RESPEC

EXTERNAL MEMORANDUM

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cc: Project Central File 2428 — Category A

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Date: October 13, 2020

Subject: Shell Rock River/Winnebago River Best Management Practice Targeting Methodology

This technical memorandum summarizes work done by RESPEC to target the most beneficial and cost-effective locations to place best management practices (BMPs) throughout the Shell Rock River and Winnebago River Watersheds. This project was based on Hydrologic Simulation Program – FORTRAN (HSPF) Scenario Application Manager (SAM) (hereafter referred to as SAM) loads further targeted in mile sections using the raster-based Revised Universal Soil Loss Equation (RUSLE) and nutrient-loading calculations.

OVERVIEW

The large-scale HSPF model applications for the Shell Rock River and Winnebago River Watersheds developed for the Minnesota Pollution Control Agency (MPCA) represent uniform loading rates for each land cover within each Hydrologic Unit Code (HUC) 14 (Minnesota Department of Natural Resources [MNDNR] Level 7). At the HUC 8-scale and given the available observed data, this resolution is adequate for effectively representing the predominant sources and general locations of the contributing nutrient and sediment loads. However, within each HUC 14, significant variations in watershed characteristics that may not be captured by the watershed scale models can occur. The targeting tool will help watershed managers to identify areas for implementation at a higher resolution.

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METHODOLOGY

The first step for targeting higher nutrient- and sediment-loading areas was to choose the most appropriate targeting polygons. RESPEC determined that because of the resolution of the tillage information available, polygons at the Public Land Survey System (PLSS) square-mile level would be ideal for this project. PLSS square-mile polygons were intersected with the HSPF subwatershed and given IDs (Poly_SubIDs) based on county, township, section, range, and subwatershed. Poly_SubID polygons are shown in Figure 1. A set of map keys with Poly_SubID values is included in Attachment A. The second step was to perform the RUSLE raster calculations and the nutrient-loading raster calculations.

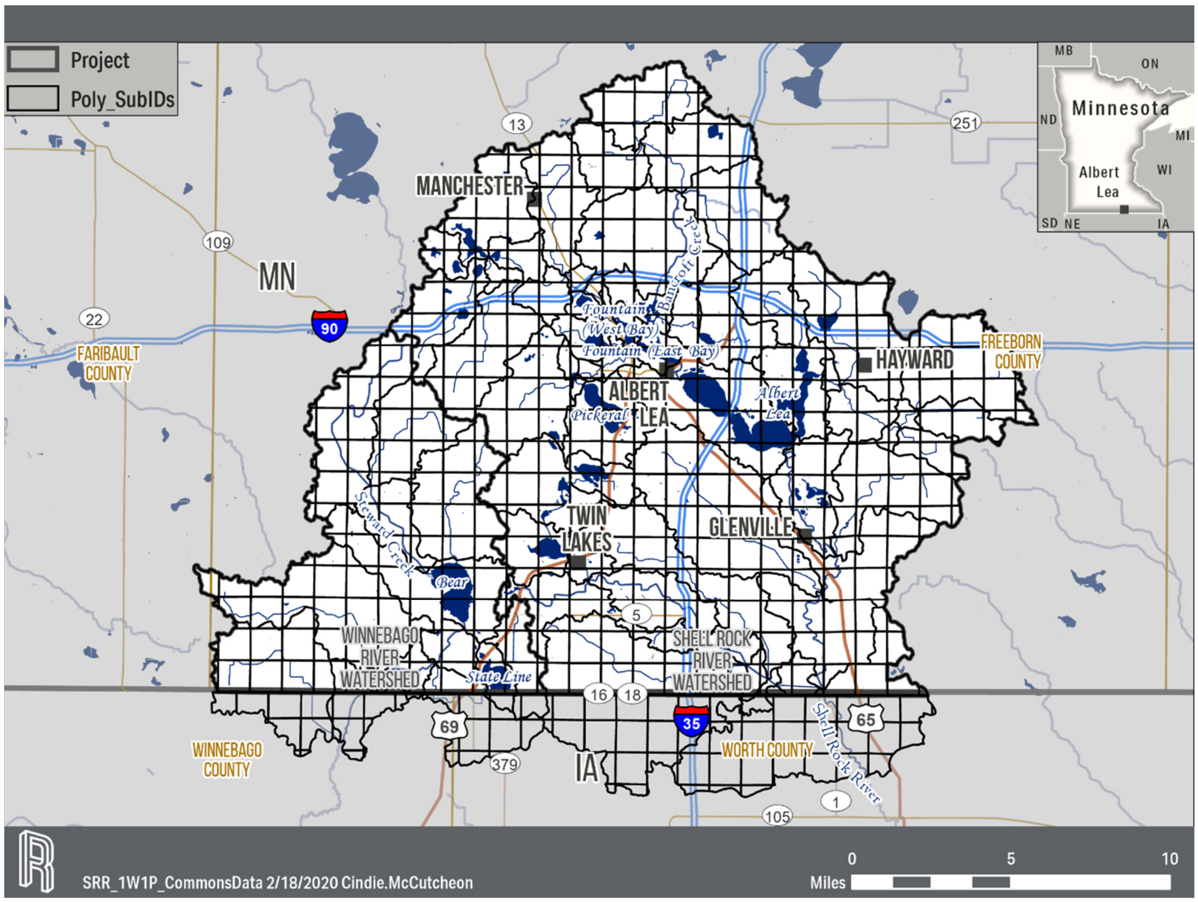

Figure 1. Polygons Used for Shell Rock River/Winnebago River Best Management Practice Targeting.

The HSPF-SAM targeting methodology focuses on analyzing the water quality impact of establishing cover crops, no-till, and/or Water and Sediment Control Basins (WASCOBs) on row crops in the corn and soybean rotation. All of the cropland was assumed to be in this rotation because in this area the corn and soybeans make up approximately 99 percent of crops planted. The HSPF modeled loads are calibrated to instream observed flow and water quality, which provide better estimates at a larger scale. These more accurate large-scale HSPF cropland loads were distributed to cropland in each Poly_SubID by calculating the percent of the total high-resolution load on the cropland in each Poly_SubID.

Current sediment loads were estimated using the same spatial datasets and the RUSLE. Current total nitrogen loads were estimated spatially based on the Lazarus methodology [Lazarus, 2018] and used elevation (i.e., slope), crop type, soil, and county spatial datasets. Current total phosphorus loads were estimated as a function of the nitrogen and sediment loads.

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ESTIMATION OF SEDIMENT LOADING

The higher-resolution sediment loading was estimated using the RUSLE. The RUSLE [Renard et al., 1997] is an empirical erosion prediction equation that can be used to estimate the long-term mean annual soil loss from several variables. RUSLE is given as:

$$A = RKLSCP \tag{1}$$

where A is the long-term mean annual soil loss (imperial tons per acre), R is the rainfall-runoff erosivity factor (hundreds of foot-ton-inches per acre per hour), K is the soil erodibility factor (ton-acre-hours per hundred foot-tons per inch), L is the slope length factor, S is the slope steepness factor, C is the cover-management factor, and P is the support practice factor. Factors L and S are often considered as a single factor LS, which is referred to as the combined length-slope factor. Separate rasters were developed for each of the five components and soil loss (A) was determined as the product of those layers. The following sections detail how each layer used in the RUSLE calculation was developed.

R FACTOR

R, the rainfall-runoff erosivity factor, captures the effect of rainfall-runoff processes, storm intensity, and total storm energy. Both event-specific and mean annual R values are available from various sources. For estimating mean annual erosion, a raster of R values was calculated using Equation 2 for the Eastern United States [Cooper, 2011]:

$$R = 1.24P^{1.36} \tag{2}$$

where:

P = Mean annual precipitation (in)

R = Rainfall erosivity factor.

K FACTOR

The soil erodibility factor, K, represents a soil's susceptibility to erosion by rainfall and runoff processes. K values that correspond to the map unit key (mukey) values in the Gridded Soil Survey Geographic database (gSSURGO) were used to create a K-value raster.

LS FACTOR

The combined length-slope factor, LS, represents the effects of terrain and hydrology on soil loss. LS is the product of the original terms L (the slope-length factor) and S (the slope-steepness factor). LS values were estimated by using the relationships shown in Equations 3 and 4, adapted from Moore and Wilson [1992], Jain and Kothyari [2000], and Breiby [2006]:

$$LS = (m+1)\left(\frac{A_s}{22.13}\right)^m \left(\frac{\sin\beta}{0.0896}\right)^n \tag{3}$$

where A_s is the specific catchment area with units as m (the units for area are square meters [m^2] divided by flow-path width [m]), β is the slope in degrees, m is 0.4, and n is 1.3, with the m and n

exponents relating to the characteristics of erosion in the watershed based on the relative prevalence of rill and inter-rill erosion.

$$A_s = \frac{FA \times \text{Cell Area}}{\text{Cell Size}} = \frac{FA \times (\text{Cell Size})^2}{\text{Cell Size}} = FA \times \text{Cell Size} \quad (4)$$

where FA is the flow accumulation, which is the number of gridcells upstream of a given gridcell; Cell Area is the area of each gridcell; and Cell Size is the edge length of a raster cell (i.e., 9 m for a 9- × 9-m grid). Equation 4 assumes that the flow-path width is equal to the Cell Size. A maximum value of flow accumulation of 0.001 times the maximum (gridcells) was used to determine which flow paths were stream channels/open water. Values above the maximum flow accumulation were set to the maximum value.

C FACTOR

C, the land-use factor, represents the effect of land use on soil loss. C values (Table 1) were developed for each of the National Land Cover Database (NLCD) land uses present in Minnesota and were tabulated from Panagos et al. [2015], Doucet-Beer [2012], and Yoo et al. [2013].

Table 1. Costs for Best Management Practices Included in Targeting Tool

Land Cover	Code	C(a)	C(b)	C(c)	Value Used	Source
Open Water	11	0	0	0	0	C(c)
Developed, Open Space	21	—	0.003	0.003	0.003	C(c)
Developed, Low Intensity	22	—	0	0.001	0.001	C(c)
Developed, Medium Intensity	23	—	0	0.001	0.001	C(c)
Developed, High Intensity	24	—	0	0	0	C(b)
Barren Land	31	0.1–0.45	0.3	0.7	0.7	C(c)
Deciduous Forest	41	0.0001–0.003	0.002	—	0.002	C(b)
Evergreen Forest	42	0.0001–0.003	—	0.0001	0.002	C(b), Deciduous Forest
Mixed Forest	43	0.0001–0.003	—	—	0.002	C(b), Deciduous Forest
Shrub/Scrub	52	0.01–0.1	—	0.038	0.038	C(c)
Grasslands/Herbaceous	71	0.01–0.08	0.005	0.042	0.042	C(c)
Pasture/Hay	81	0.05–0.15	0.05	0.1	0.1	C(c)
Cultivated Crops	82	0.07–0.35	—	0.24	0.24	C(c)
Woody Wetlands	90	—	0.001	0.003	0.003	C(c)
Emergent Herbaceous Wetlands	95	—	0.001	0.003	0.003	C(c)

(a) Panagos et al. [2015]
(b) Doucet-Beer [2011]
(c) Yoo et al. [2013].

P FACTOR

P, the support practice factor, represents the effect of land management on soil loss. The P value for the area was set equal to 1.

RUSLE RESULTS

Mean annual erosion values were calculated as the product of raster layers R, K, LS, C, and P. Zonal statistics were calculated on the resulting RUSLE raster to determine the expected gross soil erosion from the cropland within each Poly_SubID. Mean erosion rates (tons per acre per year [tons/ac/yr]) on cropland in each Poly_SubID range from less than zero to 82, with an average value of 5.1 tons/ac/yr. Figure 2 shows RUSLE calculation results on cropland throughout the project area.

