Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WATERSPREADING

CODE 640

(ac)

DEFINITION

A system of diverting or collecting runoff from natural watercourses and spreading the runoff over relatively flat areas.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce the potential for flooding and ponding.
- Reduce the potential for gully formation.
- Manage natural precipitation more efficiently.
- Facilitate ground water recovery.

CONDITIONS WHERE PRACTICE APPLIES

Waterspreading is timed by the availability of natural runoff flow and applies to all land uses. Although applicable to any climatic condition, areas with an average annual precipitation of 8 to 25 inches show the greatest benefit from waterspreading.

Waterspreading applies to areas where the following conditions are all present:

- Soils have suitable intake rates and adequate water-holding capacities for the type of system;
- Topography is suitable for the diversion or collection and the benefited area allows uniform spreading of water to achieve the desired result; and
- Flows can be collected or diverted, spread and excess water returned without causing excessive erosion.

This standard does not apply to irrigation systems.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct this practice to comply with all Federal, State and local regulations. The landowner must obtain all necessary permissions from regulatory agencies, or document that no permits are required. The landowner and/or contractor is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

Diversion works

The diversion works must require no manual controls to divert the stream into the conveyance system or onto the spreading areas, except on watercourses with expected flow durations of more than 24 hours.

Include erosion control at the diversion works, within the spreading area, and at the outlet facilities as an integral part of the waterspreading system.

Provide suitable diversion controls so that only the desired rate of flow enters the conveyance system.

Install a low-flow bypass to exclude bedload from the system where inflows contain sediment in amounts that will either reduce the life of the system or damage soil characteristics.

Design inlet controls to be adjustable to exclude flow from the spreading areas at undesirable times, such as when crops are to be mechanically harvested. Protect the diversion works, conveyance system, or the spreading area from the diverted flow to prevent undue maintenance problems.

Conveyance system
Design the conveyance system to safely convey the design flow from the diversion works to the spreading area. For earthen channels use relevant criteria found in NRCS Conservation Practice Standard (CPS) Open Channel (Code 582). For pipe conveyance use criteria from NRCS CPS Irrigation Pipeline (Code 430).

Spreading area
Arrange and locate ditches, dikes, diversions, conduits, and similar structures to spread diffused flow over the land surface or to pond water over the land, depending on the type of system selected. Grade and shape all slopes to facilitate management and harvesting operations.

Outlet works
Make provisions for returning excess water from the system to the stream channel or other parts of the system without causing excessive erosion and in time to prevent crop damage by ponded water. The flow line of the structure used for this purpose should be below ground level to improve flow characteristics.

Additional Criteria for Detention-Type Waterspreading Systems

Topography
Curve basins to fit topography where possible. When multiple basins are used in a spreading area, design the basins to be as parallel to one another as practicable. Space basins to permit use of modern farming equipment.

Water impounding dike
The maximum allowable depth of water impounded against dikes is 3 feet except across channels, sloughs, swales, or gullies less than 40 feet wide, where up to 5 feet of depth is allowed. If the water depth is greater than this,use the criteria in NRCS CPS Pond (Code 378) to design the embankment.

Minimum top width of dikes at design top elevation will be 3 feet. Include a minimum freeboard of 1.0 foot above the design water surface, or the wave height (from wind and fetch length calculations) above the design water surface, whichever is greater.

Design dikes with side slopes no steeper than two horizontal to one vertical (2:1). Design flatter side slopes as needed for stability and 4:1 or flatter for safe mowing or other operations of farm equipment.

Outlet works
Base the design of outlet(s) on the inflow from the 10-year 24-hour peak flow from the contributing area at minimum. Design at least one outlet or overflow section that is 1.0 ft or more below the design top elevation for each basin. The outlet must convey runoff water to a point where it will not cause damage. This may be a vegetated spillway, stable rock, weir overflow structure, pipe outlet, or some combination of these.

Total capacity of the outlet must exceed the diverted design inflow to the impoundment.

