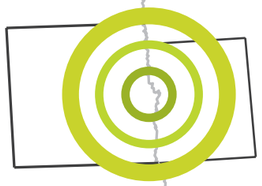
holoscene

high performance landscape systems

// An Integrated Solution

vc.hefti
NORTH DAKOTA STATE UNIVERSITY
Department of Landscape Architecture
MAY 2012 | dominic fischer



NORTH DAKOTA

MINNESOTA

problem statement

What if a connected system of landscape infrastructure,
a working landscape, could enhance ecological functioning
to serve as a civic asset rather than an environmental liability?

0 25 50 100MI

liability vs. asset

flood — concrete channel — residents

RESIDENTS/community

WILDLIFE/vegetation

CITY PLANNERS/researchers

user/client description

native prairie reconstruction

integrated wetlands

urban infrastructure

renewable energy

sustainable resources

civic recreation

environmental education

major project elements

[flood mitigation
[integrated stormwater management
[detention/retention
[pervious infiltation (ex. aquifer recharge)
[wastewater treatment
[contaminant & sediment filtation
[soil conservation & formation
[slope/soil stabilization
[nutrient cycling
[habitat
[biodiversity
[climactic regulation
[atmospheric regulation
[interpretive education (literal/figurative elements, including signage & sitefurnature)
[urban health solutions (social, psychological, and physiological)
[parks & open space
[recreation_structured_sports (ex. fields, courts, rinks)
[recreation_structured_gathering spaces (ex. plazas)
[recreation_nonstructured (ex. walking/biking trails)
[trail systems & networks
[alternative transportation
[hierarchy of circulation (creative solutions to avoid habitat fragmentation)
[neighborhood connections
[cultural heritage_
[cultural heritage_ecological
[community unity
[efficient energy use
[feasible efficient economic land use strategies -TBD
[adaptive management

solutions

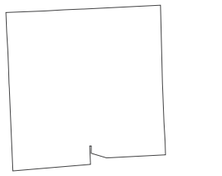
HYDROLOGY

ECOLOGY

CIVIC AMENITY

ECONOMIC

studyarea



CASS

argusville	2560.65274
reilies acres	320.82212
north river	35.35728
mapleton	2503.3699
oxbow	261.83059
kindred	924.7076
davenport	158.97206
briarwood	84.74632
harwood	771.37414
frontier	109.93365
west fargo	9701.61997
prairie rose	25.59238
fargo	30752.53364
fargo et	17899.753
horace	6964.73221

total acreage~73076

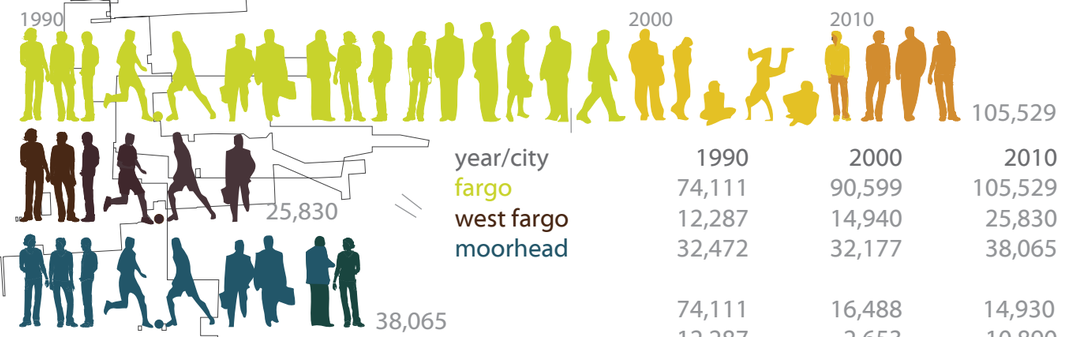
CLAY

felton	648.593671
georgetown	650.556007
glydon	926.117521
sabin	289.453649
comstock	147.813195
dilworth	2055.383293
moorhead	12621.53659

total acreage~17339

MUNICIPAL

total acreage~90415



year/city	1990	2000	2010
fargo	74,111	90,599	105,529
west fargo	12,287	14,940	25,830
moorhead	32,472	32,177	38,065
	74,111	16,488	14,930
	12,287	2,653	10,890
	32,472	-295	5,888

site issues

- flooding
- water supply
- water quality
- mass wasting
- soil eroision
- ecological extinction
- unplanned sprawl
- poor design
- waste public space

"No snowflake in an avalanche ever feels responsible."

Stanisław Jerzy Lec,
poet & aphorist

FLOODING

memorial bridge
fargo/moorhead border

http://farm4.staticflickr.com/3594/3395342393_49bbbf5c46_o.jpg

WATER SUPPLY

west fargo aquifer
buffalo aquifer

http://www.merchantcircle.com/directory/ND-West-Fargo/cityphotos/4

WATER QUALITY

aquifers, streams
drainage ditches

http://www.merchantcircle.com/directory/ND-West-Fargo/cityphotos/4

SLOPE STABILITY

soil structure
water ways

http://www.ndsu.edu/fargo_geology/mass_wasting/slumptyp
http://www.ndsu.edu/fargo_geology/mass_wasting/creep

SOIL EROSION

water
wind

http://www.ndsu.edu/fargo_geology/mass_wasting/slumptypes.htm
http://www.ndsu.edu/fargo_geology/mass_wasting/creep&flow.htm

ECOSYSTEM EXTINCTION

tallgrass prairie
wetland

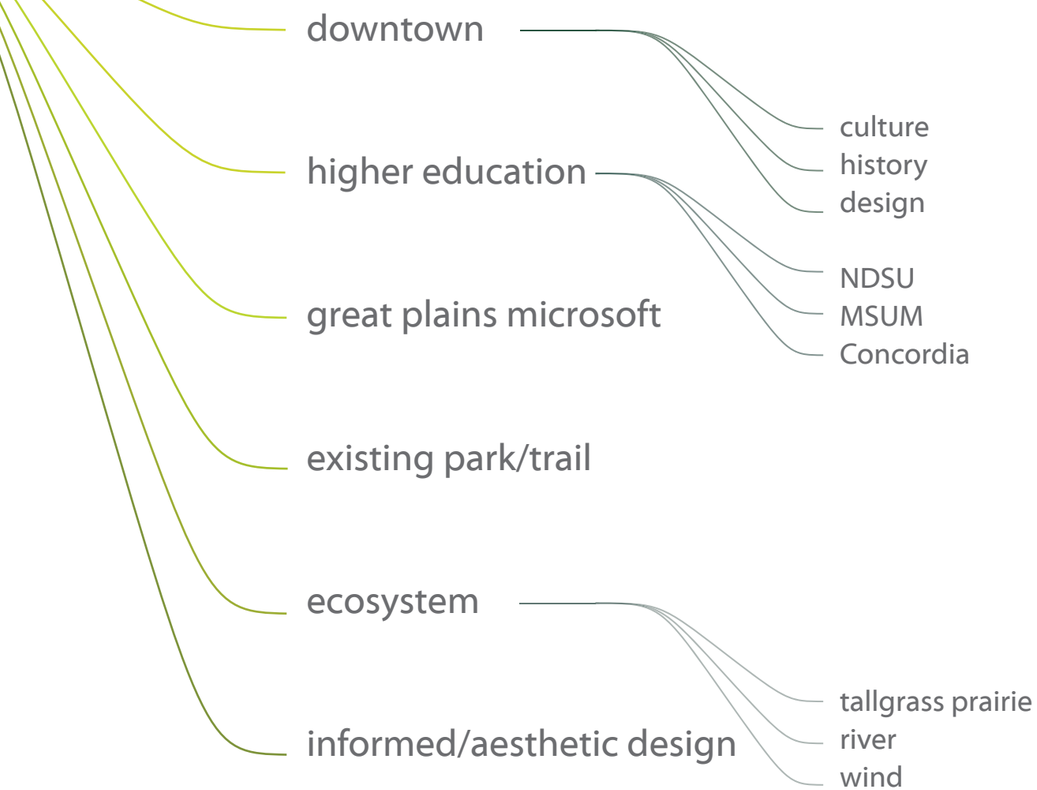
http://www.midwestliving.com/travel/destination/illinois/illinois-midewin-national-tallgrass-prairie/

POOR PLANNING & DESIGN

http://www.theoildrum.com/story/2006/3/18/174032/731

http://www.marketingpilgrim.com/2011/08/cup-of-joe-honking-at-red-lights-on-a-hot-day.html

site opportunity



"Let everyone sweep
in front of his own door, and
the whole world will be clean."

Johann Wolfgang von Goethe,
German Playwright, Poet, Novelist and Dramatist

DOWNTOWN

design, culture, history

http://www.midwestliving.com/travel/destination/illinois/illinois-midewin-national-tallgrass-prairie/

HIGHER EDUCATION

ndsu, msum, concordia

http://www.midwestliving.com/travel/destination/illinois/illinois-midewin-national-tallgrass-prairie/

INTELLECTUAL INDUSTRY

great plains microsoft,
sanford health

http://microsoft.areavoices.com/2011/06/04/little-gem-on-the-prairie-inside-the-microsoft-campus/

EXISTING PARK & TRAIL

fargo, moorhead,
west fargo

http://www.liveworkdream.com/2007/07/30/fargo-its-not-what-youd-expect/

ECOSYSTEM

tallgrass prairie,
wind, river

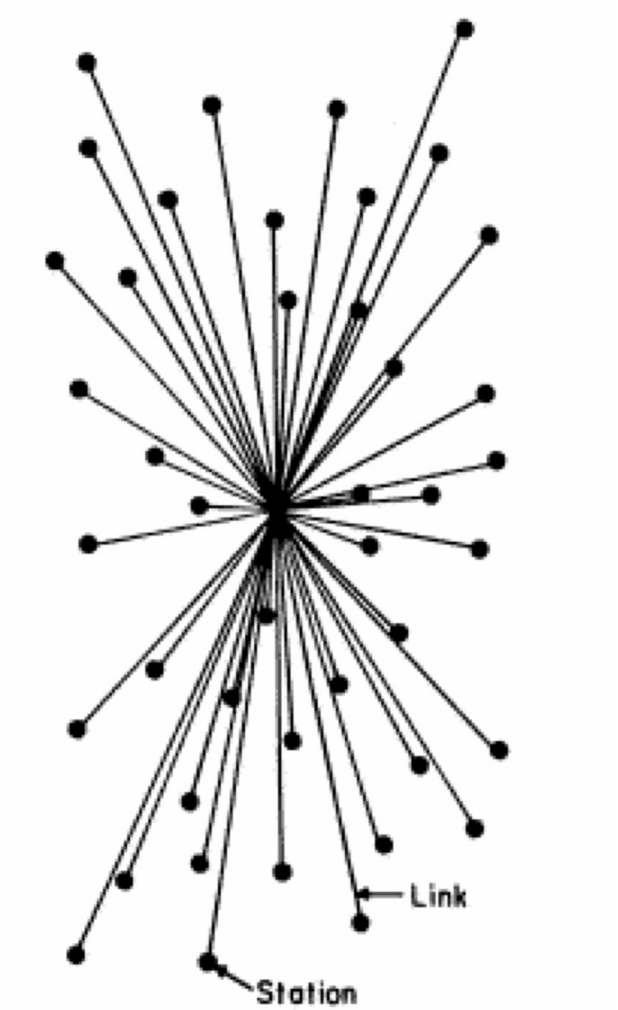
http://www.midwestliving.com/travel/destination/illinois/illinois-midewin-national-tallgrass-prairie/

INFORMED DESIGN

tallgrass prairie,
wind, river

http://www.midwestliving.com/travel/destination/illinois/illinois-midewin-national-tallgrass-prairie/

from this...



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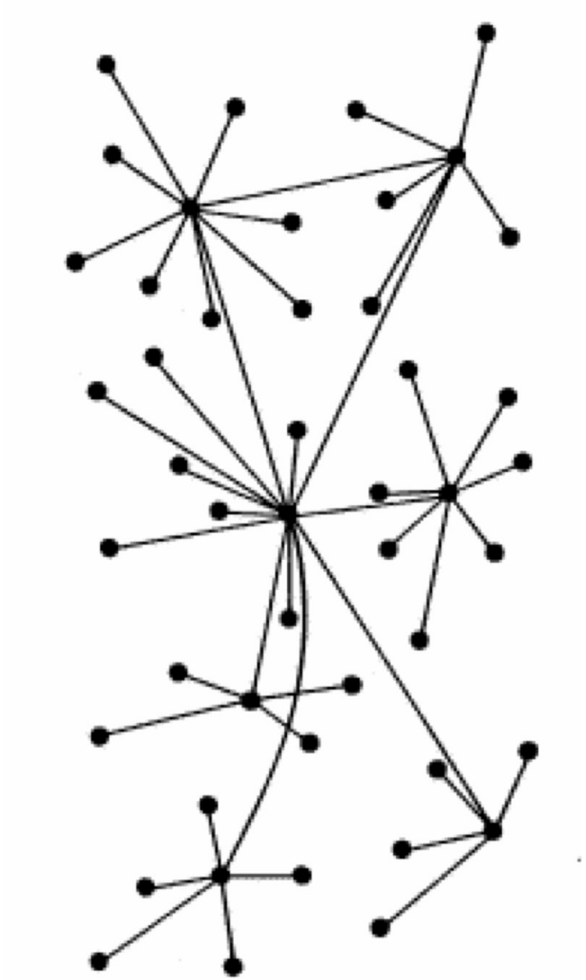
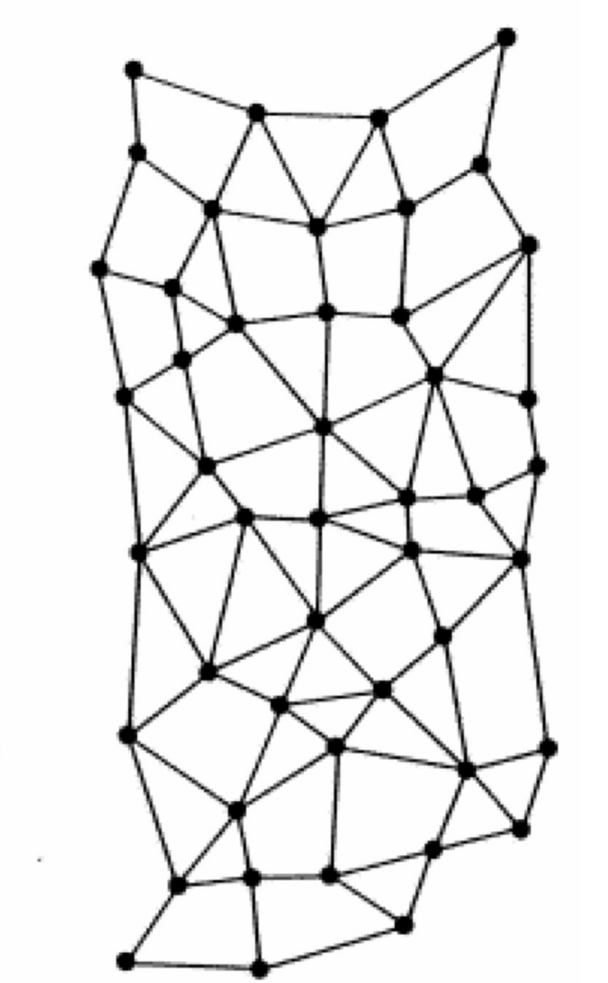
(A)



DECENTRALIZED
(B)

to this



DISTRIBUTED
(C)

data/picture source

theoretical postulate

Joseph Paxton// Birkenhead Park_1842
Community public parks.
Landscape Gardening Movement moved parks from private to public when two streams of progress converged,the rapid growth of technology, and an increased demand for better living and working conditions.

