BOICEVILLE RIPARIAN AREA MANAGEMENT PLAN

PROJECT PROGRESS REPORT

03/04/2024

Prepared by:

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Restaino Design
LANDSCAPE ARCHITECTURE PC

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Task 3. Draw up Invasive Plant Control Plan and Riparian Vegetation Planting Plan

Introduction

The initial site reconnaissance of the project area along the Esopus Creek occurred in October and November of 2023. A complete tree inventory and partial shrub and herbaceous plant inventory was done at that time and noted in the 12-18-2023 report. It was evident that Knotweed, *Reynoutria japonica*, was the predominant invasive plant species and that it posed a significant threat to the existing native vegetation as well as a challenge for eradication and restoration. It was dominant over much of the site from the edge of the shoreline up to the toe of the slope where flooding occurs periodically. The site experienced flooding on December 18, 2023, and subsequent smaller flood events that flattened the knotweed canes and produced a thick mattress interspersed with wrack, debris deposited by the Creek. A follow-up site visit was done on February 9, 2024, with Bobby Taylor of the Catskill Stream Buffer Initiative and Gene Sorbellini of the Town of Olive to mark dead Ash, hazardous trees, and a few non-native trees for removal. We noted that fresh sand had been deposited by the river in the knotweed area and any planting following removal would need to be flood tolerant and able to withstand dry, sandy soils. Knotweed, although the predominant threat, is not the only plant on the site difficult to control. The second most problematic plant is Mugwort, *Artemesia vulgaris*, also an herbaceous plant that indiscriminately invades the more upland edges and associated field areas. Autumn Olive, *Elaeagnus umbellata,* is a large non-native shrub present on the site and the surrounding area, thorny and tolerant of sandy soil. Oriental Bittersweet, *Celastrus orbiculatus,* a non-native vine that strangles trees, covers many dead trees and is compromising others. Both Autumn Olive and Oriental Bittersweet spread by fruiting prolifically. These four plants are compromising the health of the riparian buffer, competing with native vegetation, threatening the health of the remaining viable trees, and preventing access.

Knotweed towers over visitor and prevents access and views

Plan for Removal of Target Invasive Plants

Knotweed, *Reynoutria japonica*

Of the problematic non-native plants, Knotweed, a large herbaceous plant, is the most damaging to the integrity and use of the project site. Recent research has shown that Knotweed causes erosion by using chemicals in its roots (allelopathy) to discourage other plants from taking hold leaving bare areas. Knotweed which spreads primarily by root fragments, encourages erosion from stormwater flowing across the landscape, as well as undercutting soil on streambanks to allow pieces of rhizome to travel down waterways and establish new colonies[1]. Causing erosion is an opportunistic strategy for this plant. Knotweed can tolerate a wide range of soils, pH, and can thrive on sandy soil with few nutrients such as the soil on the river bench at the project site. Originally from volcanic regions in Japan and brought unwittingly to this country as an ornamental, Knotweed is damaging to infrastructure and can cause undermining and chemically compromise, stone, concrete, and asphalt. Often growing in thick stands to eight feet and over, its presence on the project site blocks access and views to the Esopus Creek as well as preventing native plants from flourishing. The only area that is free of the Knotweed on the riparian bank is shaded by large established deciduous trees of 24" caliper and over. Their health is critical to the site's integrity.

Methods of Control: Knotweed and Mugwort

Several methods of Knotweed control are used, not all of them successful. Cutting periodically can be done but is found to be labor intensive with many mowings required for years to weaken the plant, while full eradication may not be accomplished. Grazing is similar and would have to be on-going. Covering and tarping is not an option at the project site because the riparian area is subject to flooding. Eliminating Knotweed by this method is not certain and rhizomes could live for many years even if covered. Unless it is a newly established plant that can easily be removed by hand, activity that digs or cuts into the crown will produce small pieces of plant and could facilitate spread to other areas. There is a biocontrol, a small leaf sucking insect called a Knotweed Psyllid, developed in the UK that is being evaluated by the USDA for use here. The insect successfully debilitates Knotweed stands but has trouble overwintering[2]. A fungus that targets the root system of the Knotweed is being investigated in the UK. Until a viable biocontrol is developed, best management practices prescribed by Cornell University College of Agriculture and Life Sciences and New York Invasive Species Research Institute, recommend a systemic herbicide applied in the spring, approximately May, when the plants are one meter tall and leaves fully developed, repeated several times during key times per year as necessary.[3] Foliar application is more practical for large stands; stem injection is effective but more labor intensive and good for follow-up treatments.

