

Farm-Crossing Mitigation Design and Native Plant Tolerance & Function



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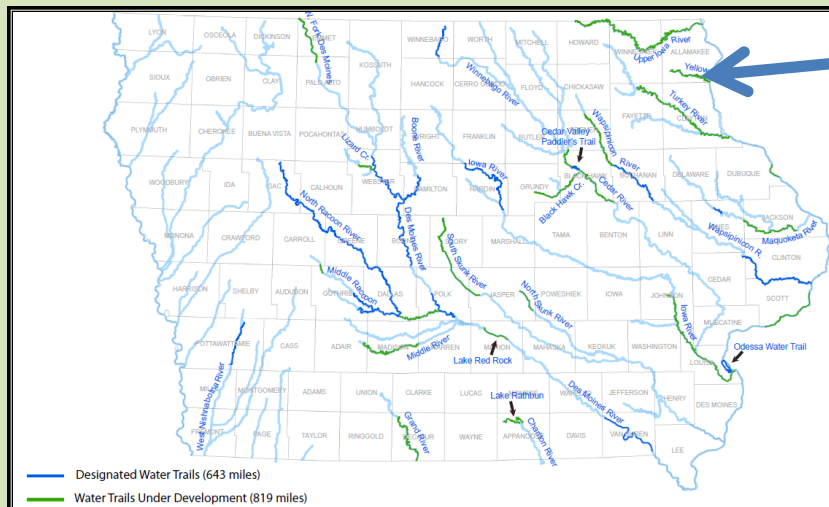
Yellow River “At Thalweg” Crossing / Restoration Plantings

Nate Hoogeveen



Project Location

- Northeast Iowa
- Paleozoic plateau landform region (“Driftless”)
- 1,200 acre working farm, private crossing
- Owned by Kurt Warner



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Problems for Public

- Kayak livery opened, people getting sucked through pipes against their will
- Fish passage limitations
- Difficult to maintain portage landing upstream

