



MN CREP Wetland Restoration Overview

Presentation Topics

- **Overview of Wetland Types and Relationship to Eligibility and Scoring**
- **Overview of Commonly Used Wetland Restoration Strategies**

Goal

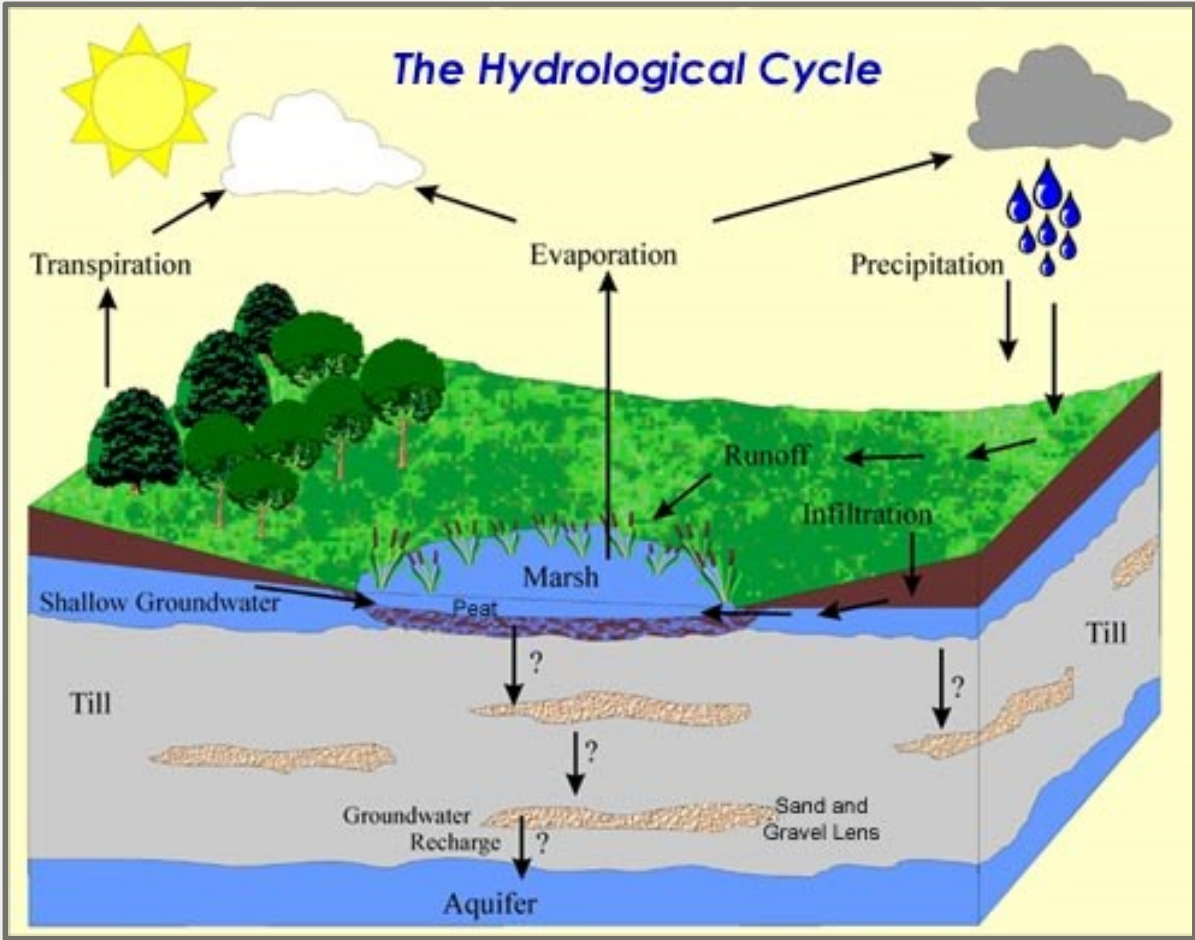
The program goal is to restore drained and altered wetland communities (hydrology and vegetation) to their original pre-manipulation condition, wherever feasible and practicable.



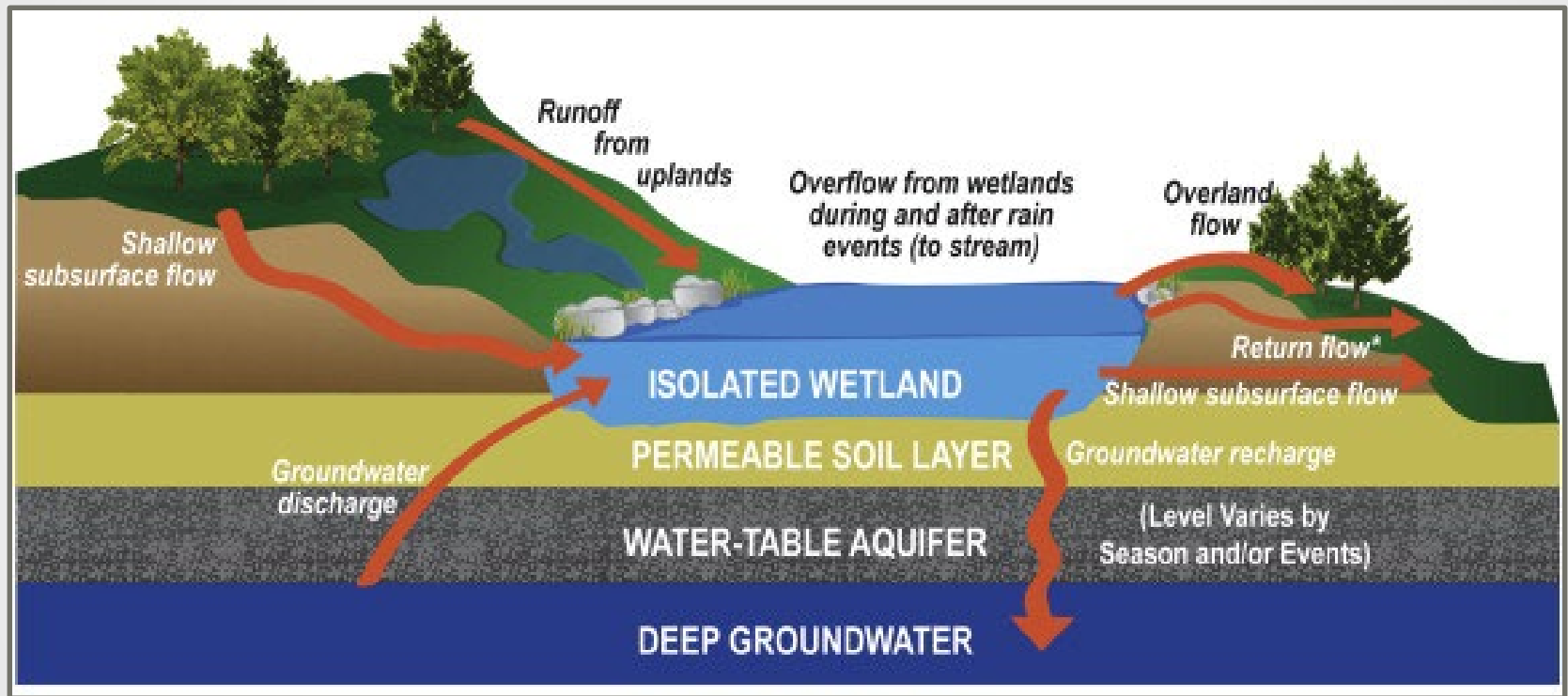


Overview of Wetland Types within the MNCREP Area

Hydrologic Cycle Within Typical MN Pothole Wetland

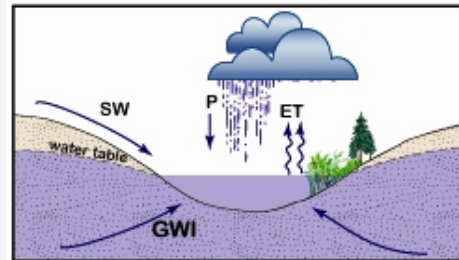
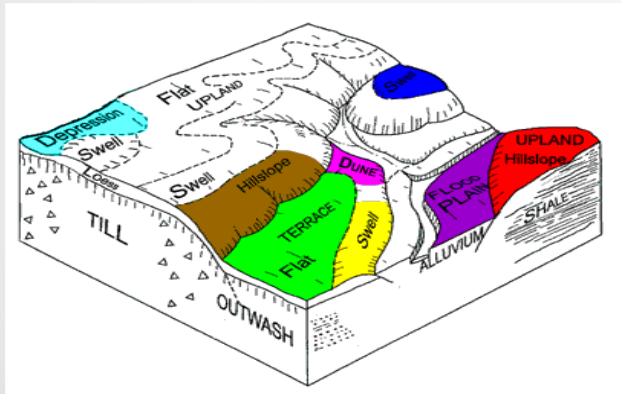


Subsurface (Groundwater) Hydrologic Relationships

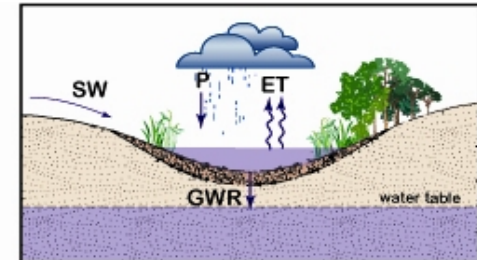


Wetland Types from an Ecological Sciences Perspective

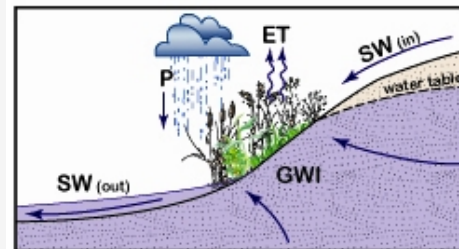
Varying Geomorphic Landscape Settings “Wetland Types” Within CREP Area



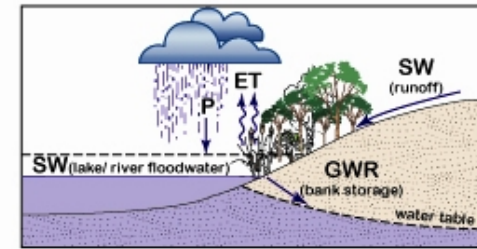
Ground Water - Depression



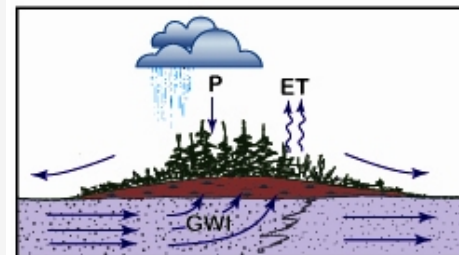
Surface Water - Depression



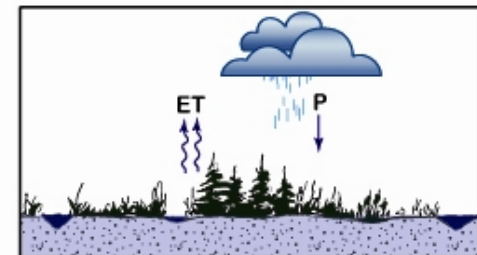
Ground Water - Slope



Surface Water - Slope



Ground Water - Extensive Flat



Surface Water - Extensive Flat

- P = Precipitation
 ET = Evapotranspiration
 SW = Surface Water
 GWI = Ground Water Inflow
 GWR = Recharge to Ground Water

Depressional Wetlands

- ***Seasonal Wetlands***
- ***Sedge Meadows***
- ***Shallow/Deep Marshes***
- ***Fens***



