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Vol. 4 of 6

Foothills Parkway Section 8B Final Environmental Report

Volume 4

Appendices E–I

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July 1999

Prepared for

The National Park Service
Denver Service Center and
The Great Smoky Mountains National Park

MANAGED AND OPERATED BY
LOCKHEED MARTIN ENERGY RESEARCH CORPORATION
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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VOLUME 4 SUMMARY

In 1994, Oak Ridge National Laboratory (ORNL) was tasked by the National Park Service (NPS) to prepare an Environmental Report (ER) for Section 8B of the Foothills Parkway in the Great Smoky Mountains National Park (GSMNP). Section 8B represents 27.7 km (14.2 miles) of a total of 115 km (72 miles) of the planned Foothills Parkway and would connect the Cosby community on the east to the incorporated town of Pittman Center to the west. The major deliverables for the project are listed below.

Study Plan	August 1994
First Field/Progress Report	October 1994
Second Progress Report	February 1995
Third Progress Report	June 1995
Draft Environmental Report	April 1997
Final Environmental Report	July 1999

From August 1995 through October 1996, NPS, GSMNP, and ORNL staff interacted with Federal Highway Administration staff to develop a conceptual design plan for Section 8B with the intent of protecting critical resources identified during the ER process to the extent possible. In addition, ORNL arranged for bioengineering experts to discuss techniques that might be employed on Section 8B with NPS, GSMNP, and ORNL staff during September 1996.

For the purposes of this ER, there are two basic alternatives under consideration: (1) a build alternative and (2) a no-build alternative. Within the build alternative are a number of options including constructing Section 8B with no interchanges, constructing Section 8B with an interchange at SR 416 or U.S. 321, constructing Section 8B with a spur road on Webb Mountain, and considering operation of Section 8B both before and after the operation of Section 8C. The no-build alternative is considered the no-action alternative and is not to construct Section 8B.

This volume of the ER consists of Appendices E through I (all ecological survey reports), which are summarized individually in the sections that follow. The following conclusions result from the completion of these surveys and the ER impact analysis:

- Forest clearing should be limited as much as possible.
- Disturbed areas should be replanted with native trees.
- Drainages should be bridged rather than leveled with cut and fill.
- For areas of steep slopes and potential erosion, bioengineering techniques should be implemented.
- The Webb Mt. spur road is not recommended. If the spur road is built, no grass shoulders should be used (to minimize forest fragmentation impacts).
- Transplanting of protected plants should be done when possible.

- Construction in wetland areas should be avoided, and erosion and sedimentation mitigation measures discussed under water resources and aquatic ecology should be implemented.

The following summary sections provide information on Appendices E–I.

APPENDIX E: FLORAL RESOURCES

The inventory of floral resources, during April to September 1994, along the proposed Section 8B resulted in the following conclusion: Of the sensitive habitats and protected species discovered on the ROW, the areas of greatest concern are the floodplains of the Little Pigeon River and Cosby Creek; Webb Mountain, including the Sheep Pen Branch area, Mill Dam Branch, north and south facing slopes below Jones Gap, and headwater drainages of Matthews Creek; and the wetland areas near Dunn Creek. Of greatest concern are the populations of the federal candidate ovate catchfly and state threatened ash-leaved bush-pea. Mitigation efforts should include more intensive surveys near known populations of these two species to locate and map the populations. The large, healthy population of butternut may be resistant to butternut canker. If so, it is especially important to protect this population.

APPENDIX F: BIRD SURVEY REPORT

A breeding bird survey was conducted during April, May, and June 1995 at selected sample points along the ROW to identify bird communities, area sensitive species, and species of special interest (e.g., federal and state listed species) now using the ROW. The survey also provides baseline data for the assessment of habitat impacts. The survey led to the following principal conclusions: Section 8B is frequented by typical forest and forest-edge avian species. No threatened, endangered, or federal candidate species were identified during the survey. It is important that the EIS for Section 8B analyze the impacts of the proposed action and alternatives on the forest habitats and resident bird species.

APPENDIX G: SURVEY REPORT FOR LISTED WILDLIFE

Appendix G presents the results of the survey of mammal species conducted from August through early October 1994, occurring along the proposed Section 8B, with emphasis on the distribution and status of the 19 small mammal species possibly present that are listed as endangered, threatened, candidate species for listed, in need of management, of special concern, or sensitive. The results of the survey indicate that construction and operation of Section 8B would impact several small mammal species listed as of special concern to the NPS by destroying portions of their habitat or by disturbance (e.g., noise). Overall, however, there would be relatively little actual impact because those species are most likely present in significant numbers and are distributed over a very large area of the GSMNP region.

APPENDIX H: BRYOPHYTE AND LICHEN SURVEY

Field surveys were conducted along selected portions of Section 8B to inventory bryophytes and to survey for bryophytes and lichens officially listed as federal candidate taxa of known or potential occurrence in the southern Appalachian region. Seven field surveys were conducted during the period from October 1994 through April 1995. One hundred and fifty taxa (2 hornworts, 43 liverworts, and 105 mosses) are reported to occur within the boundaries of the ROW. The federal, state, and Park status and rank of these taxa are given in the appendix. Four taxa are officially reported for the first time in the GSMNP as a result of this survey.

APPENDIX I: WETLAND SURVEY FIELD NOTES

The field notes from the wetland survey of Section 8B area are given in this appendix. The field observations were made in 1994 and 1995 and present both general and specific results of the surveys of soil conditions, vegetation, wetland areas, seeps, surface water bodies, and floodplains.

Appendix E

FLORAL RESOURCES

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January 1995

Part 1: Survey of Protected Vascular Plant Species E-3
Part 2: Landcover Maps E-17
Part 3: Habitat Maps E-27

PART 1

E.1 BACKGROUND

Compiling a flora from a floristic survey of an area or conducting quantitative analyses based on random and non-random sampling are common field botany practices. Neither of these methods is particularly useful in conducting a rare plant survey. Compiling a flora, which consists of identifying all of the species on a site, may result in the location and identification of rare plants but is a highly time- and cost-intensive approach.

Quantitative sampling techniques based on establishing quadrants is not useful because the probability of finding certain rare taxa at randomly chosen sites is low, even in suitable habitats. Rare taxa often occur singly or in small groups in localized areas within specific habitats. A systematic survey along transects covering the entire area intended to locate and identify rare taxa and habitats of rare taxa is a more effective approach than quantifying all species.

Some area surrounding the proposed site should also be included in the transect survey to allow evaluation of potential effects of development or operation on protected plant populations or habitats close to the project. Eroding soil, sedimentation, and altered hydrology are potential problems for protected plant populations on lower slopes and bottomland areas. The survey should, therefore, include stream bottoms and slopes downhill from the project area, with the total area to be surveyed depending on the landscape and potential for offsite effects.

Transects are unmarked and only roughly defined but are designed to cover the entire site as efficiently as possible. In general, this means following topographic contours and paralleling stream drainages, but other strategies may be appropriate. The transects vary in spacing, depending on the season, topography, type of vegetation, and degree of disturbance. For example, during early spring, when forest understory vegetation is not dense, transects can be spaced much farther apart than in dense herbaceous or shrubby growth. Transect spacing is determined by the distance the field botanist can see clearly on both sides.

Development of search images, or mental pictures of the target species and their habitats is an important part of preparation for the field work. The strongest search images are formed from seeing the plants growing in their native habitats. In the absence of direct observation, adequate search images may be formed by viewing herbarium samples, studying drawings, and discussions with individuals familiar with the plant in the wild. These search images are critical in identifying potentially important habitats during the initial field reconnaissance and for recognizing target species in the subsequent intensive survey. Additionally, an experienced surveyor who is familiar with all of the common species can recognize species which do not fit the search images of common species. This approach allows the detection of species new to the area as well as new to science.

After potentially important habitats are located during the initial field reconnaissance, they are intensively surveyed for target species. As in the initial reconnaissance, search transects tend to follow topography, but the spacing of transects is smaller to allow a closer scan of the entire ground surface. The intensity of the search is partly determined by the growth characteristics of the target species. For example closer scrutiny is required for herbaceous species that grow singly than for clustered herbs, shrubs, or trees.

Because of the life cycle and vegetative characteristics of certain rare plant taxa, it is usually necessary to survey a site throughout the growing season if potential habitat is present. For example, the emergence and flowering dates of rare taxa with the potential to occur on the survey site may range from spring through fall. In addition, identification of certain taxa requires that a specific plant part such as the flower, fruit, or seed be present. If potential habitats for rare plants are found on a site, it will be necessary to conduct a survey of those habitats at the appropriate time of year for the taxa in question.

Plant dormancy and occurrence in atypical habitats also confound efforts to find rare plants. Some rare plants may have prolonged periods of dormancy under certain environmental conditions in which the individual or population exists for many years either as rhizomes (underground) or as propagules in soil seedbanks. Therefore, the identification of potential habitat, especially near known rare plant occurrences, is important to the goal of rare plant identification and mitigation. If there is a strong possibility that rare plants could be found in the identified habitat, it is recommended that disturbance in that area be avoided if possible. Upon the return of favorable

conditions for growth, if they are known, the area can be resurveyed. For these three reasons (1) life-cycle and vegetative characteristics, (2) specific plant parts needed for identification, and (3) plant dormancy), it is essential that the field botanist be familiar with life-cycle and vegetative characteristics of the rare plants that might be in the area, including the dates of emergence, flowering, and setting fruit or seed and other specific characteristics.

Plants will sometimes occur in habitats atypical for the species. An example of a rare taxon occurring in an atypical habitat is the heavy sedge (*Carex gravida*), a prairie species typical of dry, open sites, which has been found in east Tennessee in a forested wetland and on a dry, forested, rocky slope (Cunningham et al. 1993). Rare taxa in atypical habitats are less likely to be discovered because (1) the habitat is not identified during the initial reconnaissance as habitat for the taxon, (2) the field botanist might not be using a relevant search image if the taxon is not expected to occur in the habitat, or (3) the taxon might have an unusual growth form because of habitat factors and therefore be different from the search image. Conversely, if the plant appears unusual for the vegetation community, it could attract attention. During the initial and intensive habitat searches, the field botanist is on the alert for plants whose forms may appear atypical for the particular habitat or vegetation community. It is necessary for the field botanist to be familiar with the appearance of the typical plant communities on the survey site so that unusual plants or plants present in atypical habitats will be readily detected.

Therefore, a rare plant survey consists of (1) identifying target species which could potentially be present on the study site; (2) a field reconnaissance to identify potentially important habitats on the site; and (3) an intensive, seasonal survey of those habitats for target species.

E.2 IDENTIFICATION OF TARGET SPECIES AND INITIAL FIELD RECONNAISSANCE

The survey for vascular plant species was initiated in mid-April 1994. Target species included state and federal candidate, proposed, and listed species; species that might be placed on these lists (e.g., plants not previously recorded for Tennessee); plants listed as rare or previously unreported in the GSMNP; and non-native plant species that pose a threat to native vegetation. The survey was conducted along the proposed right-of-way and included adjacent areas that could potentially

be affected by the construction and operation of the parkway, in particular, areas downslope from the ROW. The survey extended over one growing season, April through October.

Lists were compiled of species of concern from GSMNP staff and of protected species from the Tennessee Department of Environment and Conservation. From these lists and examination of topographic maps, a list of species of concern (Table E.1) that could potentially be present in the study area was developed.

The reconnaissance survey was conducted in a systematic fashion to include the entire ROW as well as adjacent areas which might be affected by construction or operation of the Parkway. In most reconnaissance surveys, roughly defined transects, generally following the contours or stream drainages, are used to cover the entire area (Cunningham et al. 1993). The systematic field reconnaissance ideally should be completed before deciduous trees and shrubs develop foliage when visibility is greatest and habitats can be readily located with minimum effort. Due to delays in project initiation, surveys were started somewhat late in the growing season after deciduous trees were already beginning to leaf out. Reduced visibility, rough terrain, and extensive areas of dead and fallen pine trees slowed the initial field reconnaissance; therefore, intensive habitat surveys were conducted in tandem with the initial field reconnaissance in some areas. The initial survey consisted primarily of walking the center line of the ROW and making educated guesses as to the most critical areas for intensive survey based on topography, hydrology, vegetation, degree of disturbance, or other features, such as boulder fields, which indicated plant habitats might be appropriate for target species. Potentially suitable habitats were explored as they were identified, they were marked on a reference map, and material was collected as needed for identification.

Field trips were conducted in mid- and late April, early, mid- and late May, mid- and late June, mid-July, late August, and late September. Ninety percent of the initial reconnaissance was completed by late May, and surveys of other areas with less potential for protected species or sensitive habitats were completed by mid-July. Due to the length of the ROW, difficulty of terrain, and limited access points, the entire ROW was not done in sequence. The survey began in April in the vicinity of Pittman Center and progressed northeast along the ROW to Webb Mt., in the vicinity of the water tank in Cobbly Nob. The survey continued in May from the Branam Road access east to the Rocky Flats area near Dunn Creek and from Cosby Creek southwest to Apple Tree Lane in the Rocky Flats area. The Sheep Pen Gap area, Jones Gap, the headwaters of

Table E.1. Protected species which could potentially occur on the ROW.

