

# Interagency Cooperative Sinkhole Protection and Karst Remediation in Virginia

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## Abstract

Federal, state, and private cost share programs fund sinkhole clean outs and other karst protection work in Virginia. The Virginia Karst Program—in the Virginia Department of Conservation and Recreation's Division of Natural Heritage—commonly acts as project coordinator and liaison between landowners, contractors, volunteers, and funding entities. The Karst Program also provides tools for assessing sinkhole dumps, prioritizing sinkholes for remediation, and executing projects in a low-impact manner. Sinkholes are prioritized based on degree of degradation, hydrological function, biological significance, and use as water supplies. The United States Fish and Wildlife Service's Partners for Fish and Wildlife Program funds habitat restoration for species listed under the Endangered Species Act. The U.S. Department of Agriculture's Natural Resources Conservation Service manages the Wildlife Habitat Incentive Program and the Environmental Quality Incentive Program to improve the quality of wildlife habitat and encourage beneficial conservation practices by landowners. The Conservation Reserve Enhancement Program and Virginia Agricultural Best Management Practices, administered by Natural Resources Conservation Service and local Soil and Water Conservation Districts are joint Federal-State land retirement conservation programs that apply to lands currently under active agricultural use. The Cave Conservancy of the Virginias sometimes funds sinkhole clean-outs in significant cave and karst areas. These programs can pay up to 75 percent of project expenses and some provide additional tax credit and land rental incentives. Landowner and volunteer labor and materials commonly serve as in-kind match to meet cost share requirements. Management agreements, typically 10 to 15 years in duration, accompany most projects.

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## Summary

Virginia's karstlands are found along the valley and ridge province extending from Frederick County in northern Virginia to Lee County in the far southwestern part of the state. More than 3,300 caves are found in Virginia, some containing globally significant biota adding to Virginia's biodiversity. Karst landscapes in Virginia and elsewhere suffer from many years of sinkhole dumping and other improper management practices. Landowners commonly water their livestock in streams flowing directly into karst aquifers. Sinkhole dumping often results in pollution of groundwater in karst terrains. These actions may lead to destruction of the critical habitats of the troglobitic and stygobitic organisms inhabiting caves. The Virginia Karst Program, a part of the Virginia Department of

Conservation and Recreation's Division of Natural Heritage is working to correct some of these problems by using a variety of federal, state, and private cost share and grant programs.

A number of tools are used to identify karst features in need of attention. A sinkhole classification scheme and sinkhole dump assessment form and associated training is being developed to enable conservation professionals with little background in karst to work effectively to protect karst resources. A sinkhole clean out procedures guide is used to ensure proper attention is paid to engineering procedures, safety, and business arrangements with contractors and landowners. It is important to prequalify excavation contractors used for karst remediation work. Contractors are often chosen based on a low bid, but differences

in equipment and experience should be taken into account. Any contractor must demonstrate compliance with state contractor licensing and insurance requirements. Agreements should stipulate payment be made only for work performed. A typical clean out involves removal of trash and other debris from the sinkhole and the proper disposal of materials at a landfill or recycling center. Measures to stabilize the sinkhole's land surface and the establishment of an appropriate ground cover with native plants are usually preferred. Sinkholes are often fenced to exclude livestock and casual visitors.

The Division of Natural Heritage Karst Program staff manages sinkhole clean outs using external funding sources. Volunteer assistance and the cooperation of local government organizations are also important elements for the success of the program. Expenses associated with sinkhole clean outs include costs of heavy equipment and hauling, landfill tipping fees, and supplies such as erosion control materials and fencing. Priority of sinkhole projects is based on the presence of natural heritage resources including state or federally listed species, the sensitivity of the sinkhole to environmental damage, and the nature of the refuse present in the sinkhole.

The Cave Conservancy of the Virginias is a private nonprofit conservation organization that funds some of the sinkhole clean out work administered by the Virginia Division of Natural Heritage Karst Program. A large sinkhole clean out project in Rockbridge County during the spring of 2000 known affectionately as "the Sinkhole from Hell" was performed using Cave Conservancy of the Virginias funds. The "Sinkhole from Hell" project removed 500 tires, kitchen appliances, and vehicles from the site with the assistance of 20 volunteers from the Virginia Region of the National Speleological Society. Another clean out project funded by Cave Conservancy of the Virginias during the fall of 2001 was the Neel Sinkhole clean out in Giles County. The Neel Sinkhole clean out removed more than 15 tons of debris including an old house trailer that had directly discharged sewage next to the sinkhole. Numerous tires and several old batteries were also removed from the site. The Neel Sinkhole project was accomplished with help from 35 volunteers and workers including many members of the VPI Cave Club. The Giles County Public Works Department provided a backhoe and operator for the project.

The United States Fish and Wildlife Service plays an active role in karst protection in Virginia. The Partners for Wildlife Program, administered by U.S. Fish and Wildlife Service with some technical assistance from the Divi-

sion of Natural Heritage, has funded bat friendly cave gates, cave and sinkhole clean outs, and sinkhole fencing projects. During fiscal year 2001 the U.S. Fish and Wildlife Service spent approximately \$43,000 on Upper Tennessee River Karst Projects (personal communication with Gale Heffinger of USFWS). Landowners who participate in the Partners for Wildlife Program must sign a contract agreeing to cease all dumping and adopt certain specified management practices for a defined period of time, usually ten years. Agreements of this nature are typical of most cost share programs. The Partners for Wildlife Program is unique in that the federal money can cover from 75% to 90% of the cost of a project (and sometimes 100%). This program is concerned with increasing habitat for federally listed species.