"...a judicious expenditure for such objects is always a wise and safe investment."
-Horace Cleveland,
on the Minneapolis/St. Paul park system

Horace Cleveland// Minneapolis & St. Paul_1872
"The subject of public improvements in the form of parkways is sure in its first inception to meet with opposition."

"...there was a unity in this complication. ...one single question with many parts... The one great central problem...the [wise] use of the earth for the good of man."
-Gifford Pinchot,
Head of US Forest Service

" Compare the two maps one showing the opportunity, the other the miserable present result. Do not the facts speak for themselves?"
-Charles Eliot,
on Boston's lack of conservation

<1800 1842 1870 1900 2010>

royal parks > *city parks* >> *park systems* >>> *national/state parks* >>>> *town planning* >>>>> *working landscapes* >>>>>>

recreation > public health >> preservation >>> conservation & economics >>>> sustainability >>>>> resilience >>>>>>

Public Health_ 1870
Massachusetts Board of Health:
"all citizens have an inherent right to the enjoyment of pure and uncontaminated air, and water, and soil, that this right should be regarded as belonging to the whole community, and that no one should be allowed to trespass upon it by his carelessness and avarice" (Wellock, 2006). The Report on the Sanitary Conditions of the Labouring Population of Great Britain by Edwin Chadwick in 1842 emphasized medical authorities advocating more city parks to "absorb deleterious gases." Parks, reformers concluded, were the "lungs of the city" and promoted health (Wellock, 2006).

"In the ten years succeeding...Central Park the increased valuation of taxable property in the... surrounding it was no less than $54,000,000, affording a surplus…sufficient... to pay the entire cost of the park in less times than was required for its construction."

"...securing the areas that are needed before they become so occupied or acquire such value as to place them beyond reach. Look forward for a century...when the city has a population of a million...They will have wealth enough...but all their wealth cannot purchase a lost opportunity"

"...evident that St. Paul and Minneapolis ...will become virtually one city...they should unite in the designing...the area which now separates them, by which they are to be mutually benefitted" (Newton, 2006).

Ebenezer Howard//"Garden City"_1898
"Neither the Town magnet nor the Country magnet represents the full plan and purpose of nature.

Human society and the beauty of nature are meant to be enjoyed together. The two magnets must be made one... Town and country must be married, and out of this joyous union will spring a new....civilization" (Newton, 2006).

data/picture source

anthropocene

zones

mosaic

pixels

holoscene

gr. 'holos' - 'cenos' - 'scene'

gradient

holos= 'whole/entire' *cenos*= 'new/recent'
scene= 'view/picture/where something occurs/milieu

site analysis

- ecology
- geology
- hydrology
  - water
  - flood
  - ditches
- land use
- land use
  - tallgrass prairie
  - river
  - wind
- climatology

"Knowing is not enough; we must apply.
Willing is not enough; we must do."

Johann Wolfgang von Goethe,
German Playwright, Poet, Novelist and Dramatist

workinglandscape

About a third of the endangered species in the United States make their homes in wetlands.

No other ecosystem in America removes as much carbon dioxide from the atmosphere as prairie grasslands (nps.gov, complex prairie ecosystem).

75-80% of the prairies biomass, or plant material, is underground.

Beneath the surface lies the main stems or rhizomes, running horizontally.

Here, they remain protected from drying, grazing, trampling, fire, and frost.

Tough fibrous roots descend from these rhizomes deep into the ground. Some plants have been reported to go 10 to 15 feet deep (nps.gov, complex prairie ecosystem).

Repeated Burn cycles create dark mineral and nutrient rich top soil.

Restored prairies can reclaim many of their native qualities in as little as 10 years

OPERANT DISTIRBANCE REGIMES//

drought>

fire>> 4-5yr fire regime

grazing>>>

TALLGRASS PRAIRIE ECOSYSTEM

deep roots > water infiltration >> water/sediment filtration >>> recharging groundwater stores >>>
slope stabilization >>>> erosion prevention >>>>> keeps silt from clogging streams >>>>>>

WET-MESIC

loam - silt - clay - sandy outwash
glacial till : alluvial deposits

poorly drained
high groundwater table : gleying just below the A horizon
commonly ponded: winter, spring, after heavy rain

4-5yr fire regime

headwater streams
floodplains
shallow swales

WET

silt - clay loam
glacial till : alluvial deposits

saturated > a few days a normal year
high groundwater table
soil waterlogged within root zone for
extended periods during growing season

fire,
periodic prolonged flood events

FAUNA

BIRDS summer breeding/ migration route/ yearround

blackpoll warbler Dendroica striata
Common loon Gavia immer
horned grebe Podiceps auritus
Bohemian waxwing Bombycilla garrulus
American coot Fulica Americana
American wigeon Anas Americana
American goldfinch Carduelis tristis
American bittern Botaurus lentiginosus
American redstart Setophaga ruticilla
Baird's sparrow Ammodramus bairdii
black tern Chlidonias niger
black-crowned night heron Nycticorax nycticorax
blue-winged teal Anas discors
bobolink Dolichonyx oryzivorus
burrowing owl Athene cunicluaria
common yellowthroat Geothlypis trichas
Cooper's hawk Accipiter cooperii
dickcissel Spiza Americana
downy woodpecker Picoides pubescens
evening grosbeak Coccothraustes vespertinus
gadwall Anas strepera
grasshopper sparrow Ammodramus savannarum
greater prairie-chicken Tympanuchus cupido
killdeer Charadrius vociferus
kingbird Tyrannus spp.
Lapland longspur Calcarius lapponicus
lark bunting Calamospiza melanocorys
least tern Sterna antillarum
loggerhead shrike Lanius ludovicianus
mallard Anas platyrynchos
marbled godwit Limnosa fedoa
marsh wren Cistothorus pallustris
mourning dove Zenaida macroura
northern harrier Circus cyaneus
northern pintail Anas acuta
northern shoveler Anas clypeata
olive-sided flycatcher Contopus cooperi
orange-crowned warbler Vermivora celata
osprey Pandion haliaetus
pine grosbeak Pinicola enucleator
piping plover Charadrius melodus
red crossbill Loxia curvirostra
red-headed woodpecker Melanerpes erythrocephalus
red-winged blackbird Agelaius phoeniceus
redhead Aythya americana
ring-billed gull Larus delawarensis
sedge wren Cistothorus platensis
short-eared owl Asio flammeus
snow bunting Plectrophenax nivalis
Sprague's pipit Anthus spragueii
Swainson's hawk Buteo swainsoni
upland sandpiper Bartramia longicauda
veery Catharus fuscescens
Virginia rail Rallus limicola
western meadowlark Sturnella neglecta
white-winged crossbill Loxia leucoptera
white-faced ibis Plegadis chihi
whooping crane Grus americana
willet Catoptrophorus semipalmatus
Wilson's phalarope Phalaropus tricolor
yellow warbler Dendroica petechia
yellow rail Coturnicops noveboracensis
yellow-bellied sapsucker Sphyrapicus varius
yellow-rumped warbler Dendroica coronata

INVERTEBRATES

American burying beetle	*Nicrophorus americanus*
Dakota skipper	*Hesperia dacotae*
Powesheik skipperling	*Oarisma poweshiek*
Regal fritillary	*Speyeria idalia*

FISH

Brook Stickleback	*Culaea inconstans*
Creek chub	*Semotilus atromaculatus*
Fathead minnow	*Pimephales promelas*
Johnny darter	*Etheostoma nigrum*

AMPHIBIANS/ REPTILES

Blanchard's cricket frog	*Acris crepitans blanchardi*
Cope's gray treefrog	*Hyla chrysoscelis*
Northern redbelly snake	*Storeria o. occipitomaculata*
Plains garter snake	*Thamnophis radix*
Prairie skink	*Eumeces septentrionalis*
Snapping turtle	*Chelydra serpentina*
Spiny softshell	*Trionyx spiniferus*
Tiger salamander	*Ambystoma tigrinum*

MAMMALS

Deer mouse	*Peromyscus maniculatus*
Eastern cottontail	*Sylvilagus floridanus*
White-tailed jackrabbit	*Lepus townsendii*
Northern pocket gopher	*Thomomys talpoides*
Plains pocket gopher	*Geomys bursarius*
American badger	*Taxidea taxus*
Elk	*Cervus elaphus*
American bison	*Bison bison*
Coyote	*Canis latrans*
Franklin's ground squirrel	*Spermophilus franklinii*
Gray fox	*Urocyon cinereoargenteus*
Jumping mice	*Zapus spp.*
Meadow jumping mouse	*Zapus hudsonius*
Least weasel	*Mustela nivalis*
Little brown myotis	*Myotis lucifugus*
Long-tailed weasel	*Mustela frenata*
Meadow voles	*Microtus pennsylvanicus*
Mink Mustela vison	*mink Mustela vison*
Mule deer	*Odocoileus hemionus*
Muskrat	*Ondatra zibethicus*
Prairie vole	*Microtus orchrogaster*
Red fox	*Vulpes vulpes*
Richardson's ground squirrel	*Spermophilus richardsonii*
Striped skunk	*Mephitis mephitis*
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
White-tailed deer	*Odocoileus virginianus*

FLORA

GRAMINOID

WET	
Big Bluestem	*Andropogon gerardi*
Prairie Cordgrass	*Spartina pectinata*
Mat Muhly Grass	*Muhlenbergia richardsonis*
Narrow Reedgrass	*Calamagrostis stricta*
Wooly Sedge	*Carex pellita*
Switchgrass	*Panicum virgatum*

MESIC	
Big Bluestem	*Andropogon gerardi*
Prairie Dropseed	*Sporobolus heterolepis*
Indian Grass	*Sorghastrum nutans*
Little Bluestem	*Schizachyrium scoparium*
Prairie Cordgrass	*Spartina pectinata*
Kalm's Brome	*Bromus kalmii*
Switchgrass	*Panicum virgatum*
Porcupine Grass	*Stipa spartea* (important on drier site

FORB

Prairie Loosestrife	*Lysimachia quadriflora*
Northern Bedstraw	*Galium boreale*
Tall Meadow Rue	*Thalictrum dasycarpum*
Wild Strawberry	*Fragaria virginiana*
Golden Alexanders	*Zizia aurea*
Black-eyed Susan	*Rudbeckia hirta*
White Camas	*Zigadenus elegans*
New England Aster	*Symphyotrichum novae-angliae*
Sawtooth Sunflower	*Helianthus grosseserratus*
Cowbane	*Oxypolis rigidior*
Mountain Mint	*Pycnanthemum virginianum*
Culver's Root	*Veronicastrum virginicum*

Northern Bedstraw	*Galium boreale*
Purple Prairie Clover	*Petalostemon purpureum*
Canada Goldenrod	*Solidago canadensis*
Heath Aster	*Aster ericoides*
Rigid Goldenrod	*S. rigida*
Maximilian Sunflower	*Helianthus maximiliani*
Heart leaved Golden Alexanders	*Zizia aptera*
Black-eyed Susan	*Rudbeckia hirta*
Tall Meadow Rue	*Thalictrum dasycarpum*
Smooth Aster	*Aster laevis*
Wild Strawberry	*Fragaria virginiana*
White Camas	*Figadenus elegans*
Mountain Mint	*Pycnanthemum virginianum*
Golden Alexanders	*Zizia aurea*
Harebell	*Campanula rotundifolia*
Wild Bergamot	*Monarda fistulosa*
Flodman's Thistle	*Cirsium flodmanii*
Hoary Puccoon	*Lithospermum canescens*
Stiff Sunflower	*Helianthus rigidus*
Rough Blazing Star	*Liatris aspera*
Pale Spiked Lobelia	*Lobelia spicata*
Wood Lily	*Lilium philadelphicum*
Prairie Onion Allium	*Allium stellatum*
Wild Licorice	*Glycyrrhiza lepidota*
Smooth Rattlesnake-root	*Prenanthes racemosa*
Grass-leaved Goldenrod	*Solidago graminifolia*
Wood Betony	*Pedicularis canadensis*
Indian Paint Brush	*Castilleja coccinea*
Downy Phlox	*Phlox pilosa*
White Prairie Clover	*Dalea candidum*
White Sage	*Artemisia ludoviciana*

SHRUB

Slender Willow	*Salix petiolaris*
American Willow	*Salix discolor*

TREE

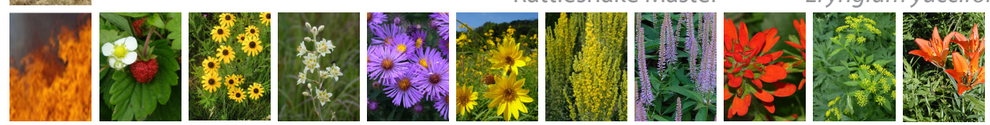
Silver Maple	*Acer saccharinum*
Elm	*Ulmus Americana*
Cottonwood	*Populus deltoides*
Willow	*Salix alba*

SEMI-SHRUB

Prairie Rose	*Rosa arkansana*
Fragrant False Indigo	*Amorpha nana* (common on moister
Leadplant	*Amorpha canescens* (shrub/legume)

SHRUB

Canada Wildrye	*Elymus canadensis*
Compass Plant	*S. lacinatum*
Fringed Gentian	*Gentianopsis crinata*
Prairie Panic Grass	*Panicum leibergii*
Sawtooth Sunflower	*Helianthus grosseserratus*
Pale Purple Coneflower	*Echinacea angustifolia* (common on d
Prairie Bird-foot Violet	*Viola pedatifida*
Alumroot	*Heuchera richardsonii*
Prairie Cinquefoil	*Potentilla arguta*
Missouri Goldenrod	*S. missouriensis*
Bicknell's Sedge	*Carex bicknellii*
Rattlesnake Master	*Eryngium yuccifolium*



climatology

//Northern hemisphere_northern temperate zone_humid continental

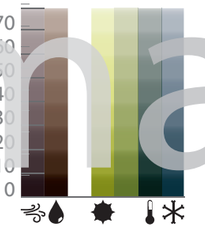
average sunshine (hrs) 15 13 11 9 7 5 3 1 0

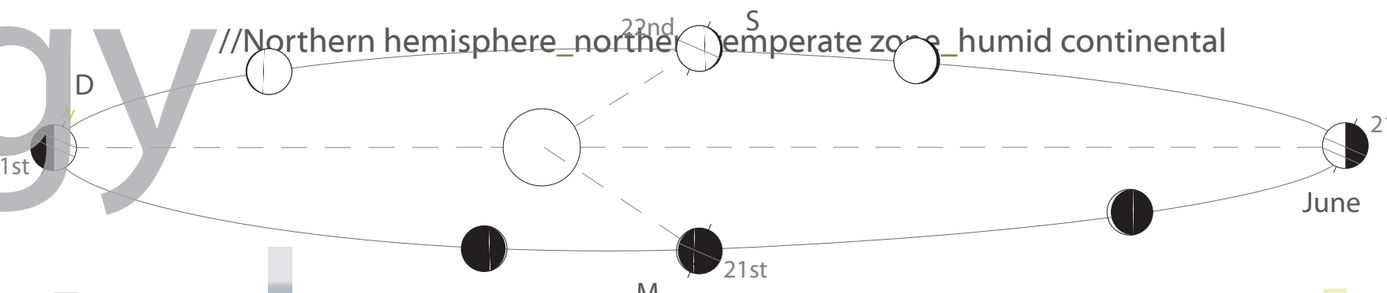
average wind speed (mph) 3-9 9-15 15-21 21-27