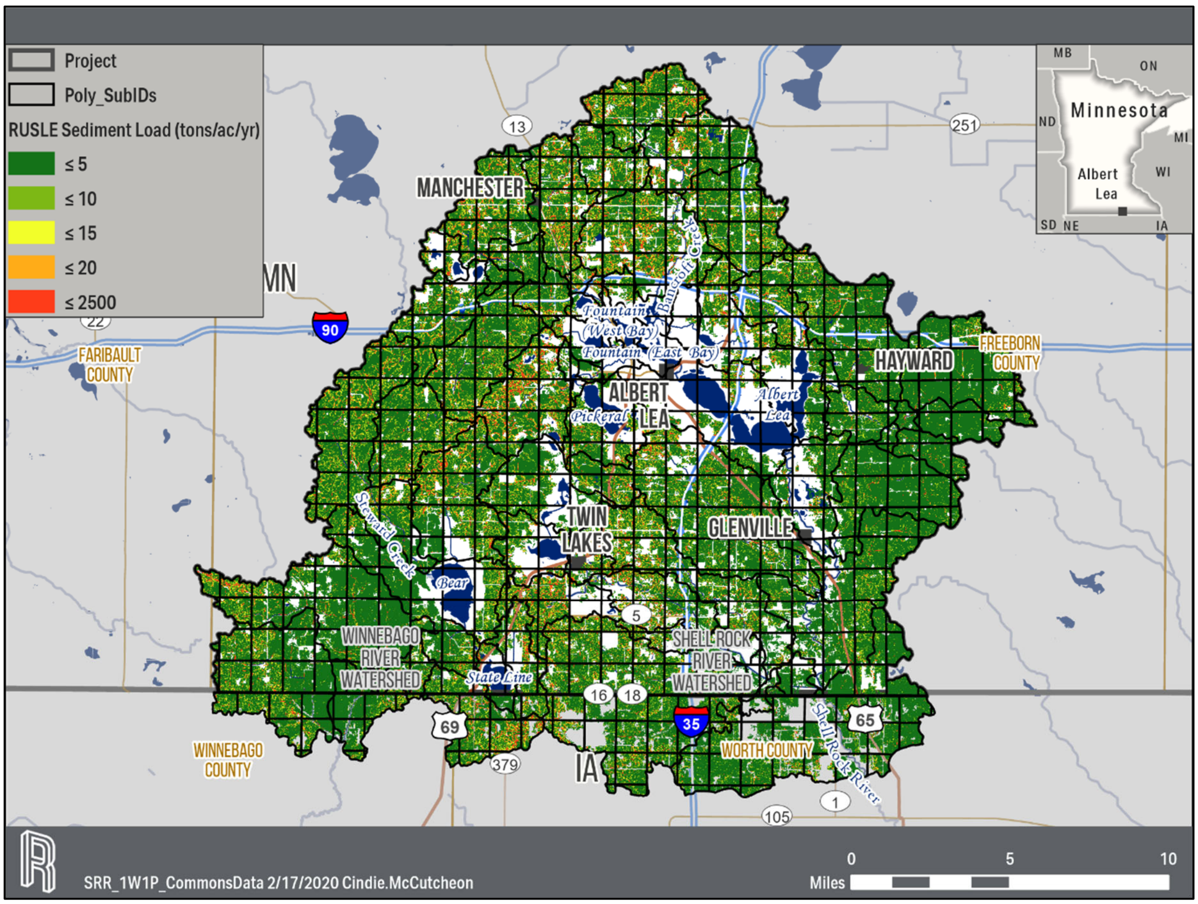

Figure 2. Sediment-Loading Rate on Cropland in the Project Area Calculated Using Revised Universal Soil Loss Equation.

ESTIMATION OF NUTRIENT LOADING

The methodology to estimate nutrient loads at a finer scale was based on regression equations from the spreadsheet tool developed by Bill Lazarus [Lazarus and Keller, 2018]. These loads were calculated using the methodology outlined in Chapter D4 of the MPCA's [2013] report *Nitrogen in Minnesota Surface Waters* using the following spatial datasets: the National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL), gSSURGO soil surveys, slope from a digital elevation model (DEM), and county boundaries [Mulla et al., 2012]. The loads were developed as a 30- × 30-m grid. Zonal statistics were performed on the resulting raster to determine the expected nitrogen loads from the cropland within each Poly_SubID. Mean loading rates (pounds per acre per year [lbs/ac/yr]) on cropland in each

Poly_SubID range from less than 1 to 22.4 with an average value of 13.8 lbs/ac/yr. Figure 3 shows nitrogen calculation results on cropland throughout the project area.

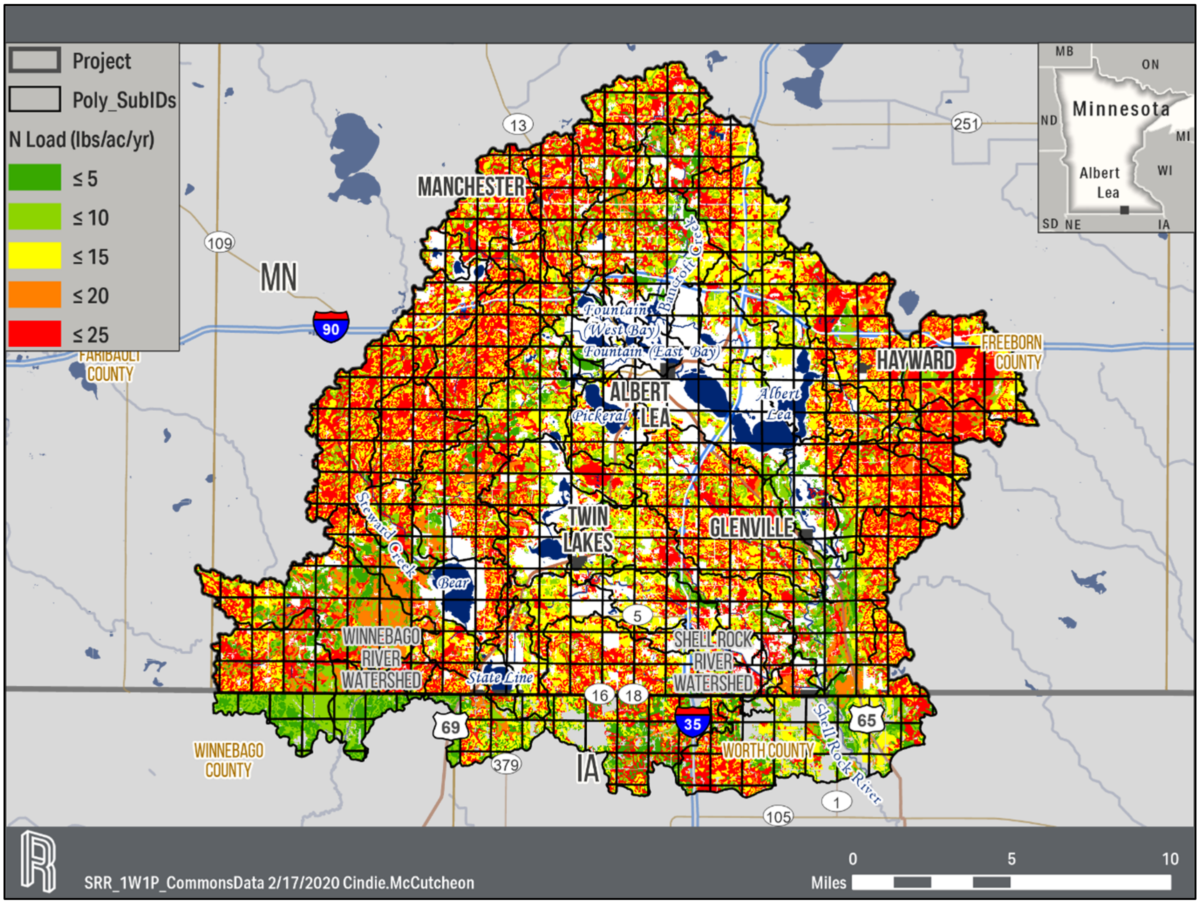

Figure 3. Nitrogen-Loading Rate on Cropland in the Project Area Calculated Using the Lazarus Methodology.

The spatial nitrogen loads were calculated to represent the loads as if the corn and soybean rotation was present in each grid cell. The nutrient loads for assuming cover crops were being planted were also calculated as a grid using the same methodology but different regression equations. This method allowed for a high-resolution representation of cover-crop reductions on cropland in each Poly_SubID. Mean loading rates for corn-soybean rotations with cover crops ranged from less than 1 to 12.8 lbs/ac/yr with an average value of 7.6 lbs/ac/yr.

TARGETING SPREADSHEET TOOL

The Targeting Spreadsheet Tool allows the user to specify the fraction of cropland each practice will be applied to in each Poly_SubID. The tool uses a treatment train applying cover crops first, followed by conservation tillage, followed by wetland restoration to each area. The fraction is entered in the "Scenario Builder" tab under "BMP Selection" with "CC" for cover crops, "Till" for conservation tillage, or "TWR" for wetland restoration.

BMP prioritization is based on the cost of pollutant removal and, as such, developing estimates of both the pollutant removed and cost of BMP construction is necessary. BMP construction costs were adapted from construction costs in HSPF-SAM, which were adapted from Minnesota Environmental

Quality Incentive Program (EQIP) payment rates. BMP costs are included in Table 2. Costs can be edited in the Targeting Spreadsheet Tool in the "Info" tab. BMP removal rates were based on values in SAM and the *Agricultural BMP Handbook for Minnesota 2017* [Lenhart and Peterson]. BMP efficiency factors are summarized in Table 3. Efficiency factors can be edited in the Targeting Spreadsheet Tool in the "Info" tab.

Table 2. Costs for Best Management Practices Included in the Targeting Tool

Practice	Cost ($/ac/yr)
Cover Crop	37.98
No-Till	11.03
Restored Wetlands	31.64

ac = acres
yr = year.

Table 3. Uniform Base Reduction Efficiencies for Best Management Practices Included in the Targeting Tool

Cropland Type	Parameter	Cover Crop (%)	No-Till (%)	Restored Wetlands (%)
Tile Drained	TSS	69	74	70
	TN	28	28	47
	TP	24	58	42
Not Tile Drained	TSS	74	80	70
	TN	28	32	47
	TP	27	65	42

TSS = Total Suspended Solids
TN = Total Nitrogen
TP = Total Phosphorus.

The Targeting Spreadsheet Tool also allows the user to view load reduction in any local Poly_SubID, as well as the fate of the pollutant to any reach specified in cell M5 of the "Scenario Builder" tab as the "Select Reach of Interest." Fate can be looked up in the tool using a set of fate matrices for TSS, TN, and TP developed from SAM.

The last option for the user in the Targeting Spreadsheet Tool is to select whether the tool uses nitrogen reductions for the cover crop practice from the Table 3 efficiency factors or efficiencies from Lazarus method targeted reductions [Lazarus, 2018]. This specification is selected in the "Info" tab cell B2 dropdown as "Efficiency" or "Targeted Loading."

Once the user selections are made in the Targeting Spreadsheet Tool, the local and specified reach reductions can be sorted to find the Poly_SubID locations with the highest reductions of a pollutant per acre or the most cost-effectiveness in columns BX through CU. The tool also generates a "Progress

Summary" in the top-left side of the "Scenario Builder" tab that summarizes the total cost for selected BMPs in all of the Poly_SubIDs; expected local and specified reductions of TP, TN, and TSS; and cost effectiveness.

TARGETING SCENARIO DEVELOPMENT IN SAM

Poly_SubIDs were prioritized using the Targeting Spreadsheet Tool to run the following set of scenarios in SAM with targeted efficiencies:

1. Conservation tillage on 30 percent of cropland
2. Fall cover crops on 15 percent of cropland
3. Fall cover crops on 30 percent of cropland
4. Conservation tillage on 30 percent + fall cover crops on 50 percent
5. Increase water storage by 10 percent.

Outside of the Targeting Spreadsheet Tool, a 30 percent internal loading reduction in all of the modeled lakes was represented in SAM as Scenario 6.

