Monitoring and Assessment of Conservation and Restoration Practices

Minnesota Board of Water & Soil Resources

BWSR Academy 2013

Presented by Carol Strojny &Terry Ragan

Monitoring, Assessments, Inspections....

Conservation Practices

Native Prairie Reconstruction
Wetland Restoration

Raingardens and Biofiltration Areas

Shorelines & slope stabilization

Woodland & Forest Rehabilitation

Process

Preparation for Site Visit

On-Site Evaluations

Documentation

Prior to Site Visit

Understand the project goals

- ✓ Review site background information
- ✓ Familiar with terms of agreement and/or conservation easement

Example table from conservation plan

Field	Acres	Practice Code	Prior Wetland Class (Use FSA Designation)	Restored Wetland Class (Use Cowardin Labels)	Restoration Description (Optional) Modification Basis (for non-Toolkit generated Modifications)
1	10.4	657	NI	PEMC	Restore wetland by installing a structure with natural regeneration of vegetation
2	8.4	643	NI	U	Restore Tallgrass Prarie by doing a permenent grass seeding
3	0.3	657	NI	PEMC	Existing wetland
4	0.2	657	NI	PEMC	Existing wetland
5	2.5	657	NI	PEMC	Restore wetland by installing a structure with natural regeneration of vegetation
6	0.3	657	NI	PEMC	Restore wetland by installing a structure with natural regeneration of vegetation

Example conservation plan map

Compatible Use Authorizations

Project Goals:

- stabilize soil by establishing deep rooted perennial plants
- restore wetlands to shallow marsh communities
- establish at least 80% native cover

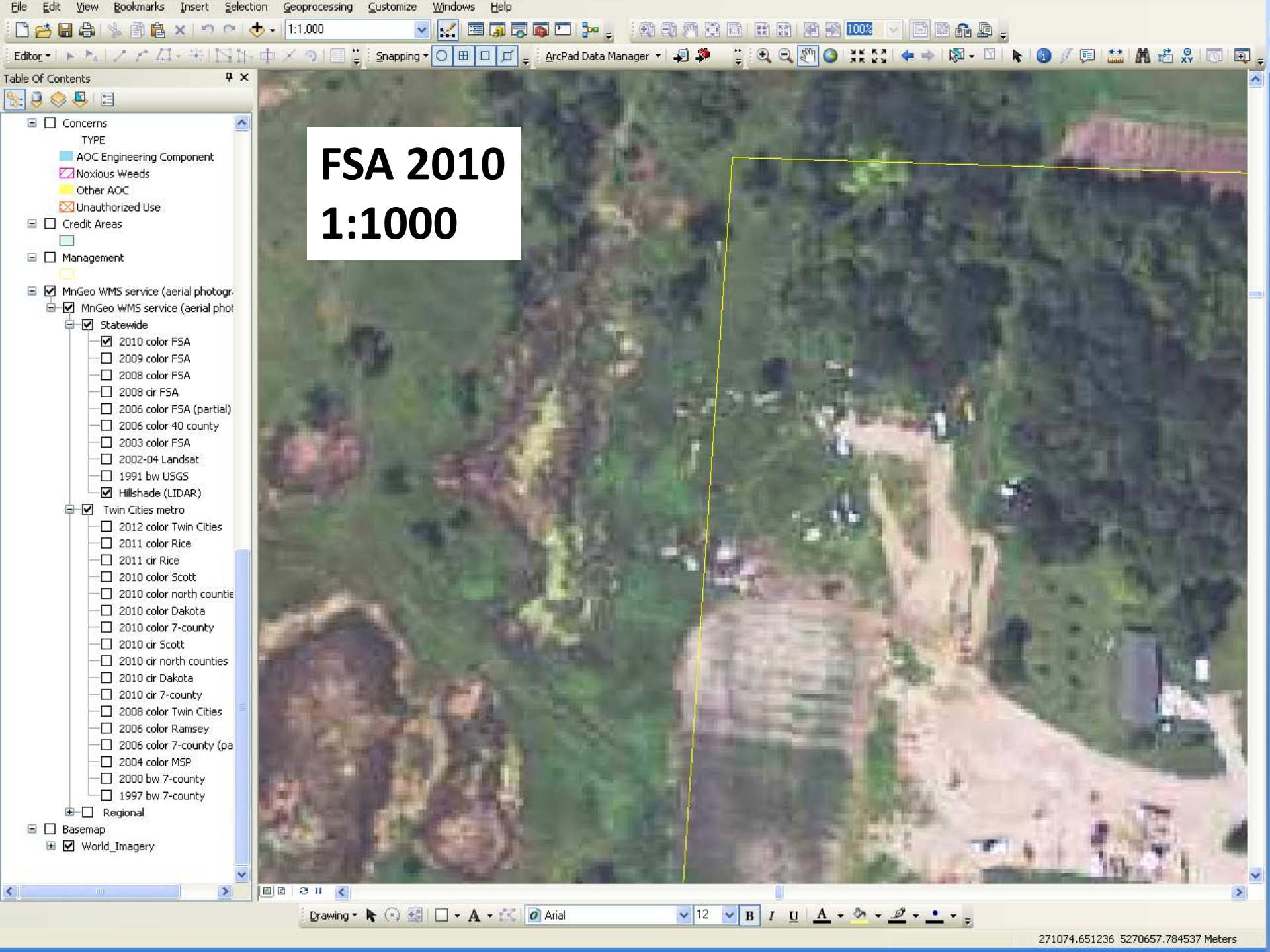
Prior to Site Visit

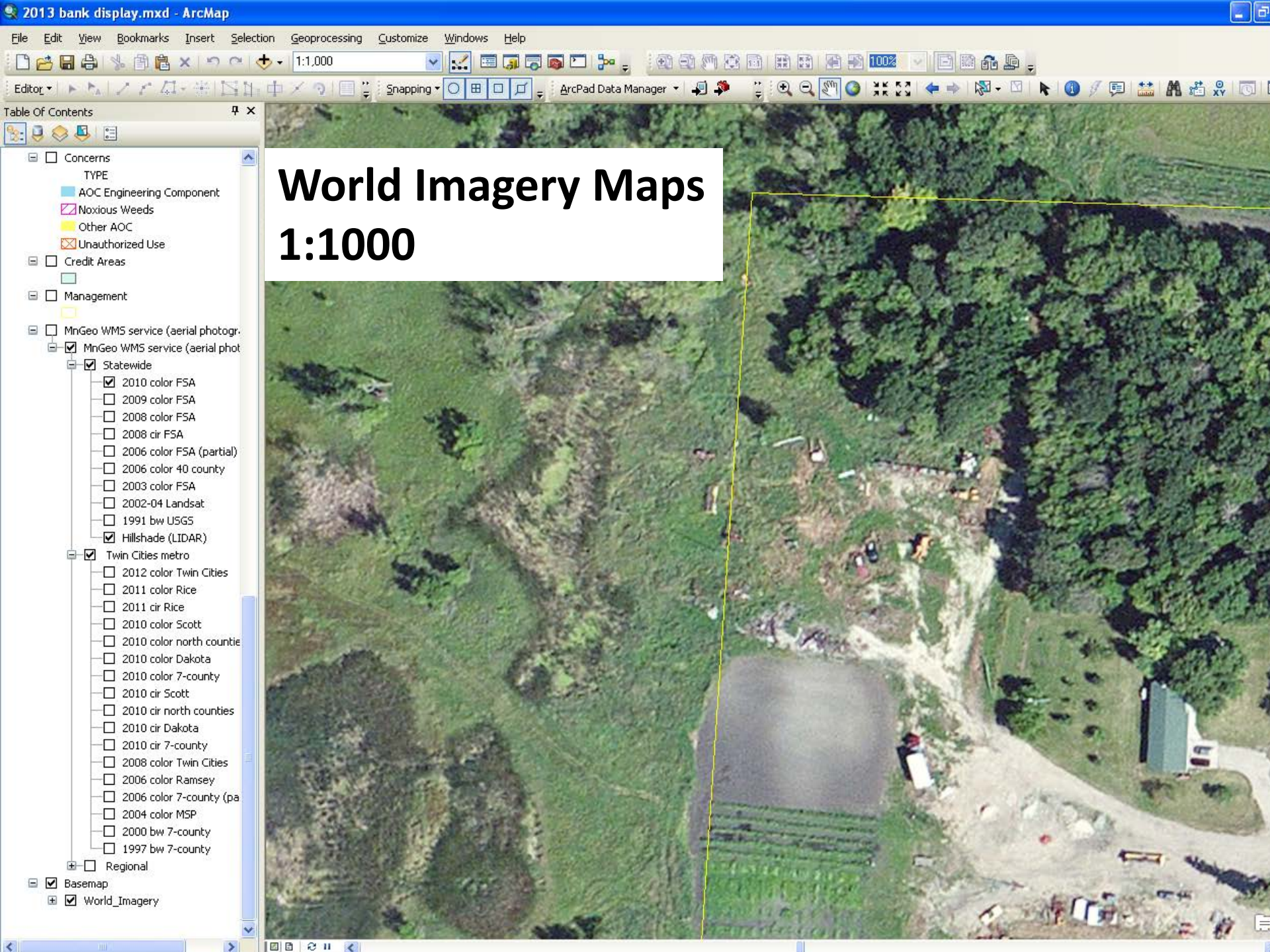
- ✓ Review air photos
- ✓ Review previous monitoring reports

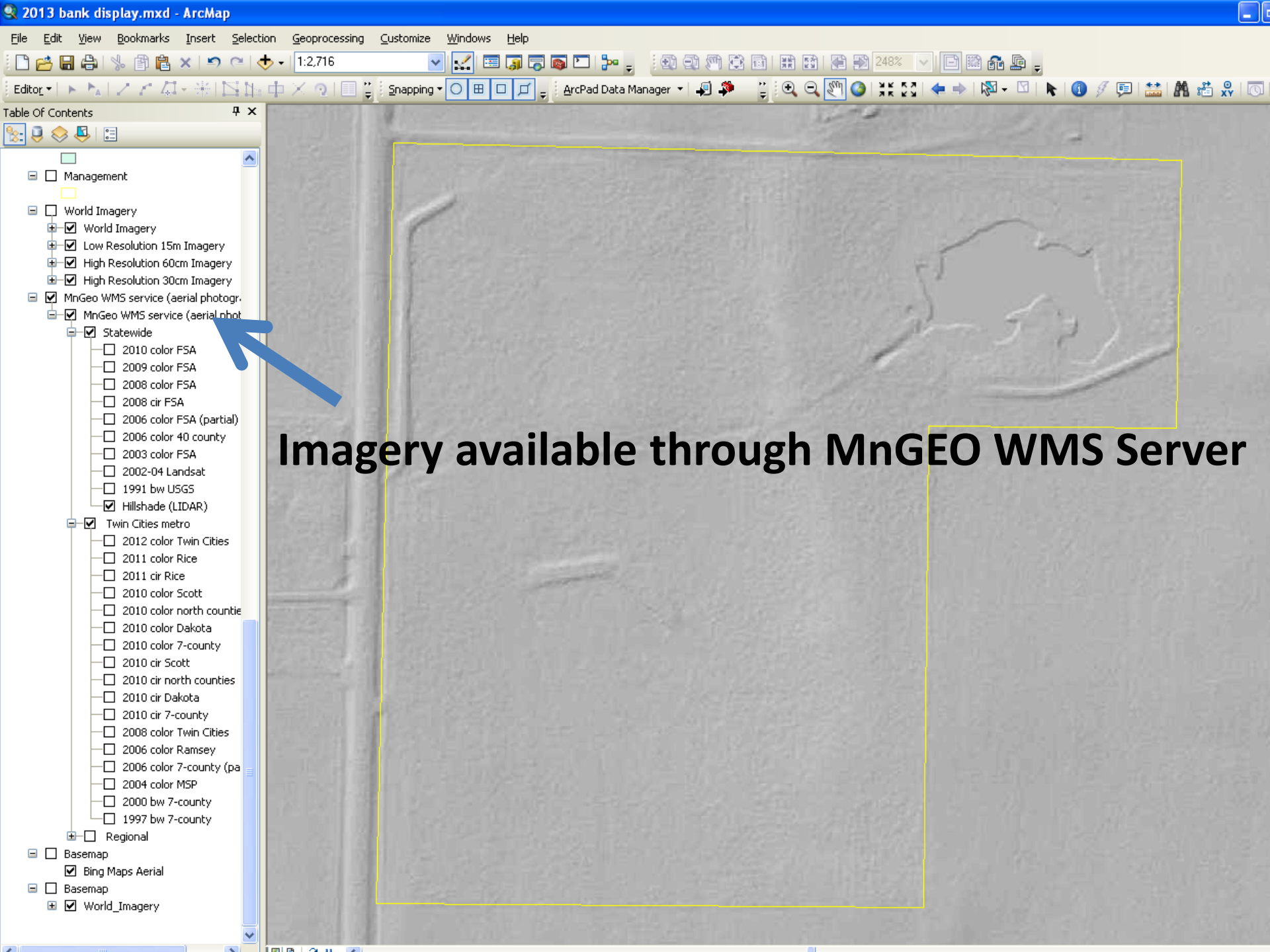
- ✓ Notify Landowner of site visit
- ✓ Prepare equipment

Air Photo Review

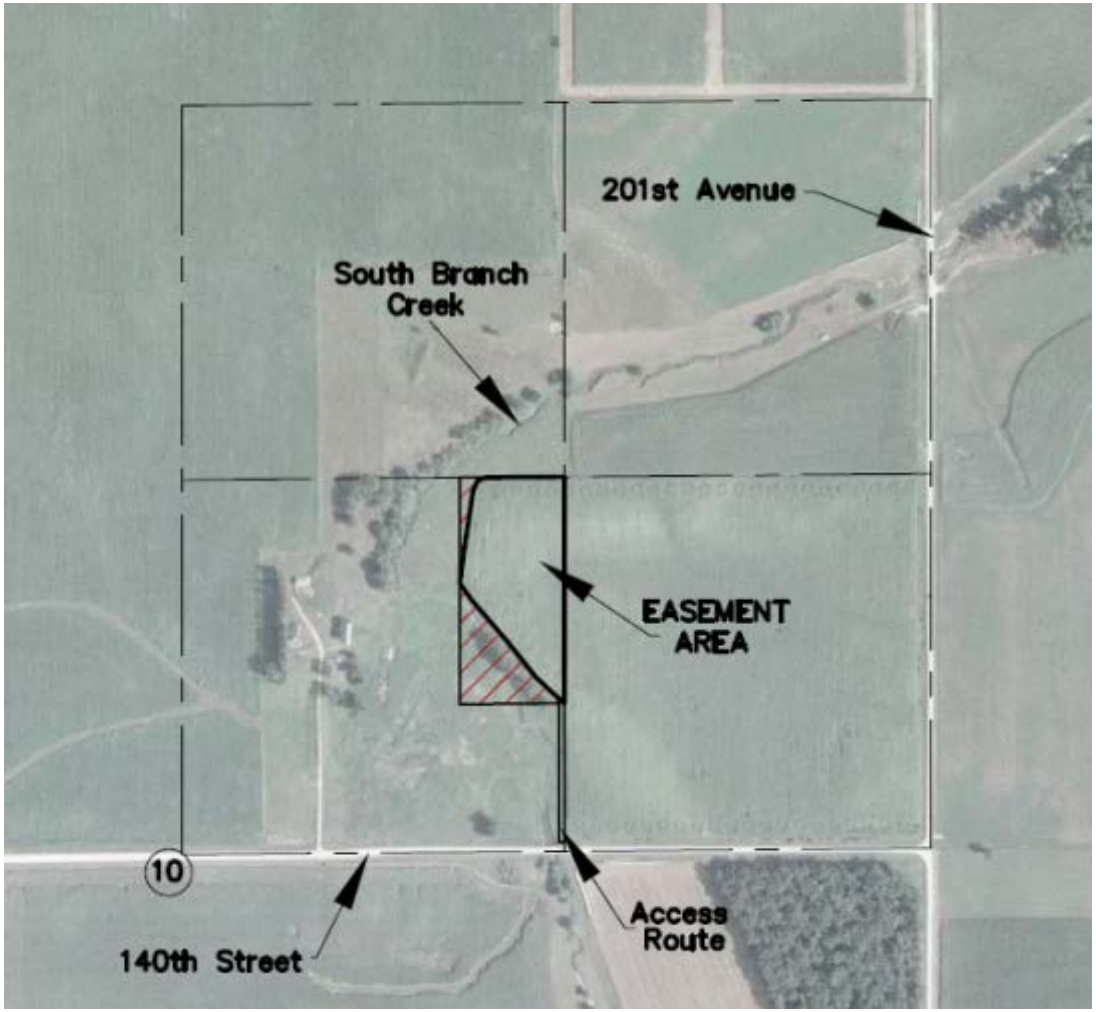
FSA 2010
1:3000


File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:1,000
Editor
Snapping
ArcPad Data Manager
Table Of Contents
Concerns
TYPE
AOC Engineering Component
Noxious Weeds
Other AOC
Unauthorized Use
Credit Areas
Management
MnGeo WMS service (aerial photogr
MnGeo WMS service (aerial phot
Statewide
2010 color FSA
2009 color FSA
2008 color FSA
2008 cir FSA
2006 color FSA (partial)
2006 color 40 county
2003 color FSA
2002-04 Landsat
1991 bw USGS
Hillshade (LIDAR)
Twin Cities metro
2012 color Twin Cities
2011 color Rice
2011 cir Rice
2010 color Scott
2010 color north countie
2010 color Dakota
2010 color 7-county
2010 cir Scott
2010 cir north counties
2010 cir Dakota
2010 cir 7-county
2008 color Twin Cities
2006 color Ramsey
2006 color 7-county (pa
2004 color MSP
2000 bw 7-county
1997 bw 7-county
Regional
Basemap
World_Imagery
FSA 2010
1:1000
Drawing
Arial
12
271074.651236 5270657.784537 Meters


