Demand for Drainage

Requirements for Drainage

For subsurface drainage systems to be successful, the following conditions should exist (SCS 1984, DNR 1991)

Groundwater Movement

Information on the elevation and movement of groundwater is essential for the design and operation of an effective agricultural drainage system.

Sufficient Soil Permeability

Soils must be permeable enough to allow the required movement of water through the soils toward the ditch. Soils vary in their ability to move water to a drain.

Drainage is Influenced by the Landscape

Topography and the geomorphology of an area greatly influence the drainage system.

Suitable Outlet

Subsurface drainage systems must have a suitable outlet available, either by gravity flow or by pumping.

The outlet must have the capacity to remove surface and subsurface water from its drainage area in sufficient time to prevent crop damage

Location: The location of the outlet is of primary importance in the operation of interceptor ditches

Adequate Outlet

The outlet must be adequate for the quantity and quality of the outflow to be conveyed.

Adequacy: Fields may discharge by gravity into natural or artificial ditches. Any of these are suitable provided they are deep enough and of sufficient capacity to carry the drainage water from their entire drainage system.

Channel Capacity

Cross-Sectional Volume: The outlet ditch must have the capacity to remove the drainage runoff from its watershed in a period of time sufficient to prevent crop damage.

Channel Depth

The ditch must be deep enough so that there is at least one foot clearance between the bottom of the root zone and soil water flow line and the normal low water stage in the ditch.

Channel Grade

In the fine sands of Anoka County, minimum grades should produce a velocity of at least 1.4 feet per second whenever

possible.

Flow Rate The drainage system should conduct flow without causing excessive erosion (≤ 3 ft per second)

Drainage Capacity

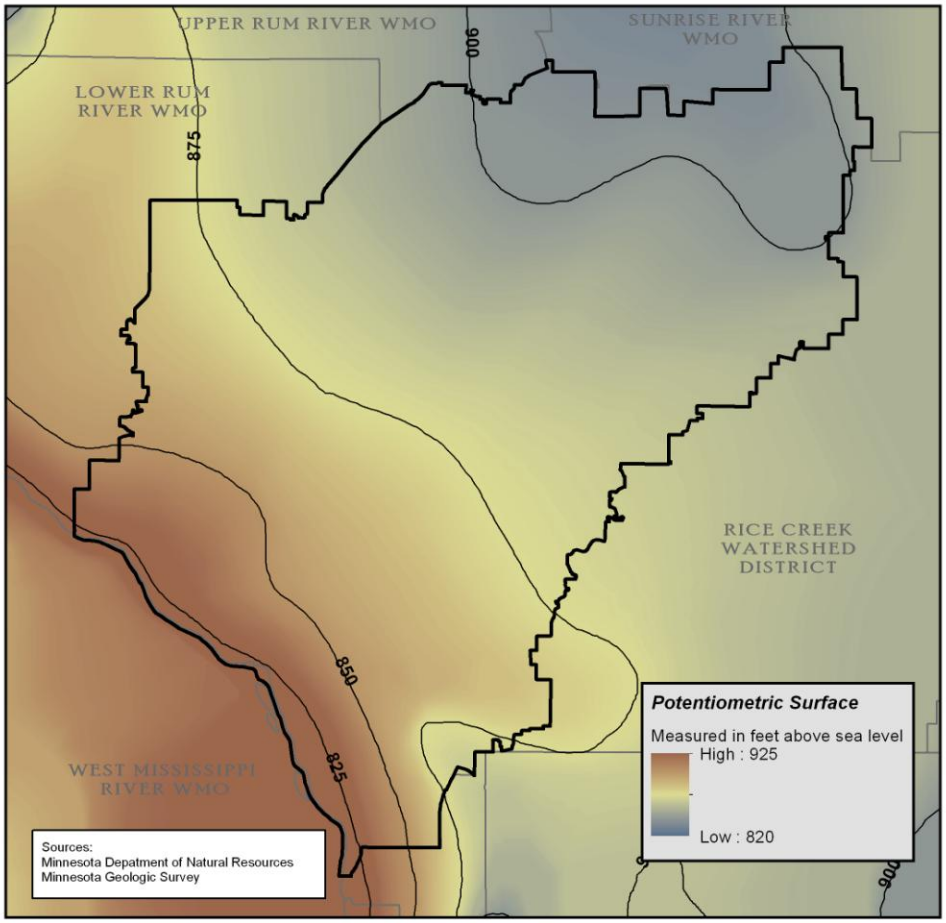
Subsurface drainage is used to control high water table conditions in areas where the benefits of lowering such water tables justify installation costs.

The drainage and conveyance system of the watershed was originally designed and constructed between 1889 and 1918 for one purpose:

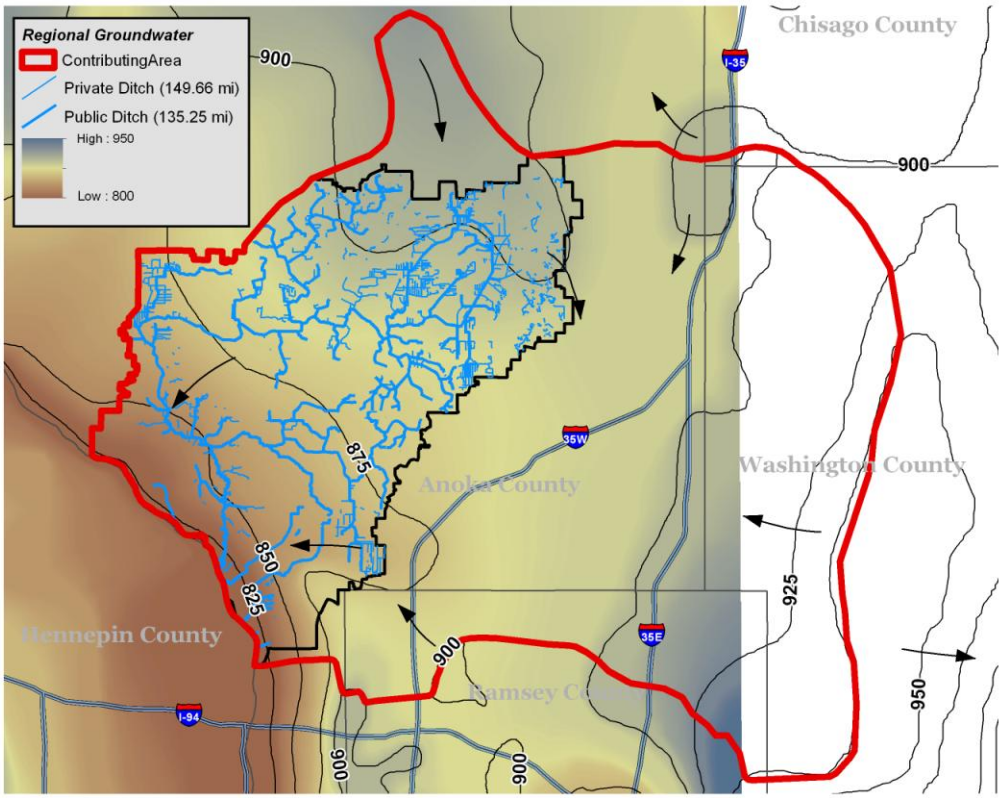
'to move water'

