February 15, 2008

Final Outline

Comprehensive Plan to Eradicate Variable Leaf Watermilfoil (Myriophyllum heterophyllum) and Carolina Fanwort (Cabomba caroliniana) from Upper Lake and Lower Lake in the Carmans River Watershed

I. **Executive Summary**

II. **Objectives**
- A. Evaluate all options to eradicate, and/or manage the aquatic invasive present in Upper and Lower Lake.
- B Decide, preferably through consensus, the best action to implement for the overall health of the lakes and river.
- C. Identify best management practices for the long-term management.

III. **Geography of the Carmans River Watershed and River segment**
(Note: Characterized in Suffolk County's Carmans River Assessment)

IV. **Pertinent legal designations and management plans.**
a. NYS-designated Wild, Scenic and Recreational River
b. NYS-designated Significant Coastal Fish and Wildlife Habitat
c. South Shore Estuary Reserve CMP actions
d. Interstate Fishery Management Plan for American Eel, Addendum II.
e. Interstate Fishery Management Plan for Shad/River Herring
f. New York State Comprehensive Wildlife Conservation Strategy
g. Environmental Assessment of Carmans River (Cashin Associates on behalf of Suffolk County, 2002)
h. South Shore Estuary Reserve Watershed Plan – Draft (Nelson Pope and Vorhees)
i. USFWS Wertheim Management Plan
j. Other

V. **Community and Public Involvement in Upper and Lower Lakes and in the Carmans River.**
a. Should include a discussion of the community organizations, non government organizations and government agencies involved in the protection/restoration of the Carmans River.
b. Should include environmental, social, recreational, economic and community values related to use of the Upper and Lower Lakes as well as the Carmans River.

VI. **Characterization of aquatic invasive plant problem** (in terms of recreation, ecology, life history, etc.)

a. Variable Leaf Watermilfoil (*Myriophyllum heterophyllum*)
b. Carolina fanwort (*Cabomba caroliniana*)
c. Common reed (*Phragmites australis*)
d. A discussion of the ecology and life history of Cabomba caroliniana and Myriophyllum heterophyllum to asses the causation of why these species are dominating the lakes to help determine what best management strategies are needed to help prevent re-infestations.

VII. **Discussion of impacts invasive aquatic plants have on the recreational, economic and social uses of the lakes and river system.** Discussion should include ecological impacts including direct impacts to native plants, wildlife and water quality.

VIII. **Priority species dependent on Carmans River**
a. American eel
b. Brook trout
c. Alewife
d. Other (e.g., insects, waterfowl, amphibians, other fish)

IX. **Habitat assessment of river reach**
a. Water Quality (dissolved oxygen, temperature, contaminants, pH, turbidity)
(Note: USGS and Suffolk County have water quality data)
b. Sediment
i. Quality (*e.g.*, grain size, nutrient characteristics, contaminants)
ii. Depth distribution survey
iii. Bathymetry survey
(Note: Town of Brookhaven to supply data for i., ii., and iii.)
iv. Analysis of presence and location of the historic river channel and contours of river bed, inc. historic maps and/or pictures
c. Aquatic plants
i. Historic and current composition
(Note: Possible contact could be Torrey Botanical Society, among others)
ii. Distribution
(Note: Town of Brookhaven documented aquatic invasive distribution in 2007 growing season)
d. Fish Species
i. Historic and current composition looking at pre and post dam composition as dam removal Pre dam fish composition could be estimated using NYSDEC Fisheries sampling data from riverine sections of the Carmans and historical data from the Carmans and other similar Long Island streams.
ii. Distribution
e. Hardened Structures
i. Dams
1. Type

