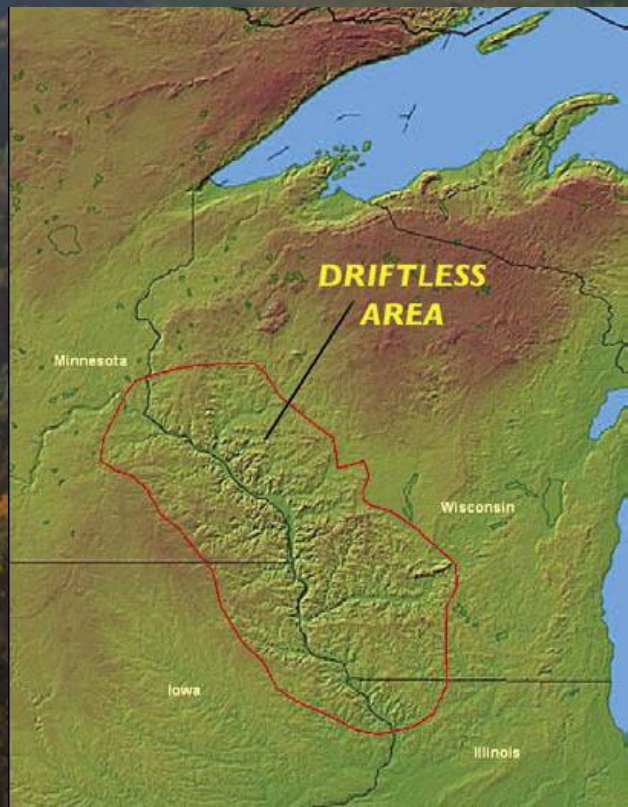
Jeff Hastings

Trout Unlimited

Project Manager

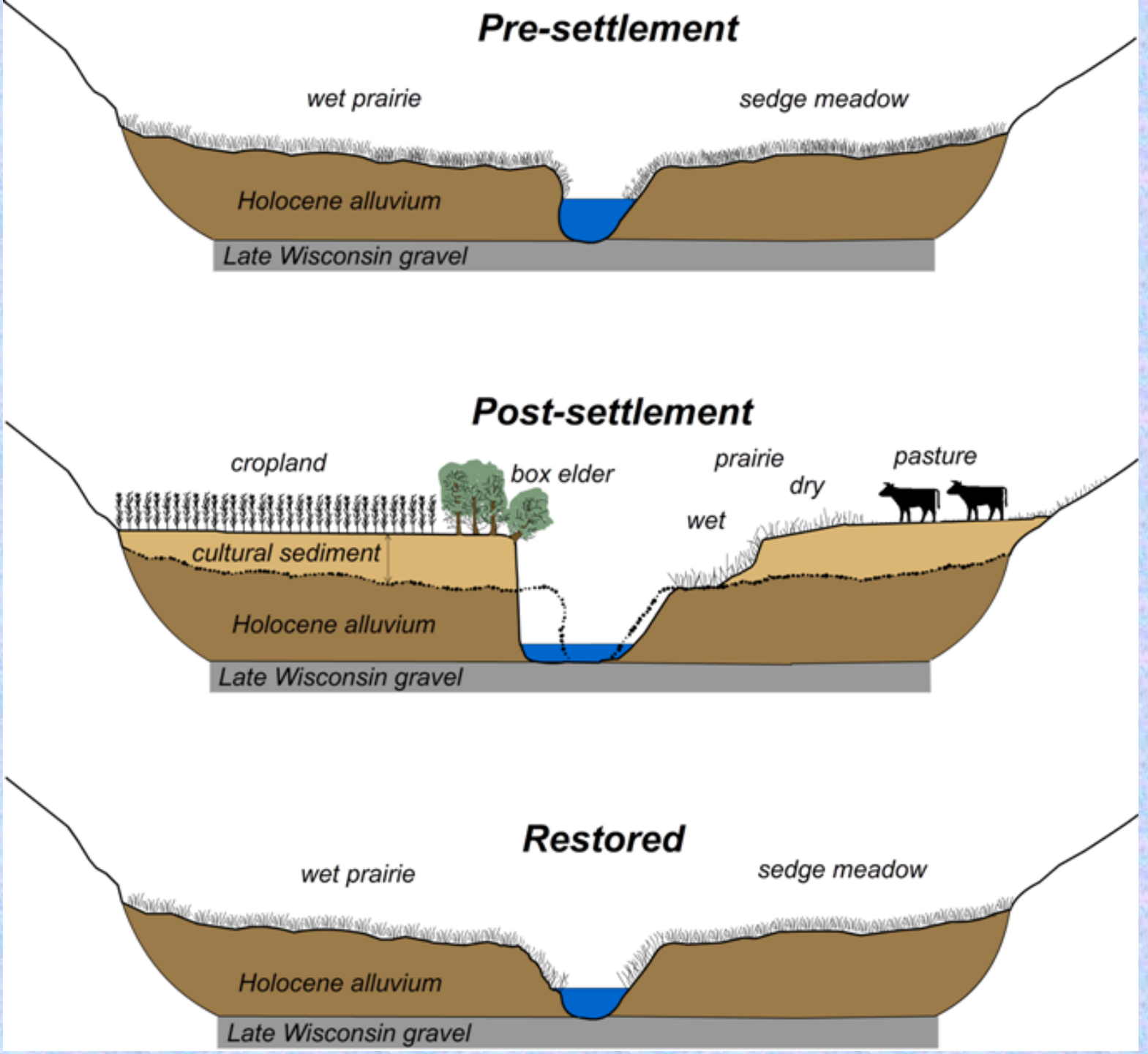
Driftless Area Restoration Effort


DRIFTLESS
AREA
Minnesota
Wisconsin
Iowa
Illinois

A Story of Degradation…


Wis-717


85%


Pre-settlement
wet prairie
sedge meadow
Holocene alluvium
Late Wisconsin gravel
Post-settlement
cropland
box elder
prairie
dry
wet
pasture
cultural sediment
Holocene alluvium
Late Wisconsin gravel
Restored
wet prairie
sedge meadow
Holocene alluvium
Late Wisconsin gravel

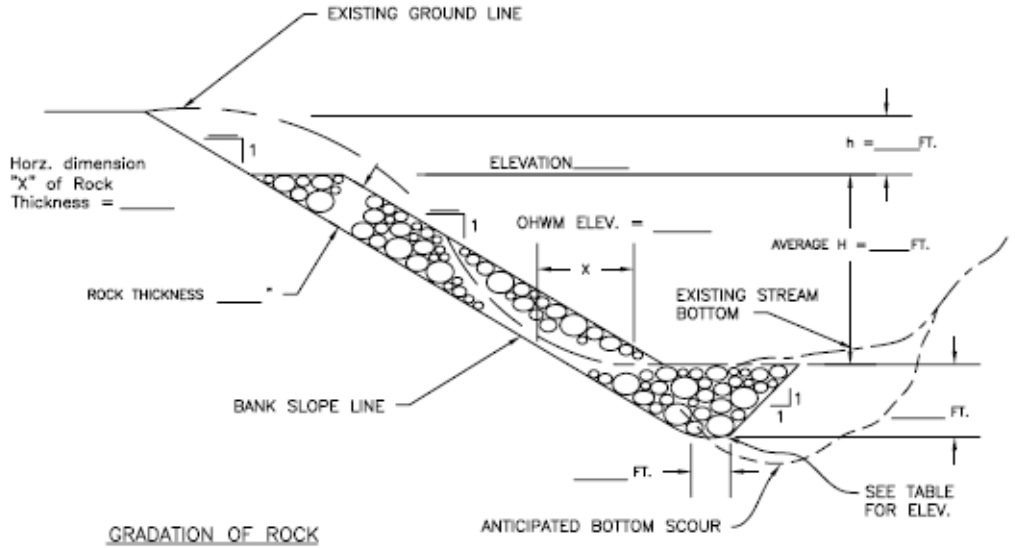

08/24/2010


MC266


Long term
maintenance


Easements
Macroinvertebrate


900 cu.yds.



TYPICAL CROSS SECTION

GRADATION OF ROCK

PERCENT PASSING BY WEIGHT	SIZE (INCHES)
100	
60–85	
25–50	
5–20	
0–5	

STATION	ELEVATION

QUANTITY ESTIMATE*

BANK SLOPING FOR RIPRAP	_____	LIN. FT.
BANK SLOPING (SEEDING ONLY)	_____	LIN. FT.
ROCK FOR RIPRAP (WI CONST. SPEC. 9)	_____	CU. YD.
SEEDING	_____	ACRES

* ESTIMATED TO THE NEAT LINES AND GRADE

NOTE:

1. DOUBLE THE ROCK THICKNESS FOR A DISTANCE OF _____ FEET AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE RIPRAP. BLEND THE ROCK SURFACE TO MATCH THE EXISTING STABLE BANK SURFACE.
2. THE BED OF THE STREAM IS ALLOWED TO SCOUR. THE LAUNCHABLE TOE WILL FALL INTO THE SCOUR HOLE AND PROTECT THE BANK. ROCK SURFACE TO MATCH THE EXISTING STABLE BANK SURFACE.

LAUNCHABLE TOE

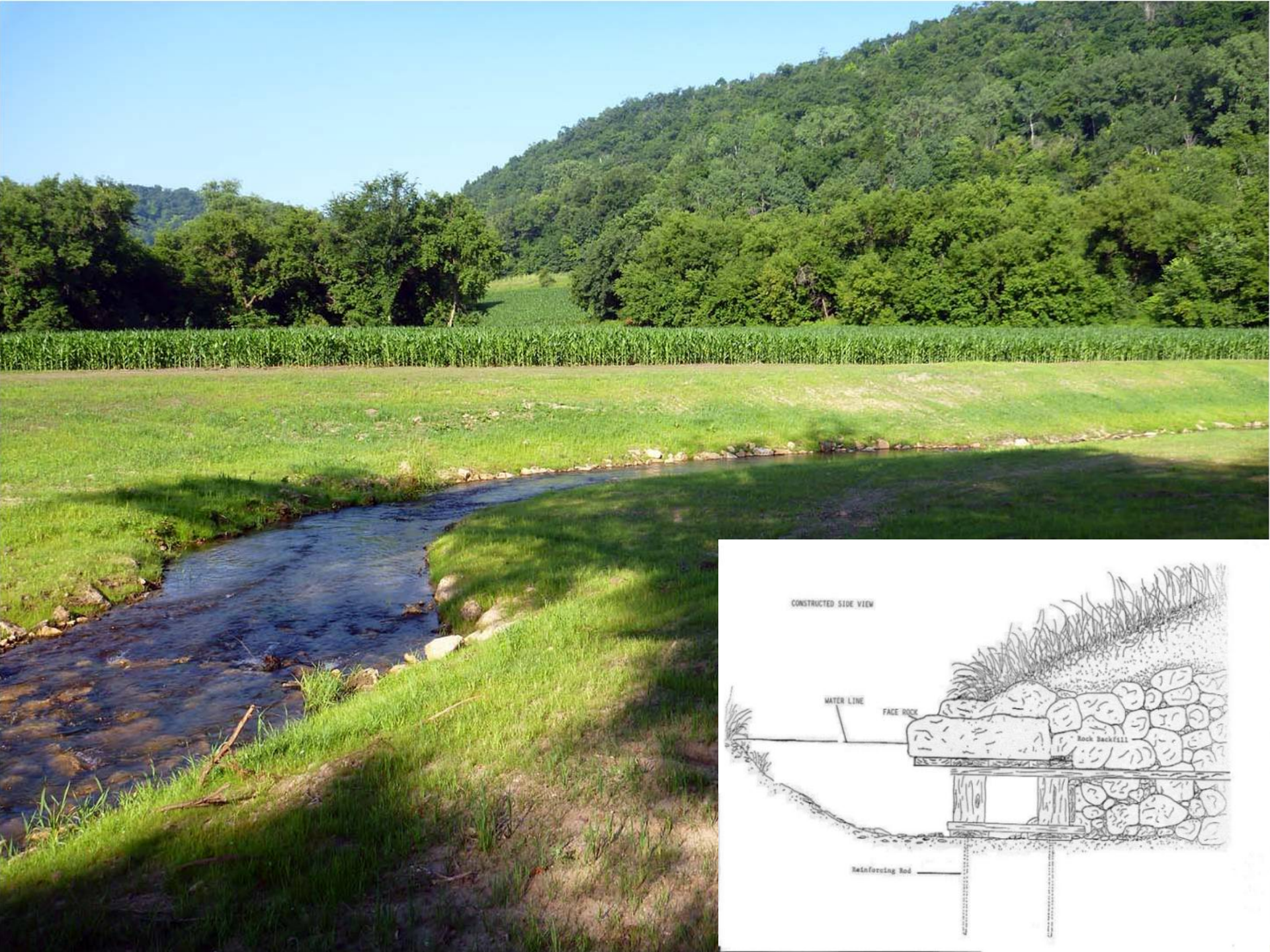
SITE _____

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

STREAMBANK PROTECTION
NO FILTER OR GEOTEXTILE
(PARTIAL BANK HEIGHT)

CLIENT: _____
COUNTY: _____

	Date	File Name
Designed		WI–404E–LT
Drawn		Date 6/07
Checked		
Approved		Sheet of


CONSTRUCTED SIDE VIEW
WATER LINE
FACE ROCK
Rock Backfill
Reinforcing Rod

Over 600 coldwater streams.

Greater than 4,000+ miles.


TOTAL ECONOMIC CONTRIBUTION:
$646,819,673 Direct Effect + $464,691,659 Indirect/Induced Effects
= $1,111,511,332


Saw a fair-sized trout here today—

Promising Restoration Results

Typical Winona County Brown Trout
May 2006
26” long, 8 lbs.

L Little

U Underwater

N Neighborhood

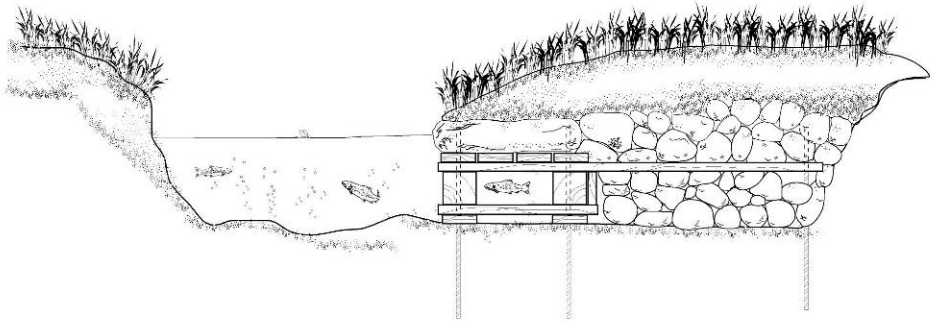
K Keepers

E Encompassing

R Rheotactic

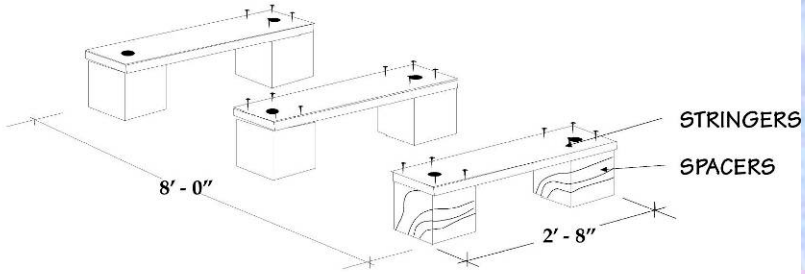
S Salmonids

LUNKER
ASSEMBLY INSTRUCTIONS



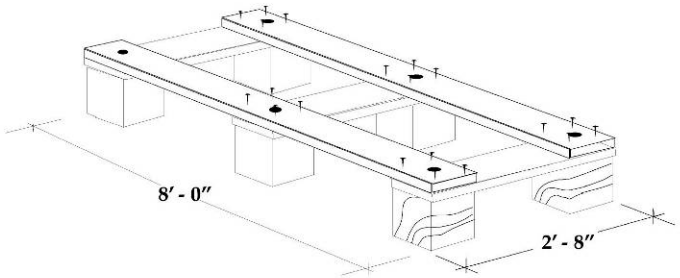
STEP 1

CUT SIX SPACERS, 8"X 8"X 8" AND PLACE THEM ON THE GROUND IN PAIRS WITH THE OUTSIDE EDGES 2' -8" APART AS ILLUSTSRATED BELOW. NAIL A 2"X 8" X 2'-8" OAK STRINGER BOARDS TO THE TOP OF THE SPACERS, MAKING SURE NOT TO PUT THE NAILS IN THE CENTER OF THE SPACERS BECAUSE THAT WILL BE DRILLED LATER TO ACCOMODATE A 3/4" RE-ROD.



