Dickey Brook:
Rehabilitation Master Plan
Final Report

February 2011

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Dickey Brook: Rehabilitation Master Plan

Presentation Overview

- Study Process
- Report Summary
- Questions & Comments


Rusted Culvert under Willow Street

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Process to Date

- Site Visit and Inventory
- Stakeholder Interviews
- Visioning Workshop
- Review of Preliminary Plan
- Draft Report presentation to Council

1.0 Origins

The Dickey Brook Rehabilitation Plan is the first phase of a plan to restore Amherst's most important urban stream corridor. The watershed for Dickey Brook encompasses over 33% of the Town's boundary. The RFP was issued in the summer of 2010 in order to develop an action strategy and implementation plan for achieving the revitalization of this 'forgotten asset' to an 'environmental jewel'.

Since the Brook has no flow gauges, monitors or water quality testing data, it is impossible to quantify rehabilitation metrics for the catchment and monitor long-term success in this first phase of the project. As a result, this strategy focuses on open space and qualitative measures for rehabilitation using accepted urban stream rehabilitation best practices. A key objective of the Plan will be the development of a realistic action strategy and implementation plan for the next 1 to 5 years.

Unlike many urban streams, Dickey Brook has been fortunate in that it has not been put into a pipe and forgotten. Many municipalities are developing plans for costly 'stream daylighting' programs to bring back the ecological integrity of these lost ecosystems and community resources. The potential for recapturing a significant community resource at Dickey Brook is a realistic objective of the Municipality. This short report outlines a preliminary strategy for achieving this lofty goal.

1.2 Study Objectives

The Request for proposals outlined a series of objectives for this study including:

1. **Identify opportunities, including specific designs of each opportunities, to make the Brook and surrounding Town property more aesthetically pleasing.**

- Identify and design location specific opportunities to improve the aesthetic appearance of the Brook and immediate surrounding property (within 3 metres of top of bank).

2. **Identify opportunities, including specific designs of each opportunity, for integrating the Brook into the adjacent trail / park system, particularly from Albion Street to Church Street and Donald Street to Willow Street.**

- Identify and design site specific opportunities to bring the Brook into a place of prominence in relation to the surrounding public property;
- Identify and design site specific opportunities to integrate the Brook into the functionality of the surrounding public property;
- Identify, design and articulate opportunities for environmental interpretation and learning along the Brook;

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Report Outline

- Origins
- Dickey Brook Master Plan
- Implementation

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Study Objectives

- Identify opportunities to make the Brook more aesthetically pleasing
- Identify opportunities for integrating the Brook into the Town's trails / open space system
- Identify options to improve the stormwater function of the Brook
- Identify options to improve the environmental quality of the Brook

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Inventory & Analysis

- Catchment & Stream Characteristics
- Rainfall
- Slope
- Stream Discharge
- Soils

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Inventory and Analysis

- Stormwater & Culverts
- Imperviousness
- Ecology
- Open Space

LEGEND

Dickey Brook

Base Map

2010/11/08

LEGEND

	Tormentine	26,725	Brown or yellowish red sandy loam over yellowish red or reddish brown sandy loam	Red sandy loam compact till	Well drained	Hay, pasture	Favourable
	Debert	143,633	Reddish Brown, Brown or dark brown sandy loam to loam over slowly permeable yellowish red to reddish brown sandy loam	Reddish brown to dark red sandy loam, weakly calcareous compact till	Imperfect	Hay, grain, pasture, forest	Drainage, structure, topography, stoniness
	Masstown	62,721	Mottled brown sandy loam to loam over slowly permeable mottled reddish brown sandy loam	Reddish brown to dark red sandy loam, weakly calcareous compact till	Poor to very poor	Forest, pasture, hay	Drainage improve