2013 bank display.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:1,000
Editor
Snapping
ArcPad Data Manager
Table Of Contents
Concerns
TYPE
AOC Engineering Component
Noxious Weeds
Other AOC
Unauthorized Use
Credit Areas
Management
MnGeo WMS service (aerial photogr
MnGeo WMS service (aerial phot
Statewide
2010 color FSA
2009 color FSA
2008 color FSA
2008 cir FSA
2006 color FSA (partial)
2006 color 40 county
2003 color FSA
2002-04 Landsat
1991 bw USGS
Hillshade (LIDAR)
Twin Cities metro
2012 color Twin Cities
2011 color Rice
2011 cir Rice
2010 color Scott
2010 color north countie
2010 color Dakota
2010 color 7-county
2010 cir Scott
2010 cir north counties
2010 cir Dakota
2010 cir 7-county
2008 color Twin Cities
2006 color Ramsey
2006 color 7-county (pa
2004 color MSP
2000 bw 7-county
1997 bw 7-county
Regional
Basemap
World_Imagery
World Imagery Maps
1:1000


2013 bank display.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:2,716
Editor
Snapping
ArcPad Data Manager
Table Of Contents
Management
World Imagery
World Imagery
Low Resolution 15m Imagery
High Resolution 60cm Imagery
High Resolution 30cm Imagery
MnGeo WMS service (aerial photogr
MnGeo WMS service (aerial phot
Statewide
2010 color FSA
2009 color FSA
2008 color FSA
2008 cir FSA
2006 color FSA (partial)
2006 color 40 county
2003 color FSA
2002-04 Landsat
1991 bw USGS
Hillshade (LIDAR)
Twin Cities metro
2012 color Twin Cities
2011 color Rice
2011 cir Rice
2010 color Scott
2010 color north countie
2010 color Dakota
2010 color 7-county
2010 cir Scott
2010 cir north counties
2010 cir Dakota
2010 cir 7-county
2008 color Twin Cities
2006 color Ramsey
2006 color 7-county (pa
2004 color MSP
2000 bw 7-county
1997 bw 7-county
Regional
Basemap
Bing Maps Aerial
Basemap
World_Imagery
Imagery available through MnGEO WMS Server

Landowner Contact



Prepare Equipment

On-Site Evaluations: Installed Engineering Practices

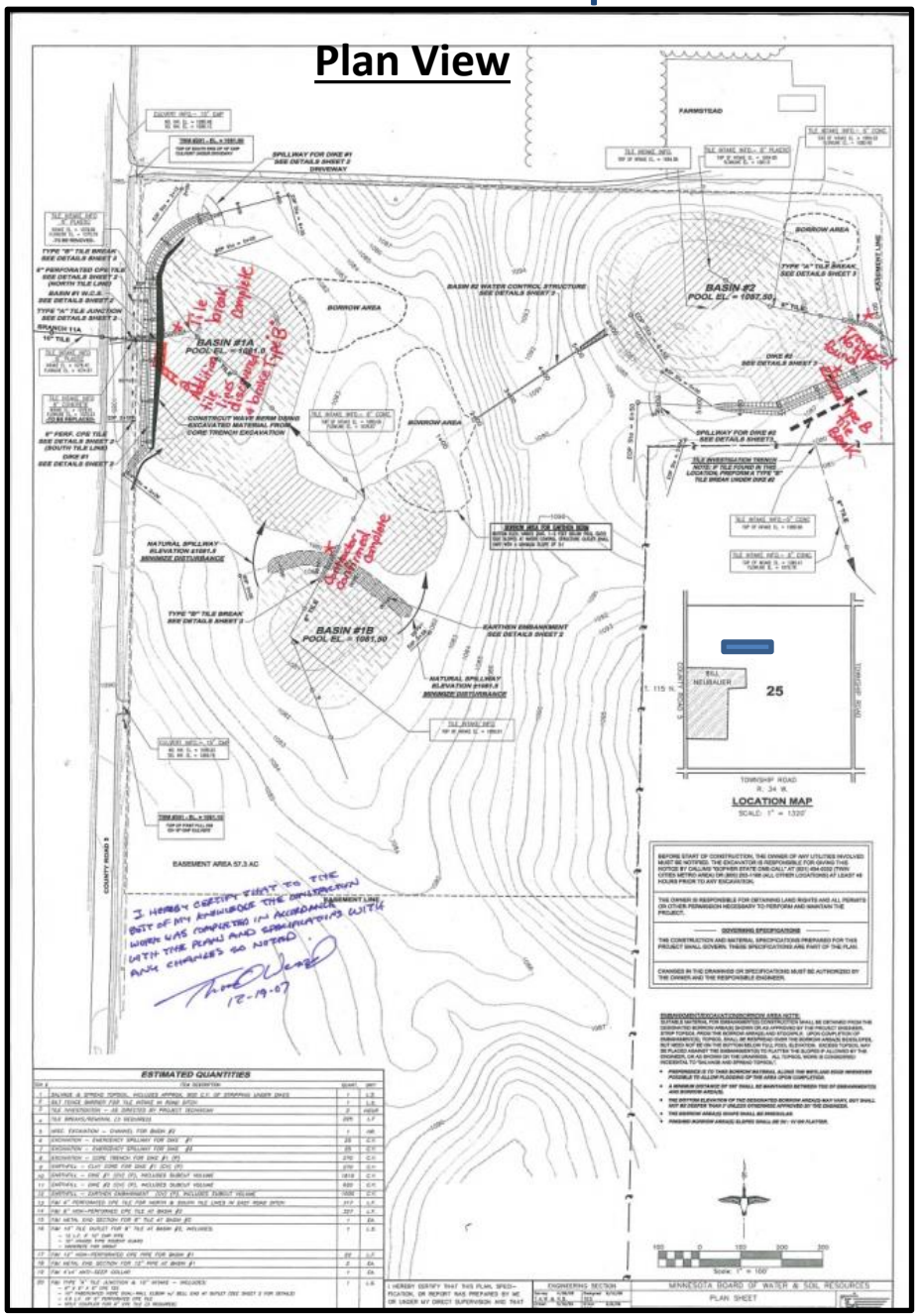
Table of Contents

- Preparation
- Embankment
- Outlets – Vegetative and Mechanical
- Shoreline
- Other

Table of Contents

- Preparation
  - ✓ As-Built Drawings
- Embankment
- Outlets – Vegetative and Mechanical
- Shoreline
- Other

As-Built Drawings



As-Built Drawings

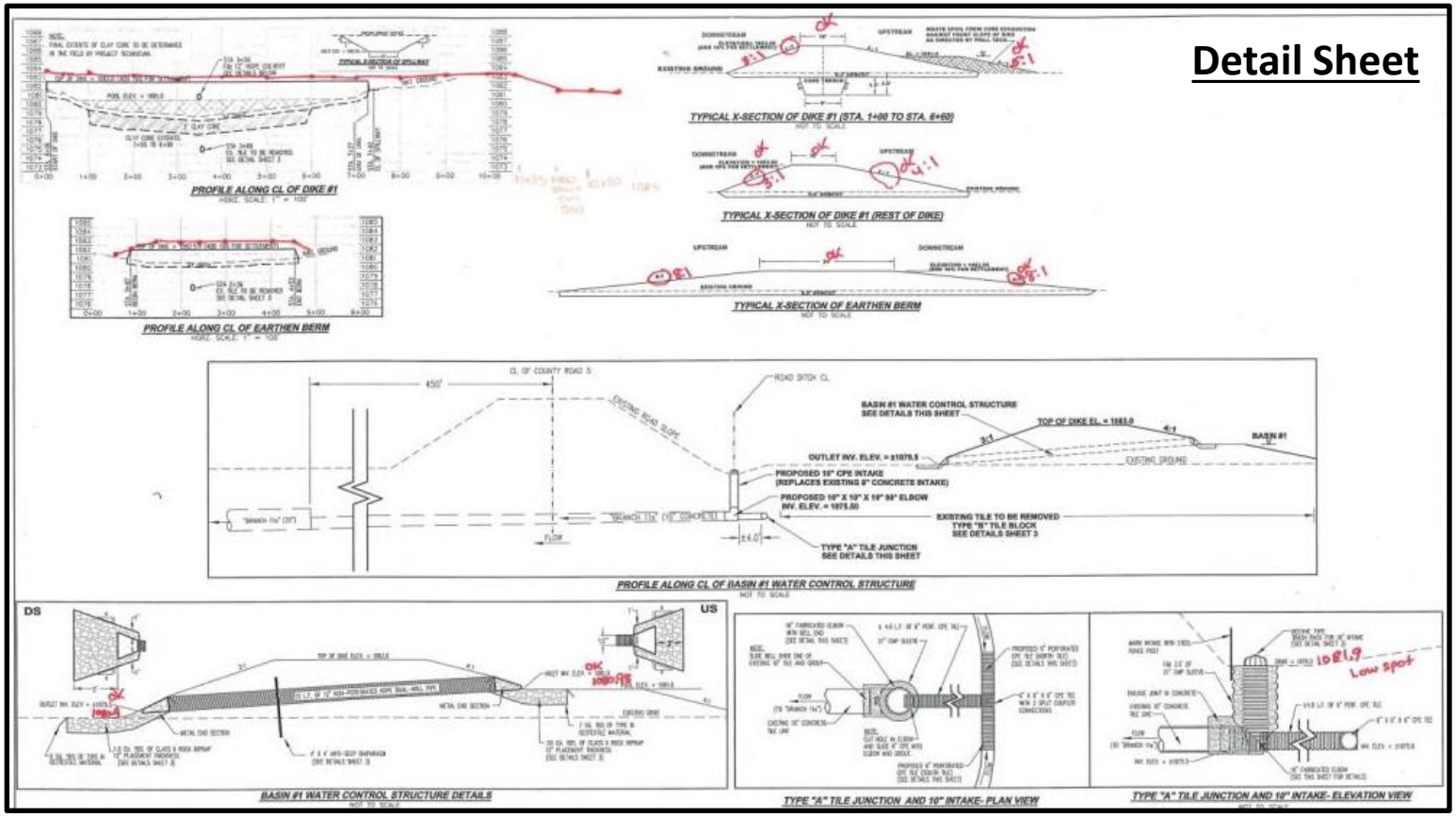
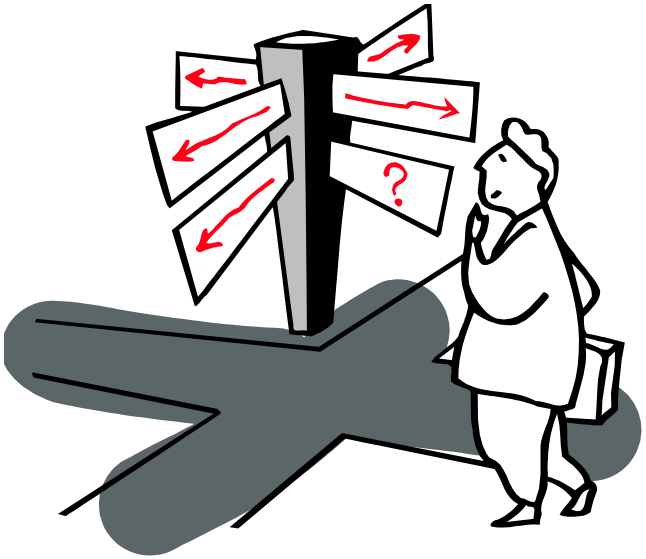
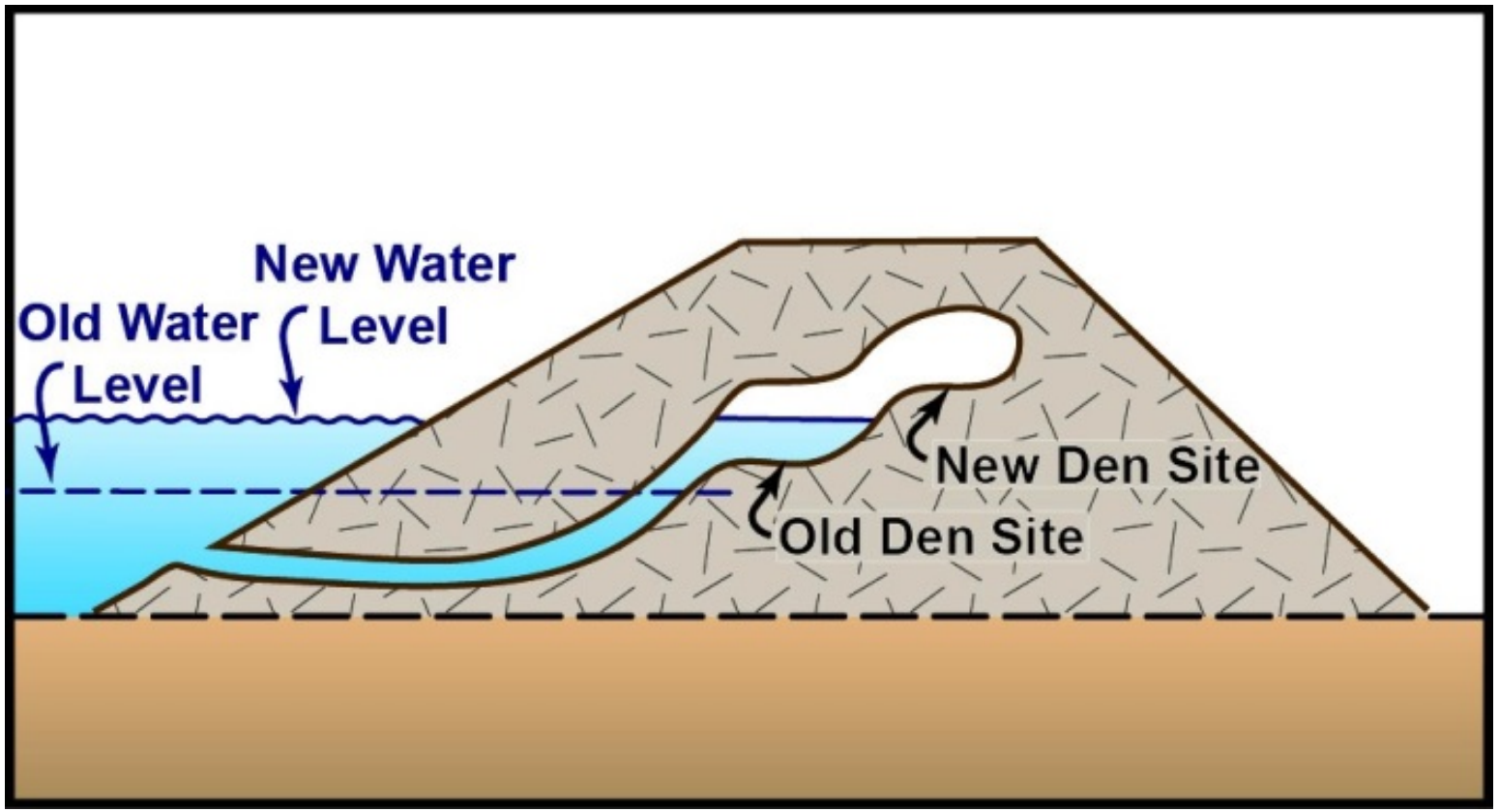


Table of Contents

- Preparation
- Embankment
  - ✓ Rodent Activity
  - ✓ Woody Vegetation
  - ✓ Embankment Seepage
  - ✓ Wave Action Damage
- Outlets – Vegetative and Mechanical
- Shoreline
- Other



