Community Reforestation

Growing Ecological Health in the Annapolis River Watershed

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Helping communities create a healthy environment

Aider les collectivités à créer un environnement sain

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List of Acronyms

CARP	Clean Annapolis River Project
CES	Champlain Elementary School
AWEC	Annapolis West Education Centre
CRMS	Clark Rutherford Elementary School
O 2	"Options and Opportunities" program in high schools
BHS	Bridgetown High school
MHS	Middleton High school
Meadow's A.R.C.	Meadow's Adult Residential Centre
ABCC	Annapolis Basin Conference Centre
GPS	Global positioning system
FEC	Forest Ecosystem Classification

Acknowledgements:

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- Environment Canada's Eco Action program for financial support
- The Town of Annapolis Royal for donating planting materials
- Annapolis West Education Centre Options and Opportunities classes, Middleton High School 02 class, Bridgetown High School Science classes for planting trees
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- CARP staff and volunteers who worked tirelessly to plant all the trees

Executive Summary

Community reforestation is a very effective way of improving the overall ecological health of the Annapolis River watershed and the health of our communities in the long term.

The Community Reforestation project was developed by CARP to improve the ecological health in the Annapolis River watershed by engaging volunteers in tree planting in varied landscapes to achieve ecosystem enhancement objectives such as:

- Riparian habitat restoration
- Shelterbelts and windbreaks in agricultural landscapes
- Reforestation
- Diversification of tree species
- Greening of urban landscapes within towns and villages

The 2015 field season focused on planting trees to achieve project objectives. In order to ensure planting initiatives supporting the improvement of ecological health, the following tools were used:

- Thorough site assessment which included soil tests; observation of existing vegetation, wind and harsh climate exposure and present and past uses.
- Tree selection according to the site requirements and objectives of the planting site
- Providing landowners with professional recommendations
- Engagement of stakeholders like municipalities, schools, community groups and private landowners in tree planting initiatives

Most of the sites fall under a combination of objectives and support ecosystems in multiple ways. A riparian restoration can also serve as a wind break, a reforestation and enhance the species composition. Nine of the sites were planted with caliper trees to improve the urban ecological health of school yards, towns, trails and parks. Fifteen sites were planted with tree seedlings to address ecological health issues within agricultural and rural landscapes.

Results of the 2015 Community Reforestation project were:

- 6562 trees and shrubs were planted in total, including 6120 seedlings, 51 caliper trees and 391 shrubs
- 3.3 hectares of shoreline were protected
- 50 hectares of habitat were protected in total
- 435 people participated in the project including volunteers and staff

The 2015 community reforestation project was extremely successful in engaging volunteers in ecosystem enhancement actions. It contributed to the development of stronger community partnerships. There are still many sites within the watershed that require additional restoration efforts however, and further planting efforts should target such areas.

1.0 Introduction

The Annapolis River Watershed is the third largest in Nova Scotia, covering an area of over 200,000 km^2. Much of its landscape has been impacted by human land uses such as agriculture and forestry, which have affected the ecological health of the area and have removed trees from this region. Restoring trees to the landscape will help to address landscape health issues related to various land uses, and can have many ecological benefits, such as (adapted from Canadian Urban Forest Research Group, 2013):

- **Erosion control**: Tree roots will hold the soil in place and a tree canopy will slow down the rain water, which can help to improve its overall retention and absorption.
- **Absorption of excess water and run off from farming:** A well forested riparian zone will absorb storm water before it even reaches the streams and will slow it down significantly. This allows water soluble nutrients like nitrogen to be used before they enter a watercourse.
- **Shading of watercourses:** The presence of trees will provide streamside cover for watercourses, helping to cool their water temperature; this will prevent the spread of bacteria and slow the spread of algae. It also will increase biodiversity in the stream and support the survival of different fish species like trout by improving instream habitats.
- **Providing shelter and shade in the landscape:** The shelter of a tree canopy will help moderate ground temperatures which can encourage the survival of microorganisms and minimize the competition from grasses. This will promote the development of the appropriate soil and shelter conditions for other more climax tree species to move in, especially typical Acadian forest species like yellow birch, sugar maple and red spruce, and will also increase habitat complexity and therefore biodiversity.
- **Preventing the spread of invasive species:** Planting native tree and shrub species leave little room for invasive species to spread, as they will occupy a site instead.
- **Positive effect on the climate:** Mature trees balance out the temperature fluctuations and create a more moderate micro climate. In dry climates and seasons, they provide welcome shade and help retain soil moisture.
- **Carbon sequestration:** Trees remove carbon dioxide from the atmosphere and store it in their wood. The carbon is locked up in the wood until trees are burned or decompose. Sustainable tree and forest management is important to maintain this vital function.

The Community Reforestation project's goal was to undertake planting at sites in ecologically degraded landscapes, and collaborate with landowners to improve ecological health through ecosystem enhancement actions such as riparian habitat restoration, creation of shelterbelts, reforestation and greening of urban and agricultural landscapes. Appropriate trees were selected based on site assessments and objectives.

Another goal was to engage volunteers in the tree planting process, especially youth. Encouraging youth engagement was a good way to promote a feeling of ownership and support ongoing stewardship. The project also engaged municipalities and community groups to become partners in creating a more ecologically healthy landscape.

2.0 Methodology

To achieve the objectives of the reforestation project, it was necessary to conduct thorough site assessments, in order to align project and landowner objectives for sites, and to select the appropriate trees species. Site areas were calculated by GPS to determine the amount of trees that would be required for the site. The availability of tree species and sizes had to be considered in deciding the most appropriate planting actions for each site as well, as caliper trees require a lot of pre–planning in terms of site assessment, shipping, timing and planting.

2.1 Site assessment

Site assessments were conducted for each site where planting was to occur, and were adapted in part from the Riparian Health Assessment Tool (Nova Scotia Department of Agriculture, 2008) and the Forest Ecosystem Classification Guide (Nova Scotia Department of Natural Resources, 2010). Several considerations that needed to be taken into account when assessing sites and developing tailored site plans for the agricultural and urban planting sites were considered, and are listed below.

Considerations taken into account for agricultural sites were:

- Landowner information and objectives
- Project objectives
- Visual assessment of the surrounding areas
- Existing tree species and shrub species
- Ground cover
- Presence of invasive plants
- Any other visible ecological features
- Soil assessment/texture
- Moisture and nutrient regime
- Slopes and exposure
- Access to site and safety hazards
- Present and future land use and cooperativeness of the landowner
- Whether cattle needed to be fenced out before tree planting.

Considerations for urban sites were:

- All of the above
- Traffic flow and potential obstruction from planting
- Locations of power lines
- Presence of view lanes
- Underground pipelines and other infrastructure
- Buildings and adjacent property owners
- Potential for involving schools and community groups – to help develop a sense of ownership of the trees to support their ongoing stewardship and protection
- Participation of municipalities and towns – regular maintenance of the trees is important for the survival especially in an urban environment

2.2 Tree selection

The next step after site assessments were completed was to select and acquire the appropriate trees for sites, to improve survival and success.

Agricultural and forestry sites:

The process of selection of trees for agricultural and forestry sites was influenced by the following site features and considerations:

- Site conditions especially soil texture, moisture and nutrient regime
- Canopy cover already present on site (important to consider when fill or under planting existing forest stands)
- Potential for wildlife damage
- Landowner objectives
- Presence of natural forest at the location, observation of any adjacent forest and existing vegetation

Hardwoods were only selected as species of caliper trees, and no hardwood seedlings were selected for reforestation initiatives. Planting hardwood seedlings would not be viable without protection against deer and mice, therefore planting larger hardwood trees and building wildlife protection were options that were considered where hardwoods were desired.

Tree seedlings were selected for sites using guidelines such as those outlined in Table 1.

Table 1. Tree selection guidelines used to determine the most appropriate for individual sites.

Tree species	Soil texture	Shade tolerance	Tolerant of grass competition	Other comments
White spruce	Wide range	Low -moderate	tolerant	Pioneer tree
Black spruce	Tolerates swampy conditions	Low -moderate	moderate	Tolerates temporary flooding
Red spruce	Well drained	Good	intolerant	Long living species
White pine	Well drained	Moderate when young	tolerant	Susceptible to white pine weevil when planted without canopy
Red pine	Very well drained	Intolerant	Moderately tolerant	Susceptible to shoot blight (*sirococcus)* on less then sandy soils
Tamarack	Tolerates swampy conditions	Intolerant	Moderately tolerant	

Eroded shorelines

Native willows were selected for use along rural and agricultural shorelines, close to the water in riparian habitats. The intention was to use the roots to help minimize bank erosion problems, as willows are a fast growing and resilient species.