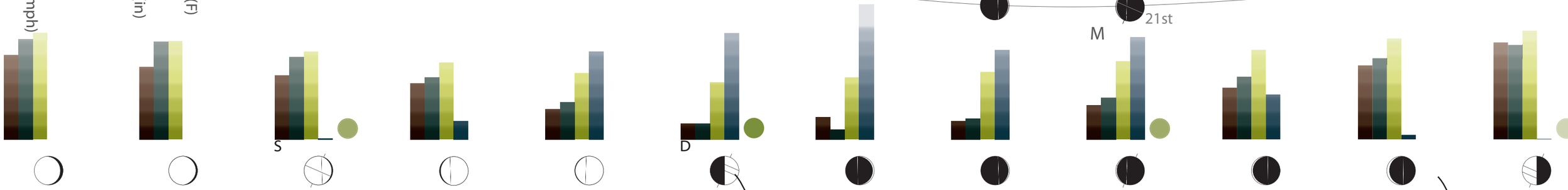
average snowfall (in) 7 6 5 4 3 2 1 0

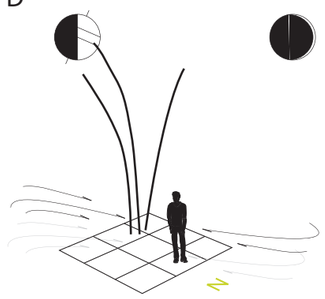
average perciptation (in) 3.5 3 2.5 2 1.5 1 0.5 0

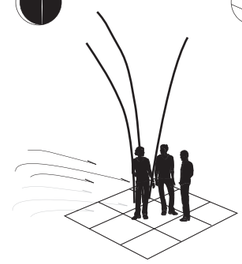
average temperature (F) 70 60 50 40 30 20 10 0

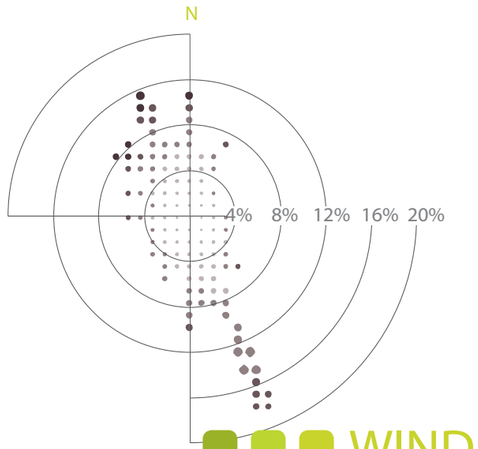




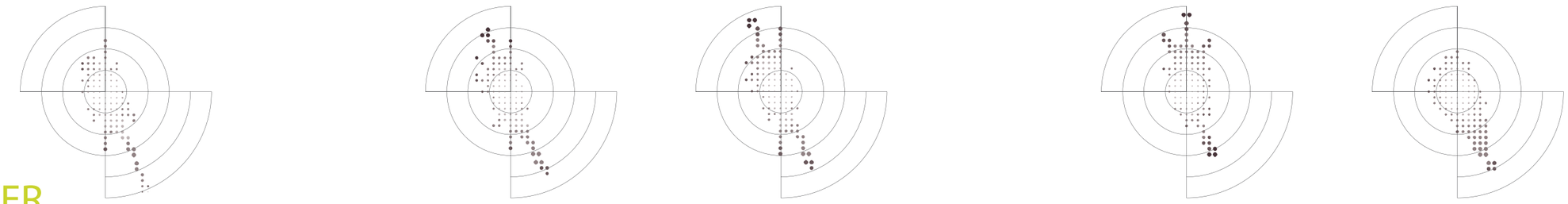






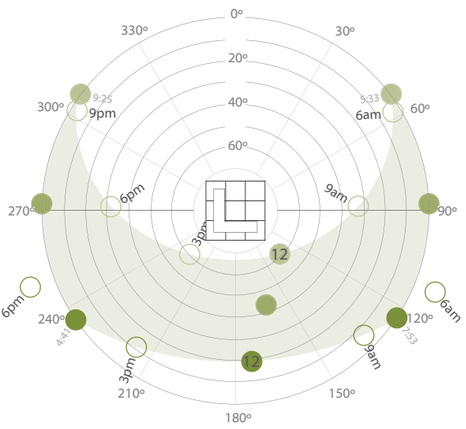


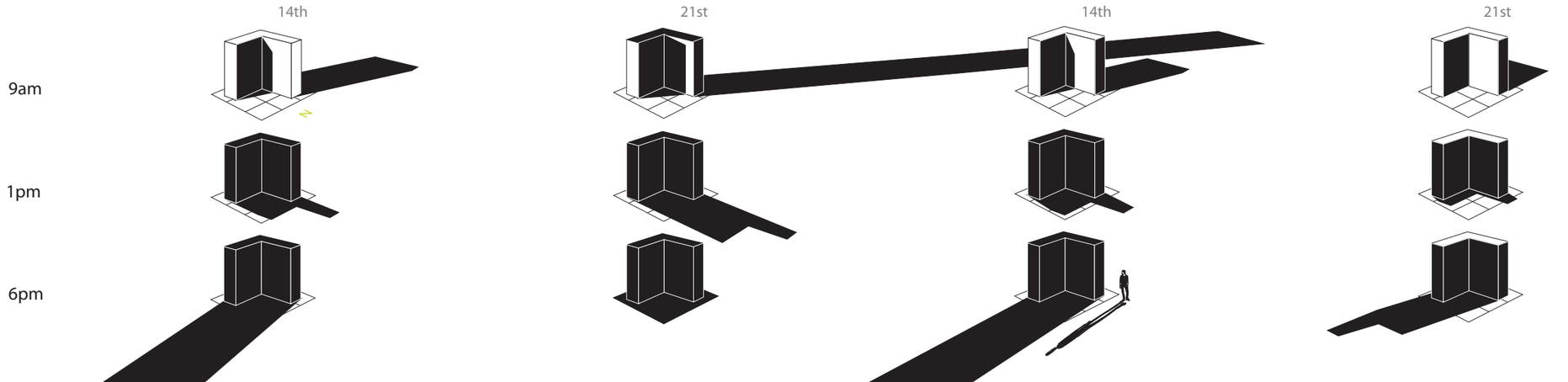
summer winds > September November < winter winds > February May <



WIND POWER

season > August < fall season > November < winter season > March < spring season > May < summer

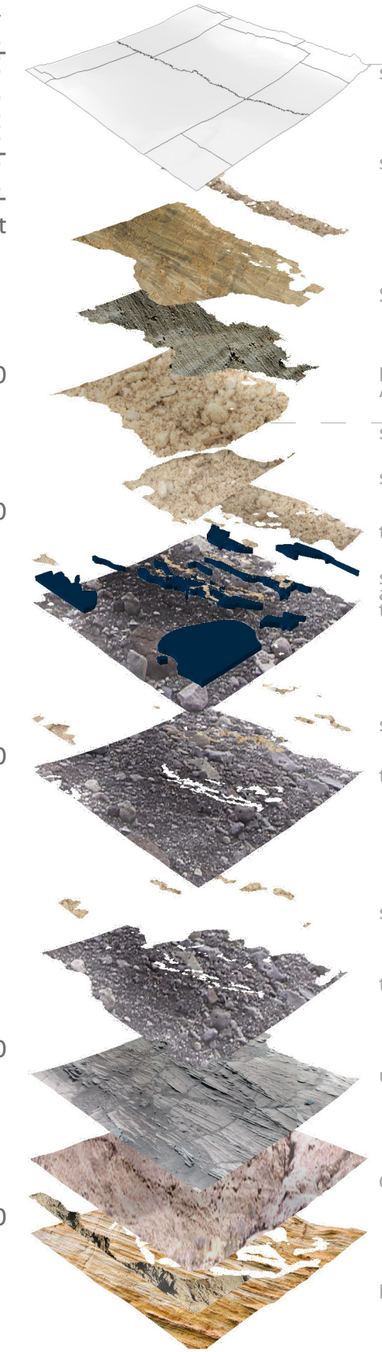




geology

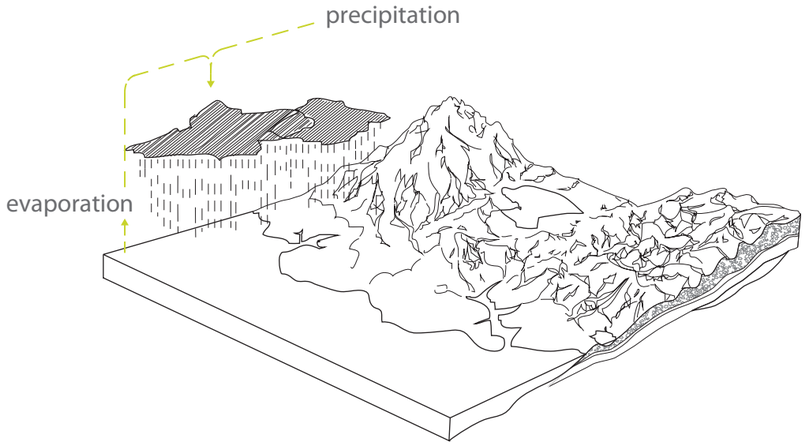
//Glacial movement_glacial melt_soil depth & composition
/long-term drought water supply
/sustainable water resources use

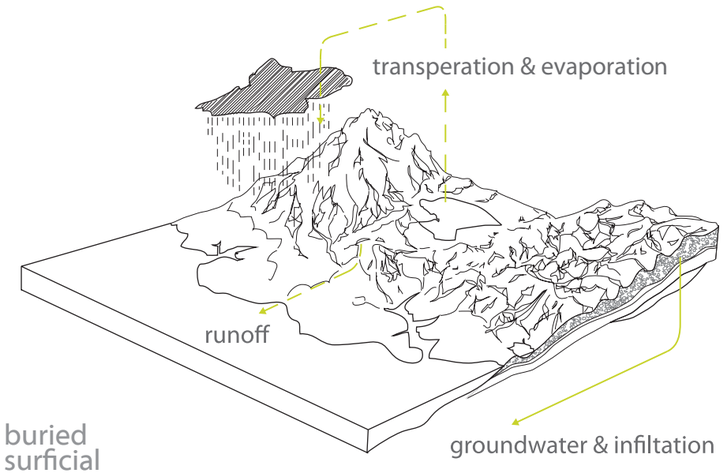
SURFICIAL GEOLOGY



			glacial	river	lake	
			outwash	overbank	offshore	
surface						caisson depth
sands	holocene				Qlg	
Oahe Fm.				Qha		
Sherack Formation Poplar River Fm. W.Fargo Mbr. Harwood Mbr.					Qlo Qpwf Qph	
Brenna Formation Argusville Formation					Qb Qarg	
sediment			Qrs			
sediment				Qro		
till			Qus			
sand & gravel aquifers till				Qgo		
			Qgs			
sand & gravel	pleistocene	QUATERNARY				
till					Qoo	
			Qos			
sand & gravel						
till			Qts		Qto	
undivided bedrock		CRETACEOUS				
Cretaceous bedrock						
Pre-Cretaceous bedrock						

SURFICIAL GEOLOGY



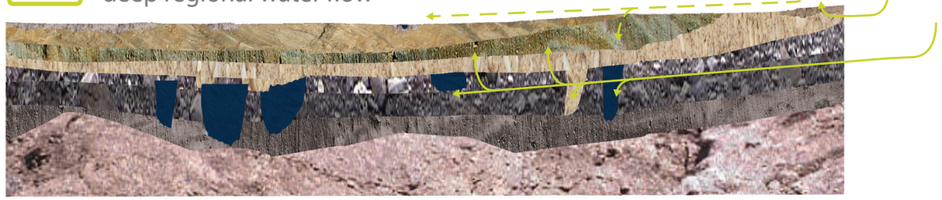


West Fargo Aquifer	415 bgals	buried
Moorhead		surficial
Buffalo Aquifer	250 bgals	surficial

SECTION

near surface water flow

deep regional water flow



workinglandscape

DATASTREAM>>>>>>>>>>>>>>>>>>>>

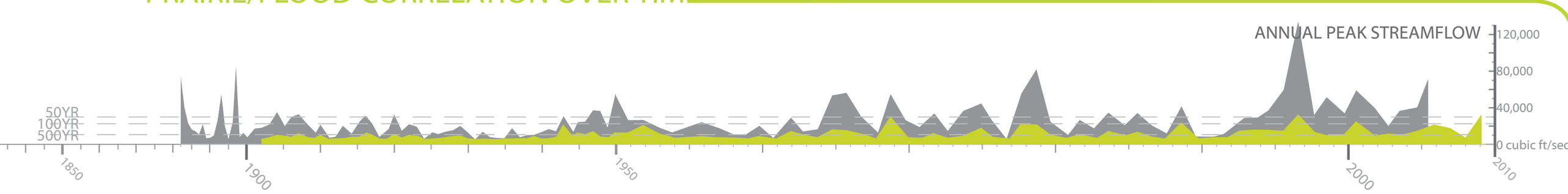
	average monthly water use	average monthly water system losses
FARGO		
1996	440	120.1
1997	326	49.6
1998	421	12.3
1999	361	39.3
2000	420	29.9
2001	415	21.1
total	~2383	~366.4 millions of gal.

These water losses are attributed to pipe leaks>>
Distance transport suggested by the Red River Valley Water Supply Project would be far more expensive in losses and construction than acquiring land for a high performance 'Wetland Recharge' landscape.
Bureau of Reclamation's solutions range:
$28,240,000 - 150,711,000

TALLGRASS PRAIRIE ECOSYSTEM

Location	Past area (ha.)	Current area (ha.)	**Decline (%)**
Manitoba	600,000	300	99.9
Minnesota	7,300,000	30,000-60,000	99.2-99.6
North Dakota	130,000	120	99.9

PRAIRIE/FLOOD CORRELATION OVER TIME



1800
One of the biggest wetland areas in the world was from Manitoba/Dakotas to Ontario/Ohio (McNeill, 2000).

settlement> landform > *prairie grasses removed>>* climate >> *fields ploughed>>>* limited waterholding/slowing vegetative cover >>> *drainage ditches>>>>* impervious surfaces >>>>

1870
American farmers drained 17 million hectares of wetland, United States drained half (McNeill, 2000).

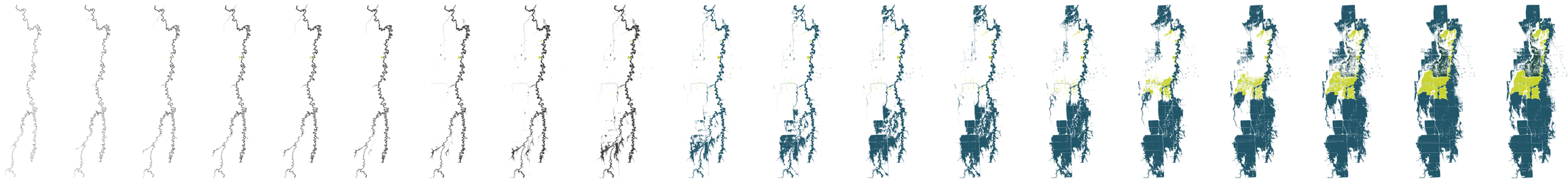
drainage tiles>>>>> encouraged drainage >>>>> *increased runoff>>>>>>* upstream development >>>>>>

FLOOD STAGES
- flooding
- ponding
- protected

- floodwall
- levee [constructed]
- levee [earthen]
- levee [sandbag]

