***Water Management and Soils***

Water management, as discussed here, relates to construction of relatively small- or medium-sized impoundments, control of waterways of moderate size, installation of drainage and irrigation systems, and control of surface runoff to minimize erosion. These activities may require large capital expenditures. In most cases, onsite evaluation should be conducted, particularly for soil properties at depth. Order 2 or order 3 soil surveys can be helpful in evaluation of alternative sites, but onsite investigations are required to design engineered projects.

**Ponds and reservoirs.—**Soil information is used in predicting soil suitability for ponds and reservoir areas. Impoundments contained by earthen dikes and fed by surface water have somewhat different soil requirements than those that are excavated and fed by ground water. Separate interpretations are commonly made.

Soil seepage potential, as determined by the minimum saturated hydraulic conductivity and the depth to pervious soil material, is an important factor for design of ponds and reservoirs. Slope is also important because it affects the capacity of the reservoir. The soil’s hydrologic group (see [chapter 3](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054253)) pertains to the prediction of runoff into a pond or reservoir.

**Embankments, dikes, and levees.—**These are raised structures made of disturbed soil material constructed to impound water or to protect land from inundation. Soils are evaluated as sources of material for construction. Particle-size distribution and placement in the Unified system are important considerations. Interpretations do not consider whether the soil in place can support the structure. Performance and safety may require onsite investigation to depths greater than are typically considered in a soil survey.

**Irrigation.—**Important considerations for the design of irrigation systems are feasible water application rates, ease of land leveling and the resultant effect on the soils, possibility of erosion by irrigation water, physical obstructions to use of equipment, and susceptibility to flooding. An order 1 soil survey may be needed for observations and measurements of infiltration rates at depths greater than typically surveyed. The interpretations may be based on various soil properties, including saturated hydraulic conductivity, available water capacity, erodibility, slope, stoniness, effective rooting depth, salinity, sodium adsorption ratio (SAR), gypsum content, and other properties that may affect the level of crop response.

Interpretations for irrigation in arid and semiarid regions may be more complex than in humid regions, because irrigation changes the soil water regime more in arid and semiarid areas. Salinity and SAR of soils can be particularly significant, as can the quality of irrigation water. In arid and semiarid areas, small differences in slope and elevation can lead to an accumulation of salt-laden drainage water in low places or to development of a high water table if a proper drainage system is not provided.

**Drainage.—**Drainage refers to the removal of excess water from soils for reclamation or alteration. Engineers establish the criteria for drainage construction. The criteria include spacing and depth of subsurface drains, depth and width of open ditches and their side slopes, and allowable gradient. Soil properties important to drainage include water transmission, soil depth, soil chemistry, potential frost action, slope, and presence of rock fragments > 75 mm.