

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**DRAINAGE WATER MANAGEMENT**

(Ac.)

CODE 554

**DEFINITION**

The process of managing water discharges from surface and/or subsurface agricultural drainage systems.

**PURPOSE**

The purpose of this practice is:

- Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters
- Improve productivity, health, and vigor of plants
- Reduce oxidation of organic matter in soils
- Reduce wind erosion or particulate matter (dust) emissions
- Provide seasonal wildlife habitat

**CONDITIONS WHERE PRACTICE APPLIES**

This practice is applicable to agricultural lands with surface or subsurface agricultural drainage systems that are adapted to allow management of drainage discharges.

The practice may not apply where saline or sodic soil conditions require special considerations.

This practice does not apply to the management of irrigation water supplied through a subsurface drainage system. For that purpose, use NRCS Conservation Practice Standard, Irrigation Water Management (449).

**NRCS, NHCP**  
**September 2008**

**CRITERIA**

**Federal, State and Local Laws and Permits**

***Design, construction, operation and maintenance activities shall comply with all federal, state, and local laws, rules, and regulations governing activities in or along streams, floodplains or wetlands as well as pollution abatement, health, safety or utility activities.***

***Permits may be required from the following agencies as well as others:***

1. ***US Army Corps of Engineers (USACE)***
2. ***West Virginia Department of Environmental Protection (WV DEP) – Division of Water and Waste Management (DWWM)***
3. ***WV Department of Natural Resources (WVDNR) – Public Land Corporation (PLC) – Stream Access Application***
4. ***US Fish and Wildlife Service (USFWS)***
5. ***WV Division of Forestry***
6. ***Local, state and county ordinances***

***The owner or operator is responsible for securing all permits or approvals and for performing in accordance with such laws and regulations. NRCS employees do not procure permits, rights, or approvals, or enforce laws and regulations. NRCS may provide the landowner or operator with technical information needed to obtain the required rights (or approvals) to construct, operate, and maintain the practice.***

***All required permits shall be acquired before construction implementation.***

**NRCS, WV**  
**August 2011**

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [Field Office Technical Guide](#) (FOTG).  
**Note: Bold italics is information added or changes made to the National Conservation Standard by WV.**

**General Criteria Applicable to All Purposes**

The management of gravity drained outlets shall be accomplished by adjusting the elevation of the drainage outlet.

The management of pumped drainage outlets shall be accomplished by raising the on-off elevations for pump cycling.

Structures and pumps shall be located where they are convenient to operate and maintain.

Raising the outlet elevation of the flowing drain shall result in an elevated free water surface within the soil profile.

When operated in free drainage mode, water control structures shall not restrict the flow of the drainage system.

Drainage discharges and water levels shall be managed in a manner that does not cause adverse impacts to other properties or drainage systems.

Release of water from control structures shall not allow flow velocities in surface drainage system components to exceed acceptable velocities prescribed by NRCS Conservation Practice Standard, Surface Drainage, Main or Lateral (608).

Release of water from flow control structures shall not allow flow velocities in subsurface drains to exceed velocities prescribed by NRCS Conservation Practice Standard, Subsurface Drain (606).

**Additional Criteria to Reduce Nutrient, Pathogen, and/or Pesticide Loading**

During non-cropped periods, the system shall be in managed drainage mode within 30 days after the season's final field operation, until at least 30 days before commencement of the next season's field operations, except during system maintenance periods or to provide trafficability when field operations are necessary.

The drain outlet shall be raised prior to and during liquid manure applications to prevent direct leakage of manure into drainage pipes through soil macro pores (cracks, worm holes, root channels).

Manure applications shall be in accordance with NRCS Conservation Practice Standards,

Nutrient Management (590) and Waste Utilization (633).

**Additional Criteria to Improve Productivity, Health, and Vigor of Plants**

When managing drainage outflow to maintain water in the soil profile for use by crops or other vegetation, the elevation at which the outlet is set shall be based on root depth and soil type.

If using this practice to control rodents, apply in conjunction with NRCS Conservation Practice Standard, Pest Management (595).