[1] *Invasive Japanese Knotweed as a Catalyst for Streambank Erosion,* webinar by Brian Colleran, CERP, PWS, 2020 Society of Ecological Restoration: https://www.ser.org/news/news.asp?id=567622&hhSearchTerms=%22knotweed%22

[2] *Biology and Biological Control of Knotweeds,* Fritzi S. Grevstad, Rachel L. Winston, Robert S. Bourchier, Richard Shaw, Jennifer E. Andreas, and Carol B. Randall, USDA Forest Service: https://www.invasive-species.org/wp-content/uploads/sites/8/2021/03/Fritzi-et-al.-2018-Biology-and-Biological-control-of-knotweeds.pdf

[3] file:///C:/Users/Barbara/Downloads/Japanese%20Knotweed%20BMP%20Final-1.pdf
Japanese Knotweed (Reynoutria japonica): Best Management Practices, Cornell University CALS and NYISRI, compiled and written by Sam Shultz

On January 5, 2024, Bobby Taylor of CSBI and Adam Doan of AWSMP met with Josh Rudder of Taconic Invasive Plant Control to plan herbicide treatment of invasive plants at the Stucki project site and the connected drainage swale at the Town Wastewater Treatment Plant. Glyphosate with a surfactant that can be used near aquatic environments is a common choice. The invasive plants to be treated with herbicide are primarily Knotweed and Mugwort. Two applications are planned for spring of 2024 followed up by two applications in the fall. This regimen will be repeated in 2025. Details will be included in this report when the exact spraying protocol is firmed up. The Town will facilitate removal of dead trees and fencing in preparation for the herbicide application.

Mugwort, *Artemesia vulgaris*, at edge of open field at the project site

Similar to Knotweed, colonies of Mugwort , *Artemesia vulgaris*, become easily established in disturbed areas through the spread of rhizomes in contaminated soil. Mugwort also produces copious seeds, up to 200,000 seeds per plant. These seeds are exceedingly small, dispersed by wind, and contribute to allergies. Researchers at the University of Connecticut have found that the seeds are viable if they are mature. Therefore, mowing immature seedheads in summer or early fall is a beneficial way to prevent the spread of new plants. A combination of mowing at the proper time, before seedheads mature, and repeated applications of an herbicide such as Glyphosate, will reduce viability but may not entirely eradicate Mugwort [4]. This plant is also allelopathic and contains chemicals in its leaves that discourage competition and change soil chemistry.

[4]*Artemisia vulgaris (Mugwort): Overlooked Infiltrator of Meadow Habitats:* Sigrun N. Gadwa, MS and Todd L. Mervosh, PhD, University of Connecticut, https://cipwg.uconn.edu/wp-content/uploads/sites/244/2016/10/Mugwort-Poster-10-10-16-36x48Landscaperevised.pdf

Methods of Control: Autumn Olive and Oriental Bittersweet

Present but not yet widespread on the project site, the thorny small tree, Autumn Olive, *Elaeagnus umbellata*, has the potential to populate disturbed areas such as the floodplain at the project site. Furthermore, it is tolerant of sandy infertile soils, and produces its own nutrients by fixing nitrogen in its roots. The Lower Hudson Partnership for Regional Invasive Species Management (LH PRISM) ranks it as highly invasive in New York. It fruits prolifically and spreads by birds dropping seed from fruits. Ironically, its fruits are much less nutritious for wildlife than native berries and seeds. Methods of control include foliar spray, basal bark herbicide application, and cut stump herbicide application which is the most practical for the site. There is a chance that the basal bark herbicide could leach onto nearby trees. Cut stump application involves the cutting and removal of the shrub and painting the stump with a systemic herbicide so it does not regenerate. "Direct application of glyphosate to cut stumps can also be effective, particularly late in the growing season (July-September)."[5] This method needs to be done immediately after cutting. Autumn Olive has significant thorns and wearing eye protection during removal is especially important. Newly established plants can be treated with foliar herbicide or hand pulled but all roots must be removed.