Problems for Warners



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XS1649.1

○ Ground Points

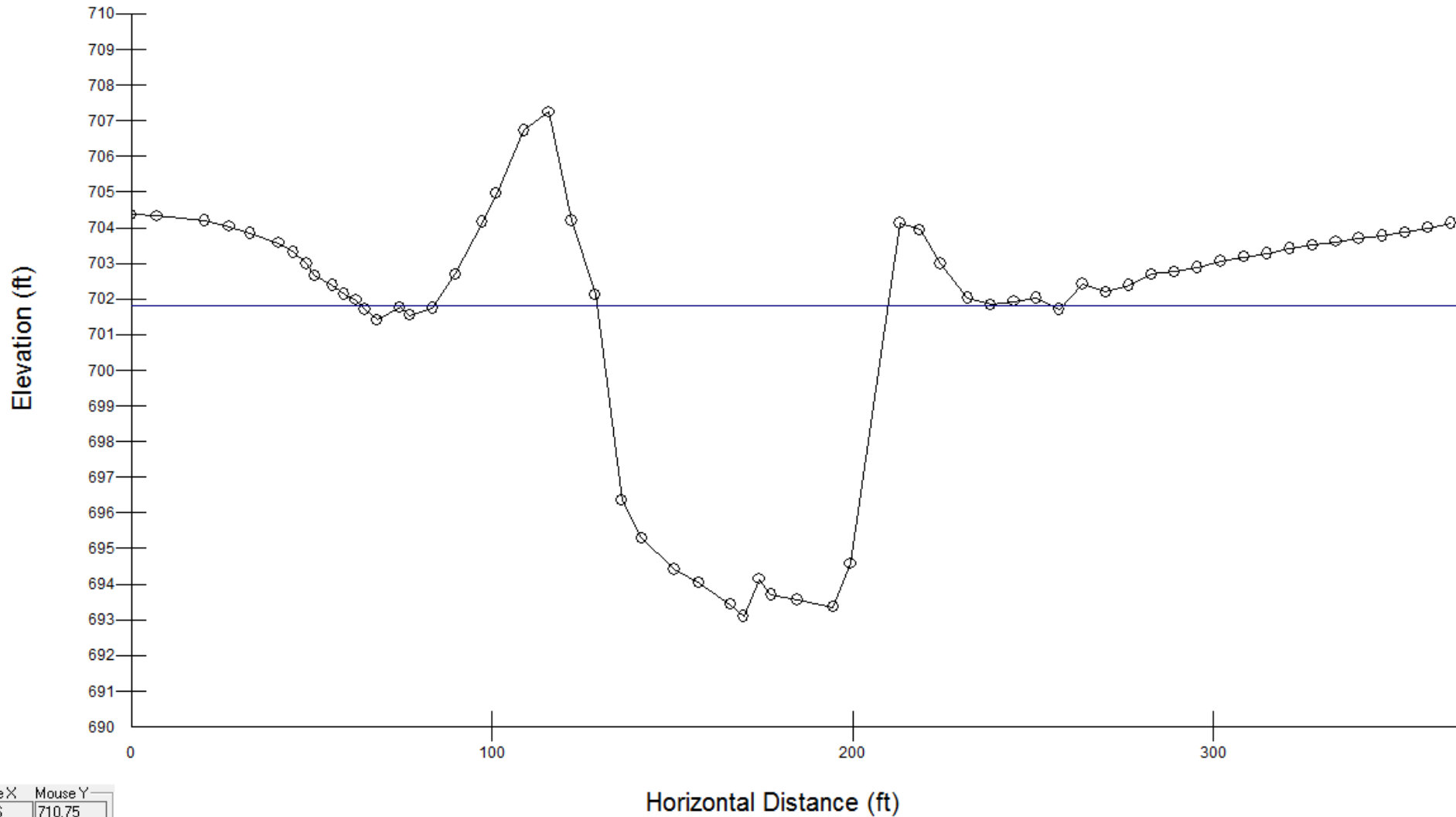
◆ Bankfull Indicators

▼ Water Surface Points

Wbkf = 104.4

Dbkf = 5.29

Abkf = 552



Mouse X	Mouse Y
11.16	710.75

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FARM CROSSING MITIGATION DESIGN