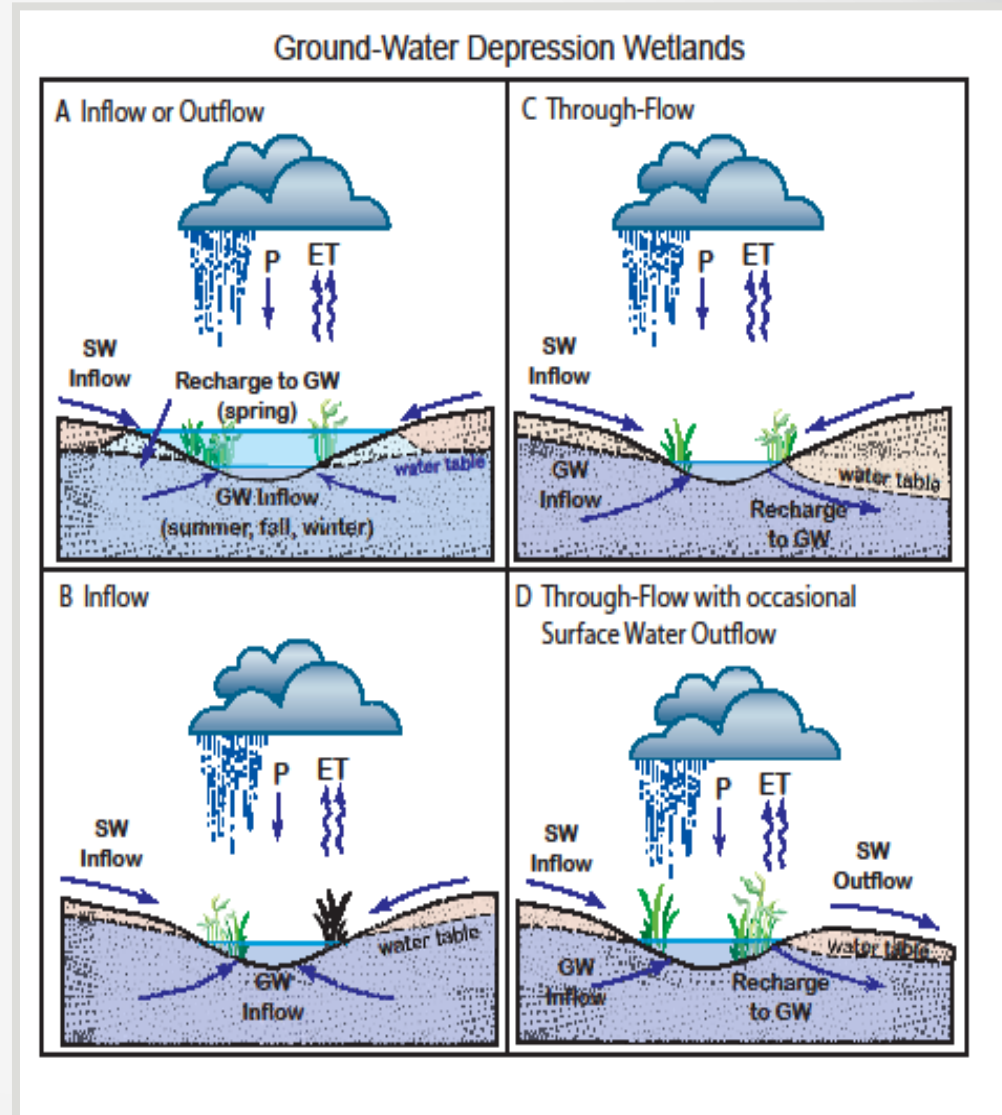
Wetland Hydrology

Geomorphic Setting

Depressional Wetlands

Ground Water Supported

- *Marshes*
- *Sedge meadows*
- *Fens*



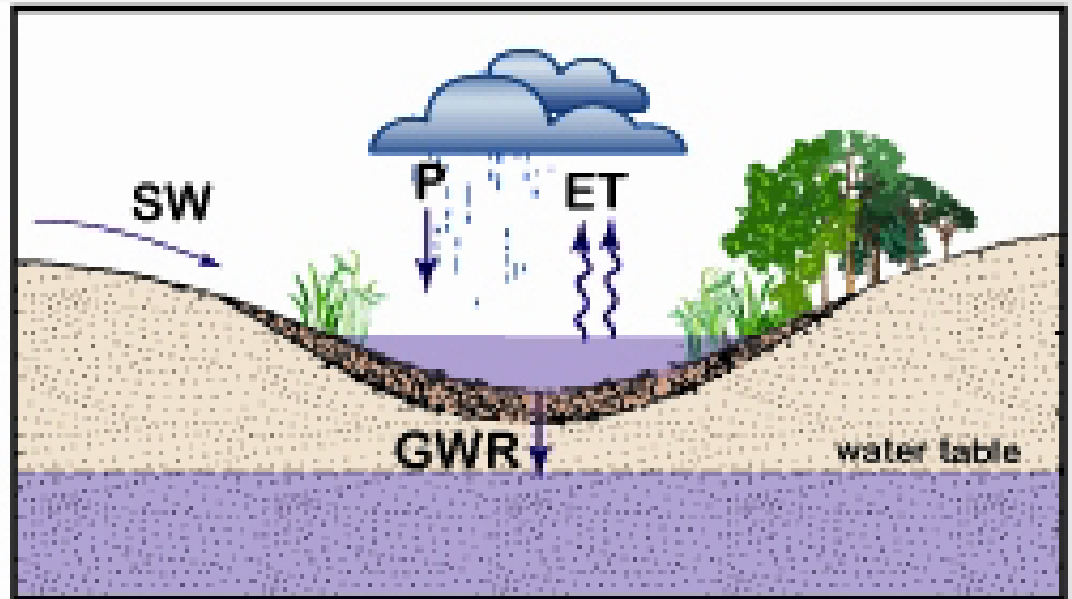
Wetland Hydrology

Geomorphic Setting

Depressional Wetlands

Surface Water Supported

- *Seasonal Wetlands*
- *Sedge meadows*
- *Marshes*



Surface Water - Depression

Sloped Wetlands

- ***Shallow Marshes***
- ***Shrub Swamps***
- ***Riverine Wetlands***
- ***Floodplain Forests***
- ***Fens***



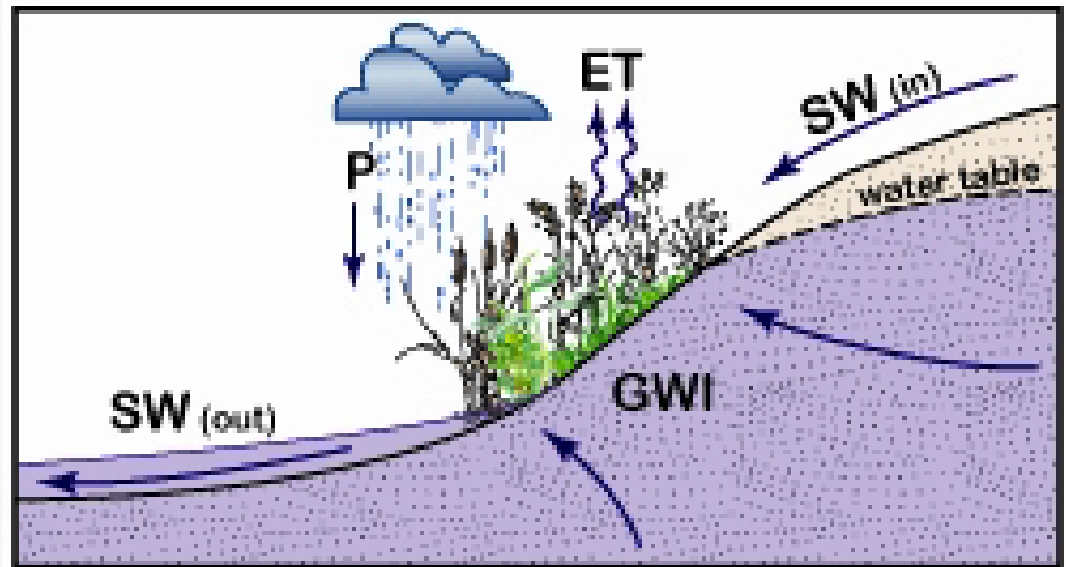
Wetland Hydrology

Geomorphic Setting

Sloped Wetlands

Ground Water Supported

- *Marshes*
- *Fens*



Ground Water - Slope

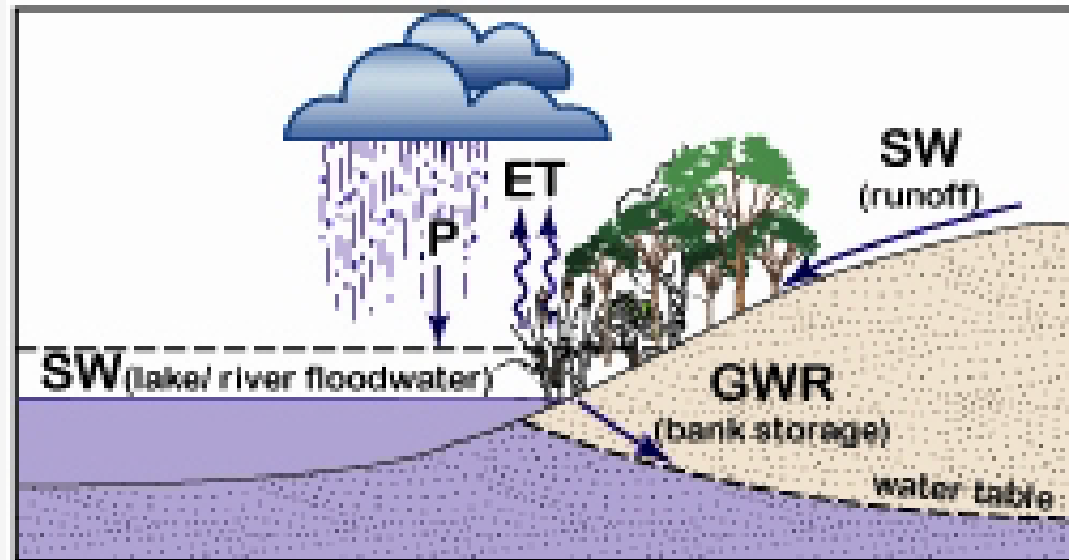
Wetland Hydrology

Geomorphic Setting

Sloped Wetlands

Surface Water Supported

- *Marshes*
- *Shrub Swamps*
- *Riverine Wetlands*
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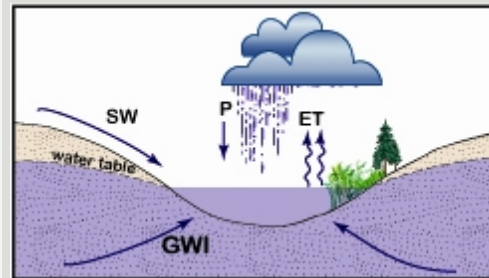


Surface Water - Slope

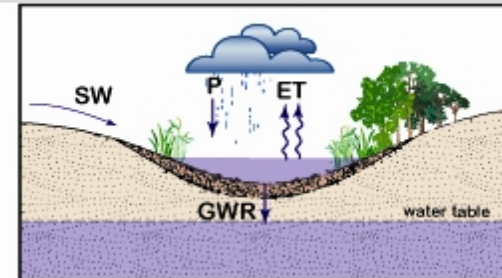
Wetland Hydrology

Geomorphic Setting

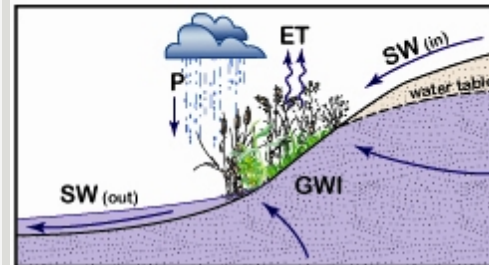
Why is it Important to Understand This?



