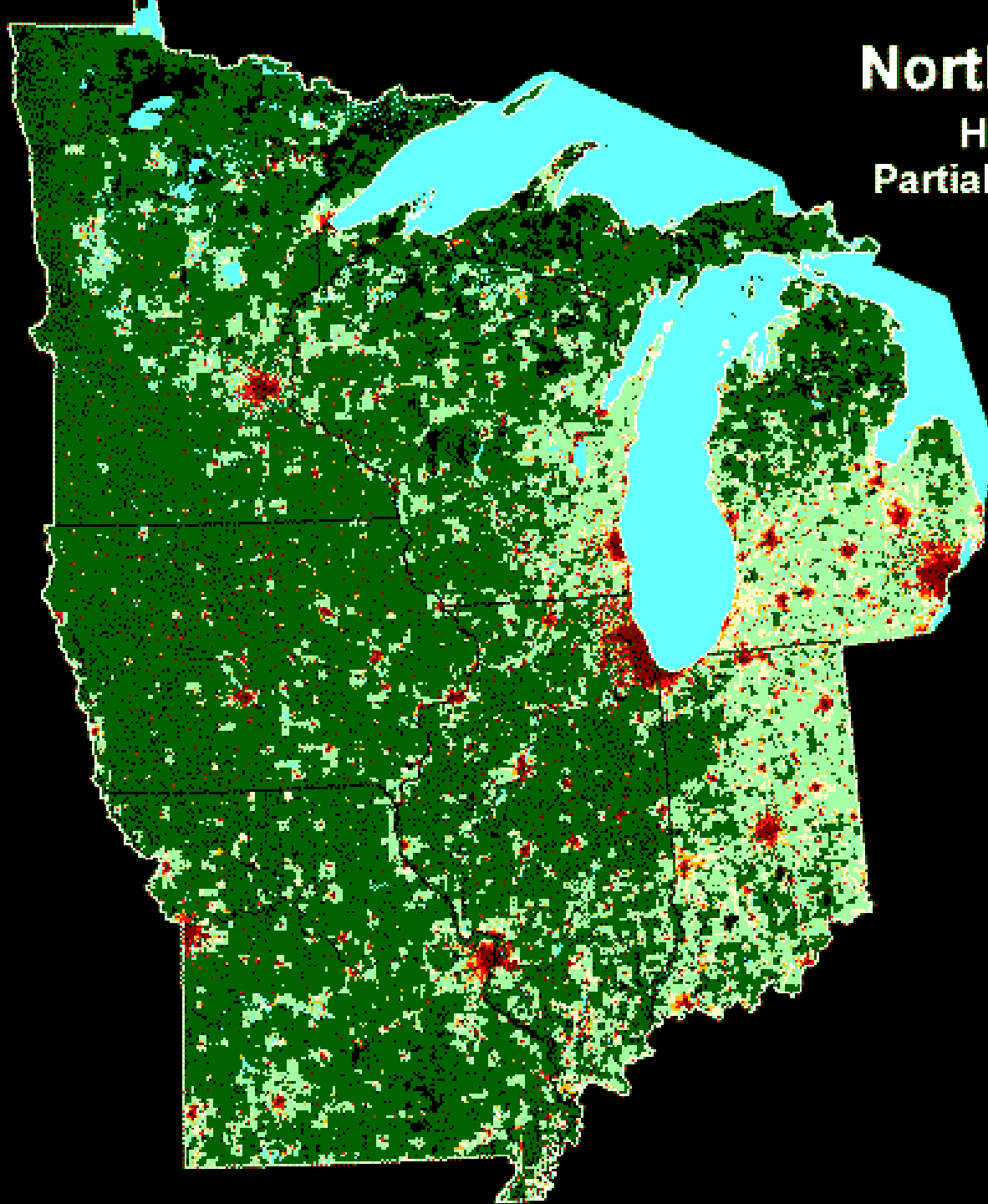
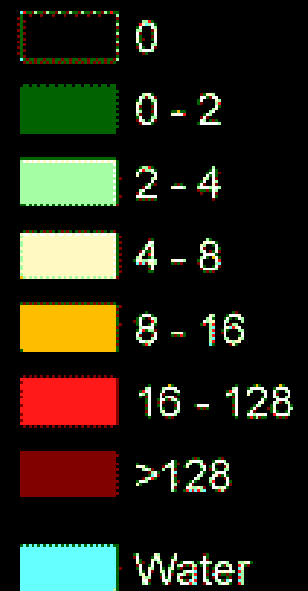


North Central Region

Housing Density 1940
Partial Block Group Resolution



Housing Units
per Km²



Connections between land use and water quality

The 4 realities of land use and water quality

Trends in land use and the Mississippi Basin

**Marketing conservation land use planning
(Hanover Pilot Study) An alternative approach**

Water Quality & Environmental Benefits

Quality of life, Public Value, Economics





Maria Meadows

2+ ACRE HOMESITES

HAGE
& CO. INC.
CUSTOM HOME BUILDERS



FOR INFORMATION CALL

800-680-3379 EXT.200

counselor
realty.com

612-990-6000

MODEL

OPEN

SAT & SUN 1-4

Lot Information Inside





August 2006



March 2007









MAR 16 2004
Photo by [unreadable]





**Chisago County
Green Lake Sequence**

03/19/2007



03/19/2007



03/19/2007



03/19/2007



**Green Lake
Chisago City**

03/15/2007



**Colby Lake,
Woodbury**



Prior Lake Wetland

08/02/2006 13:52



05/02/2006



I 494 (Minnehaha Creek)

05/02/2006



I 494

05/02/2006



**Carver Lake
Woodbury**

05/02/2006

Long Lake



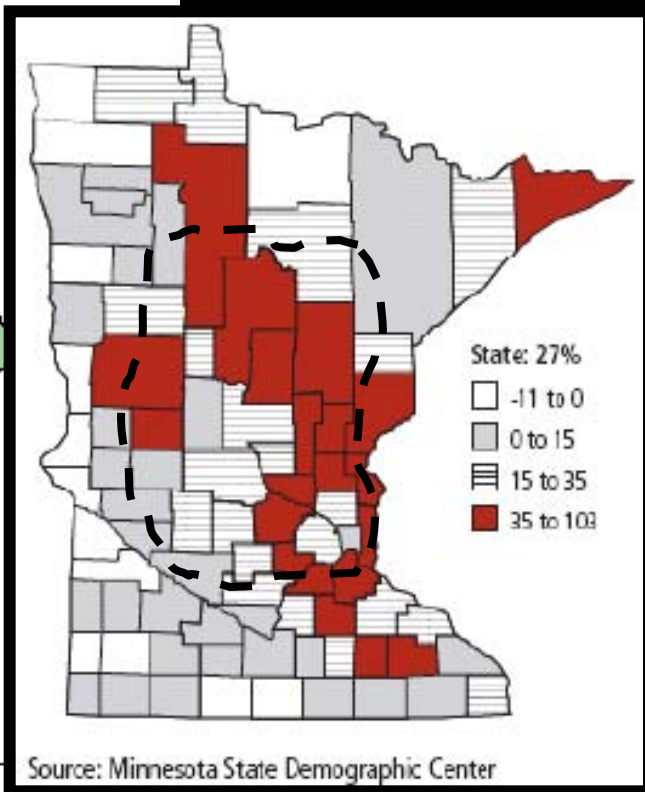
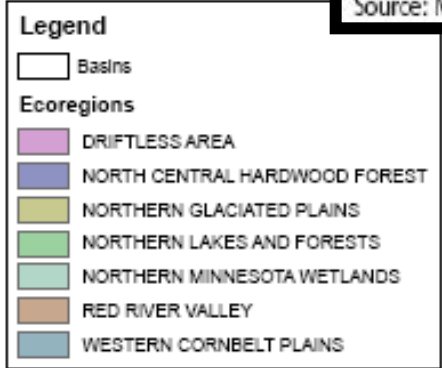
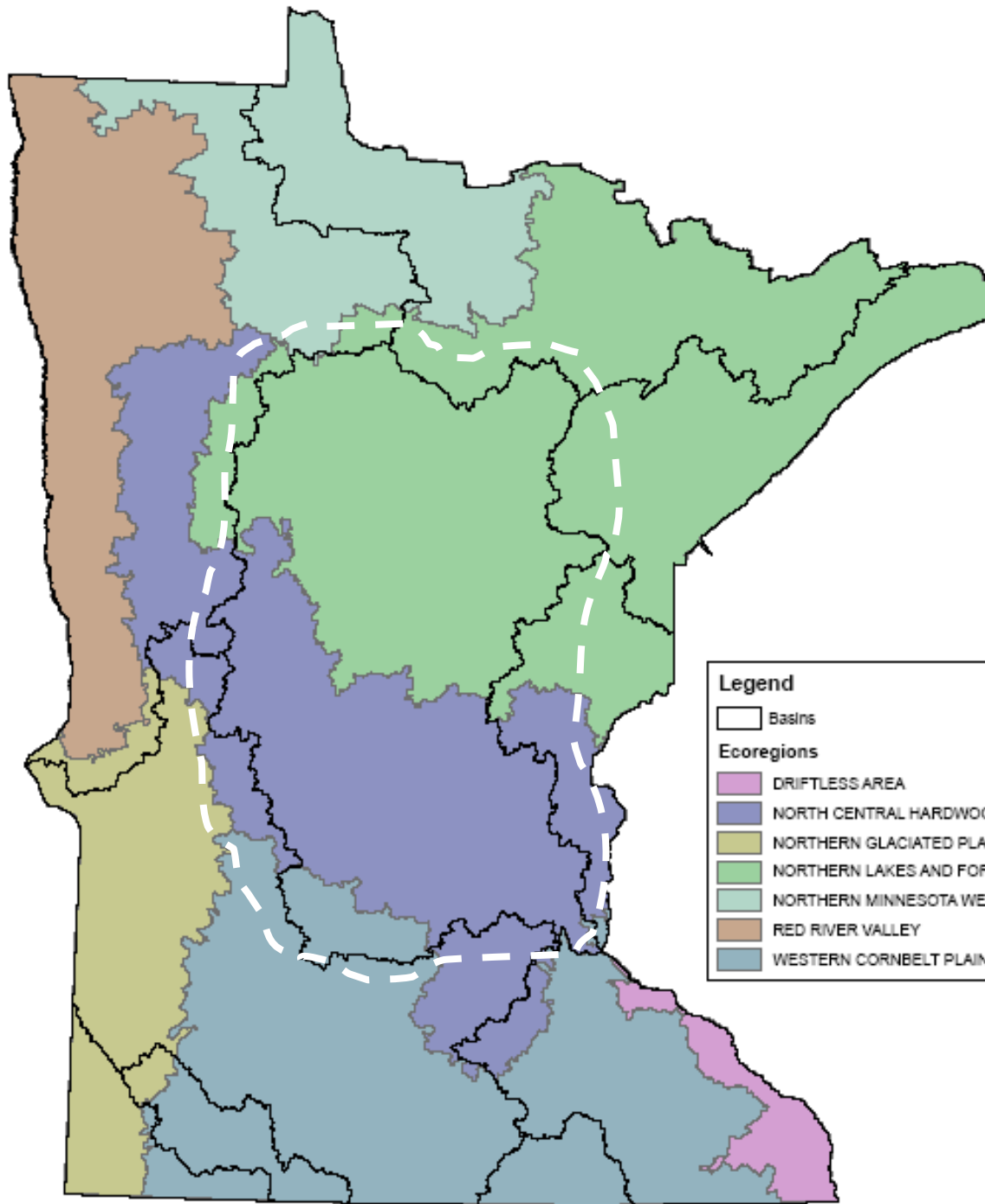
05/02/2006

Growth and development is reality

How can we avoid the pound of
cure?