XS1749.2

○ XS1749.2

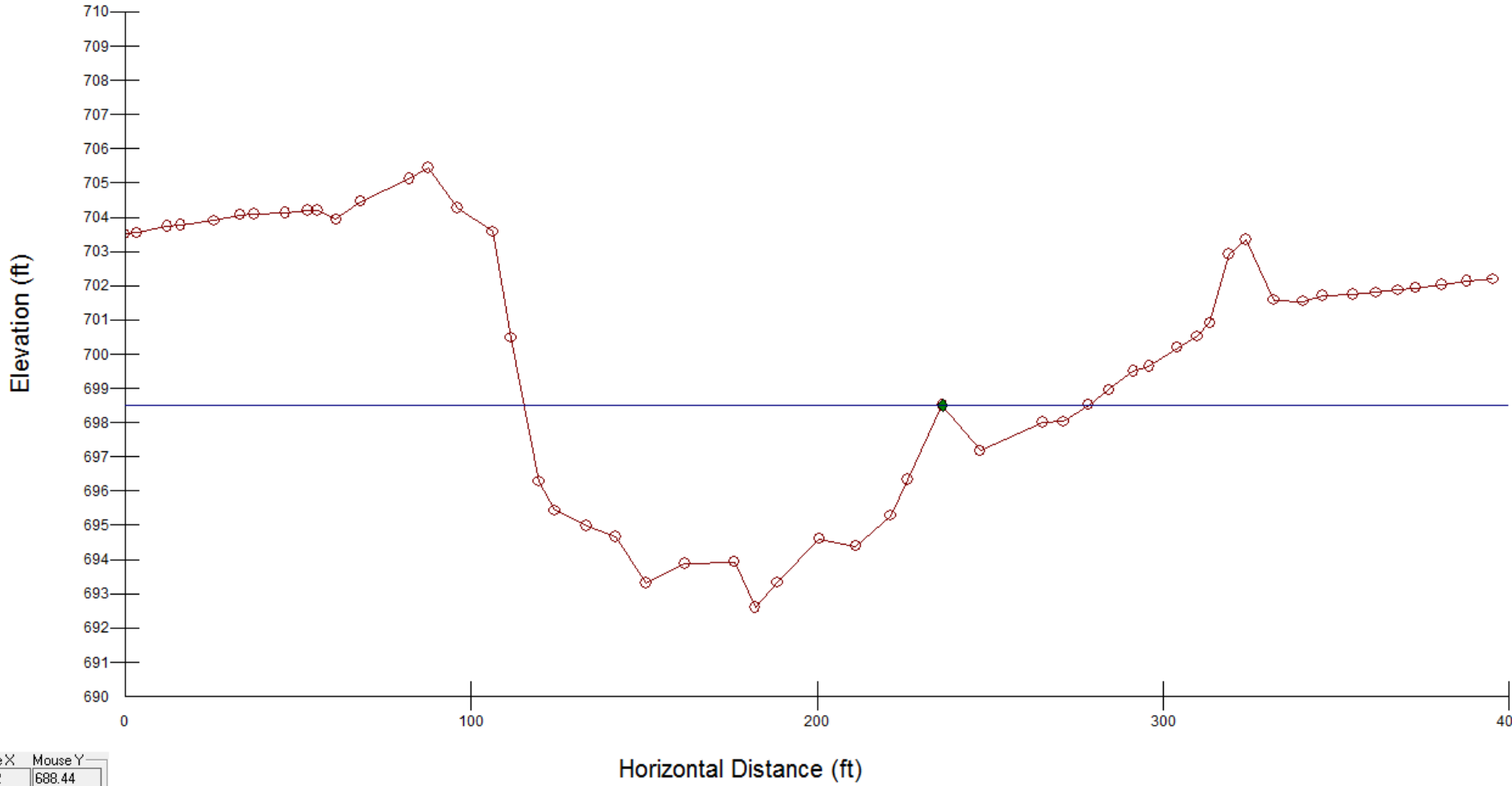
◆ Bankfull Indicators

▼ Water Surface Points

Wbkf = 162.7

Dbkf = 3.02

Abkf = 491.4

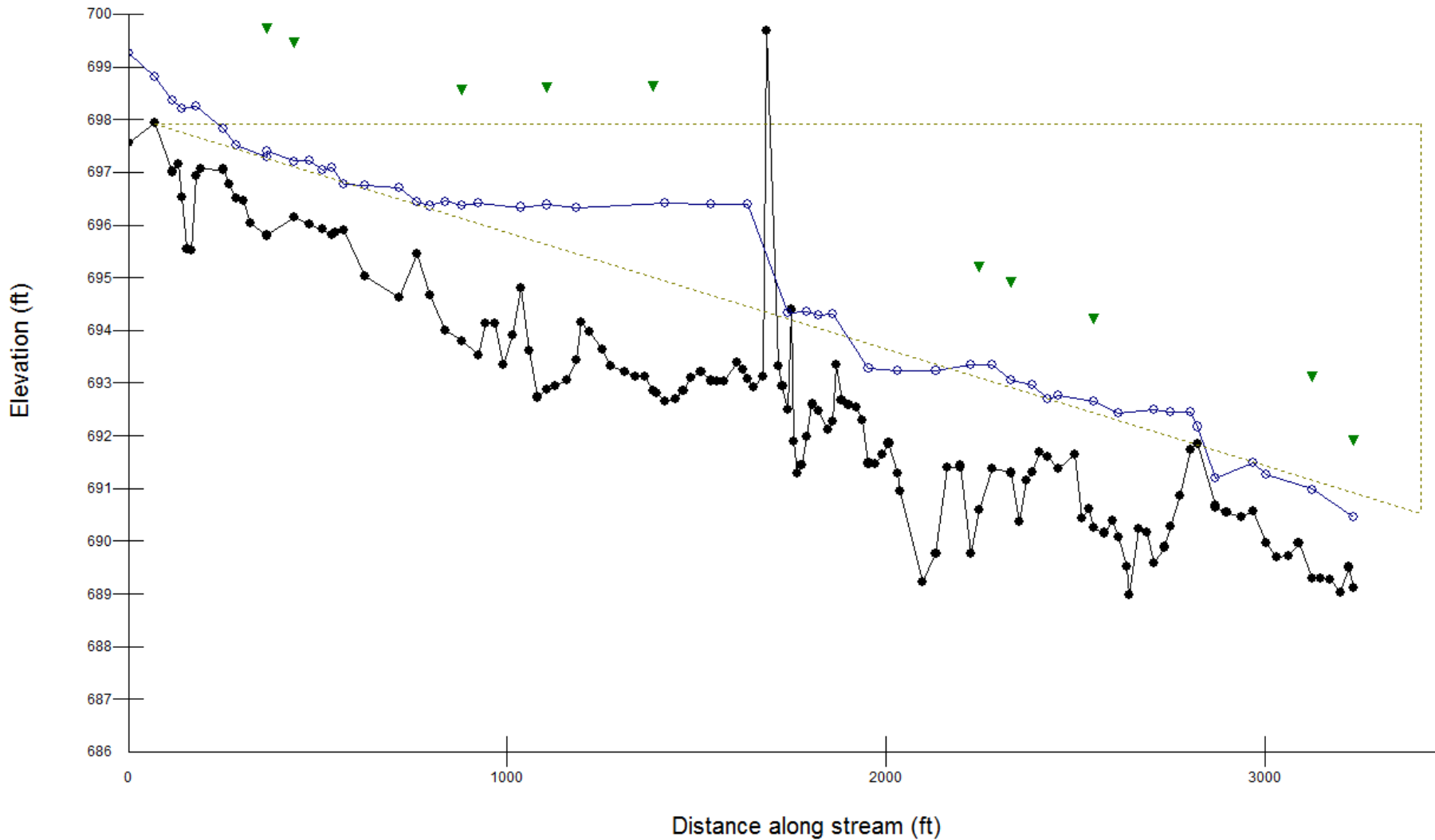


Mouse X	Mouse Y
43.82	688.44

Design Needs

- Fish passage
- Non-hazardous / navigable channel
- Stable banks conditions
- In character with the scenic Yellow River
- Budget project

