NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE STANDARD

WATERSPREADING (ACRE)

CODE 640

DEFINITION

A system of dams, dikes, ditches, or other means of diverting or collecting runoff from natural channels, gullies, or streams and spreading it over relatively flat areas.

PURPOSE

Supplement natural precipitation in areas where plants can effectively use additional moisture.

CONDITIONS WHERE PRACTICE APPLIES

Waterspreading differs from irrigation in that applications are timed by the availability of natural runoff flow rather than scheduled to meet plant needs. This standard does not apply to **Field Office Technical Guide (FOTG), Section IV–Practice Standards and Specifications for** Conservation Practice Standard (**Code** 443) Irrigation System, Surface and Subsurface.

Although applicable to any climatic condition, areas with an average annual precipitation of 8 to 25 inches show the greatest benefit from waterspreading.

Waterspreading systems apply to areas where:

- local, state, **tribal,** and federal laws and regulations will permit development.
- soils have suitable intake rates and adequate water-holding capacities for the type of system and crops to be grown.
- topography is suitable for the diversion or collection and the use area allows uniform spreading of water to achieve the desired result.
- a system can be installed that allows for the economical production of feed, forage, or grain crops.
- climatic conditions are such that the additional moisture can be expected to improve plant growth.
- runoff and streamflow are available at the time of year, of suitable quality, and in a volume sufficient to increase plant growth.
- flows can be collected or diverted and spread and excess water returned without causing excessive erosion.
- fish, wildlife, and cultural resources will not be adversely affected.
- grazing of the spreading area **and riparian areas** can be controlled**, according to the landowner's grazing management plan**.

CRITERIA

General Criteria Applicable To All Waterspreading Systems

Laws and Regulations. This practice must conform to all federal, state, **tribal,** and local laws and regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Drainage area. The contributing area, or ratio of watershed area to benefited area for a "dependable" water supply, must be such that the volume of divertible flow needed for the design

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water application can be expected on an average of 8 years in 10.

Systems with less than "dependable" water supply are classified "questionable". To be economical, these systems must typically be less expensive to construct and must furnish at least the application volume that can be expected 1 year out of 2. **In all projects, an economic evaluation considering construction, operation, and maintenance costs compared to potential on- and off-site benefits shall be made and presented to the landowner prior to completion of final design.**

Diversion works. The diversion works should be automatic, requiring no manual control 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. **Diversion works may be structural, or a combination of structural and embankment elements. Appropriate practice standards shall be followed for each element.**

The waterspreading system must be capable of safely conveying the design peak flows through the system or bypassing them at the diversion. Suitable diversion controls should normally be provided so that only the desired rate of flow enters the conveyance system.

Where significant sediment is present in flood flows, amounts that will either reduce the life of the system or damage soil characteristics, a low-flow bypass must be installed to exclude bed load from the system. **Adequate water will be bypassed during waterspreading events to provide the needed runoff to maintain the downstream riparian area. The amount of flow can be best estimated from the active base channel dimensions downstream of the point of diversion.**

Inlet control(s) must be adjustable to exclude flow from the spreading areas at undesirable times, such as when crops are to be harvested mechanically. The diverted flow must not cause undue maintenance problems in the diversion works, conveyance system or the spreading area.

Conveyance system. The conveyance system shall have the capacity to safely convey the design flow **without erosion** from the diversion works to the spreading area. **All components of the conveyance system shall meet the practice standard for that component. If a portable pump is necessary to pump the water to the system, the pump capacity and volume requirements shall be made a part of the design, and drawings.**

Spreading area. Ditches, dikes, diversions, conduits, and similar structures will be arranged and located to spread diffused flow over the land surface or to pond water over the land, depending on the type of system selected. All slopes will be stable and graded to the slope necessary for management and harvesting operations. Land leveling, land forming, land smoothing, obstruction removal, and similar practices may be performed for more uniform distribution of water and increased operation efficiency. All component practices, installed as part of the overall system, will comply with the NRCS standard for that practice.

If the water is to be spread over the area as diffused flow, the depth of application should be the approximate depth of water that the soil will absorb in the period equal to the estimated flow duration. For soils that have rapid or very rapid permeability, this depth may be more than is needed to fill that root zone.

If the water is to be impounded on the spreading area, the depth of application should approximately equal the available moisture capacity of the soil profile for the effective root zone of the plants to be grown. Rapidly permeable soils are generally unsatisfactory for impoundment systems. The system should be designed and managed to minimize deep percolation. **Soil intake rates should be evaluated to determine the time it will take to fill the available water holding capacity within the plant root zone. Controls should be installed to drain ponded areas before negative affects occur to the plant community or to soil/water quality.**

Outlet works. A provision must be made 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 **inlet** flow line of the structure used for this purpose **or other water control structures in the system** should be below ground level to improve flow characteristics. **Outlet discharge from such structures shall be released with minimal erosion.**

Additional Criteria Applicable To Detention-Type Waterspreading Systems

Topography. Detention type systems are ideally suited to uniform, gently sloping land. Care must be

taken to provide drainage for each basin by grading a channel along the top side of each dike toward each drain.