Urban planting sites

Additional considerations were used to select the tree seedlings for the urban environments compared to those used for agricultural/ forestry environments, such as:

- Evergreen trees were not planted in urban conditions; as they can obstruct the view lanes for traffic and homeowners, and reduce visibility of businesses. Also they can be considered a security issue around schools, public trails and playgrounds. They can be used when screening is the goal.

- Local municipalities were partnered with to check if there were any tree related by-laws and to include the local public works department in initial discussions. These were helpful first steps because these trees are going in for the long term, and the municipalities and public works departments have will be involved in the ongoing maintenance of the trees.

- Ease of maintenance, and plans for upkeep of urban trees needed to be worked out with the property owner or responsible organization.

- At the nursery all trees were inspected individually for health problems, damage, and a good structure suitable for street trees (one terminal leader was important). Trees were inspected from the roots up to the crown before purchasing.

Table 2 outlines some of the additional guidelines that were used to select trees for planting at various urban sites.

Table 2. Criteria used to select the trees for urban planting sites.

Tree species	Soil texture requirements	Suitable to urban conditions	Longevity	Other comments
Red maple	Can tolerate wide range of soil conditions, even clay and temporary wet conditions	yes	Long living	Very good street tree
Sugar maple	Well drained	Not as tough as red maple	Longer living then red maple	Decent urban tree, good for park conditions
Yellow birch	Well drained	yes	Long living	Good urban tree, prefers park conditions
Silver maple	Tolerates wet conditions	Very large crown, tends to lift up sidewalks	Long living	Very fast growing, not suitable to plant along the street
White birch	Tolerates a range of conditions but prefers well drained	Moderately, sensitive to droughts	Shorter living pioneer species	
Iron wood	Well drained	moderately	Understorey species	Smaller tree
Mountain ash	Well drained	moderately	Shorter living	Smaller tree
Red oak	Well drained	yes	Very long living	Susceptible to a lot of diseases
Black ash	Can tolerate poor drainage	moderately	Long living	Ash trees could be threatened by the Emerald Ash borer and the ash die back in the near future

2.3 Tree planting

After site planning was completed for each of the urban, agricultural and forestry sites, planting of seedlings and large caliper trees began.

Tree seedlings

For agricultural and forestry sites, conifer seedlings were selected for replanting of riparian and deforested areas as well as wind breaks and shelterbelts. On one site a combination of seedlings and caliper trees was used to create a windbreak to create extra biodiversity and habitat complexity. The wind break was planted in a way that the wind would pass through the trees and shrubs and slow down on the other side.

Most conifer seedlings were spaced about 2.4 m apart (one per 5.76 m^2). On the shore of watercourses, trees were planted in groves of 10 to 100 trees in an irregular pattern. The best planting micro sites were selected to optimize tree success. This way the planting mimicked the natural regeneration that occurred in other places and it left meadow-like spaces between the groves for other tree species and shrubs to settle naturally. White pine seedlings were planted approximately 2.1 m apart. They were placed closer together to prevent white pine weevil damage.

Planting spades were used to dig holes and loosen the soil. Tree seedlings were planted just deep enough to cover their roots. The soil was then firmly pressed around the root ball and wherever possible was mulched with grass or other available materials to prevent frost heaving in heavier soils. In forested areas shade conditions were considered to select the appropriate tree species.

Willows

Willows were cut in the CARP willow nursery. The willows were about 2 to 3 m high and they were taken down to about a 60 cm stake. Willows were transported to planting site(s) and cut into 60 cm long pieces. The stakes were slightly uneven because the whole willow was used. Then the stakes were pushed into the ground about 50 cm to 1 m apart. Several of the nodes were left underground and touching the soil to allow the willows to grow roots. Several nodes were also left above ground, to allow willow stakes to grow leaves.

Caliper trees

Caliper trees were mostly planted in areas that were either susceptible to wildlife grazing or where urban greening was required. On one site they were used to create a wind break and increase the biodiversity.

In most cases holes were pre-dug with a small excavator. If holes were left unattended they were covered or filled up again for safety reasons. Soils were amended with compost and dried kelp or bone meal to stimulate root growth and water holding capacity. A high nitrogen fertilizer would not be recommended because it would make trees grows too fast and increase their susceptibility to disease and drought. It is also important that the roots of the planted tree start growing to look for water and nutrients in the existing soil. The holes were large enough to accommodate the root ball as well as soil to surround them.

Trees were pulled out of the pots and the roots were loosened prior to planting the tree. It is important not to plant the trees deeper than they were in the pot, it will make them suffocate. Trees were watered as they were being planted and a foot long piece of drain tile was placed into the hole for easier watering later on. Trees were then planted and the soil was firmly pressed around the roots to avoid creating air pockets. Bark mulch was applied to keep roots moist and prevent weeds from growing close to the tree. In urban situations this will also help prevent tree damage from lawn mowing contractors. After trees were planted posts were placed on either side of the tree and the trees were tied to both posts. Trees were able to move slightly in the wind, which will stimulate root growth and firm up the trunk. Pieces of old garden hose were useful to pad the ropes to prevent rubbing of the bark.

2.4 Tree maintenance

General tree maintenance guidelines were discussed with the property owners, and can be found in Appendix C. Properties where ecological enhancement activities took place also committed to tree maintenance through stewardship agreements.

Tree seedlings

Planted conifer seedlings will mostly not require particular maintenance. There were some cases where cattle needed to be fenced out or herbaceous vegetation was so strong that the sites will require weeding. These sorts of requirements were discussed with the property owners.

Caliper trees

Maintenance plans were created and CARP entered into stewardship agreements with property owners for the maintenance of caliper trees planted in urban areas.

Newly planted trees will require watering weekly during the growing season for 2 years. Mulch circles will need to be maintained by weeding and reapplication of mulch the second year. Tree stakes will also need to be inspected regularly to avoid rubbing damage, and corrective pruning may be necessary. Maintenance guidelines can be found in Appendix C.

3.0 Results

The 2015 field season was successful, with the planting of 6378 trees by 435 community volunteers. A total of 5 riparian areas (3 ha) were enhanced, 3 wind breaks (0.28 ha) created, 10 sites received urban greening, and 6 sites fall under a reforestation category with 43.22 ha.

Table 3 displays a summary of the tree planting results, including the numbers of the trees planted at each site and the amount of area enhanced, protected and restored.

Table 3. Overview of the tree planting results **Names of private landowners have been removed from this version of the report*

Site	Objective	# Trees planted	Tree species	Area of protected shoreline (ha)	Area of protected habitat (ha)	# of participants
Annapolis Royal Playground	urban greening	6	willows			
		2	dogwoods		0.002	10
Champlain Elementary School	urban greening	2	red maple			
		1	yellow birch		0.02	
		2	tamarack			
		1	black ash			
		1	silver maple			
		1	ironwood			150
AWEC	urban greening	2	red maple			
		2	red oak		0.009	15
CRMS	urban greening	1	yellow birch			
		1	red maple			
		2	mountain ash			70
Aylesford	urban greening	1	red maple		0.005	
		1	mountain ash			30
Meadow's ARC	urban greening	2	red oak		0.008	8
French Basin Trail	riparian habitat restoration	3	silver maple	0.1	0.1	6
Bridgetown	urban greening	2	red maple		0.01	
		1	mountain ash			
		1	yellow birch			
		1	sugar maple			5
		1	red oak			
Cornwallis Park	urban greening	2	red maple		0.025	
		2	white birch			
		1	yellow birch			
		1	red oak			
		2	sugar maple			

		3	silver maple			10
Private Farm	reforestation	1680	white spruce		2.0	68
Private Farm	riparian habitat restoration	150	white spruce	0.1	0.1	
		100	black spruce			21
Cornwallis Park storm water drain	urban greening, riparian zone	150	white spruce		0.5	
		50	black spruce			2
Private Land	riparian habitat restoration	163	white pine	0.83	0.83	
		188	black spruce			
		59	white spruce			4
Private Land	riparian habitat restoration	360	white spruce	1.11	1.11	
		115	white pine			
		230	black spruce			7
		4	black ash			
Private Land	reforestation and diversification of species	656	black spruce		39.14	
		450	red spruce			
		85	white pine			
		202	white spruce			2
Private Land	reforestation and diversification of species	50	red spruce		1.37	
		12	white pine			
		5	black spruce			
		13	white spruce			3
Private Land	riparian habitat and diversification of species	440	white spruce	0.86	0.86	5
		343	black spruce			
		45	white pine			
		85	red pine			
		2	tamarack			
		1	yellow birch			
		150	willow			
		36	dogwoods			
Raven Haven	reforestation, diversification of tree species, greening of urban landscapes	50	white pine			3
Private Farm	shelterbelts and windbreaks, diversification of species	1	ironwood		0.09	3
		1	yellow birch			
		30	white pine			
		1	service berry			
		1	wild raisin			
		3	highbush cranberry			
		1	mountain ash			

		1	tamarack			
		2	elder			
Private Land	reforestation	25	red pine		0.06	2
Private Land	reforestation	165	red pine		0.15	3
Private Land	shelterbelt and windbreak	110	red pine		0.02	3
Private Land	shelterbelt and windbreak	105	red pine		0.17	3
Private Land	diversification of tree species, greening of urban landscapes	10	red pine		0.02	2
Total		**6378**		**3.0**	**44.6**	**435**

Sections 3.1 and 3.2 give more detailed information about each planting site.