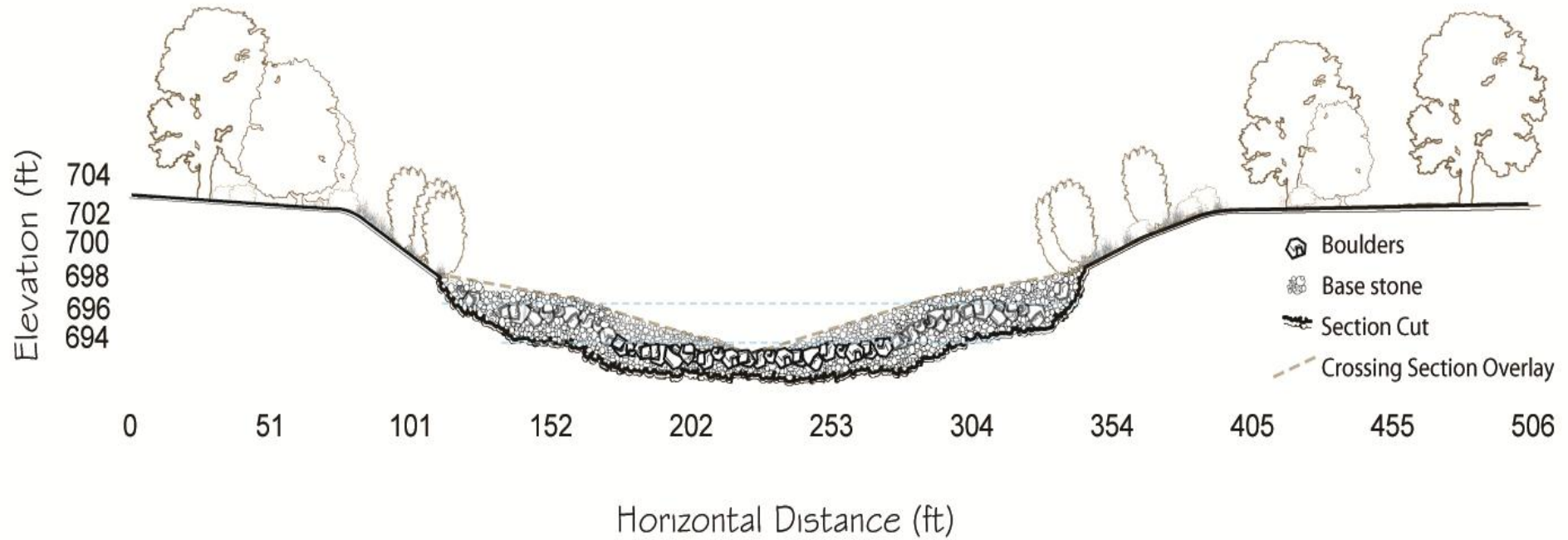
Impacted Reach



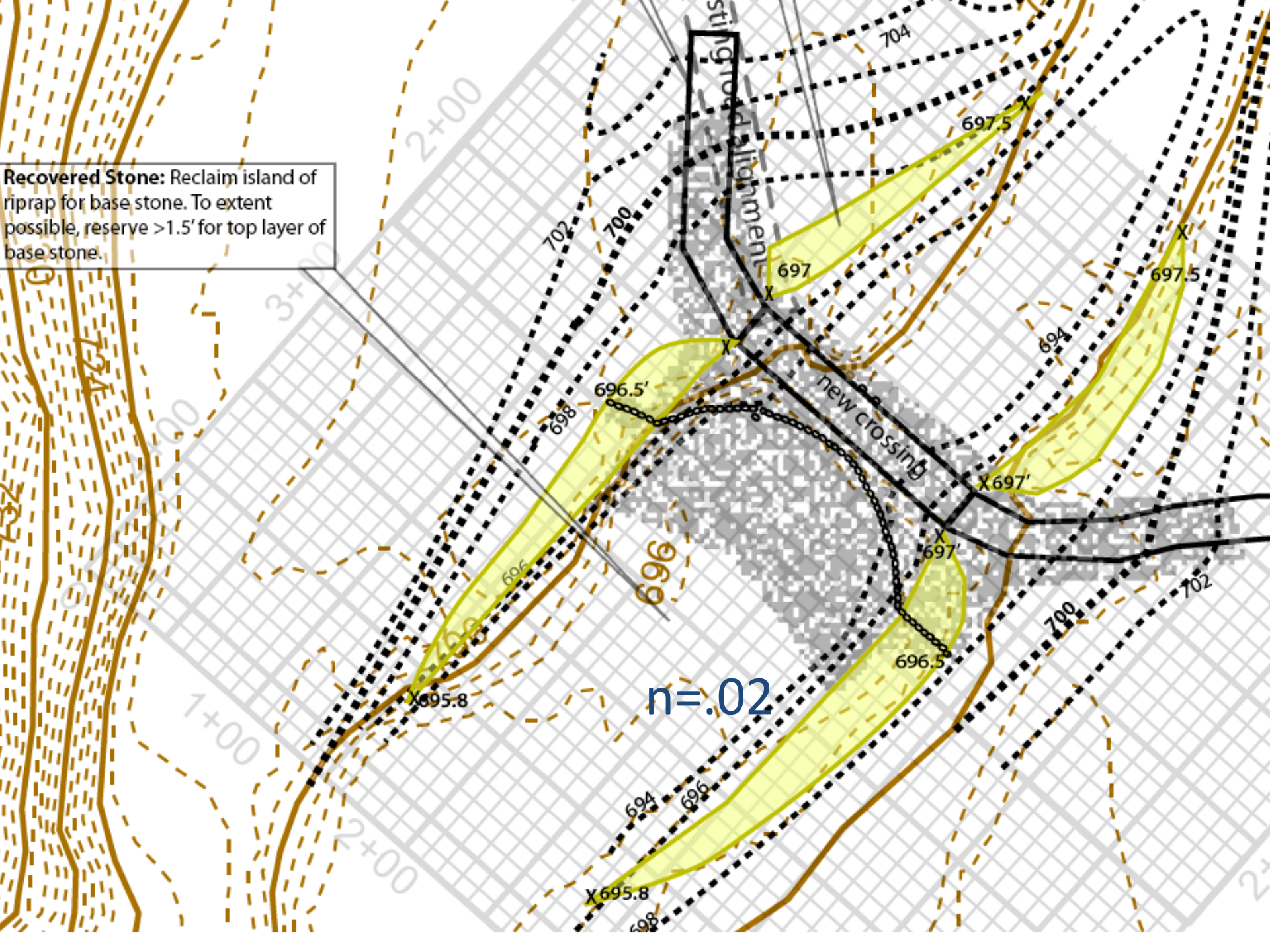
- Reach thalweg and BKF slope was .0003 with individual riffles up to .026.

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Proposed Downstream Weir, Cross Section



Recovered Stone: Reclaim island of riprap for base stone. To extent possible, reserve >1.5' for top layer of base stone.



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Project Budget

- \$78,500 contracted costs
- 50 percent state costshare
- 50 percent Warner Enterprises, Inc.
- Additional \$6,000 for plant materials / crew time

May 2011: Native Plantings

- 200 bare root shrubs, clustered by species
- 400 black willow and cottonwood live stakes, clustered by species
- NRCS Iowa CP-28 transitional mix inter-seeded on bankfull floodplain and side slopes
- 600 plugs in bankfull floodplain and sideslopes
- Seeded mix of Virginia and Canada wildrye at top of bank

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Nursery Stock

- 20 trees planted
- Mulched with 4 layers of coco fiber
- Beaver / deer fence

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Collectree

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2012 Survey Methods

- Divided survey into 13 zones of similarly
 - low floodplains
 - side slopes
 - soil type
 - top of bank
- Presence / absence
- Where species dominate, recorded approximate percent cover



2012 Survey

- 30% Black-eyed Susan (*Rudbeckia hirta*)
- 30% Rice cut grass, (*Leersia oryzoides*)
- 10% Reed canary grass (*Phalaris arundinacea*)
- 5% Prairie cord grass (*Spartina pectinata*)
- Blue vervain (*Verbena hastate*)
- Jerusalem artichoke (*Helianthus tuberosus*)
- Field mint (*Mentha arvensis*)
- Daisy fleabane (*Erigeron strigosus*)
- Sneezeweed (*Helenium autumnale*)
- Black willow (*Salix nigra*)
- Cottonwood (*Populus deltoides*)
- Silverweed cinquefoil (*Argentina anserine*)
- Common boneset (*Eupatorium perfoliatum*)

Zone 1

- Bankfull floodplain
- Submerges at 900 cfs

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Zone 5

- Bankfull floodplain
- Submerges 900 cfs

2012 Survey

30% Wildrye (*Elymus virginicus* or *riparius*)