The service expected from drainage is the removal of water from the root zone of sod or root crops within 24 hours, after which the plants begin to experience stress and thereby decreasing quality and/or yields

Surficial Groundwater Elevation and Movement



Source of Shallow Groundwater



Ditch	Suitable Outlet	Adequacy (Drainage Density)	Slope	Hydric Soil (ac)	Level of Function (%)
11	10	4	11		25
17			1		1
20	10	1	3		14
23	10	8	1		19
37	7	2	3		12
39	7	7	5		19
41	4	10	6		20
44	4	12	11		27
52					0
54	1	11	11		23
57	1	3	10		14
58	4	5	7		16
59	1	6	7		14
60	7	9	7		23
LCC					0
Springbrook					0

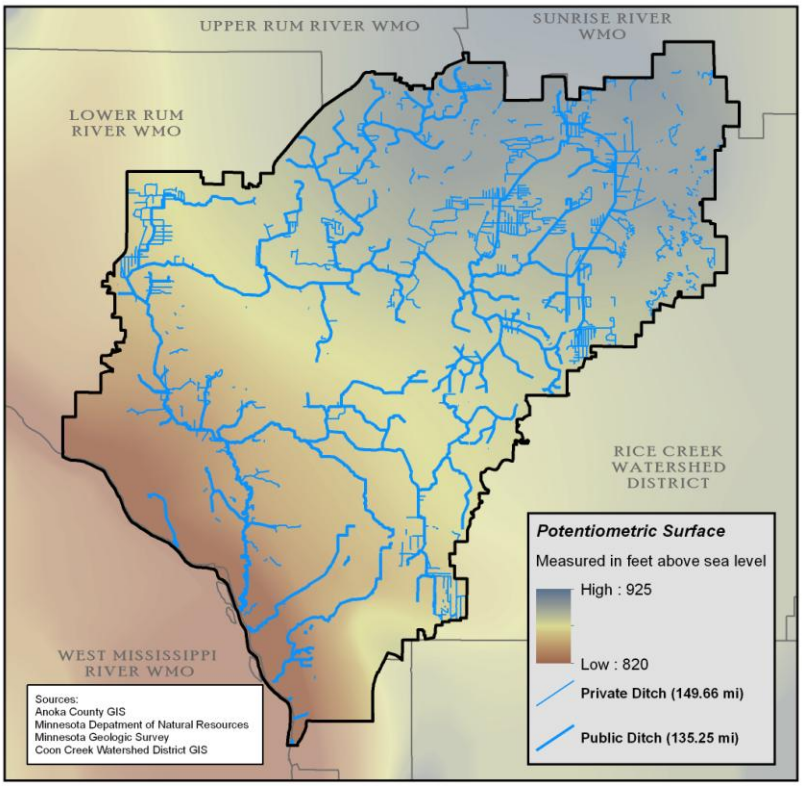
	Land Type Association		
	River Terrace	**Lake Hugo**	**Lake Fridley**
Pct of HSG Soils			
A	79%	88%	75%
B	7%	11%	25%
C	7%	0%	0%
D	7%	1%	0%
Percent Slope	1.4%	0.9%	0.7%

Current Distribution of Public and Private Drainage

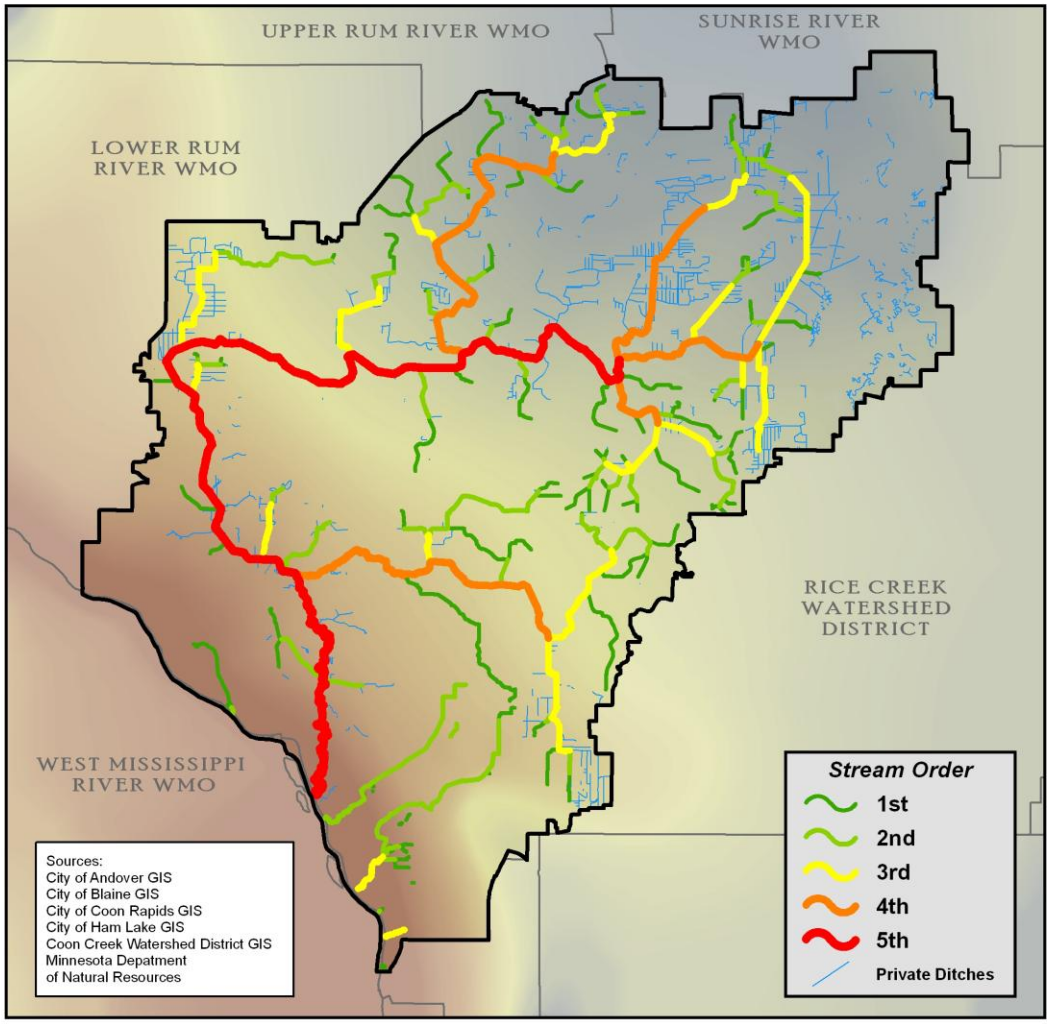
An assessment of how well an area is draining relative to the biogeochemical processes that support a service and an area's service capacity.

