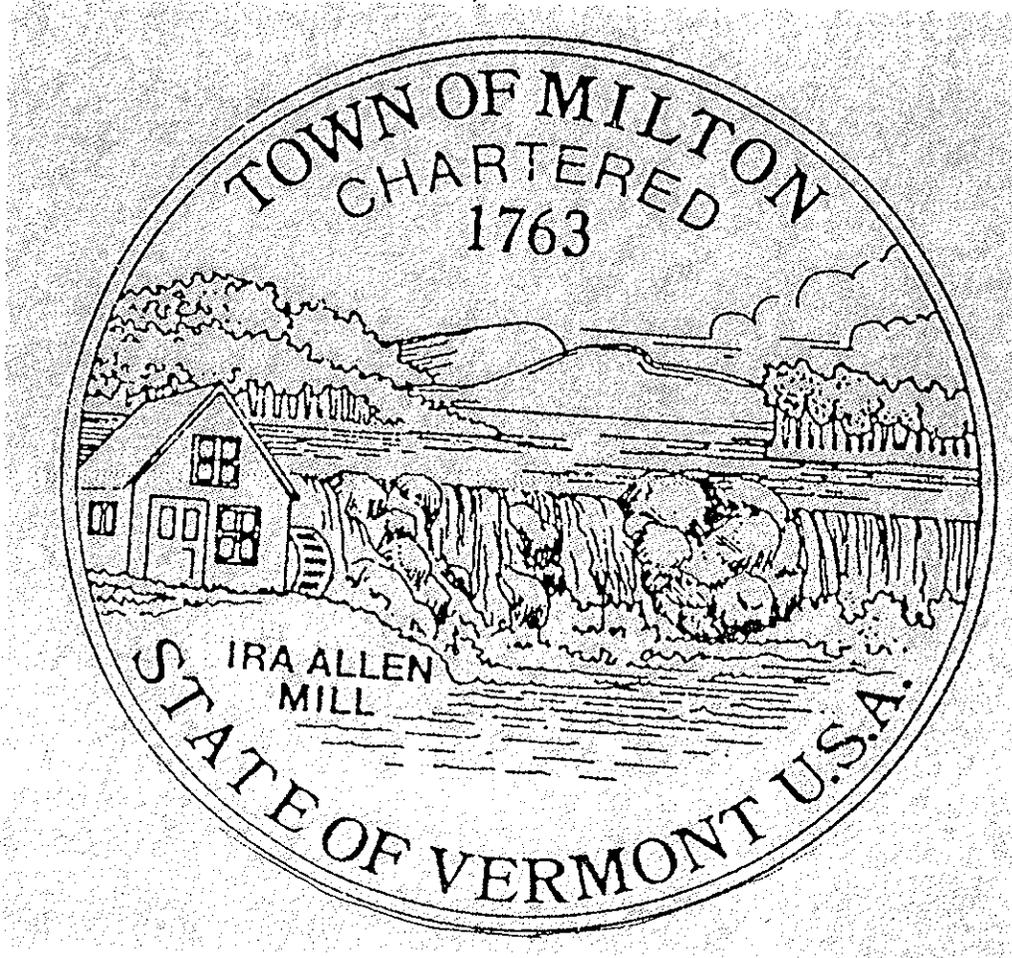


**TOWN  
of  
MILTON, VERMONT**



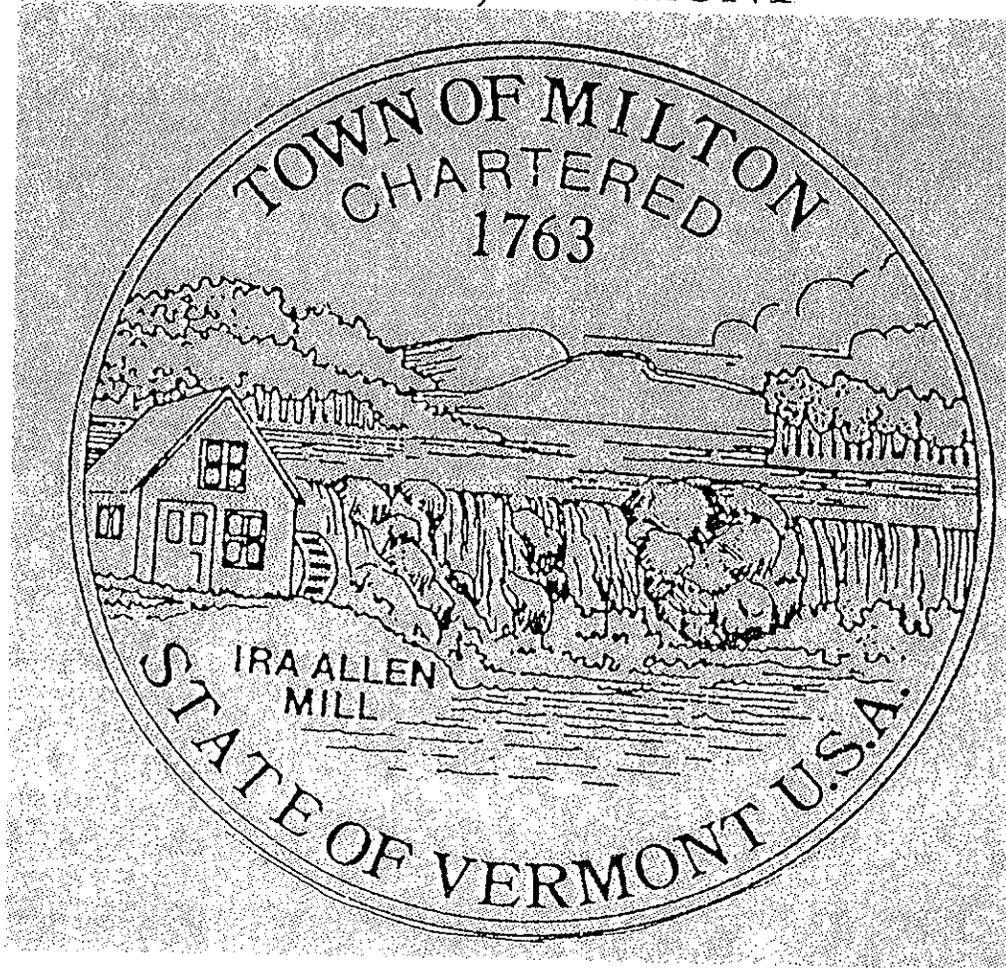
**BEST MANAGEMENT PRACTICES  
for  
STORMWATER CONTROL and  
WATERCOURSE BUFFERS**

September 2002

## Acknowledgements

The buffer information and methodology in this manual was developed with information from: "The Buffer Handbook", developed by Phoebe Hardesty, Androscoggin Valley Soil and Water Conservation District, and Cynthia Kuhns, Lake & Watershed Resources Management Associates, "Method to Identify Effective Riparian Buffer Widths for Atlantic Salmon", by Alan Haberstock *et al*, Journal of the American Water Resources Association, "Stormwater Facts" pamphlets by The Wisconsin Department of Natural Resources & University of Wisconsin-Extension, and "Riparian Buffer Procedure" State of Vermont, Agency of Natural Resources.

**TOWN  
of  
MILTON, VERMONT**



**BEST MANAGEMENT PRACTICES  
for  
STORMWATER CONTROL and  
WATERCOURSE BUFFERS**

September 2002

**A note from the Town Engineer:**

This document has been written to educate and give information to the citizens of the Town of Milton for use on their property or lot to reduce and in some cases eliminate impacts to the water quality of the lakes, ponds, streams and wetlands within the Town caused by stormwater and changing land use.

The stormwater BMPs are for homeowners and their projects that typically do not get the oversight and review of a large project that must meet State and Federal permits requirements. All the information within this BMP manual is voluntary for the individual homeowner but if used in your project will improve and protect the water quality though out the Town for future Town generations.

These stormwater BMPs can be used as a starting point for developers but do not offer the detail or options required for the stormwater treatment needs of larger projects. For projects involving one acre or more of impervious surface and/or five acres or more of land disturbance, please refer to the Town of Milton Public Works Specifications.

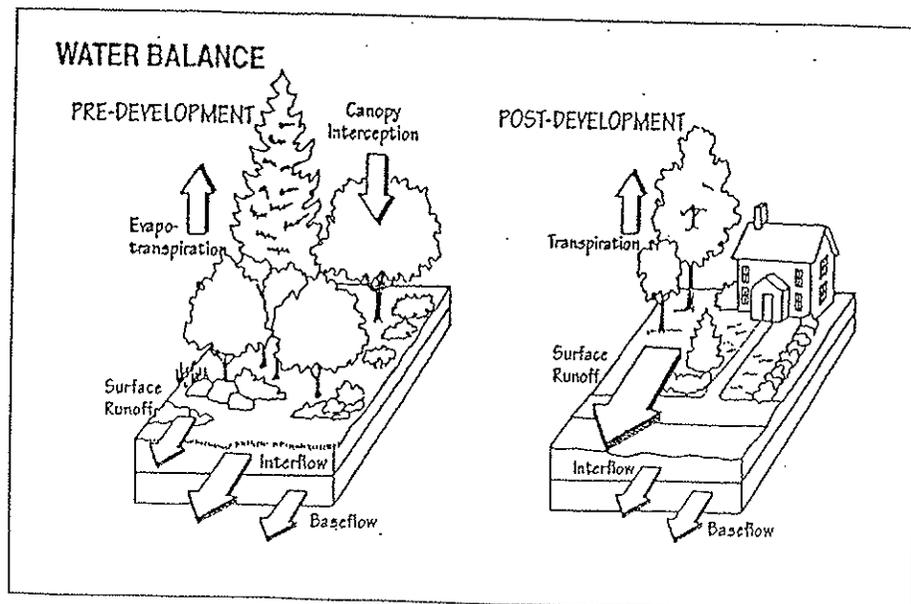
The buffer methodology can be used by developers, contractors and homeowners to develop water course buffers within the Town of Milton.

There is a companion document on Erosion and Sediment Control BMPs available from the Town Public Works Department.

**STORMWATER in GENERAL****What is stormwater?**

Stormwater is the rain and melting snow that flows off streets, parking areas, roofs, lawns, farm and forest lands. While this is a natural occurrence it is also can be a problem. Figure 1 shows the relationship of pre-development to post-development surface runoff and infiltration.

Figure 1:  
Water Balance



Water Balance at a Developed and Undeveloped Site  
(Schueler, 1987)

**What are stormwater pollutants?**

**Sediment:** Sediment is soil and earth particles that are transported by stormwater from exposed soil, roadways, construction sites and farm fields into lakes and streams. This sediment makes the water cloudy (turbid). Over time this sediment settles out of the water and fills in the lake and stream bed.

**Phosphorus and other fertilizers:** Phosphorus and other fertilizers are nutrients that quite often can become attached to soil particles. The increase of phosphorus and other fertilizers in water courses and lakes can increase the growth of algae and aquatic weeds. This increase of growth can degrade water quality and impact swimming, fishing boating and other water uses.

**Micro-organism:** Micro-organism, i.e. bacteria, viruses and other pathogens (disease causing organism) impact water courses by closing beaches, causing swimmers itch and reducing other recreational uses of our waterways. Fecal coliform is a good example. Some organisms like Cryptosporidium are very difficult to remove through water treatment and can endanger people lives.

**Pesticides:** Pesticides (insecticides and herbicides) have been detected in urban and suburban stream flows at concentrations that approach or exceed toxicity levels for aquatic life.

**Toxic Chemicals:** Motor oil, gasoline additives, trace metals (cadmium copper, lead and zinc) all can be found in stormwater runoff and have negative impacts on water quality of the receiving waters. Motor oils and other hydrocarbons can be toxic to aquatic life even at low concentrations. Trace metals can be toxic to aquatic life and can also accumulate in lake bottom sediment. Some of these chemicals can bio-accumulate in fish and macro-invertebrates impacting the entire food chain.

**Thermal Impacts:** The temperature of stormwater can be raised by running on sun heated impervious surface like roadways and roofs. These thermal impacts can raise the water temperature of the receiving waters. These temperature increases can seriously impact aquatic life that live in cool and cold waters.

**Trash and debris:** Much of the trash and debris that collect in our local waterways have come there from stormwater runoff. This is unsightly and detracts from the natural beauty of the water course.

## STORMWATER &amp; BUFFER BMPS'

Type 2 watersheds are the brooks and streams that are third order streams. The three third order streams drain into the following one directly into Lake Champlain, one into Malletts Bay and the last into the Lamoille River. The three type 2 watersheds are:

1. Allen Brook Watershed – drains into Malletts Bay
2. Trout Brook Watershed – drains directly into Lake Champlain
3. Street Brook Watershed – drains into the Lamoille River

Type 3 watersheds are brooks and streams that are fourth order streams. There are two type 3 watersheds and they drain into Lake Champlain directly or into Malletts Bay. The two type 3 watersheds are:

1. Malletts Creek Watershed – drains into Malletts Bay
2. Stone Bridge Brook Watershed – drains directly into Lake Champlain.

These are shown in the Town of Milton Watersheds map located in the appendix.

### What is the potential stormwater impact to these Milton Watersheds?

The impacts caused by stormwater to the watersheds can be rated as high, medium and low. These ratings are based the level of past, current and future development and land changes within these watersheds. These ratings are not to stop or slow development but to show where the citizens of Milton must take some care to protect the environment while allowing the Town to grow.

Table 1

Stormwater Impact Priority Rating	Definition
HIGH	A high stormwater impact is a town growth area or is all ready substantially developed. Watershed impervious surface greater than 30% or the watershed is all ready negative impacts. (note problem may not be within Milton but down stream of)
MEDIUM	A medium stormwater impact is an area showing moderate growth and with past development with limited stormwater control. Watershed impervious surface area no greater 30% than and no less than 10%
LOW	Low stormwater impacts are areas with slower growth, large lot size, and large areas of protected lands. Watershed impervious surface is generally less than 10%
Low to Medium or Medium to High	These watersheds are transitional in nature over time and development.

## STORMWATER &amp; BUFFER BMPS'

Infiltration Swales and Basins: Infiltration swales and basin are shallow grass lined swales and basins that are used to collect stormwater and allow infiltration of stormwater into the surrounding soils. These can also be depressions located in your yard that after a storm allow surface waters storm drain to. These typically are used along driveway and at end of parking lots.

Sizing of stormwater BMPs for homeowners and small lots:

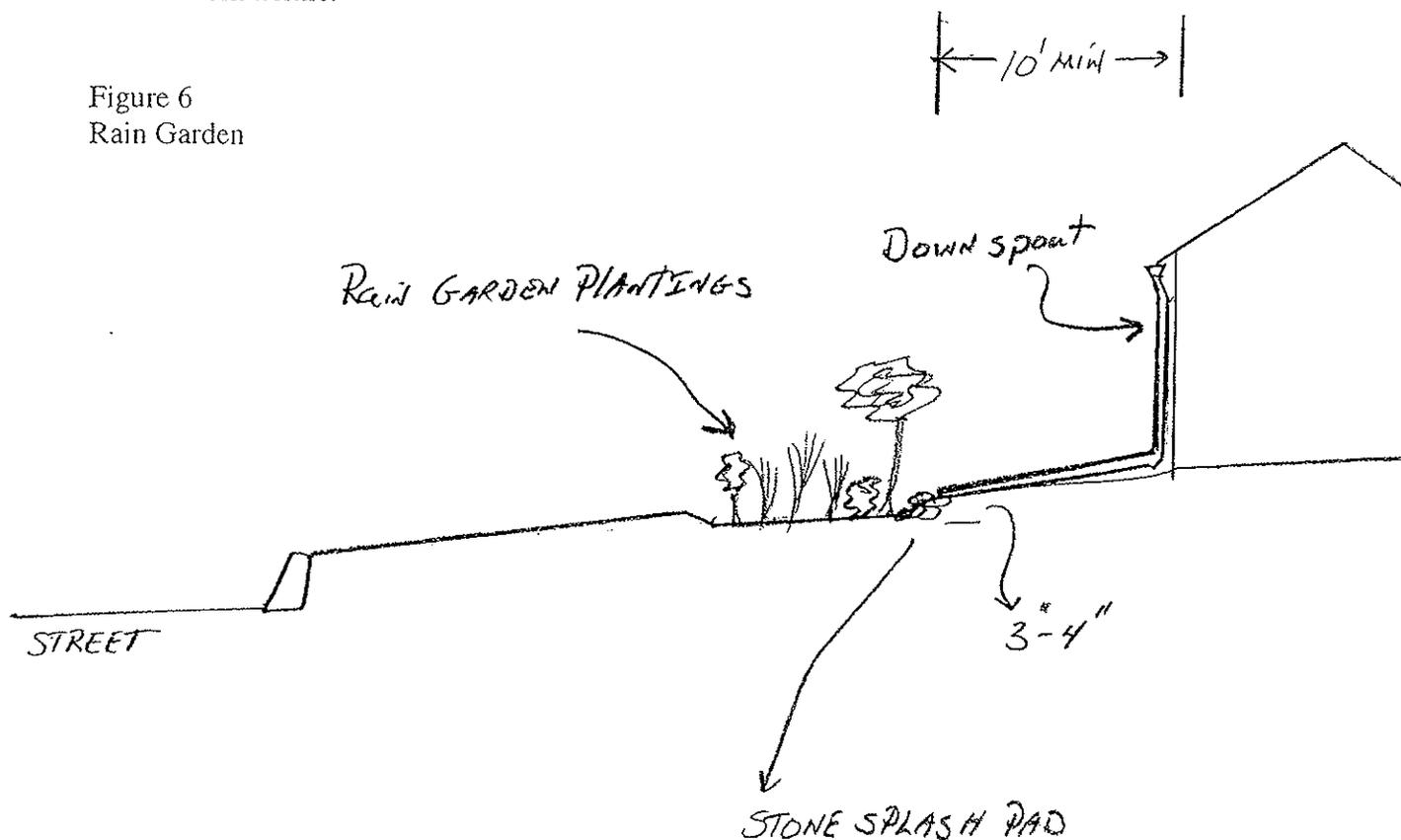
- Perfect: 1 square foot BMP for 1 square foot impervious surface
- Near Perfect  $\frac{3}{4}$  square foot BMP for 1 square foot impervious surface
- Very Good  $\frac{1}{2}$  square foot BMP for 1 square foot impervious surface
- Good  $\frac{1}{4}$  square foot BMP for 1 foot impervious surface
- It Helps any thing less than  $\frac{1}{4}$  square foot BMP for 1 foot impervious surface.

NOTE: Infiltration practice work best in SCS Soil groups A and B. This information can be found in the Appendix under Soils Maps for Milton. DO NOT use infiltration practices in D soils.

## Constructing a Rain Garden

1. Step 1 is to size your Rain Garden. Find out the impervious area of area Rain Garden will serve and size Rain Garden to fit your yard. See sizing above.
2. Step 2 locate your Rain Garden when you can get the stormwater into the garden by rain gutter down spout or a shallow swale.
3. Step 3 layouts the shape of your Rain Garden, use a rope to layout boundary if you want any shape other than a square shape. Use lime, lawn edging, non-toxic paint to mark out the outer boundary set by rope if need be.
4. Step 4 dig out interior of Rain Garden remembering to make it 3 to 4 inches lower that the surrounding lawn and as level across the bottom as possible. With the sides tapered to allow the stormwater to flowing into the Rain Garden.
5. Step 5 plant your Rain Garden with the native plants that you have chosen.
6. Step 6 make sure that the water you plan to going to the Rain Garden does so.
7. Step 7 enjoy the Rain Garden remembering that you are helping solve water quality problems, offering food and habitat for birds and other animals and lessening your yard work a little.

Figure 6  
Rain Garden



STORMWATER & BUFFER BMPS'

- 6. Step 6 put in a minimum of 2 to 3 inches of top soil and smooth, then seed and mulch.

