Please note the meeting will be held 7:00pm, **MONDAY,** November 19, 2018 in the County Board Room at the Carver County Government Center, 602 East 4th Street, Chaska, MN.

LOWER MINNESOTA RIVER
WATERSHED DISTRICT

Executive Summary for Action

Lower Minnesota River Watershed District Board of Managers Meeting
Monday, November 19, 2018

Agenda Item
Item 7. E. LMRWD Projects

Prepared By
Linda Loomis, Administrator

Summary

i. **Eden Prairie Area #3 Stabilization**
No new information since last update.

ii. **Riley Creek Cooperative project/Lower Riley Creek restoration**
No new information since last update.

iii. **Seminary Fen ravine stabilization project**
No new information since last update.

iv. **East Chaska Creek (Carver County Watershed Based Funding)**
Staff has begun work on this project. The first step was to validate the findings of the 2016 report prepared by Burns & McDonnell. Staff conducted a field inspection and a report is attached.

v. **Schroeder Acres Park (Scott County Watershed Based Funding)**
No new information since last update.

vi. **Shakopee Downtown BMO Retrofit (Scott County Watershed Based Funding)**
No new information since last update.

vii. **PLOC (Prior Lake Outlet Channel) Restoration (Scott County Watershed Based Funding)**
No new information since last update.

viii. **Dakota County Fen Gap Analysis and Conceptual Model (Dakota County Watershed Based Funding)**
Staff intends to set up a meeting with the DNR to share the work plan and determine roles and responsibilities. An agreement between the Dakota SWCD and the LMRWD will need to be drafted, because of the way in which funds have been allocated by BWSR.

ix. **Hennepin County Chloride Project (Hennepin County Watershed Based Funding)**
No new information since last update

x. **Vegetation Management Plan**
Staff has prepared a draft outline for the Vegetation Management Plan. The draft is attached for the Board's information.

xi. Sustainable Lake Management Plan - Trout Lakes

No new information since last update.

xii. Geomorphic Assessment of Trout Streams

Staff has been investigating the possibility of partnering with the Department of Bioproducts & Biosystems Engineering at the University of Minnesota to assist with the assessment. A draft of the means & methods for this assessment is attached for the Board's information.

Attachments

East Chaska Creek report
Vegetation Management draft outline
Geomorphic Assessment draft means & methods

Recommended Action

No action is recommended

Young Environmental Consulting Group, LLC

SITE LOCATION:	East Chaska Creek Project Area - Chaska, MN
PURPOSE:	Review Current Site Conditions of Project Area and Compare to 2016 Report Conducted by Burns & McDonnell (B&M)
DATE AND TIME:	8 November 2018, noon –2:30 p.m.
ATTENDEES:	Sarah Duke Middleton, Water Resources Scientist Young Environmental Consulting Group, LLC., on behalf of the Lower Minnesota River Watershed District (LMRWD) Adam Howard, Water Resources Engineer Barr Engineering Co.
WEATHER:	30° F., overcast, light and variable winds

DISCUSSION

Adam and I met on the southern end of the designated project area, near the Carver County Courthouse and Courthouse Lake. We walked the entire length of the defined project area, starting on the southern end at the levee and finishing just south of Engler Blvd. at the bridge. Prior to this meeting, both Adam and I reviewed the 2016 B&M report. Our main areas of focus were the recommended maintenance items cited for the City of Chaska to complete, and the recommended creek stabilization projects. All recommendations were reviewed during the site visit and photographed. See the attached photo log to compare the site during the 2016 field visits to current conditions.

It was evident that the City of Chaska has addressed most of the maintenance items cited in the 2016 B&M report. While reviewing the site, Adam and I discussed our findings at length. We agree that the 2016 B&M report appeared thorough, with only a few minor items missing (small outlets in 2–3 locations). Based on field visits, Adam indicated that the creek stabilization recommendations were logical, and he would likely recommend something similar to what the 2016 B&M report presented.

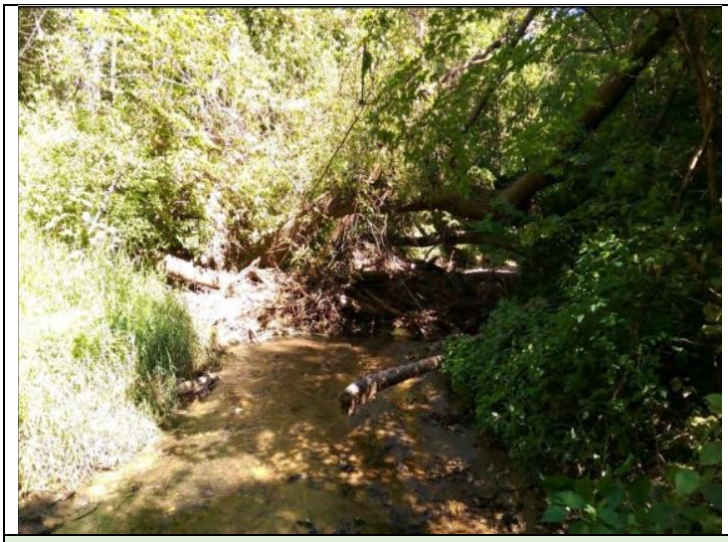
At the conclusion of the site visit, Adam indicated he would work with Jeff Weiss (Barr Engineering) to generate a feasibility study for the proposed East Chaska Creek Restoration Project.

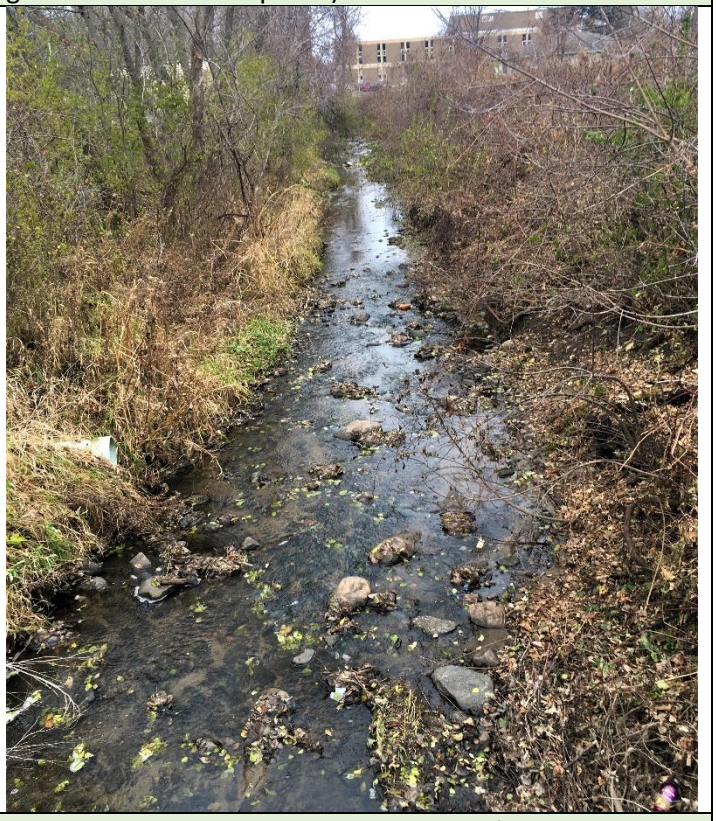
Young Environmental Consulting Group, LLC

PHOTO LOG

The following log is a visual comparison of East Chaska Creek project site conditions in 2015 (when field work for the 2016 report was conducted) and November 2018. If the exact location of a photograph from 2015 was not known, a 2018 photo in that same general area of the creek was used.

