

STORMWATER SYSTEMS MANAGEMENT PLAN

Prepared for:

Michael and Marti Mulhern

91 Bagdad Road

Durham, NH 03824

Tax Map 10 Lot 8-6

Prepared on:

February 15, 2021

Prepared By:



ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

5 RAILROAD ST., P.O. Box 359
NEWMARKET, NH 03857
PHONE: (603) 659-4979, FAX: (603) 659-4627
E-MAIL: MJS@MJS-ENGINEERING.COM

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1.0 EXECUTIVE SUMMARY

The Stormwater Systems Management Plan (SSMP) provides a complete reference guide for use by the property owner and their chosen maintenance subcontractor for the inspection and maintenance of the stormwater best management practices (BMPs) at 93 Bagdad Road. While the primary purpose of the SSMP is to establish inspection and maintenance requirements, the plan also summarizes the purpose and function of each practice. The SSMP, in conjunction with the construction plans and details found in the Site Plan Package, describe the construction requirements of each BMP and standards for their protection and initial stabilization during the construction phase of the development and therefore should be incorporated into the construction bid documents. Compliance with the recommendations in the SSMP will assure expected operation, performance, and life cycle of the BMPs which have a common purpose of collecting and treating storm water runoff in an effort to protect the quality of public waters.

2.0 CONTACT INFORMATION

The individual responsible for the required reporting, inspection, and maintenance activities specified in this manual is;

Marti Mulhern
93 Bagdad Road
Durham, NH 03824

3.0 PERMANENT BEST MANAGEMENT PRACTICES

The section identifies the BMPs employed on this development and provides a brief summary to establish their purpose in the collection and treatment train within the storm water system. See the included Storm Water Systems Overview Plan for the location(s) of each of the BMPs.

3.1 SEDIMENT FOREBAYS

A sediment forebay is a pre-treatment practice that consists of a small basin designed to dissipate the energy of incoming runoff and allow for settling of suspended solids. A staff gage (wood stake) marked at 6 inch increments shall be permanently installed to measure the depth of sediment accumulation. Runoff outlets through a spillway.

3.2 GRAVEL WETLANDS

Gravel wetlands are constructed wetlands consisting of a sediment forebay and two cells designed to provide stormwater treatment and detention. Each gravel filled cell is topped with a wetland soil media. The soil media is planted with a New England Wetland Seed mix containing a variety of wetland species suitable for this area. During smaller storm events runoff flows horizontally through the gravel and root zone of the vegetation providing treatment. During larger storm events, the controlled release of runoff occurs through an outlet control structure. The outlet control structure is designed to maintain a saturated condition to just below the level

of the soil media. A series of PVC risers and underdrains allow the system to function and provide a means for inspection.

3.3 CONVEYANCE SWALE

Conveyance swales are vegetated channels that collect and transport runoff. Conveyance swales do not provide stormwater treatment. Swale shall have 85% vegetative growth prior to receiving runoff.

3.4 TREATMENT SWALE

Treatment swales are long, wide, vegetated channels that allow for longer hydraulic residence time to promote filtration and vegetative uptake of pollutants. Care shall be taken to prevent the flow of sediment laden runoff to the treatment swale. Swale must have greater than 85% vegetated growth prior to receiving runoff.

3.5 OUTLET PROTECTION

Rip rap aprons and a plunge pool are used as outlet protection for all the pipe outlets. These will reduce the velocity of stormwater and prevent erosion at the pipe outlet and receiving channel.

3.6 STONE BERM LEVEL SPREADER

A stone berm level spreader is an outlet structure used to convert concentrated flow to “sheet flow” and discharge to a receiving area that is usually undisturbed vegetated ground. This allows runoff to be discharged at non-erosive velocities onto natural ground.

4.0 LONG TERM MAINTENANCE OF PERMANENT BMPS

This section will be useful to the property owner and their maintenance subcontractor to establish a systematic approach for the inspection and maintenance of the on-site storm water system components. Included in Appendix B is an Inspection Matrix which summarizes the inspection needs described below. An Inspection Report is provided in Appendix C. It is recommended that completed Inspection Reports be filed with this manual for future reference.

