Rock fragments 36-40 ft below surface
Scour Analysis

• Deep scour potential downstream of the Rt 4 bridge
  – Existing pools >15ft deep

• Installation of large woody habitat structures could increase scour potential, risk and uncertainty along channel margins
Suncook River and Leighton Brook Designs

Suncook River Flow

Bank Stabilization

Leighton Brook: Roughened Channel Construction

Grade Control
Designs – Leighton Brook

NOTES:
SEE TYPICAL DETAILS 2 AND 3 ON SHEET 8 FOR LARGE
WOOD PLACEMENT DETAILS.

LARGE WOOD IS SHOWN FOR SCHEMATIC PURPOSES
ONLY. SEE SPECIFICATIONS FOR SIZES OF LARGE
WOOD PIECES.

SCALE IN FEET

ROCK BUTTRESSES

PROPOSED GROUND

AVERAGE SLOPE = 5.54%

EXISTING GROUND

5 FT. (MIN.)

STA/6033.4
ELLEV:302.3

STA/075.0
ELLEV:305.3
Construction Photos
Suncook River and Leighton Brook Designs

Suncook River Flow

Bank Stabilization

Leighton Brook: Roughened Channel Construction

Grade Control
- Consolidated clays with embedded cobbles and boulders
- Pool below ~15-20 ft deep – large scour potential
- Sandy, silty banks
Grade Control
Riffle

Suncook River

Access

PRELIMINARY Plan FOR CONSTRUCTION

SUNCOOK RIVER MITIGATION

BOULDER Voids shall BE Filled WITH NATIVE CASTINGS FROM EXCAVATION. THE FINAL TWO FEET OF FILL PLACED IN THE RIVER ACCESS AREA SHALL BE NATIVE MATERIAL.
Avulsion Site Bank Stabilization

- ~10 vertical drop over 350 ft
- Boulders 1-3 ft diameter

- Channel eroding around boulders through sand on left bank
- No stable geology
- Part of 10 ft knickpoint has begun to migrate upstream
Avulsion Site: Bank Stabilization

NOTE:
Boulders voids shall be filled with native castings from excavation. The final two feet of fill placed in the river access area shall be native material.

GRAPHICAL SCALE

PRELIMINARY NOT FOR CONSTRUCTION

NH DEPARTMENT OF ENVIRONMENTAL SERVICES & NH GEOLOGICAL SURVEY
SUNCOOK RIVER MITIGATION
### Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Estimate ($)</th>
<th>Actual Cost ($)</th>
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<tbody>
<tr>
<td>Leighton Brook</td>
<td>$311,000</td>
<td>$259,217</td>
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<tr>
<td>Suncook River</td>
<td>$2.6 million</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,911,000</strong></td>
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<table>
<thead>
<tr>
<th>Source</th>
<th>Funding Amount</th>
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</thead>
<tbody>
<tr>
<td>FY16/17 Capital Funds</td>
<td>$1.8 million</td>
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<tr>
<td>NHDOT Federal Highway Bridge Funds</td>
<td>$900,000</td>
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<tr>
<td>Mitigation Settlement</td>
<td>$336,000</td>
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<tr>
<td>Remaining funds from Leighton construction</td>
<td>$81,319</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$3,117,319</strong></td>
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</tbody>
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- Replacing bridge: estimated at $12-15 million
Summary

• Local geology is not very helpful
• Bridge replacement too costly
• Valley-spanning control too costly
• Scour potential too great for substantial use of logs, rootwads
• Fabric lifts and revegetation will help soften look above the high shear stress values
• Science and $$$ guide the designs – no room for error in bridge infrastructure projects
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