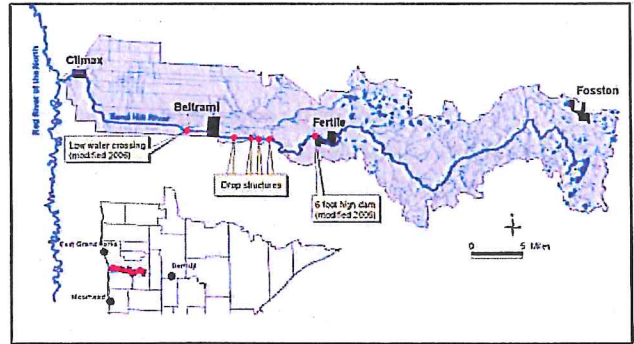
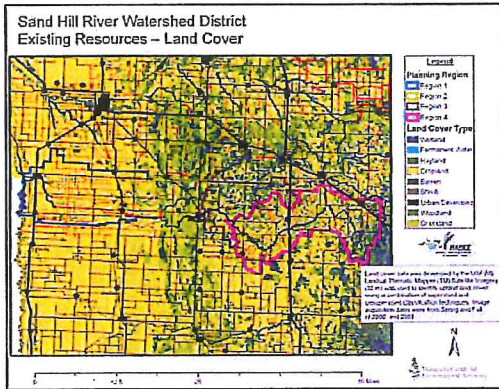


APPENDIX H

SAND HILL RIVER WATERSHED DISTRICT

NATURAL RESOURCE ASSESSMENT

Sand Hill River Watershed District Natural Resource Assessment



*Completed for reference and use in the
Sand Hill River District 10-year Comprehensive Plan*

11/18/2010

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INTRODUCTION

Watershed District plans traditionally have provided a working guide for watershed districts in the Red River basin to implement flood control and drainage projects. The Red River Flood Damage Reduction Mediation Agreement requires consideration and incorporation of natural resource enhancement (NRE) into the next generation of watershed plans. Comprehensive review of existing natural resource plans and assessments of natural resource features in watershed districts are needed to complete these requirements but are not available. The Sand Hill River Watershed District (SHRWD) contracted the Minnesota Center for Environmental Advocacy (MCEA) to provide a natural resource assessment of the watershed district. The following report summarizes this natural resource assessment. The assessment information and maps presented here is for use in development of the 2010 Sand Hill River Watershed District 10-Year Comprehensive Plan.

PURPOSE OF A NATURAL RESOURCE ASSESSMENT

The purpose of a watershed based natural resource assessment is to identify areas in the watershed district with existing and potentially restorable natural resource features and to identify priority areas for conservation and enhancement. During the watershed planning process, the locations of these areas can be used to identify opportunities for combination flood damage reduction and natural resource enhancement projects and may be used help avoid potential future conflicts between flood damage reduction (FDR) and natural resource enhancement (NRE) projects.

Diverse natural resource features on a landscape contribute to the ability of the landscape to provide important functions. For example, relatively undisturbed natural resource areas (woodlands, wetlands, grasslands, brushlands, etc) provide critical habitats for a variety of plants and wildlife communities, reduce peak runoff, help recharge groundwater, help stabilize stream flows, reduce erosion, and improve water quality. Use of these areas for recreation (fishing, hunting, camping, bird watching, etc) has been recognized as an important part of Minnesota's quality of life and increasingly, the economy of rural Minnesota. Over time, these natural resource features have become scarce in some areas of the Red River basin. Assessment of existing features and incorporating their conservation and enhancement into watershed district plans should ensure better management of these important features in the future.

METHODS

Three steps were completed as part of this assessment to identify existing, restorable, and priority natural resources areas in the SHRWD.

Step 1) Gather data and create draft maps of existing and restorable resources. This assessment used GIS data gathered and created by the Minnesota Department of Natural Resources (DNR), SHRWD, Houston Engineering, Natural Resource Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), Counties (Polk, Norman, Mahnomen), and others (Appendix A). The types of data included land cover, soils, sensitive species, existing conservation lands, protected areas, CRP lands, the National Wetlands Inventory, water quality, etc. In this step of the assessment, these data

were used to create a series of working draft maps for the watershed district that illustrate the “existing” and “restorable” resources in the SHRWD. The data and content of maps are described in more detail in step 3.

Step 2) Complete Natural Resource Planning Worksheets

Once working maps of existing and restorable resources were created, technical resource professionals (e.g., SWCD, NRCS, DNR, USFWS, PCA) met to review the information and complete natural resource planning worksheets (Appendix D). The process of completing the worksheets provided a consistent way to encourage discussions and review of existing and restorable natural resource features within the watershed district as a whole and in each planning region. Input from meetings with natural resource professionals was compiled into a final draft of each worksheet after each meeting. The information from the worksheets was also used to develop a set of natural resource goals and objectives for each planning region. The completed worksheets including goals and objectives were distributed for comments and revised as needed.

Step 3) Create final maps of existing, restorable, and priority natural resource areas in the SHRWD.

The final versions of the maps for existing, restorable, and priority resources that are described below were created based working maps and natural resource planning worksheets completed in step 2.

Existing Resources Maps

Existing resources are those features on the landscape that currently provide natural resource functions. These features can be grouped into three general categories: wetland habitats, upland habitats (grassland, brushland, and woodland features), and aquatic habitats (streams and lakes).

Land Cover 2000 and 2001.

Land cover data used in this assessment was developed by the United States Fish and Wildlife Service (USFWS) Habitat and Population Evaluation Team (HAPET). Landsat Thematic Mapper (TM) Satellite Imagery (30 m) was used to identify upland land cover using a combination of supervised and unsupervised classification techniques. Image acquisition dates were from Spring and Fall of 2000 and 2001. Image signatures were put into 15 classes (Open water, wetlands defined by National Wetland Inventory, Riparian Vegetation – Peat Bog, Riparian vegetation – Cattails, Forested – Deciduous, Forested – Evergreen, Forested – Mixed, Introduced Grassland, Native Disturbed Grassland, Native Undisturbed Grassland, Hayland, Cropland, Barren Land, Shrub, and Urban). This data and additional information is available at:

<http://www.fws.gov/midwest/HAPET/StrategicMgmtAndMapping.htm>.

For purposes of this assessment, maps were created with 9 land use categories (Wetland, Permanent Water, Hayland, Cropland, Barren, Shrub, Urban/Developed, Woodland, and Grassland).

Conservation Lands

Conservation lands are public and private lands in the watershed currently dedicated to conservation. These lands include USFWS Waterfowl Production Areas, USFWS Conservation Easement, National Wildlife Refuges, Reinvest In Minnesota (RIM) Easements, The Nature Conservancy (TNC) Lands, Private Conservancy Lands Identified by GAP analysis, Conservation Reserve Program Lands (CRP) from the 1997 contract period, MN DNR Wildlife Management Areas, MN State Parks, and MN DNR Scientific and Natural Areas (SNA). This land information was available in GIS polygon format from the Minnesota Department of Natural Resources. DNR data was supplemented with GIS data on conservation and publicly-managed lands obtained from Counties and The Nature Conservancy.

Watercourses and Lakes

Watercourses include all channels types found in the 24K streams layer and 24K lakes layer from MN DNR. These data originated with the USGS and were digitized from USGS quadrangle maps.

Wetlands

Wetlands include all data available in the National Wetlands Inventory (NWI). The National Wetlands Inventory is a national program from 1981 which was sponsored by the US Fish and Wildlife Service (USFWS).

Percent Grassland and Percent Woodland

The percent grassland and percent woodland data used in this assessment was developed by the United States Fish and Wildlife Service (USFWS) Habitat and Population Evaluation Team (HAPET). Grassland and woodland information in these maps was generated with GIS modeling techniques and represent the percent of landscapes comprised of grassland or woodland within all potential home ranges of nesting mallard hens. A moving window technique was used to calculate the amount of grassland or woodland habitat within 2 miles of each cell. The data for these maps were produced as part of a joint project between the HAPET and the Ducks Unlimited Great Plains Regional Office, Bismarck, North Dakota.

Species of Greatest Conservation Need (SGCN)

The MN DNR recently completed "Minnesota's Comprehensive Wildlife Conservation Strategy" (MN DNR 2006). This planning document identifies species in greatest conservation need (SGCN) throughout Minnesota and also "key habitats". SGCN were identified in a multistep process by MN DNR. SGCN are plant and animal species that are rare, declining, and vulnerable in Minnesota based on population levels or on other factors such as dependence on threatened habitats or other specific threats. The SGCN maps created for this assessment list species occurrences by township that have been reported since 1990.