STEP 2

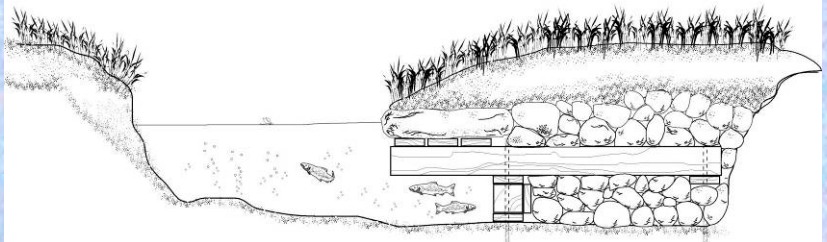
PLACE 2 - 2" X 8" X 8' LONG BOARDS ACCROSS THE 2' -8" STRINGERS AND NAIL IN PLACE TO TIE THE PAIRS TOGETHER,

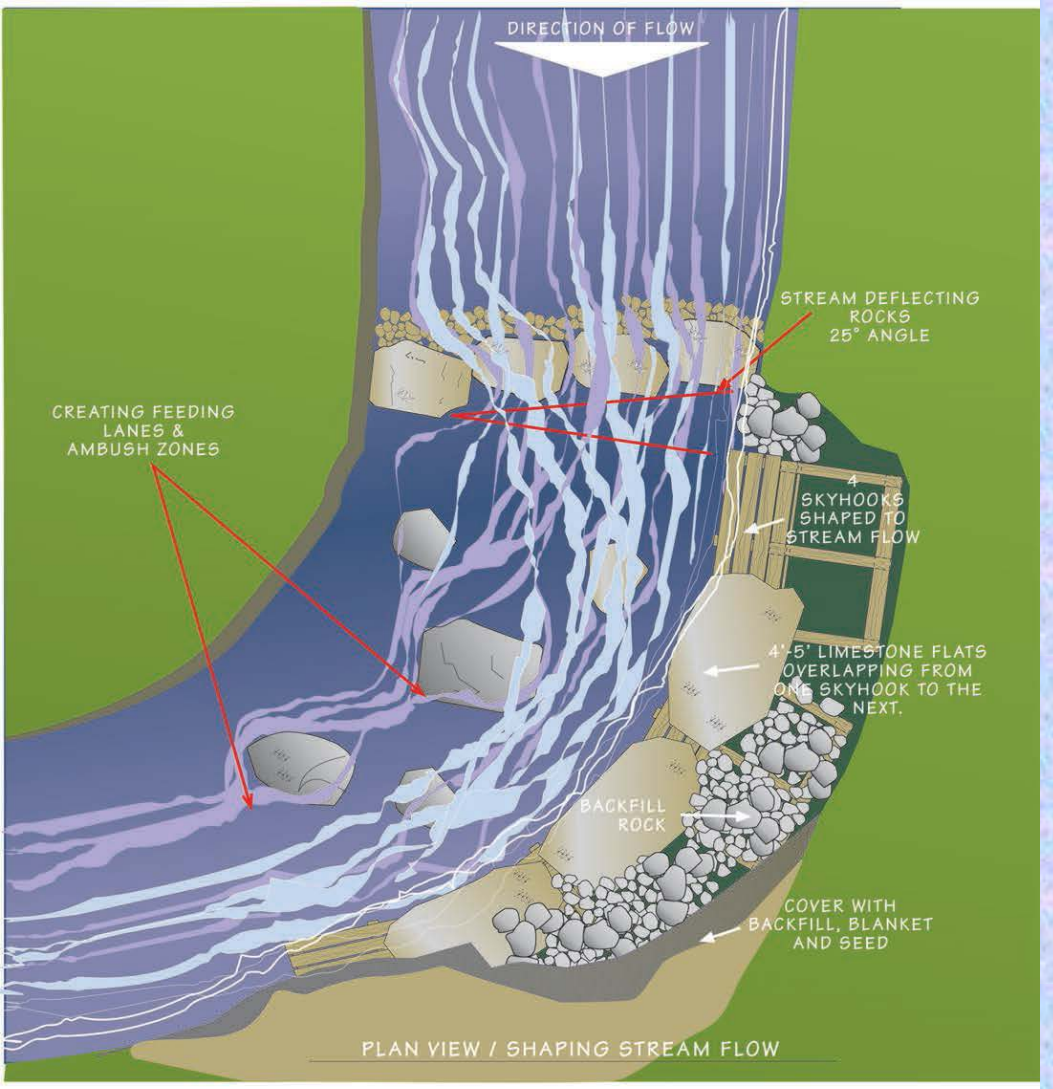


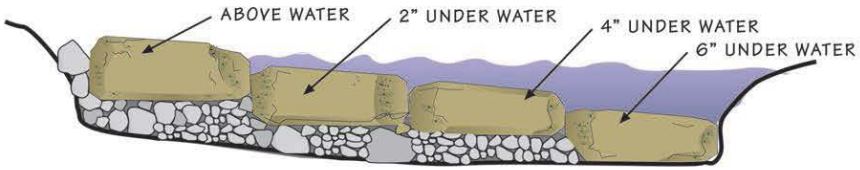

GENERAC 6500XL
04/28/2007


04/28/2007

MINNESOTA SKYHOOK
ASSEMBLY INSTRUCTIONS







STREAM LEVEL / FOR STREAM DEFLECTION

ILLUSTRATED BY: TOM LANE

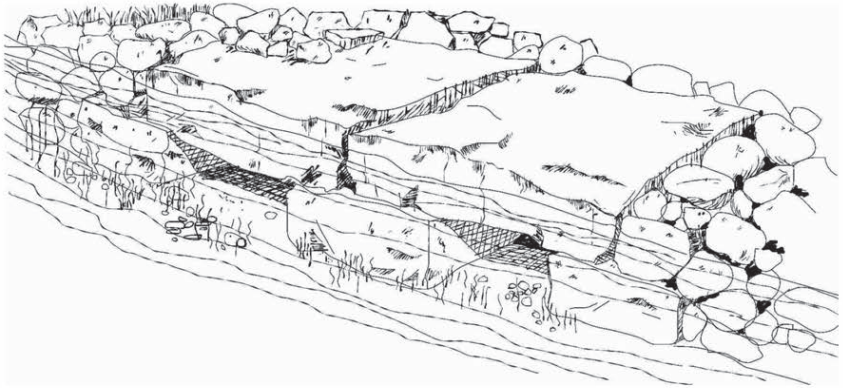

CAT


CAT

BARNIE RUBBLE

TROUT HABITAT STRUCTURE

ORIGINAL DESIGN BY TOM DORNACK

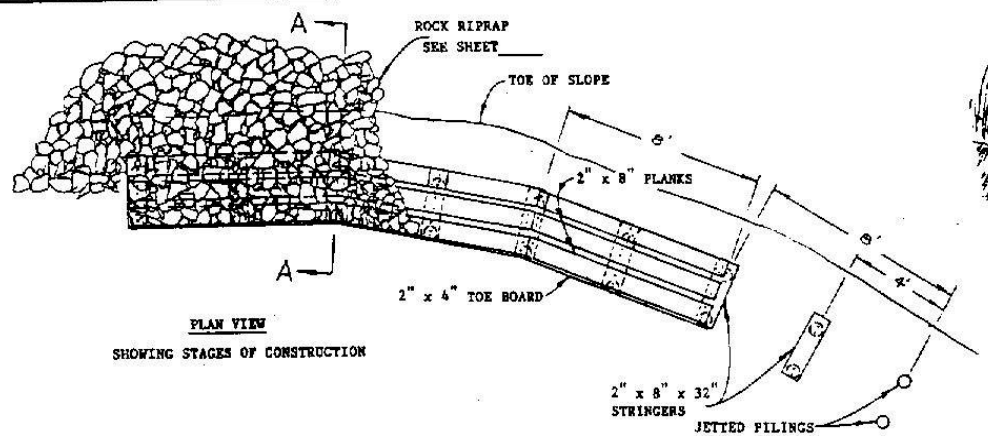


MATERIAL LIST

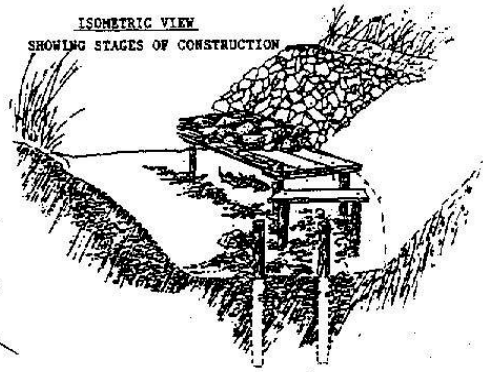
A BUNCH OF LIMESTONE
ROCKS AND A SKILLED
BACKHOE OPERATOR

ORIGINAL DESIGN BY TOM DORNACK
ILLUSTRATED BY: TOM LANE - JULY '09
FOR USE BY: TROUT UNLIMITED & DNR

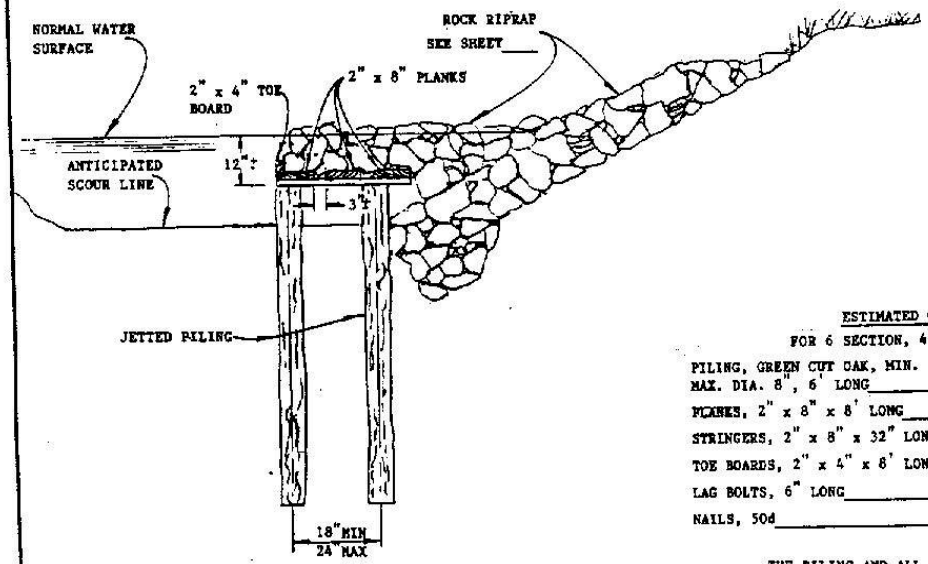
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



PLAN VIEW
SHOWING STAGES OF CONSTRUCTION



ISOMETRIC VIEW
SHOWING STAGES OF CONSTRUCTION



SECTION A-A

CONSTRUCTION PROCEDURE:

1. JET PILING IN PLACE TO REQUIRED LINE, GRADE AND ELEVATION
2. NAIL 2" x 8" x 32" STRINGERS TO TOP OF PILING
3. NAIL 2" x 8" x 8' PLANKS ON TOP OF STRINGERS
4. PLACE ROCK RIPRAP, SEE SHEET____FOR GRADATION, LINE, GRADE AND ELEVATIONS.
   THE ROCK RIPRAP IS PLACED ON THE STRUCTURE AT THE SAME TIME THE STREAMBANK STABILIZATION OCCURS.

ESTIMATED QUANTITIES
FOR 6 SECTION, 48' LONG STRUCTURE

PILING, GREEN CUT OAK, MIN. DIA. 6", MAX. DIA. 8", 6' LONG	26 EACH
PLANKS, 2" x 8" x 8' LONG	18 EACH
STRINGERS, 2" x 8" x 32" LONG	13 EACH
TOE BOARDS, 2" x 4" x 8' LONG	6 EACH
LAG BOLTS, 6" LONG	18 EACH
NAILS, 50d	10 LBS.

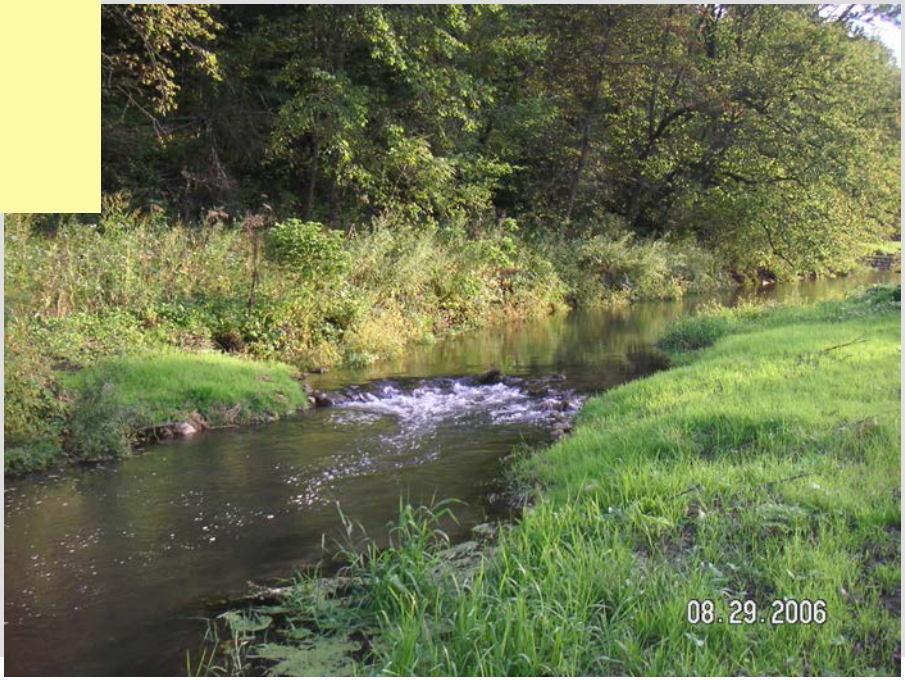
THE PILING AND ALL LUMBER EXCEPT THE 2" x 4" TOE BOARDS ARE TO BE GREEN ROUGH SAWED OAK

JETTED PILING & PLANK FISH STRUCTURE

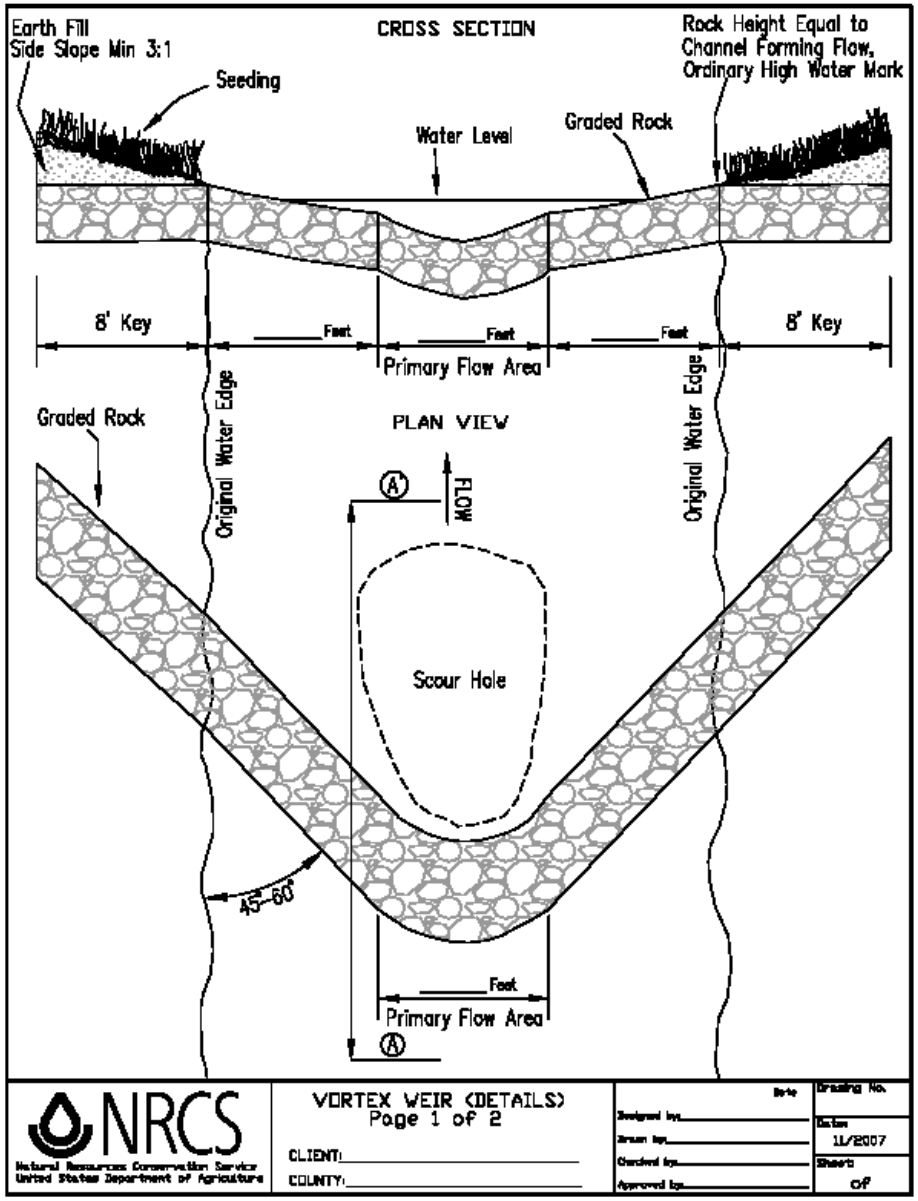
OWNER
TREMPEALEAU COUNTY L.C.D., WISCONSIN