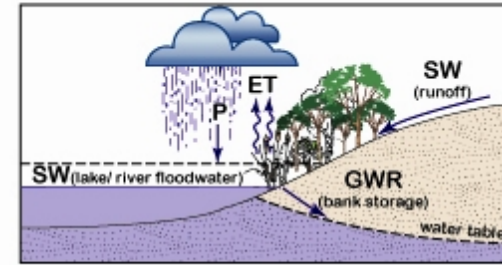
Ground Water - Depression



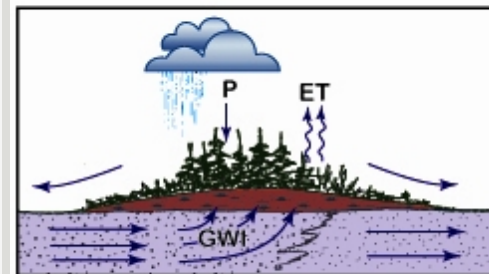
Surface Water - Depression



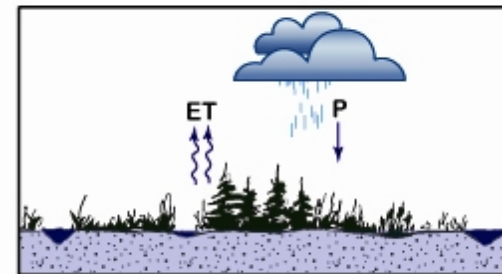
Ground Water - Slope



Surface Water - Slope



Ground Water - Extensive Flat



Surface Water - Extensive Flat

P = Precipitation
 ET = Evapotranspiration
 SW = Surface Water
 GWI = Ground Water Inflow
 GWR = Recharge to Ground Water

Wetland Hydrology

Geomorphic Setting

*Because it influences how
and to what extent wetlands
are (were) drained*



Wetland Hydrology

Geomorphic Setting

And it influences strategies used to effectively restore them



Wetland Hydrology

Geomorphic Setting

Example - restoration of a *Surface water supported (discharge) wetland* may require sealing off breaches through the wetland's substrate. If not sealed, the wetland's ability to retain hydrology may be limited





MN CREP Eligible Wetland Types

- Wetlands Farmed Under Natural Conditions



Wetlands Farmed Under Natural Conditions:

- Includes former wetlands whose hydrology has not been manipulated by drainage or filling but rather hydrophytic vegetation has been removed by annual cropping
- Often (not always) mapped by NRCS as a “W”



Wetlands Farmed Under Natural Conditions:

- **Restoration is often referred at “Crop Cessation”**
- **Restoration is achieved by re-establishing hydrophytic vegetation suitable for the site or through natural colonization if best professional judgement determines an adequate seedbank is already present**





MN CREP Eligible Wetland Types

- **Prior Converted - Drained and Altered Wetlands**



Prior Converted - Drained and Altered Wetlands:

- Includes former wetlands who's hydrology has been manipulated by drainage, fill, or other means
- Often (not always) mapped by NRCS as a "FW's and PC's"
- Restoration should address both hydrology and vegetation



Prior Converted - Drained and Altered Wetlands:

Restoration is achieved by:

- **Re-establishing hydrophytic vegetation suitable for the site or through natural colonization if best professional judgement determines an adequate seedbank is already present**



Prior Converted - Drained and Altered Wetlands:

AND

- **Restoration of site hydrology to the extent feasible and practicable**



Prior Converted - Drained and Altered Wetlands:

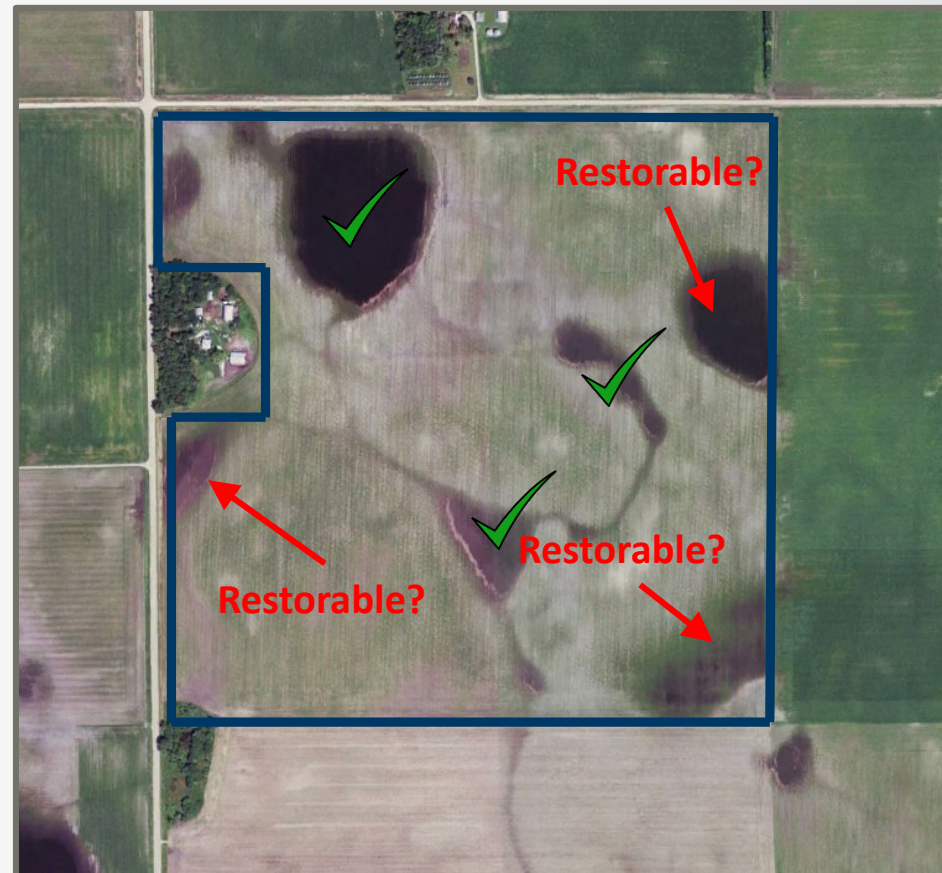
- **Practice feasibility, economic costs, site limitations, along with other considerations may limit the extent of restoration that can be accomplished**

Prior Converted - Drained and Altered Wetlands:

What if restoration of hydrology is determined to be infeasible, unlawful or not practicable to consider?

*As per USDA's CP23/23A
Documentation of Suitability and
Feasibility Worksheets dated June
2018*

- *Consider as being minimally restored once vegetated*
- *In other words – include as part of eligible restorable wetland area but do not score them as being restorable*





Overview of Restoration/Construction Strategies

Presentation Topics

- **Ditch Blocks and Fills**
- **Shallow Earthen Embankments**
- **Tile Blocks**
- **Outletting Incoming Drainage Tile**
- **Rerouting Tile and Ditch Systems**
- **Removing, Relocating, and Installing Drainage Lift Stations**
- **Sediment/Vegetation Removal**
- **Constructing Wetland Outlets**

Overview of Restoration/ Construction Strategies

Ditch Blocks/Fills



Overview of Restoration/ Construction Strategies

Ditch Blocks/Fills



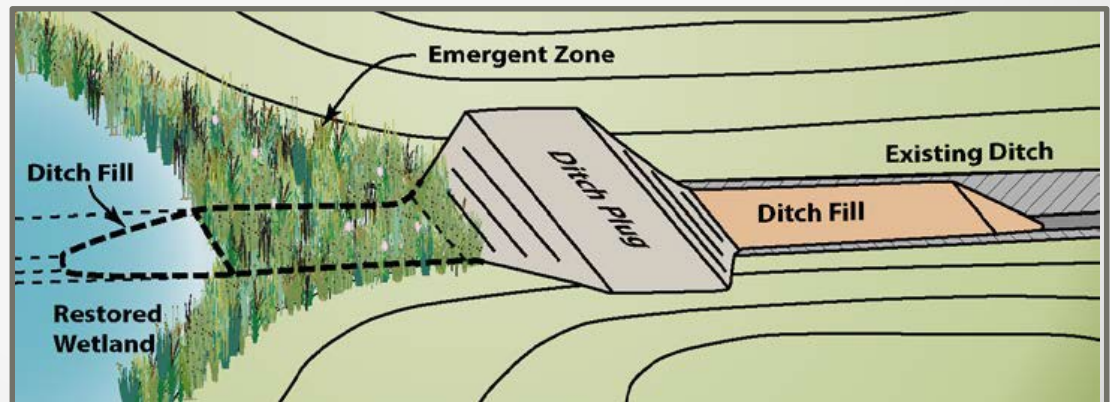
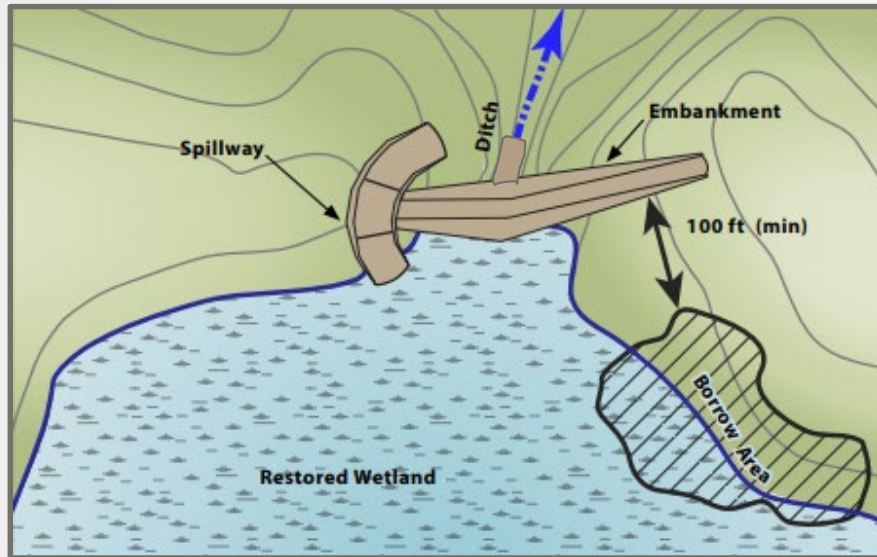
Overview of Restoration/ Construction Strategies

Shallow Earthen Embankments



Design Considerations for all Plugs and Embankments

Overview of Restoration/ Construction Strategies



Design Considerations for all Plugs and Embankments

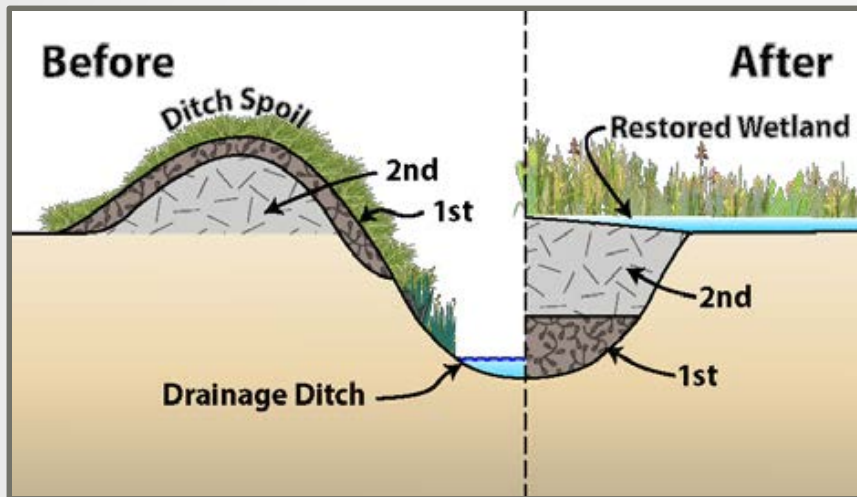


Overview of Restoration/ Construction Strategies



Design Considerations for all Plugs and Embankments

Overview of Restoration/ Construction Strategies



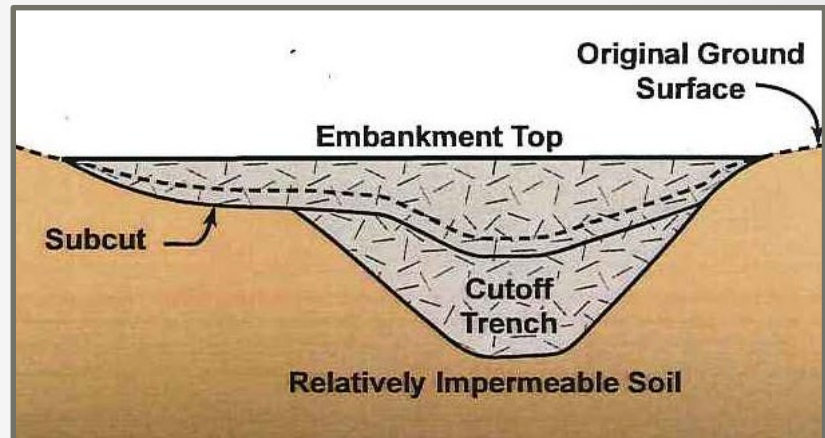
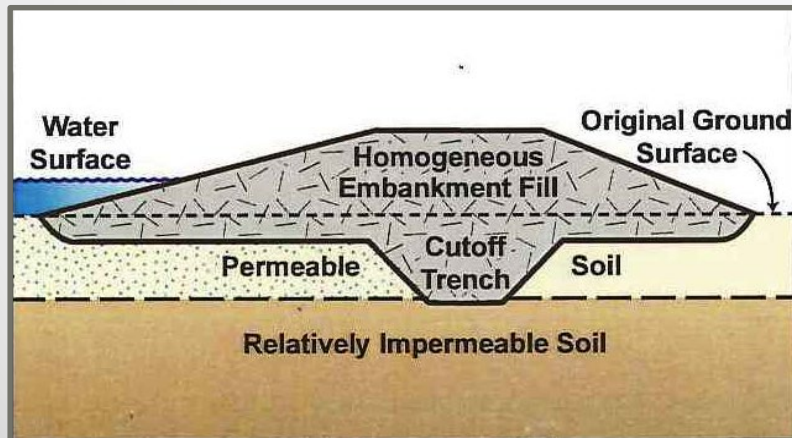
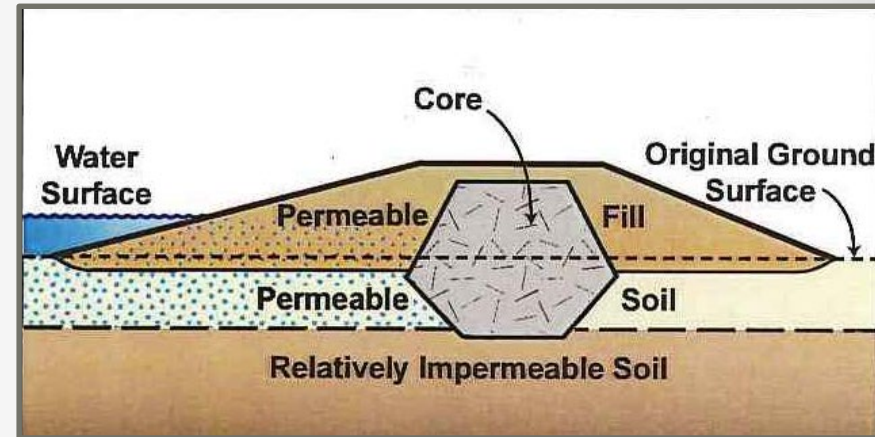
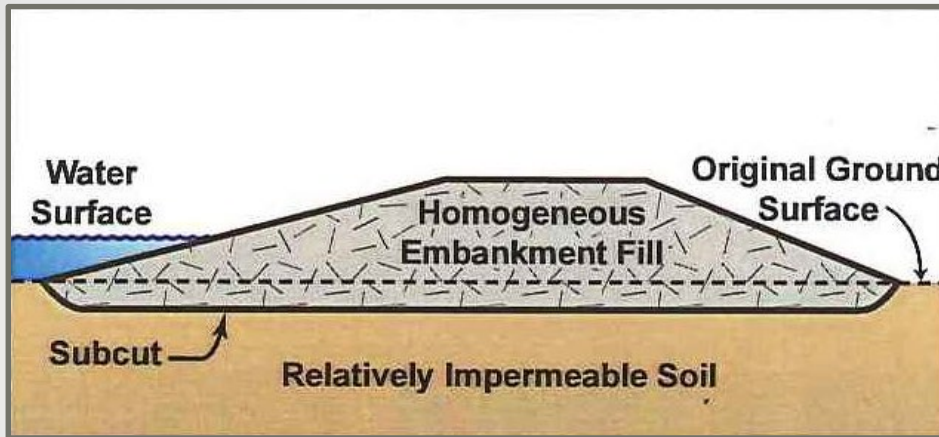
Overview of Restoration/ Construction Strategies

