Land Use Management &
Health and Human Services

Goodhue County Urban Fringe Health Impact Assessment Appendix/Maps

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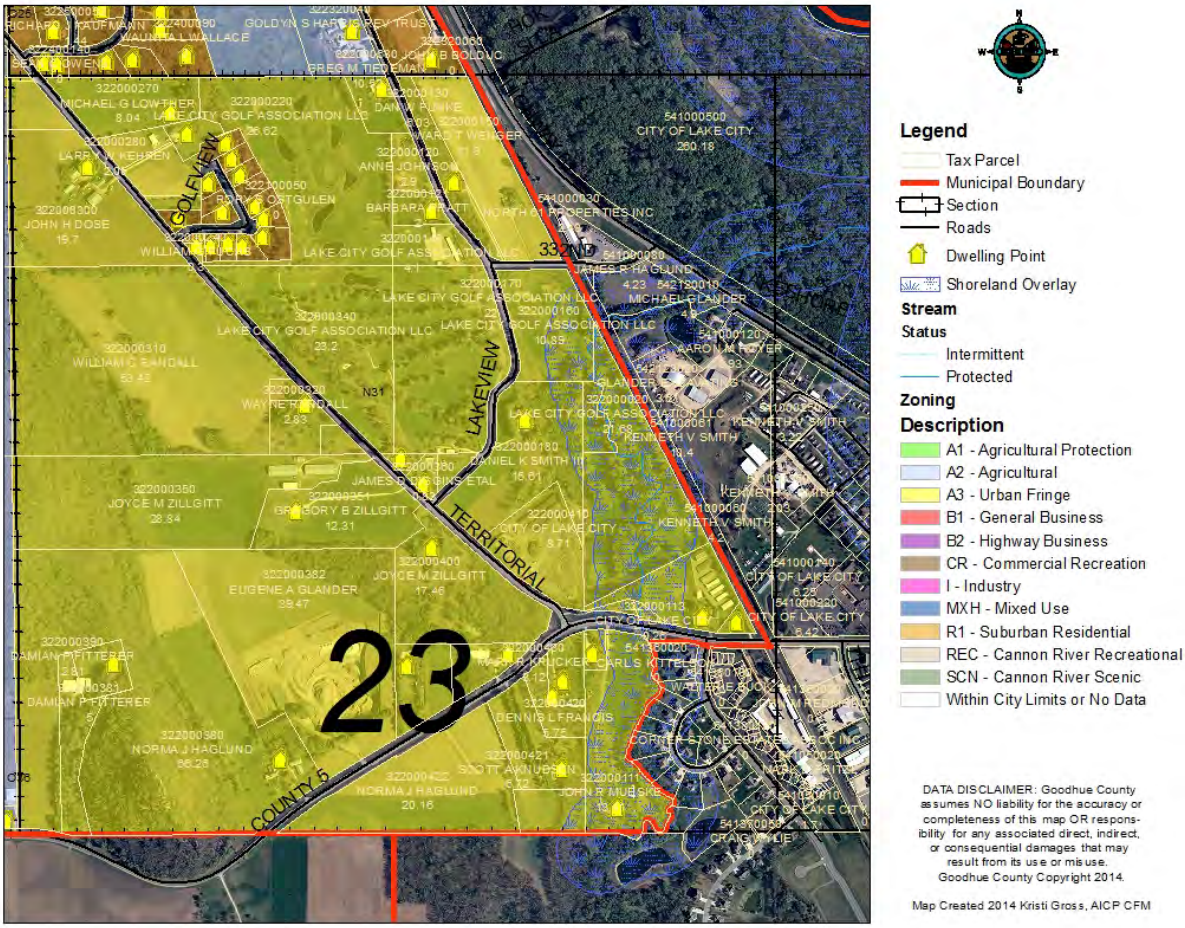
Explanation of Township and County Zoning District Regulations



Florence Township contains one section that is zoned A-3, but they do not recognize the A-3 zone. So, if a property owner in that section would like to build, they would need to meet the more restrictive rule. Goodhue County would allow one dwelling per thirty five acres lot (more restrictive lot size). Florence Township would allow the dwelling to be located on two acres, but they only allow a total of twelve dwellings in the section (more restrictive density standard). Therefore if the landowner owned 40 acres, and the section was not full (fewer than twelve dwellings in the section) they could build. Meeting Florence Township's more restrictive density standard is not enough, however. They have to follow Goodhue County's more restrictive rule too. They would not be permitted to split the property into one thirty-five acre lot and one five-acre lot (which the township may have allowed). The county rule does not allow the five-acre lot.

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Project:	Goodhue County Urban Fringe District HIA

Pathway: Natural Resources

Health Determinant:	**Change in dwelling density**
Geographic Scope:	All current A3 zones in Goodhue County, MN
Zoning Plans:	Convert all current A3 Urban Fringe District zones to A2 or A1 Agricultural zones
Potential Health Impacts:	Physical Activity, Mental Health/Well-being, Respiratory Health

Existing Conditions Research Questions	Impact Research Questions	Indicators	Data Sources	Methods
Proximate Effects				
What is the current dwelling density in the study area?	How might the zoning change impact the dwelling density for the study area?	Number of dwellings	GIS aerial maps	GIS database inquiry and/or visual assessment of GIS maps
What is the current dwelling density in the study area?	How might the zoning change impact the dwelling density for the study area?	"Full" sections--where number of dwellings is equal to total number that would be allowed by the zoning change	Draft maps created by land use office	Include in appendix. Kristi or GIS re-do maps for clarity
How much of the current land area zoned as A-3 is in a "natural environment" state (not being farmed or used for residential purposes)?	How might the zoning change impact natural environment preservation for areas currently zoned as A-3 zones in Goodhue County?	Areas on aerial maps that do not show indications of farming and/or residential use (would need to further define criteria for this), would also need to be able to quantify amount of land deemed to fit this category	Perhaps GIS aerial maps??	Visual assessment of GIS maps
What kinds of natural resources are available in the study area?	How might the zoning change impact the kinds of natural resources available in the study area?	Listing of natural resources in A3 area	Land Use Natural Resource Inventory (Lake City and/or whole watershed)	Document review
To what extent do residents in the study area use these natural resources?	How might the zoning change impact the access to natural resources in the study area?	Reported usage of natural resources for hiking, hunting wildlife, etc.	Primary data collection	Survey
How do residents in the study area perceive their access to these natural resources?	How might the zoning change impact resident perceptions regarding access to natural resources in the study area?	Perceived access to natural resources (places for recreation and reflection)	Primary data collection	Focus group

How do residents in the study area perceive "living in the country"?	How might the zoning change (limiting the number of dwellings) affect resident perceptions of "living in the country"?	Perceived satisfaction with living in a rural residential environment (with fewer dwellings, and/or more natural resources)	Primary data collection	Survey/Focus group
Do residents in the study area perceive that they experience social isolation?	How might the zoning change (more people "living in the country") affect the number of people who perceive that they experience social isolation?	Perceived experience of social isolation from living in a rural residential environment	Primary data collection	Focus group
How does preservation of natural resources (including non-tillable acres, "wasteland") affect water quality?	How might the zoning change (limiting the number of dwellings) impact water quality?	Filtering effect of wetlands on pollution before it reaches drinking water, economic benefits of reduced need for expensive water filtration facilities	Literature review	
How does preservation of natural resources (forests, wetlands, non-tillable acres, "wasteland") affect air quality?	How might the zoning change (limiting the number of dwellings) affect air quality?	Filtering effect of tree canopy and vegetation for air quality	Literature review	
How does preservation of natural resources affect wildlife habitat?	How might the zoning change affect wildlife habitat?	How natural resource preservation protects wildlife habitat	Literature review (Department of Natural Resources?)	
Health Outcomes				
How do residents in the study area perceive housing development/loss of natural resources?	How would the zoning change affect the rates of stress due to housing development/destruction of natural resources?		Primary data collection	survey
What are the current rates of stress in the study area?	How will the zoning change impact the rates of stress in the study area?	Perceived stress (use questions from Perceived Stress Scale, and/or develop questions specific to stress of topic of interest)	Primary data collection	survey, focus group
What are the current rates of physical activity in the study area?	How will the zoning change impact rates of physical activity in the study area?	Physical activity	BRFSS	

How does water pollution affect health?	How will the zoning change affect health?	Brief summary of health effects of drinking water contamination from polluted wetlands, rivers	Literature review	
How does air pollution affect health?	How will the zoning change affect health?	Brief summary of health effects of air quality alerts, i.e. why these alerts are issued to close	Literature review	
Vulnerable populations				
What percentage of the population in the study area is low-income?	How would proposed changes to zoning impact low-income residents in the study area?	Household income (use Census questions for this concept)	Primary data collection	Survey
What percentage of residents in the study area study area are elderly?	How would proposed changes to zoning impact the elderly?	Age	Primary data collection	Survey
Do residents in the study area experience isolation from services?	How might the zoning change (more people "living in the country") affect isolation from services, as people age?	Is there any place more than 15 minutes from an ambulance/EMS service in the A3 district?	Primary data collection	Key informant interview with ambulance service

Project:	**Goodhue County Urban Fringe District HIA**
Pathway:	**Succession Planning**
Health Determinant:	**Change in parcel sizes/dwelling density**
Geographic Scope:	All current A3 zones in Goodhue County, MN
Zoning Plans:	Convert all current A3 Urban Fringe District zones to A2 or A1 Agricultural zones
Potential Health Impacts:	Mental Health/Well-being

Existing Conditions Research Questions	Impact Research Questions	Indicators	Data Sources	Methods
Proximate Effects				
What is the current minimum lot size allowed in the study area?	How would this zoning change affect the minimum lot size allowed?	Lot size in acres	Land Use Office	Ordinance citation
Potential new question		How many new parcels have been split from larger parcels in A-1 and A-2 district last 2 years	Kristi will review splits from last 2 years.	Evaluating split from shoreland report for last 3 years.
What was the average parcel size for sales of land currently zoned as A-3 (last 3 years)?	How might the zoning change impact the average parcel size for sales of land in the study area?	Average parcel size, in acres	Assessor's Office	Data inquiry
How many requests for variances regarding the parcel size requirement in the zoning ordinance are received by Land Use Management annually (last 10 years)?	How might the zoning change impact the number of requests for variances to the parcel size requirement in the zoning ordinance?	# of variances	Land Use Office	Database inquiry
How many private loans (e.g. for new dwelling construction, home improvement, purchase of ag building site, or re-financing) were requested but denied, based on the parcel size in the A-3 zone?	How might the zoning change impact the ability to obtain a loan for new dwelling construction, home improvement, purchase of ag building site, or re-financing?	A list of lending criteria or (if available) # of loans denied	Alliance Bank, White Rock Bank, First Farmers and Merchants Bank	Key Informant Interview (1-2 interviews sufficient)
How many potential sales of existing residences or land to build a new residence (e.g. for the purposes of farm succession) were not initiated due to parcel size?	How might the zoning change impact the likelihood of older adult farm owners in the study area to transfer land to younger generations?	Response to survey questions such as - How important is it to you to transfer your property to younger generation? Does current lot size impact your ability to transfer land? How does that make you feel?	Primary data collection	Landowner Survey (mail/website), Focus groups
How much of the current land area zoned as A-3 is tilled vs. not tilled?	How might the zoning change impact agricultural land preservation for areas currently zoned as A-3 zones in Goodhue County?	Areas on aerial maps that show indications of farming use (would need to further define criteria for this), would also need to be able to quantify amount of land deemed to fit this category	Farm Service Agency (may be able to tell us actual acres farmed), Goodhue County Soil Survey "Prime Agricultural Soils" (acres that could be farmed)	Visual assessment of GIS maps

How does sustained local agricultural production, with successful succession planning, contribute to community identity? (Agriculture needs large contiguous parcels of land for economic use.)	How might the zoning change impact the community identity in the study area?	Perceptions and existing literature about how essential agricultural activity is to a diverse economy capable of sustaining a community through downturns in any single industry.	Primary data collection	Focus groups/Lit review
How does locally-grown food from farms in the study area contribute to community identity in the study area?	How might the zoning change impact the community identity in the study area?	# Goodhue county farms marketing product locally (product differentiation as "local"), e.g. from *Minnesota Grown* directory, in the study area	List of local farms from Minnesota Department of Agriculture's *Minnesota Grown* directory and/or list of farmers' market vendors at various cities in the county	Document review/address lookup
How important is it to the identity of the community for people to transfer farms from generation to generation?	How might the zoning change impact the community identity in the study area?	Response to survey question, To what extent is the community of this area based on the families that live here and whether they continue to live here?	Primary data collection	Landowner Survey (mail/website), Focus groups
Health Outcomes				
What are the current rates of stress in the study area?	How will the zoning change (changes to succession planning, access to loans, community identity, preservation of ag) impact the rates of stress in the study area?	Perceived stress (use questions from Perceived Stress Scale, and/or develop questions specific to stress of topic of interest)	Primary data collection	survey, focus group
Vulnerable populations				
What percentage of the population in the study area is low-income?	How would proposed changes to zoning impact low-income residents in the study area?	Household income (use Census questions for this concept)	Primary data collection	Survey
What percentage of residents in the study area study area are elderly?	How would proposed changes to zoning impact the elderly?	Age	Primary data collection	Survey
What is the average age of farmers in the study area (i.e. are members of this occupation likely to be among the elderly population)?	How would proposed changes to zoning impact the elderly?	Age	Secondary data	There may be statewide survey on this--perhaps from U of M Extension or similar?

Project:	**Goodhue County Urban Fringe District HIA**
Pathway:	**Housing Development**
Health Determinant:	**Reduce dwelling density**
Geographic Scope:	All current A3 zones in Goodhue County, MN
Zoning Plans:	Convert all current A3 Urban Fringe District zones to A2 or A1 Agricultural zones
Potential Health Impacts:	Physical Health

Existing Conditions Research Questions	Impact Research Questions	Indicators	Data Sources	Methods
Proximate Effects				
What is the current dwelling density in the study area?	How might the zoning change impact the dwelling density for the study area?	Number of dwellings	GIS aerial maps	GIS database inquiry and/or visual assessment of GIS maps
What is the current dwelling density in A-1 and A 2?	How might the zoning change impact the number of homes in the study area?	Number of dwellings -- what is allowed, and current conditions (actual density)	Land Use Office, GIS aerial maps	Ordinance citation, GIS data inquiry and/or visual assessment of GIS maps
How likely are landowners in the districts currently zoned A-3 to be planning to sell this land for income?	How might the zoning change impact the number of homes developed outside city infrastructure in the study area?	Survey response - How likely are you to some land for the purpose of housing development, for income?	Primary data collection	Landowner Survey (mail/website), Focus groups
How many dwellings are relying on private wells? (Note: equivalent to How many homes are outside of city infrastructure?)	How might the zoning change impact the number of homes with private wells?	Number of dwellings	Environmental Health Inventory (Pam)	Extrapolate from township inventory if data is not available for whole county
How many dwellings are relying on septic systems? (Same as above)	How might the zoning change impact the number of homes with septic systems?	Number of dwellings	Environmental Health Inventory (Pam)	Extrapolate from township inventory if data is not available for whole county
What is the impact of private septic systems on groundwater pollution that affects private wells?	How might the zoning change impact pollution from septic systems that affects wells?	Likelihood of contamination, means of contamination, etc.	Literature review.	
What is the impact of agricultural production, particularly field runoff from fertilizers (anhydrous ammonia) and pesticides, on groundwater pollution that affects private wells?	How might the zoning change impact pollution from agricultural producation that affects wells?	Likelihood of contamination, means of contamination, etc. Fertilizer permit process. Pesticide permit process. Best management practices (commercial applicators are licensed, private applicators get permits). Risks from lawn fertilizers applied by (non-licensed?) private individuals.	Literature review.	

What are the current levels of nitrates in the groundwater in the study area?	How might the zoning change impact the number of people using private wells contaminated with nitrates?	Location of high nitrate probability ranking areas as determined by MDH map (nitrate loading from land use plus hydrogeologic sensitivity of the water table aquifer)	Minnesota Department of Health Oct. 2011 map, if nothing more recent (request map of just Goodhue County if MDH has it, talk to Goodhue co. Environmental Health 1st)	Assessment of map
How many feedlots are in the A3 district?	How might the zoning change affect the # of feedlots	# feedlots	Feedlot officer (Virginia)	
What are existing manure management practices in the study area?	How might the the zoning change affect existing practices?	Manure management plan requirements (note, for fewer than 300 animal units there would be no records/manure management plans)	Feedlot officer (Virginia)	
Health Outcomes				
What are the physical health outcomes of using water with high fecal coliform bacteria counts for drinking, cooking, and/or bathing?	How might the zoning change impact physical health outcomes related to pollution from septic systems that affects wells?	Symptoms, long-term health effects, effect on children and/or elderly, etc.	Literature review.	
What are the physical health outcomes of using water contaminated with nitrates for drinking, cooking, and/or bathing?	How might the zoning change impact physical health outcomes related to pollution from agricultural producation that affects wells?	Symptoms, long-term health effects, effect on children and/or elderly, etc.	Literature review.	
What are the physical health outcomes of using water contaminated with pesticides for drinking, cooking, and/or bathing?	How might the zoning change impact physical health outcomes related to pollution from agricultural producation that affects wells?	Symptoms, long-term health effects, effect on children and/or elderly, etc.	Literature review.	
Vulnerable populations				
What percentage of the population in the study area is low-income?	How would proposed changes to zoning impact low-income residents in the study area?	Household income (use Census questions for this concept)	Primary data collection	Survey
What percentage of residents in the study area study area are elderly?	How would proposed changes to zoning impact the elderly?	Age	Primary data collection	Survey

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Urban Fringe District Landowner S...

Design Survey Collect Responses Analyze Results

CURRENT VIEW

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FILTER: Web Link

SAVED VIEWS (1)

Original View (No rules applied) Revert

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EXPORTS

SHARED DATA

No shared data

Sharing allows you to share your survey results with others. You can share all data, a saved view, or a single question summary. Learn more »

Share All

FILTERED: 348 of 348 respondents

Export All Share All

Question Summaries Data Trends Individual Responses

All Pages

PAGE 1

Q1 Export

Please enter the 4-digit ID number from your survey letter.

Answered: 348 Skipped: 0

Responses (348) Text Analysis My Categories (0)

Categorize as... Filter by Category Search responses

Showing 348 responses

0007
5/2/2014 1:24 PM View respondent's answers Categorize as...

0006
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1475
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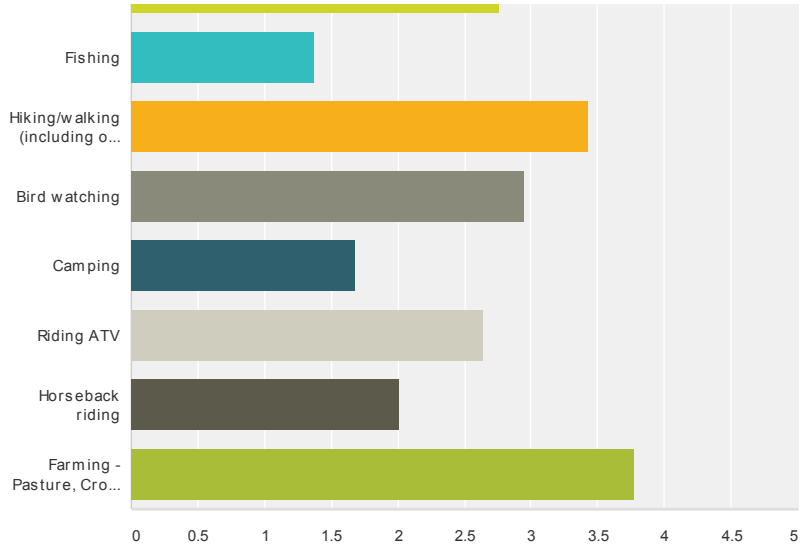
Q2 Customize Export

How often is your property in the study area used for the following purposes?

Answered: 342 Skipped: 6

Hunting

Appendix C



	Never	Rarely	Occasionally	Frequently	Very Frequently	Total	Average Rating
Hunting	26.98% 92	16.13% 55	24.93% 85	17.01% 58	14.96% 51	341	2.77
Fishing	82.35% 280	6.18% 21	6.18% 21	2.06% 7	3.24% 11	340	1.38
Hiking/walking (including on roads adjacent to your property)	13.53% 46	9.12% 31	24.41% 83	26.47% 90	26.47% 90	340	3.43
Bird watching	24.19% 82	15.04% 51	21.24% 72	20.94% 71	18.58% 63	339	2.95
Camping	58.33% 196	22.32% 75	14.58% 49	2.38% 8	2.38% 8	336	1.68
Riding ATV	30.09% 102	16.22% 55	25.37% 86	15.93% 54	12.39% 42	339	2.64
Horseback riding	48.20% 161	20.96% 70	17.37% 58	8.08% 27	5.39% 18	334	2.01
Farming - Pasture, Crops, Rented Out, Hobby Farm	23.88% 80	2.39% 8	5.07% 17	9.55% 32	59.10% 198	335	3.78

Comments (23)

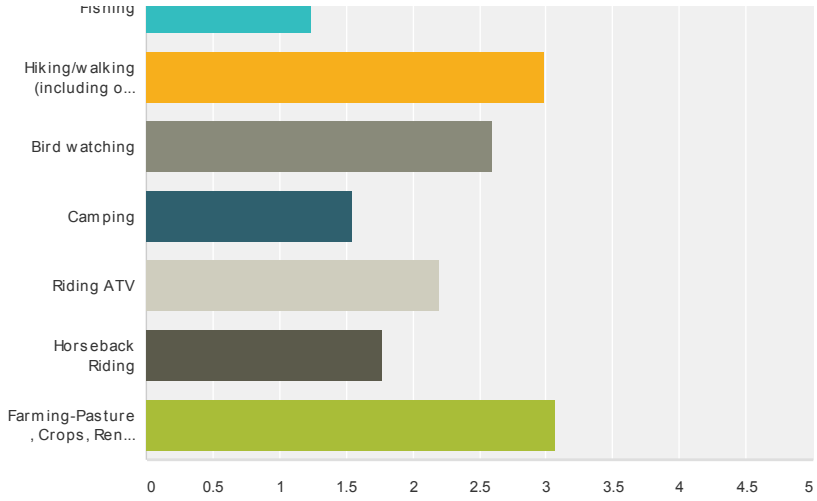
Q3

Customize Export

The A-3 district currently has a minimum lot size of 35 acres. If the zoning changed to allow for sales of lot sizes of 2 acres, how often would your property in the study area be used for the following purposes?

Answered: 338 Skipped: 10

Appendix C



	Never	Rarely	Occasionally	Frequently	Very Frequently	Total	Average Rating
Hunting	47.77% 161	16.62% 56	17.21% 58	10.68% 36	7.72% 26	337	2.14
Fishing	85.89% 286	6.91% 23	5.71% 19	0.60% 2	0.90% 3	333	1.24
Hiking/walking (including on roads adjacent to your property)	22.75% 76	12.57% 42	25.75% 86	20.96% 70	17.96% 60	334	2.99
Bird watching	28.27% 93	23.10% 76	20.97% 69	16.11% 53	11.55% 38	329	2.60
Camping	66.07% 220	19.82% 66	10.21% 34	2.10% 7	1.80% 6	333	1.54
Riding ATV	43.11% 144	18.56% 62	20.66% 69	10.48% 35	7.19% 24	334	2.20
Horseback Riding	58.84% 193	18.90% 62	13.11% 43	5.18% 17	3.96% 13	328	1.77
Farming-Pasture, Crops, Rented Out, Hobby Farm	38.48% 127	6.06% 20	6.97% 23	6.67% 22	41.82% 138	330	3.07

Comments (19)

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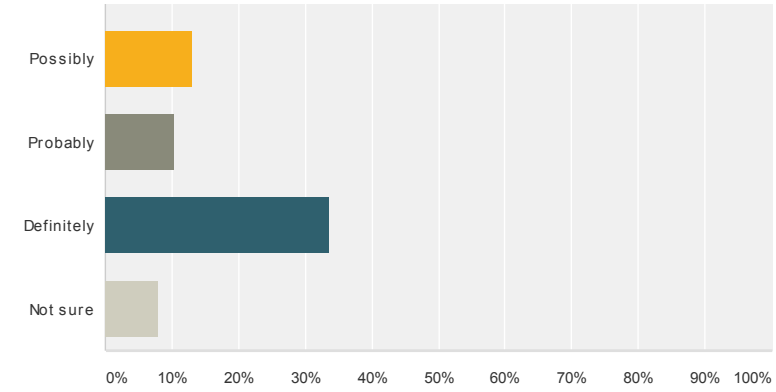
Q4

Customize Export

The A-3 district currently has a minimum lot size of 35 acres. Would changing this minimum lot size to 2 acres affect your ability to transfer (sell or give) your property in the study area to someone else?

Answered: 336 Skipped: 12

Appendix C



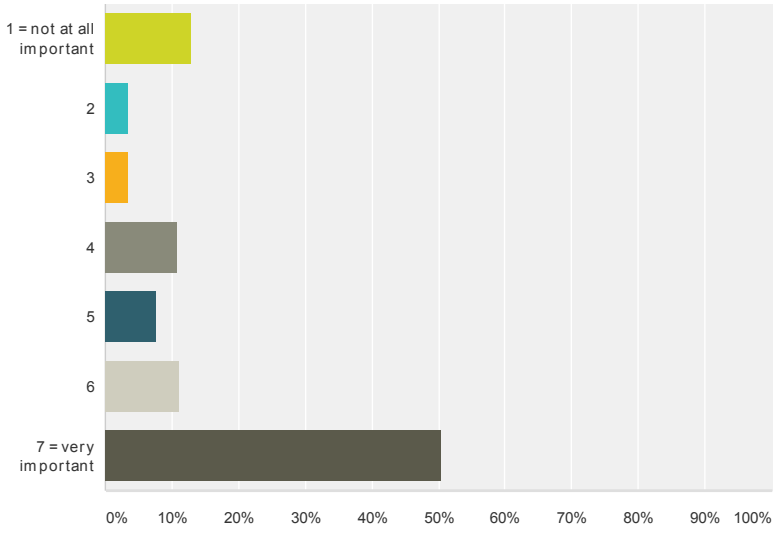
Answer Choices	Responses	
Definitely not	11.90%	40
Probably not	22.92%	77
Possibly	13.10%	44
Probably	10.42%	35
Definitely	33.63%	113
Not sure	8.04%	27
Total		336

Q5

Customize Export

How important is it to you to be able to transfer your property to a younger generation in your family?