The level of service (provision of a beneficial uses, specific benefits and services) reflects the level and type of biogeochemical functions and any other off-site characteristics that either limit or enhance the ability to provide the chosen service. It is in essence a product of the level of function and the service capacity

Drainage system



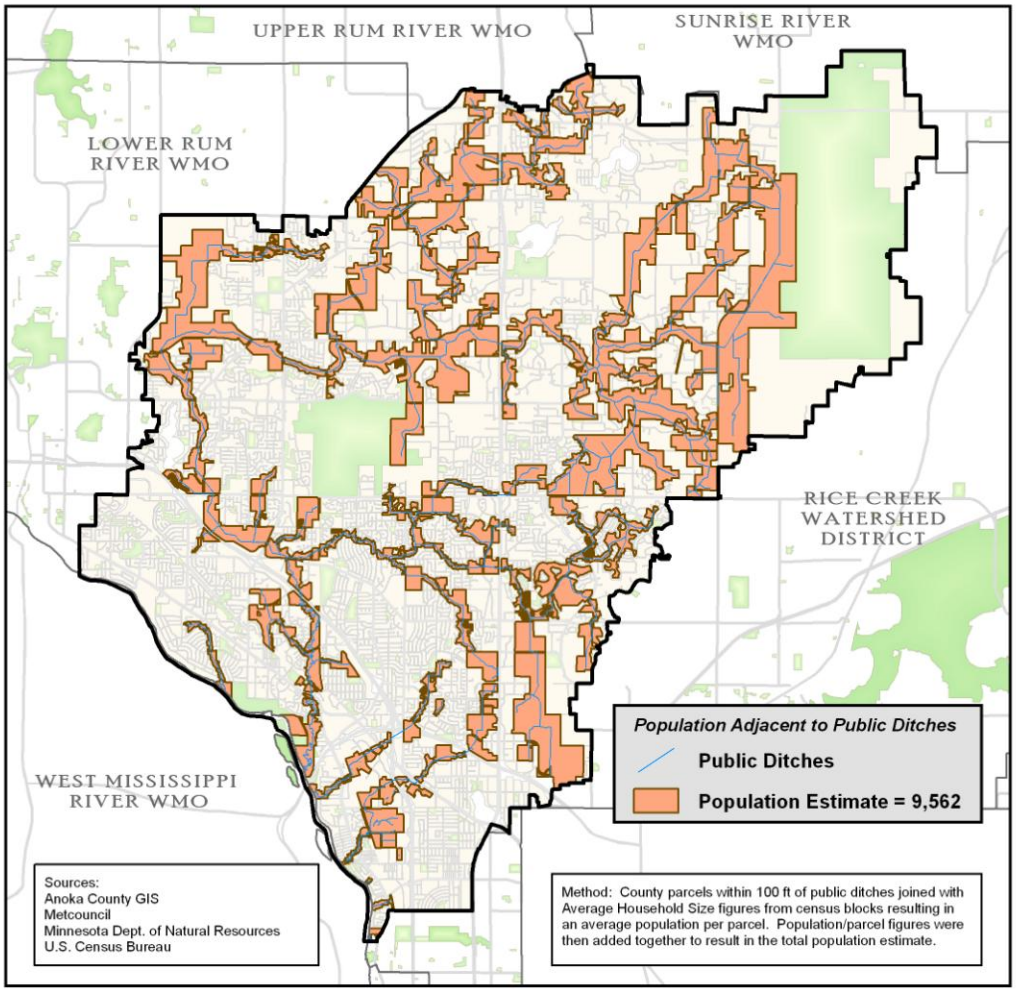
Ditch	Public (ft)	Private tributaries estimate (ft)
11	28,212	122,097
17	26,672	10,265
20	16,125	12,931
23	9,882	2,888
37	22,001	56,245
39	17,232	0
41	96,804	55,048
44	77,438	165,973
52	10,432	340
54	27,000	36,245
57	64,286	31,777
58	98,203	63,389
59	108,491	58,493
60	29,724	4,929
Lower Coon Creek	28,349	15,344
Oak Glen Creek	1,832	
Pleasure Creek	20,949	
Riverview Creek	8,249	
Stoneybrook Creek	422	
Tronson Creek	6,840	4,310
Woodcrest Creek	3,149	5,344
SUM FT:	702,054	645,618
Private Non-tributary Est.:		157,024
Total Feet:	702,054	802,642
TOTAL MILES:	133	152


UPPER RUM RIVER WMO
SUNRISE RIVER WMO
LOWER RUM RIVER WMO
RICE CREEK WATERSHED DISTRICT
WEST MISSISSIPPI RIVER WMO
Sources:
City of Andover GIS
City of Blaine GIS
City of Coon Rapids GIS
City of Ham Lake GIS
Coon Creek Watershed District GIS
Minnesota Depatment of Natural Resources
Stream Order
1st
2nd
3rd
4th
5th
Private Ditches