For each modeled subwatershed, the acres required to meet the scenarios listed above in the Poly_SubID areas with the most effective reductions were entered into a set of SAM scenarios along with the adjusted costs and efficiency factors from the Targeting Spreadsheet Tool. Figure 4 shows locations for SAM scenario results. Table 4 shows the SAM scenario results (percent reduction) for the set of scenarios using the original SAM efficiency factors compared to the targeted SAM efficiency factors at five primary locations throughout the project area. The "Increase Water Storage" scenario is expected to have a larger impact in SAM than just the efficiency factors shown because this scenario reduces flows and, therefore, will lower bed and bank scour. There are numerous metrics in the tool that can be used to develop a targeted scenario using any of the modeled reaches as a location of concern. The scenario results presented in Table 4 were developed using a comprehensive targeting approach that looks at the effect of all the parameters at all the locations in the table. If a specific parameter and location are targeted using the Targeting Spreadsheet Tool it is likely that the reductions and effectiveness will be even more improved when compared to the base SAM scenarios.

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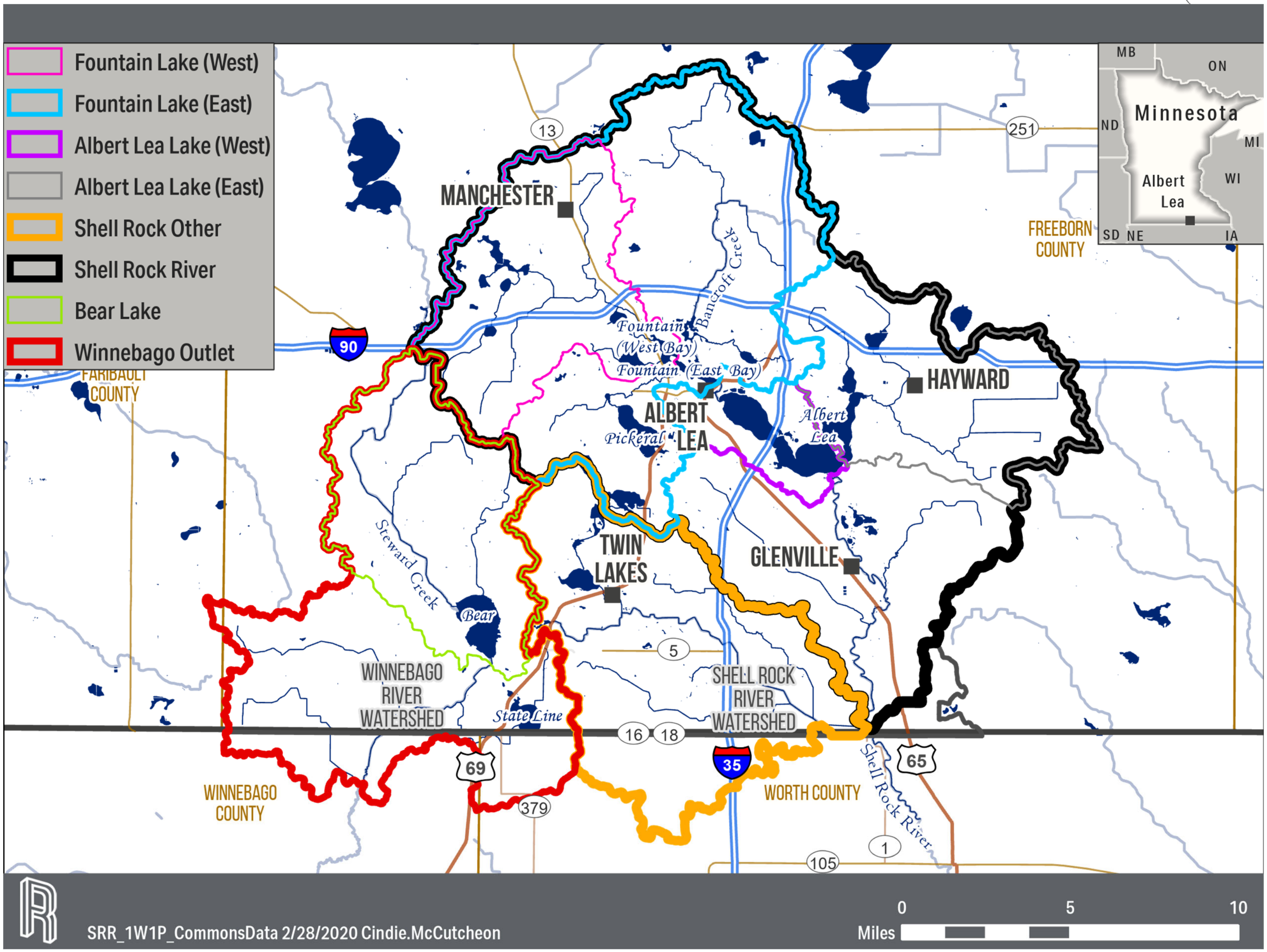

Figure 4. Areas Draining to Main Points of Interest.

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Table 4. Percent Reductions of Total Suspended Solids, Total Nitrogen, and Total Phosphorus for Alternative Crop Scenarios Output From SAM Using Supplied Efficiency Factors and Applied Uniformly to a Subwatershed in Each Minor Watershed in the Project Area (Page 1 of 3)

Scenario	Watershed	Reach I.D.	Uniform Reductions (%)			Targeted Reductions (%)		
			Total Suspended Solids	Total Nitrogen	Total Phosphorus	Total Suspended Solids	Total Nitrogen	Total Phosphorus
Scenario 1: Conservation Tillage on 30% of Cropland	Fountain Lake West	80	17	10	16	24	14	23
	Fountain Lake East	120	18	11	15	21	12	19
	Albert Lea Lake West	140	16	12	10	19	13	11
	Albert Lea Lake East	148	17	12	15	21	12	15
	Shell Rock River	190	16	10	6	19	11	7
	Shell Rock Other Area	213	20	9	17	24	12	22
	Bear Lake	260	20	10	15	28	11	17
	Winne Outlet	310	19	9	16	26	12	20
Scenario 2: Fall Cover Crops on 15% of Cropland	Fountain Lake West	80	8	4	3	10	7	6
	Fountain Lake East	120	8	4	3	11	8	6
	Albert Lea Lake West	140	7	4	2	10	9	3
	Albert Lea Lake East	148	8	4	3	11	7	4
	Shell Rock River	190	7	4	1	9	7	2
	Shell Rock Other Area	213	9	4	3	12	9	7
	Bear Lake	260	9	4	3	15	8	5
	Winne Outlet	310	9	4	3	14	10	7
Scenario 3: Fall Cover Crops on 30% of Cropland	Fountain Lake West	80	16	8	7	18	14	11
	Fountain Lake East	120	16	8	6	20	15	11
	Albert Lea Lake West	140	14	8	4	18	16	5

Table 4. Percent Reductions of Total Suspended Solids, Total Nitrogen, and Total Phosphorus for Alternative Crop Scenarios Output From SAM Using Supplied Efficiency Factors and Applied Uniformly to a Subwatershed in Each Minor Watershed in the Project Area (Page 2 of 3)

Scenario	Watershed	Reach I.D.	Uniform Reductions (%)			Targeted Reductions (%)		
			Total Suspended Solids	Total Nitrogen	Total Phosphorus	Total Suspended Solids	Total Nitrogen	Total Phosphorus
Scenario 3: Fall Cover Crops on 30% of Cropland (continued)	Albert Lea Lake East	148	16	9	6	20	14	9
	Shell Rock River	190	15	7	2	17	14	4
	Shell Rock Other Area	213	18	8	7	21	16	13
	Bear Lake	260	19	8	6	26	15	10
	Winne Outlet	310	18	8	7	26	18	13
Scenario 4: Conservation Tillage on 30% and Fall Cover Crops on 50% of Cropland	Fountain Lake West	80	38	23	25	42	38	37
	Fountain Lake East	120	39	23	24	38	33	31
	Albert Lea Lake West	140	34	24	14	33	34	16
	Albert Lea Lake East	148	38	25	22	37	31	24
	Shell Rock River	190	35	21	9	33	28	11
	Shell Rock Other Area	213	43	20	26	41	32	35
	Bear Lake	260	44	22	22	47	29	25
	Winne Outlet	310	42	21	25	45	33	32
Scenario 5: Increase Water Storage on 10% of Cropland	Fountain Lake West	80	1	1	1	8	8	6
	Fountain Lake East	120	1	0	0	6	5	4
	Albert Lea Lake West	140	1	1	1	5	6	3
	Albert Lea Lake East	148	2	1	1	6	5	3
	Shell Rock River	190	1	1	0	5	5	1
	Shell Rock Other Area	213	1	0	1	6	5	5
	Bear Lake	260	1	0	0	7	5	3
	Winne Outlet	310	1	0	1	7	5	4

Table 4. Percent Reductions of Total Suspended Solids, Total Nitrogen, and Total Phosphorus for Alternative Crop Scenarios Output From SAM Using Supplied Efficiency Factors and Applied Uniformly to a Subwatershed in Each Minor Watershed in the Project Area (Page 3 of 3)

Scenario	Watershed	Reach I.D.	Uniform Reductions (%)			Targeted Reductions (%)		
			Total Suspended Solids	Total Nitrogen	Total Phosphorus	Total Suspended Solids	Total Nitrogen	Total Phosphorus
Scenario 6: 30% Internal Loading Reduction in Lakes	Fountain Lake West	80	0	1	2	NA	NA	NA
	Fountain Lake East	120	0	1	3	NA	NA	NA
	Albert Lea Lake West	140	0	2	13	NA	NA	NA
	Albert Lea Lake East	148	0	1	8	NA	NA	NA
	Shell Rock River	190	0	1	3	NA	NA	NA
	Shell Rock Other Area	213	0	0	1	NA	NA	NA
	Bear Lake	260	0	2	3	NA	NA	NA
	Winne Outlet	310	0	1	1	NA	NA	NA

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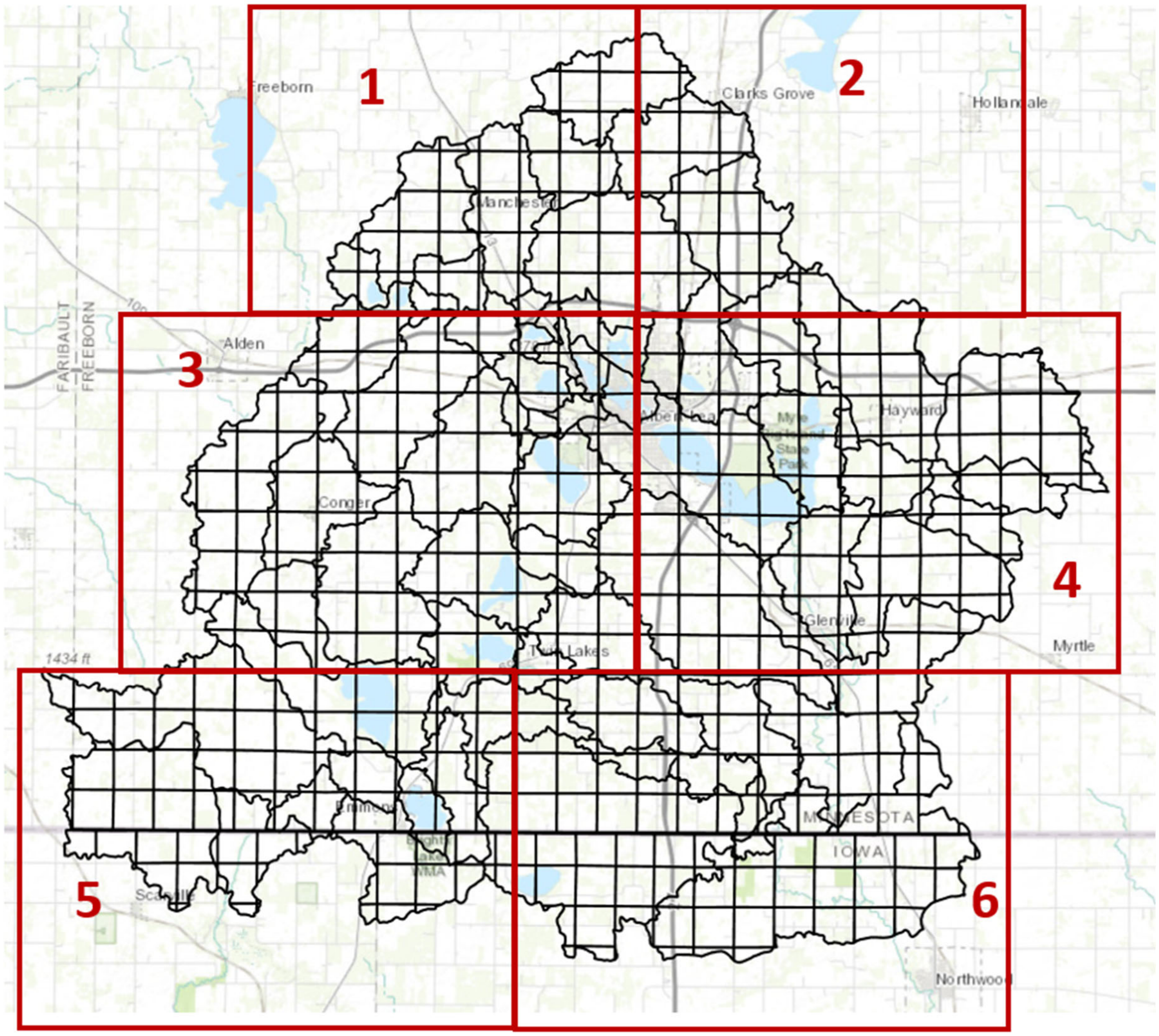
Enclosure

