Community Conservation Assessment for SPRINGS and Associated Rare Animal Species

(photo by Byrd and Strunk, from Strunk, 1992).

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HOOSIER NATIONAL FOREST

This Conservation Assessment was prepared to compile the published and unpublished information on springs and associated rare animals species in the Hoosier National Forest. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community and associated taxa, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

The purpose of this document is to provide the background information necessary to prepare a Conservation Strategy, which will include management actions to conserve springs and spring communities.

DESCRIPTION OF HABITAT AND COMMUNITY

Discharge of groundwater to the surface can occur in many ways, although the most common is via springs. In some cases an enterable cave passage is present, while in others the conduit through which the groundwater was travelling is either too small for human entry or is not enterable through a spring orifice. Most springs on the Hoosier National Forest are associated with karst and discharge from conduits created in limestone. Further classification is sometimes afforded by measuring the amount of water flowing from the spring. Most springs are perennial and have measurable quantities of water flowing from them. A standard for the classification of springs according to flow was proposed by Meinzer (1927):

Magnitude	Discharge
First	>100 cubic feet/second
Second	10 – 100 cubic feet/second
Third	1 – 10 cubic feet/second
Fourth	100 gallons/minute – 1 cubic foot/minute (448 gpm)
Fifth	10 – 100 gallons/minute

Flow information is generally unavailable for springs on the Hoosier National Forest, although it is envisioned that at base flow conditions most would fall into fourth or fifth magnitudes.

The community associated with springs is a mixture of stygobionts characteristically found in caves (but sometimes tolerant to varying degrees the conditions present in spring orifices or even spring streams) and epigean animals. The stygobiont isopod Caecidotea stygia is nearly ubiquitous in springs of the Hoosier National Forest. Almost any other stygobiont species occurring in the Hoosier National Forest area might occur in spring orifices, in particular the amphipods Crangonyx packardi, Crangonyx undescribed species, or the flatworm Sphalloplana weingartneri. Common epigean species are the isopod Lirceus fontinalis, amphipods Gammarus minus and Crangonyx forbesi, and crayfish Cambarus laevis. Insects, usually larval forms, comprise another subset of the spring community, typically ephemeroptera (mayflies) and trichoptera (caddisflies). Limited numbers of plants, typically bryophytes, also grow associated with springs.

A second kind of groundwater discharge is the seep or seep-spring. Seeps can occur at the soil/bedrock contact (epikarst, soil/limestone contact), at the contact of two dissimilar types of rock (e.g., sandstone/limestone contact), or from joints or bedding planes in a single rock type. The flow from a seep is typically minimal, frequently barely enough to

wet the rock from which it is flowing. Seeps are usually periodic in nature. The fauna obtained from them is typically stygobiontic and only present ephemerally. The most commonly encountered species is the isopod Caecidotea stygia. Although presently unknown in the Hoosier National Forest, amphipods of the genus Stygobromus are to be expected in seepage areas.

COMMUNITY ECOLOGY/ENVIRONMENTAL CONDITIONS

The water emerging from a spring orifice has the characteristics of the water in the conduit from which it is emerging. In general under base flow conditions spring water is clear, since the phytoplankton that clouds surface waters is impossible in a lightless ecosystem. At the spring orifice the water is the same temperature as cave water, typically about 54-56 degrees F. in southern Indiana. Flowing from limestone strata the pH varies from neutral to mildly alkaline (i.e., pH 7-8). Dissolved oxygen is typically at or near saturation, usually above 10 parts per million. All of these parameters change as the water flows away from the underground system and takes on the characteristics of a surface stream. In particular the temperature changes to reflect ambient conditions and plant communities appear shortly downstream from the spring's emergence. Considering the relative ease with which contaminants may enter groundwater conduits, even springs that are cool, clear and inviting in appearance may contain high concentrations of fecal coliform bacteria. Contamination can originate from either animal or human sources (Vineyard and Feder, 1974).

CURRENT COMMUNITY CONDITION, DISTRIBUTION AND ABUNDANCE

Due to the widespread presence of karst topography in the Hoosier National Forest, spring communities are relatively common. Every valley present in the Crawford Upland where the valley floors are limestone is likely to have one or more springs present. All of the springs visited by the subterranean bioinventory project of the Hoosier National Forest (Lewis, et al., 2002; and in progress) appeared to be at least grossly intact with animals present consistent with normal spring fauna.