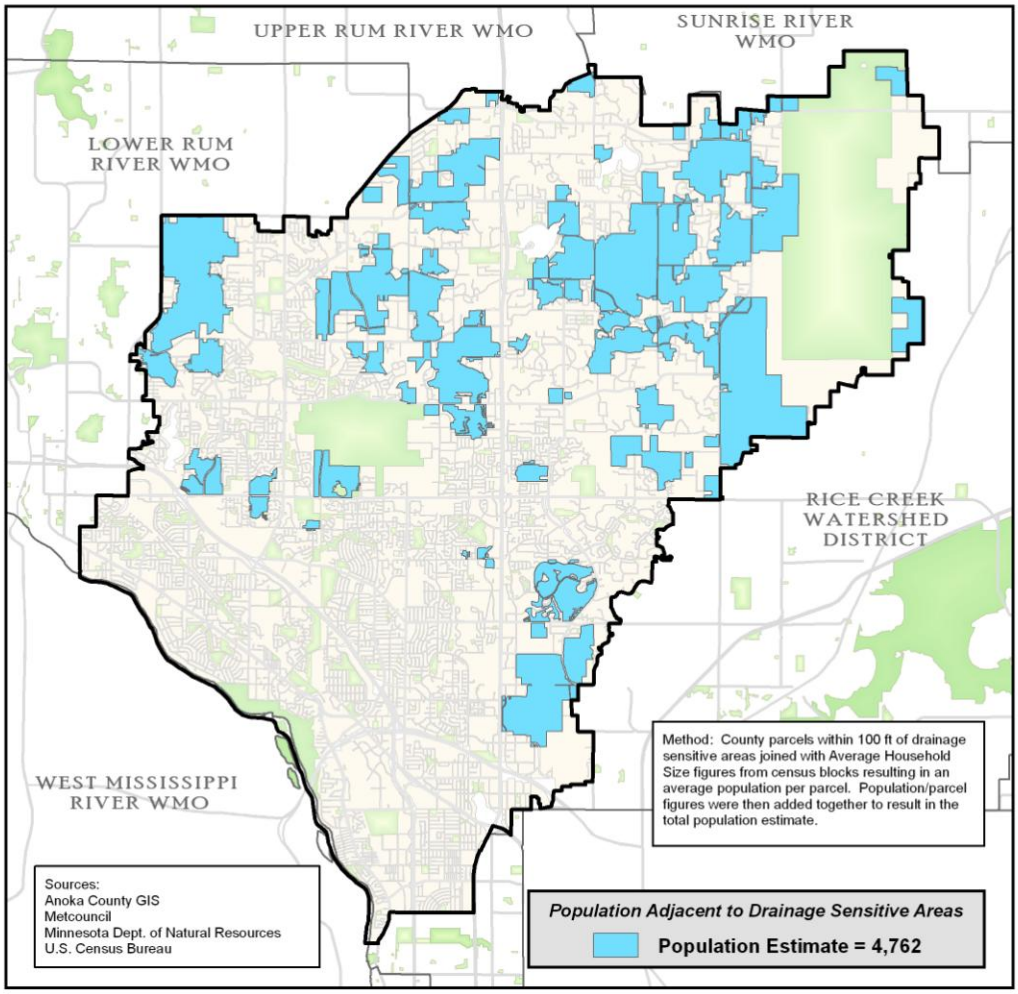
Value of Drainage

The aggregate demand for drainage within the Coon Creek Watershed is a function of the following.

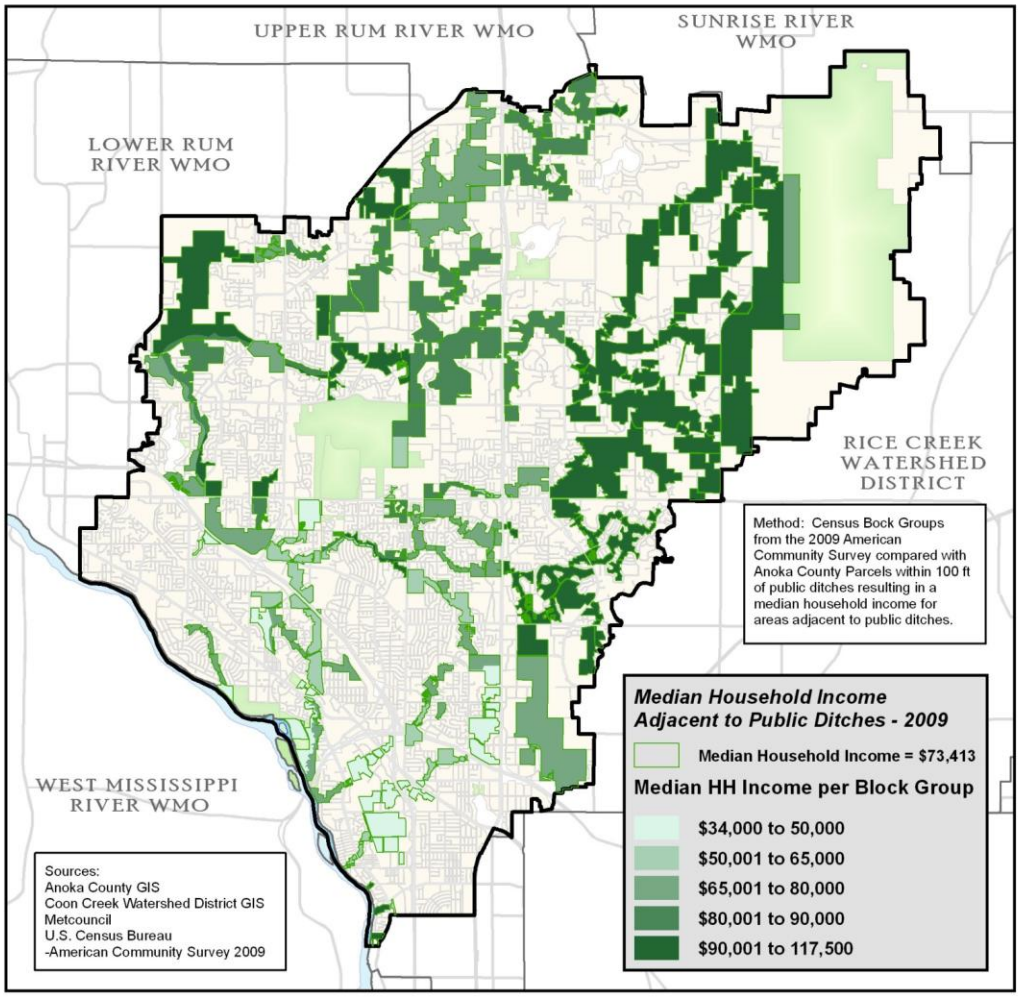
Population Approximately 14,000 people depend directly upon drainage.