Design Considerations for all Plugs and Embankments



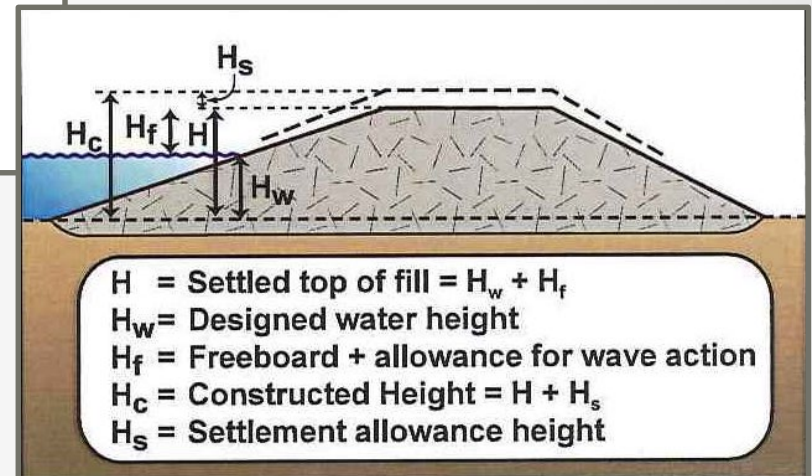
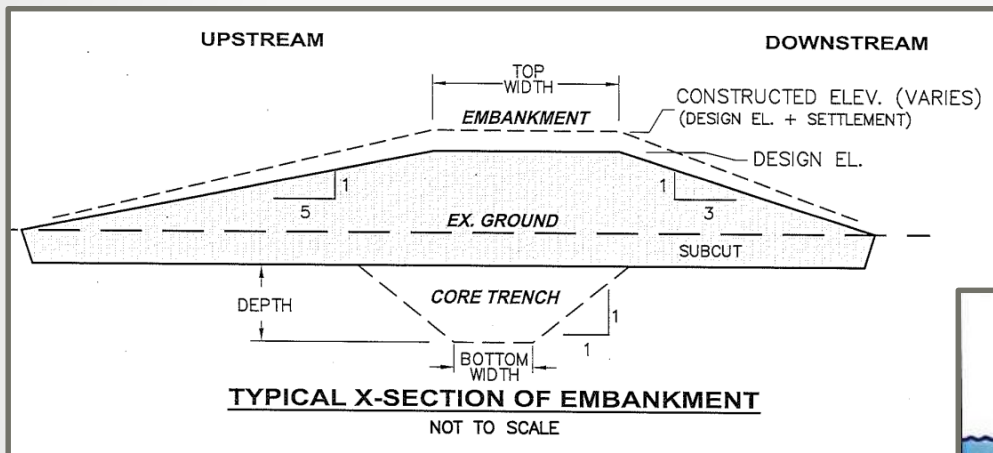
Overview of Restoration/ Construction Strategies

Design Considerations for all Plugs and Embankments



Overview of Restoration/ Construction Strategies

Design Considerations for all Plugs and Embankments



Overview of Restoration/ Construction Strategies

Design Considerations for all Plugs and Embankments

- Dozer
- Loaded Scraper
- Sheepsfoot

10-20 psi (lb/in²)
100 psi (lb/in²)
200 psi (lb/in²)



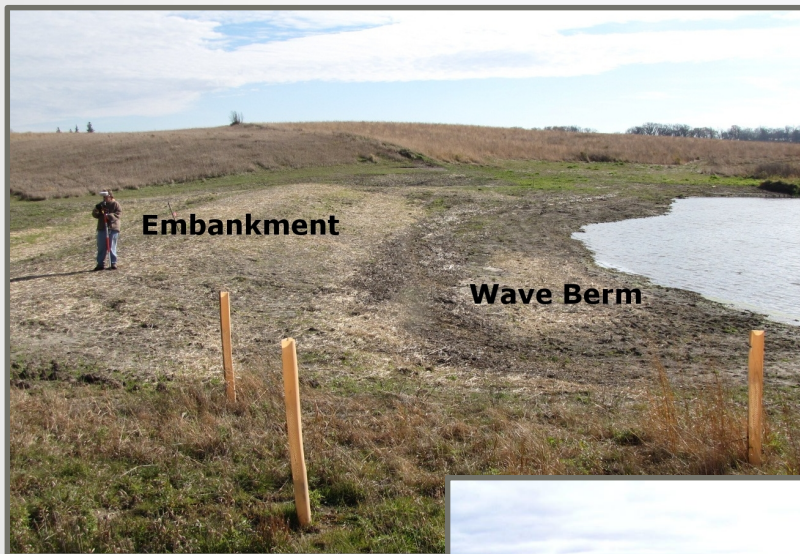
Overview of Restoration/ Construction Strategies

Design Considerations for all Plugs and Embankments



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Design Considerations for all Plugs and Embankments



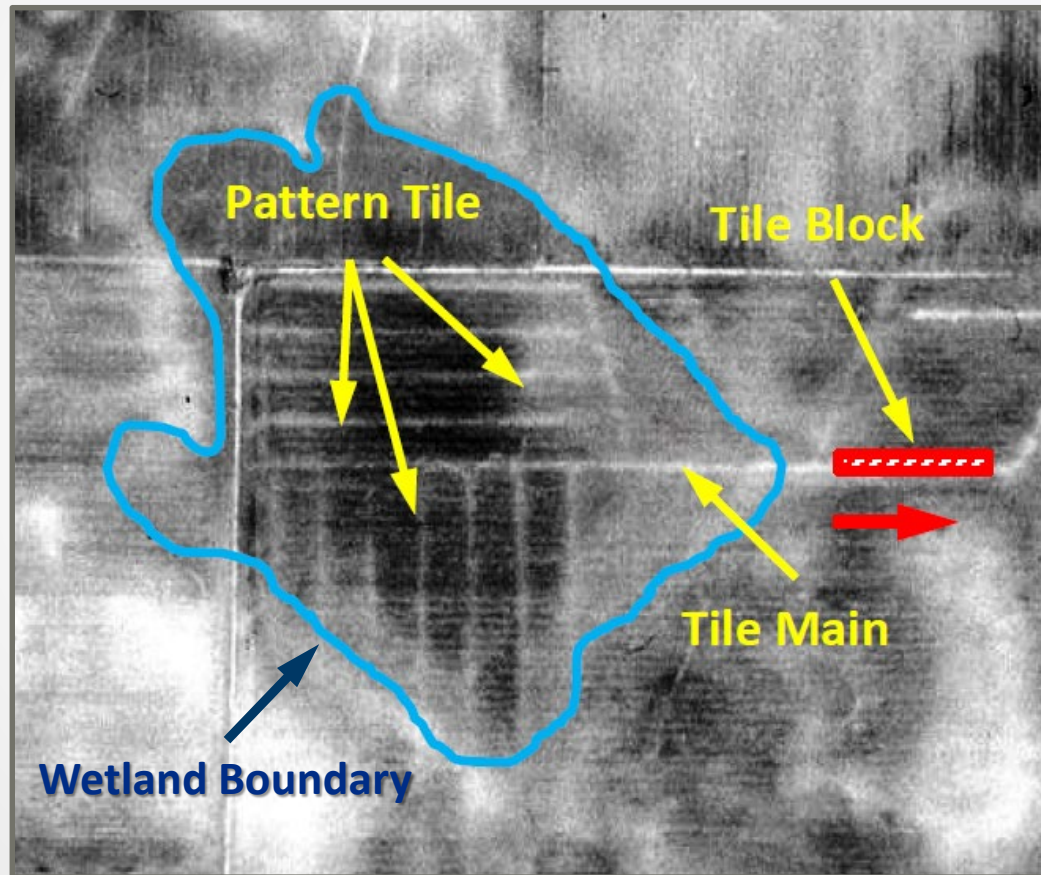
Overview of Restoration/ Construction Strategies

Design Considerations for all Plugs and Embankments



Overview of Restoration/ Construction Strategies

Blocking Drain Tile



Overview of Restoration/ Construction Strategies

Blocking Drain Tile

05/04/2001 14:27 5078632377 WFS PAGE 02

Tile Installation Record - Location Plan

Scale
1 inch = 440 feet

LEGEND
Farm Boundary -X-X-X-
Existing Tile Line - - - - -
New Tile Installed _____

