Powell Mountain Karst Preserve:

Biological Inventory of Vegetation Communities, Vascular Plants, and Selected Animal Groups

Interim Report
Jan 2009-July 2009

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For:

The Cave Conservancy of the Virginias

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Introduction

The Cave Conservancy of the Virginias contracted with the Virginia Department of Conservation and Recreation, Division of Natural Heritage in 2008 to conduct a biological inventory of vegetation communities, vascular plants, and selected animal groups within the Powell Mountain Karst Preserve. The project period began in January 2009 and culminates in a final report summarizing the findings of the inventory due April 2010.

The scope of work set forth in the contract called for a number of tasks to be completed during the contract period including field surveys of bat hibernacula, mist netting, cave invertebrate sampling, general non-cave invertebrate sampling, botanical survey, and vegetation community classification.

This interim report summarizes the progress of field work, and incorporates the results available from all surveys and identifications made as of June 18 2009.

Methods and Results

Natural Community Inventory

Natural Heritage vegetation ecologists Gary Fleming and Karen Paterson conducted field work on 11-12 May. A reconnaissance inventory of the entire property was conducted and four plots of representative vegetation types were sampled. Within each 400 m^2 plot, all plant species were recorded, along with their estimated cover, stem measurements of all woody plants ≥ 2.5 cm diameter at breast height, and various standard environmental measurements. Soil samples were also collected from each plot for later laboratory analysis. Additional field notes and species lists were recorded from other locations on the preserve.

Three natural communities and one semi-natural / modified community were documented during this fieldwork:

> Successional Tuliptree Forest – this type occupies much of the eastern and northern parts of the property which were cut over fairly recently. It is a young forest characterized by coppice sprouts from cut trees and dense sapling and pole-sized regeneration. Tuliptree (*Liriodendron tulipifera*) is abundant and characteristic, but a number of other trees occur, including oaks (*Quercus* spp.), hickories (*Carya* spp.), maples (*Acer* spp.), and white ash (*Fraxinus americana*). The shrub and herb layers are fairly rich, but are sparse in some areas where sapling or coppice density is very high. Small patches of older forest and individual large trees are scattered in the stand.

Dry-Mesic Calcareous Forest – this is the predominant community type on the steeper western and southern slopes of the property. Stands observed were medium-aged, probably about 60-80 years old, and were variably co-dominated by sugar maple (*Acer saccharum*), northern red oak (*Quercus rubra*), shag bark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), and tuliptree. Black oak (*Quercus velutina*), white ash, and cucumber magnolia (*Magnolia acuminata*) are common associates. Redbud (*Cercis canadensis*) and hophornbeam (*Ostrya virginiana*) are common understory trees. The herb layer is moderately rich but is sparse in places.

Montane Dry Calcareous Forest / Woodland – this dry, open forest occupies the rocky crest and upper southeast slope of the spur ridge in the southern part of the property. It is characterized by a stunted canopy of eastern red-cedar (*Juniperus virginiana*), chinkapin oak (*Quercus muhlenbergii*), white oak (Quercus alba), shagbark hickory, and white ash. Post oak (*Quercus stellata*), and sugar maple are occasional associates. A large number of drought-tolerant shrubs and herbs occur in the stand. This forest is probably as old as, or older than, the Dry-Mesic Calcareous Forest of adjacent steeper slopes.

Rich Cove / Slope Forest – a single small patch of this community type was found on the slopes of the large sinkhole around and below Parsons Cave. This lush forest occupies deep, bouldery, colluvial soils. The principal trees are sugar maple, white basswood (*Tilia americana* var. *heterophylla*), hickories, white ash, and slippery elm (*Ulmus rubra*). Pawpaw (*Asimina triloba*) and spicebush (*Lindera benzoin*) are common shrubs. The herb layer is dense and contains many moisture- and nutrient-demanding species, e.g., wild ginger (*Asarum canadense*), wood nettle (*Laportea canadensis*), sweet cicely (*Osmorhiza claytonii*). Bulblet fern (*Cystopteris bulbifera*) is abundant on the moist mossy boulders and rock faces.