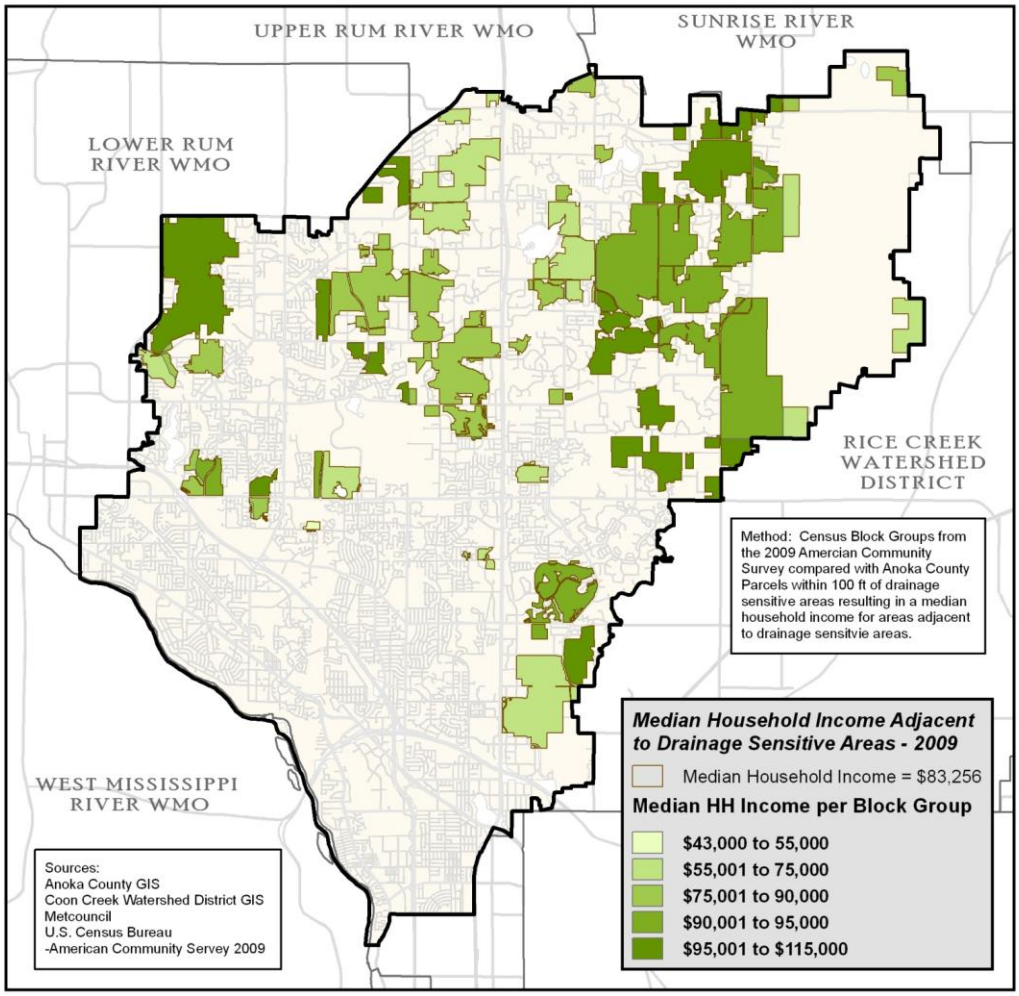
Approximately 4,700 people live adjacent to and are dependent on subsurface drainage for their land to continue in its current land use



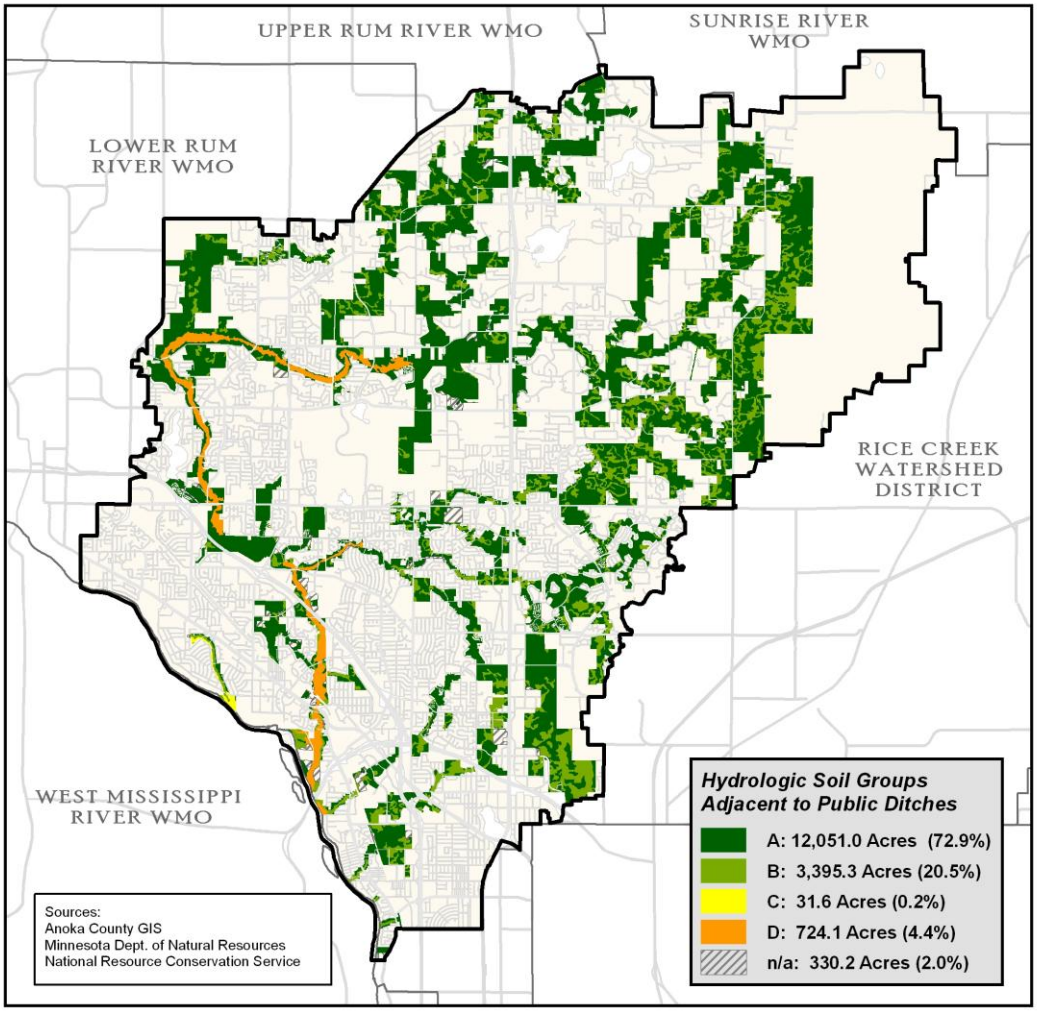
Income Income of property adjacent to the public ditch system is shown below