Job Name Robert and Rick Hanson

By Phillip Manning 7-22-76
(Signature of Contractor and Date) OVR

Sec. 34 Township Freeborn

County Freeborn State MN

Amount of Tile Installed 2560 FT Plowed

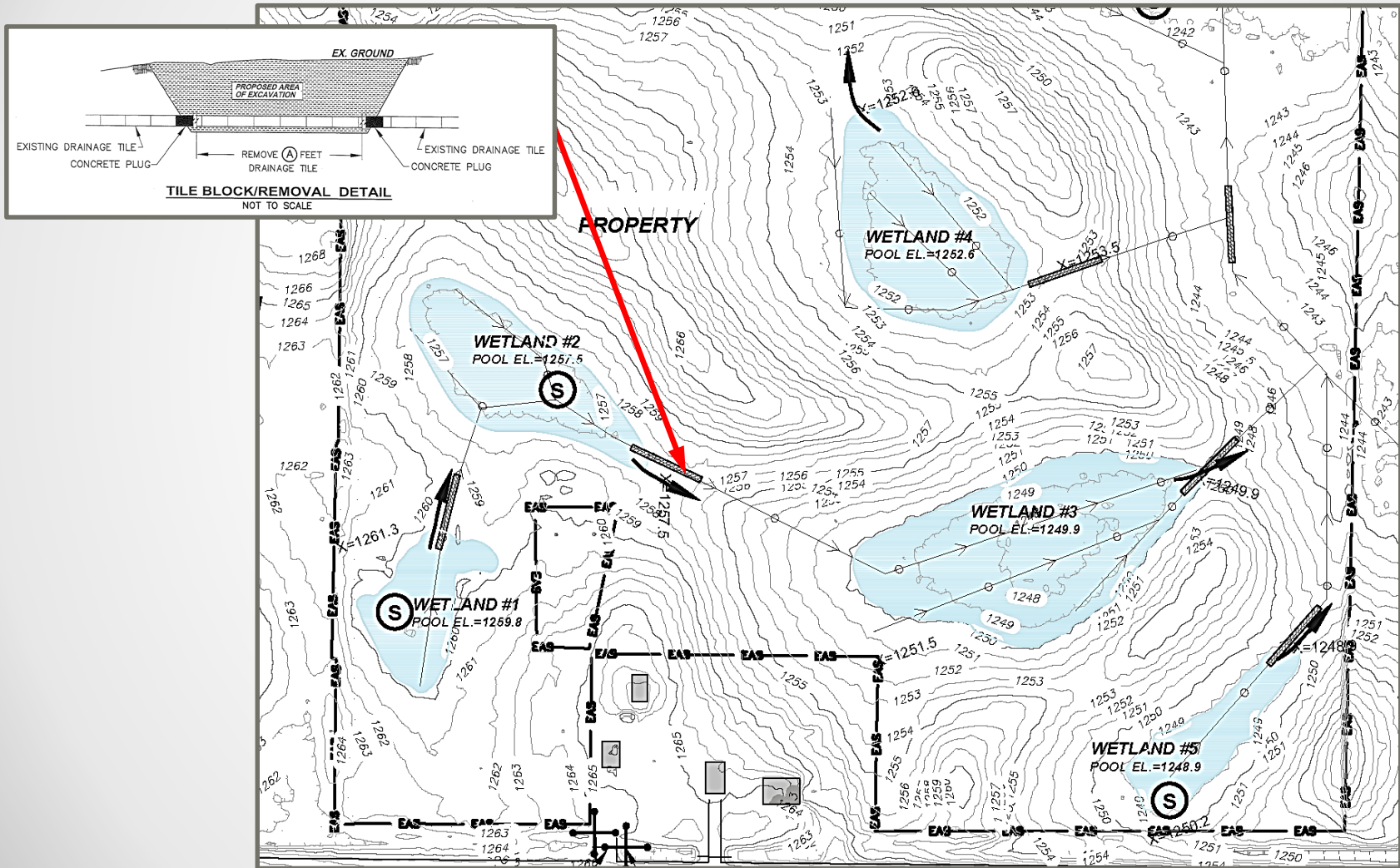
1200	Feet of	Muck Filter 6	inch tile
1360	Feet of	Muck Filter 5	inch tile
	Feet of		inch tile
	Feet of		inch tile

MORREIM DRAINAGE, INC.
Water Management Specialists
RR 2 Box 164
Albert Lea, MN 56007
Phone (507) 826-3449
Fax: (507) 826-3482
Water Management Specialists



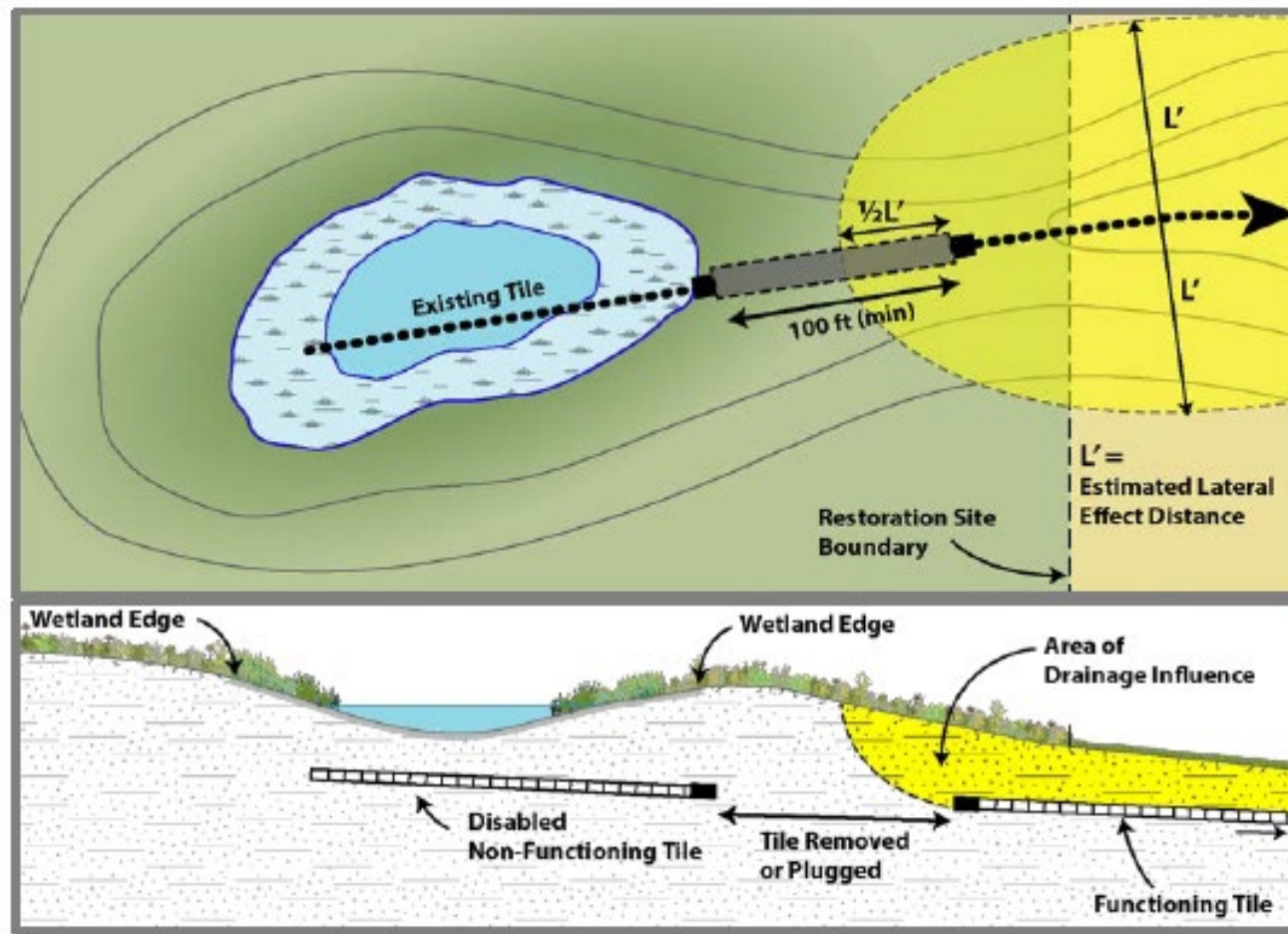
Design Considerations for Blocking Tile

Overview of Restoration/Construction Strategies

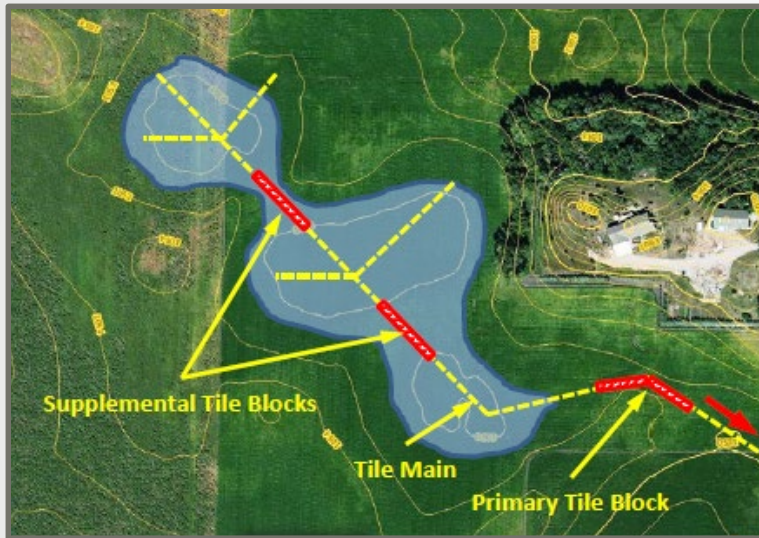


Design Considerations for Blocking Tile

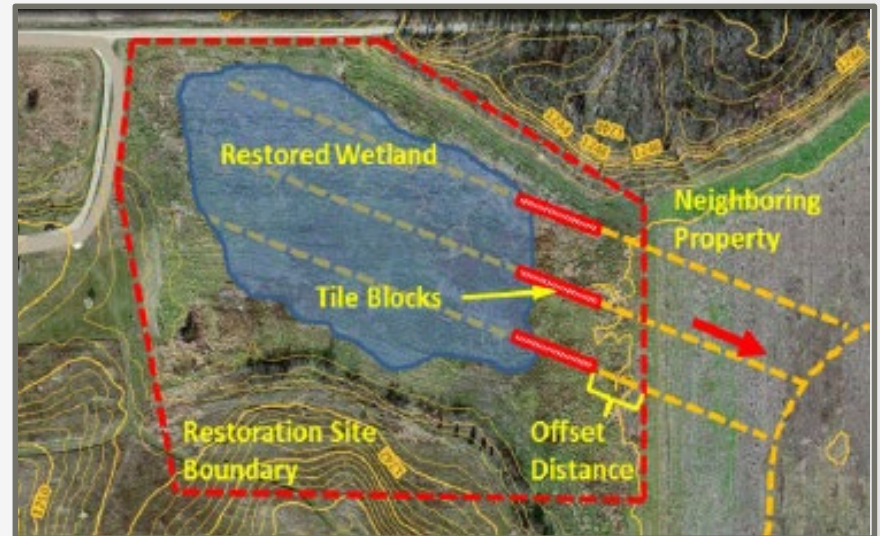
Overview of Restoration/Construction Strategies