Key Habitats

The "Minnesota's Comprehensive Wildlife Conservation Strategy" (MN DNR 2006) also identifies "Key Habitats" for SGCN. DNR used several different sources of information to develop key habitats data. Key habitat categories used in

map for the SHRWD assessment were Prairie right-of way (ROW), native plant communities (NPC), shallow lakes, and rivers. Key habitat data for Prairie Right-of-Way (ROW) and Native Plant Communities (NPC) are derived from the Minnesota County Biological Survey (MCBS). Key River Reaches were designated by The Nature Conservancy (TNC) in “The Northern Tallgrass Prairie Ecoregion: A River and Stream Conservation Portfolio”. Existing physical and biological data and professional expertise was used to identify river reaches that were priorities for conservation. Key habitat data for shallow lakes was created by the DNR Shallow Lakes program which works to protect and enhance wildlife habitat on lakes dominated by this shallow water. These data identify shallow lakes (<15ft deep) usually over 50 acres that provide important wildlife habitat.

Crop Productivity Index (CPI)

The Natural Resource Conservation Service SSURGO soils database was used to provide a relative ranking of soils in the watershed district based on their potential for intensive crop production. This indicator is known as the crop productivity index (CPI). Higher numbers indicate higher production potential.

Restorable Resources

Restorable resources are those landscape features that are likely to have the potential for restoration or rehabilitation and may be targeted for restoration or rehabilitation given existing state and federal conservation programs. Restorable resources fall into three general categories in this assessment: wetlands, watercourse buffers, and water quality.

Restorable Wetlands

Three data sources were used to identify and map areas with potential for wetland restoration: the NRCS hydric soils data, the National Wetland Inventory (NWI) “d” modified wetlands, and the USFWS HAPET restorable wetland data and model.

Hydric soils are those soils that formed under conditions of saturation, flooding or ponding long enough to develop anaerobic conditions. For this assessment, hydric soils were categorized within the watershed district in Polk, Norman, and Mahanomen counties where digitized soil survey information was available. The Soil Survey Geographic (SSURGO) database was queried to identify the hydric soils based on established hydric soils list for these counties.

National Wetland Inventory “d” modified wetlands data were identified through query of the “special modifier” field in the NWI database for the designation “d”. A “d” indicates that a wetland area has been partially drained or ditched.

The Restorable Wetlands Inventory (RWI) was conducted for Polk County by the USFWS HAPET office and a diverse set of partners. The RWI delineates a set of polygons as restorable wetlands based on photo-interpretation of historic air photos. RWI data was also used to develop relative ranking of 40 acres parcels for their potential to attract upland nesting waterfowl pairs.

Watercourse buffers

The existing extent of buffer watercourses were estimated for reaches of all watercourses in the SHRWD. Data used to create the buffer priorities for reaches were the National Hydrography Dataset (NHD) high resolution data acquired from the USGS ftp site: <ftp://nhdftp.usgs.gov/SubRegions/> and USFWS HAPET land cover data from 2000 and 2001. In the analysis, the distinct reaches of each watercourse in the SHRWD were given a 100 foot (30 meter) buffer and land use data within the buffer were clipped to each buffered reach and the types of land use within the buffered area of each reach were summarized. Reaches of buffered watercourses with more than 50% of the classified land in cropland, barren land, or urban/developed land were identified and mapped.

Water Quality

Stream reaches with impaired water quality are candidates for restoration/rehabilitation. Some lakes of impaired water quality may also be candidates for restoration. A substantial amount of water quality data is available in the SHRWD. Available water quality data from the MN PCA were used in this natural resource assessment to map the status of impaired waters (303 list) for turbidity, dissolved oxygen, fecal coliform bacteria, and biological impairments indicated by the fish index of biotic integrity (IBI).

Priority Resources

Once existing and restorable natural resources were identified and the natural resource worksheets were completed, final maps were made of "priority" areas for natural resource enhancement in the SHRWD. Priority areas were identified and mapped based on the existing and restorable natural resources analysis, input from the natural resource worksheets, and from USFWS HAPET priority maps as follows.

Wetland and Grassland Habitat Priority Areas

The USFWS HAPET office and MN DNR have recently completed an innovative habitat assessment for the prairie pothole region that includes the entire SHRWD. The goal of this assessment was to identify and prioritize wetland and grassland habitat complexes for conservation. In their analysis, existing models for focal wildlife species (black terns, upland nesting ducks, migrant shorebirds, grassland birds, marbled godwits, and pheasants) were integrated into a final model that identify science-based priority landscapes for wetland and grassland conservation. These results should be used to help guide wetland and grassland conservation efforts in the SHRWD.

Watercourse Buffer and Wildlife Corridor Areas

Contiguous buffers along key natural watercourses in the SHRWD would provide important habitat for a variety of species, provide connectivity among other habitats in the SHRWD, help reduce flood damages, help stabilize watercourse channels, and help improve water quality. The Red River, Sand Hill River, Maple Creek, and Kittleson Creek were identified in the planning worksheets as watercourses that would benefit from buffers. These watercourses were buffered with a 100

foot buffer zone. This buffer zone was then modified to straighten its borders and follow the outside of meander bends of the watercourses. In addition to the 100 foot area, a 200 foot buffer area was also created for the Sand Hill River. The resulting buffer zone should provide a buffer area that will serve multiple benefits. The results of this effort should help guide creation of watercourse buffers along natural watercourses in the SHRWD.

RESULTS

The results of this assessment include a set of maps (described in Appendix B), GIS Data folder contents (Appendix C), natural resource assessment planning worksheets (Appendix D), and recommended goals and objectives for each planning region (Appendix E). These documents are intended for use by the Citizen Advisory Committee and the Technical Advisory Committee (CAC and TAC) and planning consultants to help construct the final fish, wildlife, and outdoor recreation sections of the watershed and sub-watershed portions of the plan.

The following narratives provide an overview of key findings of this assessment of SHRWD natural resources. More specific discussions of issues and opportunities are found in the assessment worksheets for each planning region.

Existing Resources

The SHRWD has relatively diverse existing natural resources for a watershed in the Red River Basin. The existing resource maps show the locations of these resources and the planning worksheets for each region include more detailed descriptions of the key existing resource features.

Planning Region 1

Agriculture dominates the land use and natural upland habitats are very limited in this planning region. Remnant woodlands exist along the Red River and there are some grassland/wetland areas on and adjacent to Wildlife Management Areas (WMA) on the eastern margins of this region. Water resources include the Red River and Sand Hill River. The low gradient highly sinuous aquatic habitats in the Red River support diverse aquatic communities. The most downstream 12 miles of the Sand Hill River channel is relatively sinuous and provides some good aquatic habitat; however, the remaining portions of the Sand Hill River (approximately 18 miles) in this planning region is a straight ditched channel which provide little aquatic habitat and three drop structures in this reach effectively prohibit fish passage into the remaining reaches of the Sand Hill River. Numerous small and large ditches and laterals also exist in this region. Ditches may provide for some aquatic habitat on a seasonal basis.

Planning Region 2

This planning region includes a diverse mix of agricultural lands and conservation oriented lands in public and private ownership. Conservation Reserve Program (CRP) lands are very common and contribute to a high proportion of grassland cover in this planning region. A number of WMAs including Chicog and Maple Meadows include large blocks of wetland and grassland habitat. The Sand Hill River is the dominant aquatic habitat feature although shallow lakes and a variety of wetland basins are present on the WMAs and numerous private conservation lands. Several calcareous fens are located in this region and also some remnant tracts of native prairie.

Planning Region 3

This planning region includes a diverse mix of agricultural land, grasslands, wetlands, woodlands, shallow lakes, and fishing lakes. The existing wetlands and lakes are the most

notable habitats in this planning region. CRP lands are not common. Woodside and Ranum WMAs along with four USFWS waterfowl production areas (WPA) provide wetland and grassland habitats. The area near Union Lake and Lake Sara has the highest density of woodlands in the entire watershed.

Planning Region 4

This planning region includes a diverse mix of agricultural land, grasslands, wetlands, woodlands, and shallow lakes. Agricultural land use is more common in this planning region than in region 2. CRP lands are not as common in this planning region as in Region 2 with a notable concentration of CRP along the Sand Hill River. The Sand Hill River is the dominant aquatic habitat and includes numerous riparian wetland areas. Numerous small streams and ditches are tributary to the river in this region. These small streams and ditches may provide for some aquatic habitat on a seasonal basis.

Restorable Resources

There are many opportunities to restore and/or rehabilitate wetlands and watercourse buffers in the SHRWD and to improve water quality. The restorable resource maps show the locations of these opportunities and the planning worksheets for each region include additional comments on specific restoration/rehabilitation opportunities.

Planning Region 1

Restorable resources areas to note in planning region 1 include:

- The corridor of woodland habitat along the Red River.
- The channelized reaches of the Sand Hill River along with a wooded corridor.
- Channelized reaches of Kittleson Creek and Maple Creek.
- Buffers of perennial vegetation along the ditches in this region would provide limited habitat but could help stabilize channels and improve water quality.
- Few opportunities to restore wetlands exist in this region of the SHRWD beyond riparian wetlands in river and stream corridors.