Species	Common name	Federal status[a]	State status[b]
Adlumia fungosa	Climbing fumitory		T
Amelanchier sanguinea	Roundleaf shadbush		T
Botrychium matricariifolium	Chamomile grapefern		S
Buckleya distichophylla	Piratebush	C2	T
Cardamine flagellifera	Bitter cress		T
Cardamine rotundifolia	Round-leaf watercress		T
Caulophyllum giganteum	Giant blue cohosh		T
Cymophyllus fraserianus	Fraser's sedge		T
Cypripedium acaule	Pink lady's slipper		E
Draba ramosissima	Branching Whitlow-grass		S
Euonymus obovata	Running strawberry-bush		S
Fothergilla major	Mountain witch-alder		T
Helianthemum sp.	Frostweed		S or E
Heuchera longiflora var aceroides	Maple-leaf alumroot		S
Hydrophyllum virginianum	John's cabbage		T
Isotria medeoliodes	Dwarf whorled pogonia	E	E
Juglans cinerea	Butternut	C2	T
Leucothoe racemosa	Fetter-bush		T
Lilium canadense	Canada lily		T
Listera smallii	Kidney-leaf twayblade		T
Lonicera canadensis	American fly-honeysuckle		S
Lysimachia fraseri	Fraser's loosestrife	C2	E
Melanthium latifolium	Broadleaf bunchflower		E
Menziesia pilosa	Minniebush		S
Monotropsis odorata	Sweet pinesap	C2	T
Panax quinquefolius	American ginseng		T
Pieris floribunda	Mountain fetter-bush		T
Platanthera psycodes	Small purple fringed orchid		T

Table E.1. continued

Species	Common name	Federal status[1]	State status[2]
Prunus virginiana	Choke cherry		S
Saxifraga careyana	Carey saxifrage		S
Saxifraga caroliniana	Carolina saxifrage		E
Scutellaria saxatilis	Rock skullcap		T
Silene ovata	Ovate catchfly	C2	T
Spirea virginica	Virginia spirea	T	E
Stellaria alsine	Trailing stitchwort		E–P
Thalictrum coriaceum	Leatherleaf meadowrue		T
Thermopsis fraxinifolia	Ash-leaved bush pea		T
Trillium rugelii	Southern nodding trillium		E
Xerophyllum asphodeloides	Eastern turkeybeard		T

[a]T—threatened, C2—species under review for listing (USDI-FWS 1993, USDI-FWS 1994).
[b]E—endangered, T—threatened, S—special concern, E–P—endangered and possibly extirpated (Somers 1989).

Matthew Branch, and the floodplain of the Little Pigeon River were also more intensively surveyed in May. The segment from the water tank to the Branam Road access was judged to be the least likely to yield important observations and was surveyed last.

E.3 RESULTS OF SURVEY

Most of the ROW is a mosaic of forest vegetation and mixed oak-hickory, oak-pine, or pine are the most abundant forest types. Hemlock (*Tsuga canadensis*) is common on some sheltered slopes. A recent southern pine-beetle outbreak has killed most of the mature pines on the ROW. Areas of the ROW hit hardest by the pine beetle are Webb Mountain, the area between the Branam Road access and Rocky Flats, and some areas on Big Ridge. Most pines that were killed were mature Table Mountain pine (*Pinus pungens*) on Webb Mountain and a mixture of mostly Table Mountain and Virginia pines (*Pinus virginiana*) elsewhere.

Most of the ROW shows evidence of human disturbance, except for upper slopes of Webb Mountain. Remnants of fences and fence rows are present in most of the ROW at lower elevations, and Virginia pine is abundant in areas that appear to have been cleared within the last 50 to 75 years. This is in contrast with Section 8D of the ROW where most areas that were previously cleared are currently tulip-poplar stands. These vegetational differences are primarily due to the generally northern aspect of slopes on Section 8D and generally southern aspect of slopes on 8B.

Understory or heath shrub vegetation in the dry oak, oak-pine, and pine stands was diverse and variable. In some areas, mountain laurel (*Kalmia latifolia*) was the dominant shrub. It was especially abundant in the Branam Hollow Road to Rocky Flats segment of the ROW in areas with widespread dead and fallen pine. In other areas, huckleberry (*Gaylussacia* sp.), fetter-bush (*Leucothoe recurva*), blueberry (*Vaccinium* sp.), or male-berry (*Lyonia ligustrina*) were dominant.

American chestnut (*Castanea dentata*) sprouts were abundant on Webb Mt., especially east of Jones Gap. Many sprouts were dead from blight. Stems varied in size from pencil-sized young sprouts to small saplings.

E.4 SPECIES OF CONCERN ON THE ROW

Two federal candidate and six additional state protected vascular plant species (Table E.2) have been located growing on the ROW.

Federally listed species. The federal candidate butternut grows in two locations on the ROW. One population consists of about 30 individuals ranging in size from saplings to mature trees. Some trees appear to have been cut during the centerline surveys, and others may have been poached (e.g., cut stumps and tops are present but logs are missing). Butternut is threatened by butternut canker. One individual of this species was also found on Section 8D of the ROW.

Two flowering stems of the federal candidate ovate catchfly grow in hardwood forest in one drainage area and another population has been reported in another drainage. This species may be present in other parts of the ROW. The hardwood forest habitat of the ovate catchfly is a common

Table E.2. Protected status vascular plant species growing on the right-of-way

Species	Common name	Federal status[a]	State status[b]
Juglans cinerea	butternut	C2	T
Silene ovata	ovate catchfly	C2	T
Carex howei	Howe's sedge		E
Cypripedium acaule	pink lady's-slipper		E
Trillium rugellii	southern nodding trillium		E
Panax quinquefolius	ginseng		T
Thermopsis fraxinifolius	ash-leaved bush-pea		T
Heuchera longiflora var. aceroides	maple-leaf alumroot		S

[a]C2—species under review for listing (USDI-FWS 1993, USDI-FWS 1994).
[b]E—endangered, T—threatened, S—special concern (Somers 1989).

habitat on the 8B section of the ROW, and intensive survey of this extensive habitat type is beyond the current scope of this project.

State listed species. No species new to Tennessee were found on the ROW. The state endangered southern nodding trillium grows in a north-facing stream drainage of the ROW. Southern nodding trillium is a southern Appalachian endemic species, and was also found on Section 8D of the ROW. This species is endangered in Tennessee but is more common in North Carolina.

The endangered Howe's sedge grows in two wetlands. This species is sometimes considered by taxonomists to be a variety of *Carex atlantica*; however, both taxa (*C. atlantica* var. *capillacea* and *C. atlantica* var. *atlantica*) are present at the Dunn Creek site. It is in a mossy bog and has not been previously reported in Tennessee east of the Cumberland Plateau.

The endangered pink lady slipper, which is found throughout the ROW, is more common than is normally the case for Tennessee listing. It and the threatened ginseng are listed because of the potential threat from commercial exploitation. There are several populations of pink lady slipper on the ROW, mostly in dry pine forest. Some were also found in dry oak-pine forest. Two populations of ginseng are in mesic forest sites. Both species were also found on Section 8D of the ROW.

The threatened ash-leaved bush-pea grows at three known sites. Two populations are in open, dry, mixed forest containing pine killed by southern pine beetle. The other population is in oak forest in a ravine. It is possible that other populations are present. There are large areas of potential habitat for this species on the ROW and an intensive search of this habitat type was beyond the scope of this survey. This species was previously only known from the GSMNP on Section 8D of the ROW.

The maple-leaf alumroot, a state species of special concern, was found in two locations on the ROW and one location downslope from the ROW. This species has been previously reported from rich calcareous woods (Radford et al. 1968) and calcareous shales or bluffs (Wofford 1981). It has previously only been reported from Greene and Cocke counties and may be a new record for Sevier County.

Species listed by GSMNP as rare. Seven species new to GSMNP, seven species in the GSMNP rarest category (P1), and three species in the second most rare GSMNP category (P2) (Table E.3) were found. The slimpod rush was new to both GSMNP and east Tennessee. Of the new or rare species in the GSMNP, all but the two exotic species (coltsfoot and ivy-leaved speedwell) and three species growing in upland forest (Table E.3) were found in wetlands or floodplains. This abundance of GSMNP rare wetland species may be a result of the relative rarity of wetland and floodplain habitats in the GSMNP.

The plant identified as log fern, a P1 species, may be of hybrid origin. Dr. Murray Evans, Botany Department, University of Tennessee, concluded that it is best assigned to *Dryopteris celsa* but it may have some genes from *D. cristata* due to hybridizing (personal communication, Murray Evans to Larry Pounds, December 1994). *D. cristata*, a state listed species of special concern, was not found during the field searches. Pre-construction monitoring should include a search for *D. cristata*.

Non-native (exotic) invasive species. Vegetation on most of the ROW is native. A few areas are infested with aggressive, non-native species (Table E.4), especially in disturbed areas and up drainage systems from disturbed areas outside the ROW.

Table E.3. Vascular plants found during surveys on the ROW which were either new or considered rare in GSMNP, other than state and federally listed species in Table 2

Species	Common name	Park status[a]
Aronia arbutifolia	Red chokeberry	P2
Asclepias amplexicaulis	Clasping milkweed	P1
Aster sagittifolius	Arrow-leaved aster	P1
Carex prasina	Drooping sedge	P2
Carex austrocaroliniana	South Carolina Sedge	P2
Carex debilis var. pubera	Sedge	P1
Carex howeii	Howe's sedge	New
Carex atlantica	Atlantic Sedge	New
Cyperus brevifoliodes	Pasture flatsedge	P1
Danthonia epilis	Wild oatgrass	New
Dryopteris celsa	Log fern	P1
Eclipta alba	Yerba-de-tajo	P1
Juncus diffusissimus	Slimpod rush	New
Muhlenbergia tenufolia	Slender muhly	P1
Tradescantia virginiana	Virginia spiderwort	New
Tussilago farfara	Coltsfoot	New (exotic)
Veronica hederaefolia	Ivy-leaved speedwell	New (exotic)

[a]New = previously not reported from GSMNP (exotic species are non-native to the region); P1 = extremely rare in GSMNP; P2 = rare in GSMNP (Rock and Langdon 1991).

The greatest threat from exotic plants to native vegetation on the ROW is from privet, which is spreading along streams into relatively undisturbed areas, especially along the tributaries to Webb Creek west of Mill Dam Branch. Although not currently abundant on the ROW, Japanese grass is another aggressive exotic species found in shaded moist areas. Construction of the parkway could increase populations of this weedy species in wetlands currently containing state listed species. Garlic mustard was not found on the ROW, but grows nearby and may invade mesic forest areas.

Coltsfoot and ivy-leaved speedwell are new exotic species for the GSMNP. The potential effects of these species on natives is unknown. Coltsfoot dominates bare ground on roadside banks and is not a threat for any of the rare species found in Section 8B of the ROW.

Table E.4. Non-native (exotic) species growing on or near the right-of-way

Species	Common name	Section of right-of-way
Microstegium vimineum	Japanese grass	Narrowly along streams
Alliaria petiolata	Garlic mustard	Rocky Flats Road, south of right-of-way
Lonicera japonica	Japanese honeysuckle	Some in many locations, especially Little Pigeon River and Cosby Creek floodplains
Veronica hederaefolia	Ivy leaved speedwell	Along Dunn Creek
Ligustrum vulgare	Privet	In disturbed areas and drainages above disturbed areas
Broussonetia papyrifera	Paper mulberry	Seen previously by NPS staff—location unknown; not relocated during survey
Vinca minor	Periwinkle	On right-of-way in vicinity of Chavis road
Dioscorea batatas	Cinnamon vine, Chinese yam	Little Pigeon River and Cosby Creek floodplains; near Chavis Road
Pueraria lobata	Kudzu	Vicinity of Chavis Road
Tussilago farfara	Coltsfoot	Branam Hollow Road
Rosa multiflora	Multiflora rose	Near Webb Creek, Cosby Creek, and Little Pigeon River.

E.5 SENSITIVE HABITATS, INCLUDING BIOLOGICALLY IMPORTANT WETLANDS

Biologically important habitats on the ROW include floodplains, boulder slopes, mesic slopes, and wetlands. Many of these habitats contain listed or candidate species, but all are of limited extent in the region because of either their unusual nature or increasing loss to urbanization, land clearing, or agricultural use.

Despite disturbance from flooding and human activity, the Little Pigeon River and Cosby Creek floodplains contain an assemblage of native bottomland species representative of large streams and small rivers in the region. This community type is increasingly threatened by development and

agricultural use throughout the region. A well developed cobble bar with mostly native vegetation is also present in the Little Pigeon River.

Boulder or talus slopes are present on the ROW on the north side of Webb Mountain below Jones Gap. Rocky areas are also found in the Lower Sheep Pen Branch area, below Jones Gap along the headwaters of Matthew Branch, and in dry pine stands on middle slopes of Webb Mountain.

The vegetation on the north side of the ROW in the vicinity of Chavis Road from the Cosby Creek area to the first cove is somewhat different from the rest of the ROW. Redbud (*Cercis canadensis*) and glade fern (*Athyrium pycnocarpon*), are species often found in calcareous areas, or areas of basic to neutral soil. Therefore, the soils and geology of this area may be more calcareous or less acid than the rest of the ROW. Some of this general area is highly disturbed and contains extensive kudzu (Table E.4).

Biologically important wetlands are present on the ROW but are not described in detail because of their sensitive nature.