3.1 Urban planting sites

Annapolis Royal Natural Playground, Town of Annapolis Royal

The Annapolis Royal playground was transformed into a natural play space in 2014. Part of the construction included a slide installed into a natural hill which was experiencing erosion problems. Three native willows and one dogwood were planted on either side of the slide by 8 volunteers from the Young Outdoors Women Club. Willows and dogwoods were selected for the site because they are easy to grow, tolerate pruning well, are non-toxic and tough around playing children. This will therefore allow protecting of the structure and it will also create a safe play space for children. The shrubs should be pruned back to about 60 cm every year to promote a bushy structure. The height is important, so kids cannot get hurt by falling onto the stubs. Also some of the bottom limbs will need to be removed on a regular basis for visibility requirements of safe playgrounds.

Figures 1 to 4 show the locations of the tree and shrub planting as well as before and after photos of the work undertaken.

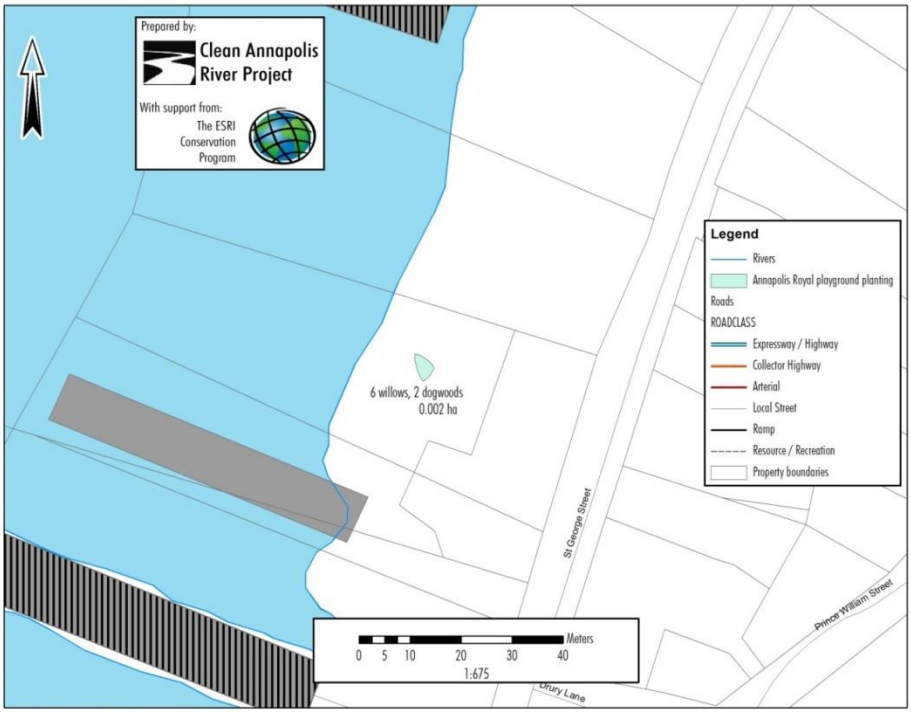

Figure 1. Annapolis Royal playground site map

Figure 2. New slide at the Annapolis Royal playground before greening work was completed.

Figure 3. Young Outdoors Women club helping with urban greening work.

Figure 4. New slide after greening work was completed.

Champlain Elementary School, Granville Ferry

Champlain Elementary School (CES) is also in the process of building a natural playground. A site map has been made that shows the tree locations (see Figure 5). Each tree site was selected by considering ecological benefits, working around planned construction, playground safety (visibility, sledding hills), underground infrastructure and playing fields. All trees were planted with the help of the students at CES, which provided an educational opportunity and allowed the kids to take ownership of the trees. The Natural Playground Committee of CES agreed to take over tree maintenance until trees are established. A total of 1 silver maple, 2 red maple, 1 yellow birch, 2 tamarack, 1 black ash and 1 ironwood were planted. One challenge at this site was that the soil was quite heavy with a high clay content and therefore tree selection and planting techniques needed to be tailored accordingly. All the holes were pre-dug by hand with volunteers and it was very hard. It would have been reasonable to use an excavator to help with this site.

Figures 5 to 9 show the tree locations and pictures before and after the planting.

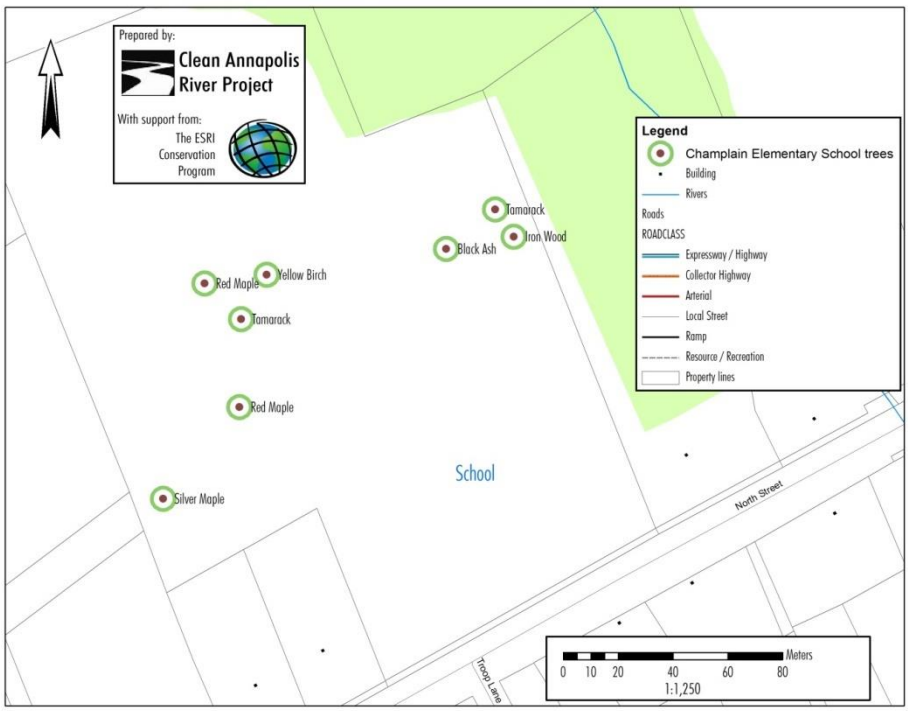

Figure 5. Champlain Elementary tree planting site map.

Figure 6. Volunteers of the CES Natural Playground Committee digging holes.

Figure 7. Kids in action planting a tamarack.

Figure 8. Site before tree planting.

Figure 9. Site after tree planting.

Annapolis West Education Centre, Annapolis Royal

The Annapolis West Education Centre (AWEC) is located on Champlain Drive, in Annapolis Royal.

Four trees were planted in collaboration with 15 students of the O2 (options and opportunities) classes. At this site 2 red maples were planted beside the school and the O2 program funded an additional 2 red oak that were planted by the walkway and behind the basketball court. Planting holes were dug by the students. There was a high clay content but it was manageable with pick axe and shovels. The Town of Annapolis Royal donated the compost and the bark mulch. The objective at this site was to create more shade for the students and provide habitat for wildlife. This site is very close to the Annapolis Royal Marsh which provides significant habitat for birds, deer, small mammals and turtles.

Figures 10 to 14 show the tree locations, students in action and the planted trees.

Figure 10. Annapolis West Education Centre tree planting site map.

Figure 11. Digging holes with the O2 students of Annapolis West Education Centre.

Figure 12. Students in action, volunteering with tree planting.

Figure 13. Two red maple trees planted to provide urban greening.

Figure 14. Two red oak trees planted to improve wildlife habitat.

Clark Rutherford Memorial School, Cornwallis Park

Four trees were planted with the students of Clark Rutherford Memorial School (CRMS), including 1 yellow birch, 1 red maple and 2 mountain ash. Holes were pre-dug using a small excavator. The soils at the site were mostly well drained and had little clay content. The trees will provide shade provide a small wind break for the playground.