REGIONAL FORESTER SENSITIVE SPECIES

No species presently listed as Regional Forester Sensitive Species occur in springs on the Hoosier National Forest. Rare species to be proposed for the Regional Forester Sensitive Species list is the flatworm Sphalloplana weingartneri, a stygobiont endemic to groundwaters of southern Indiana and has been found in at least one Hoosier National Forest Spring.

POTENTIAL THREATS

Springs are susceptible to a wide variety of disturbances. Contaminants may be introduced with ease to the subterranean conduits from which springs emerge, with devastating effects on cave and spring animals. Potential contaminants include (1)

sewage or fecal contamination, including sewage plant effluent, septic field waste, campground outhouses, feedlots, grazing pastures or any other source of human or animal waste (Harvey and Skeleton, 1968; Quinlan and Rowe, 1977, 1978; Lewis, 1993; Panno, et al 1996, 1997, 1998); (2) pesticides or herbicides used for crops, livestock, trails, roads or other applications; fertilizers used for crops or lawns (Keith and Poulson, 1981; Panno, et al. 1998); (3) hazardous material introductions via accidental spills or deliberate dumping, including road salting (Quinlan and Rowe, 1977, 1978; Lewis, 1993, 1996).

Habitat alteration due to sedimentation is a pervasive threat potentially caused by logging, road or other construction, trail building, farming, or any other kind of development that disturbs groundcover. Sedimentation potentially changes spring habitat, blocks recharge sites, or alters flow volume and velocity. Keith (1988) reported that pesticides and other harmful compounds like PCB's can adhere to clay and silt particles and be transported via sedimentation.

Impoundments may cover springs creating changes that drastically modify the habitat by covering them with back-flooded waters (Duchon and Lisowski, 1980).

Human visitation to springs may disrupt the habitat with trampling, particularly near horse trails, introduction of flora and fauna non-native to the spring (e.g., unused bait) or introduction of hazardous materials, e.g., spent carbide, batteries at spring cave entrances (Peck, 1969; Elliott, 1998).

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

Many springs occur on the Hoosier National Forest. Some examples are Patton Cave spring, Deam Wilderness, Monroe County; Gypsy Bill Allen Cave spring, Gypsy Bill Allen Cave Special Area, Martin County; Mesmore Spring Cave, Hemlock Cliffs Special Area; and Dillon Cave Spring, Seven Springs and Spring Springs in Orange County. Forest service special areas receive restrictive management for protection of the resources present in these areas (USDA Forest Service, 1991; 2000).

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

Cave and karst habitat located on the Hoosier National Forest are subject to standards and guidelines for caves and karst protection and management as outlined in the Hoosier National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service, 1991). These standards and guidelines include the following:

> *Caves are protected and managed in accordance with the Federal Cave and Karst Resources Protection Act of 1988, Forest Service Manual 2353, Memorandums of Understanding between the forest service and the National Speleological Society, the Indiana Karst Conservancy, Inc., the Forest Cave Management Implementation Plan, and individual specific cave management plans.

*Except where modified by an existing cave management prescription, vegetation within a 150-200 foot radius of cave entrances and infeeder drainages with slopes greater than 30 percent will generally not be cut. No surface disturbing activities will be conducted on any slopes steeper than 30 percent adjacent to cave entrances. Similar protection areas will be maintained around direct drainage inputs such as sinkholes and swallow holes known to open into a cave's drainage system of any streams flowing into a known cave.

*Allow no sediment from erosion of access roads and drilling sites to wash into caves or karst features.

*Seismic surveys requiring explosives shall not be conducted directly over known cave passages or conduits.

*All caves will be managed as significant.

(USDA Forest Service, 1991)

The forest plan includes a cave and karst management implementation plan. This management plan places an emphasis on cave resource protection and mitigation. Understanding of the caves is established through mapping, bioinventory, cataloging of resources (e.g., archaeological, paleontological, speleothems, etc.), and estimating use levels and trends. Protection zones or other mitigation measures recommended by a management prescription will be established around caves entrances, sinkholes and swallowholes. Specific criteria will include consideration for protection of entrance and cave passage microclimate, animals inhabiting the cave, physical and chemical parameters and aesthetic values associated with the cave.

RESEARCH AND MONITORING

A bioinventory of subterranean habitats of the Hoosier National Forest is being conducted in which the stygobiont subset of spring fauna is being sampled (Lewis, et al., 2002; and in progress).

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