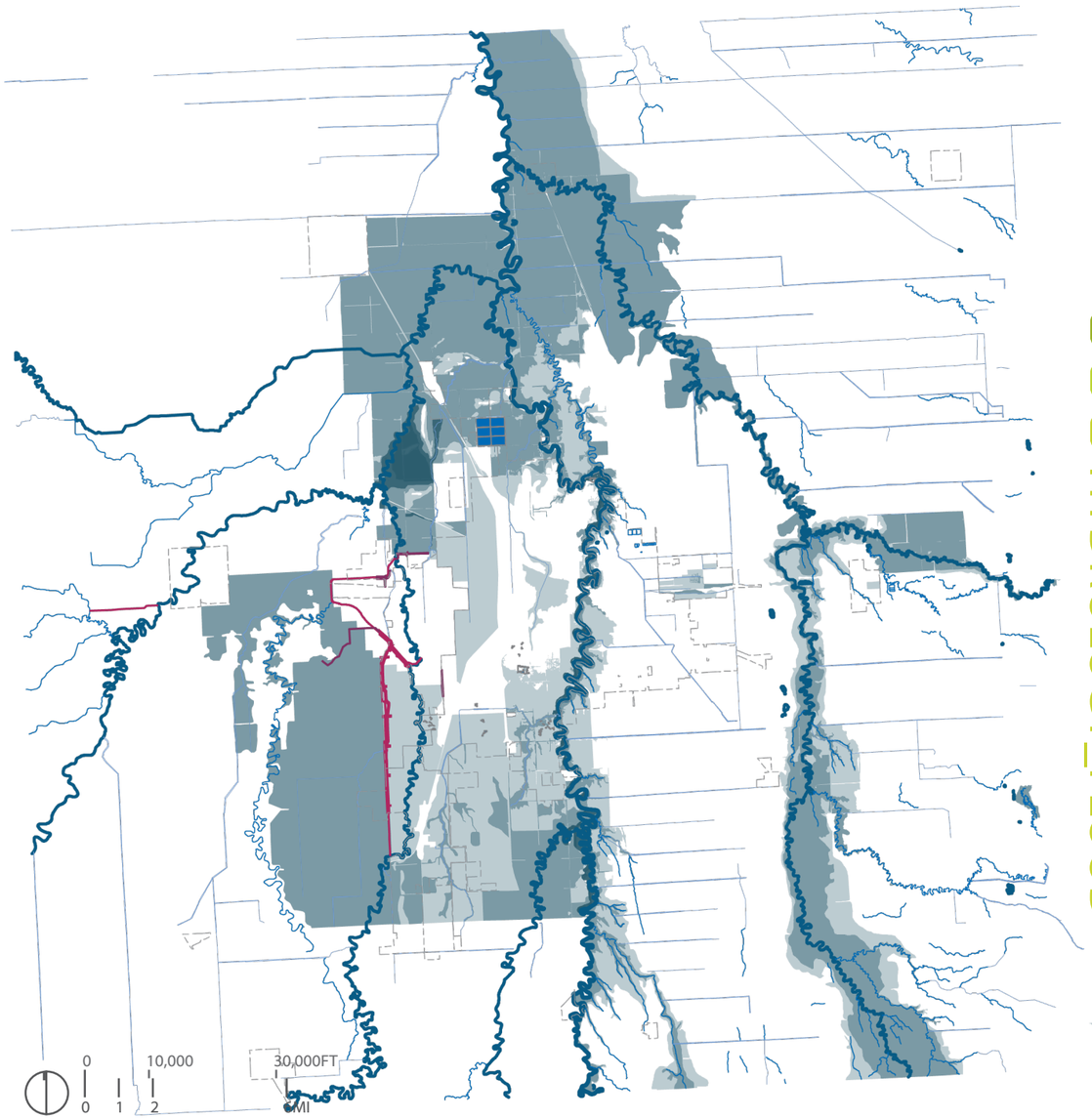
0 40,000FT
0 6MI

Channelization = fewer floods + invites people to settle in floodplains . . when it does flood causes = > damage + damages alluvial ecosystems ex. 1990_Mississippi had 26 dams 1993_flood $12 billion in damage



hydrology

//Red River Basin_~45,000 sq mi
/flood control
/water quality control



HYDROLOGY_FLOOD

RED RIVER
Whapeton, ND USA Elv. 948
Lake Winnipeg, ON Canada Elv. 712

Elv. Change 223ft

FLOOD
base 34103
prelim 285
brkout 3269
100yr 70401
500yr 34102

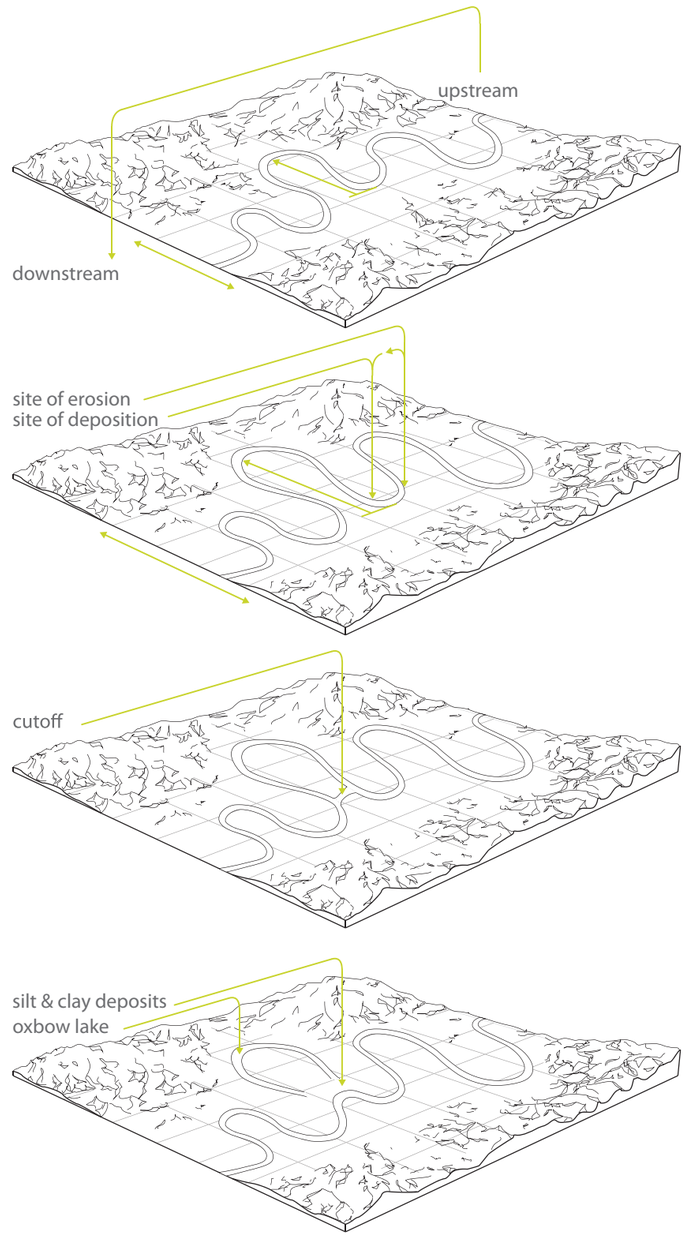
total 142160 acres

Annual Fargo-Moorhead metropolitan flood damages est. **$194.8 million**

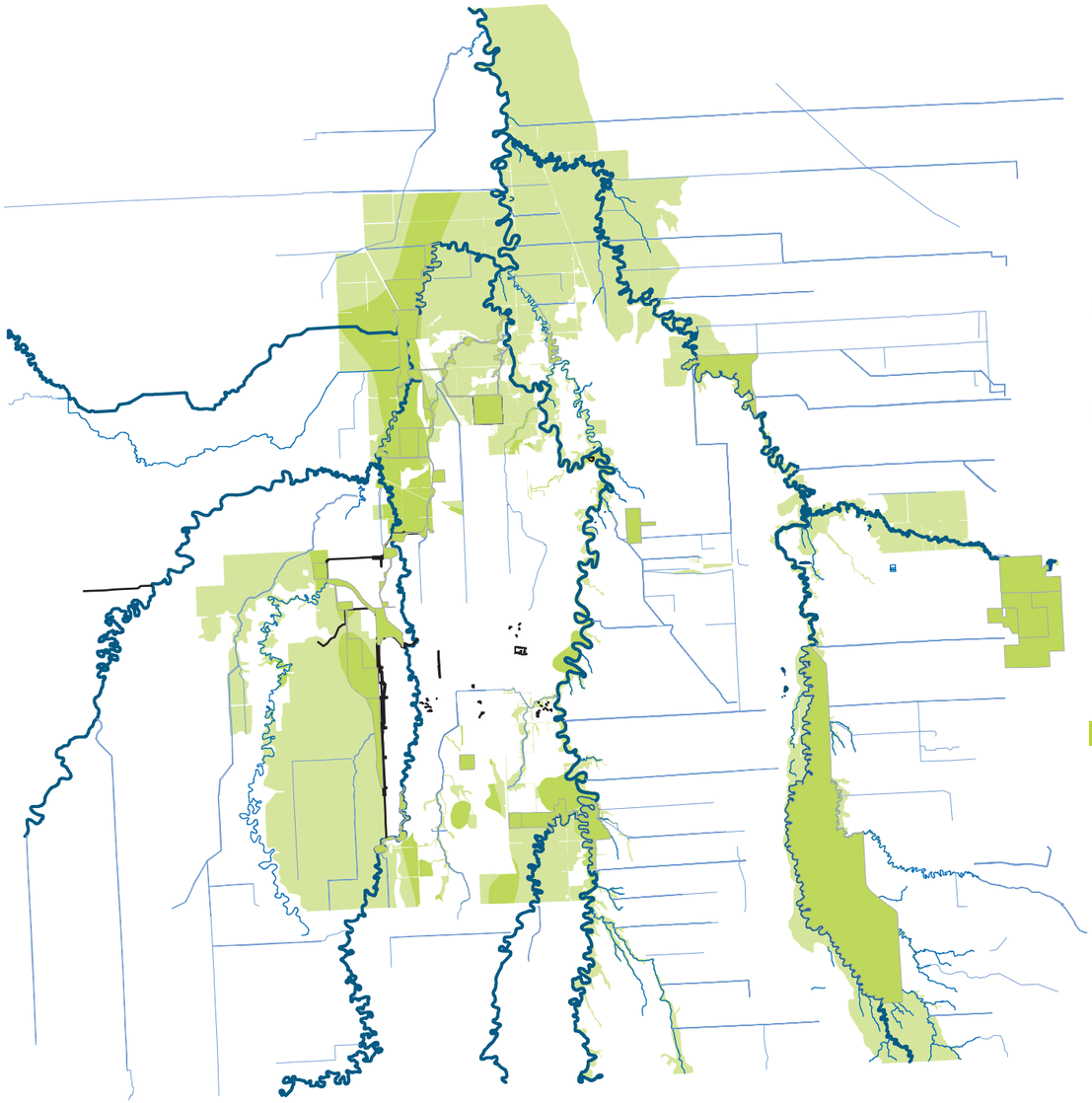
2011 Fargo submitted FEMA claims of **$5.9 million**. This is not a Federal problem and should not grant federal aid. This is an annual issue that locals need to solve, financed out of their own community for choosing to live in a floodzone

Army Corps of Engineers flood solutions range:
$1,032 - 1,462 million
All alternatives consist of a **>24 mile ditch** often concrete

Rochester, MN solved a similar problem with a park system and limited hard infrastructure for **$140 million**



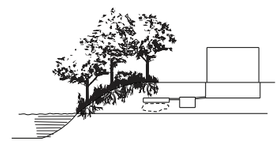
HYDROLOGY_DRAINAGE



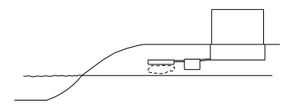
MASS WASTING _riverbank slumping

Development
>added weight
>increases runoff

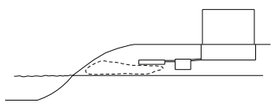
>septic install
>water adds weight
weakening soils



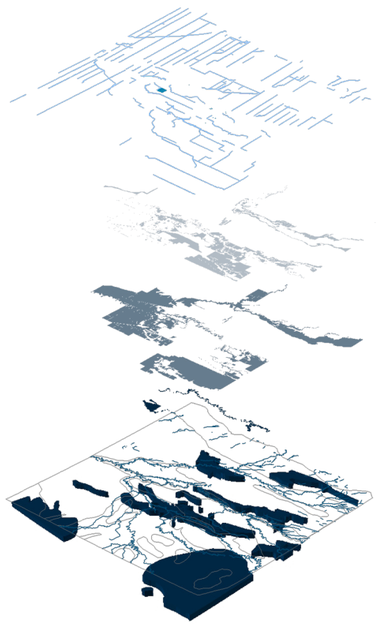
>>ground water builds
>added weight

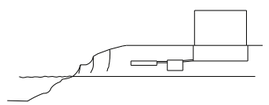


>>>native vegetation removal
>deep rooted plant removal
reduces slope stability
>reduces infiltration
>increases rate of runoff

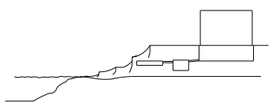


>>>>vegetation removal
>soil saturates with no
plants take water

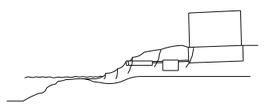




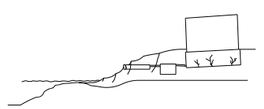
>Riverbank begins to slump



>>further slumping



>>>foundation shifts



>>>>foundation cracks

>>>>>house removed

The stratigraphic relationships of offshore lacustrine Sherack and Brenna Formations cause engineering and environmental geologic problems in combination with hydraulic movement.

workinglandscape

1 acre of established prairie can **absorb 9" of rainfall/hr** before runoff occurs, and will intercept as much as **53 tons of water** during a 1-inch per hour rain event (Tallgrass Prairie Restorations, LLC).

In IL, est. percentage increase in wetland area reduces downstream peak flows 3.7% average flood flows 1.4%. Study of sub-watersheds of the Mississippi River found: **deep wetlands reduce flood peaks 1-23%, shallow wetlands 5-9%.**

In Minnesota, wetland restoration costs range $95 -30,000 per acre

. · . restoring the entire acreage of Fargo to wetland would cost half as much as the proposed diversion

TALLGRASS PRAIRIE ECOSYSTEM

DATASTREAM>

drainage ditches_cass 31.97
drainage ditches_clay 1033.09

total 135.6 miles

classified as threatened
ammonia
biological oxygen demand
dissolved oxygen
fecal coliform bacteria
sulfate concentration

agricultural chemicals
Atrazine:
average annual use 2.152-9.855 lbs/sq. mi

lethal:750 mg/kg in rabbits

Endosulfan:
average annual use 0.26 lbs/sq. mi
lethal: 35 mg/kg in humans
(usgs.gov)

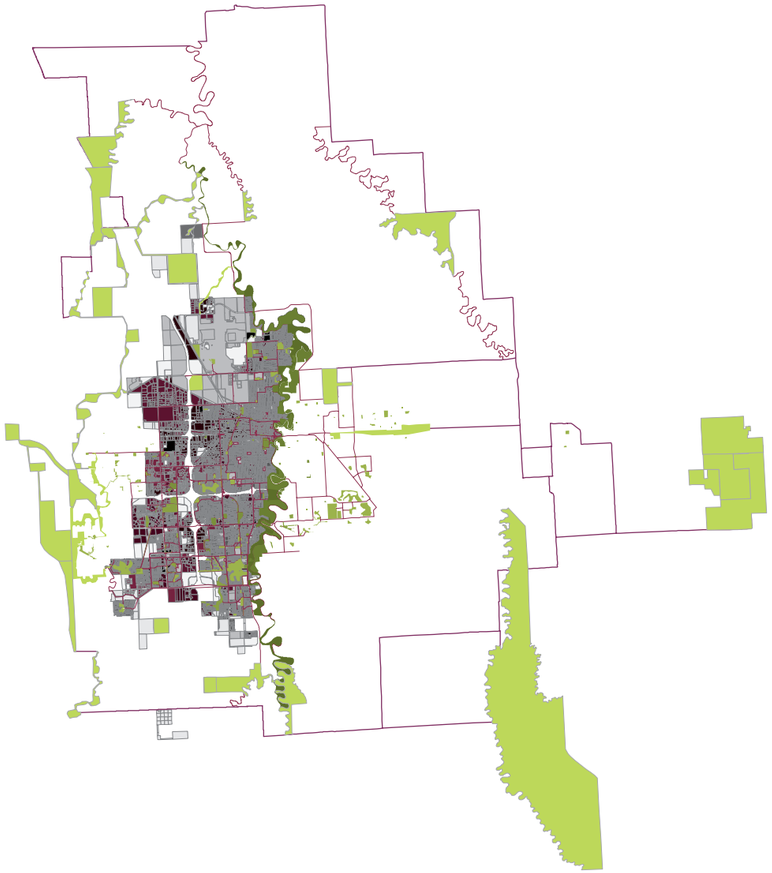
The United State pays around $20 billion per year in Agricultural subsidies.