ATTACHMENT A

POLY_SUBID REFERENCE MAPS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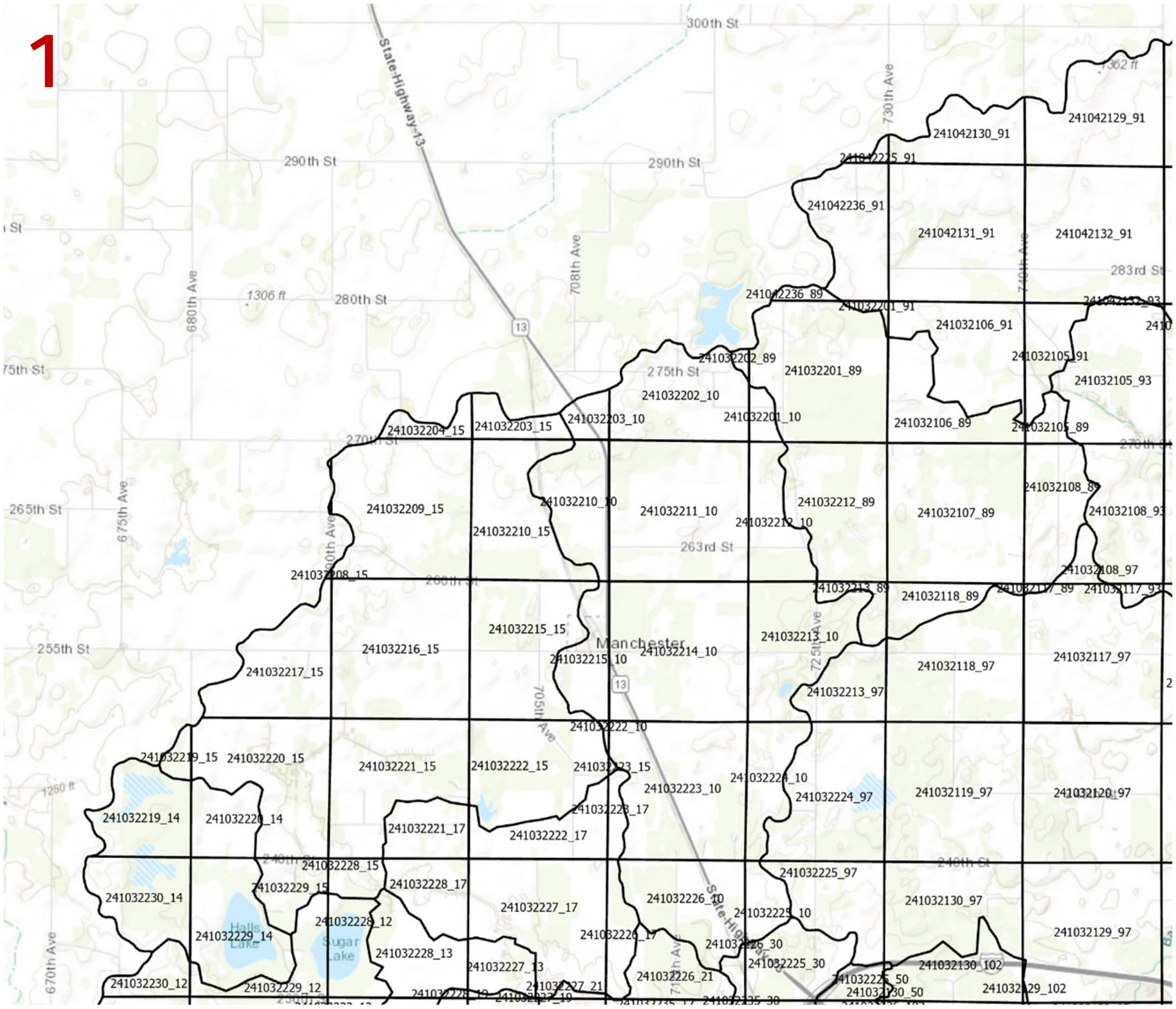
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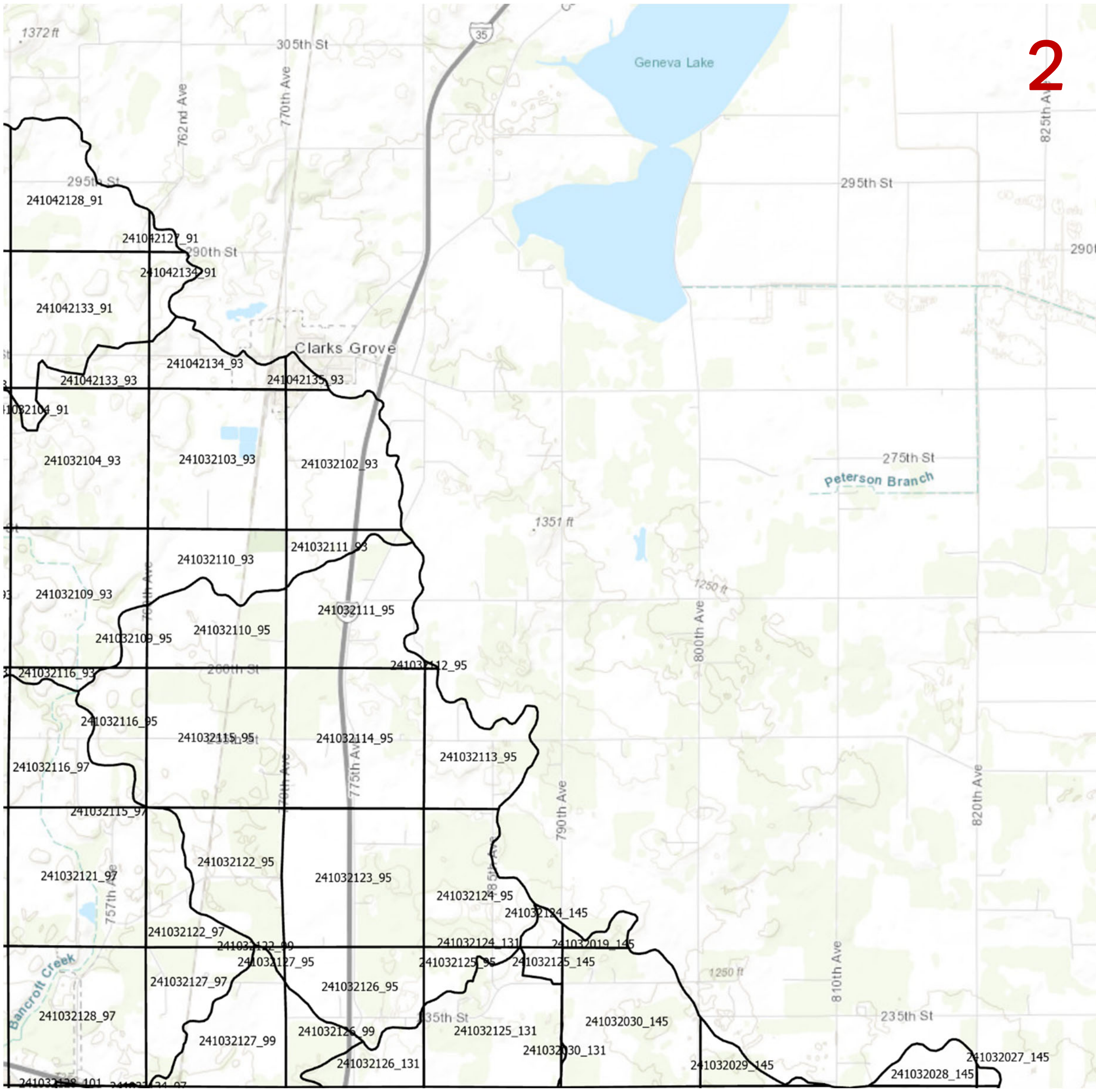
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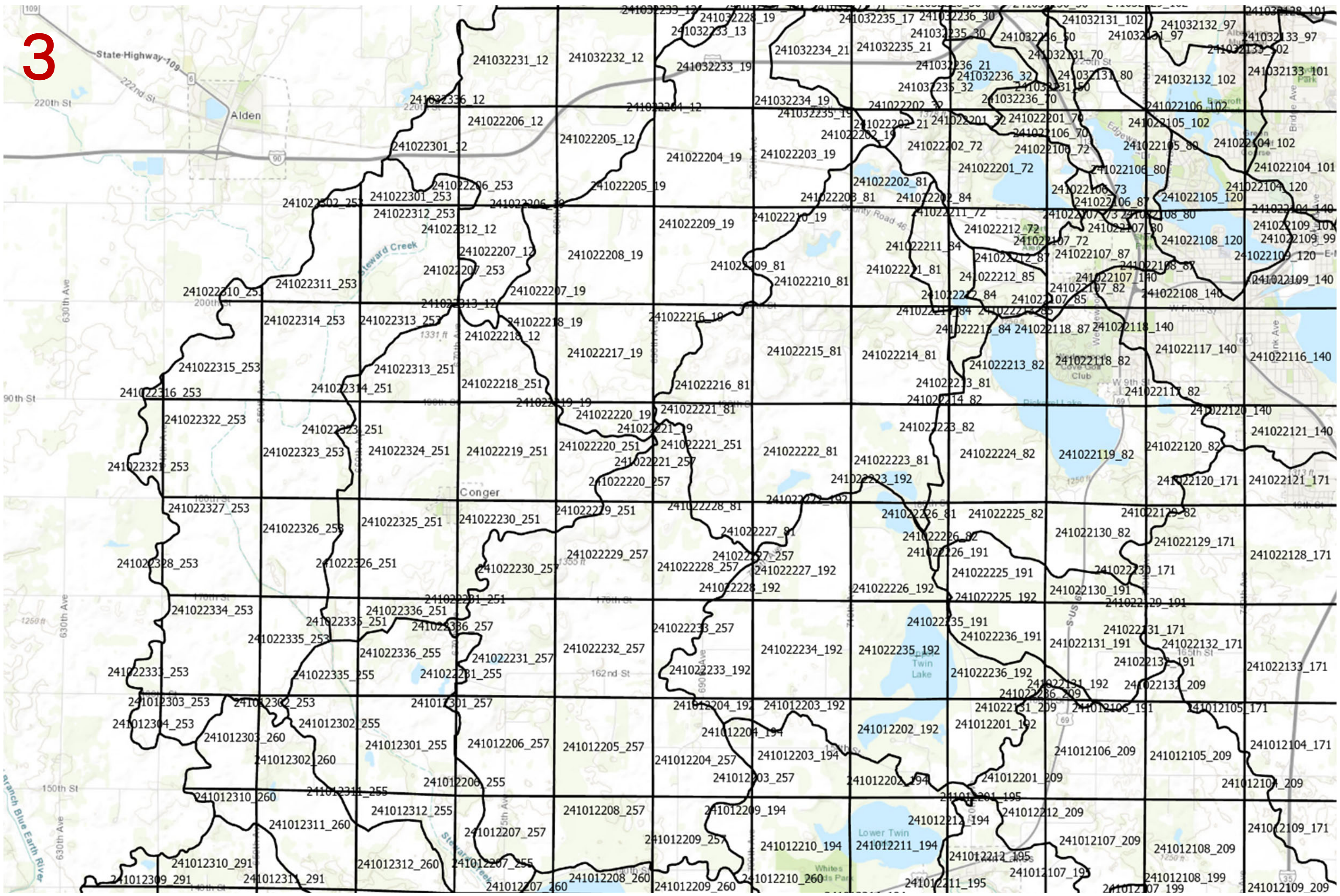
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State Highway 109
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190th St
150th St
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Conger
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Twin Lake
Lower Twin
Branch Blue Earth River
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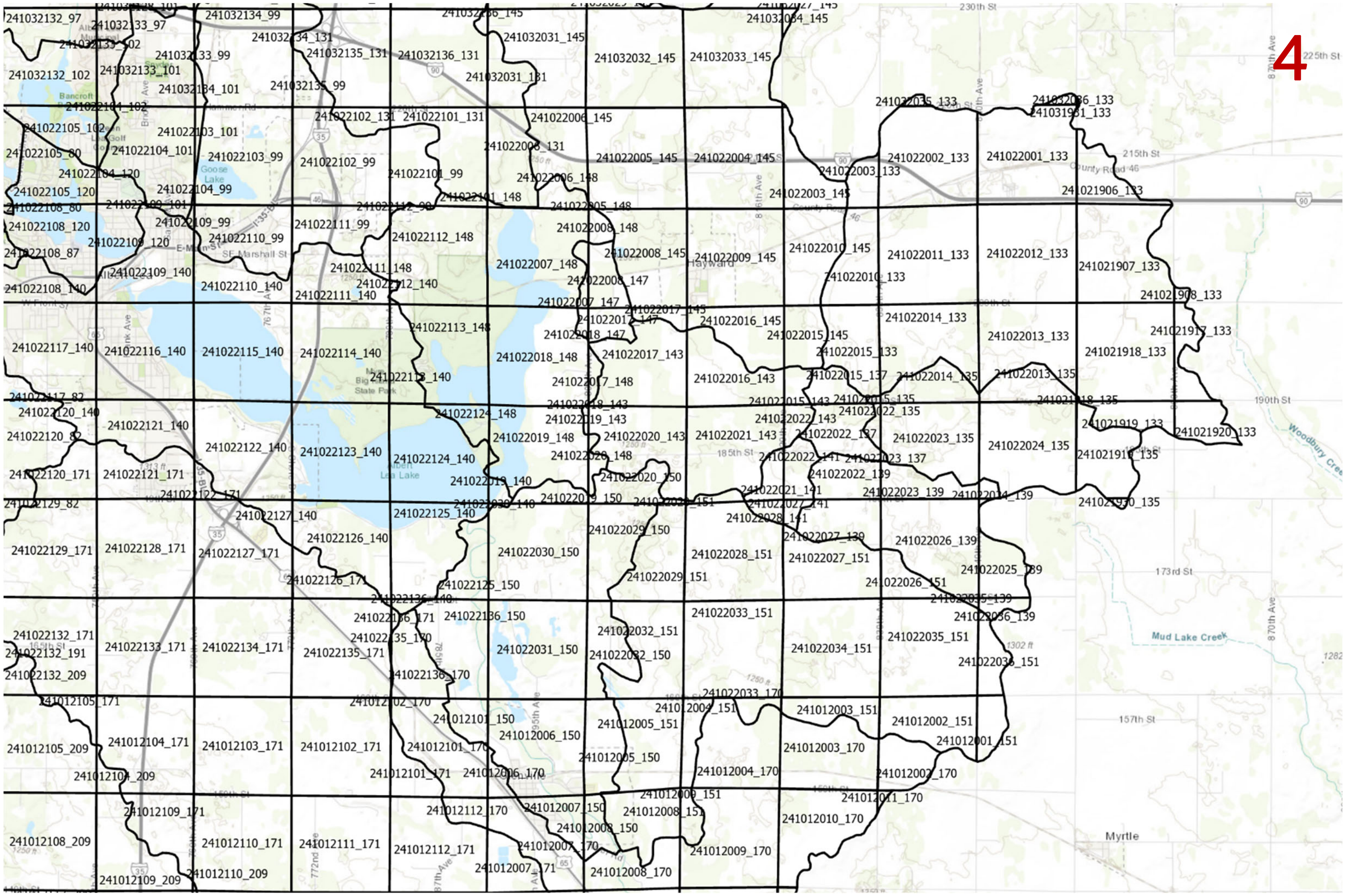
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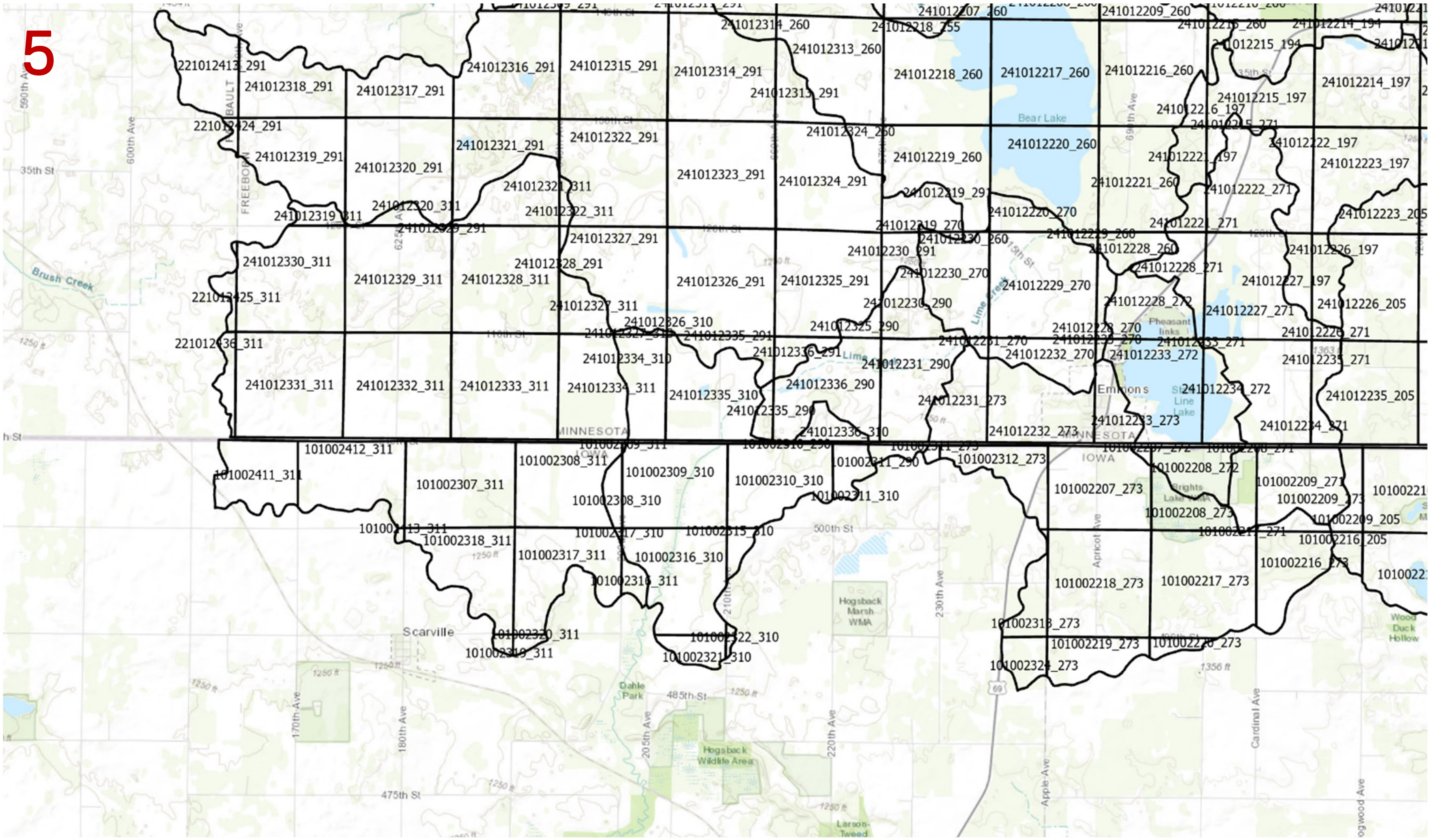
241012007_170