Figures 15 to 19 show the tree locations, the students in action, the planted trees and a thank you card made by the students.

Figure 15. Clark Rutherford Memorial School tree planting site map.

Figure 16. Tree planting with the students at Clark Rutherford Memorial School.

Figure 17. Trees planted on the CRMS playground.

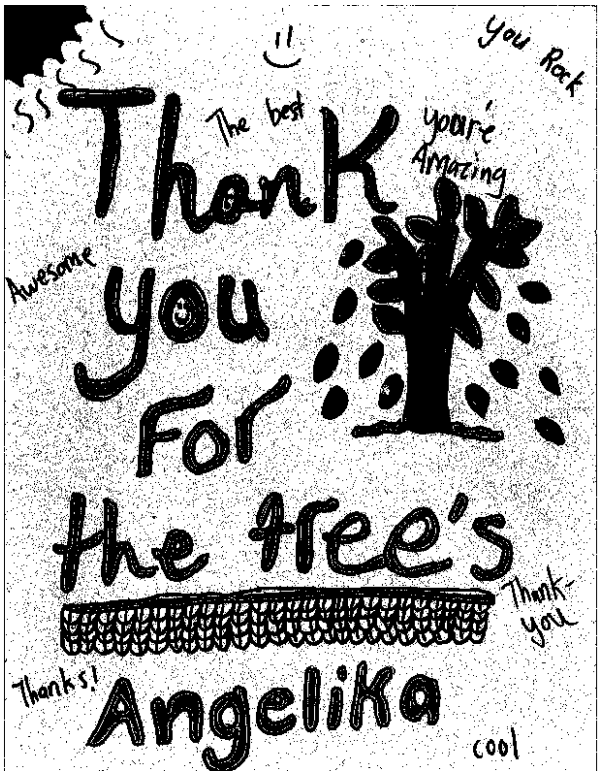

Figure 18. Thank you card made by CRMS students.

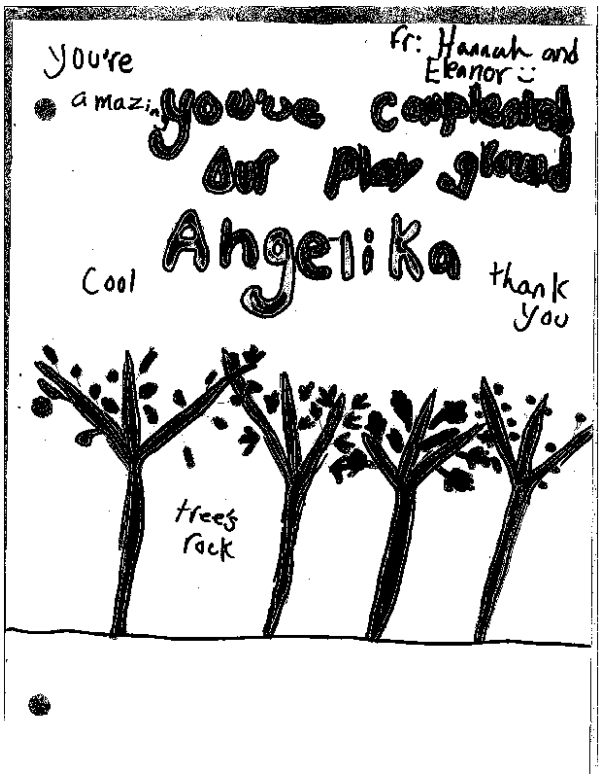

Figure 19. Thank you card made by CRMS students.

St. Mary's Elementary School, Aylesford

St. Mary's Elementary School is located in the community of Aylesford and has a wide open playground area devoid of trees. Two trees were planted to provide shade and urban greening around the play area with the primary and grade 1 students: 1 red maple and 1 mountain ash. The holes were easy to dig in the sandy soils of Aylesford. After the planting job was completed, the students were given a red pine seedling to plant at their homes. The community of Aylesford is one of the limited areas in the watershed that contains sandy soils, and red pine grows well in sandy soils only.

Figures 20 to 24 show the tree locations and the students in action.

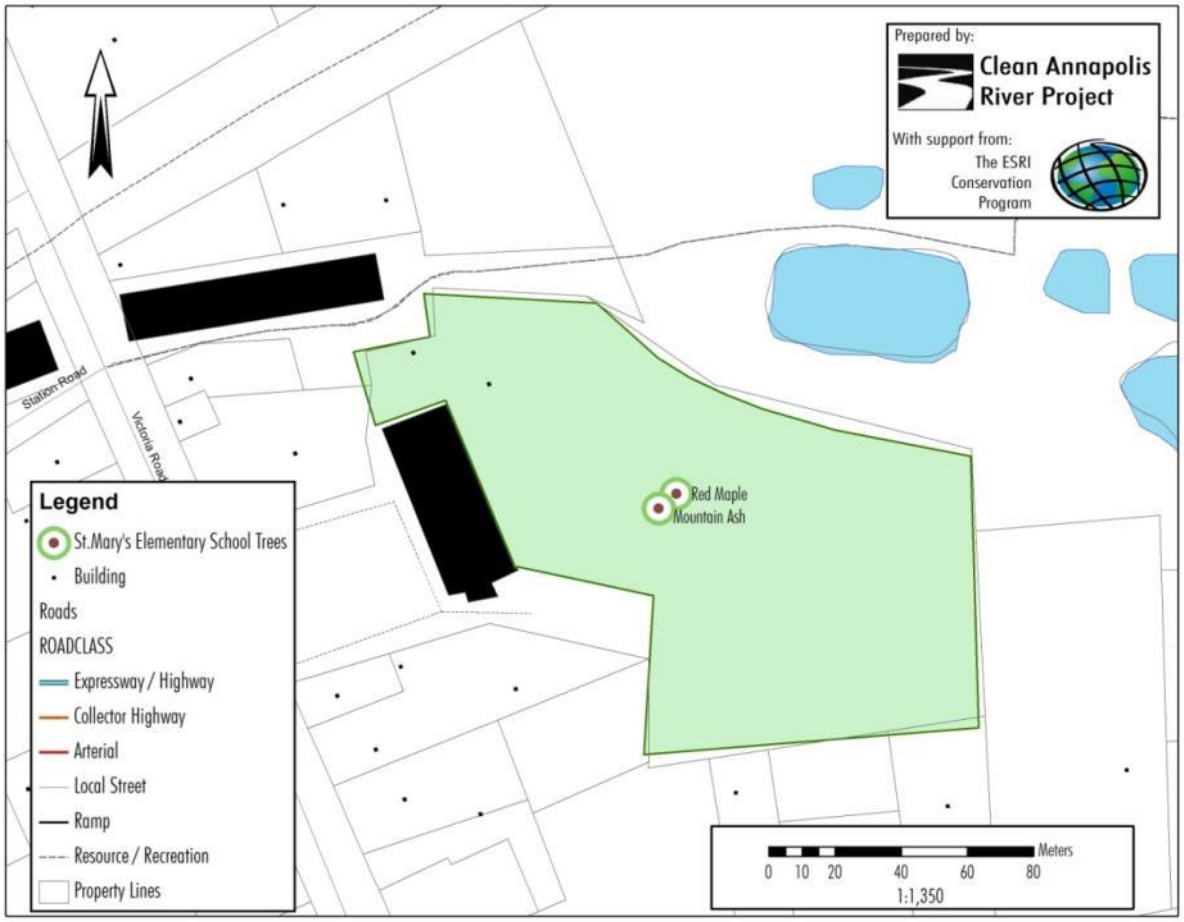

Figure 20. St.Mary's Elementary School tree planting site map.

Figure 21. St. Mary's Elementary School tree planting site map.

Figure 22. Students showing red pine seedlings they helped to plant.

Figure 23. Trees planted behind the gym and near the play structure.

Figure 24. Group shot of the planters.

The Meadow's Adult Residential Centre, Bridgetown

The Meadow's Adult Residential Centre (ARC) is part of the Annapolis County Municipal Housing cooperation and is located in Bridgetown on Church Street. Two red oak trees were planted with five of the residents. The facilities manager had all the holes pre-dug, but they were very large, and therefore topsoil belonging to the facility was used to fill the holes back up around the trees. A large rain event also occurred just before the planting day, so there was some standing water in the holes. The site was on a slope and the soil seemed well drained at the time of site assessment. Red oak grows well in well drained, even dry soils, so the water was a bit of a concern when the trees were planted. The trees were planted to provide shelter and shade for the outdoor area of the facility and enhance its ecological health by providing increased habitat diversity.