Design Considerations for Blocking Tile

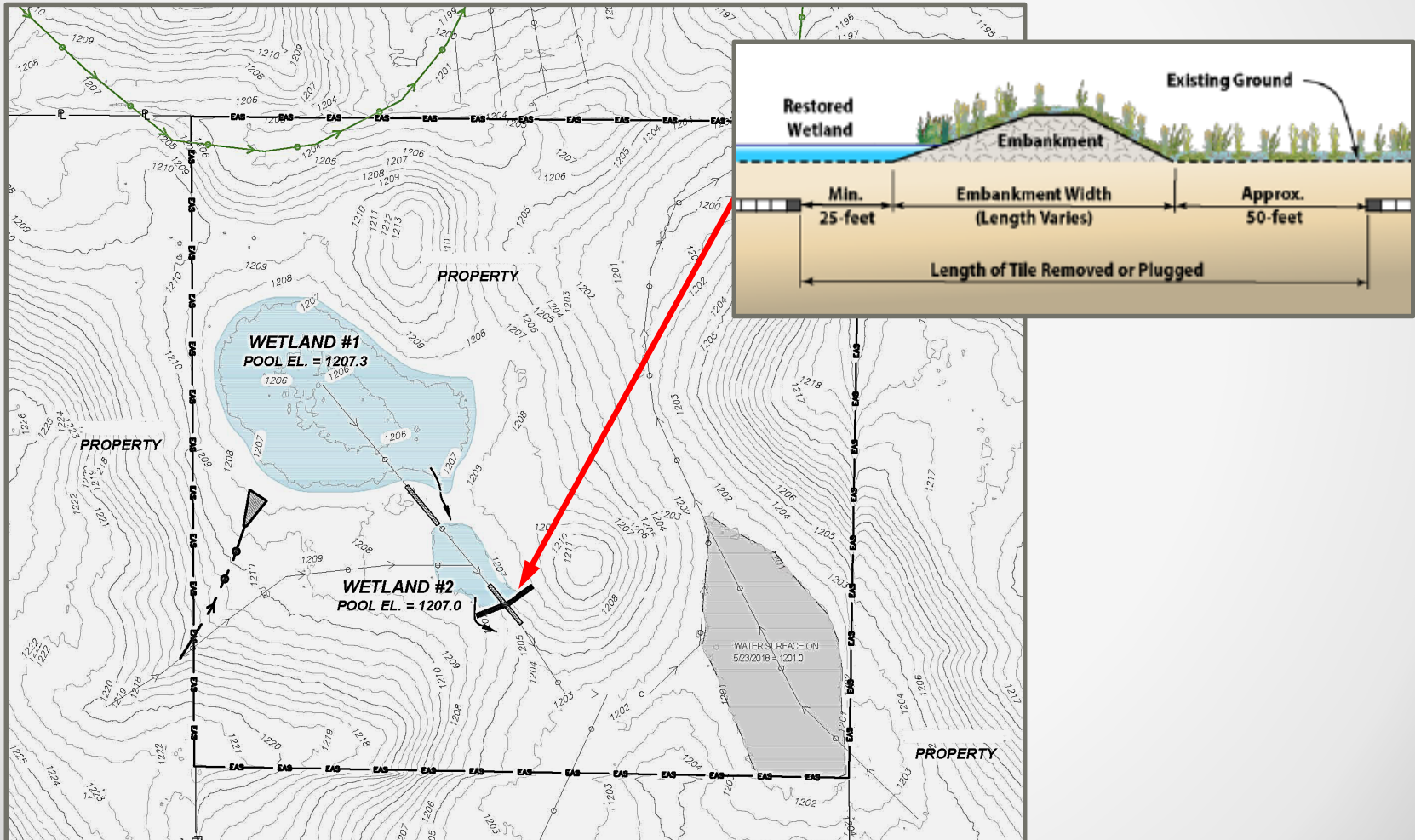


Overview of Restoration/Construction Strategies



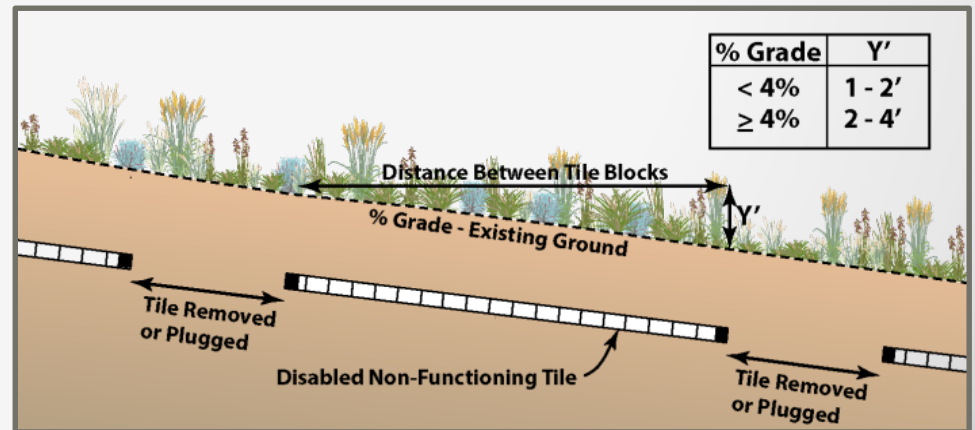
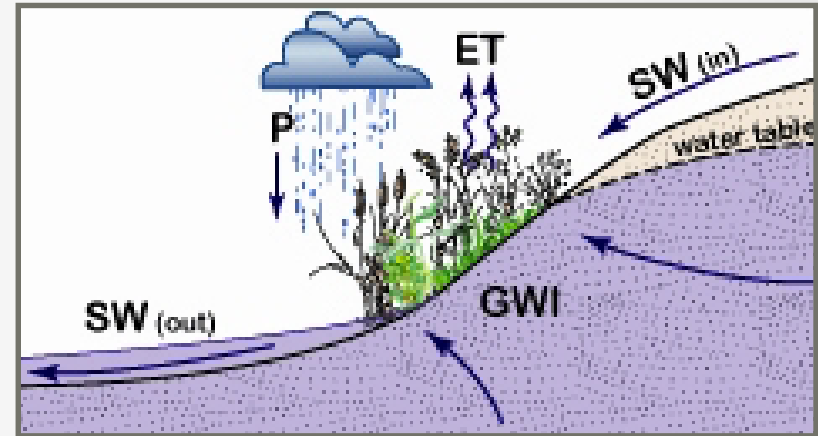
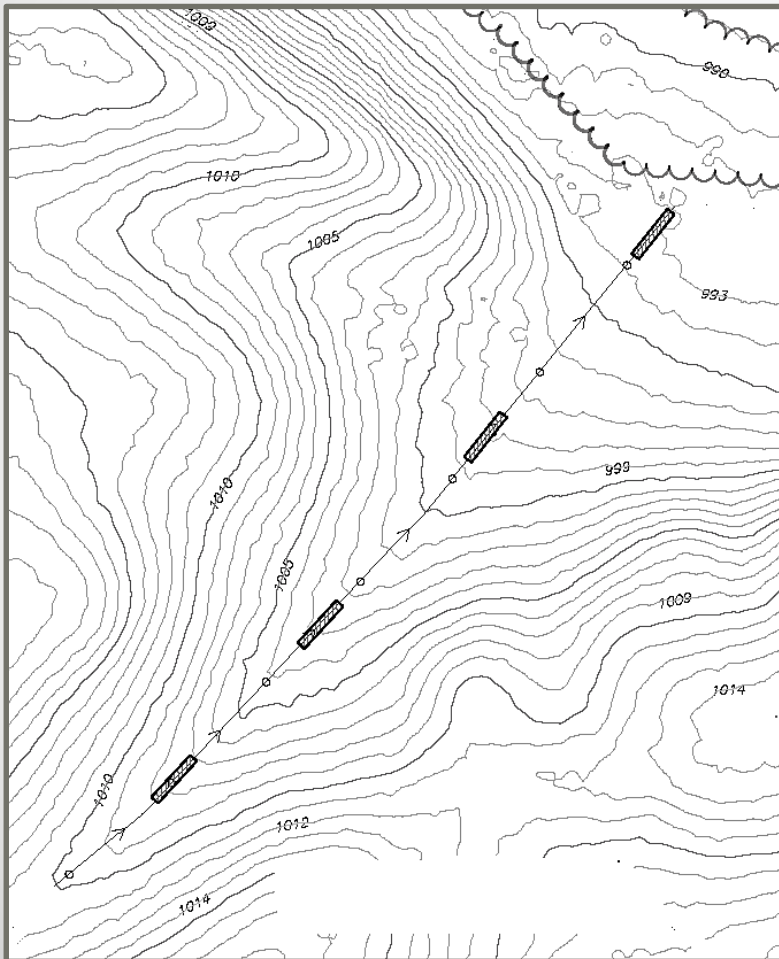
Design Considerations for Blocking Tile

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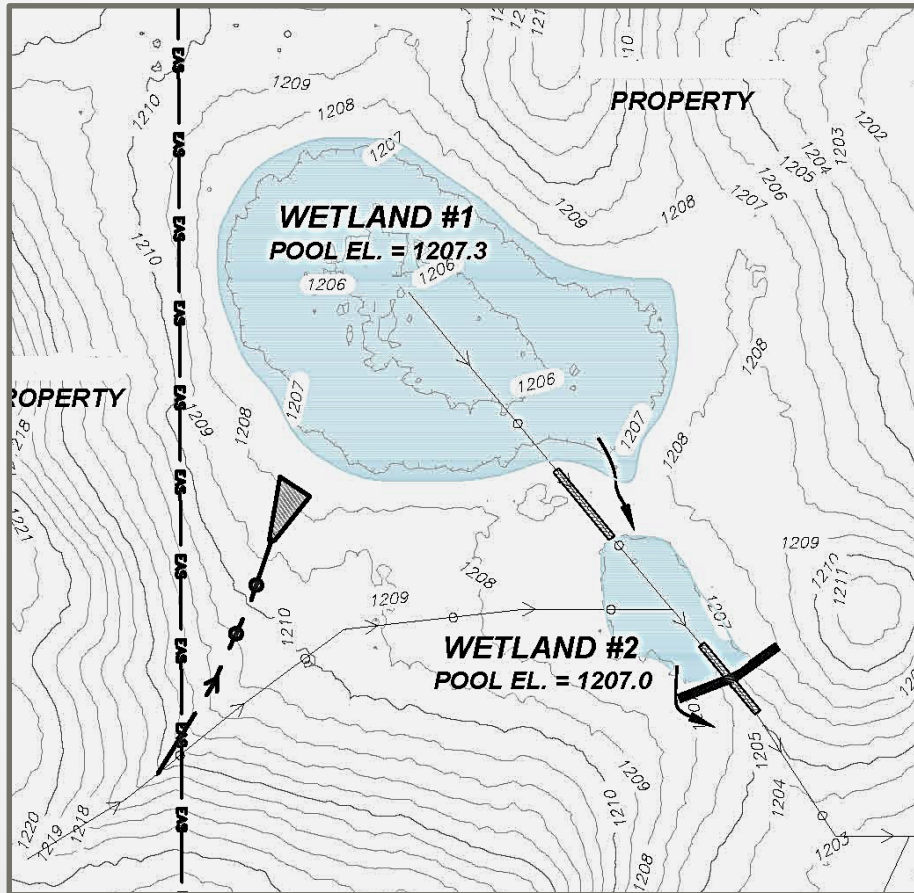
Design Considerations for Blocking Tile

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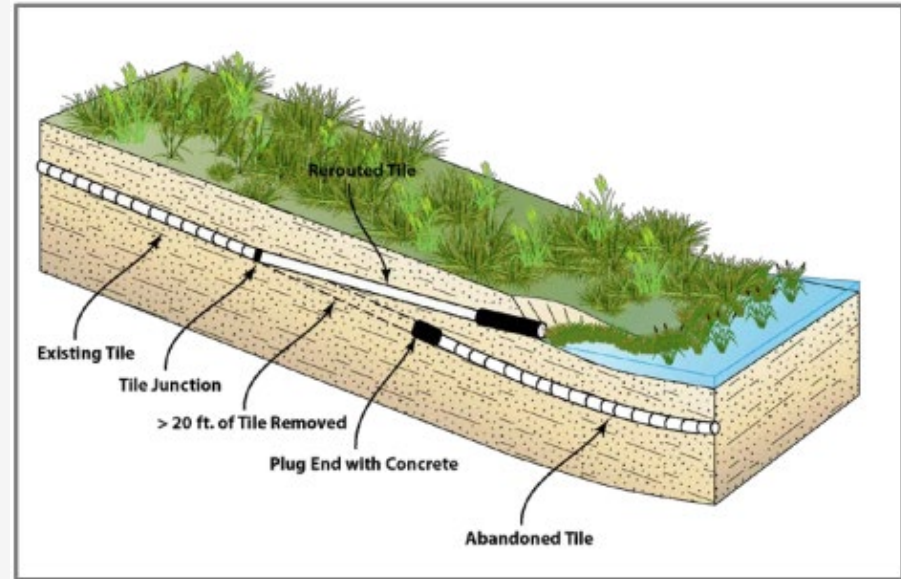
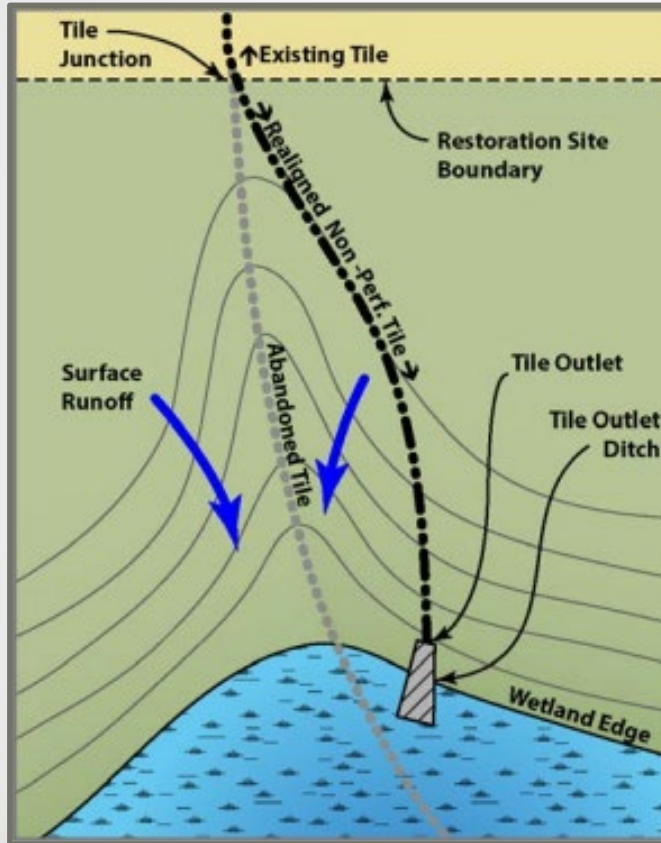
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Outletting Drain Tile



