NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

DIVERSION

(Feet)
Code 362

DEFINITION

A channel generally constructed across the slope with a supporting ridge on the lower side.

PURPOSE

This practice supports one or more of the following purposes.

- Break up concentrations of water on long slopes, on undulating land surfaces, and on land that is generally considered too flat or irregular for terracing.
- Divert water away from farmsteads, agricultural waste systems, and other improvements.
- Collect or direct water for water-spreading or water-harvesting systems.
- Increase or decrease the drainage area above ponds.
- Protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above.
- Intercept surface and shallow subsurface flow.
- Reduce runoff damages from upland runoff.
- Reduce erosion and runoff on urban or developing areas and at construction or mining sites.
- Divert water away from active gullies or critically eroding areas.
- Supplement water management on conservation cropping or stripcropping systems.

CONDITIONS WHERE PRACTICE APPLIES

This applies to all cropland and other land uses where surface runoff water control and/or management are needed and where soils and topography are such that the diversion can be constructed and a suitable outlet is available or can be provided.

CRITERIA

Plan all work to comply with all Federal, state, and local laws and regulations.

Impact to cultural resources, wetlands and Federal and state protected species shall be evaluated and avoided or minimized to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

Capacity. Diversions as temporary measures, with an expected life span of less than 2 years,

shall have a minimum capacity for the peak discharge from the 2-year frequency, 24-hour duration storm.

Diversions that protect agricultural land shall have a minimum capacity for the peak discharge from a 10-year frequency, 24-hour duration storm.

Diversions designed to protect areas such as urban areas, buildings, roads, and animal waste management systems shall have a minimum capacity for the peak discharge from a storm frequency consistent with the hazard involved but not less than a 25-year frequency, 24-hour duration storm.

Design Depth. Design depth is the channel storm flow depth plus freeboard.

The design depth at culvert crossings shall be the culvert headwater depth for the design storm plus freeboard.

Freeboard. Freeboard shall be not less than 0.3 feet for all diversions.

Cross section. The channel may be parabolic, V-shaped or trapezoidal. Design the diversion to have stable side slopes.

The ridge top width shall be a minimum of 4 feet at the design depth. The ridge top width may be reduced to 3 feet at the design depth for diversions with a drainage area less than 10 acres and located above cropland, pastureland, or woodland.

The ridge height shall include an adequate settlement factor.

The top of the constructed ridge at any point shall not be lower than the design depth plus the specified overfill for settlement.

Stability and Capacity. Channel grades may be uniform or variable. Minimum depth and width requirements for channel stability shall be determined using the procedures in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 9, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels (Sept. 1987); or other equivalent methods.

When a retardance class method is used to determine capacity by the equation

$Q = AV$, where

Q = capacity, cfs
A = flow cross-sectional area, ft^2
V = velocity, ft/sec

and the velocity is calculated by using Manning's equation,

$$V = \frac{1.486}{n} r^{2/3} s^{1/2}, \text{ where}$$

r = hydraulic radius, ft
s = energy gradient slope, ft/ft
n = Manning's coefficient of roughness

the highest expected value of "n" shall be used.

Channel velocity shall not exceed that considered non-erosive for the soil and planned vegetation or lining.

Location. The outlet conditions, topography, land use, cultural operations, cultural resources, and soil type shall determine the location of the diversion.

Protection against sedimentation. Diversions normally should not be used below high sediment producing areas. When diversions are installed below high sediment producing areas, install a practice or combination of practices, needed to prevent damaging accumulations of sediment in the channel. This may include practices such as land treatment erosion control practices, cultural or tillage practices, vegetated filter strip, or structural measures. Install practices in conjunction with or before the diversion construction.

If movement of sediment into the channel is a problem, the design shall include extra capacity for sediment or periodic removal as outlined in the operation and maintenance plan.

Outlets. Each diversion must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, a lined waterway, a vegetated or paved area, a grade stabilization structure, an underground outlet, a stable watercourse, a sediment basin, or a combination of these practices. The outlet must convey runoff to a point where outflow will not cause damage. Install and establish vegetative outlets before diversion construction to ensure establishment of vegetative cover in the outlet channel.

The release rate of an underground outlet, when combined with storage, shall be such that the design storm runoff will not overtop the diversion ridge.