Answered: 341 Skipped: 7



Answer Choices	Responses	
1 = not at all important	12.90%	44
2	3.52%	12
3	3.52%	12
4	10.85%	37
5	7.62%	26
6	11.14%	38
7 = very important	50.44%	172

Appendix C

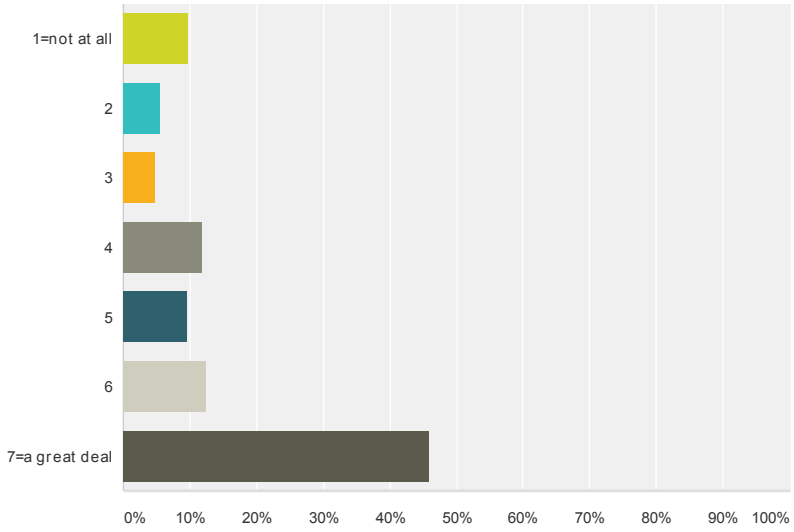
Total	341

Q6

Customize Export

Some properties have been in continuous ownership by a family for years. If families were not able to transfer their property to younger generations when desired, how would that impact the sense of community in the study area?

Answered: 336 Skipped: 12



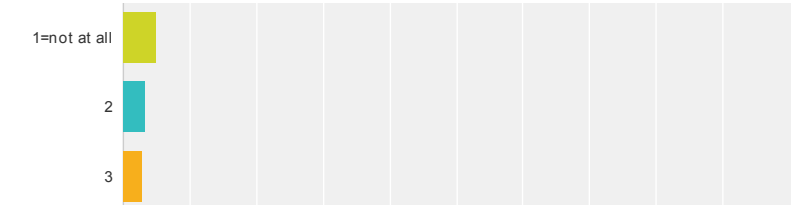
Answer Choices	Responses	
1=not at all	9.82%	33
2	5.65%	19
3	4.76%	16
4	11.90%	40
5	9.52%	32
6	12.50%	42
7=a great deal	45.83%	154
Total		336

Q7

Customize Export

To what extent does having a sense of community and belonging contribute to the positive well-being of the people who live in the study area?

Answered: 335 Skipped: 13



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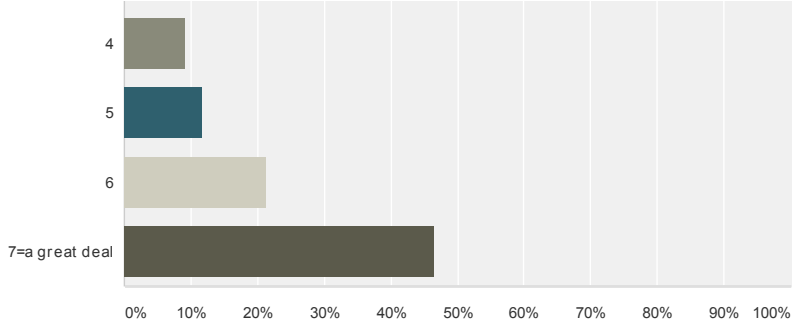


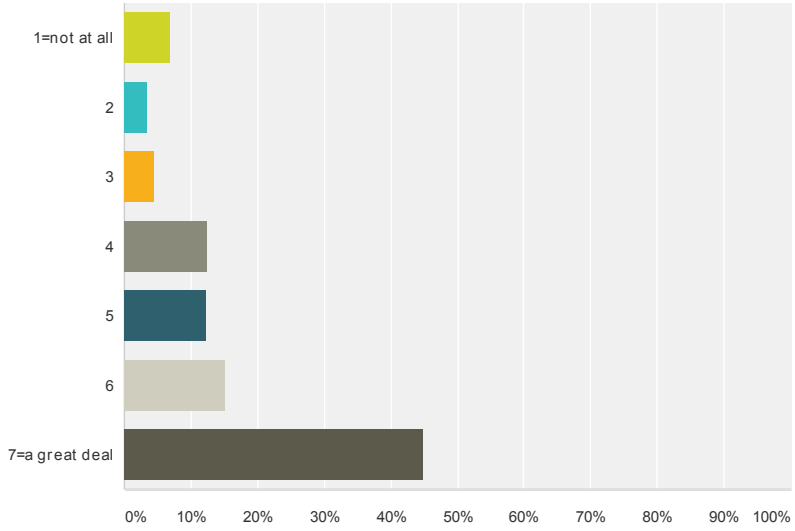
Answer Choices	Responses	
1=not at all	5.07%	17
2	3.28%	11
3	2.99%	10
4	9.25%	31
5	11.64%	39
6	21.19%	71
7=a great deal	46.57%	156
Total		335

Q8

Customize Export

To what extent would losing a sense of community impact the well-being of those who live in the study area?

Answered: 334 Skipped: 14



Answer Choices	Responses	
1=not at all	6.89%	23
2	3.59%	12
3	4.49%	15
4	12.57%	42
5	12.28%	41
6	15.27%	51
7=a great deal	44.91%	150

Appendix C

Total	334

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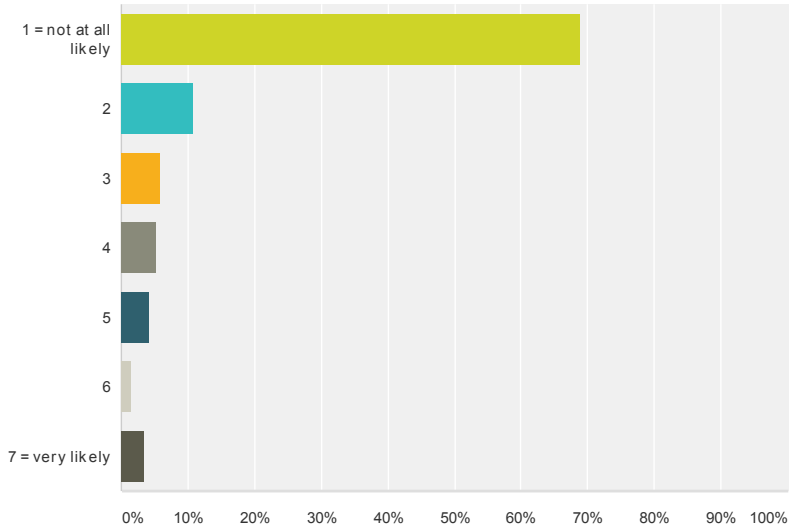
Q9

Customize Export

We are interested in studying the change that might occur in the number of housing developments (dwelling density) in the study area due to a proposed change in zoning guidelines to allow for smaller lot sizes but a maximum of 4 to 12 houses per section. Right now, how likely are you to sell some property in the study area for the purpose of housing development, for income?

Answered: 341 Skipped: 7



Answer Choices	Responses	
1 = not at all likely	68.91%	235
2	10.85%	37
3	5.87%	20
4	5.28%	18
5	4.11%	14
6	1.47%	5
7 = very likely	3.52%	12
Total		341

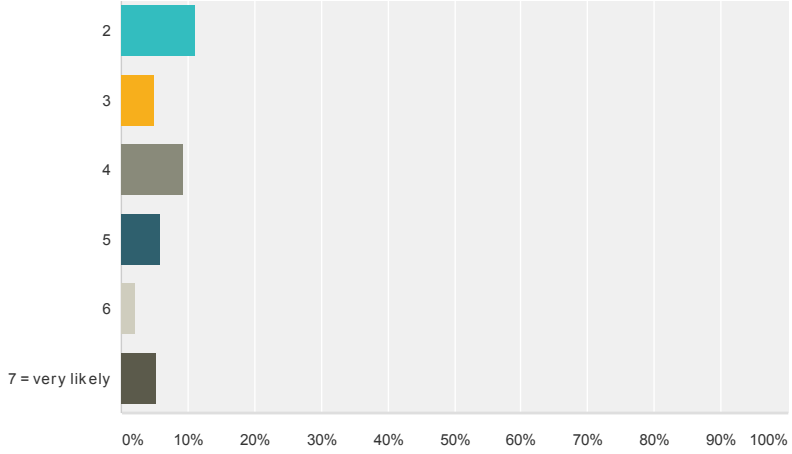
Q10

Customize Export

If zoning guidelines were changed, how likely would you be to sell some property in the study area for the purpose of housing development, for income?

Answered: 341 Skipped: 7

Appendix C



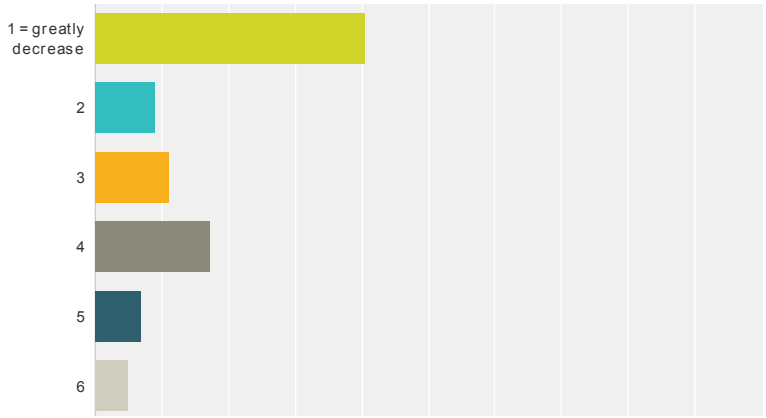
Answer Choices	Responses	
1 = not at all likely	61.29%	209
2	11.14%	38
3	4.99%	17
4	9.38%	32
5	5.87%	20
6	2.05%	7
7 = very likely	5.28%	18
Total		341

Q11

Customize Export

If new homes were built on lots adjacent to your property in the study area, how would this impact your lifestyle satisfaction?

Answered: 334 Skipped: 14



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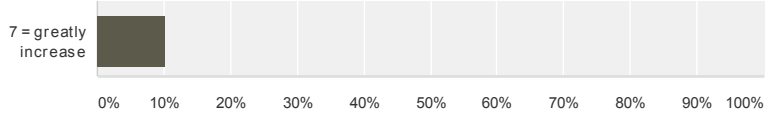

Answer Choices	Responses	
1 = greatly decrease	40.42%	135
2	8.98%	30
3	11.08%	37
4	17.37%	58
5	6.89%	23
6	5.09%	17
7 = greatly increase	10.18%	34
Total		334

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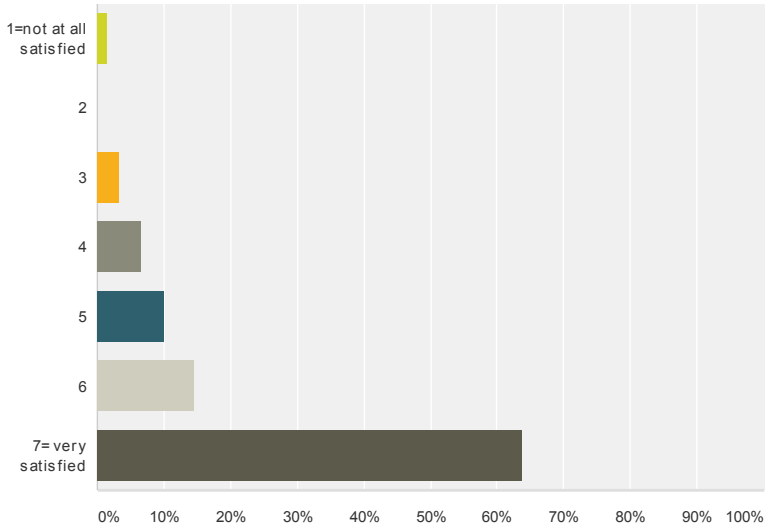
Q12

Customize Export

How satisfied are you with what you consider your neighborhood as a place to live?

Answered: 330 Skipped: 18



Answer Choices	Responses	
1=not at all satisfied	1.52%	5
2	0.00%	0
3	3.33%	11
4	6.67%	22
5	10.00%	33
6	14.55%	48
7= very satisfied	63.94%	211
Total		330

Appendix C

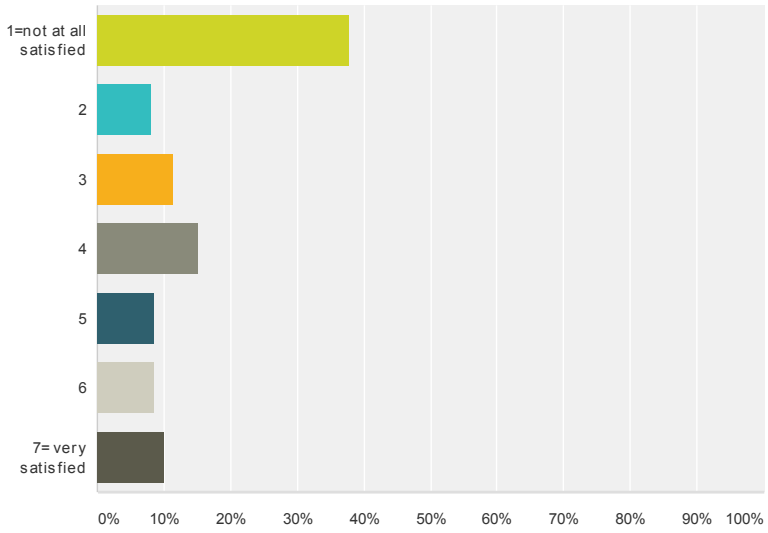
Q13

Customize Export

What do you expect your satisfaction with

What do you expect your satisfaction with your neighborhood to be if the zoning district were to change?

Answered: 328 Skipped: 20



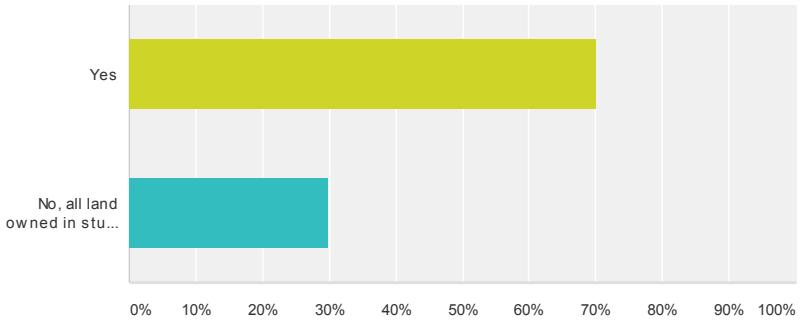
Answer Choices	Responses	
1=not at all satisfied	37.80%	124
2	8.23%	27
3	11.59%	38
4	15.24%	50
5	8.54%	28
6	8.54%	28
7= very satisfied	10.06%	33
Total		328

Q14

Customize Export

Do you own one or more homes on property in the study area?

Answered: 338 Skipped: 10



Answer Choices	Responses	
Yes	70.12%	237
No, all land owned in study area is bare land	29.88%	101
Total		338

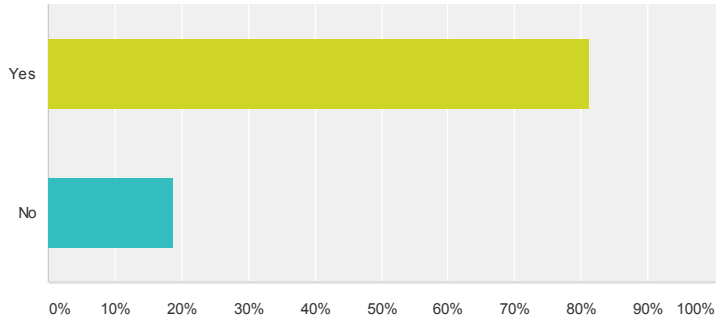
Appendix C

Q15

Customize Export

Do you have a private well for a home in the study area?

Answered: 335 Skipped: 13



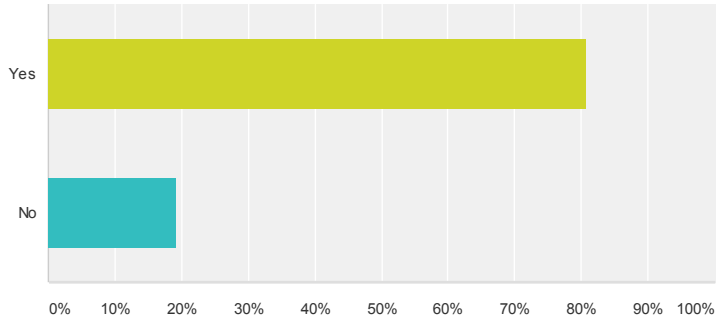
Answer Choices	Responses	
Yes	81.19%	272
No	18.81%	63
Total		335

Q16

Customize Export

Do you have a private septic system for a home in the study area?

Answered: 335 Skipped: 13



Answer Choices	Responses	
Yes	80.90%	271
No	19.10%	64
Total		335

Appendix C

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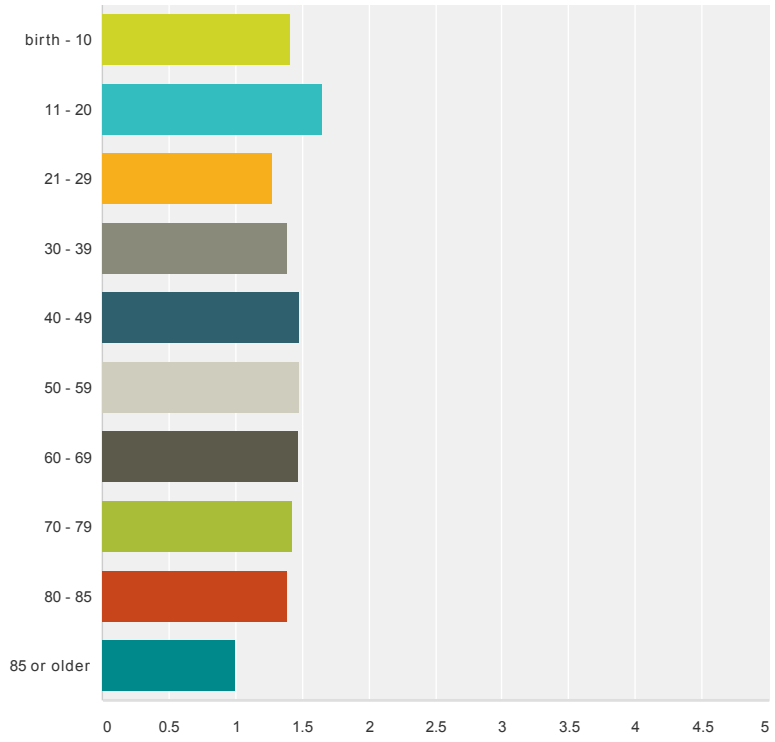
Q17

Customize Export

Including yourself, how many people in each age group live in your household?

Answered: 320 Skipped: 28



Answer Choices		Average Number	Total Number	Responses
birth - 10	Responses	1	45	32
11 - 20	Responses	2	84	51
21 - 29	Responses	1	46	36
30 - 39	Responses	1	25	18
40 - 49	Responses	1	98	66
50 - 59	Responses	1	164	111
60 - 69	Responses	1	157	107
70 - 79	Responses	1	93	65
80 - 85	Responses	1	18	13
85 or older	Responses	1	14	14

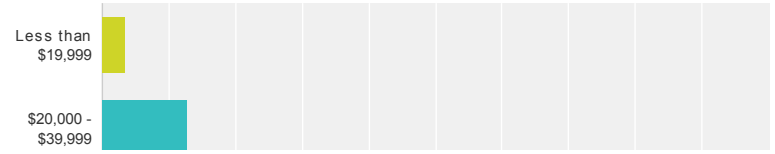
Total Respondents: 320

Q18

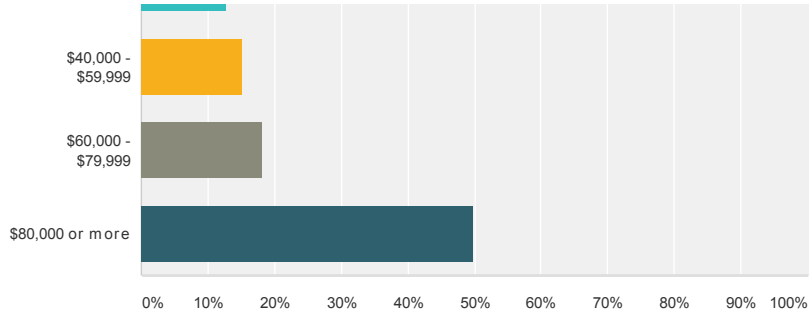
Customize Export

What was your household's income last year from all sources?

Answered: 274 Skipped: 74



Appendix C



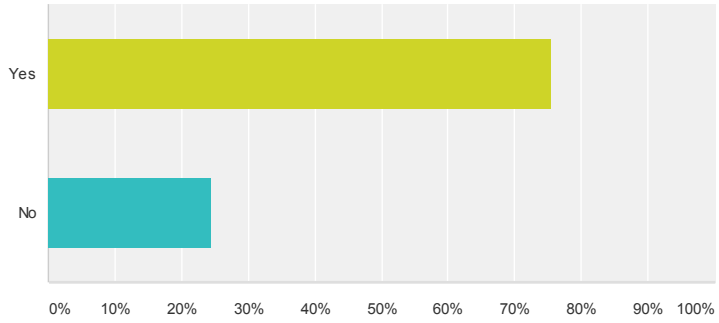
Answer Choices	Responses	
Less than $19,999	3.65%	10
$20,000 - $39,999	12.77%	35
$40,000 - $59,999	15.33%	42
$60,000 - $79,999	18.25%	50
$80,000 or more	50.00%	137
Total		274

Q19

Customize Export

Some property owners may own land in the study area but live elsewhere. Do you live in the study area?

Answered: 336 Skipped: 12



Answer Choices	Responses	
Yes	75.60%	254
No	24.40%	82
Total		336

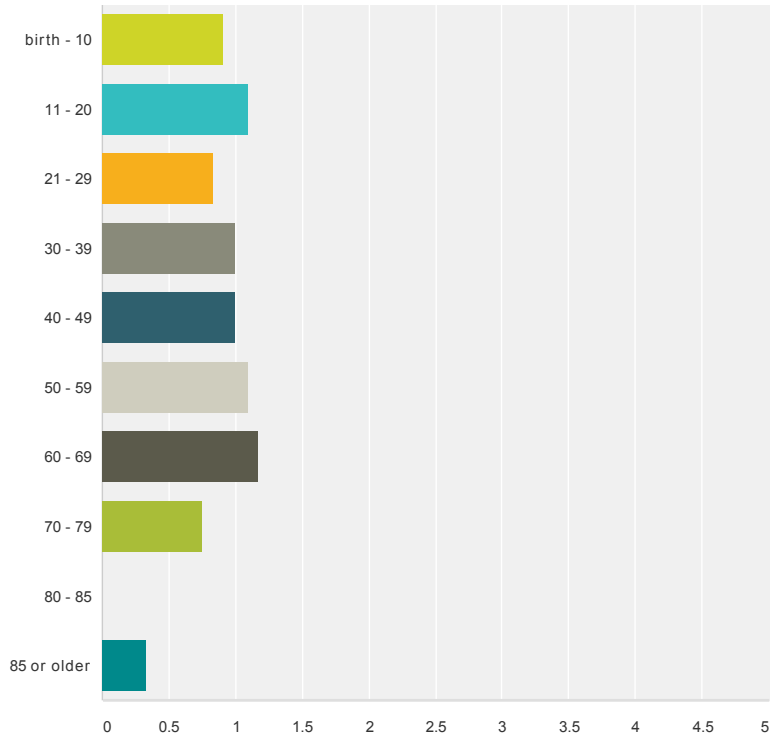
Appendix C

Q20

Customize Export

If you have tenants, how many people in each age group live on the property you own in the study area? (If you own multiple parcels, please include all parcels in the study area. Do not include persons counted in question 17.)

Answered: 31 Skipped: 317



Answer Choices		Average Number	Total Number	Responses
birth - 10	Responses	1	10	11
11 - 20	Responses	1	11	10
21 - 29	Responses	1	5	6
30 - 39	Responses	1	8	8
40 - 49	Responses	1	9	9
50 - 59	Responses	1	12	11
60 - 69	Responses	1	7	6
70 - 79	Responses	1	3	4
80 - 85	Responses	0	0	2
85 or older	Responses	0	1	3

Total Respondents: 31

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Q21

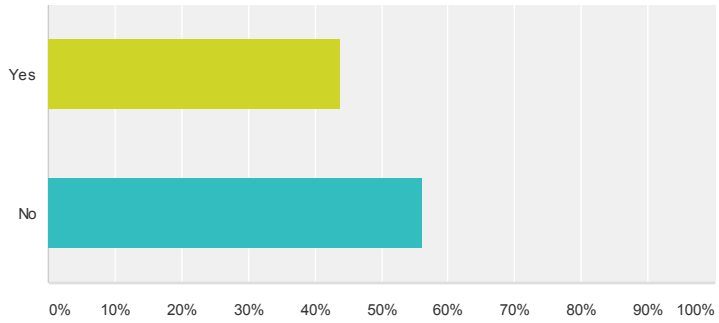
Customize Export

We may be interested in following up on some of your responses. We are able to provide a $10 gift card to Target for those who are selected to participate in a 2-hour focus group. Refreshments will be provided. Are you willing to be contacted for the focus group?

Appendix C

group?

Answered: 330 Skipped: 18



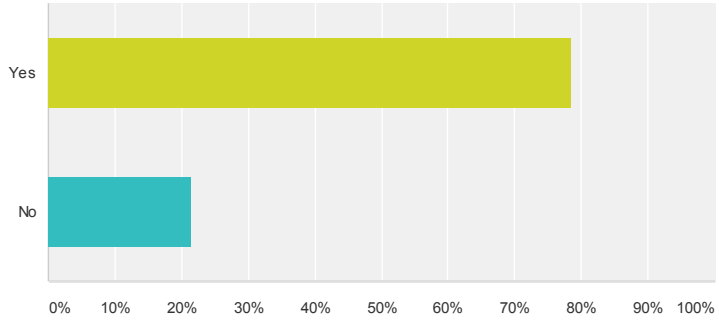
Answer Choices	Responses	
Yes	43.94%	145
No	56.06%	185
Total		330

Q22

Customize Export

We are also able to mail the executive summary of our report to keep your informed. Would you like to receive a summary of the report when it is completed?