1. The fate of water quality resides with local government and land use planning
2. Current zoning code and ordinance will replicate existing problems and priority resources will continue to be lost or impaired
3. Higher density with mixed use land development can significantly reduce environmental impacts associated with current land use planning processes.
4. We must have public engagement and responsibility to take action

**Trends in land use and the
Mississippi Basin**
(Population and impervious cover)



Source: Minnesota State Demographic Center

% Impervious change 1990 - 2000

Northern
Minnesota
wetlands

Red River

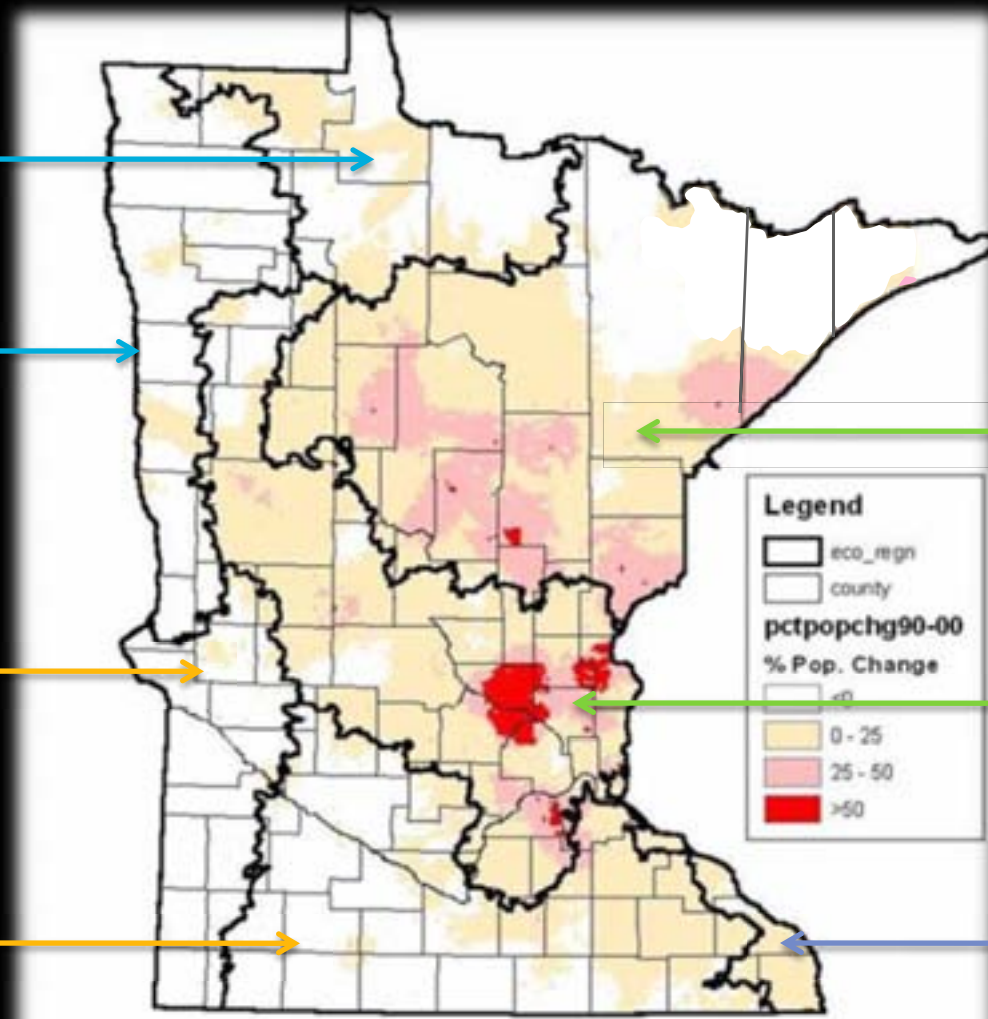
Northern
glaciated
plains

Western corn
belt plains

Northern
lakes
forests

North
central
hardwood
forests

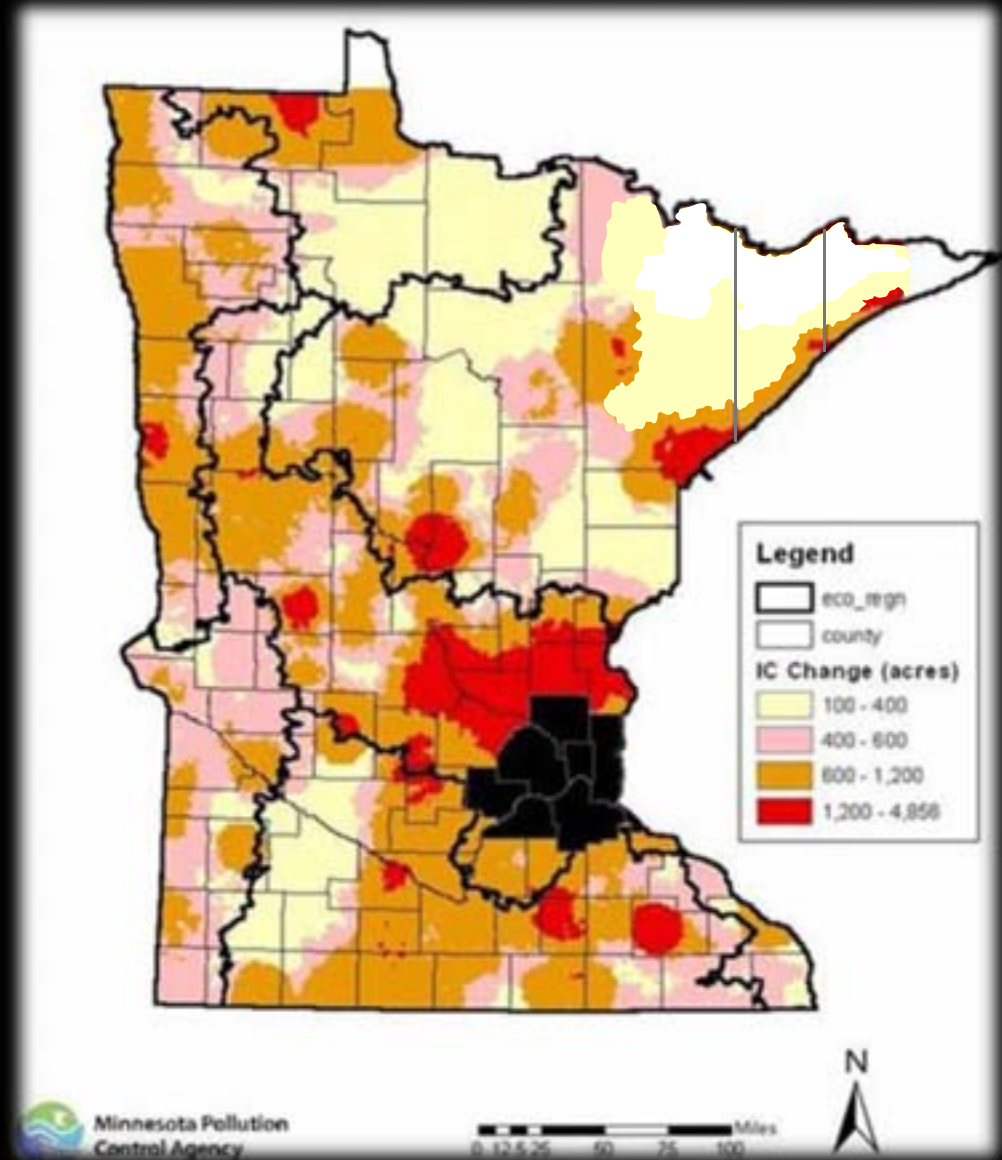
Driftless



Projected impervious acres change 2020

1990 to 2000
Impervious change
added
~1,506 square miles

By 2020
We expect to add
an additional:
1,553,798 acres, or
2,428 square miles

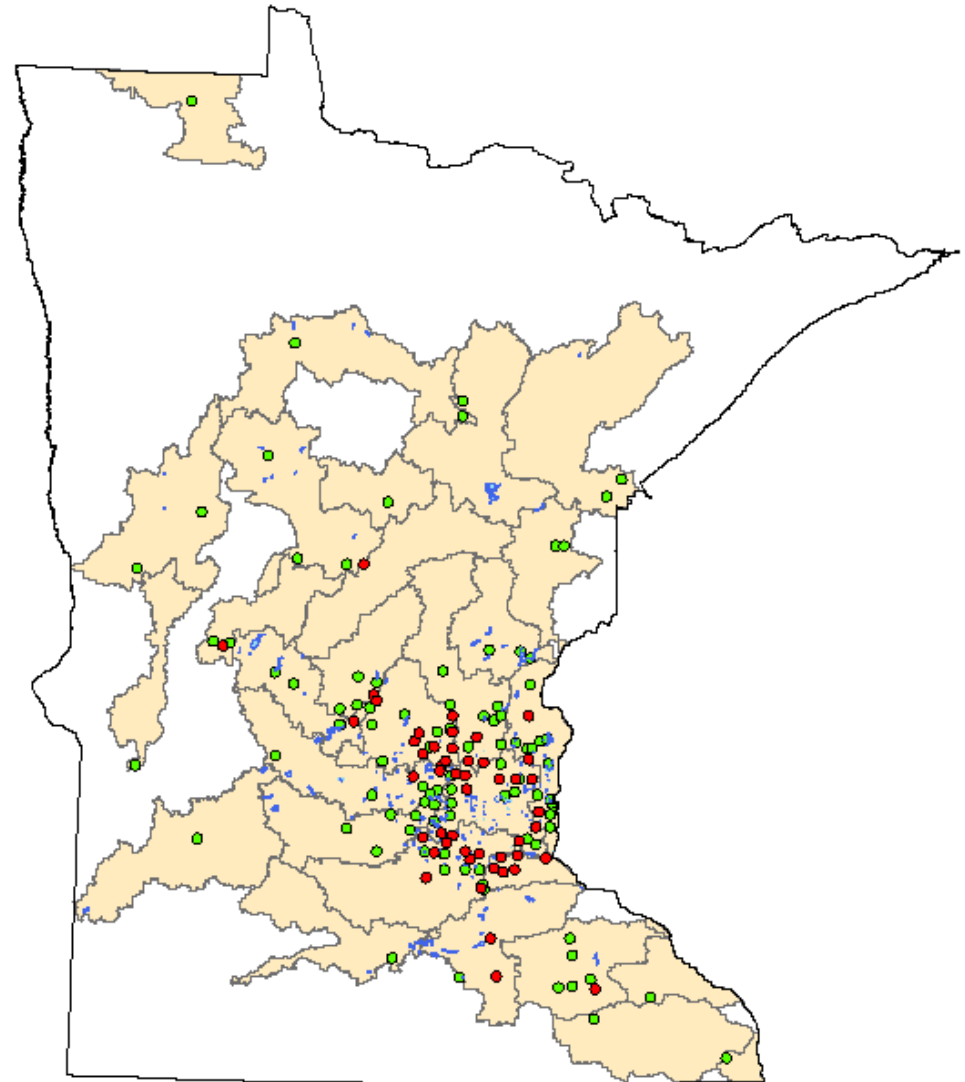


There are approximately 150 Communities growing at a significant rate.

1/3 of those communities are adding:

3,000 additional impervious surface acres or more per city by 2020

Communities with Substantial Growth



0 12.5 25 50 75 100 Miles

Legend

- Top Priority Cities
- Priority Cities
- Threatened Watersheds
- Impaired Lakes

Additional impervious surface impact is expected to be 893,506 acres by 2020.

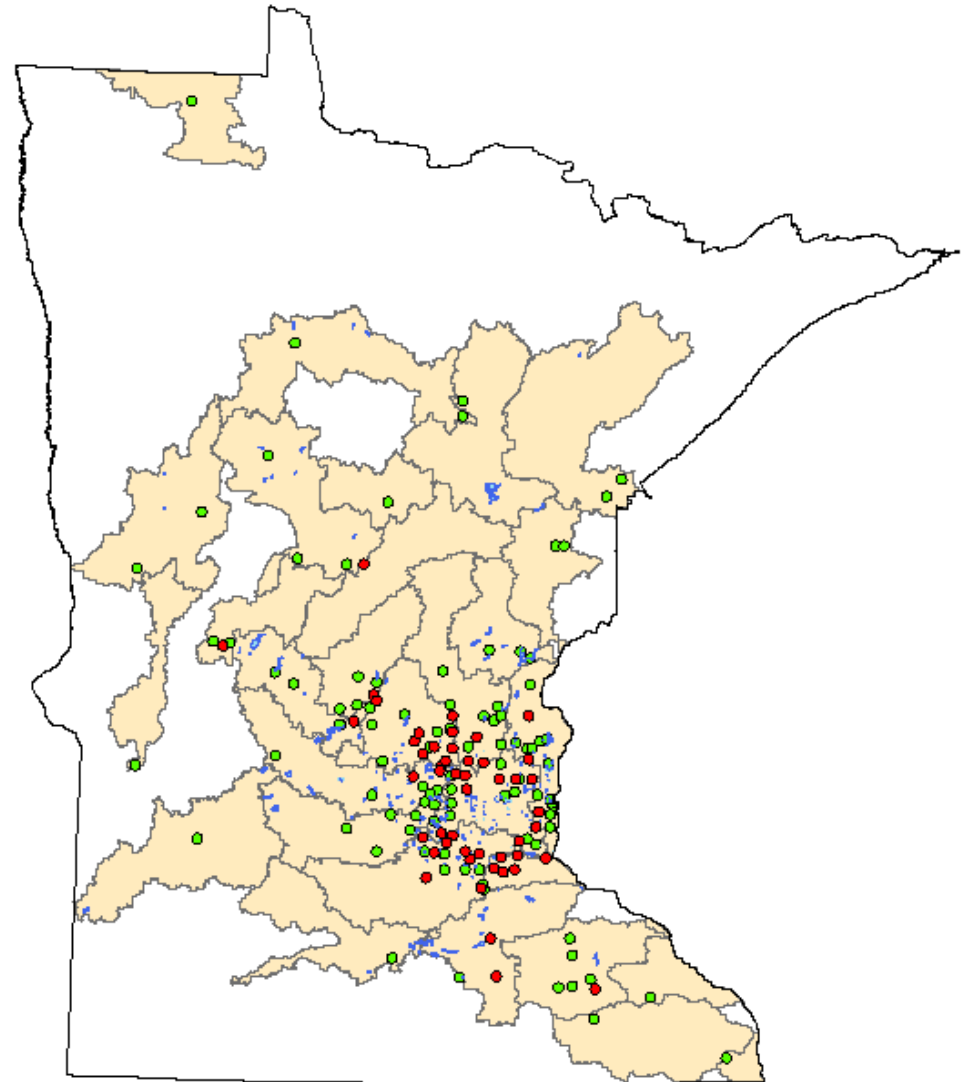
1,396 square miles

For just the top 150 communities

93% of these communities are located in just 9 watersheds.