Site Photograph from 2016 Report (2015 field season)	8 November 2018 Field Visit Photograph
	
2016 Report: East view of debris, creek levee crossing, and proposed settling basin area.	**Nov. 2018 Site Visit:** Evidence of site maintenance since 2015 field visits.
	
2016 Report: Creek levee crossing and debris.	**Nov. 2018 Field Visit:** Site maintenance evident.

	
2016 Report: View east of debris.	**Nov. 2018 Field Visit:** Debris downstream of levee, near Carver County Courthouse.
	
2016 Report: View east of RCP outlet.	**Nov. 2018 Field Visit:** Upstream (western) view of RCP outlet.

	
2016 Report: Upstream of Courthouse Lake.	**Nov. 2018 Field Visit:** Upstream of Courthouse Lake (in general area of 2016 photo).
	
2016 Report: Downstream bridge near intersection of Oak St. and E. Sixth St.	**Nov. 2018 Field Visit:** Downstream view from pedestrian bridge near Oak St. and E. Sixth St.

	
2016 Report: Upstream of bridge near intersection of Oak St. and E. Sixth St.	**Nov. 2018 Field Visit:** Near Oak St. and E. Sixth St, upstream of pedestrian bridge.
	
2016 Report: Downstream of County Road 61	**Nov. 2018 Field Visit:** Downstream of County Road 61, looking at old pedestrian bridge.

<table>
<tr><td rowspan="2">  </td><td>Photo 1  </td></tr>
<tr><td>Photo 2  </td></tr>
<tr><td>2016 Report: Outfall A – just downstream of Arby’s parking lot.</td><td>Nov. 2018 Field Visit: Photo 1 – outfall. Photo 2 – downstream of outfall. Outfall discharges at lower right corner of photograph.</td></tr>
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<tr>
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<td>Photo 1  </td>
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<td>Photo 2  </td>
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<tr>
<td>2016 Report: Pedestrian bridge north of CR 61 and downstream</td>
<td>Nov. 2018 Field Visit: Photo 1- creek bed downstream of pedestrian bridge (looking north/upstream). Photo 2 - view from pedestrian bridge (north of Hwy 61) looking downstream.</td>
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</table>

	
2016 Report: Dual 12” CMP outfalls.	**Nov. 2018 Field Visit:** Dual outfalls.
	
2016 Report: View south of eroded bank.	**Nov. 2018 Field Visit:** Eroded bank slightly upstream for dual outfalls.

	
2016 Report: View of eroded bank.	**Nov. 2018 Field Visit:** View of eroded bank.
	
2016 Report: Eastern bank eroded.	**Nov. 2018 Field Visit:** Eroded eastern bank – in both images (2016 and 2018) the light gray coloring is concrete installed to mitigate loss of bank.

Photo 1

Photo 2

2016 Report: Photo 1 – east view of bridge crossing. Photo 2 – western view of bridge and scour hole.

Nov. 2018 Field Visit: Eastern view of bridge crossing

THE LOWER MINNESOTA RIVER WATERSHED DISTRICT VEGETATION MANAGEMENT PLAN 2018

Draft Outline

Executive Summary – If you're a resident!

I. Quick summary on watershed, why sensitive areas are important (4-5 sentences).

II. Know your site: what's on it? What do you want to remove/why? What needs to be protected?

III. Removal

A. Two primary methods: Mechanical and chemical; combination; Secondary: biological primarily targets large populations of noxious weeds

B. Location: general, or sensitive? If sensitive – special considerations

C. Timing: immediate removal or flexible?

IV. Replanting

A. No Action

B. Plant something: Seed, root stock, interseed/plant

V. Maintenance – game plan for a healthy site; after the 1st year, what do you need to do?

Executive Summary – If you're a resource manager or with industry

I. Quick summary on watershed, why sensitive areas are important (4-5 sentences).

II. Know your site: what's on it? What needs to be protected? What are your objectives?

III. Removal (references applicable state laws, county ordinances, etc.).

A. Two primary methods: Mechanical and chemical; combination; Secondary: biological primarily targets large populations of noxious weeds

B. Location: general, or sensitive? If sensitive – special considerations

C. Timing: immediate removal or flexible?; use recommended control method timelines for best results

IV. Replanting (references applicable state laws, county ordinances, etc.).

A. No Action – natural revegetation via seedbank and rhizomes

B. Revegetation of the site:

1. Seeding

2. Root stock

3. Interseeding/planting

V. Maintenance

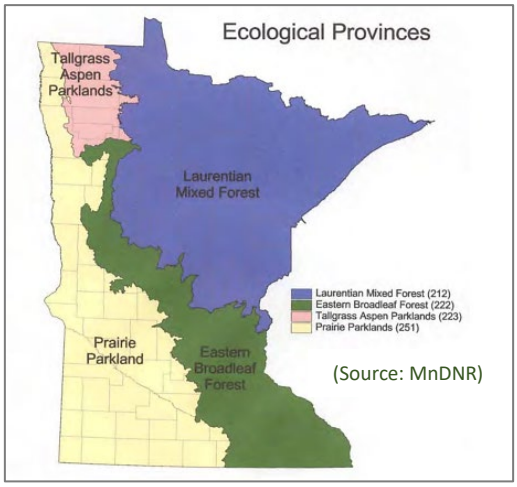
A. Noxious weed and disease prevention

B. Development of a Vegetation Management Plan – often needed to obtain permits for site work, etc.

I. Introduction

The Lower Minnesota River Watershed District's Vegetation Management Plan shall:

- Identify means/methods of vegetation removal that will minimize ground disturbances
- Identify methods of revegetating disturbed areas
- Identify measures that will reduce the introduction of noxious weeds and invasive species on areas disturbed by vegetation removal.
- Identify means and methods of vegetation removal and establishment for environmentally sensitive areas: wetlands and steep slopes/bluffs



II. General Watershed Information/Background

Topography, Geography, Maps

Features of Note: Minnesota River, MN Wildlife Refuge

Ecological Province: Easter Broadleaf Forest

Flora and Fauna species of note

Links for additional resource information

III. Why Write A Vegetation Management Plan?

A. Overview of existing veg management; also state law and county ordinances (short narrative); include references to finding local regulations/ordinances

B. Gaps to be addressed in this VMP

C. Goals for this VMP – sensitive area protection: bluffs/steep slopes, wetlands; clear means and methods for vegetation management; why vegetation management in sensitive areas is critical to water quality in the LMRWD.

IV. Means and Methods for Vegetation Management

A. <u>What vegetation is on my site?</u>. Knowing what is on site will help determine what control methods are most effective. A sound knowledge of the plant's lifecycle is critical to timing appropriate treatment. See Table ___ for a brief overview of plant types and life cycles.