Planning Region 2

Restorable resources areas to note in planning region 2 include:

- Numerous drained wetlands have restoration potential in this beach ridge area of the Sand Hill watershed district. In particular there is a partially drained wetland basin in Section 14 of Liberty township and similar wetlands along County ditch 65 in and adjacent to Maple Meadows WMA.
- Riparian wetlands, straightened reaches of channel, and the corridors along Kittleson Creek and Maple Creek have restoration or rehabilitation potential.
- Numerous wetlands that have been drained or filled.

Planning Region 3

Restorable resources areas to note in planning region 3 include:

- The shorelands of many lakes have been altered by development. There is potential to implement shoreland restoration and rehabilitation efforts on many lakeshore areas.
- The Sand Hill River corridor.

- Numerous wetlands that have been drained or filled.

Planning Region 4

Restorable resources areas to note in planning region 2 include:

- The Sand Hill river corridor.
- Channelized reaches of tributaries to the Sand Hill River.

Priority Resources

Priority resources were identified based on a review of existing and restorable resource data and discussions related to development of final planning region worksheets.

Wetland and Grassland Conservation Priority Areas

One priority area for wetland and grassland conservation and protection was identified in the SHRWD (Figure 1). This area includes almost all of planning region 2 and the northern portions of Region 3. SHRWD natural resource goals, objectives, and future project planning should consider the opportunities to conserve, build upon, and enhance the wetland and grassland complexes in this area.

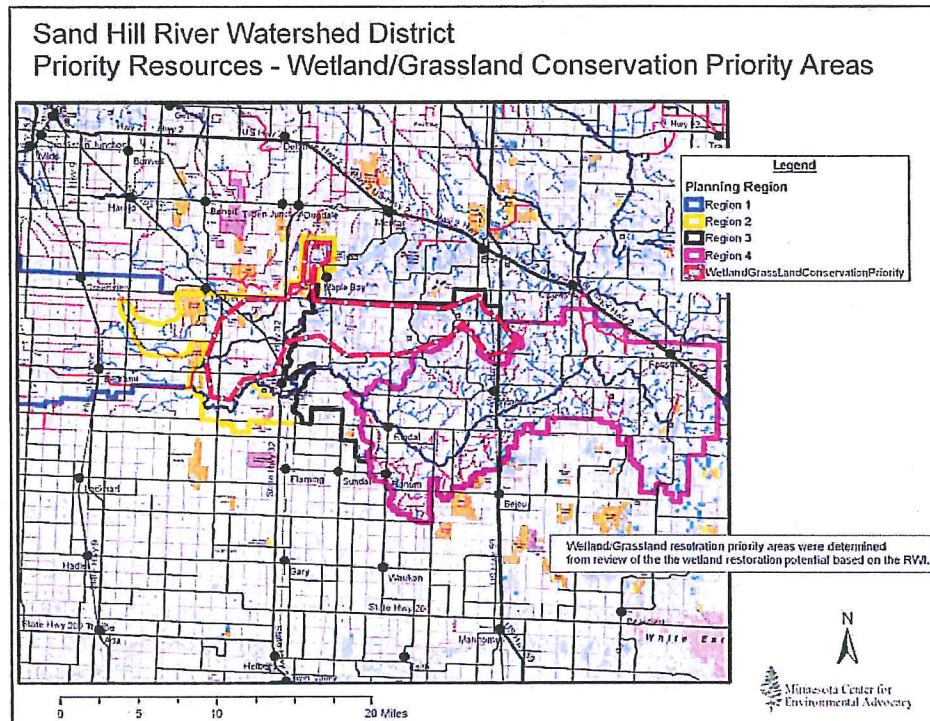


Figure 1. Sand Hill River watershed district wetland and grassland conservation priority areas.

Wetland and Grassland Restoration Priority Areas

Two priority areas for wetland and grassland restoration were identified in the SHRWD. One priority area is located generally around the northern border between planning region 3 and 4. The other priority area is located in the eastern most portion of planning region 4. SHRWD natural resource goals, objectives, and future project planning should consider the opportunities to restore wetlands and store

additional water in these regions to expand and enhance the wetland and grassland complexes in this area.

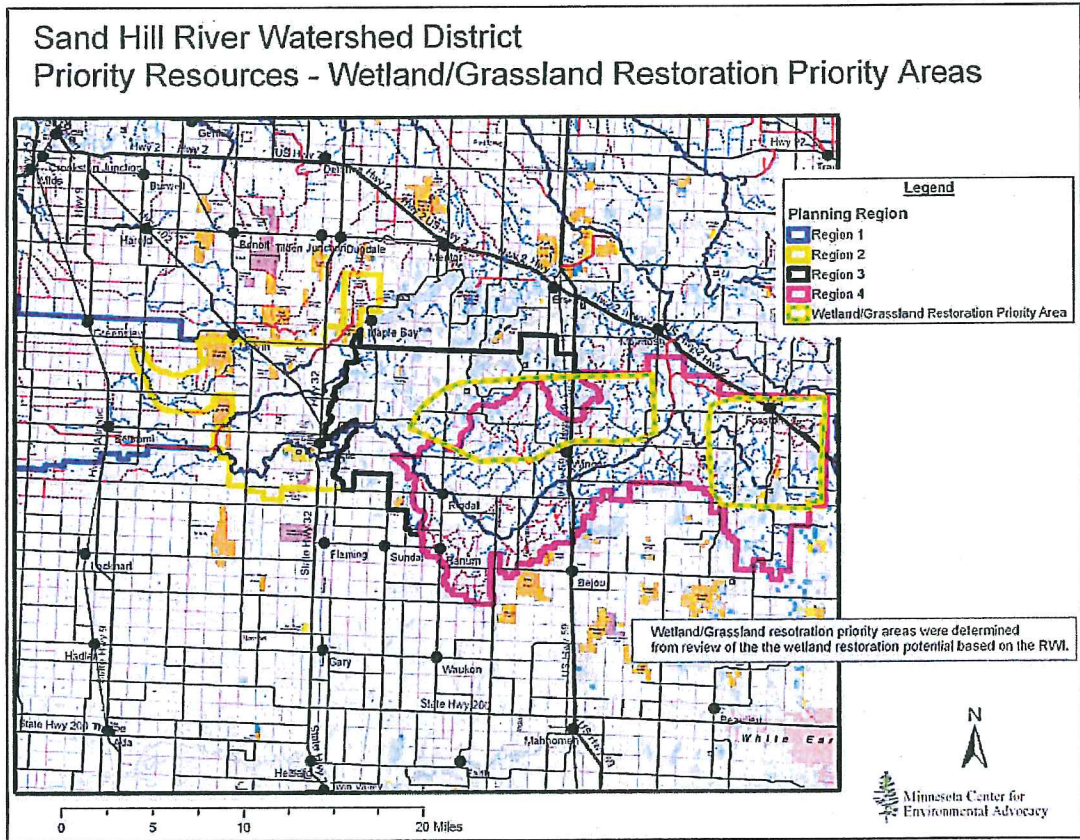


Figure 2. Sand Hill River watershed district wetland and grassland restoration priority areas.

Watercourse Buffer and Wildlife Corridor Areas

Buffer areas composed of perennial vegetation along watercourses provide multiple natural resources and flood damage reduction benefits. Natural resource benefits include helping improve water quality, promoting watercourse stability, and providing fish and wildlife habitat. They reduce flood damage by changing land use and potentially keeping buildings and other structures from areas that are most frequently flooded. In this assessment three priority watercourses and numerous reaches of ditches were identified that currently lack a modest sized buffer area of 100 feet on each side of the watercourse (Figure 3, 4, 5).