Dickey Brook

Soils Map

2010/11/08

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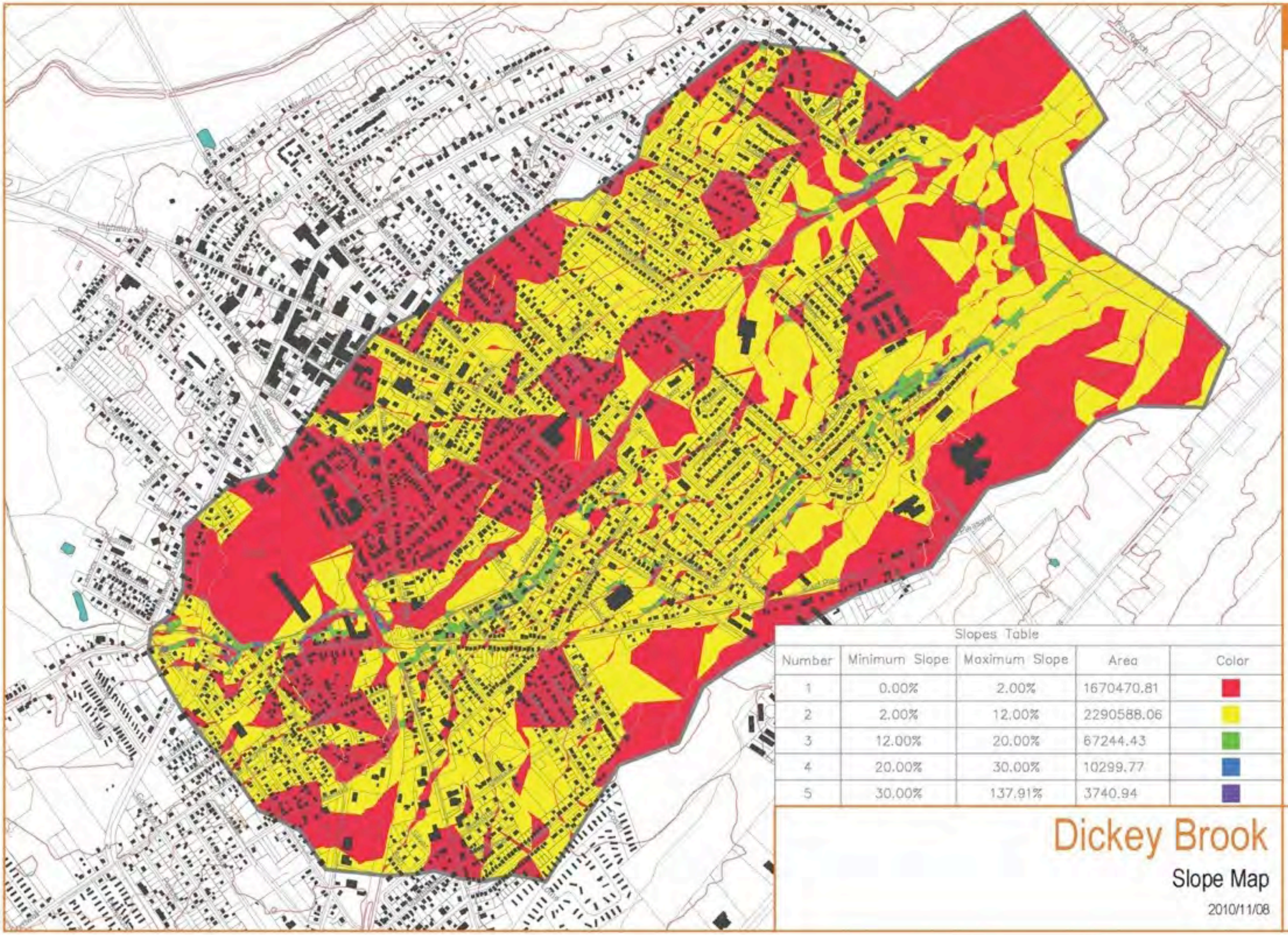

LEGEND

Slopes Table

Number	Minimum Slope	Maximum Slope	Area	Color
1	0.00%	2.00%	1670470.81	
2	2.00%	12.00%	2290588.06	
3	12.00%	20.00%	67244.43	
4	20.00%	30.00%	10299.77	
5	30.00%	137.91%	3740.94	

Dickey Brook

Slope Map

2010/11/08

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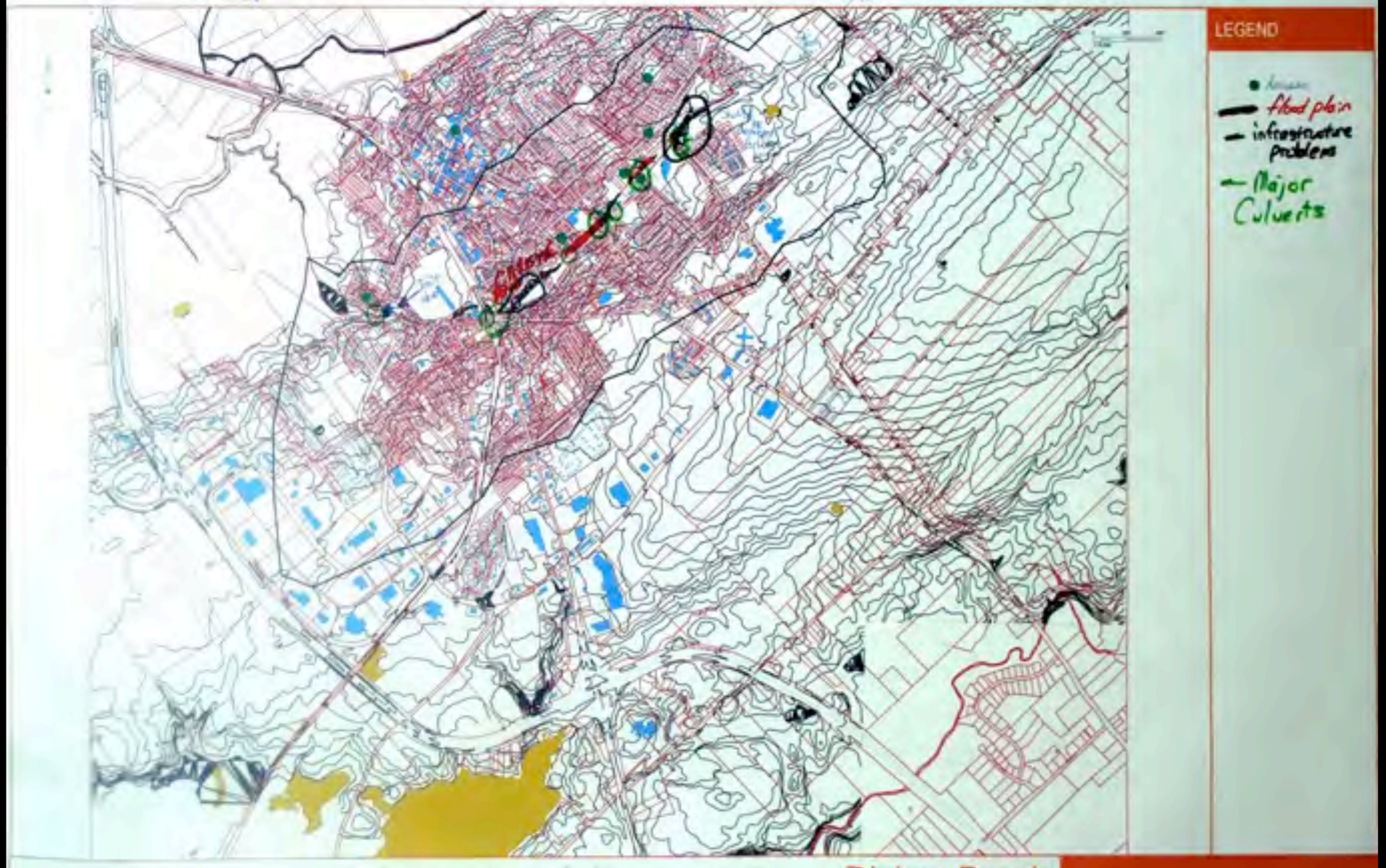
Public Participation