TABLE ____ Plant Types	
Plant Groups According to Physical Characteristics	
Grass	Have a single seed leaf; leaves are narrow and upright. Roots are fibrous and may be either a simple, shallow, annual system, or an extensive perennial system that survives winter, and spreads laterally for many feet.

Broadleaf	Have two seed leaves; generally have broad leaves with net-like vein pattern, and a coarse root system. May be winter or summer annual, biennials, or perennials.
Woody plants	Perennial plants with woody stems, which do not dies over winter. Examples are low growing brush, shrubs, perennial vines, and trees.
Plant Groups According to Life Cycle	
Annuals	Complete their life cycle in one year. **Summer annuals** germinate in spring, grow in the summer, and die in the fall. Control is most effective in the spring when they are seedlings. **Winter annuals** germinate in the fall, begin growing in the winter, and flower in early spring. Seeds are also produced in spring, and the plants die by summer. Control of these plants is most effective in the fall or early spring.
Biennials	Need two years to complete their life cycle. Produce a low-growing rosette plant in the first year, and by the second year, produce a flowering stalk. The plant dies after the seeds have matured in the second year. Control is more effective during the first year of growth.
Perennials	Live indefinitely, and reproduce by seed. May also reproduce vegetatively, by rhizomes, tubers, or root sections. Difficult to control because of their extensive root systems. Control most effective by use of systemic herbicides, and when plants are seedlings. For established perennials, control methods should be adapted to the yearly life cycle of the plant. Herbicides applied to foliage during the early part of summer are not very effective because of plant characteristics. Once flowering has begun, characteristics are such that folia applications of herbicides are most effective, during bud to flower stage, and especially just before flowering. Chemical herbicides are also effective right after plants are cut (on woody plants) and new growth occurs (on herbaceous plants). Application in fall, prior to plants going dormant is effective since the herbicides move with natural energy flow into the roots of the perennial plants. Foliar herbicides are most effective on woody plants when applied in mid- to late summer. Treatment with dormant basal applications can be very effective from late fall through winter as well.
	Source: 6

B. What Sensitive Areas/Features Do I Need to Protect? (wetlands, bluffs, floodplain, native plant communities, habitats, adjacent land use considerations), objectives, maintenance – all fold into what approaches will be selected for your project.

1. *Residents*:

   a. What is a sensitive area/feature? – wetlands, bluffs, steep slopes, native plant communities, features you want to protect (trees, etc.)

   b. Is this a 'sensitive area'? – help resources to contact to assist with site assessment

   c. If I have a sensitive area/feature, then what?

2. *Resource Managers/Industry*:

C. Vegetation Removal

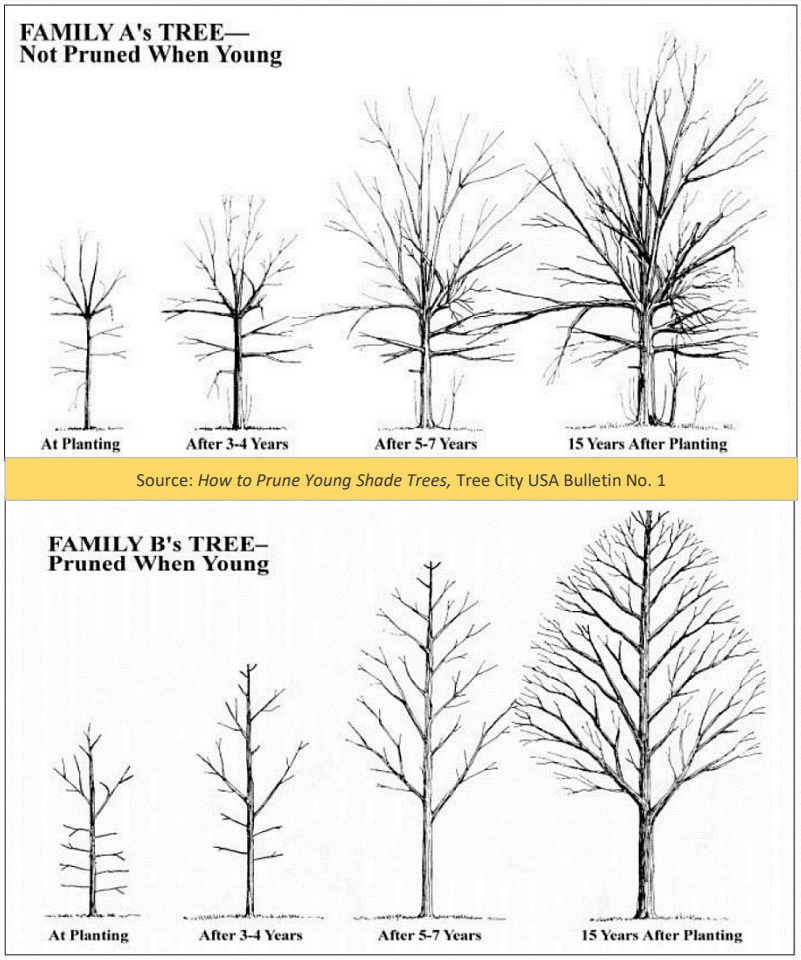
1. Mechanical/Physical Methods

When feasible, leave plants, stumps and root systems in place to anchor soil.

a. Lop and Scatter: cut and scatter in place; dispersed to permit natural growth; no deeper than 1". Often used in areas with few trees, predominately shrubs and brush.

b. Cutting: the removal of woody vegetation (trees and shrubs).

c. Trimming/Pruning: woody vegetation management practice; prune young trees every 2 years; intensely managed stands – prune trees every 5 years. Prune trees while they are young to ensure minimal pruning wounds. Oak wilt (see section C.6.b.1. for more information)



(1) *Winter*: dormant pruning done to stimulate growth burst in spring; wait until coldest part of winter has passed.

(2) *Summer:* Once seasonal growth is complete, prune to direct tree growth and correct tree structure.

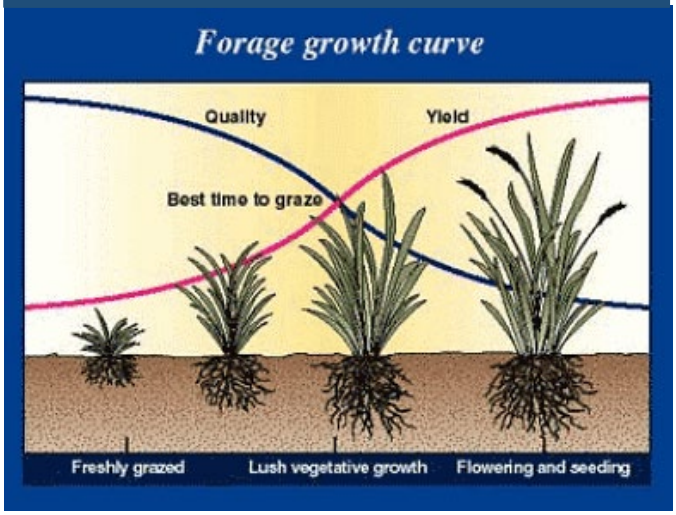
(3) *Fall:* Do not prune if possible during this time. Tree wounds heal very slowly this time of year; decay fungi and spores everywhere

d. Mowing/Hydro-ax: woody materials, shrubs, tall grasses; unevenly cut vegetation spread in a loose arrangement.