20% Reed canary grass (*Phalaris arundinacea*)

10% Black-eyed Susan (*Rudbeckia hirta*)

5% Pasture clovers

Rice cut grass, (*Leersia oryzoides*)

Blue vervain (*Verbena hastata*)

Sandbar willow (*Salix interior*)

Daisy fleabane (*Erigeron strigosus*)

Sweet Yellow Clover (*Melilotus officinali*)

Rice cut grass, (*Leersia oryzoides*)

Silverweed cinquefoil (*Argentina anserine*)

Canada thistle (*Cirsium arvense*)

Smooth blue aster (*Symphotrichum laeve*)

Hackberry (*Celtis occidentalis*)

Basswood (*Tilia americana*)

Kentucky coffee tree (*Gymnocladus dioicus*)

Lurid sedge (*Carex lurida*)

Blue flag iris (*Iris virginica shrevei*)

Sneezeweed (*Helenium autumnale*)

Stinging nettle (*Urtica dioica*)

Water horehound (*Lycopus americanus*)

Field mint (*Mentha arvensis*)

Wild parsnip (*Pastinaca sativa*)

Prairie cordgrass (*Spartina pectinata*)

Swamp milkweed (*Asclepias incarnata*)

Giant goldenrod (*Solidago gigantea*)

Early conclusion: The shrubs died (mostly)

- Bare root and live stakes may not have had adequate water to start
- May have suffered from hungry deer and beavers
- May have been outcompeted by inter-seeded species / questions on care of plant material
- Also: The coco fiber appeared to limit seeding success

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Probable BKF and Water's Edge Successes

- Prairie Cordgrass (plugged and seeded – plugs success appears greater)
- Sneezeweed (inter-seeded)
- Rice cutgrass (plugged)
- Common boneset (inter-seeded)
- False indigo (limited seeding)
- Bluejoint grass (inter-seeded)

Promising Volunteer Species

- Monkeyflower
- Water horehound
- Cutleaf coneflower
- Silverweed cinquefoil



Limitations

- Only appreciable flood was two weeks after project was planted
- Only one year of data



Research Directions

- Canoe accesses, dams, stream bank restorations
- Developing broad list of relatively common Iowa riparian species, narrowed by project with BONAP county-level map
- Emory's sedge (*Carex emoryi*) planted with armored toe

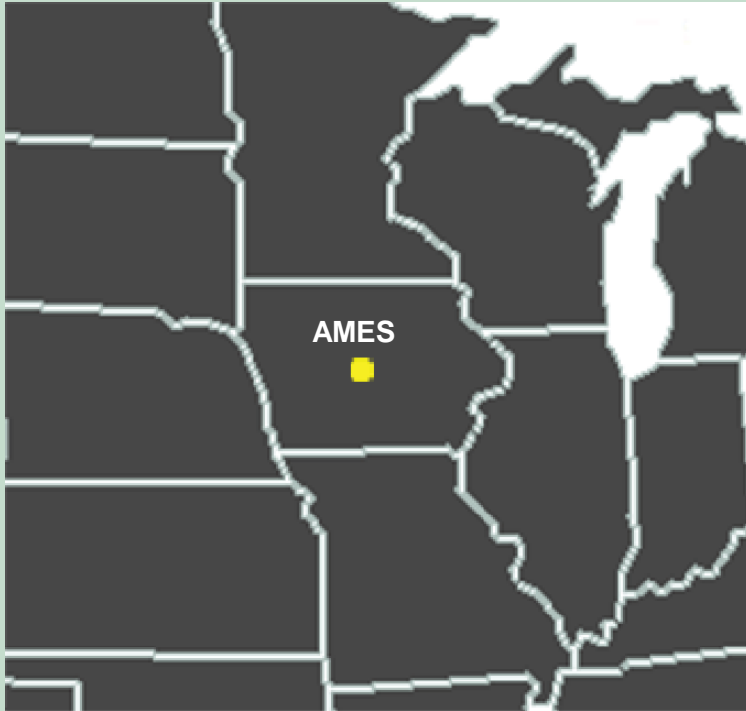
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NATIVE PLANT TOLERANCE AND FUNCTION

