Suncook River Avulsion
Geomorphology-based Restoration Alternatives

Summary of the River Survey

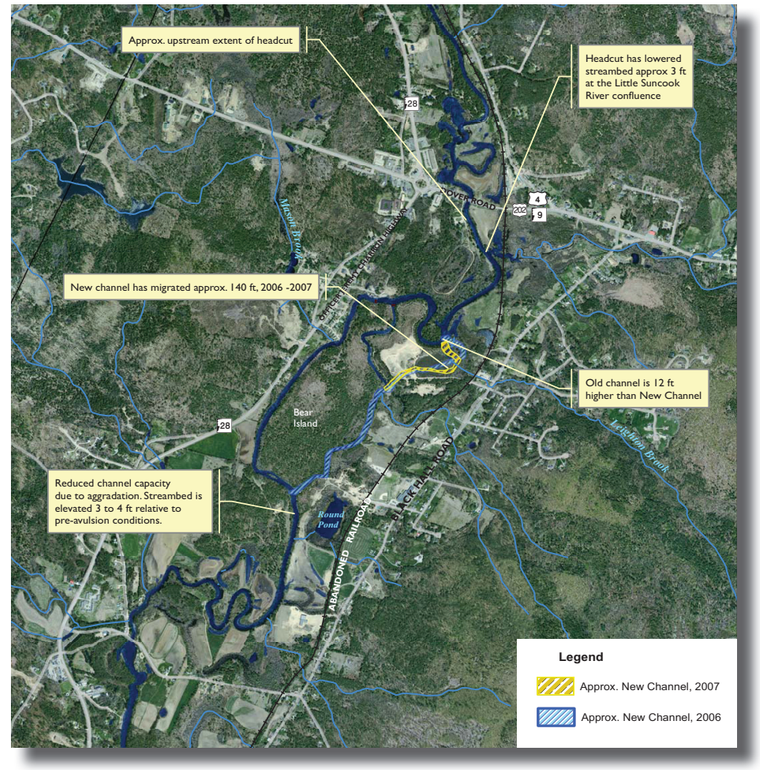
The river has been quite stable over the last 50 years. Although the river is quite winding in places, an analysis of topographic maps and aerial photographs from 1921, 1953, and 2003 illustrates that the river channel has been quite stable over the recent past, with negligible changes occurring.

An active headcut was initiated by the avulsion and appears to be actively migrating upstream, threatening infrastructure such as US 4. A headcut is a type of erosional feature seen in flowing waters where a deep incision of the streambed forms, progressing upstream, lowering the streambed and usually causing the riverbanks to erode and collapse.

Severe degradation has occurred at the avulsion site, which means that the elevation of the new stream channel is up to 12 feet lower than the old channel bed. This channel degradation has moved upstream to a point north of the confluence with the Little Suncook (i.e., an active "headcut" is moving upstream). The streambed near the mouth of the Little Suncook appears to be as much as three feet lower than before the avulsion.

Recent surveys of the river indicate that the New Channel is rapidly adjusting laterally. A comparison of aerial photography from 2006 to 2007, as well as GPS survey data collected by the NH Geological Survey, indicates that a large meander bend in the New Channel has been rapidly migrating, contrary to the relative stability seen in the river planform prior to the avulsion. From 2006 to 2007, this meander bend migrated about 140 feet or more to the south.

The New Channel is relatively stable for relatively low flows (equal to or less than those occurring every 1.5 to 2 years, on average). but prone to excessive erosion and sedimentation for flows exceeding "bankfull." One calculation, the "critical discharge," which measures the flow needed to move sediment, shows that flows close to "bankfull" are required to initiate movement of most of the bed sediment.



This unstable condition will remain until the river carves an adequate floodplain through the valley and attains a new dynamic equilibrium. While it is impossible to predict exactly how long it would take the river to reach equilibrium, observations by the assessment team, as well as experience with similar sites, leads to the conclusion that the process could take decades. Hence, higher than normal levels (pre-avulsion levels) of sediment can be expected to be transported downstream for many years to come.

Downstream of the avulsion, deposition of fine material has raised the river bed such that it is at the same elevation as the surrounding floodplain, creating the risk that a secondary avulsion may occur. This possibility is perhaps greatest below the confluence of the old and new channels, near Round Pond. Additionally, there is a risk of avulsion to the west through an agricultural field at the meanders in the floodplain north of Short Falls Road.

Summary of Findings & the Recommended Restoration Alternative

Finding: The No-Action Alternative should be rejected. We draw this conclusion primarily due to the substantial risk of further property and ecological damage that would result from continued headcutting above the avulsion and in the Little Suncook River and in Leighton Brook, and the potential for a secondary avulsion downstream.

