Cayuga Inlet Dredge Material:

Opportunities for Restoring Ecosystem Functions & Services

Fall 2011 Cornell University Restoration Ecology Class Report

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Executive Summary:

Ben Hedstrom

Our Restoration Ecology class (consisting of undergraduate and graduate students in the schools of Earth Systems Science, Natural and Environmental Systems, Landscape Architecture, and City and Regional Planning) spent the Fall 2011 semester investigating the Cayuga Inlet Dredging Project and the complications it has faced with the discovery of *Hydrilla verticillata*. Doctor Thomas Whitlow of the Cornell University Department of Horticulture led this course.

Our report includes findings from studies on local dredge material, Hydrilla, the southern Cayuga Lake watershed, and several case studies on successful projects involving the productive reuse of dredge material.

Dredge Material

At the Cornell Soil Health Lab, we analyzed samples of local dredge material for many qualities including toxicity and potential use as a plant growing or structural material. While restricted access to the inlet was a limitation to our study, our findings conclude that this material is not generally hazardous and the existing nutrient levels are self-stabilizing. There do however appear to be local 'hotspots' for lead so it is not a recommended medium for food production. With more intensive testing, and mixing it with other soil or compost, much of the material could potentially be used in this way.

Previous studies have indicated that the dredge material is a silty-clay, but we have found it is actually more a sandy-loam. This material contains a higher percentage of organic material than was expected and has the ability to support terrestrial plant species similar to those found on a 12-year old dredge disposal site in Dryden. The material we tested has low aggregate stability and would make a poor structural material.

Additionally, we measured the dredge material's potential to release methane into the atmosphere. The overall anthropogenic impact would be small compared to releases from local dairy operations, even given the largest scope of the dredging project.

Hydrilla verticillata

Samples of *Hydrilla verticillata* were tested over a period of several weeks for desiccation tolerance to understand the species' survival ability in dewatered dredge material. Generally, our tests indicate that short term desiccation alone cannot kill Hydrilla. A management plan for Hydrilla eradication should absolutely be made in conjunction to the plan to dredge the inlet. Given that some reports indicate Hydrilla can live for up to five years in dry material, the current plan to store dewatering dredge material for one year with subsequent use across the landscape has a great potential to proliferate the infestation in waterways throughout the county. Solarization, a method of soil sterilization beneath plastic sheeting, is potentially more effective at killing Hydrilla than mere drying.

Simultaneously, certain areas of the inlet should potentially be managed individually, namely Cascadilla Creek. Under the conditions encountered this October, our light extinction readings show that below 2.5 feet, light intensity is below the light compensation point and would be unlikely to support vigorous stands of Hydrilla. However, since Cascadilla Creek and the small tributary creek across the Inlet in Cass Park are shallow and generally have clear water, they are more prone to infestation and a separate management plan should be created for any dredge material from these areas.

Our Local Watershed

Sedimentation in the inlet is a natural geomorphologic process that has existed since the end of the glacial retreat. Human

activity has accelerated the pre-settlement condition. Replacing our native flood plain and wetland habitats at the outfalls of tributaries at the south end of the lake with paved or turf surfaces, and stripping stream edges of bank-stabilizing vegetation for development over the past century decreases functionality to the already accreting system. While our analysis of area forest cover levels indicate that there may be slightly lower levels of sediment in the future due to decreasing levels of farming, history has shown that sedimentation will continue to occur.

Dating back to the sand bar that was removed from the inlet at the beginning of the nineteenth century to allow boat traffic, dredging has been a part of Ithaca's history and will remain so as long as humans need to navigate the waterfront. Our recent tendency to defer maintenance demonstrates that perhaps a lack of action is the most significant effect of humans on the inlet.

At this time, we have a chance and a duty to make human actions that attempt to relieve this situation and instigate a plan that works with the evident natural process. Our report provides several practical and successful examples of productive dredge use and restoration projects that collectively describe opportunities to:

- Use the dredge material in ecologically and economically productive ways.
- Define an efficient plan for the future that understands sedimentation in the inlet as a persistent issue.
- Increase project innovation utilizing the expertise of diverse agencies and levels of government.

While we probably do not need to restore the channel to its original configuration for the maximum potentials of navigability, recreation, and flood-control, our legacy to the Cayuga Inlet Dredging Project should aim to create a better situation than the one that has materialized.

Potentially a wetland site, with small cells that could easily be monitored and solarized, with installation of a silt fence to retain Hydrilla from other parts of the lake, remains the most viable option. Similar to Poplar Island, but on a much smaller scale, this plan has the highest ability to confine the material, while creating a new species habitat and still limiting the distance material would travel.

"If we don't allow someone to try something to see if it works, how will we move ahead?"

Mark Sudol
USACOE Regulatory Program Chief
Science Magazine, April 2008

Project Introduction:

Tim Lynch

The City of Ithaca is in the planning and approval stage for a dredging project that will remove accumulated sediment from the inlet. The inlet consists of the Cascadilla Creek, Cayuga Inlet and the Flood Control Works. These three entities perform a variety of ecological, infrastructural, commercial and recreational functions. The Army Corps of Engineers has estimated that a total of 660,000 cubic yards of sediment have accumulated within the channels. The City will be collaborating with multiple agencies including the US Army Corps of Engineers (ACOE), New York State Department of Environmental Conservation (NYSDEC) and the New York State Canal Corporation (NYSCC).