E.6 CONCLUSIONS

Of the sensitive habitats and protected species discovered on the ROW, the areas of greatest concern are the floodplains of the Little Pigeon River and Cosby Creek; Webb Mountain, including the Sheep Pen Branch area, Mill Dam Branch, north and south facing slopes below Jones Gap, and headwater drainages of Matthews Creek; and the wetland areas near Dunn Creek. Of greatest concern are the populations of the federal candidate ovate catchfly and state threatened ash-leaved bush-pea. Mitigation efforts should include more intensive surveys near known populations of these two species to locate and map the populations. The large, healthy population of butternut may be resistant to butternut canker. If so, it is especially important to protect this population.

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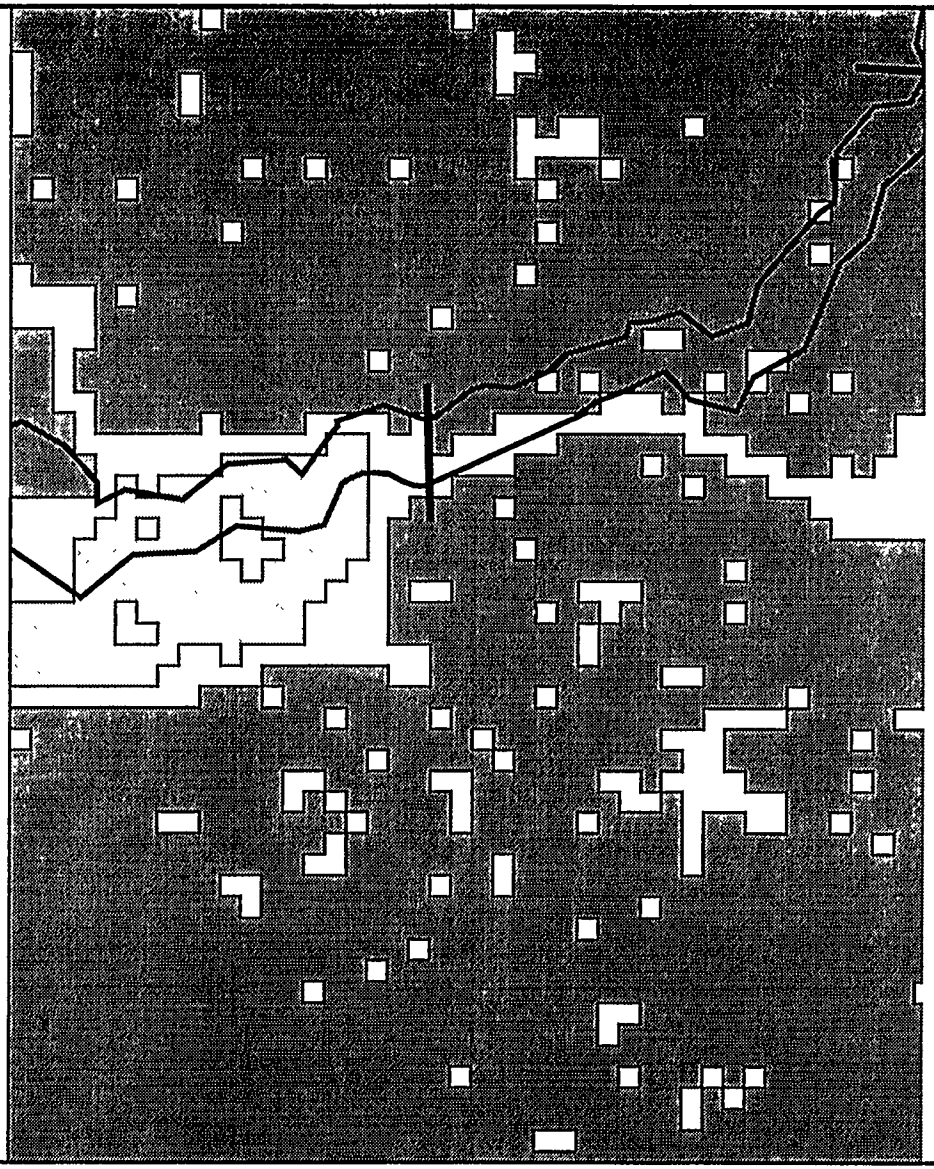
PART 2



Segment 1. Little Pigeon River Terraces

Habitat Map

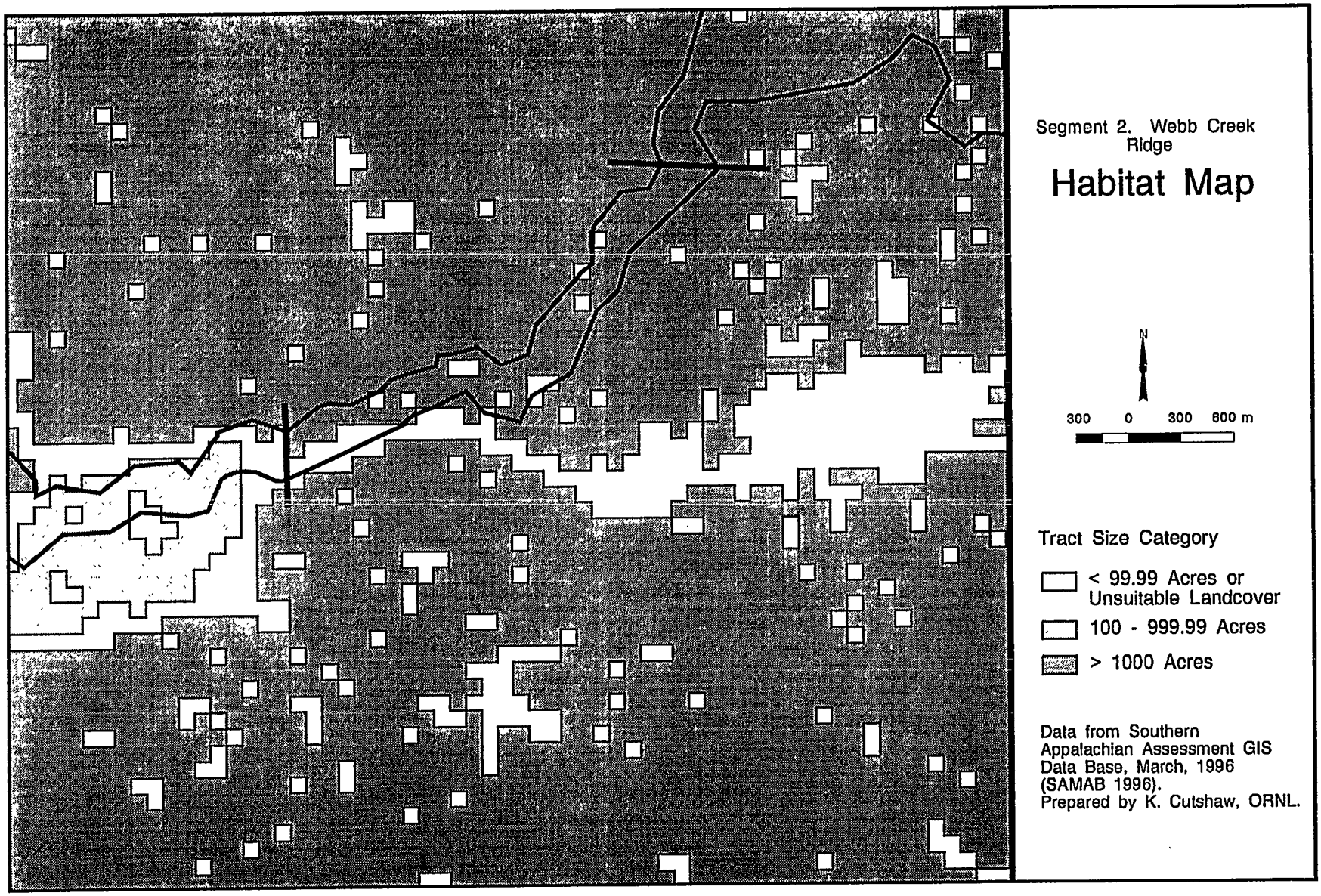
N

300 0 300 600 m

Tract Size Category

- < 99.99 Acres or Unsuitable Landcover
- 100 - 999.99 Acres
- > 1000 Acres

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.


Segment 2. Webb Creek Ridge
Habitat Map
N
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Tract Size Category
< 99.99 Acres or Unsuitable Landcover
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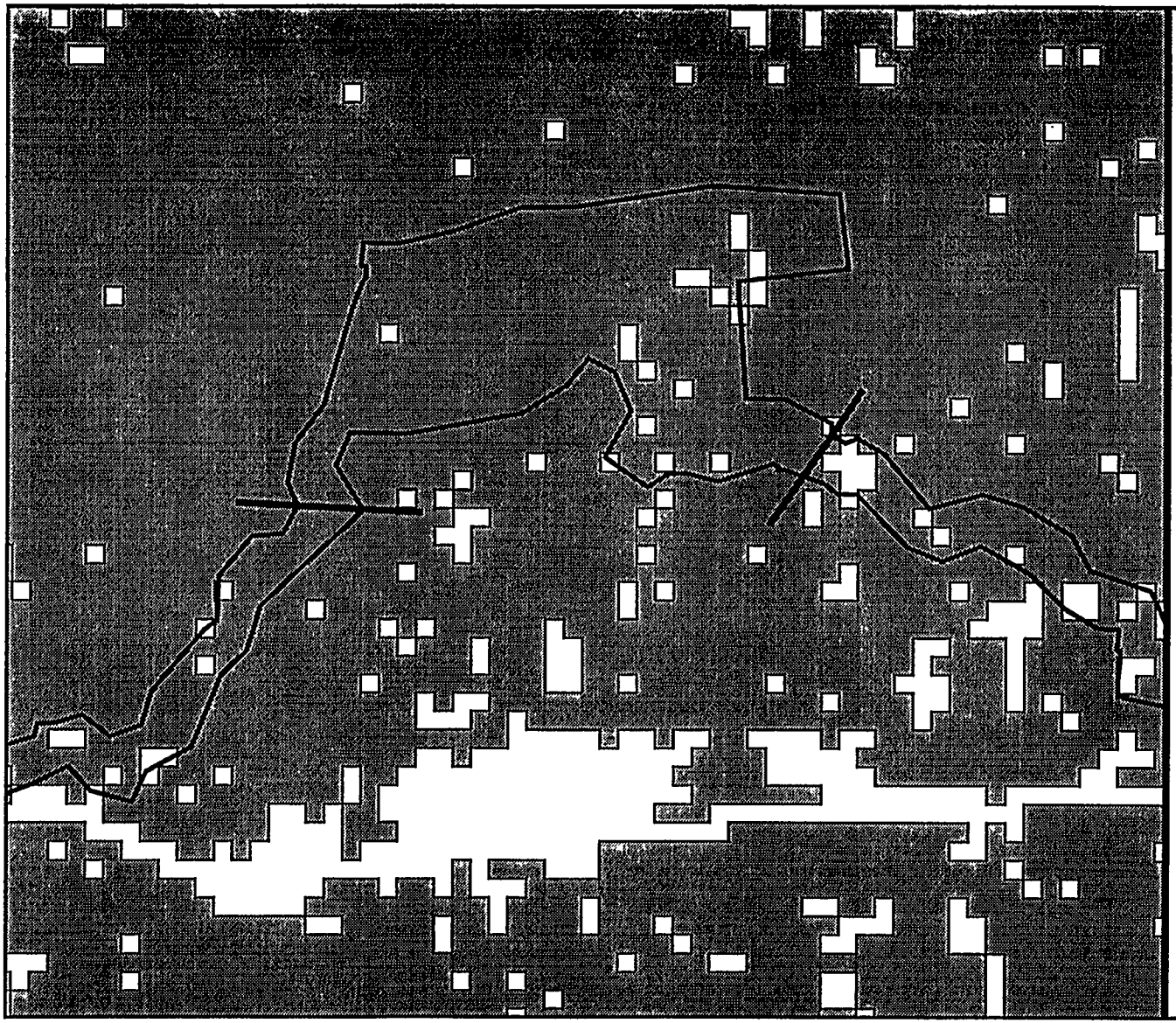
Prepared by K. Cutshaw, ORNL.