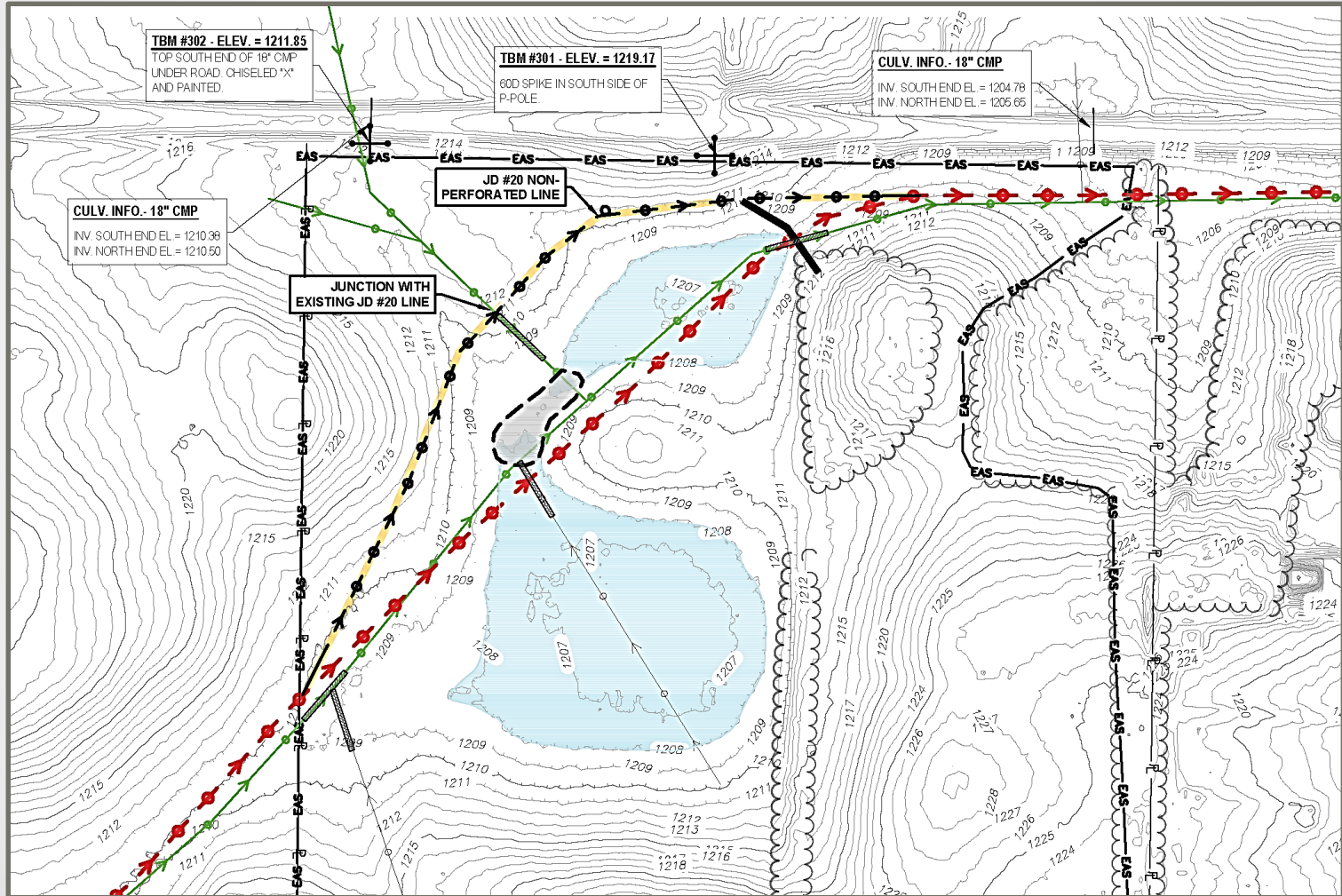
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Outletting Drain Tile



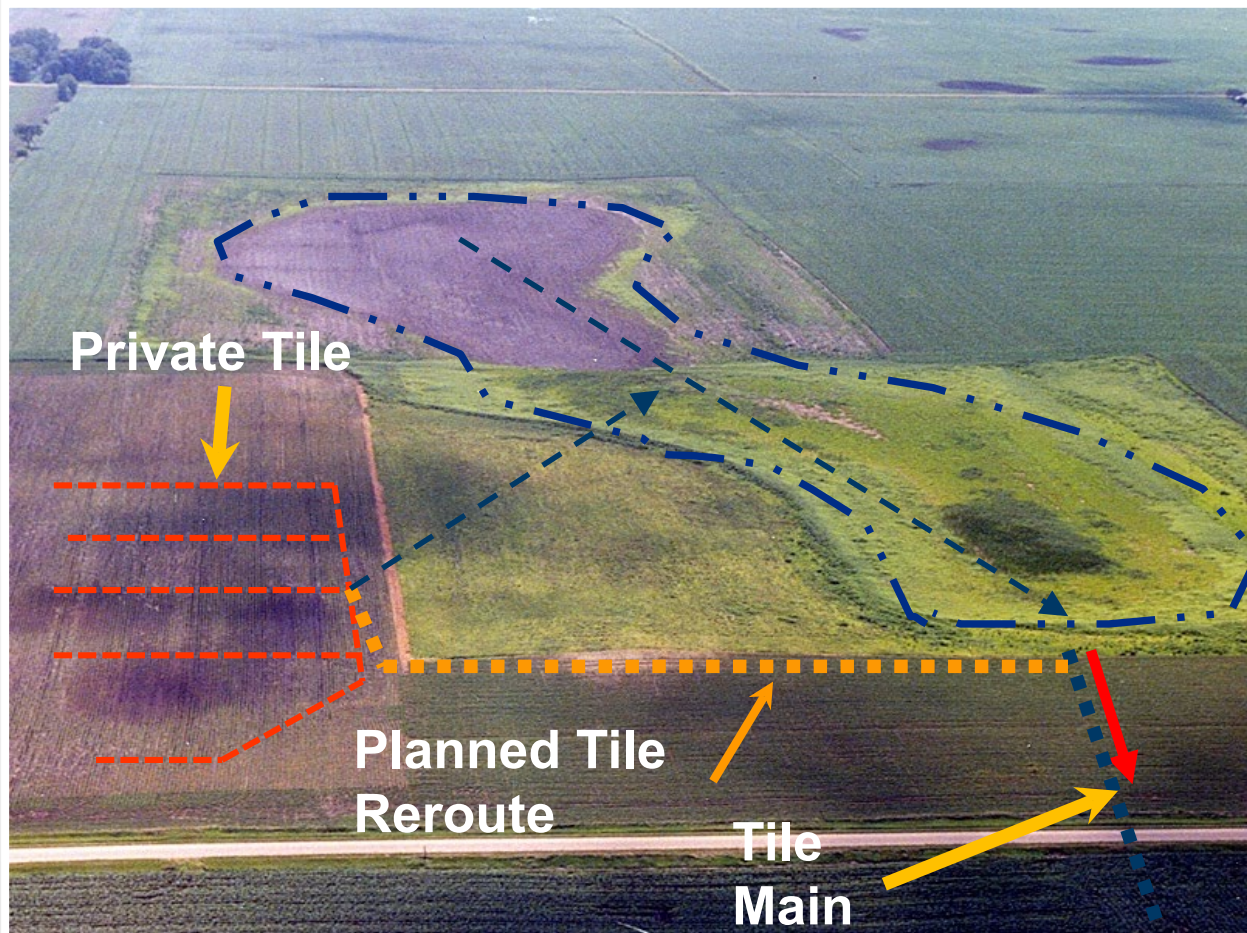
Rerouting Drain Tile and Ditch Systems

Overview of Restoration/Construction Strategies



Rerouting Drain Tile and Ditch Systems

Overview of Restoration/Construction Strategies



Rerouting Drain Tile and Ditch Systems

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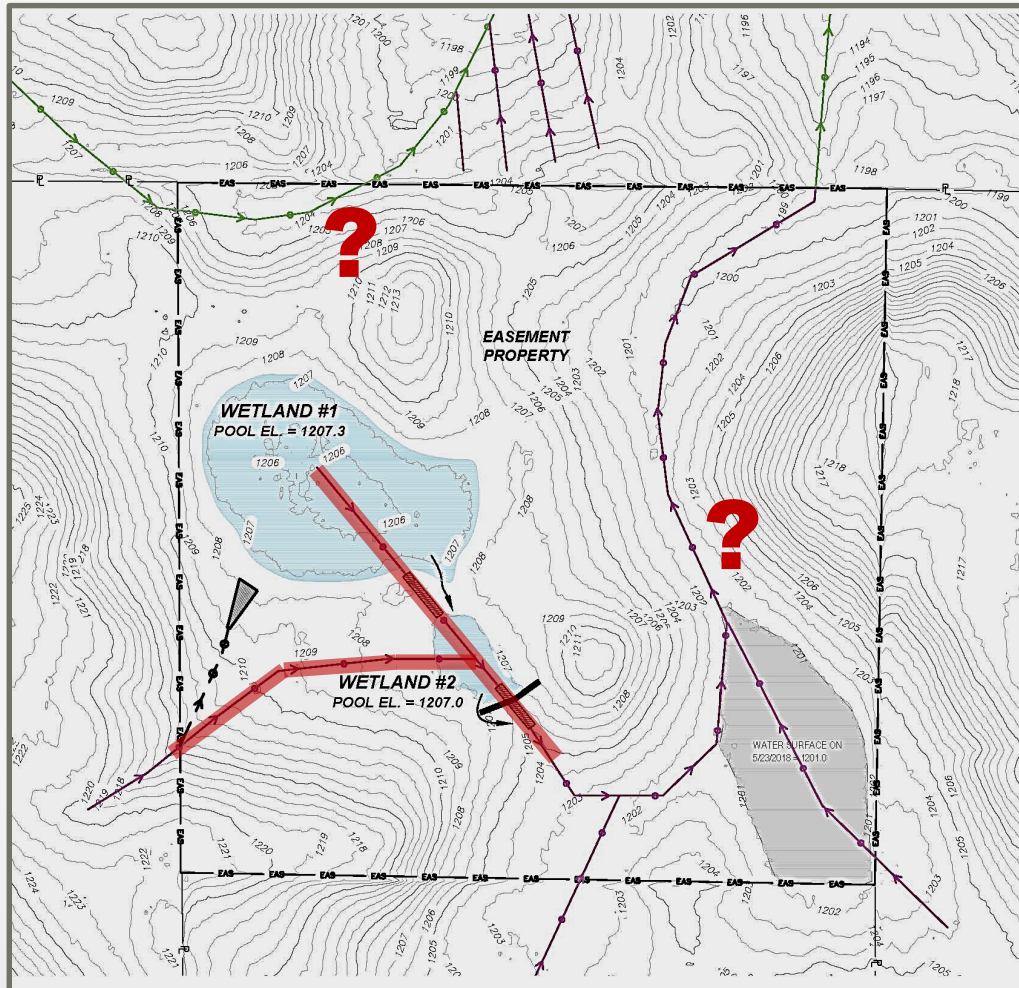


Tile Re-route



Rerouting Drain Tile and Ditch Systems

Overview of Restoration/Construction Strategies



Rerouting Drain Tile and Ditch Systems

Overview of Restoration/ Construction Strategies

Agency Policy

What Landowner's Need to Know

- Existing drainage systems will be manipulated when a wetland restoration or water quality benefit will be achieved AND when feasible and practical to do so
- When those conditions are not met, these existing drainage systems will likely be left “as is”

Rerouting Drain Tile and Ditch Systems

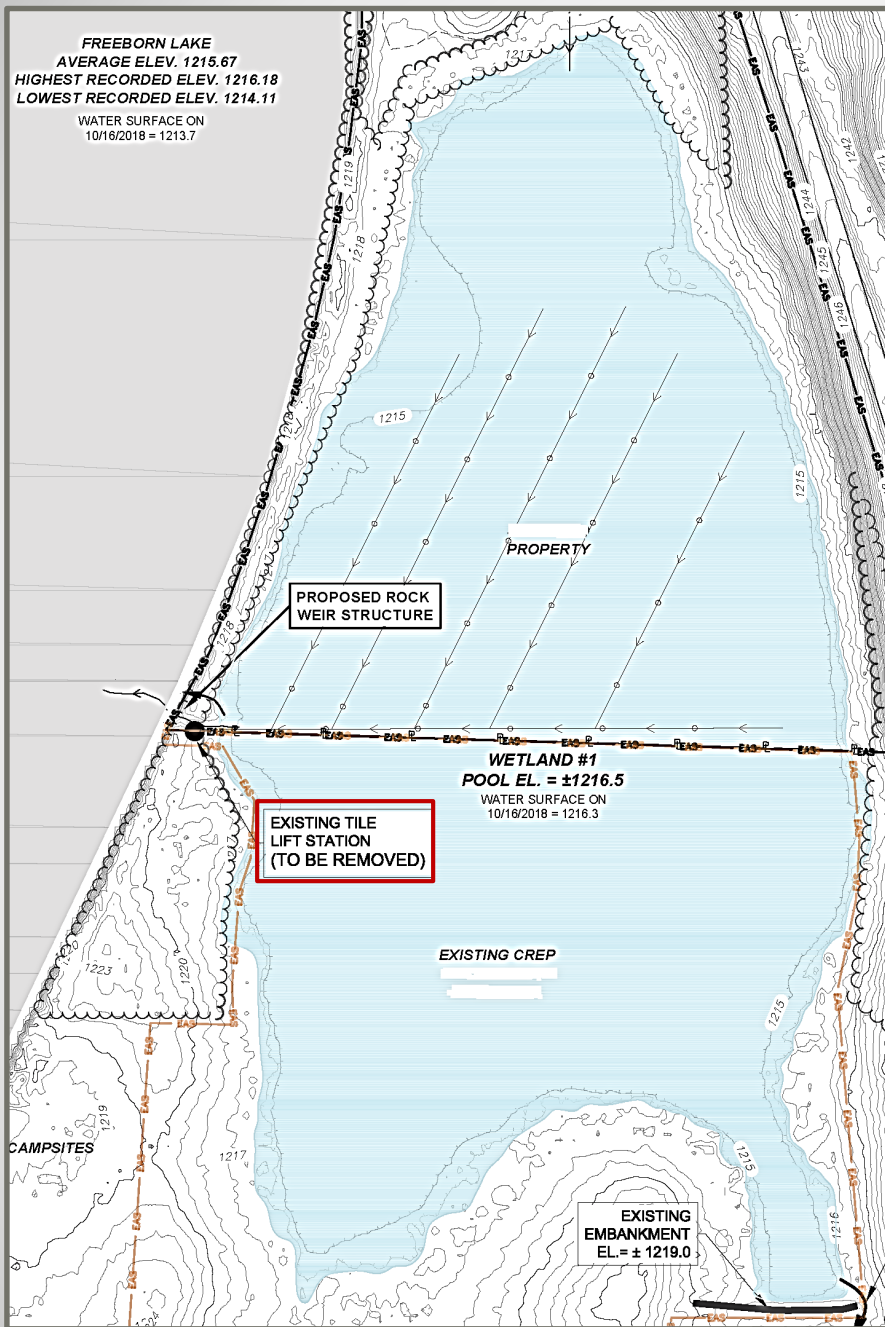
Overview of Restoration/ Construction Strategies