241012009_170
241012007_171
241012008_170
241012109_209
241012110_209
230th St
225th St
215th St
190th St
173rd St
157th St
870th Ave
Woodbury Creek
Mud Lake Creek
Myrtle
County Road 46
Big Island State Park
Albert Lea Lake
Goose Lake
Bancroft Creek
Hayward
SE Marshall St
E Main St
W Front St
185th St
1302 ft
1282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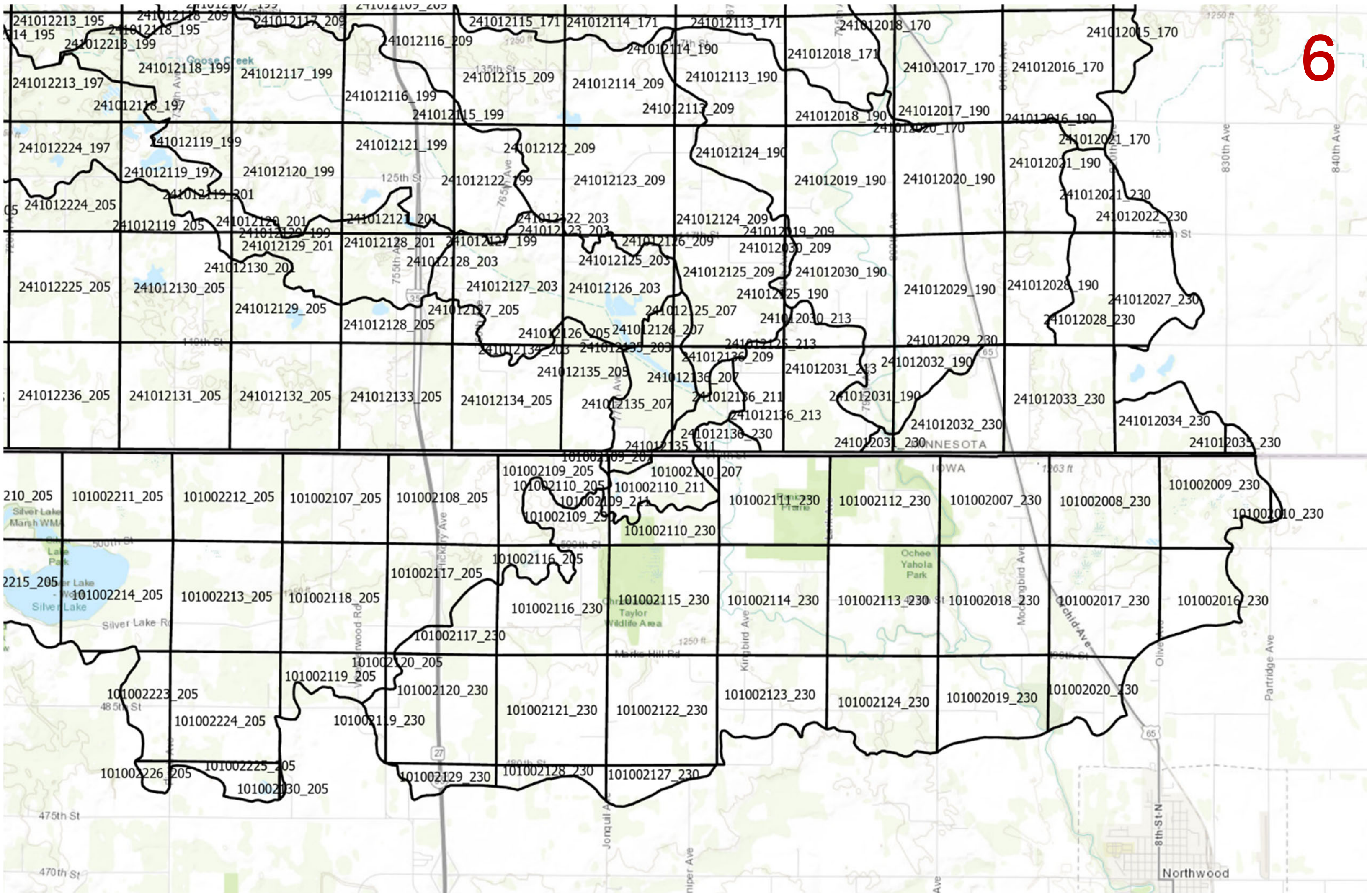
Bear Lake
Brush Creek
35th St
Scarville
Emmons
MINNESOTA
IOWA
Hogback Marsh WMA
Hogback Wildlife Area
Dahle Park
500th St
485th St
475th St
170th Ave
180th Ave
205th Ave
220th Ave
230th Ave
Apricot Ave
Apple Ave
Cardinal Ave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Goose Creek
Silver Lake
Ochee Yahola Park
Taylor Wildlife Area
Northwood
475th St
470th St
485th St
Silver Lake Rd
Partridge Ave
830th Ave
840th Ave