Figure 7A  
Plan View  
Infiltration Swale

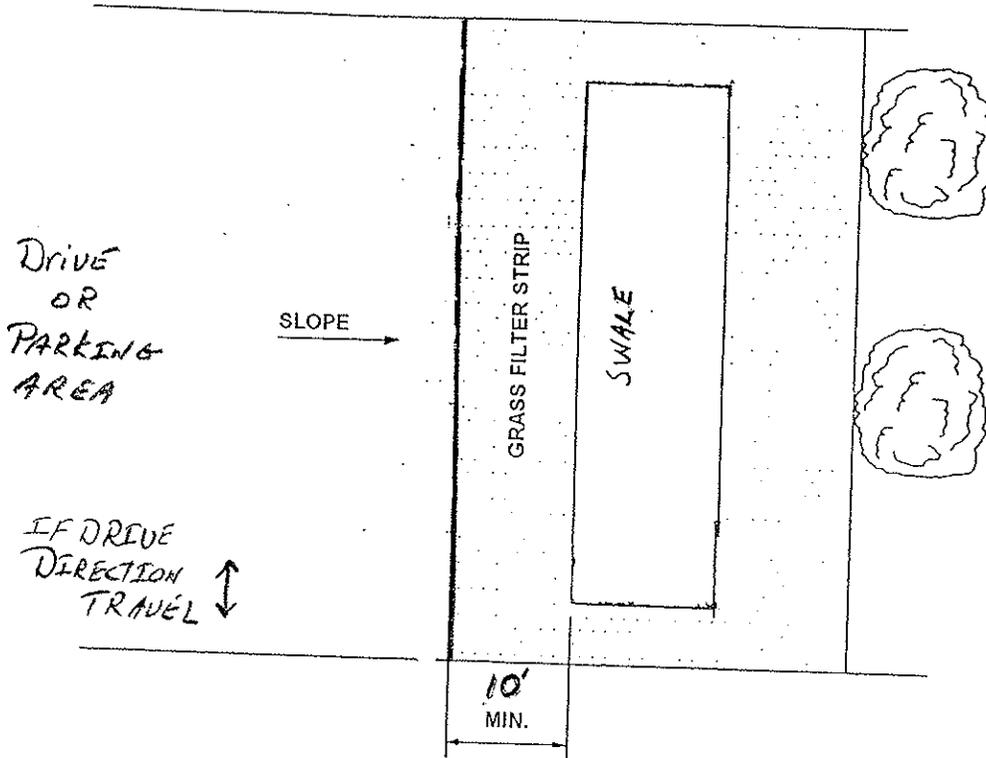


Figure 7B.  
Side View  
Infiltration Area

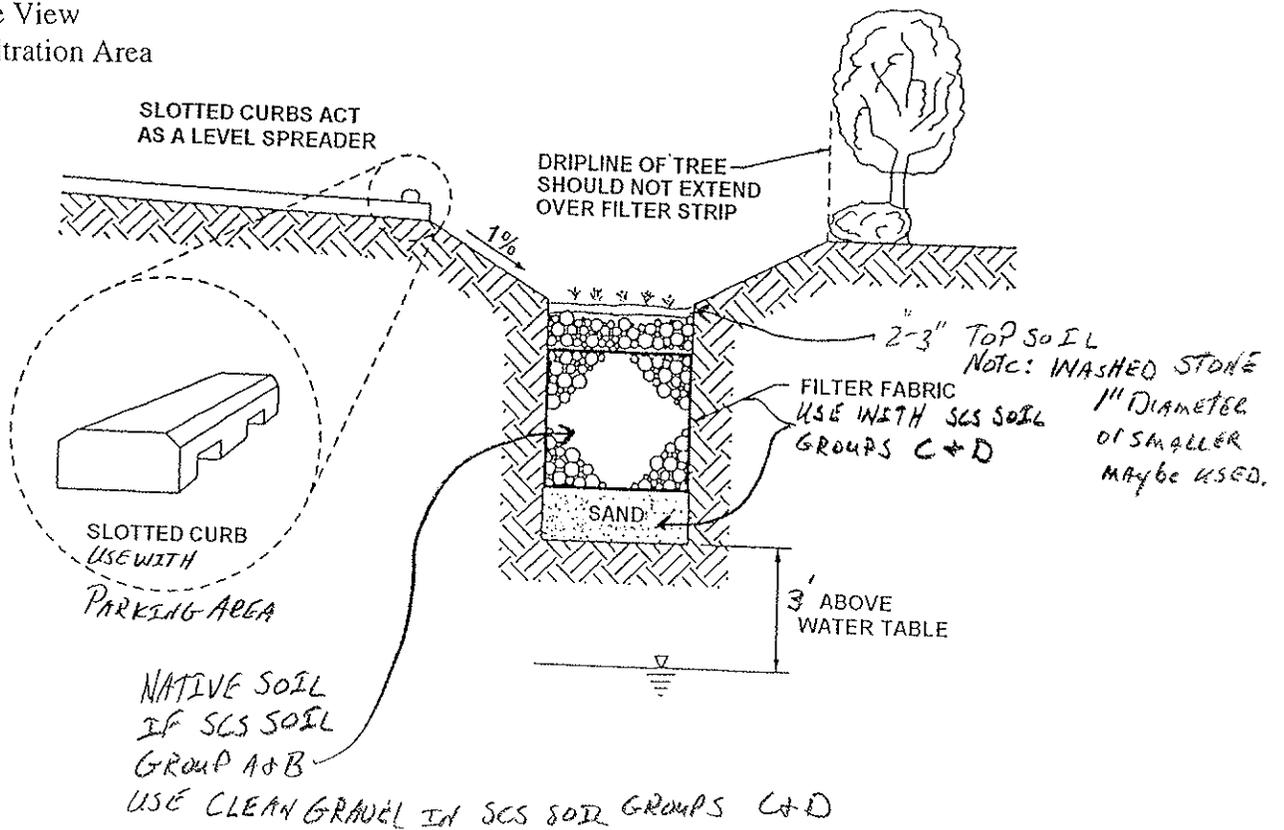
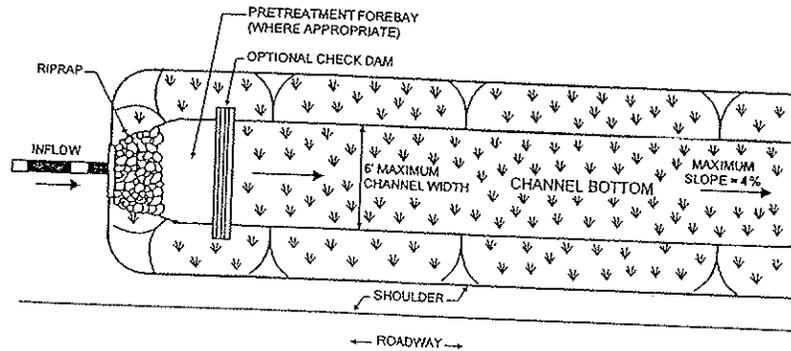
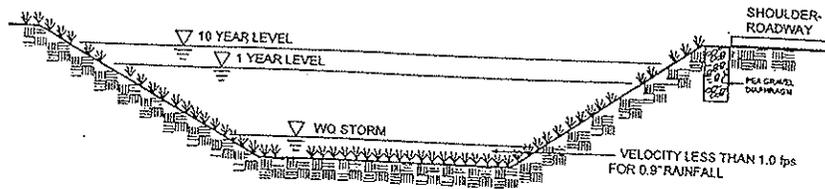


Figure 8  
Grass-lined open channel or swale

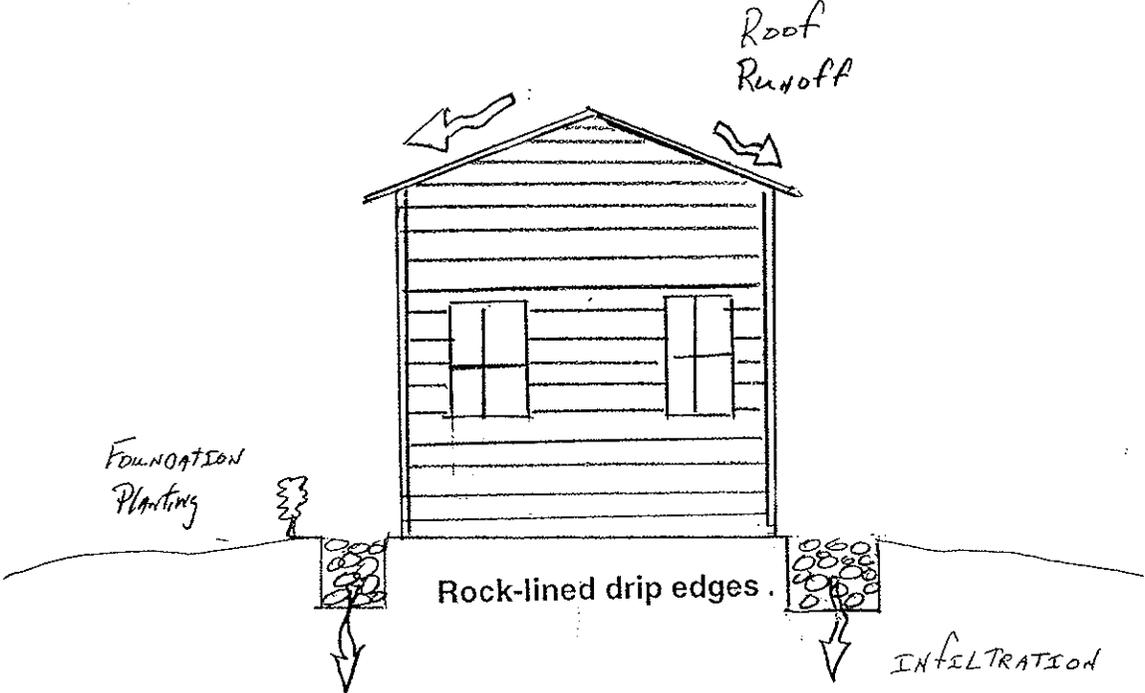


PLAN VIEW



SECTION

Figure 9  
Stone-lined Drip Edge



## STORMWATER &amp; BUFFER BMPS'

**Elements of a good buffer**

The effectiveness of a vegetated buffer is its location between the developed area of the property and the water course or water body being protected. Paths that wind down to the water front made of stable, non-erodible material. Undisturbed natural features like uneven ground surfaces cause by hammocks and depressions, a deep forest duff and as deep as possible buffer and spanning the entire length of the developed area.

**“A good buffer should have several vegetative layers and a variety of plants to maximize the benefit of each type”** ‘The Buffer Handbook’ Phoebe Hardesty *et al*, Androscoggin Valley Soil and Water District.

**Trees.....** Both evergreens and deciduous trees, break up rain and wind impacts, slow flood water flows in over bank situations, provide shade and wildlife habitat and are long lived. The trees root systems absorb water and nutrients while stabilizing banks and slopes with their root.

**Shrubs.....** Both flowering and non-flowering break up rain and wind impacts, provide shade, add to aesthetic and intrinsic values, food and shelter habitat for small animals and birds, slow flood water, and root systems absorb water and nutrients while stabilizing banks and slopes with their root.

**Groundcovers.....** These are vines, grasses native and ornamental, flowers, herbs and wood plants all slow down surface flows, absorb nutrients and water, trap sediment and organic debris and stabilizes soil with their shallow root systems. Ground covers also add to the aesthetic and intrinsic values of the buffer and increasing wildlife and bird habitat by offering protection and food sources.

**Duff layer.....** This is the accumulated leaves, pine needles and other plant matter on the forest floor. This layer absorbs water, traps sediment; slow surface water runoff velocities preventing erosion and the microorganisms that break down plant material and recycle nutrients live in the duff.

## STORMWATER &amp; BUFFER BMPS'

**Degree of slope:** The slope of your lot will have a direct impact on the required width of a buffer and the impact water has on your lot. Steep lots require a wider buffer and are the most sensitive to water's erosive impact requiring plants with a wide variety of root types to slow the water, filter the pollution and stop erosion. Flatter lots will require smaller buffers.

**Exposure:** Does your lot receive high winds because it faces west or northwest, or does your lot face south and is therefore warmer? Is your lot on a point of land or partially protected by a hill? By taking the time to consider your lot's exposure you can select appropriate plants for your lot and create a design that can provide shade on summer days and protect the house from cold winter winds lowering your heating cost.

**Sunlight:** As exposure impacts what plants that are appropriate for your lot so does the amount of sunlight your lot receives. Do you have a shady lot or is it sunny all day long? By watching the shadows caused by neighboring trees and buildings or those on your lot as the sun crosses the sky, locating the areas of deep shade and direct sun. You will be able to choose the appropriate plants for the conditions on your lot.

**Plant Zones:** The Town of Milton typically in Plant Hardiness Zone 4 will also have microclimates depending if you live by the lake or up on Hardscrabble Road. So choose plants that will do well on your lot and the climate it has.

**Other Conservation Practices:** Here are two practices that will help you stabilize areas of minor to moderate erosion on your property and complement your buffers.

**Rock-lined drip edges:** Beneath the roof drip line of your home construct a stone lined infiltration trench. Dig a trench typically 12 to 18 inches wide by 8 to 12 inches deep and then filled with ¾-inch stone. If you have clay soil or other heavily-compacted soils, a 2-inch layer of sand should be placed prior to the stone layer. This will allow rainwater off your roof to collect and infiltrate back into the soil. This stone drip trench will also save you money by protecting the building wood finish from splashing water damage and can prevent damage to your foundation plantings. See stormwater section for how to construct

**Stabilized pathways:** The pathways you use to walk to the garden, down to the lake or stream can be a source of soil erosion and sediment. To reduce this from occurring stabilize your paths with a 2-inch layer of bark mulch or wood chips remembering to reapply every couple of years as the mulch or chips decomposes. Built hard paths by using stones, bricks, cement tiles or slate in a matrix of mulch, wood chips, crushed stone or grass planted paths with a turf grass that will take the abuse of being walked on. You can also build boardwalks especially good in wet areas. No matter what path type remember a winding path will help stop water from developing channels in the path which increases erosion.

## STORMWATER &amp; BUFFER BMPS'

An enhanced buffer is when a natural buffer all ready in existence is planted with a few desirable plants to further fill in and enhance the functions of the buffer. The plants typically used are to shrubs, herbaceous plants and groundcovers. These shorter plants keep the property owners view of the water open but allow the buffer to function to protect the water course. There is only a moderate commitment of time and money to enhance a buffer. The advantages of this option are that the property owner has more choices on plant species and the buffer becomes established quicker. Remember to chose native plants for your plantings when ever possible. Native plants are appropriate for our regional climate, have significant wildlife value and one-third of the plants native to New England are endangered.

A landscaped buffer is the most expensive type of buffer to develop but it will also take the least time to become established and you have absolute control of the design and look of the finished product. The property owner can spread the development of the buffer out over time to save cost. The best way to install is to stop mowing between the buffer area and the shore and build the buffer on the landward side of the no mow strip.

Or, mix and match these combinations to accommodate your needs.

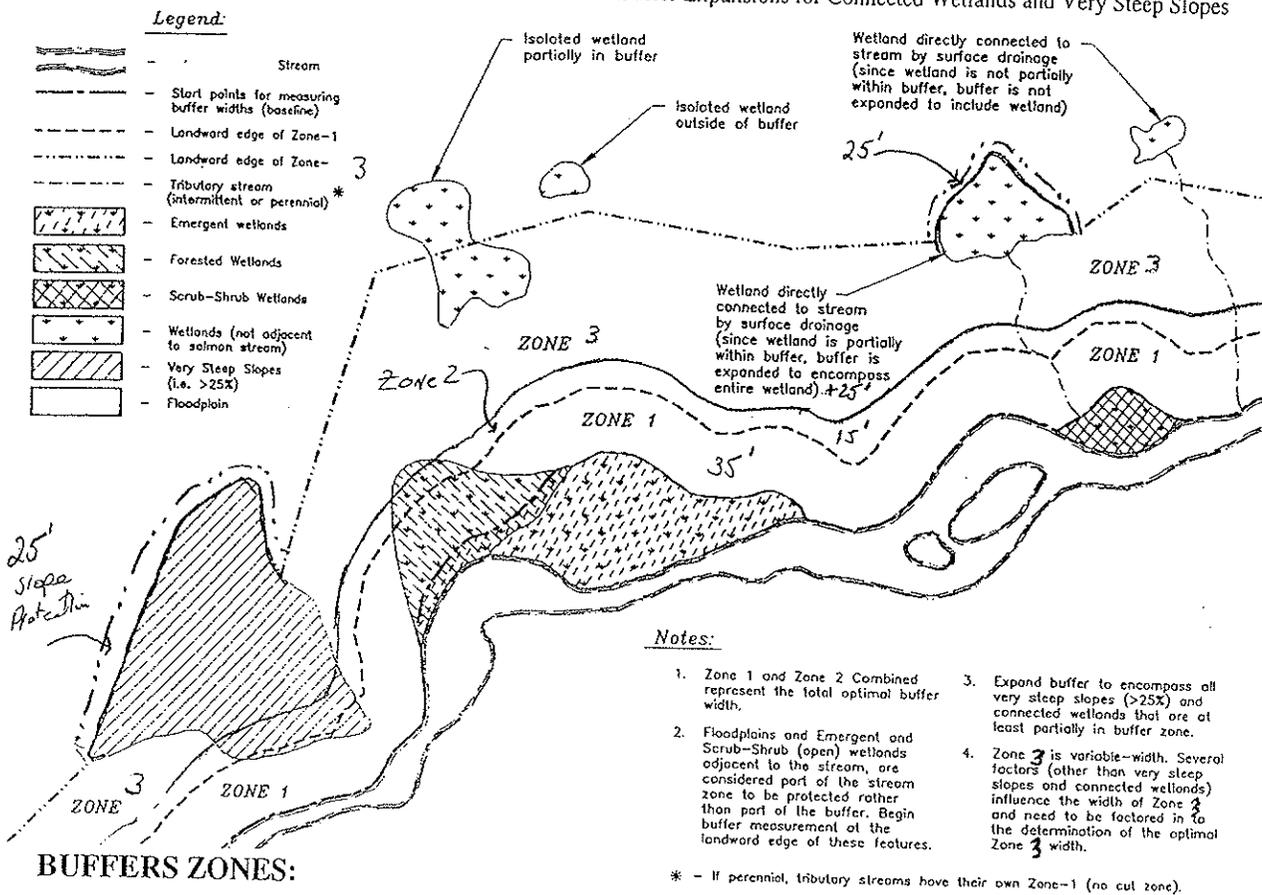
The most important decision to make is to do a buffer to protect Milton's watercourses and get started.

**SUM UP**

- 1) **Survey your lot or property** for stormwater runoff locations
- 2) **Develop a sketch plan** of your lot drawn to scale preferably include your house, out buildings, driveway, recreation area, paths to shore and erosion problem areas. Include landscape and topography features such as slopes, existing vegetation stone walls, ledge out crops wet and dry areas. Make note of your lot's orientation (N-S-E-W) make a note of where shadows are cast by buildings and trees.
- 3) **List your objectives** for the project. Examples might be: adding vegetation near shoreline or water course, stabilizing pathways, directing traffic to a single access point, catching roof runoff and driveways and the degree of maintenance for project. Select an approach best-suited to meet your objectives.
- 4) **Implement your plan!** The work you do now will prevent erosion, reduce water quality problems and enhance the value of your property.

Now if you want to develop a more comprehensive buffer please use the following buffer methodology.

Figure 11: Baseline for Buffer Width Measurements and Buffer Expansions for Connected Wetlands and Very Steep Slopes



**BUFFERS ZONES:**

The buffers for water quality protection within the Town of Milton comprises of four zones.

**WATER COURSE (STREAM) ZONE:**

The water course zone is the zone that that denotes the area that is being protected. This zone comprises of the water course and is to include all Floodplains and Emergent and Scrub-Shrub wetlands. Begin buffer measurements at the landward edge of this zone.

**ZONE 1:**

Zone 1 is the undisturbed zone and has a width of 35-feet. There can be no disturbance of forest land or any vegetation within this zone or extremely limited impact such as vista openings and water access paths. This zone in agriculture areas should be a no plow/plant zone with a 35-foot permanent grass cover that can be mowed and a minimum 15-foot no disturb zone between the water course and mowed strip.