Rodent Activity



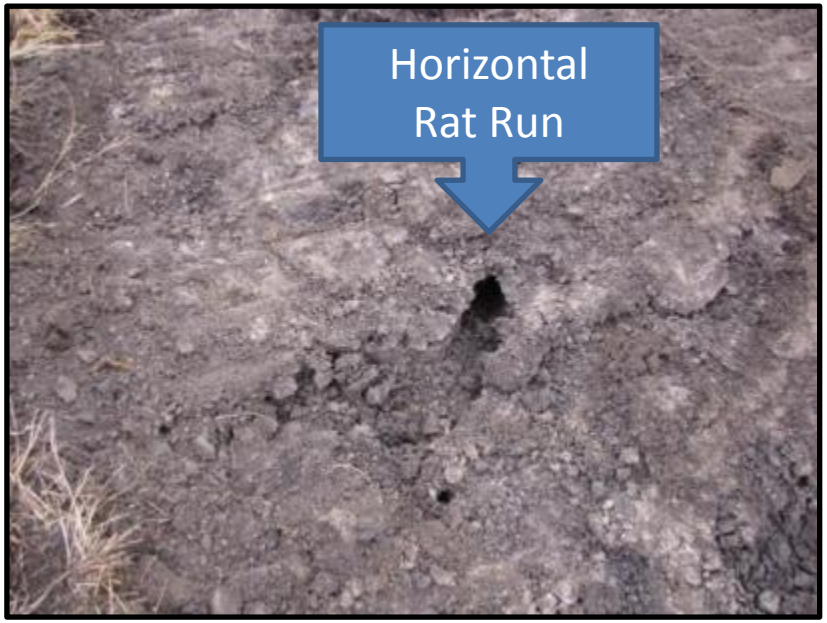
Rodent Activity

Burrow Entrances

Embankment

Flow Thru Embankment

Rodent Activity



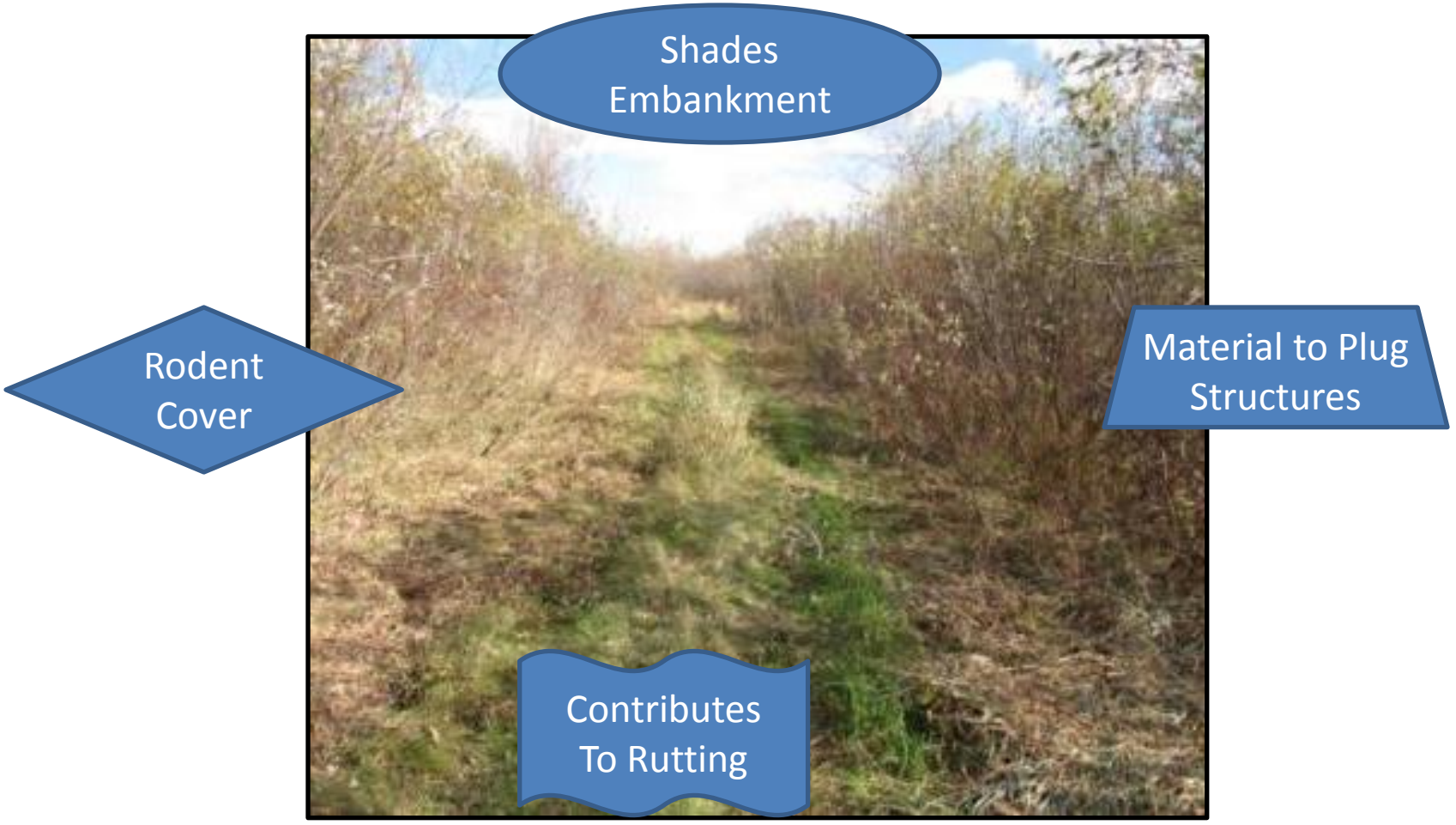
Woody Vegetation

Tree Roots Weaken Embankment

Rutting
Woody Veg. Encroachment

Shade, Poor Vegetative Cover Downstream Side

Woody Vegetation



Woody Vegetation

Woody Vegetation

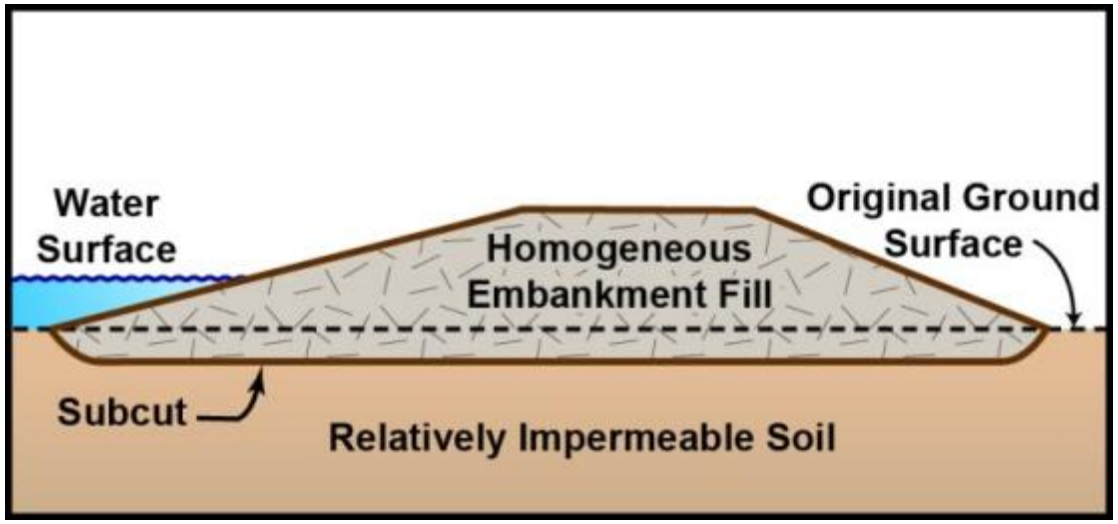
Can Restrict Pipe Flow

Deadfall Can Plug Inlets

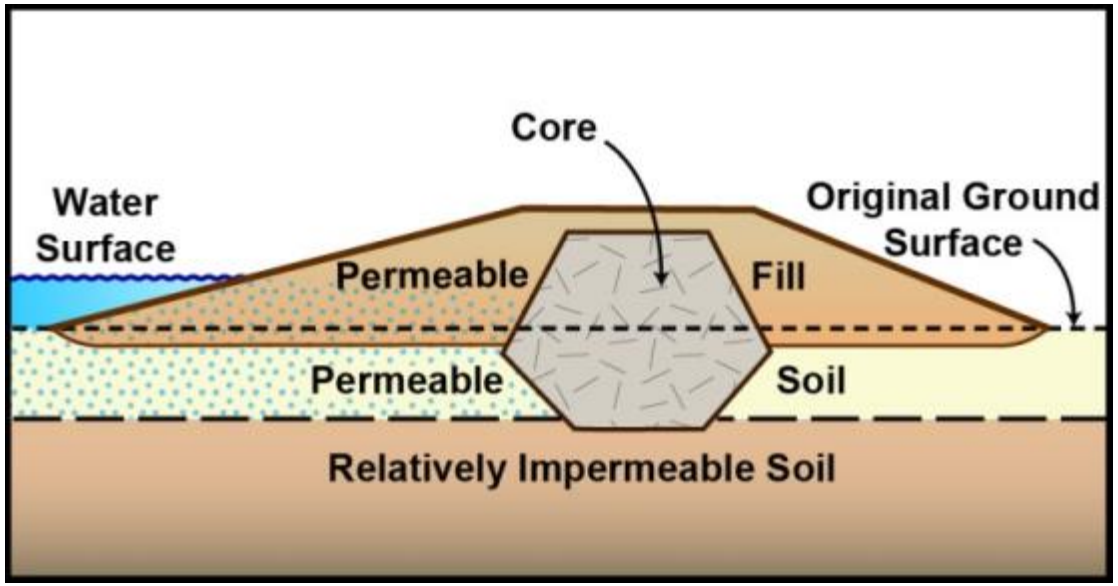
Embankment

Woody Vegetation

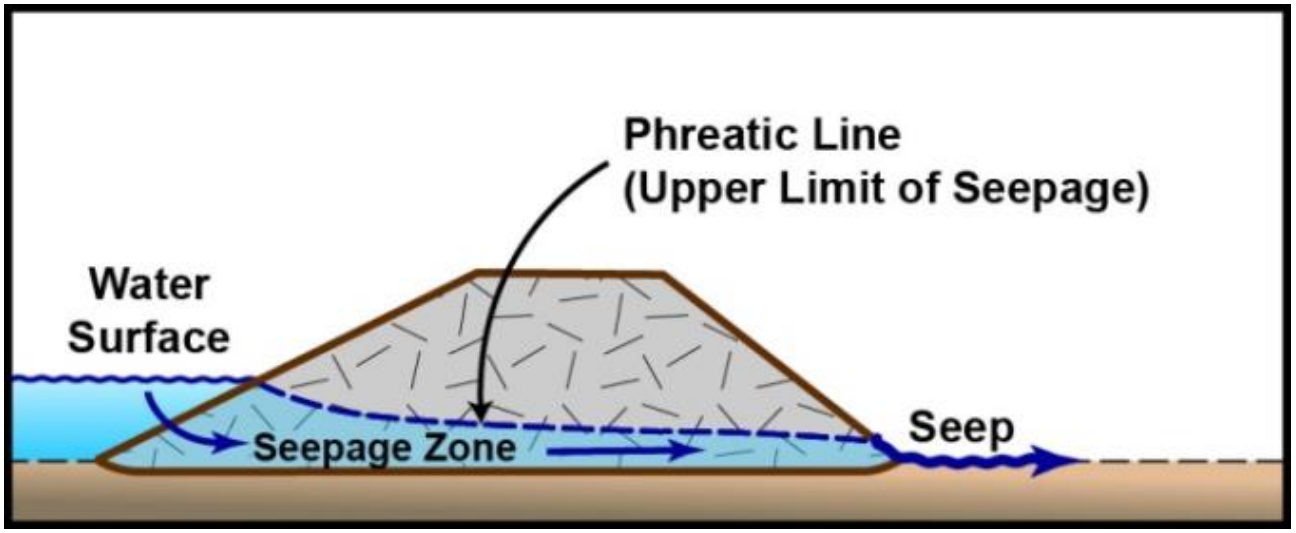
Embankment Seepage



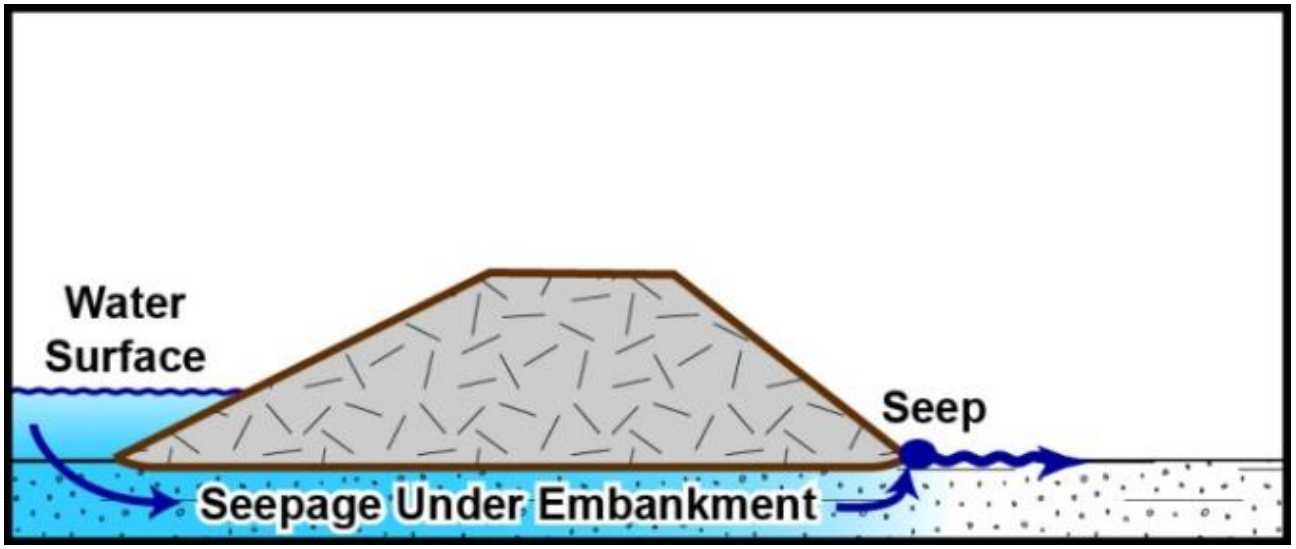
- Construction Practices to Prevent Seepage