- Workshop held September 30th, 2010
- Approximately 40 attendees
- Key themes:
  - flooding
  - security of land
  - pollution & garbage
  - missing amenities


LEGEND
flood plain
infrastructure problems
Major Culverts
Dickey Brook
Rehabilitation Plan
Sept 27, 2010
Enter the Project Phase

Group 1
3 land owners properties were part of the group (end of Franklin st. off spring, corner of Donald St and Snow, Church and Beacon St.)
Participants have witnessed flooding @ Donald St and Spring and Church St by Dickey Brook.
Current Issues: Overflowing of brook is a problem in certain areas, fields flooded, dangerous for walkers in certain areas, Sump pumps just keep flooding under control so need for power, $37k claim for insurance.
Current uses: MacDonalds Rotary Park says closed at 9, loitering a problem. Apple trees are a problem for vandalism. Fencing along the brook for safety
New Uses: extend walking trail, park for seniors, outdoor rink (Cristy Pond), Cross country skiing
Priorities: Fix flooding, Fix Musk-rat problems, Focus on walking trail (extend, maintenance and enhance), better maintenance of parks.

Group 2:
Missing uses: connect the walking trail (Centennial Trail idea needs to be extended), security of kids coming onto private property (kid safety and property owner security), Backs onto 2 schools so opportunities for living classroom.
Muskrats and pheasants a good and bad thing.
Fishing is missing. memories of fishing in the brook. Lower Sackville is a good model for bringing back the river
Priorities:
- Flooding issues
- Clean up the brook (restoration and river enhancement, garbage removal, planting trees and native vegetation, dredging is NOT the solution).
- Viable pastural trail that is walker friendly, not inline skating, biking. Sackville nature reserve and wetlands is another model
- Something to attract people to our area
- Stewardship - access are to brook but not open to private property, respect owners, once developed it needs policing and community stewardship and education.
- annual cleanup
- Connect to Marsh trail
- central duck pond - ducks 'cleaned up' the river
- Bring the swans back - skating is a missing use.
- Lighting is not required. Make natural as much as possible.
- Make the park beautiful, encourage lots of use and the river will police itself

Group 3:
Major concerns with flooding. Many of the culverts (Willow St especially and at end of Davison St) are causing serious flooding.
Keep the brook clean. Quarter annual cleanup. involve the schools and kids. Dickey St apartments are a source of some of the garbage.
Thoughts of dredging from Mill St down. Shallow brook could be contributing to the drainage problem.
Is the Enheat site a write-off?
Trout underneath the bridge at Hickman St. - goal of getting trout back
A lot of green slime in the brook. Better aeration likely a temperature problem.
Walking trails should be better connected. Continue trail development.
Church St down to the Ball field is a good model for the rest of the brook
New homes being built...is there BMP's that could improve the brook downstream??

Group 4:
Concern with flooding on Queen St and must be addressed.
Alot of garbage and debris. Culverst cause backup. Need to improve flow.
Great opportunity in making more presentable
More fencing and lighting.
MacDonald Park and trail between Church and Albion creates a lot of teen agers after dark. They throw a lot of things in the river (litter baskets in the river)
Extend the trail but also realize there are land use rights.
The garbage cans are being thrown n the brook.
Provincial Riparian Rights
Look for fund raiser and event opportunities.

2.0 Dickey Brook Master Plan

Notwithstanding the urban pressures placed on aquatic systems, degraded streams and rivers possess an inherent propensity to restore themselves to some level of equilibrated biotic health. The time it takes to reach this equilibrium and the level of 'health' that is ultimately attained is dependent on the scope and nature of the process or activity causing degradation. River restoration planning attempts to work with the natural tendency of the system to provide the necessary elements and conditions for faster recuperation.

Plan Intent

This report presents a broad-level, overall approach to the rehabilitation of Dickey Brook within the Town of Amherst. The intent of this master plan is to create a reflective, aesthetically significant, and ecologically functional stream corridor that meets the open spaces needs of the Community, while preserving valuable open space in the urban fabric.

The concept plan depicts an organic, ecologically sound, and rationally designed open space regime that includes the following characteristics:

- a major public multi-use trail system bisecting the Town;
- Enhanced public open space facilities;
- Improved road / Brook interfaces, with appropriate engineering capacity and enhanced asethetic qualities;
- Stream restoration, including reconfigured meander zones and improved fish habitat;
- Expanded Brook access and bank stabilization;
- Improved stormwater management practices across the entire catchment area.