Answered: 330 Skipped: 18



Answer Choices	Responses	
Yes	78.48%	259
No	21.52%	71
Total		330

Q23

Export

If you answered yes to questions 21 or 22, please provide your contact information below

Appendix C

below:

Answered: 259 Skipped: 89

Answer Choices		Responses	
Name:	Responses	99.61%	258
Company:	Responses	0.00%	0
Address:	Responses	98.84%	256
Address 2:	Responses	2.32%	6
City/Town:	Responses	99.23%	257
State:	Responses	99.23%	257
ZIP:	Responses	99.23%	257
Country:	Responses	0.00%	0
Email Address:	Responses	52.51%	136
Phone Number:	Responses	79.92%	207

Community: Developers • Facebook • Twitter • LinkedIn • Our Blog • Google+ • YouTube

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Policies: Terms of Use • Privacy Policy • Anti-Spam Policy • Security Statement • Email Opt-In

Language: English • Español • Português • Deutsch • Nederlands • Français • Русский • Italiano • Dansk • Svenska • 日本語 • 한국어 • 中文(繁體) • Türkçe • Norsk • Suomi

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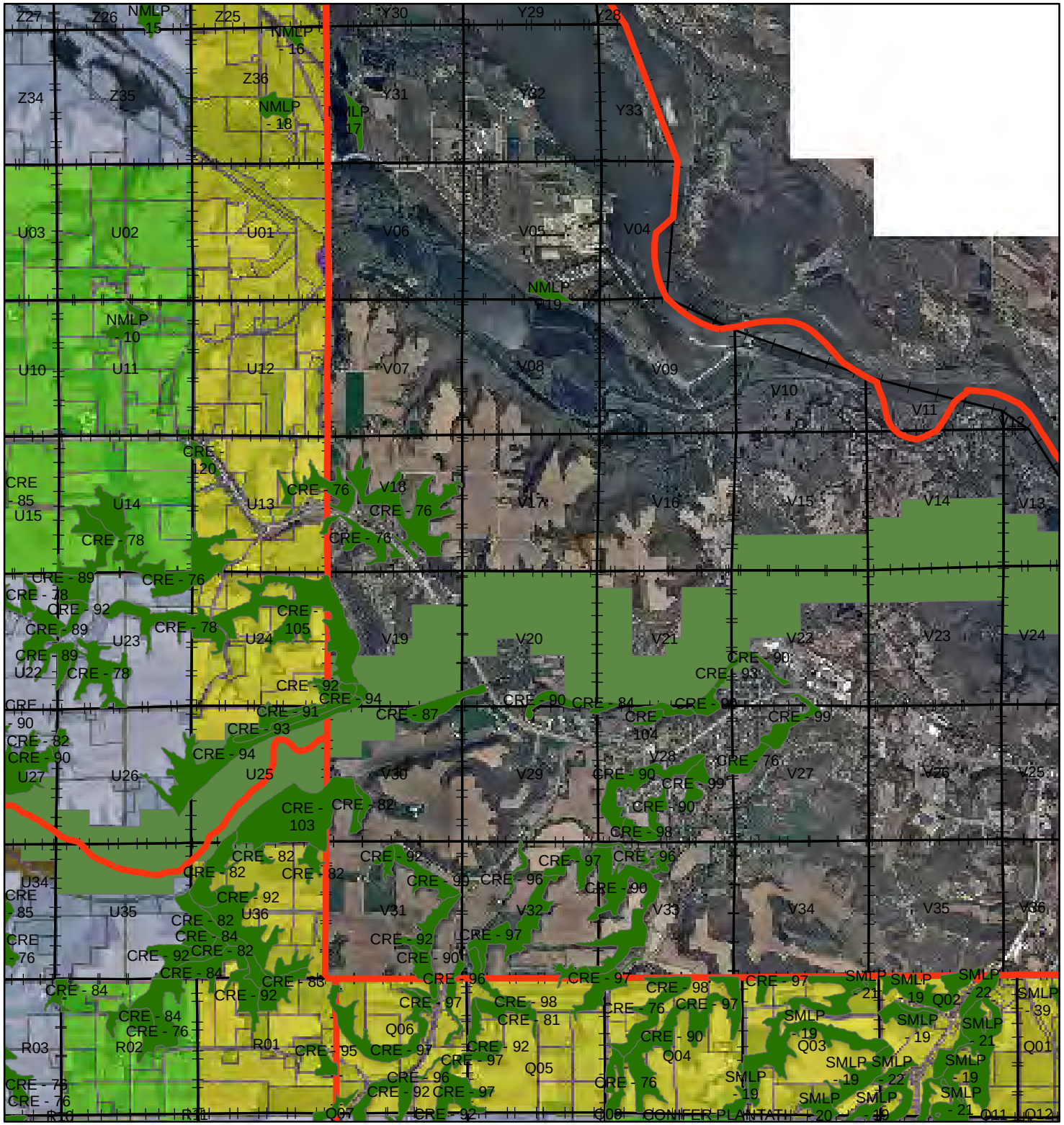
Appendix C



Red Wing West
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
- I - Industry
- MXH - Mixed Use
- R1 - Suburban Residential
- REC - Cannon River Recreational
- SCN - Cannon River Scenic
- Within City Limits or No Data

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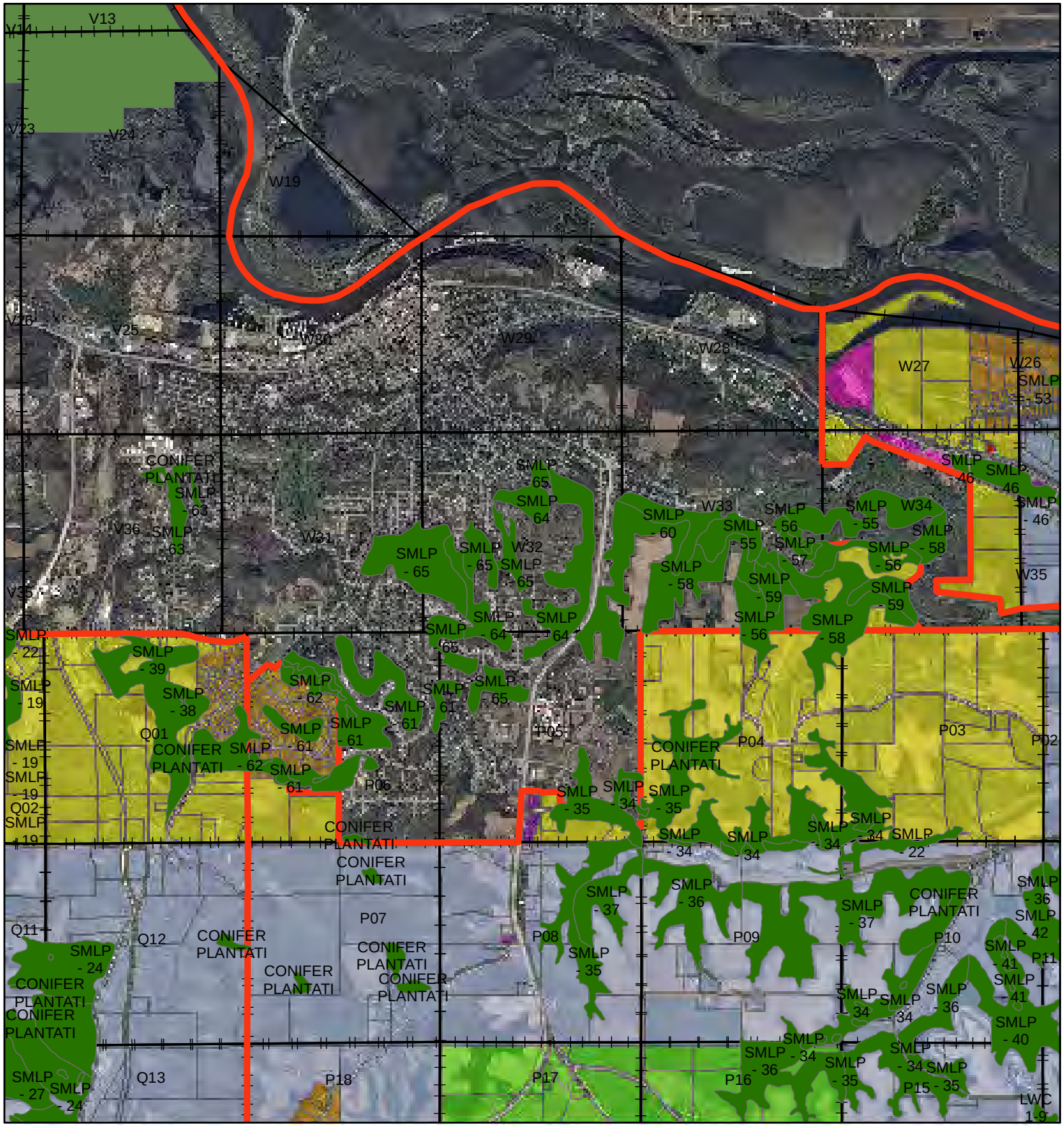
Appendix D



Red Wing East
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
- I - Industry
- MXH - Mixed Use
- R1 - Suburban Residential
- REC - Cannon River Recreational
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Appendix D

Description	Community ID	Definition
Upland soils with planted, maintained, or cultivated coniferous trees	CONIFER PLANTATION	Large plantations of conifers were often planted in many portions of southern Minnesota after the 1930s under the belief that they prevent erosion. Often these are single species groves of various pines and spruces, planted closely together in rows. When young, the ground cover continues as a field or prairie, as it was previously. Eventually, the shade created by the pines, and acid from needle-drop eliminates most ground cover vegetation and it becomes highly simplified or bare. The plantations provide shelter from wind, cover and breeding areas for songbirds, owls and other species, but also create a dense monoculture with low diversity. Depending on the original planting density, these plantations typically require thinning with age to preserve the health of the trees
Oak forest dry subtype	CRE - 103	This oak community occurs in a large parcel of forest on the south side of the Cannon River and north of Leeson Lane. The most common members of the canopy are large bur oak that average over 20 inches in diameter. Common smaller trees include basswood, white birch, sugar maple, boxelder and elm. These smaller trees are becoming more important in the composition of flat or gently sloped areas in this forest due to logging. The shrub layer varies from sparse, below areas with a thick canopy, to moderately thick in some areas that have been logged. Typical shrubs include gooseberry, cherry, and gray dogwood. The ground layer, too, varies depending on whether the area was logged and how intensively it was grazed in the past. The more common plants in the ground layer include wild geranium, sweet cicely, black snakeroot, and Pennsylvania sedge.
Oak forest dry subtype	CRE - 105	This forest varies considerably across the several properties contained in its boundaries, with a canopy that varies from broken to nearly continuous. Grazing also occurs in much of the forest. The most common canopy trees here include pin and bur oak that average about 12 inches in diameter. Common smaller trees include white birch, elm, and black cherry. The shrub layer is moderately thick in most places and thorny species that tend to increase as a result of grazing, including prickly ash, raspberry, blackberry, and gooseberry, are common. The nonnnative European

		buckthorn is also common. The ground layer is somewhat poor in composition with disturbance tolerant species such as white snakeroot, sweet cicely, and the nonnative common mullein frequent.
Dry Prairie	CRE - 120	This prairie lies on the west side of Highway 61, on a generally east-facing slope. The area appears to have been grazed in the past, subsequently may have been planted with some native flowers, and has since become slightly colonized by boxelder, American elm, and Siberian elm. The most common native species include black-eyed Susan, bergamot, common milkweed, yarrow, prairie coneflower, and purple prairie clover. Native grasses are conspicuously absent from this community with the nonnatives timothy, quackgrass, and smooth brome most common. Overall, the quality of this community is moderate to poor, although it does have good potential for improvement with supplemental seeding and some mowing/prescribed burning.
Oak woodland-brushland	CRE - 76	Found along several side valleys and bluffs bordering the Cannon River, this oak woodland is a mix of degraded savanna and prairie that has been invaded by eastern red cedar. Black walnut, boxelder, and aspen have colonized many of the areas between the mature oaks, resulting in a nearly closed canopy. The shrub layer is thick to impenetrable in most places with prickly ash and red cedar most common. The ground layer is poor quality and sparse in many areas, primarily due to the recent and dramatic increase in shade. Because of the many changes and disturbances in this community it was given a low qualitative rank.
Oak forest dry subtype	CRE - 78	This forest was probably logged in the past as indicated by old, overgrown roads through the woods. The most common large trees here are pin, bur, and white oak, with smaller elm, black walnut, boxelder, white birch, eastern red cedar and ironwood common as well. The shrub layer is in generally good condition with black cherry, brambles, gooseberry, and prickly ash, and eastern red cedar. The most frequent members of the ground layer include bloodroot, Canada goldenrod, starry false Solomon's seal, lady fern and wood anemone.

Oak forest dry subtype	CRE - 81	This dry oak forest is on a generally north-facing slope, with the best quality portions of the community on the steeper and less accessible areas of the site. Although oaks are common, other trees such as basswood, white birch, and elm are as frequent. The shrub layer is in generally good condition with gooseberry most common. This would tend to indicate a history of moderate grazing. The ground layer is in generally good condition with yellow bellwort, lady fern, Pennsylvania sedge, and wild ginger common. Other forbs that occur less frequently include bloodroot, blue cohosh, carrion flower, and rattlesnake root. Roadbuilding, house refuse, and junk piles have impacted some areas of this forest, causing a reduction in rank in an otherwise nice quality area.
Lowland hardwood forest	CRE - 82	This forest occurs mostly along the low-lying areas of a valley extending south from the Cannon River. Much of this forest has been impacted by land uses including tree cutting, refuse dumping, and intensive grazing that have resulted in extreme gully erosion and the loss of many native plant species. The most common trees found here include elm, green ash, bur oak and boxelder. The shrub layer varies considerably, with the narrower portions of the valley and higher elevations having a thick cover of European buckthorn and prickly ash, while the lower areas are more open and have a sparse shrub layer. The ground layer also varies, with the upper portions having a sparse to absent ground cover and the lower areas dominated by disturbance tolerant species such as the nonnatives stinging nettle and reed canary grass. Because of the general state of disturbance here, the forest was given a minimum ranking of “D”.
Dry Prairie	CRE - 83	This prairie has been heavily grazed and encroached on by brush, especially eastern red cedar. Nonnative pasture grasses are common in most areas, except where steep slopes occur. The most common native species include the grasses sideoats grama and big bluestem, and the forbs bergamot, gray goldenrod, tall anemone, hoary vervain, and yarrow. Despite the heavy disturbance, this community does host a very small population of kitten-tails, a State Threatened species. For this reason, it was given a slightly higher rank than its overall condition would normally warrant.

Oak forest mesic subtyp	CRE - 84	This forest is found mostly on north-facing slopes in a side valley just south of the Cannon River. Overall, the quality of this forest is good since it exhibits no excessive erosion and has a generally good species composition. The closed canopy includes white and bur oak that are mostly over 18 inches in diameter. Other smaller trees that are also common include elm, basswood, and boxelder. The shrub layer contains mostly native species, especially cherries, juneberry, and saplings of canopy trees. The ground layer includes Virginia waterleaf, wood anemone, maidenhair fern, lady fern, and sunflower.
Oak woodland-brushland	CRE - 90	This parcel of former savanna is near the peak of a bluff on the north side of the Cannon River, and southeast of Circle Drive. The most common large tree is bur oak many of which exceed 16 inches in diameter. Other, smaller trees include basswood, pin oak, red cedar, aspen, green ash, and boxelder. These combine to create a canopy with about 70 percent average cover. The shrub layer is thick to very thick and contains a large infestation of European buckthorn. Natives that are common in the shrub layer include prickly ash, gooseberry, gray dogwood, and sumac. The species composition of the ground layer has been substantially impacted by past land use. This has resulted in dominance by species that are nonnative and/or tolerant of frequent disturbance. The most common of these are stinging nettle and poison ivy.
Dry Prairie	CRE - 91	This prairie appears to have been used for agriculture in the past, and may have even been plowed, perhaps over 50 or 75 years ago. It has a brush cover of about ten percent, composed of eastern red cedar, green ash saplings, sumac, aspen and cherry. Both native and nonnative grasses are present here. The most common nonnative grass is smooth brome, while the most common native grasses include Indian grass and little bluestem. The most common native forbs include smooth blue aster, heath aster, stiff goldenrod, windflower, showy tick trefoil, and butterfly milkweed. These prairie species likely recolonized this area from the adjacent savanna and prairie, most of which have since become overrun by brush and small trees. This prairie does have good restoration potential and would be a good candidate for brush removal and the regular application of prescribed fire.

Oak woodland-brushland	CRE - 92	This area occupies portions of a south-southwestfacing slope above the Cannon River. It was formerly savanna and is characterized by scattered large, opengrown bur oaks. Between these is a dense growth of young trees and shrubs including pin oak, green ash, basswood, elm, prickly ash, European buckthorn, brambles, and gooseberry. The ground layer reflects the abrupt transition from relatively open to densely shaded and is sparse to absent in many areas. The most common species found here include heart-leaved aster, starry false Solomon's seal, bloodroot and wild geranium. The recent colonization by brush and small trees have started a transition of this area from savanna to forest. As a result, it will take several decades for appropriate species to colonize the site, displace nonnatives, and improve the overall quality.
Dry Prairie bedrock bluff subtype	CRE - 93	This dry prairie is found in patches along a steep, south-facing slope overlooking the Cannon River. It is located just to the southeast of Circle Drive. These parcels were likely one large prairie in the past, perhaps as recently as 30 or 40 years ago. Since then, brush and small trees have colonized the prairie from moister draws and lower slopes. The most common native grasses on the prairies are Indian grass, sideoats grama, and big and little bluestem. The most common forbs here include smooth blue and silky aster, prairie coreopsis, windflower, and a remarkably large population of leadplant. Also of interest on this prairie are scattered, small populations of the State Special Concern species, Hill's thistle, a native thistle found on quality dry prairies. Because of the presence of this listed species and the generally good quality, it was given a "B" rank.
Oak forest dry subtype	CRE - 94	This good quality forest occupies a south-facing slope adjacent to the Cannon River valley and is just down slope from the previous dry prairie. The nearly closed canopy is made up of mostly pin and white oaks that average over 20 inches in diameter. Other, smaller trees that occur occasionally include basswood, aspen, and black walnut. There are numerous gaps in the canopy where trees have been blown down by storms. This will likely cause a shift in canopy composition as the smaller, faster growing species race to the canopy ahead of any oaks that might regenerate. The shrub layer is moderate in both quality and thickness. The

		most common species here are chokecherry and gooseberry. The ground layer has a generally good composition with wild ginger, violet, Virginia waterleaf, Pennsylvania sedge, bloodroot, and yellow bellwort all common. Because of the minimal recent disturbance by humans in this forest, it was given a moderately high rank of “B”.
Oak forest dry subtype	CRE - 95	This somewhat small parcel of dry oak forest is located on the south side of County Road 41 just to the west of Highway 19. Overall, the quality of this forest is good, with little infestation by nonnative species. One notable exception to this is the presence of the nonnative European buckthorn along the edges. The canopy of this forest is closed or nearly so in most places. The most common trees are pin and white oak that average about 11 inches in diameter. As a whole, the shrub layer is only moderate in thickness, with gooseberry the most common species. The ground layer is in good condition, with lady fern, wild geranium, violet, red baneberry, yellow bellwort, and maidenhair fern all present.
Lowland hardwood forest	CRE - 96	This forest occurs mostly as a thin band adjacent to Highway 19 and along Spring Creek. The canopy consists of young boxelder, black willow, silver maple, black walnut, and elm, with average diameters around eight inches. The shrub layer is moderate in thickness with European buckthorn, gooseberry, and common elderberry all frequent. The ground layer includes a mix of upland and stream edge species including touch-me-not, cup plant, common milkweed, and Virginia waterleaf. Common nonnatives found here include reed canary grass and stinging nettle. Because of the linear nature of this community and the fact that it is very young with nonnatives common, it was given a moderately poor rank of “CD”.
Oak woodland-brushland	CRE - 97	Found mostly along a northeast-facing slope east of Spring Creek and south of Mill Road, this woodland is of generally poor quality. The most common trees are large, open-grown bur and pin oak that average about 12 inches in diameter. Oak saplings, white birch, red cedar, elm, basswood, and aspen have filled in the areas between these older trees. The shrub layer is thick to nearly impenetrable with prickly ash, gooseberry, and European buckthorn common.

		Grazing has substantially impacted the ground layer. This is reflected by the species present including the nonnatives stinging nettle and chickweed. The most common native species include lady fern, goldenrod, and columbine.
Dry Prairie sand-gravel subtype	NMLP - 16	This exceptionally good quality small prairie is found along both sides of the Canadian Pacific Railroad and south of Church Road. Brush levels are low in this prairie and consist mostly of small green ash, bur oak, and Siberian elm. The prairies shrubs prairie willow, prairie rose, and leadplant are also found occasionally. The most common native grasses here include sideoats grama, big and little bluestem, sand reedgrass, porcupine grass and Indian grass. Native forbs found here include hoary puccoon, roundheaded bushclover, tall wormwood, dotted blazingstar, large-flowered beardtongue, prairie coreopsis, spiderwort, and stiff goldenrod. Overall, this prairie is of good quality, and is significant on a countywide basis. In addition, this provides an excellent opportunity to restore a historic plant community.
Dry oak savanna sand-gravel subtype	NMLP - 18	This oak savanna is found just west of Larson Lake and County Road 18. Although the ground layer is significantly different than what would have occurred historically, the tree canopy and composition is similar enough to the standard to consider the community a savanna. The most common trees found here are short, open-grown bur oaks that approach 30 inches in diameter. Other smaller trees among the bur oaks include cottonwood, quaking aspen, and boxelder. The shrub layer is influenced by grazing, with sumac and Siberian elm most common. The most frequently encountered nonnative species in the ground layer include smooth brome and quackgrass, with common mullein, stinging nettle, catnip, and hoary alyssum also present. The most frequently encountered natives include ground cherry, horseweed, and yarrow. Despite the poor rank, this community presents a golden opportunity to restore a very rare plant community type. With little effort, a moderately diverse mix of native prairie/savanna species could be reintroduced to improve forage quantity/quality, as well as to provide habitat for native species.

Oak woodland-brushland	SMLP - 19	This includes several parcels just south of Red Wing, in the vicinity of Trout Brook and Spring Creek. Most of these parcels have a history of grazing, and while many of them have not been grazed for at least several decades, several are still currently used as pasture. These woodlands are characterized by large bur and pin oaks, sometimes as scattered individuals and sometimes in stands with crowns intermingling. These oaks are mostly over 16 inches in diameter. Other common trees include aspen, red cedar, boxelder, elm, black cherry and white birch. The shrub layer is generally thick across these parcels. The most common species found here are saplings of the above listed trees (except oaks), prickly ash, and the nonnatives European buckthorn and Tartarian honeysuckle. The ground layer is generally in poor condition. The many bare spots result partially from the grazing history, but more a result of the recent increase in shade created by pioneering trees. Because of the transition of this community toward a mixed hardwood forest and away from oak woodland/savanna, this community was given a moderately low rank of “CD”.
Oak forest, Dry	SMLP - 20	This forest occurs in several parcels in the vicinity of County Road 1 and 287th Street. These parcels are generally located on north- and east-facing slopes and are adjacent to, or across valleys from, SMLP-19. The canopy here is patchy, but generally averages over 80 percent cover. The most common trees are bur, red, and pin oak, all of which average over 16 inches in diameter. Other trees, including basswood, elm, paper birch, and aspen comprise a small part of the total canopy here. The shrub layer varies from moderately sparse to thick where logging has taken place. The most common member of the shrub layer is the ironwood tree, with pagoda and silky dogwood, downy arrowwood, and European buckthorn also present. The ground layer tends to be in good condition across these parcels. Species seen here include maidenhair fern, columbine, Pennsylvania sedge, lady fern, and Virginia stickseed. Overall, this forest is in moderately good condition. As this forest recovers from past logging and other activities, it will improve in quality.