Wind and flood erosion in the area removes the nutrient rich black topsoil formed by the prairie fire regime, requiring increasing dependence on fertilizers, in turn polluting waterways.

Decaying prairie plants assimilated nutrients and returned them to the ground, creating rich, dark soils

"sustainable and effective management of water resources demands a holistic approach - linking socioeconomic development with the protection of natural ecosystems and appropriate management links between land and water uses."
World Meteorological Organization, 2011

land use/transport



LAND USE & ZONING

SCHEMATIC PLAN

0 10,000 30,000FT
0 1 2 6MI

boundary_ site
municipal

water_ river
stream
drainage ditch

built_ channel/levee
manmade water

o/l_ 100YR
100YR/aquifer

0 10,000 30,000FT
0 1 2 6MI

Ru Rural Park System

preventative_

highly functional tallgrass prairie wetland ecological parks

1. Wastewater Wetland Park Sub-System
2. West Aquifer Park Sub-System
3. Buffalo Aquifer Park Sub-System

1. Rural to Suburban transition parks

Su Suburban Park System

mitigative_

neighborhood park with integrated wetland functions

2. Neighborhood parks

3. Suburban to Urban systems

Ur Urban Park System

interpretive_

wet tallgrass prairie functions integrated into highly structured spaces

1. Urban parks
2. Urban river parks

SCHEMATIC ANALYSIS

0 10,000 30,000FT

0 1 2 6MI

Ur

Su

Ru

grey material

grey fabric

structure

educational
(describing process)

interpretive

Reniassance Zone aesthetic

mitigative

green material

green fabric

ecology

functional
(programming process)

ecological

Great Plains Microsoft aesthetic

Ru Rural Park System

preventative_

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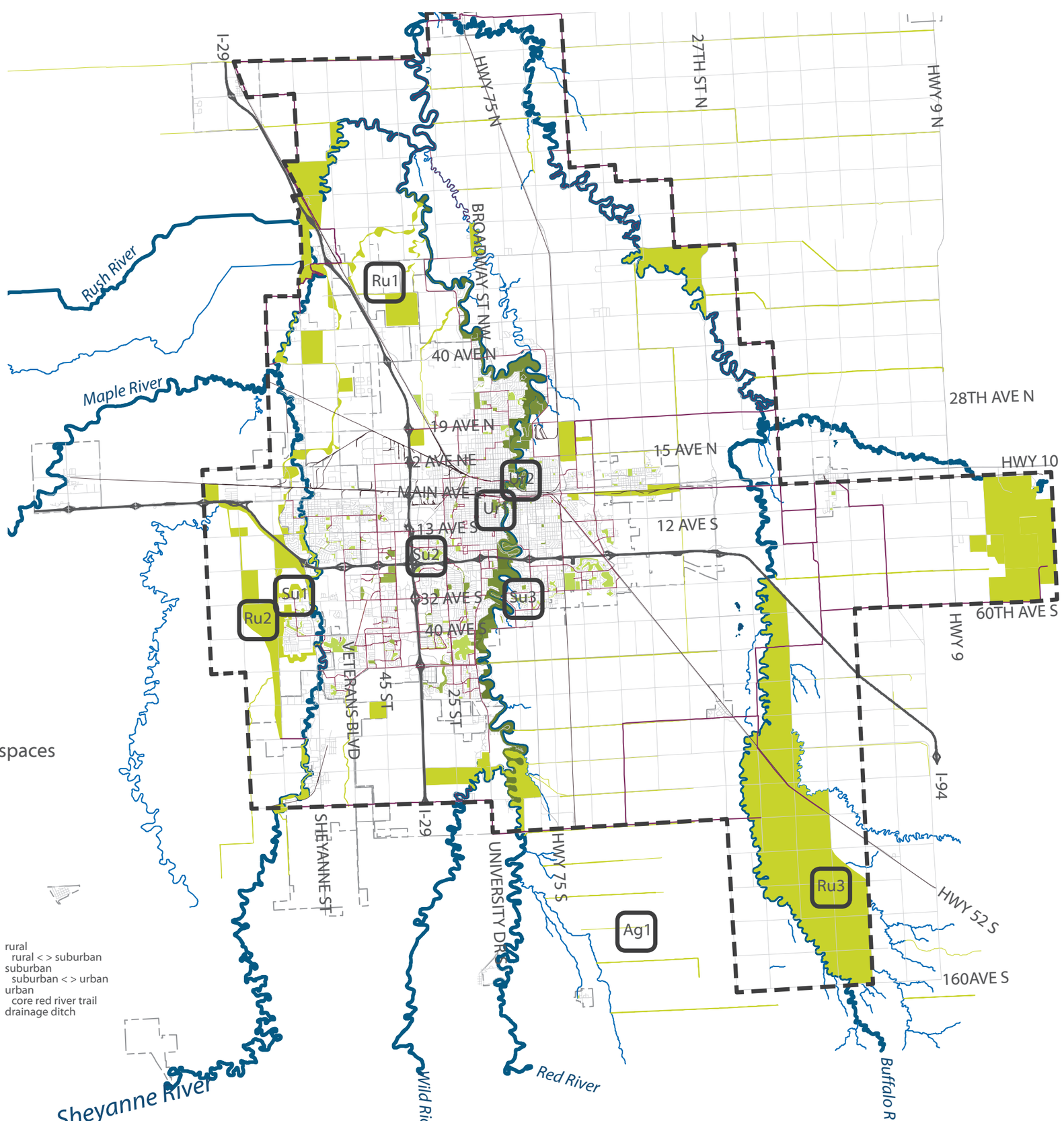


boundary_ site
municipal

street_ arterial
collector
local
rail

water_ river
stream

trail_ w/ snowmobile trails [Ag a]
w/ street/sidewalk [Ag b]

park_ rural
rural < > suburban
suburban
suburban < > urban
urban
core red river trail
drainage ditch

0 10,000 30,000FT

0 1 2 6MI

Ru Rural Park System

preventative_

highly functional tallgrass prairie wetland ecological parks

1. Wastewater Wetland Park Sub-System
2. West Aquifer Park Sub-System
3. Buffalo Aquifer Park Sub-System

1a RURAL PARK ENTRY SIGNAGE (typ.)

n.t.s.

boundary_ site
municipal

street_ arterial
collector
local
rail

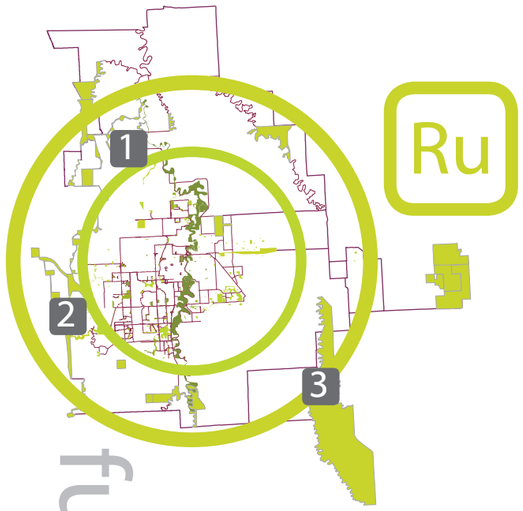
water_ river
stream

trail_ w/ snowmobile trails [Ag a]
w/ street/sidewalk [Ag b]

park_ rural
rural < > suburban
suburban
suburban < > urban
urban
core red river trail
drainage ditch

0 10,000 30,000FT

0 1 2 6MI



functional

Buffalo Aquifer Park

preventative_highly functional tallgrass prairie wetland ecological parks

PROGRAM

walking/running
dog walking
hiking
biking
horseback riding
canoeing (water level dependent)
kayaking (water level dependent)

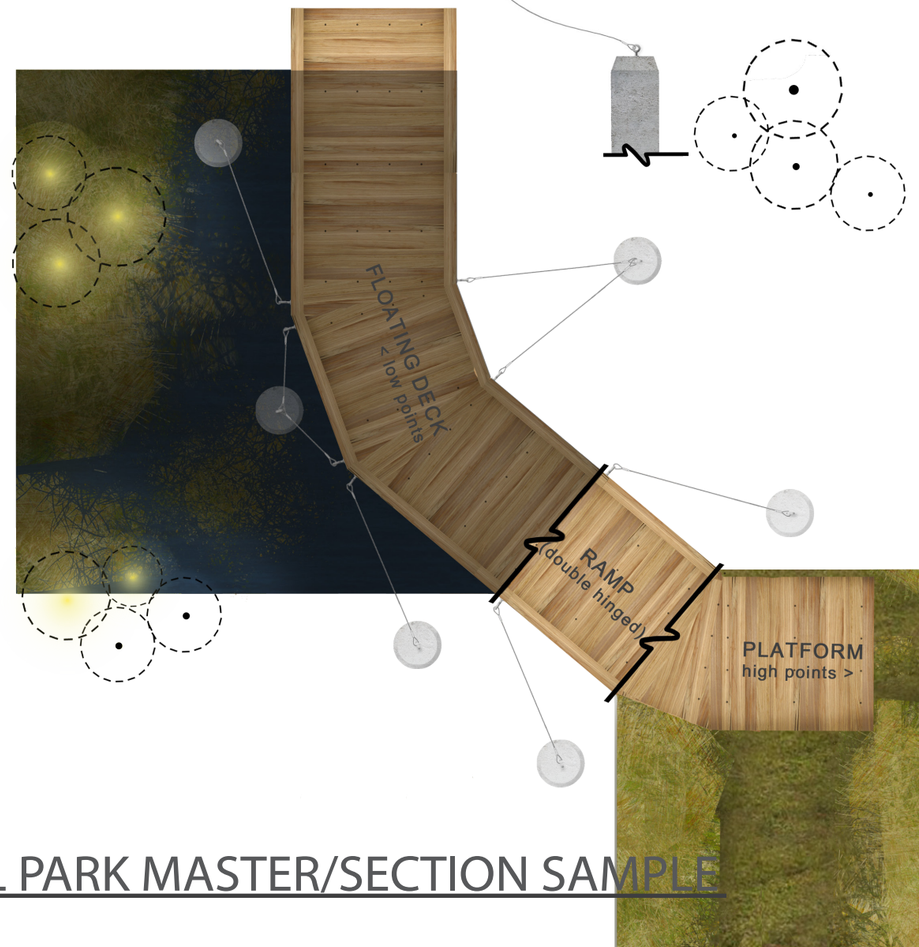
snowshoeing
cross country skiing
ice skating

festivals (permitted)

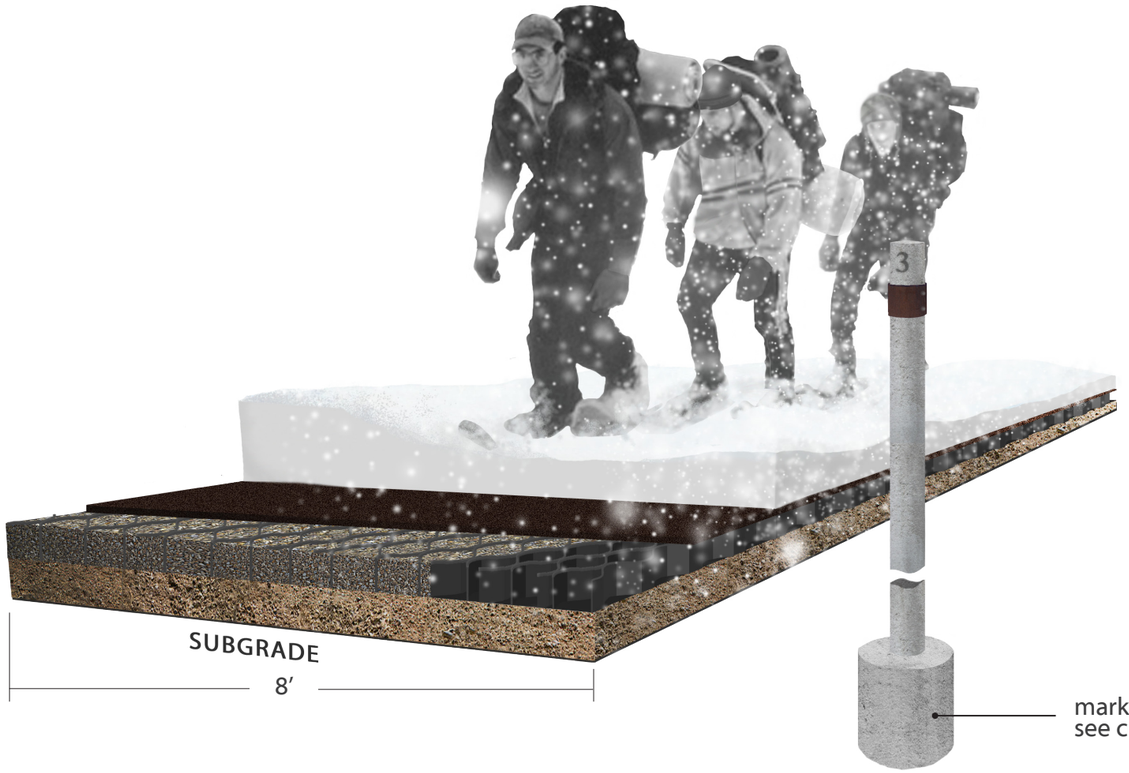
hunting/fishing/ camping (permitted)

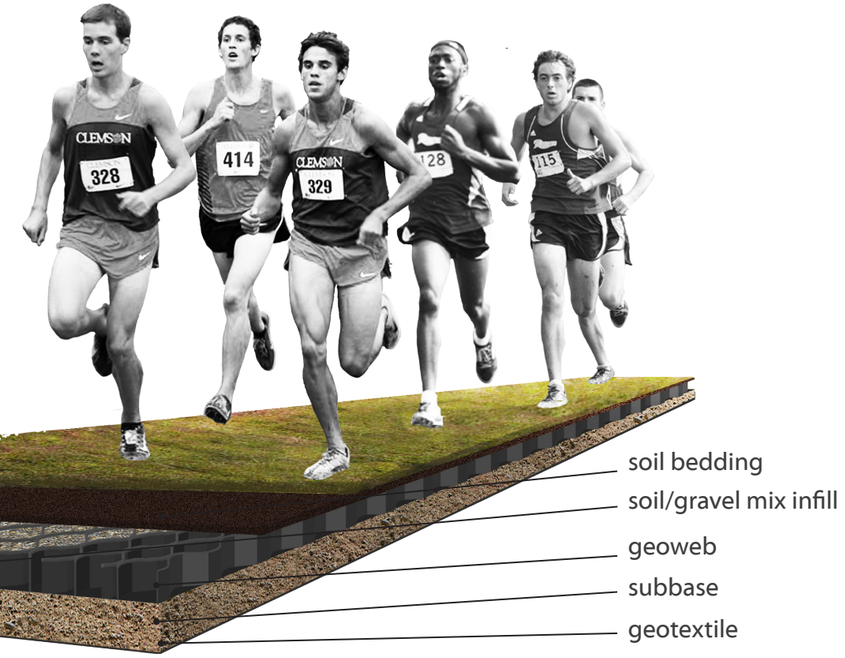
field trips
interpretive education
research

prescribed burning
adaptive management
CRP integration
natural resource use
flood control
aquifer recharge
sustainable energy generation

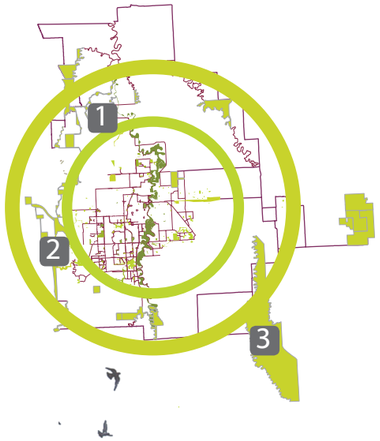


5a RURAL PARK MASTER/SECTION SAMPLE
n.t.s.