Embankment Seepage



- Inadequate Construction Practices



Embankment Seepage

Downstream Embankment Toe Seepage

Downstream Point Source Seepage

Wave Action

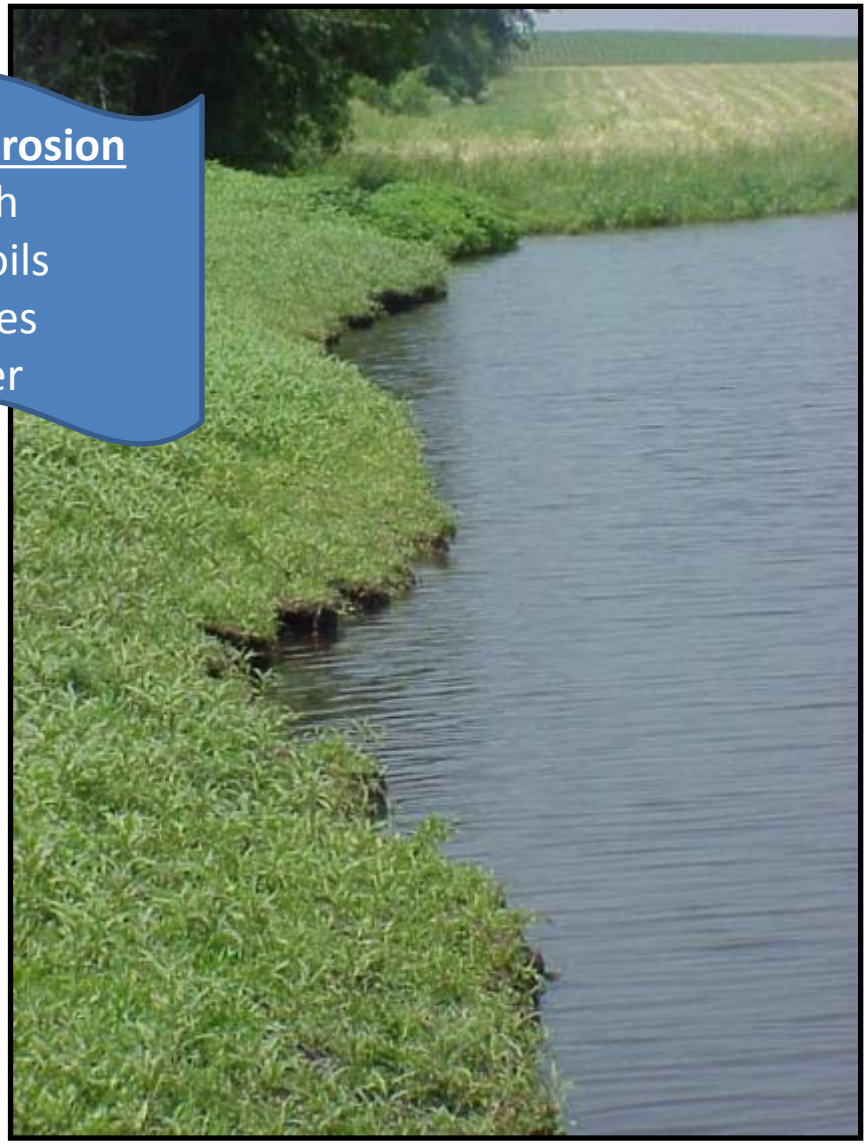
Embankment Erosion

Long Fetch

Unstable Soils

Steep Slopes

High Water



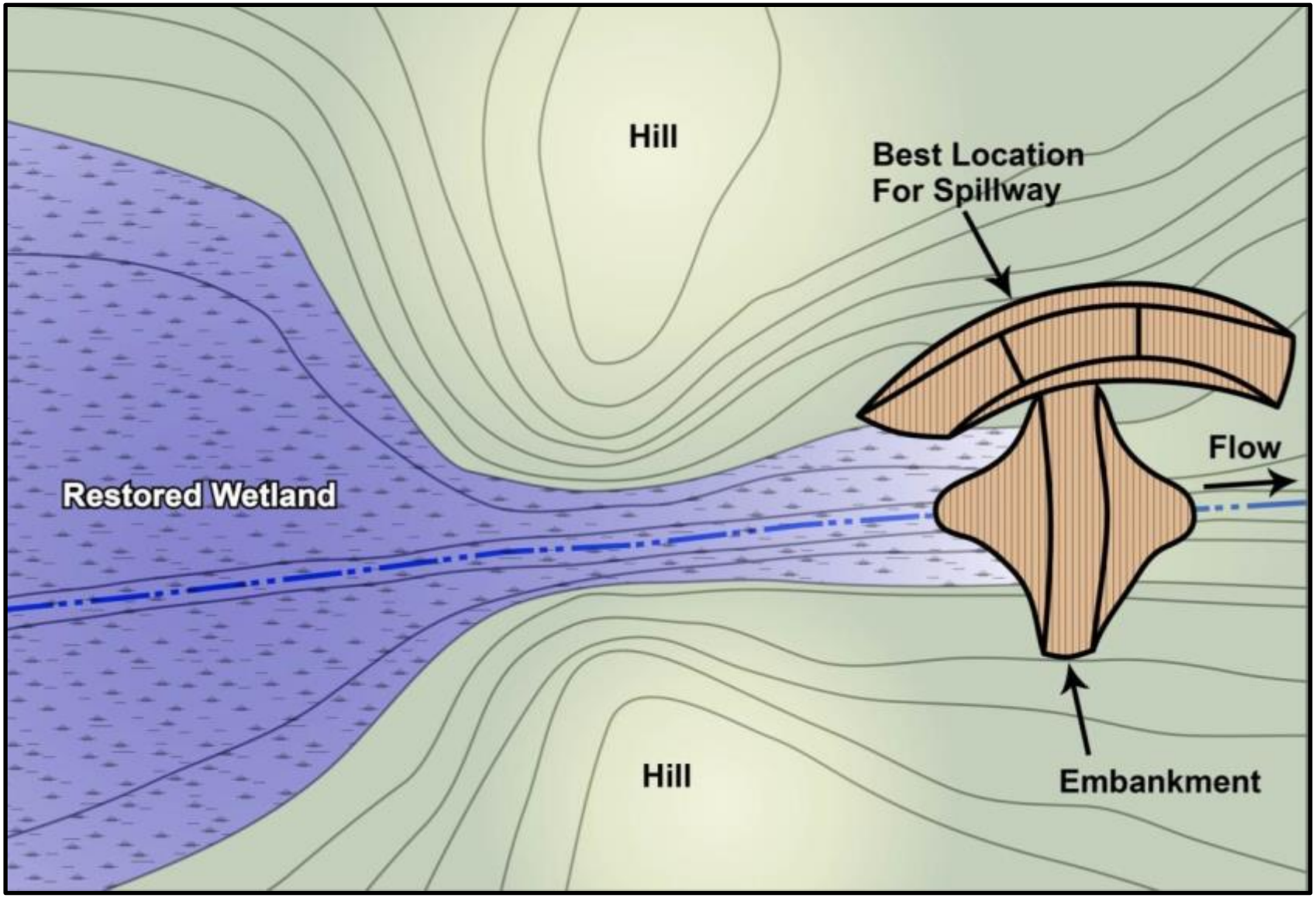
Wave Action

Embankment Erosion
Stabilized Erosion
Flatter Slopes
High Water
Vegetation Establishing

Table of Contents

- Preparation
- Embankment
- Outlets – Vegetative and Mechanical
  - ✓ Plugging
  - ✓ Leaking
  - ✓ Piping
  - ✓ Corrosion
- Shoreline
- Other

Vegetative


Hill
Best Location
For Spillway
Flow
Restored Wetland
Hill
Embankment

Vegetative

Mechanical

Steel Sheet Pile Weir Structures

Shallow Drop

Steep Drop

CONCERNS:

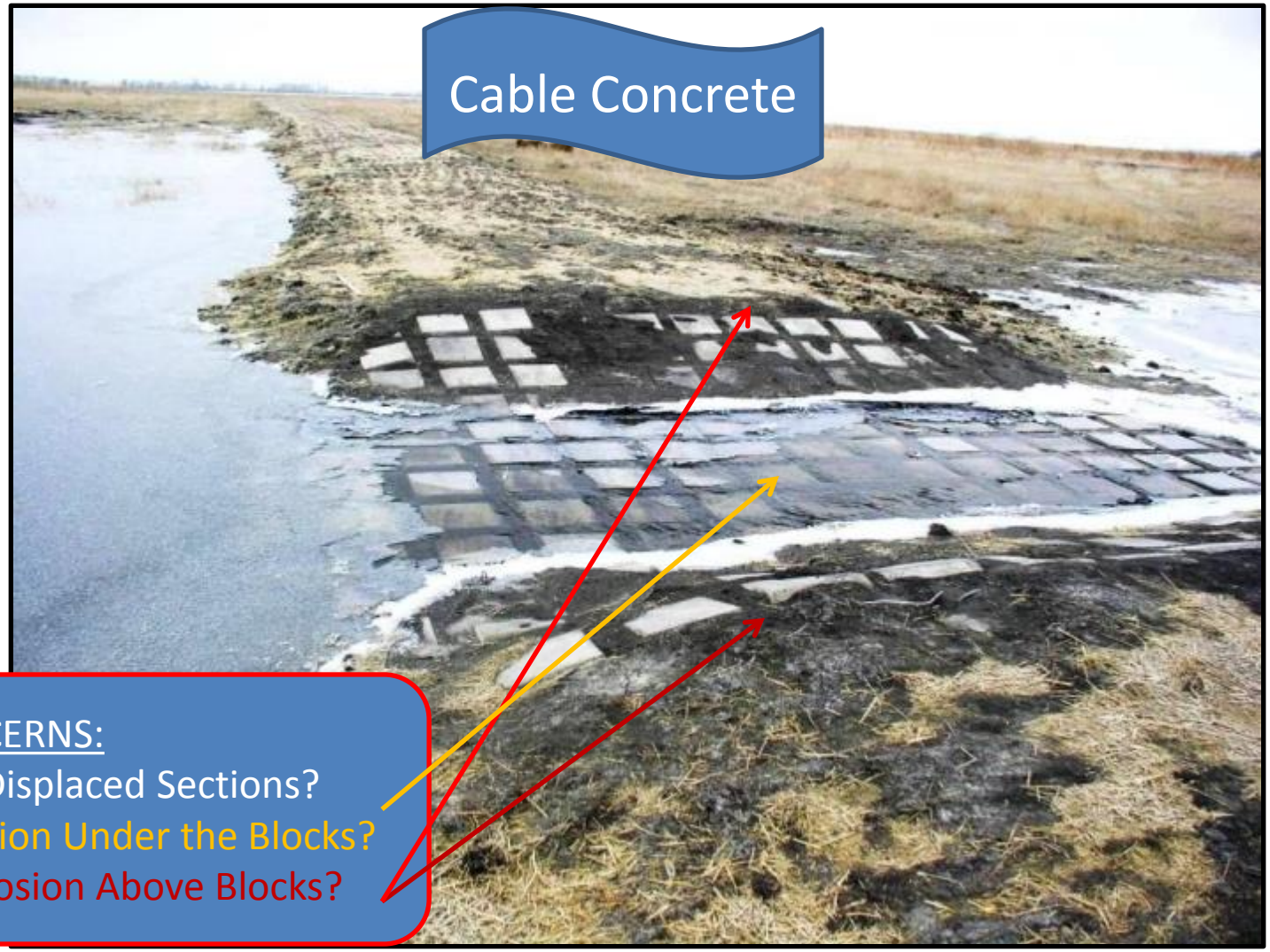
Vertical Alignment?

Horizontal Alignment?

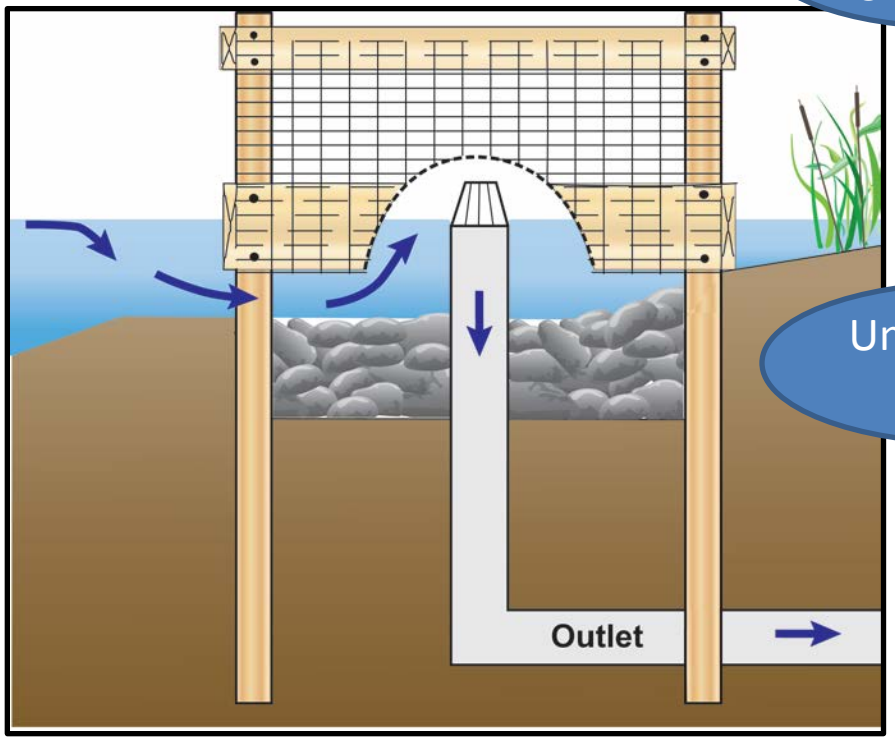
Riprap Displacement?

End Erosion?

Mechanical


Cable Concrete
CONCERNS:
Displaced Sections?
Erosion Under the Blocks?
Erosion Above Blocks?

Mechanical



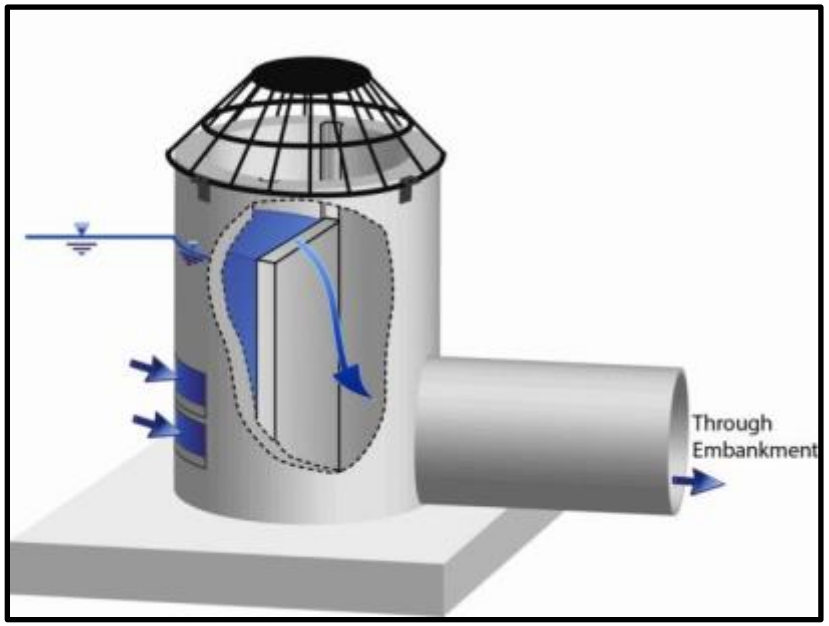
Trash Skimmers

Unrestricted Flows

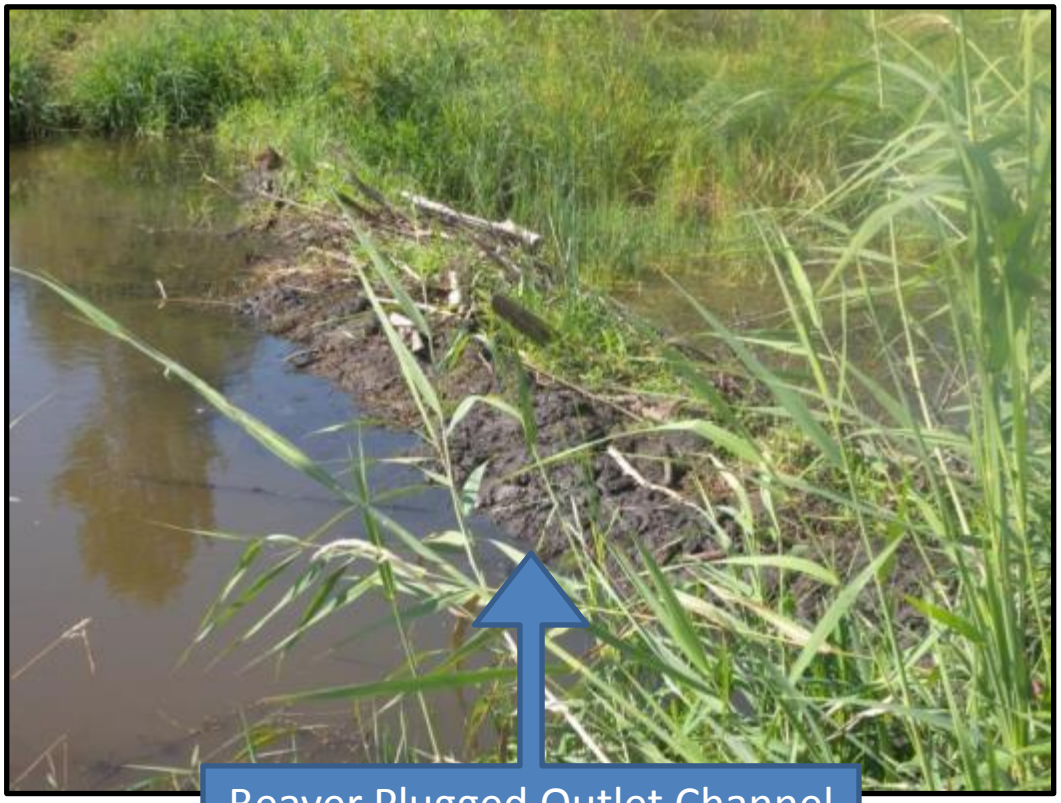
Adequate Grate

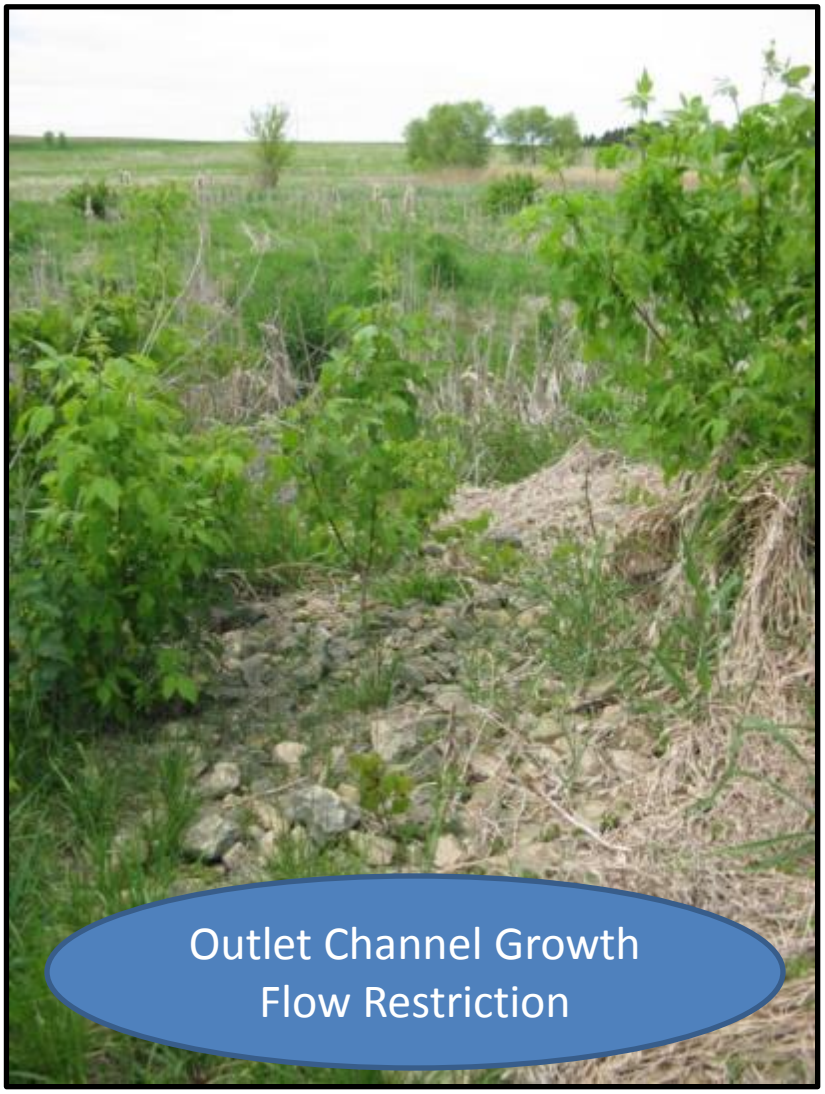
Low Fence - Restriction

Mechanical



Plugging


Beaver Plugged Outlet Channel


Outlet Channel Growth
Flow Restriction

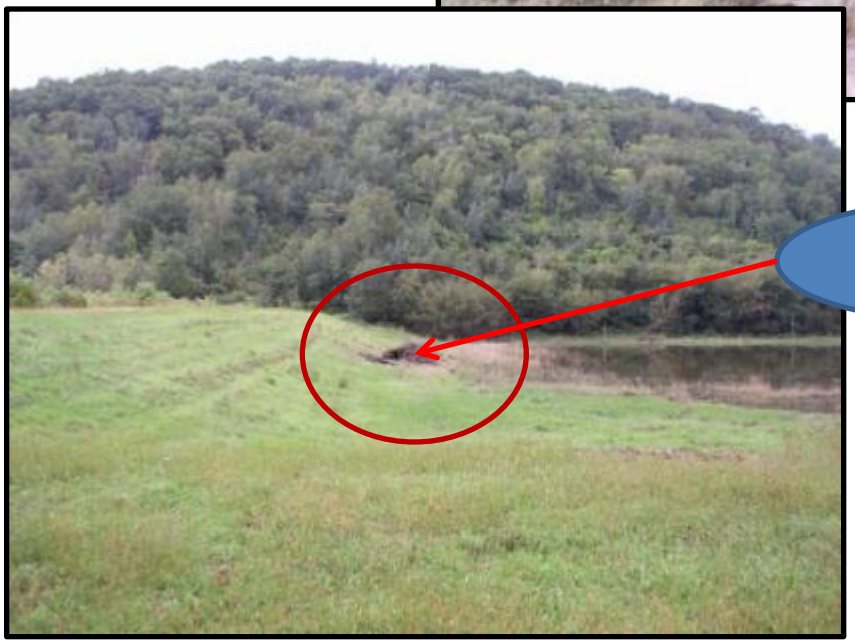
Plugging

Beaver Activity:

- Ideal Site
- Good Source of Material
- Easy Control Section to Plug
- Plug Removed, Material Placed Upstream

Plugging

Principle Spillway Blockage



48-Inch Riser

Result!

