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Soils, Water, Drainage of the Wagner, Tower, and Greenwood Irrigation Units

Most soils in the Wagner, Tower, and Greenwood Unit Project areas are good dryland soils. This does not always mean, however, that all the land will be good producing soils under irrigation. Generally speaking, three problems must be solved.

1. Provisions must be made to drain excess irrigation and rain water from the surfaces.

2. Dangerous accumulations of salts in the root zone must be avoided.

3. Internal drainage of the soil must be provided to avoid an abnormally high water table.

Most of the soils in the area have a slowly permeable or tight layer of soil somewhere on the top 20 feet that will not permit easy downward movement of water. Where these slowly permeable layers occur at less than 6 feet below the surface the soil is classified as non-irrigible.

GENERAL DESCRIPTION OF LAND CLASSES TO BE IRRIGATED

Class 1. Lands of this class are highly suitable for irrigation farming, being capable of producing the best yields of adapted crops in an approved rotation, at reasonable cost.

These lands have smooth slopes lying in a continuous plain. The soils are deep, friable, open-textured loams and silt loams which allow for maximum root, air, and water penetration.

Class 2. This class comprises lands of moderate suitability for irrigation farming. These lands are not well suited for sustained irrigation farming as class 1 because of some deficiency in soils, topography, or drainage.

The deficiency may be due to soil textures, or shallow depth that reduces moisture holding capacity. It may be due to a topography deficiency that

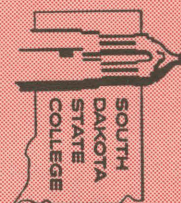
By F. F. Kerr, Extension water resources specialist, and Raymond Lund, district specialist, Water Resources Commission



Only about 70% of this irrigation water will be effectively used. The other 30% must be removed by drainage systems.

Soils, Water, Drainage of the Wagner, Tower, and Greenwood Irrigation Units

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would require a moderate amount of land leveling.

Class 3. Lands of this class are considered suitable for sustained irrigation farming, but are less desirable because of deficiency or combination of deficiencies in the soil, topography, and drainage that are more extreme than described for Class 2 lands.

Class 6. Lands in this class are not recommended for irrigation development because the deficiencies are so extreme that it is not economically feasible to develop them, or there would be a danger of reducing their productive capacity.

IRRIGATION WATER

The irrigation water for these units will come from the Missouri River. The total dissolved solids of this water will average 556 PPM (Parts per Million). Sodium and other troublesome chemicals are well within the permissible limits for irrigation use.

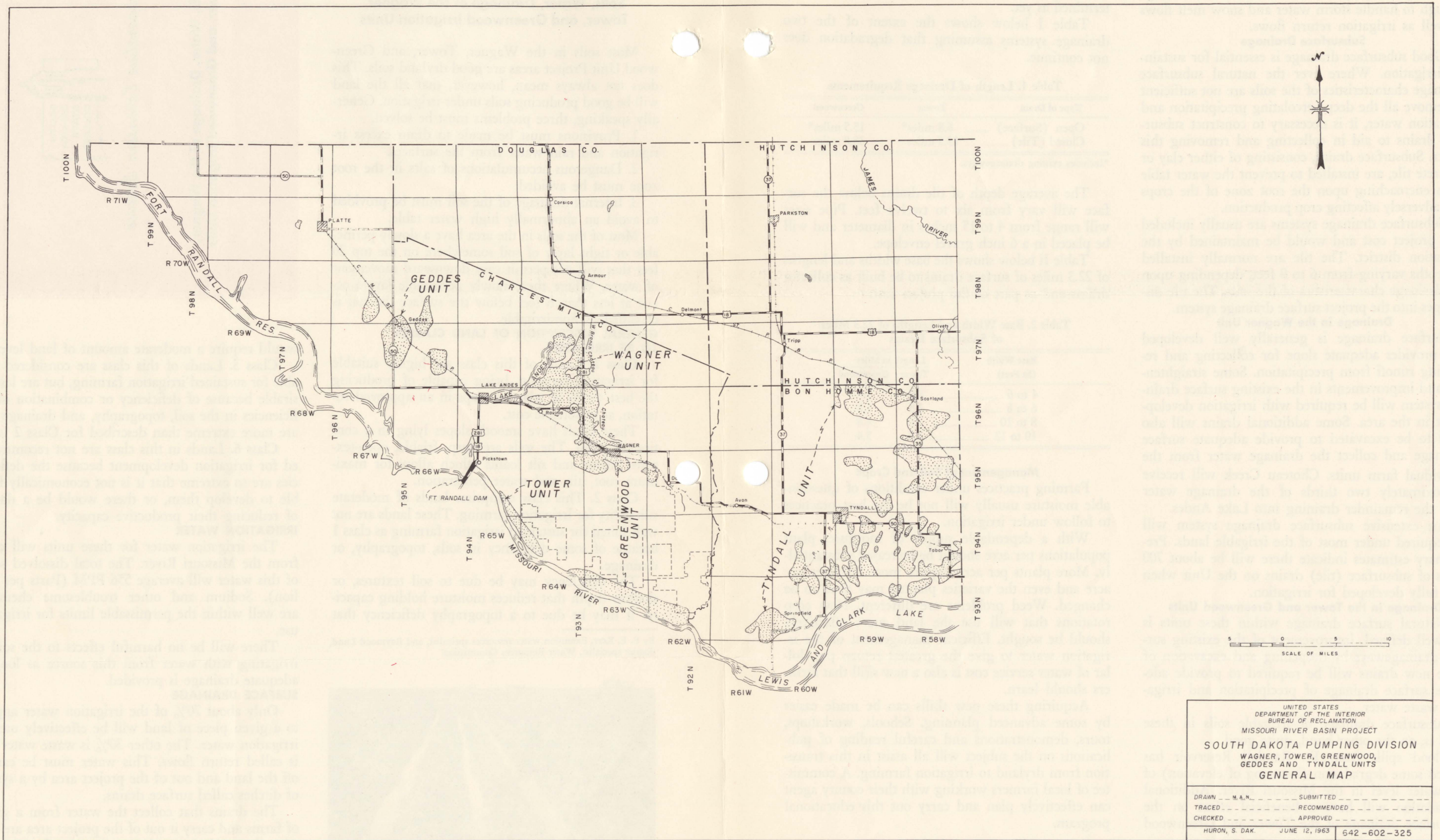
There will be no harmful effects to the soil by irrigating with water from this source as long as adequate drainage is provided.