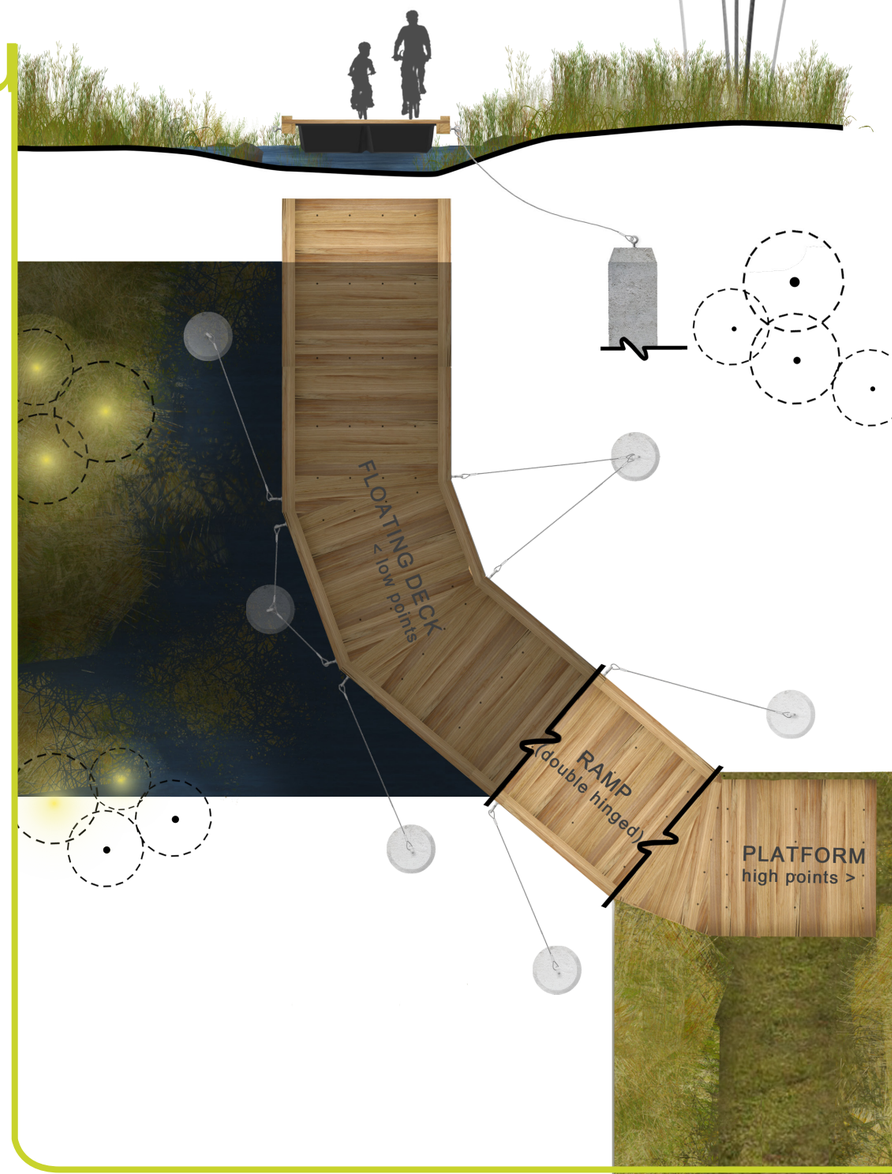


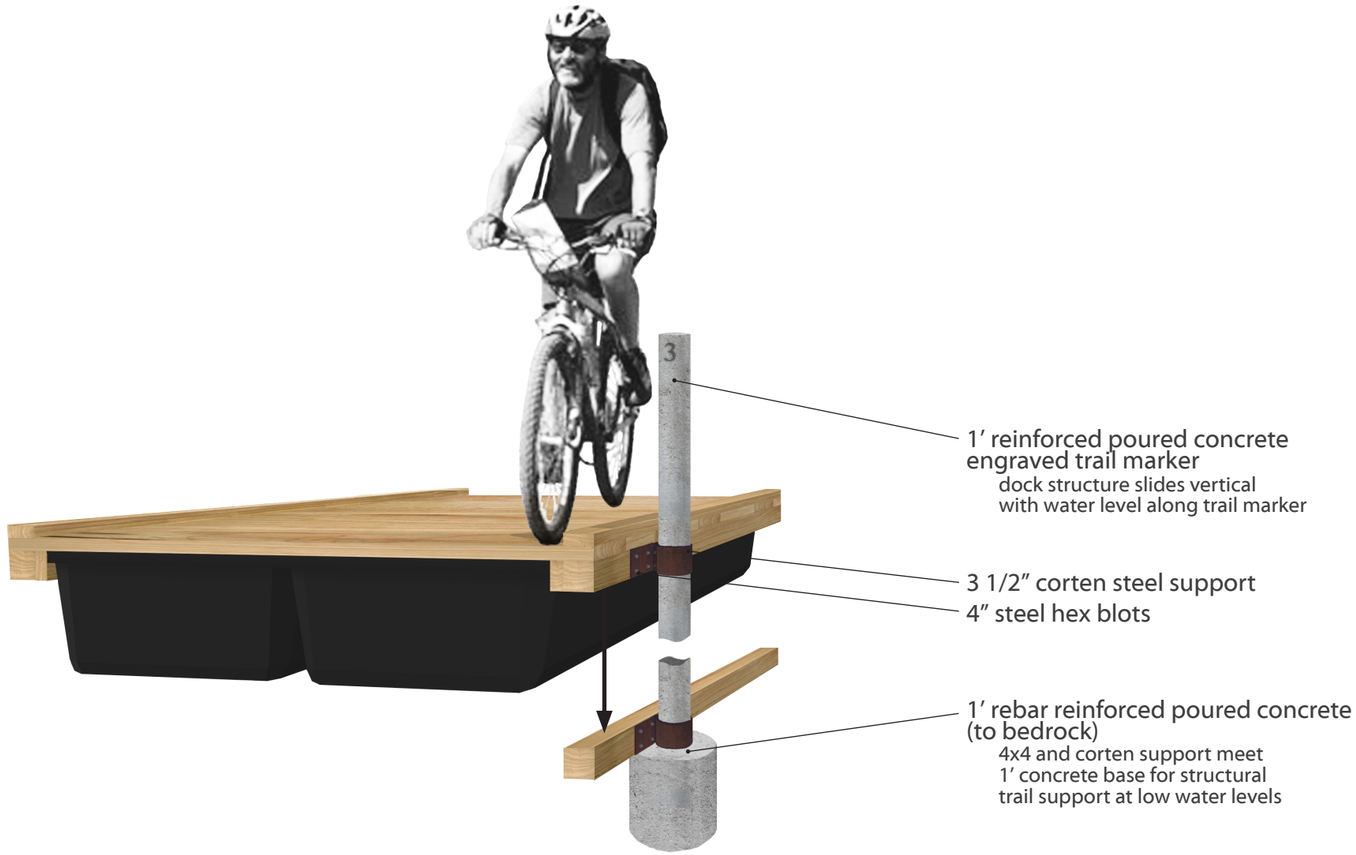


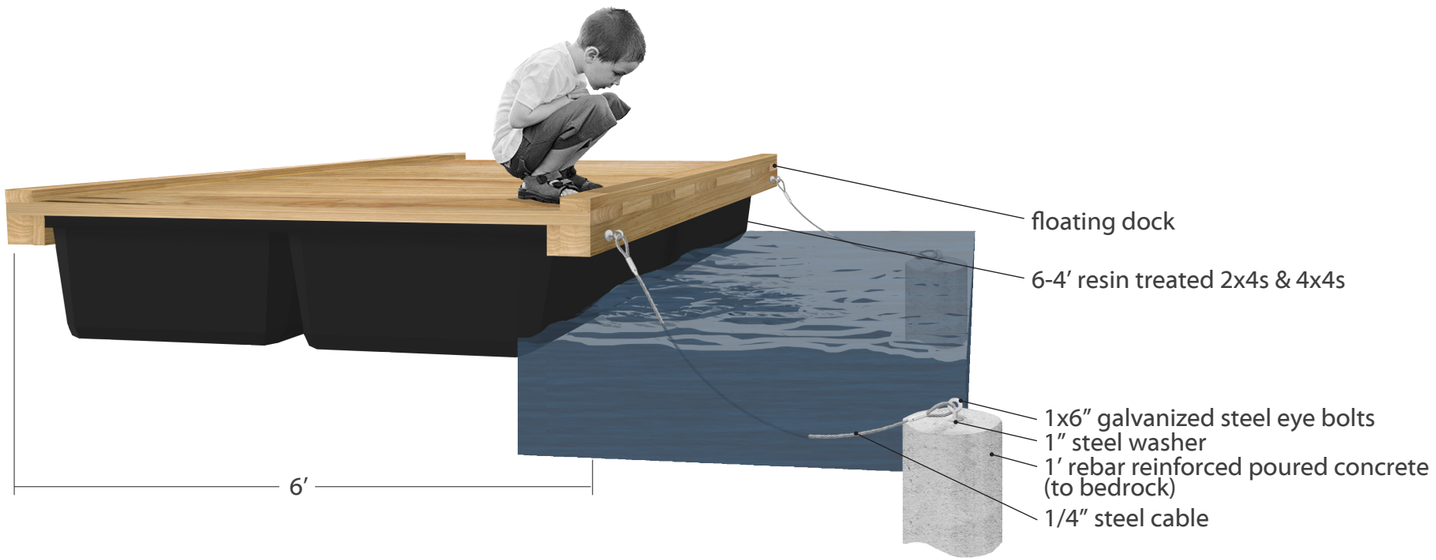
2 a1 GEOWEB TRAIL STRUCTURE (typ.)
n.t.s.



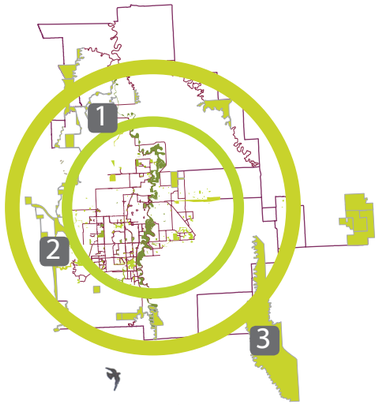
Ru



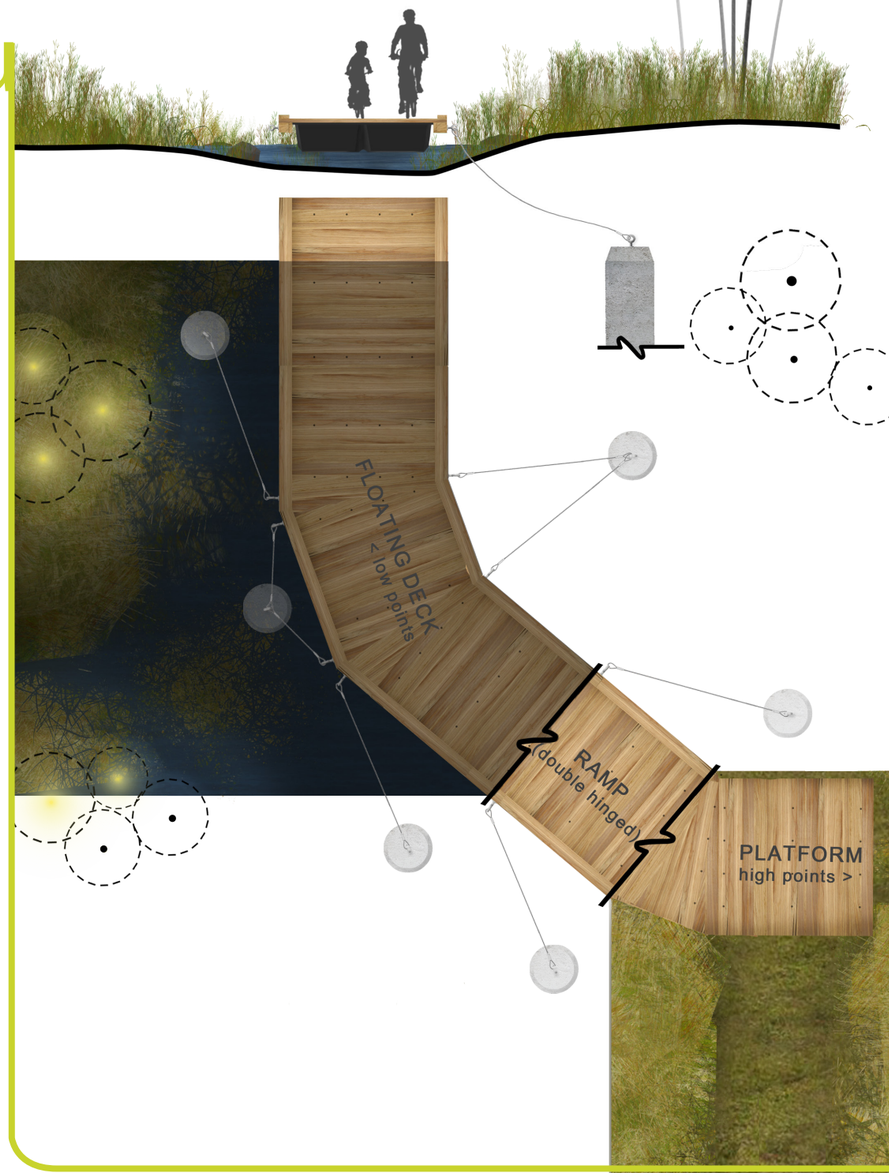


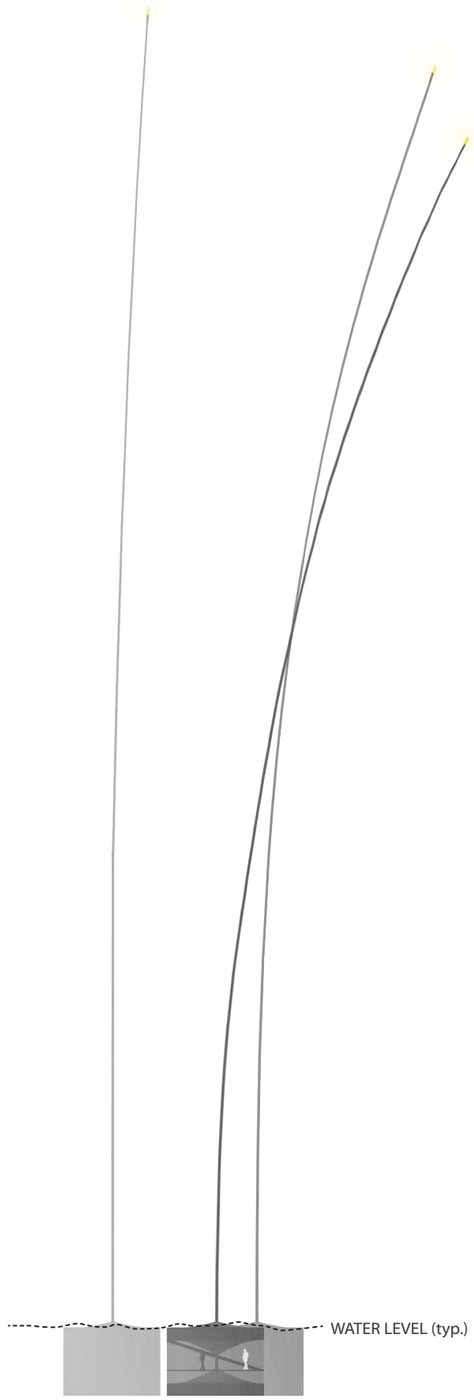


3
b1
FLOATING SUSPENSION BRIDGE (typ.)
n.t.s.