Plugging

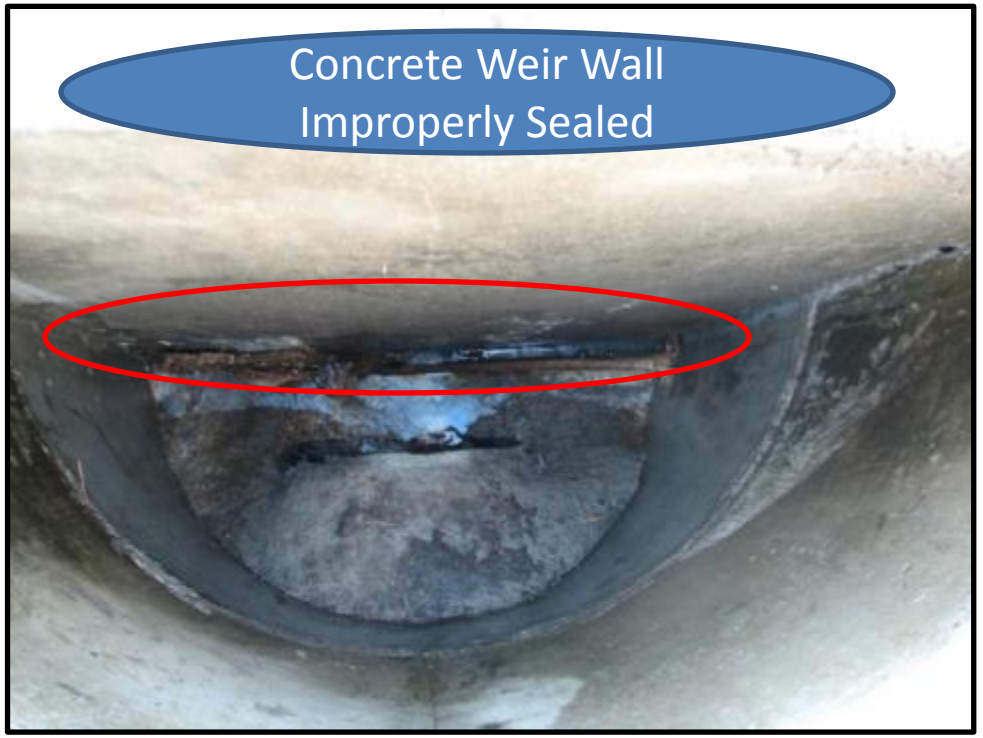
Trash Skimmer
Cattail Inside & Around
Flow Restriction?

Home Made Grate
Small Openings
Easily Plugged

Properly Functioning
Control Structure

Leaking

Outlets



Piping

Examples of Possible Piping

Length/Depth

Outlets

Top Could Lead to the Bottom

Corrosion

Reasons:

- Acidic Soils
- Pipe Age
- Use

Table of Contents

- Preparation
- Embankment
- Outlets – Vegetative and Mechanical
- Shoreline
- Other

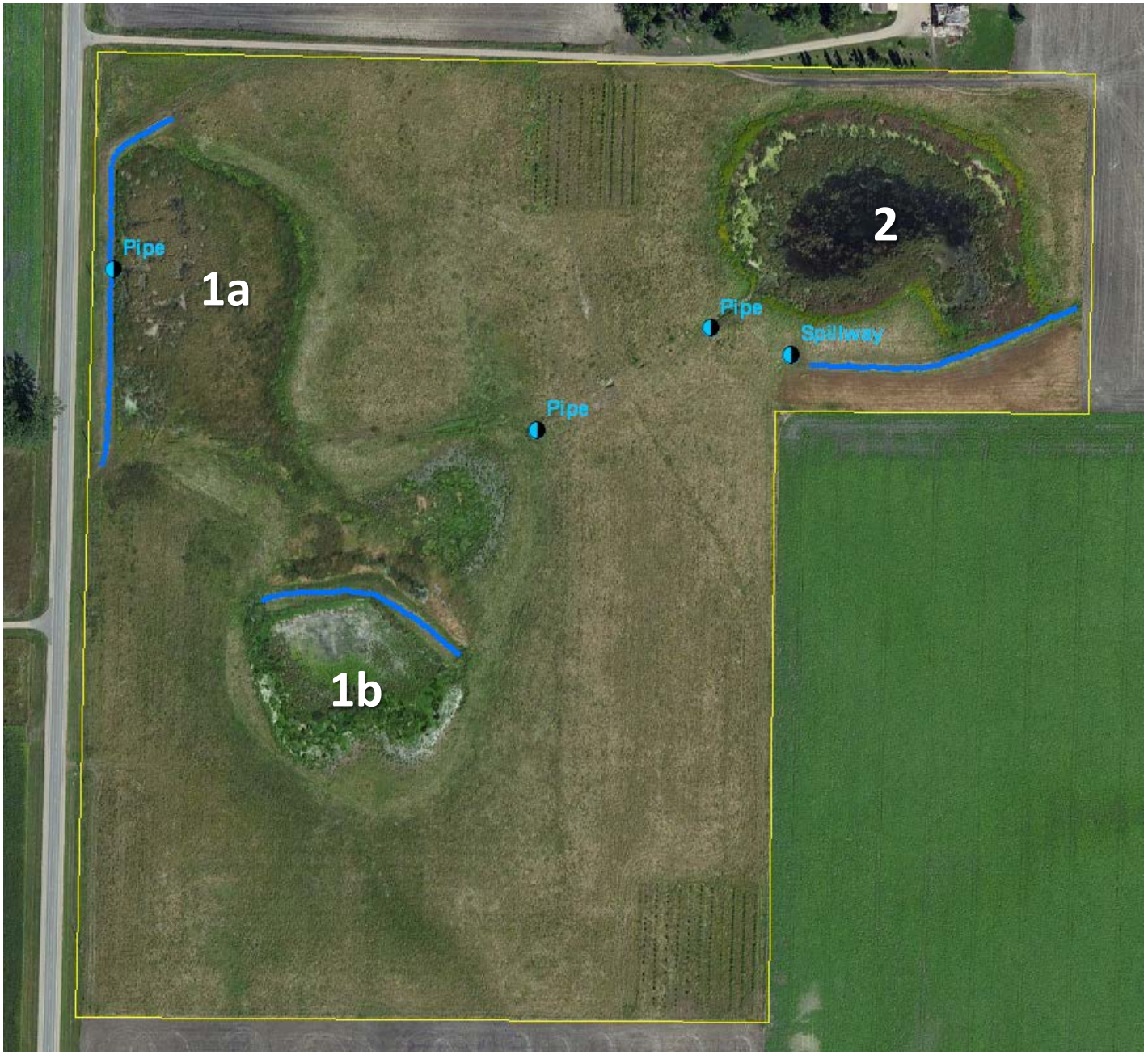

Check Opposite Shoreline For Erosion
Stream Barbs/Jetties


Bio Rolls/Logs

Table of Contents

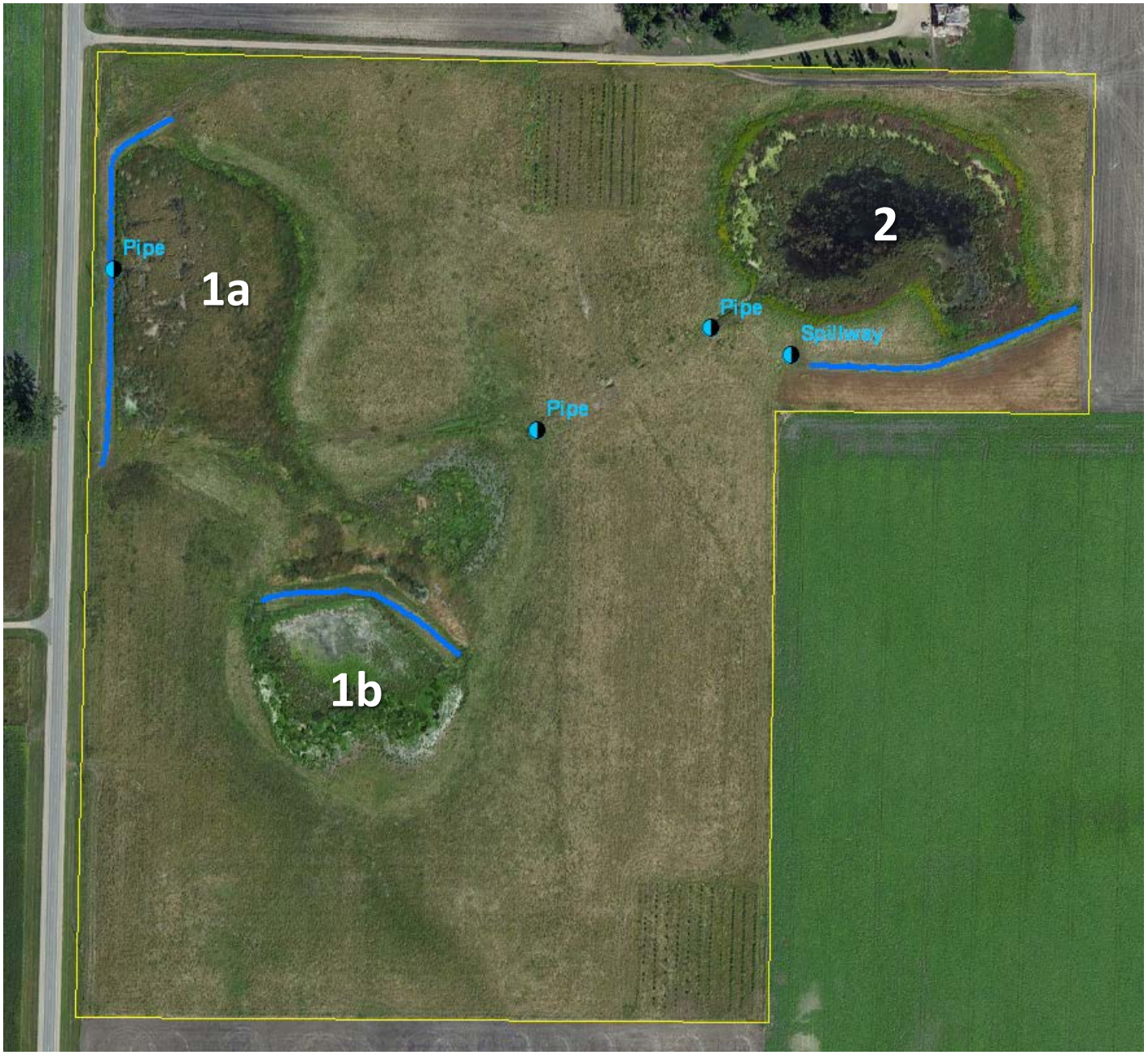
- Preparation
- Embankment
- Outlets – Vegetative and Mechanical
- Shoreline
- Other
  - ✓ Sliding/sloughing
  - ✓ Settlement
  - ✓ Vehicle traffic

Exercise: Inspecting Engineering Components


Pipe
1a
2
Pipe
Spillway
Pipe
1b


Embankment Basin 1a:
1-2 inch diameter willows established
at toe of embankment, entire length

Water flowing through muskrat tunnel


Pipe
1a
2
Pipe
Spillway
Pipe
1b

Embankment
Basin 2

Spillway Basin 2

Outlet Basin 2

INSTRUCTIONS

For each basin, assess components, identify and describe concerns, and assign condition score. **Document with photographs** and map. Use table for list of components and common concerns.

Condition Scores:
1 = Monitor (potential for problem development)
2 = Maintenance Required
3 = Repair May be Necessary

Basin ID	Component (type)	Issue	Score	Notes
1a	Embankment	Woody Vegetation Establishment	2	1-2 inch willow established along upstream toe of embankment, entire length
1a	Embankment	Rodent Damage	3	Breech; water flowing through tunnel; other burrowing detected (5-10 areas pool side)
2	Pipe (outlet)	Obstruction	2	Semi-plugged with grassy vegetation.

Attachments: ☒ **Photos** ☒ **Map**

Other Notes:

Good condition: Basin 1a riser, 1b embankment, 1b pipe inlet, Basin 2 embankment and spillway

On-Site Evaluations: the rest of the story.....

Acceptable Hydrology?

Hydrology Indicators?

Acceptable Hydrology?

Gages on site?