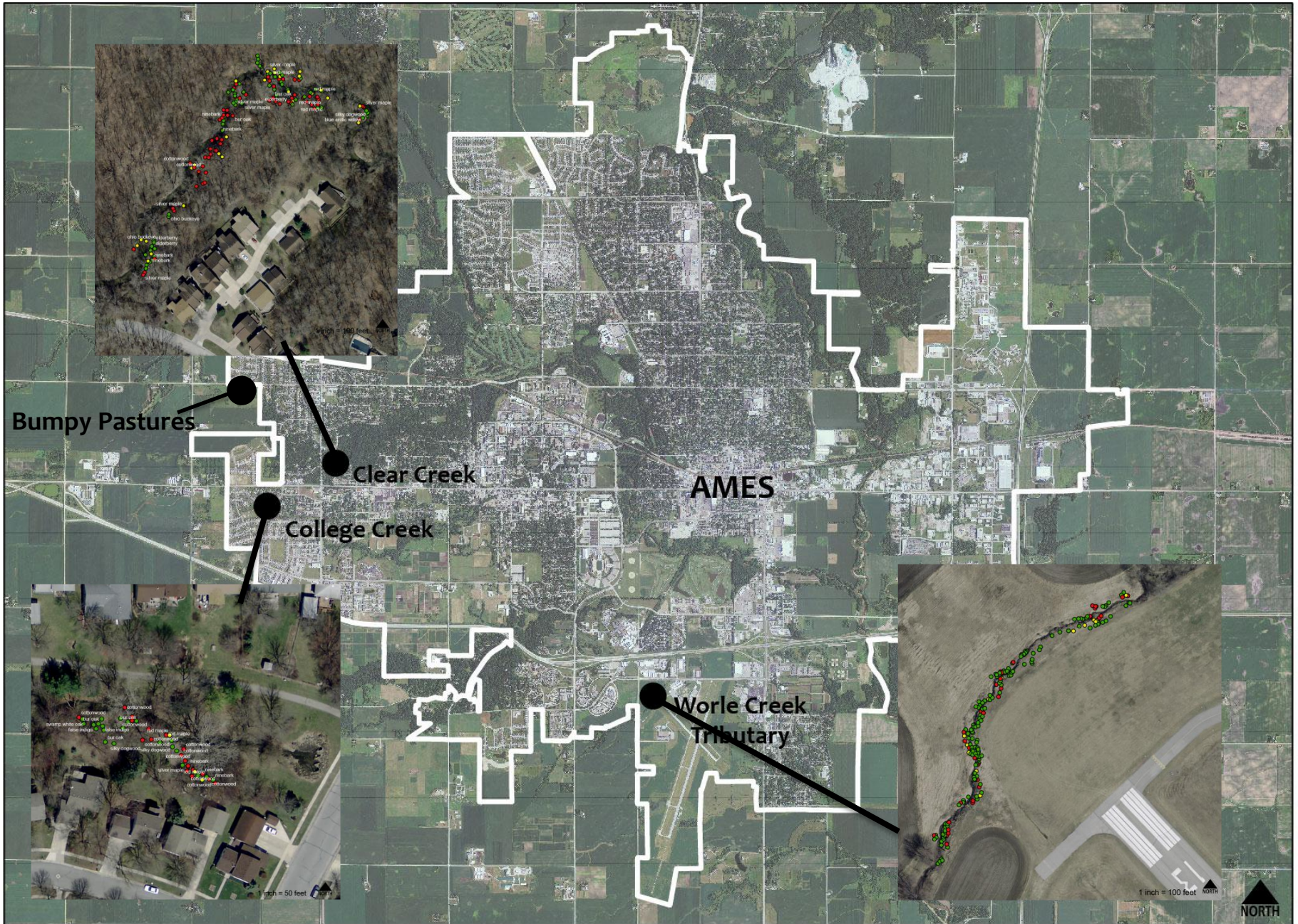


RESEARCH OVERVIEW

- Species survival studies based on channel condition and location above bankfull elevation
- Low cost installation/no maintenance method
- Yearly survival monitoring for 2 years

- 0.5 miles of stream channel total at 3 sites
- 17 species
- 400 plants
 - 378 bare root plants
 - 22 dormant cuttings
- 1.5 installation days for crew of 5

NATIVE PLANT TOLERANCE AND FUNCTION



NATIVE PLANT TOLERANCE AND FUNCTION

LONG RANGE GOAL: Understand the shear stress component of plant tolerance more effectively, especially on incised channels