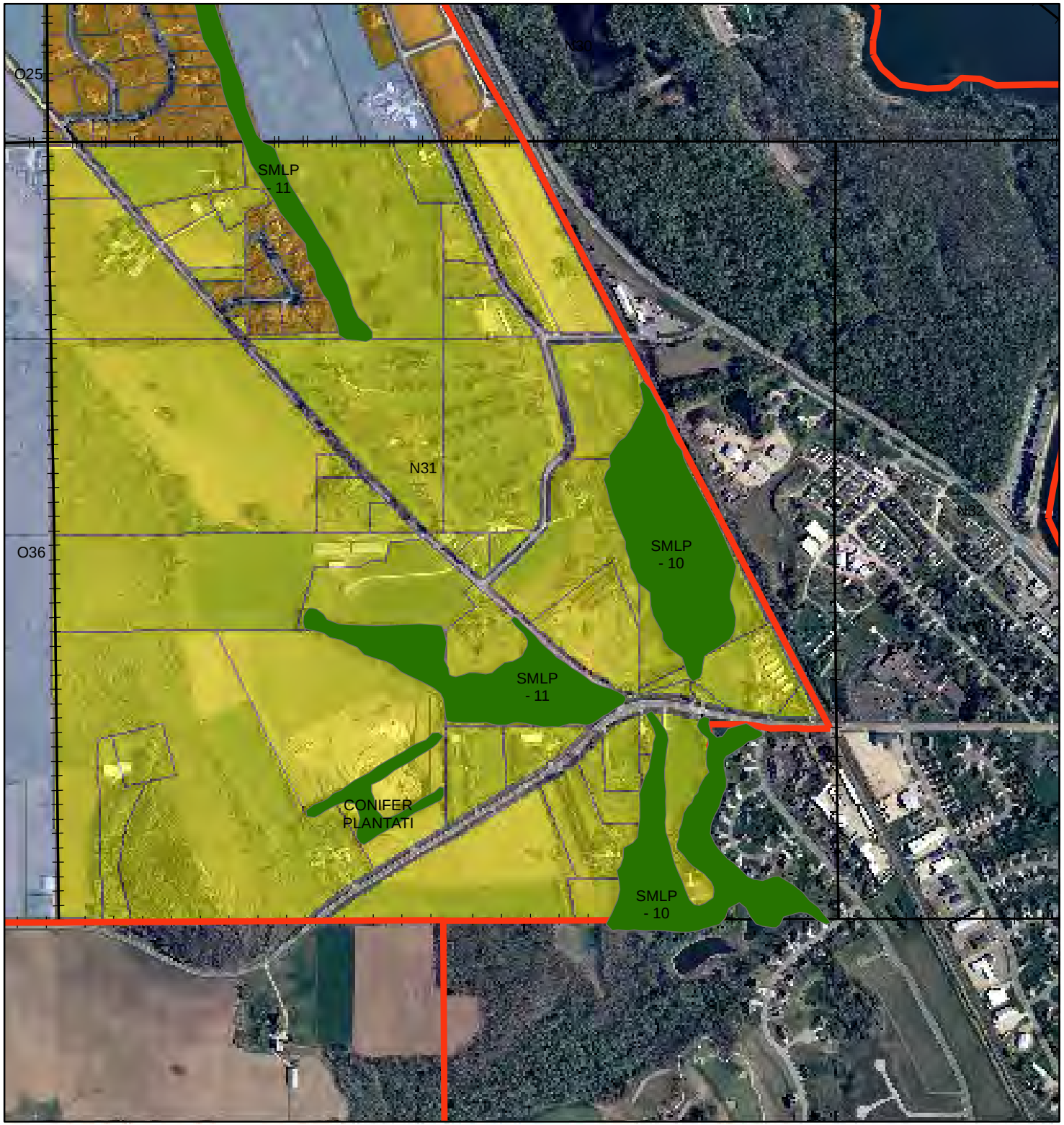
Dry Prairie bedrock bluff subtype	SMLP - 21	This community includes several prairies on southfacing bluffs. These tend to be species rich despite the apparent past grazing on all of the sites. The most frequently encountered grasses here include Indian grass, big and little bluestem, plains muhly, June grass, prairie dropseed, and sideoats grama. Forbs that are found occasionally here include sky blue, silky and aromatic aster, rough and dotted blazingstar, prairie violet, prairie coreopsis, puccoon, purple prairie clover and windflower. Although the amount of brush invasion on these parcels varies, it averages about 20 to 30 percent. The most frequent colonizers include red cedar, sumac, white birch, black cherry, dogwood, and European buckthorn. Because the overall quality of these prairies is good, this community was given a moderately high rank of "BC".
Lowland hardwood forest	SMLP - 22	This low-lying forest is found along Hay Creek and some tributary valley bottoms. The age and composition of the forest varies somewhat, but the overall quality is similar across the site. The most common trees in the patchy canopy are black walnut, elm, and boxelder, all with average diameters around 12 inches. Silver maple, while present, occurs less frequently. The shrub layer is dominated by common elderberry, European buckthorn, black raspberry, and red osier dogwood. The ground layer hosts plant species typical of this community type, including Virginia waterleaf, Canada wildrye, goldenglow, and white snakeroot. Also found here are the nonnative species reed canary grass, creeping charlie, and stinging nettle. In some of the upper drainage areas within this community, there are a few areas of severe erosion, with recent down cuts exceeding ten feet. Because this forest is still developing, it was given a moderately low rank.
Dry Prairie bedrock bluff subtype	SMLP - 34	This prairie parcel is found on the east side of Flueger Road. Brush cover is around 20 percent, and is dominated by sumac, red cedar, and gray dogwood. The most common grasses encountered include Indian grass, prairie dropseed, sideoats grama, big and little bluestem, plains muhly, and the nonnatives Canada bluegrass and smooth brome. Typical forbs include purple prairie clover, gray goldenrod, sky blue, heath, and silky aster, narrow-leaved puccoon, yellow flax, and dotted blazingstar, although overall forb levels are

Dry Prairie bedrock bluff subtype (cont)		relatively low, due to past grazing. Because of this and of the brush encroachment, this prairie was given a moderate rank of “C”.
Oak woodland-brushland	SMLP - 35	The canopy of this woodland varies from sparse and dominated by open-grown bur and pin oaks, to patchy and up to 70 percent cover with groves of tall, straight bur oak. Between these larger oaks are smaller aspen, red cedar, dogwood, and young oaks on south-facing slopes. North-facing slopes have more young elm, white birch, and aspen. Some limited logging appears to have taken place in some areas of this community. The shrub layer varies from sparse to moderately thick, depending on the aspect of the slope, and is dominated by native species. The ground layer is in fair condition with a mix of disturbance tolerant and better quality native species, as well as some nonnative species that have persisted in the aftermath of past grazing. Overall, this is a moderate quality woodland with some restoration potential and was given a rank of “C”.
Oak woodland-brushland	SMLP - 39	This woodland surrounds SMLP-38 above Hay Creek Trail. The most common trees here include large open-grown bur and pin oaks, with a thick stand of young red and white oak, aspen, white birch and black cherry between them. The shrub layer is thick to nearly impenetrable. Typical shrubs at this site include European buckthorn, prickly ash, gray dogwood, blackberry, hazel, and bittersweet. The ground layer has been affected by grazing, which has reduced the diversity both here and in the shrub layer. Although their overall cover is sparse, the native graminoids and forbs white snakeroot. Pennsylvania sedge, and feverwort are present. Because of the dramatic shift in species composition, this woodland was given a moderately low rank.
Wet meadow	SMLP - 46	This wetland community is adjacent to Highway 61 in an abandoned channel of the Mississippi River. It is contiguous with a complex of wetland communities mapped by the MN DNR County Biological Survey, including a fen. In addition to wet meadow, this wetland includes small pockets of cattail marsh, as well as some floodplain forest. The most common native graminoids found here include white grass, tussock and lakebank sedges, bluejoint , woolgrass, and dark

Wet meadow (cont)		green bulrush. Also found here in abundance are the nonnative species reed canary grass and narrow-leaved cattail, the latter of which is native to the east coast region of the country but not to Minnesota. The most frequently encountered forbs include the natives boneset, spotted joe-pye weed, marsh milkweed, water dock, smartweed, and bur-reed. Nonnative forbs found at least occasionally include purple loosestrife and stinging nettle. Shrubs that dot the wetland include red osier dogwood, speckled alder, and several species of willows. Despite the prevalence of nonnative species here, this wetland was given a moderate ranking, in part due to the fact that it adjoins a better quality wetland that was mapped by the MN County Biological Survey.
Oak forest mesic subtype	SMLP - 55	This nice quality oak forest is found on moderately steep north-facing slopes on the Mississippi National Golf Links property. With few exceptions, the canopy is closed and dominated by tall, straight red, white, bur and pin oaks that average about 18 inches in diameter. Other, smaller trees that are found occasionally include white birch, elm, bigtooth aspen, basswood, and black cherry. The shrub layer is sparse in most places, but has an abundance of thorny brambles. Some frequent members of the shrub layer include American hazel, blackberry, black raspberry, and young boxelder. The ground layer is generally diverse and dominated by species typical of the community type. Some of these include lady and maidenhair ferns, bishop's cap, columbine, interrupted fern, pointed-leaf tick trefoil, and zigzag goldenrod. Because of the nice quality, cathedral-like appearance of the oak canopy, and the fact that it occurs within a city, this forest was given a good qualitative rank.
Oak woodland-brushland	SMLP - 56	Occurring in several parcels in the vicinity of the Mississippi National Golf Links, this oak community is found on a south-facing ridge and on either side of Lehrbach Road. The woodland is characterized by widely spaced, open-grown bur and pin oak trees with younger aspen and shrubs between them. The shrub layer is dominated by the nonnatives European buckthorn and Tartarian honeysuckle. The ground layer is generally only moderate in quality, with species such as white snakeroot, hairy wood chess, Pennsylvania sedge, and satin grass frequently

Oak woodland-brushland (cont.)		encountered. If actively managed, these woodlands would improve in quality, particularly the parcel on the Mississippi National Golf Links property. However, in their current state, they are only able to garner a rank of “CD”.
Oak forest dry subtype	SMLP - 58	This forest is similar in species composition and structure to SMLP-55. Notable exceptions include the greater percentage of non-oak species in the canopy, a thicker shrub layer that includes the nonnatives European buckthorn and Tartarian honeysuckle, as well as a ground layer that is not quite as species-rich. For these reasons, it was given a modest rank of “C”.
Lowland hardwood forest	SMLP - 59	Found along the lower portions of a west-facing slope adjacent to Lehrbach Road, this forest is dominated by young black walnut. Other trees that are not as common as the walnut include quaking aspen, white birch, and pin and black oak. The shrub layer varies from thick to absent and may be a function of how long ago the different areas were removed from grazing. The ground layer is generally dominated by nonnative species, particularly nonnative, cool season pasture grasses including Kentucky bluegrass. Because of the apparently recent origin of the walnuts and because of past disturbance by grazing, this forest was given a low qualitative rank.
Oak forest dry subtype	SMLP - 61	This oak forest has a canopy composed mostly of pin and bur oaks, with aspen, hackberry, black cherry, and several other species also present. These form a nearly closed canopy of good structural character. The shrub layer varies from moderately thin to moderately thick and is mostly dominated by natives. The ground layer is generally diverse and dominated by species common for this community type. Some of these include white snakeroot, lady fern, wild geranium, columbine, interrupted fern, pointed-leaf tick trefoil, and zigzag goldenrod. Some fragmentation has occurred in this forest as a result of development in the area. The impacts of this could be reduced if residents planted oaks in their yard, and included shrubs and ground cover of locally native species. This would help restore some habitat value and reduce the amount of lawn nutrient transport and stormwater runoff.

Dry Prairie bedrock bluff subtype	SMLP - 62	This prairie includes several parcels within the City of Red Wing, all of which have developments immediately adjacent. These prairies are in good condition and their overall size is remarkable, since many bluff prairies in the region have been overrun by brush. The total shrub cover of these prairies is about five percent, with smooth sumac, quaking aspen, black cherry, and eastern red cedar most common. The most common native grasses include big and little bluestem, Indian grass, sideoats and hairy grama, plains muhly and prairie dropseed. Contributing to the overall quality, few areas of nonnative grasses were seen, and they were all minor in coverage. Some of the common forbs seen here include purple prairie clover, gray goldenrod, dotted and cylindric blazingstar, silky, sky blue, and aromatic asters, prairie coreopsis, hoary puccoon, harebell, and prairie sagewort. Because of the size, intact nature, and quality species composition of these prairies, the community was given a high qualitative rank. However, this prairie is receiving some disruptive pressure from the adjacent housing development. Some residents are planting nonnnative shrubs, trees, and flowers in portions of the prairie, as well as cutting, or dumping yard waste. These prairies are of significant enough quality to warrant distributing information about how to be a good neighbor to the prairie.



Lake City
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
- I - Industry
- MXH - Mixed Use
- R1 - Suburban Residential
- REC - Cannon River Recreational
- SCN - Cannon River Scenic
- Within City Limits or No Data

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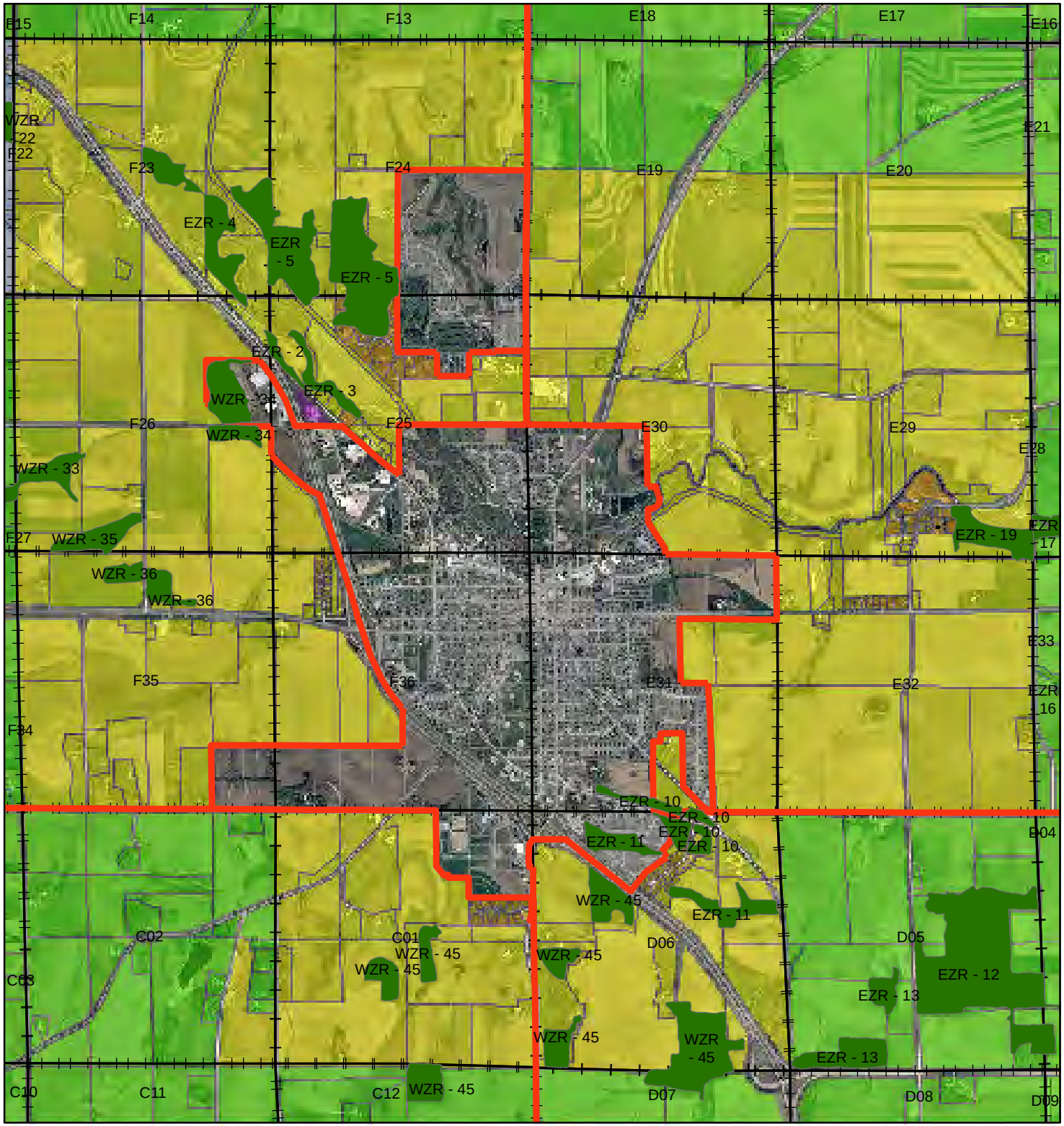
Description	Community ID	Definition
Lowland hardwood forest	SMLP - 10	This may have formerly been an oak woodland that has become overgrown by smaller trees including elm, black cherry, cottonwood, hackberry, boxelder, and Siberian elm. The shrub layer is moderate to thick, with European buckthorn, gray dogwood, and smooth sumac among the more frequently encountered species. The ground layer is a mix of native and nonnative species, with the nonnative pasture grasses smooth brome and Kentucky bluegrass most common. Overall, this is a substantially disturbed area and was given a rank of "CD".
Oak woodland-brushland	SMLP - 11	This woodland includes several parcels, most of which are linear in shape and were likely pastured in the past. They are characterized by large, open-grown bur oaks with younger aspen, elm, cherry, and other trees colonizing the areas between the oaks. The shrub layer is dense to impenetrable with prickly ash and buckthorn most common. The ground layer is dominated by weedy natives and nonnative species, with only an occasional patch of desirable natives. In addition, development in the last few decades has further fragmented these small areas. Because of the level of past disturbance and generally poor composition, this woodland was given a minimum rank.
Upland soils with planted, maintained, or cultivated coniferous trees	CONIFER PLANTATION	Large plantations of conifers were often planted in many portions of southern Minnesota after the 1930s under the belief that they prevent erosion. Often these are single species groves of various pines and spruces, planted closely together in rows. When young, the ground cover continues as a field or prairie, as it was previously. Eventually, the shade created by the pines, and acid from needle-drop eliminates most ground cover vegetation and it becomes highly simplified or bare. The plantations provide shelter from wind, cover and breeding areas for songbirds, owls and other species, but also create a dense monoculture with low diversity. Depending on the original planting density, these plantations typically require thinning with age to preserve the health of the trees



Zumbrota
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
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Appendix D

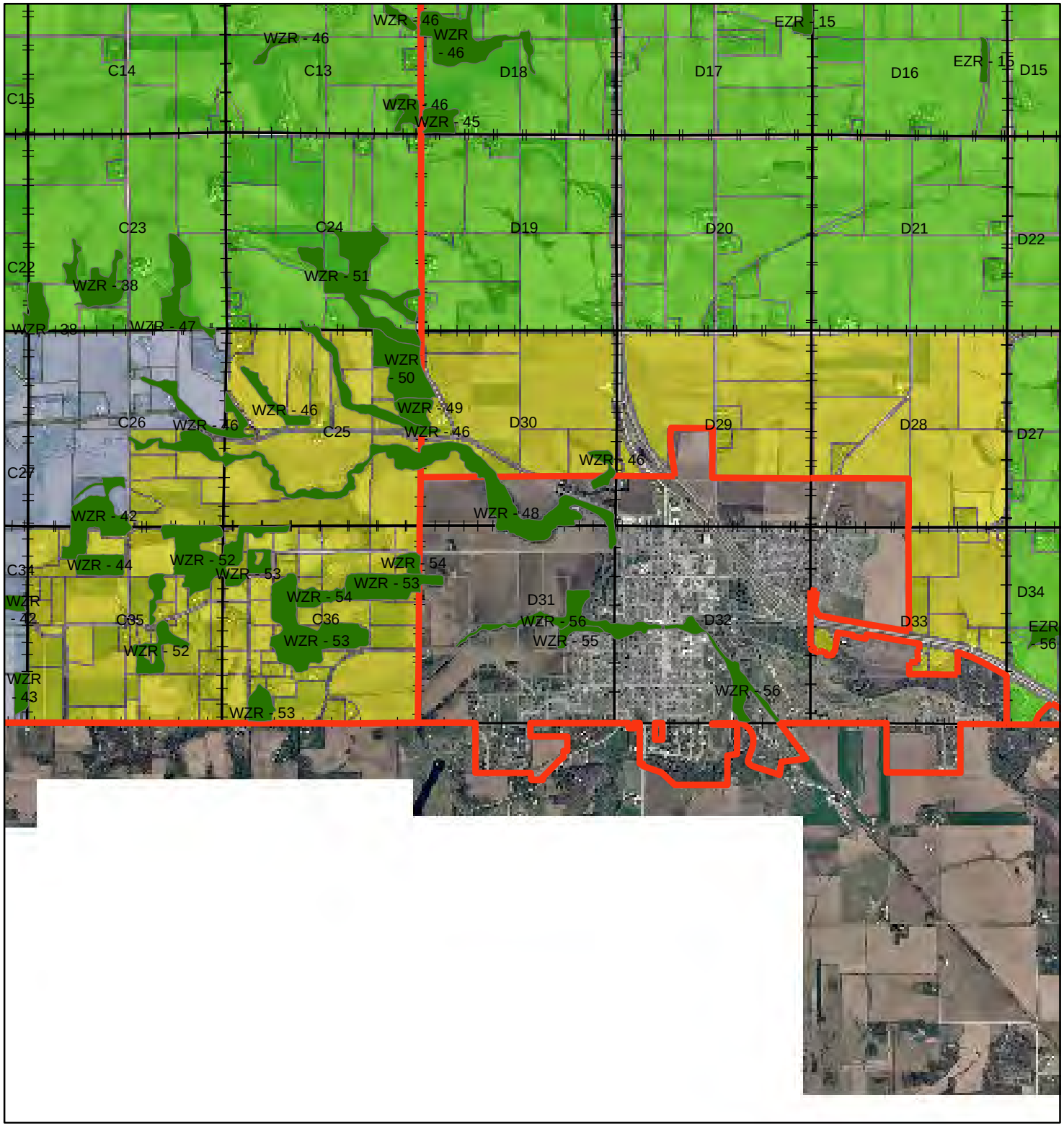
Description	Community ID	Definition
Wet meadow	EZR - 02	This wet meadow community has been disturbed by past grazing, which has shifted the species composition towards a reed canary grass dominated community. Deeper areas contain stands of broadleaved cattail, and there are still some scattered clumps of sedge. Small thickets of shining willow are present. The heavy level of past disturbance and resulting very low species diversity suggest that a low qualitative rank is appropriate.
Lowland hardwood forest	EZR - 03	The patchy canopy in this wooded community includes abundant cottonwood, black willow, and boxelder, with lower levels of green ash and American elm. A few bur oak are present. Shrub cover is fairly light, with species that tend to increase with grazing predominant. This includes prickly gooseberry, European buckthorn, and some poison ivy. Disturbance-tolerant/non-native plants also characterize the ground layer. Reed canary grass is quite common, and there are patches of stinging nettle and wild parsnip. Because past disturbances have reduced species diversity significantly, the site receives a moderately low qualitative rank.
Lowland hardwood forest	EZR - 04	This community consists of two separate cover types located contiguous to each other, but overall condition is similar enough to warrant listing them together here. In addition, historically they were all part of the same community, and, if allowed to experience natural succession, the more open areas would mature to lowland hardwood forest. The northern-most and southern-most sections of the site are currently pastured, and are dominated by pasture grasses such as Kentucky bluegrass and smooth brome, as well as some species of sedge. These areas have relative sparse levels of trees, with total cover around 25 percent. Species present are typical of the community type, including green ash, boxelder, and cottonwood. The more forested middle section contains a more closed canopy with green ash, cottonwood, some black willow, and an occasional bur oak, over a shrubby brush layer. Ground cover is more sparse in this area, due to the lower light levels.

Oak forest mesic subtype	EZR - 05	This mesic forest community contains an unusually diverse canopy, with bur and black oak, green ash, sugar maple, basswood, quaking aspen, and other species contributing to the total cover of 45 – 60 percent. Many of these are relatively small and young, and have moved into a canopy position since the area was logged 30 or more years ago. Sugar maple dominates the understory, and is likely to eventually dominate the canopy when the community matures, resulting in an eventual shift to a maple-basswood forest. The shrub layer is quite patchy, and dominated by young saplings of canopy species, especially sugar maple and black cherry. The ground layer is thick. Species tolerant of grazing are most common, with little representation of typical mesic forest herbs. However, if any spring ephemerals persist in this mesic community nearly all of them would have been dormant at the time of the field survey, and would not have been tallied. Common species include stinging nettle, black snakeroot, and honewort, as well as some scattered patches of maidenhair fern. A number of houses have been built on the east side of the community. Because the shrub layer is so sparse and the community has the potential to improve with time, it receives a moderately low qualitative ranking.
Lowland hardwood forest	EZR - 10	This community is in low-lying, wet area, and has a canopy dominated by black willow and quaking aspen. The brush layer is very thick, with typical species including European buckthorn, and a ground cover with some reed canary grass, stinging nettle, and other disturbance-adapted species. Overall quality of the site is low, with poor diversity and significant disruption from past disturbance.
Lowland hardwood forest	EZR - 11	This site consists of two different areas with slightly different land-use histories, but with overall similarities in their structure and composition. Canopy cover ranges from 30 – 50 percent and is dominated by cottonwood. Black willow, boxelder, and green ash form the remainder of the cover. The shrub layer varies from thick to moderate, and contains some thickets of gray dogwood as well as patches of prickly gooseberry and blackberry. The patchy ground cover is thickest below canopy gaps, and is mostly dominated by reed canary grass, motherwort, a species of sedge, and wild parsnip.

Oak forest mesic subtype	EZR - 19	This forest community occupies the bluff top and steep, north-facing slope along the North Fork Zumbro River. It is an attractive site, with a number of tall, straight, small-canopied trees and a moderate understory. The interrupted canopy is dominated by a mix of bur, white, and black oak, with some basswood, black cherry, and occasional sugar maple. Sugar maple becomes more common along the north facing slope, and, if that area was large enough to map separately, it would be listed as a maple-basswood forest. The shrub layer includes some blackberry, young black cherry, and moderately high levels of gray dogwood. Ground layer species strongly indicate past grazing on the site. The species present include stinging nettle, cleavers, and white snakeroot. It is possible that additional, spring ephemeral species may be present, especially in steeper areas that were likely not grazed as heavily, but their presence could not be evaluated at the time of the mid-summer field visit.
Wet prairie	WZR - 33	This broad swale is found just south of 445th Street and west of 165th Avenue. It crosses several properties and is composed of a mix of wet prairie and sedge meadow that are of good quality. The areas bordering the cultivated fields, and those areas most heavily grazed in the past are of somewhat lower quality, but do not detract from the overall structure or function of this exceptional area. In a brief walk-through of this site over 60 species of plants were noted at this species-rich site. Some grasses and sedges of note include tussock sedge, bluejoint, prairie cordgrass, prairie dropseed, big bluestem, Indian grass, switch grass, and satin grass. A large number of forb species were also noted, including spotted joe-pye weed, golden alexanders, Virginia mountain mint, sawtooth sunflower, swamp saxifrage, bottle gentian, prairie smoke, marsh milkweed, prairie rose, alum root, marsh bellflower, and Canada anemone. One plant species of particular note here is the State Threatened valerian. Trees and shrubs comprise about 10 to 20 percent of the total cover and include boxelder, cottonwood, black willow, pussy willow, and red osier dogwood. Also of interest is a prairie planting on the southeast side of this community into a formerly cultivated field. It does include some species not native to Minnesota,

		such as purple coneflower Echinacea purpurea , as well as some State Listed species including glade mallow Napaea dioica and rattlesnake master Eryngium yuccifolium . Overall, this is a good planting and it seems to be both strong and stable. This natural community is one of the most species-rich communities in the West Zumbro River area, and one of just a few wet prairies in Goodhue County. Because it is such a rare community type, it is a good candidate for enrollment in a Prairie Bank or Exemption program. For these reasons, it is exceptionally important and efforts should be made to work with the landowners to manage and preserve this rare prairie/wet meadow complex.
Lowland hardwood forest	WZR - 34	This site lies to the north and south of 445th Avenue just west of Highway 52. It is a highly disturbed site that was formerly disturbed by rail road activities, road building, quarrying, and most recently by gas pipeline construction, clearing and tilling. The most common trees here include aspen, boxelder, cottonwood, and others. The shrub layer is very thick and dominated by mostly thorny nonnatives. This pioneering plant community is of very poor quality and was given a minimum ranking of “D”.
Wet meadow	WZR - 35	Found in a swale on the west side of 165th Avenue, this wet meadow is of moderately low quality. It is dominated by cattail, sedge, and a few species of nonnative pasture grasses. Also, the area was being grazed by beef cattle at the time of field visit. Despite these detractors, it still appears to have unaltered hydrology and a few native forbs, causing a slight elevation in rank. Modification of grazing regime could benefit this swale, and potentially increase the amount of forage available on a seasonal basis.
Oak woodland-brushland	WZR - 36	This community includes several parcels, some of which are grazed, while others are not. Despite the difference in grazing regime, these parcels all have somewhat similar structure and quality. They are characterized by tall bur oaks that tend to form a patchy canopy. Younger trees of secondary importance include aspen, boxelder and green ash. The brush layer tends to be thick, particularly in the areas no longer grazed. The ground layer is in poor condition with a handful of weedy species and nonnative pasture

		grasses most common. Because of the impact of longterm, intense grazing, these woodlands were given a relatively low rank. Despite this, they are good candidates for restoration and/or modification in grazing practice. The planting of native cool season grasses could improve the overall quality of the sites, while providing increased forage (provided the grazing was conducted in a rest-rotation fashion, with adequate time for plant recovery between grazings).
Oak woodland-brushland	WZR - 45	This woodland is found in several parcels south of Zumbrota. All of these are small, and relatively similar in composition. Canopy cover here ranges from about 25 to 75 percent. The most common trees are opengrown bur and pin oak that average about 16 inches in diameter. Less common here are quaking aspen, elm, boxelder, black cherry and hackberry. The shrub layer is moderate in thickness with European buckthorn and Tartarian honeysuckle most common. Other shrub species tend to be either thorny and/or unpalatable to cattle. The ground layer is moderately poor in quality with only a few native species indicative of quality present, including horse gentian and Pennsylvania sedge. Some past tree cutting in evident, and current or former grazing also influences the woodlands. Although these parcels have good restoration potential and would require relatively low inputs to improve, their current condition requires the low ranking.