Finding: Returning the river to its former channel (through implementation of "Alternative 4") is not the most cost effective way to minimize the chance of further property damage. Furthermore, this alternative carries substantial risks and costs (estimated to be $4.0 to $5.5 million) that are not associated with other alternatives. Review of the river leads to the conclusion that such an expensive and difficult course of action is probably not the most prudent action.

Finding: Alternative 3 is an effective way to minimize the potential to future property impacts. Implementation of Restoration Alternative 3 would restore the "New Channel" corridor to an equilibrium form, and hence, minimize the production of sediment from about 2,500 linear feet of channel.

The recommended alternative for addressing the Suncook River Avulsion (called "Alternative 3" in the technical report) involves leaving the river channel in its current position but addressing erosion and sedimentation at strategic locations along the system, as well as shaping the "New Channel" into a stable configuration. The intent of this alternative would be to provide self-maintaining channel stability and minimize the production of excess sediment through the New Channel.

Alternative 3 includes the following elements:

- Severe erosion ("headcutting") in the main channel between the US 4 bridge and the avulsion site would be stabilized through installation of stone grade control structures ("cross-vanes") in conjunction with channel shaping and grading.
- Likewise, headcutting in the Little Suncook and Leighton Brook could also be adequately treated through installation of appropriately placed boulder grade control structures in conjunction with minimal grading and shaping of the existing channel.
- The New Channel would be re-configured to a stable equilibrium endpoint. Specifically, the river survey (i.e., the "geomorphic assessment") found that the New Channel is an "F5" stream type, which tends to be deeply entrenched and relatively straight and wide, with steep eroding banks. Since these stream types generally evolve to a narrower, more sinuous and less incised "C5" stream type, it is recommended that the channel be reshaped so that it is closer to a C5 channel type.
- This alternative would also create a floodplain with an average width of about 400 to 500 feet to allow the river access to a floodplain in the New Channel area, which will help prevent flooding elsewhere and will help dissipate erosive river energy.
- Stream reaches downstream of the New Channel which have filled with sediment would be excavated to restore cross-sectional area and appropriate sediment transport capacity.
- Further investigation would determine the degree to which the old railroad grade on the east side of the river acts as a floodplain barrier. If it is found to be a significant floodplain barrier, installation of floodplain culverts or excavation of portions of the grade is recommended to allow the river to access its floodplain.