**ZONE 2:**

Zone 2 is limited a use zone and is 15-feet wide. This zone can be lawn or other perennial vegetative cover and can not have any structures or other devices located within it.

## STORMWATER &amp; BUFFER BMPS'

5. Using resources maps find unadjusted buffer width for Zone 3 for site soil conditions, slope and forest canopy cover fill out Table 4, Buffer Calculation Sheet. For adjustments to Zone 3 use Table 3 to find information on very steep slopes, attached wetlands, springs and seepages. Field work will confirm office work and allow the observation of the sites surface roughness, spring and seepages, attached wetlands and steep slopes to confirm office data.
6. Fill information found in step 5 into Table 4 Buffer Calculation Sheet.
7. Sum up Zone 3 buffer width adjustment column. Use the sum of the Zone 3 buffer width adjustment column and measure landward from the edge of the Zone 2 buffer using the Zone 3 buffer width. Place this number on the Buffer Data sheet and submit with design plans.

## STORMWATER &amp; BUFFER BMPS'

TABLE 3: Zone 3 Adjustment factors

Slope	Adjustment Factor	Slope	Adjustment Factor	Slope	Adjustment Factor	Slope	Adjustment Factor
0-8%		8-15%		8-25%		> 25%	
Hydrologic Group A & B Soils		Hydrologic Group A & B Soils		Hydrologic Group A & B Soils			Included within buffer + 35 ft out from bank face.
76-100% canopy	50 ft	76-100% canopy	60 ft	76-100% canopy	80 ft		
51-75% canopy	50 ft	51-75% canopy	70 ft	51-75% canopy	90 ft		
26-50% canopy	50 ft	26-50% canopy	80 ft	26-50% canopy	100 ft		
0-25% canopy	50 ft	0-25% canopy	90 ft	0-25% canopy	110 ft		
Hydrologic Group C Soils		Hydrologic Group C Soils		Hydrologic Group C Soils			Included within buffer + 35 ft out from bank face.
76-100% canopy	50 ft	76-100% canopy	80 ft	76-100% canopy	100 ft		
51-75% canopy	50 ft	51-75% canopy	90 ft	51-75% canopy	110 ft		
26-50% canopy	60 ft	26-50% canopy	100 ft	26-50% canopy	120 ft		
0-25% canopy	70 ft	0-25% canopy	110 ft	0-25% canopy	130 ft		
Hydrologic Group D Soils		Hydrologic Group D Soils		Hydrologic Group D Soils			Included within buffer + 35 ft out from bank face.
76-100% canopy	60 ft	76-100% canopy	100 ft	76-100% canopy	120 ft		
51-75% canopy	70 ft	51-75% canopy	110 ft	51-75% canopy	130 ft		
26-50% canopy	80 ft	26-50% canopy	120 ft	26-50% canopy	140 ft		
0-25% canopy	90 ft	0-25% canopy	130 ft	0-25% canopy	150 ft		

STORMWATER & BUFFER BMPS'

Figure 12: Procedure for Determining a Continuous Buffer Width Line Over An Entire Evaluation Area

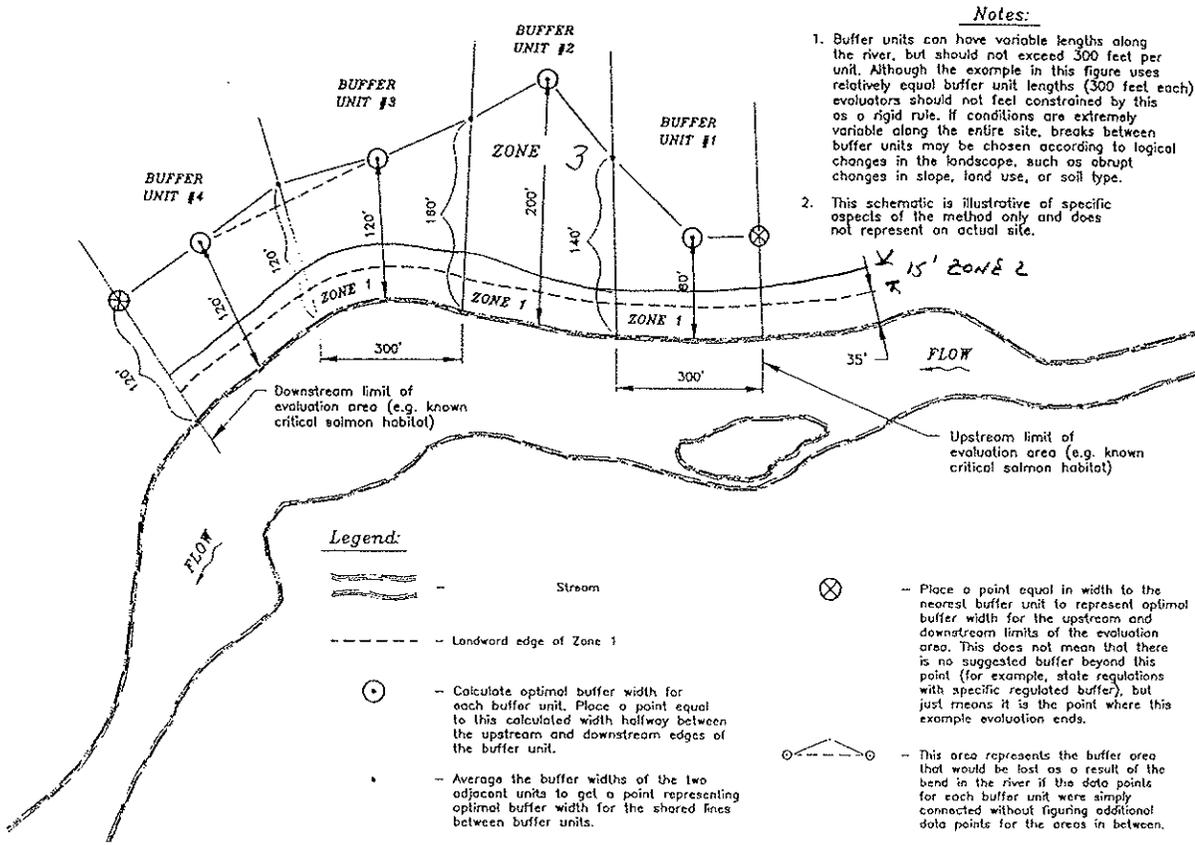
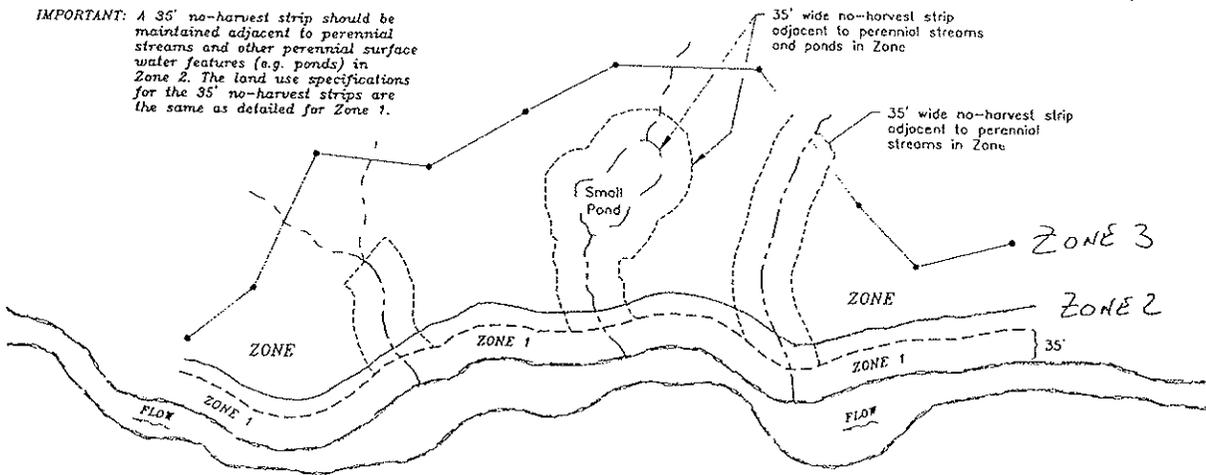


Figure 13: Forestry No Harvest Strips and Land Use Specifications



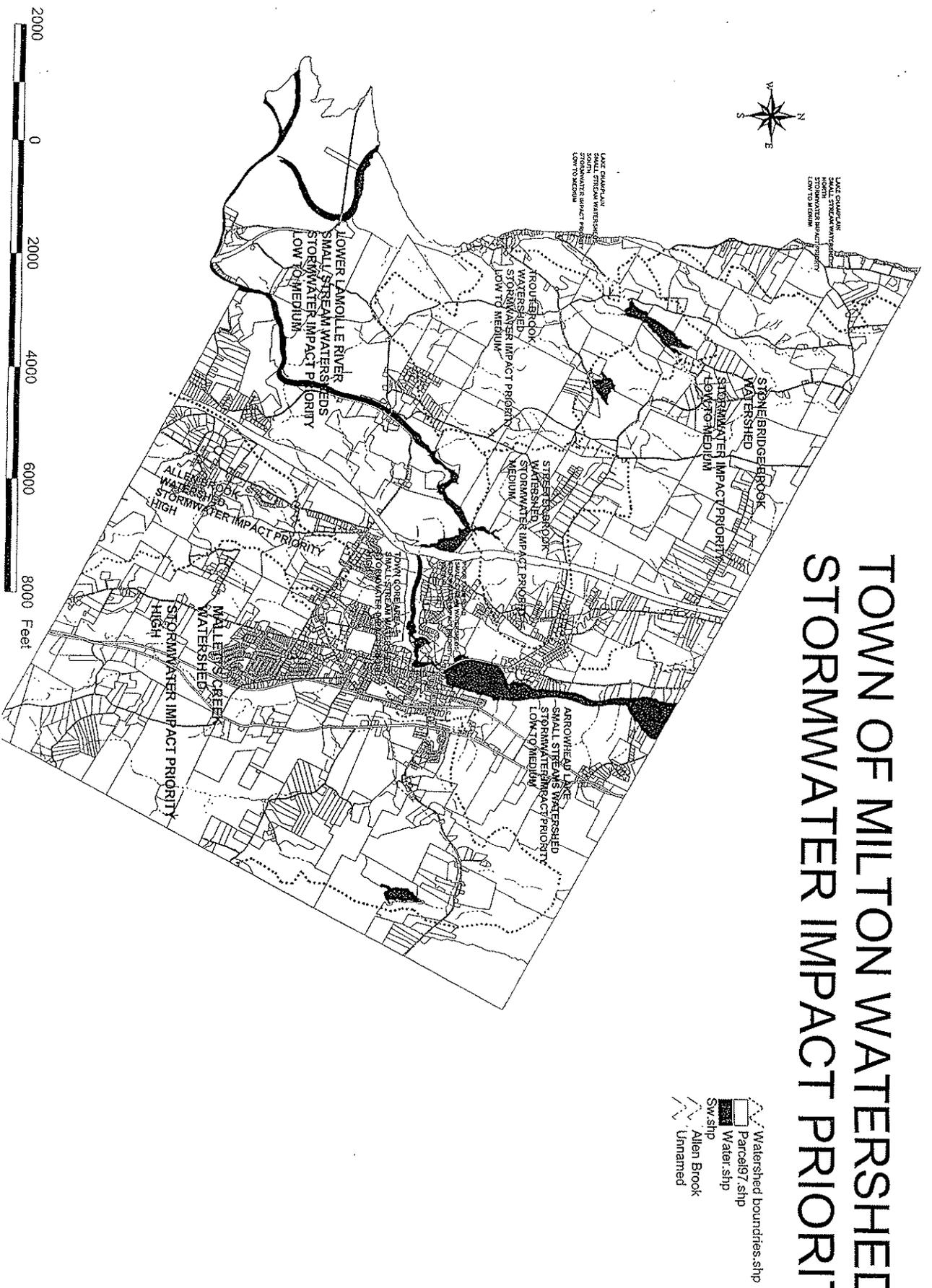
**APPENDIX**

**STORMWATER IMPACTED WATERS  
TOWN OF MILTON**

**APPENDIX B**

**STORMWATER IMPACTED WATERS  
TOWN OF MILTON**

# TOWN OF MILTON WATERSHEDS STORMWATER IMPACT PRIORITY



## STORMWATER &amp; BUFFER BMPS'

**Town Core Small Streams Watersheds:** The Town Core Small Stream watersheds comprises of all the small streams that flow into the Lamoille River from East of the I-89 Interstate, north of West Milton Road and US RT 7 to the northern limit of the Village of Milton boundary on the eastern shore of Arrowhead Lake. This area is currently a large portion of the existing Milton down town and encompasses the new town growth areas. The watershed is comprised of the a majority of the M4-Checkerberry Zoning District, R1-old Towne Residential, M-5 Old Town Residential/Commercial, all of the M6 Main Street, I1-Light Industrial and M2-MCMP West Zoning Districts. The densities within these zoning range from a low 15% of to a high of 70%.

The potential stormwater impact caused by development to these watersheds is high. This high potential is also the current impact because this area is all ready has a large impervious area and having been rezoned to even greater lot density will increase the potential impact.

This area being currently built up makes lessening the potential impacts from stormwater more challenging. These priory developed areas typically handled stormwater by moving it away from the impervious areas as fast as possible. In the redevelopment and infill of theses areas to event greater density on of the goals should be to lessen the specific sites stormwater runoff while increasing the areas density. The other major goal should be to improve the existing stormwater infrastructure to improve the stormwater quality passing through the system.

The handling of stormwater in these area requires cooperation from developers, homeowners, and the Town to meet the negative impact potential from stormwater. The development of buffers, increase use of infiltration methods where applicable, use of off site infiltration and water quality and quantity systems where applicable, regular maintenance of the existing stormwater system, spring time street sweeping, erosion and sediment control during redevelopment all can have positive impacts to handling stormwater in this area.

**Arrowhead Lake Small Streams Watersheds:** The Arrowhead Lake small streams watersheds comprises of all the small streams that run into Arrowhead lake from approximately Quarry Lane north to the Georgia Town line and east to the Malletts Creek watershed boundary. The major development within some of these watersheds is Husky and the Cooper Road, Hidden Meadow and Quarry Lane residential areas. These watersheds are in the I3-Industrial Conservation, R-4 Transitional Residential and R5- Agricultural/Rural Residential zoning districts. The lot densities are within these zoning districts range from a low 15% of to a high of 40%.

The potential stormwater impact caused by development to these watersheds is low to medium. The small number of streams and the currently limited impact to these areas caused by development make the current impact low to medium. The area is zoned for controlled growth with the majority of the watersheds being easily protected and with lot coverage limited to 15% of lot all work to lessen the impact of stormwater. The medium impact is do to the potential change of the watersheds major land use of agriculture to other uses (business and homes) that increase the impervious surfaces offer the majority of the threat.

The strong use of buffers between any water course and development, the development of open space set a sides, low lot density (15% coverage maximum) for the majority of the watersheds, the use of erosion and sediment control plans during construction and wide use of infiltration practices where applicable water quantity and quality control will all limit negative stormwater impacts.

**Streeter Brook Watershed:** The Streeter Brook Watershed is bound by approximately Lake Road to the North, Poor Farm Road to the east and approximately Mears Road to the west. The watershed is comprised of two zoning districts R5- Agriculture/ Residential and R2-Medium Density Residential. The developments located within the watershed are Slim Brown Road area, Streeter Brook Road area and Sheldon Road area. The lot densities are within these zoning districts is 15%.

The potential stormwater impact caused by development is medium. This is because of part of the watershed has been developed and there is still developable lands within the watershed.

The use of and development of buffers, erosion and sediment control plans and infiltration of stormwater during lot redevelopments while managing post-development of stormwater flow to match pre-development conditions will mitigate the impacts of development on stormwater in these watersheds.

**Trout Brook Watershed:** The Trout Brook watershed comprises of approximately the area enclosed by Bebee Hill Road on the west, Long Pond Drive and Everest Road on the north and Mears Road, Sanderson Rod and Bear Trap Road to the east and the first mile of Caderact Road off Bear Trap to the south. The major zoning district of the watershed is R5-Agriculture with the balance in R6-Shoreland Residential. The lot densities are within these zoning districts range from a low 15% of to a high of 25%.

The potential stormwater impact caused by development is low to medium. This is because of the large areas of developable lands of this watersheds are in protection due to farming or other conservation easements and the low lot coverage density allowed. The goal for these areas is to maintain the low potential stormwater impacts by maintaining and developing buffers when applicable

The use of and development of buffers, erosion and sediment control plans and infiltration of stormwater during lot redevelopments while managing post-development of stormwater flow to match pre-development conditions will mitigate the impacts of development on stormwater in these watersheds.

**APPENDIX C**

**SOIL TYPES AND LOCTATIONS  
TOWN OF MILTON**

Table 5 Continue

MAP SYMBOL	DESCRIPTION	SLOPE	HYDROLOIC GROUP	Depth to Bedrock feet	Depth to Seasonal High water Table feet
EwA	Enosburg & Whately Souls	0 to 3 %	C	5 +	½ - 1
EwB	Enosburg & Whately Souls	3 to 8 %	C	5 +	½ - 1
FaC	Farmington extremely rocky loam	5 to 20 %	C	1 - 1 1/2	4+
FaE	Farmington extremely rocky loam	20 to 60 %	C	1 - 1 1/2	4+
FsB	Farmington- Stockbridge rocky loams	5 to 12 %	C	1 - 1 1/2	4+
FsC	Farmington- Stockbridge rocky loams	12 to 20 %	C	1 - 1 1/2	4+
FsE	Farmington- Stockbridge rocky loams	20 to 60 %	C	1 - 1 1/2	4+
Fu	Fill Land				
Fw	Fresh Water marsh		D		
GeB	Georgia stony loam	3 to 8 %	B	5+	1 - 2
GeC	Georgia stony loam	8 to 15 %	B	5+	1 - 2
GgC	Georgia extremely stony loam	0 to 15 %	B	5+	1 - 2
GgE	Georgia extremely stony loam	15 to 60 %	B	5+	1 - 2
GrA	Groton gravelly fine sandy loam	0 to 5 %	A	4+	4+
GrB	Groton gravelly fine sandy loam	5 to 12 %	A	4+	4+
GrC	Groton gravelly fine sandy loam	12 to 20 %	A	4+	4+
GrD	Groton gravelly fine sandy loam	20 to 30 %	A	4+	4+
GrE	Groton gravelly fine sandy loam	30 to 60 %	A	4+	4+
Hf	Hadley very fine sandy loam		B	5+	0 - 3
Hh	Hadley very fine sandy loam - frequently flooded		B	5+	0 - 3
H1B	Hartland fine sandy loam	2 to 6 %	B	5+	3+
H1C	Hartland fine sandy loam	6 to 12 %	B	5+	3+
H1D	Hartland fine sandy loam	12 to 25 %	B	5+	3+
H1E	Hartland fine sandy loam	25 to 60 %	B	5+	3+
HnA	Hinesburg fine sandy loam	0 to 3 %	B	5+	3-4+
HnB	Hinesburg fine sandy loam	3 to 8 %	B	5+	3-4+
HnC	Hinesburg fine sandy loam	8 to 15 %	B	5+	3-4+
HnD	Hinesburg fine sandy loam	15 to 25 %	B	5+	3-4+
HnE	Hinesburg fine sandy loam	25 to 60 %	B	5+	3-4+

Table 5 Continue:

MAP SYMBOL	DESCRIPTION	SLOPE	HYDROLOIC GROUP	Depth to Bedrock feet	Depth to Seasonal High water Table feet
PsC	Peru Extremely stony loam	0 to 20 %	A	5+	1-2
PsE	Peru Extremely stony loam	20 to 60%	A	5+	1-2
Qd	Quarry				
Rk	Rock Land				
ScA	Scantic silt loam	0 to 2 %	B	5	0-1
ScB	Scantic silt loam	2 to 6%	B	5	0-1
Sd	Scarboro Loam		B	5+	0- 1/2
StA	Stetson gravelly fine sandy loam	0 to 5%	B	4+	4+
StB	Stetson gravelly fine sandy loam	5 to 12%	B	4+	4+
StC	Stetson gravelly fine sandy loam	12 to 20%	B	4+	4+
SuB	Stockbridge and Nellis stony loams	3 to 8%%	A	5+	3-4
SuC	Stockbridge and Nellis stony loams	8 to 15%	A	5+	3-4
SuD	Stockbridge and Nellis stony loams	15 to 60%	A	5+	3-4
SxC	Stockbridge and Nellis extremely stony loams	3 to 15%	A	5+	3-4
SxE	Stockbridge and Nellis extremely stony loams	15 to 60%	A	5+	3-4
TeE	Terrace Escarpment, silty and Clayey		D		
VeB	Vergennes clay	2 to 6%	C	5+	1/2 - 2
VeC	Vergennes clay	6 to 12%	C	5+	1/2 - 2
VeD	Vergennes clay	12 to 25%	C	5+	1/2 - 2
VeE	Vergennes clay	25 to 60%	C	5+	1/2 - 2
Wo	Winooski very fine sandy loam		B	5+	1 1/2 - 2

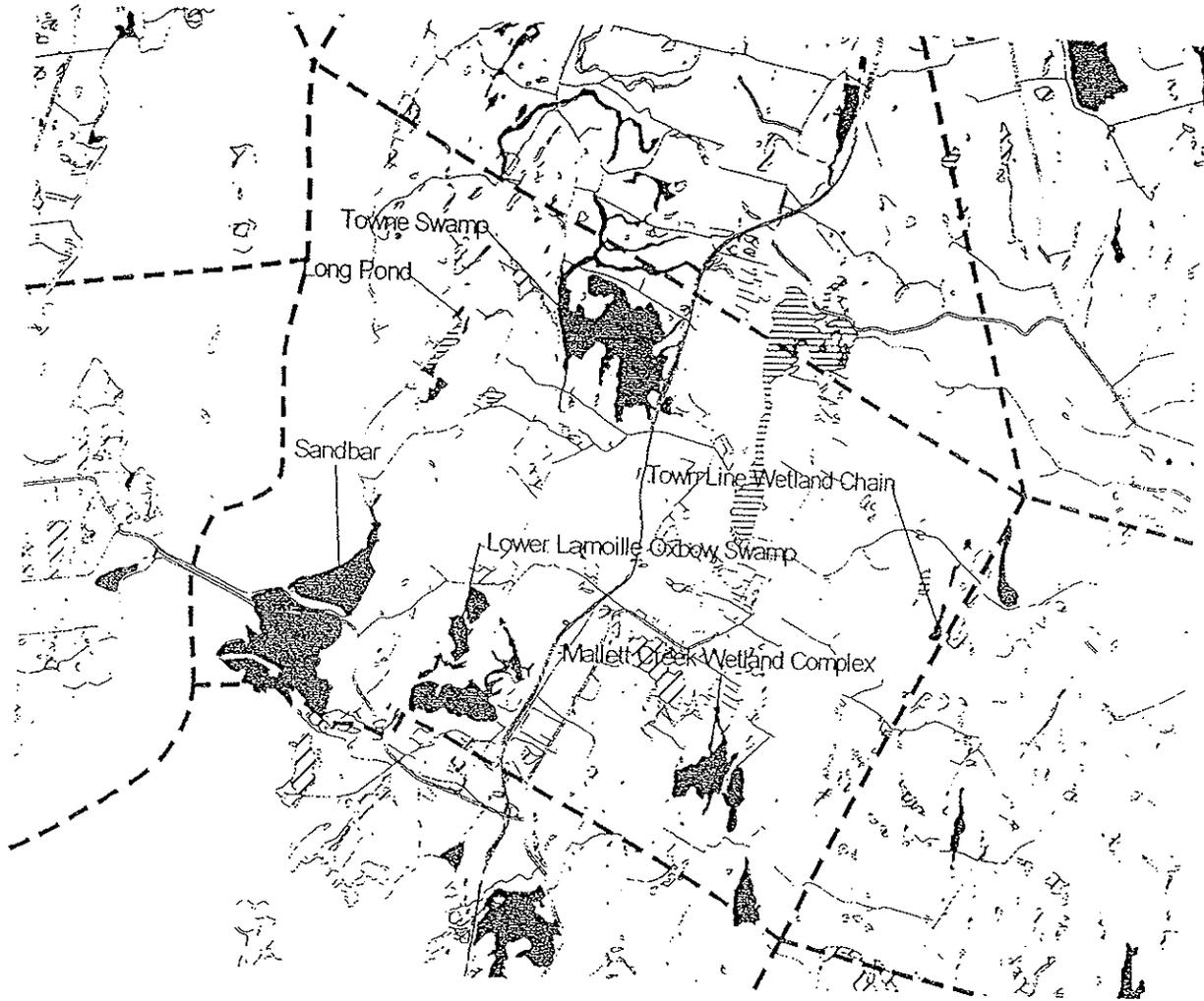
**APPENDIX D**

**SOILS MAPS FOR THE TOWN OF MILTON**

**APPENDIX E**

**TOWN OF MILTON  
PRIORITY WETLANDS**

# Town of Milton Priority Wetlands

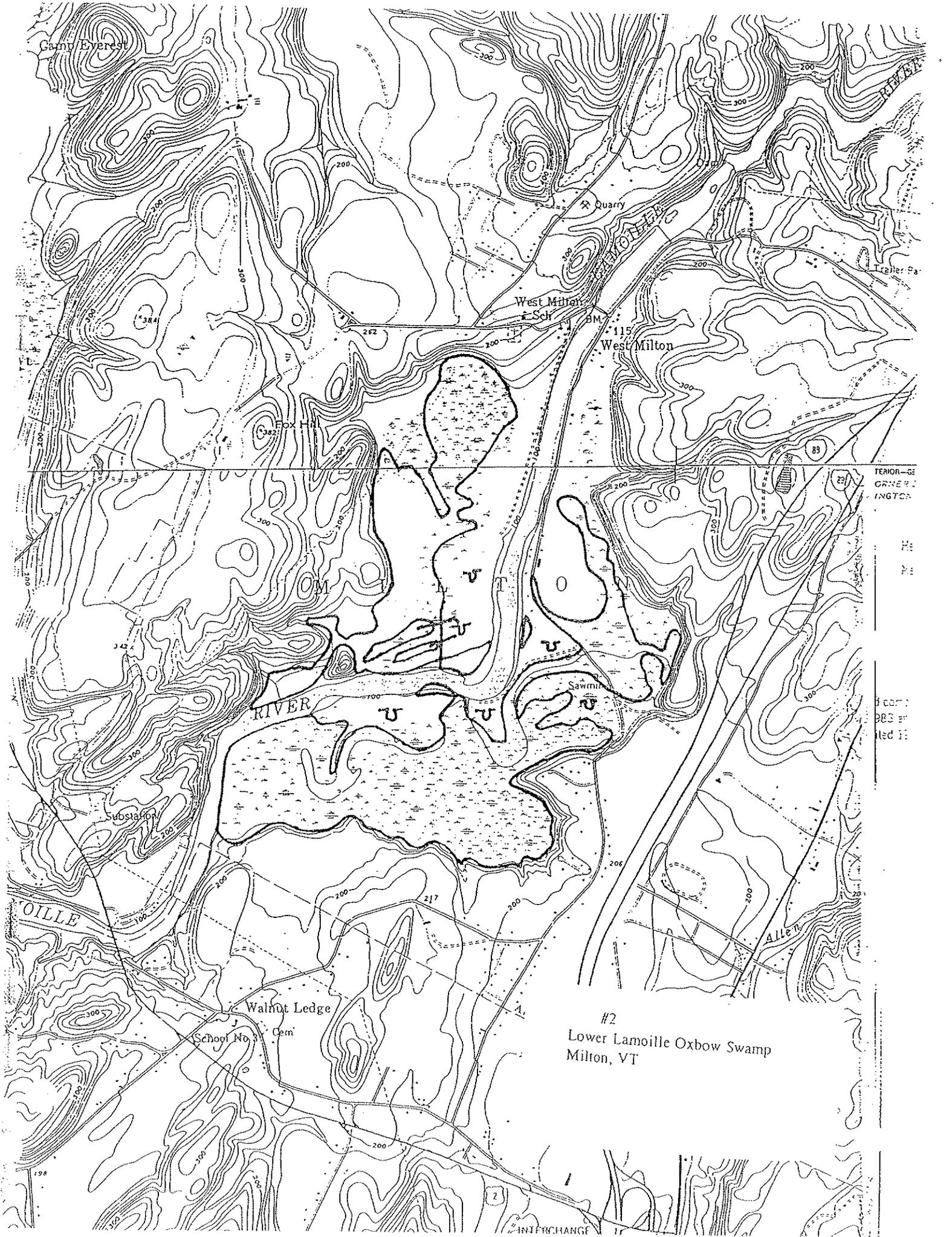


## Legend

-  Priority Wetlands
-  NWI Wetlands







Garny Everest

Quarry

West Milton Sch

West Milton

LAMOILLE RIVER

Substation

Walnut Ledge

School No. 1

Cem

#2  
Lower Lamoille Oxbow Swamp  
Milton, VT

TERMINUS  
GRAND  
INGTON

1833  
1833  
1833

INTERCHANGE

Lower Lamoille Oxbow Swamp, continued.

**THREATS AND VULNERABILITY:** Even though recent developers seem to be aware of the value of this site, the bottomland forest is especially unique and deserves protection. Besides pollution of all sorts from encroaching human habitation, logging and draining are most likely to damage the area.

Vulnerability of the wetland is MODERATE, degradation of the northern wetland is HIGH, and of the southern area is MODERATE.

**COMMENT:** The high banks of outwash deposits have helped separate developed areas from the wetland and provide a buffer. However, a number of new developments are being proposed. An extended buffer of 100 feet would be advantageous here to assure protection for wildlife. In addition, the northern wetland that has been drained for agricultural use would make an excellent site for wetland restoration, not only because it would complement the 1700 acres of the Sandbar wetland area, but also because of its high natural fertility and potential to support rare species and its value as a refuge for wildlife.

GRAND ISLE CO  
CHITTENDEN CO

780 000  
FEET

ROUSES POINT 3.5 MI  
SOUTH HERO 3.6 MI.

SAND BAR BRIDGE

SAND BAR  
STATE PARK

SAND BAR NATIONAL WATERFOWL  
MANAGEMENT AREA

SAND BAR NATIONAL WATERFOWL MANAGEMENT AREA

SBNWMA

Round Pond

Substation

GREAT  
BACK  
BAY

Camp Kiniya

Winnisquam  
Orchard

#3  
Sandbar  
Milton, VT

#3

Sandbar

Milton, VT

#3

Sandbar

Milton, VT

RIVE

J.L.

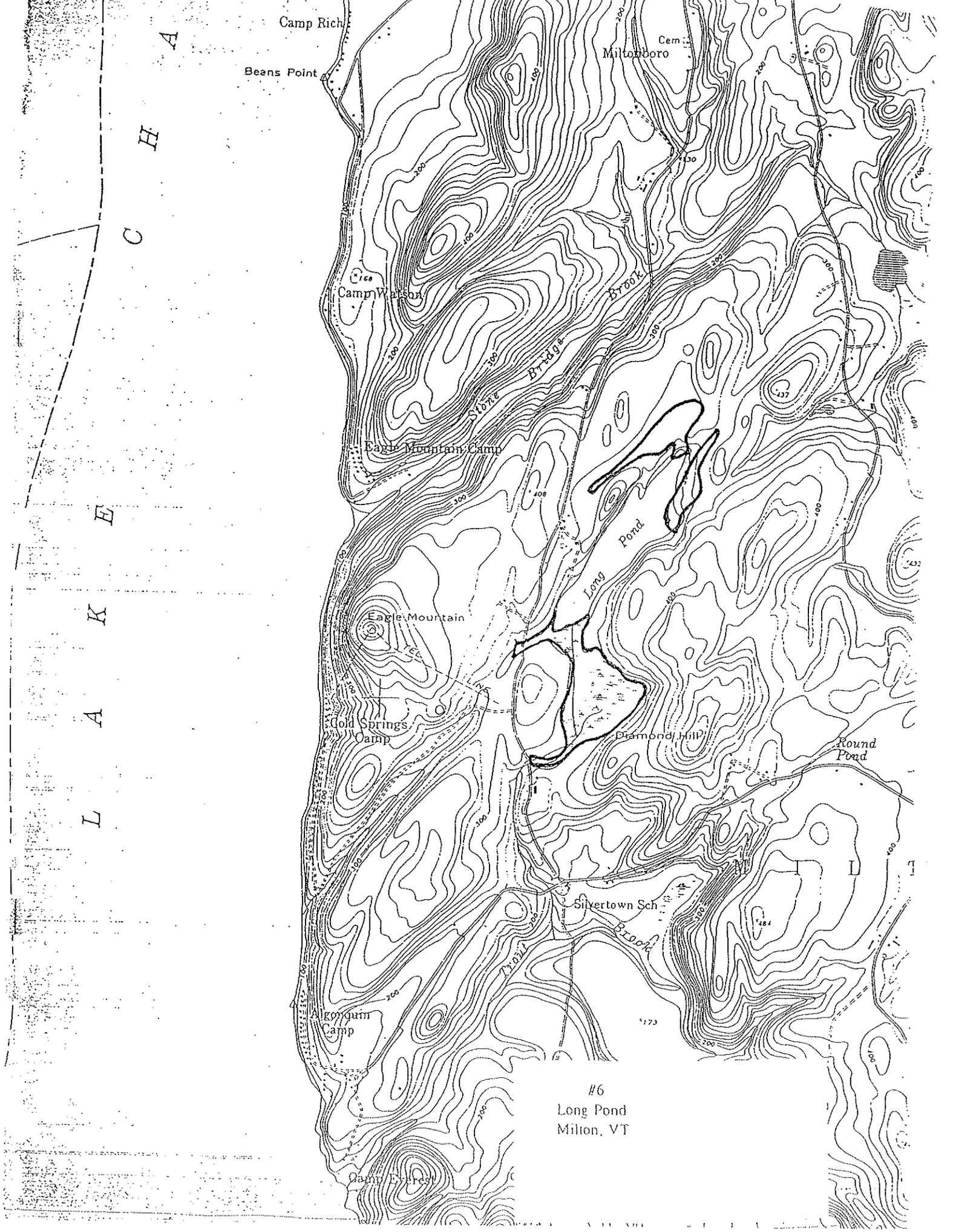
Sandbar Wetland, continued.

**OWNERSHIP:** Mostly by the State of Vermont, but some land is private- no access without landowner permission.

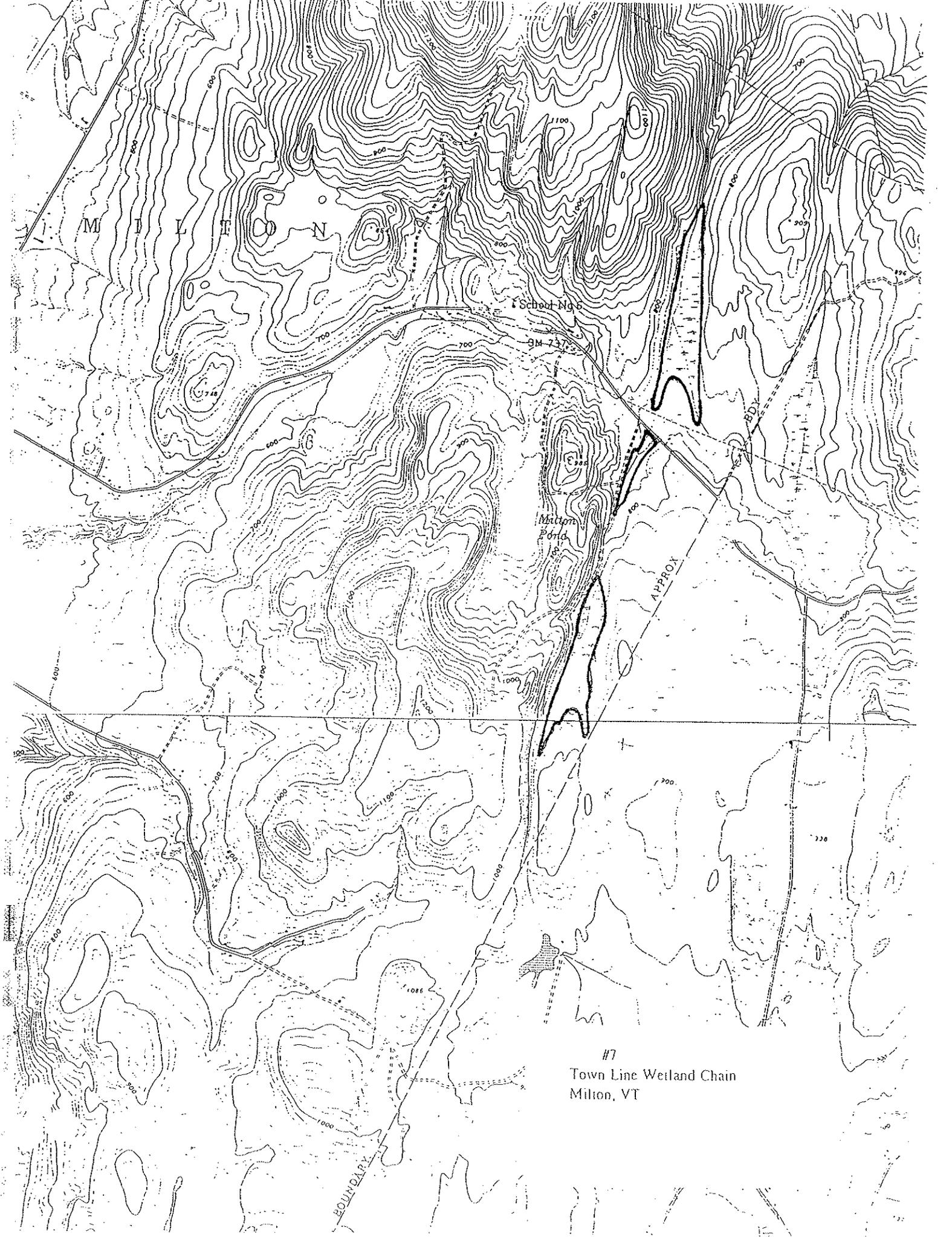
**THREATS AND VULNERABILITY:** Pollution is probably the biggest threat stems from the road crossings which introduce oil, gas, salt, noise and exhaust from automobile use. Vulnerability and Degradation of the Sandbar Wetland are both LOW due to the protection as a wildlife refuge by the Department of Fish and Wildlife.

**COMMENTS AND MANAGEMENT GUIDELINES:** The site merits further investigation by naturalists, geomorphologists, and biologists. Information gathered should be deposited in a single location so the delta as a whole can be better understood. Land management decisions should be comprehensive so as to include natural communities, animal communities and rare plants.





#6  
Long Pond  
Milton, VT



#7  
Town Line Wetland Chain  
Milton, VT

## Acknowledgements

The Vermont Department of Environmental Conservation would like to thank the Environmental Protection Agency for their financial support of this project. In addition, we would like to thank Annie Reed, a student intern, without whose help this project could not have been completed. We also would like to thank student interns Betsy Shands, Stephanie, and Chris Hicks. George Springston was instrumental in preparing the wetland maps and reviewing the wetland summaries. Peter Keibel prepared the town maps. Cathy O'Brien coordinated the project and wrote this report. Lisa Borre originally contemplated this project.