Pine Island
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
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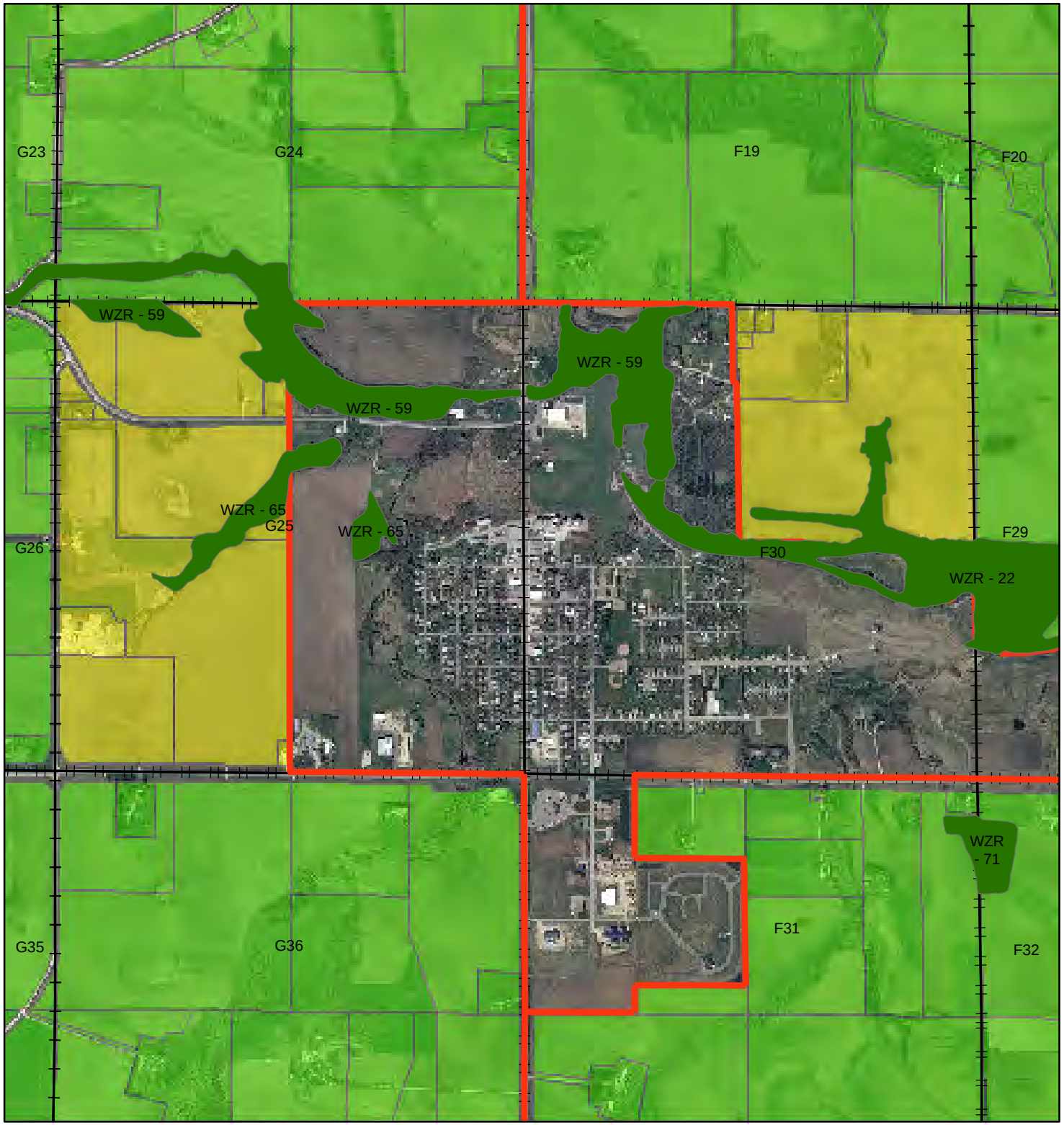
Description	Community ID	Definition
Lowland hardwood forest	WZR - 42	This forest is relatively young and is found in several parcels, two of which abut a forest mapped by the MN DNR MCBS. Overall, this forest is of moderately poor quality. Varied uses among these parcels, including grazing and tree cutting, have impacted their overall composition and structure. Oaks appear to be among the older trees here, but younger, faster growing trees such as elm and ash are common. Mature sugar maples occur in one valley. Throughout most of these parcels the shrub layer is sparse, although shrub cover
Oak woodland-brushland	WZR - 44	This small parcel of oak forest was clear cut around 1990 and has had generally good regeneration of oak trees. Despite the good regeneration, the composition of the former forest has been dramatically altered, particularly in the ground layer, where forest species have not prospered under the full sunlight. The slash from the logging activities was piled in windrows and will likely persist for many decades to come. Because of the abrupt recent transition from closed canopy to no canopy, this community was treated as an Oak Woodland. As the site recovers and the canopy once again closes, it could be reclassified as forest in 30 to 50 years.
Oak woodland-brushland	WZR - 46	This oak woodland has a canopy cover that averages about 70 percent. It has been grazed historically,and has some significant erosion resulting from runoff from steep slopes that are cropped upslope. The most common species of trees here are bur and pin oak with aspen, black cherry, hackberry, and elm also present. The shrub layer is thick and contains a mix of nonnative and thorny native species. Although the ground layer is disturbed, it does have some natives present including Virginia wildrye and Virginia waterleaf. These parcels have good restoration potential, despite the somewhat lowered rank.
Lowland hardwood forest	WZR - 48	Although similar in composition to the previous two communities, this oak woodland has experienced less overall disturbance and has a better species composition. These parcels have scattered large oaks with other, younger trees between them. The overall canopy cover is about 5 to 10 percent, except for the west side, where it approaches 80 percent in an oak

		grove. Some of the younger trees include small ash, boxelder, and elm. The shrub layer is variable, but generally sparse. Some of the shrubs found here include eastern red cedar, common elder, gooseberry, domestic apple, and most notably, hawthorn. The ground layer across much of the site includes a mix of nonnative pasture grasses with some weedier native species. There are also some areas where prairie species dominate, including sideoats grama grass, heath aster, bergamot, New England aster, prairie sage, marbleseed, Indian grass, and false boneset. The more open areas in this community are currently used for grazing dairy cattle. The west-facing slope also contains a number of seeps that are in moderately good condition. Some of the species found here include tussock sedge, bluejoint, satin grass, sneezeweed, boneset, prairie cordgrass, and spotted joe-pye weed. Overall, this community is in moderately good condition. Adding to this quality are the scenic views offered throughout this small valley. This pasture/woodland is worthy of active management and may a good candidate for modification of the grazing system that would both benefit the natural community and improve the forage production.
Maple-basswood forest	WZR - 49	This is a small forest that is characterized by a mix of sugar maple, bur oak, basswood, and elm trees. It is currently grazed by cattle. Because of the large number of cattle placed in this small area, there is virtually no shrub or ground layer remaining. In addition, much of the soil on the site has been workedup by the cattle. Although this forest contains trees typical of a maple-basswood forest, little was visible at the time of the field visit to indicate that the quality of the forest would improve in the foreseeable future.
Maple-basswood forest	WZR - 50	Adjacent to the previous community, this forest is of somewhat better quality. It too has been grazed, and was also cut over. However, this forest has begun the process of recovery. Most trees are less than 12 inches in diameter, with sugar maple, basswood, and boxelder most common. The shrub layer varies from moderate to thick with red raspberry, European buckthorn, blackberry and other thorny species common. The ground layer is generally dominated by nonnative or weedy native species, however, there are

		some individual plants of more conservative species that appear to have recently colonized the site. If additional disturbance is withheld during the next few decades, this forest should improve in quality on its own.
Lowland hardwood forest	WZR - 51	Although this area was likely a more open, oakdominated community in the past, it has been colonized by trees typically found in low-lying areas. For this reason it was classified as a Lowland Hardwood Forest. The most common trees are boxelder and elm. Along with green ash they comprise a majority of the trees, and all average about 12 inches in diameter. The oaks found here average about 18 inches in diameter. The shrub and ground layers are both disturbed and indicate past disturbance, which was likely grazing. The most common species here include European buckthorn, stinging nettle and Virginia waterleaf. Because of the lack of native ground cover and the recent advent of a closed canopy, some sheet and rill erosion is occurring. This is, in no small part, due to the cultivation of ground on the upper portions of the slope. Overall, the composition of this forest is somewhat low causing a rank of “CD”.
Oak forest mesic subtype	WZR - 52	This forest crosses several property boundaries. It is quite variable in its three-dimensional structure, and, to a lesser degree, in its species composition. Some areas have been logged in the past, some appear to have been grazed, and still others have experienced both. One portion of the forest was logged within the last year, with a reduction in canopy of about 75 percent. Large oaks, and to a lesser degree sugar maples were removed, and younger oaks left as a shelter species. One cut red oak, 18 inches in diameter, was aged at 94 years. Some resprouting of the oaks has taken place, but the prevalence of sugar maple seedlings and saplings in the understory suggests that this area will likely transition to maplebasswood forest in the next few decades. The most common trees here are white and bur oak, and elm, with basswood, aspen, pin and red oak, and sugar maple less common. The shrub layer is dominated by natives including ironwood, gray dogwood, bitternut hickory and prickly ash. The ground layer has a nice complement of native species in the logged area. However, some of those in the logged area appear to

		be severely stressed due to lack of canopy cover. Some of the more notable species in the ground layer include zigzag and elm-leaved goldenrod, blue cohosh, lady fern, hepatica, early meadow rue, heart-leaved aster, and Jacob's ladder. The most common graminoids include Pennsylvania sedge, bottlebrush grass, hairy wood chess, and woodland sedge. Other areas that have been primarily grazed, as well as the northwest corner, are of lower overall quality and have a poorer composition in the shrub and ground layers.
Maple-basswood forest	WZR - 53	This forest occurs in several parcels and in fairly good condition, despite some recent wind damage to canopy trees. The most common trees in the generally closed canopy are sugar maple, basswood, and red, white, and bur oaks. Most of these average about 18 inches in diameter. The shrub layer is dominated by natives including ironwood, bitternut hickory, and sugar maple seedlings. The ground layer is in moderately good condition and is dominated by species typical of the forest type. Some of these include wild ginger, zigzag goldenrod, lady fern, early meadow rue, and Jacob's ladder. The most common grass-like plant found was Pennsylvania sedge. Some parcels of this forest appear to be owned by rural residential homes and do not appear to be under any pressure from their limited activities, which include wood cutting and minor trails. Still others are currently grazed, which has adversely affected the ground layer.
Maple-basswood forest	WZR - 54	The tree species composition of these forest parcels is similar to the previous community, but includes more pioneer species such as aspen and elm. The shrub layer is moderate in thickness and is characterized by species that are either tolerant of some grazing and/or thorny. Some of these include ironwood, prickly ash, red cedar and others. The ground layer is substantially disturbed due to the grazing and is dominated primarily by nonnative, cool season grasses and a few unpalatable natives. Because of the substantial disturbance by grazing, this forest was given a lowered rank of "CD".



Wanamingo
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
- I - Industry
- MXH - Mixed Use
- R1 - Suburban Residential
- REC - Cannon River Recreational
- SCN - Cannon River Scenic
- Within City Limits or No Data

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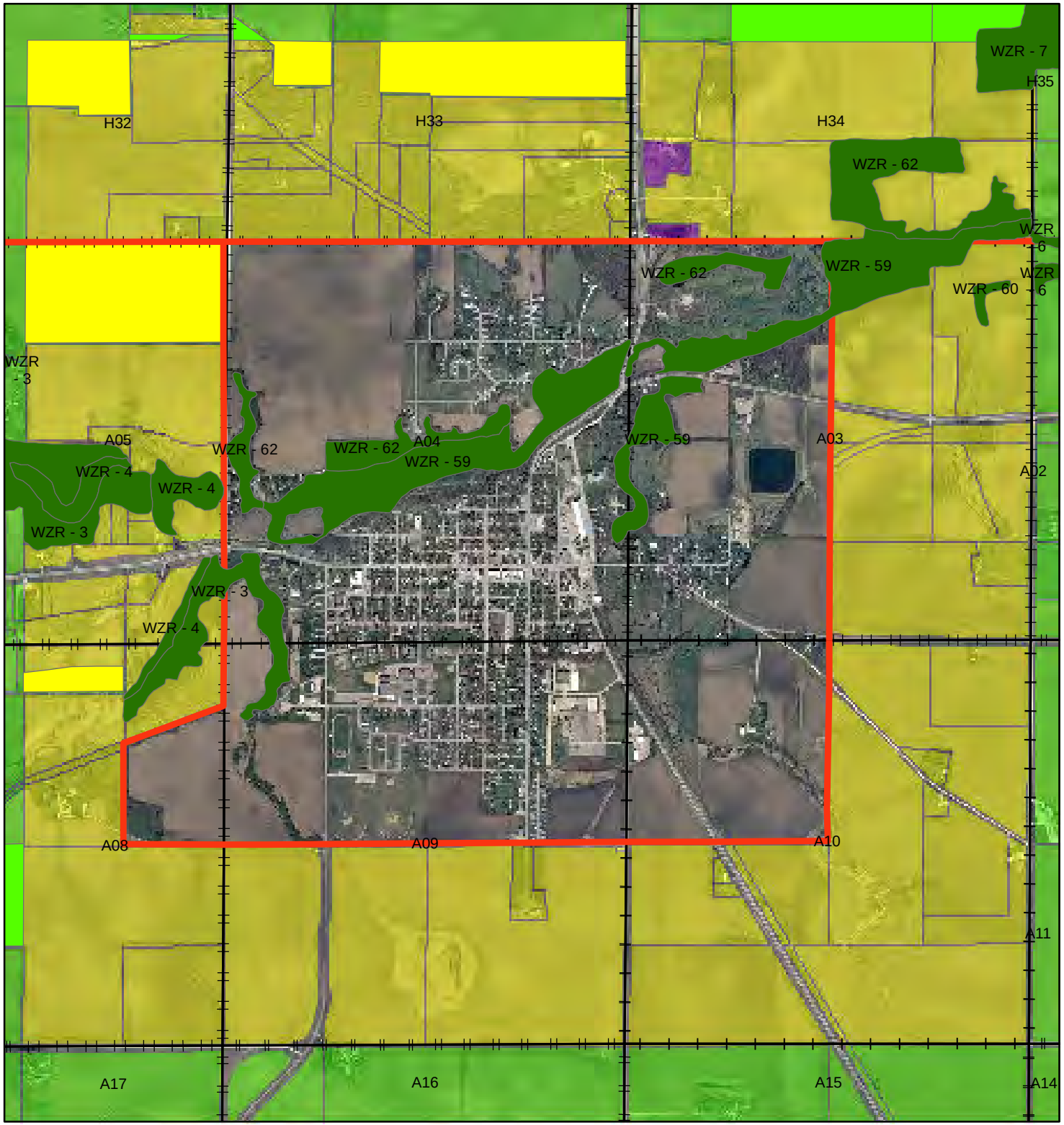
Description	Community ID	Definition
Lowland hardwood forest	WZR - 22	This community is an extension of MN County Biological Survey Sites 175 and 109, although it is of slightly lower quality. It extends in a corridor along the Zumbro River, and also along an old rail bed just to the south. The most common trees here include boxelder, elm, black and green ash, and silver maple. The shrub layer is patchy and varies from sparse to moderately dense with native species common. The ground layer includes a mix of native species typical of forests that flood periodically. Some of these include Virginia waterleaf, cleavers, and Virginia wildrye. Also included in this community is a small upland forest with a mix of oak, sugar maple and basswood. Although none were found during the brief field survey for this project, the areas along the river and west of the MCBS site should be checked for rare species, particularly glade mallow.
Lowland hardwood forest	WZR - 59	This forest occurs along the Zumbro River on the north side of Kenyon. It is characterized by tall, scattered cottonwood, and somewhat smaller, but more evenly distributed boxelder. Other trees present include elm, black willow, silver maple, and green ash. The shrub layer is moderately thick, with some thickets found occasionally. The most common shrubs here are European buckthorn and common elderberry. The ground layer is a mix of native species, and nonnatives that persist from the former use of much of this site as pasture. Common nonnatives found here include stinging nettle, reed canary grass, and creeping charlie. The most frequently encountered natives in the ground layer include wood nettle, and Virginia and Canada wildrye. Overall, this community is in moderate condition and seems to be approaching early maturity as a patchy forest.
Wet meadow	WZR - 65	This community includes several moderate quality parcels of wet meadow, two of which are found on the west edge of Wanamingo. All of these have been formerly grazed, with one of the meadows on the west side of Wanamingo still being grazed. The most common graminoid species here include tussock sedge, prairie cordgrass, Virginia wildrye, bluejoint, fringed brome, fowl bluegrass, other sedges and the nonnatives reed canary grass and Kentucky bluegrass Some of the forbs encountered here include Culver's root, common boneset, turtlehead, Virginia mountain mint, great blue lobelia, angelica, water dock, and marsh milkweed. Brush cover among these parcels averages about 20 percent with several species of willow, and redosier dogwood most common. Overall, these wet meadows are in relatively good condition and were given a rank of "C".



Kenyon
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
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- R1 - Suburban Residential
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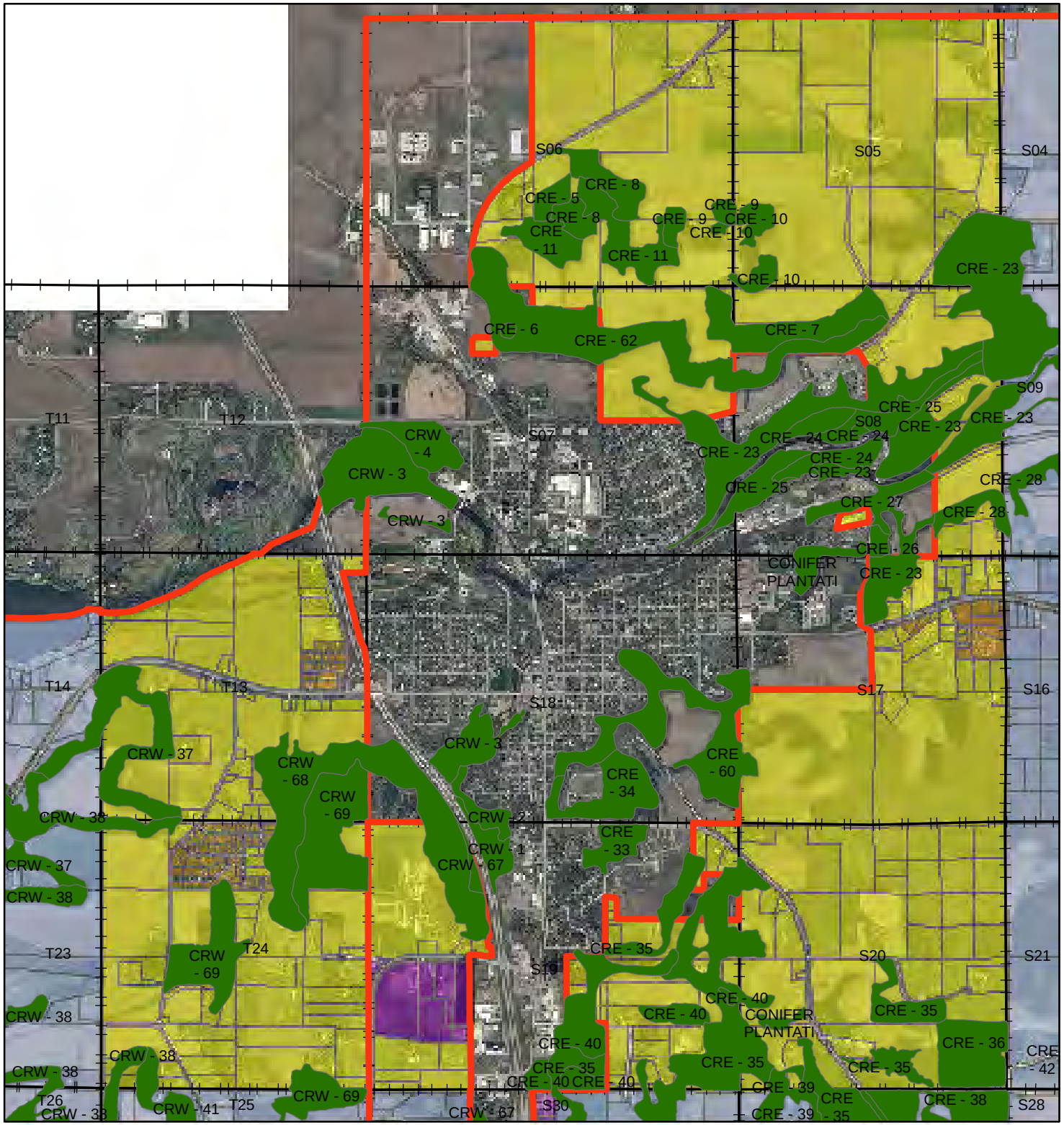
Description	Community ID	Definition
Maple-basswood forest	WZR - 03	This community includes several parcels of forest west of Kenyon, on either side of Highway 60. The northern parcel occurs along a tributary valley to the North Fork Zumbro River, and the southern along the main branch of the river. Canopy cover in this community approaches 100 percent in most places, with bur oak and basswood common. These average about 17 inches in diameter. Other, less common trees include American elm, pin oak, green ash, and sugar maple. The southeast portion of the northern parcel has a much higher percent of sugar maple in the canopy than other areas. There are many smaller sugar maples and few small oaks in this forest, indicating that the community will eventually shift to a maple-basswood forest in the absence of active management. The shrub layer is moderately thick in most places, with the exception of one small area that is currently grazed. Common species include black cherry, gooseberry and European buckthorn. The ground layer is variable in quality, but is in at least moderate condition in most places. The most frequently encountered ground layer species include bedstraw, sweet cicely, wild geranium, and honewort. Overall, this forest is in moderately good condition, and continues to recover from past grazing.
Lowland hardwood forest	WZR - 04	This low-lying forest occurs in two parcels adjacent to the previous community. This forest is of moderately low quality as a result of past grazing and subsequent colonization by some pioneer species of trees. These trees contribute to a patchy canopy of black willow, cottonwood, elm, boxelder, and ash. The shrub layer is moderately sparse across most of the site, although there are some localized thickets. The ground layer is generally dominated by reed canary grass and other nonnative pasture grasses. Native species occur less frequently here, and are mostly those plants that are adapted to a disturbance regime more intense than that normally experienced in a Lowland Hardwood Forest.
Oak forest mesic subtype	WZR - 07	Lying just to the north of the Zumbro River, this forest is a mix of many different species, with a varied past land use. The patchy canopy is composed of a mix of several oak species, ash, elm, sugar maple, hackberry,

		black cherry and others. The western parcel contains more oaks and sugar maples than the east parcel does. The entire community appears to have a history of grazing. The shrub and ground layer both reflect this history and are dominated by thorny species, those unpalatable to cattle, and those that are tolerant of persistent grazing. Because of this, the forest was given a moderately low rank.
Oak woodland-brushland	WZR - 57	These two woodlands lie on either side of 450th Street. Together they total about 15 acres, and are characterized by a mix of open-grown and forestgrown bur oaks. The shrub layer is dense and hosts young green ash, elm, and a very thick growth of European buckthorn. The ground layer is sparse and dominated by species typical of disturbed sites. Although these two parcels are disturbed, they represent good opportunities for active management. With relative ease, native grasses and forbs could be reintroduced, the brush removed, and mowing or burning be used to maintain the area.
Lowland hardwood forest	WZR - 59	This forest occurs along the Zumbro River on the north side of Kenyon. It is characterized by tall, scattered cottonwood, and somewhat smaller, but more evenly distributed boxelder. Other trees present include elm, black willow, silver maple, and green ash. The shrub layer is moderately thick, with some thickets found occasionally. The most common shrubs here are European buckthorn and common elderberry. The ground layer is a mix of native species, and nonnatives that persist from the former use of much of this site as pasture. Common nonnatives found here include stinging nettle, reed canary grass, and creeping charlie. The most frequently encountered natives in the ground layer include wood nettle, and Virginia and Canada wildrye. Overall, this community is in moderate condition and seems to be approaching early maturity as a patchy forest.
Wet meadow	WZR - 60	This sedge dominated wet meadow is found in a side valley of the Zumbro River, in an intensively used pasture. Overall, it appears to have retained much of its historic water regime with minimal shrub invasion. Moderate to intense grazing over a period of decades has impacted the species composition, resulting in a downgrading of its qualitative rank. Throughout the

		region, swale and side-hill seep types of wet meadow wetlands continue to be lost through human activity, making this type of community relatively important in a county-wide context.
Oak woodland-brushland	WZR - 62	This woodland community occurs as several parcels in Kenyon, and to the east of the city. They are moderately low in quality, partly due to past and present grazing practices. These parcels are characterized by large, open-grown oaks, mostly bur oaks that create a broken canopy. Secondary growth is filling in the canopy gaps. The shrub layer varies from moderately thick to nearly impenetrable with thorny species common. Nonnative cool season grasses such as Kentucky blue grass dominate the ground layer.