In the case of Dickey Brook there are several issues that a restoration master plan must address. These include:

1. stream morphology and ecology,
2. the architecture of stream buffers
3. park and open space,
4. stormwater management,
5. maintenance and administration
6. watershed planning and policy

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Plan Intent

- Major public trail system
- Enhanced open space
- Improved Brook / Road interfaces
- Stream Restoration
- Expanded Brook Access
- Improved Stormwater Management Practices

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Urban Stream Principles

- Ecology vs. Recreation
- Naturalization Aesthetics
- Celebrate Dickey Brook
- Intercept Stormwater
- Fish Restoration

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Rehabilitation Components

- Headwater Conservation Subdivision
- Riparian Corridors & Stream Naturalization
- Stream Morphology Design
- In-Stream Design

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Rehabilitation Components

- Bridges & Box Culverts
- Stormwater Management Design
- Christie Pond Restoration
- Outdoor Learning Centre
- Centennial Trail
- Maintenance Practices

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Dickey Brook

Rehabilitation Plan

Sept 27, 2010

Functional Plan

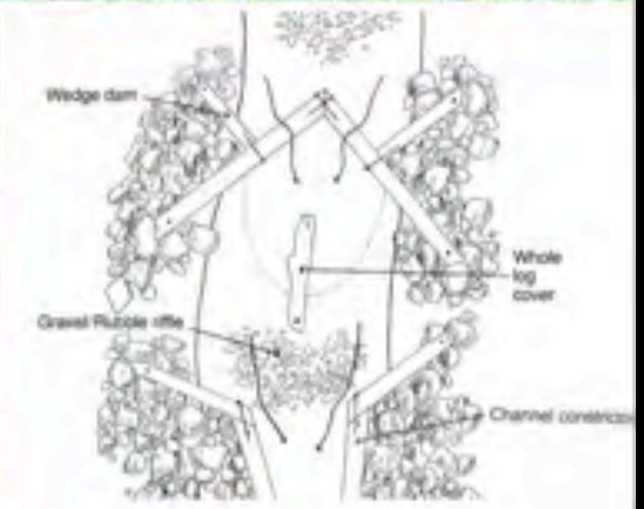

Conservation
Subdivision
Conservation
Subdivision
Conservation
Subdivision
Conservation
Subdivision
Conservation
Subdivision
Educational
Woods
Google