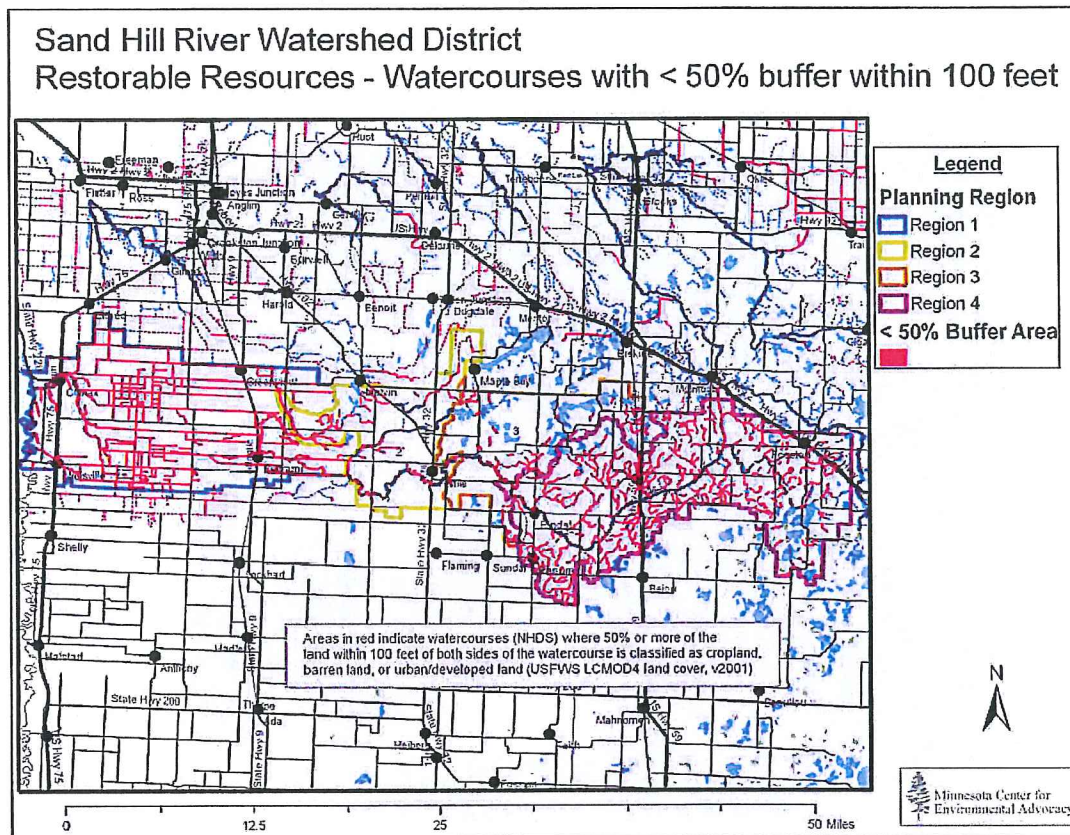


Figure 3. Areas along watercourses in the Sand Hill River watershed district where 50% or more of the land within 100 feet of the channel is classified as cropland, barren land, or urban/developed land.

Sand Hill River Watershed District
Priority Resources - Buffer Area Example for Sand Hill River.

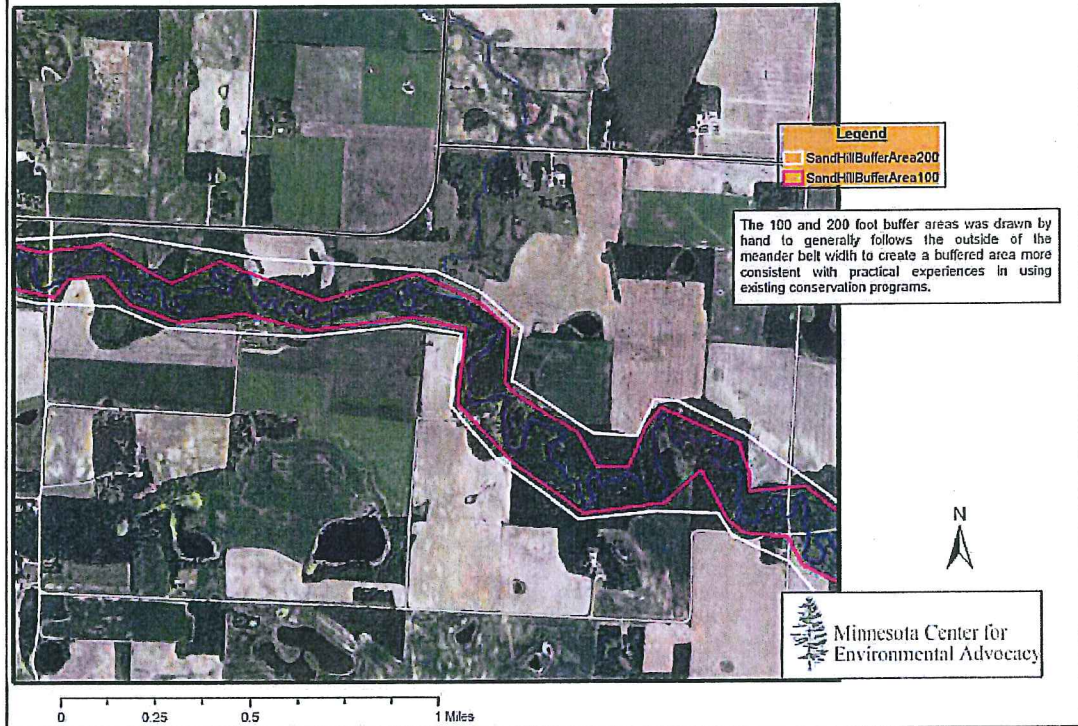


Figure 4. Example of the land use within 100 and 200 foot buffer areas along the Sand Hill River.

Sand Hill River Watershed District
Priority Resources - Buffer Area Example for Maple Creek

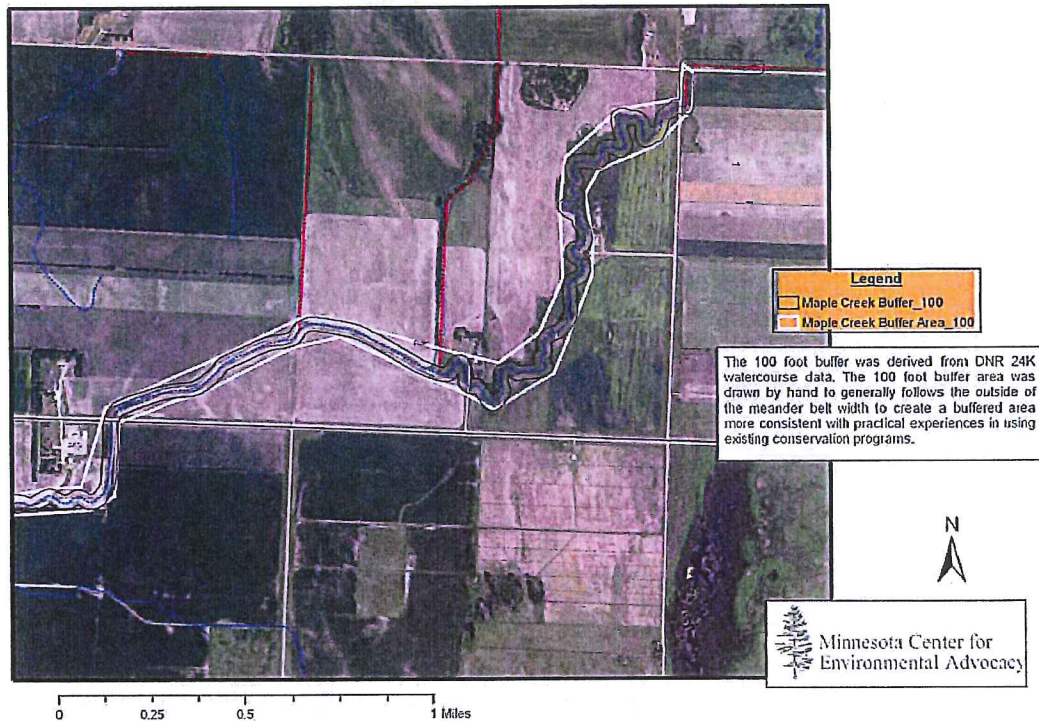


Figure 5. Example of the land use within a 100 foot buffer area created along Maple Creek.

SHRWD natural resource goals, objectives, and future project planning should consider the opportunities to better buffer watercourses in these identified areas. Specifically, four priority areas were identified to establish and/or conserve buffers in the SHRWD. SHRWD natural resource goals, objectives, and future project planning should consider the opportunities to enhance natural resources and water quality in these areas:

- 1) Sand Hill River
- 2) Maple Creek
- 3) Kittleson Creek
- 4) Public drainage systems

Changing land use in these areas to perennial vegetation including working hayland and pasture will result in some loss of existing farmland (Table 1); however, more than 50% of the lands in these buffer areas are not prime farmland (Table 2).

Table 1. Summary of the amount of land cover types found within buffer areas developed for three watercourses in the Sand Hill River Watershed District.

Base Buffer Width (ft)	Sand Hill River		Sand Hill River		Maple Creek		Kittleson Creek	
	200		100		100		100	
Land Cover Category	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)
Cropland	2071	34%	1126	28%	205	53%	53	13%
Forested wetland	5	<1%	3					
Grassland	666	11%	377	9%	79	20%	160	39%
Hayland	93	2%	57	1%	53	14%	10	3%
Permanent wetland	181	3%	117	3%			64	16%
Riverine	383	6%	352	9%	43	11%	38	9%
Seasonal wetland	1146	19%	796	20%			10	2%
Semi-permanent wetland	204	3%	144	4%			4	1%
Shrub	82	1%	62	2%				
Temporary wetland	116	2%	27	1%	5	1%	52	13%
Unknown	4	<1%	1	<1%				
Urban-Developed	346	6%	245	6%				
Woodland	861	14%	683	17%	1	<1%	17	4%
Total	6,159		3,990		385		408	

Table 2. Summary of the amount of farmland types found within buffer areas developed for three watercourses in the Sand Hill River watershed district (NRCS farmland classification based on SSURGO soils).

Base Buffer Width (ft)	Sand Hill River		Sand Hill River		Maple Creek		Kittleson Creek	
	200		100		100		100	
Farmland Classification	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)
Prime farmland	725	12%	325	8%	78	19%	18	5%
Farmland of statewide importance	316	5%	161	4%	28	7%	40	10%
Not prime farmland	4,154	68%	3,097	78%		0%	288	70%
Prime farmland if drained	879	14%	404	10%	298	74%	54	13%
Water	3	0%	2	0%		0%	9	2%
Total	6,077	100%	3,988	100%	404	100%	409	100%

Appendix A.