Cannon Falls
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
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Appendix D

Description	Community ID	Definition
Upland soils with planted, maintained, or cultivated coniferous trees	CONIFER PLANTATION	Large plantations of conifers were often planted in many portions of southern Minnesota after the 1930s under the belief that they prevent erosion. Often these are single species groves of various pines and spruces, planted closely together in rows. When young, the ground cover continues as a field or prairie, as it was previously. Eventually, the shade created by the pines, and acid from needle-drop eliminates most ground cover vegetation and it becomes highly simplified or bare. The plantations provide shelter from wind, cover and breeding areas for songbirds, owls and other species, but also create a dense monoculture with low diversity. Depending on the original planting density, these plantations typically require thinning with age to preserve the health of the trees
Dry Prairie barrens subtype	CRE - 05	This prairie is an old field that has been colonized by prairie species from the surrounding area. It has been planted with pines that make up about one half of the total cover. Other brush is common and includes prickly ash, red cedar, smooth sumac, and bur oak saplings. The ground layer is mostly dominated by the nonnative grass smooth brome. However, natives commonly occur here also, and include round-headed bushclover, gray goldenrod, frostweed, long-bearded hawkweed, rough blazingstar, and sky blue aster. This prairie meets the minimum conditions for classification, and has added significance due to the presence of the uncommon plant long-bearded hawkweed.
Dry Prairie bedrock bluff subtype	CRE - 06	This prairie occurs along a south- to southwest-facing slope, characterized by moderate slopes in most places with a caprock of dolomite. This creates a very steep slope covered by platey cobbles at the top. It is reported by one of the landowners to have been completely open about 40 years ago. Currently, it has about 80 percent cover by eastern red cedar, and to a lesser degree, small trees and shrubs. The most common native grasses found here include sideoats grama, big and little bluestem, indian grass, and prairie dropseed. The nonnative Canada bluegrass is also common in many areas as a result of being introduced over 50 years ago in an attempt to provide additional

		forage for cattle. The most common native forbs include narrow-leaved and hoary puccoon, bastard toadflax, prairie violet, pasque flower, Virginia mountain mint, and Loesel's twayblade orchid. Two State-listed species of note that occur on the Molenaar's property include the State Threatened kitten-tails and the State Special Concern Hill's thistle. Although this prairie has been impacted dramatically by the invasion of red cedar and brush, existing prairie openings of quality and the presence of several statelisted species enable a moderate ranking of "C".
Lowland hardwood forest	CRE - 07	This forest is located on north and east-facing slopes and has canopy coverage of about 70 percent. Bur and red oak are fairly common, as are elm and green ash. Other trees found less frequently include hackberry, bigtooth and quaking aspen, basswood, and cottonwood. No stumps were seen indicating that logging had not occurred in the last 50 to 75 years. The most common species in the shrub layer are European buckthorn, prickly ash, and young elm, hackberry, and black walnut trees. The ground layer is in moderately poor condition with white snakeroot, sweet cicely, clearweed, enchanter's nightshade, and motherwort common.
Oak woodland brushland	CRE - 08	This woodland is dominated by open-grown bur oaks with smaller pin oak, black cherry and hackberry filling-in the areas between them. The shrub layer is generally thick, with European buckthorn, ironwood, elm, bur oak, and prickly ash most common. The ground layer is of moderate quality with silky wildrye, lopseed, enchanter's nightshade, honewort, and black snakeroot found frequently. Because of the transition to a brushy woodland and the resulting reduction in species diversity, this community was given a moderate rank of "C".
Lowland hardwood forest	CRE - 09	This forest was being grazed at the time of the field visit. Although the grazing is only of moderate intensity, it has enabled a significant infestation of the nonnative scotch thistle to develop. Common trees include elm, and hackberry, with bur oak less common. The shrub layer is dense and dominated by thorny species. The ground layer is also in moderately poor condition, with honewort, clearweed, enchanter's nightshade and white snakeroot common.

Eastern Red Cedar woodland	CRE - 10	This is not a recognized natural community type according to the MN DNR Natural Heritage Program methods and was therefore given no rank. The community was given this classification because it has near total coverage by eastern red cedar. In addition, it was being used as a pasture during the field visit in the summer of 2000.
Lowland hardwood forest	CRE - 11	This forest is dominated by elm and boxelder, with bur oak, hackberry, basswood, and green ash less common. European buckthorn and tree saplings dominate the shrub layer. The ground layer is in moderately poor condition with the nonnatives stinging nettle and fescue grass common. The most commonly found native species include lopseed, honewort, clearweed, and enchanter's nightshade.
Oak woodland-brushland	CRE - 23	This former savanna and bluff prairie contains some very large bur oak with open-grown characteristics. There is a dense undergrowth of red cedar, prickly ash and buckthorn. The ground layer is sparse due to the rapid increase in shade caused by shrub colonization and the most common species include white snakeroot, burdock, and white avens. Although there are a few prairie remnants that persist in very small canopy openings, these will likely become overtaken by brush within a few years. Because of the rapid transition of this community from relatively open to nearly closed and the dramatic decline in species richness that resulted, this community was given a low qualitative rank.
Dry Prairie sand-gravel subtype	CRE - 24	This prairie occurs on a terrace of the Cannon River on both sides of the Cannon River. It lies to the northeast of the high school. Most of this community appears to be old field that has been recolonized by a number of prairie species. The area on the north side of the river has about 50 percent shrub cover with Siberian elm and eastern red cedar common. All areas have a ground cover dominated by smooth brome, bluegrass and other nonnative cool season grasses, with some moderate quality patches of prairie scattered throughout the site. The prairie areas contain sideoats grama, Canada wildrye, and big and little bluestem as the most common native grasses. The most common forbs include silverleaf scurf-pea, stiff goldenrod, heath aster, and tall boneset. Also of interest is the

		colonization of dry, shady areas on the north parcel by Loesel's twayblade. Because this community is characterized by past disturbance and few plant species have been able to quickly recolonize the site, it was given a poor rank. Despite this, the parcel on the south side of the river provides an excellent opportunity for the City of Cannon Falls to manage and restore a rare community type. Efforts have already been made to reconstruct a prairie closer to the school and additional activities should include restoration of this river terrace prairie. Some activities for this site could include prescribed burning and the reintroduction of additional, local ecotype native grasses and forbs.
Floodplain forest silver maple subtype	CRE - 25	This forest is mostly associated with a flood raceway in the floodplain of the Cannon River. The site appears flood regularly, with debris evident in shrubs and other areas. The site does not appear to have been cut or logged in the past and most of the trees are relatively young, with most under 18 inches. The canopy is nearly closed in most places and the most common trees include silver maple and black willow. Other trees that are more common on the slightly higher ground include black walnut, cottonwood, boxelder, and elm. A subcanopy includes occasional boxelder and the shrub layer is nearly absent in most places. The ground layer contains species commonly found in floodplain forest. Some of these include wood nettle, Virginia wildrye, goldenglow, sneezeweed, and white grass. The presence of nonnative species, including stinging nettle and chickweed, as well as the relatively young age of the canopy trees are the two primary reasons for the moderate grade of this community. Despite this, it should improve to a "B" level rank in the next ten to twenty years if left undisturbed.
Dry Prairie barrens subtype	CRE - 26	This prairie includes what appears to be former pasture adjacent to the access road to Northern Hardwoods. The brush cover of this area is about 20 percent, but exceeds 50 percent in some areas along the margins. The most common brush species include Siberian elm and red cedar. The most common native graminoids include Indian grass, sand dropseed, a species of panic grass, and purple lovegrass. Forbs present that are characteristic for this community type include silky prairie clover, narrow-leaf and hoary puccoon,

		cudweed, oxeye false sunflower, and stiff and gray goldenrods. Because the species characteristic of better quality communities are found only occasionally and because most of the site appears to have been cultivated historically, this community was given a low qualitative rank. Because this community occurs on sandy soil, it is a good candidate for restoration. Potential activities include brush removal, prescribed burning and minimizing damage from trails and ATVs.
Lowland hardwood forest	CRE - 27	This forest is found along a terrace and small hill adjacent to the Cannon River. It is mostly made up of young boxelder and Siberian elm interspersed with scattered mature pin and bur oaks. The shrub layer is generally thick and dominated by thorny shrubs. The ground layer is a mix of nonnative grasses and disturbance tolerant native forbs in drier areas, and native sedges, grasses and flowers in the moister, lowlying areas. Because of the recent origin of the boxelder and nonnative Siberian elm, this community was given a low rank. However, it would be a nice community to manage along with adjacent prairie areas.
Oak woodland-brushla	CRE - 28	This community includes several parcels along the bluffs of the Cannon River. Most of these appear to be former prairie, savanna, or open woodlands that have more recently been colonized by brush and young trees. The most common trees include bur and pin oak, with young quaking aspen, green ash, black walnut, red cedar, and elm found occasionally. The most common shrubs are black raspberry, blackberry, dogwood, and prickly ash. The ground layer includes woodland sunflower, elm-leaved goldenrod, white snakeroot, Pennsylvania sedge, and false Solomon's seal. Overall, the quality of this community is moderate to good and was given a rank of "C".
Lowland hardwood for	CRE - 33	Found in a narrow strip between the Cannon River and the Sunset Trail, this forest is of moderate quality. It has a sparse canopy of trees with about 25 percent total cover. Sometimes the trees occur in small groves, while in other areas they are present as scattered individuals. The most common large trees include cottonwood, elm, black willow and to a lesser degree boxelder and eastern red cedar. The shrub layer is patchy, with prickly ash, wild rose, false indigo, and

		gray dogwood most common. The ground layer is a mix of native species and introduced species. Nonnative species found here include bluegrass, smooth brome, and quackgrass. The most frequent native ground cover includes several species of sedge, big bluestem, Canada wildrye, goldenglow, sawtooth sunflower, Indian grass, purple giant hyssop, and cup plant. Although the species composition of this community would indicate a higher ranking, the small size and fragmentation caused a ranking of “C”. Similar parcels are located within the city of Cannon Falls, and are mapped under the same description.
Oak woodland-brushla	CRE - 34	This woodland includes several separate parcels of similar character and quality. It is characterized by large, open-grown pin and bur oak with younger trees, including quaking aspen and elm, in between. The shrub layer varies from sparse to moderately thick in some places. The ground layer is also variable, with some savanna and prairie species persisting along edges and in small openings, while much of the site has species that are typical of young, disturbed woodlands. The bluff just north of County Road 24 and west of County Road 24 hosts some prairie species and should be searched in the future for the possible occurrence of species such as kitten-tails.
Oak woodland-brushla	CRE - 35	Moderately poor in quality, this community contains large pin and bur oaks with a moderately dense shrub layer of young trees and shrubs. These include plum, elm, prickly ash, dogwood, and boxelder. Nonnative pasture grasses, including Kentucky bluegrass, dominate the ground layer. These conditions cause a lowered qualitative rank of “CD”.
Oak forest dry subtype	CRE - 36	Although this former woodland/savanna has been impacted in the past by grazing and limited tree cutting, it is transitioning very nicely into a quality dry oak forest. The most common members in the nearly closed canopy are bur and pin oak that average about 19 inches in diameter. Other, less common trees include bitternut hickory, basswood, elm, and black walnut. The shrub layer varies from sparse to thick with prickly ash and prickly gooseberry common. The ground layer has a good representation of species found in woodlands and oak forests. Some of these include wild sarsaparilla, yellow bellwort, pointed-leaf

		tick trefoil, wild geranium, hairy wood chess grass, and zigzag goldenrod.
Lowland hardwood for	CRE - 39	This community occupies the lowest portions of a drainage in a gently to moderately rolling area just east of County Road 25. The entire area is either currently pastured or appears to be formerly pastured. The most common tree species include boxelder, elm, and to a lesser degree green ash. The shrub layer varies from sparse in the areas that are intensively grazed, to thick in areas that have not been grazed for an extended period of time. Both the shrub and ground layers are dominated by nonnative species, including European buckthorn, Kentucky bluegrass, orchardgrass, Canada thistle and others.
Dry Prairie barrens sub	CRE - 40	This prairie lies to the north and south of 318th Way in Cannon Falls. Most portions appear to have been plowed in the past, while a few small areas in the north were perhaps only grazed. There is about 20 percent cover by eastern red cedar, sumac and dogwood on this prairie. The most common native grasses include purple lovegrass, Indian grass, sand reedgrass, rough dropseed, paspalum, porcupine grass, and little and big bluestem. Some of the more frequent native forbs include round-headed bushclover, windflower, wild strawberry, ground cherry, and stiff sunflower. Other native forbs found here that are associated with quality prairie include silky prairie clover, hoary puccoon, rough blazingstar, rhombic-petaled evening primrose, and anise hyssop. Overall, the quality of this prairie is at best moderate, although some pockets of better quality are found here. Despite its current condition, this prairie has good restoration potential and is of a prairie subtype (barrens prairie) that is exceedingly rare in this region.
Oak forest dry subtype	CRE - 60	This forest is found on the southeast side of Cannon Falls. It has a canopy that averages about 85 to 90 percent closure and is dominated by tall, straight trees. The most common of these are bur and pin oak that average about 18 inches in diameter, and boxelder, elm, aspen, basswood, and sugar maple being smaller and less frequent. The shrub layer varies from moderate to sparse depending on the slope position and the amount of past disturbance. The areas that seem to be the least disturbed are those just below the

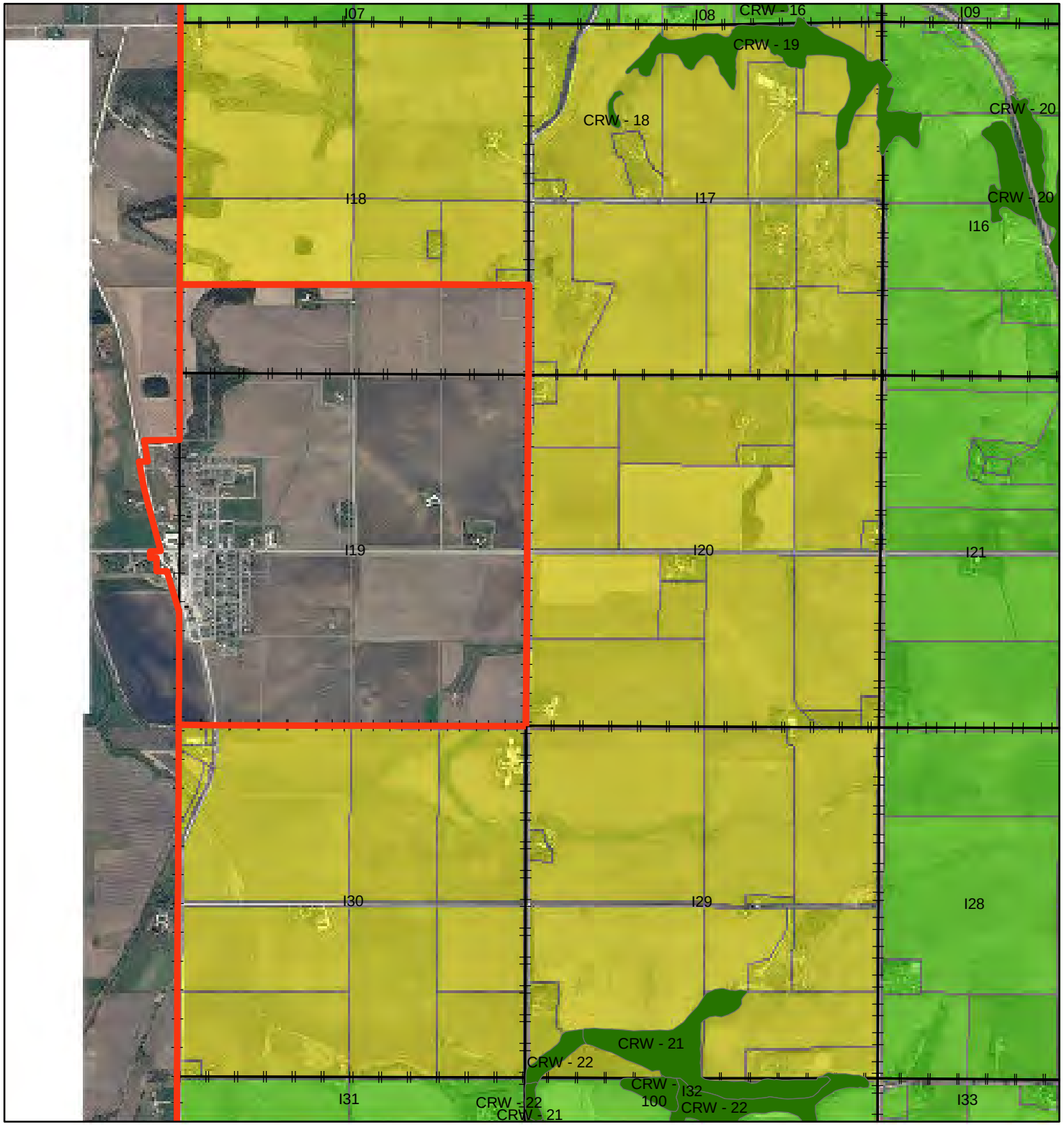
		crest of hills, and those with some bedrock near the surface. The most common members of the shrub layer include bitternut hickory, ironwood, sugar maple saplings, and prickly ash. The ground layer is in good condition with most areas dominated by species typical of oak forests. Some of these include wild geranium, lopseed, wild sarsaparilla, pointed-leaf tick trefoil, bloodroot, and zigzag goldenrod. Although there are some small areas of higher disturbance, most of the site is in good to very good condition. For this reason, and because it occurs within the city of Cannon Falls, this forest was given a rank of “BC”.
Oak forest dry subtype	CRE - 62	This dry oak forest is similar in species composition to CRE-61, but has a more closed canopy. As with the previous community, the level of disturbance and fact that the forest is in the early stages of recovery cause a lowered rank of CD.
Dry Prairie bedrock blu	CRW - 01	This dry prairie is found on a generally north-facing slope that is moderately steep and dissected. At the time of field inventory this prairie was being grazed. Prairie species are found in small areas and are composed largely of species that cattle find unpalatable, including prairie larkspur and prairie sage. Based on the areas of erosion and altered species composition, it appears that the grazing pressure is too intensive to sustain the scattered patches of prairie found here. Despite the disturbed character of this prairie, it has added importance because it is located near McKnight prairie, and other mesa-like bluff prairies in the surrounding few miles.
Oak woodland-brushla	CRW - 02	Found immediately to the north of CRW-1, this oak woodland-brushland is of recent origin. It is characterized by widely scattered open-grown bur oaks with dense growth of younger brush and trees between them. These younger trees average about 10 inches in diameter and are dominated by box elder and black cherry. The brush layer is very thick in most places and dominated by prickly ash, European buckthorn, Siberian elm, eastern red cedar, and brambles. Based on the species composition and overall character, it appears that this site was intensively grazed for many years and then retired. After the cattle were removed, trees and thorny shrubs quickly colonized this moderately inclined north slope. Because of the

		apparent past disturbance and the early stage of recovery that this area is in, it was given a low qualitative rank of “D”.
Dry Prairie	CRW - 03	This prairie is found in two parcels that are approximately one-quarter mile apart. The northern segment lies completely within an abandoned Chicago Great Western railroad right-of-way, while the southern segment includes both the old rail bed and a south-facing hillside to the east. The quality of this prairie is moderately poor in the rail bed portions where land is cultivated on either side. The portion east of the rail bed is of somewhat better quality and includes some species that indicate this. The most common prairie species in this community include big bluestem, prairie rose, porcupine grass, prairie sage, stiff goldenrod, and prairie coneflower. Species found less often that associated with high quality prairies include purple prairie clover, prairie phlox, leadplant, and spiderwort. On the east side of the north portion of this community, the landowner has planted switchgrass, presumably for habitat. The growth character of the grass seems to indicate that it is a cultivated variety and may not have a local wild population origin. Despite this, it serves as an important buffer to the remnants of prairie in the abandoned rail right-of-way and should be viewed as generally beneficial. Overall, the quality of these prairie parcels is moderate due to the pressures exerted by rowcrop agriculture in the north parcel, and the pending encroachment by brush in the south segment.
Floodplain forest	CRW - 04	This community lies in a low spot in an east-west oriented wetland area, and separates the two parcels of CRW-3. It appears to be of relatively recent origin with the largest cottonwoods averaging less than 14 inches in diameter. The canopy in nearly closed in most places and consists of boxelder, cottonwood, silver maple, and quaking aspen where slight rises occur. The shrub layer and ground layer are sparse under the thick canopy. Common species found here include red-osier dogwood, reed canary grass, rough avens, and several species of sedge. Because of the generally poor species composition of this community and apparently recent origin, it was given a lowered qualitative rank.

Oak forest mesic subty	CRW - 37	These forest parcels occur on several north-facing slopes along the same ridgeline, the northern portions of which are dominated by oak, the southern ones have a larger percentage of sugar maple. One of the southern segments, along with an adjacent forest that was mapped as Maple-basswood Forest by the MN DNR Minnesota County Biological Survey, has been substantially fragmented by a housing/golf course development. Overall, the most dominant trees are bur and red oak that average about 14 inches in diameter. Elm, hackberry, and sugar maple are less common. One 20-inch sugar maple cut during golf course construction was 110 years old when it was removed. The configuration of the growth rings on the tree, as well as the presence of surrounding stumps, indicate that this forest was probably clear-cut about 50 years ago. The shrub cover varies from sparse to moderately thick. Sugar maple saplings are common in this layer, with prickly ash, European buckthorn, nannyberry, chokecherry, and bitternut hickory seedlings also present. The ground layer is also variable and is most disturbed where grazing appears to have been regularly practiced. Species found in the ground layer include wood anemone, woodland sunflower, wild geranium, bottlebrush grass, red baneberry, and pointed-leaved tick trefoil. Overall, the quality of this site is moderate having been influenced in the past by grazing and logging and recently by landscape alteration associated with development.
Oak woodland-brushla	CRW - 38	Found along the south-facing portions of the same bluff line that hosts CRW-37, these oak woodlandbrushland parcels are of moderately poor quality. They are characterized by large bur oaks and some large pin oaks. In some places these trees have an open-grown form, while in others they form groves with intermingling crowns. Between these is a second growth of young cedar, elm, boxelder, and oaks. The shrub layer is generally thick and filled with thorny species, e pecially European buckthorn and prickly ash. The ground layer varies in quality, but is generally species poor. Some of the more common species here include white snakeroot, wildrye, bottlebrush grass, and Pennsylvania sedge. Most of these parcels appear to have had their openness maintained by grazing in the past, with an influx of young trees and shrubs after grazing subsided.

Oak forest mesic subty	CRW - 41	This forest is found on a generally east-northeast facing slope with much of it heavily impacted by grazing. The canopy is in moderately good condition despite some limited tree cutting. It is dominated by basswood, sugar maple, and white oak with bur oak, bitternut hickory, and hackberry co-dominant. These trees average about 16 inches in diameter. The shrub layer is sparse in most places with only limited recruitment of tree seedlings, due to grazing pressures. The most common species here is elm, with European buckthorn, gooseberry, and ironwood less common. The ground layer appears to have been heavily impacted by grazing as well, although some spring blooming plants may persist and were not seen due to the July field visit. The most frequent ground layer species include sweet cicely, wood nettle, bottlebrush grass, and Virginia waterleaf. Because of the pronounced impact of grazing, this community received a moderately poor rank. Appropriate reduction or removal of grazing should allow the condition of this forest to improve in quality within a few decades.
Oak forest dry subtype	CRW - 67	This forest is found along a lengthy east-west trending slope that faces south. It is dominated by bur and pin oak that form a nearly continuous canopy. Where gaps occur, other trees have filled-in, including black walnut, ash, sugar maple, and elm. The shrub layer varies from moderately thick to thick with European buckthorn and prickly ash most common. The ground layer is a mix of disturbance-oriented species such as honewort, white snakeroot, and Virginia stickseed. Others are more characteristic for the community type including enchanter's nightshade, blue cohosh, Pennsylvania sedge, and figwort. Because the species composition for this forest is of moderate quality, it received a "C" rank.
Lowland hardwood for	CRW - 68	This forest occurs along the Little Cannon River between Highway 52 and Oxford Mill Road, south of Highway 19. In general this forest is relatively young and dominated by species of trees that tend to follow release from activities such as grazing. The most common trees here include boxelder, willow, and cottonwood. The shrub layer varies in thickness and contains many young trees. The ground layer is dominated in most places by nonnative grasses,

		particularly reed canary grass and bluegrass, with native forbs less common. There is also some ATV damage to this community, mostly concentrated near Highway 52. See CRW-69 for additional information. Because of the apparently recent origin of this forest and past disturbance, this community was given a moderately low rank of “CD”.
Oak woodland-brushla	CRW - 69	Found adjacent to CRW-68, this oak woodland varies in composition and quality. Several portion of the community are currently or formerly used for grazing. It is characterized by large, open-grown bur oaks that sometimes stand alone but more often have crowns that intermingle with neighboring trees. The shrub layer varies in thickness depending on how recently a particular area was grazed. The most common shrubs include nonnative and/or disturbance tolerant species such as prickly ash, buckthorn, honeysuckle, and eastern red cedar. The ground layer is dominated by nonnative cool season pasture grasses in most places, with native grasses and flowers comprising a small portion of the total cover. In addition to grazing and limited tree cutting, some areas in this community have been heavily impacted by ATV use. These Off Road Vehicles are very common in the Cannon Falls area and cause substantial damage to the sandy soils and slopes. One area just west of Highway 52 has a notch approximately 10-15 feet deep cut into a hillside from ATV damage. This has also resulted in a large sediment plume at the bottom of the hill. Because of the prevalence of nonnative plants and the continuing pressure posed by ATV’s, this community was given a low qualitative rank of “D”.