Oriental Bittersweet, *Celastrus orbiculatus*, is an introduced aggressive vine that is a threat to trees and forested areas. It can grow to the height of host trees with vine diameters up to 10 inches. This twining vine causes damage and death of trees by strangling and smothering with thick vining growth. Tree blow-down can be caused by the vine acting as a sail in high winds. Spreading perniciously by seed and with extensive vegetative roots, Oriental Bittersweet can quickly overtake tree lines and forested areas. Several trees in the project area have been killed or compromised by this vine. If vine control is done in spring 2024, the trees that are still viable will have a chance to recover. Bobby Taylor of the Catskill Stream Buffer Initiative recommends cutting the vines at the base and leaving the upper cut part on the trees to desiccate so that the tree canopy would not be damaged further by ripping down the vines. Penn State recommends the "window-cut" method where each vine is cut at the base and at eye height, helping to give room for treatment. They further recommend that the most practical method is wait until the cut vine stump resprouts and then apply a foliar herbicide.[6] Repeated control will have to be done in the project area, including the treatment of newly emerging vines but the initial vine cutting will significantly benefit trees.

[5] https://www.lhprism.org/species/elaeagnus-umbellata
Lower Hudson PRISM, Hosted by the NYNJ Trail Conference
[6] https://extension.psu.edu/oriental-bittersweet, Skylure Templeton, Art Gover, Dave Jackson, and Sarah Wurzbacher. Reviewed by Norris Muth, Amy Jewitt, and Andrew Rohrbaugh: Penn State Extension, July 16, 2020

Site Restoration and Planting Plan

Successful restoration followed by removal of invasive plants noted in the Invasive Plant Removal Plan will be a challenge. There is scant literature and case studies describing protocol for establishing a resilient native plant stream buffer in these formerly overrun areas. Fortunately, there are a few helpful relevant studies that can be used for guidance for restoration of the project site. The first is a restoration project by the USDA Natural Resources Conservation Service that focused on native grass species that could compete with reemerging Knotweed in plots that had been suppressed by a combination of mowing and/or herbicide for one to two years.[7] The research was done by NRCS partners in New York and Pennsylvania. The plots in the study were first mowed in

the spring to produce a smaller leaf mass for spraying later in the summer. Initial mowing to reduce leaf mass may not be feasible on the project site because of the slopes and limited access. Early herbicide application done twice per year is the best option as recommended by CSBI. In the study, the plots were planted in the spring after two years of foliar herbicide treatment and evaluated two years later. The study found that the plots with two years of herbicide application followed up by seeding an aggressive native grass or riparian mix produced the best results. Of the six different mixes, the most successful at Knotweed suppression was Virginia Wildrye – Prairie Cordgrass Mix and a commercial riparian mix consisting of 27 varieties of grasses and forbs.

The second study is by Hudsonia Ltd. and involves Knotweed management on the Batavia Kill for the Green County S&WCD and NYC DEP. This research approach was different and did not plant after Knotweed suppression but had specific plots planted as part of the initial experiment. It was geared toward situations where maintenance or follow-up was not feasible. Plots were either mowed, treated with stem injection herbicide, or planted with woody plants. The study found that small trees planted directly in untreated plots did not do well and were quickly overtaken by Knotweed. The stem injection herbicide method allowed an increase in plot plant diversity by suppressing the Knotweed and had potential. However, the study surmises that: "Planting larger or faster growing trees and shrubs, or cutting larger areas of knotweed before planting, may allow woody plants to thrive in, and eventually shade out, knotweed patches."[8]

Considering both studies, the project site would benefit from a combination of two years of Knotweed foliar spraying, both spring and fall as planned, followed up by planting an aggressive cover crop of drought tolerant riparian grasses and forbs. The seed mixes specified here for restoration contain a high percentage of Virginia Wildrye, *Elymus virginicus*, which is a fast growing, aggressive, cool season native grass, tolerant of dry as well as flooded sites. There is always the possibility that seeds would be washed away before germinating or burn out with lack of rain and reseeding will become necessary. However, seeding is a much less costly and time-consuming planting method compared to planting plugs or installing woody material. Old Knotweed canes and wrack caught in the canes by flooding could hamper treatment and seeding operations. Removing the canes from the site is not a good option and could cause unwanted Knotweed to spread. Without the yearly regrowth of canes, the two-year suppression may eliminate some of the accumulation of plant debris and allow better access to the soil. Seeding a native grass and riparian mix can be done the following spring with a backpack or rotary spreader so the operator can more easily traverse uneven ground. During this third year any reemerging Knotweed can be targeted and treated with stem injection, limiting exposure to desired plantings. These targeted treatments may be on-going but as new trees produce shade, native grasses compete, and Knotweed is suppressed, the amount of herbicide treatments may diminish with time.