For management of vegetation along roadways, see MnDOT; MN state law has ROW mowing restrictions to protect nesting habitat, with the exception of mowing to control noxious weeds.

e. Pulling by Hand: dependent upon plant size, species, and soil conditions. Ideal method for removal of small populations of herbaceous noxious weeds (when utilizing safe techniques)– removal of entire root system. Labor intensive and time consuming

Figure ___ illustrates the ideal timeframe for grazing herbaceous vegetation. If you have an abundance of non-woody weeds, grazing prior to flowering and seeding will provide a high quality food source while eliminating the reproduction of weeds (some species, not all). (Source: U of Illinois Extension)



f. Rotational grazing

g. Prescribed burning

h. Additional Considerations:

(1) *Timing*: tree and shrub removal in frozen conditions to the greatest extent possible. – limits soil disturbance, compaction, spread of NWIS

(2) *Steep slopes/buffer*– clearing should be avoided when at all possible in these area. If necessary clearing should be done selectively, leaving adequate herbaceous/shrub cover to minimize potential erosion. Selective removal is the removal of isolated individual trees or shrubs. This method does not substantially change the canopy or understory conditions of the site. Low impact equipment should be used, with hand-tool operations preferred.

Necessary permits; local approval- elaborate.

For safety, don't mow slopes steeper than 1:3

(3) *Wetlands* – clearing should be done by hand (when feasible), with low ground-pressure equipment (when feasible), from temporary construction mats, or when soils are frozen.

Necessary permits; local approval, etc.

i. Additional Resources - sources to learn more about mechanical controls, etc.

2. Chemical: Pesticide Applications

should be used in accordance with manufacture's recommendations, and local/state/federal regulations. Contact local extension office for recommended pesticides and their application rates.

a. Insecticide versus Herbicides

b. Means & Methods of Application:

(1). *Broadcast vs spot spray*

(2). *Foliar/foliage vs basil*

c. Treatment recommendations

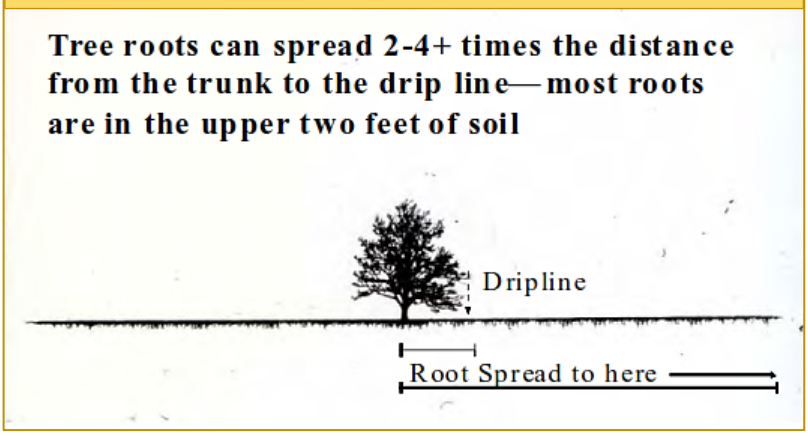
(1) *Brush*: mow, then treat resprouted foliage when 3-5ft.

(2) *Trees & shrubs* spray when < 6ft.; >6ft, cut it down, then basil stump treatment.

(3) *Herbaceous*: foliar spray

d. Timing: when feasible, spray prior to maturation of bloom and/or seedheads. Some species have very short lifecycles that allow for follow up spraying later in the growing season. Fall spraying is also ideal from several weedy species, as they direct more energy into root systems at that time – carry herbicide into root system

Adhere to herbicide labels for application guidance. Not following recommendations could damage non-targeted vegetation, like trees through horizontal root absorption. (source: 6)



(1) *Steep slopes/bluffs* – when feasible, spot spray rather than broadcast to avoid elimination of non-weed/non-targeted vegetation.

(2) *Wetlands*– when feasible, spot spray rather than broadcast to avoid elimination of non-weed/non-targeted vegetation.

(3) *Non-targeted vegetation*

f. More information: for more information on selecting an appropriate pesticide for your site and safe handling, visit _____

3. Biological Weed Control – use of insects or pathogens to control population; best for large infestations

a. Overview

b. More information – local resources to contact, local programs residents/resource managers/industry professionals can participate in.

4. Combination Treatments

On many sites one control method is not enough to adequately address the site; however, a combination of approaches will generate the desired effect. Below is a list of examples, not all inclusive

a. Physical removal & Chemical treatment

(1) Woody vegetation: cut and remove; then basal application of herbicide to reduce chances for regrowth, stump suckers

(2) Pull and remove 1st year growth; foliar application of herbicide to all 2nd yr + vegetation. *Species specific and dependent upon life cycle: if 1st year of growth does not produce propagating parts (ex: works well for garlic mustard)*

b. Biological & Mechanical

(1) In native plantings, utilize insect biocontrol (see section___ below), also conduct prescribed burns to

Basal stump treatment. After cutting the undesired tree down, a herbicide was applied (basal stump application). The outer blue ring covers the xylem and phloem, a tree's arteries and veins, carrying the herbicide into the roots. This prevents new shoots, called stump suckers, from growing. (Source: Missouri Dept. of Conservation)

increase native plant competition (not while adult biocontrol is present, generally burn outside of June-Sept window)

c. More information – questions or want a consult on how to combine methods for effective management? See the following resources _____

5. Invasive species removal

a. State and County Noxious Weed Management. MN Noxious Weed Law, MN Statues, sections 18.75-18.91: "The Minnesota Noxious Weed Law defines a noxious weed as an annual, biannual, or perennial plant that the Commissioner of Agriculture designates to be injurious to public health, the environment, public roads, crops, livestock, or other property. The purpose of the law is to protect residents of the state from the injurious effects of noxious weeds."

Refer to county noxious weed lists

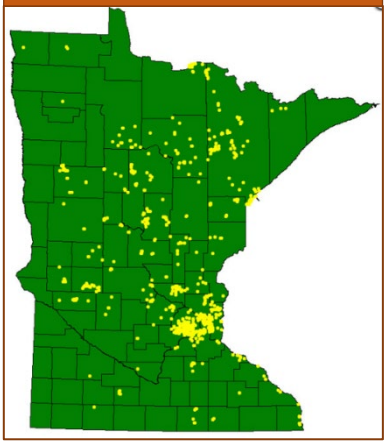
b. What is on my site? Many beneficial native plants have a similar appearance to noxious or invasive weeds (Golden Alexanders – native and Wild Parsnip – noxious weed; native Flodman thistle); know your weed and its lifecycle

c. Invasive Species Removal Methods:

In general, non-chemical control practices trigger a much slower weed response.

Window of treatment should coincide with plant lifecycle (1st year of garlic mustard, prior to viable seed development, etc.)Soil disturbance can transport dormant weed seed from soil seed bank to uninfested areas.

Insect release sites in MN for Biological Control (Source: Mn DNR)



(1) *Herbicide Applications* – when dealing with large populations or an extremely aggressive noxious weed, herbicides can be a great tool. Broadcast or spray 15ft perimeter of dense populations to limit spread into unaffected areas.