GIS data used for NR assessment in the Sand Hill River Watershed District.

Data Layer	Original Data Source	MCEA	Houston eng.	DNR, USFWS or DU
Watershed & planning subwatershed boundaries	MNDNR cover modified by SHRWD		x	
National Wetland Inventory and "d" modified wetlands	United States Fish and Wildlife Service (USFWS) through MN DNR data Deli and Houston Engineering		x	x
Key habitats – NPC, Shallow lakes, river reaches, and GAP	2006 MN DNR data. Data and information available at: http://www.dnr.state.mn.us/cwcs/index.html			x
Conservation Lands (state wildlife management areas, state scientific and natural areas, USFWS waterfowl production areas, USFWS conservation easements, National wildlife refuges, The Nature Conservancy lands, Reinvest in Minnesota easements)	All data available at MN DNR data deli.			x
Hydric Soil and Prime farmland soils	SSURGO soils data from Natural Resources Conservation Service. Data queries performed with Soil Data Viewer 5.1	x		
Restorable wetlands	USFWS Habitat and Population EvaluationTeam (HAPET)			x
Grassland bird conservation areas	USFWS Habitat and Population EvaluationTeam (HAPET)			x
Priority areas for wetland and grassland conservation	USFWS Habitat and Population EvaluationTeam (HAPET)			x
Channels and ditches	revised MNDNR cover (USGS quad watercourses)			x
Water quality impairments	State threatened and impaired waters (303) list and 305b report to Congress; 1998 – 2006 data reported.	x		
Watercourse buffer assessment	Based on the National Hydrography Dataset (NHD) and USFWS land cover data	x		x
Watercourse buffer areas	Based on MN DNR 24K data	x		x
FEMA 100 year flood plain	Federal Emergency Management Administration		x	

Appendix B

Natural Resource Planning Maps and Summary Data.

Numerous Natural Resources related maps and summary data tables were produced during this assessment. A list of maps and tables are provided below. The CD that contains this document also contains JPEG and PDF files of these maps. Data summary tables are also provided as described below.

Watershed District Area and Planning Region Maps*

Existing Resources

- Land Cover
- Conservation Lands
- Lakes and Watercourses
- National Wetlands Inventory (NWI) Wetlands
- Crop Productivity Index (CPI)
- Percent Grass
- Percent Wooded
- Key Habitats
- Species of Greatest Conservation Need (SGCN) Occurrence

Restorable Resources

- Drained Wetlands
- Restorable Wetlands
- Hydric Soils
- Wetland Restoration Potential
- Stream buffer assessment

Priority Natural Resource Areas

- Wetland/Grassland Conservation Priority Areas
- Wetland/Grassland Restoration Priority Areas
- Stream Buffer/Corridor Priority Areas

* All map categories were created for the entire SHRWD and most were also made for each planning region. In some planning regions, maps were not created for some categories because they were not applicable to the region.

Appendix C: GIS Data folder contents.

The NR Assessment DVD contains low and high resolution jpeg images of all maps and summary tables produced for this NR assessment.

Maps

The CD contain a folder titled “Maps”. Within this folder there are four subfolders. One for each planning subwatershed with 2 and 3 combined and one for the entire watershed. All maps are found within these folders in both JPEG and PDF format. All files were exported at 300 dpi.

Files on the CD use a common naming system. The name is divided into two parts. The first part of the name indicates the mapped area as follows:

- Watershed - Entire SHRWD
- Reg1 - Planning Region 1
- Reg23 – Planning Region 2 and 3
- Reg4 – Planning Region 4

The second part of the name indicates the content of the file as follows:

- Conservation – Conservation Lands
- CPI – Crop Productivity Index
- DWetland – NWI wetland data with “d” modified wetlands highlighted.
- LandCover - Land Use Land Cover from Ducks Unlimited/USFWS data.
- KeyHabitats – Key Habitats
- PercentGrass – Percent Grass
- PercentWood – Percent Woodland
- RestWetlands – Restorable wetland layer based from USFWS.
- SGCN – SGCN occurrence
- Watercourses – Stream layer from DNR 24K stream layer.
- Buffers – Watercourses with less than 50% perennial vegetation within a 100’ buffer.
- Wetlands – NWI wetland data.
- WetGrassPriority – Wetland/Grassland Priority areas from USFWS
- WQDO – Water quality dissolved oxygen
- WetGrassRestorationPriority – Wetland/Grassland restoration priority areas
- WetGrassConservationPriority - Wetland/Grassland conservation priority areas
- WatercourseBufferPriority – Watercourse buffer priority areas

Appendix C
ArcView GIS project

The DVD that contains this report also has a GIS data folder with key data layers used in this assessment to identify priority buffer and wetland/grassland conservation areas.

Appendix D

Natural Resource Planning Worksheets

<u>Subwatershed</u>	<u>Page</u>
Planning Region 1	D-2
Planning Region 2	D-5
Planning Region 3	D-7
Planning Region 4	D-9

NR Planning Worksheet WD Subwatersheds

This worksheet was be used to help prompt discussion about natural resources in each subwatershed in the watershed district. The worksheet was completed during a meeting with natural resource professional that work in the planning region.

Subwatershed Name: Sand Hill WD Planning Region 1

1) What important/significant natural resource features exist in this subwatershed? (list and describe wetland, upland, grassland, woodland, riverine, etc. habitats)

The landscape within planning region 1 is dominated by private lands in agricultural production. The Red River and Sand Hill River are the most prominent and important natural resource features in this planning region. The eastern border of this planning region extends into the base of the beach ridge area and the western portions of Liberty WMA and Chicog WMA (Melvin slough). Conservation reserve program (CRP) lands are not common with only a few blocks of CRP found in the eastern portion of this planning region and some CRP along a few of the watercourses in the region. Some small private woodlands are found along the Red River, near Beltrami in abandoned natural channel areas, and along the Sand Hill river.

2) What factors limit the productivity and quality of these natural resource features? (e.g., lack of prescribed burning, needs to be larger, extended low flows, etc.)

- Limiting factors for the Red River include a flashy hydrograph, high sediment loads, and the lack of a contiguous riparian buffer which is wide enough to provide substantive wildlife habitat.
- Limiting factors for the Sand Hill River are flashy flows, extended periods of low flow, high sediment loads, and a lack of a contiguous riparian buffer which is wide enough to provide substantive wildlife habitat. In addition, the channelized reach of the Sand Hill River provides only low quality fish habitat compared to a natural channel and the drop structures are barriers to fish passage.
- Grassland, wetland, and woodland habitats and the animal communities that depend on them are limited by the overall lack of quantity and quality of these habitats in this planning region.

3) What unique resource features are located in this subwatershed? (fens, trout streams).

- Sand Hill River.
- Some side hill seep areas on eastern border of this planning region.

4) Where are there opportunities to make larger blocks of habitat?

- Building larger blocks of habitat is possible on the eastern border of this planning region adjacent to Liberty WMA (sections 17, 19, 20) and Chicog

WMA. Use of conservation programs such as CRP and WRP would build larger blocks of habitat in these areas.

- Building larger blocks of habitat are also possible along the Red River corridor in the western portion of this planning region.

5) Where are there opportunities to connect existing quality habitats?

- Additional habitat connections could be made between the Liberty WMA and the CRP lands between the WMA and Beltrami. These include areas along Kittleson Creek and the Sand Hill River.

6) Where are there opportunities to rehabilitate streams and other waterways?

- Modify or remove fish barriers on the Sand Hill River.
- Rehabilitate the channelized reach of the Sand Hill River.
- Rehabilitate the channelized reach of Kittleson Creek downstream of Liberty WMA.
- Installing functional buffers and drainage system best management practices (e.g side inlets) along natural and artificial watercourses would help stabilize these channels, reduce sedimentation, and improve water quality.

7) Where are the known areas in this subwatershed where wildlife concentrate (e.g. deer wintering, waterfowl/shorebird migration)

- Flooded fields provide waterfowl and shorebird habitat during spring migration.
- Deer and other wildlife concentrate in wooded areas along the Sand Hill and Red rivers.

8) What areas in this subwatershed have notable wind and/or water erosion problems?

- There is an area of channel erosion near City of Climax on Sand Hill River where trail system crosses.
- Wind erosion is a potential concern throughout the central and western portions of this planning region.

9) CRP and WRP may provide important NR features in this watershed. If so, where are the acres from the most recent sign-up concentrated? Where are the areas where large amounts of CRP may return to production in the next ten years?

- CRP is a small component of this planning region. Some loss of CRP is expected. Continuous sign-up CRP is a good program for all watercourses in this planning region.

10) List specific action items to create, rehabilitate, or generally improve the natural resources in this subwatershed.

- Modify barriers to fish passage.
 - Buffer strips along watercourses. Side inlets. Ag. BMP's. Wind breaks.
- More natural areas on eastern fringe of this planning region.