Figures 25 to 28 show the tree locations, the site before planting and the residents at work.

Figure 25. The Meadow's A.R.C. tree planting site map.

Figure 26. Planting location before planting activities.

Figure 27. Residents of Meadow's A.R.C. adding topsoil to the holes for the trees.

Figure 28. Group shot with planted trees and volunteers.

French Basin Trail, Annapolis Royal

The French Basin Trail extends around the Annapolis Royal Marsh, a large pond with islands created by Ducks Unlimited. It houses many different waterfowl and a hiking trail leads all around the pond. One challenge for the site is the rapid spread of invasive plant species in this area. Examples are glossy buckthorn, multiflora roses, reed grass, English oak and scots pine. CARP has led projects on invasive species here in the past. A keen volunteer started removing some of the larger multiflora roses and CARP was looking for a native tree/ shrub species that would be able to grow fast enough to fill the space. After some research it was decided to plant 3 silver maples, very fast growing trees that grow well in flood plains and on river shores. Silver maple is native to New Brunswick and there is a stand of silver maple in the King's County in part of the watershed. All of the trees were planted by 4 students of the AWEC Envirothon Club.

Figures 29 to 31 show planting locations and activities.

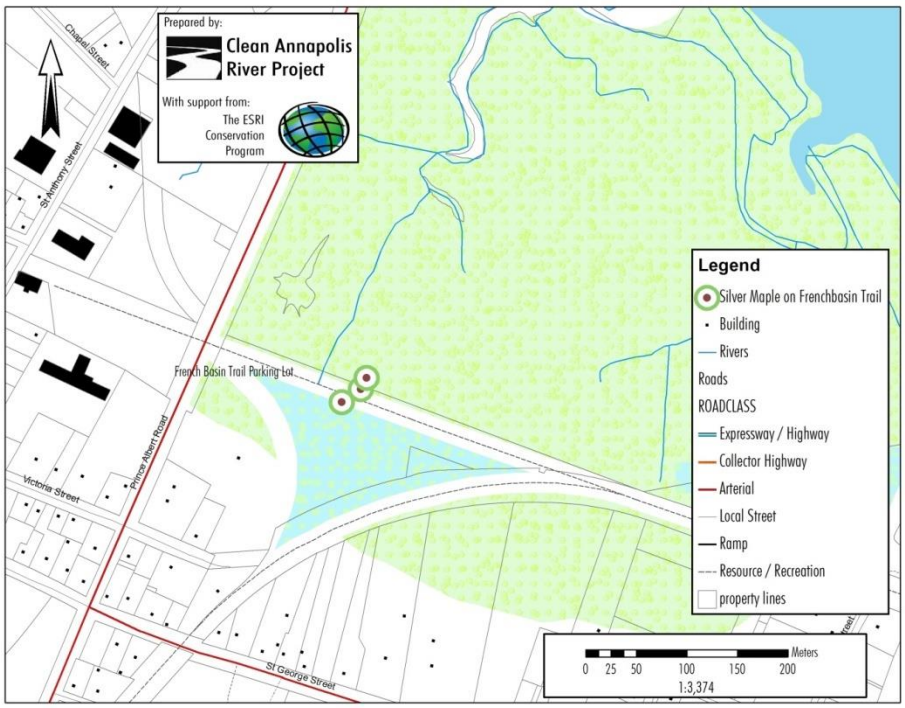

Figure 29. French Basin Trail tree planting site map

Figure 30. Envirothon students planting a silver maple.

Figure 31. Planted silver maple.

Bridgetown

As part of efforts to green urban areas, 5 trees were planted in Bridgetown with the help of the public works and parks maintenance staff. One mountain ash was planted in front of the library, 1 red maple was planted on pool property, 2 more red maple were planted near the high school, 1 sugar maple close to the Jubilee Park, and 1 red oak and 1 yellow birch went in along the main street. These trees will provide shade and increase habitat complexity within the Bridgetown urban forest.

Figures 32 to 35 show the tree locations and planted trees.

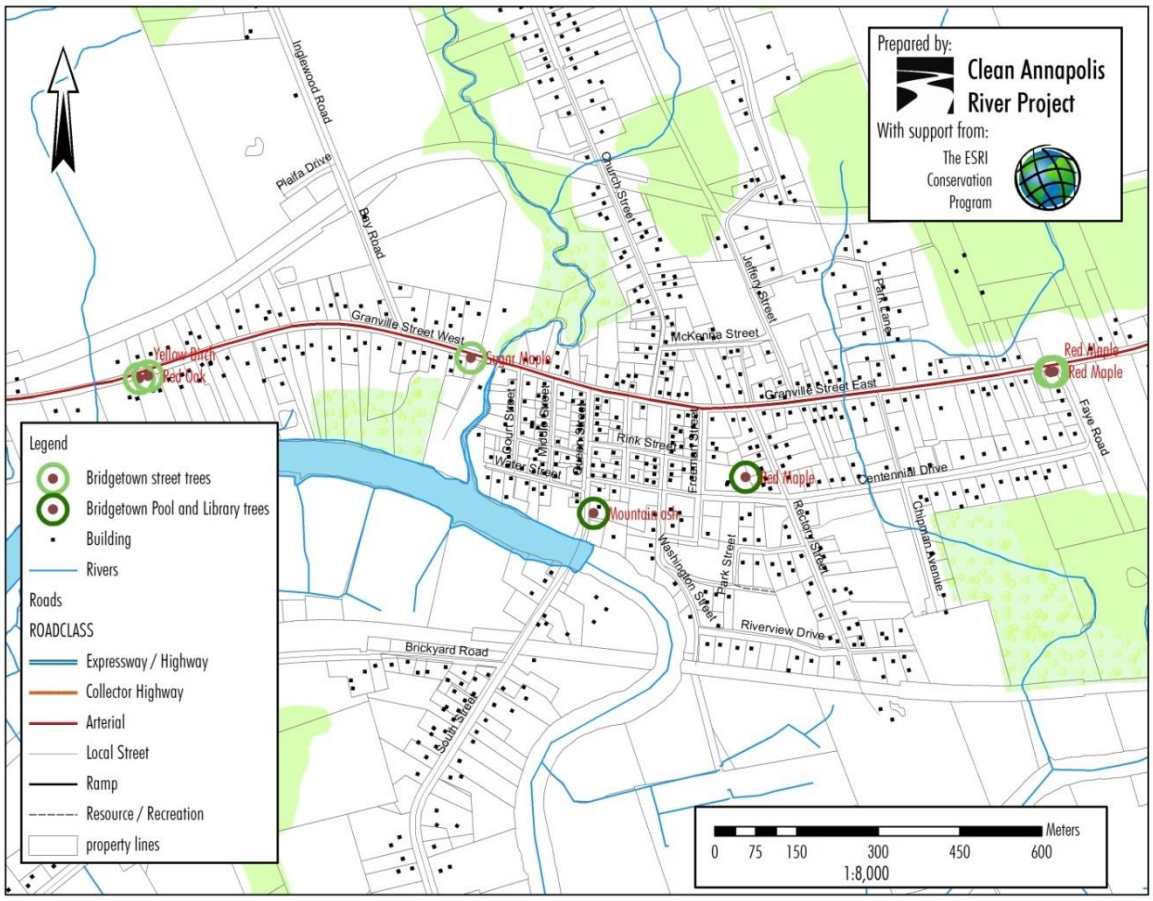

Figure 32. Bridgetown tree planting site map.

Figure 33. Planted tree at the Bridgetown pool.

Figure 34. Tree planted at Bridgetown Library.

Figure 35. Trees planted along Highway 1 in Bridgetown.

Cornwallis Park, Broadway Avenue

Cornwallis Park is the site of former Canadian Forces Base Cornwallis. In the 1990's, the area became a combination of a residential community and industrial area. It is home to 433 residents, and several industrial, governmental, and non-governmental organizations including the Acadian Seaplants and Foamworx factories, the Fundy YMCA, the Annapolis Basin Conference Centre, the offices of NS Agriculture and NS Fisheries and Aquaculture, and the HMCS Acadia Cadet Training Centre. Cornwallis Park is situated on highly sloped terrain between the South Mountain and the Annapolis Basin. Cornwallis Park has a large proportion of hardened surfaces such as roadways, parking lots, and buried foundations of former building sites, as well as large unused open areas.

Three silver maple were planted along Highway 1 and 5 trees were planted along Paul LaFleche Hall (a large building along the main street) – 1 red maple, 1 sugar maple, 1 red oak, 1 yellow birch and 1 white birch. One sugar maple, 1 red maple and 1 white birch were planted along the west side of Broadway Avenue. The Fundy YMCA youth zone volunteered with the tree planting with 5 kids and 3 leaders.