Measure level from fixed structure

Vegetation

Groups

Native

Non-native

- **Invasive**
- **Introduced**

Graminoid

- **Grass**
- **Sedge**
- **Rush**

Forb

Woody

Bryophyte

Annual

Biennial

Perennial

Warm-season

Cool-season

Common Vegetative Establishment Concerns

- Lack of forbs
- Sparse vegetation
- Woody plant establishment
- Problem weeds

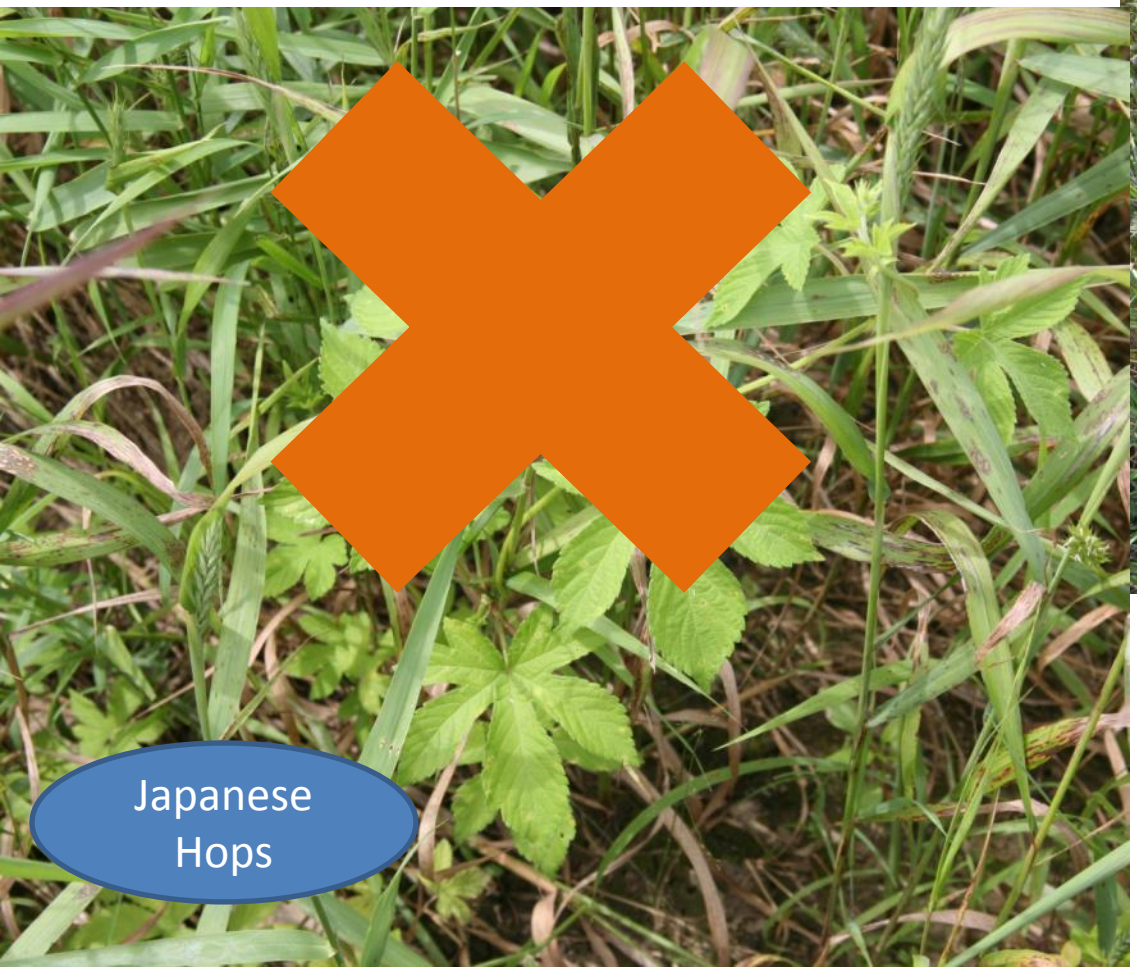

Sparse
Vegetation

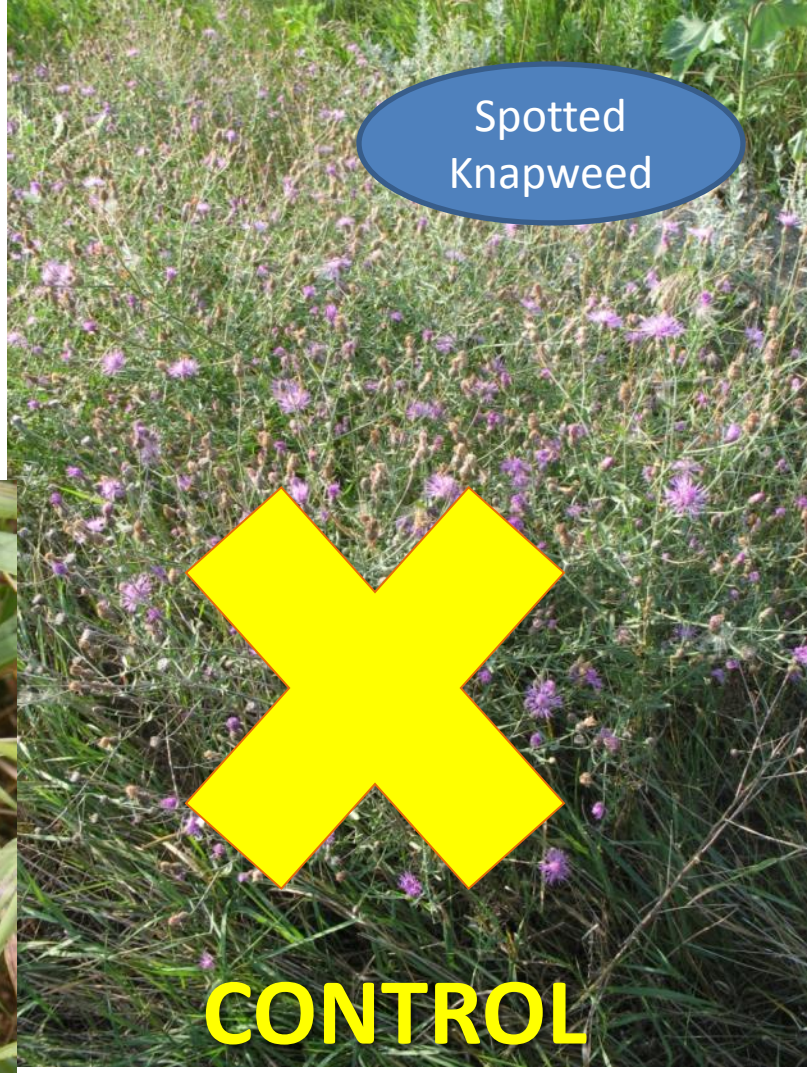

Woody Plant
Establishment


Problem Weeds :
Invasives

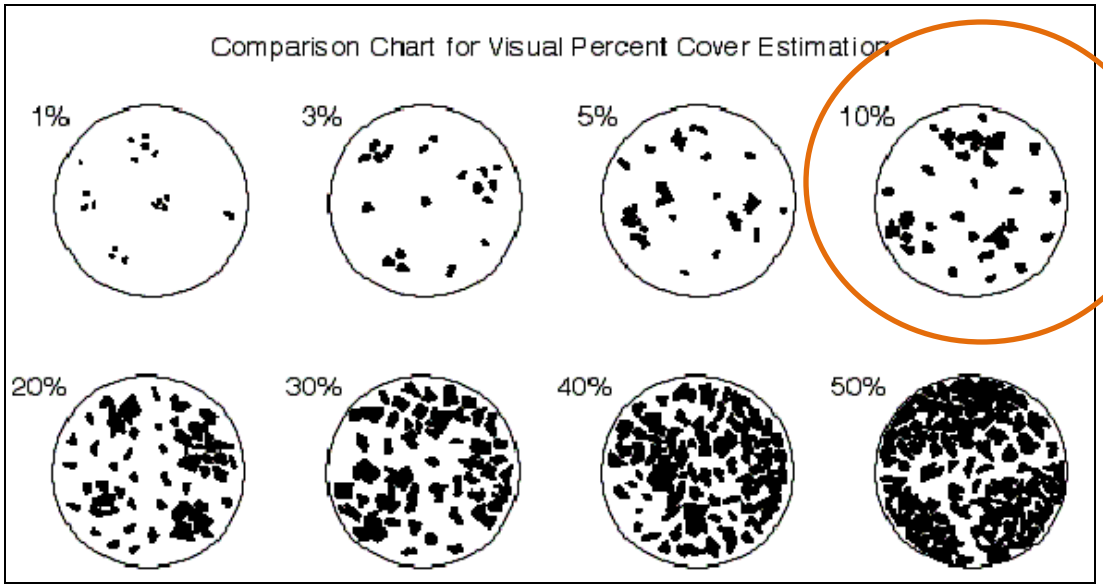
Problem Weeds: Noxious

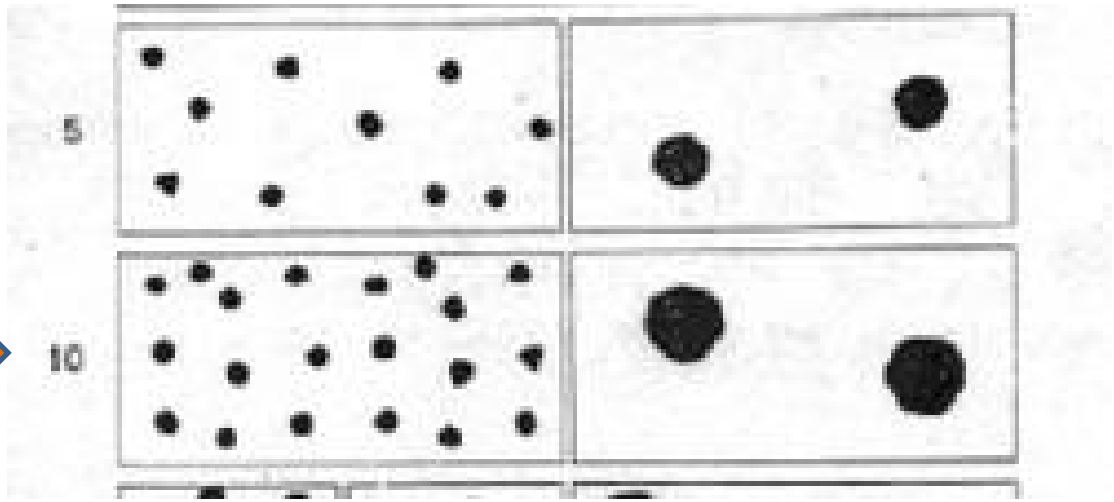
ERADICATE



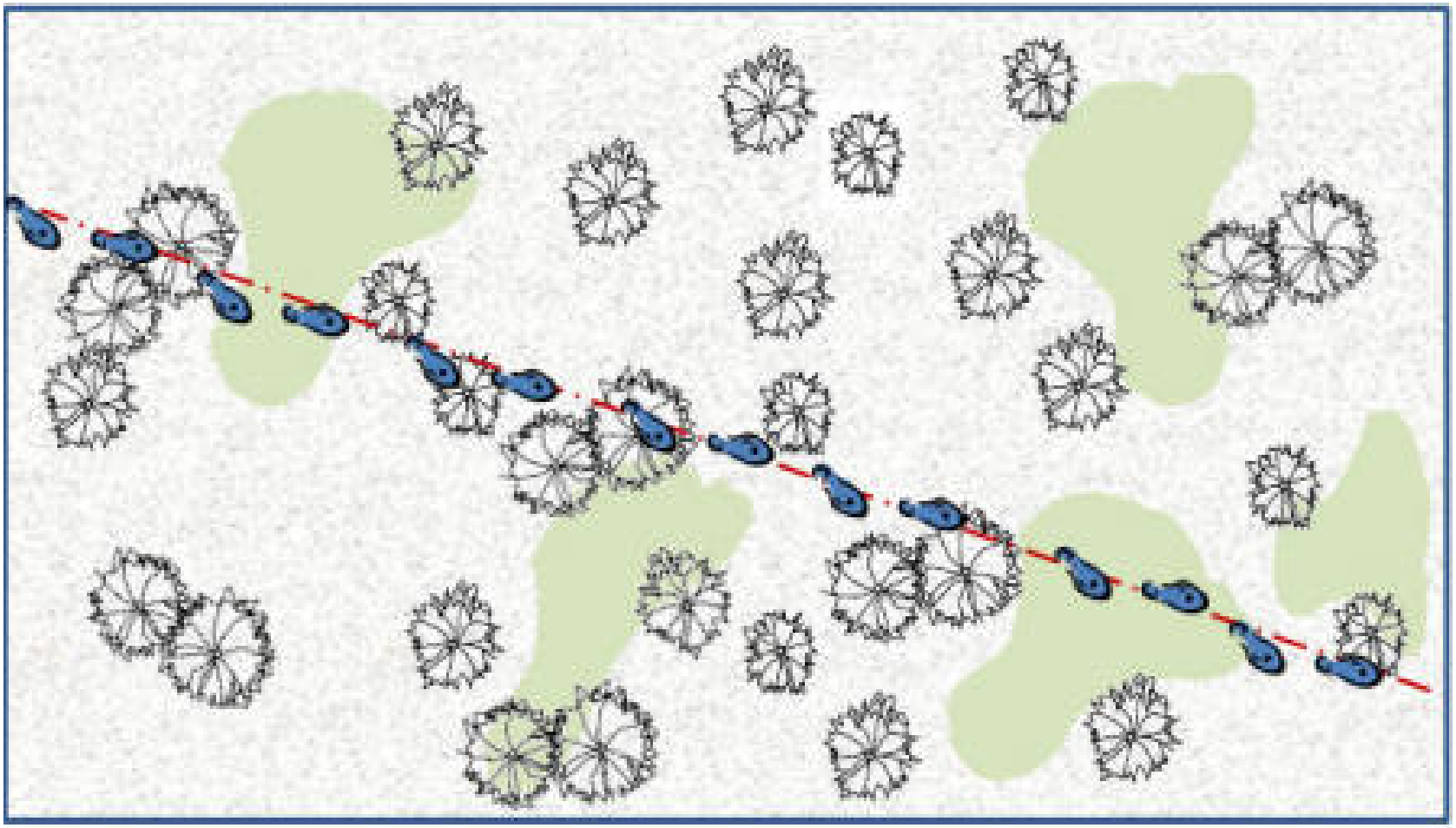


Tip: Estimating Cover

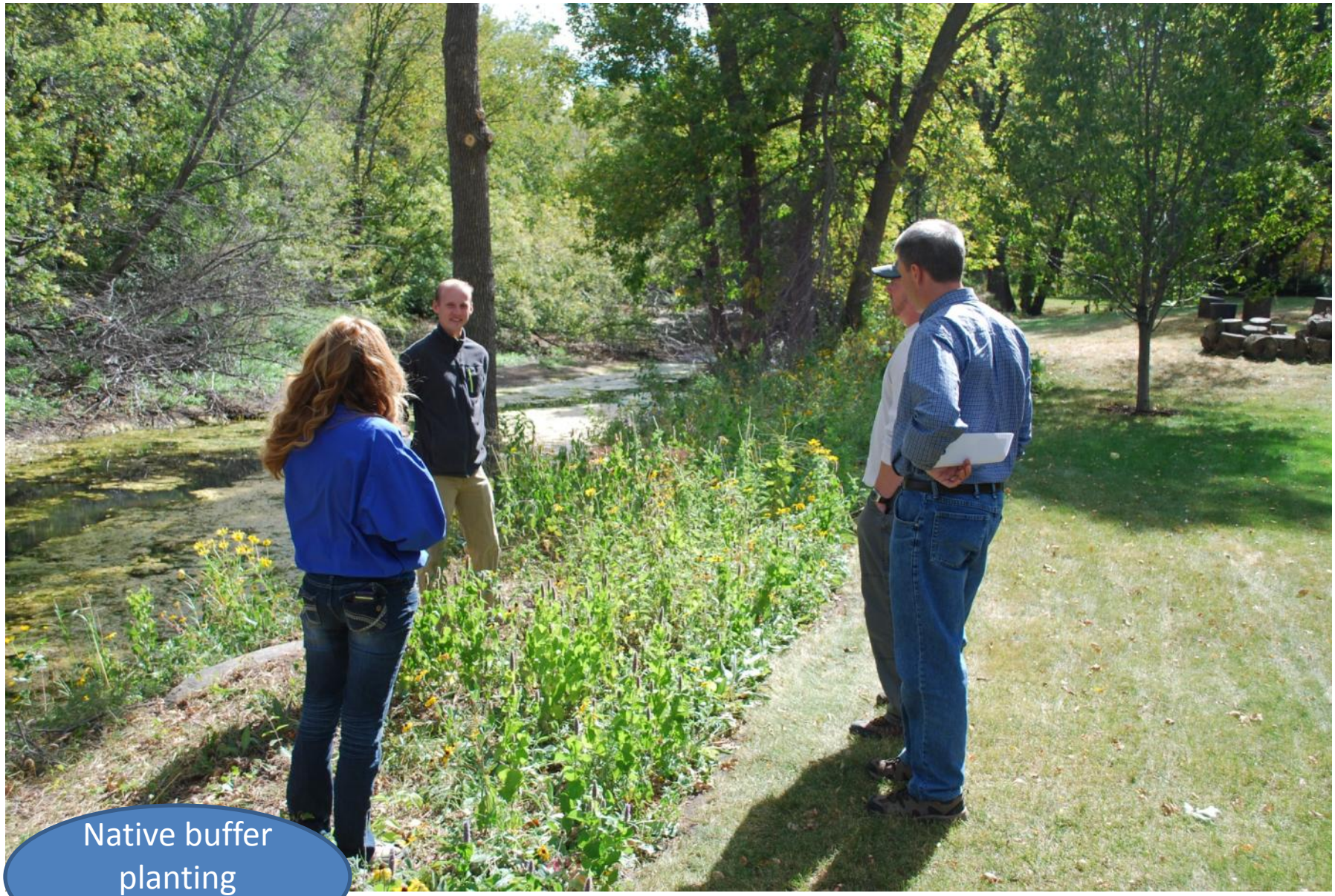




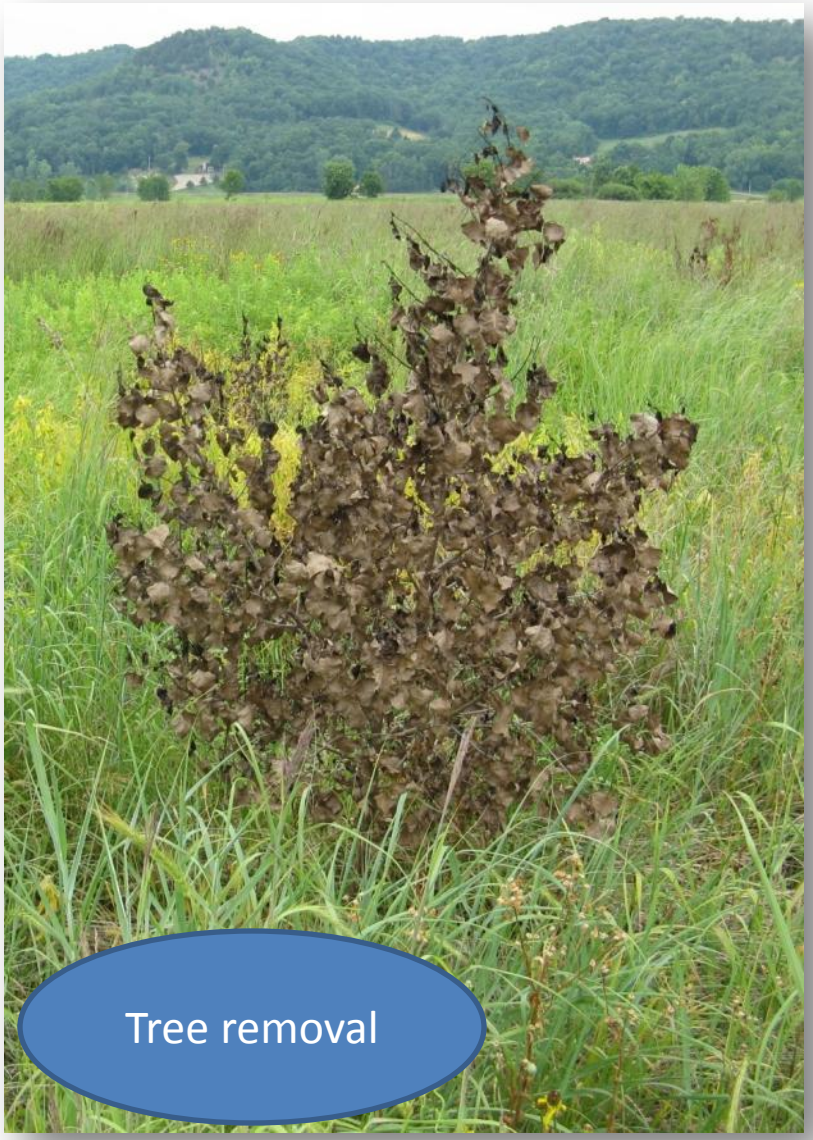
Estimating Cover



Installation & Management Plans


Native buffer planting evaluation


Tree planting


Tree removal

Tip: Consider Context

Poor establishment or adequate?