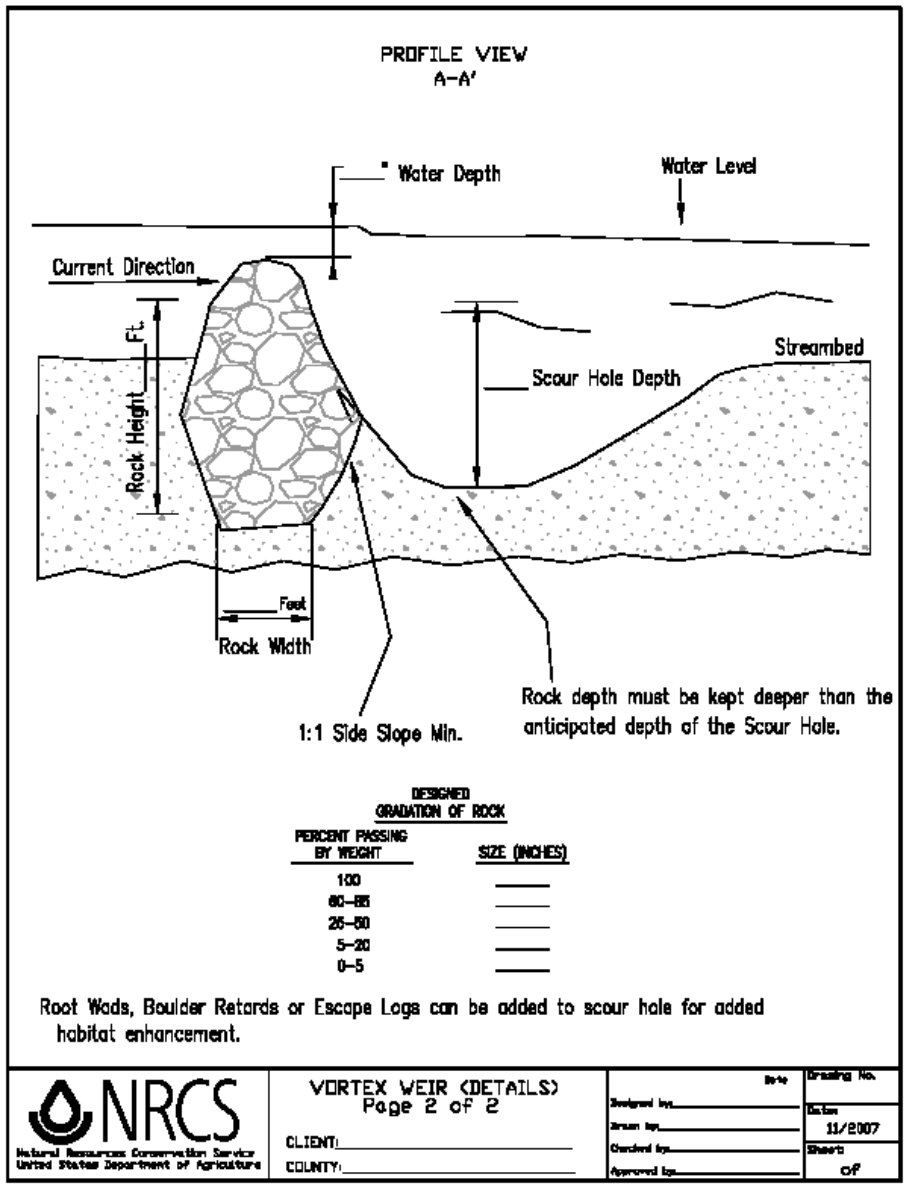
Drawn _____ Date _____ Checked _____
SHEET ____ OF ____ DRAWING NO. _____

Vortex Weirs



Vortex Weir


Earth Fill
Side Slope Min 3:1
CROSS SECTION
Rock Height Equal to
Channel Forming Flow,
Ordinary High Water Mark
Seeding
Water Level
Graded Rock
8' Key
Feet
Feet
Feet
8' Key
Primary Flow Area
Graded Rock
Original Water Edge
PLAN VIEW
Original Water Edge
A
FLOW
Scour Hole
45°-60°
Feet
Primary Flow Area
A
NRCS
Natural Resources Conservation Service
United States Department of Agriculture
VORTEX WEIR (DETAILS)
Page 1 of 2
CLIENT:
COUNTY:
Date
Drawing No.
Designed by
Drawn by
Checked by
Approved by
11/2007
Sheet
of


PROFILE VIEW
A-A'
Water Depth
Water Level
Current Direction
Ft.
Rock Height
Streambed
Scour Hole Depth
Feet
Rock Width
1:1 Side Slope Min.
Rock depth must be kept deeper than the anticipated depth of the Scour Hole.
DESIGNED
GRADATION OF ROCK
PERCENT PASSING BY WEIGHT
SIZE (INCHES)
100
60-85
25-50
5-20
0-5
Root Wads, Boulder Retards or Escape Logs can be added to scour hole for added habitat enhancement.
NRCS
Natural Resources Conservation Service
United States Department of Agriculture
VORTEX WEIR (DETAILS)
Page 2 of 2
CLIENT:
COUNTY:
Date
Drawing No.
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Drawn by
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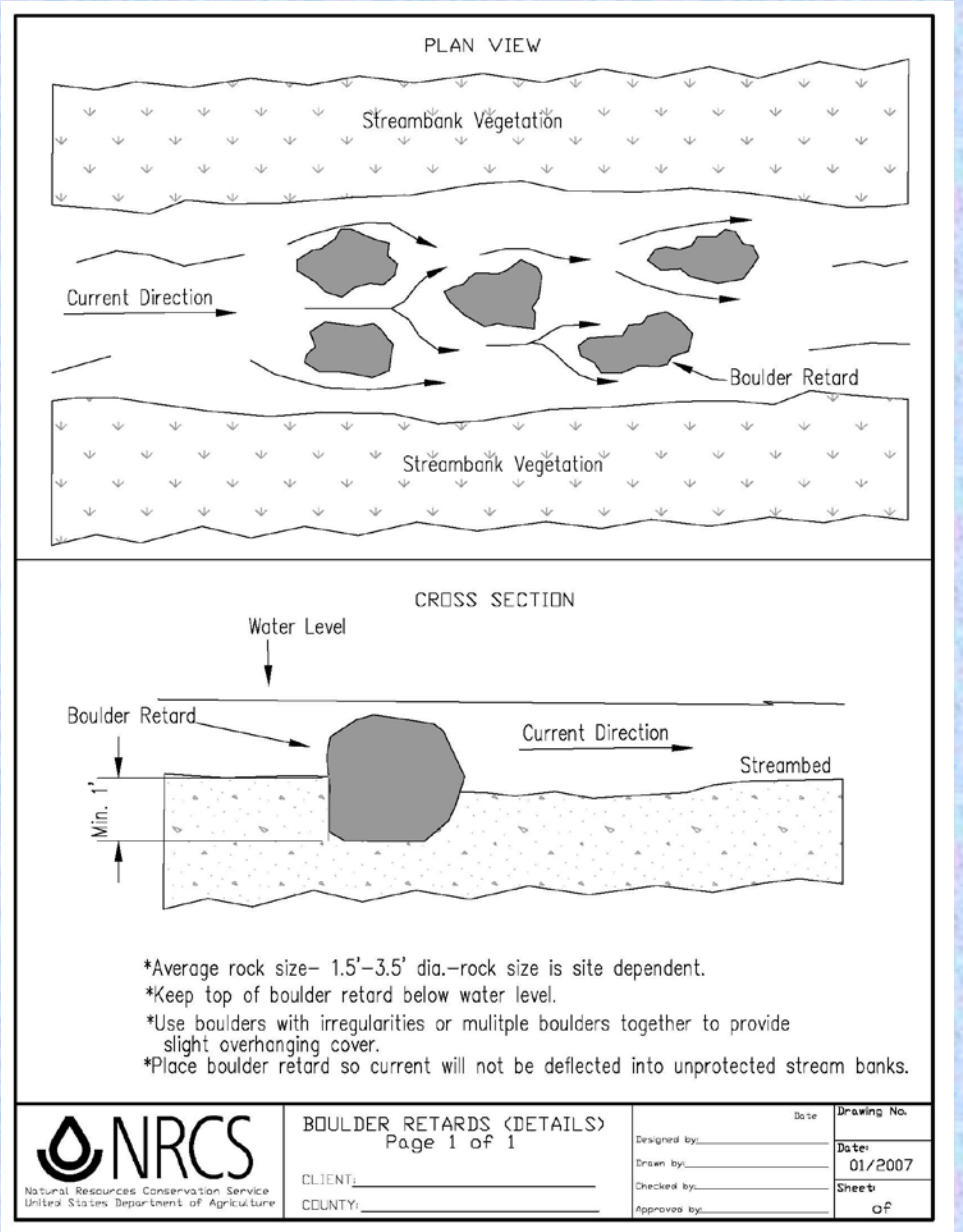
Approved by
11/2007
Sheet
of


08.29.2006

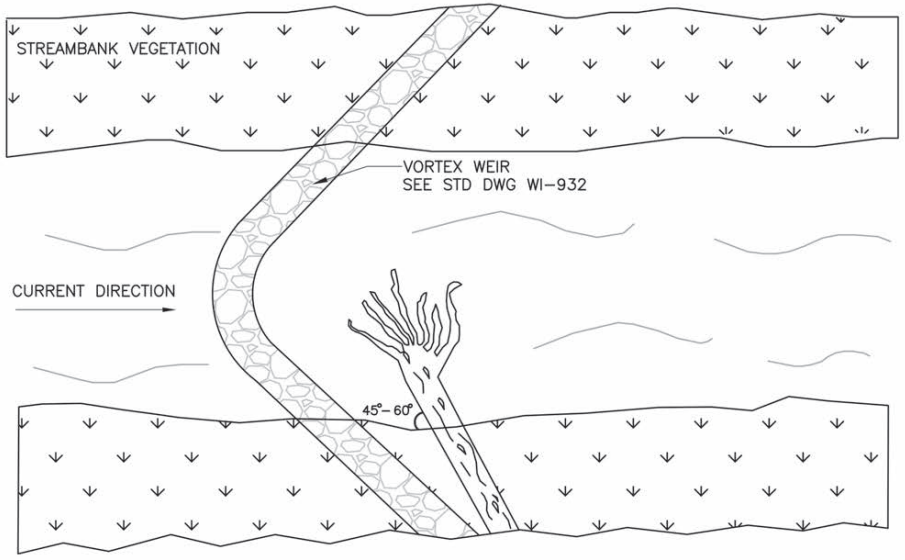
Vortex Weir

Cover Rock

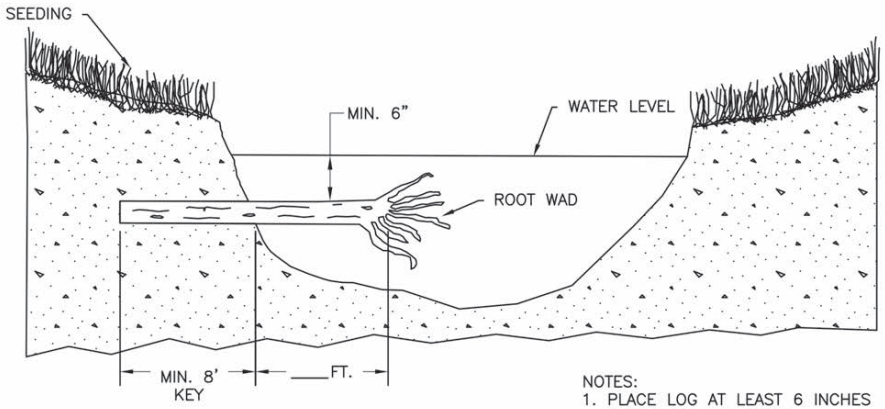
Cover Rock


PLAN VIEW
Streambank Vegetation
Current Direction
Boulder Retard
Streambank Vegetation
CROSS SECTION
Water Level
Boulder Retard
Current Direction
Streambed
Min. 1'
*Average rock size- 1.5'-3.5' dia.-rock size is site dependent.
*Keep top of boulder retard below water level.
*Use boulders with irregularities or mulitple boulders together to provide slight overhanging cover.
*Place boulder retard so current will not be deflected into unprotected stream banks.
NRCS
Natural Resources Conservation Service
United States Department of Agriculture
BOULDER RETARDS (DETAILS)
Page 1 of 1
CLIENT:
COUNTY:
Date
Designed by:
Drawn by:
Checked by:
Approved by:
Drawing No.
Date: 01/2007
Sheet: of


06/05/2006



PLAN



CROSS SECTION

NOTES:
1. PLACE LOG AT LEAST 6 INCHES BELOW THE WATERLINE.
2. PLACE LOG AT A 45–60 DEGREE ANGLE UPSTREAM FROM BANK.
3. REFERENCE WI STD DWG 932 FOR DETAILS ON VORTEX WEIR CONSTRUCTION.

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

ROOT WAD

CLIENT: _____

COUNTY: _____

	Date
Designed	
Drawn	
Checked	
Approved	

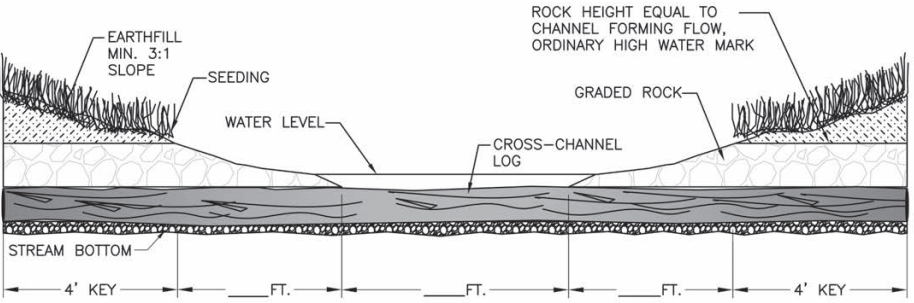
Drawing Name: WI–936

Date: 7/10

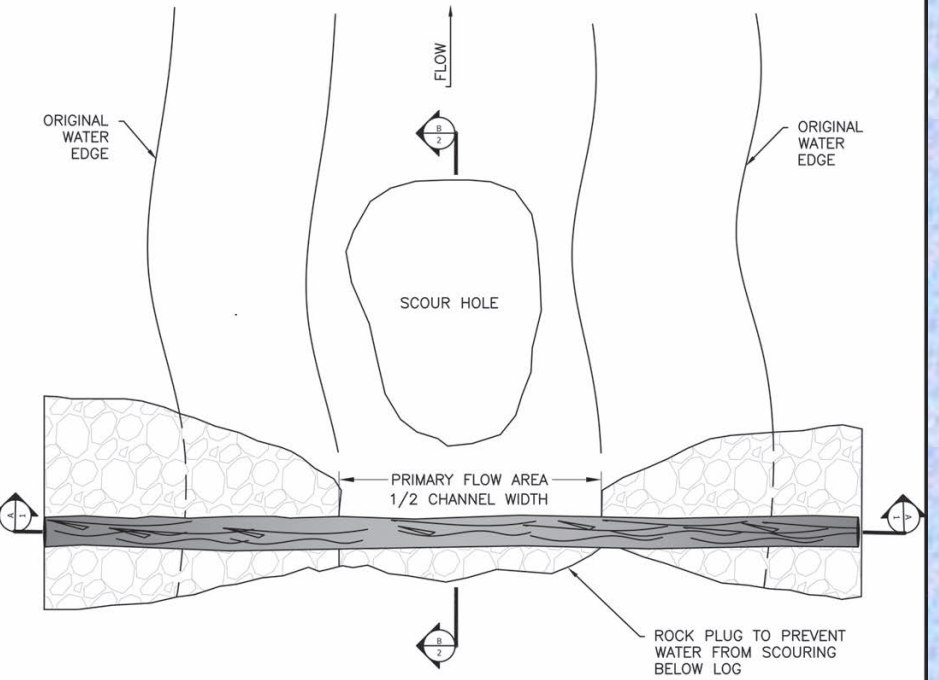
Sheet of


08.29.2006


06/05/2006



CROSS SECTION A–A



PLAN VIEW

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

CROSS CHANNEL LOG

CLIENT: _____

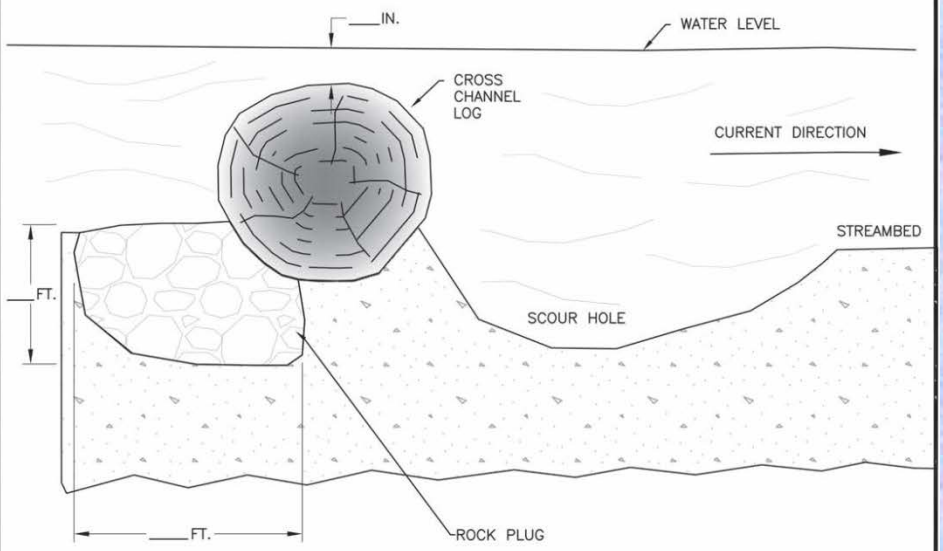
COUNTY: _____

	Date
Designed	
Drawn	
Checked	
Approved	

DWG Name/Date
WI-935/12-11

Page
1 of 2

Sheet of



CROSS–SECTION B–B

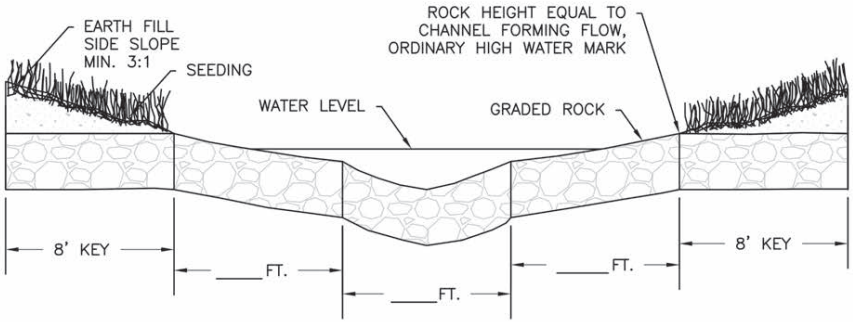
NOTE: ROOT WADS, BOULDER RETARDS OR ESCAPE LOGS CAN BE ADDED TO SCOUR HOLE FOR ADDED HABITAT ENHANCEMENT