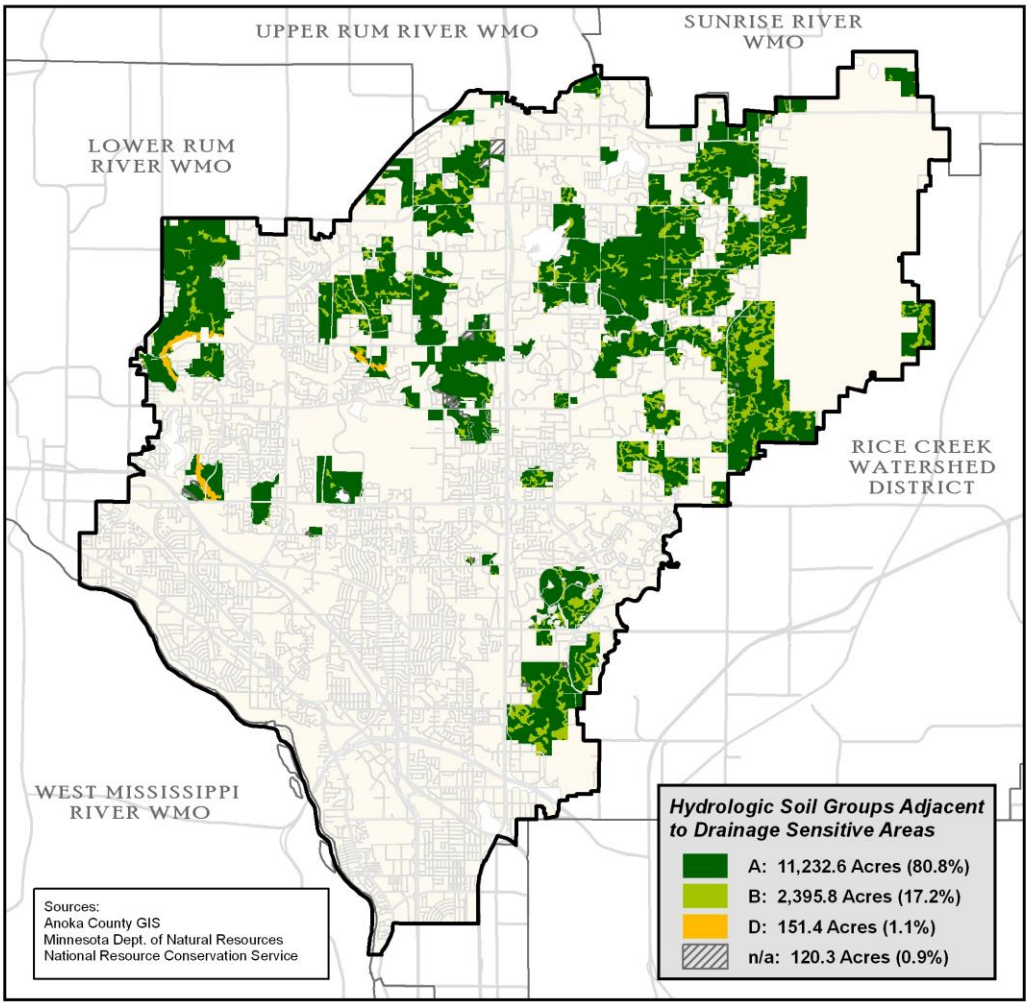
The income of property adjacent to drainage sensitive land is shown below



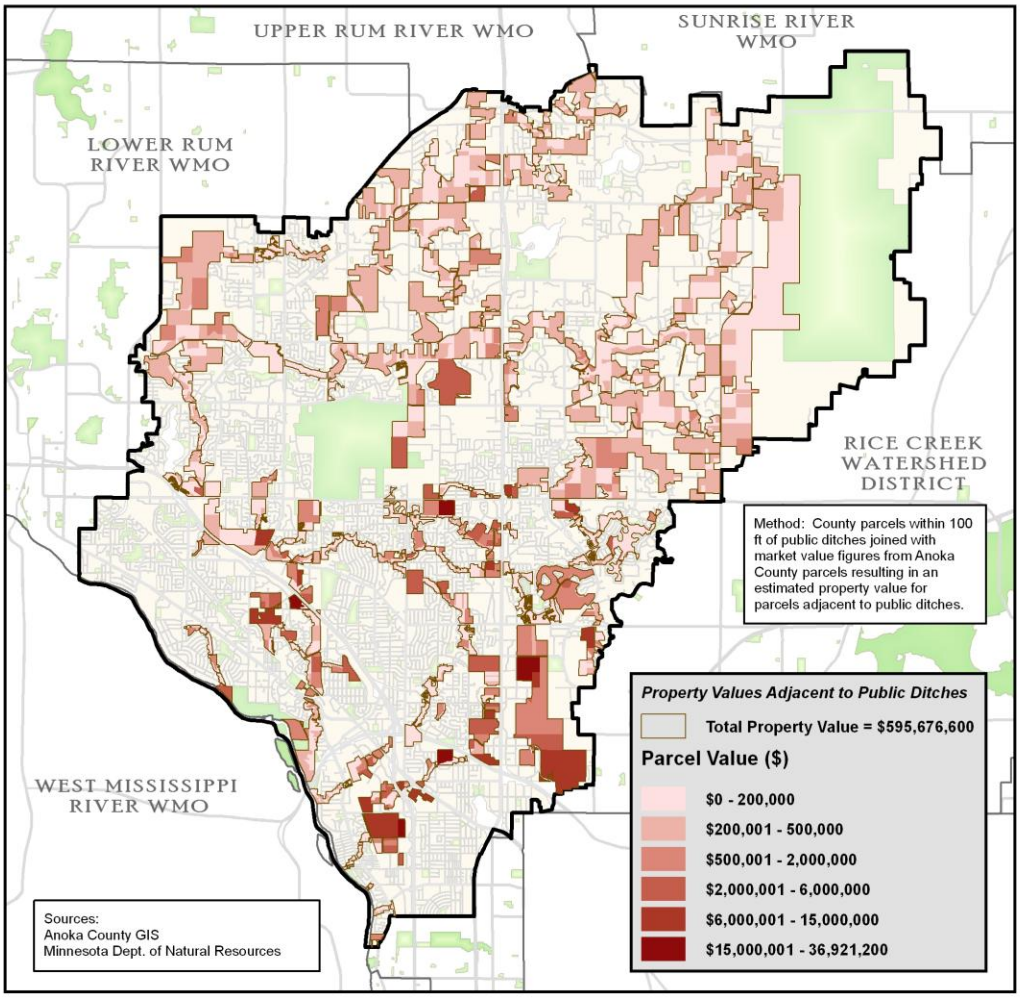
Soil Characteristic Map and acres of HSG adjacent to public ditches



Map and acres of HSG within or benefiting from Drainage sensitive lands



Property Value Drainage influences the value on approximately $600 million dollars of land



Service Preference

While drainage ranked 5th among citizens within the District it should be noted that it is closely related to flood control, which tied with water quality across all groups surveyed.