Progressing as planned?

Easement Compliance

IN ADDITION, THE GRANTORS, FOR THEMSELVES, THEIR HEIRS, SUCCESSORS AND ASSIGNS COVENANT THAT THEY:

1. Shall establish and maintain wetlands and upland buffers within the Bank Easement Area as specified in the bank plan approved by the LGU and on file at the offices of the LGU. The wetland and any upland buffer
not make any use of the Bank
of the area. Those functions a
the approved bank plan.

2. Shall pay the c
wetlands and upland buffers w
necessary to comply with the s
The Grantor's obligations und
on the Real Property.

8. Acknowledge that, unless expressly authorized in writing by the LGU bank plan, Grantor:

(a) Shall not produce agricultural crops on the Bank Easement Area, exce
provision does not restrict the harvest of the seeds of native vegetatio
head is removed in the process of harvest and does not involve the us
motorized equipment;

(b) Shall not cut hay, mow vegetation or cut timber on the Bank Easemen
allowed or prescribed in the Bank Plan;

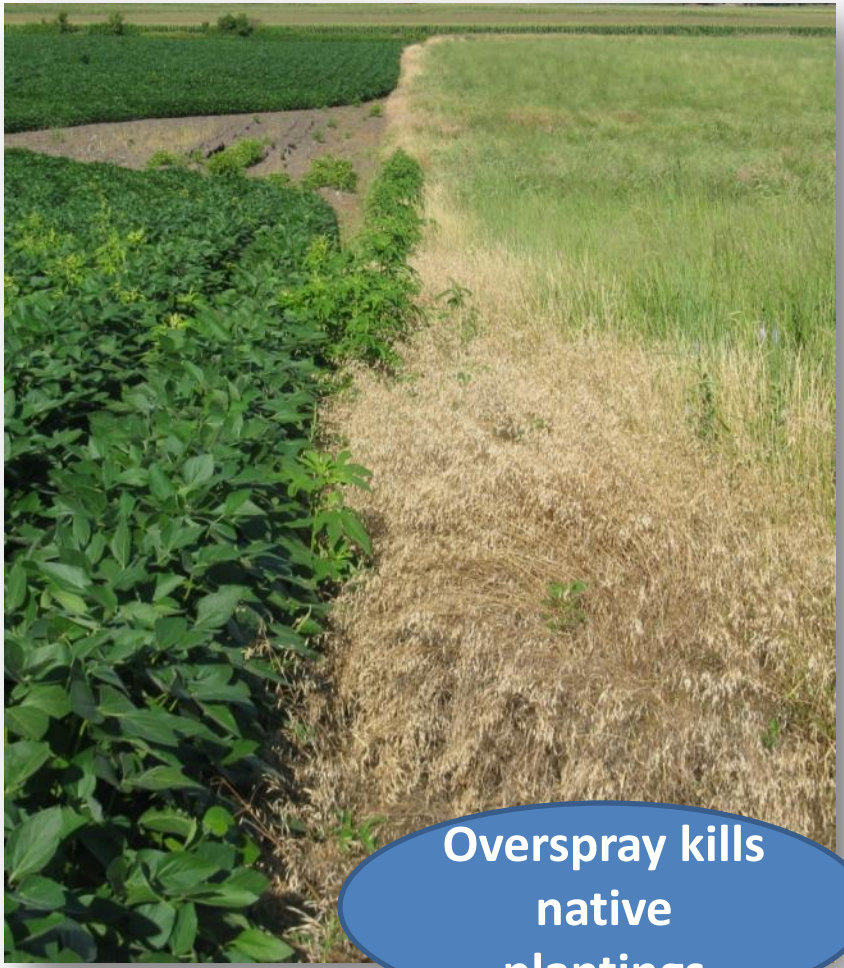
(c) Shall not make any vegetative alterations on the Bank Easement Area
enhance or would degrade the ecological functions and values of the I
Area. Vegetative alterations shall be limited to those listed in the app

(d) Shall not graze livestock on the Bank Easement Area;

Boundary Posts


Crop
Encroachment

Haying / Encroachment



Overspray kills native plantings

Best easement edge to crop edge ever!


Shall not dump trash or store materials


.. or vehicles or equipment!

Unauthorized tree plantings

Mowing and plantings...


Unauthorized
field road

Structures?

Rustic, customary, and elevated

Documentation

Requirements and protocols vary by program

Take good notes!

Photo Documentation

Screen Shots of Smart Phone Apps

Landscape Photos

At least one representative photo per community type or installed practice

LS Deep Marsh

LS Wet Meadow

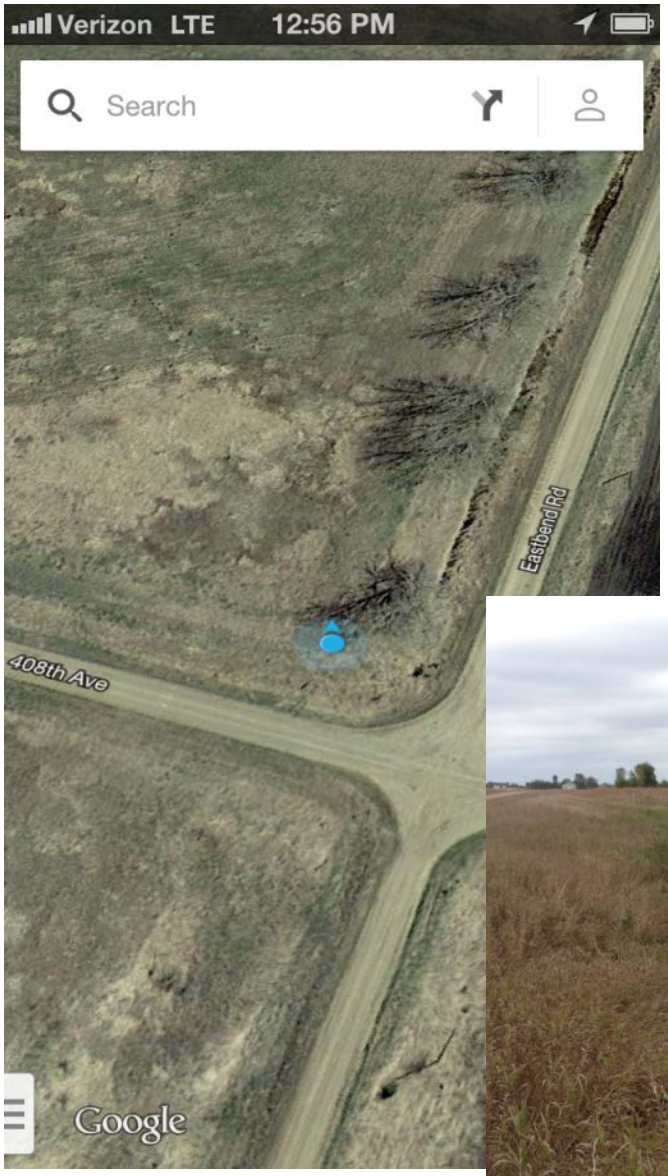
LS Upland

Management Concerns

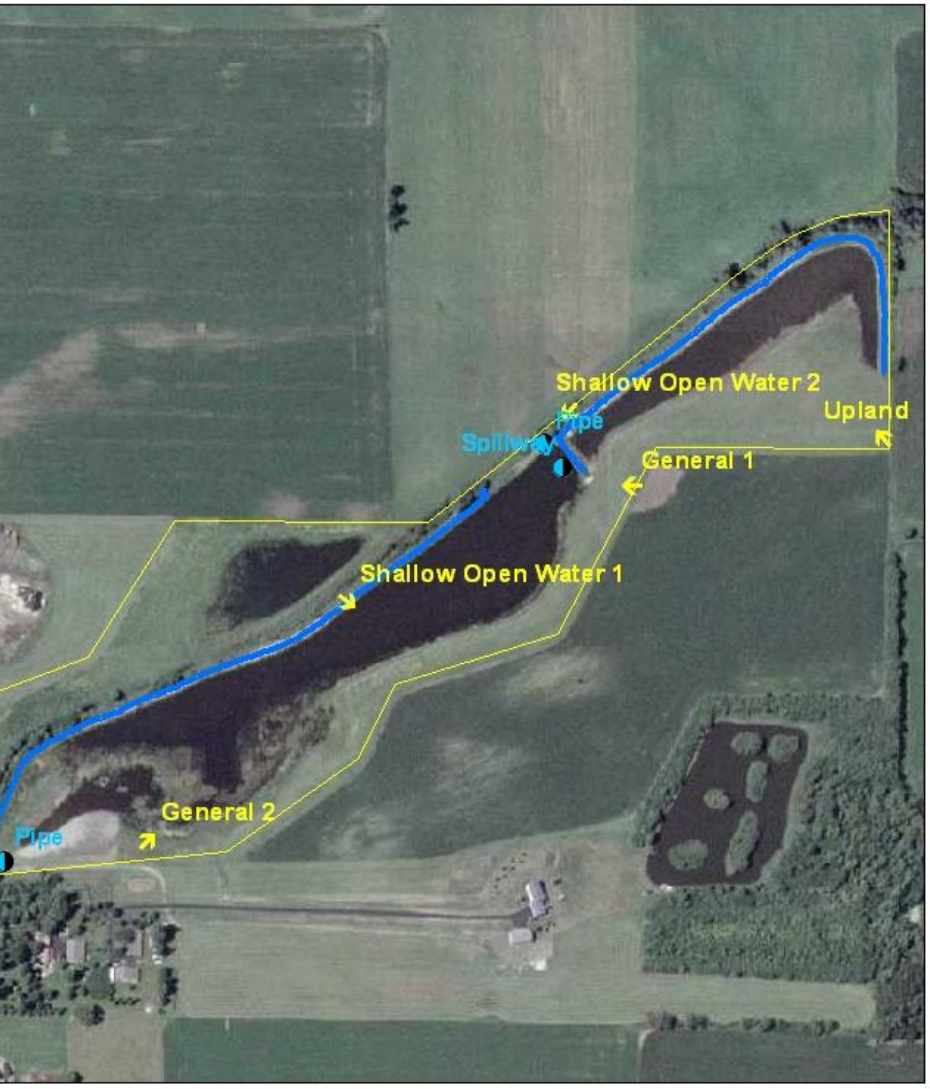
Incomplete seeding and mulching

Woody vegetation establishment in prairie

Mapping



Mapping



330 660
Feet

Meters
100 200

Legend

N

1:4,500

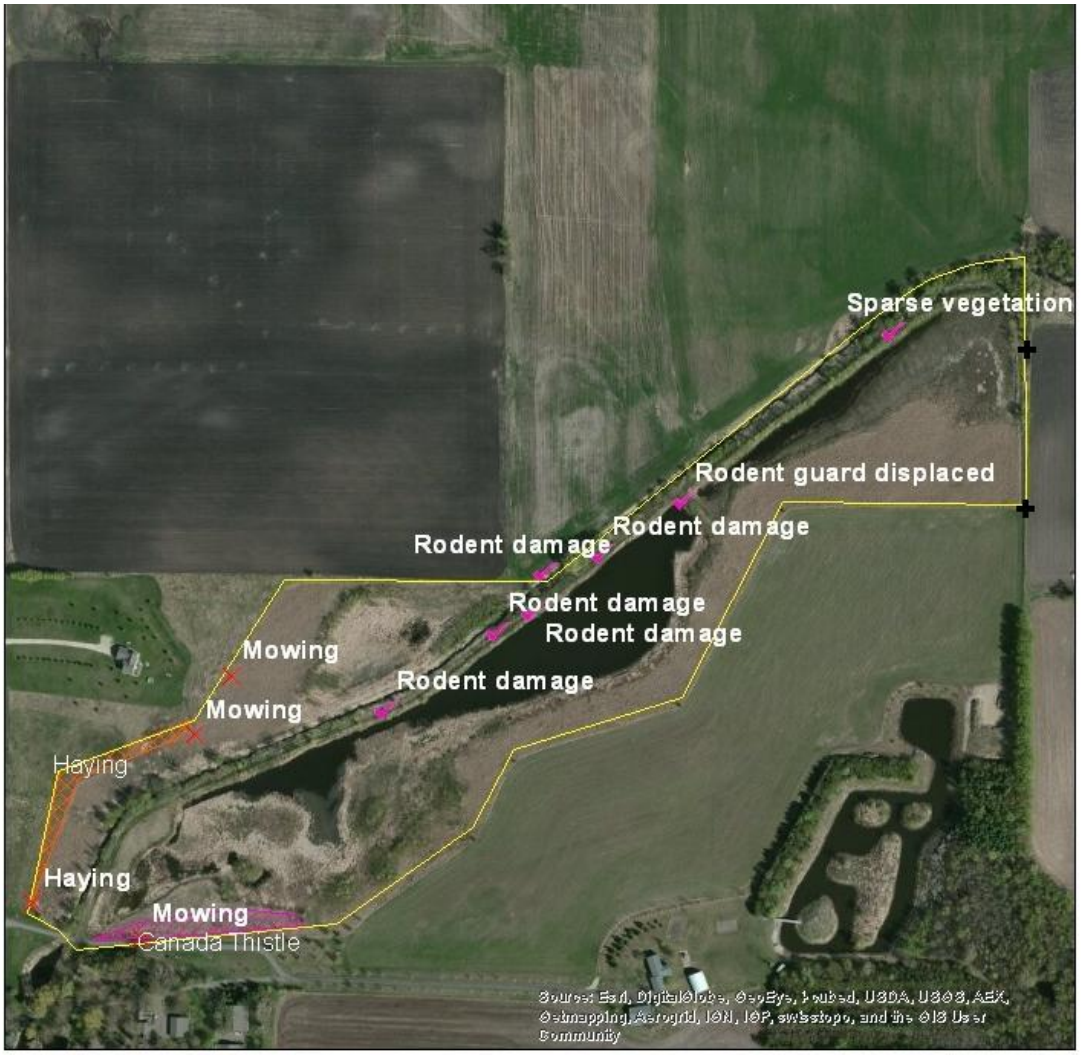
BankArea

Photo

Engineering Components

Embankment

Mapping



0 330 660 Feet

0 100 200 Meters

Legend

- BankArea
- Posted
- Unauthorized Use
- Engineering Component Concern
- Unauthorized Use
- Noxious Weeds

N

1:4,500

Aerial Imagery Exercise

Project Goals:

- restore 3 shallow marsh – deep marsh basins
- establish native perennial dominant upland prairie buffer