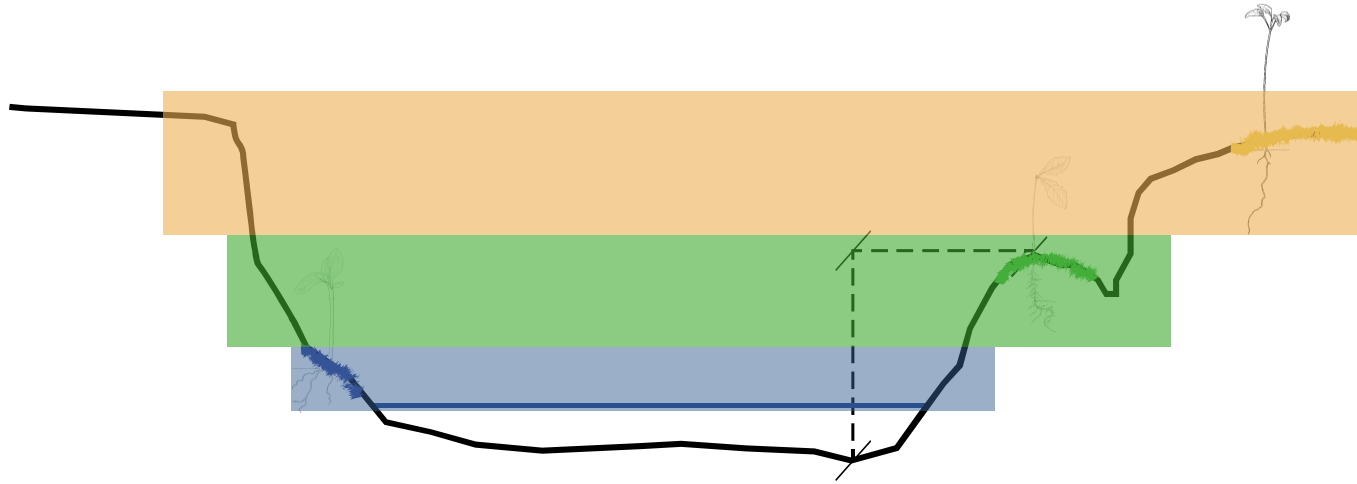


Plant Species Included:

- Arrowwood Viburnum
- Bald Cypress
- Black Chokeberry
- Bur Oak
- Buttonbush
- Cottonwood
- Elderberry
- False Indigo
- Highbush Cranberry Viburnum
- Nannyberry Viburnum
- Ninebark
- Redosier Dogwood
- Red Maple
- Silky Dogwood
- Silver Maple
- Swamp White Oak
- Willow



NATIVE PLANT TOLERANCE AND FUNCTION

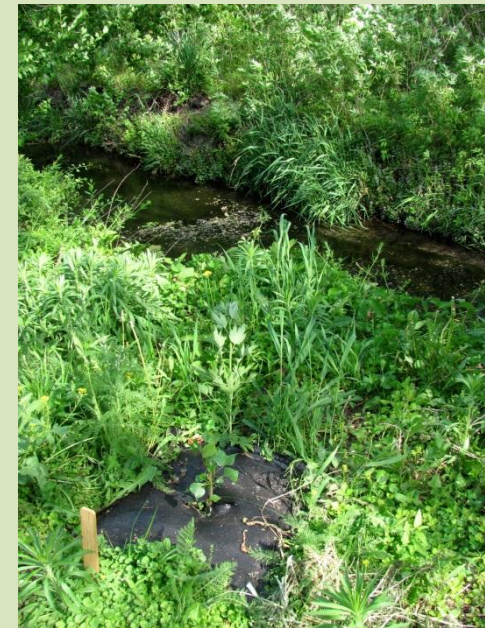


Planting Zones

Blue: plants are planted in a zone slightly above the bankfull elevation; plants must be able to withstand frequent/standing water

Green: plants planted at flood prone elevation; periodic standing water

Tan: plants that are planted at top of bank; low chance of flooding or standing water--drought tolerant



NATIVE PLANT TOLERANCE AND FUNCTION

Blue Zone	leaf-out survival	Year 1	Year 2
Bumpy Pastures		78%	71%
Clear Creek, College Creek, & Worle Creek	93%	82%	

Green Zone	leaf-out survival	Year 1	Year 2
Bumpy Pastures		60%	40%
Clear Creek, College Creek, & Worle Creek	92%	63%	

Tan Zone	leaf-out survival	Year 1	Year 2
Bumpy Pastures		69%	50%
Clear Creek, College Creek, & Worle Creek	84%	64%	



Future Analysis

- Shear Stress Calculations based on rainfall events
- Continued Plant Survival Studies annually
 - Planting zone
 - Exposure
 - Slumping presence
 - Height & distance from channel bottom
 - BEHI rating

Mimi & Angela Advice

- Select Study Segments Based on Specific Research Need/Interest
- Planting schedules appropriate for plant forms
- Replication at other locations is important
- Seek funding for installation and monitoring



Nate's Advice for Plant Selection

- Plant Selection Based on Species Tolerance: Scour, Sedimentation, Exposure, Soil Texture, Anaerobic Soils tolerance
- Elevation relative to BKF
- Mimic observed stable plant communities at reference reach
- Diversity is a way to hedge your bets



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