2. History and current use
3. Ownership
4. Structural integrity
(Note: Funding allocated in Bond Act awards to assess structural integrity. Also, Robert and Audrey Kessler provided engineer report from November 2007 for Upper Yaphank Lake Dam)

ii. Bulkheads and other armoring
1. distribution
2. ownership

f. Underwater Land Ownership

X. **Habitat assessment of riparian corridor** (*i.e.*, 100 ft from either side of river from Lower Lake westward)

a. Buffers
i. Current widths along river segment
ii. Vegetative composition (natural vs. landscape vegetation vs. invasives)
iii. Quality

b. Development
i. Density
ii. Type

c. Land Ownership

XI. **Management Alternatives**

Regardless of which management option is ultimately used pre and post vegetative sampling within the ponds and in the river immediately down stream of the ponds should be required. This is needed to measure the success of the treatments and determine what if any impacts there were to native plant species in the ponds and river. The aquatic macrophyte sampling should measure relative abundance and densities for all plants in the ponds and in areas immediately downstream of the treatment areas.

a. Dam removal - Seek references previous dam removal projects which had similar sized impoundments (surface water acreage and/or gallons), topography, and geology (soils).

i. Methodology
1. Options
2. Cost
a. Up front costs
b. Maintenance costs
3. Permitting Issues
4. Other

ii. Impact on aquatic invasive plants
1. Degree of control success expected
2. Anticipated project longevity

iii. Other potential benefits
1. Wildlife (animals and plants)

2. Non-market resources (address issues such as kayaking, trout fishing, increased filtering capacity for adjacent septic systems, increased public access)
3. Effect of river restoration on property values

iv. Potential negative impacts

v. Hydrological analysis of changes in upstream and downstream river characteristics (narrative and maps)

vi. Restoration of river channel and adjacent terrestrial corridor

1. Suitability
2. Options

vii. Issues pertinent to uplands that were previously underwater lands

1. Ownership changes, if any
2. Anticipated management approach

viii. Fate of sediments trapped behind each dam. This section should include an estimate of the amount of sediments trapped behind each dam, how these sediments will be removed and/or stabilized, and how the rest of the former lake bottoms will be stabilized.

ix. Changes in the downstream floodplain (e.g., volume of water, flow strength, potential temporary widening of the river, affected developed areas)

x.. Timeline associated with control (days, weeks, months.)

b. Dam modification - Seek references previous dam removal projects which had similar sized impoundments (surface water acreage and/or gallons), topography, and geology (soils).

i. Methodology

1. Options
2. Cost
    a. Up front costs
    b. Maintenance costs
3. Permitting Issues
4. Other

ii. Impact on aquatic invasive plants

1. Degree of control success expected
2. Anticipated project longevity

iii. Other potential benefits

1. Wildlife (animals and plants)
2. Non-market resources (address issues such as kayaking, trout fishing, increased filtering capacity for adjacent septic systems, increased public access)
3. Effect of river restoration on property values

iv. Potential negative impacts

v. Hydrological analysis of changes in upstream and downstream river characteristics (narrative and maps)

vi. Restoration of river channel and adjacent terrestrial corridor
    1. Suitability
    2. Options
vii. Issues pertinent to uplands that were previously underwater lands
    1. Ownership changes, if any
    2. Anticipated management approach
viii. Fate of sediments trapped behind each dam- This section should include an estimate of the amount of sediments trapped behind each dam, how these sediments will be removed and/or stabilized, and how the rest of the former lake bottoms will be stabilized.
ix. Changes in the downstream floodplain (e.g., volume of water, flow strength, potential temporary widening of the river, affected developed areas)
x. Timeline associated with control

c. Dredging
i. Methodology (*e.g.*, clam shell, hydraulic, drag line)
    1. Amount of sediment that would need to be removed, with figures
    2. Evaluation and testing of dredge sediments
    3. Disposal options
    4. Cost
        a. Up front costs
        b. Maintenance costs
    5. Other
ii. Impact on aquatic invasive plants
    1. Degree of control success expected
    2. Anticipated project longevity
iii. Other potential benefits
    1. Wildlife (animals and plants)
    2. Non-market resources (address issues such as kayaking, trout fishing, increased filtering capacity for adjacent septic systems, increased public access)
iv. Potential negative impacts
    1. Affects on wildlife (*e.g.*, turtles)
    2. Water quality (*i.e.*, turbidity)
    3. Other (*e.g.*, sedimentation downstream)
v. Timeline associated with control
vi. Assessment of staging and dewatering needs for dredge materials. Also machinery access routes should be looked at and whether any impact to shoreline vegetation will result. If removal of shoreline vegetation is necessary then a replanting plan will be required.

