BMP 4

Sinkholes

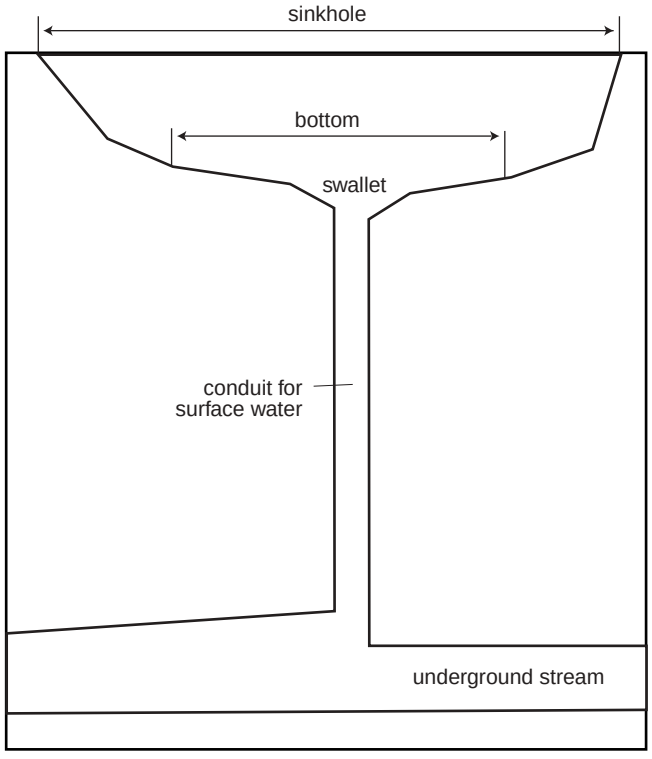
Purpose

Best Management Practices should be implemented to reduce nonpoint source pollutants from flowing into the bottom of sinkholes and to minimize degradation to groundwater, the underground drainage system, and the downstream surface water into which the underground streams flow.

Definitions

Sinkholes (or karst windows) are open or closed circular depressions in karst (limestone) areas where surface waters flow to join an underground drainage system (Figure 4-1). Sinkholes are caused by dissolution of the underlying limestone bedrock. A "**swallet**" is a point where surface water leaves the surface and flows underground. For purposes of this BMP, sinkholes include depressional areas with or without swallet, sinking streams, caves, karst windows, and pits or vertical shafts.

Figure 4-1. Flow of Waters through a Sinkhole



Specifications

Sinkholes with open swallets, where surface water can drain unfiltered into underground drainage systems, require special concern. While sinkholes with no open swallet should pose no significant concern, it is often difficult to determine if an open swallet exists in forested sinkholes. Therefore, caution must be exercised during silvicultural and timber harvesting operations around sinkholes.

Disturbed Ground

- Runoff from access roads, skid trails, and log landings should be diverted so as not to drain directly into sinkholes, sinking streams, or caves. (Note: If runoff does enter a sinkhole, a UIC permit may be required. See Appendix A.)
- Disturbing soil in sinkholes with open swallets should be avoided. However, each case can be evaluated individually, and minimum distances in Table 4-1 are recommended (Figure 4-2).

> **Distance from Disturbed Area to Sinkhole Bottom**
> The distance between any disturbed area (disturbed areas include access/haul roads, skid trails, log landings, or those disturbances produced from mechanical site preparation treatments) and the bottom of a sinkhole will be at least 30 feet for areas of 5 percent slope. An additional 10 feet in width will be added to this zone for each 10 percent increase in slope, up to a maximum width of 65 feet (Table 4-1).