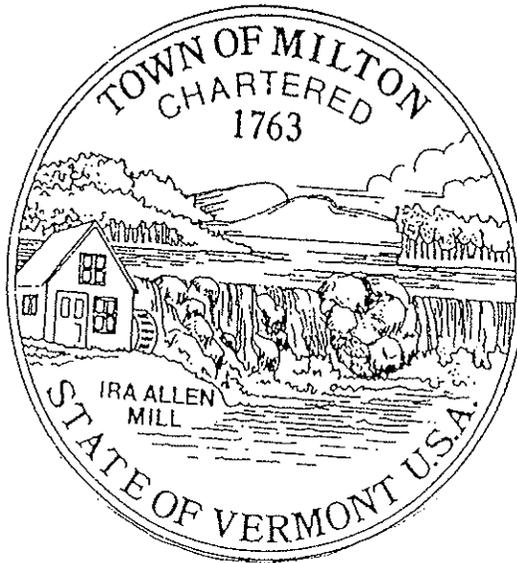
Information from the Vermont Nongame and Natural Heritage Program's surveys in Chittenden County, Grand Isle County and Franklin County have been included in some of the wetland reports. Some information on the Burlington wetlands came from Parson's 1988 report.

**APPENDIX F**

**RAIN GARDEN AND BUFFER PLANT LIST**

**TOWN OF MILTON, VERMONT**

**RAIN GARDEN AND BUFFER PLANT LIST**



Acknowledgements:

State of Vermont, Agency of Natural Resources, Department of Conservation, "The Buffer Handbook Plant List" Cynthia Kuhns, Lake & Watershed Resources Management Associates, Maine Department of Environmental Protection, Massachusetts Department of Environmental Protection, US EPA, US Department of Agriculture and US Soil and Conservation Service.



Please read this section before choosing plants for your buffer. It is important to understand how plants were selected for this plant list and to understand the meanings of the various terms and abbreviations used in the list.



## PLANT SELECTION

- Plants were selected that are low-maintenance, long-lived, hardy and sturdy. A few short-lived plants were included if they spread or self-seed easily. Low-maintenance means, for the most part, that plants do not need pruning, staking, mulching or regular dividing. In some cases, these activities may improve the form of the plant but not affect its ability to function in a buffer and therefore can be performed at the discretion of the land owner. Generally, buffer plants should be sturdy and, once established, able to hold their own against weeds and invasive plants. Plants that require little competition to thrive or special care were not included on this list. Following is a brief summary of the possible benefits of light maintenance:

Pruning Pruning can sometimes help fill out and invigorate a scraggly shrub but pruning to create a tight, landscaped appearance as is done with many evergreens can limit the plant's ability to absorb rain and make them vulnerable to insects, disease and drought.

Staking Some of the taller plants included on this list may benefit from staking if they are grown alone or in the open. In a buffer, there should be enough other vegetation to keep things upright. Your site will help determine this; plants in windy locations may need staking, then again you may want to avoid tall plants if you have a lot of wind.

Mulching Many perennials require winter mulching to protect from freezing and thawing. Most of the plants on this list are hardy enough to not need winter mulch, provided they are not grown beyond their hardiness limit. Here again it can depend on the exposure of your site. You should ask the nursery about this at the time of purchase.

Dividing Plants that need regular dividing to maintain vigor were not included on this list. They can be used in a buffer if you are willing to maintain them and keep buffer disturbance to a minimum in the process. Plants such as daylily and iris can form large clumps that benefit from dividing, however, for most varieties, dividing need only be done every 5 to 10 years. Daylilies will continue to thrive without dividing but will produce fewer flowers. Some irises can go indefinitely without dividing and others will die from the center of the clump out. Keep this in mind when selecting varieties for your buffer.

- Many sources were used in the preparation of this plant list. Occasional discrepancies were found in maximum size and hardiness zone. Every attempt was made to provide accurate information but size and hardiness zone should always be double-checked at the nursery.
- Some plants (flowers in particular) were included simply because they add beauty, are good space fillers or attract birds and butterflies. Some of these die back earlier than others and therefore do not provide as much buffering capacity so should not be planted exclusively. On the other hand, some of these emerge early in the spring and provide cover before other plants get started. Virginia Bluebells, Oriental and Hardy Lilies and many bulbs fall into this category.

- Many plants come in standard and dwarf varieties. Except for trees, when this is the case for a plant on this list, the plant is listed in the largest size category that it occurs and an asterisk is shown on the chart to indicate that it is also available in dwarf form(s). For instance, lilac is listed only in 'small trees/large shrubs even though varieties can be found in smaller sizes. For trees, the standard form and the dwarf form are listed in separate categories. For instance, balsam fir is listed in 'trees' and dwarf balsam fir is listed in 'small
- Tolerances for things like salt, drought, flooding etc. are given for plants where these tolerances are known for certain. There may be other plants with these tolerances as well. Always check with your nursery supplier for this information.
- The cold hardiness zones are shown in bold at the end of each description. Zones 3, 4 and 5 occur in Maine. The zone given is the coldest one tolerated, so if a plant is shown as zone 3, that means it will also tolerate zones 4 and 5. If you are on the boundary of two zones, it is best to select plants hardy in the colder zone. The zone map provided with this list is general and you should check with the local nursery for plant hardiness. Try to purchase plants that have been grown locally rather than ones brought in from far away. The locally grown ones will be hardier.

#### TERMS AND ABBREVIATIONS

- **Sun or Full Sun** Generally this means 6 or more hours of direct sun in a day.
- **Part-sun** Generally means less than 6 hours of direct sun or a full day of dappled sunlight.
- **Shade** Very little to no direct sun, especially through the middle of the day.
- **Moist** Average soil conditions, not wet, not dry. Able to retain water long enough for plants to use but not soggy.
- **Wet** Has standing water part of the time or is boggy and damp most of the time.
- **Dry** Very little moisture, often sandy soil. Dries out quickly after rain.
- **Deciduous** Deciduous plants lose their leaves or needles every winter and regrow them in the spring. Larch is the only conifer in this area that is deciduous.
- **Semi-evergreen** These plants may or may not lose all or some of their leaves or needles in the winter depending on their hardiness and the local conditions where they are grown.
- **Evergreen** These plants do not lose their leaves or needles in the winter. There may be some annual 'shedding' of old needles (as in pine) but the entire plant does not go bare. These plants continue to grow and feed throughout the winter and need sunlight and water throughout. Evergreen plants like rhododendrons need protection from too much sun and wind in winter to keep their leaves from drying out.

## GENERAL TREE & SHRUB PLANTING GUIDE

- Choose plants suitable to your location; sun, moisture, wind and zone.
- Space plants according to the instructions or nursery advice, keeping in mind the eventual spread of the tree or shrub. Things may look too far apart at first, but within a few seasons will spread and fill the space.
- Dig a hole 2-3 times the width of the pot or rootball; you want the roots to spread out more than down so the wider the better.
- Dig the hole to the same depth as the pot or rootball.
- Keep the rootball intact while handling and planting. Trim off broken roots and long, trailing roots that won't fit in the hole without bending. Do not over prune roots. Dig a bigger hole if
- If the plant is root-bound (roots are in a dense, tangled mat) loosen the roots with your fingers or use a knife to make vertical cuts around the rootball to allow roots to branch out.
- Place the rootball so that it is level or slightly above the surrounding soil unless it comes with other instructions.
- In areas with very heavy or wet soil, be sure to consult with nursery personnel on how best to establish new plants in these areas.
- Do not add materials (compost, manure or other soil) to the soil unless it is very poor and you are planting something that needs better soil. If that is the case, add equal amounts of loam, compost or peat moss. In the long run it is better to plant things that can tolerate the existing conditions rather than trying to improve a large area of soil.
- Place the rootball in the hole and back-fill  $\frac{1}{2}$  way, flood with water to eliminate air pockets and finish filling the hole. Pack soil firmly but not too heavily. Leave a depression around the plant and flood with water again.
- Do not fertilize the first year. Most trees and shrubs do not need fertilizer at all. Fertilizer can speed growth and result in weak, poorly rooted plants. If fertilizer is used, use it sparingly and only for a year or two after the plant is established. Some plants (rhododendrons etc.) may need an acid booster if planted in non-acidic soil. In any event, apply fertilizer so that it cannot wash into a lake or stream.
- The first season, keep soil moist but not soggy. It is better to water deeply now and then (approximately once a week) rather than frequent, light waterings. It takes about 5 gallons to a 3 foot shrub to saturate the soil. Use more if the soil is particularly dry or sandy and less if the soil is heavy or wet. Take care not to wet the leaves or needles to help prevent disease. Proper watering the first year is the most critical factor to success.
- Do not stake plants unless they will not stay upright in a moderate wind. Use a broad, soft material that will not damage the bark. Remove bindings as soon as the plant can support itself and do not let the bindings get tight.



## TREES 30 TO 100 FEET IN HEIGHT

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	Sandy
<b>Deciduous</b>								
Basswood	3	X	X	X		X		
Beech	3	X				X		
Bigtooth Aspen	4	X				X	X	X
Box Elder	4	X	X		X	X	X	
Cottonwood	4	X				X		
European Alder	4	X	X		X			
Green Ash	3	X	X		X	X	X	
Honey Locust	5	X			X	X		
Katsura Tree	5	X	X			X		
Littleleaf Linden	3	X				X	X	
Mountain Ash	3	X					X	X
Northern Red Oak	3	X				X	X	
Paper Birch	3	X				X	X	
Quaking Aspen	3	X				X	X	
Red Maple	3	X	X		X	X	X	
River Birch	4	X			X	X	X	
Silver Maple	3	X			X	X		
Sugar Maple	3	X				X		
Swamp White Oak	4	X			X	X		
Weeping Willow	3	X			X	X		
White Ash	3	X				X		
Yellow Birch	3		X	X		X		
<b>Evergreen</b>								
Austrian Pine	4	X				X	X	
Balsam Fir*	3	X	X		X	X		
Black Spruce	3	X			X	X		
Colorado Blue Spruce	3	X				X		
Hemlock*	3	X	X	X		X		
Japanese Black Pine	5	X				X	X	X
Larch (Tamarack)	3	X			X	X		
Norway Spruce	3	X				X	X	
Red Pine	3	X				X	X	X
White Cedar*	3	X	X		X	X		X
White Pine	3	X	X	X		X	X	
White Spruce	3	X	X			X	X	

\* also available in dwarf forms

See page 3, Terms & Abbreviations, for explanation of column headings



**Northern Red Oak** (*Quercus rubra*) Grows to 70 feet with a similar spread. A 'grand tree' with reddish-brown bark and dark-green leaves. Leaves are brown and persistent into late fall. Rapid growth. Full sun. Moist to dry soil. **Zone 3 N**



**Paper Birch** (*Betula papyrifera*) Also called White Birch. Grows to 70 feet with a 35 foot spread and an irregular, pyramidal crown. Often found in clumps of 3 or more and used ornamentally. Interesting snow-white bark that peels horizontally. Found along lakes and streams. Tolerates occasional flooding and drought. Rapid growth. Full sun. Does best in moist, well-drained soil. Good for birds. **Zone 3 N**

**Quaking Aspen** (*Populus tremuloides*) Also called Popple. Can grow to 60 feet but usually less. Narrow, rounded crown. Nice yellow to gold fall color. Leaves quiver in the breeze, making a soft rustling sound. Rapid growth. Short-lived. Full sun. Moist to dry soil. Tolerates a wide variety of conditions. Tolerates heat and some salt. Not flood tolerant. Good for wildlife and birds. Likely to lose trees if active beavers in the area. Found in and in old fields. **Zone 3 N**



Preferred food of beavers. clearcuts, after fires

**Red Maple** (*Acer rubrum*) Grows to 60 feet with a 35 foot spread. Nice early red spring flowers and good red fall color. Used as an ornamental. Rapid growth. Full to part-sun. Prefers moist, acid soil but tolerates a wide variety of conditions. Tolerates wet soil and flooding. Not salt tolerant. Found along swamps and lakes. **Zone 3 N**

**River Birch** (*Betula nigra*) Also can be found in a dwarf variety. Grows to 70 feet with a 50 foot spread. Short trunk is often divided into several arching limbs forming an irregular crown. Gray to brownish-red bark is attractive in winter. Full sun. Best in moist soil. Tolerates poor drainage and flooding. Found along river and lake banks. **Zones 4-5 N**

**Silver Maple** (*Acer saccharinum*) Grows to 70 feet or more with a 45 foot spread. Attractive tree with graceful, arching branches. Bright-green leaves have a silvery-white underside. Good yellow fall color. Rapid growth. Full sun. Best on moist, well-drained soil but tolerates several weeks of flooding. Found along river banks and bottom lands. Used ornamentally. Good for birds and wildlife. **Zone 3 N**

**Sugar Maple** (*Acer saccharum*) Grows to 80 feet or more with a 40 foot spread. Good shade tree with classic shape if grown in the open. Excellent yellow to red fall color. Full sun best but tolerates some shade. Moist, well-drained soil. Does not tolerate wet or compacted soil. Sensitive to salt. Found in upland areas throughout New England. **Zone 3 N**



**Swamp White Oak** (*Quercus bicolor*) Grows to 60 feet with similar spread. Produces quantities of acorns. Poor fall color. Full sun. Moist to wet soil. Scraggy, peeling branches make it less appealing as an ornamental but its value lies in its tolerance of swampy, poorly-drained conditions. Good for wildlife. **Zones 4-5 N**

**Weeping Willow** (*Salix alba* var. *Tristis* or *Salix babylonica* or *Salix niobe*) Grows to 70 feet with a similar spread. Graceful, drooping branches with long, slender leaves with pale, silvery undersides. Interesting ornamental or specimen tree. Drops a lot of leaves and branches. Rapid growth. Full sun. Moist to wet soils. **Zone 3**

**White Ash** (*Fraxinus americana*) Grows to 80 feet. A tall, slender tree with good yellow fall color. In the open the tree can become quite spreading. Compound leaves. Rapid growth. Full sun. Best on moist, well-drained soil but tolerates poor drainage and heavy soil. Often found growing near water. Good for birds. **Zone 3 N**



**White Cedar** (*Thuja occidentalis*) Also called Arbor Vitae. Grows to 60 feet and 25 feet across at the base. A dense, oval or pyramidal tree with flat, green, aromatic foliage. Makes a good hedge and windbreak. Can be sheared but has an attractive form on its own. Many varieties available, including dwarf forms. Sun to part-sun. Moist soil best. Tolerates dry, sandy to wet soils. Tolerates flooding and occasional drought. Found in wet soils and swampy areas. Good for birds and wildlife. **Zone 3 N**

**White Pine** (*Pinus strobus*) Grows to 100 feet with a 40 foot spread. A large, open tree with horizontal branching. Branches occur to the base in open-grown specimens. Long, soft, blue-green needles give softer overall appearance than Red Pine. Several varieties available. Can be pruned to hedges and windbreaks. Rapid growth. Sun to part-sun. Moist soil best but tolerates dry soil. Does not tolerate salt or flooding. Good for birds and wildlife. **Zone 3 N**

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**White Spruce** (*Picea glauca*) Grows to 65 feet. A large, conical tree with horizontal branching and dark-green to bluish foliage. Broader and fuller than black spruce. Slow growth and a somewhat disagreeable odor when needles are bruised. Makes a good windbreak. Several forms available. Full sun. Moist soil. Tolerates a variety of conditions. Common on lake shores. Good for birds and wildlife. **Zone 3 N**





**SMALL TREES/LARGE SHRUBS  
12 TO 30 FEET IN HEIGHT**

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	Sandy
<b>Deciduous</b>								
American Hornbeam	4		X	X		X	X	
American Mountain Ash	3	X	X			X		
Blackhaw	4		X			X	X	
Canada Plum	3	X	X	X		X		
Chokecherry	3	X	X			X		
Common Witchhazel	4	X	X	X		X		
Crabapple*	4	X				X	X	
Eastern Wahoo	5			X		X		
Hawthorn*	4	X				X	X	X
Hop Hornbeam	3	X	X	X			X	
Kwanzan Cherry	5	X				X		
Laurel Willow	3	X			X			
Lilac*	3-4	X				X	X	
Nannyberry	3	X	X	X		X	X	
Ninebark	3	X	X			X	X	
Northern Arrowwood	3	X	X			X		
Pagoda Dogwood	4	X	X	X		X		
Purpleosier Willow	3	X	X	X	X	X		
Pussy Willow	3	X			X	X		
Serviceberry*	3-4	X	X			X	X	
Siberian Peashrub	3	X				X	X	
Smooth Sumac	3	X	X	X			X	
Speckled Alder	3	X	X	X	X	X		
Staghorn Sumac	3	X	X	X			X	
Striped Maple	3		X	X		X		
<b>Evergreen</b>								
Eastern Redcedar*	4-5	X	X	X	X	X	X	X
Fraser Fir	4	X	X			X	X	
Japanese Yew	3	X	X	X		X	X	X
Mugo Pine*	3	X	X	X		X		

\* also available in dwarf forms

See page 3, Terms & Abbreviations for explanation of column headings



**Lilac** (*Syringa sp.*) Several species and varieties available. Grows from 3 to 30 feet with corresponding spread. Attractive, upright shrub with dense, green foliage and large clusters of showy, fragrant flowers from white to pink to purple. Some varieties spread to form large clumps. Full sun. Adaptable to various soil conditions, must be well-drained. Good bird nesting sites. **Zones 3-5**



**Nannyberry** (*Viburnum lentago*) Also known as Wild Raisin. Grows to 20 feet in fast, spreading growth. Showy, white flowers in June; black fruit and good fall color. Found along roads, edges of woods, streambanks and in thickets. Sun to shade. Moist to dry soil. Good for birds. **Zone 3 N**

**Ninebark** (*Physocarpus opulifolius*) Grows 8 to 14 feet. Shows rapid growth. Clusters of white flowers in spring; interesting pink fruit and yellow fall color. Has peeling bark. Grows in thickets, along river banks and in rocky places. Sun to part-sun. Moist to dry soil. Good for birds. **Zone 3 N**

**Northern Arrowwod** (*Viburnum recognitum*) Grows 10 to 15 feet in clumps and thickets. White spring flowers; blue fruit and red fall color. Sun to part-sun. Moist soil. Good for birds. **Zone 3 N**

**Pagoda Dogwood** (*Cornus alternifolia*) Grows 15 to 20 feet with similar spread. Branches and leaves occur in flattened layers. Fragrant, white flowers and blue fruit. Maroon fall color. Red stems in winter. Part-sun to shade. Cool, moist, well-drained soil. **Zone 4 N**

**Purpleosier Willow** (*Salix purpurea*) Also called 'Streamco Willow'. Standard form of the Dwarf Arctic Willow. Grows 10 to 18 feet in ideal conditions. A slender shrub that forms thickets. Typical, long, narrow willow leaves have a purplish cast to the upper surfaces and pale undersides. Shoots and branches have a purple to red hue. Easy to establish from unrooted cuttings. Excellent erosion control along streams. Sun to part-sun. Any moist to wet soil. Is not drought tolerant. Good for grouse and wildlife. **Zone 3**

**Pussy Willow** (*Salix discolor*) Grows to 20 feet in multi-stemmed clumps up to 15 feet wide. Spreading shrub with fuzzy catkins in spring. Full sun. Naturally found in moist to wet soil but tolerates drier soil. Good for birds. **Zone 3 N**



**Serviceberry** (*Amelanchier sp.*) Several species and varieties available. Also called Juneberry, Shad, Sugar Plum, Sarviceberry. Grows from 5 to 30 feet high in multi-stemmed clumps. Attractive shrub with white flower clusters, edible, purple-blue berries and orange-red fall color. Sun to shade. Moist to dry soil, depending on variety. Good for birds. **Zones 3-5 N**

**Siberian Peashrub** (*Caragana arborescens*) Other species and varieties available. Grows to 15 feet with a 10 foot spread. Oval shape with bright-green, fine-textured leaves, small yellow flowers and yellow fall color. Full sun. Tolerates poor soil but must be well-drained. Drought and salt tolerant. Good for hedges. Good bird habitat and food. **Zone 3**

**Speckled Alder** (*Alnus rugosa*) Grows to 20 feet in large, bushy clumps. Does best in full sun but tolerates light shade. Moist to wet soil. Found along brooks, lakes, swamps. Does well in poor conditions. Fixes nitrogen. Good bird habitat and food. **Zone 3 N**

**Staghorn Sumac** (*Rhus typhina*) Grows to 20 feet. Upright, open habit with fuzzy stems. Yellow flowers; large, upright clusters of red fruit and yellow to red fall color. Sun to shade. Well-drained soil. Tolerates poor soils. Common in old pastures and open areas. Good for migrating birds. **Zone 3 N**