Segment 3. Webb Mountain

Habitat Map

N

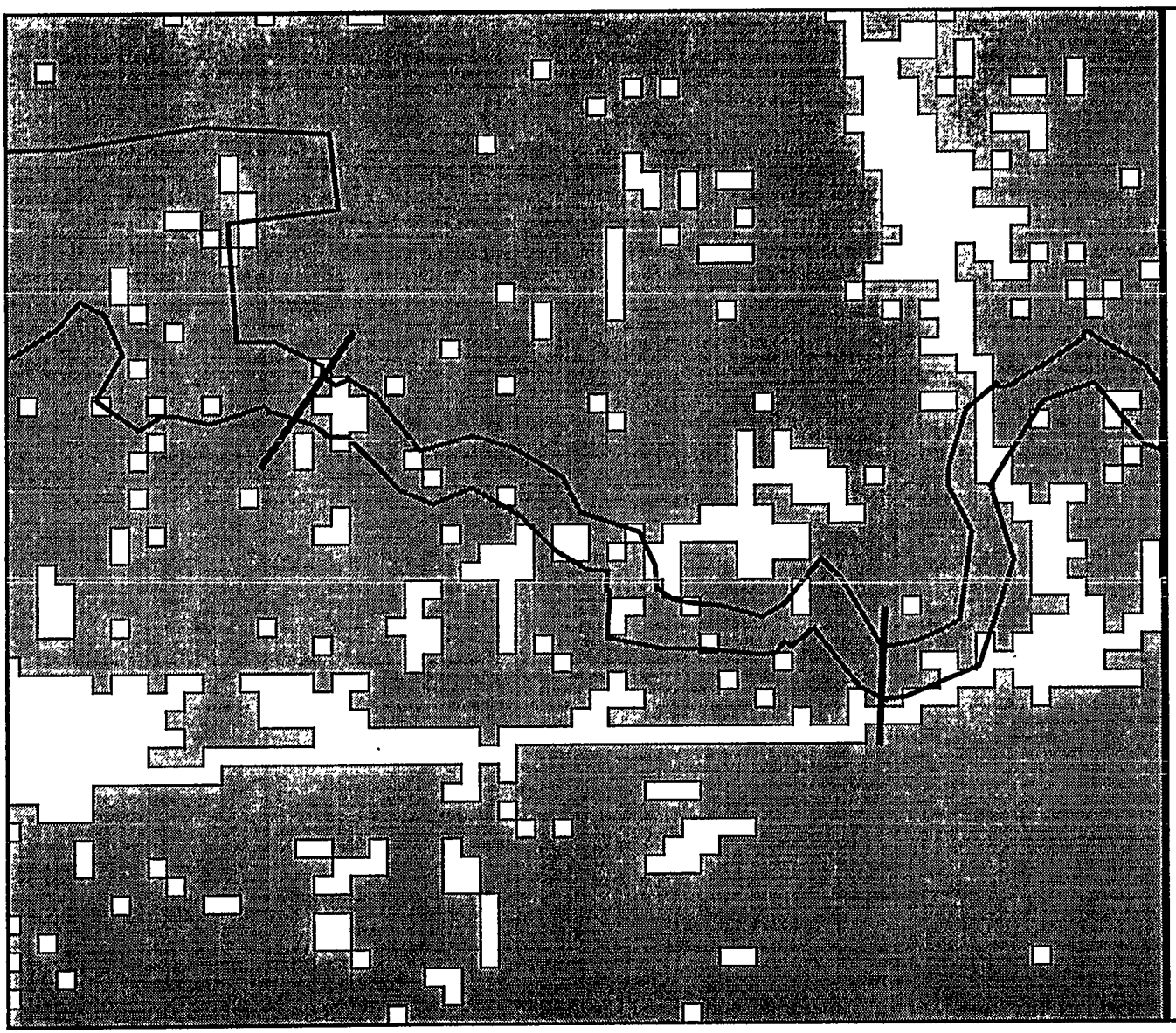
300 0 300 600 m

Tract Size Category

< 99.99 Acres or Unsuitable Landcover

> 1000 Acres

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 4. Matthew Branch Ridge

Habitat Map

N

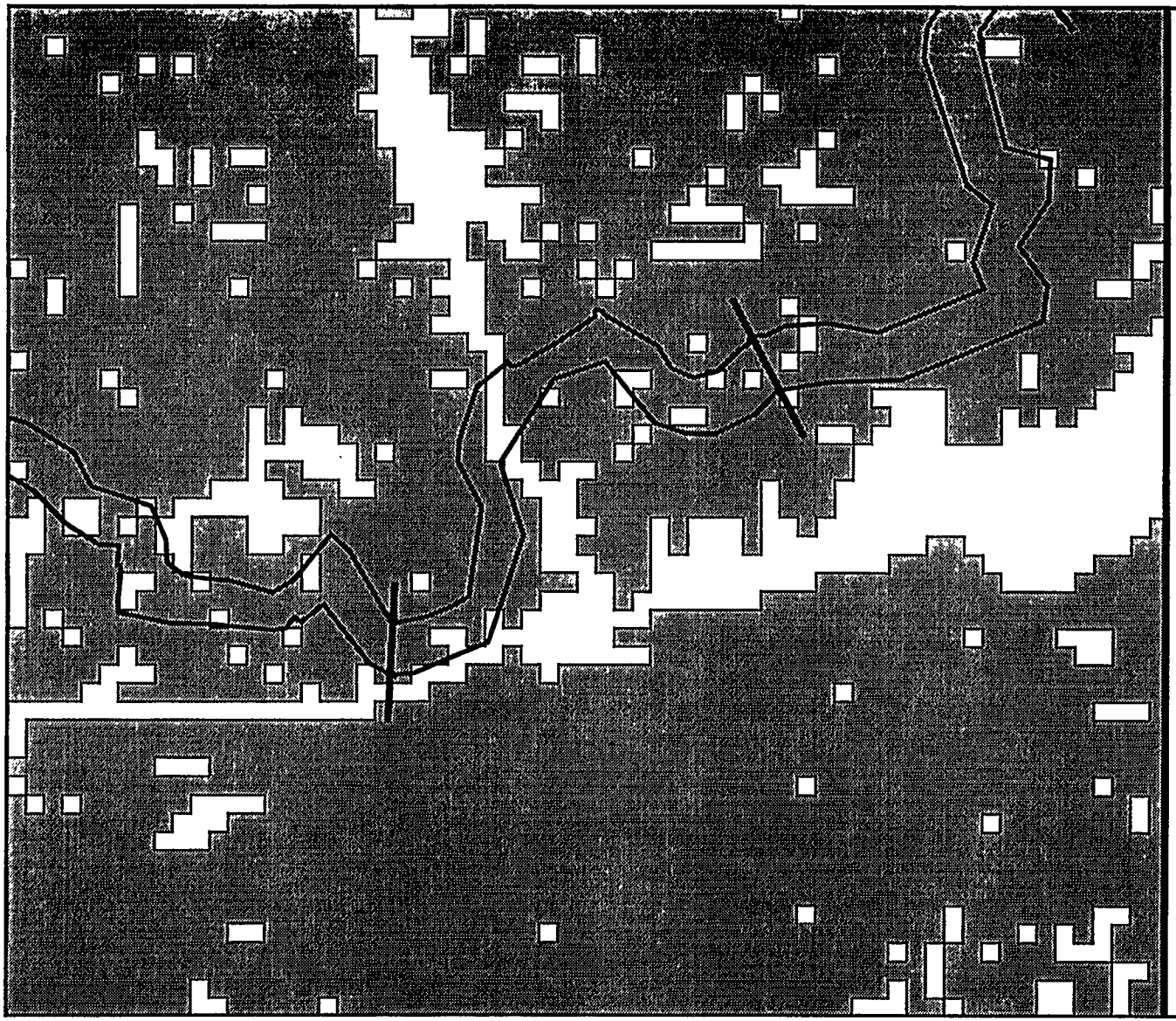
300 0 300 600 m

Tract Size Category

< 99.99 Acres or Unsuitable Landcover

> 1000 Acres

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 5. Rocky Flats

Habitat Map

N

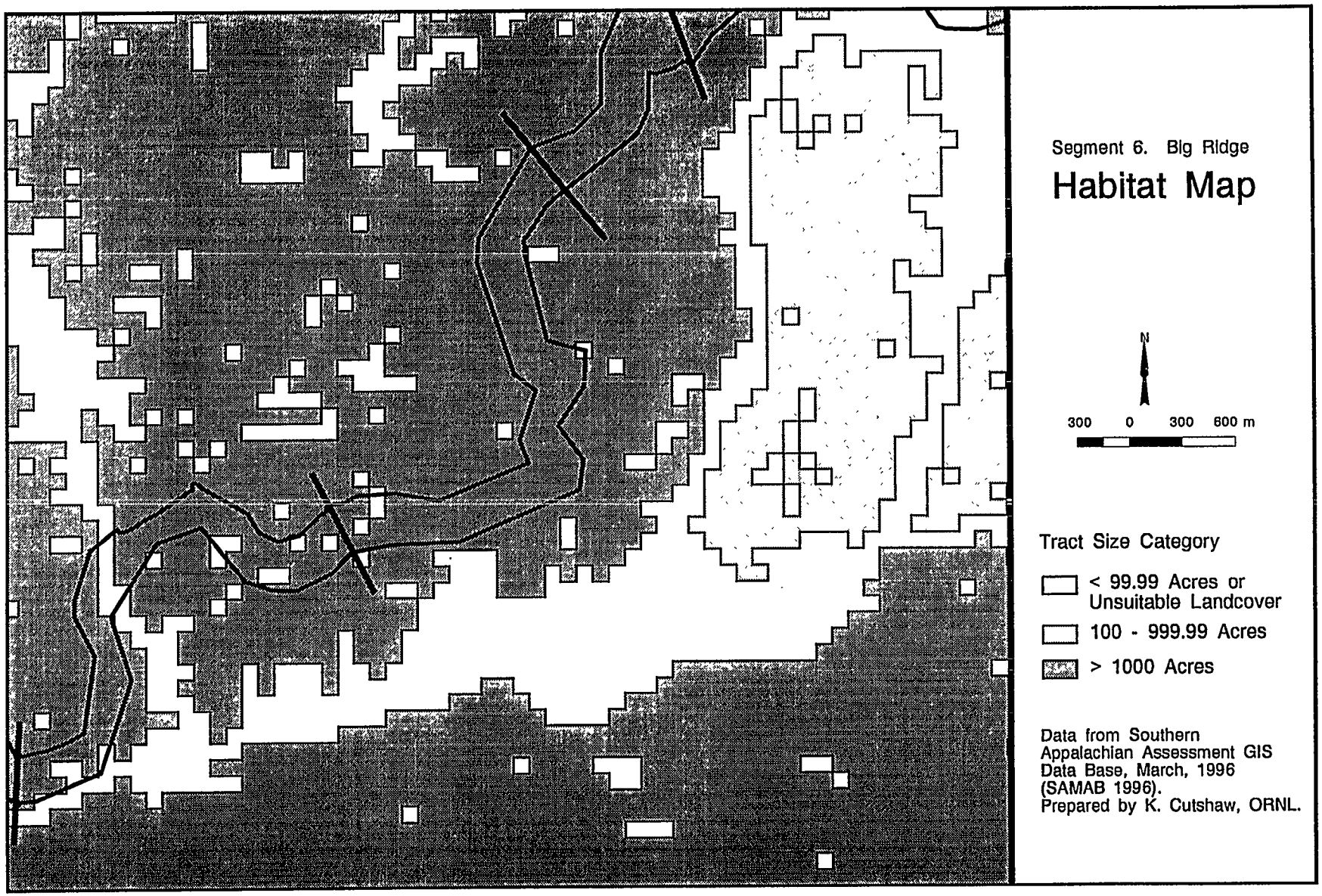
300 0 300 600 m

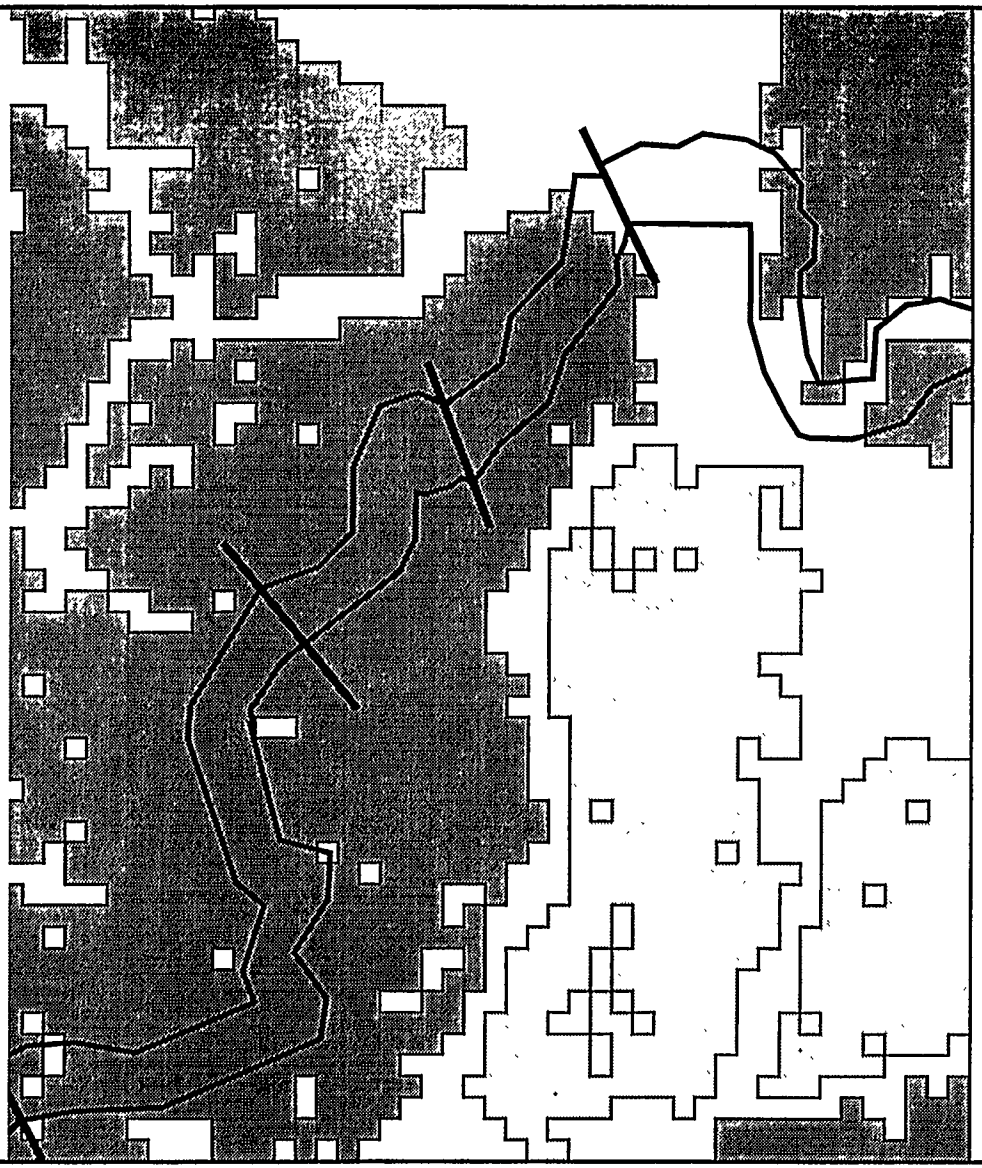
Tract Size Category

< 99.99 Acres or Unsuitable Landcover

> 1000 Acres

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.