4.1 SEDIMENT FOREBAYS

Inspect annually for sediment accumulation, erosion, and condition of vegetation. Sediment should be removed and properly disposed of from the forebay at least once per year and more if accumulation exceeds 1 foot in depth as noted on the staff gage. Embankments should be mowed at least twice per year. Inspect spillway outlet annually and repair as necessary.

4.2 GRAVEL WETLANDS

Inspect the wetland vegetation and bed in the spring. Remove accumulated sediment and replant damaged or dead areas with a suitable New England wetland restoration mix from a local native plant nursery. The seed mix should be suitable for wetland restoration sites that are not permanently inundated. The riser cleanouts and outlet control structure should be inspected annually after a storm event exceeding 2.5 inches in a 24 hour period to determine if the gravel wetland is functioning as designed. Consult a professional if the basin is inundated for more than 48 hours following such an event as replacement of the soil media, gravel, and vegetation

may be necessary. Inspect annually the outlet control structure and pipe outlet for clogging and/or debris. The berm should be inspected annually for eroded areas or rodent damage and repaired as necessary. Invasive species shall be removed using hand tools and disposed at the local landfill. Do not dispose of cut invasive species in the woods as this could cause further spreading of the plants.

4.3 CONVEYANCE SWALE

Swales shall be inspected at least annually for sediment accumulation, erosion, and condition of vegetation. Annual mowing to no less than 4 inches of the swale is required to prevent the growth of woody vegetation. Swale shall have 85% vegetative growth prior to receiving runoff.

4.4 TREATMENT SWALE

Inspect annually for sediment accumulation, erosion, and condition of vegetation. Remove sediment and debris, repair eroded areas, and reseed bare areas as necessary. Channel should be mowed at least once per year to a minimum height of 4 inches.

4.5 OUTLET PROTECTION

Inspect rip rap apron and plunge pool annually for damage and repair as needed. Ensure outlet is free of debris and sediment.

4.6 STONE BERM LEVEL SPREADER

Inspect level spreader annually for accumulation of sediment and debris and signs of erosion. Remove debris and sediment when accumulation exceeds 25% of channel depth. Repair damage as needed. Mow as required but at a minimum annually.