No additional ecological field work is planned. However, additional data analysis will be conducted, and the final results will be provided in the final report due in April 2010.

Botanical Inventory

Natural Heritage botanist John Townsend conducted field work during 26-29 May, the first of three intended visits to the property (one each in late spring, mid-summer, and autumn). A list of all observed plants was recorded, and specimens were collected to verify identifications if field identification was not possible. Thus far, 343 vascular plant taxa (species, subspecies, and varieties) have been identified on PMKP. A list of all species recorded from the PMKP will be provided in the final report due April 2010.

Some species of conservation significance have already been located on the property. These species are found on the DCR-DNH document entitled "Natural Heritage Resources of Virginia: Rare Plants" (available online at

http://www.dcr.virginia.gov/natural_heritage/documents/plantlist09.pdf).
Rare plant species are defined as those taxa which are *imperiled* or *critically imperiled* in Virginia, while watchlist species are somewhat more widespread or secure and are therefore only considered to be *vulnerable* in Virginia.

The rare plant species *Crataegus mollis* (downy hawthorn; G5/S1) was documented on PMKP in late May near Omega Cave. This is primarily a species of northern distribution with scattered occurrences in the southeast. Its state rank of "S1" means it is critically imperiled in Virginia, while its "G5" rank denotes its wide distribution to the north.

Four species found on the DCR-DNH watchlist were found at PMKP as well: *Diarrhena americana* (American beakgrain; G4G5/S3), *Juglans cinerea* (butternut or white walnut; G4/S3?), *Lithospermum latifolium* (American gromwell; G5/S3), and *Panax quinquefolius* (American ginseng; G3G4/S3S4).

Summer Bat Inventory

Summer bat inventory at PMKP was scheduled to begin in late May, with plans to mist net bats over roads and trails within the preserve. This effort was delayed to accommodate a request by United States Fish and Wildlife Service to abstain from mist netting until June 2009.

Mist netting and summer bat surveys began on 9-11 June, and resulted in some interesting finds. A single 2 x 6 m mist net was set on the south side of the Omega Cave entrance, Two other nets (18 x 18 ft: and 6 m x 9 m) were placed along the main east/west access road in the vicinity of Parson's Cave, and downslope from Franklin Pit.

Of these, the single net at the entrance of Omega Cave was the most productive with 48 of the total 58 captures. Of the 58 captures, all but two individuals (escaped before banding) were banded using individually numbered USFWS bands, or VDGIF bands. Fifty seven of the 58 captured bats were male.

Results suggest that a large population of male *Myotis septentrionalis* is using Omega Cave as a summer roost. Of the total 45 male *M. septentrionalis* captured, 37 of them were captured at this entrance. No female *M. septentrionalis* were captured at the Omega entrance, however one pregnant female was captured in one of the road nets near Parson's Cave. It is likely that this female, and perhaps others are using forest habitat at PMKP rather than caves during summer.

Three of the four *Myotis lucifugus* captured were at the Omega entrance, as well as five *Myotis leibii* (G3 S1) and one *Perimyotis subflavus*. One male *Eptesicus fuscus*, and one male *Myotis sodalis* (Federally Endangered G2 S1) were captured in mist nets set along the access road near Parson's Cave. This capture of the *M. sodalis* at PMKP is

significant considering that fewer than 10 total summer records for the species have been documented in Virginia.

These efforts will continue through July, and August, and further results will be presented in subsequent interim reports and in the final report.

Cave invertebrate inventory

Invertebrate inventory for cave species was scheduled to begin earlier in spring 2009, however, due to concerns related to the spread of White Nose Syndrome, this work was delayed.

To date, two cave invertebrate surveys have been conducted, one in Parson's Cave on 27 May, the second in Franklin's Pit on 11 June. Wil Orndorff, and Bill Balfour conducted the survey of Parson's Cave, and collected a number of cave invertebrates from aquatic and terrestrial habitats. Among the collections were stygobitic flatworms, diplurans, spiders, aquatic isopods (*Caecidotea* sp.), and amphipods.