✓ Most are in the Mississippi Basin.

Communities with Substantial Growth



0 12.5 25 50 75 100 Miles

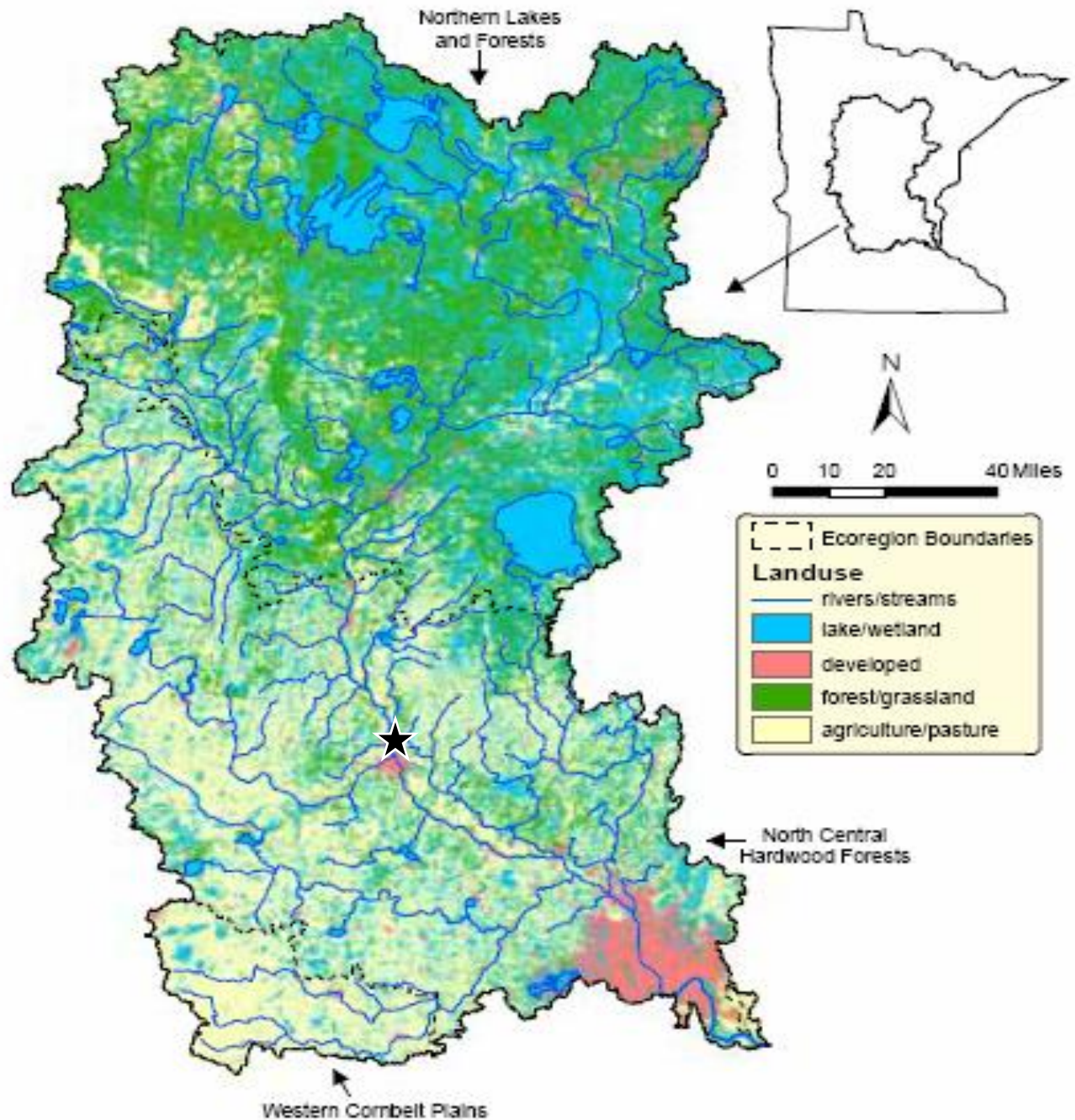
Legend

- Top Priority Cities
- Priority Cities
- Threatened Watersheds
- Impaired Lakes

Land Use Mississippi Basin

(1) Basin
(3) Eco-Regions
Diverse land cover
Forest
Grass Land
Agriculture
Developing
residential and
commercial

By 2020
(314) Square miles
IC cover total
(206) Square miles
IC cover Upper
portion alone



17 Counties
9 Watersheds

57% of total impervious cover change

Counties	Count
Dakota	7
Sherburne	6
Scott	5
Carver	5
Anoka	5
Wright	5
Washington	4
Hennepin	3
Hennepin	3
Benton	2
Stearns	1
Chisago	1
Crow Wing	1
Douglas	1
Olmsted	1
Rice	1
Steele	1

Watershed	
Mississippi	25
Minnesota	8
St. Croix	4
Rum	4
North Fork Crow	3
Cannon	2
Zumbro	1
Long Prairie	1
Sauk	1

Lake Pepin (Red Wing)	8
Twin Cities	7
Saint Cloud	8
Sartell	1
Brainerd	1

Total impervious acres change statewide
= 2,428 Square Miles

Top 150 = 1,396 Square Miles ~ 57% of total

Top 49 = 456 Square Miles

Top 20 = 288 Square Miles

Top 10 = 207

Mississippi Basin

MS4 Communities		IC acres	Confidence Factor	Population	Population	Population			
LUG's Requesting Assistance		2020 Project	(+/-)10% error rate	1990	2020	% change			
Watersheds									
NAME	TYPE	IC acres Total	% IC Change 2020				Watershed	Basin	County
New Market	City	2986	14117%	227	6700	1918.1%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Scott
Rockville	City	9998	4031%	579	3395	353.3%	Sauk	Upper Mississippi	Stearns
Victoria	City	3556	2404%	2354	19600	387.0%	Mississippi (Twin Cities)	Upper Mississippi	Carver
Rogers	City	6355	2154%	698	14400	301.3%	North Fork Crow	Upper Mississippi	Hennepin
Hugo	City	6794	2023%	4417	29000	355.8%	Mississippi (Twin Cities)	Upper Mississippi	Washington
Dayton	City	4236	1657%	4392	20100	327.8%	Mississippi (Twin Cities)	Upper Mississippi	Hennepin
Empire twp.	Township	3408	1186%	1340	4650	183.9%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Otsego twp.	Township	3144	1114%	5219	11051	73.0%	Mississippi (St. Cloud)	Upper Mississippi	Wright
Baldwin twp.	Township	4618	1040%	2909	8638	84.9%	Rum	Upper Mississippi	Sherburne
Albertville	City	2427	974%	1251	7911	118.5%	Mississippi (St. Cloud)	Upper Mississippi	Wright
St. Francis	City	2743	883%	2538	10400	111.8%	Rum	Upper Mississippi	Anoka
Livonia twp.	Township	2995	781%	2288	7040	79.7%	Mississippi (St. Cloud)	Upper Mississippi	Sherburne
St. Michael	City	4278	752%	2506	17429	91.5%	North Fork Crow	Upper Mississippi	Wright
Becker	City	6123	701%	902	6051	126.4%	Mississippi (St. Cloud)	Upper Mississippi	Sherburne
Farmington	City	4186	665%	5940	27100	119.2%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Becker twp.	Township	4361	653%	2336	5998	66.4%	Mississippi (St. Cloud)	Upper Mississippi	Sherburne
Ramsey	City	9163	615%	12408	45000	143.1%	Rum	Upper Mississippi	Anoka
Sartell	City	3540	590%	5393	18240	89.2%	Mississippi (Sartell)	Upper Mississippi	Benton
Big Lake twp.	Township	4064	554%	4452	10602	56.3%	Mississippi (St. Cloud)	Upper Mississippi	Sherburne
Baxter	City	5052	499%	3695	10272	84.9%	Mississippi (Brainerd)	Upper Mississippi	Crow Wing
Rosemount	City	9477	487%	8622	30100	105.9%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Monticello	City	4051	398%	5045	12711	61.6%	Mississippi (St. Cloud)	Upper Mississippi	Wright
Lakeville	City	10806	363%	24854	78400	81.8%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Elk River	City	8838	351%	11143	26313	60.0%	Rum	Upper Mississippi	Sherburne
Buffalo	City	3214	338%	6856	15290	51.4%	North Fork Crow	Upper Mississippi	Wright
Sauk Rapids	City	2982	282%	7823	15319	50.0%	Mississippi (St. Cloud)	Upper Mississippi	Benton
Alexandria	City	3265	251%	8029	11708	32.7%	Long Prairie	Upper Mississippi	Douglas
Blaine	City	9517	243%	38975	76100	69.3%	Mississippi (Twin Cities)	Upper Mississippi	Anoka
Lino Lakes	City	2653	239%	8807	26300	56.6%	Mississippi (Twin Cities)	Upper Mississippi	Anoka
Andover	City	4652	216%	15216	39000	46.7%	Mississippi (Twin Cities)	Upper Mississippi	Anoka
Maple Grove	City	9575	213%	38736	75700	50.3%	Mississippi (Twin Cities)	Upper Mississippi	Hennepin
Apple Valley	City	7686	189%	34598	69100	51.8%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Hastings	City	3147	168%	15440	27500	51.1%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Rochester	City	14147	140%	70729	113256	32.0%	Zumbro	Lower Mississippi	Olmsted
Inver Grove Heights	City	5580	139%	22477	40600	36.5%	Mississippi and Lake Pepin (Red Wing)	Lower Mississippi	Dakota
Faribault	City	3687	121%	17085	27501	32.1%	Cannon	Lower Mississippi	Rice
Owatonna	City	3904	112%	19386	27101	20.8%	Cannon	Lower Mississippi	Steele
		201209 Acres	314 Square Miles						

Questions?