ROCK GRADATION	
PERCENT PASSING BY WEIGHT	SIZE IN INCHES
100	
60–85	
25–50	
5–20	
0–5	

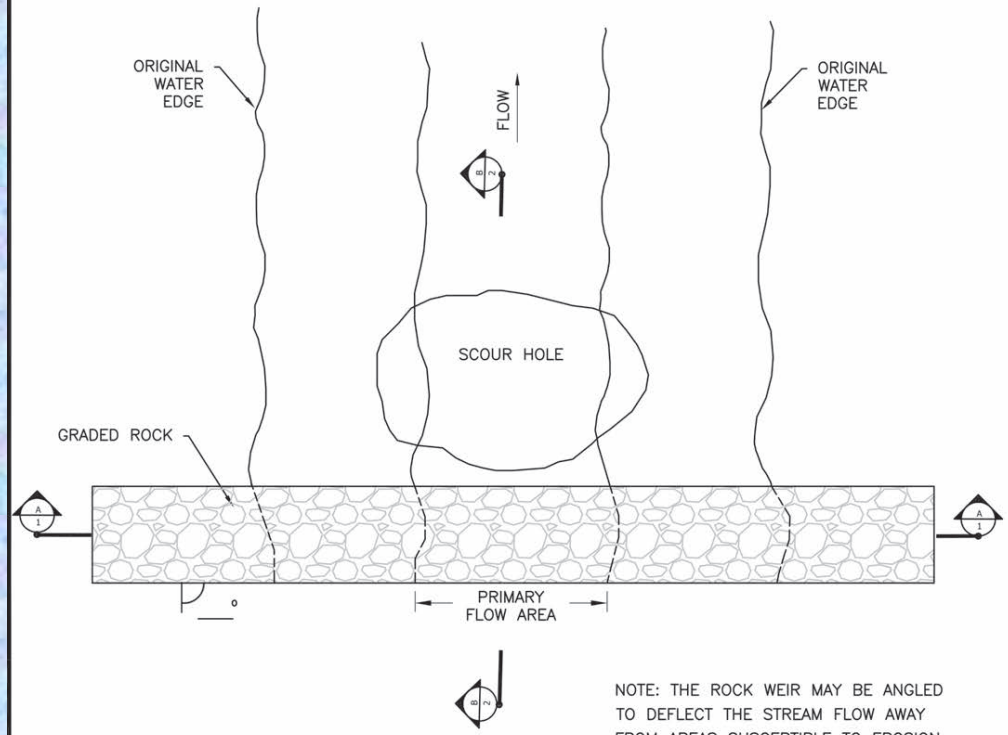
QUANTITIES	
ROCK RIPRAP FOR ROCK PLUG (W.C.S.* 9)	CU. YD.

*W.C.S. = WIS. CONSTRUCTION SPECIFICATION
*ESTIMATED TO THE NEAT LINES AND GRADE

WI–935

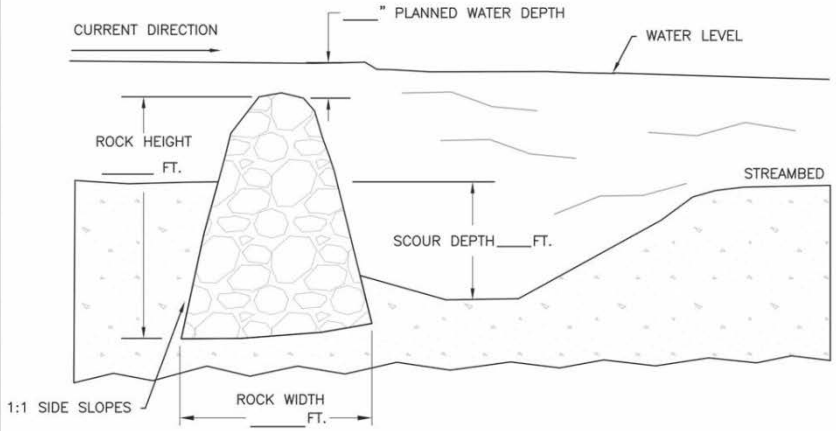


CROSS SECTION A–A



NOTE: THE ROCK WEIR MAY BE ANGLED TO DEFLECT THE STREAM FLOW AWAY FROM AREAS SUSCEPTIBLE TO EROSION.

PLAN VIEW



CROSS–SECTION B–B

NOTES:
1. ROCK DEPTH BELOW STREAMBED MUST BE GREATER THAN THE ANTICIPATED DEPTH OF HE SCOUR HOLE.

2. ROOT WADS, BOULDER RETARDS, ESCAPE LOGS, ETC. CAN BE ADDED TO SCOUR HOLE FOR HABITAT ENHANCEMENT.

ROCK GRADATION	
PERCENT PASSING BY WEIGHT	SIZE IN INCHES
100	
60–85	
25–50	
5–20	
0–5	

QUANTITIES	
ROCK RIPRAP FOR ROCK WEIR (W.C.S.* 9)	CU. YD.

*W.C.S. = WIS. CONSTRUCTION SPECIFICATION
*ESTIMATED TO THE NEAT LINES AND GRADE

WI–935A

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

CROSS CHANNEL ROCK WEIR

CLIENT: _____

COUNTY: _____

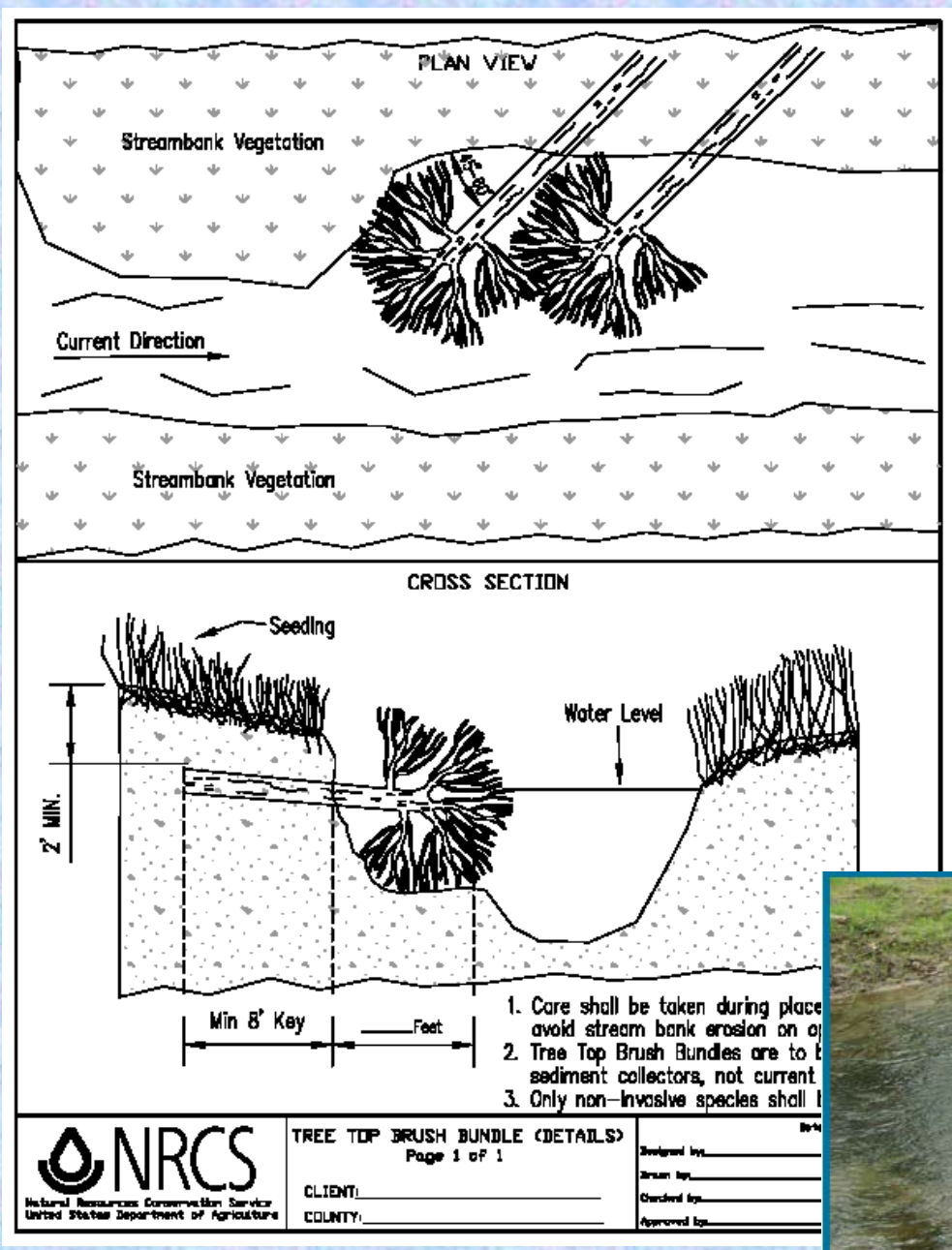
	Date
Designed	
Drawn	
Checked	
Approved	

DWG Name/Date
WI–935A/12–11

Page
1 of 2

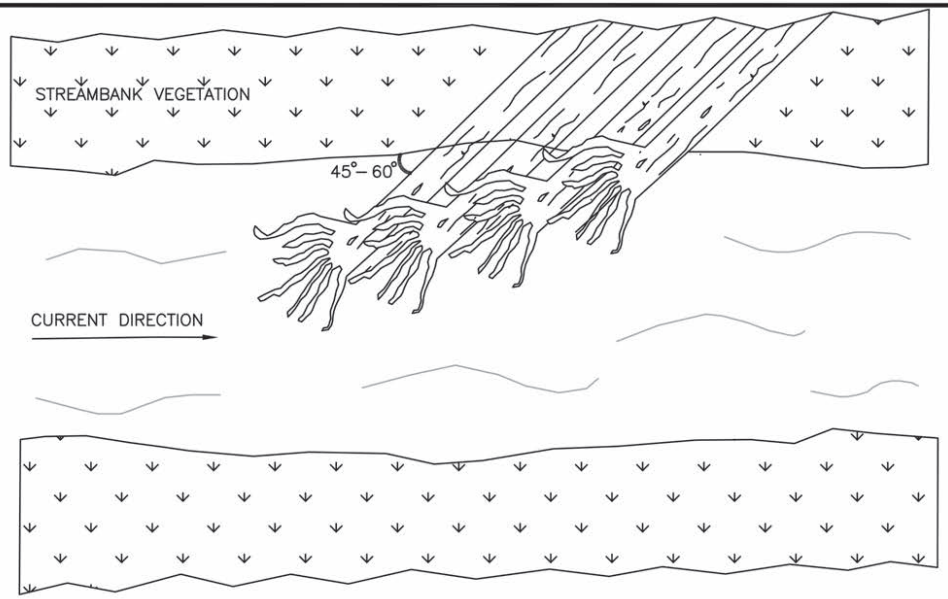
Sheet of

Tree Top Brush Bundle Design Drawing

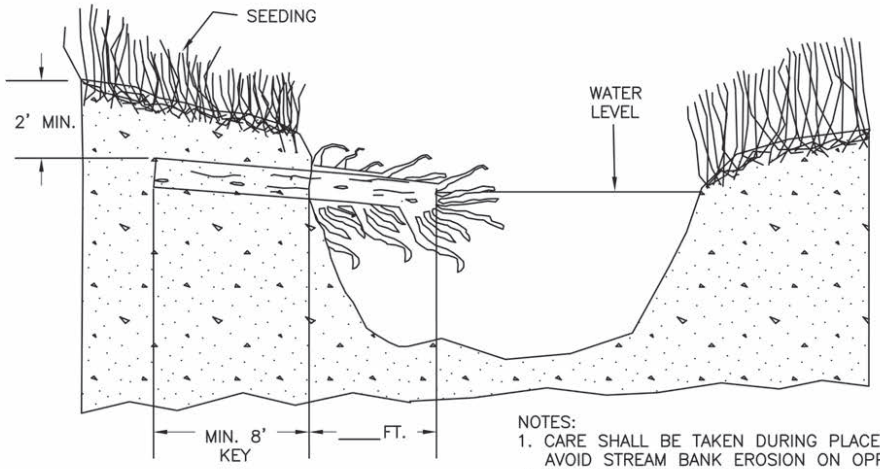


© Jeff Hastings

Brush anchored with rocks are stable and provide valuable habitat, Hay Creek, MN



PLAN



CROSS SECTION

NOTES:
1. CARE SHALL BE TAKEN DURING PLACEMENT TO AVOID STREAM BANK EROSION ON OPPOSITE BANK.
2. ROOT WADS MUST BE PRESENT ON EACH LOG.
3. THE LOG DEFLECTOR SHALL CONSIST OF THREE LOGS AT A MIN 24" DBH OR FIVE LOGS OF APPROX. 16" DBH.
4. THE MAJORITY OF THE LOG SHALL BE SUBMERGED WITH APPROX. 15% OF THE LOG EMERGED. CARE SHALL BE TAKEN TO KEEP THE LOG BELOW THE OHWM.