[7] https://www.nrcs.usda.gov/plantmaterials/nypmcpo10640.pdf
Planting Native Species to Control Re-Infestation by Japanese Knotweed: Martin van der Grinten, R. Howard Skinner, Art Gover and Mark Simonis USDA-NRCS-Big Flats Plant Materials Center, Corning, New York, USDA-ARS-Pasture Systems and Watershed Management Research Unit, University Park, PA Penn State Wildland Weed Management, Penn State University

[8] http://www.catskillstreams.org/pdfs/Hudsonia_knotweed.pdf
Experimental Management of Japanese Knotweed (Fallopia japonica) on the Batavia Kill, Greene County, New York: Tanessa Hartwig and Erik Kiviat, Hudsonia Ltd. Annandale, NY, Report to Greene County S&WCD and NYC DEP December 2009

Sandy soils, Knotweed canes, and wrack: project site, Esopus Creek floodplain

In addition to competition by native grasses and forbs, shading out any reinfestation of Knotweed can be accomplished by planting large fast growing native riparian trees such as Sycamore *Platanus occidentalis*, Basswood *Tilia americana*, and Tulip Tree *Liriodendron tulipifera* after the two years of herbicide use. Additional woody shrubs could be added in future years as determined by CSBI for understory and biodiversity if Knotweed is sufficiently suppressed. The planting plan lists recommended trees informed by the Society of Environmental Restoration's protocol for using "reference sites" as guides, ones that are similar but more ecologically intact and can function as models for restoration. The 2012 *Inventory, Classification, and Description of Riparian Natural Community Reference Types for Ashokan Watershed* [9], provides "forested floodplain" examples further upstream (north) along the Esopus Creek and tributaries. These are less disturbed sites. The report provides an inventory of existing plants, among them native species that can be used in a plant palette for a planting plan. As noted previously, the trees remaining on the project site are among native tree species listed in the report and belong to a "forested floodplain" ecology. For areas further upland on the project site, Mugwort will be controlled in a similar manner with two years of foliar spray. Replanting native grasses and forbs in these areas will follow with a seed mix matching the field edge habitat. Oriental Bittersweet areas are primarily at existing trees and may not require replanting, just freeing the existing trees; Autumn Olive is present sporadically throughout the site and areas that are left bare by its removal will be reseeded and replanted with native varieties of seed mix and native species of trees following the above-described invasive control and native planting program.

[9] https://ashokanstreams.org/wp-content/uploads/2022/08/Ulster_Riparian_Reference_Final_Report_2012.pdf *Inventory, Classification, and Description of Riparian Natural Community Reference Types for Ashokan Watershed, New York*, New York Natural Heritage Program (2012) pp. 25-29.

33' FISHING EASEMENT
RONSON PIANO
EX. ASPHALT DRIVEWAY
FORMER STUCKI EMBROIDERY
TOWN OF OLIVE
CONC.
15' R.O.W. EASEMENT
BOICEVILLE IGA
SUPERMARKET
EX. FENCE
TRASH
SHED
CUT & TREAT BITTERSWEET & RUSSIAN OLIVE AS PRESCRIBED
THROUGHOUT BRUSHY AREA & ELSEWHERE ON SITE
OPEN FIELD
36" RED OAK
DEAD TREE
36" SYCAMORE
DEAD HARDWOODS TO
REMAIN FOR HABITAT
22" SUGAR MAPLE
32" SYCAMORE
DBL 28" BASSWOOD
CUT & TREAT BITTERSWEET VINES
AT 10" RED OAK AS PRESCRIBED
EDGE OF FIELD
REMOVE
NORWAY
MAPLE
8" RED OAK
REMOVE NORWAY SPRUCE
40" LEANING RED OAK
UPPER ESOPUS CREEK
REMOVE & TREAT ANY REMAINING BITTERSWEET
FROM DEAD ASH REMOVAL AREA
6" TULIP
REMOVE FENCE FOR ACCESS
TREAT MUGWORT AS PRESCRIBED IN
INVASIVE PLANT CONTROL PLAN
DBL. 4" TULIP
15" SYCAMORE
BRUSH & SMALL TREES
MUGWORT AREA
KNOTWEED AREA
FLOW
4" RED OAK
SAVE SMALL RED OAK
CUT & TREAT BITTERSWEET
VINES AT 36" OAK
30" WHITE PINE
36" WHITE PINE
8" RED OAK
TREAT KNOTWEED AS PRESCRIBED
IN INVASIVE PLANT CONTROL PLAN
PIPE OUTLET
HEMLOCK HEDGE
15" SUGAR MAPLE
12" ASH
36" OAK
12" ASH
DRAINAGE CHANNEL
CREEK EDGE FROM
2021 ORTHO AERIAL
12" CPP
NYS POINT OF
DISCHARGE
TOWN OF OLIVE
WASTEWATER
TREATMENT PLANT
NYCDEP LANDS