Don Berger

MPCA

(651) 757-2223

Donald.berger@pca.state.mn.us

Connections between land use and water quality

The 4 realities of land use and water quality

Trends in land use and the Mississippi Basin

**Marketing conservation land use planning
(Hanover Pilot Study) An alternative approach**

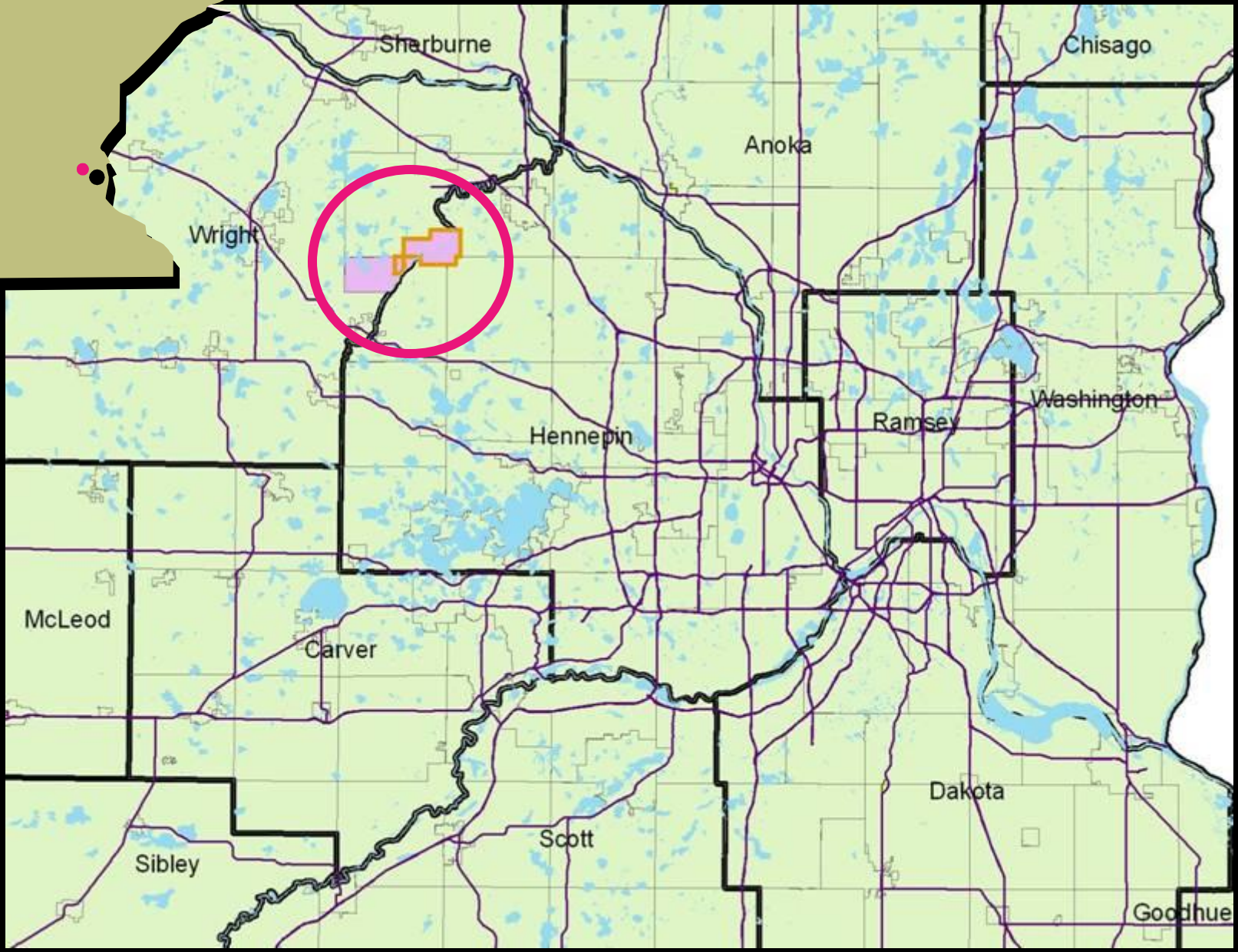
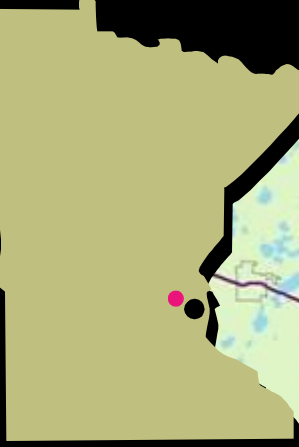
Water Quality & Environmental Benefits

Quality of life, Public Value, Economics

Hanover Pilot Study

Vision shift

*Problems solved, and
different land use planning processes*





Urban core -
developed suburbs



Developing suburbs

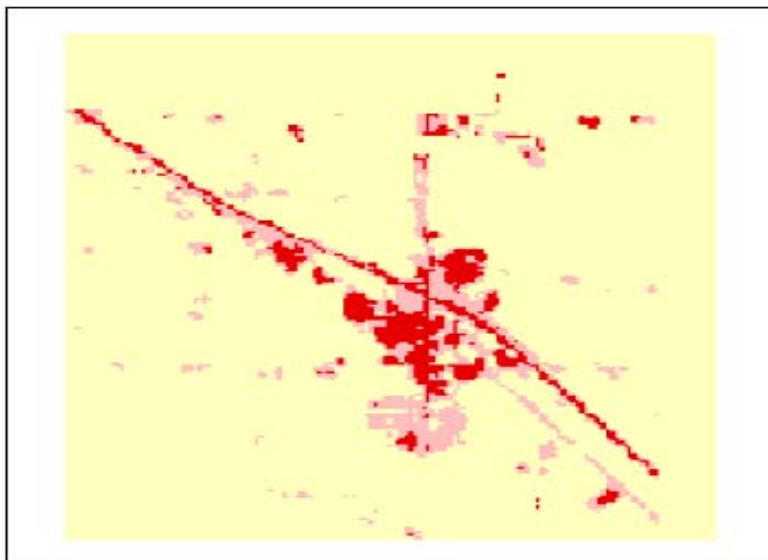
Urban/rural
transition



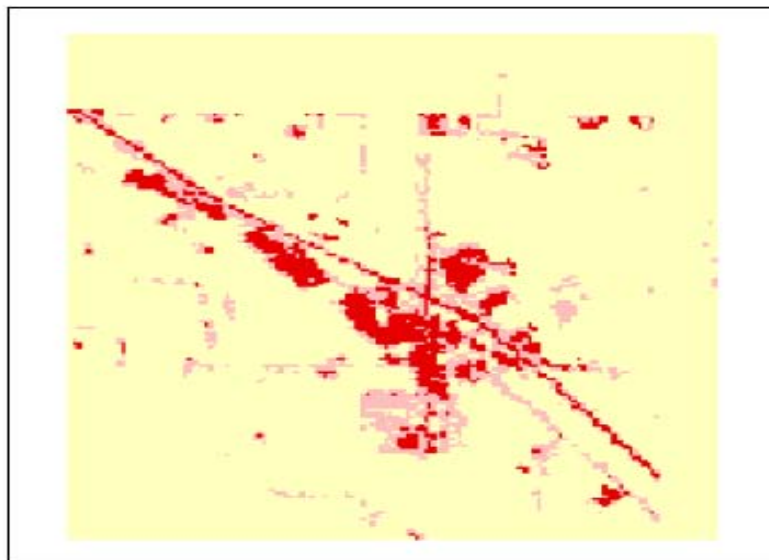
Rural and
agricultural

City of Rogers Impervious Coverage based on Satellite Remote Sensing

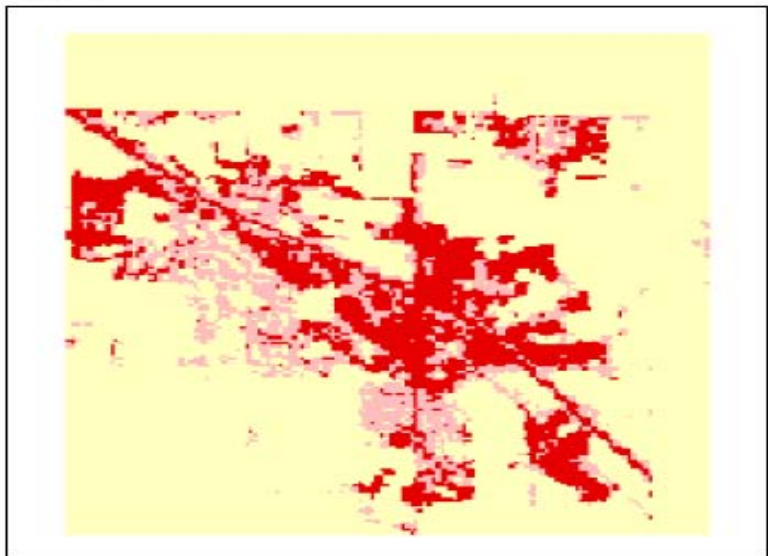
1986



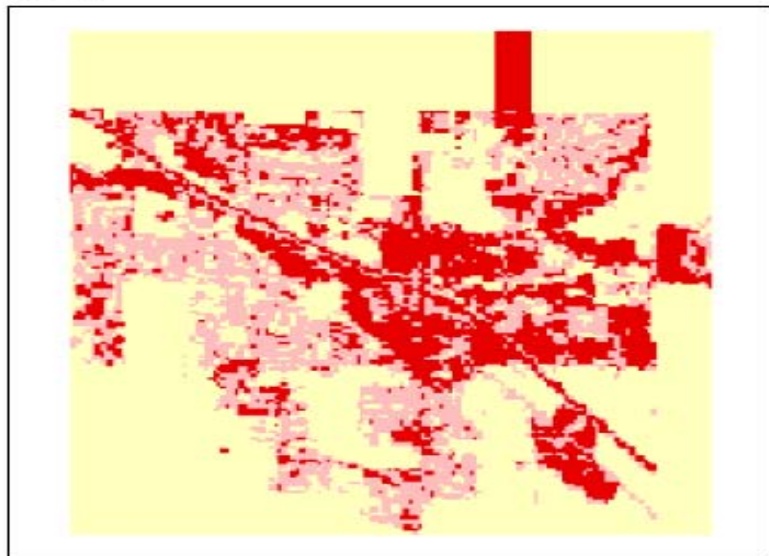
1991



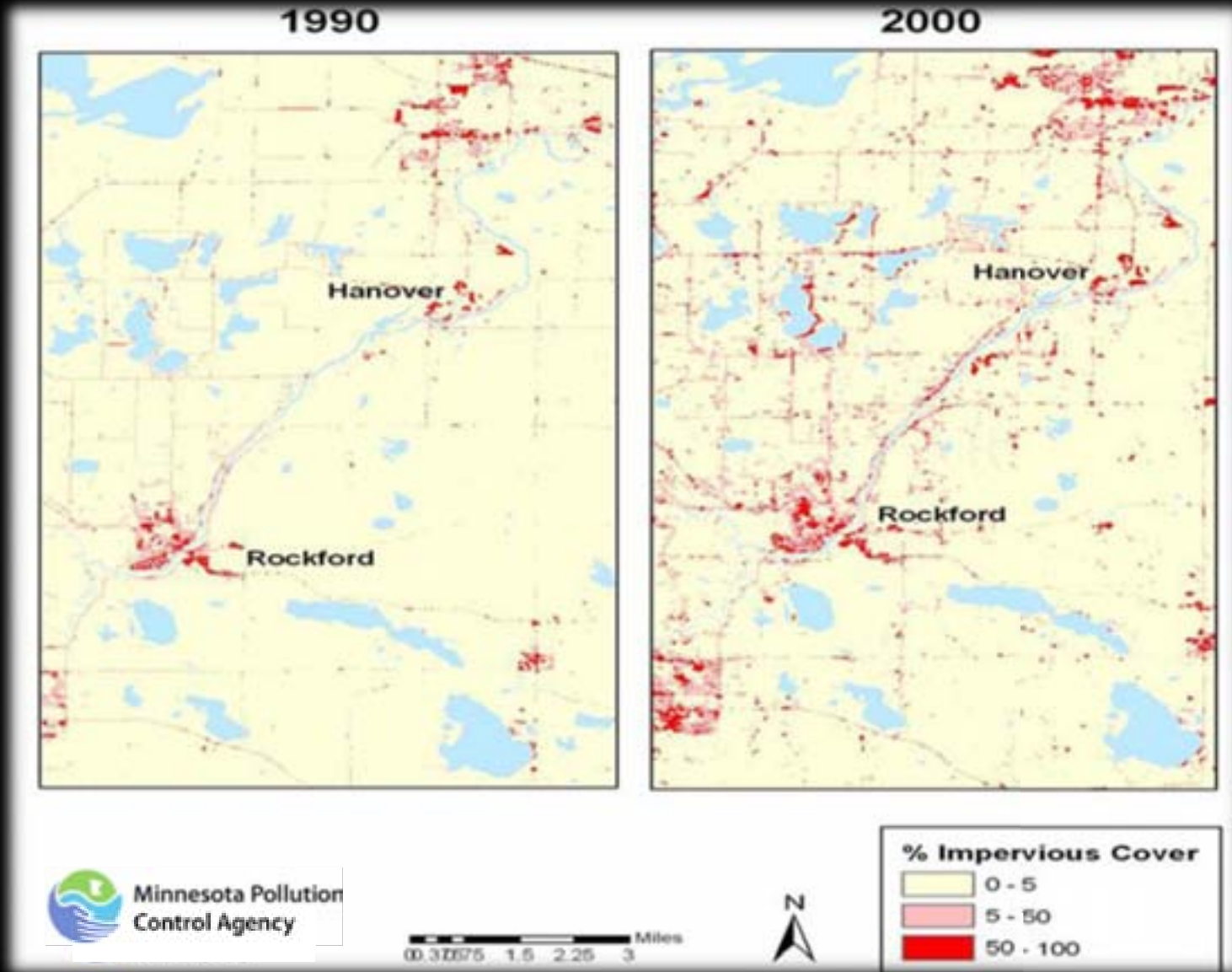
1998



2002



Impervious cover in the Hanover, MN area ~300% increase



STOP the MADNESS!

KEEP...