SURFACE DRAINAGE

Only about 70% of the irrigation water applied to a given piece of land will be effectively used as irrigation water. The other 30% is waste water and is called return flows. This water must be carried off the land and out of the project area by a system of ditches called surface drains.

The drains that collect the water from a group of farms and carry it out of the project area are called collector drains and are constructed as part of the project cost. The cost of building the small surface drains necessary to collect the excess water on individual farms and carry it off the farm is borne by the farmer.

(continued on page 4)



Map 1. Wagner, Tower, and Greenwood Units.

Farm and project drains must both be large enough to handle storm water and snow melt flows as well as irrigation return flows.

Subsurface Drainage

Good subsurface drainage is essential for sustained irrigation. Where ever the natural subsurface drainage characteristics of the soils are not sufficient to remove all the deep-percolating precipitation and irrigation water, it is necessary to construct subsurface drains to aid in collecting and removing this water. Subsurface drains, consisting of either clay or concrete tile, are installed to prevent the water table from encroaching upon the root zone of the crops and adversely affecting crop production.

Subsurface drainage systems are usually included as a project cost and would be maintained by the irrigation district. The tile are normally installed at depths varying from 6 to 9 feet, depending upon the drainage characteristics of the soils. The tile discharges into the project surface drainage system.

Drainage in the Wagner Unit

Surface drainage is generally well developed and provides adequate slope for collecting and removing runoff from precipitation. Some straightening and improvements in the existing surface drainage system will be required with irrigation development in the area. Some additional drains will also need to be excavated to provide adequate surface drainage and collect the drainage water from the individual farm units. Choteau Creek will receive approximately two thirds of the drainage water with the remainder draining into Lake Andes.

An extensive subsurface drainage system will be required under most of the irrigable lands. Preliminary estimates indicate there will be about 700 miles of subsurface (tile) drains on the Unit when it is fully developed for irrigation.

Drainage in the Tower and Greenwood Units

Natural surface drainage within these units is not well defined. Improvement of the existing surface drainageways by deepening and excavation of some new drains will be required to provide adequate surface drainage of precipitation and irrigation waste water.

Subsurface drainage of irrigable soils in these units is, on the other hand, quite good.

Flood spills from Ft. Randall Reservoir has caused some degradation (lowering of elevation) of the water level in the Missouri River. Additional degradation will have a beneficial effect on the subsurface drainage of the Tower and Greenwood

Units. The extent of this degradation cannot be determined as yet.

Table I below shows the extent of the two drainage systems assuming that degradation does not continue.

Table 1. Length of Drainage Requirements

Type of Drain	Tower	Greenwood
Open (Surface)	6.8 miles*	15.5 miles*
Closed (Tile)	13.5 miles	38.8 miles

*Includes existing drainageways.

The average depth of tile drains below the surface will vary from six to twelve feet. Pipe sizes will range from 4 to 15 inches in diameter and will be placed in a 6 inch gravel envelope.

Table II below shows the base widths and lengths of 22.3 miles of surface drains to be built as collector drains and as part of the project cost.

Table 2. Base Width and Lengths of 22.3 Miles of Subsurface Drains

Base Width (In Feet)	Length in Miles	
	Tower	Greenwood
4 to 6	1.0	3.5
6 to 8	3.5	1.8
8 to 106	4.8
10 to 12	1.7	5.4

Management of Soil and Crops

Farming practices under conditions of questionable moisture usually will not be the best practices to follow under irrigation.

With a dependable supply of moisture, plant populations per acre should be increased substantially. More plants per acre require more fertilizer per acre and even the varieties planted may need to be changed. Weed problems are different. New crop rotations that will use the land more effectively should be sought. Efficient management of the irrigation water to give the greatest return per dollar of water service cost is also a new skill that farmers should learn.

Acquiring these new skills can be made easier by some advanced planning. Schools, workshops, tours, demonstrations and careful reading of publications on the subject will all assist in this transition from dryland to irrigation farming. A committee of local farmers working with their county agent can effectively plan and carry out this educational program.