Segment 6. Big Ridge
Habitat Map
N
300 0 300 600 m
Tract Size Category
< 99.99 Acres or Unsuitable Landcover
100 - 999.99 Acres
> 1000 Acres
Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 7. Cosby Creek Terraces

Habitat Map

N

300 0 300 600 m

Tract Size Category

- < 99.99 Acres or Unsuitable Landcover
- 100 - 999.99 Acres
- > 1000 Acres

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.

PART 3

Segment 1. Little Pigeon River Terraces

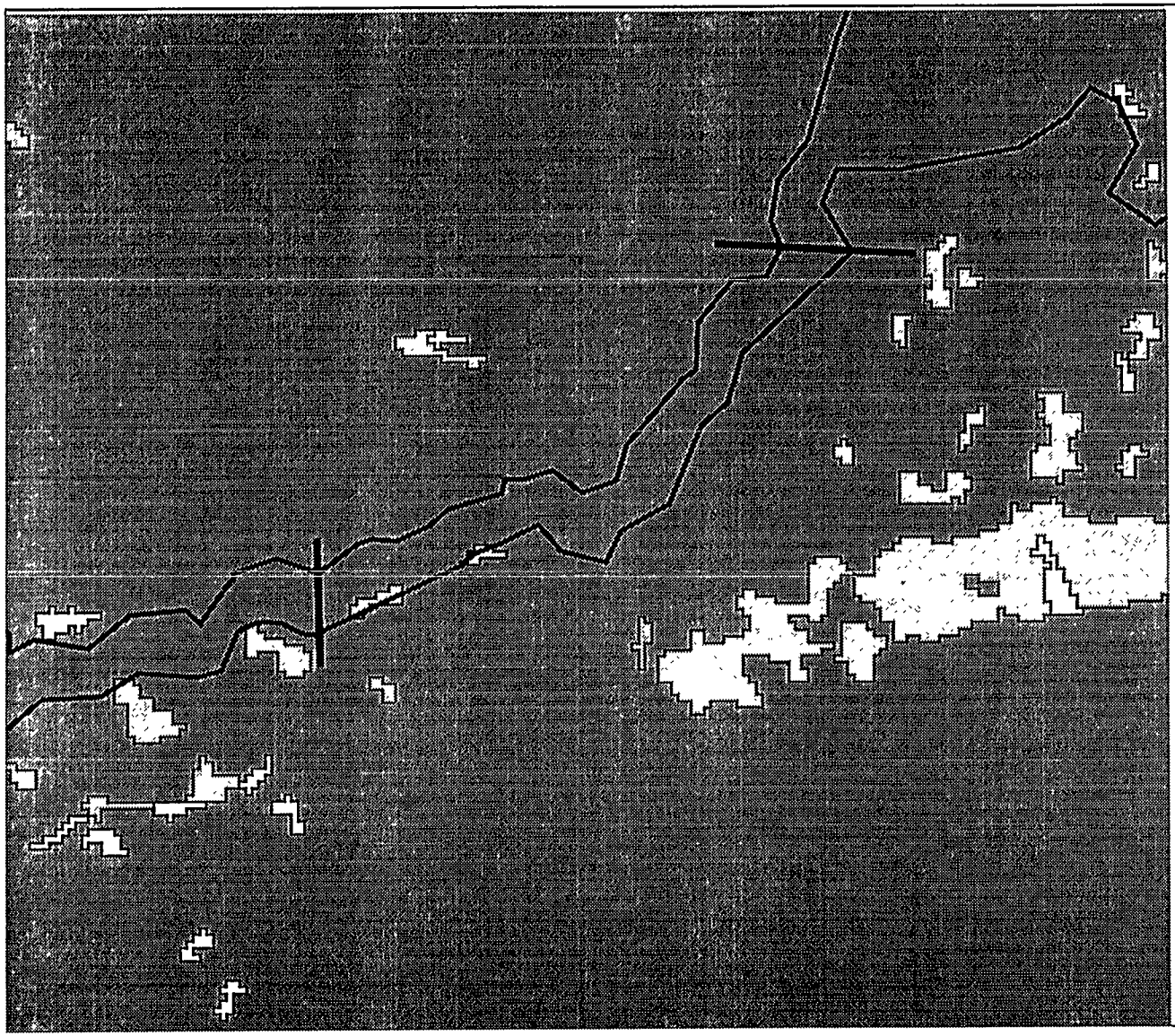
Landcover Map

N

280 0 280 560 m

Landcover Category
- Developed
- Open
- Forest

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 2. Webb Creek Ridge

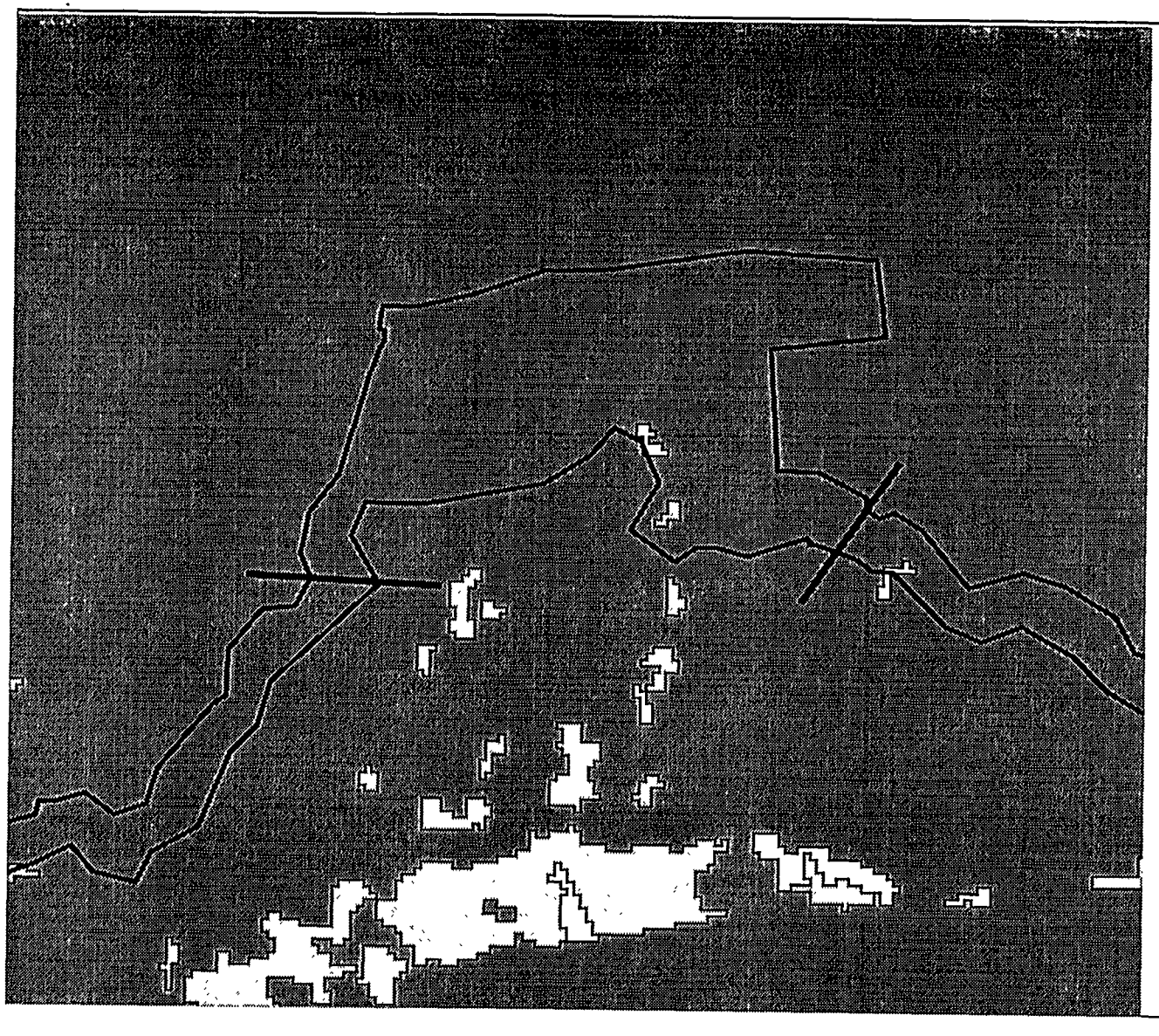
Landcover Map

N

280 0 280 560 m

Landcover Category
- Developed
- Open
- Forest

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 3. Webb Mountain

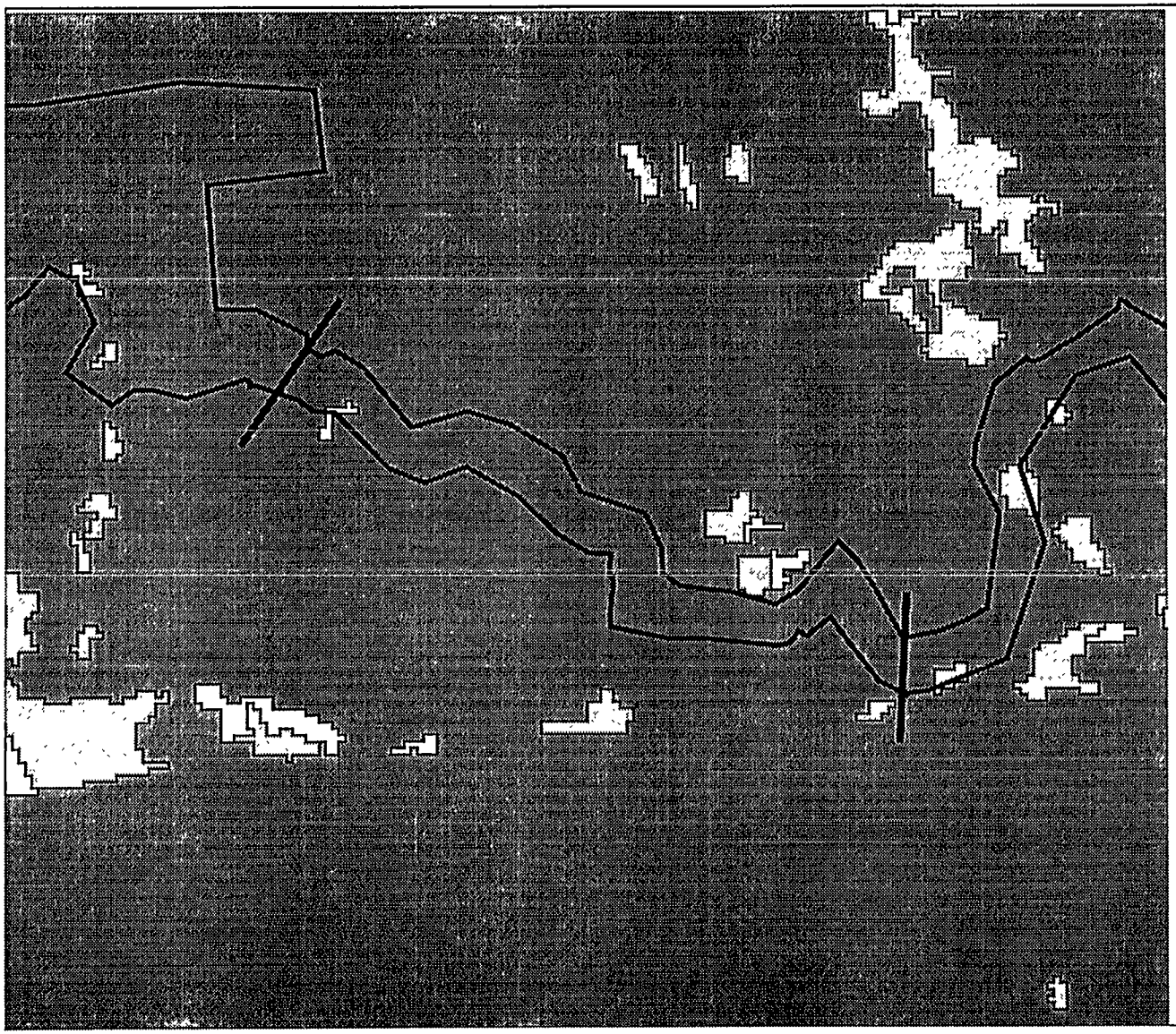
Landcover Map

N

280 0 280 560 m

Landcover Category
- Developed
- Open
- Forest

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 4. Matthew Branch Ridge

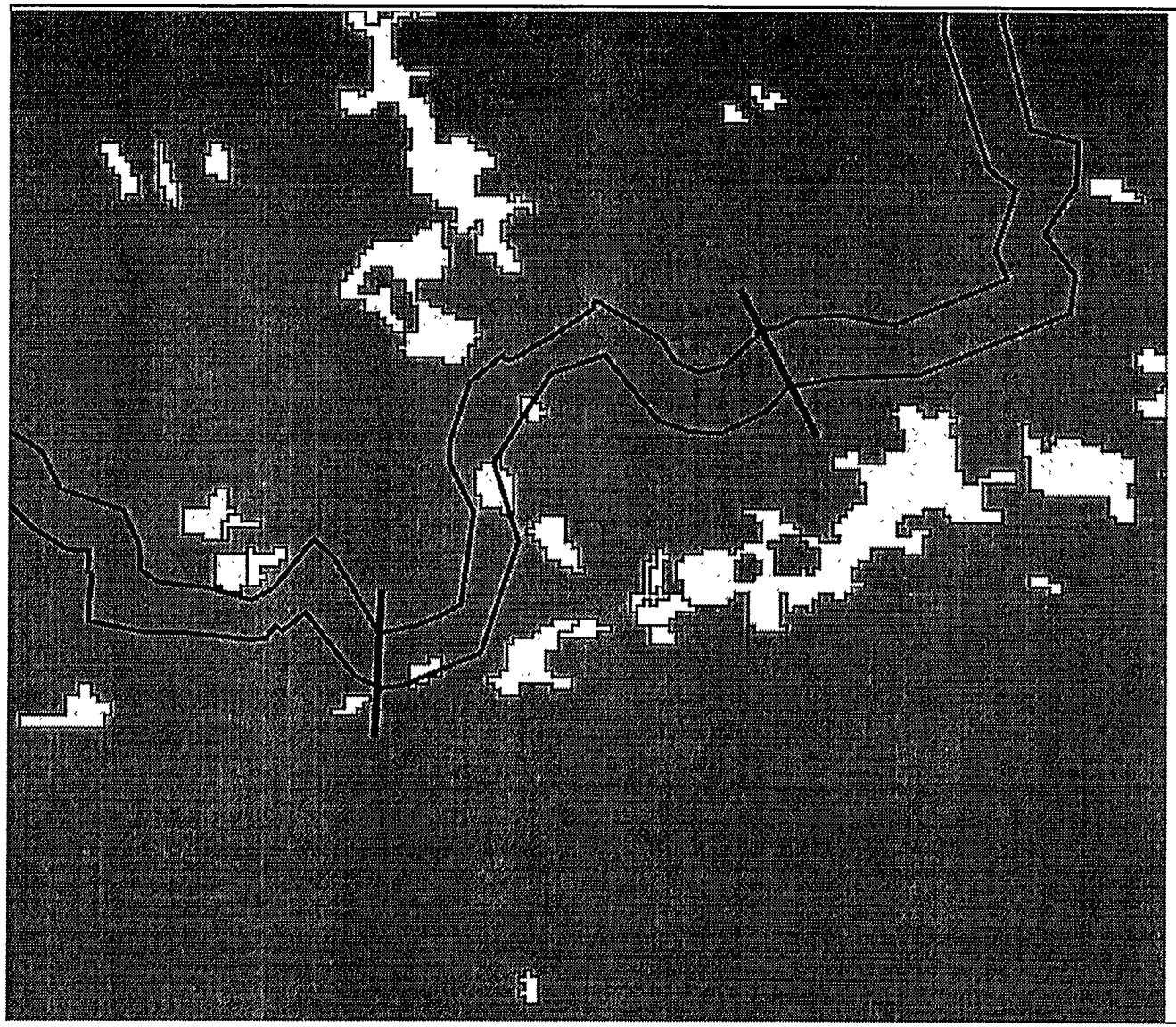
Landcover Map

N

280 0 280 560 m

Landcover Category
- Developed
- Open
- Forest

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 5. Rocky Flats

Landcover Map

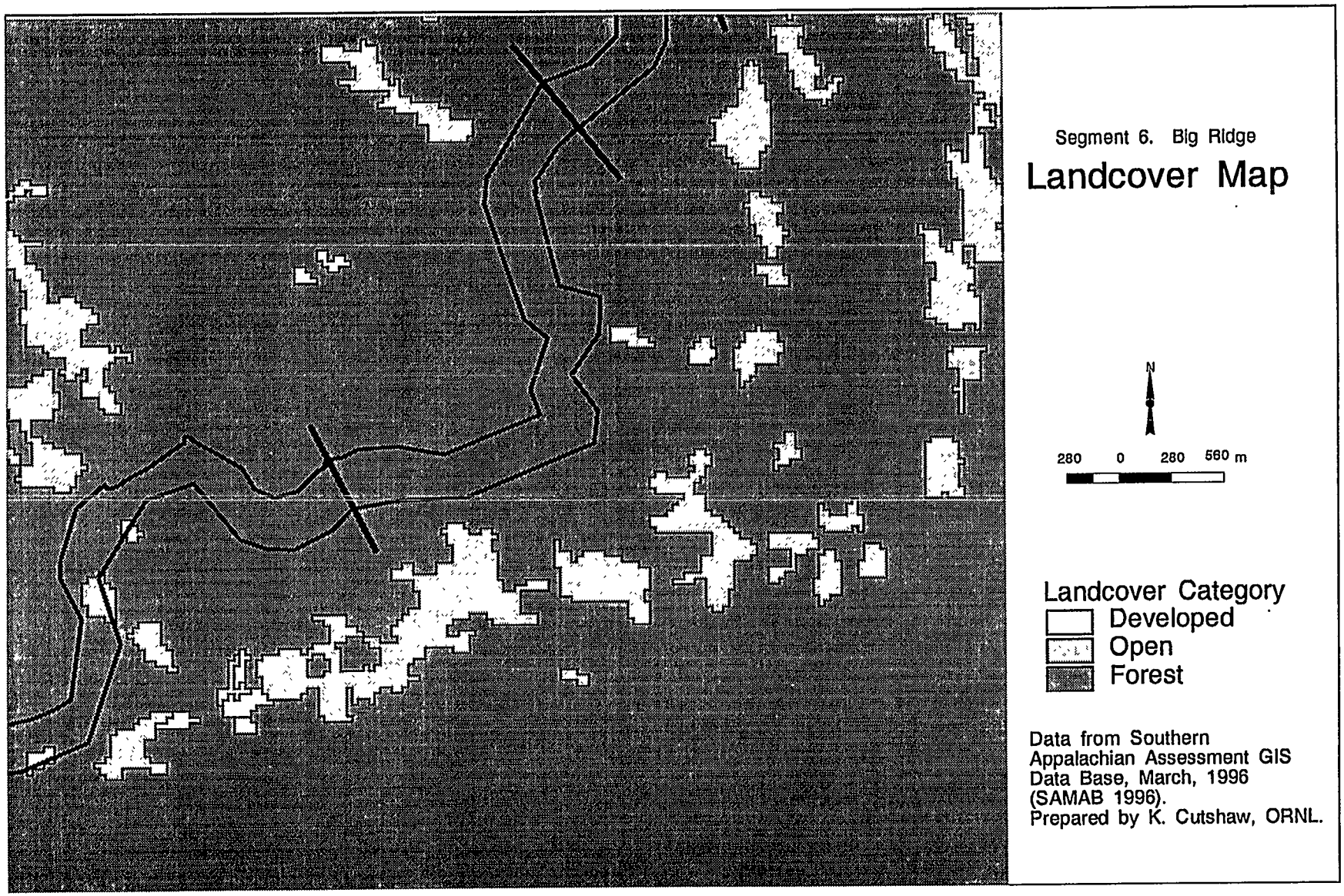
N

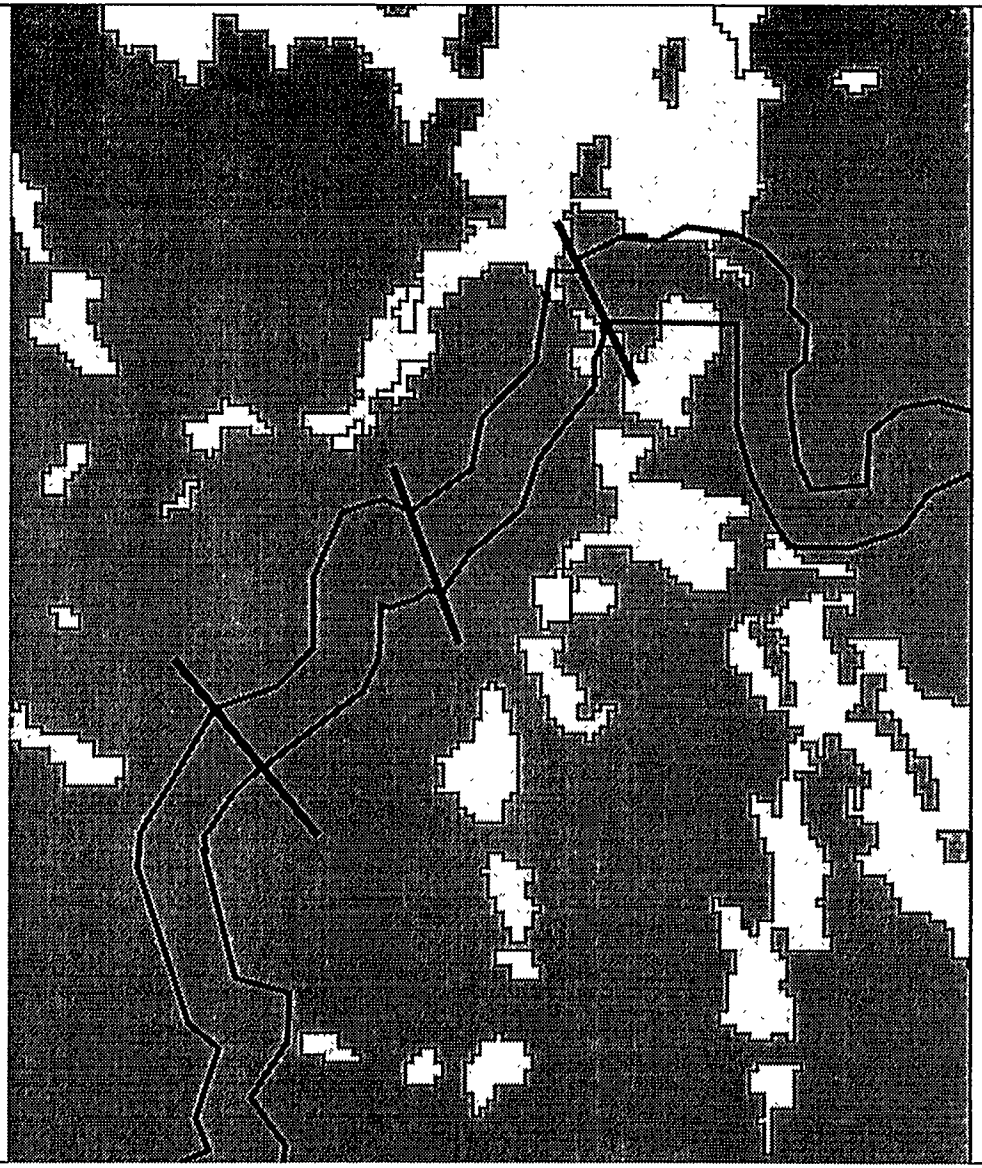
280 0 280 560 m

Landcover Category

- Developed
- Open
- Forest