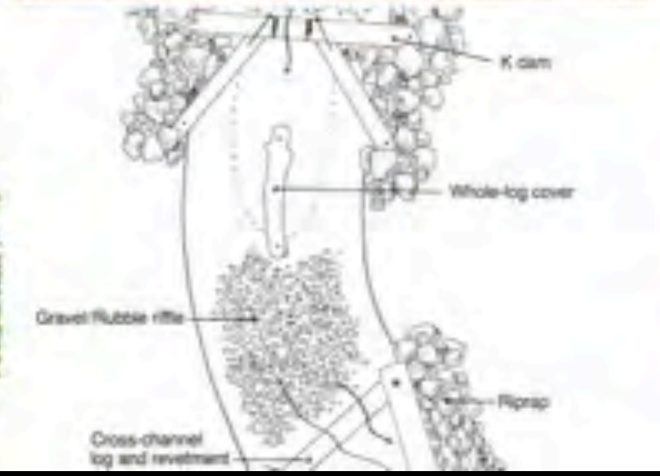
Restoration Planting Palette

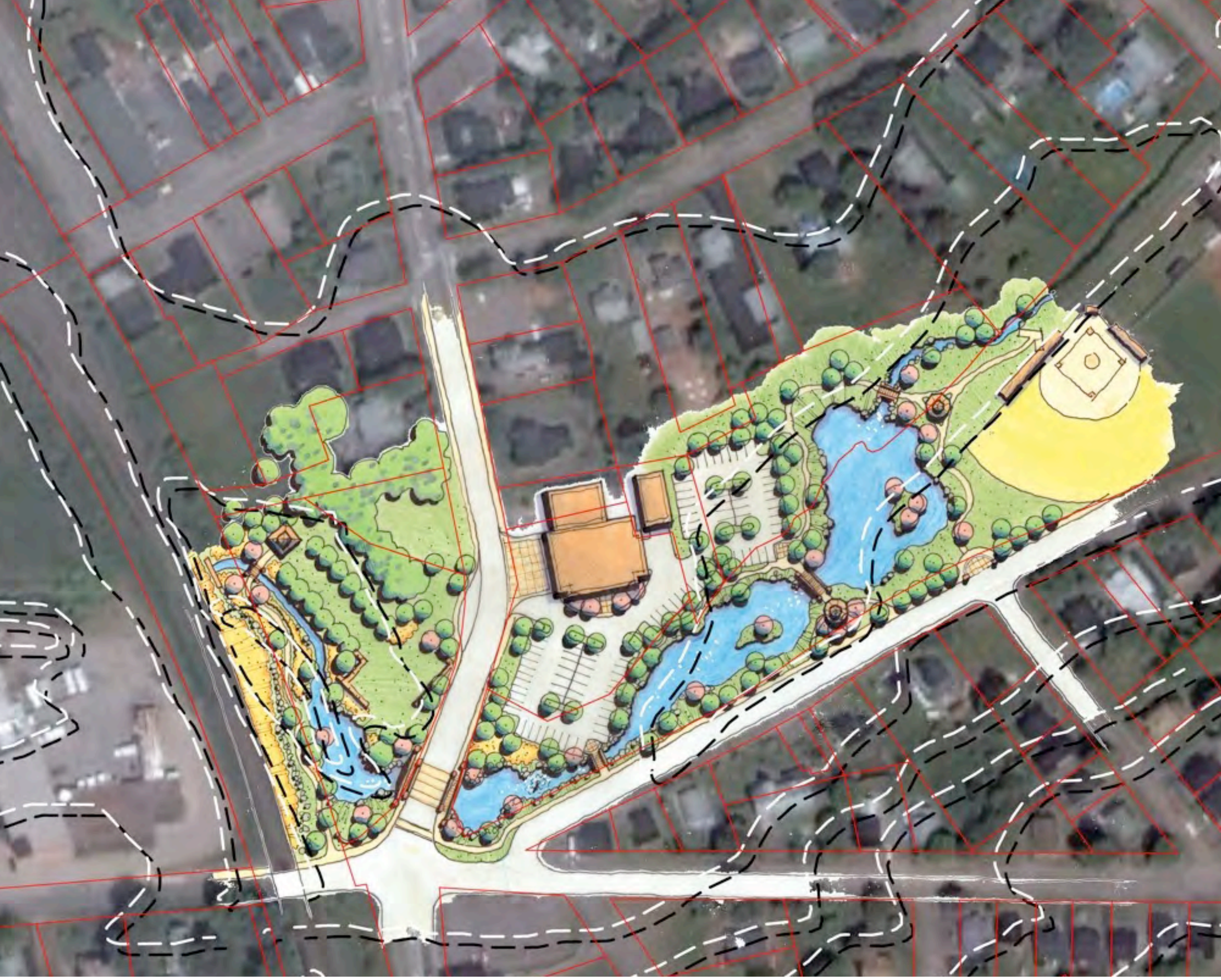
Submergent Vegetation - Deep (Below 250mm depth)	
Botanical Name	Common Name
Elodea canadensis	Canada Waterweed
Ceratophylum demer	Coontail
Pontednderia cordata	Pickerelweed
Potamogeton pectin	Sago Pondweed
Scirpus subterminalis	Mermaid's Hair
Vallisneria americana	Tapegrass
Submergent Vegetation - Shallow (Waterline to 250mm depth)	
Botanical Name	Common Name
Alismima plantago	Water Plantain
Juncus balticus	Baltic Rush
Juncus torreyi	Torrey's Rush
Sagitaria latifolia	Arrowhead
Scirpus actus	Hardstem Bulrush
Scirpus pungens	Threesquare Bulrush
Transitional Zone (Waterline and above, subject to periodic flooding)	
Botanical Name	Common Name
Catamagrostis canadensis	Canada Bluejoint Grass
Carex bebbii	Bebb's Sedge
Carex stricta	Tussock Sedge
Glyceria striata	Fowl Manna Grass
Impatiens capensis	Jewel Weed
Iris versicolor	Blue Flag Iris
Scirpus cyperinus	Woolgrass Bulrush
Shrubs	
Botanical Name	Common Name
Cornus stolonifera	Red Osier Dogwood
Cornus racemosa	Gray Dogwood
Sambucus canadensis	American Elder
Salix candida	Sage Leaved Willow
Salix discolor	Pussy Willow
Rhus typhina	Staghorn Sumac
Viburnum trilobum	Highbush Cranberry
Coniferous Trees	
Botanical Name	Common Name
Picea glauca	White Spruce
Pinus strobus	Eastern White Pine
Tsuga canadensis	Canadian Hemlock
Deciduous Trees	
Botanical Name	Common Name
Acer rubrum	Red Maple
Fagus grandifolia	American Beech
Juglans nigra	Black Walnut
Prunus virginiana	Choke Cherry
Salix nigra	Black Willow
Tilia americana	Basswood


Bank cover logs
Gravel-Rubble riffle
Current deflector
(stone only)
Mid-channel boulder retards


Tree drop deflector
Log piling retards
Bank cover
and current deflector
Brush mats
Boulder retards