**Striped Maple** (*Acer pensylvanicum*) Grows to 30 feet with a 15 to 20 foot spread. Slender, upright tree with irregular branches and interesting greenish bark with white stripes. Part-sun to shade. Moist, cool soil. Found in cool woods and on rocky mountain slopes. **Zone 3 N**



**MEDIUM SHRUBS  
6 TO 12 FEET IN HEIGHT**

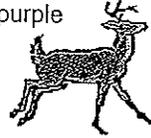
Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	Sandy
<b>Deciduous</b>								
Arrowwood Viburnum	3	X	X	X	X	X		
Bayberry	3	X	X			X	X	X
Beach Plum	4	X				X	X	X
Beaked Hazelnut	3	X	X				X	
Beautybush	4	X				X		
Black Chokeberry	3	X	X		X	X	X	
Buttonbush	4	X	X		X			
Cranberrybush*	3	X	X			X		
Doublefile Viburnum	4	X	X			X		
Elderberry*	3	X				X		
False Spirea	3	X	X			X		
Flowering Raspberry	4	X	X	X		X		
Forsythia*	3-4	X	X			X		
Fothergilla*	4	X	X			X		
Gray Dogwood	3	X	X	X	X	X	X	
Hazelnut	3	X	X				X	
Highbush Blueberry	4	X	X	X	X	X	X	X
Hobblebush	4	X	X	X		X		
Korean Spice Viburnum	4-5	X	X			X		
Mock Orange*	4	X				X		
Nanking Cherry	3	X				X		
Pee Gee Hydrangea	4	X	X			X		
Purpleleaf Sandcherry	3	X					X	X
Red Chokeberry	4	X	X			X	X	
Red-Osier Dogwood	3	X	X		X	X		
Red-Twig Dogwood	3	X	X		X	X		
Redvein Enkianthus	5	X	X			X		
Silky Dogwood	3	X	X		X	X	X	
Snowball Bush	3	X	X			X		
Spicebush	5		X	X	X	X		
Spirea*	3-4	X			X	X	X	
Tatarian Dogwood	3	X	X		X	X		
Vernal Witchhazel	4	X	X			X		
Wayfaring Tree	3	X	X	X		X		
Winterberry	3	X	X		X	X		
Witherod	4		X	X	X	X	X	
<b>Evergreen</b>								
Mountain Laurel	5	X	X	X		X	X	
Rhododendron*	4-5	X	X	X		X		

\* also available in dwarf forms

See page 3, Terms & Abbreviations, for explanation of column headings



**Elderberry** (*Sambucus canadensis*) Grows to 10 feet with a similar spread. A vase-shaped, multi-stemmed, spreading shrub with bright-green to yellowish foliage. A 'fern-leaf' variety is also available. Large clusters of tiny, white flowers in early summer are followed by red to dark-purple fruits used in making jelly and wine. Rapid growth. Sun to part-sun (flowers and fruits best in full sun). Prefers moist soil but has some drought tolerance. Tolerates severe pruning. Found in rich lowlands, in thickets and open places along paths, streams and roads. Good for birds and deer. **Zone 3 N**



**False Spirea** (*Sorbaria sorbifolia*) Grows to 8 feet with a 5 to 10 foot spread. A spreading, upright, multi-stemmed shrub with fern-like foliage and large plumes of white flowers. Sun to part-sun. Moist soil. **Zone 3**

**Flowering Raspberry** (*Rubus odoratus*) Grows from 5 to 10 feet with equal spread. An erect, branching shrub with large, deep-green, maple-shaped leaves. Large, showy, fragrant, pink to purple flowers in early summer followed by dry, red fruit. Sun to shade. Moist soil. Found in rocky woods and moist ravines. Best used in the back of a shrub border. **Zone 5 N**

**Forsythia** (*Forsythia sp.*) Many varieites available. Check on local hardiness. Grows 6 to 10 feet with a similar spread. Upright to arching varieites as well as ones developed for pruning. Full shrub with light-green leaves and varying shades of yellow flowers in spring. Flowers profusely in good conditions. Sun to part-sun (flowers best in full sun). Moist, rich soil. **Zones 3 to 5**

**Fothergilla** (*Fothergilla major*) Grows 6 to 10 feet with a similar spread. Dense, rounded, multi-stemmed shrub with deep-green leaves. Early, fragrant, white, 'bottle-brush' flowers. Excellent yellow to red fall color. Slow growth. Sun to part-sun. Moist, well-drained, acid soil. **Zone 4**

**Gray Dogwood** (*Cornus racemosa*) Grows 10 to 12 feet with similar spread. A multi-stemmed, spreading shrub with white flowers in spring and white berries in summer. Interesting, reddish bark turns gray with age. Sun to shade. Tolerates a variety of soils. Some drought tolerance. Found along roadsides, in open thickets and swamp edges. Good for birds and wildlife. **Zone 3 N**

**Hazelnut** (*Corylus americana*) Also called Filbert. Grows 8 to 10 feet with a 4 to 6 foot spread. A strong, multi-stemmed shrub often forming thickets. Round edible nuts in fall. Nice, orange fall color. Sun to part-sun. Dry soil. Found on edges of woods and along open stone walls. Good for birds and wildlife. **Zone 3 N**

**Highbush Blueberry** (*Vaccinium corymbosum*) Several varieties available; some naturally-occurring. Grows from 6 to 10 feet in an oval, upright form. Attractive, twisted branches, white flowers in spring; bright red fall color; red stems in winter and large edible blue fruits. Sun to shade (best fruit and shrub shape in full sun). Acid, sandy, peaty soil. Wet to dry. Found in acidic lowlands, along lakes and in rocky woods. Good for birds and wildlife. **Zone 4 N**



**Hobblebush** (*Viburnum alnifolium*) Grows to 10 feet. A graceful, erect, somewhat straggling shrub that spreads to form dense thickets. Large, heart-shaped leaves and large, showy clusters of white flowers, followed by purple fruits. Red fall color. Sun to shade. Moist soil. Found along lakes and streams and in cool, moist woods. Good for birds and deer. **Zone 4 N**

**Korean Spice Viburnum** (*Viburnum carlesii*) An ornamental viburnum. Grows 4 to 8 feet high with similar spread. A dense, rounded shrub with fragrant, white flowers in spring and small, red fruit. Red fall color. Sun to part-sun. Moist soil. Good for birds. **Zones 4 to 5**

**Mock Orange** (*Philadelphus sp.*) Several species and varieties are available in standard and dwarf forms. Grow from 2 to 10 feet with corresponding spread. Most are upright with attractive green foliage. Fragrant, showy, white flowers in early summer. Rapid growth. Full sun. Moist soil. **Zone 4**





**Tatarian Dogwood** (*Cornus alba*) Several varieties ranging from 5 to 10 feet high and with spreads of 4 to 8 feet. Vigorous, upright shrubs that may sucker to form thickets. Stems range from bright-red to yellow and are attractive in winter. Leaves vary from simple green to variegated green with white, cream, yellow and rose. Sun to part-sun. Tolerate heavy and damp soil. **Zones 3 to 4**

**Vernal Witchhazel** (*Hamamelis vernalis*) Grows 6 to 10 feet with similar spread. A dense, multi-stemmed shrub with dangling, fragrant, yellow flowers in spring. Excellent yellow fall color. Good for unpruned hedges, screens and groupings. Sun to part-sun. Does best in moist, well-drained soil. **Zone 4**

**Wayfaring Tree** (*Viburnum lantana*) Naturally-occurring and cultivated. Grows from 6 to 13 feet high with a somewhat greater spread. Upright and rounded with compact growth habit. Large, fuzzy, dark-green leaves and many round clusters of white flowers in spring. Red fruit in summer turns black in fall. Sun to part-sun. Tolerates some shade. Moist soil. Good for birds. **Zones 3 to 4 N**

**Winterberry** (*Ilex verticillata*) Naturally grows 6 to 10 feet with similar spread. Cultivated varieties are somewhat smaller. Multi-stemmed shrub with slightly glossy leaves. Small yellow flowers followed by red berries that persist into winter. Need both male and female plants for fruit. Yellow fall color. Sun to part-sun. Moist to wet soil. Tolerates a variety of soil types. Found in swampy areas and along ditches but grows equally well in lighter, drier soils. Winter stems with berries used decoratively. Good for birds. **Zones 3 to 4 N**



**Witherod** (*Viburnum cassinoides*) Also called Wild Raisin. Grows 6 to 10 feet with a lesser spread. A slender, upright shrub with glossy, green leaves. Round clusters of feathery, white flowers in late spring and whitish fruit turning blue-black in fall. Red fall color. Sun to shade. Moist to wet soil but tolerates drier conditions. Found in damp clearings, swamps and moist thickets. Good for birds. **Zone 4 N**



**SMALL SHRUBS  
1 TO 6 FEET IN HEIGHT**

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	Sandy
<b>Deciduous</b>								
Annabelle Hydrangea	4	X	X			X		
Bristly Locust	4	X				X		
Cotoneaster	4	X	X			X		
Cutleaf Stephanandra	3	X	X			X		
Dwarf Arctic Willow	3	X	X		X	X		
Dwarf Bush Honeysuckle	3	X	X	X			X	X
Dwarf Fothergilla	4	X	X			X		
Dwarf Honeysuckle	3	X	X				X	X
Flowering Almond	4	X				X		
Flowering Quince	4	X	X			X		
Fragrant Sumac	3	X					X	X
Hancock Coralberry	4	X	X			X	X	
Indiancurrant Coralberry	3			X			X	
Mapleleaf Viburnum	3	X	X	X		X	X	
Potentilla	3	X	X		X	X	X	
Rhodora	3	X			X	X		
Rose	3-5	X				X	X	
St. Johnswort	4	X	X				X	X
Silver Creeping Willow	4	X			X	X		
Snowberry	3	X	X		X	X	X	
Summersweet	3	X	X	X	X	X		
Sweet Fern	3	X					X	X
Sweet Gale	3	X			X	X		
Weigela	4	X				X	X	
<b>Evergreen</b>								
American Yew	3		X	X		X		
Bearberry	3	X	X				X	X
Bog Rosemary	3	X	X		X	X		
Creeping Juniper	3-4	X	X			X	X	X
Dwarf Balsam Fir	3	X	X			X		
Dwarf Cedar	3-4	X	X			X		
Dwarf Hemlock	3-4	X	X	X		X		
Leucothoe	5			X		X		
Lingonberry	4	X	X	X	X	X	X	
Sheep Laurel	3	X	X		X	X	X	
Siberian Carpet Cypress	3	X	X			X		
Spreading Yew	3	X	X	X		X	X	

See page 3, Terms & Abbreviations, for explanation of column headings



**Fragrant Sumac** (*Rhus aromatica*) Available in standard and dwarf (Gro-Low) varieties. Standard form grows 2 to 6 feet with a 6 to 10 foot spread and the dwarf grows 2 to 3 feet with a 6 to 8 foot spread. A low, upright or straggling shrub with compound leaves and small, fragrant, yellow flowers in spring, followed by red fruit. Good orange to red fall color. Leaves are aromatic when crushed. Full sun. Dry, sandy or rocky soil. Good as bank covers and in mass plantings. Dwarf variety used as a ground cover. Found in dry, rocky, open woods. **Zone 4 N**

**Hancock Coralberry** (*Symphoricarpos X Chenaultii*) Grows 2 to 4 feet with a 6 foot spread. A small, open shrub with graceful arching branches. May spread by suckering. Pink spring flowers, followed by pink to red fruits in fall. Sun to part-sun. Tolerates a variety of soils. Good bank cover. **Zone 4**

**Indiancurrant Coralberry** (*Symphoricarpos orbiculatus*) Similar to above. Grows 3 to 6 feet and spreads to form thickets. Has white to pink flowers and red fruits. Shade. Dry soil. **Zone 3**

**Mapleleaf Viburnum** (*Viburnum acerifolium*) Grows 3 to 6 feet. A slender, branched shrub with clusters of white flowers in late spring; blue-black fruit and large, downy, 3-lobed leaves that turn purple in the fall. Sun to shade. Moist soil. Found as an understory shrub in dry woods. Good for birds. **Zone 3 N**

**Potentilla** (*Potentilla fruticosa*) Also called Bush Cinquefoil. Native and cultivated. Many varieties available. Grows 2 to 4 feet with equal spread. Compact to spreading habits. Small leaves from silver-green to light-green to blue-green to dark-green. Flowers occur in shades of white, yellow, pink and orange that bloom from early summer through to frost. Full sun best. Moist soil, although several varieties are very drought tolerant *once established*. Naturally found in wet to dry meadows, along lake shores and in open areas. **Zone 3 N**

**Rhodora** (*Rhododendron canadense*) A deciduous rhododendron growing from 1 to 3 feet tall with many branches and showy, rose to purple flowers in spring. Full sun. Wet, cold, peaty soil. Often seen in large colonies in bogs and old, wet pastures. **Zone 3 N**

**Rose** (*Rosa* sp.) Many species and varieties available in all forms and shapes. Some native and many cultivated or introduced. Most grow from 2 to 6 feet, although some arching and climbing types grow to 10 feet. All require full sun. Soil requirements range from moist to dry and most need fertile, well-drained soil. Check with local nurseries for hardy varieties and low-maintenance roses. **Zones 3 to 5 N**



**St. Johnswort** (*Hypericum* sp.) Naturally-occurring and cultivated species and varieties available. Most grow 2 to 3 feet high with similar spread. Compact plants with blue-green foliage and bright-yellow flowers with different bloom times and lengths. Sun to part-sun. Check specific variety for soil preferences; some grow in wet areas, some in dry, sandy soil. Found along shores, in wet meadows, old fields and pastures. **Zones 3 to 5 N**

**Silver Creeping Willow** (*Salix repens* var. *nitida*) Grows to 2 feet high and spreads. Silvery foliage, insignificant flowers and fruits. Rapid growth. Sun. Moist to wet soil. **Zone 4**

**Snowberry** (*Symphoricarpos albus*) Grows 3 to 6 feet high with similar spread. Spreads by suckering so will form thickets, if allowed. Good for erosion control. Blue-green foliage, pink spring flowers and ornamental, white berries in fall. Rapid growth. Sun to part-sun. Moist to wet soil. Adaptable to a variety of soil conditions. Good for birds. **Zone 3 N**

**Summersweet** (*Clethra alnifolia*) Also called Hummingbird Clethra or Sweet Pepperbush. Grows 3 to 8 feet high with a 4 to 6 foot spread. Attractive, deep-green foliage and very fragrant, white or pink flowers in summer. Sun to shade. Moist to wet soil. Salt tolerant. **Zone 3 N**

**Sweet Fern** (*Comptonia peregrina*) Grows 2 to 4 feet high with similar spread. *Not* a true fern but has somewhat leathery fern-like foliage which has a nice, pungent, spicy smell. Brown catkins in early spring and a bur-like nut in the fall. Full sun. Moist to dry soil. Grows well on poor, sandy, rocky soil. Deep, good root system. Good for roadbanks and steep, dry areas. **Zone 3 N**



**Leucothoe** (*Leucothoe fontanesiana*) Grows 3 to 5 feet high and 5 or more feet wide. A graceful, broad-leaved evergreen with dark, lustrous foliage and small, delicate, fragrant, white flowers in spring. Nice, purple winter color. Good in woodland settings and as a high ground cover on shady slopes. Low-maintenance, reliable plant as long as it has shade and is not allowed to dry out. Shade. Moist, acid, well-drained soil, high in organic matter. **Zone 5 (N)**

**Lingonberry** (*Vaccinium vitis-idaea*) Also called Crowberry or Mountain Cranberry. Grows to 7 inches and spreads. Small, glossy-green, leathery foliage and small pink or white flowers, followed by small, red fruit, sour but edible. Found in bogs and wet or dry, rocky, mossy slopes. Sun to shade. Dry to moist soil. **Zone 4 N**

**Sheep Laurel** (*Kalmia angustifolia*) Grows to 3 feet with slightly narrower spread. Slender, dense, low-growing shrub with upright stems; shiny, leathery, deep-green leaves with pale undersides; and showy clusters of deep-pink, saucer-shaped flowers in early summer.   
Poisonous to livestock, hence, the alternate name, Lambkill. Sun to part-sun. Poor, acid soil; wet to dry. Tolerates occasional flooding. Found in moist, open swamps, pastures and rocky slopes. **Zone 3 N**

**Siberian Carpet Cypress** (*Microbiota decussata*) Grows to 12 inches high and can spread up to 10 feet. Densely branched with soft-green needles that turn bronze in winter. Rapid growth. Good as an evergreen ground cover. Sun to part-sun. Moist soil. Tolerates adverse conditions. **Zone 3**

**Spreading Yew** (*Taxus X media var. Densiflora*) Grows to 4 feet with an 8 foot spread. Compact shrub with dark-green needles. Slow growth. Sun to part-sun. Moist to dry soil. Good for hedges and mass plantings. **Zone 3**



## PERENNIAL HERBS & FLOWERS

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
Anise Hyssop	4	X				X		
Artemesia	3	X	X				X	
Aster	3	X	X			X		
Astilbe	4	X	X		X	X		
Baptisia	3	X	X		X	X	X	
Barrenwort	3		X	X	X	X		X
Barren Strawberry	4	X	X	X		X		X
Basket of Gold	3	X	X			X		
Bee Balm	4	X	X		X	X		
Bellflower	4	X	X			X	X	X
Bergenia	4	X	X		X	X		X
Bird's Foot Trefoil	3	X			X	X	X	X
Black-eyed Susan	3	X	X			X		
Blazing Star	3	X	X		X	X	X	
Bleeding Heart	4		X			X		
Blue Star Flower	3		X			X		
Blueberry	3	X	X			X	X	X
Boltonia	4	X			X	X		
Boneset	3	X	X		X	X		
Bugbane	3		X	X	X	X		
Bugleweed	3	X	X	X		X	X	X
Bugloss	3	X	X	X	X	X		
Bunchberry	3			X		X		X
Butterfly Weed	4	X					X	
Cardinal Flower	3	X	X		X	X		
Catmint	3	X	X		X	X	X	X
Chameleon Plant	3	X	X	X	X	X		X
Chinese Lantern	3	X	X			X		
Comfrey	4		X		X	X		
Coneflower	3	X				X		
Cornflower	3	X				X		
Cranesbill	3-5	X	X	X	X	X	X	X
Creeping Jenny	3	X	X		X	X		X
Creeping Phlox	3		X	X		X		X
Crown Vetch	3	X	X			X	X	X
Culver's Root	3	X	X			X		
Cushion Spurge	3	X				X	X	
Daisy	4-5	X				X		
Daylily	3	X	X		X	X		
Evening Primrose	4-5	X	X			X	X	X
False Lupine	3	X	X			X	X	



## PERENNIAL HERBS & FLOWERS CONTINUED

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
Periwinkle	4	X	X	X		X		X
Phlox	3	X				X		
Plume Poppy	3	X	X			X		
Potentilla	5	X	X			X	X	X
Pussy-toes	3	X					X	X
Sage	3-5	X				X	X	
Sedum	3	X	X			X	X	X
Skullcap	4		X		X	X		
Snow-in-Summer	3	X				X	X	X
Snow-on-the-Mountain	3	X	X	X	X	X	X	X
Solidaster	5	X				X		
Solomon's Seal	3		X	X	X	X		
Sunflower Helioopsis	3	X				X	X	
Sweet Flag	3	X	X		X			
Sweet Woodruff	4		X	X		X		X
Swordleaf Inula	3	X			X	X		
Tansy	3	X				X		
Thin-leaved Sunflower	3	X				X		
Thyme	4	X	X			X	X	X
Tickseed	3	X				X		
Turtlehead	4	X	X		X	X		
Valerian	4	X	X			X		
Veronica	3-5	X	X			X		X
Viola	3-5	X	X			X		X
Virginia Bluebells	3		X	X		X		
White Clover	3	X	X		X	X		X
Wild Ginger	3-4		X	X		X		X
Wintercreeper Euonymus	3	X	X	X		X		X
Wintergreen	3		X	X		X		X
Yarrow	3	X				X	X	