Vegetative cover
Seed all areas where vegetation has been disturbed during construction following completion of construction. Use criteria from NRCS CPS Critical Area Planting (Code 342) for seedbed preparation, seeding, sodding, fertilizing, and/or mulching. If the soils or climatic conditions preclude the use of vegetation for erosion protection, nonvegetative linings such as concrete, gravel, rock riprap, cellular block, or other approved manufactured lining systems may be used.

CONSIDERATIONS

When planning this practice, consider the following, as applicable:

- Other practices needed such as CPSs Land Clearing (Code 460), Brush Management (Code 314), and Fence (Code 382) when planning a waterspreading system.
- Farmland can be utilized, primarily during the nongrowing season, to spread water in order to infiltrate and replenish ground water aquifers, especially in water-stressed regions where water quantity (and quality) is a resource concern.
- Crops to be grown. Potential benefits are highest with forage, hay, or seed crops having greater effective rooting depth.
- When reestablishing vegetative cover encourage sowing native plant species that provide abundance pollen and nectar for pollinators.
- Effects of livestock use on the spreading areas. Manage livestock to prevent compaction when soils are wet and to prevent range degradation by overuse.
- The effect of climate on water spreading. Northern and mountainous regions receive a large percentage of annual runoff from snowmelt. Volumes, quality, and conditions during snowmelt become important to system design. Typically, a detention type system should be used if snowmelt runoff is diverted, to prevent erosion and promote infiltration.
- Slopes greater than 2 percent should generally be avoided. Cost escalates rapidly as slope increases. Effective basin slope may be flattened by taking borrow along top of each basin (immediately below next higher dike above).
- The reduction of downstream surface water quantity, and effects on potential users. Evaluate both the volume of water diverted and volume of return flows.
- Effects of increased soil moisture and ground water quantity on the waterspreading areas.
- Sediment, pathogens, adsorbed and dissolved nutrients and pesticides, and soluble chemicals infiltrating in the waterspreading areas.
- Potential chemical degradation of return flows leaving the waterspreading areas. Consider rate and volume of return flows, chemicals used, time of chemical application in comparison to predictable storm events, and the nature of sediments transported.
- Potential ground water degradation from applied chemicals caused by increased infiltration. Important factors include available soil moisture storage, evapotranspiration, type and amounts of chemicals used, and saline geology.
- Potential for adverse effects to fish, wildlife, native pollinators, and cultural resources.
- Land leveling, land forming, land smoothing, obstruction removal, and similar practices may be performed for more uniform distribution of water and increased operation efficiency.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for waterspreading that describe the requirements for installing the practice to achieve its intended purpose. As a minimum, include the following:

- Design map showing the vicinity location, location of diversions, ditches, spreading area, elevations, north arrow, and scale.
- Detail drawings of the diversions and outlets, and other structural components.

- Written specifications that describe the site-specific details of installation.

OPERATION AND MAINTENANCE

Provide the client an operation and maintenance (O&M) plan specific to the type of waterspreading installed. Include specific instructions for operating and maintaining facilities with the purposes of the practice, intended life, and the criteria for its design. At a minimum, address the following:

- Specific instructions and operational requirements to safely divert the desired volume of water into the system, store as applicable, and release return flows.
- Average water yields by event, times to fill and empty the system, and any other hydrologic and hydraulic information needed to operate the system as designed.
- Soil infiltration and water-holding capacities, anticipated crops to be grown, effects of inundation, and any other information that will assist the operator in making sound economic and environmental decisions.
- Service, repair, or replacement of components as necessary to maintain their full function.
- Removal of debris and foreign material from structures, ditches, and other components that might hinder operation.
- Maintenance of good vegetative cover on all slopes and watercourses.

REFERENCES

Critchley, W., K. Siegert, C. Chapman, and M. Finkel. 1991. A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production. Food and Agriculture Organization of the United Nations, Rome, Italy.

Nill, D., K. Ackermann, E. van den Akker, A. Schöning, M. Wegner, C. van der Schaaf, and J. Pieterse. 2012. Water-spreading weirs for the development of degraded dry river valleys. Deutsche Gesellschaft für and Internationale Zusammenarbeit (GIZ) GmbH. Germany.