0 30 60
SCALE IN FEET

INVASIVE PLANT AREAS SHOWN DO NOT INCLUDE ALL EXISTING ON SITE. THE PROJECT AREA MUST BE FIELD CHECKED BEFORE CONTROL ACTIVITIES COMMENCE.

USE OF HERBICIDES TO CONTROL KNOTWEED AND MUGWORT INFESTATIONS MUST BE DONE BY AN HERBICIDE APPLICATOR CERTIFIED IN NYS.

INVASIVE PLANT REMOVAL PLAN

RIPARIAN MANAGEMENT PLAN -TOWN OF OLIVE

SCALE: 1"=30'

MARCH 4 2024

RESTAINO DESIGN LANDSCAPE ARCHITECTURE, PC
bzr@restainodesign.com

RONSON PIANO

FORMER STUCKI EMBROIDERY
TOWN OF OLIVE

PATH T.B.D. AND SHOWN AS PLACEHOLDER

SEED FIELD INVASIVE CONTROL AREAS
W/RIPARIAN SEED MIX

UPPER ESOPUS CREEK

6 CC

3 TA

4 PO

6 LT

SEED CREEKSIDE INVASIVE CONTROL AREA
WITH FLOODPLAIN SEED MIX

4 PD

8 AL

3 CC

6 TA

SWALE

4 LT

4 PO

5 CC

0 30 60

SCALE IN FEET

TOWN OF OLIVE
WASTEWATER
TREATMENT PLANT

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	#	SIZE	COND.
		TREES			
AL	AMELANCHIER LAEVIS	SERVICEBERRY	8	7 - 8' HT.	CONT. GROWN
CC	CARPINUS CAROLINIANA	AMERICAN HORNBEAM	11	7 - 8' HT.	SINGLE TRUNK
LT	LIRIODENDRON TULIPIFERA	TULIPTREE	10	8 - 10' HT.	CONT. GROWN
PO	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	8	8 - 10' HT.	"
PD	POPULUS DELTOIDES	EASTERN COTTONWOOD	4	8 - 10' HT.	"
TA	TILIA AMERICANA	BASSWOOD	9	8 - 10' HT.	"

SEED MIXES: FLOODPLAIN MIX (ERNMX-154) & RIPARIAN MIX (ERNMX-178) BY ERNST SEEDS
https://www.ernstseed.com/

SEED AT 20 LBS. PER ACRE OR 1/2 LB. PER 1000 SQ. FT.
SEED FROM APRIL 1ST OR AFTER LAST CHANCE OF FROST UNTIL MAY 31.
OVERSEED OR REPAIR AREAS AS NEEDED.

PLANTING & SEEDING AREAS SHOWN DO NOT INCLUDE ALL EXISTING IN PROJECT AREA.

PLANT NUMBERS & VARIETIES MAY BE MODIFIED BY CATSKILL STREAM BUFFER INITIATIVE. PLANTING METHODS BY CSBI. NATIVE SHRUBS MAY BE ADDED TO PLANTING BY CSBI.

PLANTING & SEEDING OPERATIONS IN EARLY SPRING FOLLOWING TWO YEARS OF KNOTWEED SUPPRESSION.