These trees were planted to provide a buffer against the strong winds coming off the Annapolis Basin and to help slow down stormwater runoff in an area with a high amount of impermeable surfaces. Trees were also planted in this urban landscape to provide shade and improve habitat quality and diversity in the area.

Figures 36 to 41 show the tree locations and the planting activities.

Figure 36. Cornwallis Park tree planting site map.

Figure 37. Planting site along the highway before tree planting.

Figure 38. Paul LaFleche Hall, Broadway Avenue, Cornwallis Park before tree planting.

Figure 39. Removing sods and excavating holes for the trees.

Figure 40. New trees on Broadway Avenue, Cornwallis Park.

Figure 41. New trees along Paul LaFleche Hall, after planting.

3.1.1 Planting on Private Land

1. Private Landowner #1 was located adjacent to the Annapolis River. The shoreline along the Annapolis River showed significant erosion issues. Approximately 114 willows were planted in the spring of 2016 to prevent further erosion. Challenges were grass and blackberry competition.

Figure 42. Photo of the planting site.

Figure 43. CARP staff loaded up with willow stakes.

2. Private landowner 2 was located in Brickton, NS, along Highway 201. The property has severe erosion issues along the adjacent brook and the land is slumping. The site was planted with 59 willows and 7 dogwoods.

Figure 44. Slumping and erosion occurring on the property.

Figure 45. Willow stakes and dogwoods after planting.

3.2 Agricultural and forestry sites

The sites chosen for agricultural and forestry enhancement efforts were selected with a view to restore the ecological health of habitats by planting tree seedlings in deforested and degraded landscapes.

3.2.1 Private Farm 1

Farm 1 was a field that was reforested with Norway spruce in the past; most of them died and were attacked by the white pine weevil (pissodes strobi), a small beetle that lays eggs along the top leader of white pine and other spruce trees like Norway spruce. The hatching larvae will eat around and into the top leading limb and this will cut off the water supply to the top. Subsequently the tops of the trees will die off. The field was replanted with white spruce this season which is not susceptible to the weevil.

White spruce, being a native pioneer species, can handle a wide range of soil conditions and can compete with grass. The soil in this field had a high clay content and was poorly drained in places, which impacted where planting occurred (very wet, poorly drained areas were avoided). Over 1280 seedlings were planted with 60 student volunteers from the Bridgetown High School science classes, and 400 additional more were planted to finish the site by CARP staff.

Figure 46. Norway spruce with white pine weevil damage.

Figure 47. Planting site in on Farm 1

Figure 48. Science student from Bridgetown High School planting trees.

Figure 49. Another student in action planting trees.

Figure 50. Student planting teams.

3.2.2 Private Farm 2

This site contains the riparian zone of a wetland that is connected to the Annapolis River. Initial site assessments revealed that cattle were allowed to graze on the site and had access to the water. The site is like a pond and it will occasionally flood. The cattle were fenced out to protect the planted trees. A mix of white spruce and black spruce were planted here by 18 students of the Middleton 02 class. Black spruce was chosen for the lower lying areas of the site because it is tolerant to temporary flooding. A total of 250 seedlings were planted protecting 0.1 ha of shoreline, and restoring a degraded habitat.

Figure 51. Students from the Middleton 02 class planting trees in Mochelle.

Figure 52. Planting site at Farm 2.

Figure 53. Another view of the planting site.

Figure 54. Group shot Middleton 02 planting volunteers.

3.2.3 Cornwallis Park Stormwater Drain, Cornwallis Park

This site was located on Highway 1. There was a big culvert in the middle of the site that collected the stormwater coming off the mountain and directed it underneath the highway. The site was no longer mowed but was colonized by invasive shrub species like multiflora roses and glossy buckthorn. Seedlings were planted to help retain water and fill in the spaces to prevent the spread of invasive shrubs. CARP staff planted 150 white spruce and 50 black spruce. The black spruce was mostly planted in the swampier areas of the site.

Figures 59 to 61 show the planting site and planted seedling locations.

Figure 55. Cornwallis Park stormwater drain tree planting map.

Figure 56. Planting site along Highway 1 in Cornwallis Park.

Figure 57. Another view and multiflora roses.

3.2.4 Private Land 3

Private Land 3 runs along the shore of the Annapolis River. A lot of erosion was observed due to the lack of adequate riparian vegetation on the site. The land was very fertile and the soil was mostly well drained. Some areas on the site were swampy, and the soil changed from clay to mostly silty loam in micro sites. One concern was the existing vegetation. This nutrient rich soil on site was growing very tall goldenrod, asters and thick tall grasses like canary grass. In order to plant tree seedlings, a scythe with a brush blade needed to be used to mow the planting sites and some of the cut grass was laid around the seedlings for mulch. The planting occurred in groves of up to 50 seedlings, to give the planting a more natural look and allow natural regeneration of trees between groves. Most of the tall weedy plants on site are late bloomer species like goldenrod, so for most of the early summer tree growing season the vegetation will be low and will give the trees a chance to grow before being covered in vegetation. Seedlings that were planting on site were 163 white pine, 188 black spruce and 59 white spruce, all of which can compete well with other vegetation. The site should be re-visited in the fall 2016 to see how well each of the species copes with the site conditions.

Figure 58. Planting site close to the Annapolis River in Tupperville.

Figure 59. Mowing the planting site before planting.

Figure 60. White pine seedling after being planted, prior to mulching.

3.2.5 Private Land 4

Private Land 4 property connects to the VerFaillie property on the shore of the Annapolis River. This site was also experiencing erosion problems, and had similar site conditions as the VerFaillie property. The soils on site were well drained with a few swampy areas within the site, and there were tall asters and grasses that had to be mowed before planting. The same pattern was used for planting with the creation of the groves. The property owners were very appreciative of the planting and joined CARP staff for most of it. A total of 360 white spruce, 115 white pine, 230 black spruce were planted in groves along the shore to improve the riparian habitat. The tree planting also helped to improve habitat by connecting the existing forested areas.

In addition to the shoreline planting, 4 black ash trees were planted in the adjacent woodlot to re-introduce the species. Black ash is an ash species that tolerates swampy conditions and is a species at risk in Nova Scotia. The property owners offered to build wire cages to protect the trees from deer damage until they are big enough and no longer need protection.

Figure 61. Private Land 4 tree planting.

Figure 62. Property owner planting black ash trees.

3.2.6 Private Land 5

Private Land 5 is a woodlot located at the foot of the North Mountain with access from Clarence Road. The existing stand consisted of gray birch, coppiced red maple and beech, some balsam fir regeneration, scattered apple trees and red oak. Occasionally there was a large hemlock, red spruce or black spruce and bigger tree stumps on site which indicated that the area was probably clear cut in the past but not re-planted or silvicultured. There was not enough regeneration to restock the site with long living species (climax species) of the Acadian Forest; therefore the open areas were planted with tree seedlings. There was also indication of heavy browsing by deer and porcupines and very few older trees were left for reseeding. The site was very rocky and included different microsites, ranging from well drained to swampy. Some areas were fully stocked with gray birch and aspen, making them too shady for any regeneration to establish itself and thrive. The described area was planted with 450 red spruce, 656 black spruce, 85 white pine and 202 white spruce.

Figure 63. Old stumps, witness of former forest cover.

Figure 64. Deer damage on red maple, forest cover of wild basil.

Figure 65. Tree planting in forest openings.

3.2.7 Private Land 6

Private Land 6 is located on the Hampton Mountain Road with a mostly well drained silty loam soil (Loess soil). The drainage depended on where the basalt bedrock was positioned and ranged from well drained to poorly drained. Two large brooks ran through the property that had healthy riparian zones with a variety of Acadian Forest species like yellow birch, red maple, some red spruce, service berries, mountain maple, white birch and alternate- leaved dogwood. There was a wooded area surrounded by open fields which appeared to have caused a lot of wind fall. A total of 50 red spruce, 12 white pine, 5 black spruce and 13 white spruce were planted on this site. The white pine and white spruce were planted to create a wind break and reforest small areas, the red and black spruce were used to fill in the holes where trees were lost and limited seed was available.

Figure 66. Planting white pine for a windbreak.

Figure 67. Hurricane damage.

3.2.8 Private Land 7

This property belongs to a private landowner who was building a small house in the back of the property at the time of assessment. Chelsey brook ran through the property and converged with the Annapolis River just downstream of the property. The lower portion of the brook was estuarine, as the saltwater tides mix with the Annapolis River at this point, creating brackish waters. The soil was a silty loam and has been used to grow squash organically. The fields had been left to fallow for a couple of years but the vegetation cover was light at the time of planting which made the planting easier. A total of 440 white spruce, 343 black spruce, 45 white pine and 85 red pine were planted along the watercourse in groves that followed the natural landscape. Additionally, 150 willow and 36 dogwood stakes were planted directly along the bank. Closer to the house 1 yellow birch and 2 tamarack were planted, to improve site diversity and create a small wind break for the house.