The globally rare epikarstic amphipod *Stygobromus cumberlandus* (Cumberland Cave amphipod; G3G4 S1S2) was recorded from rimstone drip pools at the base of flowstone columns near the entrance of Parson's Cave. Despite previous inventories of Parson's Cave, and other caves on the property, this is the first record of *S. cumberlandus* from the PMKP. No *Stygobromus mackini* were detected, despite this species previous collection at PMKP.

The two troglobitic dipurans are likely the same new (undescribed) species previously recorded in Omega cave. Per Lynn Ferguson (pers. communication to W. Orndorff in 2004) the diplurans on the east side of Crackers Neck vary significantly from those on the west (Hairy Hole) side.

Franklin Pit surveys were conducted by Wil Orndorff, Bill Balfour, and Shane Hanlon. Several beetles of the genus *Pseudanophthalmus* were collected on this trip, as well as other taxa. The *Pseudanophthalmus* is likely the same globally rare species (*P. cordicollis* G1 S1) known from other caves in the area.

Identifications of invertebrates collected are pending expert review, and will be provided in the final report pending expert verification. Additional cave invertebrate surveys are planned for July 2009-February 2010, and the results of those surveys will be reported during subsequent interim reports, or in the final report.

Bat hibernacula survey

Due to concerns over the potential spread of White Nose Syndrome to bats hibernating in caves at PMKP, surveys were postponed. These surveys are scheduled to be performed

during the upcoming hibernation season from November 2009-February 2010. Results of these surveys will be provided in subsequent interim reports as available, and in the final report due April 2010.

During the invertebrate inventory of Parson's Cave on 27 May, a small number (<10) of tri-colored bats (*Perimyotis subflavus*) were found using the cave.

Bird/herp/millipede/butterfly inventory

Zoologists Chris Hobson (CSH), Anne Chazal (ACC), and Art Evans (AVE) have conducted surveys for these groups from April 6-9 (CSH, ACC), April 27-29 (CSH, AVE), May 11-14 (CSH, ACC), May 26-29 (CSH), and June 9-11 (CSH, ACC).

A total of 50 bird species have been recorded to date, including several species of neotropical migrant songbirds, most notably Cerulean Warbler, Worm-eating Warbler, American Redstart, Hooded Warbler, and Black and White Warbler. Baltimore Oriole, Ruby-throated Hummingbird, Acadian Flycatcher, Purple Finch, and Hermit Thrush are among other birds of interest. A full list of bird species encountered at PMKP will accompany the final report.

Several species of salamanders have been documented on site, including the watchlisted green salamander (*Aneides aeneus*). The green salamander (G3G4 S3) is typically found on sandstone rock outcrops, and is known from relatively few sites where it inhabits limestone, including the rock outcrops above Parson's Cave. This species has also been documented on limestone in "The Cedars" area of Lee County.

Green salamander (*Aneides aeneus*) from Powell Mountain Karst Preserve, Wise County, Virginia (photo Anne. Chazal)

Others noted include the mountain dusky salamander (*Desmognathus ochrophaeus*), seal salamander (*D. monticola*), spring salamander (*Gyrinophilus porphyriticus*), cave salamander (*Eurycea lucifuga*), long-tailed salamander (*Eurycea longicauda*), slimy salamander (*Plethodon glutinosus*), Cumberland salamander (*Plethodon kentucki*), ravine salamander (*Plethodon richmondi*), and red-spotted newt (*Notophthalmus viridescens*).

Only three species of frogs have been documented to date, spring peeper (*Pseudacris crucifer*), green frog (*Lithobates clamitans*), and gray treefrog (*Hyla chrysocelis*).

Reptiles documented to date include the northern fence lizard (*Sceloporus undulatus hyacinthinus*), eastern box turtle (*Terrapene carolina*), eastern milk snake (*Lampropeltis triangulum triangulum*), eastern garter snake (*Thamnophis sirtalis*), and northern black racer (*Coluber constrictor*). Although local residents have reported seeing both copperhead, and rattlesnake in the area, neither has been observed at PMKP during our surveys.