See page 3, Terms & Abbreviations, for explanation of column headings



**Bergenia** (*Bergenia cordifolia*) Grows 12 to 18 inches. Vigorous, spreading plants with large, bold, glossy, semi-evergreen leaves that turn from green to burgundy in cold weather. Showy spikes of white, pink or red flowers in early spring. Sun to part-sun. Moist soil. Tolerates wet soil. Good as ground cover in damp, sunny or partly sunny areas. **Zone 4**

**Bird's Foot Trefoil** (*Lotus corniculatus*) Grows 18 to 24 inches. A common wildflower in the Midwest. Useful as erosion control and quick cover on road banks and other disturbed areas. Bright-green foliage and brilliant yellow, pea-like flowers in spring and summer. Full sun. Tolerates a wide variety of soils (not sandy). Some drought tolerance. **Zone 3**

**Black-eyed Susan** (*Rudbeckia sp.*) Also called Yellow Coneflower. Several species and varieties; some native, some not; some short-lived and others long-lived and spreading. Some are invasive. Grows 1 to 4 feet with lush, green foliage and large, yellow to orange, daisy-like flowers with dark centers. Blooms summer to fall. Rapid growth. Easy to grow. Sun to part-sun. Moist soil. **Zone 3 N**



**Blazing Star** (*Liatis sp.*) Several species cultivated. Also called Gay Feather. Grow 2 to 4 feet in clumps with stiff, grass-like foliage and tall flower spikes in summer. Flowers available in white, pink or purple. Good in natural areas. Sun to part-sun. Best in well-drained soil. Sandy soil okay. Some tolerate wet. Most are native to the Midwest and have become established in New England. **Zone 3**

**Bleeding Heart** (*Dicentra sp.*) Grows 1 to 3 feet and can spread to clumps 3 to 4 feet across. Dwarf and non-spreading varieties are available. Graceful, arching stems with fern-like leaves and arching sprays of heart-shaped flowers in white, pink or red in late spring. Part-sun. Tolerates full sun in cool areas. Moist, well-drained soil. Good near woodlands. **Zone 4**

**Blue Star Flower** (*Amsonia tabernaemontana*) Also called Willow Amsonia. Grows 2 to 3 feet with willow-like, gray-green leaves and clusters of sky-blue, star-shaped flowers in late spring. Foliage turns yellow in fall. Nice, low-maintenance plant for natural settings. Does best in part-sun and cool, moist soil. Tolerates full sun and drier soils but is not as vigorous. Native to the Midwest. **Zone 3**

**Blueberry** (*Vaccinium angustifolium*) Also called Lowbush Blueberry. Grows to 1 foot and spreads by suckering. Small, glossy leaves turn bright-red in fall. Small, white flowers, followed by edible, blue fruit in mid to late summer. Sun to part-sun. Well-drained, acid soil. A sturdy, adaptable ground cover. Good for birds and small mammals. **Zone 3 N**

**Boltonia** (*Boltonia asteroides*) Grows 2 to 4 feet. An informal, vigorous, spreading, aster-like plant with blue-green foliage and profuse, small, white to pink, daisy-like flowers in late summer to fall. Easy to grow. Good for natural areas. Full sun best. Moist soil. Tolerates wet. **Zone 4**



**Boneset** (*Eupatorium perfoliatum*) Grows 3 to 5 feet. Vigorous, spreading, coarse-leaved plants with showy clusters of white flowers in summer and fall. Naturally occurs in moist, open areas. Sun to part-sun. Moist to wet soil. Good in natural plantings. **Zone 3 N**

**Bugbane** (*Cimicifuga sp.*) Also called Snakeroot or Black Cohosh. Tall, slender, woodland plants, growing 3 to 7 feet tall, with deep-green, fern-like foliage and 1 to 2 foot, arching stalks of fragrant, white to purple flowers in late summer to fall. Part-sun to shade. Rich, moist soil. Tolerates wet soil. Good in a wild garden. **Zone 3**

**Bugleweed** (*Ajuga sp.*) Several species and varieties. A low, dense, fast-growing ground cover reaching a height of 6 to 9 inches. *Ajuga reptans* spreads the most while others are more mounded in habit. Lush, lustrous foliage ranges from dark-green to bronze-purple with some variegated forms. Full sun enhances foliage variations. Short spikes of flowers bloom late spring to early summer in shades of white, pink, blue and purple. Sun to shade. Any well-drained soil. **Zone 3**

**Bugloss** (*Brunnera macrophylla*) Grows 12 to 18 inches. Fast-growing woodland plant with large, heart-shaped leaves, and small clusters of Forget-Me-Not-like flowers in spring. Sun to shade. Moist to almost wet soil. Good in woods and along pond or stream edges. **Zone 3**



**Crown Vetch** (*Coronilla varia*) Grows to 2 feet and spreads vigorously. Tangled, sprawling vines with small, pea-like foliage and masses of white to pink clusters of flowers that bloom all summer. Good for erosion control on banks and in large areas. Very aggressive. Sun to part-sun. Well-drained soil. Tolerates poor, dry soil. **Zone 3**

**Culver's Root** (*Veronicastrum virginicum*) Grows 3 to 7 feet with handsome whorls of slender leaves and long spikes of tiny, white to pink to blue, tube-like flowers in late summer. May be slow to establish. Good for moist meadows and woods. Sun to part-sun. Moist soil. **Zone 3 N**

**Cushion Spurge** (*Euphorbia epithymoides*) Grows 12 to 18 inches. Long-lived, spreading clumps form a dense mound. Dark-green leaves are somewhat fleshy and turn red in fall. Covered with bright-yellow flowers in spring and summer. (Milky sap from stems can cause irritation in sensitive people.) Easy to grow. No maintenance. Full sun. Any well-drained soil. Tolerates dry soil. **Zone 3**

**Daisy** (*Chrysanthemum X superbum* & *C. rubellum*) Many species and varieties of daisies are available but these (Shasta Daisy and Hybrid Red Chrysanthemum) are best suited to the natural planting. Both are vigorous and spreading. Both do best in full sun and rich, moist soil. *C. rubellum* is compact and branching, grows 2 to 3 feet and has masses of large, fragrant, pink to red, daisy-like flowers in late summer. Tolerates some shade. Hardy to **Zone 5**. Shasta Daisy is available in several varieties. Most grow 2 to 3 feet ('Little Princess' grows to only 12 inches) with deep-green foliage and large, white, daisy-like flowers. Prefer well-drained soil. **Zone 4**



**Daylily** (*Hemerocallis sp.*) Many, many varieties available. Heights vary from 15 inches to 4 feet. Long, narrow, lily-like leaves form large clumps. Large, fragrant, lily-like flowers in many shades of white, yellow, orange, pink and red. Bloom for long periods during the summer. Hardy and easy to grow. Good for naturalizing. Sun to part-sun. Moist, well-drained soil. Heat and drought tolerant. Also tolerates wet soil. **Zone 3**



**Evening Primrose** (*Oenothera sp.*) Also called Sundrops. Several species available. Spreading, somewhat shrubby plants, growing 6 inches to 2 feet. Smaller varieties can be useful as ground covers. Profuse, bright-yellow (some white to pink) flowers throughout summer. Sun to part-sun. Well-drained soil (some do best in poor, sandy, dry soil). **Zones 4 to 5 N**

**False Lupine** (*Thermopsis caroliniana* & *lanceolata*) Grows 2 to 4 feet and resembles a sprawling lupine. Attractive, blue-green foliage and tall spikes of yellow flowers in summer. Easy to grow and long-lived. Good in natural plantings. Sun to part-sun. Moist soil. Tolerates drought. **Zone 3**

**False Sunflower** (*Heliopsis scabra*) Grows to 3 feet. A showy, informal plant with golden sunflower-like flowers in summer. Easy to grow. Good in natural plantings. Sun to part-sun. Moist soil. Tolerates some drought and poor soil. **Zone 3**



**Fleabane** (*Erigeron speciosus*) Varieties are cultivated from native species. Grows 2 to 3 feet. A sturdy plant good for natural plantings. Clusters of large, pink to purple, daisy-like flowers in summer. Sun best. Tolerates some part-sun. Sandy, well-drained, poor soil. **Zone 4 N**

**Foamflower** (*Tiarella sp.*) Forms clumps 6 to 12 inches high with low, broad leaves, either lobed or heart-shaped. Leaves turn bronze in fall. Some are slow-growing; others rapid. Profuse airy, white to pink flowers on long stalks in late spring to summer. Part-sun to shade. Moist, rich soil. Tolerates wet. Low-maintenance ground cover for woodland areas. **Zone 4 N**

**Forget-Me-Not** (*Myosotis sp.*) Native and non-native species available. A somewhat short-lived perennial but will self-seed and become well-established if given the right conditions. Form clumps 6 to 18 inches high with many, small, clear-blue flowers in early spring to summer. Sun to part-sun. Moist soil. Some do well with more shade and moisture. Good in woodland settings. **Zone 3 (N)**

**Germander** (*Teucrium chamaedrys*) Standard and dwarf varieties are available. The standard is shrubby and compact and grows 1 to 2 feet tall. The dwarf grows 6 to 10 inches tall and spreads to 3 feet, making a good ground cover. Both are aromatic and have shiny, green leaves and small, pinkish-purple flowers late in summer. Full sun best but tolerates some shade. Any well-drained soil. **Zone 5**



**Jewelweed** (*Impatiens capensis*) Also called Touch-Me-Not. This is a native plant that may not be available at nurseries but can be spread by seed and occurs naturally in moist to wet, shaded locations. It grows 2 to 5 feet with light-green succulent stems and leaves like cultivated *Impatiens*. Spotted orange flowers hang on slender stems beneath the leaves. Blooms in summer. Ripe seedpods pop open when touched. Part-sun to shade. Moist to wet soil. **Zone 3 N**

**Joe-Pye Weed** (*Eupatorium purpureum*) Grows 4 to 7 feet. Vigorous, spreading into large clumps. A large plant with large, coarse, vanilla-scented leaves and large, showy clusters of dull pink to purple flowers in late summer and fall. Sun to part-sun. Moist to wet soil. Good in wet, natural plantings. **Zone 3 N**

**Lady's Mantle** (*Alchemilla mollis*) Other species and varieties are available but this one is probably best for a natural planting. Grows 12 to 18 inches and forms large, mounded, spreading clumps. Useful as a ground cover. Large, rounded, semi-lobed, gray-green leaves and masses of small, bright, yellow, star-shaped flowers that bloom in early summer. Sun to part-sun. Moist, well-drained soil. **Zone 3**

**Lamb's Ears** (*Stachys byzantina & officinalis*) Also called Betony or Woundwort. Several varieties with differing shades of foliage and flowers or no flowers. Grows 8 to 20 inches depending, on variety. All have large, soft, velvety, gray, silver to green foliage. Spread to form clumps or mats. Some varieties make good ground covers. Some are non-blooming, others have spikes of small pink to purple flowers. Sun to part-sun. Moist, well-drained soil. Tolerates some shade if soil is on the dry side. **Zone 4**

**Lamiastrum** (*Lamiastrum galeobdolon* or *Galeobdolon luteum*) Also called Yellow Archangel and Golden Deadnettle. Grows 1 to 2 feet high and spreads. Striking silver splashes on foliage and dense clusters of yellow flowers in spring. Useful as a ground cover and for naturalizing in difficult shady areas. Can be invasive. Part-sun to shade. Any well-drained soil. **Zone 3**

**Lamium** (*Lamium maculatum*) Also called Spotted Deadnettle. Several varieties. Grows 4 to 12 inches. Vigorous, spreading ground cover forms a leafy mat. Can be invasive. Sturdy and easy to grow. Variegated foliage with clusters of small, snapdragon-like, white, pink or purple flowers in spring. Part-sun to shade. Any well-drained soil. Tolerates some drought. Good shady ground cover. **Zone 3**

**Lavender** (*Lavandula angustifolia*) Grows 1 to 2 feet. A bushy, evergreen perennial with narrow, gray-green, fragrant foliage and spikes of fragrant, purple flowers in summer. Leaves and flowers used for their fragrance. Full sun. Moist, rich, well-drained soil. Tolerates sandy soil. **Zone 5**

**Lemon Balm** (*Melissa officinalis*) Bushy herb grows 2 to 3 feet high and spreads by seed and underground. Deeply-veined, heart-shaped, shiny, light-green, lemon-scented leaves and small, white flowers throughout summer. Used for teas and fragrances. Easy to grow. Attracts honeybees. Sun to part-sun. Rich, well-drained soil. **Zone 4**



**Ligularia** (*Ligularia sp.*) Grows 3 to 5 feet with large, decorative, toothed or deeply cut leaves up to 20 inches wide and loose clusters or tall spikes of yellow or orange daisy-like flowers in summer. Large, dramatic plants. In some, the undersides of the leaves are bronze or purple and some have black or purple stems. Need moist, cool locations. Do well near bogs, streams and ponds. Part-sun to shade. Rich, moist soil. Tolerates wet soil. **Zone 4**

**Lily** (*Lilium sp.*) Many species and varieties available. Grow 2 to 4 feet tall. Look for long-lived, easy-care (i.e., ones that do not need staking or need to be divided regularly) varieties. Some are spreading and can fill in areas nicely, coming up through grass and weeds. Turk's Cap Lily is good for naturalizing. Flowers are typical lily flowers in a wide variety of colors and shapes. Many are fragrant. Bloom summer to fall. Sun to part-sun. Moist, well-drained soil. **Zones 3 to 5**



**Lily of the Valley** (*Convallaria majalis*) Grows 6 to 12 inches with 8 inch long, deep-green leaves and extremely fragrant, bell-shaped, white flowers hanging along the stems. Blooms in spring. Spreads underground to form a ground cover in cool, moist, shaded areas. Good in woodland settings. Part-sun to shade. Moist soil. **Zone 3**



**Moss Phlox** (*Phlox subulata*) Also called Moss Pink. Grows 4 to 9 inches high in a spreading mat or mound. Makes a good ground cover in sunny, well-drained areas. Short, needle-like leaves and masses of blue, white or pink flowers in spring. Sun to part-sun. Sandy, well-drained soil best. Native west of Maine; naturalized here. **Zone 3 (N)**

**Obedient Plant** (*Physostegia virginiana*) Slender, upright plant grows 2 to 4 feet high and spreads rapidly. Good in natural settings where it can spread but can be very aggressive. A dwarf form is available which only grows to 18 inches. Varieties that spread less vigorously also have been developed. Narrow, coarse leaves and long spikes of showy, white, pink or purple flowers in late summer. Sun to part-sun. Acidic, moist soil. Tolerates wet soil. **Zone 3 N**

**Oregano** (*Origanum vulgare*) Grows to 18 inches in a spreading, trailing mat. Small, highly aromatic leaves and clusters of tiny white to purple flowers in summer. Plant parts used as flavoring in cooking. Good ground cover for small areas. Full sun. Well-drained, non-acidic soil best. **Zone 3**

**Pachysandra** (*Pachysandra terminalis*) Also called Japanese Spurge. Several varieties available, differing in color of leaves and growth habit. Grows 6 to 12 inches and spreads underground. Glossy, green leaves, some variegated and spikes of white flowers in late spring. An excellent ground cover for shaded areas. Part-sun to shade. Moist, well-drained soil. Best with high organic matter. **Zone 4**



**Pearly Everlasting** (*Anaphalis margaritacea*) Other cultivated species are available. Slender plant grows to 2 feet with narrow, gray-green, woolly leaves and masses of small, white flowers in late summer. Flowers used for drying. Native and extremely drought tolerant. Full sun. Moist to dry soil. **Zone 3 N**

**Periwinkle** (*Vinca minor*) Also called Myrtle. Several varieties available with different flower colors and growth heights. The standard species is the hardiest. A trailing, spreading, evergreen plant growing to 10 inches high with glossy, dark-green leaves and white, blue or lavender flowers in spring. An excellent, hardy, long-lived ground cover that has become naturalized in our area. Sun to shade. Moist, well-drained soil. Does not do well in drought. **Zone 4**

**Phlox** (*Phlox paniculata*) Also called Garden Phlox. There are other species and varieties of Phlox that also would do well in natural plantings (Wild Sweet William *P. maculata* & Woodland Phlox *P. divaricata*). Grows 2 to 4 feet in large clumps. Large, pyramid-shaped clusters of extremely fragrant flowers in many shades of white, pink, lilac and red. Summer-blooming. Full sun. Moist, rich soil. Has become naturalized in our area. **Zone 3**



**Plume Poppy** (*Macleaya cordata*) Large, handsome plants grow 5 to 10 feet tall. Spreads rapidly in good conditions. Large, rounded and lobed, gray-green leaves with silver undersides and long, creamy, white plumes of feathery flowers in summer. Easy to grow. Grow where there is room to spread. Sun to part-sun. Moist soil, well-drained soil. **Zone 3**

**Potentilla** (*Potentilla sp.*) Also called Cinquefoil. Several varieties and species; some spreading and some not. Look for ones that make good ground covers. Easy to grow. Grow from 3 to 18 inches, either erect or sprawling, depending on variety. Three to five-lobed foliage may be semi-evergreen and is often woolly. Bright flowers in spring or summer are red, apricot or yellow. A good choice is *P. tabernaemontani*. It forms a 6 to 9 inch high, spreading, evergreen mat with yellow spring flowers. Sun to part-sun. Tolerates a variety of soils. Light, sandy soil best. **Zone 5**

**Pussy-toes** (*Antennaria dioica*) Low, 1 inch high, gray-green or silver basal leaves and 3 to 8 inch flower stalks. Rapidly spreads to form a mat. Clusters of small, white or pink, fuzzy flowers on stalks in spring. Makes a good ground cover in sunny, dry, poor areas where little else will grow. Full sun. Dry soil. **Zone 3 (N)**



**Tansy** (*Tanacetum vulgare*) Vigorous, spreading plants grow to 3 feet with highly aromatic, fern-like foliage and bright-yellow, button-like flowers in late summer. Good for naturalizing sunny areas. Related to a native species. Has become naturalized in many areas. Full sun best. Tolerates part-sun. Any well-drained soil. **Zone 3**



**Thin-leaved Sunflower** (*Helianthus decapetalus*) Vigorous, spreading, native, sunflower-like plant. Grows 3 to 5 feet high with large, coarse leaves and large, yellow sunflower-like flowers in late summer. Good for natural plantings. Full sun. Moist, well-drained soil. **Zone 3 N**



**Thyme** (*Thymus sp.*) Several varieties of low, spreading, aromatic herbs. Grow 2 to 12 inches, depending on variety. Small, shiny leaves and masses of tiny rose to purple clusters of flowers in spring or summer. Good ground covers for sunny, dryish areas. Some varieties tolerate high traffic. Best in full sun and well-drained, acid soil. Tolerates part-sun. **Zone 4**

**Tickseed** (*Coreopsis sp.*) Several species and varieties available; some native to the Midwest and naturalized here. Reliable and easy to grow. Some are spreading and some are drought resistant. Grow 8 to 36 inches. Have lobed to fern-like to thread-like, well-branched foliage and masses of brilliant to soft yellow to orange to pink daisy-like flowers in spring and summer. Most are long-blooming. Full sun. Moist, well-drained soil. Some tolerate drought. Good in natural plantings. **Zone 3 (N)**

**Turtlehead** (*Chelone sp.*) *Chelone glabra* (white turtlehead) is native; *C. lyonii* & *obliqua* are not. Grow 2 to 4 feet high with coarse, dark-green leaves and long-blooming spikes of snapdragon-like flowers in white to pink to red. Bloom summer to fall. Spread to form patches. Found in wet areas along streams and lakes. Full to part-sun. Rich, acidic, moist to wet soil. **Zone 4 (N)**

**Valerian** (*Centranthus sp.* or *Valeriana sp.*) Vigorous, bushy plants growing 2 to 3 feet high with green to blue-green leaves and showy clusters of small, fragrant, white to deep-red flowers in summer. Spreads by self seeding. Full to part-sun. Poor, moist, well-drained soil. Does not like acidic soil. **Zone 4**