Ru

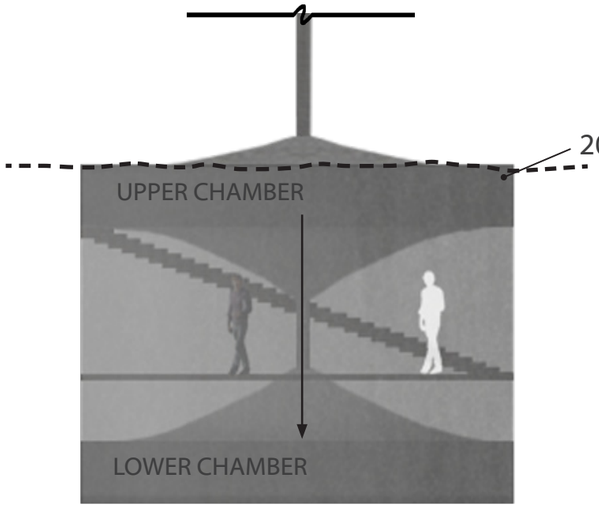




7″ max LED lamp; positively correlated light intensity with wind speed

180′x1′ diameter (25′x1/4′ min) carbon fiber reinforced resin poles tapering toward the peak to 2″ (1″min)

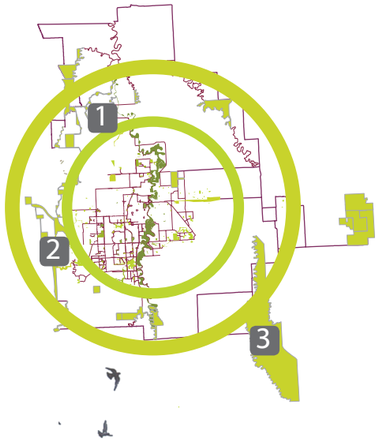
poles contain electrodes between piezo-electric ceramic discs. A cable connects every other electrode, another cable connecting the others. When the pole sways, the stack of piezoelectric disks is compressed, generating a current through the electrodes.



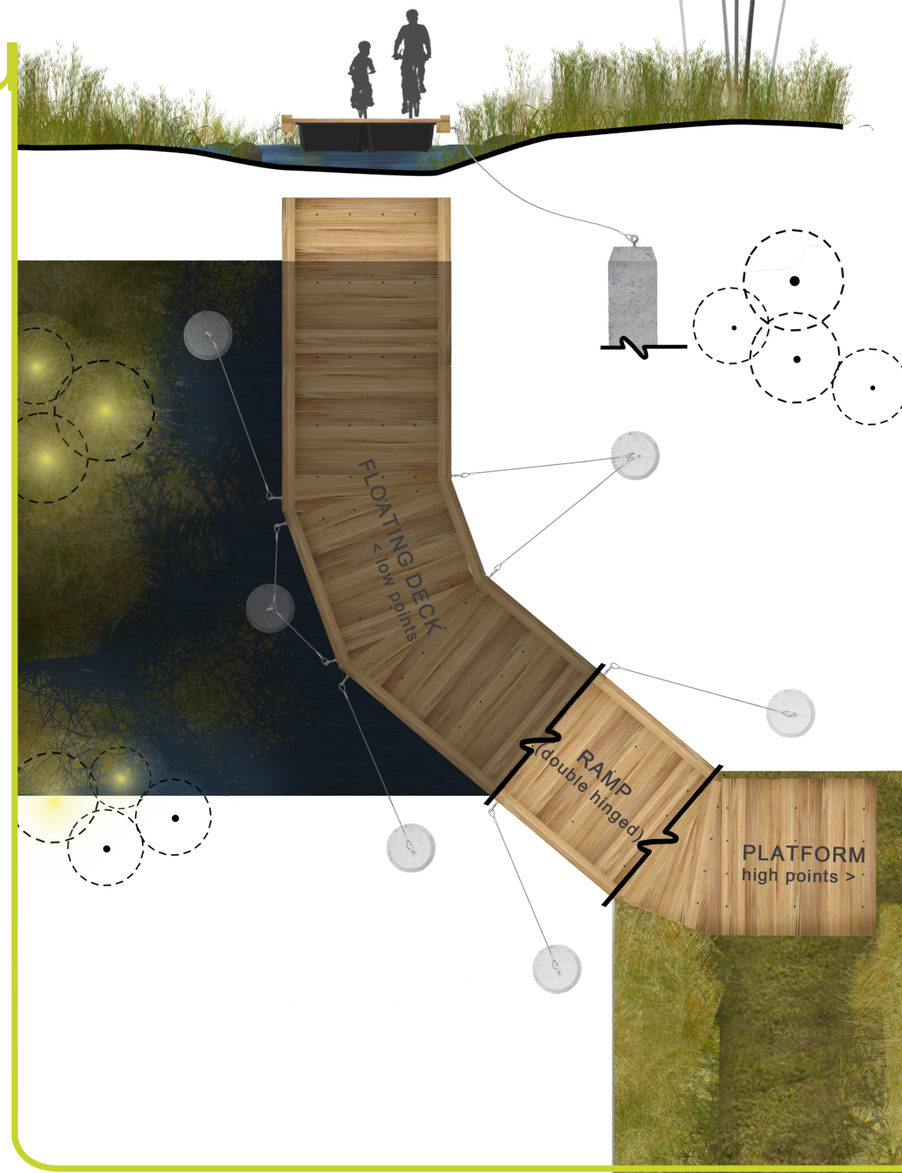
20′ diameter max concrete chamber

housing a torque generator converting the kinetic energy of poles into electrical energy with an array of current generating shock absorbers, using the forced movement of fluid through the cylinders.

part of the wind energy goes to power a set of pumps that move water from lower chamber to upper. This acts as a back up generator, allowing water from the upper chamber to flow down to the lower chamber, turning the pumps into generators.



Ru



4 / a1 WINDSTALK STRUCTURE CONCEPT (typ.)
n.t.s.

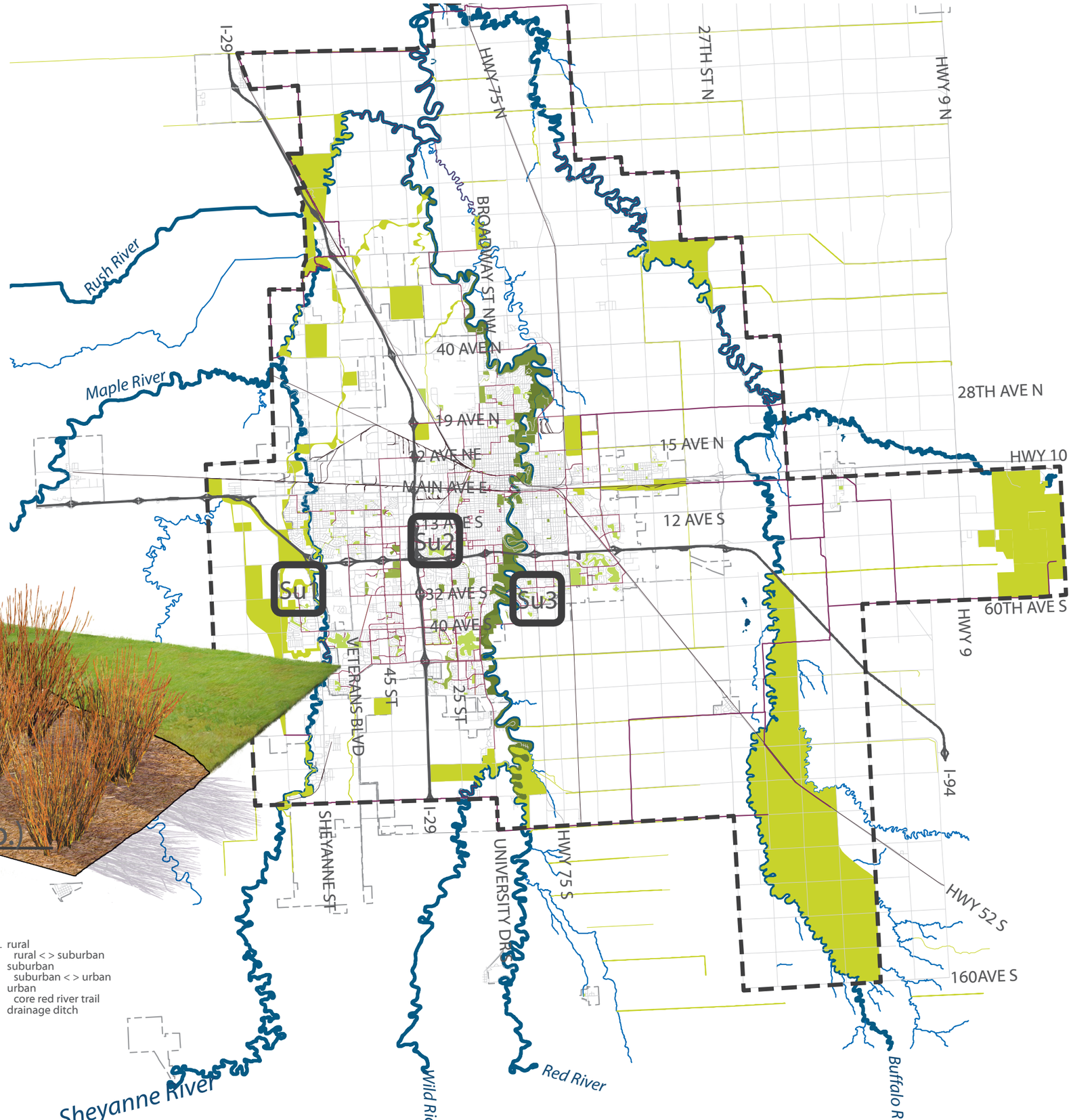
Su Suburban Park System

mitigative_

neighborhood park with integrated wetland functions

1. Rural to Suburban transition parks
2. Neighborhood parks
3. Suburban to Urban systems

1b SUBURBAN PARK ENTRY SIGNAGE (typ.)
n.t.s.



boundary_ site
municipal

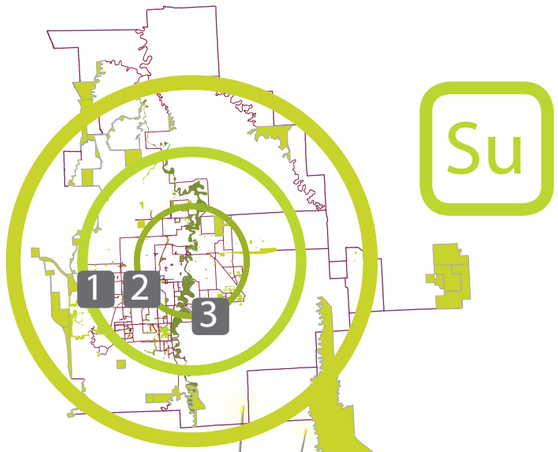
street_ arterial
collector
local
rail

water_ river
stream

trail_ w/ snowmobile trails [Ag a]
w/ street/sidewalk [Ag b]

park_ rural
rural < > suburban
suburban
suburban < > urban
urban
core red river trail
drainage ditch

0 10,000 30,000FT
0 1 2 6MI



mitigative

cantilever bench (4c)
cast concrete
2x4 treated wood
stainless steel support
LED underlighting
rock underbed

carbon fiber windstalks (4a)

planting
red maple
red oser dogwood
mulch bed

patterned brick (4b)

planting
preserved riparian old growth
reconstructed wet tallgrass prairie

engraved mile marker
rebar reinforced concrete
rock bed

permeable asphalt trail

100

planting
preserved riparian old growth
reconstructed wet tallgrass prairie
reconstructed river edge

geoweb groomed trail (ru3a)

25

5YR FLOOD LEVEL

Suburban Park System

mitigative_neighborhood park with integrated wetland functions

PROGRAM
walking/running
biking

basketball/tennis/volleyball courts
soccer/football/baseball fields
frisbee golf course

*additional neighborhood requested activities

children's play areas
art and sculpture

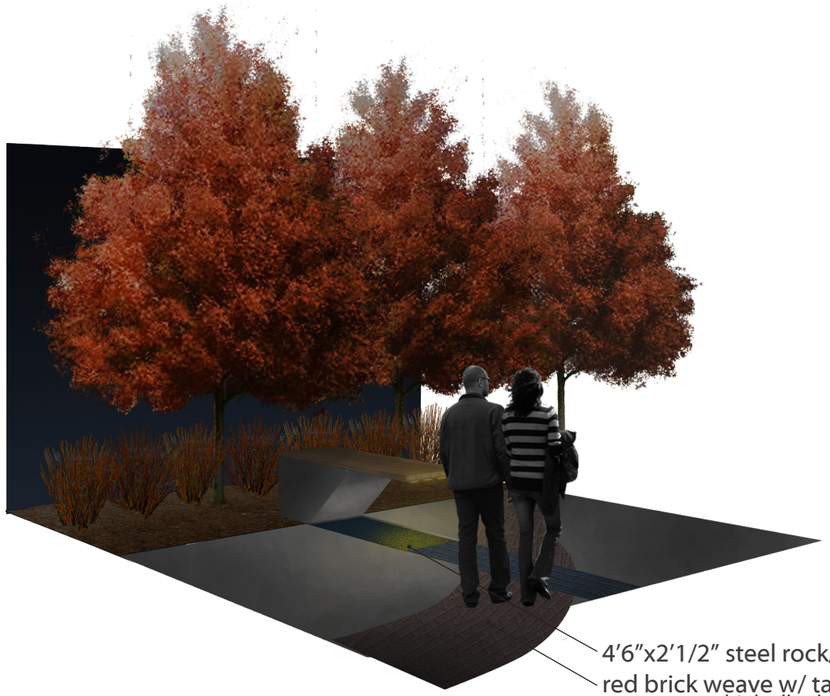
snowshoeing
cross country skiing
hockey rink

ice skating

festivals/concerts (permitted)
interpretive education

prescribed burning
adaptive management
stormwater retention/detention
sustainable energy generation

5b SUBURBAN TRAIL SYSTEM (typ.)
n.t.s.