Agency Policy

What Landowner's Need to Know

- BWSR's conservation easement allows for lawful maintenance or repair of existing drainage systems being left "as is"
- BWSR will not be responsible for any costs relating to maintenance or repair of existing drainage systems when left "as is" within a conservation easement
- As a result, the state will not provide practice money to install non-perforated conduit thru an easement area just to avoid future maintenance issues

FREEBORN LAKE
AVERAGE ELEV. 1215.67
HIGHEST RECORDED ELEV. 1216.18
LOWEST RECORDED ELEV. 1214.11
WATER SURFACE ON
10/16/2018 = 1213.7



Overview of Restoration/ Construction Strategies

*Removing, Relocating, and
Installing Drainage Lift Stations*



Overview of Restoration/ Construction Strategies

Removing, Relocating, and Installing Drainage Lift Stations



Sediment/Vegetation Removal

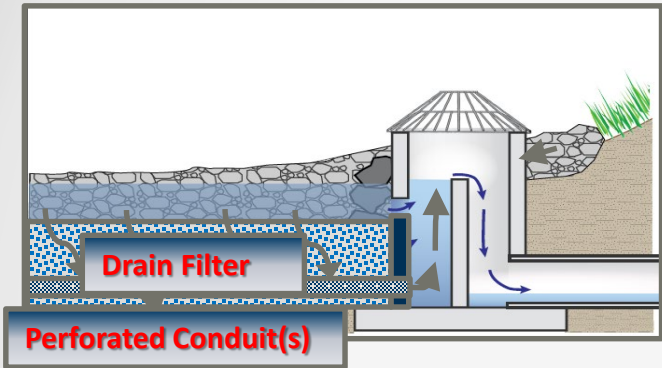


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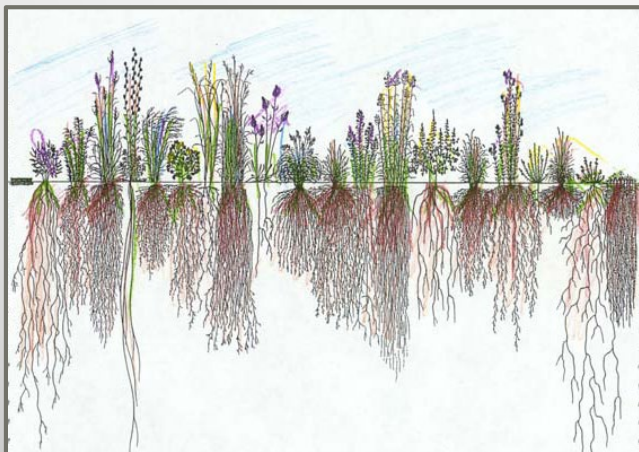
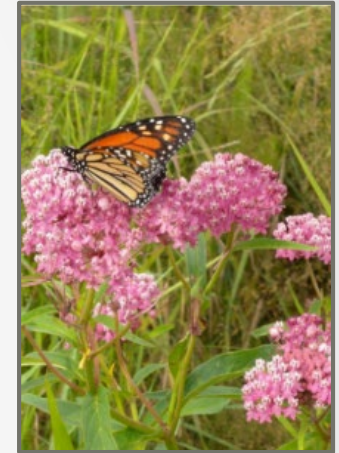
Constructing Wetland Outlets

Overview of Restoration/Construction Strategies

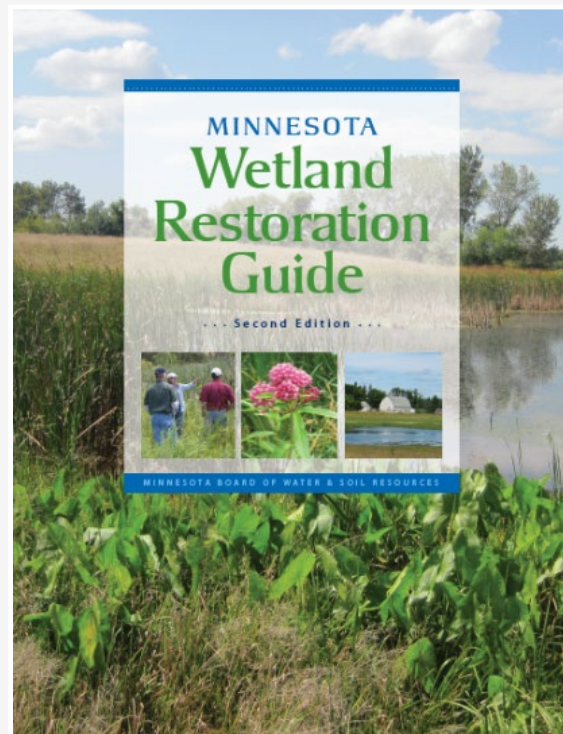


Vegetation Establishment

Overview of Restoration/ Construction Strategies



MN Board of Water and Soil Resources Wetland Restoration Programs/Guide



Overview of Restoration/ Construction Strategies

Restoration Guide Website:



Located at: bwsr.state.mn.us/restoration/index.html

Minnesota Board of Water & Soil Resources

A to Z Topics Contact Search

Home Easements Grants Resource Management and Planning Conservation Implementation **Wetlands**

Wetlands

Wetland Regulation	Wetland Banking	Wetland Delineation	Training	Plans and Reports
WCA forms and regulatory guidance General permitting information Current WCA Rule - Chapter 8420, effective August 10, 2009 2011 WCA Statute Changes (updated 08/07/2011) 2012 WCA Statute Changes (posted 6/28/2012) 2015 WCA Statute Changes (posted 09/10/2015) Unofficial Compilation of WCA Statutes (posted 1/23/2012) WCA Local Government Unit directory MnDOT District Wetland Contacts BWSR WCA contacts WCA Enforcement DNR TEP Representatives (January 2014) U.S. Army Corps of Engineers Dispute Resolution (Oct. 10, 2014) Understanding Wetland Replacement Ratios (Jan. 15, 2015)	Credits Fee and Sales Data Forms Guidance 2015 BWSR/Corps Wetland Banking Training (<i>New!</i>) Agricultural Wetland Banking Easement Acquisition Monitoring Policy Local Road Wetland Replacement Program Links & Newsletter Easement Data  Interactive Map of All Wetland Banking Easements Download File Geodatabase of Wetland Banking Easement Boundaries 	Wetland Delineation Guidance and Resources Corps of Engineers 1987 Wetland Delineation Manual Drainage Setback Guidance 1987 Manual Regional Supplements U of MN Wetland Delineator Certification Program and List of Certified Wetland Delineators ↗ Wetland Functional Assessment BWSR-approved wetland evaluation methods: MnRAM (Minnesota Routine Assessment Methodology for Evaluating Wetland Functions) A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Prairie Potholes (May 2006)	Training Materials on administering WCA, wetland identification and related topics are on the BWSR Training Archives page Wetland Delineator Certification Program Training Wetland Restoration Wetland Plants & Plant Communities of MN & WI - 3rd Edition Wetland Restoration Guide (<i>New!</i>) Native vegetation and seed sources Wetland Restoration Plant ID Guide Guidance Document: Field Assessment of Construction Components for Wetland Restorations (<i>New!</i>) Evaluating the Potential of Using GIS for a Drained Wetlands Inventory (2001)	Development of 2015 Legislative Recommendations Siting of Wetland Mitigation in NE Minnesota (2014) Governor's Executive Order 12-04 (2012) Northeast Wetland Mitigation Inventory and Assessment (2009-2010) Minnesota Wetland Program Plan (2012) Wetlands Restoration Strategy: A Framework for Prioritizing Efforts in Minnesota (2009) Biennial MN Wetland Reports (1997-2003) Minnesota Wetlands Conservation Plan (1997)

Overview of Restoration/ Construction Strategies

OUTLETTING DRAINAGE SYSTEMS

TECHNICAL GUIDANCE DOCUMENT

Document No.: WRG 4A-3
Publication Date: 10/14/2015



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- ◆ Design Considerations
- ◆ Construction Requirements
- ◆ Other Considerations
- ◆ Cost
- ◆ Maintenance
- ◆ Additional References

INTRODUCTION

In Minnesota, wetlands planned for restoration are commonly drained by surface drainage ditches and subsurface drainage tile. These drainage systems often extend upstream from planned restoration sites and provide drainage to neighboring lands not part of a restoration project.

The restoration of wetlands in these types of drainage scenarios provides a number of design and construction challenges and may not always



Figure 1. Upstream Drainage Tile Outletting into Restored Wetland

be possible. However, strategies to address incoming drainage systems as part of restoration do exist and should be considered, when feasible. These strategies include rerouting incoming drainage systems away from or around planned wetland restorations or when possible, outletting them directly into planned wetlands or other suitable areas within the restoration site.

APPLICATION

This Technical Guidance Document focuses on strategies to design effective and functional outlets within restoration sites for neighboring upstream drainage systems. The design of drainage system outlets will primarily be dependent on the type, location, elevation and grade of the drainage system as it approaches and enters the restoration site. If the approaching drainage system is steep enough in grade, then it may be possible to modify it and construct an effective and functional outlet directly onto the restoration site. The design will also be influenced by the general landscape of the planned outlet's location and, if part of a wetland restoration, the type of wetland being restored.

The strategies presented are most applicable to modifying subsurface tile drainage systems that

BLOCKING AND FILLING SURFACE DRAINAGE DITCHES

TECHNICAL GUIDANCE DOCUMENT

Document No.: WRG 4A-1
Publication Date: 10/14/2015



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INTRODUCTION

Surface ditches are common in Minnesota and have drained and altered countless wetlands. When attempting to restore wetlands drained by surface ditches, it is usually necessary to place earth fills at strategic locations within the drainage ditch to block the flow of water. This wetland restoration strategy is commonly referred to as constructing a "ditch plug". While these earthen fills are often thought of as being only small, simple structures, ditch plugs are essentially small dams and must be designed and constructed accordingly.



Figure 1. Construction of an Earthen Plug Across Drainage Ditch

In addition to constructing appropriately located and designed ditch plugs, there is often a need or desire to also completely fill the entire reach of ditch within the planned restoration area. In certain landscape settings, this additional action will be necessary for the successful restoration of wetland hydrology.

APPLICATION

Drainage ditches remove excess water that collects on the land surface as well as in the soil profile. They provide a means to manage or lower water tables and can rapidly convey runoff from wetlands to areas downstream. Ditches can be just a few inches to many feet in depth, depending on topography and landscape setting.

Drainage ditches can be located in depressional wetlands, sloped wetlands, and wetland flats. As discussed in Section 3-4 and in Appendix 3-A of the Guide, each of these wetland types interact with surface and ground water to varying degrees depending on hydrogeologic factors such as soil characteristics, geologic setting, and water table position. It is important that the dynamic nature of a drained wetland's hydrogeology be understood to accurately determine effective design strategies for restoration. More specifically, it will be important to determine if a ditch plug alone will be

Questions?