ATTACHMENT B

SAM TARGETED SCENARIO INPUTS

ATTACHMENT B: SAM TARGETED SCENARIO INPUTS

CONSERVATION TILLAGE ON 30 PERCENT OF CROPLAND

Table B-1. Conservation Tillage on 30 Percent of Cropland Targeting Tool Summary

Progress Summary	Reach 80	Reach 120	Reach 140	Reach 148	Reach 190	Reach 213	Reach 260	Reach 310
Total Cost ($/year)	$556,280							
Treated Area (acres)	50433							
Percent of Local Cropland	30.1%							
Percent of Shell Rock	31.7%							
Percent of Winnebago	25.7%							
Treated Area above Location (acres)	7032	14361	15605	6094	28388	8327	6445	11365
Percent of Cropland above Location	38.9%	32.0%	33.8%	31.7%	32.4%	32.2%	32.2%	30.3%
TSS Local Load Reduction (t/yr)	2817	2817	2817	2817	2817	2817	2817	2817
TN Local Load Reduction (lb/yr)	809745	809745	809745	809745	809745	809745	809745	809745
TP Local Load Reduction (lb/yr)	27505	27505	27505	27505	27505	27505	27505	27505
TSS Local % Reduction Achieved	29%	29%	29%	29%	29%	29%	29%	29%
TN Local % Reduction Achieved	10%	10%	10%	10%	10%	10%	10%	10%
TP Local % Reduction Achieved	20%	20%	20%	20%	20%	20%	20%	20%
Effectiveness (%Red/%Area)	0.658	0.658	0.658	0.658	0.658	0.658	0.658	0.658
Cost Effectiveness* (/k$/yr)	1.205	1.205	1.205	1.205	1.205	1.205	1.205	1.205
TSS Reach Load Reduction (t/yr)	406	811	680	234	1178	468	250	445
TN Reach Load Reduction (lb/yr)	87955	168026	82781	49212	237109	138712	36130	120154
TP Reach Load Reduction (lb/yr)	3126.8	6193.2	4273.7	2456.6	17876.3	4659.3	1213.5	4018.2

TSS Reach % Reduction Achieved	26%	23%	21%	24%	21%	27%	30%	28%
TN Reach % Reduction Achieved	12%	10%	10%	9%	9%	11%	10%	11%
TP Reach % Reduction Achieved	24%	20%	22%	24%	17%	23%	22%	22%
Effectiveness (%Red/%Area)	0.531	0.553	0.528	0.600	0.487	0.630	0.640	0.671
Cost Effectiveness (lb/k$/yr)	1.139	0.999	0.940	1.047	0.897	1.143	1.263	1.173

Table B-2. Conservation Tillage on 30 Percent of Cropland SAM Scenario Input by Subwatershed from Targeting Tool

Reach	SAM Reach	SAM Area (Cropland)		SAM Cost	SAM Efficiencies		
		(acres)	%	($/acre/year)	TSS	TN	TP
10	10	2315	69%	11.03	0.83	0.31	0.63
12							
13	13	193	50%	11.03	0.86	0.31	0.62
14							
15	15	1857	50%	11.03	0.92	0.30	0.63
17	17	571	55%	11.03	0.98	0.30	0.64
19	19	1397	30%	11.03	0.93	0.31	0.64
21	21	487	46%	11.03	0.92	0.31	0.64
30	30	59	25%	11.03	1.36	0.27	0.72
32							
50	50	84	94%	11.03	0.80	0.32	0.64
70	70	31	96%	11.03	0.79	0.32	0.63
72							
73	73	16	97%	11.03	0.80	0.32	0.65
80	80	21	97%	11.03	0.80	0.32	0.65
81	81	2096	55%	11.03	0.94	0.31	0.65
191							
82							
84	84	186	78%	11.03	0.88	0.36	0.70
85	85	152	97%	11.03	0.80	0.32	0.64
87	87	50	70%	11.03	1.01	0.38	0.74
89	89	382	19%	11.03	1.21	0.29	0.68
91							
93	93	1154	39%	11.03	1.02	0.32	0.68
95	95	752	19%	11.03	0.95	0.34	0.68
97	97	1796	36%	11.03	0.92	0.32	0.67
99	99	518	31%	11.03	0.93	0.31	0.65
101	101	32	59%	11.03	0.88	0.32	0.65
102	102	211	57%	11.03	0.82	0.34	0.66
120							
140	140	1244	95%	11.03	0.77	0.30	0.60
131	131	591	30%	11.03	1.01	0.31	0.66
133	133	1530	29%	11.03	1.12	0.29	0.63
135	135	250	16%	11.03	1.38	0.29	0.62
137	137	143	47%	11.03	1.12	0.28	0.65
139	139	772	61%	11.03	0.79	0.30	0.61
141							
143	143	266	16%	11.03	0.90	0.33	0.66
145	145	1204	22%	11.03	1.11	0.31	0.66
147	147	131	67%	11.03	0.80	0.30	0.61

148	148	1205	97%	11.03	0.77	0.30	0.61
150	150	1917	100%	11.03	0.79	0.31	0.63
151	151	375	8%	11.03	1.08	0.34	0.69
170	170	2460	61%	11.03	0.83	0.35	0.69
171	171	136	2%	11.03	1.27	0.31	0.69
190	190	1800	53%	11.03	0.90	0.36	0.70
192							
194							
195	195	436	87%	11.03	0.79	0.31	0.63
197							
199	199	1234	60%	11.03	0.93	0.32	0.66
201	201	159	31%	11.03	0.82	0.34	0.66
203	203	566	83%	11.03	0.80	0.32	0.64
205	205	3862	35%	11.03	0.92	0.37	0.71
207	207	141	65%	11.03	0.99	0.32	0.66
209	209	1465	30%	11.03	1.03	0.32	0.67
211	211	85	48%	11.03	1.03	0.38	0.75
213	213	379	80%	11.03	0.76	0.32	0.63
230	230	2354	23%	11.03	0.88	0.41	0.76
251	251	451	13%	11.03	1.07	0.30	0.64
253	253	1107	18%	11.03	1.04	0.31	0.65
255	255	549	29%	11.03	1.20	0.32	0.69
257	257	2410	49%	11.03	0.95	0.32	0.66
260	260	1927	53%	11.03	1.07	0.33	0.68
270	270	184	15%	11.03	0.80	0.34	0.66
271							
272							
273	273	2123	68%	11.03	0.86	0.36	0.70
290	290	629	62%	11.03	0.88	0.32	0.65
291	291	1367	17%	11.03	1.31	0.36	0.75
310	310	617	28%	11.03	0.85	0.61	0.93
311							

FALL COVER CROPS ON 15 PERCENT OF CROPLAND

Table B-3. Fall Cover Crops on 15 Percent of Cropland Targeting Tool Summary

Progress Summary	Reach 80	Reach 120	Reach 140	Reach 148	Reach 190	Reach 213	Reach 260	Reach 310
Total Cost ($/year)	$961,506							
Treated Area (acres)	25318.33							
Percent of Local Cropland	15.1%							
Percent of Shell Rock	15.6%							
Percent of Winnebago	13.7%							
Treated Area above Location (acres)	2782	7096	8002	2979	13858	4241	3213	6056
Percent of Cropland above Location	15.4%	15.8%	17.3%	15.5%	15.8%	16.4%	16.0%	16.1%
TSS Local Load Reduction (t/yr)	1408	1408	1408	1408	1408	1408	1408	1408
TN Local Load Reduction (lb/yr)	619719	619719	619719	619719	619719	619719	619719	619719
TP Local Load Reduction (lb/yr)	8767	8767	8767	8767	8767	8767	8767	8767
TSS Local % Reduction Achieved	15%	15%	15%	15%	15%	15%	15%	15%
TN Local % Reduction Achieved	8%	8%	8%	8%	8%	8%	8%	8%
TP Local % Reduction Achieved	6%	6%	6%	6%	6%	6%	6%	6%
Effectiveness (%Red/%Area)	0.633	0.633	0.633	0.633	0.633	0.633	0.633	0.633
Cost Effectiveness* (/k$/yr)	0.332	0.332	0.332	0.332	0.332	0.332	0.332	0.332
TSS Reach Load Reduction (t/yr)	167	402	351	128	585	231	134	242
TN Reach Load Reduction (lb/yr)	51573	124696	64606	35534	163529	110763	27480	105205
TP Reach Load Reduction (lb/yr)	794.9	2000.7	1635.8	1007.2	7906.3	1534.5	417.7	1459.8
TSS Reach % Reduction Achieved	11%	12%	11%	13%	10%	13%	16%	15%
TN Reach % Reduction Achieved	7%	7%	8%	7%	6%	9%	7%	10%
TP Reach % Reduction Achieved	6.1%	6.4%	8.5%	9.9%	7.7%	7.5%	7.4%	8.1%
Effectiveness (%Red/%Area)	0.515	0.534	0.527	0.633	0.511	0.603	0.649	0.677
Cost Effectiveness (lb/k$/yr)	0.255	0.271	0.268	0.316	0.254	0.309	0.374	0.351

Table B-4. Fall Cover Crops on 15 Percent of Cropland Sam Scenario Input by Subwatershed From Targeting Tool