Collections of the terrestrial millipede fauna have provided some interesting survey results. The common species *Narceus americanus* seems to be widespread and abundant throughout the property. From our collections at PMKP, several other species have been identified recently by Dr. Richard Hoffman of the Virginia Museum of Natural History, including *Apheloria virginiensis tesselatum* (unpublished species name), *Abacion magnum*, *A. tesselatum*, and most notably *Brachoria cedra*. The Cedar millipede *Brachoria cedra* (G1G2 S1) was until recently, thought to be endemic to "The Cedars" in Lee County, Virginia. A recent record from High Knob, in Wise County extended the known range, and the presence of this species at PMKP represents only the third recorded locality for this Virginia endemic. The presence of *Abacion magnum* and *A. tesselatum* at the same site has not been documented before according to Dr. Hoffman. Additional species are likely to be identified from our samples and these will be included in subsequent interim reports and in the final report.

The butterfly fauna of the preserve has yet to be fully documented, and the list of species will likely grow as a result of our continued surveys at PMKP. One watchlisted species, the West Virginia white (*Pieris virginiensis*; G3G4 S3) was observed on two occasions. To date, at least 17 species have been verified. Several specimens of butterflies representing the genus *Erynnis* were collected to verify their identity. Butterfly surveys will continue through the fall, and additional species verified and observed at PMKP will be included in subsequent interim reports and in the final report.

The common silvery checkerspot (*Chlosyne nycteis*) from Powell Mountain Karst Preserve, Wise County, Virginia (photo Anne Chazal)

In addition to the aforementioned species groups, a list of mammals encountered on the property will be presented in the final report. Many of these will need to be verified by examining skull, pelage, and other characters to verify the species, therefore a full list of species captured to date is not included in this interim report.

Two lines of "museum special" snap traps (10 per line, 20 total), were set overnight on 7 and 8 April. These traps were set along logs, inside downed trees, and in rockpiles around the sinkholes adjacent to Parson's Cave. These traps produced two taxa, *Peromyscus* sp. (deer mouse or white footed mouse), and *Blarina brevicauda* (short tailed shrew). The use of snap traps was discontinued due to the inefficiency of the traps in providing specimens of small mammals, particularly those not typically trapped in snap traps.

Pitfall traps have captured several additional species of shrews, voles, and mice (including at least three specimens of jumping mouse). Other mammal species noted so far include grey squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), southern flying squirrel (*Glaucomys volans*), White-tailed deer (*Odocoileus virginiensis*), and raccoon (*Procyon lotor*). Evidence of previous occupation by the Alleghany wood rat (*Neotoma magister*) was reported in Parson's Cave. As noted in the previous section on summer mist netting, six species of bats were recorded during 9-11 June surveys, including big brown bat (*Eptesicus fuscus*), tri-colored bat (*Perimyotis subflavus*), eastern small footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and Indiana bat (*Myotis sodalis*).

General invertebrate trapping

Various techniques including pitfall traps, sweep netting, black light bucket traps, bowl traps, Malaise trap, and Lingeren funnels (baited with 50% terpentine and 50% ethanol) have been utilized during our surveys. These methods have resulted in the capture of hundreds of specimens of beetles, moths, and other invertebrate taxa. Preliminary examination of the moth captures has resulted in the identification of one watchlisted species (*Psaphida thaxterianus*; G4 S2S4).

Although there are no permanent pond habitats, and no major streams on the property, there are several dragonflies and damselflies utilizing roads and trails on the property. *Libellula lydia* (common whitetail), *Gomphus lividus*, and *Epitheca cynosura* (common baskettail), and an undetermined damselfly have all been recorded on the property.

Roads and trails also provide habitat for at least two species of predatory tiger beetles, including the common and widespread *Cicindela sexguttata* (six-spotted tiger beetle), and the nearly flightless *Cicindela unipunctata* (one spotted tiger beetle). These beetles are typically seasonal, and it is likely that other species in the genus will be encountered during further surveys at PMKP.

The invertebrate portion of the inventory is by far the most time consuming non-field part of the inventory, and will require many hours in the laboratory where specimens will be sorted, prepared, and identified in the coming months. A full list of identified invertebrate species will be provided in the final report. Some specimens may require additional taxonomic study, and may not be available in time for final report submission.

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