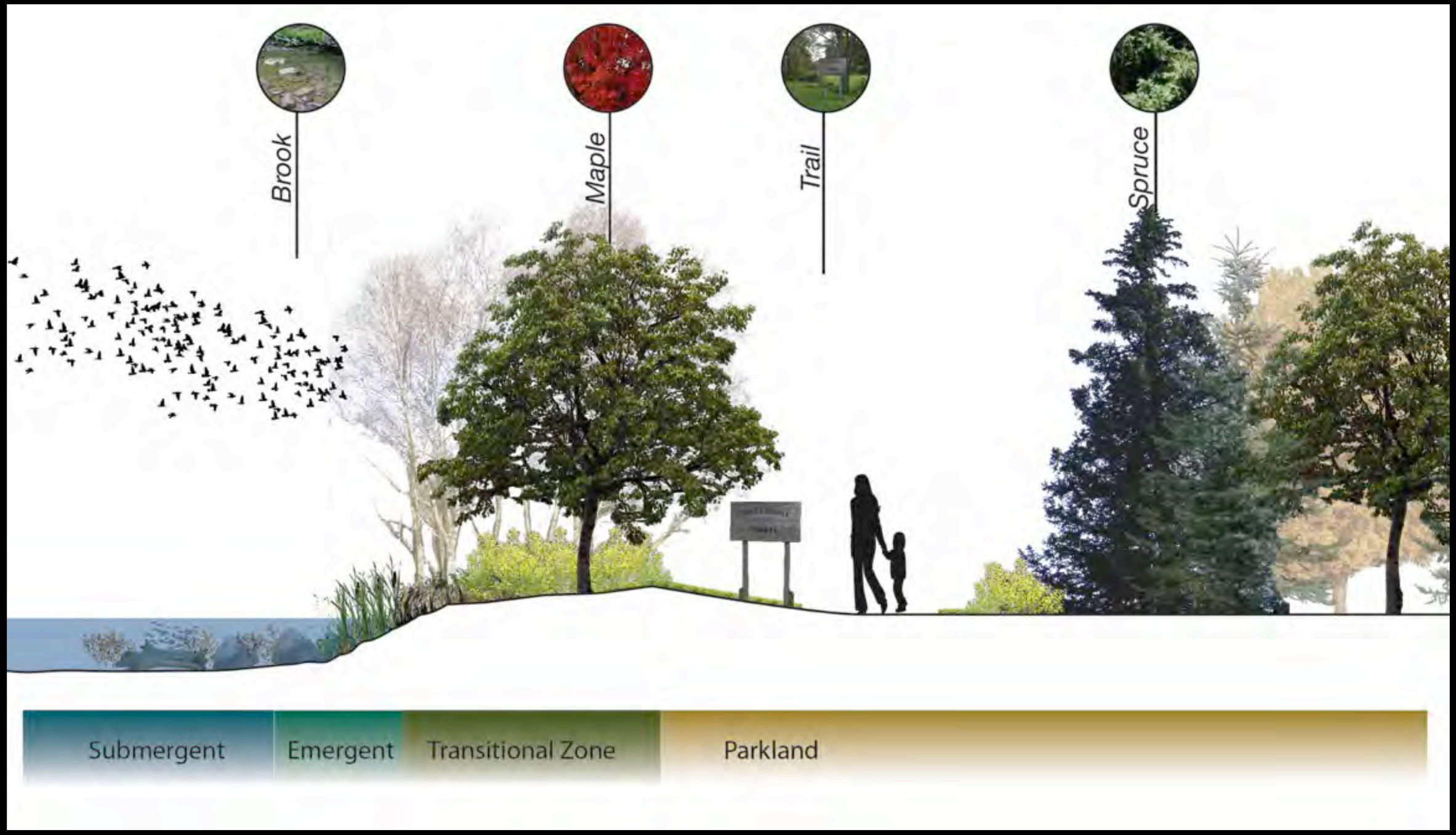

Wedge dam
Whole
log
cover
Gravel-Rubble riffle

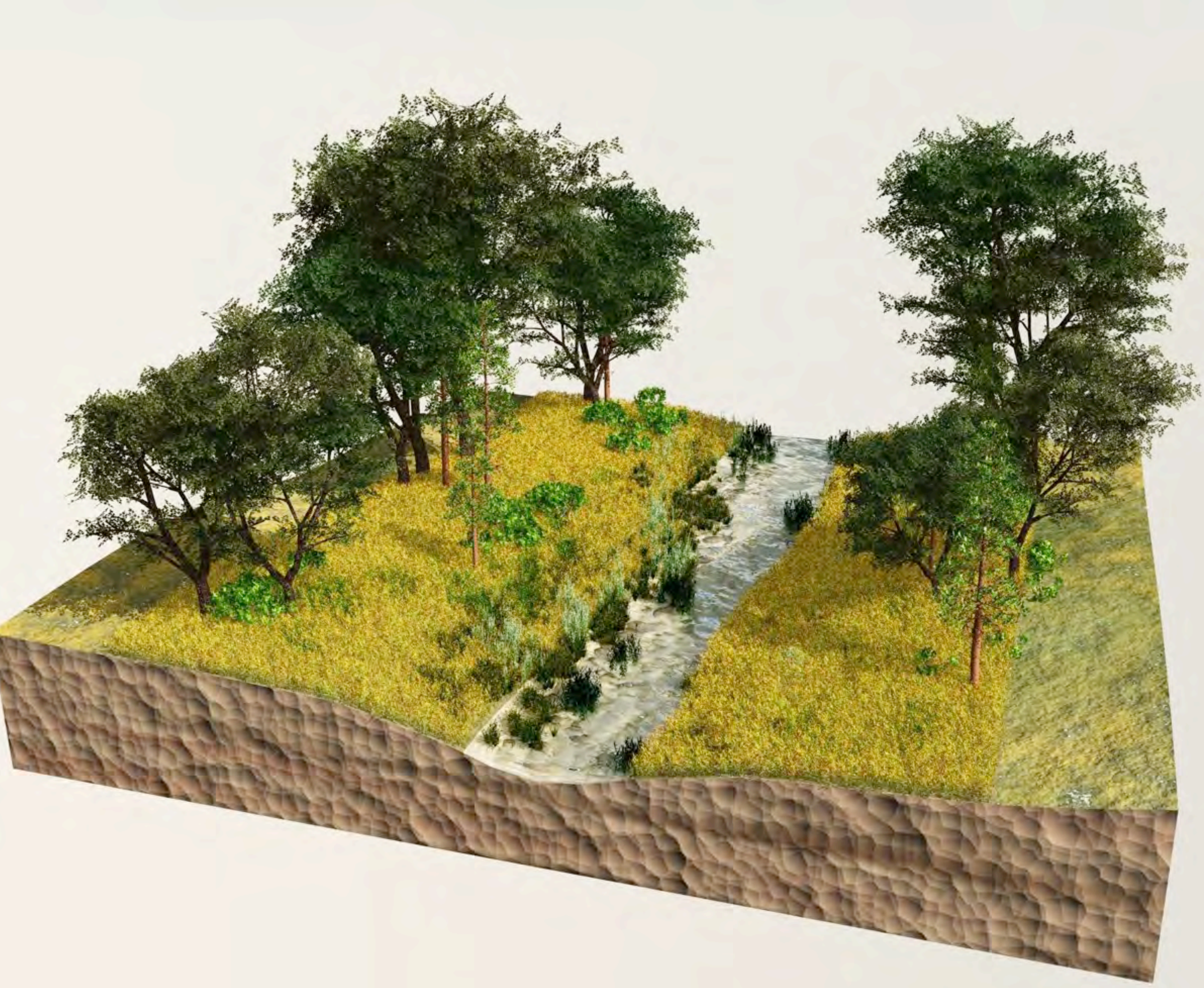

K dam
Whole-log cover
Gravel-Rubble riffle
Riprap
Cross-channel
log and revetment




Christie's Pond, Amherst, N. S.