Reach	SAM Reach	SAM Area (Cropland)		SAM Cost	SAM Efficiencies		
		(acres)	%	($/acre/year)	TSS	TN	TP
10	10	721	21%	37.98	0.80	0.47	0.39
12							
13	13	179	46%	37.98	0.79	0.45	0.38
14							
15	15	920	25%	37.98	0.94	0.44	0.39
17	17	135	13%	37.98	1.40	0.43	0.43
19	19	666	15%	37.98	0.92	0.46	0.40
21	21	12	1%	37.98	7.71	0.44	1.13
30	30	54	23%	37.98	1.26	0.40	0.44
32							
50	50	32	36%	37.98	0.87	0.49	0.42
70	70	29	88%	37.98	0.73	0.45	0.38
72							
73	73	14	89%	37.98	0.74	0.48	0.40
80	80	19	89%	37.98	0.74	0.38	0.34
81	81	1282	33%	37.98	0.91	0.45	0.41
191							
82							
84	84	172	72%	37.98	0.81	0.50	0.41
85	85	18	12%	37.98	0.55	0.91	0.55
87	87	46	65%	37.98	0.93	0.59	0.47
89	89	44	2%	37.98	2.24	0.38	0.51
91							
93	93	927	32%	37.98	1.12	0.44	0.41
95	95	367	9%	37.98	0.97	0.51	0.43
97	97	866	17%	37.98	0.85	0.52	0.43
99	99	299	18%	37.98	0.89	0.52	0.44
101	101	10	18%	37.98	1.14	0.57	0.49
102	102	283	77%	37.98	0.76	0.48	0.40
120							
140	140	906	69%	37.98	0.79	0.50	0.41
131	131	126	6%	37.98	1.42	0.41	0.45
133	133	275	5%	37.98	1.87	0.42	0.42
135	135	150	9%	37.98	1.56	0.44	0.39
137	137	184	61%	37.98	1.03	0.41	0.40
139	139	22	2%	37.98	1.59	0.50	0.45
141							
143	143	3	0%	37.98	1.19	0.47	0.42
145	145	1087	20%	37.98	1.08	0.46	0.41
147	147	18	9%	37.98	1.02	0.42	0.38

148	148	1114	89%	37.98	0.72	0.47	0.39
150	150	1830	95%	37.98	0.73	0.44	0.37
151							
170							
171							
190	190	1048	31%	37.98	0.88	0.57	0.46
192							
194							
195	195	464	92%	37.98	0.73	0.48	0.40
197							
199	199	46	2%	37.98	1.08	0.55	0.47
201							
203	203	1	0%	37.98	0.96	0.43	0.40
205	205	2792	26%	37.98	0.87	0.57	0.45
207							
209	209	842	17%	37.98	1.06	0.46	0.42
211	211	83	46%	37.98	1.01	0.54	0.45
213	213	12	3%	37.98	2.58	0.37	0.46
230	230	1164	12%	37.98	0.67	0.62	0.47
251	251	11	0%	37.98	1.80	0.35	0.41
253	253	559	9%	37.98	1.06	0.46	0.42
255	255	510	27%	37.98	1.14	0.49	0.44
257	257	582	12%	37.98	1.01	0.45	0.41
260	260	1552	43%	37.98	1.08	0.51	0.43
270	270	13	1%	37.98	1.08	0.49	0.43
271							
272							
273	273	1363	44%	37.98	0.82	0.53	0.42
290							
291	291	748	9%	37.98	1.33	0.54	0.47
310	310	720	32%	37.98	0.78	0.87	0.56
311							

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FALL COVER CROPS ON 30 PERCENT OF CROPLAND

Table B-5. Fall Cover Crops on 30 Percent of Cropland Targeting Tool Summary

Progress Summary	Reach 80	Reach 120	Reach 140	Reach 148	Reach 190	Reach 213	Reach 260	Reach 310
Total Cost ($/year)	$1,893,872							
Treated Area (acres)	49869.37							
Percent of Local Cropland	29.8%							
Percent of Shell Rock	30.4%							
Percent of Winnebago	28.0%							
Treated Area above Location (acres)	5580	13891	15041	5864	27586	7869	6391	12355
Percent of Cropland above Location	30.9%	31.0%	32.6%	30.5%	31.5%	30.5%	31.9%	32.9%
TSS Local Load Reduction (t/yr)	2585	2585	2585	2585	2585	2585	2585	2585
TN Local Load Reduction (lb/yr)	1177931	1177931	1177931	1177931	1177931	1177931	1177931	1177931
TP Local Load Reduction (lb/yr)	16681	16681	16681	16681	16681	16681	16681	16681
TSS Local % Reduction Achieved	27%	27%	27%	27%	27%	27%	27%	27%
TN Local % Reduction Achieved	15%	15%	15%	15%	15%	15%	15%	15%
TP Local % Reduction Achieved	12%	12%	12%	12%	12%	12%	12%	12%
Effectiveness (%Red/%Area)	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600
Cost Effectiveness* (/k$/yr)	0.310	0.310	0.310	0.310	0.310	0.310	0.310	0.310
TSS Reach Load Reduction (t/yr)	302	723	604	217	1060	416	230	450
TN Reach Load Reduction (lb/yr)	103178	241680	119231	71159	342506	196464	52914	196635
TP Reach Load Reduction (lb/yr)	1530.8	3722.6	2564.3	1469.5	10493.8	2750.5	726.7	2742.3

TSS Reach % Reduction Achieved	20%	21%	19%	22%	19%	24%	28%	28%
TN Reach % Reduction Achieved	14%	14%	15%	13%	13%	16%	14%	18%
TP Reach % Reduction Achieved	11.7%	11.9%	13.3%	14.4%	10.2%	13.5%	12.9%	15.2%
Effectiveness (%Red/%Area)	0.486	0.506	0.479	0.542	0.444	0.581	0.577	0.619
Cost Effectiveness (lb/k$/yr)	0.235	0.249	0.231	0.267	0.225	0.283	0.326	0.332

Table B-6. Fall Cover Crops on 30 Percent of Cropland SAM Scenario Input by Subwatershed from Targeting Tool

Reach	SAM Reach	SAM Area (Cropland) (acres)	%	SAM Cost ($/acre/year)	SAM Efficiencies TSS	TN	TP
10	10	1514	45%	37.98	0.76	0.46	0.39
12							
13	13	179	46%	37.98	0.79	0.45	0.38
14							
15	15	1715	46%	37.98	0.86	0.44	0.38
17	17	528	50%	37.98	0.91	0.43	0.39
19	19	1190	26%	37.98	0.87	0.46	0.39
21	21	160	15%	37.98	1.30	0.43	0.43
30	30	200	84%	37.98	0.76	0.46	0.39
32							
50	50	32	36%	37.98	0.87	0.49	0.42
70	70	29	88%	37.98	0.73	0.45	0.38
72							
73	73	14	89%	37.98	0.74	0.48	0.40
80	80	19	89%	37.98	0.74	0.38	0.34
81	81	1936	51%	37.98	0.87	0.46	0.41
191							
82							
84	84	172	72%	37.98	0.81	0.50	0.41
85	85	141	89%	37.98	0.74	0.45	0.38
87	87	46	65%	37.98	0.93	0.59	0.47
89	89	513	25%	37.98	1.12	0.42	0.41
91							
93	93	1550	53%	37.98	0.95	0.47	0.41
95	95	1010	26%	37.98	0.88	0.50	0.42
97	97	1955	39%	37.98	0.85	0.49	0.41
99	99	695	42%	37.98	0.86	0.49	0.42
101	101	10	18%	37.98	1.14	0.57	0.49
102	102	283	77%	37.98	0.76	0.48	0.40
120							
140	140	1149	88%	37.98	0.71	0.47	0.39
131	131	546	28%	37.98	0.94	0.47	0.42
133	133	836	16%	37.98	1.34	0.42	0.39
135	135	313	20%	37.98	1.28	0.43	0.38
137	137	184	61%	37.98	1.03	0.41	0.40
139	139	821	65%	37.98	0.73	0.44	0.37
141							
143	143	341	21%	37.98	0.83	0.48	0.40
145	145	1542	28%	37.98	1.02	0.47	0.41
147	147	168	85%	37.98	0.74	0.46	0.38

148	148	1114	89%	37.98	0.72	0.47	0.39
150	150	1830	95%	37.98	0.73	0.44	0.37
151	151	358	7%	37.98	1.00	0.46	0.40
170	170	2562	64%	37.98	0.74	0.51	0.42
171	171	680	9%	37.98	0.85	0.49	0.41
190	190	1252	37%	37.98	0.85	0.56	0.45
192							
194							
195	195	464	92%	37.98	0.73	0.48	0.40
197							
199	199	1124	55%	37.98	0.92	0.47	0.42
201	201	170	33%	37.98	0.76	0.50	0.41
203	203	444	65%	37.98	0.77	0.46	0.39
205	205	4118	38%	37.98	0.85	0.55	0.44
207	207	150	69%	37.98	0.91	0.42	0.37
209	209	1108	23%	37.98	0.98	0.48	0.42
211	211	83	46%	37.98	1.01	0.54	0.45
213	213	208	44%	37.98	0.80	0.46	0.39
230	230	2060	21%	37.98	0.81	0.57	0.45
251	251	447	13%	37.98	0.99	0.43	0.39
253	253	1171	19%	37.98	0.95	0.46	0.40
255	255	832	44%	37.98	0.92	0.48	0.41
257	257	2390	48%	37.98	0.88	0.46	0.40
260	260	1552	43%	37.98	1.08	0.51	0.43
270	270	768	62%	37.98	0.71	0.47	0.39
271							
272							
273	273	2476	79%	37.98	0.80	0.50	0.41
290	290	404	40%	37.98	0.89	0.45	0.40
291	291	1595	20%	37.98	1.21	0.53	0.46
310	310	720	32%	37.98	0.78	0.87	0.56
311							

FALL COVER CROPS ON 50 PERCENT OF CROPLAND AND CONSERVATION TILLAGE ON 30 PERCENT OF CROPLAND

Table B-7. Fall Cover Crops on 50 Percent of Cropland and Conservation Tillage on 30 Percent of Cropland Targeting Tool Summary

Progress Summary	Cover Crop								Tillage							
Reach Number	80	120	140	148	190	213	260	310	80	120	140	148	190	213	260	310
Total Cost ($/year)	$3,177,343								$556,280							
Treated Area (acres)	83665.67								50433.35							
Percent of Local Cropland	49.9%								30.1%							
Percent of Shell Rock	51.7%								31.7%							
Percent of Winnebago	45.1%								25.7%							
Treated Area above Location (acres)	11510	23695	24844	9979	46065	13175	10672	19935	7032	14361	15605	6094	28388	8327	6445	11365
Percent of Cropland above Location	63.7%	52.8%	53.8%	51.9%	52.6%	51.0%	53.3%	53.1%	38.9%	32.0%	33.8%	31.7%	32.4%	32.2%	32.2%	30.3%
TSS Local Load Reduction (t/yr)	4037	4037	4037	4037	4037	4037	4037	4037	928	928	928	928	928	928	928	928
TN Local Load Reduction (lb/yr)	1915087	1915087	1915087	1915087	1915087	1915087	1915087	1915087	470448	470448	470448	470448	470448	470448	470448	470448
TP Local Load Reduction (lb/yr)	27090	27090	27090	27090	27090	27090	27090	27090	17817	17817	17817	17817	17817	17817	17817	17817
TSS Local % Reduction Achieved	42%	42%	42%	42%	42%	42%	42%	42%	16%	16%	16%	16%	16%	16%	16%	16%