Water impounding dike. The maximum depth of water impounded against dikes will be 3 feet except across channels, sloughs, swales, or gullies less than 40 feet wide, where up to 5 feet of depth will be allowed. Water depth greater than this requires embankment design according to **Field Office Technical Guide (FOTG), Section IV–Practice Standards and Specifications for** Conservation Practice Standard (**Code** 378) Pond.

Minimum top width of dikes at design top elevation will be 3 feet. Freeboard from design water surface to dike top shall be 1.0 foot or wave height from wind and fetch length calculations, whichever is greater (see Outlet works section for added criteria).

Side slopes of dikes will not be steeper than two horizontal to one vertical (2:1). They should be flatter as needed for stability and 4:1 or flatter for safe mowing or other operations of farm equipment.

Outlet works. Dikes with a total water storage capacity less than the 10-year, 24-hour runoff volume from the contributing area must have at least one outlet or overflow section that is at least 1.0 foot below the design top elevation. This may be a vegetated spillway, stable rock, weir overflow structure, pipe outlet, or some combination of these.

The minimum design inflow rate is (1) the maximum diverted rate of flow, or (2) the 10-year, 24-hour peak flow from the contributing area, whichever is less. Total capacity of the outlet must exceed the routed design inflow to the impoundment.

Vegetative Cover. All areas where vegetation has been disturbed during construction should be seeded following completion of construction. Seedbed preparation, seeding, sodding, fertilizing, and/or mulching shall comply with applicable NRCS technical standards.

CONSIDERATIONS

- Consider other practices needed such as brush removal, fencing, and seeding, when planning a water-spreading system.

- Consider crops to be grown. Potential benefits are highest with forage, hay or seed crops having maximum effective rooting depth.

- Consider effect on soils. Do not install a water-spreading system on soils where the hazard of erosion is high. Include erosion control at the diversion works, within the spreading area, and at the outlet facilities as an integral part of the water-spreading system.

- Consider effects of livestock use of the spreading areas. Manage livestock to prevent compaction when soils are wet and to prevent range degradation by overuse.

- **The riparian corridor downstream of the diversion point shall be inventoried and managed as an element of the grazing management plan.**

- Consider climate. 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.

- Consider detention area slopes. 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 dike above).

- Consider the reduction of downstream surface water quantity, and effects on potential users. Evaluate both the volume of water diverted and volume of return flows.

- Consider effects of increased soil moisture and ground water quantity on the water-spreading areas.

- Consider sediment, **agricultural wastes,** pathogens, adsorbed and dissolved nutrients and pesticides, and soluble chemicals infiltrating in the water-spreading areas.

- Consider potential chemical degradation of return flows leaving the water-spreading 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.

- Consider potential ground water degradation from applied chemicals caused by increased infiltration, **excess deep percolation and leaching**. Important factors include available soil moisture storage, evapotranspiration, type and amounts of chemicals used, and saline geology.

- **Additional soil and water site evaluation shall be performed if the following water quality measurements are exceeded within the stated drainage boundaries:**

  EC_w > 2.0 mmhos/cm
  (affects water availability)
  SAR_{adj} >10
  (affects infiltration rate).

Tongue River and Rosebud Creek;

EC_w > 1.0 mmhos/cm
(affects water availability)
SAR_{adj} > 3
(affects infiltration rate).

For all other drainage areas within Montana;

EC_w > 2.0 mmhos/cm
(affects water availability)
SAR_{adj} > 5
(affects infiltration rate).

EC_w – Electrical Conductivity of water
SAR_{adj} – Sodium Absorption Ratio.

PLANS AND SPECIFICATIONS

Plans and specifications for water-spreading shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. **Included within the plans and specifications shall be a process to pre-wash or clean all construction equipment used for installation of this practice to control noxious weeds, or undesired vegetation as required by the landowner.**

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for use by the landowner or operator. The plan should be consistent with the purposes of the practice, intended life, and the criteria for its design.

Minimum operation requirements to be addressed in the O&M plan are:

1. Specific instructions and operational requirements to safely divert the desired volume of water into the system, store as applicable, and release return flows.

2. 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.

3. Soils 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.

Minimum maintenance requirements to be addressed in the O&M plan are:

1. Prompt service, repair, or replacement of components as necessary to maintain their full function.

2. Removal of debris and foreign material from structures, ditches, and other components that might hinder operation.

3. Maintain good vegetative cover on all slopes and watercourses. **Within the maintenance plan, a program shall be established to control undesired and exotic vegetation.**