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Natural Resources Conservation Service
United States Department of Agriculture

LOG DEFLECTOR

CLIENT: _____
COUNTY: _____

	Date	Drawing Name
Designed		WI–934
Drawn		Date
Checked		7/10
Approved		

Providing Habitat for the Wild and Rare in the Riparian Area

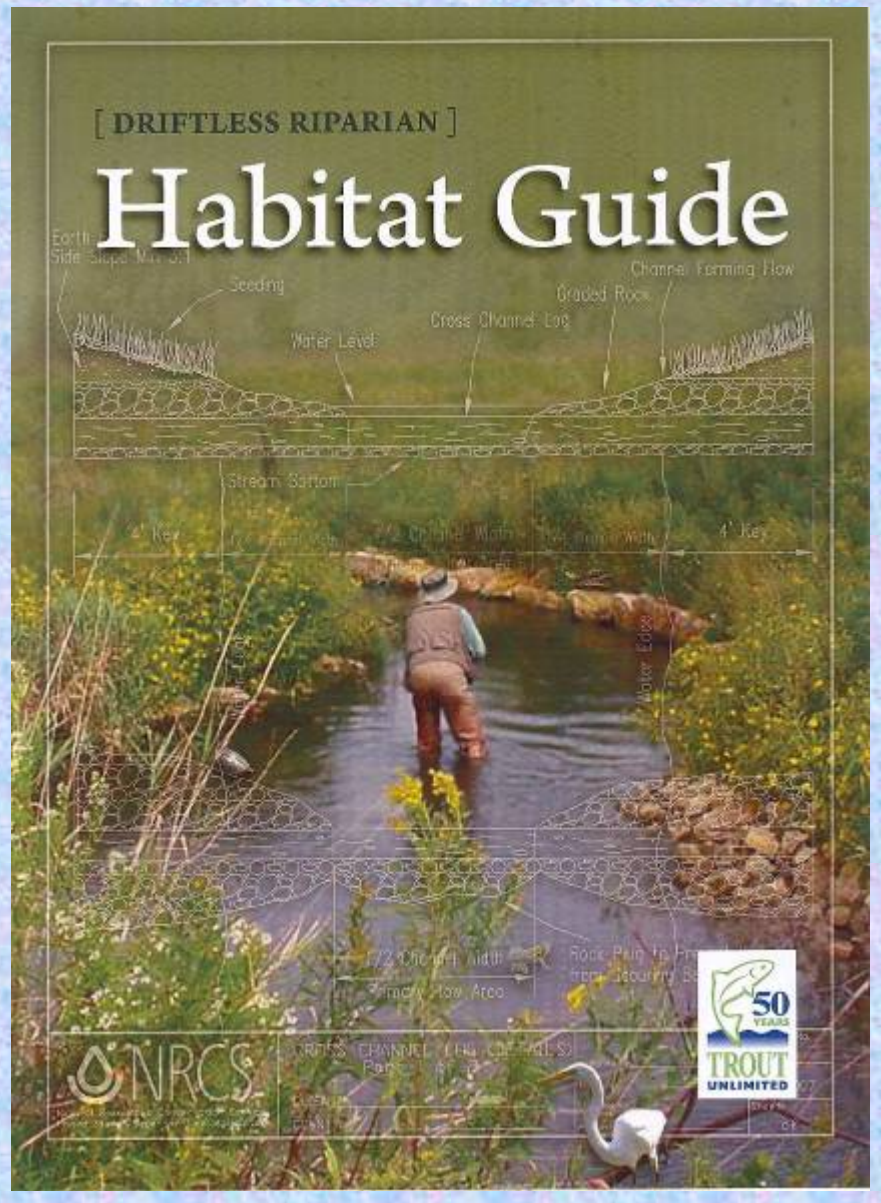
CRICKET FROG

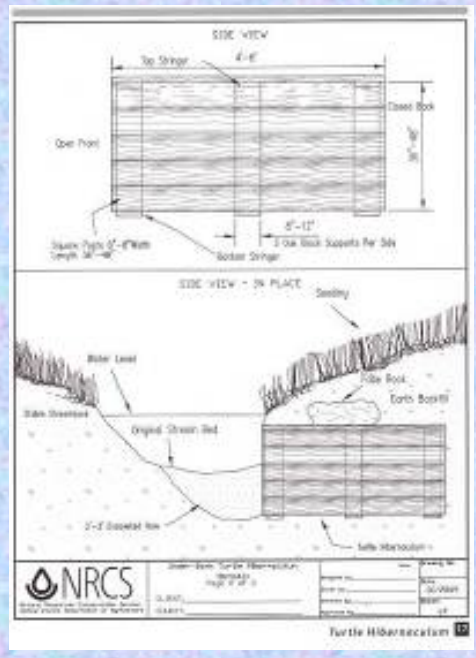

Temporary Habitat

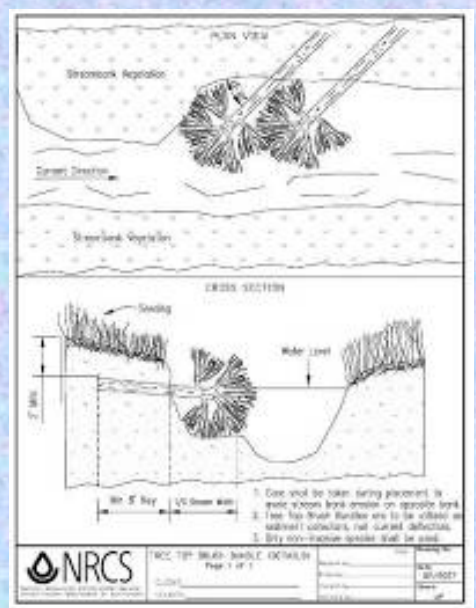
2nd Edition coming this spring

Turtle Hibernacula

Amphibian & Reptile Habitat

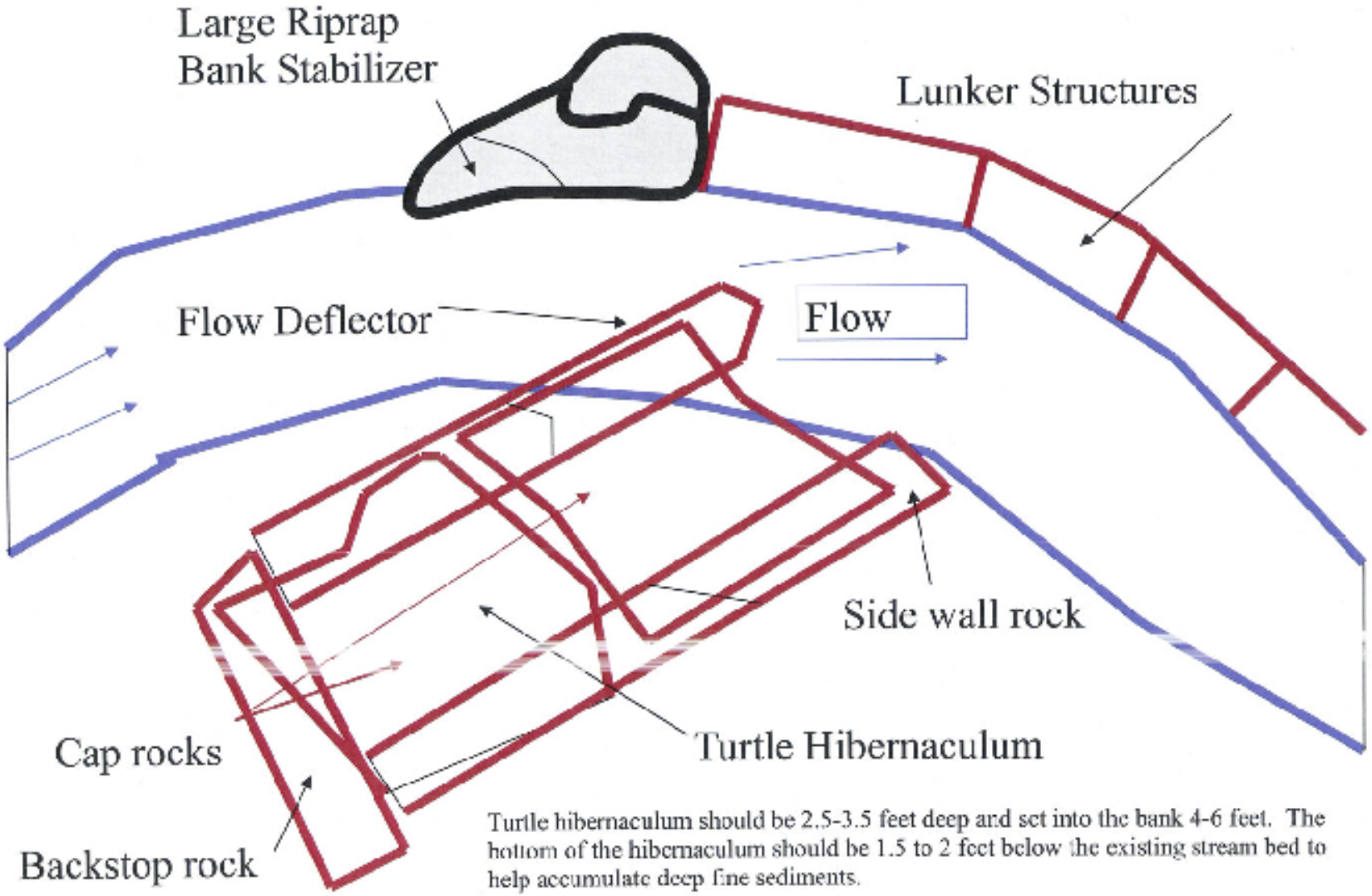






Wild & Rare Committee

Under-bank Turtle Hibernaculum– Top View



Turtle hibernaculum should be 2.5-3.5 feet deep and set into the bank 4-6 feet. The bottom of the hibernaculum should be 1.5 to 2 feet below the existing stream bed to help accumulate deep fine sediments.

TOP VIEW

4'-6'

Closed Bo

Open Front

36"-48"

8"-12"

Square Posts 6"-8"Width
Length 36"-48"

2" Oak Planks

FRONT VIEW

Top Stringer

36"-48"

Square Posts 6"-8"Width
Length 36"-48"

Bottom Stringer

36"-48"

Open Front

Structures are built using oak planks 2" thick by 8"-12" wide. Structures are nailed together with 20D ring shank nails.

NRCS

Natural Resources Conservation Service
United States Department of Agriculture

Under-Bank Turtle Hibernaculum

(Details)

Page 1 of 3

CLIENT:

COUNTY:

Date

Designed by

Drawn by

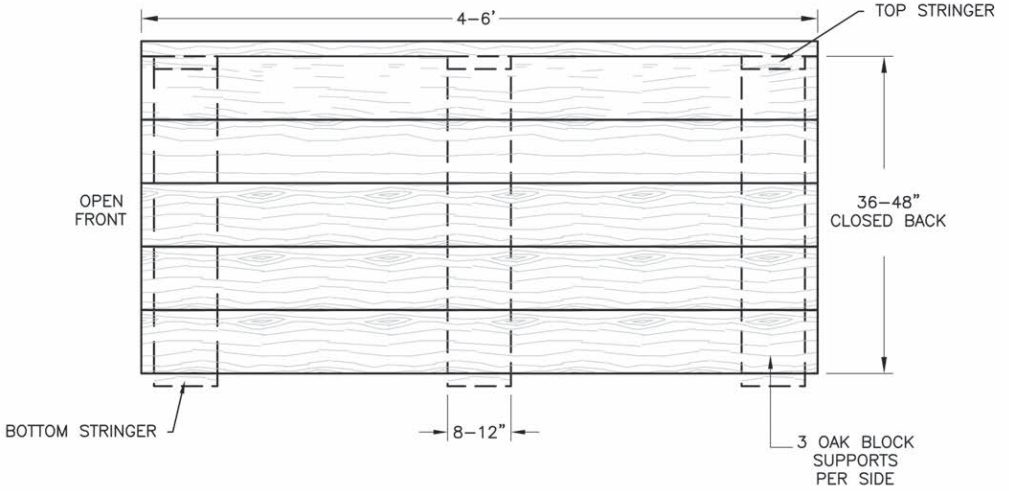
Checked by

Approved by

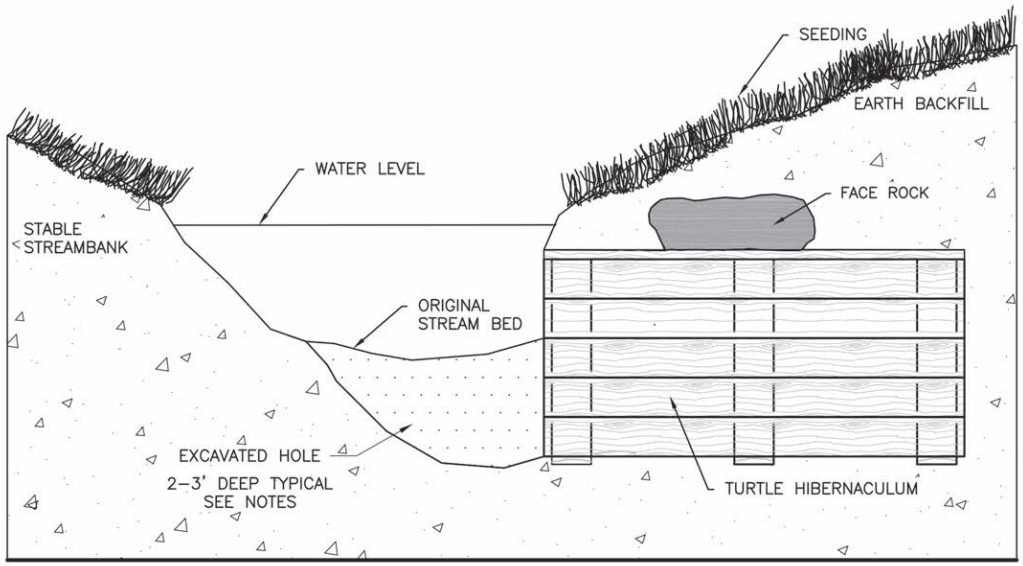
Drawing No.

Date 01/2009

Sheets of



SIDE VIEW

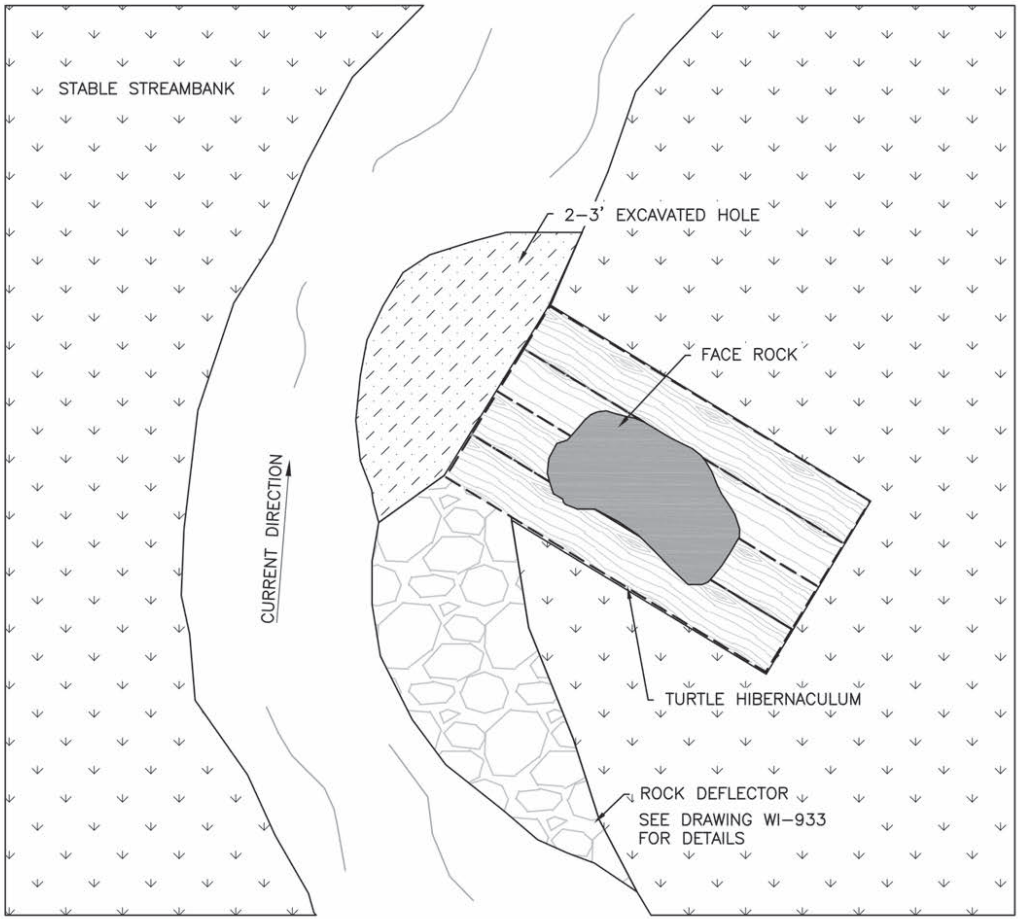


CONSTRUCTED SIDE VIEW

NOTES:
1. THE STRUCTURE MUST BE FULLY SUBMERGED TO PREVENT THE LUMBER FROM ROTTING. DEPTH OF EXCAVATED HOLE MAY BE INCREASED TO ENSURE FULL SUBMERSION.
2. THE BOTTOM OF THE HIBERNACULUM SHOULD BE A MINIMUM OF 2 FEET BELOW THE EXISTING STREAM BED TO HELP ACCUMULATE A DEPTH OF AT LEAST 2 FEET OF FINE SEDIMENTS WITHIN THE STRUCTURE.
3. A ROCK DEFLECTOR WILL BE INSTALLED TO FURTHER ENCOURAGE SEDIMENT ACCUMULATION. SEE PAGE 3 FOR DETAILS.
4. TURTLE HIBERNACULUM SHOULD SET INTO THE BANK 4–6 FEET.