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.


Segment 6. Big Ridge
Landcover Map
N
280 0 280 560 m
Landcover Category
Developed
Open
Forest
Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.



Segment 7. Cosby Creek Terraces

Landcover Map

N

280 0 280 560 m

Landcover Category
- Developed
- Open
- Forest

Data from Southern Appalachian Assessment GIS Data Base, March, 1996 (SAMAB 1996).
Prepared by K. Cutshaw, ORNL.

Appendix F

BIRD SURVEY REPORT

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August 1995

1995 BIRD SURVEY
FOOTHILLS PARKWAY SECTION 8B
NATIONAL PARK SERVICE, TENNESSEE

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1. INTRODUCTION

The Foothills Parkway Section 8B right-of-way (ROW) is a stretch of land between Pittman Center and Cosby, Tennessee that is approximately 14.2 miles long and 1,000 ft wide, with a considerably wider section on Webb Mountain (Fig. 1). A breeding bird survey was conducted at selected sample points along the ROW (Wade et al. 1994).

2. PURPOSE

The intent of the survey was to identify bird communities, area sensitive species (i.e., birds dependent on extensive forest systems for all their needs, Robbins 1979), and endangered, threatened, federal candidate, and state "*In need of management*" species now using the ROW. The survey also provides baseline data to assess future habitat impacts as well as cumulative impacts of the project.