TN Local % Reduction Achieved	24%	24%	24%	24%	24%	24%	24%	24%	8%	8%	8%	8%	8%	8%	8%	8%
TP Local % Reduction Achieved	20%	20%	20%	20%	20%	20%	20%	20%	16%	16%	16%	16%	16%	16%	16%	16%
Effectiveness (%Red/%Area)	0.570	0.570	0.570	0.570	0.570	0.570	0.570	0.570	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449
Cost Effectiveness* (/k$/yr)	0.290	0.290	0.290	0.290	0.290	0.290	0.290	0.290	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
TSS Reach Load Reduction (t/yr)	556	1132	919	324	1650	645	345	650	150	289	243	78	403	155	75	133
TN Reach Load Reduction (lb/yr)	211312	407314	194283	119668	558018	313920	85096	290754	53306	100331	49322	28468	138255	79977	20371	68703
TP Reach Load Reduction (lb/yr)	3008.4	6029.0	3617.0	2096.8	13442.2	4373.8	1121.0	3984.0	2093.7	4098.8	2816.6	1594.5	11572.0	3005.3	769.0	2563.7
TSS Reach % Reduction Achieved	36%	33%	29%	33%	30%	37%	42%	40%	15%	12%	11%	12%	10%	14%	16%	14%
TN Reach % Reduction Achieved	28%	24%	24%	22%	21%	25%	23%	26%	10%	8%	8%	7%	6%	9%	7%	8%
TP Reach % Reduction Achieved	23.0%	19.3%	18.8%	20.6%	13.1%	21.5%	19.9%	22.1%	21%	16%	18%	20%	13%	19%	17%	18%
Effectiveness (%Red/%Area)	0.456	0.479	0.442	0.486	0.402	0.547	0.532	0.558	0.393	0.379	0.361	0.403	0.306	0.429	0.415	0.448
Cost Effectiveness (lb/k$/yr)	0.260	0.233	0.207	0.237	0.205	0.262	0.292	0.286	0.714	0.575	0.526	0.583	0.471	0.652	0.702	0.646

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Table B-8. Fall Cover Crops on 50 Percent of Cropland and Conservation Tillage on 30 Percent of Cropland SAM Scenario Input by Subwatershed From Targeting Tool

Reach	SAM Reach	SAM Area (Cropland)		SAM Cost	SAM Efficiencies		
		(acres)	%	($/acre/year)	TSS	TN	TP
10	10	2544	75%	48.01	1.03	0.62	0.76
12	12	1179	45%	37.98	0.81	0.45	0.39
13	13	243	63%	46.77	1.03	0.59	0.71
14							
15	15	3235	87%	44.31	0.91	0.55	0.62
17	17	719	69%	46.75	1.10	0.59	0.72
19	19	2317	51%	44.63	0.99	0.57	0.64
21	21	934	88%	43.73	0.89	0.55	0.60
30	30	200	84%	41.23	0.90	0.51	0.53
32							
50	50	84	94%	46.10	0.96	0.61	0.78
70	70	31	96%	46.10	0.95	0.61	0.77
72							
73	73	16	97%	46.11	0.96	0.63	0.79
80	80	21	97%	46.11	0.96	0.57	0.76
81	81	2370	62%	47.73	1.11	0.63	0.78
191							
82							
84	84	186	78%	46.11	1.05	0.68	0.84
85	85	152	97%	46.11	0.95	0.61	0.77
87	87	50	70%	46.11	1.21	0.76	0.91
89	89	513	25%	46.19	1.42	0.55	0.74
91	91	353	10%	37.98	0.88	0.47	0.41
93	93	1688	58%	45.52	1.16	0.60	0.71
95	95	2382	61%	41.46	0.88	0.54	0.54
97	97	3168	63%	44.23	0.97	0.58	0.65
99	99	1020	62%	43.57	0.95	0.58	0.62
101	101	49	92%	45.07	0.92	0.59	0.66
102	102	283	77%	46.19	0.97	0.63	0.72
120							
140	140	1244	95%	46.11	0.95	0.61	0.76
131	131	1253	63%	43.18	0.98	0.55	0.60
133	133	1959	37%	46.59	1.31	0.55	0.69
135	135	576	36%	42.77	1.27	0.50	0.55
137	137	184	61%	46.59	1.32	0.53	0.73
139	139	1176	93%	45.22	0.87	0.55	0.62
141	141	122	54%	37.98	0.96	0.41	0.37
143	143	1451	90%	40.00	0.78	0.49	0.46

145	145	1956	35%	44.77	1.19	0.57	0.66
147	147	188	96%	45.64	0.89	0.58	0.65
148	148	1205	97%	46.11	0.94	0.61	0.76
150	150	1917	100%	47.28	0.94	0.60	0.76
151	151	987	20%	42.17	1.12	0.53	0.56
170	170	2569	64%	48.54	0.98	0.71	0.84
171	171	4119	52%	38.34	0.84	0.46	0.41
190	190	1800	53%	47.67	1.08	0.71	0.86
192							
194							
195	195	470	93%	48.21	0.96	0.64	0.76
197	197	780	41%	37.98	0.90	0.46	0.41
199	199	1387	67%	47.79	1.13	0.64	0.79
201	201	473	93%	41.69	0.81	0.53	0.53
203	203	636	93%	47.80	0.96	0.62	0.75
205	205	5099	47%	46.33	1.06	0.69	0.78
207	207	150	69%	48.32	1.20	0.61	0.78
209	209	3686	76%	42.36	0.92	0.54	0.57
211	211	91	51%	48.32	1.27	0.75	0.90
213	213	404	85%	48.32	0.94	0.63	0.76
230	230	4491	45%	43.76	0.94	0.65	0.68
251	251	956	27%	43.18	1.04	0.51	0.57
253	253	3076	51%	41.95	0.93	0.52	0.54
255	255	1376	72%	42.38	0.95	0.54	0.57
257	257	3354	68%	45.90	1.05	0.58	0.69
260	260	1927	53%	48.69	1.31	0.67	0.84
270	270	1194	96%	39.68	0.75	0.48	0.44
271							
272							
273	273	2509	80%	47.31	1.01	0.67	0.78
290	290	877	86%	45.90	0.94	0.59	0.68
291	291	3963	50%	41.78	1.08	0.54	0.57
310	310	720	32%	47.43	1.02	1.18	1.08
311							

RESPEC

INCREASE WATER STORAGE BY 10 PERCENT

Table B-9. Increase Water Storage by 10 Percent Targeting Tool Summary

Progress Summary	Reach 80	Reach 120	Reach 140	Reach 148	Reach 190	Reach 213	Reach 260	Reach 310
Total Cost ($/year)	$530,561							
Treated Area (acres)	16768.68							
Percent of Local Cropland	10.0%							
Percent of Shell Rock	10.5%							
Percent of Winnebago	8.7%							
Treated Area above Location (acres)	2825	4723	5102	2049	9183	2713	2103	3860
Percent of Cropland above Location	15.6%	10.5%	11.0%	10.7%	10.5%	10.5%	10.5%	10.3%
TSS Local Load Reduction (t/yr)	771	771	771	771	771	771	771	771
TN Local Load Reduction (lb/yr)	404129	404129	404129	404129	404129	404129	404129	404129
TP Local Load Reduction (lb/yr)	5982	5982	5982	5982	5982	5982	5982	5982
TSS Local % Reduction Achieved	8%	8%	8%	8%	8%	8%	8%	8%
TN Local % Reduction Achieved	5%	5%	5%	5%	5%	5%	5%	5%
TP Local % Reduction Achieved	4%	4%	4%	4%	4%	4%	4%	4%
Effectiveness (%Red/%Area)	0.579	0.579	0.579	0.579	0.579	0.579	0.579	0.579
Cost Effectiveness* (/k$/yr)	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337
TSS Reach Load Reduction (t/yr)	131	217	182	68	318	124	63	120
TN Reach Load Reduction (lb/yr)	54641	85446	41941	26303	114540	66864	17856	60292
TP Reach Load Reduction (lb/yr)	810.1	1303.5	901.1	548.0	2707.5	973.0	245.1	862.0
TSS Reach % Reduction Achieved	9%	6%	6%	7%	6%	7%	8%	7%
TN Reach % Reduction Achieved	7%	5%	5%	5%	4%	5%	5%	5%
TP Reach % Reduction Achieved	6%	4%	5%	5%	3%	5%	4%	5%
Effectiveness (%Red/%Area)	0.467	0.489	0.468	0.535	0.400	0.549	0.537	0.575
Cost Effectiveness (lb/k$/yr)	0.373	0.271	0.254	0.304	0.237	0.308	0.327	0.322

Table B-10. Increase Water Storage by 10 Percent SAM Scenario Input by Subwatershed From Targeting Tool

Reach	SAM Reach	SAM Area (Cropland) (acres)	%	SAM Cost ($/acre/year)	SAM Efficiencies TSS	TN	TP
10	10	551	16%	31.64	0.73	0.47	0.42
12	12	327	12%	31.64	0.77	0.47	0.42
13	13	74	19%	31.64	0.70	0.47	0.42
14							
15	15	699	19%	31.64	0.70	0.47	0.42
17	17	155	15%	31.64	0.79	0.47	0.43
19	19	745	16%	31.64	0.72	0.48	0.42
21	21	202	19%	31.64	0.70	0.47	0.42
30	30	43	18%	31.64	0.73	0.48	0.43
32							
50	50	17	19%	31.64	0.70	0.47	0.42
70	70	6	19%	31.64	0.70	0.47	0.42
72							
73	73	2	12%	31.64	0.70	0.47	0.42
80	80	3	12%	31.64	0.70	0.47	0.42
81	81	295	8%	31.64	0.79	0.49	0.44
191							
82							
84	84	23	10%	31.64	0.77	0.53	0.46
85	85	19	12%	31.64	0.70	0.47	0.42
87	87	6	9%	31.64	0.88	0.57	0.48
89	89	128	6%	31.64	0.80	0.49	0.44
91	91	57	2%	31.64	0.85	0.50	0.45
93	93	313	11%	31.64	0.83	0.51	0.45
95	95	286	7%	31.64	0.77	0.52	0.45
97	97	579	12%	31.64	0.73	0.50	0.44
99	99	138	8%	31.64	0.78	0.50	0.44
101	101	7	13%	31.64	0.77	0.46	0.42
102	102	46	13%	31.64	0.74	0.51	0.44
120							
140	140	379	29%	31.64	0.71	0.48	0.42
131	131	106	5%	31.64	0.85	0.50	0.45
133	133	248	5%	31.64	0.96	0.46	0.43
135	135	39	2%	31.64	1.29	0.49	0.45
137	137	56	19%	31.64	1.04	0.45	0.46
139	139	361	28%	31.64	0.70	0.48	0.42
141	141	38	17%	31.64	0.95	0.45	0.42
143	143	311	19%	31.64	0.74	0.47	0.42
145	145	473	8%	31.64	1.01	0.50	0.46
147	147	51	26%	31.64	0.72	0.47	0.42

148	148	367	29%	31.64	0.70	0.47	0.42
150	150	230	12%	31.64	0.70	0.47	0.42
151	151	408	8%	31.64	0.76	0.50	0.44
170	170	431	11%	31.64	0.71	0.53	0.45
171	171	707	9%	31.64	0.78	0.48	0.43
190	190	256	8%	31.64	0.80	0.55	0.47
192							
194							
195	195	87	17%	31.64	0.70	0.47	0.42
197	197	182	10%	31.64	0.81	0.48	0.44
199	199	258	13%	31.64	0.84	0.49	0.45
201	201	88	17%	31.64	0.70	0.47	0.42
203	203	112	17%	31.64	0.71	0.48	0.42
205	205	1114	10%	31.64	0.78	0.54	0.46
207	207	32	15%	31.64	0.77	0.49	0.43
209	209	747	15%	31.64	0.73	0.49	0.43
211	211	17	9%	31.64	0.93	0.59	0.50
213	213	75	16%	31.64	0.69	0.50	0.44
230	230	1013	10%	31.64	0.74	0.51	0.44
251	251	210	6%	31.64	0.82	0.48	0.43
253	253	552	9%	31.64	0.79	0.48	0.43
255	255	283	15%	31.64	0.74	0.49	0.43
257	257	668	14%	31.64	0.78	0.48	0.43
260	260	389	11%	31.64	0.89	0.51	0.45
270	270	229	19%	31.64	0.70	0.47	0.42
271							
272							
273	273	475	15%	31.64	0.76	0.53	0.46
290	290	141	14%	31.64	0.80	0.50	0.45
291	291	756	10%	31.64	0.92	0.52	0.46
310	310	155	7%	31.64	0.90	0.90	0.63
311							