(2) *Biocontrol* – This method of control utilizes other organisms to control weed populations. For example, spotted knapweed is controlled via seedhead and root weevils. Seedhead weevils feed upon the seedhead of the plants; meanwhile, the root boring weevil larvae damage the root system. It is very selective, and can be a safe, long-term, sustainable, and cost-effective management option. The State of Minnesota has a biological control program for leafy spurge and spotted knapweed. Both programs have proven to be highly successful in managing infestations. Disturbed sites (active gravel pit, etc.) and mowed areas are not suitable for this treatment method. See the following links for more information on these programs:

http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/leafyspurge/leafyspurge and

http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/spottedknapweed/knapweed5

Successfully biological control of Leafy Spurge using beetles. Left image: field prior to insect introduction. Right image: after insects have been released. With the introduction of a biological control, this field is now a healthy pasture. (Source: MDA)

(3) *Burning* – both controls unwanted invasives and stimulates native vegetation. Benefits: stimulate growth of natives; control weeds and woody plants; removes thatch; recycles nutrients; warms soil giving jump start to warm-season natives. Local permits generally required for burn.

(4) *Cutting with herbicide application-*

(5) *Mowing* - Can be highly effective for some species when done in accordance with species lifecycle. This is a suitable method of prevention if a few plant individuals are present. Mowing prior to seed maturity (see Table ___) can prevent a large invasive seedbank from forming. The act of mowing can move viable propagating weed parts, and should be done prior to the formation of viable seed. Set mower at no closer than 5" from the ground;

TABLE ____:
Approximate mowing schedule per weed species avoid seed maturity

WEED	May	June	July	Aug	Sept	Oct
Leafy spurge	x		x	x		
Wild parsnip		x	x			
Thistle			x	x		
Spotted knapweed			x	x		

Source: 1

d. Timing: tree and shrub removal in frozen conditions to the greatest extent possible. – limits soil disturbance, compaction, spread of NWIS

e. Disposal:

(1) *Transportation*. Transporting of noxious weed propagating parts requires a written permit from a weed inspector, or county-designated employee UNLESS they are transported for the sole purpose of disposal at a Department of Agriculture-approved disposal site. (Minn Stat. 2018, §18.82 subd. 1).

A. Resident

B. Resource Manager/Industry Professional

(2). *Burning*. Description; permits/approval needed; when appropriate to burn

f. More Information: how to accurately ID the vegetation on your site?; then how to effectively remove it? See _____

6. Diseased Vegetation Removal

a. Herbaceous Vegetation:

b. Woody Vegetation: Remove all diseased or infested wood; prune back all limbs rubbing against each other and neighboring trees/shrubs; thin crown to increase airflow.

(1) Pruning & Oak Wilt prevention- elaborate

(2) clean all tools thoroughly

c. Disposal of diseased vegetation:

d. More Information for more information, _____

D. Planting/Revegetation of a Site

(check local city/county ordinances for prohibited species; commonly buckthorn, boxelder, ginkgo, etc.; compliance with permits/local regs)

1. Assessment of site: Location, topography, sensitive flora/fauna communities? Wetlands or water features adjacent to property? What land use takes place here? Will some VM options conflict with that use?

a. Resident

b. Resource Manager/Industry Professional

2. Selecting a Method

a. No Action – preferred method, often recommended when there is a large native plant population present indicative of strong native seedbank. Preferred for wetland revegetation when dominated by native species with rhizomes; use appropriate cover crop until veg grows

b. Seeding - recommended when overhead canopy has been removed, or when using native seed mix for forested/wooded areas.; use cover crop; MnDOT seed mixes; including 2 for upland areas (cleared of overhead canopy)

(1). *Step 1. Seedbed Prep*

i. If undesirable vegetation remains on the site:

A. Broadcast herbicide: 1 wk to kill off veg, mow or burn dead plant material, then drill or rake seed into stubble

B. Cultivation: sequence of till, fallow, till; destroys veg and existing germinating weeds. Takes more time, destroys soil structure, increases erosion.

ii. When ground is bare: (in accordance with permits) till soil minimum depth of 4" (disc, cultivator, etc.), breaking up large clumps of dirt. Soil soft enough for seed penetration and anchoring of mulch, but firm enough for soil stability. In smaller or sensitive areas use rakes to prepare seedbed.

ii. Steep slopes/bluff: Use rakes to prepare seedbed or lightly work up to 2" in depth with small equipment; herbicide as needed. No cultivation.

iii. Wetland: no ground work.

(2). *Step 2: Seeding* When practical, seed/mulch along ground contours; native mixes should include a fast-growing cover crop and high diversity

i. Methods – seed to soil contact is imperative

A. Broadcast seeding: sandy soils

B. Seed drill: recommended for large native plantings in heavy soils (clay, loam); not for sandy soils – sinks and plants seeds too deep for germination

C. Hydoseeding

D. Dormant seeding: Planting seeds in the fall (Sept 15 – November 1) will allow for natural stratification over the winter and early spring. A 1-2" layer of mulch will allow for moisture retention and will reduce wildlife predation of the seeds.

E. Interseeding

ii. Timing: cover crops, permanent seed mixes for expected growth that yr (1 April – June 30, or soil temp <55 degrees F), outside of recommended window plantings

iii. Steep slopes/bluff

iv. Wetland

(3). *Step 3: Surfacing Packing*

(4). *Step 4: Stabilization*

i. Mulch (weed-free): 2 tons/acre, uniformly distributed with 90% coverage, minimum length of 8" to facilitate anchoring, crimped to depth of 2-3". Application by hand – specific rate with liquid tackifier. In MN, certified weed-free forages are available.

ii. Blanket

iii. Other

iv. Steep slopes

v. Wetland:

c. Plant Rooted Stock -

Temporary cover crops for soil protection: expected to be successful practice April 1 – Sept 30; outside of this timeframe, unlikely to germinate and adequately fulfill intended role.

d. Interseeding/planting

3. Local considerations. Prohibited species, etc. Adjacent property land use; salt along roadways

Natives Successfully Established in High-Salt Areas	
Native Grasses	Canadian wild rye, Indian grass, Little bluestem, Blue grama, Side oats grama
Wildflowers	Black-eyed Susan, Purple prairie clover, Yarrow, Bush clover
	Source: 6

4. Fertilizer: Not recommended; local ordinances (P); native plants are efficient at fixing their own nutrients; N application increases ability for weeds to thrive and complete with desirable species.

a. Steep slopes/bluffs: fertilizer application not recommended

b. Wetlands: no fertilizer application

5. Local cost-sharing – state, county, watershed, city, other entities

6. More information – additional resources on revegetating a site.

E. Maintenance/Maintaining a resilient plant community

Maintenance coincides with control methods selected and timing of those applications

Post-treatment evaluation; was it effective? If not, what other control method will likely address the issues?

1. Residents

a. Are you tackling an invasive weed or diseased plant problem? If yes, continue to (1) and (2); if no, proceed to 1.b.