WI–940

Blanding's turtle



PLAN VIEW

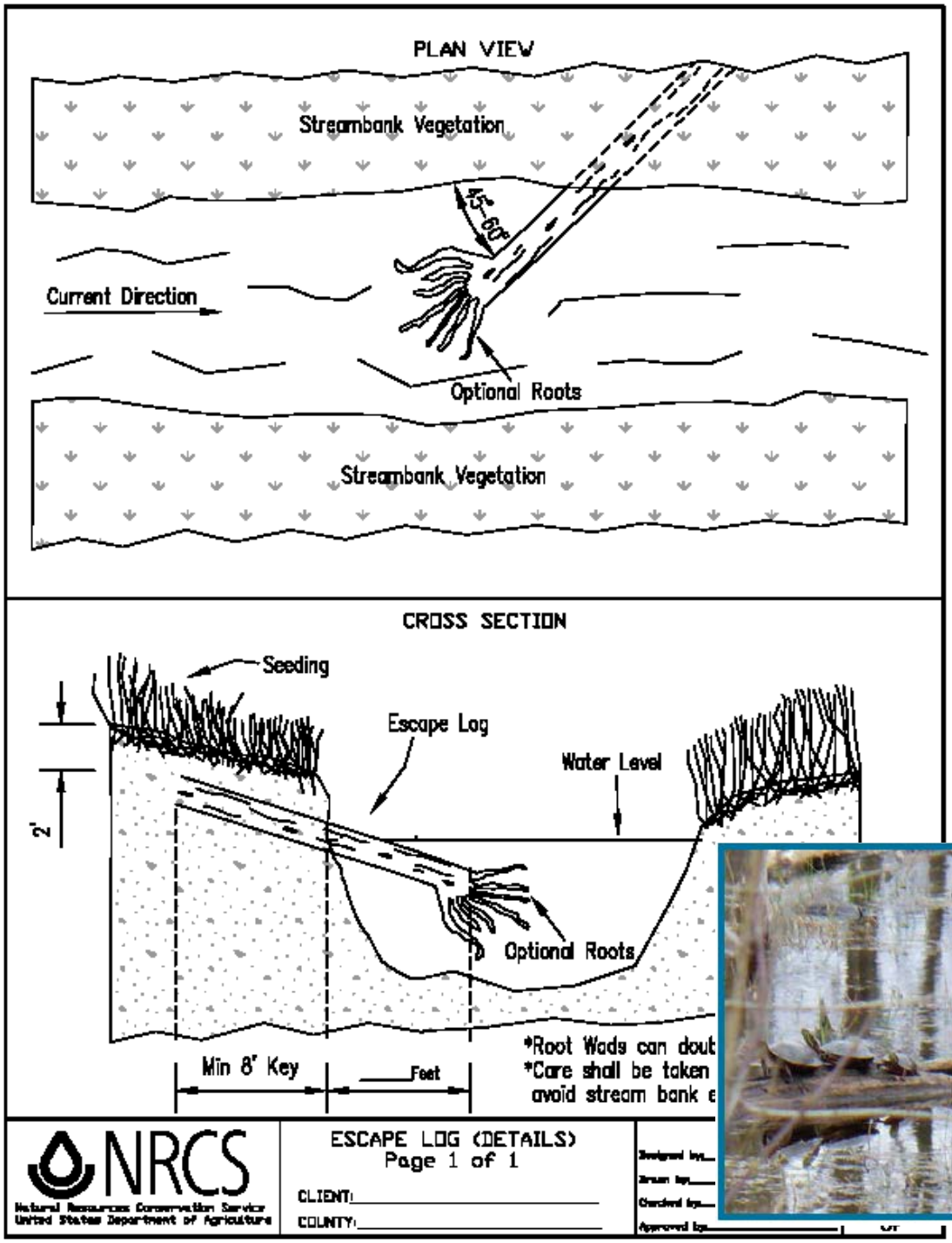
NOTE: THE HIBERNACULUM SHOULD BE PLACED DIRECTLY BEHIND A STRUCTURE WHICH DEFLECTS THE FLOW OF THE STREAM AND CREATES A BACK EDDY, CAUSING SEDIMENT ACCUMULATION. THIS BACK EDDY WILL BE ACCENTUATED BY THE EXCAVATED HOLE IN FRONT OF THE HIBERNACULUM. THE FILLING OF FINE SEDIMENT MAKES IT SUITABLE HABITAT FOR TURTLES TO BURROW INTO.

QUANTITIES	
2" OAK PLANK–8" WIDTH, 4–6' LENGTH (15–18/UNIT)	EACH
6–8" SQUARE POSTS, 36–48" LENGTH (6/UNIT)	EACH
2" OAK PLANK–8" WIDTH, 36–48" LENGTH (6/UNIT)	EACH
2" OAK PLANK–8" WIDTH, 36–48" LENGTH (5–6/UNIT)	EACH
20D RING SHANK NAILS	AS NEEDED

*ESTIMATED TO THE NEAT LINES AND GRADE

WI–940

Escape/Basking Log Design Drawing

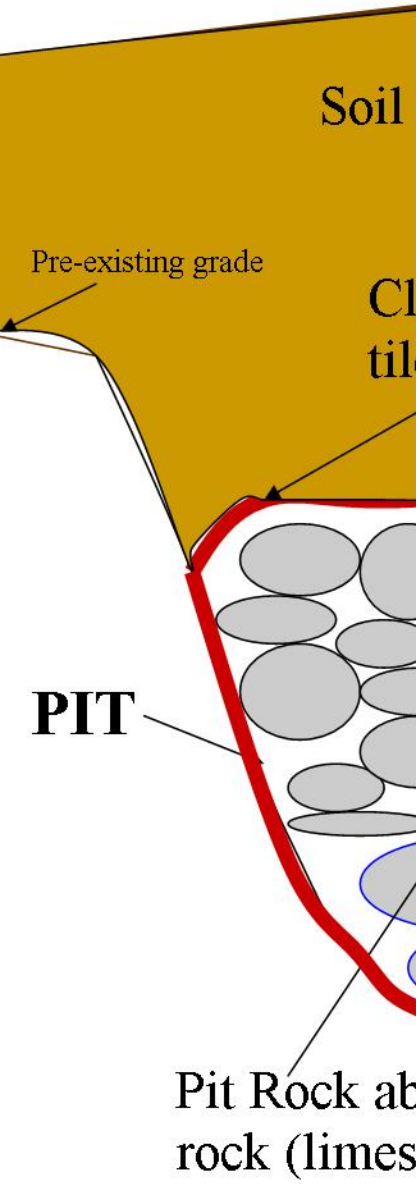


© Bob Hay

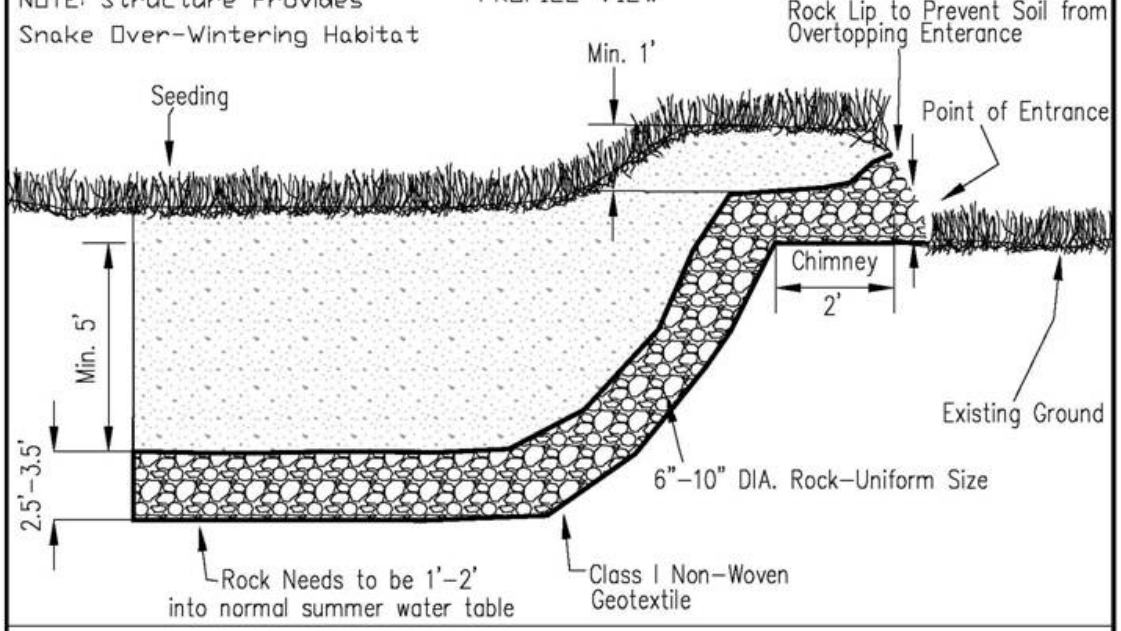

JUN 16 2005

- Dig down two feet below saturated soil level.
- Dig one and a half times wider than bucket.
- Fox, Garter & Milk Snakes

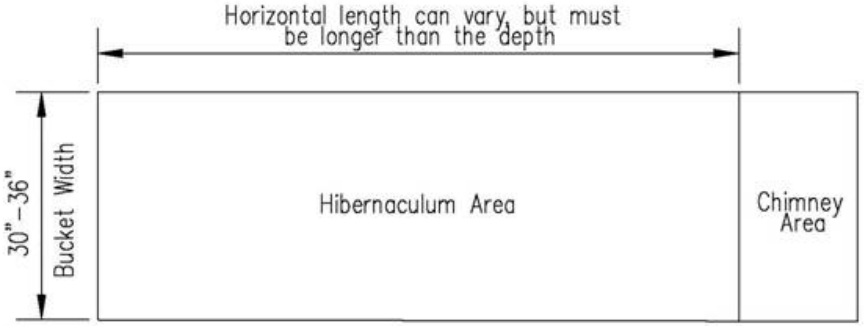
Common Gartersnake



Snake Over-Wintering Habitat



PLAN VIEW



1. Hibernaculum should be placed out of the primary floodplain with a southern or western exposure.
2. A minimum of five feet of earth fill shall cover the rock-this acts as a buffer to maintain a hibernaculum temperature of at least 51 degrees Fahrenheit.
3. A soil berm may be required to isolate the hibernaculum from the river bank, to be flagged. by technician in the field.

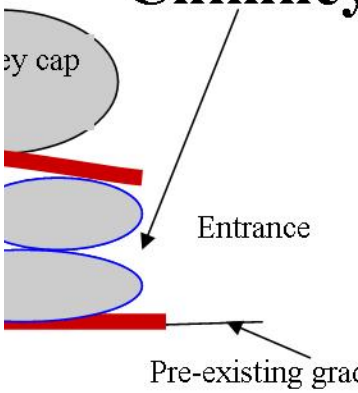
NRCS
Natural Resources Conservation Service
United States Department of Agriculture

SNAKE HIBERNACULUM (DETAILS)
Page 1 of 1

CLIENT:
COUNTY:

Designed by: Date
Drawn by:
Checked by:
Approved by:

Drawing No.
Date: 01/2007
Sheet: of



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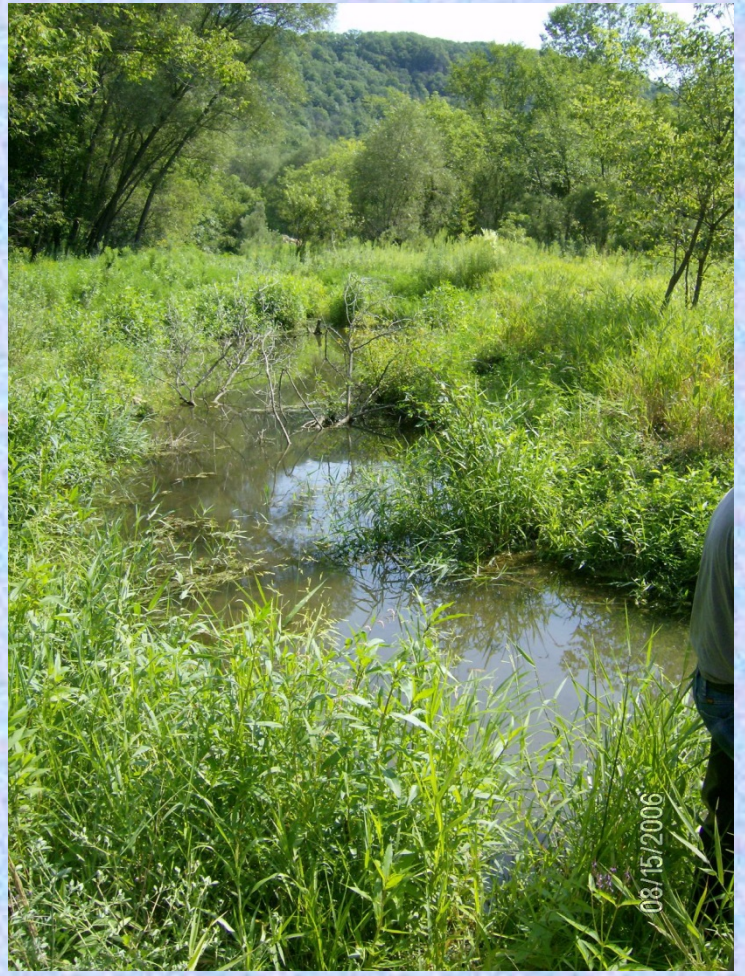
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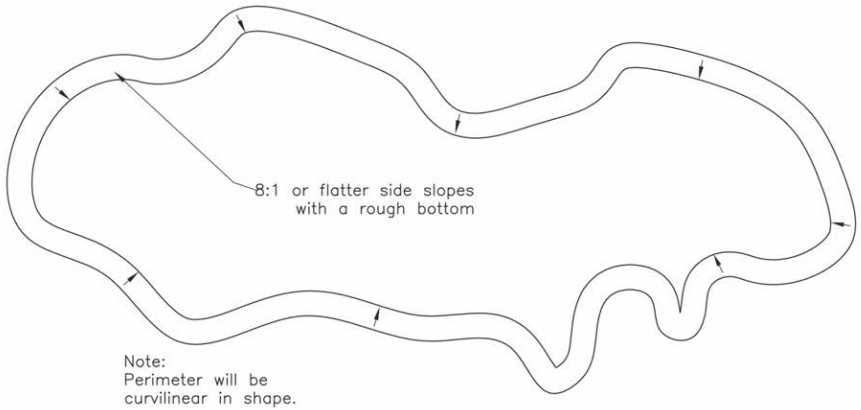
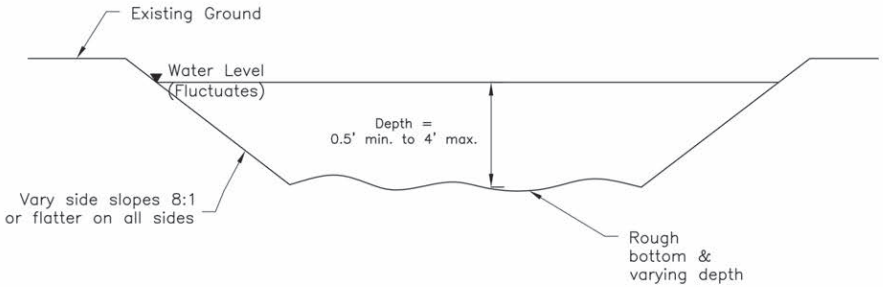


WETLAND SCRAPE PLAN VIEW



TYPICAL WETLAND SCRAPE CROSS SECTION

See Sheet_____for the
location of the scrapes

Notes:

1. Scrapes/borrow areas will be constructed at locations and as flagged by the technician.
2. Scrapes are to be irregular in shape when completed. Wheel ruts are allowed and desired.
3. Wisconsin Construction Specification 2, Excavation, shall be followed.
4. Strip minimum 6" of topsoil and stockpile it for spreading, if needed, after the excavation is completed.
5. Before topsoil is spread, the depth and slopes must be checked by the technician. Seeding shall be done as per Job Sheet 134 for Introduced Species or Job Sheet 135 for Native Species or WI Drawings WI–710 or WI–711.
6. Spoil shall be disposed of at locations approved by the technician.

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Natural Resources Conservation Service
United States Department of Agriculture

Wetland Scrape/Borrow Areas

CLIENT: _____

COUNTY: _____

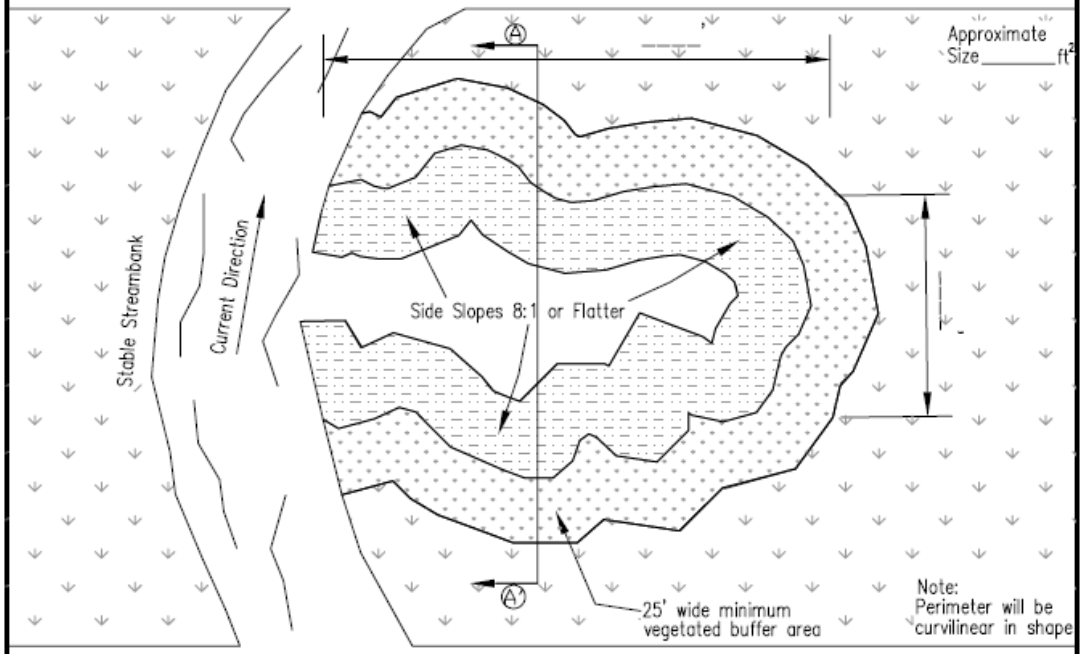
	Date
Designed	
Drawn	
Checked	
Approved	