	Citizens	City Engineers	Water Professionals	National
Drinking water	1	1	1	1
Water Quality	2	2	2	2
Flood Control	2	2	3	5
Groundwater Recharge	4	4	4	7
Storm Protection	6	5	6	6
Drainage	**5**	**6**	**7**	**8**
Aquatic life and recreation	7	6	5	9
Hunting and Fishing	7	6	9	10
Irrigation	9	9	10	4
Livestock and wildlife watering	10	10	8	11
Aesthetics	11	11	11	12
Industrial use and cooling	13	13	12	3

Substitutes

There are no natural substitutes for subsurface drainage of soils for agricultural purposes

Man-Made Substitutes

Removal of water through pumping is perhaps the only man-made substitute to drainage. Pumping allows drainage to occur when an outlet is either unsuitable or inadequate by moving water around or by-passing that outlet. However, water still needs to drain from the discharge point for efficient drainage and prevention of local flooding and recycling of water

Adoption of Substitutes

The ability to substitute pumping for drainage ditches is moderately to very difficult. The degree of difficulty and expense will depend upon the following:

1. The size of the area to be dewatered
2. The number of wells and pumps needing to be drilled and installed
3. The availability and cost to power the pumps
4. The ability to dispose of the pumped water

The Marginal Value of Drainage

The marginal value of draining land for drainage dependent uses is high. Drainage of land, in areas such as the Anoka Sand Plain, is one of, if not the most fundamental improvement increasing the utility of land.

While at one time, when the county was largely agriculture, the marginal value of additional acres made productive through drainage was high, the steady rise in land values, the conversion of land to urban purposes and the advent of the wetland conservation act and the floodplain management acts have decreased the marginal value of converting additional land to crop production purposes.

Risks and Impairments to Drainage

The value of drainage to a particular area is the expected flow of services a given ditch or drainage network will provide over time, where expected means risk adjusted.

Risks of disruptions to drainage differ from site to site and are associated with the exposure and vulnerability of the drainage system itself and the vulnerability and exposure of important landscape features that effect the functional capacity of the system. Threats that cause risk can arise from physical, social or managerial actions or processes.

Changes in Outlet Conditions Changes in outlet conditions arising from vegetation, tree fall or bank erosion or sedimentation. Changes can also occur from improperly placed or sized culverts

Changes in Outlet Adequacy Changes in outlet adequacy arising from the same variables mentioned above in addition to changes (usually and increase in volume needing to be discharged) in the hydrology of water flowing to and through the site.

With higher intensity storms, the adequacy of outlets for drainage sensitive uses may be inadequate.

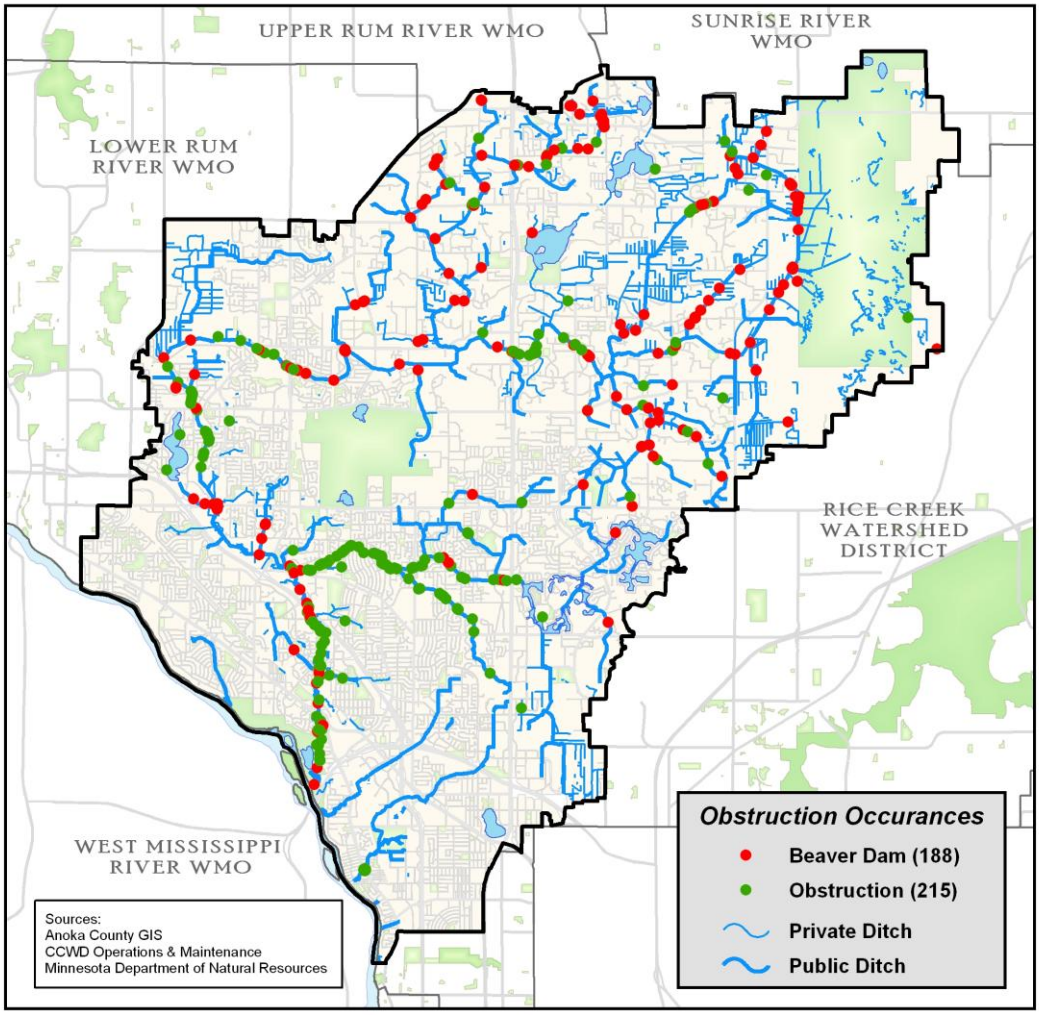
Illicit Connections Illegal connections to the drainage system which increase the volume or timing of water to be discharged

Restricting Access Restricting access for maintenance and repair through fencing plantings or construction of a structure.