11) Where are there project opportunities for flood damage reduction projects in this subwatershed?

- On and off-channel water storage areas may be present on tributary watercourses to the Sand Hill River in the eastern portions of this planning region at the base of the beach ridge area.

12) Please list/provide references for the NR's in this subwatershed (cty water plans, WMA plans, etc.)

- Polk County Water Plan.
- DNR Fisheries Management Plan for Sand Hill River.
- Sand Hill River Watershed District Fish Passage Master Plan
- Red River fisheries management plan.
- Minnesota state conservation and preservation plan.
- Tomorrow's Habitat for the Wild And Rare: An Action Plan for Minnesota Wildlife

NR Planning Worksheet WD Subwatersheds

This worksheet was used to help prompt discussion about natural resources in each subwatershed in the watershed district. The worksheet was completed during a meeting with natural resource professional that work in the planning region.

Subwatershed Name: Sand Hill WD Region 2

1) What important/significant natural resource features exist in this subwatershed? (list and describe wetland, upland, grassland, woodland, riverine, etc. habitats)

The landscape within planning region 2 is diverse mix of private lands in agricultural production, private lands in the conservation reserve program (CRP), and public conservation lands. Public conservation lands include Liberty WMA and Chicog WMA (Melvin slough) in the western portion; Onstad WMA and Maple Meadows WMA in the northern portion, Agassiz Dunes SNA and adjacent lands acquired by the Nature Conservancy, and the lands along the Sand Hill River that are part of the Agassiz Environmental Learning Center near Fertile. These lands include tracts of native prairie, restored prairie, diverse wetlands, and riparian woodlands. The Sand Hill River is also an important natural resource feature in this planning region. Conservation reserve program (CRP) lands are common throughout this planning region. Some small private woodlands are found along the Sand Hill River, Maple Creek, and Kittleson Creek.

2) What factors limit the productivity and quality of these natural resource features? (e.g., lack of prescribed burning, needs to be larger, extended low flows, etc.)

- Limiting factors for the Sand Hill River are flashy flows, extended periods of low flow, high sediment loads, and a lack of a contiguous riparian buffer which is wide enough to provide substantive wildlife habitat. In addition, the downstream drop structures are barriers to fish passage to this reach of river.
- Limiting factors on public and private conservation lands like WMAs and CRP lands are a lack of active vegetation management needed establish and maintain diverse vegetation communities.

3) What unique resource features are located in this subwatershed? (fens, trout streams).

- Sand Hill River.
- Kittleson Creek is a perennial stream.
- Several state listed calcareous fens are located within this planning region.
- Small tracts of native prairie, including a small piece of native prairie along Hwy 102 in section 27 of Onstad township.

4) Where are there opportunities to make larger blocks of habitat?

- This planning region has many large blocks of wetland and grassland habitat and is identified as a high priority area for grassland and wetland conservation by the DNR and USFWS. Existing blocks of habitat could be enlarged throughout the planning region by additional enrollment in conservation programs.

5) Where are there opportunities to connect existing quality habitats?

- There are many opportunities to connect existing conservation lands between tracts of land in CRP and between CRP land and public conservation lands.
- The Sand Hill River corridor and the patches of woodlands along Kittleson Creek could be a large contiguous block of habitat. Channel stability and water quality would benefit from a wide contiguous buffer area of wetlands, grasslands, and woodlands.

6) Where are there opportunities to rehabilitate streams and other waterways?

- The channelized reaches of Kittleson Creek could be rehabilitated.
- Modify or remove fish barriers downstream on the Sand Hill River.
- Installing functional buffers and drainage system best management practices (e.g side inlets) along natural and artificial watercourses would help stabilize these channels, reduce sedimentation, and improve water quality.

7) Where are the known areas in this subwatershed where wildlife concentrate (e.g. deer wintering, waterfowl/shorebird migration)

- Deer populations are relatively high throughout this planning region.
- Prairie chickens, sharptail grouse, and other obligate prairie birds depend upon the wetland and grasslands in this planning region.

8) What areas in this subwatershed have notable wind and/or water erosion problems?

- Channel bank erosion on watercourses prior to entering Chicog WMA.
- Wind and water erosion is potential concern (see HEL map). A lack of buffers along watercourses contributes to erosion potential.

9) CRP and WRP may provide important NR features in this watershed. If so, where are the acres from the most recent sign-up concentrated? Where are the areas where large amounts of CRP may return to production in the next ten years? CRP is common in this planning region. Some loss of CRP is expected but not as much in other regions. CCRP is also good program for this planning region on eastern margins.

10) List specific action items to create, rehabilitate, or generally improve the natural resources in this subwatershed.

- Modify barriers.
- Buffer strips along watercourses.
- Side inlets.
- Implement agricultural BMP throughout the planning region to reduce wind and water erosion.
- Preserve small woodlots.

11) Where are there project opportunities for flood damage reduction projects in this subwatershed?

- There are few apparent opportunities for FDR projects in this planning region.

12) Please list/provide references for the NR's in this subwatershed (cty water plans, WMA plans, etc.)

- Polk County Water Plan.
- DNR fisheries management plan for the Sand Hill River.
- Minnesota state conservation and preservation plan.
- Tomorrow's Habitat for the Wild And Rare: An Action Plan for Minnesota Wildlife

NR Planning Worksheet WD Subwatersheds

This worksheet was be used to help prompt discussion about natural resources in each subwatershed in the watershed district. The worksheet was completed during a meeting with natural resource professional that work in the planning region.

Subwatershed Name: Sand Hill WD Region 3

1) What important/significant natural resource features exist in this subwatershed? (list and describe wetland, upland, grassland, woodland, riverine, etc. habitats)

- The landscape within planning region 3 is diverse mix of private lands in agricultural production, shallow wildlife lakes and wetlands, fishing lakes, and some public and private conservation lands. Public conservation lands include Woodside WMA, Ranum WMA, and several USFWS waterfowl production areas. These lands include tracts of native prairie, restored prairie, diverse wetlands, and riparian woodlands. A few miles of the Sand Hill River meanders through this planning region. Conservation reserve program (CRP) lands are not common in this planning region compared to region 2. Some small private woodlands are found along the Sand Hill River. Union Lake and Lake Sarah are the significant fishing lakes in this planning region.

2) What factors limit the productivity and quality of these natural resource features? (e.g., lack of prescribed burning, needs to be larger, extended low flows, etc.)

- Limiting factors for the Sand Hill River are flashy flows, extended periods of low flow, high sediment loads, and a lack of a contiguous riparian buffer which is wide enough to provide substantive wildlife habitat. In addition, the drop structures are barriers to fish passage.
- Development pressures on shallow lakes. Do not fall into shoreland rules.
- Aquatic invasive species.
- Intensive grazing in some areas along the Sand Hill River may limit the quality of riparian habitat.
- Limiting factors on public and private conservation lands like WMAs and CRP lands are a lack of active vegetation management needed establish and maintain diverse vegetation communities.

3) What unique resource features are located in this subwatershed? (fens, trout streams).

- Union Lake and Lake Sarah and the numerous shallow lakes are unique natural resource features in this planning region.

4) Where are there opportunities to make larger blocks of habitat?

- The northern portion of this planning region is in a high priority area for wetland and grassland conservation which suggests that the existing habitat blocks could be enlarged in this area.

- 5) Where are there opportunities to connect existing quality habitats?**
- There are a few opportunities to connect existing conservation lands between tracts of land in CRP and between CRP land and public conservation lands in the northern portions of this planning region.
 - The Sand Hill River corridor could be a large contiguous block of habitat. River channel stability and water quality would benefit from a wide contiguous buffer area of wetlands, grasslands, and woodlands.
- 6) Where are there opportunities to rehabilitate streams and other waterways?**
- Active shoreland vegetation management on lakeshores would help improve water quality and habitat.
 - Installing functional buffers and drainage system best management practices (e.g side inlets) along natural and artificial watercourses would help stabilize these channels, reduce sedimentation, and improve water quality.
- 7) Where are the known areas in this subwatershed where wildlife concentrate (e.g. deer wintering, waterfowl/shorebird migration)**
- Deer populations are relatively high in this planning region.
 - Occasional prairie chickens, sharptails, and obligate prairie birds,
- 8) What areas in this subwatershed have notable wind and/or water erosion problems?**
- Shoreland erosion issues on many lakes.
 - Wind erosion is potential concern see HEL map.
 - A lack of buffers along watercourses contributes to erosion potential.
- 9) CRP and WRP may provide important NR features in this watershed. If so, where are the acres from the most recent sign-up concentrated? Where are the areas where large amounts of CRP may return to production in the next ten years?**
- CRP is not common in this planning region. Some loss of CRP is expected but not as much in other regions. CCRP is a good program for this planning region on eastern margins.
- 10) List specific action items to create, rehabilitate, or generally improve the natural resources in this subwatershed.**
- Modify downstream barriers on the Sand Hill River for fish passage.
 - Wind and water erosion is potential concern (see HEL map). A lack of buffers along watercourses contributes to erosion potential.
 - Preserve small woodlots. This area is part of Hardwood Hills Ecoregion.