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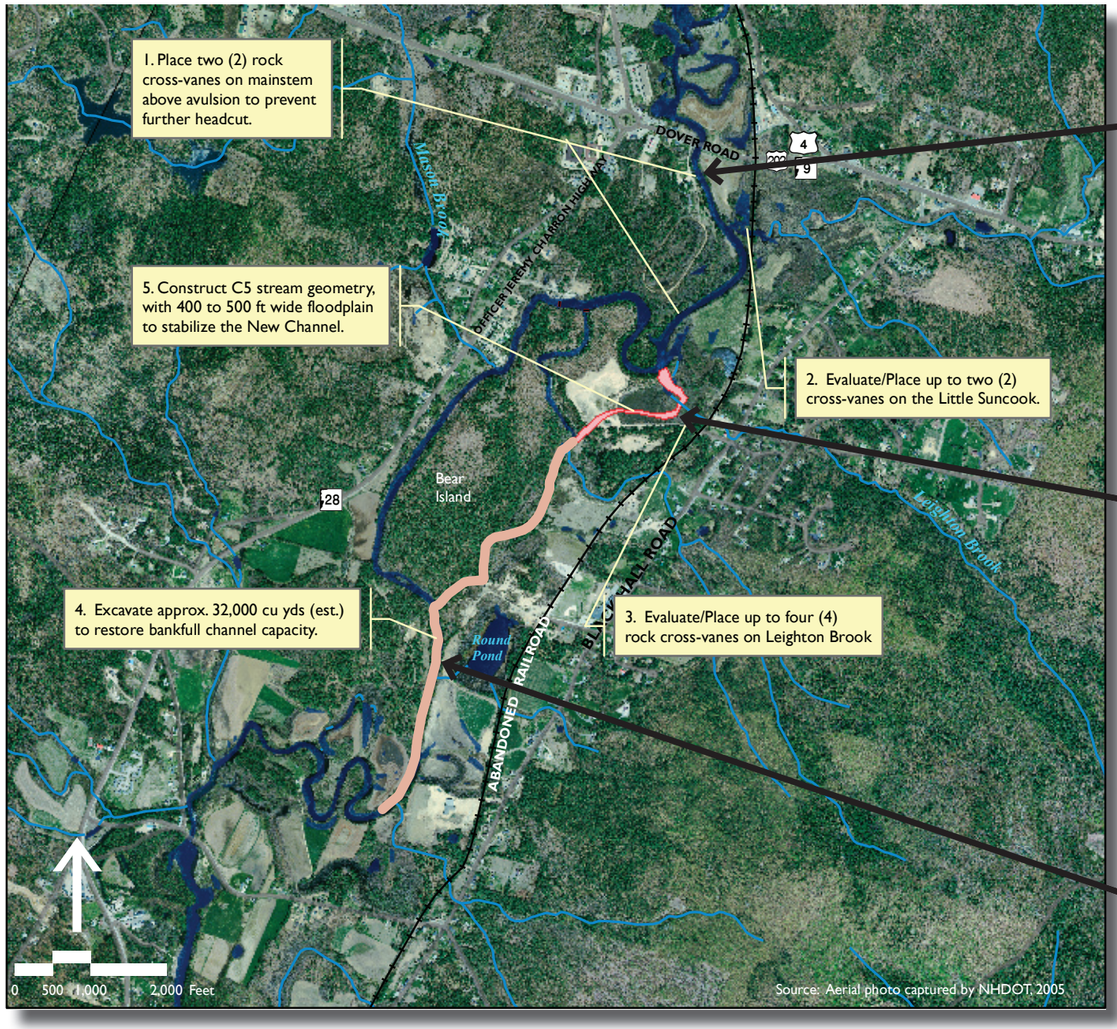
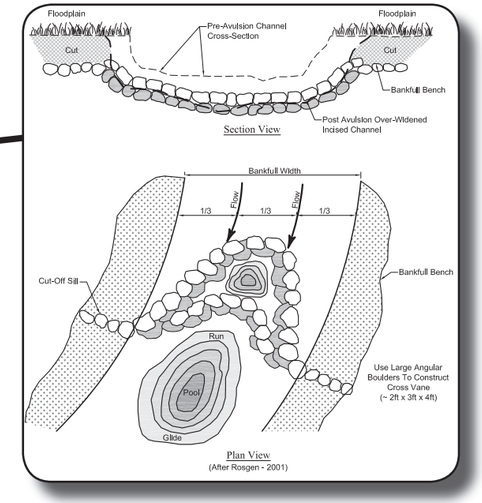
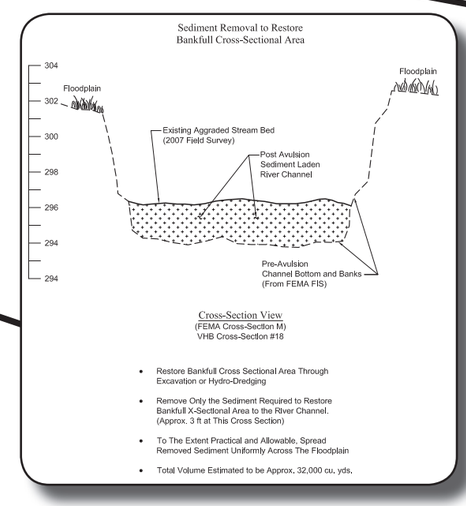
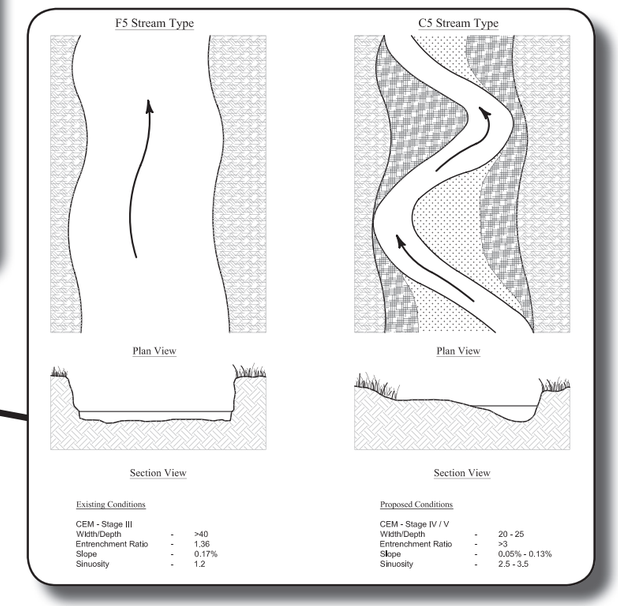
Recommended Restoration Alternative









Preliminary Opinion of Cost - Alternative 3

Nine (9) Cross-vanes	$350-450,000
Dredge 32,000 cu yds (5,000 lin ft)	$500,000
Remove and dispose of spoil (assumed 5 mile round trip)	$325,000
New Channel Restoration	$500-750,000
Total	**$1.8- $2.1 million**

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Friends of the Suncook River

NHDES

Town of Epsom Incorporated 1727