The city is currently planning a dewatering facility to be located on a 23-acre portion of city owned land behind Lowe's and Wal-Mart known as the Southwest Site. This Sediment Management Facility (SMF) will use earthen berms to create multiple cells for the processing of dredge material at different stages of dewatering. The Draft Environmental Impact Statement (DEIS) prepared for the City by Ecologic LLC estimates that the SMF would have an annual processing capacity of 80,000 cubic yards. The DEIS proposes utilizing this material for a variety of beneficial re-uses including habitat restoration and being mixed with yard waste to produce topsoil. The City does not currently have a firm plan for the beneficial re-use of material.

The city plans to construct the SMF beginning in the spring of 2012 and begin the first stage of the project with the dredging of an estimated 25,000 cubic yards of sediment from the Cascadilla Creek section of the Inlet. The DEIS submitted by the City of Ithaca in November of 2011 involves this initial stage of the larger planned project and the related construction of the SMF.

Report

This report was produced by Cornell University students as part of a semester long study of the dredge project as part of a Restoration Ecology (HORT 4400) class taught by Professor Tom Whitlow. The report intends to summarize the findings of the class research on this subject, to provide the Ithaca Community with information pertinent to the dredge project, to investigate the possible beneficial uses of the dredge material and to add to the body of knowledge related to the aquatic invasive *Hydrilla verticillata*.

Regional Geologic History

The processes of erosion and sedimentation have been an integral part of the natural history of the central NY region. Prior to the Ice Age, the Finger Lakes were north flowing rivers that were fed by a series of perpendicular streams. The rivers were

Our Class Visit to the Southwest Dewatering Site, September 2011

deepened and widened by the glaciers and the stream valleys were filled with glacial debris. Since the retreat of the glaciers, these streams have been constantly moving this debris into the lake and have formed the gorges unique to the area.

Renwick Marsh, 1906 (Ithaca Historical Society)

Inlet History and Flooding

During the nineteenth and early-twentieth centuries the inlet experienced a massive amount of man-made alterations. Significant de-forestation of the area led to soil destabilization and subsequent erosion within the watershed as well to as an increase in flood occurrence and damage. At the same time, development of the floodplain continued into Renwick Marsh, now known as Tompkins Park. At the turn of the twentieth-century, the marsh consisted of large areas of cattails and other aquatic plants. Decades of filling, bulwark construction and channelization created the inlet in its current form.

Dredge in Cayuga Inlet near Cascadilla Creek, early 1900's (Ithaca Historical Society)

Dredging History

Over the last two centuries the inlet has been dredged and re-configured as part of different projects that aimed to improve navigability and in attempt to control the common occurrence of flooding. Between 1860 and 1900 the inlet was dredged on several occasions to maintain a depth of seven feet. Between 1910 and 1965 the inlet was dredged every 20-25 years. The severe flood of 1935 set in motion the plans for the Flood Control Channel that was begun 30 years later in 1965 and completed in 1970. A major dredge in 1982 removed over 200,000 yards of material that was used to create the Hog's Hole Natural Wildlife Area in Allen H. Treman Marine Park. In 1999 the ACOE removed 75,000 CY from the flood control channel.

Dredging Process

The current plan for the inlet dredging is to use a hydraulic dredge rather than the mechanical dredge method used for the Lake Source Project. Hydraulic dredging is a vacuum process that mixes water with the material to create a slurry mix that has the ability to be pumped. There are cost advantages to this method and it reduces the immediate trucking of material. The primary disadvantage is that it requires an extended period of time and a large site for the dewatering process.

Lake Source Cooling Precedent Project

Also in 1999, Cornell University dredged 3,000 CY of material from the southeast of Cayuga Lake as part of the Lake Source Cooling project. This project used a clamshell dredge to mechanically remove material. This allowed the dewatering to occur within hours on shore in containers. The

material was then truck transported to a site in Dryden.

Dredge Material

The class was able to use the Dryden site to test the different properties of the dredge material using the existing material as a control subject. Samples collected from the Six Mile Creek Reservoir and the inlet itself were also tested. Testing included analyzing plant species at the two Dryden plots as well as numerous testing on all samples to analyze physical, biological and chemical properties of materials from different dredge sites. These experiments sought to determine the ability of these different dredge materials as plant growth mediums.

Methane

The dredging project will be removing anaerobic sediments from the inlet. These sediments contain methane and the disturbance has the potential to release this greenhouse gas into the atmosphere. Using sediment samples collected from various locations in the inlet the class conducted experiments to determine the level of potential methane release and looked at the feasibility of potential mitigation methods.

Hydrilla verticillata

The recent discovery of the aquatic invasive *Hydrilla verticillata* proposes additional challenges to the Ithaca Inlet. The highly invasive species has to potential to create major disruption to the ecology of the inlet and Cayuga Lake and to have a negative impact on the recreational industry in the area. *Hydrilla* spreads easily and has the ability to regenerate from small plant fragments. The potential for dredging to spread *Hydrilla* from its current locations is a cause for concern. Following the August discovery of *hydrilla* in multiple locations in the Inlet, the City put together a task force to deal with this issue. The locations were mapped and beginning in September the inlet was closed to boat traffic. In October the aquatic herbicide Aquathol K was applied in the affected areas. Over the next several months the City will continue monitor the known stands of *Hydrilla*.

This report will summarize the studies into the reproduction, survivability and the possible management of *Hydrilla* within the inlet.

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