**Veronica** (*Veronica sp.*) Also called Speedwell. Many species and varieties available. Reliable, hardy, easy to grow. Grow from 6 to 24 inches; many form clumps; many good as ground covers. Foliage is usually dense and ranges from silvery-gray to glossy, dark-green. Flowers occur in clusters or spikes of numerous small flowers in shades of white, pink, purple and blue. Many bloom from spring to fall. Full to part-sun. Moist, well-drained soil. Nice, versatile plant. **Zones 3 to 5**

**Violet** (*Viola sp.*) Many species and varieties available; some are native. Grow 3 to 12 inches and spread under proper conditions. Bright-green, heart-shaped, oval or divided leaves and numerous, unique flowers in spring. Occur in many colors; some bicolor; many fragrant. Good in moist, woodland settings. Full to part-sun. Moist, fertile, well-drained soil. Spread best in semi-shaded locations. Good ground cover. **Zones 3 to 5 (N)**



**Virginia Bluebells** (*Mertensia virginica* & *siberica*) Easy to grow, woodland plant. Clump-forming plants grow 1 to 2 feet high with delicate, gray-green leaves and drooping clusters of sky-blue, bell-shaped flowers. Some die back after blooming so need to be planted with plants that will fill in the area through the summer. Part-sun to shade. Rich, moist soil. **Zone 3**

**White Clover** (*Trifolium repens*) New Zealand is best variety for durability. Hardy and long-lived; spreads quickly once established. Grows to 8 inches with typical, 3-lobed leaves and small, white blossoms in summer. Good in steep areas and areas with high foot-traffic. Sun to part-sun. Moist soil. Tolerates heavy clay soils, heat and excessive moisture. Does not do as well in sand. **Zone 3**



**Wild Ginger** (*Asarum sp.*) Native and non-native species available. Should not be collected from the wild. Found in moist, rich woods. Grows 4 to 8 inches high with large, glossy, heart-shaped leaves and a single, inconspicuous, reddish-brown cup-shaped flower close to the ground. Grown mostly for its leaves as a woodland ground cover. Spreads underground. May need protection from competition until established. Part-sun to shade. Rich, moist, well-drained soil. **Zones 3 to 4 (N)**



## FERNS, GRASSES & VINES

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
<b>Ferns</b>								
Christmas Fern	3		X	X		X		
Cinnamon Fern	3	X	X	X	X	X		
Hay-scented Fern	3		X	X		X	X	X
Interrupted Fern	4		X	X	X	X		
Lady Fern	4		X	X		X		
Ostrich Fern	3		X	X	X	X		
Royal Fern	3	X	X	X	X	X		
Sensitive Fern	3	X	X	X	X	X		
<b>Grasses</b>								
Bulrushes	3-4	X	X		X			
Bur-Reed	3	X	X		X			
Big Bluestem	3	X				X	X	X
European Dunegrass	4	X					X	X
Manna Grass	3	X			X			X
Reed Grass	3	X			X	X		
Ribbon Grass	4	X	X		X	X		X
Switch Grass	3-5	X				X	X	X
<b>Vines</b>								
Boston Ivy	4	X	X			X	X	X
English Ivy	4	X	X	X		X	X	X
Sweet Pea	3	X	X			X	X	X
Virginia Creeper	3	X	X	X		X	X	X

See page 3, Terms & Abbreviations, for explanation of column headings



## GRASSES



**Bulrushes** (*Scirpus sp.*) Many species of tall (4 to 6 feet high) grass-like plants with long, narrow leaves and striking flower heads; some with dark-brown 'spikelets' and others fluffy. Found in wet areas and shallow water. Full to part-sun. Wet soil, standing water. **Zones 3 to 4 N**

**Bur-Reed** (*Sparganium sp.*) A family of grass-like plants growing 1 to 4 feet high in shallow water with either upright or floating stems and long, narrow leaves. Flowers are greenish-brown and followed by a bur-like ball. Full to part-sun. Wet soil, standing water. **Zone 3 N**

**Big Bluestem** (*Andropogon gerardi*) A versatile group of grasses; this species tolerant of dry, poor conditions. Long-lived, grows 3 to 6 feet tall with lush green leaves that turn red in fall and bluish-purple stems. Flower and seed heads branch into 3 parts. Needs extra care to get established but forms excellent cover once established. A common prairie grass. Full sun. Moist to dry soil. Tolerates poor, dry, sandy soil. **Zone 3 N**

**European Dunegrass** (*Elymus glaucus*) Native to western America. Grows to 2 feet. Vigorously spreading, ornamental grass. Good for erosion control on sandy, dune areas. Tolerates drought and salt. Good for bank stabilization. Highly aggressive. Blue-gray, arching foliage and green to yellow flower clusters in late summer. Full sun. Well-drained, sandy soil. **Zone 4**

**Manna Grass** (*Glyceria aquatilis*) Spreading, cultivated grass for damp areas. Grows to 3 feet with slender, arching, white and yellow variegated foliage. Native species grow in marshes, shallow water and wet areas. Full sun. Wet soil. **Zone 3**

**Reed Grass** (*Calamagrostis canadensis*) Also called Canada Bluejoint Grass. Other species and varieties are available. Grows 2 to 4 feet. A typical, upright, attractive grass. Spreads slowly to form clumps. Some varieties are more vigorous. Slender stems and flower heads. Does well in wet soil and is a good soil stabilizer. Full sun. Moist, fertile soil. Good near water. **Zone 3 N**

**Ribbon Grass** (*Phalaris arundinacea var. picta*) Also called Reed Canary Grass. Cultivated from a native grass. Vigorous and ornamental with green and white striped, arching leaves and narrow clusters of flowers in summer. Can be invasive. Grows 2 to 3 feet. Does best in full sun and moist, fertile soil. Does well close to water. Tolerates some shade. **Zone 4 (N)**

**Switch Grass** (*Panicum virgatum*) Several varieties. Grows 4 to 7 feet in thick, spreading clumps. Good for wildlife and birds. Typical long, narrow leaves and decorative, feathery flower heads. Holds shape throughout winter. Needs 1 or 2 years to become established. Full sun. Tolerates poor, acid, sandy, dry soil. Heat and drought tolerant. **Zones 3 to 5 N**

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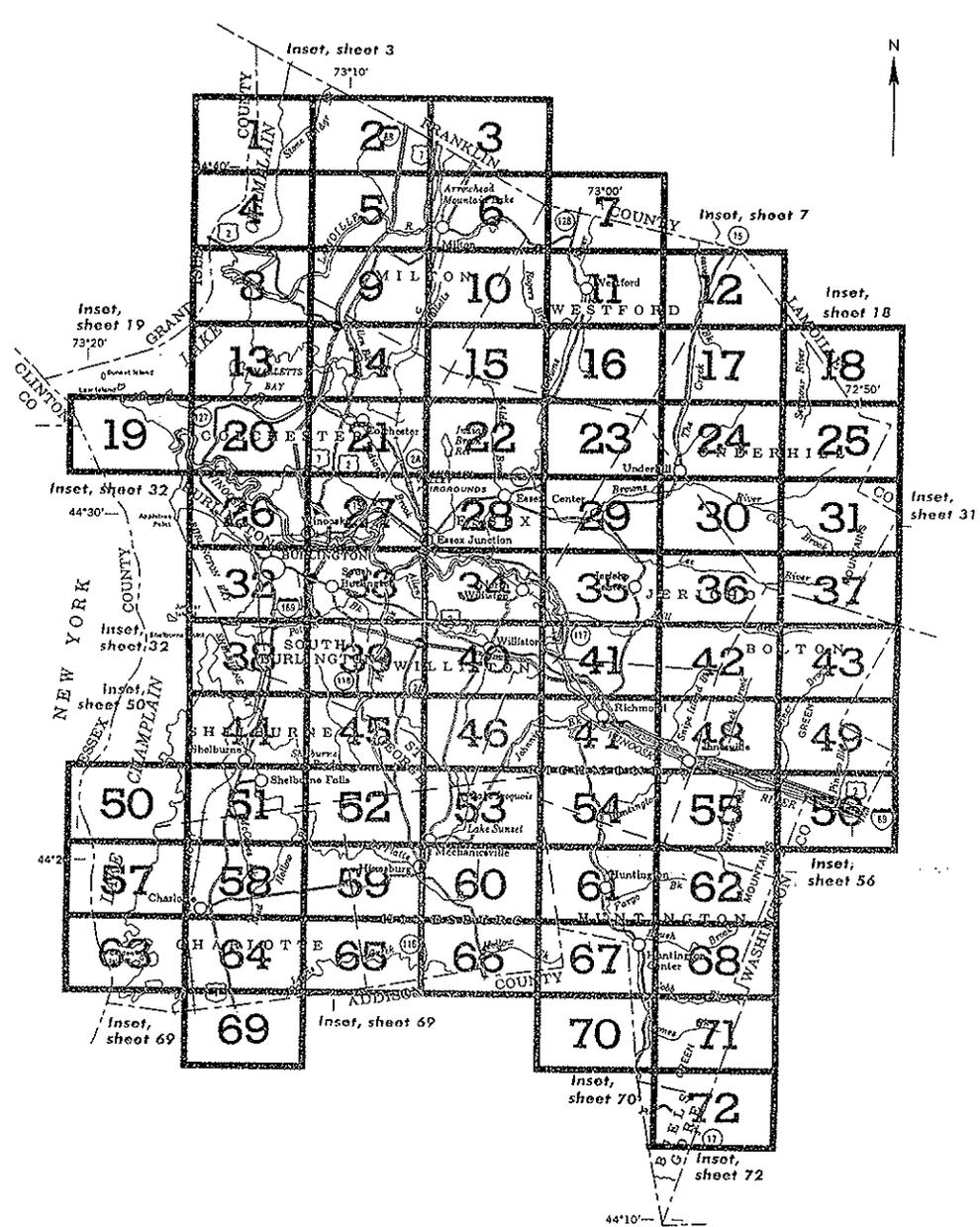
**APPENDIX G**

**BMP POLLUTION REMOVAL PERCENTAGES**

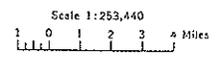
Table3  
Pollution Removal for Town of Milton small lot infiltration and Rain Garden BMPs

Practice	Total Suspended Solids-TSS [%]	Total Phosphorus TP [%]	Total Nitrogen TP [%]	Metals <sup>1</sup> [%]	Bacteria [%]	Hydrocarbons [%]
Rain Garden	86	59	38	69	37 <sup>2</sup>	84
Infiltration <sup>3</sup>	95 <sup>2</sup>	80	51	99 <sup>2</sup>	N/A	N/A
Open Channel swales <sup>4</sup>	81	34	84	70	N/A	62 <sup>2</sup>

1. Average of zinc and copper. Only zinc for infiltration.  
2. Based on fewer than five data points.  
3. Includes porous pavement, which is not on the approved practices for the Town of Milton. At this time, there are no known field studies that have measured sediment removal in infiltration trenches. However, it can logically be presumed that a properly operating infiltration trench will remove nearly 100% of the TSS load.  
4. Higher removal rates for dry swales.  
N/A Data not available



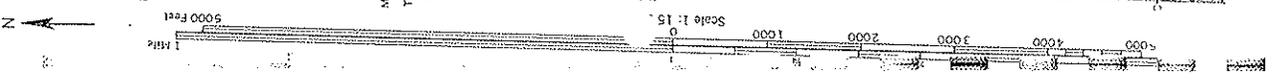
**INDEX TO MAP SHEETS**  
**CHITTENDEN COUNTY, VERMONT**



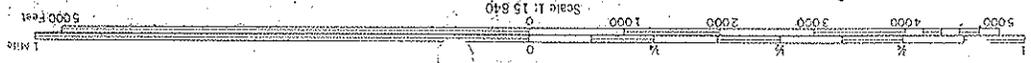
Photograph from 1952 aerial photography, Old maps based on Vincent's plan coordinate system, 1927 North American datum.

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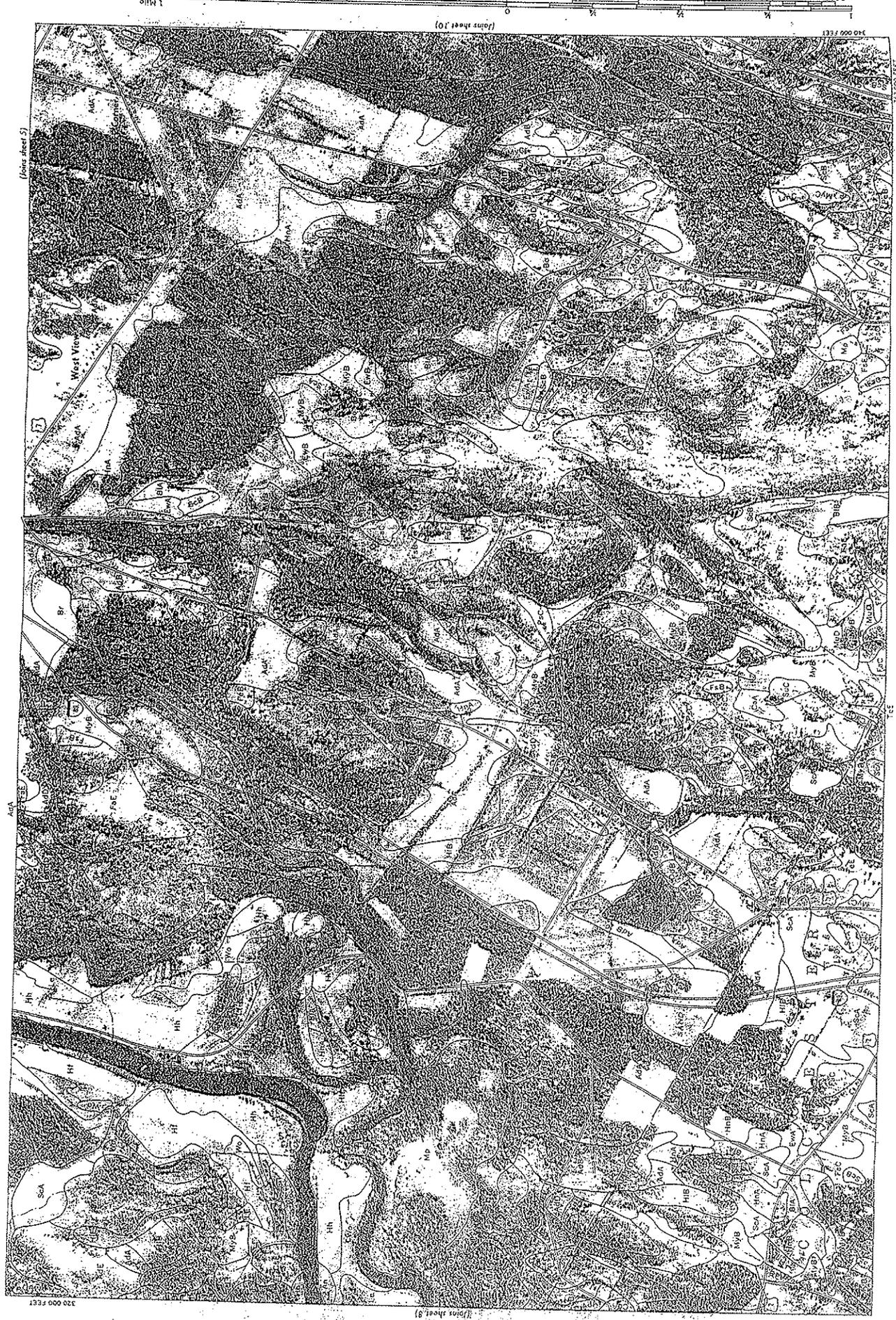
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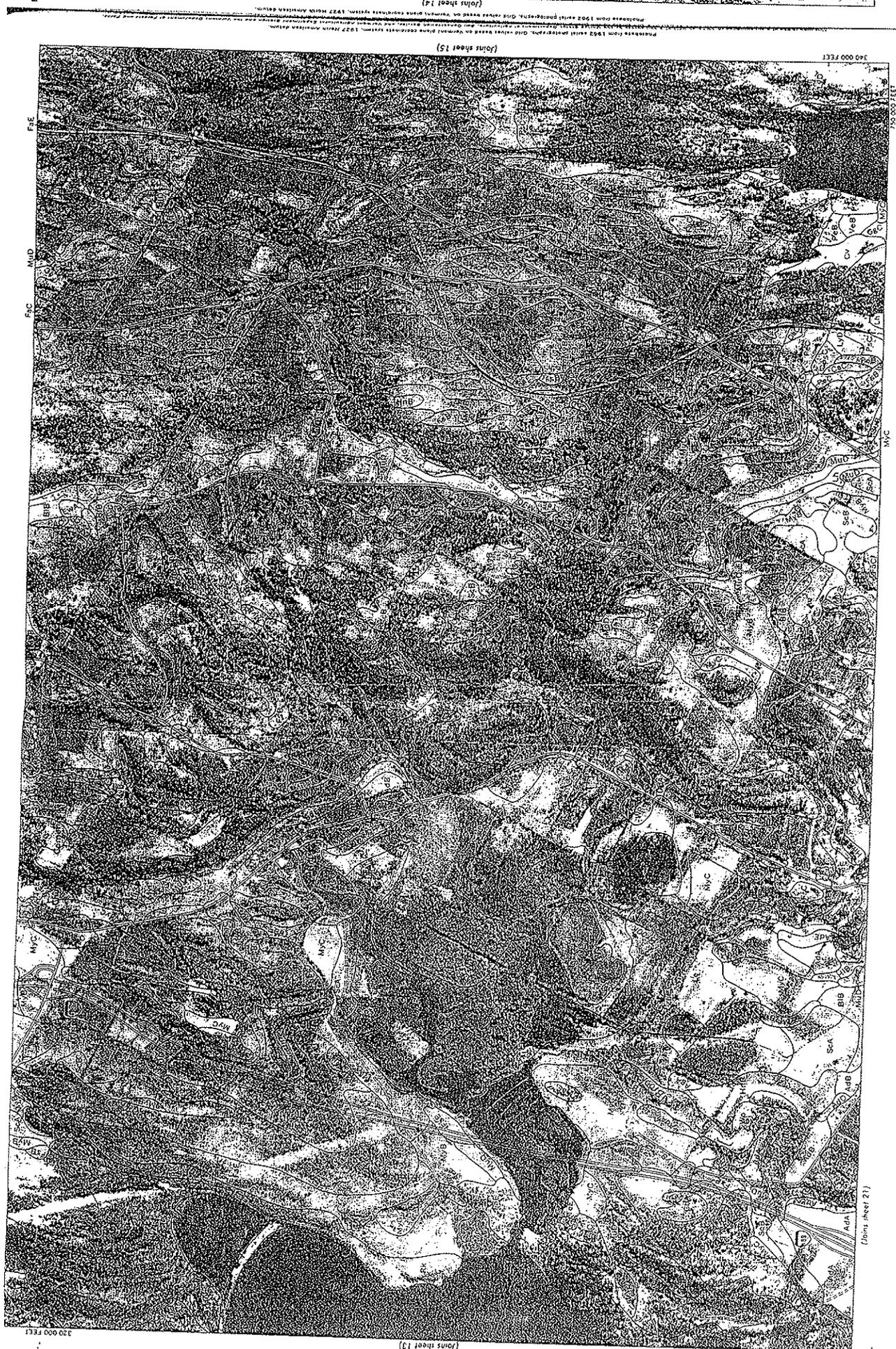
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Photograph from 1962, taken photograph. This view is based on Vermont plane coordinate system, 1927 North American datum. The map is a part of a series of maps of the State of Vermont, published by the Vermont Department of Conservation, Planning and Natural Resources. The map is a part of a series of maps of the State of Vermont, published by the Vermont Department of Conservation, Planning and Natural Resources. The map is a part of a series of maps of the State of Vermont, published by the Vermont Department of Conservation, Planning and Natural Resources.



Scale 1: 15 840

5000 Feet



(Johns sheet 15)

(Johns sheet 17)

(Johns sheet 21)

E 8

M 10

5000 Feet

1 Mile



**APPENDIX H**  
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