Several sinkhole clean out projects in Virginia have been accomplished using U.S. Fish and Wildlife Service Partners for Wildlife funds. A large amount of coal ash and garbage was removed from a sinkhole near Rye Cove High School in Scott County. Rye Cove is designated as one of Virginia's Significant Karst Areas. The educational value of having a high profile project near a school provided an added bonus. In other projects Tipton Sinkhole in Scott County and Bull Cave in Lee County were both cleaned out and erosion and sedimentation control measures installed using U.S. Fish and Wildlife Service money. The Tipton Sinkhole contained an estimated 75 tons of debris. The sinkhole at Bull Cave contained approximately 500 tires and 20 to 30 tons of other debris. Both Bull Cave and Tipton Sinkhole contain the Lee County cave isopod *Lirceus usdagalun*, and Tipton Sinkhole contains the Rye Cove cave isopod *Lirceus culveri*. These projects will help to restore the quality of the groundwater in karst aquifers and provide habitat protection for associated cave biota.

The Conservation Reserve Enhancement Program is funded through the federal farm bill. The Program is administered jointly by the Virginia Department of Conservation and Recreation and the Natural Resources Conservation Service through the Soil and Water Conservation District Offices. The Conservation Reserve Enhancement Program program seeks to protect water quality and to improve wildlife habitat by establishing a cost-sharing program with landowners to install and restore vegetated buffers around streams. The Conservation Reserve Enhancement Program targets croplands and marginal pasturelands. The Program may be used to establish a buffer around a sinkhole if the sinkhole is receiving a perennial stream or is a significant groundwater re-

charge location. Various Soil and Water Conservation District professionals sometimes interpret the rules for the Conservation Reserve Enhancement Program differently. The program provides a 50% federal cost share for establishing forested riparian buffers, filter strips, and wetland restorations meeting minimum Natural Resources Conservation Service standards paying up to \$200 per acre to implement the practice. An additional 25% toward reimbursable costs may be eligible through the state if certain criteria are met. The Conservation Reserve Enhancement Program requires a landowner to sign either a ten or fifteen year contract with an annual rental payment to the landowner of up to \$100 per acre per year. One provision from the state of Virginia with Conservation Reserve Enhancement Program lands offers to pay an additional \$500 per acre after installing conservation practices for recording a permanent open space easement to protect the buffer in perpetuity (personal communications with Gary Moore, Manager of the Division of Conservation and Recreation Conservation Reserve Enhancement Program).

Other cost share programs can potentially be used for conservation work in karst areas. The Environmental Quality Incentive Program is administered by the Natural Resources Conservation Service. The Environmental Quality Incentive Program is a cost share program targeted to "priority areas" identified by the federal government or by the state. Similar in some ways to the Conservation Reserve Enhancement Program, "priority areas" tend to be in the watersheds of impaired streams or streams exceeding their total daily maximum load limits.

The Wildlife Habitat Incentives Program is another program administered by the Natural Resources Conservation Service. The Wildlife Habitat Incentives Program is a cost share program to help private landowners to install practices to improve wildlife habitat. This program provides a 75% cost share program to install practices with a \$10,000 maximum cost share per applicant with a ten-year contract and maintenance agreement. The Wildlife Habitat Incentives Program has a continuous sign-up period; Program sign-ups are for a particular period of time. The complexities of all the cost share programs require applicants to maintain close coordination with the appropriate agencies in order to become successfully enrolled and meet sign-up deadlines.

In Virginia an exciting option is being proposed for an existing cost share program. The Virginia Best Management Practices Program is studying a proposal by the state's cost share

Advisory Committee to include some funding for sinkhole clean outs as part of the state Best Management Practices. The proposed cost share would pay 75% toward a given project with the maximum state contribution set at \$2,500. Volunteer labor contributions and in kind supplies and labor provided by the landowner typically count toward the landowner's cost share contribution. The proposed sinkhole clean-out Best Management Practice will hopefully provide Virginians with a powerful tool for karst protection.

The Virginia Department of Conservation and Recreation and the Natural Resource Conservation Service are both adopting sinkhole protection standards for use in Virginia. Priority for remediation work would be given to sinkholes actively taking water from perennial streams, intermittent streams, or other channeled flow. Sinkholes containing an obvious opening into the subsurface or with exposed bedrock in the sinkhole would be good candidates for protection. Steep internal slopes (30°) or soil slumps exposed in the side or bottom of a sinkhole would rank highly as well. Protection practices would include establishing natural vegetation buffers around sinkholes accompanied by installation of soil erosion and sedimentation control measures as required. The previous Natural Resources Conservation Service sinkhole practices were based on a standard developed in Pennsylvania that involved the filling of sinkholes with graded stone filters. Discussions between Natural Resources Conservation Service representatives and Virginia Karst Program staff recently led the Natural Resources Conservation Service in Virginia to actively discourage the filling of sinkholes except in rare and extreme cases. It should be emphasized that documentation of any filled sinkholes is critically important. A "paper trail" such as a deed book record should serve constructive notice to future potential landowners that a risk for subsidence exists at a defined location. The Natural Resources Conservation Service staff is working with the Virginia Karst Program to develop the new standard.

Karst landscapes are a fragile and valuable part of our natural heritage and deserve protection. Karst aquifers provide 75% of the drinking water supply for 27 of Virginia's western counties. Much can be accomplished by using existing state and federal programs for karst projects. The task ahead is so large that environmental professionals with little experience in karst will be called upon to do much of the protection work. Educating these same professionals about karst protection issues and