11) Where are there project opportunities for flood damage reduction projects in this subwatershed?

- No potential FDR projects were identified in this region.

12) Please list/provide references for the NR's in this subwatershed (cty water plans, WMA plans, etc.)

- Polk County water plan.
- DNR fisheries management plan for the Sand Hill River.
- DNR fisheries lake management plans for Union Lake and Lake Sarah.
- Lake Improvement District Plan for Lake Union/Sarah.
- Minnesota state conservation and preservation plan.
- Tomorrow's Habitat for the Wild And Rare: An Action Plan for Minnesota Wildlife.

NR Planning Worksheet WD Subwatersheds

This worksheet was be used to help prompt discussion about natural resources in each subwatershed in the watershed district. The worksheet was completed during a meeting with natural resource professional that work in the planning region.

Subwatershed Name: Sand Hill WD Region 4

1) What important/significant natural resource features exist in this subwatershed? (list and describe wetland, upland, grassland, woodland, riverine, etc. habitats)

- The landscape within planning region 4 is diverse mix of private lands in agricultural production, some shallow wildlife lakes and wetlands, Sand Hill Lake, and some public and private conservation lands. Public conservation lands are concentrated in the eastern portion of this planning region including Rosebud WMA, Hasselton WMA, Hovland WMA, LaVoi WMA, Kroenig WMA, Caster WMA, and several USFWS waterfowl production areas. Public lands in the western half of the planning region include Rindahl, a few acres of Bejou WMA, and several USFWS waterfowl production areas. These lands include tracts of native prairie, restored prairie, and a diversity of wetlands. The Sand Hill River originates in this planning region and upper reaches of the Sand Hill River is a ditch through this planning region. Numerous ditches and small streams are tributaries to the river in this planning region. Conservation reserve program (CRP) lands are not common in this planning region with a few parcel scattered throughout the region and a concentration of CRP lands along the Sand Hill River in Mahnommen County and near some of the public lands near Sand Hill lake. Some small private woodlands are found along the Sand Hill River but most of the river corridor is now in grasslands, especially in the reach that is a ditch.

2) What factors limit the productivity and quality of these natural resource features? (e.g., lack of prescribed burning, needs to be larger, extended low flows, etc.)

- Limiting factors for the Sand Hill River are flashy flows, extended periods of low flow, high sediment loads, and a lack of a contiguous riparian buffer which is wide enough to provide substantive wildlife habitat. Channelization of the ditched reach of the river offers low quality habitat. In addition, the downstream drop structures are barriers to fish passage to this reach of river.
- Sand Hill Lake water quality is a concern given development trends in the lake's watershed.
- Intensive grazing on the Sand Hill River, Garden Slough, and other tributary waters contribute to water quality and habitat degradation.
- Fish in some shallow lakes and wetlands limits their productivity for waterfowl and other wetland dependent animal species.

- Limiting factors on public and private conservation lands like WMAs and CRP lands are a lack of active vegetation management needed establish and maintain diverse vegetation communities.

3) What unique resource features are located in this subwatershed? (fens, trout streams).

- Sand Hill Lake.
- Numerous public wildlife areas in the eastern portion of the planning region.

4) Where are there opportunities to make larger blocks of habitat?

- The Sand Hill River corridor could be a large contiguous block of habitat. River stability and water quality would benefit from a wide contiguous buffer area of wetlands, grasslands, and woodlands.
- The areas northeast of Winger and around Sand Hill Lake are high priority areas for wetland and grassland conservation. Existing blocks of habitat in these areas could be enlarged by additional enrollment in conservation programs.

5) Where are there opportunities to connect existing quality habitats?

- The addition of grasslands and wetland habitat throughout this planning region would connect high priority wetland and grassland conservation areas to the north in the Red Lake watershed district to those high priority areas found to the south in the Wild Rice watershed district.
- The Sand Hill River corridor could be a large contiguous block of habitat. River channel stability and water quality would benefit from a wide contiguous buffer area of wetlands, grasslands, and woodlands.

6) Where are there opportunities to rehabilitate streams and other waterways?

- Channelized reaches of the Sand Hill River and its tributaries could be rehabilitated.
- Active shoreland vegetation management on lakeshores would help improve water quality and habitat.

7) Where are the known areas in this subwatershed where wildlife concentrate (e.g. deer wintering, waterfowl/shorebird migration)

- Deer populations are high in this planning region.
- Prairie chickens and sharptail grouse are present.
- Shallow lakes and wetlands provide important migratory habitat for ducks and other waterfowl.
- Wetland/grassland complexes provide important nesting habitat for waterfowl and other animal species.

8) What areas in this subwatershed have notable wind and/or water erosion problems?

- Shoreland erosion issues are present on many lakes.
- Wind erosion is potential concern (see HEL map).
- Sheet and rill erosion is an issue and exacerbated by rolling soy bean fields. A lack of buffers along most watercourses contributes to erosion potential.

9) CRP and WRP may provide important NR features in this watershed. If so, where are the acres from the most recent sign-up concentrated? Where are the areas where large amounts of CRP may return to production in the next ten years?

- CRP is not common in this planning region. Some loss of CRP is expected but not as much in other regions. CCRP is a good program for this planning region given the number of tributary watercourses to the Sand Hill River and the shallow lakes and wetlands.

10) List specific action items to create, rehabilitate, or generally improve the natural resources in this subwatershed.

- Buffer strips along watercourses. Side inlets. Ag. BMP's. Preserve small woodlots. Part of Hardwood Hills Ecoregion.
- Grazing management plans. Intensive grazing.
- Modify barriers.

11) Where are there project opportunities for flood damage reduction projects in this subwatershed?

- There may be flood damage reduction project opportunities along or next to many of the tributaries watercourse to the Sand Hill River (e.g., the Mac Meadows area)
- Numerous water and sediment basin opportunities exist on the tributaries to the Sand Hill River.

12) Please list/provide references for the NR's in this subwatershed (cty water plans, WMA plans, etc.)

- Polk County Water Plan.
- DNR fisheries management plan for the Sand Hill River.
- DNR fisheries management plan for Sand Hill Lake.
- Minnesota state conservation and preservation plan.
- Tomorrow's Habitat for the Wild And Rare: An Action Plan for Minnesota Wildlife.

Appendix E

Natural Resource Goals and Objectives for the SHRWD

Planning Region 1	E-2
Planning Region 2	E-3
Planning Region 3	E-4
Planning Region 4	E-5

Note that an Alternative structure for NR goals section within subwatershed plans is:

1. Improve fish habitat
 - Restore hydrology
 - Reduce erosion
2. Improve wildlife habitat
 - Corridor
 - Grasslands
 - Wetlands
 - Other- Impoundments
3. Historic/Unique features
4. Recreation
 - Wildlife viewing/birding
 - Hunting
 - Education

Sand Hill Watershed District Planning Region 1 Natural Resource Goals and Objectives

1. Improve existing hydrologic conditions in watercourses.
 - Implement activities that promote stream hydrology that is more consistent with a “natural” hydrograph.
 - Reduce flood peaks
 - Reduce flashiness of flows following run-off events
 - Extend the period of time it takes to get to base flow conditions after spring runoff events (extend receding limb of hydrograph).
 - Reduce number of no flow days.
2. Re-establish a functional wooded habitat corridor along the Red River.
 - Connect and widen existing woodland habitats along the Red River. Create a contiguous corridor along the river that will cover at least the meander belt width of the river.
3. Implement the Sand Hill River Watershed District Fish Passage Master Plan.
 - Modify the four drop structures to allow fish passage during a normal range of flows.
4. Rehabilitate the Sand Hill River and its corridor.
 - Rehabilitate the channelized portion of the Sand Hill River into a more natural meandering channel with a natural riparian corridor.
5. Reduce erosion and resulting sedimentation in watercourses.
 - Implement agricultural and drainage BMP’s along all drainage systems and promote land use changes (e.g., side inlets, buffer and grassed waterways, residue management, no active farming in road right-of-ways, etc.).
 - Create a contiguous corridor along the Sand Hill River that will cover at least the meander belt width of the river.
6. Protect and enhance grassland, wetland, and woodland habitats.
 - Maintain/increase CRP base and other private conservation lands throughout the planning region.
 - Actively manage vegetation on public and private conservation lands.
7. Create impoundments for spring and fall migratory bird habitat.
8. Protect existing shoreland habitats.
 - Support county and state shoreland regulations that conserve existing shoreland resources.
9. Improve water quality
 - Reduce sedimentation and erosion in watercourses and uplands.
 - Reduce wind erosion.