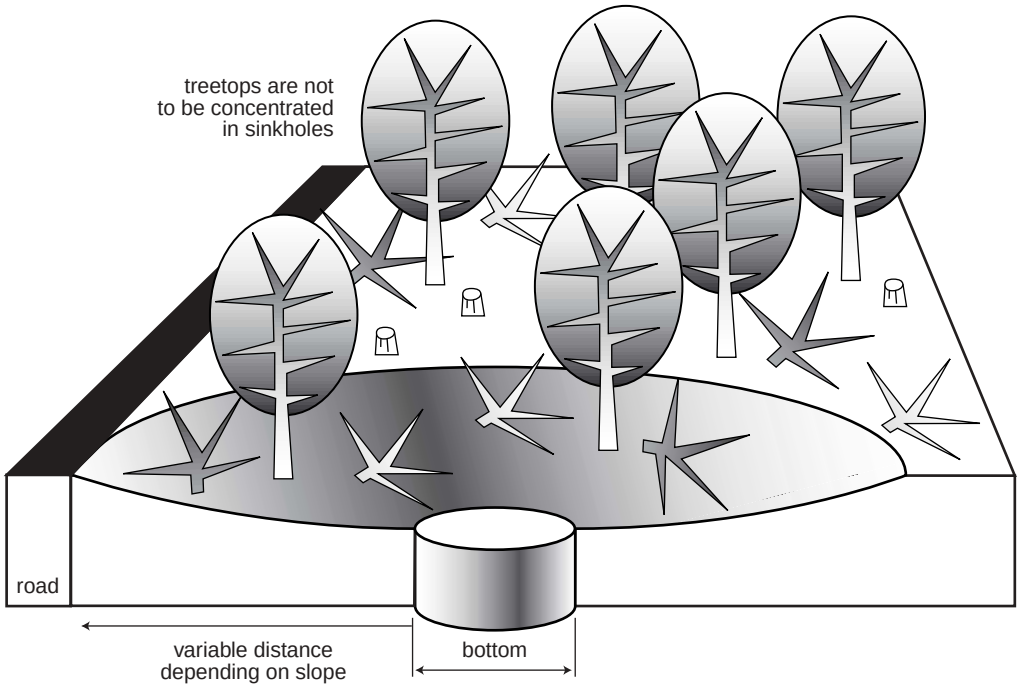
- Divert runoff away from openings in sinkholes.
- Reestablish vegetation on disturbed areas as quickly as possible (see BMP No. 2 for recommendations).

Table 4-1—Minimum Distances from Silviculturally Disturbed Areas and the Point of Lowest Elevation or Open Swallet of a Sinkhole

Slope of Land (%)	Distance (feet)
5	30
10	35
20	45
30	55
40 or higher	65

Note: this table corresponds to the recommended minimum distances for roads, trails, and landings from intermittent streams.)

Figure 4-2. Specifications for Sinkhole BMP



Debris and Fluids

- **Soil, logging debris, and other waste materials** should not be pushed into the bottom of any sinkhole or into any noticeable sinkhole opening.
- **The density of tree tops** in sinkholes should not exceed the density present in the area surrounding the sinkhole (Figure 4-2).
- **Equipment fluids** should not be drained onto the ground, and logging equipment should not be parked in the bottom of sinkholes where direct runoff of pollutants from equipment into the bottom of the sinkhole is likely to occur.

Pesticides and Fertilizers

Use of fertilizers and pesticides within 30 feet of the bottom of a sinkhole and/or swallet is undesirable and should only be applied in strict compliance with label directions for application near bodies of water. Fertilizer and pesticide use in the vicinity of a sinkhole with no swallet should pose no problem. However, a buffer zone should be employed in the vicinity of a sinking stream or sinkhole with an open swallet.

Regulatory Requirements for BMP No. 4

(See Appendix A for explanations)

- Activities around sinkholes, cave entrances, etc.: (KRS 433.870-433.875)
- Endangered species in caves: (Federal Register 55:6184 and 56:58804-58836)
- Modified sinkholes: (May need to be registered and/or permitted)
- Cave streams and other underground surface waters: (may deal with KY Surface Water Statutes and/or Outstanding Resource Waters)
- All silvicultural operations: (410 KAR 5:026, 5:029, 5:030, and 5:031)
- Activities near high-quality waters and outstanding national resource Waters: (401 KAR 5:029, 5:030, and 5:031w
- Activities near wild rivers: (KRS 146.200 *et seq.* and 401 KAR 4:100-140)
- Karst Groundwater Basin Protection

Summary: AWQA Minimum Requirements for BMP No. 4

The producer should:

- leave a buffer zone should be left between any disturbed area and the open swallet of a sinkhole of 30 feet for areas of 5 percent slope. An additional 10 feet in width will be added to this zone for each 10 percent increase in slope.
- divert runoff from haul/access roads, skid trails, and log landings so as not to drain directly into sinkholes, sinking streams, or caves. (Note: if runoff does enter a sinkhole, a UIC permit may be required.)
- not push soil, logging debris, and/or other waste material into the bottom of a sinkhole or into any noticeable sinkhole opening.
- not drain fluids from equipment onto the ground. They should be collected in a container, transported off site, and recycled or properly disposed.
- maintain a buffer zone along sinking streams or in sinkholes with an open swallet if there is fertilizer and/or pesticide usage in the vicinity.