DESIGN
Chesapeake Bay
Watershed


Brook
Maple
Trail
Spruce
Submergent
Emergent
Transitional Zone
Parkland



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Maintenance Practices

- Public Lands
  - > No mow
  - > Install Signage
  - > Urban Forestry

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Maintenance Practices

- Private Lands
  - > Pollution Prevention
  - > Promote Pervious Surfacing
  - > Tree Planting & Maintenance
  - > Planting Palette

3.0 Implementation

The Dickey Brook Rehabilitation Master Plan must be an evolving document, just as the ecology of the stream is in constant flux. Implementation will occur through a suggested two phase process that will see the realization of plan projects based on a prioritization hierarchy defined from this process, based on public and stakeholder input.

Plan Prioritization

This report describes both a long term ten year vision, and an achievable short term 5 year vision for the rehabilitation of Dickey Brook. The plans presented are consistent with the objectives refined from the public consultation process and by previous study.

Initiatives with a high profile and ease of implementation should be given high priority, especially where cost is not prohibitive. Larger and more complicated engineering projects will require further study to refine all the necessary details for implementation.

Costing and Phasing

The implementation strategy illustrates how the recommended projects may be completed in two phases. The following table (Table 3.1) summarizes the total projected costs of implementation, and a breakdown of how these costs could be distributed over the two phases.

The unit costs in the estimates include a contingency and applicable taxes. Also included in the proposed budget estimate is the design or consulting fee (10%) which is an important consideration when looking at comprehensive budget forecasting. However, it is important to note that this fee may vary, depending on the nature and scale of the project, and the exact costs will depend on the outcomes of the detailed design process, and the prevailing costs of construction at the time of realization. Most projects will require some form of further study to more forward in a realistic, cost effective manner.

The entire Dickey Brook Rehabilitation Project is estimated to cost approximately $ 2.32 million dollars (2010 dollars), including taxes and contingency. Phase 1, the first 5 years is $827,406, phase 2 (5-10 years) is $295,925, and phase 3 (10-20 years) is $1.038 million).

Funding Sources

Private Environmental Funds

Many private corporations have charitable organizations that support environmental projects. TD Canada's Friends of the Environment, Shell Canada Environmental Fund, or the RBC Blue Water Project are all potential funding sources that may be interested in supporting the Dickey Brook Restoration. These funds are typically accessed on a cyclic funding schedule, meaning that regular deadlines for applications exist. Funding applications should be specific to projects or project elements, and focus on aspects of the overall rehabilitation plan that align with the overarching goals of the corporate program.

Trout Unlimited

Trout Unlimited Canada (TUC) is a non-for-profit organization that promotes and supports the conservation of fish habitat in Canada. They provide technical guidance and program information on the restoration and conservation of streams, and the education of the public. The Nova Scotia chapter works with a local group, the Cumberland County River Enhancement Association on the improvement of local watercourses, such as the River Phillip and its tributaries. The TUC chapter would be a great resource for funding and restoration advice.

Permitting Process

The Department of Fisheries and Oceans (DFO) is responsible for conserving and protecting all fish habitat. The "Policy for the

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Implementation

- Prioritization
- Costing and Phasing
- Funding Sources
- Permitting

Table 3.1 Estimate of Probable Costs

Typical Brook Bridge Crossing (each)	qnty	units	unit cost	cost	Phase 1 (Year 1-5)	Phase 2 (Year 5-10)	Phase 3 (Year 10-20)
New concrete box culvert (3mx2m)	15	m	$ 2,200.00	$ 33,000.00	$ 33,000.00		
Remove Existing Culverts and Stream protection measures	1	each	$ 6,000.00	$ 6,000.00	$ 6,000.00		
1.5m wide concrete sidewalk	40	m2	$ 120.00	$ 4,800.00	$ 4,800.00		
Look-off and bridge railing	40	m	$ 300.00	$ 12,000.00	$ 12,000.00		
Interpretive Signage	2	each	$ 1,200.00	$ 2,400.00	$ 2,400.00		
6.6m wide heavy duty asphalt	66	m2	$ 90.00	$ 5,940.00	$ 5,940.00		
Subtotal				$ 64,140.00	$ 64,140.00	$ 0.00	$ 0.00
Construction Management, Design & Inspection (19%)				$ 12,186.60	$ 12,186.60	$ 0.00	$ 0.00
Contingency (10%)				$ 6,414.00	$ 6,414.00	$ 0.00	$ 0.00
Subtotal for Each				**$ 82,740.60**	**$ 82,740.60**	**$ 0.00**	**$ 0.00**
Total (for 10 crossings)				**$ 827,406.00**	**$ 827,406.00**	**$ 0.00**	**$ 0.00**

Typical Brook Culvert Replacement (each)	qnty	units	unit cost	cost	(Year 1-5)	(Year 5-10)	(Year 10-20)
Remove Existing Culverts and Stream protection measures	1	each	$ 6,000.00	$ 6,000.00	$ 6,000.00		
New 1.5m dia Galv culvert installed	15	m	$ 1,200.00	$ 18,000.00	$ 18,000.00		
6.6m wide heavy duty asphalt	66	m2	$ 90.00	$ 5,940.00	$ 5,940.00		
Site restoration	1	lump sum	$ 5,000.00	$ 5,000.00	$ 5,000.00		
Subtotal				$ 34,940.00	$ 34,940.00	$ 0.00	$ 0.00
Construction Management, Design & Inspection (19%)				$ 6,638.60	$ 6,638.60	$ 0.00	$ 0.00
Contingency (10%)				$ 3,494.00	$ 3,494.00	$ 0.00	$ 0.00
Subtotal for Each				**$ 45,072.60**	**$ 45,072.60**	**$ 0.00**	**$ 0.00**
Total (for 3 crossings)				**$ 135,217.80**	**$ 135,217.80**	**$ 0.00**	**$ 0.00**