To prevent the diversion from overtopping, the designed outflow capacity of the outlet(s) must be achieved at, or below, the design depth of the diversion at their junction.

Vegetative Establishment. Diversions that are not to be cultivated shall be vegetated according to Florida NRCS conservation practice standard, Critical Area Planting, Code 342. Species selected shall be suited to the site conditions and intended uses. Selected species will have the capacity to achieve adequate density, height, and vigor within an appropriate time frame to stabilize the diversion.

Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, rock, straw or hay bale dikes, fabric checks, filter fences, or runoff diversion to protect the vegetation until it is established. Planting of a close growing crop (e.g. small grains or millet) on the contributing watershed prior to construction of the diversion can significantly reduce the flow through the diversion during establishment.

If feasible, stock pile the existing topsoil and spread the topsoil over the diversion after construction to facilitate vegetative establishment.

Lining. If the soils or climatic conditions preclude the use of vegetation for erosion protection, use non-vegetative linings such as concrete, gravel, rock riprap, cellular block, or other approved manufactured lining systems.

Liners shall be designed in accordance with Florida NRCS conservation practice standard, Lined Waterway or Outlet, Code 468.

CONSIDERATIONS

A diversion in a cultivated field should be aligned and spaced from other structures or practices to permit use of modern farming equipment. Design the side slope lengths to fit equipment widths when cropped.

At non-cropland sites, consider planting native vegetation in areas disturbed due to construction.

Maximize wetland functions and values with the diversion design. Minimize adverse effects to existing functions and values. Diversion of upland water to prevent entry into a wetland may negatively affect a wetland by changing the hydrology.

Any construction activities should minimize disturbance to wildlife habitat. Explore opportunities to restore and improve wildlife habitat.

On landforms where archeological sites are likely to occur, use techniques to maximize identification of such sites prior to planning, design, and construction.

For vegetated diversions, avoid areas where unsuitable subsurface, subsoil, substratum material that limits plant growth such as salts, acidity, root restrictions, etc., may be exposed during implementation of the practice. Where these areas cannot be avoided, seek recommendations from a soil scientist for ameliorating the condition.

PLANS AND SPECIFICATIONS

Plans and specifications for installing diversions shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

As a minimum, the plans and specifications shall include:

- A plan view showing the location of diversion.
- Typical cross-section(s) showing the minimum deign depth (storm depth plus freeboard), ridge width, and settlement.
- Earthfill compaction requirements.
- Grade of diversion.
- Diversion outlet.
- Details of any structures (pipes, outlets, etc.).
- Disposal of excess material.
- Vegetative treatment or other treatment.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to and reviewed with the landowner.

The plan shall include specific instructions for maintaining diversion capacity, storage, ridge height, and outlets.

The minimum requirements to be addressed in the operation and maintenance plan are:

- Provide periodic inspections, especially immediately following significant storms.
- Promptly repair or replace damaged components of the diversion as necessary.
- Maintain diversion capacity, ridge height, and outlet elevations especially if high sediment yielding areas are in the drainage area above the diversion.
- Establish necessary cleanout requirements.
- Each inlet for underground outlets must be kept clean and sediment buildup redistributed so that the inlet is at the lowest point. Inlets damaged by farm machinery must be replaced or repaired immediately.
- Redistribution of sediment as necessary to maintain the capacity of the diversion.
- Vegetation shall be maintained and trees and brush controlled by hand, chemical and/or mechanical means. Maintenance of vegetation will be scheduled outside of the primary nesting season for grassland birds.
- Control pests that will interfere with the timely establishment of vegetation.
- Keeping machinery away from steep sloped ridges and keeping equipment operators informed of all potential hazards.

REFERENCES

ARS Agricultural Handbook 667
Engineering Field Handbook,
Part 650, Chapter 9
Florida NRCS Conservation Practice Standard,
Critical Area Planting, Code 342
Lined Waterway or Outlet, Code 468
General Manual
Title 420-Part 401
Title 450-Part 401
Title 190-Parts 410.22 and 410.26
National Cultural Resources Handbook
National Environmental Compliance Handbook
National Food Security Act Manual
National Planning Procedures Handbook
Florida Supplements to Parts 600.1 and 600.6
SCS-TP-61, Handbook of Channel Design for Soil and Water Conservation Measures.