Hanover Rural

Come To The NEXT City Meeting

SEPT-11



55 Communities

11 Counties























High quality
natural resources

Crow River
impaired water



Rural character



View sheds



Development Problems

2002 - 2006

Increased growth pressures

- development proposals
- annexation requests

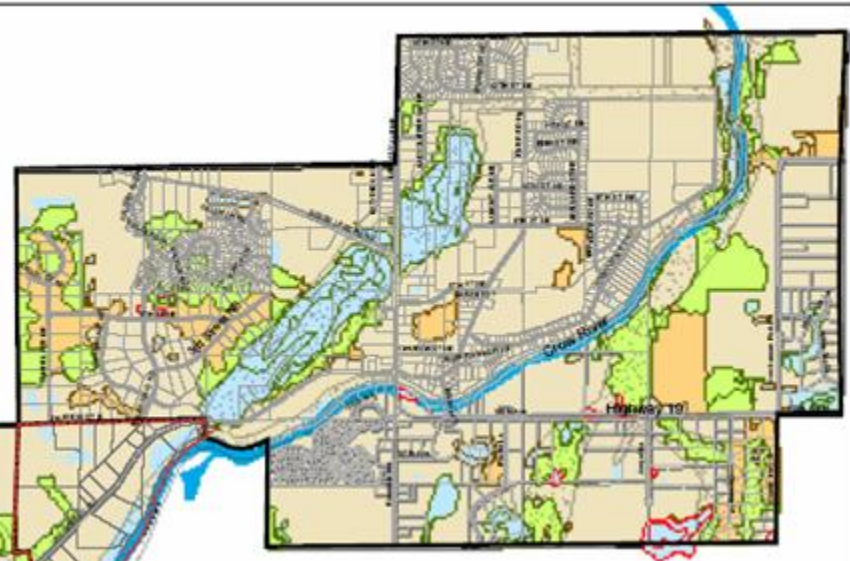
Difficulty preserving rural character

Unhappy with most new subdivisions

- few amenities: trails, parks,
- cookie cutter
- visual quality: homes, SW ponds



Hanover, Minnesota



Ecological Resources Map (Draft)

- Ecological Resource Rating
 - High
 - Medium
- Wetland Resources Rating
 - High
 - Medium
 - Low
 - Unrated Wetlands
- City Boundary
- Rockford Growth Area
- Ecological/Greenway Corridor

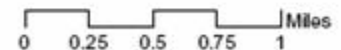
Notes:

The Ecological Resource Rating in the Rockford Growth Area was produced by Barr Engineering and includes both terrestrial and aquatic resources.

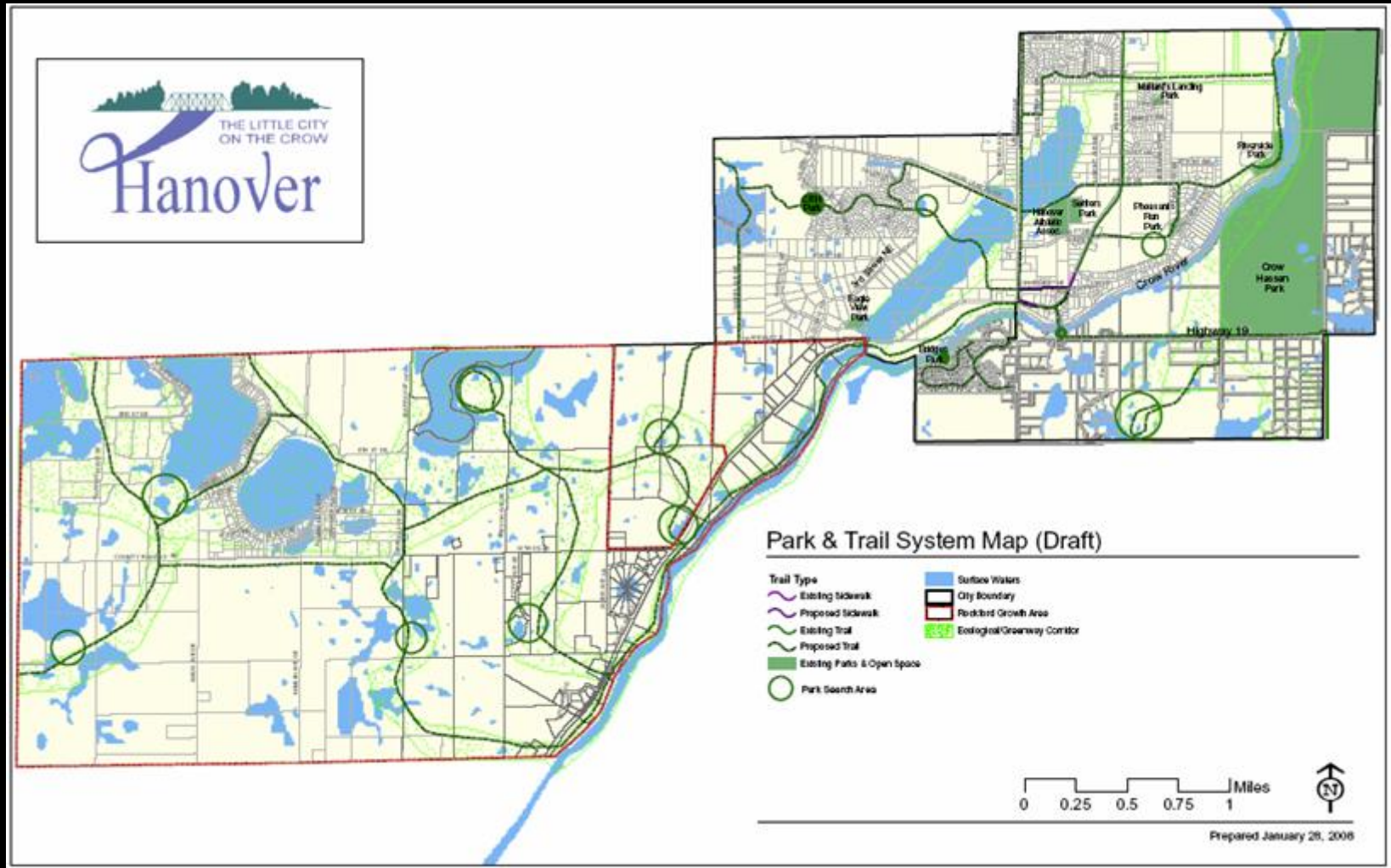
The Ecological Resource Rating in the existing city was estimated by NAC based on the 2003 Natural Resource Inventory and is for terrestrial resources only.

The Wetland Resources Rating applies only to the existing city and was produced by Applied Environmental Services as part of the 2003 Natural Resource Inventory.

The shown Ecological/Greenway Corridor includes the corridor produced by Barr Engineering and expanded by the Planning Commission.



Ecological resources & corridors provide basis for future park & trail system and economic benefit



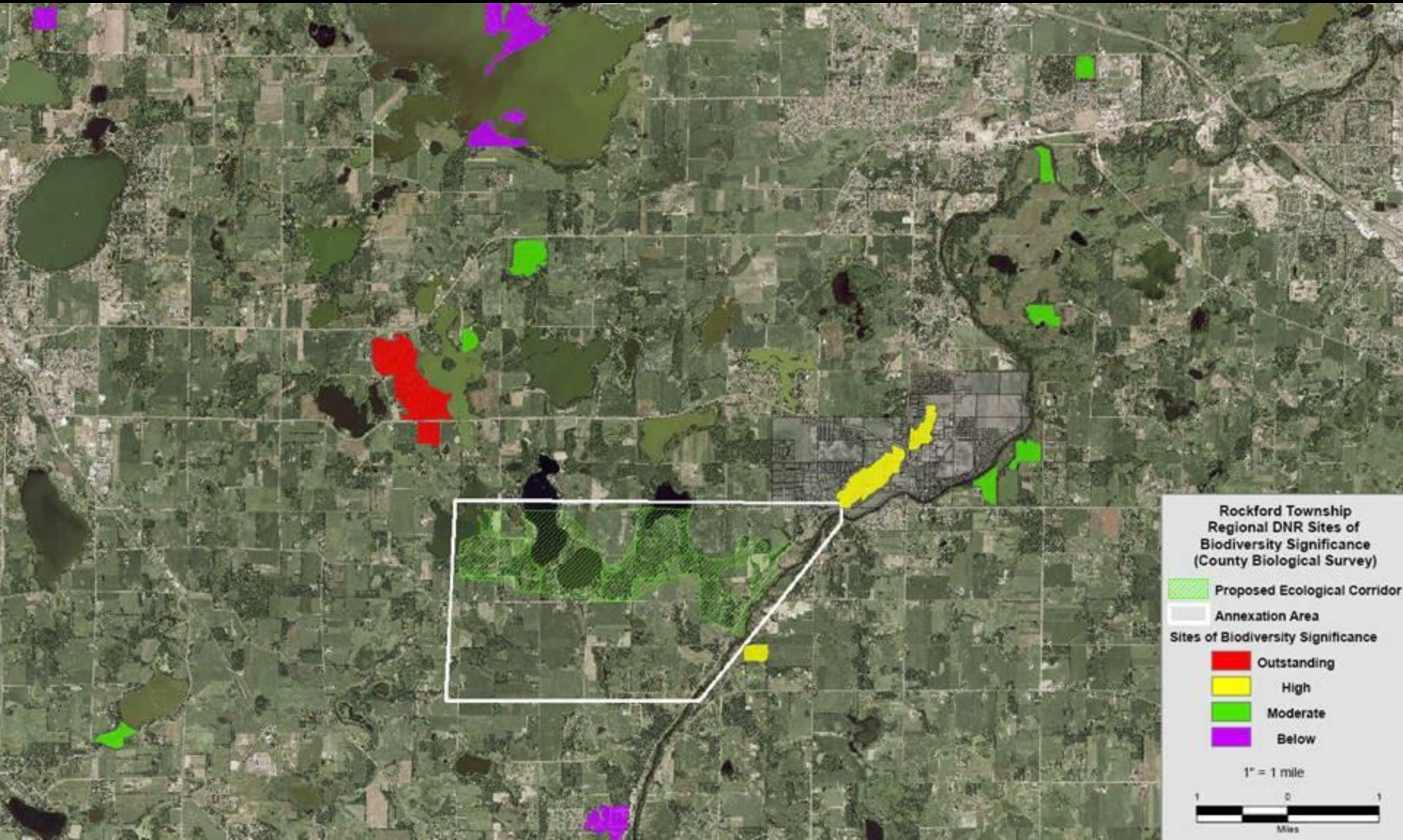
Vision shift and goals

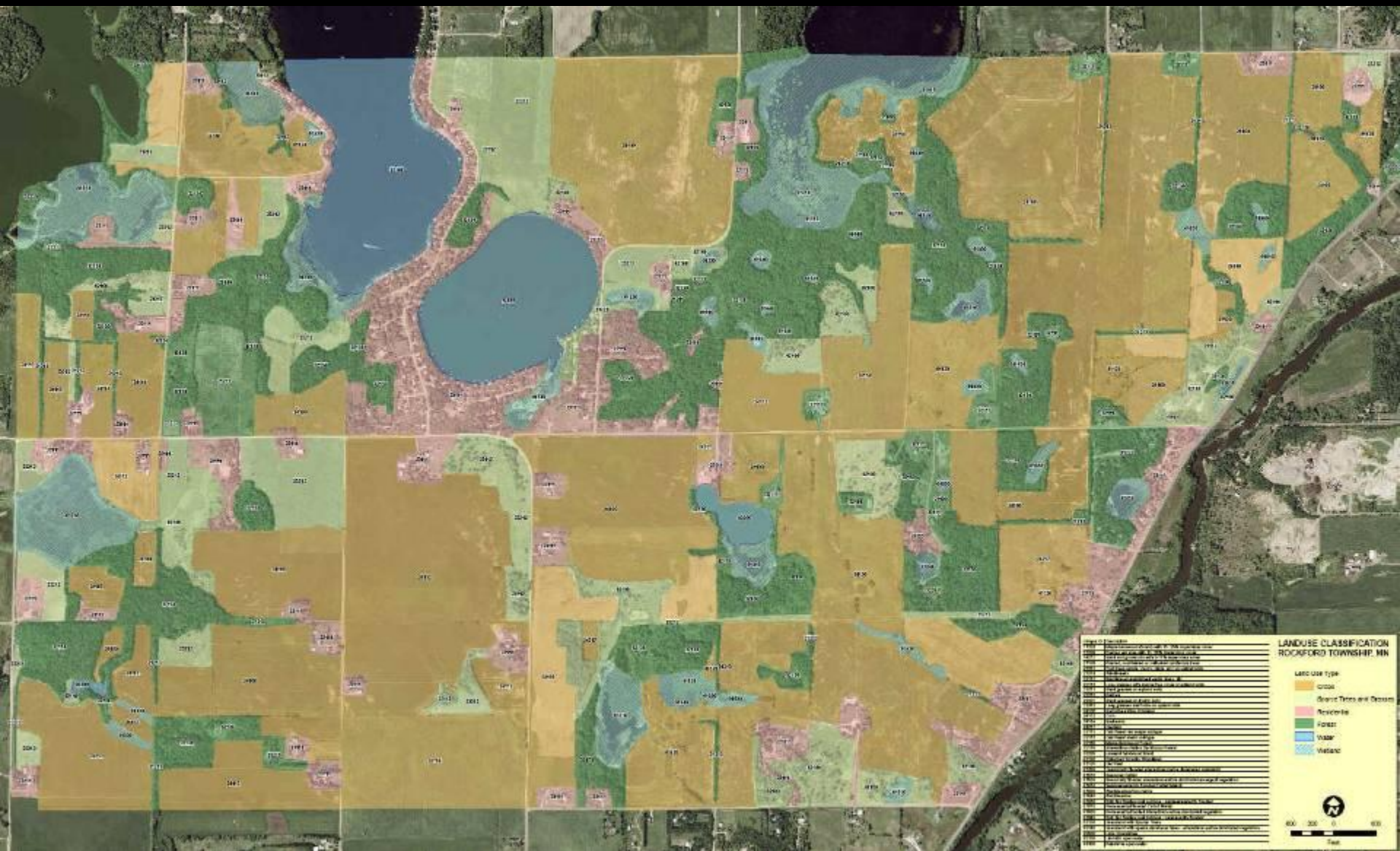
Current Reality

- ▶ large lot development
- ▶ minimum standards
- ▶ traffic management
- ▶ zoning guides density
- ▶ significant run-off
- ▶ loss of priority resources
- ▶ impaired waters