3. METHODS

A field reconnaissance of the area was conducted in April of 1995 along the Section 8B right-of-way. A total of eight widely placed survey stations were selected for intensive bird observation. Five stations were chosen in forest habitat since this is the predominant right-of-way habitat (B3, B4, B5, B7, B8). Three additional locations were chosen in other representative habitats [one in a forested wetland (B6), one in a late successional old field (B1), and one in a forest/riparian habitat (B2)] (Figure 1)[1].

Three additional locations (LPR-Little Pigeon River Floodplain, MB-Matthews Branch, and CR-Costner Road) were also surveyed three times during the survey period (Fig. 1). These stations were added to increase sample diversity of habitats and elevations. Due to time constraints these

[1]B1—Webb Creek, B2—Sheep Pen Branch, B3—Webb Mountain, B4—Lower Webb Mountain, B5—Branam Hollow Road, B6—Rocky Flats Wetlands, B7—Appletree Lane, B8—Cosby Floodplain.

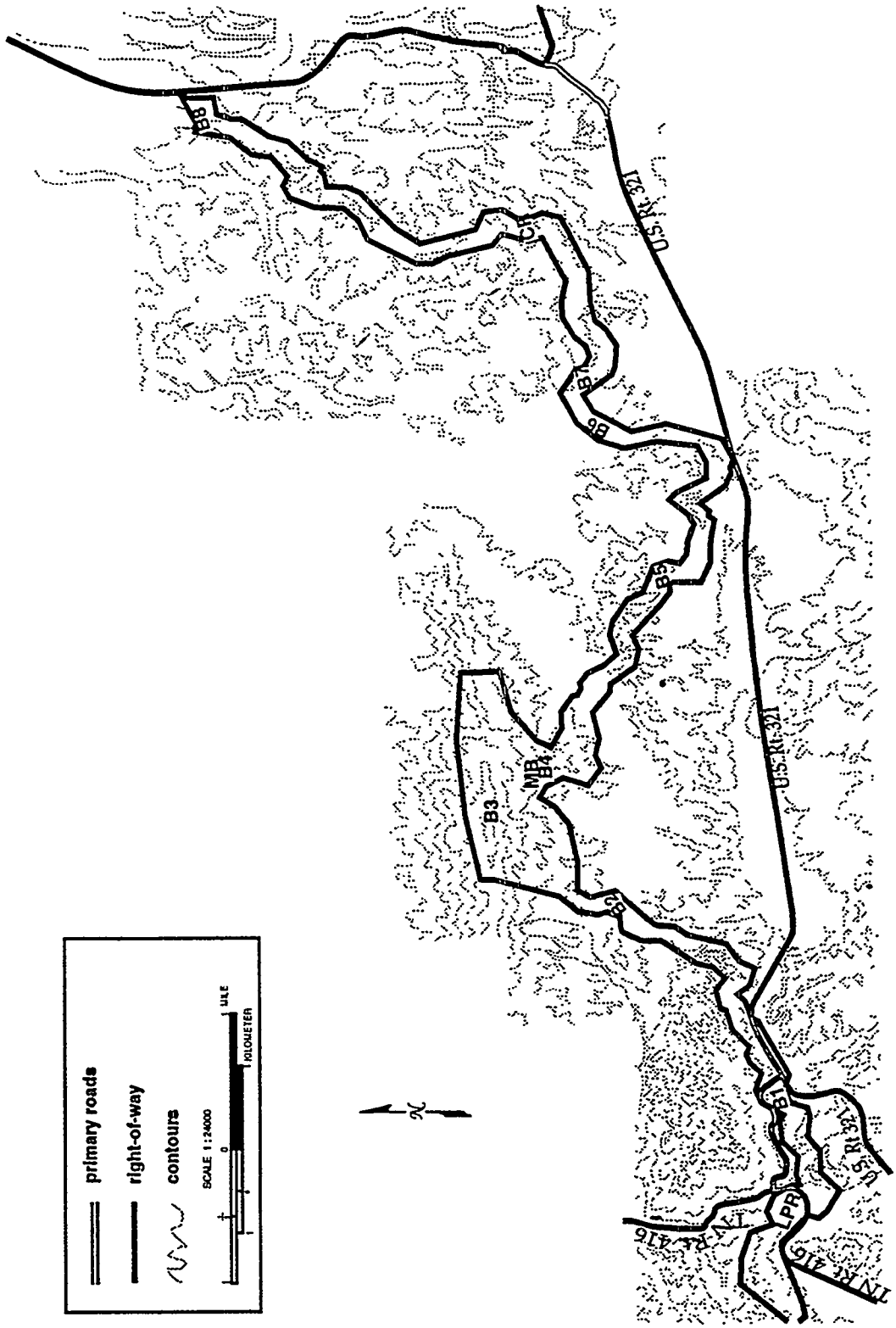

Figure 1. Bird observation stations.

stations were not surveyed as intensively as B1–B8 nor were circular plots established. General habitat descriptions were documented for these locations, however, and are included in Section 4.2 below.

3.1 BIRD SURVEY METHOD

Birds were censured using the variable circular-plot method (Reynolds et al. 1980). In the variable circular-plot method, stations are established within a plant community either at equal intervals along a transect or placed at distances which minimize the possibility of counting the same bird twice. Each bird seen or heard during a specified time period is counted and the horizontal distance from the point to the bird is estimated and recorded.

To assure that all birds would be counted within the survey station area, the maximum listening time of 10 minutes as described by Reynolds et al. 1980 was used. All surveys were conducted within 3.5 to 4.5 hours of local sunrise, the time of greatest bird activity (Robbins 1981). Each station was censured at least five times April 27 through June 19, 1995, to adequately assess breeding bird populations (Alsop 1991, National Geographic Society 1987, Robbins et al. 1981). The direction from which the bird was seen or heard was also recorded. Birds were recorded as singing males, nonsinging males, females, immatures, or birds of unknown sex or age. Flyovers were recorded incidentally when sighted. Additional birds were recorded from walking transect surveys of Webb Mountain (between sites B3 and B4) and the hike into Sheep Pen Branch (B2), because the areas were to hiked anyway in order to access sites B3 and B2, respectively.

One nocturnal survey for owls was completed at Webb Creek (B1). Webb Creek was chosen because it contained the best owl feeding area habitat (i.e., both clearings and forest) of all the survey stations. This survey was conducted between 8:00 pm and 9:30 pm, on May 2, 1995. A recorded audio tape of owl species that could be using the area was played continuously at the B1 survey point during this period.

3.2 HABITAT DESCRIPTION METHOD

It was determined that it would be reasonable to gather habitat information to correlate habitat to bird observations. This information provides baseline data and will be used for future analysis, as appropriate.

Quantitative vegetation data was collected at each of eight bird survey points (B1 through B8) using a modification of the .04 hectare circular plot method (James and Shugart 1970, Noon 1980, Lent et al. 1984). A circular plot was centered on each bird survey point to define an area in which numerous measurements of habitat structure would be taken. The circular plot method chosen is a standard and reproducible method of measuring habitat parameters. It could easily be duplicated in the future to document any habitat changes. It has the advantage over a qualitative method in that it provides actual numbers for comparative purposes. The results can be used to monitor changes in cover, tree species composition, shrub density, etc. This information can be directly correlated with changes in bird populations, which are measured at the same exact locations.

The circular plot was divided into four quadrants (northeast, northwest, southeast and southwest); within each maximum vegetation height (canopy height) was measured in meters (m) using a rangefinder. For each measurement, it was noted whether the vegetation being measured was coniferous or deciduous.

The diameter at breast height (dbh) 1.3 m above the ground of all saplings (i.e., small trees no greater than 10 cm thick) and trees (perennial woody plant with an evident trunk and generally thicker than 10 cm) within the plot was measured in nine size categories (see Appendix B) using a forester's diameter tape. These size classes follow those of James and Shugart (1970) and Noon (1980).

Shrub (i.e., a wood perennial, smaller than a tree, and usually containing several stems) density at breast height was measured along north-south and east-west running transects (each 22.6 meters long) established through the circular plot. All stems of saplings or shrubs less than 3 cm dbh including the mainstem and those stems branching from the mainstem below breast height were

counted. This was accomplished by walking each transect with outstretched arms and counting all woody stems which intercepted either the arms or the body.

Herbaceous cover was measured by establishing four 1/2 m square plots along each 22.6 m transect. The percentage of each plot occupied by a particular herbaceous species was noted along with percentages for leaf litter, bare ground, etc.

Canopy cover and ground cover (1 m in height and below) were measured utilizing a modification of the crosswire sighting tube (Winkworth 1962). The measurements were taken with an ocular tube consisting of a cardboard cylinder with cross hairs at one end. The observer walked along each 22.6 m transect sighting straight up for canopy cover and downward for shrub and other vegetation cover recording a total of 20 plus or minus readings for each transect indicating the presence or absence of green vegetation. A plus was recorded where green vegetation intercepted the crosshairs. The presence of deciduous, coniferous or evergreen vegetation was specifically noted.

General notes were taken within each circular plot of the presence of any additional low shrubs or herbaceous vegetation.

4. RESULTS

4.1 BIRDS

Bird surveys were conducted from April 27 to June 19, 1995. The survey results for each station appear below. A total of 63 species were identified during the survey and are listed in Appendix A. Along with the term area-sensitive (birds dependent on extensive forest systems for all their needs) the terms forest-dependent and forest-edge bird species are referred to throughout this section. The definition of forest-dependent birds are those dependent on forest habitats for most of their needs (Robbins 1979). For the purposes of this report, forest-edge species will be considered those dependent on forests for part of their needs but also may require field, old field, suburban, or forest-edge (the meeting of field and forest) habitats.

It should be noted that frequencies (observed per visit) of each species are listed for Tables 1–11. Frequency is commonly recorded when listing bird survey results and can indicate a number of things related to the use of a habitat by a particular species.

4.1.1 Webb Creek (B1)

With the exception of pileated woodpecker, wood thrush, hooded warbler, red-eyed vireo, and northern parula, all other birds identified at Webb Creek (B1) prefer forest edge or field habitats (Table 1). Owl tapes were used for the owls that could be using the area [i.e., barred (*Strix varia*), great-horned, eastern screech (*Otus asio*), short-eared (*Asio flammeus*), long-eared (*Asio otus*), and state "*In need of management*" species northern saw-whet (*Aegolius acadicus*) and common barn (*Tyto alba*) owls]. One great-horned owl was identified by using this method.

Table 1. Bird survey results for B1 (Webb Creek)

Common name	Frequency (observed/visits)
Northern Cardinal	5/5
Indigo Bunting	4/5
Pileated Woodpecker	3/5
Wood Thrush	3/5
American Crow	3/5
Hooded Warbler	3/5
White-eyed Vireo	3/5
Carolina Wren	2/5
Common Yellowthroat	2/5
Blue-gray Gnatcatcher	2/5
Rufous-sided Towhee	2/5
Red-eyed Vireo	2/5
Carolina Chickadee	1/5
Great-horned Owl*	1/5
Northern Parula	1/5
Common Flicker	1/5
Mourning Dove	1/5
American Goldfinch	1/5
White-throated Sparrow	1/5
Rock Dove	1/5
Barn Swallow	1/5

*Identified by nocturnal survey using owl tapes

4.1.2 Sheep Pen Branch (B2)

Eleven species of birds were identified at Sheep Pen Branch (B2). Eight of the 11 were area-sensitive, forest-dependent birds (worm-eating, black-throated green, and black and white warblers, red-eyed vireo, ovenbird, scarlet tanager, pileated woodpecker, and yellow-billed cuckoo) (Table 2, Part A). Additional forest-dependent species found along the hike into B2 (i.e., Sheep Pen Branch transect) include hooded warbler, northern parula, wood thrush, Louisiana waterthrush, solitary vireo, eastern wood pewee, and red-tailed hawk (Table 2, Part B). A Cooper's hawk was observed south of the Sheep Pen Branch area. Ruffed grouse drumming was heard during a visit to Sheep Pen Branch in early April of 1995.

4.1.3 Webb Mountain (B3)

The birds recorded at B3 included many area-sensitive species including ovenbird, red-eyed vireo, pileated woodpecker, wood thrush, worm-eating, black-throated green, and black and white warblers, eastern wood pewee, scarlet tanager, and yellow-billed cuckoo (Table 3, Part A). It is interesting to also note that some forest-edge type species were found on Webb Mountain including indigo bunting, Carolina wren, and tufted titmouse. The existence of dead pine snags (i.e., a standing dead tree often with the top broken out) have probably created openings necessary for these species. Additional birds noted on the transect of Webb Mountain include Carolina and black-capped chickadees, solitary vireo, and pine warbler. The solitary vireo and pine warbler are area-sensitive, forest-dependent bird species. Four different woodpeckers were recorded along the transect, also possibly due to the presence of the pine snags. The majority of the birds recorded along the Webb Mountain transect were forest-edge species (Table 3, Part B).

Additional observations on Webb Mountain outside of the survey period include hairy woodpeckers in March of 1994 and a broad-headed skink (*Eumeces laticeps*) in April of 1995.

4.1.4 Lower Webb Mountain (B4)

The most frequently (more than one observation) identified forest dependent birds at B4 were pileated woodpecker, wood warblers (hooded, black and white, black-throated green, and worm-eating), ovenbird, and red-eyed vireo. Forest-dependent birds recorded only one time include blackburnian warbler, wood thrush, solitary vireo, yellow-billed cuckoo, and scarlet tanager. Fourteen of 25 species encountered at B4 were forest-edge species including rufous-sided towhee, American crow, indigo bunting, Carolina wren, and blue jay.