Drawing Name	WI–950 A
Date	1/09
Sheet	of

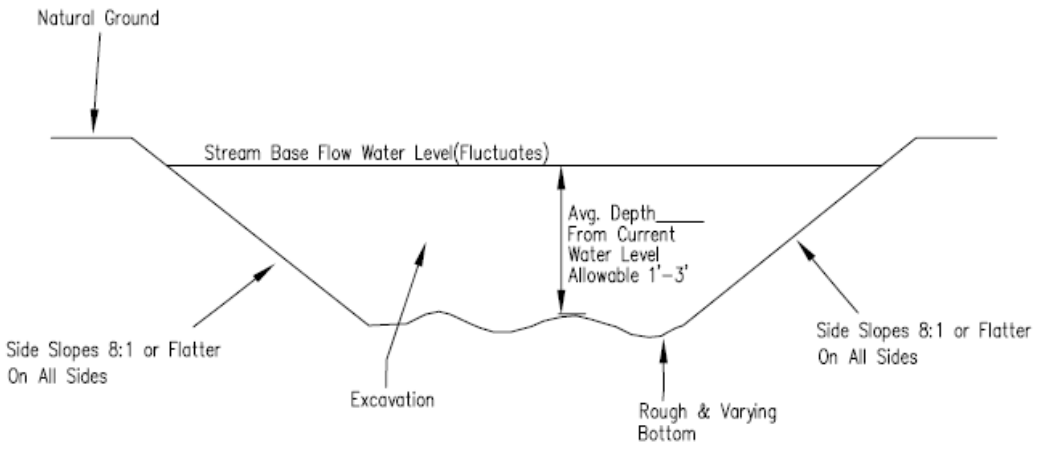

08/16/2006

Backwater Wetland

EXAMPLE PLAN VIEW - IN PLACE



TYPICAL CROSS SECTION A-A'



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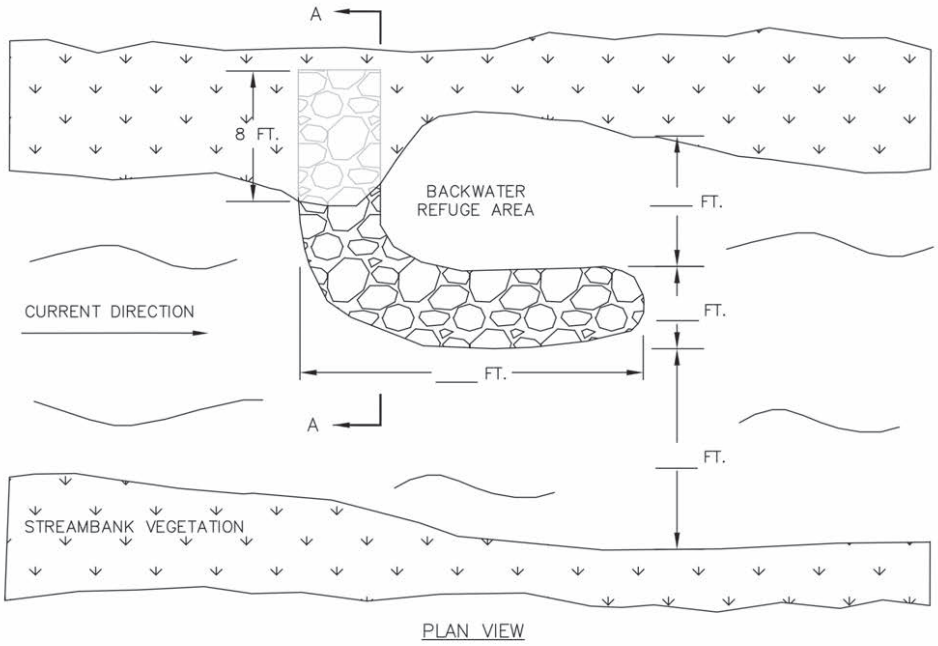
Natural Resources Conservation Service
United States Department of Agriculture

Backwater Wetland (Not to Scale)
Page 1 of 2

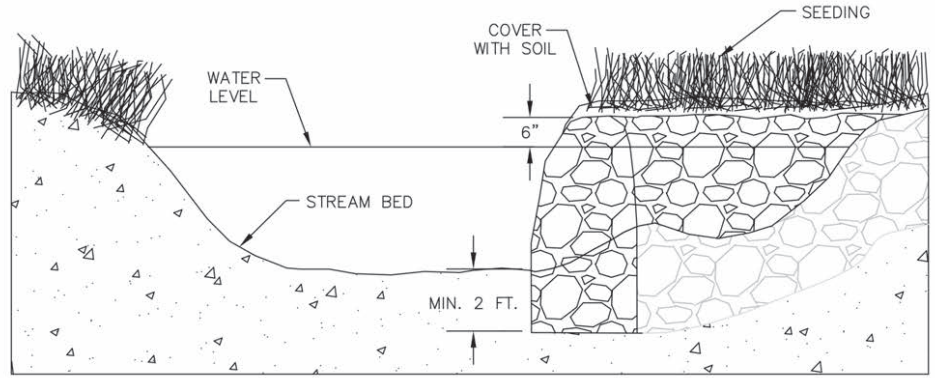
CLIENT: _____
COUNTY: _____

Date
Designed by: _____
Drawn by: _____
Checked by: _____
Approved by: _____

Drawing No.
Date: 01/2009
Sheet: of



PLAN VIEW



SECTION A–A

NOTE: CARE SHALL BE TAKEN DURING PLACEMENT TO AVOID STREAM BANK EROSION ON OPPOSITE BANK.

ROCK GRADATION	
PERCENT PASSING BY WEIGHT	SIZE IN INCHES
100	
60–85	
25–50	
5–20	
0–5	

QUANTITIES	
ROCK RIPRAP FOR HOOK (W.C.S.* 9)	CU. YD.

*W.C.S. = WIS. CONSTRUCTION SPECIFICATION
*ESTIMATED TO THE NEAT LINES AND GRADE

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

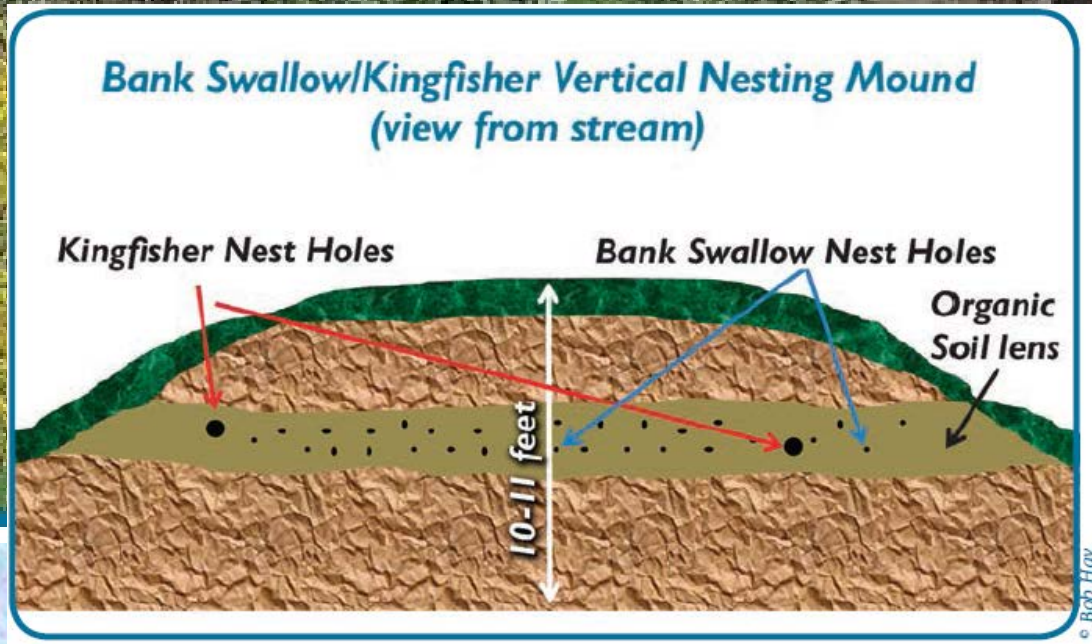
BACKWATER HOOK

CLIENT: _____
COUNTY: _____

	Date
Designed	
Drawn	
Checked	
Approved	

Drawing Name: WI–931A
Date: 12/2010
Sheet of

Gordon Creek, Iowa Co. WI


Bank Swallow/Kingfisher Vertical Nesting Mound
(view from stream)
Kingfisher Nest Holes
Bank Swallow Nest Holes
Organic
Soil lens
10-11 feet
© Bob Hay


©2007 Steve Baranoff

Nongame Wildlife Habitat Guide:

Opportunities that Compliment Stream Restorations

Guide Prepared By:
Jeff Hastings, Trout Unlimited
Driftless Area Restoration Effort
phone: 608/606-4158
email: jhastings@tu.org

Cover photos by
Jeff Hastings, Bob Hay and Tom Dornack

Nongame Wildlife Life History Consideration

Amphibians (Class Amphibia) _____ _____

Instream Habitat Features that benefit Nongame Wildlife

Riparian and Upland Area Habitat Feature that Benefit Nongame Wildlife

Turtle Hibernaculum

Stream Type	Riparian Habitat
Small, stable rock/cobble, cold headwater stream	Primarily closed canopy
Medium sized cool to cold water stream*	Primarily open canopy
Medium sized cool to warm water stream/river	
Larger warm water rivers	

© Bob Hay

No or very low value

Low to moderate value

Moderate to good value

Good to excellent value

Monitoring Section

The Wild & Rare Committee has compiled a suite of monitoring protocols to assess nongame wildlife on larger projects that incorporate several to many of the habitat features listed in this guide. The purpose of monitoring is to determine if the added

Recommended Approaches

Pre-monitoring

Conduct pre-restoration inventories to acquire a reasonable baseline for nongame species using the protocols

Monitoring Methods and Protocols

Clearly identify the monitoring area (length and width of riparian

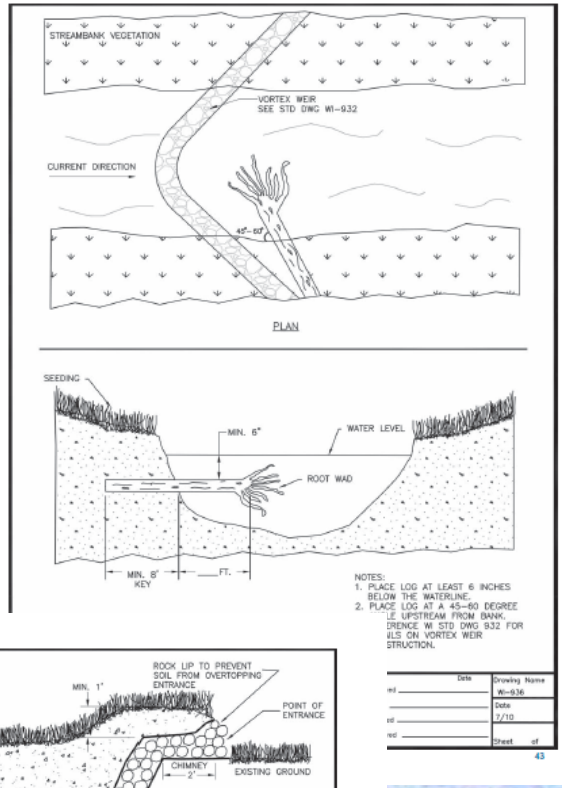
© J. Kanfer

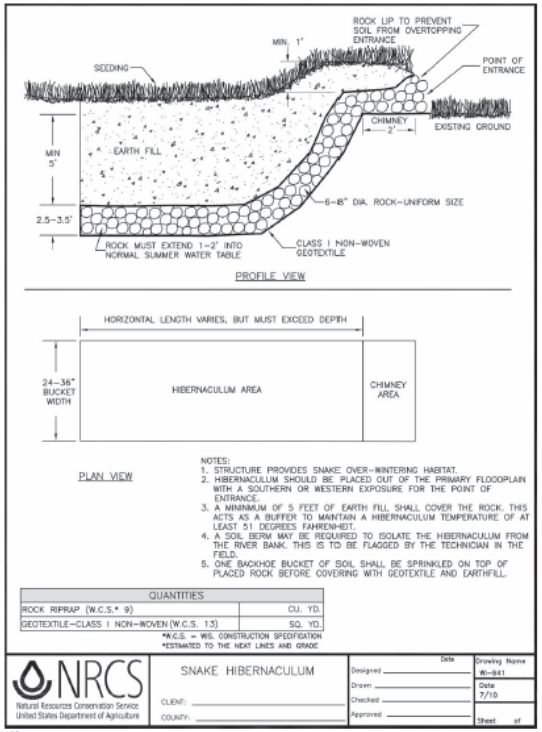
Mouse in drift fence funnel trap

Habitat Designs

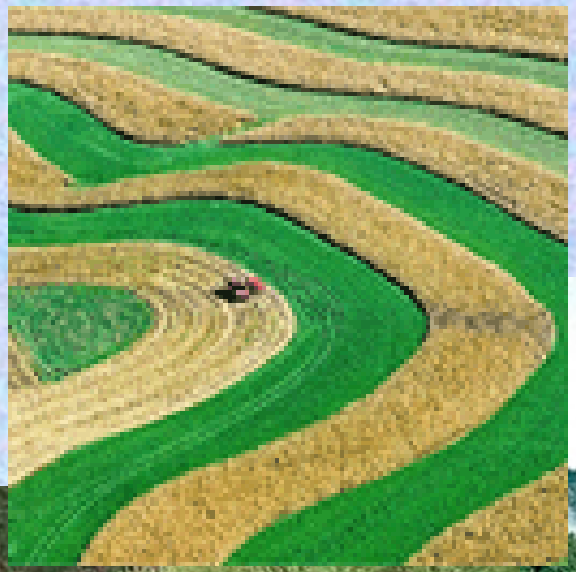
Wood turtle hatchling

Index





Farm Bill dollars



Driftless Area Landscape Conservation Initiative Proposal

A proposal to restore, improve, and protect the nationally significant fish and wildlife habitat of the Driftless Area, including working lands, woodlands, prairies, and cold water streams.

Photo by Jim Richardson @ Richardson Photography

USDA Natural Resources Conservation Service
Illinois, Iowa, Minnesota, and Wisconsin.

April 27, 2012

USDA is an equal opportunity provider and employer.

6.5 million 5 years
1.5 million for stream restoration

2013 - $2.25 million

Restore watershed health to reduce delivery of sediment and nutrients and improve water quality to benefit Driftless Area rivers and streams

Local Field Offices (NRCS & SWCD)


Trimble

“Hand-on Workshop” Trout Run, MN

Workdays..lumber, equipment, lunch, fishing!

NATIONAL FISH HABITAT ACTION PLAN

Embrace-a-Stream

National Fish and Wildlife Foundation

WISCONSIN DEPT. OF NATURAL RESOURCES

DNR

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service

USGS
science for a changing world

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

Minnesota DEPARTMENT OF NATURAL RESOURCES

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

River Protection Grants
EQIP
NFHAP
TU **Chapters**
Wal-Mart
Foundations

ENVIRONMENT
AND NATURAL RESOURCES
TRUST FUND

Lessard-Sams Outdoor Heritage

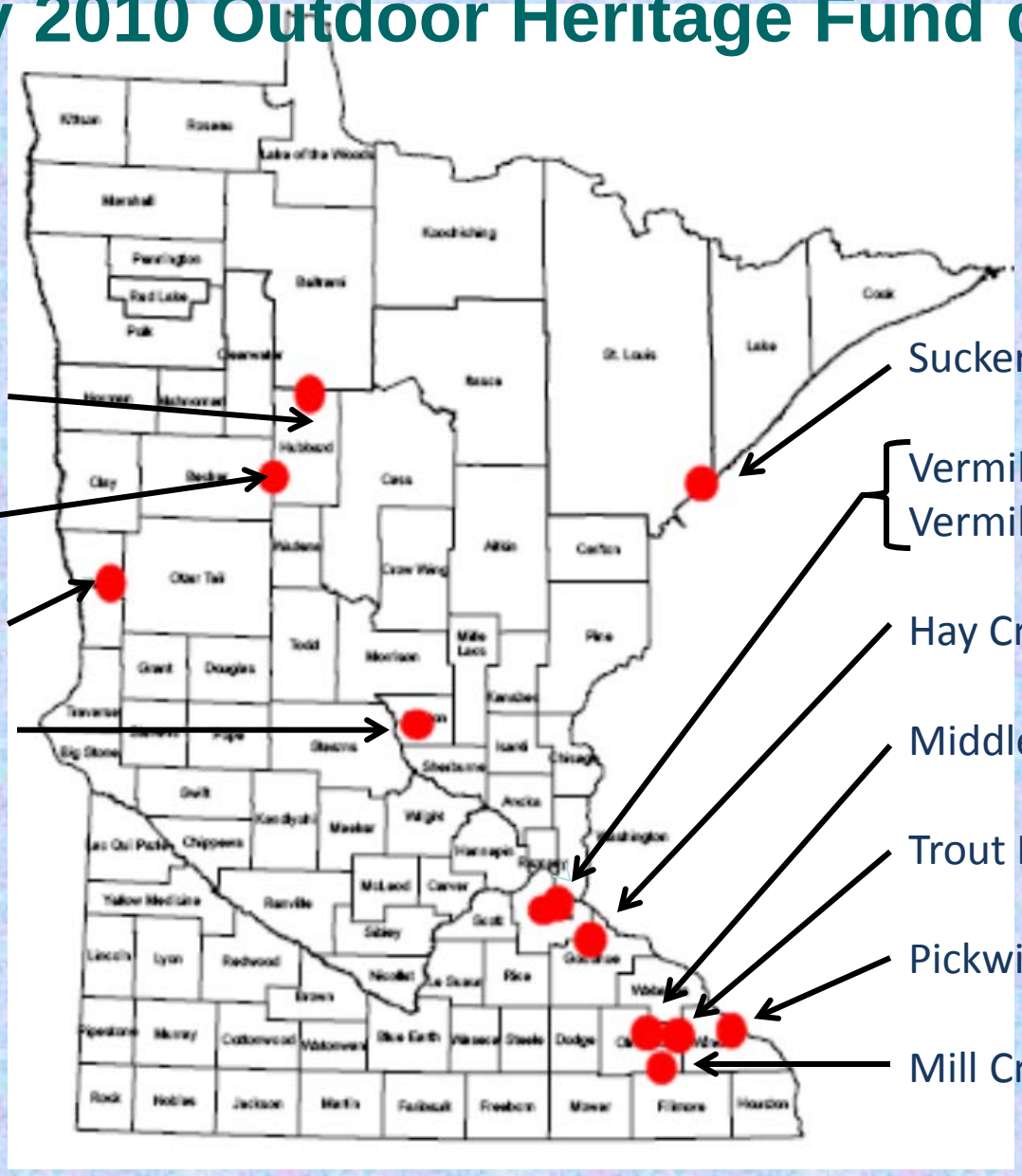
2 million – 14 miles

1. Hay Creek (Goodhue);
2. Kabekona Creek (Hubbard);
3. Lawndale Creek (Wilkin);
4. Little Rock Creek (Benton);
5. Middle Branch of Whitewater River (Olmsted);
6. Mill Creek (Fillmore);
7. Pickwick Creek (Winona);
8. Trout Run Creek (Fillmore);
9. Straight River (Becker &Hubbard);
10. Sucker River (St. Louis);
11. Vermillion River (Dakota).