Future

- ▶ Respect landscape (NRI)
- ▶ minimize impacts to natural and built environments
- ▶ Preserve priority and sensitive resources
- ▶ Significantly reduce run-off
- ▶ Focus on basin and watershed performance objectives
- ▶ lot lines drawn last rather than first (land guides density and use)





LAND USE CLASSIFICATION
ROCKFORD TOWNSHIP, MN

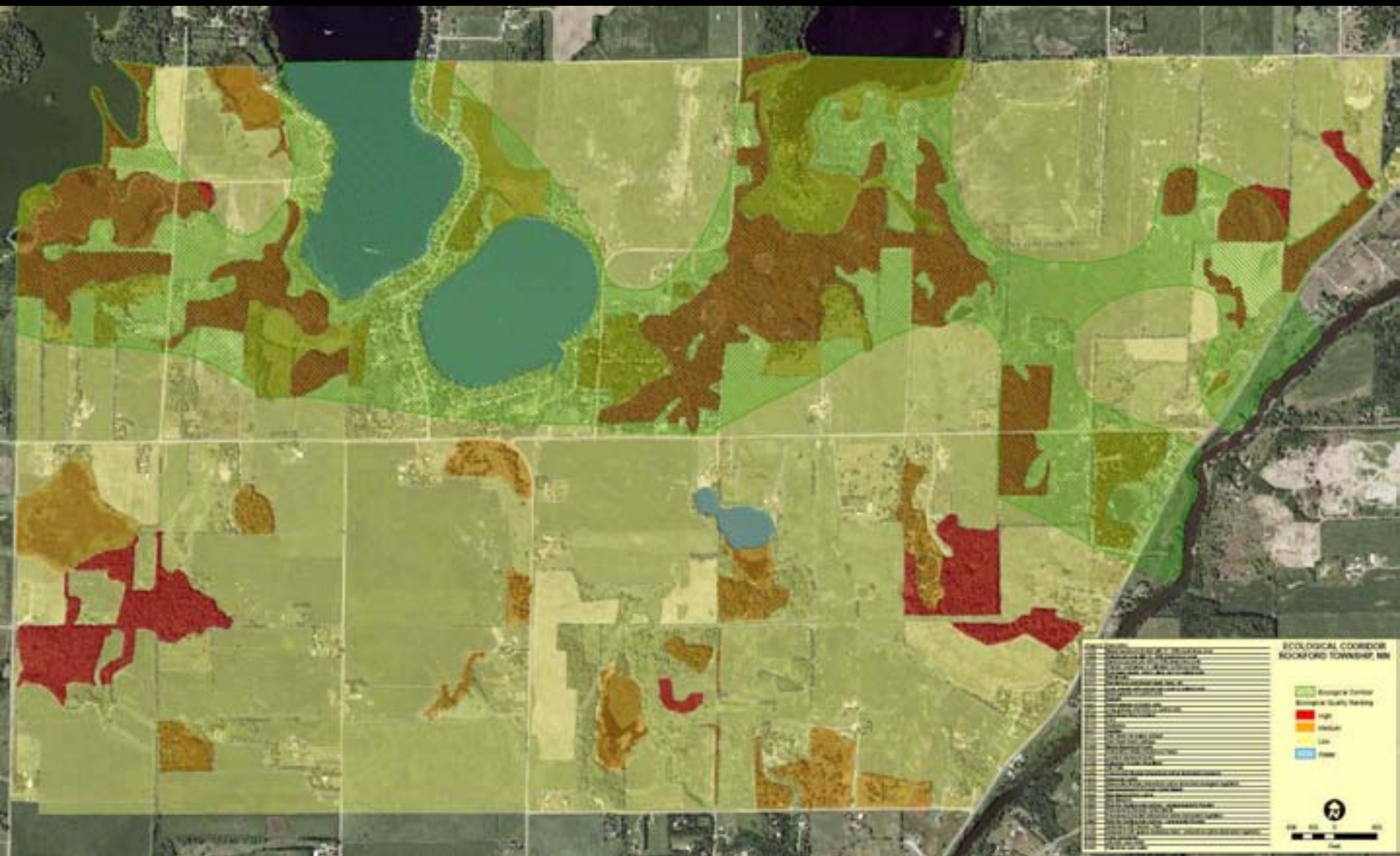
LAND USE TYPE

- Grass
- Grass Trees and Deciduous
- Residential
- Forest
- Water
- Wetland

Legend

- 0000 - Unincorporated Area
- 0001 - Township Office
- 0002 - Township Office
- 0003 - Township Office
- 0004 - Township Office
- 0005 - Township Office
- 0006 - Township Office
- 0007 - Township Office
- 0008 - Township Office
- 0009 - Township Office
- 0010 - Township Office
- 0011 - Township Office
- 0012 - Township Office
- 0013 - Township Office
- 0014 - Township Office
- 0015 - Township Office
- 0016 - Township Office
- 0017 - Township Office
- 0018 - Township Office
- 0019 - Township Office
- 0020 - Township Office
- 0021 - Township Office
- 0022 - Township Office
- 0023 - Township Office
- 0024 - Township Office
- 0025 - Township Office
- 0026 - Township Office
- 0027 - Township Office
- 0028 - Township Office
- 0029 - Township Office
- 0030 - Township Office
- 0031 - Township Office
- 0032 - Township Office
- 0033 - Township Office
- 0034 - Township Office
- 0035 - Township Office
- 0036 - Township Office
- 0037 - Township Office
- 0038 - Township Office
- 0039 - Township Office
- 0040 - Township Office
- 0041 - Township Office
- 0042 - Township Office
- 0043 - Township Office
- 0044 - Township Office
- 0045 - Township Office
- 0046 - Township Office
- 0047 - Township Office
- 0048 - Township Office
- 0049 - Township Office
- 0050 - Township Office
- 0051 - Township Office
- 0052 - Township Office
- 0053 - Township Office
- 0054 - Township Office
- 0055 - Township Office
- 0056 - Township Office
- 0057 - Township Office
- 0058 - Township Office
- 0059 - Township Office
- 0060 - Township Office
- 0061 - Township Office
- 0062 - Township Office
- 0063 - Township Office
- 0064 - Township Office
- 0065 - Township Office
- 0066 - Township Office
- 0067 - Township Office
- 0068 - Township Office
- 0069 - Township Office
- 0070 - Township Office
- 0071 - Township Office
- 0072 - Township Office
- 0073 - Township Office
- 0074 - Township Office
- 0075 - Township Office
- 0076 - Township Office
- 0077 - Township Office
- 0078 - Township Office
- 0079 - Township Office
- 0080 - Township Office
- 0081 - Township Office
- 0082 - Township Office
- 0083 - Township Office
- 0084 - Township Office
- 0085 - Township Office
- 0086 - Township Office
- 0087 - Township Office
- 0088 - Township Office
- 0089 - Township Office
- 0090 - Township Office
- 0091 - Township Office
- 0092 - Township Office
- 0093 - Township Office
- 0094 - Township Office
- 0095 - Township Office
- 0096 - Township Office
- 0097 - Township Office
- 0098 - Township Office
- 0099 - Township Office

0 200 400 600 Feet

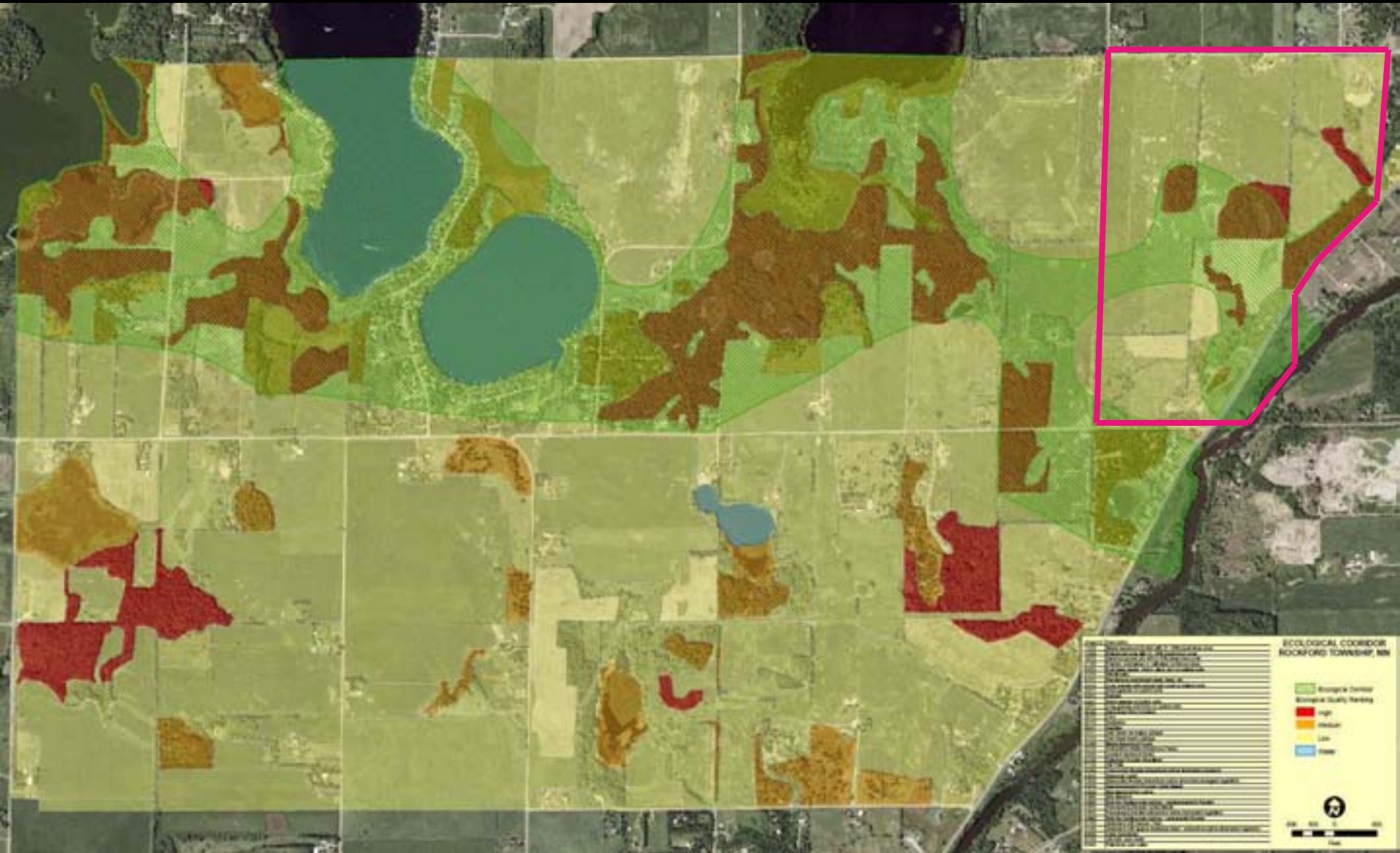


**ECOLOGICAL CORRIDOR
ROCKFORD TOWNSHIP, MN**

Ecological Corridor
Ecological Quality Rating
High
Medium
Low
Water

0 100 200
Feet

1. Ecological Corridor
2. Ecological Quality Rating
3. High
4. Medium
5. Low
6. Water



**ECOLOGICAL CORRIDOR
ROCKFORD TOWNSHIP, MN**

	Ecological Quality Rating
	Ecological Corridor
	High
	Medium
	Water

380 acres

(Less 76 acres)