**Additional Criteria to Reduce Oxidation of Organic Matter in Soils**

Drainage beyond that necessary to provide an adequate root zone for the crop shall be minimized.

To reduce oxidation of organic matter, the outlet elevation shall be set to enable the water table to rise to the ground surface, or to a designated maximum elevation, for sufficient time to create anaerobic soil conditions. The implementation of this practice must result in a reduced average annual thickness of the aerated layer of the soil.

**Additional Criteria to Reduce Wind Erosion or Particulate Matter (Dust) Emissions**

When the water table is at the design elevation, the system shall provide a moist field soil surface, either by ponding or through capillary action from the elevated water table.

**Additional Criteria to Provide Seasonal Wildlife Habitat**

During the non-cropped season, the elevation of the drainage outlet shall be managed in a manner consistent with a habitat evaluation procedure that addresses targeted species.

**CONSIDERATIONS**

In-field water table elevation monitoring devices can be used to improve water table management.

Reducing mineralization of organic soils may decrease the release of soluble phosphorus, but water table management may increase the release of soluble phosphorus from mineral soils.

Elevated water tables may increase the runoff portion of outflow from fields. Consider conservation measures that control sediment loss and associated nutrient discharge to waterways.

Elevate the drainage outlet for subsurface drains during and after manure applications to decrease potential for nutrient and pathogen loading to receiving waters.

Consider manure application setbacks from streams, flowing drain lines, and sinkholes, to reduce risk of contamination.

To maintain proper root zone development and aeration, downward adjustments of the drainage outlet control elevation may be necessary, especially following significant rainfall events.

Monitoring of root zone development may be necessary if the free water surface in the soil profile is raised during the growing season.

#### **PLANS AND SPECIFICATIONS**

Plans and specifications shall be prepared in accordance with the criteria of this standard as necessary and shall describe the requirements for applying the practice to achieve its intended purpose(s).

#### **OPERATION AND MAINTENANCE**

An Operation and Maintenance plan shall be provided that identifies the intended purpose of the practice, practice life safety requirements, and water table elevations and periods of operation necessary to meet the intended purpose. If in-field water table observation points are not used, the relationship of the control elevation settings relative to critical field water table depths shall be provided in the operation plan.

The Operation and Maintenance Plan shall include instructions for operation and maintenance of critical components of the drainage management system, including instructions necessary to maintain flow velocities within allowable limits when lowering water tables.

To prevent leakage of liquid manure applications into drain pipes, the plan shall specify the elevation of the raised drainage outlet and the number of days prior to and after

the application that a raised outlet elevation is to be maintained.

Replace warped flashboards that cause structure leakage.

#### **REFERENCES**

USDA, NRCS. 2001. National Engineering Handbook, Part 624, Sec. 16, Drainage of agricultural land.

USDA, NRCS. 2001. National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water management (Drainage).

***National Engineering Handbook (NEH) Title 210 – Section 5 – Hydraulics; Part 630 Hydraulics; Part 630 Hydrology***

***WV5-Engineering Field Handbook, Appendix A- Quick Reference Design and Construction Support Data for Conservation Practices***

***NRCS National Engineering Policy***  
<http://policy.nrcs.usda.gov/>

***NRCS National and State Utility Safety Policy (NEM Part 503-Safety, Subpart A - Engineering Activities Affecting Utilities 503.00 through 503.06)***  
***Miss Utility of West Virginia (MUWV); Call Before you Dig, 1-800-245-4848 -***  
<http://www.muwv.org/>  
***Associated Practice Standards and Scope of Work such as WV Conservation Practice Structure for Water Control (587), Subsurface Drain (606), Surface Drainage-Main or Lateral (608), Nutrient Management (590), Waste Utilization (633), Pest Management (595), etc. located at e-FOTG Section IV-***  
<http://www.nrcs.usda.gov/technical/efotg/>  
***(click on WV from the US map)***

***Drainage Handbook for West Virginia- USDA, SCS Morgantown, WV 1985***

***State Environmental Laws Affecting West Virginia Agriculture,***  
<http://www.nasda.org/nasda/nasda/Foundation/state/WestVirginia.pdf>