

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

**FLOODWATER DIVERSION**

(feet)  
CODE 400

**DEFINITION**

A graded channel with a supporting embankment or dike on the lower side constructed on lowland subject to flood damage.

**Scope**

This standard applies to the construction of a channel and embankment to divert floodwater. It does not apply to diversions (362) or floodways (404).

**PURPOSES**

To divert floodway from lowlands by the construction of a graded channel on the lowlands.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice is applicable if:

1. Floodwater originating outside the lowland area to be protected is causing damage to agricultural land, crops, or improvements or is expected to cause damage to improvements to be made in the area.
2. An adequate outlet for the design flow is available, either by gravity flow or by pumping. The outlet shall be suitable for the quality and quantity of water and sediment to be disposed of, with consideration of possible damages above or below the point of discharge that might involve legal actions under state law. The outlet can be a floodway (404) or a natural channel, river, lake, bay, or tidal estuary.
3. Land to be protected is suitable for agriculture within its capabilities after installation of required conservation practices.

**CRITERIA**

**Location**

The floodwater diversion shall be located to protect the maximum area of lowland, consistent with economic limitations, topographic requirements, and the desired slope of the hydraulic gradeline.

In selecting the location for floodwater diversions, consideration shall be given to the preservation of existing fish and wildlife habitat, trees of significant value for wildlife food, dens or shelter, and existing visual resources.

**Capacity**

Floodwater diversions that are to protect agricultural land shall have the capacity to carry the peak runoff to be expected from a 10-year frequency storm. If farmsteads, public roads, or other improvements are within the area to be protected, the design capacity shall be consistent with the hazard involved but shall not be less than the peak flow from a 25-year frequency storm.

**Hydraulic gradeline**

The hydraulic gradeline of the floodwater diversion shall tie in to the elevation of water in the outlet expected for the frequency storm selected for design, and shall be established with due regard for damages that may occur on the opposite side of the floodwater diversion from the supporting embankment. It shall have a slope in the direction of flow that will result in a velocity that will not cause excessive erosion or sedimentation.

**Cross section**

The design cross section shall be set below the design hydraulic gradeline and shall include the total cross-sectional area bounded by the embankment, the berm between embankment and channel, the channel, and the flow area on the opposite side of the channel from the embankment.

**Velocity**

If site conditions indicate that erosion is likely to be a hazard because of a higher velocity resulting from a lower roughness coefficient immediately after construction and before establishment of vegetation, such lower value of roughness coefficient shall be estimated. The resultant velocities shall be considered in designing the channel and planning protective measures. The criteria for open channels (582) regarding channel stability, velocity, and roughness coefficient shall be followed.

The maximum permissible design velocity shall be based on site conditions and determined by procedures described in TR-25, Planning and Design of Open Channels. A desirable minimum velocity is 1.5 ft/s. On flat grades where the design velocity is below this value, the cross section shall be adjusted to obtain the most efficient section that depth and maintenance methods permit.

**Berm and embankment**

The minimum berm width between channel and embankment shall be based on the depth of the channel.

Depth of channel	Minimum berm
<i>ft</i>	<i>ft</i>
2-4	4
4-6	6
6-8	10
More than 8	15

Wider berms than indicated should be used if site conditions permit. The embankment may be constructed from the channel excavation or from suitable borrow.

The design height of the embankment shall be the design water depth plus a freeboard of at least 2 ft. The constructed height shall be the design height plus an allowance for settlement based on consideration of soil material and the anticipated compaction during construction, but such allowance shall be no less than 5 percent of the design height.

The minimum requirements for the cross section of the embankment where fill is compacted by hauling or special equipment shall be:

Design water height (ft)	Minimum top width (ft)	Steepest side slope
0-6	6	1.5:1
6-12	8	2:1

If because of soils or water conditions it is impractical to compact the embankment with hauling or special equipment, dumped fill may be used. Dumped fill shall have minimum cross section dimensions incorporated within the fill as follows:

Design water height (ft)	Minimum top width (ft)	Steepest side slope
0-6	10	2:1
6-12	14	2.5: 1

Side slopes of 3:1 on water side and 2:1 on land side may be used instead of 2.5 for both slopes.

**Vegetative cover**

If needed, an adequate cover of grasses shall be established on the embankment to protect it against erosion by flood flows, wave action, or rainfall and runoff. Seedbed preparation, seeding, sprigging or sodding, fertilizer, mulching, and fencing shall comply with recommendations in applicable technical guides.

**Maintenance access**

Maintenance access shall be provided as specified in the standard for open channels (582).

**CONSIDERATIONS**

**Water Quantity**

1. Effect on the water budget, especially on volumes and rates of runoff, evaporation, infiltration, deep percolation, and ground water recharge.
2. Effects of changes in plant growth and transpiration because of changes in the amount of soil water in the vicinity of the structure.
3. Effects of eliminating filling of depressions and potholes on the flood plain.

## **Water Quality**

1. Effects of the movement of sediment and soluble and sediment-attached substances or other toxics carried by runoff.
2. Effects of erosion, including the downstream stability of streambanks and streambeds.
3. Effects of changes in ground water contamination by soluble substances because of decreases in infiltrating floodwater.
4. Effects on the visual quality of downstream water resources.

## **Endangered Species Considerations**

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

## **PLANS AND SPECIFICATIONS**

Plans and specifications for construction floodwater diversions shall be in keeping with this standard and shall describe the requirements for construction to achieve the intended purpose.

## **OPERATION AND MAINTENANCE**

An operation and maintenance plan must be prepared by the Designer for use by the owner or other responsible for operating this practice. The plan should provide specific instructions for operating and maintaining the system to insure that it functions properly. It should also provide for periodic inspections and prompt repair or replacement of damage components.