

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

KARST SINKHOLE TREATMENT

(Ft.)  
Code 527



**DEFINITION**

The treatment of sinkholes in karst areas to reduce contamination of groundwater resources, and/or to improve farm safety.

**PURPOSES**

This practice may be applied in karst topography to:

- improve water quality
- improve farm safety

**CONDITIONS WHERE PRACTICE APPLIES**

On any land surface or in conjunction with any existing practice where the soils and geologic conditions are characterized by sinkholes or karst topography.

This practice does not apply to erosional or collapse features caused by failure or leakage of underground pipes or constructed surface drainage features (e.g., canals), or due to piping of unstable soil materials, or due to poorly compacted or poorly constructed features.

This practice does not apply to sinkholes that may appear in or beneath structures or in

flowing streams. Treatment of sinkholes in these areas will be determined through engineering investigations and structural design solutions.

**CRITERIA**

**General Criteria Applicable To All Purposes**

The installation and operation of karst sinkhole treatment(s) will comply with all Federal, State, and local laws, rules, and regulations.

Evaluate and avoid or minimize impact to cultural resources, wetlands and Federal and state protected species 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).

Geologic investigation of the potential impact of the treatment of sinkholes on ground water, surface water, and the karst features will be conducted by a qualified geologist.

Where applicable, remove and dispose trash and other foreign material from the sinkhole in an environmentally sound manner.

Develop nutrient and pest management plans for the drainage area of the sinkhole controlled by the landowner.

**Surface Water Control.** Changes to the volume of surface water that enters a sinkhole may disturb the underground hydrology. To the extent possible, maintain the surface water flow at historic (or predevelopment) volumes.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Stabilize pre-existing concentrated flow channels but do not otherwise alter. If a plug or inverted filter is used, the area to be protected will be characterized by a qualified geologist to ensure a suitable design. Disperse concentrated flow caused by the construction activities with a suitable spreading or diversion technique.

Divert excess surface water caused by construction activities from the sinkhole area in accordance with the Florida NRCS conservation practice standard Diversion, Code 362.

To treat or close sinkholes via a reverse filter or plug, excavate sinkholes to stable, unweathered bedrock, if possible, prior to construction.

Do not fill sinkholes that open into caves under any circumstances. Gated openings may be used for safety reasons.

#### **Criteria Applicable To Improve Water Quality**

**Vegetative Treatment.** Establish and/or maintain a vegetated buffer around all sinkholes treated. The buffer will be a minimum of 25-foot wide measured from the rim of the sinkhole. Extend the buffer area to prevent concentrated flow channels from occurring and entering the sinkhole. Guidance for vegetative buffers for the treatment of sinkhole areas is addressed in Florida NRCS conservation practice standards Riparian Forest Buffer, Code 391, Riparian Herbaceous Cover, Code 390, and Filter Strip, Code 393. Specify the width of the vegetated buffer to be established and maintained in accordance with the type of buffer chosen.

Exclude livestock from the vegetative buffer except when grazing would be beneficial to maintenance of the buffer. Grazing shall be in accordance with an approved grazing plan.

Do not apply nutrients, herbicides, pesticides, and animal waste within an established buffer. Use only mechanical treatments for weed control.

Use appropriate erosion and sediment control measures to reduce the amount of sediment entering sinkhole openings during the establishment of the vegetative buffer.

**Surface Water Control.** Changes to the volume of surface water that enters a sinkhole may disturb the underground hydrology. To the

extent possible, maintain the surface water flow at historic (or predevelopment) volumes.

Stabilize pre-existing concentrated flow channels but do not otherwise alter. If a plug or inverted filter is used, the area to be protected will be characterized by a qualified geologist to ensure a suitable design. Disperse concentrated flow caused by the construction activities with a suitable spreading or diversion technique.

Divert excess surface water caused by construction activities from the sinkhole area in accordance with the Florida NRCS conservation practice standard Diversion, Code 362.

#### **Criteria Applicable To Improve Farm Safety**

**Sinkhole Treatment/Closing.** Adequate protection of most sinkhole and sinkhole areas can be achieved by the use of vegetative buffers and livestock exclusion. However, if an open sinkhole is a safety hazard, it may be treated with a rock filter, gabions, or other methods.

Fence the sinkhole. Design the fence to meet the requirement of Florida NRCS conservation practice standard Fence, Code 382.

#### **CONSIDERATIONS**

Consider developing nutrient and pest management plans for the drainage area of the sinkhole controlled by the landowner.

Consider current and planned land use. In particular, structures, septic fields, wells, feedlots, ponds, and animal waste storage systems should not be located over a sinkhole site or within the impact area.

For a sinkhole receiving contaminated overland flow, every effort should be made to first treat the source of the contamination. Although it is important to maintain the hydrology of the karst system, it may be more beneficial to the ground water quality to divert the contaminated water away from the sinkhole. In some cases, it may be necessary to completely plug a sinkhole with sealing materials rather than treat it with a filter. Acceptable sealing materials are provided in ASTM D 5299, Part 6.4. An example of this would be a sinkhole in a feedlot or a site that is difficult to protect by any other method.

The sinkhole treatment should not result in excessive surface water ponding or high soil moisture conditions over an extended period of time.

Treatment of one sinkhole may have an effect on other sinkholes or solution features in the vicinity.

Consider the use of a conservation easement for the buffer and sinkhole.

### **PLANS AND SPECIFICATIONS**

Prepare the plans and specifications for karst sinkhole treatment in accordance with this standard and describe the requirements for applying the practice to achieve its intended purpose.

As a minimum, include in the plans and specifications the following:

- Plan view showing the location of sinkhole and sinkhole area. Include topographic information and photographs.
- The geologic investigation will include a study of potential impacts on the karst resource.
- Delineate the drainage area of sinkhole on a topographic map.
- Depth to stable, unweathered bedrock.
- Description of planned treatment measures.
- Availability of safe outlet for surface water, if applicable.
- Removal and disposal of trash, if applicable.

- Special safety requirements.
- Environmental assessment, if applicable.
- Location of utilities and notification.

### **OPERATION AND MAINTENANCE**

Provide an operation and maintenance (O&M) plan with specific instructions for maintaining the sinkhole and sinkhole area treatment, including reference to periodic inspections and the prompt repair and/or replacement of damaged components.

### **REFERENCES**

- ASTM D 5299, Part 6.4
- Florida NRCS Conservation Practice Standards
  - Diversion, Code 362
  - Critical Area Planting, Code 342
  - Fence, Code 382
  - Filter Strip, Code 393
  - Mulching, Code 484
  - Riparian Forest Buffer, Code 391
  - Riparian Herbaceous Cover, Code 390
- General Manual
  - Title 420-Part 401
  - Title 450-Part 401
  - Title 190-Parts 410.22 and 410.26
- National Cultural Resources Procedures Handbook
- National Environmental Compliance Handbook
- National Food Security Act Manual
- National Planning Procedures Handbook Florida Supplements to Parts 600.1 and 600.6