4’6”x2’1/2” steel rock/water bed
red brick weave w/ tan/blue brick strips
high albedo aids in snow/ice melt
rebar reinforced cast concrete
1’6”base x 3’ x 2’1/2”
1/4” steel supporting plate
6’ treated 2x4’s
LED strip underlighting

Memorial Plaza trail design

2c CANTILEVER BENCH (typ.)
n.t.s.

Su

Ur

Urban Park System

interpretive_

wet tallgrass prairie functions integrated into highly structured spaces

1. Urban parks
2. Urban river parks

1/c URBAN PARK ENTRY SIGNAGE (typ.)
n.t.s.

boundary_ site
municipal

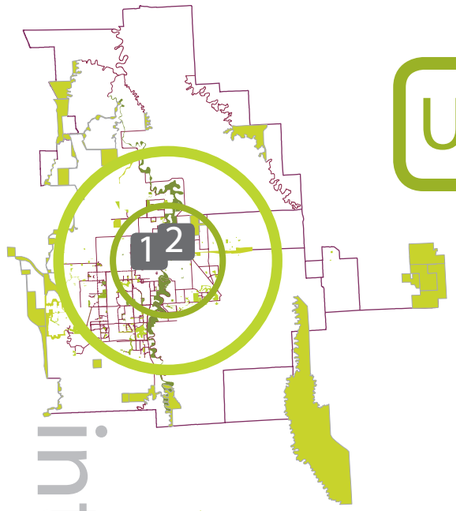
street_ arterial
collector
local
rail

water_ river
stream

trail_ w/ snowmobile trails [Ag a]
w/ street/sidewalk [Ag b]

park_ rural
rural < > suburban
suburban
suburban < > urban
urban
core red river trail
drainage ditch

0 10,000 30,000FT
0 1 2 6MI



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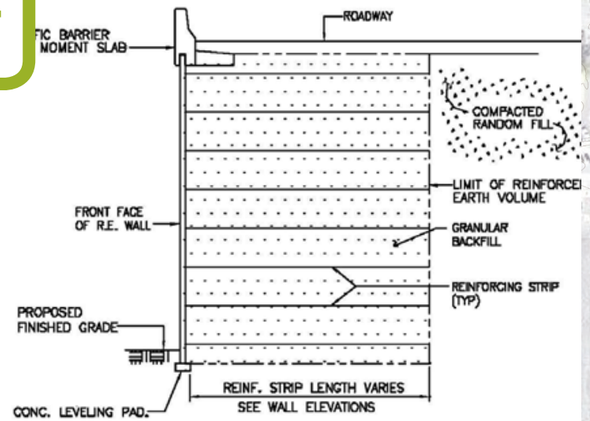


interpretive

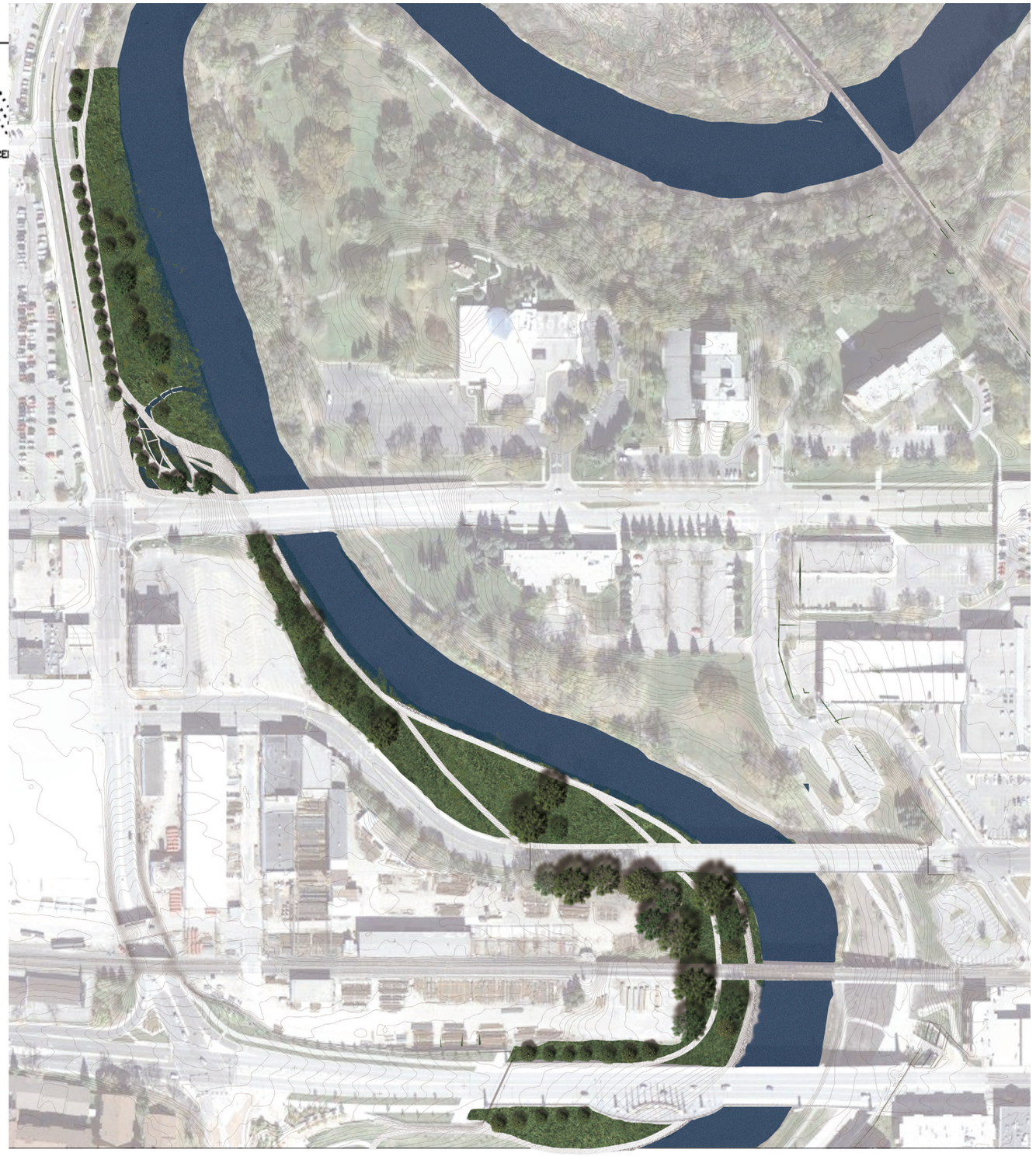
Red River Fire Festival

Annual Community Celebration

Prairie grasses require burning every 3-5years. With a stratigized staggered approach, prairie burning festivals are held annually in celebration of the unique and beautiful Red River prairie landscape.

Burning different sectors of the park system every year, creates a civic bonding of the community in an entirely rare and identifying way. These festivals close down the streets of Downtown, creating a pedestrian mall, bringing in markets, music, food, drink, and folly, all in the theme of the 'Red'.

Every year, just when the buds of the Sugar Maple begin to open, this festival turns a once mournful spring that used to drown the city, into a celebratory jubilation of the underlaying ecosystems that serves the community with the utmost function and utility.



Ru Rural Park System

preventative_

highly functional tallgrass prairie wetland ecological parks

1. Wastewater Wetland Park Sub-System
2. West Aquifer Park Sub-System
3. Buffalo Aquifer Park Sub-System

Su Suburban Park System

mitigative_

neighborhood park with integrated wetland functions

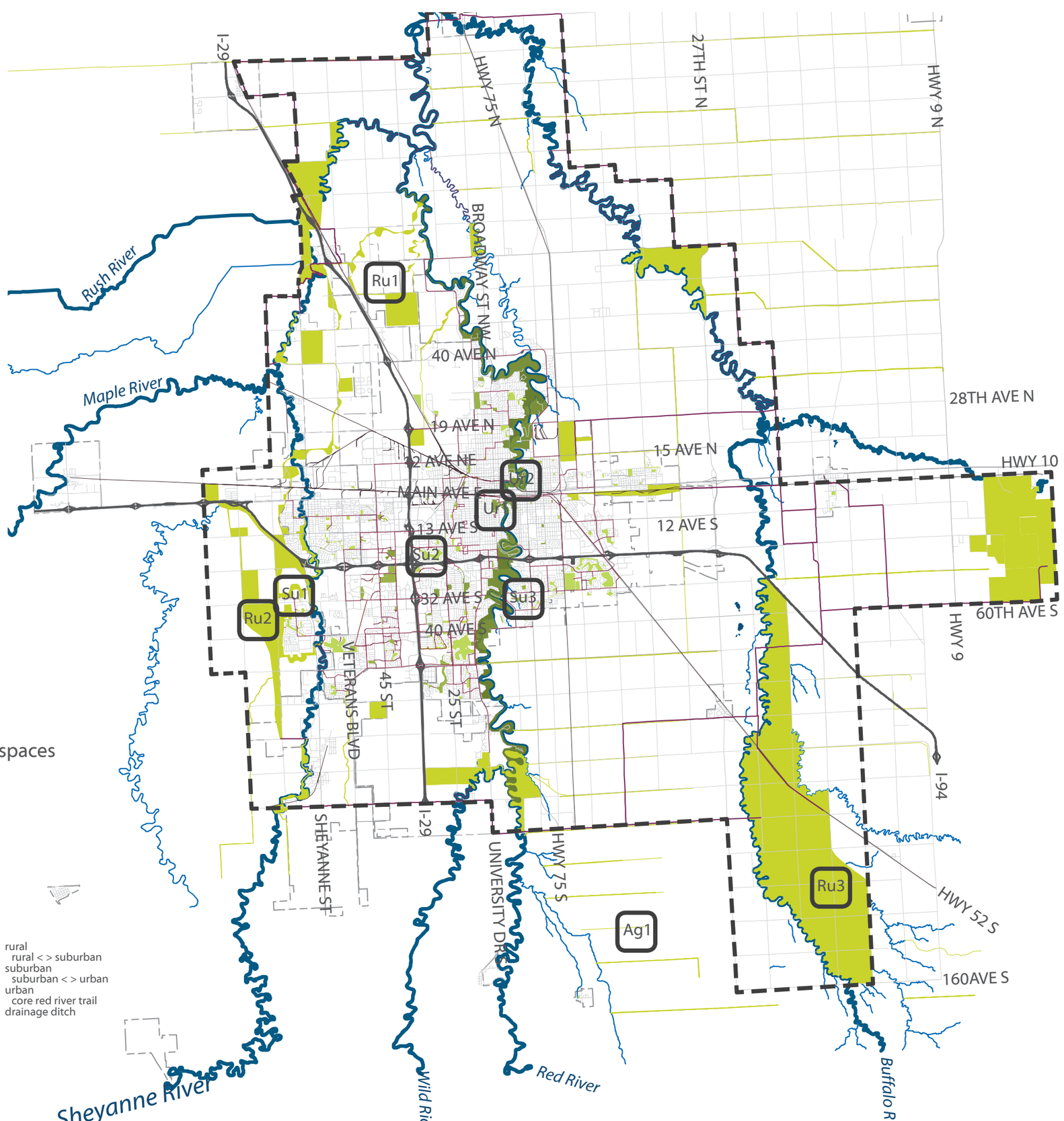
1. Rural to Suburban transition parks
2. Neighborhood parks
3. Suburban to Urban systems

Ur Urban Park System

interpretive_

wet tallgrass prairie functions integrated into highly structured spaces

1. Urban parks
2. Urban river parks



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park_ rural
rural < > suburban
suburban
suburban < > urban
urban
core red river trail
drainage ditch

0 10,000 30,000FT

0 1 2 6MI

problem statement

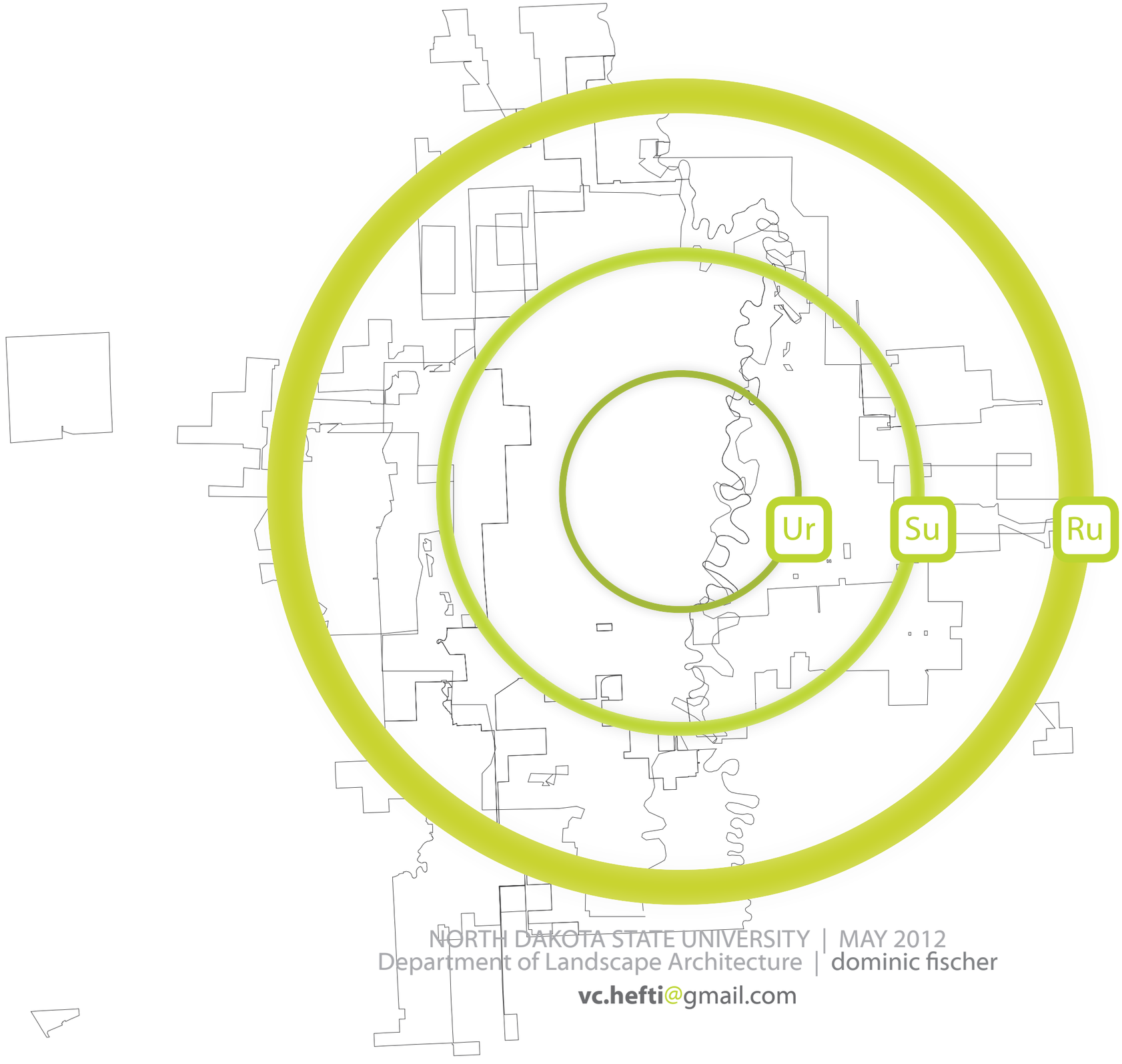
What if a connected system of landscape infrastructure,
a working landscape, could enhance ecological functioning
to serve as a civic asset rather than an environmental liability?

"Success on any major scale requires you to accept responsibility . . . .
In the final analysis, the one quality that all successful people have
is the ability to take on responsibility."

Michael Korda
Editor-in-Cheif, Simon & Schuster

"Being responsible sometimes means pissing people off."

General Colin Powell



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