Dennison
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
- I - Industry
- MXH - Mixed Use
- R1 - Suburban Residential
- REC - Cannon River Recreational
- SCN - Cannon River Scenic
- Within City Limits or No Data

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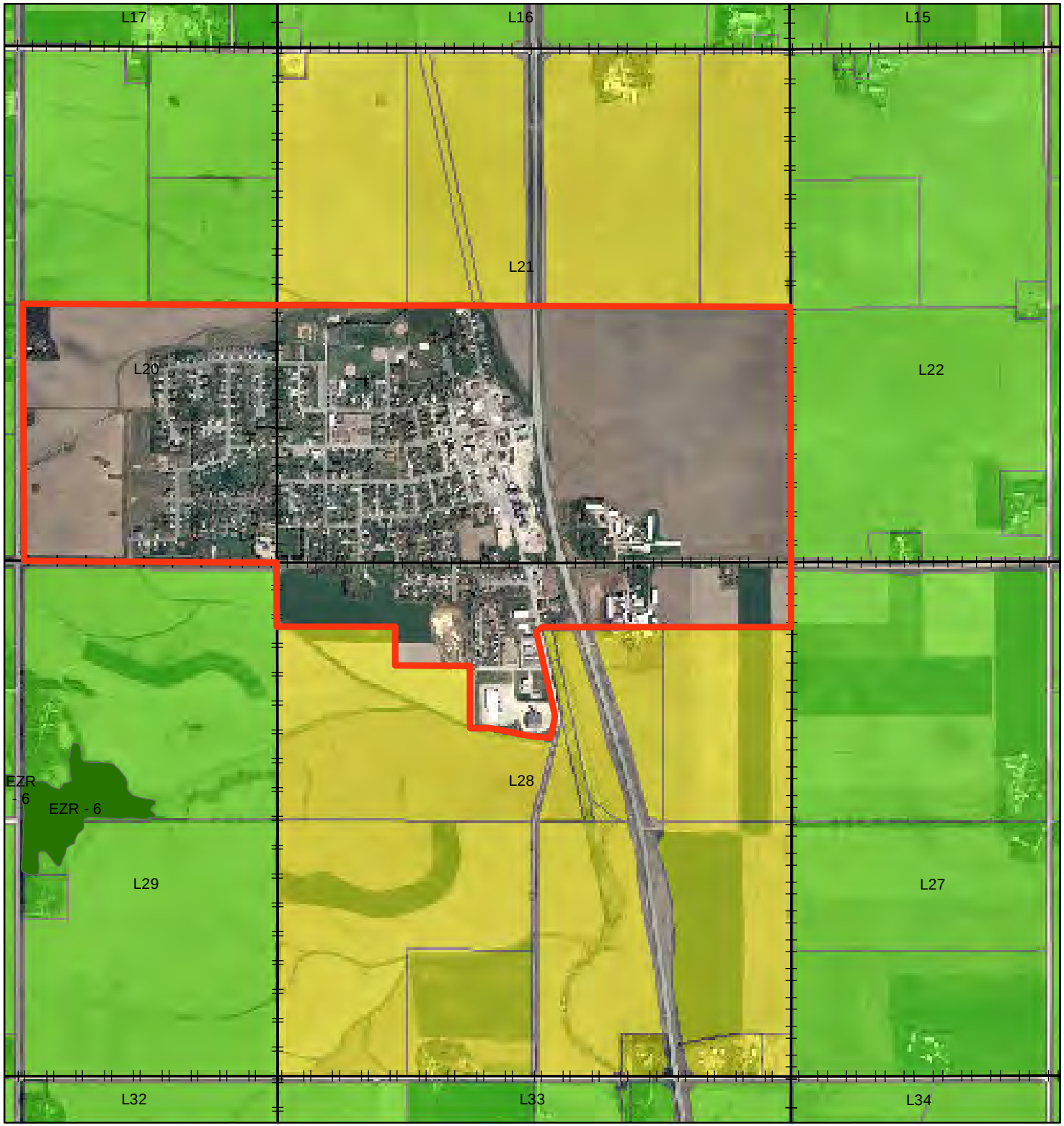
Map Created 2014 Kristi Gross, AICP CFM

Appendix D

Description	Community ID	Definition
Seepage meadow	CRW - 18	This community is a perched seep near the crest of a west-northwest facing hillside. It has been disturbed in the past, but appears to be slowly recovering. Common native species include woolly sedge, boneset, dark green bulrush, spotted joe pye weed, and cutleaved water horehound. The most frequent nonnative species is reed canary grass, which occurs sporadically. Because of the small size of this community, its past disturbance and the fact that it is surrounded by low quality forest, this wet meadow was given a rank of "D".
Lowland hardwood forest	CRW - 19	This forested community occurs on a generally northfacing slope. It appears to have been grazed and more open in the past. It is characterized by some scattered bur oaks, with black walnut, butternut, hackberry, and black cherry also present. The shrub layer is somewhat patchy, but overall is moderately in thickness. Small native trees, blackberries, and raspberries dominate this layer. This forest should continue to improve in quality on its own during the next few decades.
Wet prairie	CRW - 21	This low lying area includes several swales and a former pasture. The wet meadow portions of the community are of moderate quality and contain a mix of native and nonnative graminoids. The most common nonnatives are reed canary grass, red top, and wild parsnip. Native graminoids found here include tussock sedge, Buxbaum's sedge, woolly sedge, and Canada bluejoint grass. Forbs found in the swales include spotted joe pye weed, marsh vetchling, and sawtooth sunflower. There is also a remarkably large population of northern bog-orchids here, containing perhaps more than 1,000 individuals. This wet meadow grades upslope into wet prairie that was formerly pastured. Some of the more common species in the wet prairie section include prairie cordgrass, golden alexanders, New England aster, and Virginia mountain mint. This community also has an increasing presence of shrubs, most notably red-osier dogwood, pussy willow, and gray dogwood. Overall, the quality of this community is moderate because of the apparent past grazing and the encroachment by brush. Although this community received a qualitative rank of "C", it has added importance due to the fact that wet prairies are extraordinarily rare throughout the upper Midwest.

Lowland hardwood forest	CRW - 22	This forest is a recent development on swale edges and waterways that were likely grazed in the past. Thi activity probably maintained the open character of the site, with trees and shrubs quickly colonizing the site once the livestock were removed. The most common tree species here is box elder, with cottonwood, black willow, and a few other species also present. The shrub layer varies from sparse to moderate with red osier dogwood and willows most common. The ground layer in these areas is characterized by nonnative pasture grasses and weedy nonnative flowers. Some of these include reed canary grass, Kentucky bluegrass, Canada thistle, stinging nettle, and wild parsnip. Because of the degree of disturbance and the mostly poor species composition, this community was given the minimum rank of “D”.



Goodhue
A-3
Natural Resources Inventory

Legend

- Natural Resources Inventory
- Municipal Boundary
- Section

Zoning

Description

- A1 - Agricultural Protection
- A2 - Agricultural
- A3 - Urban Fringe
- B1 - General Business
- B2 - Highway Business
- CR - Commercial Recreation
- I - Industry
- MXH - Mixed Use
- R1 - Suburban Residential
- REC - Cannon River Recreational
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Map Created 2014 Kristi Gross, AICP CFM

Unique Natural Features, all cities
Upland soils with planted, maintained, or cultivated coniferous trees
Oak forest dry subtype
Oak forest dry subtype
Oak woodland-brushland
Lowland hardwood forest
Oak forest mesic subtype
Dry Prairie
Dry Prairie bedrock bluff subtype
Dry Prairie sand-gravel subtype
Dry oak savanna sand-gravel subtype
Oak forest, Dry bluff subtype
Wet meadow
Wet prairie
Maple-basswood forest
Dry Prairie barrens subtype
Eastern Red Cedar woodland
Floodplain forest
Floodplain forest silver maple subtype
Seepage meadow

Survey Comments

Goodhue County Urban Fringe District Health Impact Assessment

I. On April 25th we received a letter in the mail stating:

April 23, 2014

Goodhue County Health & Human Services

Public Health Division

Attn: Gaye Ruhlach

509 West 5th St, Suite 104

Red Wing MN 55066

RE: Urban Fringe District Landowner Survey

Dear Ms. Ruhlach:

I am a landowner in Goodhue County, I have received the survey and want to make my feelings clear on the proposed re-zoning of our area. I don't see how I can clearly state this on the "survey" that was sent out so that is why I am writing this letter. I do not support re-zoning of our area as this is a rural area and if the zoning is changed it will negatively impact this area and the landowners.

My family uses our land for recreation and farming, we have animals that free range, gardens to get our produce from as well as hiking paths to creeks and ponds where we view wildlife. We hunt and enjoy the outdoors from our land. My neighbors have similar views and activities. I have spoken to them and we are in agreement about this proposal.

It sounds to me like the county is pushing to have our area turn into urban sprawl. This is a rural area and that's why people want to live here. Urban sprawl will negatively impact the health, environment and culture of this area. The negative impacts will include increased pollution of air and water, denser population and loss of habitat.

Please feel free to contact me if you'd like more information, I will be contacting my local representatives.

Thank you for your consideration,

Appendix **E**

II. Survey 1418:

3. The A3 district currently has a minimum lot size of 35 acres. If the zoning changed to allow for sales of lot sizes of 2 acres, how often would your property in the study area be used for the following purposes?

- Hunting- who knows? **Never if housing were built**
- Bird Watching- **who knows**
- Riding ATV- **who knows if housing were built**
- Horseback riding- **who knows**
- Farming- Pasture, Crops, Rented out, Hobby Farm- **how does one answer these questions accurately**

Poorly worded survey

6. Some properties have been in continuous ownership by a family for years. If families were not able to transfer their property to younger generations when desired, how would that impact the sense of community in the study area?
Response**- who knows stupid question**

8. To what extent would losing a sense of community impact the wellbeing of those who live in the study area? **– Our "community' is spread out**

11. If new homes were built on lots adjacent to your property in the study area, how would this impact your lifestyle satisfaction? – **Probably wouldn't**

18. What was your household's income last year from all sources? – **None of your business**

III. Survey 1330

13. What do you expect your satisfaction with your neighborhood to be if the zoning district were to change? – **I would leave the state!**

IV. Survey 1274

7. To what extent does having a sense of community and belonging contribute to the positive wellbeing of the people who live in the study area? – **Ridiculous Question**

8. To what extent would losing a sense of community impact the wellbeing of those who live in the study area? – **Ridiculous Question**

V. Survey 1459

13. What do you expect your satisfaction with your neighborhood to be if the zoning district were to change? – Changed how? Need to know that first. Cluster Houses?

VI. Survey 1141

2. How often is your property in the study area used for the following purposes? – **Stated other- Snowmobiling**

3. The A3 district currently has a minimum lot size of 35 acres. If the zoning changed to allow for sales of lot sizes of 2 acres, how often would your property in the study area be used for the following purposes? – **Stated other- Snowmobiling difficult**

5. How important is it to you to be able to transfer your property to a younger generation in your family? **1 (for us personally) & 7 (for others if desired)**

2 acre lots are too small, would prefer 10 acre lots.

VII. One landowner wrote a note stating attached to a blank survey stating:

I do not wish to be a part of the survey. I own less than 4 acres. The back portion has a huge electric transformer tower and wires running across it, area not good as a result. Mortgage on home, income less than $14,000. Live alone. Please do not include me in survey. Thank you.

VIII. Survey 1506

3. The A3 district currently has a minimum lot size of 35 acres. If the zoning changed to allow for sales of lot sizes of 2 acres, how often would your property in the study area be used for the following purposes? – **Stated Other- No more trap shooting, more environmental problems, no more hunting, loss of farm land**

IX. Survey 1230

Are you willing to be contacted for the focus group? – **Stated No- It would not make a difference. Whatever you're up to, you will do anyway.**

Appendix **E**

Baseline Information for Goodhue County

Goodhue County Urban Fringe District Health Impact Assessment

General Information about Goodhue County

People	**Goodhue County**
Population, 2013 estimate	46,464
Population, percent change, April 1, 2010 to July 1, 2013	0.6%
Population, 2010	46,183
Persons under 5 years, percent, 2012	6.1%
Persons under 18 years, percent, 2012	23.2%
Persons 65 years and over, percent, 2012	17.7%
Female persons, percent, 2012	50.4%
White alone, percent, 2012	95.5%
Black or African American alone, percent, 2012	1.1%
American Indian and Alaska Native alone, percent, 2012	1.3%
Two or More Races, percent, 2012	1.4%
Hispanic or Latino, percent, 2012	3.1%
Living in same house 1 year & over, percent, 2008-2012	88.8%
High school graduate or higher, percent of persons age 25+, 2008-2012	91.4%
Bachelor's degree or higher, percent of persons age 25+, 2008-2012	22.5%
Housing units, 2013	20,253
Homeownership rate, 2008-2012	77.3%
Housing units in multi-unit structures, percent, 2008-2012	16.7%
Median value of owner-occupied housing units, 2008-2012	$184,700
Households, 2008-2012	18,690
Persons per household, 2008-2012	2.42
Median household income, 2008-2012	$55,603
Persons below poverty level, percent, 2008-2012	8.7%
Geography	
Land area in square miles, 2010	756.84
Persons per square mile, 2010	61.0

(State & County QuickFacts- Goodhue County)

Natural Resources Inventory

The natural resources inventory was conducted in 2001 by Goodhue County on a grant from the Department of Natural Resources. The inventory is a data layer in GIS. A query was run to select the natural resource inventory layer that intersected the A-3 zoning District. A

table and maps were created to show all the natural resources that are listed in the inventory for each city with A-3 zoning District (see Appendix D).

Dwelling Density

Each city is different, some are more agricultural in nature and some have more wooded hills and valleys. Cannon Falls has an average of 13 dwellings per section, with one section with 28 dwellings. Red Wing has an average of 6 dwellings per section with one section containing 31, and the lowest containing 0 (Table NR-1)

	Dwellings per section		
City	Most	Least	Average
Cannon Falls	28	1	13
Dennison	7	4	6
Goodhue	3	1	2
Kenyon	12	1	5
Pine Island	22	1	10
Red Wing	31	0	6
Wanamingo	3	2	3
Zumbrota	14	1	7

Table NR- 1

Natural Environment

Currently 51% of land in the A-3 Urban Fringe Districts is in the Natural Environment state, which could be woodlands, floodplains, pasture, waterways, or drainage ways. According to the Natural Resources Inventory the natural features that were cited in the A-3 districts contain dry prairie, Oak Forest, Floodplain Forest and Seepage meadow. Table 2 lists all of the natural features found in the county in the A-3 districts and next to it is the findings from the survey indicating the frequency land was used for recreational purposes. Appendix yyy breaks down the natural features according to city and provides a description for each one based on the 2000 Natural Resources Inventory.

Natural Features, all cities	
Upland soils with planted, maintained, or cultivated coniferous trees	Oak forest, Dry bluff subtype
Oak forest dry subtype	Wet meadow
Oak forest dry subtype	Wet prairie
Oak woodland-brushland	Maple-basswood forest
Lowland hardwood forest	Dry Prairie barrens subtype
Oak forest mesic subtype	Eastern Red Cedar woodland
Dry Prairie	Floodplain forest
Dry Prairie bedrock bluff subtype	Floodplain forest silver maple subtype
Dry Prairie sand-gravel subtype	Seepage meadow
Dry oak savanna sand-gravel subtype	

Table NR- 2

The current minimum lot size in the A-3 district is 35 acres. The zoning change would allow a parcel to be split as small as two acres. However it must be clarified that this is only the minimum parcel size allowed, that not every two acre parcel could contain a dwelling and many parcels will likely be larger than 2 acres.

Average parcel size of land sold that was zoned A-3 over the last three years was 65 acres. The zoning change will not likely change the average size of parcel sale. Over the last three years the average parcel sale is 86.3 acres in the A-1 and A-2 Districts.

There have been a total of seventeen requests for variances to the lot size minimum in the A-3 district over the last ten years. A common reason people have stated the need for a variance is based on not being able to qualify for a conventional loan. Currently 48.7% of the total acres of the A-3 district are being tilled. According to the Goodhue County Soil Survey data, 19,334.83 acres in the A-3 district have a rating of Prime Farmland, or Important Farmland rating, that means that most of the soils with prime or important farmland rating are actually being tilled.

Tilled Acreage	15,663.53	48.7%
Other	16,485.38	51.3%
Total Acres	32,148.91	

Table SP 1

Characteristics of the A-3 District

The vast majority of dwellings in the A-3 district use wells and septic systems. Houses are usually annexed into the city limits when city sewer and water services are extended to them.

There are currently 32 feedlots located in the A-3 zoning district. Regulations do not let new feedlots establish in the A-3 zoning district. If the zoning district were to change, new feedlots may be allowed if they meet setbacks such as 1000 feet from a dwelling, and one mile from certain cities. Five farms in the study area are listed in Minnesota Grown as local sources of food.

Manure application setbacks for the county are:

- 300ft setback from any dwelling (other than owners dwelling), church, or school and private schools excluding home school sites for surface, in corporated or injected manure.
- 1000ft from any dwelling (other than owners dwelling), church or schools, and private schools excluding home school sites, for irrigation manure.
- 200ft setback from any public or private well for surface, incorporated, injected, or irrigation manure application.

Mental Well Being Information for Minnesota and Goodhue County

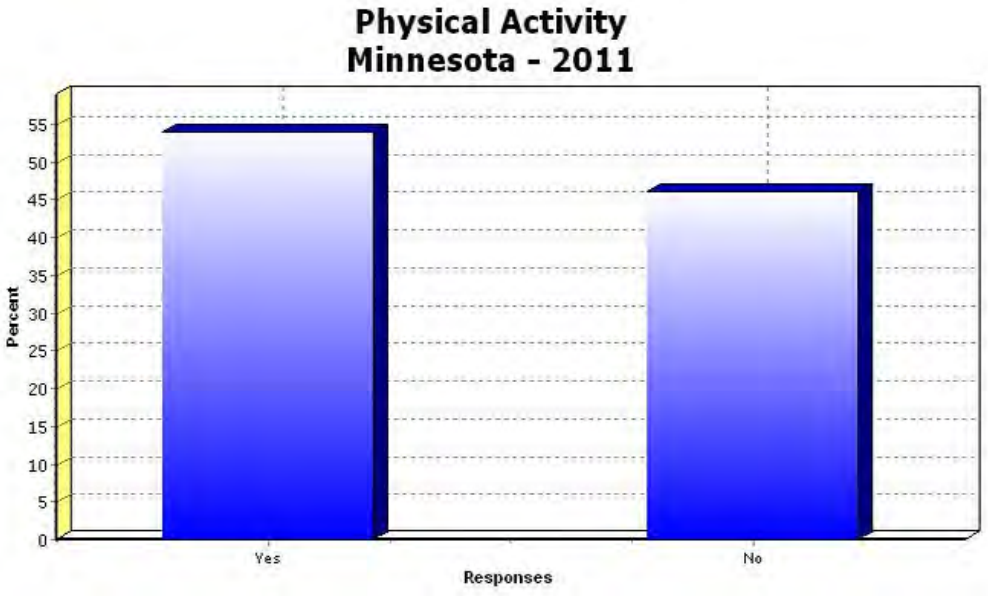
2012 Goodhue County Health Priorities ranked Mental Health as the number two health priority for the county. In the 2014-2018 Community Health Improvement Plan we have outlined Mental Health and Well Being as an area of focus. Below is information from the 2012 Goodhue County Community Health Assessment. Good mental health is as important as good physical health. Mental illness can impair one's ability to work, to raise a family, and to

participate in civic life. Suicide is almost always the result of untreated or undertreated mental illness. Mental health also imposes significant economic costs on employers, government, health care systems, and the general public. Admission to a hospital for mental health reasons can be an indicator of a failure to diagnose or treat mental health problems early on. Goodhue County had 6.1 psychiatric hospital admissions per 1,000 residents age 14 and older in 2012. Resident feedback from the Community Health Assessment was consistent in that a lot of people were "getting by" (Community Health Assessment, 2012). Unfortunately, a person with mental illness having coexisting problems with drugs or alcohol is common and it worsens the prognosis (National Alliance on Mental Illness, 2013). In 2009, 35 persons in Goodhue County were homeless; 42 percent of homeless reported a significant mental health problem in the last two years and 79 percent had a serious or chronic disability (mental illness, substance abuse disorder or other condition that limits work or activities of daily living). Mental health and/or substance abuse can have a connection to homelessness because the individual may not be able to hold a job, pay bills on time, or understand how to properly care for themselves.

The Behavioral Risk Factor Surveillance System (BRFSS) shows that throughout the state of Minnesota in 2012 17.1 percent of respondents stated that they had been told that they had a form of depression. Goodhue County specific data is not available but area data is available throughout the state. More specifically in the Twin Cities area including Wisconsin counties: Pierce and St. Croix respondents indicated that 16.5 percent had been told they had a form of depression. In the Faro area 20 percent of respondents stated that they had been told they had a form of depression. In the Duluth area 21.9 percent of respondents stated that they had been told they had a form of depression.

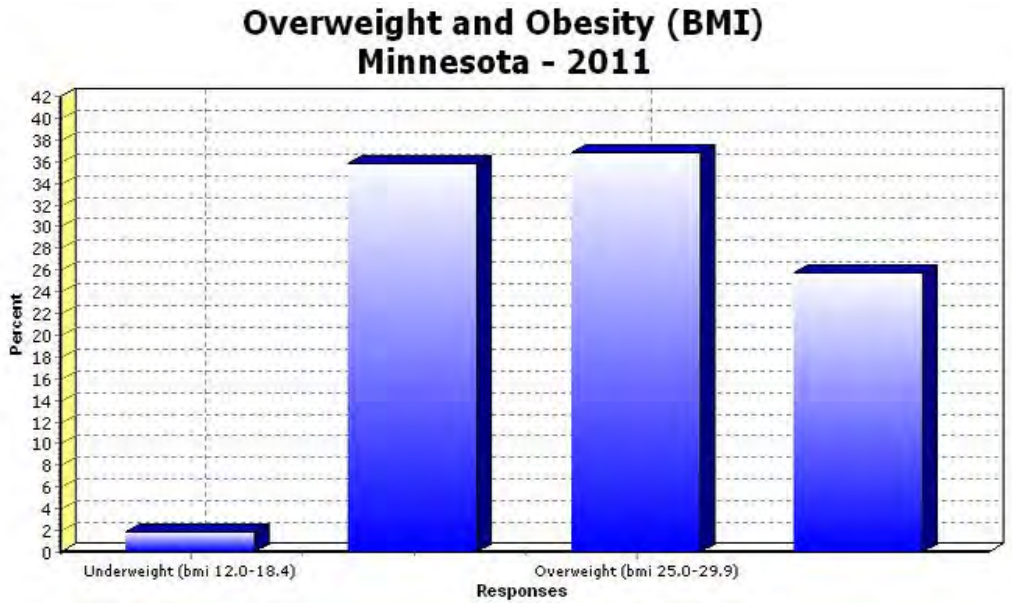
Physical Activity and Weight Classifications by Body Mass Index (BMI) for Goodhue County

Prevalence and Trends Data from the Behavioral Risk Factor Surveillance System (BRFSS) shows that in 2011, 54 percent of Minnesota residents state that they participate in 150 minutes or more of aerobic physical activity each week.



(Prevention, Prevalence and Trends Data: Minnesota - 2011- Physical Activity, 2011)

Trend data from the BRFSS also shows that 37.3 percent of Minnesota residents stated that they were Overweight with a BMI of 25.0- 29.9 and 25.7 percent stated they were obese with a BMI of 30.0-99.8.



(Prevention, Prevalence and Trends Data: Minnesota - 2011 -Overweight and Obesity (BMI), 2011)

Goodhue County specific data is not available but area data from other parts of the state are available. More specifically in the Twin Cities area including Wisconsin counties: Pierce and St. Croix respondents indicated that 37.0 percent were overweight with a BMI of

25.0- 29.9 and 23.9 percent were obese with a BMI of 30.0- 99.8. In Fargo area36.6 percent were overweight with a BMI of 25.0- 29.9 and 25.1 percent were obese with a BMI of 30.0- 99.8. In In the Duluth area 36.8 percent were overweight with a BMI of 25.0- 29.9 and 30.2 percent were obese with a BMI of 30.0- 99.8.

Physical Health

The Center for Disease Control and Prevention states that the United States has one of the safest public drinking water supplies in the world. (Prevention, Water-related Diseases and Contaminants in Public Water Systems, 2014) There are regulations on drinking water to ensure safety for the public. Even with these regulations there is always a chance for contamination. If water sources are contaminated it can lead to negative health outcomes. Vulnerable populations such as the elderly and the young, people living with chronic disease and woman who are pregnant may be more susceptible to these negative health outcomes. "During 2009–2010, a total of 33 drinking water–associated outbreaks were reported to CDC, resulting in 1,040 cases of illness, 85 hospitalizations, and nine deaths." (Prevention, Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water and Other Nonrecreational Water — United States, 2009–2010, 2013)

Characteristics of waterborne disease outbreaks associated with drinking water (N = 33) and other nonrecreational water* (N = 12), by state/jurisdiction — Waterborne Disease and Outbreak Surveillance System, United States, 2009–2010										
Drinking Water	Month	Year	Etiology	Predominant Illness	# of cases	# of hospitalizations	# of deaths	Water system	Water source	Setting
MN	June	2010	*Giardia intestinalis*	Acute Gastroin-testinal Illness	6	0	0	Transient Noncom-munity	Well	State Park

(Prevention, Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water and Other Nonrecreational Water — United States, 2009–2010, 2013)

Literature Review

Goodhue County Urban Fringe District Health Impact Assessment

Goodhue County is in the process of changing the land use zone around the incorporated city limits of Red Wing, Goodhue, Zumbrota, Wanamingo, Pine Island, Kenyon, Cannon Falls, and Dennison from an Urban Fringe District to one of two types of Agricultural Districts: A-1 Agricultural Protection District, and A-2, Agricultural District. The differences between the Urban Fringe Zoning District and the Agricultural Districts are housing density, and some conditionally permitted activities. The A-1 district allows for 4 dwellings per section while the A-2 district allows for 12 dwellings per section, one dwelling per quarter of a quarter section (approximately forty acres).

Currently the Urban Fringe District surrounds the incorporated areas of the county. Homes are typically built on larger lots of land (minimum of 35 acres). The Goodhue County Zoning Ordinance states that it is preserved for agricultural and open space purposes to allow for the future growth of the adjacent city. If the Urban Fringe District becomes an agricultural zone, the number of homes allowed in the area could be reduced (significantly if zoned) and other uses previously prohibited such as mining or feedlots may be allowed (subject to setbacks). However, there are also conditionally permitted uses that are called out in the Urban Fringe district that are not allowed now in either of the Agricultural districts. By eliminating this zone and not specifically allowing those uses, some forms of development could be discouraged beyond current city limits, but subsequently encouraged within city limits.

The Goodhue County Health Impact Assessment's goal is to provide the Goodhue County Planning Advisory Commission, the Goodhue County Board and other interested stakeholders with information about the health impacts of changing the A3 Urban Fringe District to A-2 or A-1 Agricultural Zoning Districts. Changes in zoning can have both direct and indirect impacts on health.

The HIA team developed pathway diagrams to illustrate the relationship of converting all current A3 Urban Fringe District zones to A2 or A1 Agricultural zones in Goodhue County to the health outcomes of interest. These health outcomes are:Physical Activity

- Well being
- Physical Health.