(1). *Invasive Weed Population Maintenance*

(2) *Disease Maintenance*

b. Native Plants

c. Do you need a Vegetation Management Plan for your site?

d. Additional Resources

2. Resource Manager/Industry Professional

a. Invasive species prevention

(1). *Prescribed Burning*: Suitable for most areas with large native plant populations (not wetland); burning will impede growth of invasive seed in the soil seedbank, and stimulate native species. The most effective way to prevent invasive species is to develop and maintain a strong and diverse native species population.; emphasize local permits needed with links on how to contact them

(2) *Adjacent Land Use:* Invasive weed prevention can be very difficult when neighboring parcels have an abundance of them. Work with adjacent landowners …..

(3) *Site Traffic and Maintenance:* clean equipment; minimize vehicle traffic as much as possible. Don't transport veg from one site to another, unless it is a disposal location or clean firewood. Seeds and propagating plant parts can easily log in equipment while working on a site; especially mowing decks and blades. Clean before and after visiting each site.

(4). *Mulch:* If using for stabilization, ensure it is certified weed-free. During long projects, temporary wood mulch is often used as a weed suppressant/stabilization.

b. Diseased plant prevention

c. Establishing a native plant community

Strong cover crop

Weeds can overtake prairie seedlings quickly. Use Table ___ as a guide for mowing.

TABLE ___ Mowing Schedule for New Native Prairie Planting						
	Height of mower	May	June	July	Aug	Sept
1st Year	4"		x	x (mid July)		x
2nd Year	7"	x				
	12"		x (if needed)			
Source: 6						

Spot-spray persistent weed. If bare soil results, reseed with cover crop in that area.

Burn 2-3 years after planting, or when enough vegetation litter accumulates to carry a fire; then every 2-5 years thereafter. Burn in sections to stimulate prairie growth without adversely impacting any one species all at once.

For more information on how to plant and establish a strong native planting, see: ____

d. Develop a site vegetation management plan (likely a necessity to receive local approval for some vegetation control methods).

It is unlikely that your site is a monoculture; therefore, different control methods may be required in different areas of the site.

Native plantings: prescribed burns, less mowing, less spraying for high quality plant community

Rare plants or features: avoid spraying or construction disturbances.

Other considerations: water quality, wildlife, privacy, timber harvesting, crops, snow/wind fencing

e. Additional Resources

V. Wrap Up of key points/Conclusion

Terms:

Bluff/Steep Slope:

Control: the management or prevention of the maturation and spread of noxious weeds that does not adversely affect the environment.

DBH (Diameter at Breast Height): for the purposes of this VMP, this is defined as the diameter of a tree species at 4.5ft from ground level.

Noxious Weed: An annual, biennial, or perennial plant that the MN Commissioner of Agriculture designated to be injurious to public health, the environment, public roads, crops, livestock, or property.

Propagating Parts: All parts of a plant, including seed, that are capable of producing new plans

Wetland:

Sources:

1Mille Lacs County. (2016). *Mille Lacs County Integrated Roadside Vegetation Management Plan*. Retrieved from: https://www.millelacsswcd.org/wp-content/uploads/2018/01/Integrated-Roadside-Vegetation-Management-Plan_2016.pdf

5Minnesota Department of Agriculture. (2018). *Biological Control of Weeds.* Retrieved from: http://www.mda.state.mn.us/biological-control-weeds

3Minnesota Department of Agriculture. (2018). *2018 Noxious Weed List*. Retrieved from: http://www.mda.state.mn.us/sites/default/files/inline-files/noxiousweeds2018_0.pdf

7 Minnesota Department of Natural Resources. (2016). *Mississippi River Corridor Critical Area Rulemaking Project.*

6Minnesota Department of Transportation. (2008). *2008-20 Best Practices Handbook for Roadside Vegetation Management*. Retrieved from: https://www.lrrb.org/pdf/200820.pdf

4Minnesota Noxious Weed Law, Minn. Stat. §18.75-18.91 (2018).

2Minnesota Power. (2016). *Great Northern Transmission Line Vegetation Management Plan.* Retrieved from: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={E8ACCAFA-C959-4B0C-9D9B-ED3280DBA6 4F}

Appendix A

Examples of common invasives that require some form of veg management.

Include photos and some management techniques.

Buckthorn

Status: Restricted Noxious Weed

Identification

Management Techniques

Buckthorn stump 1 year after cutting, with no herbicide application. Stump suckers have grown quickly. MAKE SURE TREAT AFTER YOU CUT! (Source: City of Burnsville, MN)

Garlic Mustard

Status: Restricted Noxious Weed

Identification

Management Techniques

Purple Loosestrife

Status: Control List

An owner of nonfederal lands underlying public waters or wetlands is not required to control or eradicate purple loosestrife below the ordinary high water level of the public water or wetland. The commissioner of natural resources is responsible for control and eradication of purple loosestrife on public waters and wetlands designated under section 103G.201. (Minn. Stat. 2018, §18.78, subdivision 2).

Identification

Management Techniques

Reed Canary Grass

Status

Identification

Management Techniques

Wild Parsnip

Status: Control List

Identification

Management Techniques

A Geomorphic Assessment of Trout Streams in the Lower Minnesota River Watershed District

Overview of Means & Methods for Phase 1 and Phase 2
1 November 2018

I. **Overview of LMRWD Trout Streams**

Name	Site ID	Watershed Area	Approx. Miles of Stream	State Designated Trout Stream?
Ike's Creek	LM-053-STR-IC1 (Main stem) LM-053-STR-IC2	Gun Club Lake Fen	~1.1 + (Main stem) ~0.8	
Assumption Creek	LM-019-STR-AC1 (Main stem) LM-019-STR-AC2 (unnamed)	Seminary Fen	2.75 (Main stem) 0.34 (unnamed)	X
Eagle Creek	LM-139-STR-EC1 (Main stem) LM-139-STR-EC2 LM-139-STR-EC3 LM-139-STR-EC4 LM-139-STR-EC5 LM-139-STR-EC6	Savage Fen	2.19 (Main stem) 0.26 0.04 0.74 0.39 0.05	X
Eagle Creek, East Branch	LM-139-STR-EEB		0.57	X
Unnamed Creek #7	LM-037-STR-U71 (Main stem) LM-037-STR-U72 LM-037-STR-U73	Black Dog Fen/Nicols Meadow Fen	0.48 0.08 0.06	
Kennaley's Creek	LM-037-STR-KNC		0.96	X
Black Dog Creek	LM-037-STR-BDC		1.15	
Harnack Creek (Unnamed #1)	LM-037-STR-HNC		0.16	X
One Mile Creek (Unnamed #4)	LM-037-STR-OMC		0.69	X

II. **Phase 1 Assessment** - Overview of general physical characteristics of watershed. P1 will be conducted remotely; No site visits as part of this phase.

A. Final Products of Phase 1

1. *Reference Stream Typing*: division of trout streams into geomorphic reaches that are assigned a reference stream type based upon physical parameters (geology, slope, land formation, etc.)