The End


DO NOT CROSS PASTURE UNLESS
YOU CAN DO IT IN 3.7
THE BULL CAN DO IT IN 3.8

Minnesota Trout Unlimited Projects completed using Fy 2010 Outdoor Heritage Fund dollars



Kabekona Creek

Straight River

Lawndale Creek

Little Rock Creek

Sucker River

Vermillion River 2009

Vermillion River 2010

Hay Creek

Middle Br. Whitewater

Trout Run Creek

Pickwick Creek

Mill Creek

CLEAN WATER LAND & LEGACY AMENDMENT

TROUT UNLIMITED

Why improve fish habitat?

- Produce more fish! Increase the carrying capacity & wild fish will maximize productivity
- Avoid expense and uncertainties of reliance upon hatcheries (disease, budget cuts, etc.)
- Increase angler access and participation
- Reduce erosion and sedimentation,

  and improve water quality
- Ensure legacy of productive fisheries

  for future generations

Where to do habitat improvement projects?

- Only where lack of habitat is a limiting factor
- Only where fishery is capable of sustained natural reproduction
- Public access = so public reaps the benefits
- Good long term sustainability
- High priority of DNR

Goals of fish habitat projects in streams and rivers

- Narrow and deepen stream channel
- Create in stream cover habitat
- Stabilize banks & reduce sedimentation
- Lower water temperatures
- Increase adult abundance & reproduction
- Increase angler participation
- Generate landowner and citizen interest in **watershed** improvements

Methods - tailored to address conditions in this agricultural area

- Remove invasive, shallow rooted trees to curb erosion and increase energy inputs
- Remove streamside sediments, slope back banks & reconnect stream to its floodplain
- Create overhead cover – bank and depth
- Stabilize banks to curb erosion
- Re-establish deep rooted grasses

Project outcomes

- 300% increase in trout over 11 inches
- Better practical access for anglers
- Increased angling participation
- Dramatically reduced sedimentation (e.g., **1,700 tons of soil annually** eroded from the Pickwick project essentially halted)
- Increased landowner awareness

Straight River (near Park Rapids)

TROUT UNLIMITED

Minnesota DEPARTMENT OF NATURAL RESOURCES

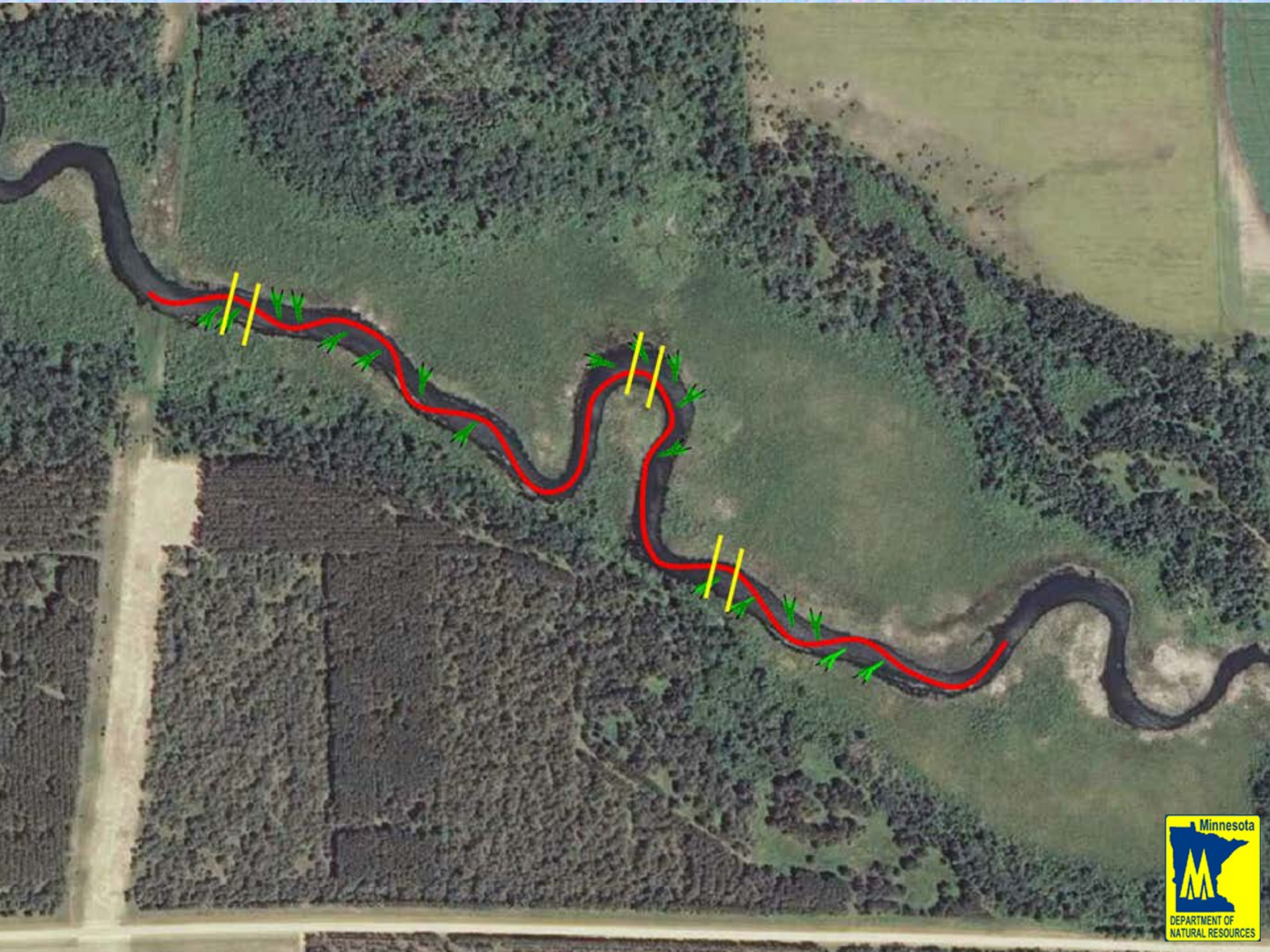
CLEAN WATER LAND & LEGACY AMENDMENT

Degraded habitat found in Straight River project reach

- Sandy soils and very low gradient
- Extremely over-wide, shallow channel – as wide as Red River, but one thirtieth the flow!
- Lack of cover habitat
- Water warming into lethal range

Project goals and methods

- Narrow and deepen stream channel
- Increase water velocity to move sediments
- Placed clusters of whole pine trees in channel to narrow it, capture silt and vegetation & restore meander pattern
- Gradually flush excess sediments from narrowed channel, deepening it
- Scour depth at tips of “sweepers”


Minnesota
DEPARTMENT OF
NATURAL RESOURCES

Pre-project - Oct 2010

3 months after project-Sept 2011

Sucker River (North Shore)

TROUT UNLIMITED

CLEAN WATER LAND & LEGACY AMENDMENT

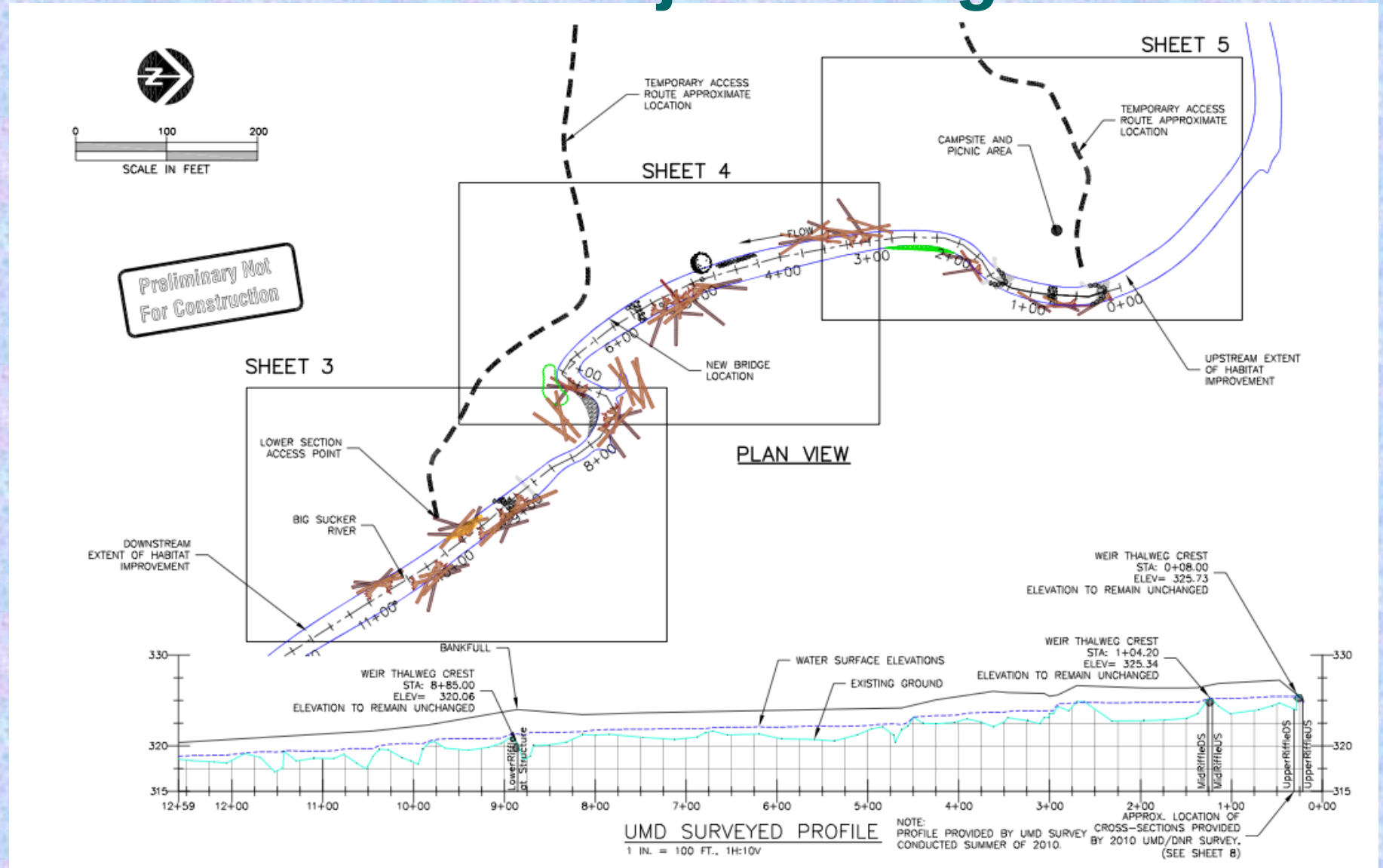
Degraded habitat found in Sucker River project reach

- Historic logging removed large “seasonally stable” logs from channel, which had created depth and cover habitat for trout
- 50-100 years before forest can produce large trees which will be “recruited” to channel
- Lack of deep pools for wintering and surviving low summer flows

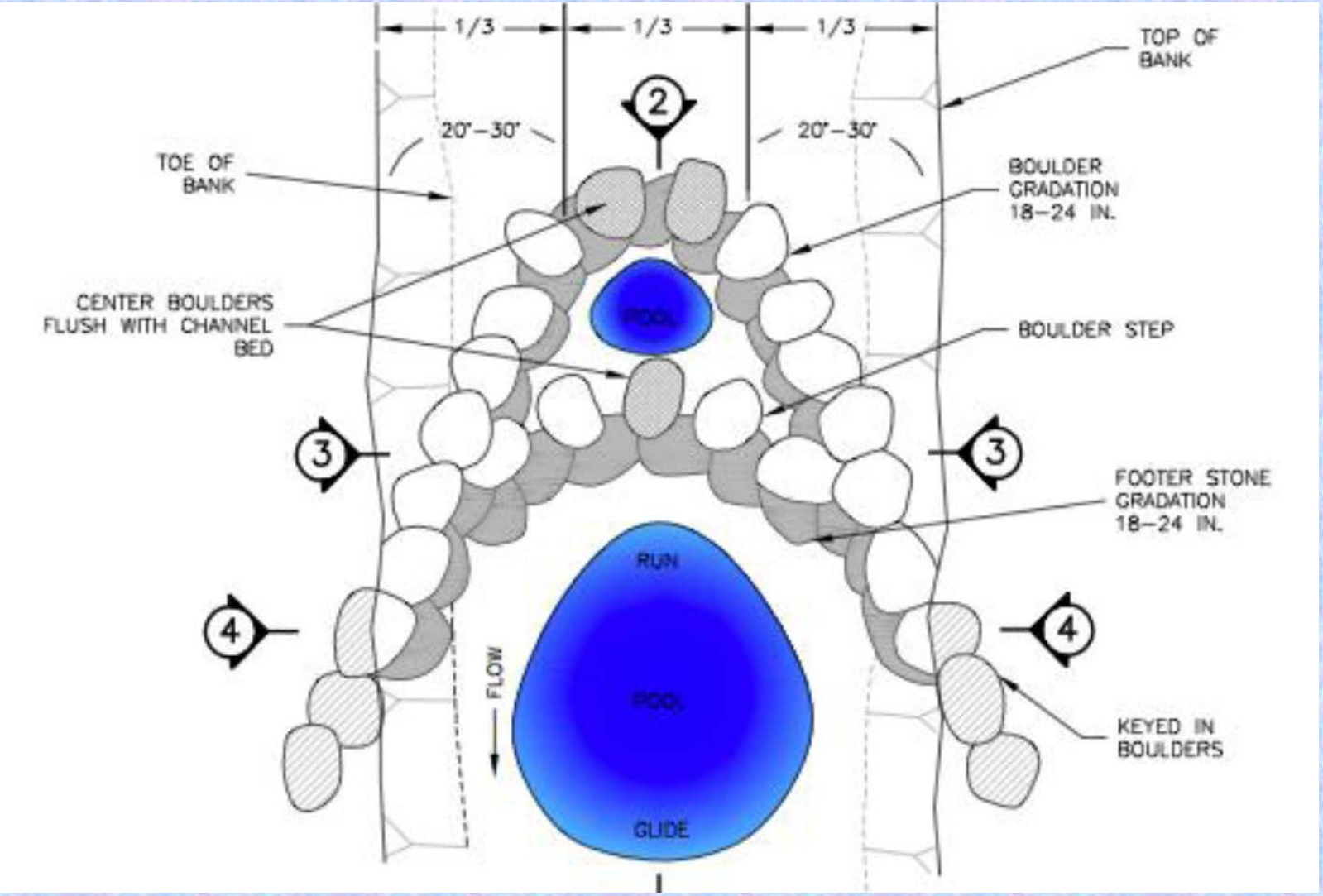
Project goals and methods

- Restore large logs to channel to increase amount of pool habitat and overhead cover
- Rock weirs used to scour deep holes and direct flow to overhead cover logs
- Designed to scour pools in high water
- Increase adult trout abundance & natural reproduction
- Increase angler participation

Sucker Project Design



Rock weir design



Re-cap: Goals of all projects

- Narrow and deepen stream channel
- Create in stream cover habitat
- Stabilize banks & reduce sedimentation
- Increase abundance & natural reproduction
- Increase angler participation
- Create engaged citizen-advocates for watershed improvement & protection
- Leave a legacy of robust fisheries