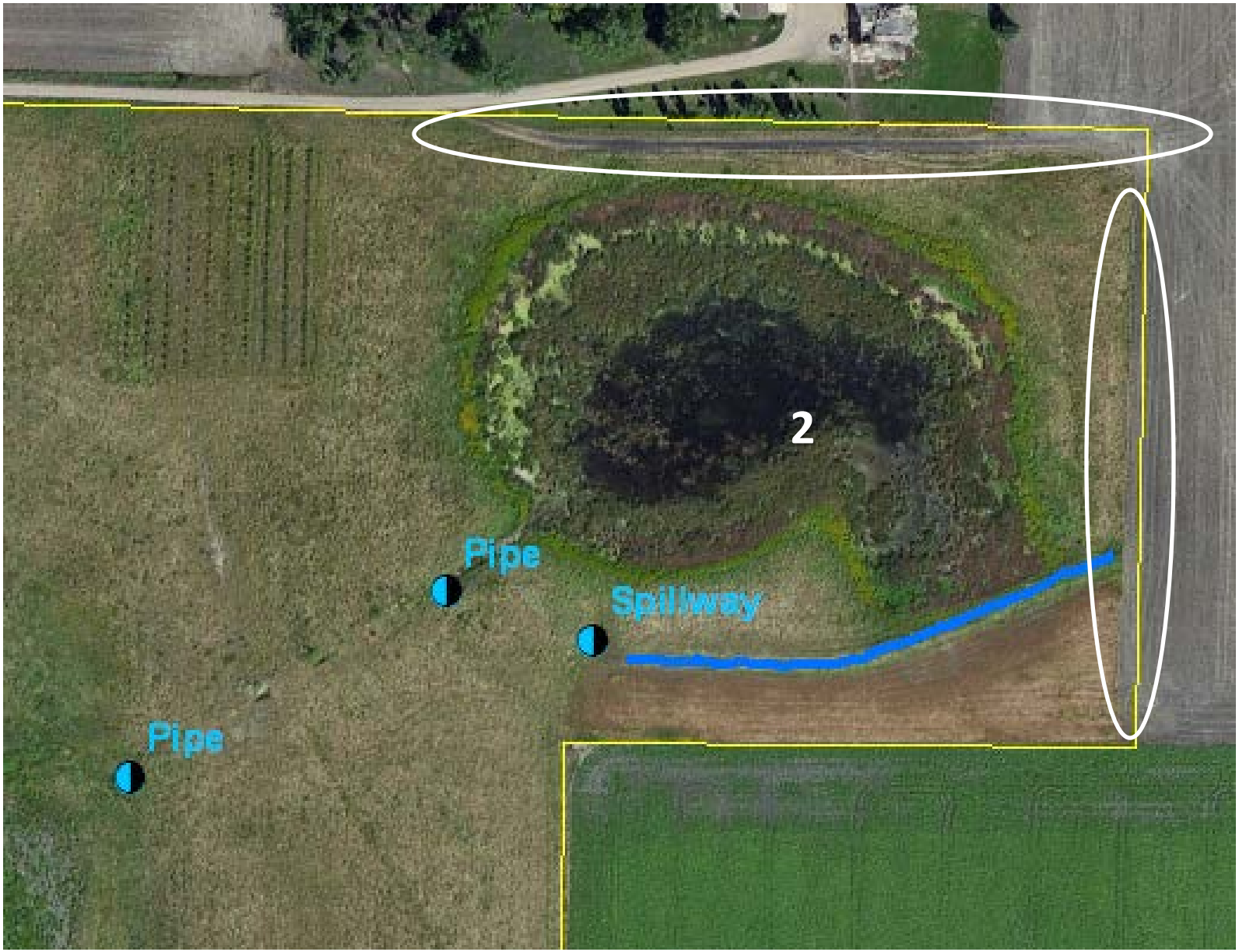
Components

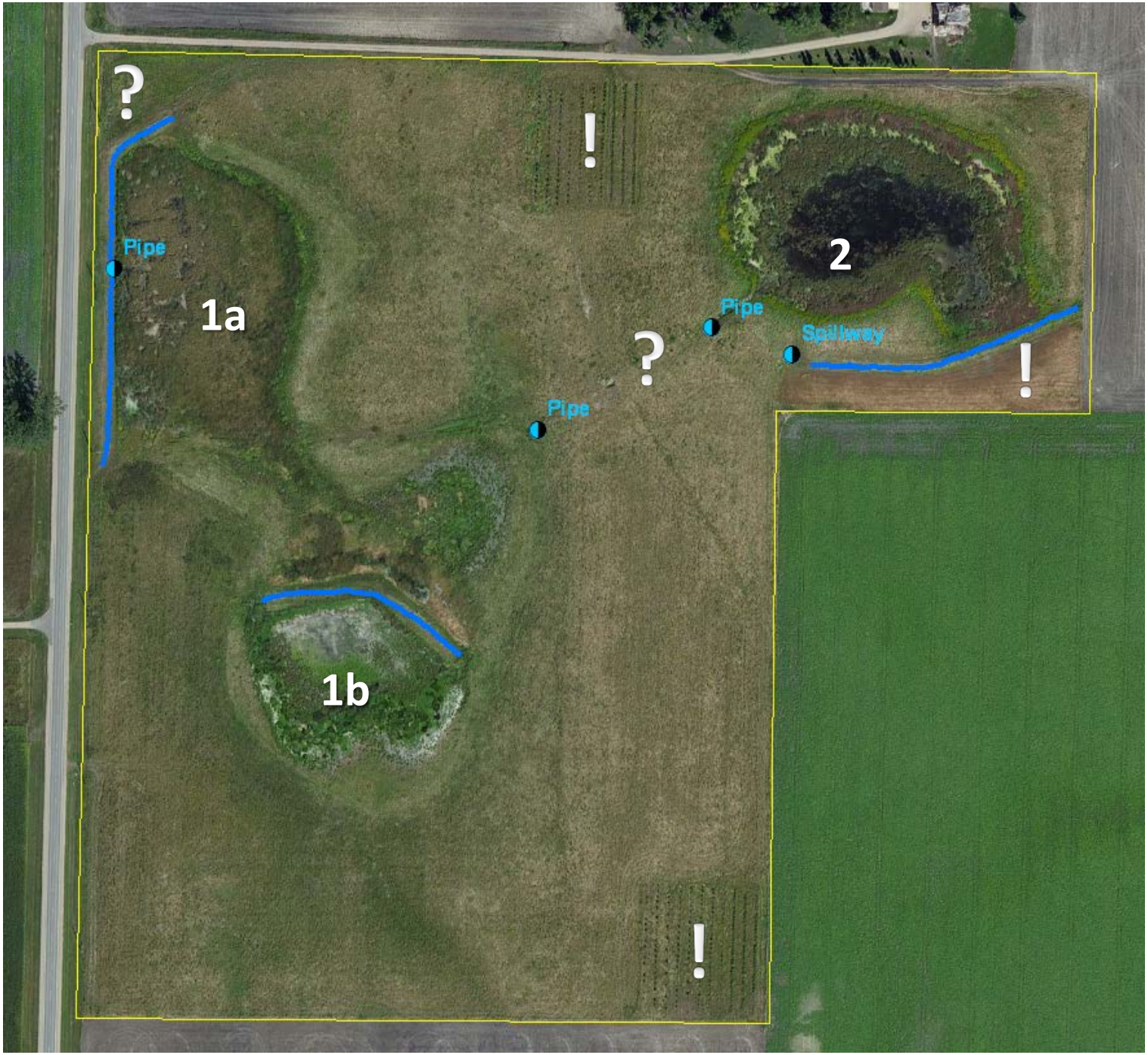
- 3 embankments
- 3 pipe outlets/inlets

Boundary Posts Required

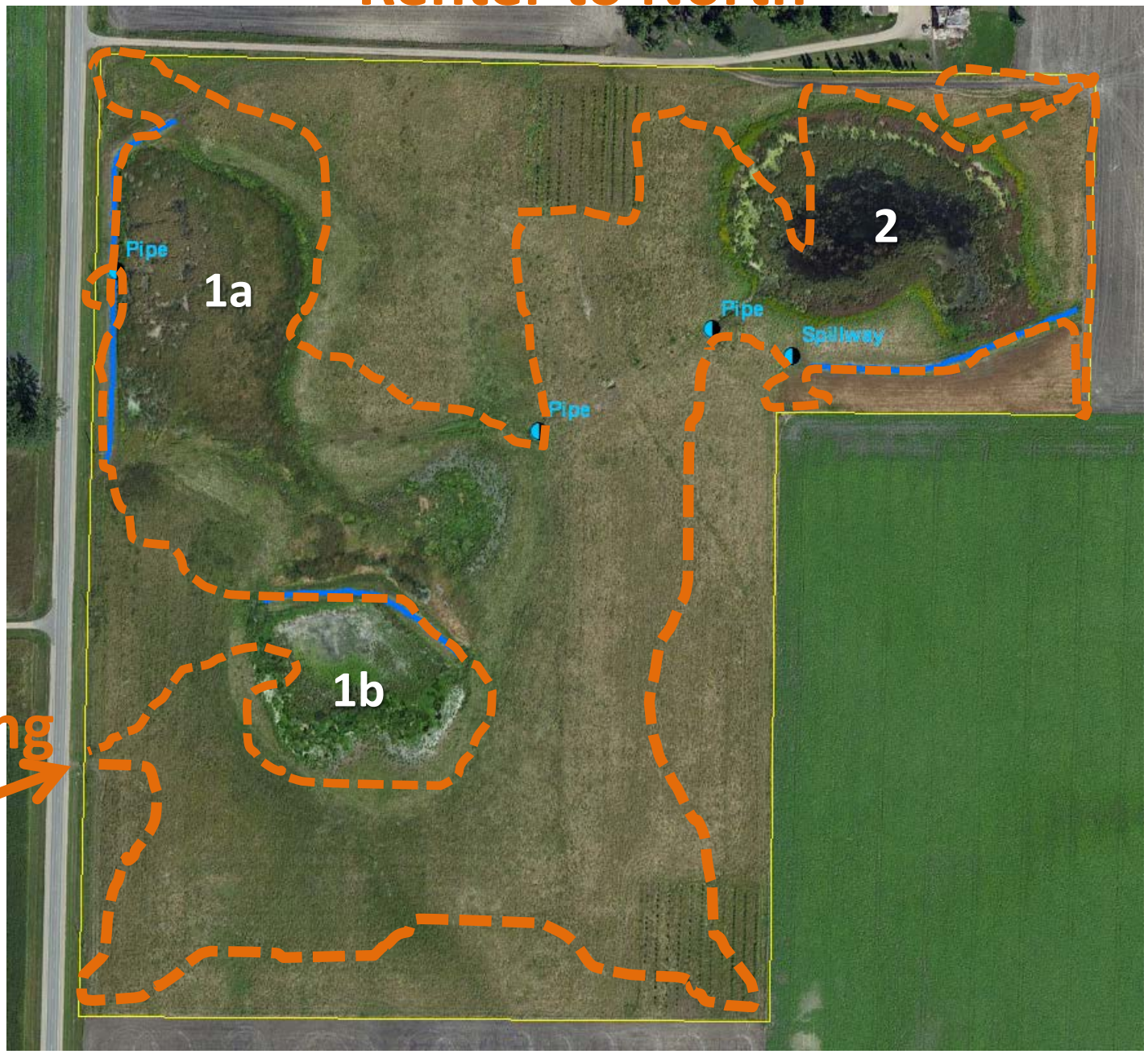
Renter to North

Parking


2
Pipe
Spillway
Pipe


?
!
Pipe
1a
2
Pipe
Spillway
?
!
Pipe
1b
!

Renter to North

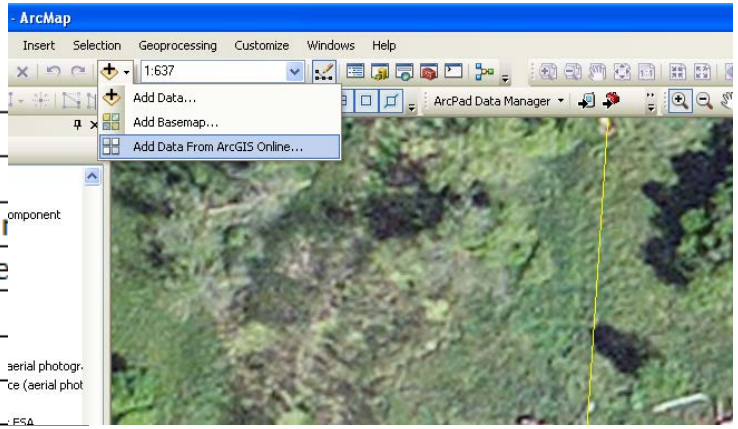


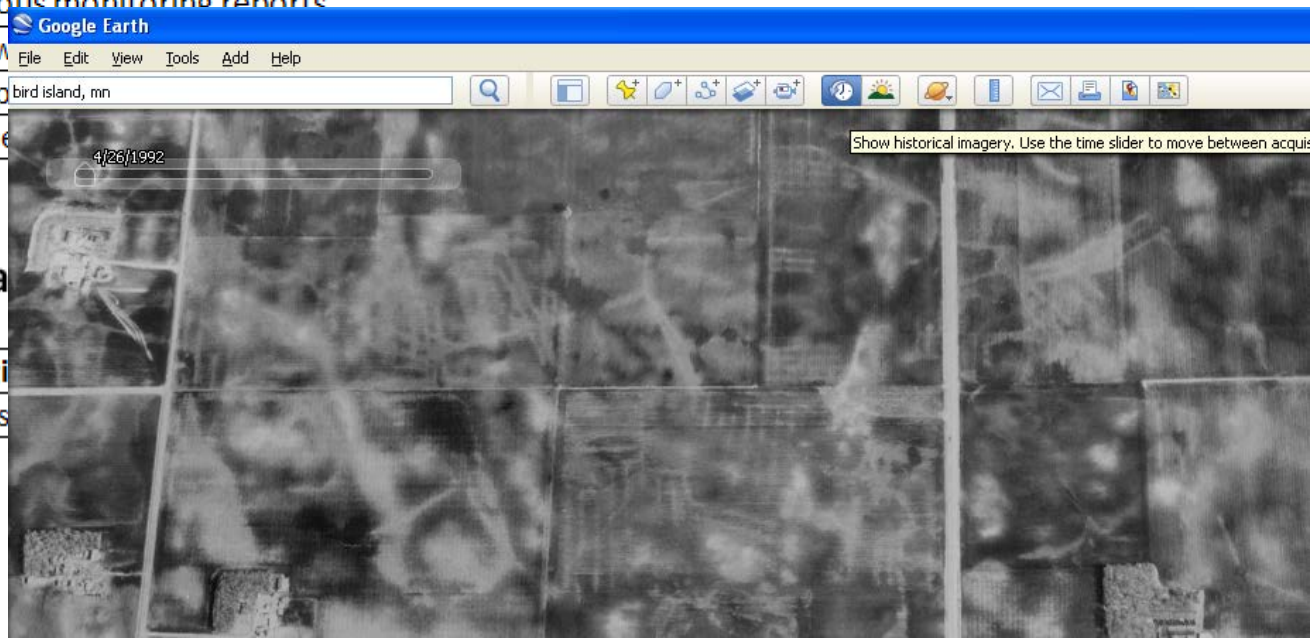
Parking

Resources & Tools in Handout

✓ Checklist prior to site inspection

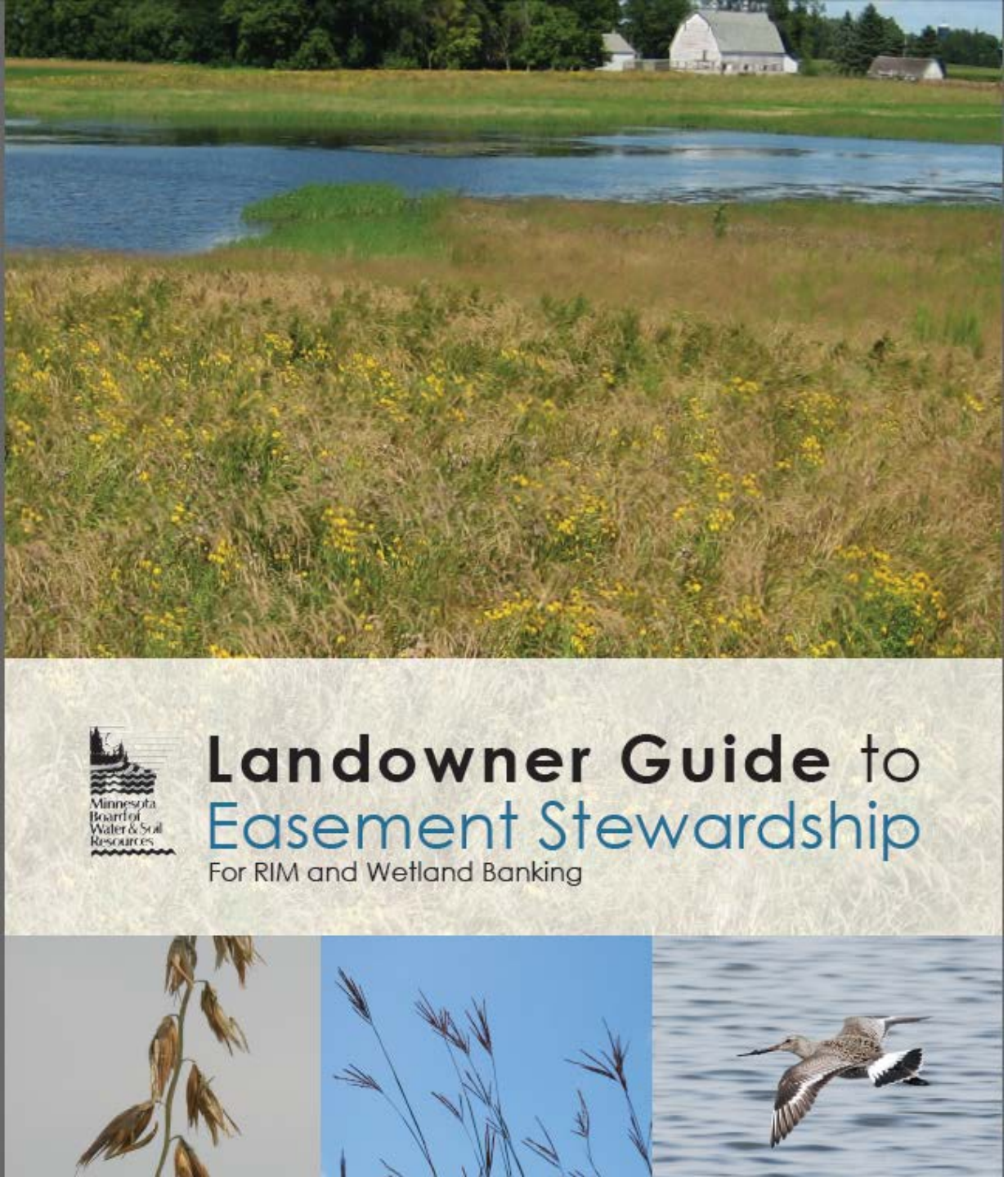
File Review	
☐	Review site background information
	-conservation plans, as-builts, installation ar
☐	Familiar with terms of agreement and/or conse
☐	Project goals identified
Tasks to do:	
☐	Review recent air photos or imagery
☐	Review previous monitoring reports
☐	Notify landow
☐	Prepare equip
	-GPS device





✓ Things to ta

	Installed Engi
☐	Condition of s



(In draft form)