A. Natural Resources

Access to natural resources affects recreation

Natural Resources recreation as defined by the Lansing, MI: Michigan Land Resource Project is "voluntary, free time experience in the outdoors that is socially tolerated and based on natural resources. Participants view it as an integral part of their quality of life." (Nelson, 2001)

Natural resources recreation depends on various factors. The presence/ access of natural resources is the most important aspect of natural resources recreation. Recreation activities such as stream fishing, hunting, bird watching and mushroom and berry picking depend on public land and a place to park a vehicle. These activities focus on the resource as it is, with little support or guidance for recreationists. In 2010, more than 1.6 million people visited national wildlife refuges and wetland districts in Minnesota to hunt, fish, participate in interpretive programs and view wildlife. (Melius & Wooley, 2011)

Access to natural resources affects lifestyles satisfaction from living on rural land

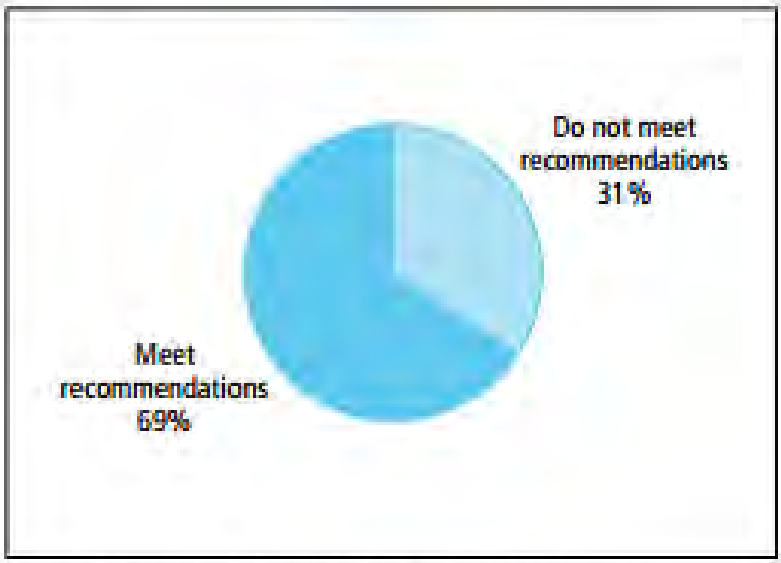
In an article by Judith Lisansky and Gregory Clark, the authors talk about the misperception that some people who currently live in urban areas have about moving to a rural community. The concept of land use conflict is brought to attention especially in regards to farming. The article defines land use conflict as "simply any dispute or harm which results when one person interferes with the way another person wants to use his land." The authors then stated, "Nonfarmers clash with farmers over a variety of issues, such as machinery noise, aerial spraying, animal odors, dust, and the recreational use of farmers' fields." (Lisansky & Clark, 1987)

Recreation and/or lifestyle satisfaction from living on rural land affects physical activity

The World Health Organization defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity may occur in four domains of daily life: activities of daily living, transportation, occupation and recreation. Participating in activities such as walking, hiking, bird watching, hunting, ATV riding and horseback riding increases a person's physical activity.

There are many health benefits associated with physical activity. Physical activity can improve your mental well-being and mood, control your weight, strengthen your bones and muscles and reduce your risk of cardiovascular disease, type 2 diabetes, depression and some forms of cancer. Physical inactivity has been estimated as the fourth leading risk factor for global mortality. (World Health Organization, 2010) Promoting physical activity is vital for improving health and preventing obesity. The CDC recommends being moderately active for 150 minutes or vigorously active for 75 minutes per week. (Office of Disease Prevention and Health Promotion, 2008)

Nearly one-third of adult Minnesotans do not get enough physical activity per week to meet CDC recommendations



Source: Minnesota Physical Activity Survey, 2007

Lifestyle satisfaction from living on rural land affects mental well being

Minnesota has many rural counties, people living in these areas experience unique stressors. People in these areas are more prone to experience certain challenges accessing quality mental health care. Some of these challenges may be shortage of mental health providers and services, possibility of social stigma associated with seeking mental health treatment, isolation from existing mental health clinics and financial barriers. Adequate, economical housing is important to the economic and social wellbeing of the citizens of Goodhue County and is a priority issue.

By definition, population density is lower in rural areas. In many rural areas there is a greater distance between people and services and people from other people. With less population density, people living in an area often know each other and have fewer options of people with whom to associate. This may lead to rural people being concerned about the way they are perceived to others in their community. This may directly affect a person not seeking treatment for a mental illness or wanting to be seen at a mental health facility. Mental Wellbeing is highly stigmatized in rural areas more so than in urban areas.

Change in dwelling density affects preservation of Natural Resources

In Goodhue County, public discussions and research indicate that residential growth within the cities is the most efficient way to allocate urban resources and to preserve agricultural land. The county should encourage the growth and confinement of multiple housing developments within existing urban centers, provide for orderly, staged, diversified and compatible development of all cities of Goodhue County, and ensure an efficient transition from rural to urban land use.

The variety of land uses that have emerged in Goodhue County have suggested that there is a need for a strategy to ensure a balanced response to land use needs. The balance between residential, commercial, industrial, agricultural and undisturbed natural lands has been identified as vital to a healthy community.

B. Succession Planning

Increased access to home loans and Succession planning (farmers) affects community identity

"Rural Minnesota is rife with belonging, its identity having as much to do with people as to the buildings they construct and the land they call home." (Krakhmalnikov, 2011) The ability of new generations of farmers to establish successful farms is an important factor to United States agriculture. Gaining access to affordable agricultural land is a major challenge and many farmers are facing difficulties in regards to succession planning.

The U.S. Department of Agriculture (USDA) states that an estimated 70% of U.S. farmland will change hands in the next twenty years. This is one of the reasons why succession planning is vital. If land, especially a farm or ranch, has not properly planned for succession, it increases the chances that it might go out of business or turned over into non-farm use. The USDA states that in those scenarios, impacts of farm entry and exit on rural communities, the environment, and the national economy can be significant. "Recent farmer surveys by Gary Hachfeld and others at the University of Minnesota show that nearly 60 percent did not have an up-to-date estate plan and nearly 89 percent did not have a farm transfer plan." (Hipp, 2008)

There are many challenges in regards to succession planning. There are many factors that have to be addressed by families when thinking of succession planning. Some of these factors are parents' wishes/ goals compared to their heirs/ children, financing and dispersing land between more than one person. Financing can be difficult due to high land values and access to financial loans.

Farming is an integral part of the rural image and community identity. Many of the cultural values and philosophies of rural living are rooted in hard work, self-sufficiency and camaraderie amongst neighbors. Many rural families take pride in their land and community. Many have known their neighbors and their neighbor's family for many years. Community identity is valued and can be seen regularly amongst neighbors with a friendly wave or help during a crisis.

C. Housing Development

<u>Private septic systems affect groundwater pollution that affects private wells</u>

Diagram of Septic System

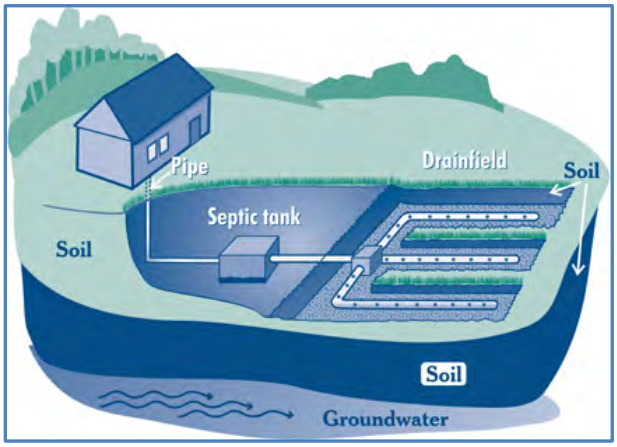
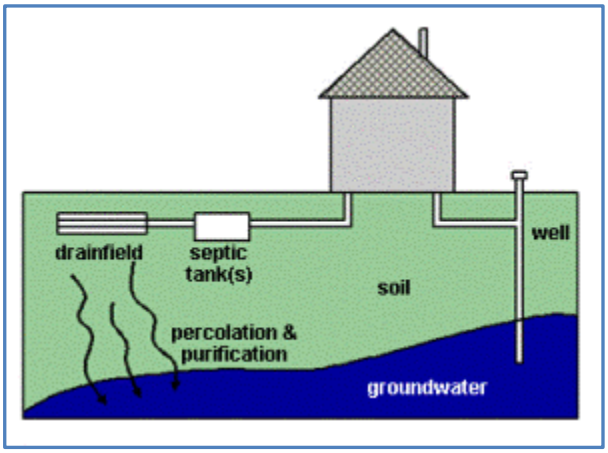


Diagram of Septic System including well

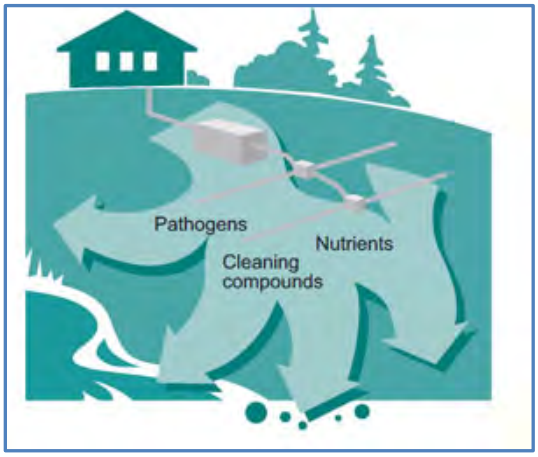


(Sewage (Septic) System Basics)

(Consultation and System Maintenance (Sewage))

Many household products have the potential to pollute ground water. Pollution from these products often occurs from faulty septic tanks and septic leaching fields. Septic systems must be carefully managed to prevent pollution. The U.S. Environmental Protection Agency (EPA) states that "when septic systems are properly designed, constructed, and maintained, they effectively reduce or eliminate most human health or environmental threats posed by pollutants in household wastewater. However, they require regular maintenance or they can fail." (A Homeowners Guide to Septic Systems) Failing home septic systems can allow coliforms and nitrates in the outflow to flow into the water table and other adjacent water leading to water pollution. Nitrate and Nitrite originating from septic tanks can make their way into drinking water. Nitrate is very soluble in water and can travel easily. Children and the elderly are at extra risk when exposed to waterborne bacteria.

Improperly functioning septic



(Brown , et al., 2008)

<u>Impact of agricultural production, particularly field runoff from fertilizers and pesticides, on groundwater pollution that affects private wells</u>

Agricultural water is water abstracted from surface and ground water. It can become contaminated through a variety of ways and can potentially spread bacteria, viruses, and parasites to crops and animals. "Contamination of water resources is one of the most damaging and widespread environmental effects of agricultural production. Drinking water is vulnerable to pollution by agricultural chemicals, including pesticides, herbicides, fungicides, and fertilizers, as well as their metabolites." (Mott, Fore, Curtis, & Solomon, 1997) With the increasing demand for crops and livestock from the agricultural industry there has been an increase in contaminants polluting the soil and waterways. "Agriculture in many parts of the world is highly efficient in producing and delivering high-quality products to consumers. However, when agricultural activities are not well-monitored and managed, certain practices can negatively affect water quality." (Water Contamination, 2010)

In the 2002 National Water Quality Inventory report to U.S. Congress, the states reported that agricultural nonpoint source (NPS) pollution is the leading cause of river and stream deterioration and the second leading cause of lakes, ponds, and reservoirs deterioration. (United States Environmental Protection Agency, 2007) According to the U.S. Environmental

Protection Agency (EPA), nonpoint source pollution is pollution that comes from many sources. The main form of nonpoint source pollution is polluted runoff that drains into streams, rivers and lakes. Polluted runoff occurs when rainwater or snowmelt doesn't soak into the ground but runs off the land into a body of water. As this water flows over land it picks up pollutants that may be in its path. These pollutants may include fertilizers, soil, animal waste, pesticides, herbicides, oil, waterborne bacteria and viruses. The runoff then drains in to a body of water such as streams, rivers and lakes or into a storm drain. "Agricultural activities that cause NPS pollution include confined animal facilities, grazing, plowing, pesticide spraying, irrigation, fertilizing, planting, and harvesting." (Protecting Water Quatilty from Agricultural Runoff, 2005)

Physical health outcomes of using water with high fecal coliform bacteria counts for drinking, cooking, and/or bathing

Fecal coliform resides in the intestinal tracts of warm-blooded animals including humans. The presence of fecal coliform in drinking water indicates that human or animal waste has been or is present. Many diseases are spread through fecal transmission so the presence of fecal coliform is cause for concern. Swimming in bodies of water such as lakes, streams, ponds and rivers, for all practical purposes is relatively safe if the level of fecal coliform bacteria is low. Fecal coliform in drinking water is a serious concern and appropriate actions should be taken.

"Coliform bacteria in drinking or swimming water will not necessarily make you ill." (Coliform Bacteria in Water) However, since the presence of fecal coliform in drinking water indicates that human or animal waste has been or is present there is a possibility that other disease-causing organisms may also be present. Drinking water contaminated with bacteria usually produces minor symptoms such as diarrhea and cramps.

Physical health outcomes of using water contaminated with nitrates for drinking, cooking, and/or bathing

"Nitrate and nitrite is a nitrogen-oxygen molecule that can combine with various organic and inorganic compounds." (Nitrate and your Health, 2013) Nitrogen, in the forms of nitrate or

nitrite, is an essential nutrient for plant growth. The greatest use of nitrate is as a fertilizer. In areas where nitrogen-based fertilizers are used, Nitrate can frequently be found in the water. The U.S. Environmental Protection Agency (EPA) set levels of 10 mg/L for total nitrate and nitrite, 10 mg/L nitrate, and 1 mg/L nitrite as drinking water standards. (Nitrate and your health, 2013) Nitrates can also be found in human and animal wastes, fertilizers, sewage and leaching from septic tanks. Vegetables, food, and meat are major sources of nitrate exposure.

Nitrogen is essential for humans but high levels of Nitrate in drinking water can be harmful, especially to infants and women who are pregnant. Infants under the age of 6 months who drink water containing more than 1 mg/L nitrite, or 10 mg/L nitrate, could become seriously ill and, if left untreated, may die. The serious illness in infants is due to the transformation of nitrate to nitrite in the body. This transformation can interfere with the oxygen-carrying capability/ oxygen flow of the infant's blood. Symptoms include shortness of breath and blueness of the skin which can occur over a period of days. This health threat is called "blue baby" syndrome. (Basic Information about Nitrate in Drinking Water) Nitrates and nitrites in water are not a health concern when showering/bathing**.**

Physical health outcomes of using water contaminated with pesticides for drinking, cooking, and/or bathing

Pesticides are applied to farmlands, gardens and lawns and can potentially contaminate ground water or surface water systems. Such pollution depends on the types and amounts of chemicals used and how they are applied. Pesticide contamination "is a concern for people living in agricultural areas where pesticides are most often used, as about 95 percent of that population relies upon groundwater for drinking." (Pesticides in Groundwater, 2014) There are many ways that pesticides can contaminate ground water. Some ways pesticides can cause pollution are when pesticides are applied to crop fields, improperly disposed of, if there is an accidental spill or leakage and also environmental such as seasonal snow and rainfall, also affect this pollution.

The EPA has found that about one out of ten public water supply wells contains pesticides. From this data, the EPA draws inference that nearly 10,000 community drinking water wells and about 440,000 rural domestic water wells contain pesticides, most seemingly do not exceed the EPA's drinking water standards for pesticides. (Our Children At Risk: The Five Worst Environmental Threats to Their Health, 1997)

The health effects of pesticides depend on the type of pesticide, how toxic the pesticides are, how much is in the water, and how much exposure occurs on a daily basis. Some pesticides such as organophosphates and carbamates, affect the nervous system; others may irritate the skin or eyes, be carcinogens or affect the hormone or endocrine system in the body.

District	Purpose
A-1, AGRICULTURAL PROTECTION DISTRICT	This district is to maintain, conserve and enhance agricultural lands which are historically valuable for crop production, pasture land, and natural habitat for plant and animal life. This district is intended to encourage long-term agricultural uses and preserve prime agricultural farmland by restricting the location and density of non-farm dwellings and other non-farm land uses.
A-2 AGRICULTURE DISTRICT	The purpose of this district is to maintain and conserve agricultural investments and prime agricultural farmland, but provide for a slightly higher density of dwellings than the A-1 District. This A-2 District is intended to apply to those areas where large farms and feedlots are more scattered and greater numbers of non-farm uses or small parcels are present. This district also has more topographic features and less prime farmland than the A-1 District.
A-3 URBAN FRINGE DISTRICT	The intent of the A-3 District is to provide for urban expansion in close proximity to existing incorporated urban centers within Goodhue County in accordance with the Comprehensive Plan by conserving land for farming and other open space land uses for a period of time until urban services become available. It is the intent that urban development be deferred in such areas until an orderly transition from farm to urban uses shall be achieved by either the annexation of areas adjacent to the incorporated limits of existing urban centers or the extension of public or other centralized sewage collection and treatment systems. It is intended that the status of all areas in this district be reviewed, jointly, by the appropriate planning bodies who shall determine whether there should be a transfer of all or any part of such area to some other appropriate land use, or to indicate any changes in the existing Land Use Plan for the particular political entity or change in the Capital Program of the community affecting this district.

(Goodhue County Zoning Ordinance)

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Cannon Falls			
Section	# of Dwellings	Psbl Zone	Full?
S06	4	A2	No
S05	10	A2	No
S07	1	A2	No
S08	5	A2	No
T13	22	A2	Yes
S17	17	A2	Yes
T24	28	A2	Yes
S19	20	A2	Yes
S20	11	A2	No
Avg/Sec	13		

Pine Island			
Section	# of Dwellings	Psbl Zone	Full?
C26	15	A2	Yes
C25	7	A2	No
D30	4	A1	Yes
D29	1	A1	No
D28	4	A1	Yes
C35	18	A2	Yes
C36	22	A2	Yes
D33	7	A2	No
Avg/Sec	10		

Dennison			
Section	# of Dwellings	Psbl Zone	Full?
I18	4	A1	Yes
I17	7	A1	Yes
I20	7	A1	Yes
I30	4	A1	Yes
I29	6	A1	Yes
Avg/Sec	6		

Goodhue			
Section	# of Dwellings	Psbl Zone	Full?
L21	1	A1	No
L28	3	A1	No
Avg/Sec	2		

Kenyon			
Section	# of Dwellings	Psbl Zone	Full?
H32	7	A1	Yes
H33	12	A1	Yes
H34	4	A1	Yes
A05	9	A1	Yes
A03	1	A1	No
A08	3	A1	No
A09	1	A1	No
A10	5	A1	Yes
Avg/Sec	5		

Red Wing			
Section	# of Dwellings	Psbl Zone	Full?
Z13	0	A2	No
Z24	0	A2	No
Z25	1	A2	No
U01	4	A2	No
U12	12	A2	Yes
U13	8	A2	No
U24	5	A2	No
U25	1	A2	No
U36	3	A2	No
R01	10	A1	Yes
Q06	5	A1	Yes
Q05	1	A1	No
Q04	4	A2	No
Q03	3	A2	No
Q02	31	A2	Yes
Q01	14	A2	Yes
P06	0	A2	No
P05	2	A2	No
P04	8	A2	No
P03	9	A2	No
W34	7	A2	No
W27	4	A2	No
Avg/Sec	6		

Wanamingo			
Section	# of Dwellings	Psbl Zone	Full?
G25	2	A1	No
F30	3	A1	No
Avg/Sec	3		

Zumbrota			
Section	# of Dwellings	Psbl Zone	Full?
F23	6	A2	No
F24	9	A2	No
E19	6	A1	Yes
E20	3	A1	No
F26	3	A1	No
F25	8	A1	Yes
E30	7	A2	No
E29	12	A2	Yes
F35	8	A1	Yes
F36	5	A1	Yes
E33	1	A1	No
E32	10	A1	Yes
C02	14	A1	Yes
C01	9	A2	No
D06	7	A2	No
Avg/Sec	7		

Heath Factor or Outcome	Expected Change based on Data	Stakeholder Projections	Heath Outcome	Expected Health Impact	Magnitude of Impact	Likelihood of Impact	Distribution	Quality of Evidence
NATURAL RESOURCES								
Preservation of Natural Resources	Mixed	Increase	Physical Activity/ Well Being	Positive	Low	Likely	Landowners/ Residents in the study area	**
Owner/Tenant Access to Natural Resources	Mixed	No Change	Physical Activity/ Well Being	No Impact	Low	Not Likely	Landowners/ Residents in the study area	**
Recreation &/or lifestyle satisfaction from living on rural land	Mixed	Mixed	Physical Activity/ Well Being	Mixed	Medium	Possible	Landowners/ Residents in the study area	**
SUCCESSION PLANNING								
Options to divest property	Increase	Increase	Well Being	Positive	High	Likely	Landowners/ potential buyers of property in	***
Change in Parcel Size	Decrease	Decrease	Well Being	Positive	High	Likely	Landowners of property in the study area	***
Dwelling Density	Mixed	Increase	Well Being	No Impact/ Negative	Medium	Possible	Residents in study area	**
Access to Home loans	Increase	Increase	Well Being	Positive	High	Likely	Landowners/ buyers of property in the study area	***
Preservation of Agricultural Land	Mixed	Decrease	Well Being	No Impact/ Negative	Low	Not Likely	Farmers/ landowners in study area	*
Succession planning	Increase	Increase	Well Being	Positive	High	Likely	Landowners/ Residents in study area	***
DWELLING DENSITY								
Homes developed in areas not served by city infastructure	Increase	Increase	Physical Health	No Impact/ Negative	Low	Not Likely	Residents in study area	*
Homes built near animal and crop agriculture	Increase	Increase	Physical Health	No Impact/ Negative	Low	Not Likely	Residents in study area	*
Private Wells	Increase	Increase	Physical Health	No Impact/ Negative	Low	Not Likely	Residents in study area	*
Individual On-Site Sewage Treatment Systems	Increase	Increase	Physical Health	No Impact/ Negative	Low	Not Likely	Residents in study area	*
Water Quality	No Change	Decrease	Physical Health	No Impact/ Negative	Low	Not Likely	Rural Residents	***

Legend for Impact Table

Multiple Sources	Multiple areas of data analysis this could include at least three of the following options * Key Informant Interview * Literature Review * Survey Findings * Focus Group Findings * Natural Resources Index * Map/other data analysis
Expected Change Based on Data	- No Change- Data Analysis did not show any large changes - Mixed-Data Analysis from different sources showed opposite changes - Increase-Data Analysis from multiple sources showed a likely increase - Decrease-Data Analysis from mulitple sources showed a likely decrease
Stakeholder Projections	- Stakeholder projections were based on Steering Committee Comments
Expected Health Impact	- Positive-Changes that may improve health - Negative-Changes that may worsen health - Mixed-Changes could be positive and/or negative - No effect-No identified effect on health
Magnitude of Impact	- Low-Affects no or very few people or properties in the study area - Medium-Affects a larger number of people or properties in the study area - High-Affects majority of people or properties in the study area
Likelihood of Impact	- How likely the impact will occur as a result of the proposal
Distribution	- The populations most likely to be affected by changes in the health factor based on literature review, data analysis and expert opinion such as residents, landowners, or farmers of the study area.
Quality of Evidence	*** Evidence comes from multiple sources or highly credible as defined above ** Evidence comes from 2 types of sources * Evidence comes from only survey

Key Findings and Recommendations

Natural Resources Pathway

Major Findings	Recommendations
Dwelling Density and Access to Natural Resources and Recreation: Although survey and focus group findings differed on this topic, an overall review of the findings suggests that there will be limited change in dwelling density, which means there will be no change in utilization of property for natural resources. Survey findings show that Goodhue County residents use their property for recreational activities such as hiking/walking, bird watching, hunting, riding ATVs, and horseback riding. If people are using their property for these activities today, it is anticipated they will continue to do so after the zoning change.	Education to the cities, townships and residents to clarify what the zoning change would mean to residents and landowners. There is a disconnect between what people percieve could happen with what the zoning district would actually allow.
Well-Being: The focus groups confirmed being able to utilize property for recreation lowers stress levels and enhances well-being. Adversely, other people using their property can lead to stress. Neighbors can use each other's property when it is requested of them, however when non-neighbors impose on property owners it is stressful.	Maintaining and enforcing zoning ordinances that require setbacks that establish boundaries between neighbors.

Succession Planning	
Major Findings	**Recommendations**
Succession Planning: Survey responses indicated that the zoning change would improve the ability to transfer property to someone else, that transferring property to a family member is important, and that not being able to transfer to family would impact the overall sense of community. A sense of community has a positive impact on the well-being of those who live in the area. The steering committee also confirmed the desire to keep Goodhue County agricultural in nature and preserve the existing sense of community in the rural area.	Maintain agricultural protection standards in the zoning ordinance and the Goodhue County Comprehensive Plan.
Dwelling Density and Preservation of Agricultural Land: There were mixed reviews on whether the proposed changes would make it easier or harder to sell land. Some stated that the smaller lot size will make it easier to sell land and obtain loans. Others stated that the proposed zoning changes would take away from the rural aspect of their property which would then make it harder to sell their land. The prediction is that allowing dwellings to be sited on two acres would allow for more options to divest property. The perception was that allowing smaller tax parcels would lead to more homes being built than what are there currently.	Ensuring that density standards are abided by will protect the agricultural districts from becoming over populated.

Housing Development	
Major Findings	**Recommendations**
Homes Developed in Areas Not Served by City Infrastructure: Survey respondents indicated that they were unlikely to sell their property for profit today, and nearly the same percentage reported being unlikely to sell their land for profit if the zoning were to change. This would disprove the fact that there could be an increase in houses built. However follow up with the focus group challenged this finding.	Use caution in increasing density in the agricultural sections. Make sure to talk to townships and citizens during the process and attempt to gain consensus prior to increasing density limits. If density limits are increase, enact other measures to preserve agricultural land such as transfer of development rights and encouraging conservation based subdivisions.
Private Wells and Septic Systems: Research found that many household products have the potential to pollute ground water. Pollution from these products often occurs from faulty septic tanks and septic leaching fields. Septic systems must be carefully managed to prevent pollution.	Increase education on proper maintenance requirements for wells and septic systems. Goodhue County could look into pump maintenance programs such as utilized by Dakota County.
Animal Agriculture: Homes developing near animal agriculture may also be at risk for water pollution. Fecal coliform resides in the intestinal tracts of warm-blooded animals including humans. The presence of fecal coliform in drinking water indicates that human or animal waste has been or is present. Fecal coliform in drinking water is a serious concern and appropriate actions should be taken.	Ensure that animal feedlots are utilizing best management practices and adhering to prescribed setbacks when spreading and handling manure.
Crop Agriculture: Agricultural water is water abstracted from surface and ground water. It can become contaminated through a variety of ways and can potentially spread bacteria, viruses, and parasites to crops and animals.	Enforcing the required 50 foot buffer on protected waterways will aid in protecting and improving water quality in Goodhue County.