2. *Stream Impact Rating*: this assigns each reach a priority ranking; stems from scoring assigned to the channel, floodplain, and land use modifications for each reach
   - High score – reaches that may physically respond to disturbances, warrant further field study
   - Low score – reaches that might be suitable reference reaches for streams in adjustment

3. *Provisional Geomorphic Condition Evaluation*. Conducted for each reach, and should include the following information:
    - Reach Condition - description of any changes from reference condition
    - Reach Sensitivity - due to natural causes, human activity
    - Channel Adjustment Process – type of change that might be occurring

4. *Like Reach Evaluation*. Reaches are grouped by similar valley and stream types, and similar geomorphic condition or impact rating

5. *Trout Stream Maps*. Generate GIS maps depicting Phase 1 reaches and data, the provisional geomorphic condition, and the like reach evaluation.

6. *A LMRW Trout Stream Database*. This online summation of field data and photos will serve as a repository for trout stream data in the Lower Minnesota Watershed. It will be continually updated in both P1 and P2.

7. *Quality Assurance Review*. This should be conducted throughout P1 and documented. Topics address, but are not limited to:
    - Name and position of QA Team Lead
    - Training of P1 assessment team
    - Reach Break Review
    - Consistent use of protocols throughout
    - Tools used to collect data
    - Review of deliverables 1-6 (cited above)
    - Confidence Level

B. Resources & Skills to Complete P1

1. Data Sources & Associated Skills Required
    - General – at least one year of college education and coursework in environmental and/or biological science. Moderate computer skills to work within a digital database.
    - Remote Sensing Data – reading topographic maps; interpreting aerial-orthophotos; basic calculations; reading soil and geologic surveys; use of ArcView mapping software and extensions.
    - Existing Data – review of soil surveys, discussion with resources specialists, ability to use and operate GIS to digest and convey information visually, etc.

C. Materials Needed to Complete P1

1. Topographic maps of the Lower Minnesota River Watershed
2. Orthophoto series from two different time periods (current and a series 20+ years old)
3. Computer mapping program that can measure distances, areas, and latitude/longitude
    - GIS layers for streams
    - Digitized resource layers (NRCS soils, land use, wetland maps, etc.)
    - If available, manually digitized watershed, meander center lines, and valley walls
4. Internet access
5. Ability to develop and maintain a resource database

D. P1 Methods

PHASE 1 - METHODS		
Step	**Description**	**Est. People hours**
Step 1: Defining Stream Reaches	Defining geomorphic stream reaches of assessment trout streams	10-12
Step 2: Reach Locations	Reach description; Town; lat & long	6-8
Step 3: Determining Stream Types	Downstream & Upstream elevations; valley length & slope; channel length & slope; sinuosity; watershed size; reference channel width; valley width; confinement; reference stream type.	25-30
Step 4: Basin Characteristics: Geology & Soils	Alluvial fan; grade controls; geologic materials; valley side slopes; soil properties	20
Step 5: Land Cover Reach Hydrology	Watershed Land Cover/land use; Corridor land cover/land use; riparian buffer width; groundwater and small tributary inputs	10-15
Step 6: Instream Channel Modifications	Flow regulations and water withdrawals; bridges and culverts; bank armoring or revetments; channel straightening; dredging and gravel mining history	15-20
Step 7: Planform Changes and Floodplain Modifications	Berms and roads; river corridor development; depositional features; meander migration/channel avulsion; meander width ratio; wavelength ratio	15
Step 8: Bed and Bank	Bank Erosion – relative magnitude; debris and ice jam potential	10-15
Step 9: Stream Impact Ratings	Total impact score; priority rating	25
Step 10: Stream Geomorphic Condition Assessment	Channel Adjustment process; reach condition; reach sensitivity	30-40
Step 11: Like Reach Evaluation		20-25
Step 12: Quality Assurance	QA review intermittently throughout P1	10-15
Step 13: Database	Input of all data collected (raw data and photos)	20-30
	Total People Hours for P1 *rough estimate includes generation of deliverables and travel time	**216-270**

III. **Phase 2: Rapid Field Assessment.** Collect field data, both measurements and observations, at the reach scale.

A. Final Products of Phase 2

1. An *Existing Stream Type determination* for all trout stream reaches. Verification of the provisional reference stream type made during P1 and identify where the existing stream type has departed from the reference stream type.

2. A *Stream Geomorphic Assessment* for each reach assessed that includes the following:
    - Reach Condition – based upon land use, channel, floodplain modifications; degree of departure from the reference condition
    - Channel Adjustment Process – or type of change that may be underway due to natural causes or human activity
    - Reach Sensitivity – of the valley, floodplain and/or channel condition to change due to natural causes and/or anticipated human activity.

3. *Stream Habitat Assessment*. Assessment of physical habitat parameters to each reach assessed, includes a stream habitat condition rating.

4. *Up-to-date LMRW Trout Stream Database.* Includes the reach planform, typical condition, and assessed features. Field Maps, raw data, and photographs.

5. *Recommendations*. A narrative summarizing data collected, and discussion of monitoring recommendations moving forward.

6. *Quality Assurance Review*. This should be conducted throughout P2, and after all field data has been collected. Topics address, but are not limited to:
    - Name and position of QA Team Lead
    - Training of P2 assessment team
    - Consistent use of protocols throughout
    - Comparison of P1 and P2 data
    - Review of deliverables 1-5 (cited above)
    - Confidence Level

B. Resources & Skills to Complete P2

1. General
    - At least one year of college education and coursework in environmental and/or biological science.
    - Ability to perform moderate physical activity for long periods of time (ex: standing, hiking, wading through streams, etc.).

2. Data Sources & Associated Skills Required
    - General
        - Ability to read topographic maps
        - Calculating basic mathematical equations
        - Estimating lengths and areas
        - Data entry and database management

    - Field Assessment Skills
        - *Rapid field assessment notes*: describe, measuring distances in and around streams, and photograph stream components.
        - *Rapid Habitat Assessment & Rapid Geomorphic Assessment*: quantitatively assess and score physical habitat and geomorphic stream features

C. Materials Needed to Complete P2

1. Phase 1 data reports
2. Topographic map and ortho-photographs for each reach being assessed
3. Measuring tools
    - Measuring tape – 100ft or longer ideally incremented in tenths not inches
    - Measuring rod
    - Metric ruler or gravelometer
    - Heavy-duty tent stakes or long screw drivers to anchor tape measure when measuring bank width.
4. Leveling Equipment
    - (Optional) Range finder and level
    - Line level
5. Technology
    - Digital camera
    - GPS unit
    - Internet access
6. Pencils and clipboards
7. Chalk board or white board and writing materials – use to include the site ID, date, etc. with each photograph taken.
8. Waders or wading shoes
9. Vehicle to travel to sites
10. Multiple 2+-person crews

D. P2 Field Protocol & Methods

1. Field Protocol
    - Unless otherwise instructed, observations should be made only to the designated sample reaches
    - Data collection and field visits should be conducted during daylight hours.
    - When feasible, data collection should be done when streams are at or near base flow.
    - Take at least 4 photos per assessed segment: upstream, downstream, right bank, left bank. Include some measurement of scale within photo.
    - Use GPS to document feature locations