PLANTING PLAN

RIPARIAN MANAGEMENT PLAN -TOWN OF OLIVE

SCALE: 1"=30'
DATE: MARCH 4, 2024

RESTAINO DESIGN LANDSCAPE ARCHITECTURE, PC
bzr@restainodesign.com

Plant Descriptions

Boiceville Riparian Management plan

TREES

AMELANCHIER LAEVIS
SERVICEBERRY, SHADBLOW

Serviceberry is a multi-stemmed small tree with showy white flowers in spring, edible purplish-black fruit in June, blue-green leaves in summer, and orange-red fall color. It is native to the northeast, a multi-season understory tree and tolerant of a range of soils. Prefers part shade.

CARPINUS CAROLINIANA
AMERICAN HORNBEAM, MUSCLEWOOD

American Hornbeam is an upright, medium-sized native tree that is a tough small understory tree. The gray trunk of a mature tree has distinctive fluting that gives the common name Musclewood. Flowers appear in spring in separate male and female catkins. Dark green oval leaves produce yellow and orange fall shades. Adaptable and deer resistant.

LIRIODENDRON TULIPIFERA
TULIPTREE, TULIP POPLAR

Tuliptree , one of the largest native trees in North America is a member of the Magnolia family. A tree often found in floodplains, named for its distinctive tulip shaped flowers, is a favorite nesting place for birds and attracts hummingbirds. Star shaped leaves turn a clear yellow in fall.

PLATANUS OCCIDENTALIS
AMERICAN SYCAMORE

American Sycamore is a massive tree of floodplains reaching its largest size along rivers and streams. Dark exfoliating bark reveals creamy inner bark making it very ornamental. The leaves can be about a foot across and are coarsely toothed. Female trees carry button like fruit that disperse seeds.

Plant Descriptions

POPULUS DELTOIDES
EASTERN COTTONWOOD

Eastern Cottonwood is a large spreading, fast growing, short-lived deciduous tree of rivers, streams, and wetlands. Catkins appear in early spring on both male and female trees. Later female trees release floating cottony seeds giving the Cottonwood its name. Large triangular leaves turn yellow in the fall.

TILIA AMERICANA
BASSWOOD, AMERICAN LINDEN

Basswood is the only representative of Tilia in North America. It prefers full sun and rich well-drained soils but is highly adaptable to soil conditions and can be found in floodplain habitats. Growing 60 to 80 ft. in height, Basswood is a dense shade tree with heart-shaped green foliage, and fragrant creamy yellow flowers that are attractive to pollinators.

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: March 04, 2024

Floodplain Mix - ERNMX-154

	Botanical Name	Common Name	Price/Lb
20.00 %	*Elymus virginicus*	Virginia Wildrye	8.84
15.00 %	*Sorghastrum nutans, NY4 Ecotype*	Indiangrass, NY4 Ecotype	14.47
14.60 %	*Panicum clandestinum, Tioga*	Deertongue, Tioga	22.08
14.00 %	*Andropogon gerardii, 'Prairie View'-IN Ecotype*	Big Bluestem, 'Prairie View'-IN Ecotype	6.53
10.00 %	*Carex vulpinoidea, PA Ecotype*	Fox Sedge, PA Ecotype	28.80
6.30 %	*Carex lurida, PA Ecotype*	Lurid Sedge, PA Ecotype	67.20
6.30 %	*Carex scoparia, PA Ecotype*	Blunt Broom Sedge, PA Ecotype	81.60
3.00 %	*Verbena hastata, PA Ecotype*	Blue Vervain, PA Ecotype	38.40
2.00 %	*Juncus effusus*	Soft Rush	48.00
2.00 %	*Zizia aurea, PA Ecotype*	Golden Alexanders, PA Ecotype	72.00
1.90 %	*Asclepias incarnata, PA Ecotype*	Swamp Milkweed, PA Ecotype	177.60
1.00 %	*Verbena urticifolia, PA Ecotype*	White Vervain, PA Ecotype	144.00
0.60 %	*Eupatorium perfoliatum, PA Ecotype*	Boneset, PA Ecotype	192.00
0.50 %	*Solidago rugosa, PA Ecotype*	Wrinkleleaf Goldenrod, PA Ecotype	264.00
0.40 %	*Aster novae-angliae, PA Ecotype*	New England Aster, PA Ecotype	336.00
0.40 %	*Aster puniceus, PA Ecotype*	Purplestem Aster, PA Ecotype	432.00
0.40 %	*Monarda fistulosa, Fort Indiantown Gap-PA Ecotype*	Wild Bergamot, Fort Indiantown Gap-PA Ecotype	96.00
0.30 %	*Mimulus ringens, PA Ecotype*	Square Stemmed Monkeyflower, PA Ecotype	216.00
0.30 %	*Scirpus atrovirens, PA Ecotype*	Green Bulrush, PA Ecotype	144.00
0.30 %	*Scirpus cyperinus, PA Ecotype*	Woolgrass, PA Ecotype	115.20
0.20 %	*Aster lanceolatus*	Lance Leaved Aster	432.00
0.20 %	*Lobelia siphilitica, PA Ecotype*	Great Blue Lobelia, PA Ecotype	384.00
0.20 %	*Lycopus americanus, PA Ecotype*	American Water Horehound, PA Ecotype	72.00
0.10 %	*Euthamia graminifolia, PA Ecotype*	Grassleaf Goldenrod, PA Ecotype	504.00