Obstructions Blockages of flow resulting from improperly sized or placed culverts, beaver dams or accumulations of vegetative debris

resulting from downed trees or brush.

Inefficiencies Inefficiencies in the channel can slow the rate and or volume of discharge to the point where drainage dependent land uses can be adversely affected. Inefficiencies can occur for partial blockages and from excess vegetation growth in the channel and on the ditch bank or the accumulation of sediment in the form of a sand bar or sediment fan



Expected Future of Drainage

The quantity and quality of land drainage for agriculture by 2020 will depend on:

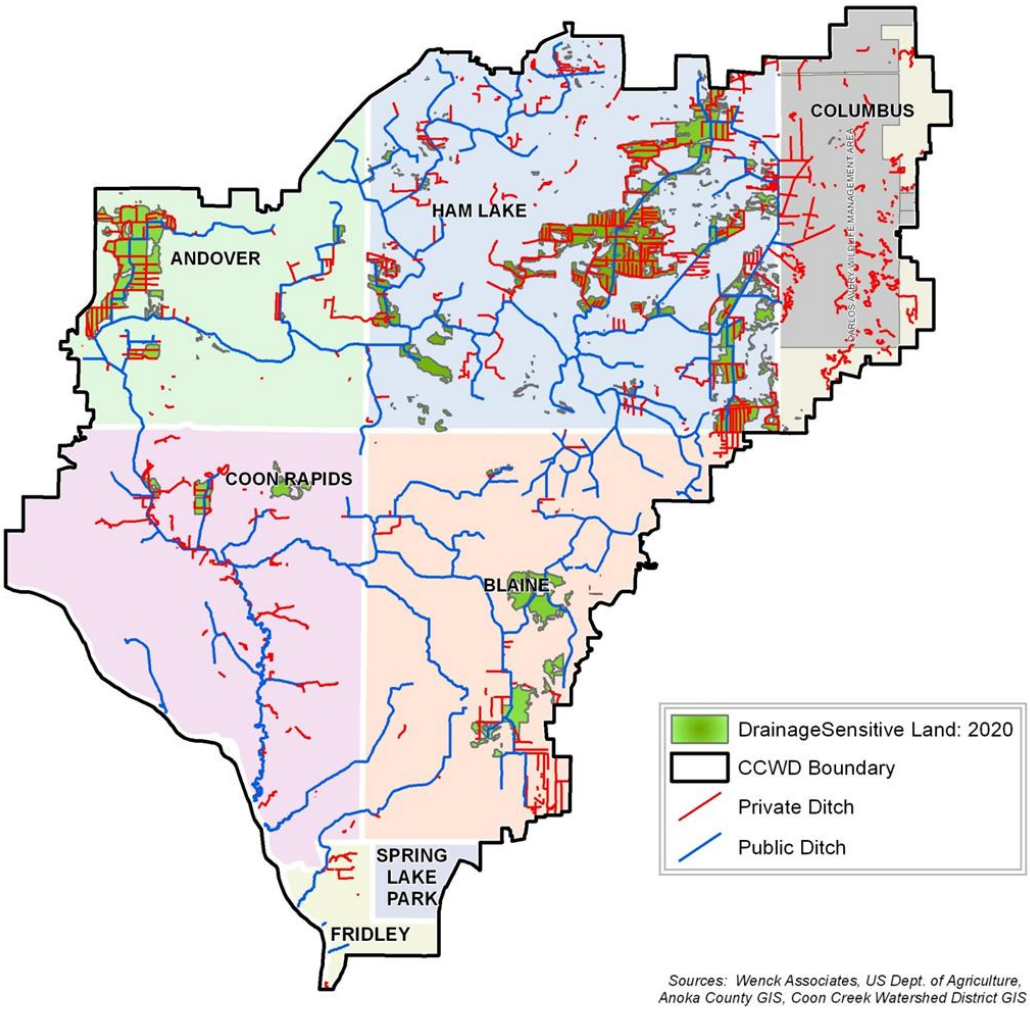
Population

Expected Surficial Groundwater Levels

Surficial groundwater levels are expected to decline up to 10 feet in some areas of the watershed over the next 10 to 20 years

Amount of Drainage Dependent Land

A 642 acre (17%) decrease in drainage dependent land by 2020 is expected. However, the geomorphology of the Coon Creek watershed is such that large portions of the watershed will continue to need drainage for flood control and to influence surficial groundwater elevations



Needs

The public ditch system needs to be managed for both drainage and conveyance with an awareness of the water quality impacts and varying maintenance needs of both.

Increases in impervious surface can result in sufficient volumes and rates of runoff to short-circuit the drainage system and prevent infiltration and sub-surface drainage from occurring

Apply methods

It is the policy of the District to:

1. Maintain ditch and conveyance systems within the watershed to fulfill the role identified within the District's Comprehensive Management Plan and the drainage law.
2. Promote, preserve and enhance the water and related land resources of the Coon Creek Watershed.
3. Protect the water and related land resources of the Coon Creek Watershed from the adverse effects resulting from poor or incompatible land use activities.
4. Encourage compatibility between land use activities upstream and downstream.
5. Regulate land-disturbing activities affecting the course, current, cross section and quality of ditches and water courses.
6. Regulate improvements by riparian property owners of the bed, banks, and shores of lakes, streams, and wetlands for preservation and beneficial use.
7. Protect stream channels from degradation.
8. To regulate crossings of ditches and watercourses in the District to maintain channel profile stability and conveyance capacity.

To manage Watershed District water resources for multiple-uses by balancing present and future resource use with domestic water supply needs

Identify minor sub-watersheds providing water within the drinking water supply Management Area as defined in the City's well-head protection plan or 1 year travel time of municipal and other public wells and water supplies during land management planning.

Develop prescriptions on a case-by-case basis to ensure desired multiple-use outputs while recognizing domestic

water supply needs.

Do not rely on management practices to provide pure drinking water. Use only proven techniques in management prescriptions for municipal supply watersheds.

Determine increased costs of any unusually restrictive practices required to meet state-approved Best Management Practices for protection of drinking water; identify any revenue losses from applying such restrictions

O&M To maintain in operable condition all drainage and Stormwater improvements in the Watershed and other lands controlled by the Watershed District

Planning To plan and execute a coordinated program of water resource development to maximize public benefits within the Watershed.

O&M To respond quickly and effectively to alleviate the effects of natural disasters and reduce the threat to life, public health, and property

PGR To integrate water resource management with Watershed District land and resource management planning and to coordinate Watershed District water resource protection, development, and improvement programs with similar programs of other Federal, State, and local agencies.