5.0 CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described in Appendix D.

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

6.0 REFERENCES

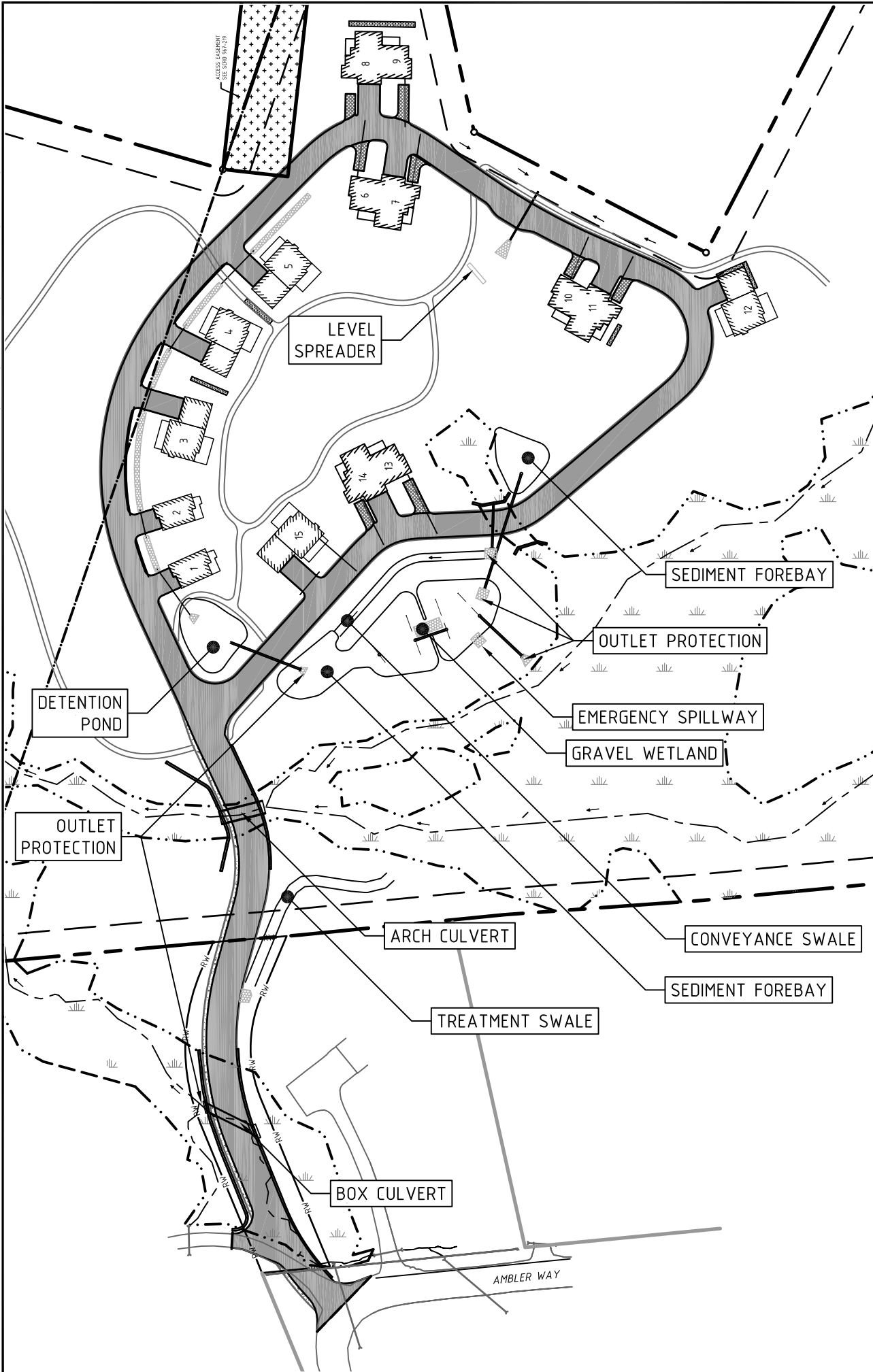
The Storm Water Systems Management Plan incorporates many standard and accepted practices. Specifically the following references were utilized:

Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire. Rockingham County Conservation District, August 1992, or latest edition.

The New Hampshire Stormwater Manual, December 2008, Revision 1.0.


“Control of Invasive Plants”, New Hampshire Department of Agriculture, Markets & Food by Douglas Cygan.

APPENDIX A:
STORMWATER SYSTEMS OVERVIEW PLAN



DATE: 4/21/21		SEAL:
SCALE: 1"=100'	DESIGNER: MJS	
DRAWN BY: MCS	APPROVED BY: MJS	
DRAWING FILE:		

STORMWATER BMP MAINTENANCE PLAN	
prepared for	
MULHERN	
TAX MAP 10, LOT 8-6	
93 BAGDAD ROAD, DURHAM NH	

	ENGINEERING, P.C. CIVIL • STRUCTURAL • ENVIRONMENTAL
	5 Railroad St., P.O. Box 359 Newmarket, NH 03857 Phone: (603) 659-4979, Fax: (603) 659-4627 E-mail: mjs@mjs-engineering.com

SHEET 1 OF 1
JOB: NM19063
STORM BMP

APPENDIX B:

MAINTENANCE MATRIX

LONG TERM BMP INSPECTION / MAINTENANCE MATRIX

BMP	Major Inspection / Maintenance Criterion ⁽¹⁾	Inspection / Maintenance Interval				Other / Notes
		Spring ⁽²⁾	Summer	Fall ⁽³⁾	Winter	
Sediment Forebays	I - read staff gage to determine depth of sediment accumulation M - remove accumulated sediment. M - mow embankments at least twice per year	I - RQ M - RQ	I - O	I - R M - R	I - O	Remove sediment annually or more if over 1 foot depth as measured with staff gage.
Gravel Wetlands	I - check for drawdown time I - inspect wetland vegetation and bed I - check earthen dam for settlement, rodent damage, failures I - inspect riser cleanouts, outlet control structure, and pipe outlet M - replant additional wetland vegetation M - remove fallen leaves, branches, etc M - remove invasive species M - remove accumulated sediment	I - RQ M - RQ	I - O	I - R M - R	I - O	Drawdown time to be checked annually following a storm of 2.5 inches or more in a 24 hour period.
Conveyance Swales	I - check for sediment accumulation M - remove debris and sediment M - mow once per year M - reseed bare areas M - repair eroded areas	I - RQ M - RQ	I - O	I - R M - R	I - O	Grass shall be mowed to a height of 4 inches minimum. Reseed with grass mix noted on plans.
Treatment Swales	I - check for sediment accumulation M - remove debris and sediment M - mow once per year M - reseed bare areas M - repair eroded areas	I - RQ M - RQ	I - O	I - R M - R	I - O	Grass shall be mowed to a height of 4 inches minimum. Reseed with grass mix noted on plans.
Outlet Protection	I - check damage to rip rap apron M - remove debris including accumulated leaves and branches M - Repair rip rap apron	I - RQ M - RQ	I - O	I - R M - R	I - O	
Notes (1) The BMP should be inspected as recommended and maintenance shall be performed as needed. Maintenance may be needed at shorter or longer intervals depending on weather conditions, and use of the property and contributing watershed (2) Early Spring as vegetation begins to blossom or earlier (3) Late Fall after majority of leaf fall, but prior to snow fall		Abbreviations I - Inspection M - Maintenance O - Optional R - Recommended RQ - Required				

APPENDIX C:

MAINTENANCE REPORTS



ENGINEERING, P.C.

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5 RAILROAD ST., P.O. Box 359
NEWMARKET, NH 03857
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E-MAIL: MJS@MJS-ENGINEERING.COM

BMP Maintenance Report

Site Name:	Harmony Homes by the Bay
Site Location:	93 Bagdad Road
Installation Date:	Summer 2022

Owner:	Michael and Marti Mulhern	Contractor:	
Contact Name:	Marti Mulhern	Contact Name:	
Company Name:		Company Name:	
Telephone:		Telephone:	
Fax:		Fax:	
Address:	93 Bagdad Road Durham, NH 03824	Address:	

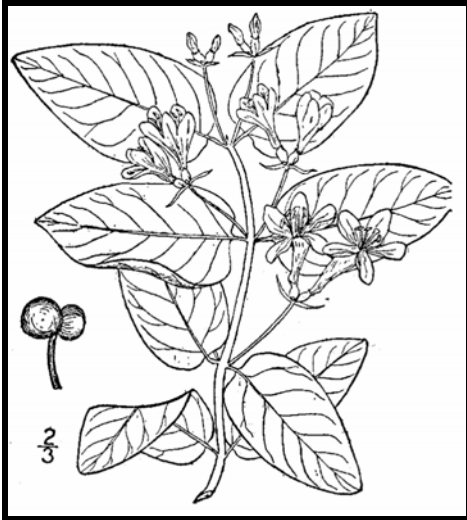
Maintenance Log

Items Inspected	Checked		Maintenance Needed		Comments
	Yes	No	Yes	No	
Sediment Forebays					
Gravel Wetlands					
Conveyance Swales					
Treatment Swales					
Outlet Protection					

APPENDIX D:
CONTROL OF INVASIVE PLANTS



Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle

Lonicera tatarica

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine

the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvases.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag “head first” at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can’t be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn’t be burned as the seeds may disperse by the hot air created by the fire.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don’t reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn’t used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don’t compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.






Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database /
Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Be diligent looking for seedlings for years in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

Woody Plants	Method of Reproducing	Methods of Disposal
Norway maple <i>(Acer platanoides)</i> European barberry <i>(Berberis vulgaris)</i> Japanese barberry <i>(Berberis thunbergii)</i> autumn olive <i>(Elaeagnus umbellata)</i> burning bush <i>(Euonymus alatus)</i> Morrow's honeysuckle <i>(Lonicera morrowii)</i> Tatarian honeysuckle <i>(Lonicera tatarica)</i> showy bush honeysuckle <i>(Lonicera x bella)</i> common buckthorn <i>(Rhamnus cathartica)</i> glossy buckthorn <i>(Frangula alnus)</i>	Fruit and Seeds 	Prior to fruit/seed ripening Seedlings and small plants <ul style="list-style-type: none"> ▪ Pull or cut and leave on site with roots exposed. No special care needed. Larger plants <ul style="list-style-type: none"> ▪ Use as firewood. ▪ Make a brush pile. ▪ Chip. ▪ Burn.
		After fruit/seed is ripe Don't remove from site. <ul style="list-style-type: none"> ▪ Burn. ▪ Make a covered brush pile. ▪ Chip once all fruit has dropped from branches. ▪ Leave resulting chips on site and monitor.
oriental bittersweet <i>(Celastrus orbiculatus)</i> multiflora rose <i>(Rosa multiflora)</i>	Fruits, Seeds, Plant Fragments 	Prior to fruit/seed ripening Seedlings and small plants <ul style="list-style-type: none"> ▪ Pull or cut and leave on site with roots exposed. No special care needed. Larger plants <ul style="list-style-type: none"> ▪ Make a brush pile. ▪ Burn.
		After fruit/seed is ripe Don't remove from site. <ul style="list-style-type: none"> ▪ Burn. ▪ Make a covered brush pile. ▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.

Non-Woody Plants	Method of Reproducing	Methods of Disposal
<p>garlic mustard (<i>Alliaria petiolata</i>)</p> <p>spotted knapweed (<i>Centaurea maculosa</i>)</p> <ul style="list-style-type: none"> ▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling. <p>black swallow-wort (<i>Cynanchum nigrum</i>)</p> <ul style="list-style-type: none"> ▪ May cause skin rash. Wear gloves and long sleeves when handling. <p>pale swallow-wort (<i>Cynanchum rossicum</i>)</p> <p>giant hogweed (<i>Heracleum mantegazzianum</i>)</p> <ul style="list-style-type: none"> ▪ Can cause major skin rash. Wear gloves and long sleeves when handling. <p>dame's rocket (<i>Hesperis matronalis</i>)</p> <p>perennial pepperweed (<i>Lepidium latifolium</i>)</p> <p>purple loosestrife (<i>Lythrum salicaria</i>)</p> <p>Japanese stilt grass (<i>Microstegium vimineum</i>)</p> <p>mile-a-minute weed (<i>Polygonum perfoliatum</i>)</p>	<p>Fruits and Seeds</p> 	<p>Prior to flowering</p> <p>Depends on scale of infestation</p> <p>Small infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and leave on site with roots exposed. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material. <hr/> <p>During and following flowering</p> <p>Do nothing until the following year or remove flowering heads and bag and let rot.</p> <p>Small infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and leave on site with roots exposed. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
<p>common reed (<i>Phragmites australis</i>)</p> <p>Japanese knotweed (<i>Polygonum cuspidatum</i>)</p> <p>Bohemian knotweed (<i>Polygonum x bohemicum</i>)</p>	<p>Fruits, Seeds, Plant Fragments</p> <p>Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn't materially influence disposal activities.</p>	<p>Small infestation</p> <ul style="list-style-type: none"> ▪ Bag all plant material and let rot. ▪ Never pile and use resulting material as compost. ▪ Burn. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile. ▪ Monitor and remove any sprouting material. ▪ Pile, let dry, and burn.

January 2010

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