100.00 % **Mix Price/Lb Bulk: $38.33**

Seeding Rate: 20 lb per acre with a cover crop. For a cover crop use either grain rye (1 Sep to 30 Apr; 30 lbs/acre) or Japanese millet (1 May to 31 Aug; 10 lbs/acre).

Grasses & Grass-like Species - Herbaceous Perennial; Herbaceous Flowering Species - Herbaceous Perennial; Riparian Sites

The diverse annual and perennial grasses and forbs are attractive to humans and animals. Designed for economical wildlife food and habitat in newly established wetlands where wildlife food value is needed. The wildryes establish quickly and tolerate low fertility in wet or dry soils. Seed from October-May in full sun or partial shade. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

Price quotes guaranteed for 30 days.
All prices are FOB Meadville, PA.
Please check our web site at www.ernstseed.com
for current pricing when placing orders.

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: March 04, 2024

Riparian Buffer Mix - ERNMX-178

	Botanical Name	Common Name	Price/Lb
20.00 %	*Elymus virginicus*	Virginia Wildrye	8.84
18.00 %	*Panicum clandestinum, Tioga*	Deertongue, Tioga	22.08
17.90 %	*Andropogon gerardii, 'Southlow'-MI Ecotype*	Big Bluestem, 'Southlow'-MI Ecotype	10.81
17.90 %	*Sorghastrum nutans, NY4 Ecotype*	Indiangrass, NY4 Ecotype	14.47
9.00 %	*Panicum virgatum, 'Shelter'*	Switchgrass, 'Shelter'	12.53
3.50 %	*Verbena hastata, PA Ecotype*	Blue Vervain, PA Ecotype	38.40
3.00 %	*Rudbeckia hirta*	Blackeyed Susan	31.20
2.40 %	*Asclepias incarnata, PA Ecotype*	Swamp Milkweed, PA Ecotype	177.60
2.00 %	*Aster pilosus, PA Ecotype*	Heath Aster, PA Ecotype	264.00
2.00 %	*Heliopsis helianthoides, PA Ecotype*	Oxeye Sunflower, PA Ecotype	33.60
1.50 %	*Zizia aurea, PA Ecotype*	Golden Alexanders, PA Ecotype	72.00
0.80 %	*Eupatorium perfoliatum, PA Ecotype*	Boneset, PA Ecotype	192.00
0.80 %	*Solidago rugosa, PA Ecotype*	Wrinkleleaf Goldenrod, PA Ecotype	264.00
0.50 %	*Monarda fistulosa, Fort Indiantown Gap-PA Ecotype*	Wild Bergamot, Fort Indiantown Gap-PA Ecotype	96.00
0.40 %	*Aster lanceolatus*	Lance Leaved Aster	432.00
0.30 %	*Eupatorium fistulosum, PA Ecotype*	Joe Pye Weed, PA Ecotype	273.60

100.00 % **Mix Price/Lb Bulk: $31.65**

Seeding Rate: 20 lb per acre with a cover crop at 30 lb per acre (dry sites - grain oats, Jan 1-Aug 1; or, grain rye, Aug 1-Jan 1; moist sites - grain rye year-round)

Grasses & Grass-like Species - Herbaceous Perennial; Herbaceous Flowering Species - Herbaceous Perennial; Riparian Sites

A diverse mix of upland and wetland grasses and forbs with extensive wildlife and pollinator value. Provides food and cover for many of our songbirds, pheasants, deer and turkey. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

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All prices are FOB Meadville, PA.
Please check our web site at www.ernstseed.com
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