Figure 68. Chelsey brook, which converged with the Annapolis River estuary.

Figure 69. CARP staff preparing willow stakes for planting.

Figure 70. Tree planting along Chelsey brook.

Figure 71. Planting tamarack.

3.2.9 Raven Haven, Sandy Bottom Lake

Raven Haven is a family park located on Sandy Bottom Lake that features camping, swimming and canoeing. There were some erosion issues with the camp sites and missing regeneration of the white pine. The site was very sandy and well drained. Along the roadside were a wide variety of trees and shrubs: service berry, red oak, wild raisin, bayberry, red chokeberry, blueberries and many more. The site had a lot of potential for biodiversity; it was therefore recommended to stop mowing in selected areas to let the natural vegetation occur. Several camp sites were experiencing erosion problems, therefore planting was completed. To address the issue 4 bayberries were planted around the campsites. A total of 50 white pine were planted throughout the site to provide some regeneration. The planting was completed in cooperation with the park's maintenance manager, so he would know where all the little seedlings were. Planting at this site will help to improve the lake shore habitat and will enhance the site's biodiversity.

Figures 81 to 83 show pictures of the site and the tree planting site map.

Figure 72. Raven Haven tree planting site map.

Figure 73. Red chokeberries, one of the shrub species present at the site.

Figure 74. Existing white spruce along the edge of the parking lot at Raven Haven.

3.2.10 Private Land 8

Private Land 8 is an organic vegetable farm located in Round Hill. The soil on this site was a silty – sandy loam, very fertile and well drained. The property owners were looking for a windbreak and also to increase the diversity in species on site, preferably something to provide fodder for wildlife such as birds. Tree and shrubs were planted around the fields in an L shape. A windbreak works best when it consists of tree and shrubs of multiple shapes and heights to allow for the wind to pass through and slow down on the other side (Simpson, 2015). The following trees and shrubs were planted on the site: 1 ironwood, 1 tamarack, 30 white pine, 1 mountain ash, 1 yellow birch, 1 wild raisin, 1 serviceberry, 2 elderberries and 3 highbush cranberries. The property owner did some preparation and had the site disked prior to planting.

Figure 75. Planting site around the field.

Figure 76. Prepared site, CARP staff planting seedlings to create a windbreak.

3.2.11 Private Land 9

Private land 9 is located on sloped terrain in Clementsport, NS and subjected to high winds throughout the year from the Annapolis Basin. A total of 25 red pine were planted on the slope behind the Green House to prevent erosion and create a windbreak. The soil was sandy loam, and well drained, and therefore suitable for red pine.

Figure 77. Steep planting site in Clementsport.

3.2.12 Private Land 10

Private land 10 was a private woodlot located in Mochelle, where 165 red pine were planted. The site did not show any natural regeneration. The soil was well drained, rocky and a sandy loam, so red pine was suitable for the location.

Figure 78. Patch cut being replanted.

3.2.13 Private Land 11

The Marshall property is located in Nictaux, NS. It contained an apple orchard (Spy Hill Farm) which needed wind breaks along two sides. The soil on site was a well –drained sandy loam, which was ideal for planting red pine. A total of 110 red pine were planted on the site.

Figure 79. Planting site along the road.

Figure 80. Spy Hill Apple Orchard.

3.2.14 Private Land 12

This site needed a windbreak. The field was an overgrown apple orchard with an abundance of invasive species like multiflora roses. There was lots of evidence of deer browse and bear droppings were also found. The soil was a fertile, well drained sandy loam and the site had a south facing slope. A total of 105 red pine were planted along the edge of the property.

Figure 81. Cook property planting site in Clarence, prior to replanting efforts.

3.2.15 Private Land 13

\Private Land 13 is in Middleton had well-drained and sandy loamy soil. Ten red pine were planted by the property owner to create new habitat and green space around the property.

3. Tree survival assessment

The table below displays the tree survival per planting site and overall. The caliper trees that were planted all survived and are thriving. Except one tamarack that was heavily damaged by a buck deer scratching the bark off the trunk.

On the forestry and agricultural sites tree survival was assessed by sampling a minimum of 30% of the total of planted trees on every site and subsequently evaluating their survival. The planting sites often consisted of many different microsites, requiring adjustment of tree species and irregular planting patterns. This made the tree survival assessment challenging because it was harder to determine if there were trees missing. Other obstacles to tree survival included heavy deer and rabbit browsing, unanticipated flooding events, broken cattle fences, beavers, other rodents and raccoons. One site had soil with high clay content and it was planted by 50 high school students. As a result trees were not always planted deep enough and several experienced frost heave. It was very dry at the beginning of the planting season; therefore planting results were better later in the season. White spruce and white pine generally had the best survival rates; these species seem less susceptible to drought and are less likely to get browsed by wildlife.

Overall there was a 54% survival rate. This includes one site that had a higher than average overpopulation of deer and rabbit and an unexpectedly elevated amount of browsing of the majority of spruce and pine trees was observed. Most other sites not subjected to that extreme case of browsing pressure experience much higher success of tree survival, at a rate of over 90%. Individual survival rates for each property are outlined in greater detail in Table 4.

Table 4. Overview of tree survival by site.

Site	Objective	# Trees planted	Tree species	% survival	Comments, possible cause of tree loss and damage
Annapolis Royal Playground	urban greening	6	willows	100	
		2	dogwoods	100	
Champlain Elementary School	urban greening	2	red maple	100	
		1	yellow birch	100	
		2	tamarack	100	
		1	black ash	100	
		1	silver maple	100	
		1	ironwood	100	
AWEC	urban greening	2	red maple	100	
		2	red oak	100	
CRMS	urban greening	1	yellow birch	100	
		1	red maple	100	
		2	mountain ash	100	
Aylesford	urban greening	1	red maple	100	

Site	Objective	# Trees planted	Tree species	% survival	Comments, possible cause of tree loss and damage
		1	mountain ash	100	
Meadow's ARC	urban greening	2	red oak	100	One oak was a slower leafing out, high water table possible
French Basin Trail	riparian habitat restoration	3	silver maple	100	
Bridgetown	urban greening	2	red maple	100	
		1	mountain ash	100	
		1	yellow birch	100	
		1	sugar maple	100	
		1	red oak	100	
Cornwallis Park	urban greening	2	red maple	100	
		2	white birch	100	
		1	yellow birch	100	
		1	red oak	100	
		2	sugar maple	100	
		3	silver maple	100	
Warren Farm	reforestation	1680	white spruce	83	Some frost heave, a few were poorly planted (high school students), better performance in wetter areas
Barteaux Farm	riparian habitat restoration	150	white spruce	2	Cattle fence down, unexpected flooding of site, beavers
		100	black spruce	5	See above
Cornwallis Park storm water drain	urban greening, riparian zone	150	white spruce	20	Rodents, raccoons, deer
		50	black spruce	20	See above
VerFaillie	riparian habitat restoration	163	white pine	70	Drought in the beginning of season and clay soils
		188	black spruce	76	See above
		59	white spruce	76	See above
Crossland/ Emery	riparian habitat restoration	360	white spruce	96	
		115	white pine	90	
		230	black spruce	91	
		4	black ash	100	
Parker woodlot	reforestation and diversification of species	656	black spruce	5	Heavy deer and rabbit browsing
		450	red spruce	5	See above
		85	white pine	5	See above
		202	white spruce	5	See above
Newington	reforestation and diversification of	50	red spruce	0	
		12	white pine	80	

Site	Objective	# Trees planted	Tree species	% survival	Comments, possible cause of tree loss and damage
	species	5	black spruce	1	
		13	white spruce	95	
VanderWeit	riparian habitat and diversification of species	440	white spruce	40	Rodent damage on the whole site
		343	black spruce	20	
		45	white pine	50	
		85	red pine	50	
		2	tamarack	100	
		1	yellow birch	100	
		150	willow	64	
		36	dogwoods	78	
Raven Haven	reforestation, diversification of tree species, greening of urban landscapes	50	white pine	96	
		4	Bayberry	100	
Whipple Tree Farm	shelterbelts and windbreaks, diversification of species	1	ironwood	100	
		1	yellow birch	100	
		30	white pine	90	
		1	service berry	100	
		1	wild raisin	100	Deer browsing
		3	highbush cranberry	100	
		1	mountain ash	100	
		1	tamarack	0	Buck damage
		2	elder	100	Deer browsing
Allan Green Clementsport	reforestation	25	red pine	100	
Keith Barteaux	reforestation	165	red pine	87	
Lee Marshall	shelterbelt and windbreak	110	red pine	95	
Roy Cook	shelterbelt and windbreak	105	red pine	88	
Wendy Rhodda	diversification of tree species, greening of urban landscapes	10	red pine	100	
Total		6382		54	

4. Recommendations

1. Sites should be re-visited to check tree health annually. The best time to do so would be in the spring.
2. Landowners where seedlings were planted were encouraged to use forest management guidelines provided by the Association of Sustainable Forestry (http://www.asforestry.com/docs/) and the Department of Natural Resources (Simpson, 2015) for future maintenance of the planted species.
3. Tree maintenance guidelines were outlined in Stewardship agreements for caliper trees and follow up should occur to ensure that property owners are adequately caring for planted caliper trees (see Appendix C).