2. Data Collection Methods (see table below)

Phase 2: Methods	
Step	**Description**
Step 1: Site Location & Description	- *Location Map* - *Assessment Type*: Select from the following • DEG: Degraded site which may be the focus of management efforts • HGC: Gage site for a hydraulic geometry curve study • NCD: Natural channel design restoration project monitoring • REF: Reference site • MGS: Limited assessment of meander geometry • HMS: Habitat Monitoring Site - *Valley & Stream Type* - *Surficial Geology* - *Nearest Gauging Station & Location*

	- *Upstream Corridor* - *Notes on unique field observations:* Flood occurrences, how access to site was granted, recent weather, runoff events, etc.
Step 2: Valley & River Corridor	- *Segmentation Evaluation* - *Alluvial Fans Evaluation* - *Corridor Encroachment Evaluation:* take photos (berms, roads, development, etc.) - *Adjacent Terrance or Hillside Evaluation*: dominate texture of exposed material on right and left banks, lower half of slope. - *Confinement Evaluation* (actual versus the natural measured in P1) - *Grade Controls Evaluation*: record by type (waterfall, ledge, dam, weir, etc.). Include total height, height above water surface, photos, GPS location.
Step 2: Stream Channel	**If time allows, complete more than one cross section per segment* - *Bankfull Width*: record measurement to the nearest foot - *Bankfull Max Depth*: record measurement to the nearest foot - *Bankfull Mean Depth*: evaluate using 10 bankfull depths at evenly spaced intervals - *Floodprone Width*: if distance is more than 500ft, estimate distance via range finder or eye. - *Recently Abandoned Floodplain (RAF)*: record measurement to the nearest foot. - *Human Elevated Floodplain (HEF) versus RAF* - *Width/Depth Ratio*: divide bankfull width by mean bankfull depth. - *Entrenchment Ratio* - *Incision Ratio* - *Sinuosity* - *Riffles/Steps*: Describe using the terms: complete, eroded, sedimented, not applicable, not evaluated - *Riffle/Step Spacing* - *Bed Substrate Composition*: • use pebble count methodology and record percentage of class sizes • Note presence of clay • Visual estimate of detritus • Large woody debris: count, minimum length, min. diameter - *Average Largest Particle*: Bed and bar - *Stream Type*: slope; dominant bed sediment (d50); bed forms
Step 3: Stream Banks, Buffers and Corridors	- *Stream banks*: typical bank slope; lower and upper bank texture; bank erosion; gullies and mass failures; bank revetments; bank vegetation type (dominant and sub); bank canopy (avg percentage); across channel canopy (open versus closed). - *Riparian Buffer*: buffer width (NOT avg buffer width, but rather most dominate buffer condition), buffer veg type (dominate and sub on both sides of channel) - *River Corridor Land Use*: indicate both dominant and sub land uses on both sides the corridor
Step 4: Flow Modifiers	- *Springs, Seeps, & Small* Tributaries: abundant/minimal/none - *Adjacent Wetlands*: abundant/minimal/none - *Flow Status*: low/moderate/high - *Debris Jams*: cite as # of debris jams per segment or reach - *Flow regulation and Water Withdrawals*: categorize via the following options:

	• Type: Withdrawal/ bypass/ run of river/ store & release/ none/ no data/ not evaluated • Size: small or large • Use: drinking/ irrigation/ flood control/ hydro-electric/ recreation/ other - *Upstream/Downstream Flow Regulation and Water Withdrawals:* Note the presence of water withdrawals and flow regulations outside of the reach (or segment) being assessed that are affecting the reach (or segment). Refer to impacting feature's location as follows: upstream/ downstream/ both/ none - *Stormwater Inputs*: Note number of stormwater conveyance systems to the segment or reach. Should be indexed with the following categories: tile drain/ road ditch/ urban stormwater pipe/ field ditch/ overland flow - *Channel Constrictions*: consider both natural and man made - *Beaver Dams*: number of dams and length of segment influenced by dam. If the segment is composed of a series of beaver dams, take many photos and complete steps 1, 3, and 4. Skip steps 2, 5, 6, and 7.
Step 5: Channel Bed & Planform Changes	- *Bed Sediment Storage & Bar Types*: include the number of features within the following categories: mid-channel/ point/ side(lateral)/ diagonal/ delta/ islands/ none - *Flood Chutes, Neck Cut-Offs, Channel Avulsions, Migration, & Braiding*: indicate the number of each present in the segment (or reach) - *Steep Riffles or Head Cuts*: Record number of each; those features that are uncharacteristically steep (2-3x greater slope than average riffle within segment or reach); indicate Y/N whether headcuts are observed at the mouth of tributary streams that will likely initiate tributary rejuvenation. - *Stream Ford or Animal Crossing*: Y/N if present. If Y, mark location on map/GPS. - *Channel Alterations*: • Straightening: Look for evidence on aerial photos or on the ground. Index as either straightening or with windrowing. • Dredging: Record exact location of dredging and index as dredging/ gravel mining/ commercial mining/ none
Step 6: Rapid Habitat Assessment (RHA)	Assign good/ fair/ poor score for all 10 parameters 1- *Epifaunal Substrate/Available Cover*: review quantity and variety before assigning a score 2a- *Embeddedness (high gradient)*: use quartile percentages (0-25%, 26-50%, 51-75%, 76-100%) 2b- *Pool Substrate Characterization (low gradient)*: evaluate type and variety 3a- *Velocity/Depth Patterns (high gradient)*: Indicate how many of each bed features are present: step/ riffle/ run/ pool/ glide. 3b- *Pool Variability (low gradient)* 4- *Sediment Deposition* 5- *Channel Flow Status* 6- *Channel Alteration* 7a- *Frequency of Riffles/Steps (Morphological Diversity)(high gradient)* 7b- *Channel Sinuosity (low gradient)* 8- *Bank Stability* 9- *Bank Vegetative Protection* 10- *Riparian Vegetative Zone Width*

	- Generate Rapid Habitat Assessment based upon scoring the above parameters	
Step 7: Rapid Geomorphic Assessment (RGA)	- *Degree of Channel Degradation (Incision)* - *Degree of Channel Aggradation* - *Widening Channel* - *Changes in Planform* - *Channel Adjustment Process* - *Stream Condition* - *Stream Sensitivity* Generate RGA based upon scoring the above parameters	
Step 8: Database Update	Update database will all raw field data and photographs	
Step 9: Recommendations	Based upon data collected, cite recommendations for future monitoring efforts.	
*rough estimate includes generation of deliverables & travel (3-4 days per ½ mile reach via Vermont P2 Protocol document)	**Total People Hours for P2**	700 – 850 hours

Reference Documents:

Minnesota Pollution Control Agency (May 2017). *MPCA Stream Habitat Assessment (MSHA) Protocol For Stream Monitoring Sites*. Retrieved from: https://www.pca.state.mn.us/sites/default/files/wq-bsm3-02.pdf

Vermont Agency of Natural Resources (May 2007). *Vermont Stream Geomorphic Assessment Phase 1 Handbook: Watershed Assessment.*

Vermont Agency of Natural Resources (May 2009). *Vermont Stream Geomorphic Assessment Phase 2 Handbook: Rapid Stream Assessment.*

Vermont Agency of Natural Resources (May 2009). *Vermont Stream Geomorphic Assessment Phase 3 Handbook: Survey Assessment.*