Typical Stream Realignment & Improvements (Donald St to Croft St)	qnty	units	unit cost	cost	(Year 1-5)	(Year 5-10)	(Year 10-20)
Removal of Gabion Walls	1000	m	$ 55.00	$ 55,000.00		$ 55,000.00	
Restoration of Meander Section	500	m	$ 120.00	$ 60,000.00		$ 60,000.00	
Revegetation of Stream Edge	1000	m	$ 30.00	$ 30,000.00		$ 30,000.00	
Subtotal				$ 145,000.00	$ 0.00	$ 145,000.00	$ 0.00
Construction Management, Design & Inspection (19%)				$ 27,550.00	$ 0.00	$ 27,550.00	$ 0.00
Contingency (10%)				$ 14,500.00	$ 0.00	$ 14,500.00	$ 0.00
Total:				**$ 187,050.00**	**$ 0.00**	**$ 187,050.00**	**$ 0.00**

Outdoor Learning Centre	qnty	units	unit cost	cost	(Year 1-5)	(Year 5-10)	(Year 10-20)
Streamside Ampitheatre	1	lump sum	$ 30,000.00	$ 30,000.00			$ 30,000.00
Stream Realignment and Naturalization	300	m	$ 120.00	$ 36,000.00			$ 36,000.00
Stormwater wetland	150	m2	$ 250.00	$ 37,500.00			$ 37,500.00
Pedestrian Bridge	3	each	$ 12,000.00	$ 36,000.00			$ 36,000.00
2.0m wide stone dust pathway	500	m	$ 45.00	$ 22,500.00			$ 22,500.00
Pedestrian Bridges	3	each	$ 14,000.00	$ 42,000.00			$ 42,000.00
Wayfinding Kiosk	1	each	$ 8,000.00	$ 8,000.00			$ 8,000.00
Naturalized landscaping (meadows, wetland plants, riparian shrubs, etc.)	24000	m2	$ 1.00	$ 24,000.00			$ 24,000.00
Tree Planting	250	each	$ 300.00	$ 75,000.00			$ 75,000.00
Subtotal				$ 311,000.00	$ 0.00	$ 0.00	$ 212,000.00
Design, Construction Management & Inspection (15%)				$ 42,150.00	$ 0.00	$ 0.00	$ 31,800.00
Contingency (10%)				$ 31,100.00	$ 0.00	$ 0.00	$ 21,200.00
Total:				**$ 384,250.00**	**$ 0.00**	**$ 0.00**	**$ 364,000.00**

River Greenway - Centennial Trail	qnty	units	unit cost	cost	(Year 1-5)	(Year 5-10)	(Year 10-20)
Trail Head	7	each	$ 2,200.00	$ 15,400.00		$ 15,400.00	
Trail Signage	7	each	$ 600.00	$ 4,200.00		$ 4,200.00	
2.0m wide stone dust pathway	1500	m	$ 45.00	$ 67,500.00		$ 67,500.00	
Subtotal				$ 87,100.00	$ 0.00	$ 87,100.00	$ 0.00
Design, Construction Management & Inspection (15%)				$ 13,065.00	$ 0.00	$ 13,065.00	$ 0.00
Contingency (10%)				$ 8,710.00	$ 0.00	$ 8,710.00	$ 0.00
Total:				**$ 108,875.00**	**$ 0.00**	**$ 108,875.00**	**$ 0.00**

Chrisie Pond & Historic Park	qnty	units	unit cost	cost	(Year 1-5)	(Year 5-10)	(Year 10-20)
Restoration of Christie Pond	3500	m2	$ 70.00	$ 245,000.00			$ 245,000.00
Pedestrian Bridge	4	each	$ 14,000.00	$ 56,000.00			$ 56,000.00
Gazebo	1	each	$ 25,000.00	$ 25,000.00			$ 25,000.00
2.0m wide stone dust pathway	460	m	$ 45.00	$ 20,700.00			$ 20,700.00
In-water Fountain	1	each	$ 24,000.00	$ 24,000.00			$ 24,000.00
Concrete Sidewalk	625	m	$ 125.00	$ 78,125.00			$ 78,125.00
Cosmetic 'Bridge Cross' for Albion Street	1	lump sum	$ 40,000.00	$ 40,000.00			$ 40,000.00
Landscaping	20000	m2	$ 1.50	$ 30,000.00			$ 30,000.00
Tree Planting	30	each	$ 700.00	$ 21,000.00			$ 21,000.00
Subtotal				$ 539,825.00	$ 0.00	$ 0.00	$ 539,825.00
Construction Management & Inspection (15%)				$ 80,973.75	$ 0.00	$ 0.00	$ 80,973.75
Contingency (10%)				$ 53,982.50	$ 0.00	$ 0.00	$ 53,982.50
Total:				**$ 674,781.25**	**$ 0.00**	**$ 0.00**	**$ 674,781.25**

Overall Project Total for Dickey Brook Improvements:				**$ 2,317,580.05**	**$ 827,406.00**	**$ 295,925.00**	**$ 1,038,781.25**

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Questions??