d. Herbicides -
i. Possible options
    1. Fluridone (Sonar is trade name)

2. 2,4-D
3. Triclopyr
4. Others including but not limited to endothal and diquat

ii. Methodology
1. Cost
a. Up front costs
b. Maintenance costs
2. Flow through considerations
3. Groundwater considerations
4. Other

iii. Impact on aquatic invasive plants
1. Degree of control success expected
2. Anticipated project longevity

iv. Other potential benefits
1. Wildlife (animals and plants)
2. Non-market resources (address issues such as kayaking, trout fishing, increased filtering capacity for adjacent septic systems, increased public access)

v. Potential negative impacts
1. Affects on wildlife (e.g., fish, turtles)
2. Native vegetation
3. Other

vi. Timeline associated with control

vii.Groundwater considerations for each herbicide

viii.Long Term Management Plan - The NYSDEC is unlikely to approve any herbicide treatments without a long term management plan in place which include thresholds for treatment and alternative strategies for addressing small re-infestations.

ix. Other

e. Mechanical controls including but not limited to using a harvester, rotovators and hydrorakes.

i. Methodology

ii. Cost
1. Up front costs
2. Maintenance costs

iii. Limitations

iv. Benefits

v. Potential negative impacts

vi. Timeline associated with control

vii. Information on staging and storage of plant materials.

viii. Machinery access routes

ix. Assessment of potential needs for removal of shoreline vegetation, if necessary then a replanting plan will be required.

x. Screening needs for the outfall to prevent plant fragments from leaving the ponds and causing possible downstream infestations.

xii..Other

f. Benthic barriers
- i. Methodology
- ii. Cost
  1. Up front costs
  2. Maintenance costs
- iii. Limitations
- iv. Benefits
- v. Potential negative impacts
- vi. Timeline associated with control
- vii. Machinery access and staging needs assessment.
- viii. Pre and post monitoring of benthic invertebrates.
- ix. Examples where benthic barriers have been used successfully at this scale should be provided.
- x. .Other

g. Handpulling
- i. Methodology
- ii. Cost
  1. Up front costs
  2. Maintenance costs
- iii. Limitations
- iv. Benefits
- v. Potential negative impacts
- vi. Timeline associated with control
- vii. Assessment of the staging, storage and disposal of plant material.
- viii. Screening at the outfall to prevent plant fragments from leaving the ponds and causing possible downstream infestations.
- ix. Other

h. Drawdown, both temporary and periodic (Note: one method may be to open the sluiceway)
- i. Methodology
- ii. Cost
  1. Up front costs
  2. Maintenance costs
- iii. Limitations
- iv. Benefits
- v. Potential negative impacts
- vi. Timeline associated with control
- vii. Data on the length of time and weather conditions needed for successful treatment.
- viii. Assessment of impacts of drawdowns, at the proposed time of year, on fish and herp populations.
- vii.Other

i. Non-native grass carp (Biocontrol)
(Note: Triploid grass carp were released in Canaan Lake in mid to late '90's – still there now)

i. Methodology
ii. Cost
iii. Limitations
iv. Benefits
v. Potential negative impacts
vi. Timeline associated with control
vii Studies should be provided showing results of this type treatment on the intended target species.
viii.Other

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j. Multiple methods (such as a combination of mechanical and hand harvesting with benthic barriers)

i. Methodology
ii. Cost
iii. Limitations
iv. Benefits
v. Timeline associated with control
vi. Other

k. No Action Alternative
l. Other

XII. **Identification of data gaps**

XIII. **Analysis of control options**.

i. This needs to include a discussion of community acceptance and regulatory acceptance of each control option.
ii. Discussion of post treatment monitoring including native plant species, fisheries, water quality, ect.

XIV. **Identification of future preventative measures**.

Including educational materials, signage at lower lake launch and likely roadside access points.
Indentification of post treatment maintenance and surveillance

XV. **Conclusions and recommendations**