5. References

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Nova Scotia Department of Agriculture. (2008). *Nova Scotia Riparian Health Assessment.* Goverment of Nova Scotia.

Nova Scotia Department of Natural Resources. (2010). *Forest Ecosystem Classification Guide for Nova Scotia.* Halifax: Nova Scotia Department of Natural Resources.

Simpson, J. (2015). *Restoring the Acadian Forest 2nd Edition: A Guide to Forest Stewardship for Woodlot Owners in the Maritimes.* Halifax, Nova Scotia: Nimbus Publishing Ltd and NS Department of Natural Resources.

6. Appendices

Appendix A. Site assessment sheet for urban planting

Site assessment sheet for urban planting

Landowner information

Name :

Contact person:

Phone and email:

Project objectives:

- ☐ riparian habitat restoration
- ☐ shelterbelts and windbreaks in agricultural landscapes
- ☐ reforestation – tree replacement
- ☐ diversification of tree species
- ☐ greening of urban landscapes within towns and villages

Visual assessment of surrounding area:

Tree species

Shrub species:

Poisonous plants: -

Important ecological features?

Soil conditions:

Exposure:

Access to site:

Safety hazards:

Wildlife issues: -

Traffic

View lanes

Adjacent businesses , houses:

Power lines:

Other comments

Maintenance (mowing, mulching, fertilizing)

Stewardship agreement:

Area/ waypoints for tree sites:

Photos taken:

Appendix B. Site assessment sheet for agricultural and forestry planting

Community reforestation site assessment check list

Landowner information
Name:
Contact:
Address:
Phone number:
Email:
Project objectives :

- ☐ riparian habitat restoration
- ☐ shelterbelts and windbreaks in agricultural landscapes
- ☐ reforestation
- ☐ diversification of tree species
- ☐ greening of urban landscapes within towns and villages

Visual assessment of surrounding area:
Tree species:
Shrub species:
Invasive plants:
Milkweed?
Sandy, gravelly beach? Turtles?
Any other ecological features?

Vegetation type of surrounding area (use Forest Ecosystem classification FEC if applicable):
Soil type (FEC):
Soil horizons: - organic matter:
Compaction: residual herbicides, pesticides:
Texture: ph: disturbances:

Exposure:
Slope:
Access to site:
Safety hazards:
Questions to land owner:
comments:
Mention the stewardship agreement, willing to sign? Yes no
potential planting site area (calculated by GPS)

Recommendation:

Appendix C. Example stewardship agreement for urban planting sites:

Stewardship Agreement

I _____, hereby agree to support the Clean Annapolis River Project's 'Growing Ecological Health' project through my own actions and in partnership with CARP. As a steward of the land I agree to commit to preserving the ecological health of my property by protecting and maintaining the trees planted on my property to the best of my ability. I agree to follow the maintenance recommendations outlined below and in the personalized plan developed for my property.
Recommended actions include:
Urban tree planting (schools, municipalities- large trees in pots)
The tree species selected for urban planting are selected according to site conditions and availability. Listed below are guidelines for continuing tree care to ensure the trees thrive and survive for a long time:

Year one
Fall
- Water once a week until the wet weather sets in (i.e. mid November?)
- Winter protection- make trees visible for snow ploughs (i.e. place long stakes with orange tops between new trees and driveways or roadways). Call contractors to point the new trees out to them.

Year two
Early spring
- Check on the stakes and ties, and remove winter protection

Spring /summer
- Water plants once a week, weed, top up mulch, check on stakes and ties

Fall
- Winter protection –see above

Year three
Spring
- Weed around the trees
- Give all the trees a layer of compost and bone meal and then add a fresh layer of mulch
- Remove stakes and ties if tree is stable

Summer
- Water during dry periods

Fall
- Winter protection as required

Year four
- Weed and top up compost and mulch

Summer or fall
- Weed
- Remove stakes and ties if stable
- Water if required

After four years

- Maintain the mulch circle
- Weed regularly (this will also prevent lawn mowing damage)
- Conduct a visual check of leaves, branches and bark. Look for damage and irregularities.
- Do some corrective pruning if necessary. Allow only one leader to grow for street trees, about 50% of the size of the tree should be well branched for healthy growth.
- Remove dead wood if necessary.

Additional recommendations

- Protect the tree trunks, crowns, or roots from construction in the future should this be necessary by talking to contractors, boarding up trees trunks, staying away from the root systems etc.
- Talk to lawn mowing contractors or maintenance staff to include them in the protection of the trees. The maintenance of the mulch circles around the trees prevents whipper snipping damage and keeps the lawn mowers from driving over the root system.

Name of Steward _____
Signature of Steward_____
Date_____
CARP Executive Director _____
Signature of Executive Director _____
Date_____

Appendix D. Example stewardship agreement for agricultural and forestry sites

Stewardship Agreement

I _____, hereby agree to support the Clean Annapolis River Project's 'Growing Ecological Health' project through my own actions and in partnership with CARP. As a steward of the land I agree to commit to preserving the ecological health of my property by protecting and maintaining the trees planted on my property to the best of my ability. I agree to follow the maintenance recommendations outlined below and in the personalized plan developed for my property.

Recommended actions include:

1. Agricultural reforestation and riparian restoration

The tree species used for agricultural planting are selected to compete with given site conditions but it will be helpful to support their establishment using the following actions:

☐ Wildlife protection (i.e. deer fencing to protect a group of trees, cages for single trees, tape around the terminal bud for hardwoods, wrapping against mice damage)

☐ Protection from live stock (fence off the area)

☐ Protection from machine damage (staking, talking to operators)

☐ Weeding to control the competition of grasses, cut tall plants like golden rod, and invasive species like multiflora roses

Name of Steward _____

Signature of Steward_____

Date_____

CARP Executive Director _____

Signature of Executive Director _____

Date_____

Appendix G. List of scientific tree and shrub names used in this project

Deciduous trees and shrubs:

Sugar maple *(acer saccharum)*

Red maple *(acer rubrum)*

Silver maple *(acer saccharinum)*

White ash *(fraxinus americana)*

Black ash *(fraxinus nigra)*

Yellow birch *(betula alleghaniensis)*

White birch (*betula papyrifera)*

Gray birch *(betula populifolia)*

Red oak *(quercus rubra)*

Mountain ash *(sorbus americana)*

Iron wood *(ostrya virginiana)*

Elder berry *(sambucus canadensis)*

Service berry *(amelanchier ccnadensis and laevis)*

Wild raisin *(viburnum cassanoides)*

Highbush cranberry *(viburnum ovatum)*

Red chokeberry *(aronia arbutifolia)*

Willow spec. *(salix spec.)*

Red osier dogwoods *(cornus sericea)*

Invasive species:

Glossy buckthorn *(rhamnus frangula)*

Multiflora rose *(rosa multiflora)*

Conifers:

Tamarack *(larix laricina)* (this is deciduous but a conifer)

White spruce *(picea glauca)*

Black spruce *(picea mariana)*

Red spruce *(picea rubens)*

Norway spruce *(picea abies)*

Balsam fir *(abies balsamea)*

White pine *(pinus strobus)*

Red pine *(pinus resinosa)*

Appendix H. List of Nurseries

List of nurseries where trees were purchased from:

Strathlorne Forest Nursery, Department of Natural Resources, P.O. Box 489, Inverness, Nova Scotia

Conifer seedlings (white spruce, red spruce, black spruce, red pine, white pine)

Baldwin's Nurseries, 500 Mines Rd, Falmouth, Nova Scotia, Hwy, Exit #7

Caliper trees, good selection of native species

Briar Patch Farm Nursery, 4568 Highway #1, Berwick, Nova Scotia, B0P 1E0

Caliper trees, good selection of native species