20 Acre = 15

10 Acre = 30

2.5 Acre = 103



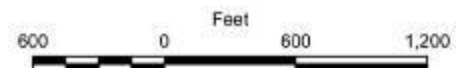
RURAL RESIDENTIAL 2.5 ACRE LOTS

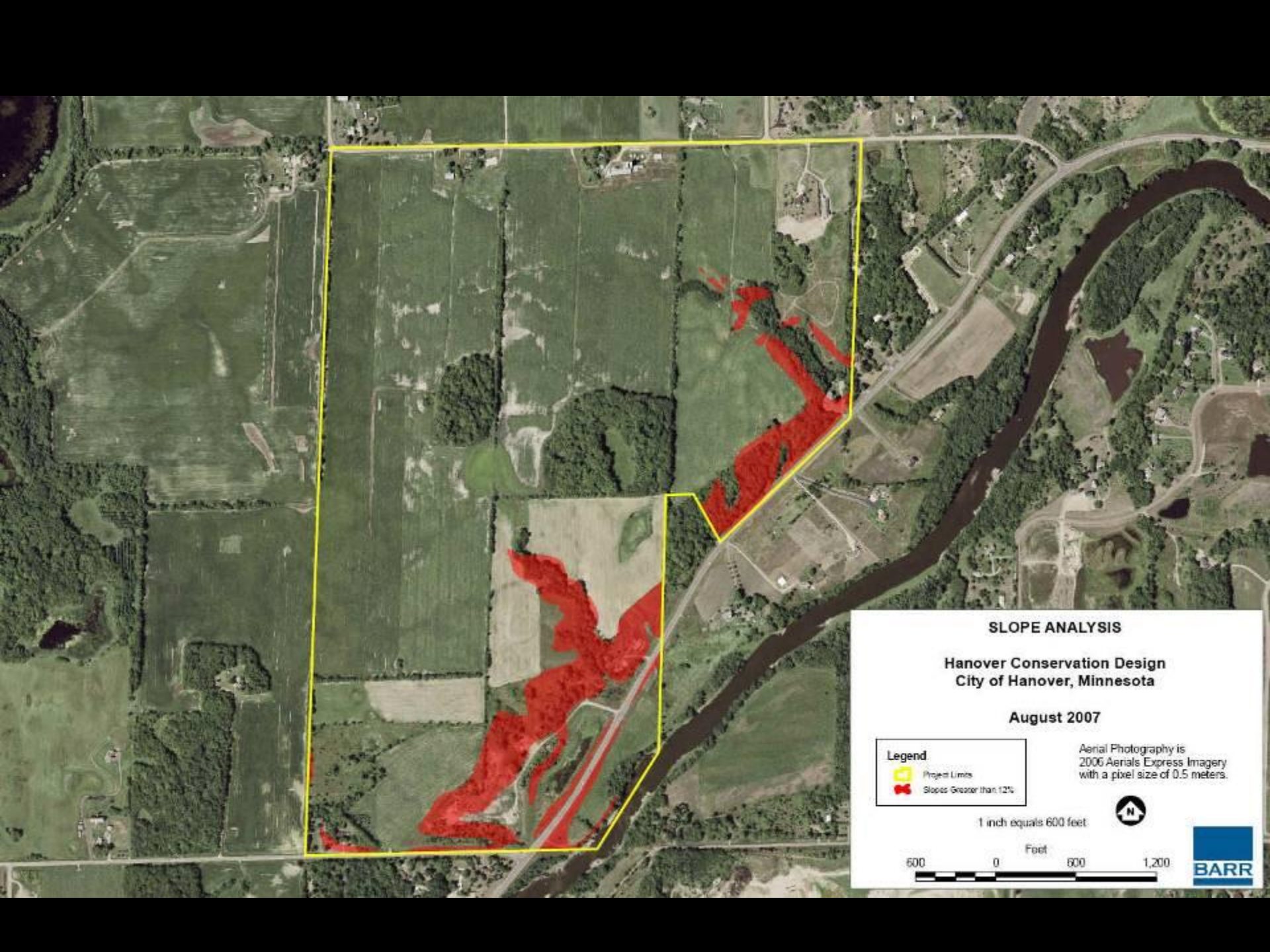
Hanover Conservation Design
City of Hanover, Minnesota

August 2007



1 inch equals 600 feet





SLOPE ANALYSIS

Hanover Conservation Design
City of Hanover, Minnesota

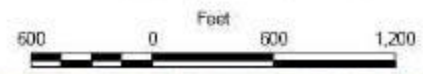
August 2007

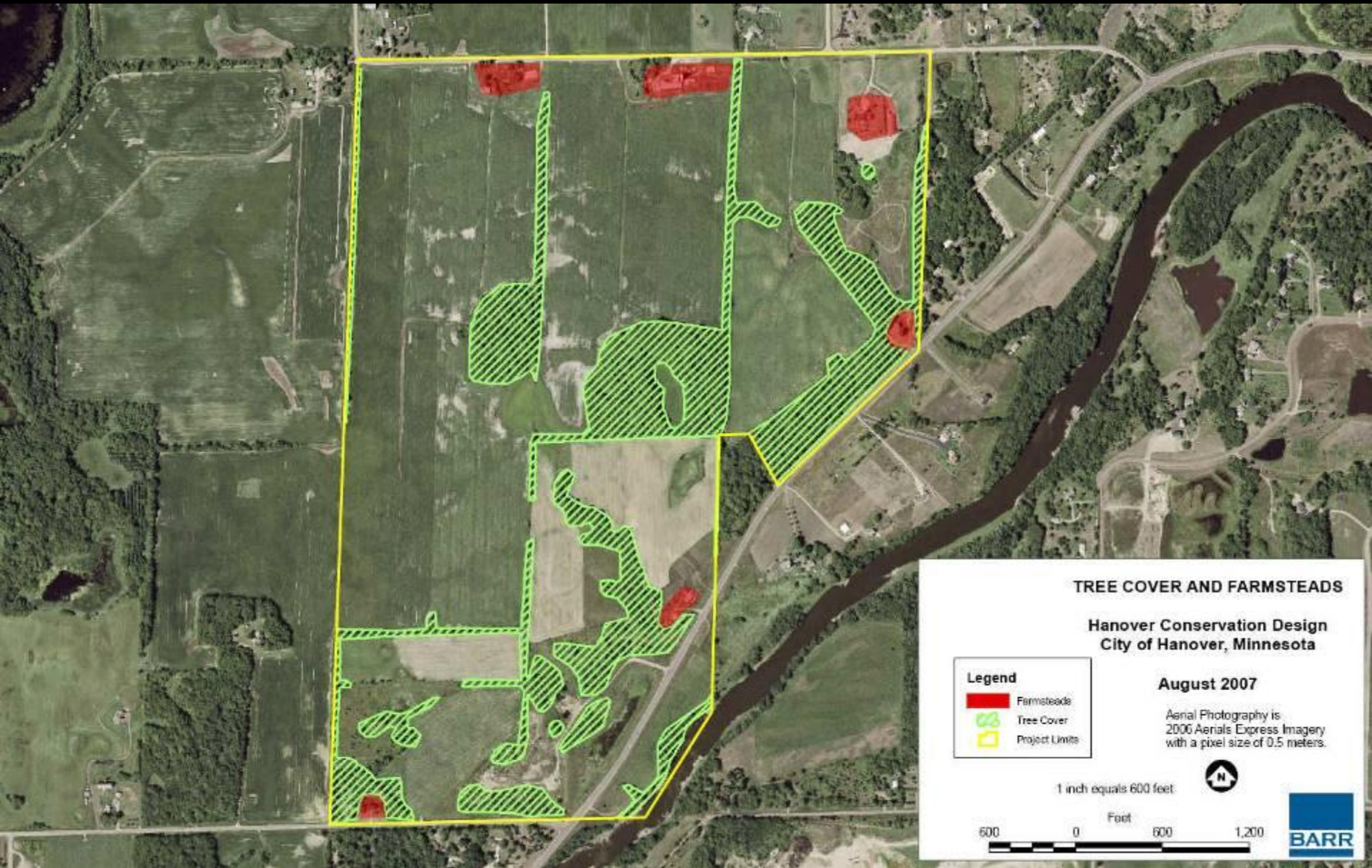
Legend

-  Project Limits
-  Slopes Greater than 12%

Aerial Photography is
2006 Aerials Express Imagery
with a pixel size of 0.5 meters.

1 inch equals 600 feet





TREE COVER AND FARMSTEADS

Hanover Conservation Design
City of Hanover, Minnesota

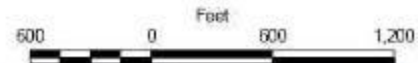
August 2007

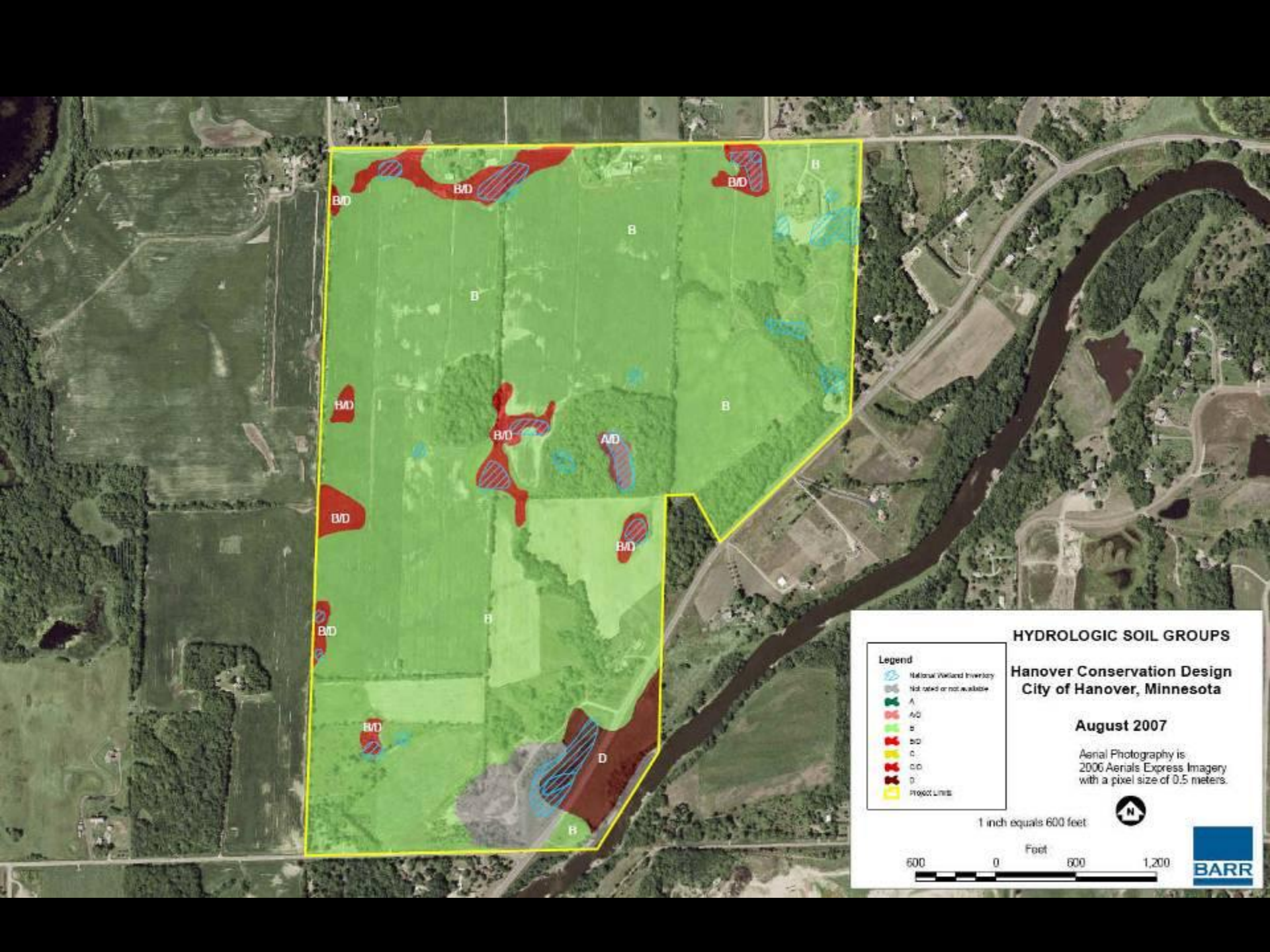
Aerial Photography is
2006 Aerials Express Imagery
with a pixel size of 0.5 meters.

Legend

-  Farmsteads
-  Tree Cover
-  Project Limits

1 inch equals 600 feet





HYDROLOGIC SOIL GROUPS

**Hanover Conservation Design
City of Hanover, Minnesota**

August 2007

Aerial Photography is
2006 Aerials Express Imagery
with a pixel size of 0.5 meters.