Sand Hill Watershed District Planning Region 2 Natural Resource Goals and Objectives

1. Improve existing hydrologic conditions in watercourses.
 - Implement activities that promote stream hydrology that is more consistent with a “natural” hydrograph.
 - Reduce flood peaks
 - Reduce flashiness of flows following run-off events
 - Extend the period of time it takes to get to base flow conditions after spring runoff events (extend receding limb of hydrograph).
 - Reduce number of no flow days.
2. Maintain a functional wooded habitat corridor along the Sand Hill River.
 - Widen existing woodland habitats along the Sand Hill River to maintain a contiguous corridor along the river that will cover at least the meander belt width of the river.
3. Rehabilitate straightened reaches and maintain a functional corridor along Kittleson Creek and Maple Creek.
4. Implement the Sand Hill River Watershed District Fish Passage Master Plan.
 - Modify the four drop structures to allow fish passage during a normal range of flows.
5. Reduce erosion and resulting sedimentation in watercourses.
 - Implement agricultural and drainage BMP’s along all drainage systems and promote land use changes (e.g., side inlets, buffer and grassed waterways, residue management, no active farming in road right-of-ways, etc.).
 - Promote and encourage installation of sediment basins and prioritization of areas for conservation programs.
6. Protect and enhance grassland, wetland, and woodland habitats.
 - Maintain/increase CRP base and other private conservation lands throughout the planning region.
 - Actively manage vegetation on public and private conservation lands.
7. Create impoundments for spring and fall migratory bird habitat.
8. Protect existing shoreland habitats.
 - Support county and state shoreland regulations that conserve existing shoreland resources.
 - Support shoreland restoration programs.
9. Improve water quality
 - Reduce sedimentation and erosion in watercourses and uplands.
 - Reduce wind erosion.

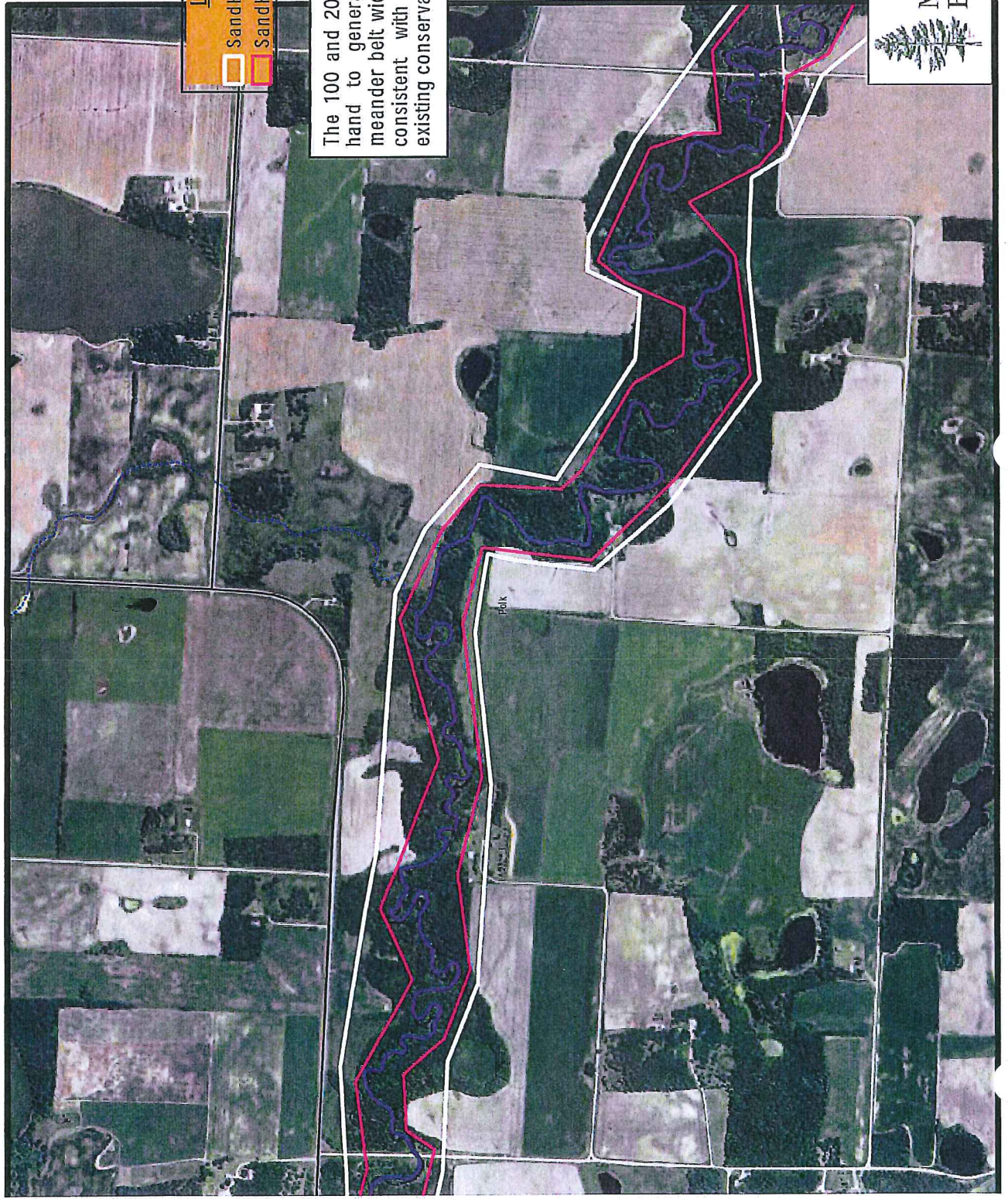
Sand Hill Watershed District Planning Region 3 Natural Resource Goals and Objectives

1. Improve existing hydrologic conditions in watercourses.
 - Implement activities that promote stream hydrology that is more consistent with a “natural” hydrograph.
 - Reduce flood peaks
 - Reduce flashiness of flows following run-off events
 - Extend the period of time it takes to get to base flow conditions after spring runoff events (extend receding limb of hydrograph).
 - Reduce number of no flow days.
2. Maintain a functional wooded habitat corridor along the Sand Hill River.
 - Widen existing woodland habitats along the Sand Hill River to maintain a contiguous corridor along the river that will cover at least the meander belt width of the river.
3. Implement the Sand Hill River Watershed District Fish Passage Master Plan.
 - Modify the four drop structures to allow fish passage during a normal range of flows.
4. Reduce erosion and resulting sedimentation in watercourses.
 - Implement agricultural and drainage BMP’s along all drainage systems and promote land use changes (e.g., side inlets, buffer and grassed waterways, residue management, no active farming in road right-of-ways, etc.).
 - Promote and encourage installation of sediment basins and prioritization of areas for conservation programs.
5. Protect and enhance grassland, wetland, and woodland habitats.
 - Maintain/increase CRP base and other private conservation lands throughout the planning region.
 - Actively manage vegetation on public and private conservation lands.
6. Protect and rehabilitate shoreland habitats.
 - Support county and state shoreland regulations that conserve existing shoreland resources.
 - Support activities that promote restoration and maintenance of natural shoreland vegetation.
7. Improve water quality
 - Reduce sedimentation and erosion in watercourses and uplands.
 - Reduce wind erosion.
 - Develop individual lake management plans to protect water quality of shallow lakes.

Sand Hill Watershed District Planning Region 4 Natural Resource Goals and Objectives

1. Improve existing hydrologic conditions in watercourses.
 - Implement activities that promote stream hydrology that is more consistent with a “natural” hydrograph.
 - Reduce flood peaks
 - Reduce flashiness of flows following run-off events
 - Extend the period of time it takes to get to base flow conditions after spring runoff events (extend receding limb of hydrograph).
 - Reduce number of no flow days.
2. Maintain a functional wooded habitat corridor along the Sand Hill River.
 - Widen existing woodland habitats along the Sand Hill River to maintain a contiguous corridor along the river that will cover at least the meander belt width of the river.
3. Implement the Sand Hill River Watershed District Fish Passage Master Plan.
 - Modify the four drop structures to allow fish passage during a normal range of flows.
4. Reduce erosion and resulting sedimentation in watercourses.
 - Implement agricultural and drainage BMP’s along all drainage systems and promote land use changes (e.g., side inlets, buffer and grassed waterways, residue management, no active farming in road right-of-ways, etc.).
 - Promote and encourage installation of sediment basins and prioritization of areas for conservation programs.
5. Protect and enhance grassland, wetland, and woodland habitats.
 - Maintain/increase CRP base and other private conservation lands throughout the planning region.
 - Actively manage vegetation on public and private conservation lands.
6. Create multipurpose projects along Sand Hill River tributaries that reduce flood damages and enhance natural resources.
 - Develop and build two multipurpose projects in this planning region.
7. Protect existing shoreland habitats.
 - Support county and state shoreland regulations that conserve existing shoreland resources.
 - Support activities that promote restoration and maintenance of natural shoreland vegetation.
8. Improve water quality
 - Reduce sedimentation and erosion in watercourses and uplands.
 - Reduce wind erosion.
 - Develop individual lake management plans to protect water quality of shallow lakes.

Sand Hill River Watershed District Priority Resources - Buffer Area Example for Sand Hill River.



Sand Hill River Watershed District Priority Resources - Buffer Area Example for Maple Creek