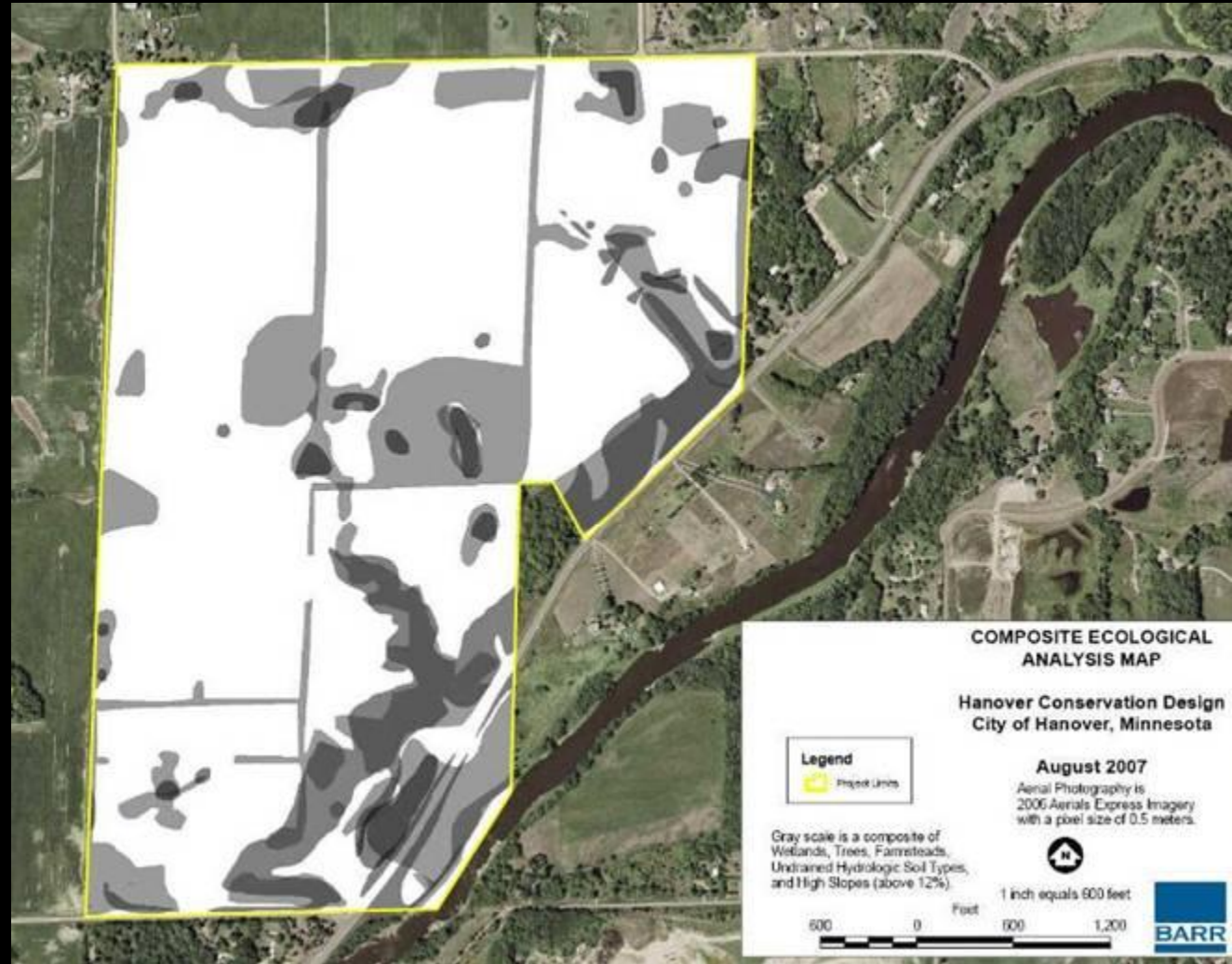
Legend

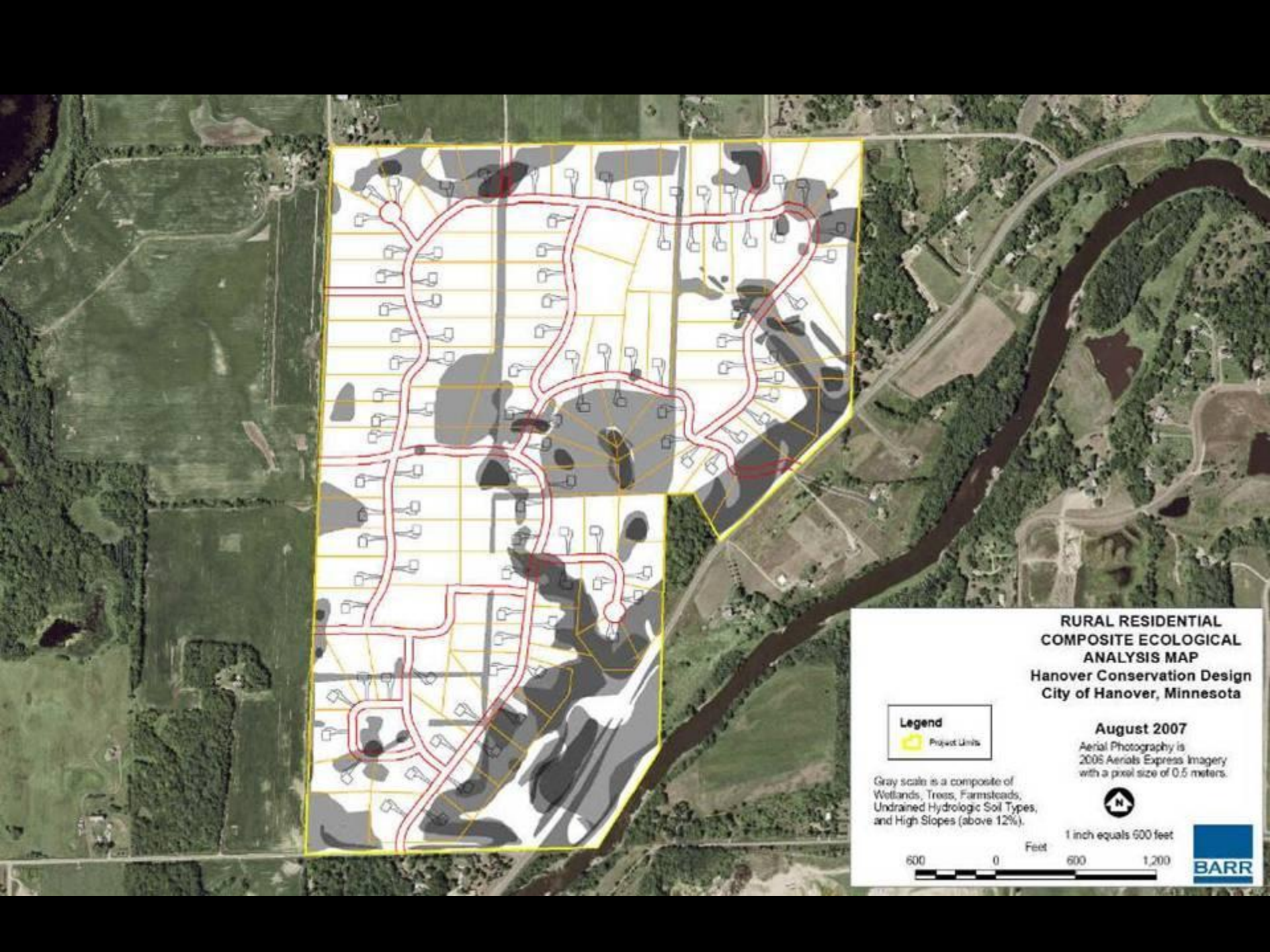
- National Wetland Inventory
- Not tested or not available
- A
- AD
- B
- BD
- C
- CD
- D
- Project Limits

1 inch equals 600 feet



In conservation design less than 50% of developable land (*white space*) is developed.





**RURAL RESIDENTIAL
COMPOSITE ECOLOGICAL
ANALYSIS MAP**
Hanover Conservation Design
City of Hanover, Minnesota

August 2007

Aerial Photography is
2005 Aerials Express Imagery
with a pixel size of 0.5 meters.

Legend
 Project Units

Gray scale is a composite of
Wetlands, Trees, Farmsteads,
Undrained Hydrologic Soil Types,
and High Slopes (above 12%).



1 inch equals 600 feet



380 acres

56% open
space

289 homes

186
additional
home sites



Legend

- Trails
- Right of Way
- Lot Lines
- Building Envelope
- Project Limits

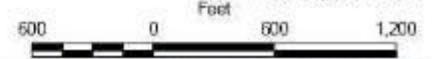
**CONSERVATION DESIGN OPTION
COMPOSITE ECOLOGICAL
ANALYSIS MAP - SCEN 1
100-Foot Frontage
Hanover Conservation Design
City of Hanover, Minnesota
August 2007**

Aerial Photography is
2006 Aerials Express Imagery
with a pixel size of 0.5 meters.

Gray scale is a composite of
Wetlands, Trees, Farmsteads,
Undrained Hydrologic Soil Types,
and High Slopes (above 12%).



1 inch equals 600 feet









Scenario 1

100 ft lot

frontage

1/3 acre

189 homes



Scenario 2
80 ft lot
frontage
¼ acre
373 homes



Connections between land use and water quality

The 4 realities of land use and water quality

Trends in land use and the Mississippi Basin

**Marketing conservation land use planning
(Hanover Pilot Study) An alternative approach**

Water Quality & Environmental Benefits

Quality of life, Public Value, Economics

Quality of Life, Public Value, Economics

Density considerations

Land development choices, and

Cost comparison analysis

Large Lot Zoning

Research analyzing environmental pollutant loads on a per capita basis (*rather than a per unit land area basis*) show that higher density results in a lower pollutant load for a given population when compared to the same population at lower density.

- Does not preserve rural character
- Not as economically viable
- Contributes less to tax base
- Typically doesn't serve community vision and values (*Comp Plan*)
- May not yield desired environmental objectives



Land development choices



Enhanced Quality of Life

- Rural character preserved
- More privacy
- More recreation



- Increased property value
- Enhanced view-sheds
- Less to maintain



- Preserve rural character
- Economically viable
- Increase tax base
- Reduce property development disputes
- Preserve & protect WQ

Development analysis

	Rural residential design	Conservation design 1 & 2	
		Scenario 1 (100-ft frontage)	Scenario 2 (80-ft frontage)
Total area	380 acres	380 acres	380 acres
Total buildable area	329 acres	329 acres	329 acres
Average lot size	2.82 acres	0.33 acres	0.26 acres
Lots per acre (<i>buildable area</i>)	0.31 lots/acre	0.88 lots/acre	1.13 lots/acre
Total lots	103 lots	289 lots	373 lots
Road miles	4.6 miles	6.6 miles	6.6 miles
Total road hard surface	19.5 acres	20.8 acres	20.8 acres
Total hard surface	42.2	53.3 acres	62.7 acres
Open space	50.5 acres	211 acres	210 acres
Open space % of total area	13%	56%	56%
Walking/biking trails	0.7 miles	9.4 miles	9.4 miles

Cost comparison of rural residential & conservation design #1 (100-ft frontage)

	Rural residential	Conservation design #1
Roads	\$1,275,918	\$1,357,824
Sanitary	\$1,103,310	\$1,566,720
Water	\$858,130	\$1,218,560
Storm sewer	\$108,150	\$85,050
Walking/biking trails	\$32,525	\$436,762
Total	\$3,378,033	\$4,664,916
Cost per lot	\$32,796	\$16,142

1990

2000

Hanover

Hanover

Rockford

- Rehabilitation is expensive (>1 Million/Lake)
- EB for avoided costs (~ 22 Million)
- EB permanent conservation (set aside PDR >100 Million)



Connections between land use and water quality

The 4 realities of land use and water quality

Trends in land use and the Mississippi Basin

**Marketing conservation land use planning
(Hanover Pilot Study) An alternative approach**

Water Quality & Environmental Benefits

Quality of life, Public Value, Economics

Water Quality & Environmental Benefits

Environmental performance (subdivision pilot)
Environmental performance (commercial pilot)
Credits

Environmental performance

	Current zoning	Conservation design
Removed: phosphorus	60%	92%
suspended solids	85%	98%
Open space	13%	56%
Impervious cover	118.5 acres	53.3 acres ~ 55% reduction
Sprawl factor	1,066 acres	380 acres ~ 64% reduction
Cost per lot	\$32,796	\$16,142 ~ 49% reduction
Runoff volume reduction	0	83%



BANKLEET

BANKLEET

NOW
OPEN





- ▶ Stormwater used to water plants
- ▶ Mimics natural hydrology
- ▶ Recharges ground water
- ▶ dirt, oil, and other garbage goes to rain-gardens rather than river
- ▶ No ponds.
Infiltrates
standing water
in 24 hours
- ▶ >80% reduction
in runoff
- ▶ >90% reduction
in phosphorus
- ▶ Engineered for
the 10 year
storm event
- ▶ Bank saved
time and money



Connections between land use and water quality

The 4 realities of land use and water quality

Trends in land use and the Mississippi Basin

**Marketing conservation land use planning
(Hanover Pilot Study) An alternative approach**

Water Quality & Environmental Benefits

Quality of life, Public Value, Economics