Table 2. Bird survey results for the Sheep Pen Branch area

Part A—Sheep Pen Branch (B2)		Part B—Sheep Pen Branch Transect	
Common name	Frequency (observed/visits)	Common name	Frequency (observed/visits)
Red-eyed Vireo	4/5	Hooded Warbler	5/5
Tufted Titmouse	3/5	Pileated Woodpecker	4/5
Worm-eating Warbler	3/5	Ovenbird	4/5
Black-throated Green Warbler	2/5	Blue-gray Gnatcatcher	4/5
American Crow	2/5	Northern Parula	4/5
Ovenbird	2/5	Black & White Warbler	3/5
Black & White Warbler	2/5	Carolina Chickadee	3/5
White-breasted Nuthatch	1/5	Indigo Bunting	3/5
Carolina Chickadee	1/5	Red-eyed Vireo	3/5
Scarlet Tanager	1/5	Wood Thrush	3/5
Pileated Woodpecker	1/5	Rufous-sided Towhee	3/5
Yellow-billed Cuckoo	1/5	Louisiana Waterthrush	3/5
		Downy Woodpecker	2/5
		Scarlet Tanager	2/5
		American Crow	2/5
		Black-throated Green Warbler	2/5
		Worm-eating Warbler	2/5
		Solitary Vireo	2/5
		Tufted Titmouse	2/5
		Northern Cardinal	2/5
		Red-bellied Woodpecker	1/5
		Mourning Dove	1/5
		Eastern Wood Pewee	1/5
		Yellow-billed Cuckoo	1/5
		Cooper's Hawk*	1/5
		Hairy Woodpecker	1/5
		White-breasted Nuthatch	1/5
		American Goldfinch	1/5
		Red-tailed Hawk	1/5
		Blue Jay	1/5
		Chimney Swift	1/5

*Seen on road driving up to site.

Table 3. Bird survey results for the Webb Mountain area

Part A—Webb Mountain (B3)		Part B—Webb Mountain Transect	
Common name	Frequency (observed/visits)	Common name	Frequency (observed/visits)
Ovenbird	6/6	Black & White Warbler	6/6
Red-eyed Vireo	6/6	Rufous-sided Towhee	6/6
Black & White Warbler	4/6	Hooded Warbler	6/6
Eastern Wood Pewee	4/6	Pileated Woodpecker	6/6
American Crow	4/6	Indigo Bunting	6/6
Downy Woodpecker	3/6	Worm-eating Warbler	6/6
Scarlet Tanager	3/6	Eastern Phoebe	5/6
Yellow-billed Cuckoo	3/6	Red-eyed Vireo	5/6
Pileated Woodpecker	2/6	Ovenbird	5/6
Indigo Bunting	2/6	Black-capped Chickadee	5/6
Carolina Wren	1/6	Tufted Titmouse	4/6
Wood Thrush	1/6	Common Flicker	4/6
Tufted Titmouse	1/6	Downy Woodpecker	4/6
Worm-eating Warbler	1/6	Scarlet Tanager	3/6
Common Flicker	1/6	Black-throated Green Warbler	3/6
Black-throated Green Warbler	1/6	Solitary Vireo	3/6
Brown-headed Cowbird	1/6	Wood Thrush	2/6
Blue Jay	1/6	Yellow-rumped Warbler	2/6
		American Crow	2/6
		White-breasted Nuthatch	2/6
		Mourning Dove	1/6
		Turkey Vulture	1/6
		Red-breasted Nuthatch	1/6
		White-throated Sparrow	1/6
		Northern Cardinal	1/6
		Blue Jay	1/6
		Carolina Wren	1/6
		Rose-breasted Grosbeak	1/6
		Blackburnian Warbler	1/6
		Brown-headed Cowbird	1/6
		Eastern Wood Pewee	1/6
		Chimney Swift	1/6
		Hairy Woodpecker	1/6
		Pine Warbler	1/6
		Carolina Chickadee	1/6

Table 4. Bird survey results for Lower Webb Mountain (B4)

Common name	Frequency (observed/visits)
Rufous-sided Towhee	6/6
American Crow	6/6
Ovenbird	6/6
Red-eyed Vireo	4/6
Indigo Bunting	4/6
Black-throated Green Warbler	3/6
Worm-eating Warbler	3/6
Carolina Wren	2/6
Black & White Warbler	2/6
Hooded Warbler	2/6
Pileated Woodpecker	2/6
Blue Jay	2/6
Downy Woodpecker	2/6
Wood Thrush	1/6
Yellow-rumped Warbler	1/6
Solitary Vireo	1/6
Tufted Titmouse	1/6
Carolina Chickadee	1/6
Northern Cardinal	1/6
Common Flicker	1/6
White-breasted Nuthatch	1/6
Eastern Phoebe	1/6
Blackburnian Warbler	1/6
Yellow-billed Cuckoo	1/6
Scarlet Tanager	1/6

4.1.5 Branam Hollow Road (B5)

Birds recorded at B5 are very similar to those identified at B4. Exceptions to that are brown thrasher, red-breasted nuthatch, pine warbler, and American robin which were encountered at B5 and not B4.

Table 5. Bird survey results for Branam Hollow Road (B5)

Common name	Frequency (observed/visits)
Rufous-sided Towhee	5/5
American Crow	5/5
Ovenbird	4/5
Black-throated Green Warbler	4/5
Hooded Warbler	4/5
Pileated Woodpecker	3/5
White-breasted Nuthatch	3/5
Black & White Warbler	2/5
Carolina Wren	2/5
Common Flicker	2/5
Indigo Bunting	2/5
Red-eyed Vireo	2/5
Tufted Titmouse	2/5
Downy Woodpecker	2/5
Wood Thrush	1/5
Brown Thrasher	1/5
Scarlet Tanager	1/5
Blue Jay	1/5
Carolina Chickadee	1/5
Red-breasted Nuthatch	1/5
Pine Warbler	1/5
Northern Cardinal	1/5
Solitary Vireo	1/5
American Robin	1/5

4.1.6 Rocky Flats Road (B6)

Ten out of 14 birds recorded more than once at B6 were forest-edge species. The four forest-dependent species identified more than once were ovenbird, wood thrush, yellow-billed cuckoo, and red-eyed vireo. Other birds observed include the only Kentucky warbler heard during the bird survey.

Table 6. Bird survey results for Rocky Flats Road (B6)

Common name	Frequency (observed/visits)
Northern Cardinal	6/7
Ovenbird	6/7
American Crow	5/7
Wood Thrush	5/7
Indigo Bunting	5/7
Yellow-billed Cuckoo	5/7
Red-eyed Vireo	5/7
Blue Jay	4/7
Pileated Woodpecker	3/7
Carolina Chickadee	2/7
Tufted Titmouse	2/7
Common Grackle	2/7
American Robin	2/7
Chimney Swift	2/7
Song Sparrow	2/7
Common Flicker	2/7
Scarlet Tanager	1/7
Gray Catbird	1/7
Yellow Warbler	1/7
Hooded Warbler	1/7
Black-throated Green Warbler	1/7
Brown Thrasher	1/7
Eastern Wood Pewee	1/7
Mourning Dove	1/7
Blue-gray Gnatcatcher	1/7
Kentucky Warbler	1/7

4.1.7 Apple Tree Lane (B7)

Birds identified at B7 were a fairly even mixture of forest-dependent versus forest-edge species (14 vs. 11). The species recorded are similar to those of B4 and B5. The only record of Acadian flycatcher during the survey was at B7.

Table 7. Bird survey results for Apple Tree Lane (B7)

Common name	Frequency (observed/visits)
Ovenbird	6/6
Hooded Warbler	5/6
American Crow	4/6
Carolina Chickadee	3/6
Carolina Wren	3/6
Pileated Woodpecker	3/6
Red-eyed Vireo	3/6
Wood Thrush	2/6
Tufted Titmouse	2/6
Yellow-billed Cuckoo	2/6
Eastern Phoebe	2/6
Blue Jay	2/6
Northern Cardinal	2/6
Scarlet Tanager	2/6
Black & White Warbler	2/6
Gray Catbird	1/6
Hairy Woodpecker	1/6
Northern Parula	1/6
American Robin	1/6
Indigo Bunting	1/6
Downy Woodpecker	1/6
Black-throated Green Warbler	1/6
Common Flicker	1/6
Common Grackle	1/6
Acadian Flycatcher	1/6

4.1.8 Cosby (B8)

The majority (18 out of 22) of the bird species observed at B8 were forest-edge species. These included yellow-breasted chat, common yellowthroat, and northern bobwhite. The four forest-dependent species were ovenbird, yellow-billed cuckoo, red-eyed vireo, and pileated woodpecker.

Table 8. Bird survey result for Cosby (B8)

Common name	Frequency (observed/visits)
Carolina Wren	6/6
Indigo Bunting	6/6
Northern Cardinal	6/6
Yellow-billed Cuckoo	5/6
Tufted Titmouse	5/6
Northern Bobwhite	5/6
Blue-gray Gnatcatcher	5/6
Red-eyed Vireo	5/6
Yellow-breasted Chat	4/6
Pileated Woodpecker	3/6
American Crow	3/6
Rufous-sided Towhee	3/6
White-eyed Vireo	2/6
Brown-headed Cowbird	2/6
Eastern Phoebe	2/6
Chimney Swift	2/6
Carolina Chickadee	2/6
White-throated Sparrow	1/6
Red-bellied Woodpecker	1/6
Blue Jay	1/6
Ovenbird	1/6
Common Yellowthroat	1/6

4.1.9 Little Pigeon River (LPR)

Only three (northern parula, red-eyed vireo, and pileated woodpecker) of 22 species recorded at LPR are forest-dependent. The rest include forest-edge as well as wetland/stream (i.e., mallard, belted kingfisher) species. LPR was the only site where the eastern meadowlark and northern mockingbird were identified. Prior to the survey in April 1995 wood ducks were seen near LPR.

Table 9. Bird survey results for Little Pigeon River (LPR)

Common name	Frequency (observed/visits)
Northern Parula	3/3
Indigo Bunting	3/3
Northern Cardinal	3/3
Carolina Chickadee	3/3
Song Sparrow	2/3
American Crow	2/3
Red-eyed Vireo	2/3
Gray Catbird	1/3
Yellow Warbler	1/3
Red-winged Blackbird	1/3
Common Flicker	1/3
Pileated Woodpecker	1/3
Chimney Swift	1/3
Mourning Dove	1/3
Eastern Meadowlark	1/3
Blue Jay	1/3
Northern Mockingbird	1/3
Turkey Vulture	1/3
White-eyed Vireo	1/3
Carolina Wren	1/3
Belted Kingfisher	1/3
Mallard	1/3

4.1.10 Matthews Branch (MB)

The birds documented during the survey at MB were also observed at B4 with the exception of the indigo bunting. In April of 1994 a hen ruffed grouse and chicks were seen in the Matthews Branch drainage.

Table 10. Bird survey results for Matthews Branch (MB)

Common name	Frequency (observed/visits)
Black & White Warbler	3/3
Hooded Warbler	3/3
Ovenbird	2/3
Downy Woodpecker	1/3
Common Flicker	1/3
Tufted Titmouse	1/3
American Crow	1/3
Rufous-sided Towhee	1/3
Indigo Bunting	1/3
Carolina Wren	1/3
Black-throated Green Warbler	1/3
Worm-eating Warbler	1/3

4.1.11 Costner Road (CR)

The bird species of CR are similar to those of Webb Mountain and Branam Hollow. During a walk through of Section 8B in May of 1993 a ruffed grouse nest with eggs was observed on Big Ridge near the CR site.

Table 11. Bird survey results for Costner Road (CR)

Common name	Frequency (observed/visits)
Red-eyed Vireo	3/3
Hooded Warbler	2/3
Ovenbird	2/3
Worm-eating Warbler	2/3
Yellow-billed Cuckoo	1/3
Mourning Dove	1/3
Tufted Titmouse	1/3
Black & White Warbler	1/3
Carolina Wren	1/3
Carolina Chickadee	1/3
Scarlet Tanager	1/3
American Crow	1/3
Northern Cardinal	1/3
Pileated Woodpecker	1/3
Tufted Titmouse	1/3
Turkey Vulture	1/3
Rufous-sided Towhee	1/3

4.2 VEGETATION

The following is a brief summation of the general habitat and vegetation data collected during field visits between 4/7/95 and 5/23/95.

4.2.1 Circular Plot Sites

This section summarizes the vegetative habitat of each site for which circular plots were completed. The results from the circular plots are included in Appendix B and C.

4.2.1.1 Webb Creek (B1)

This site is located alongside Webb Creek. Approximately one half of it is disturbed edge habitat and the other half is open field habitat. The disturbed edge habitat has a small amount of canopy cover comprised of black walnut and yellow buckeye. Beneath this it is overgrown with multiflora rose and blackberry bushes. Several kinds of herbaceous species are abundant in this area as well. They include Miami mist, speedwell, sandwort, and pasture grass species. The open field habitat has no canopy or shrub species. It is comprised entirely of herbaceous species (pasture grasses and flowering plants). Fescue grasses and *agrostis* species of grasses along with red clover, vetch, tumble mustard, Miami mist, and others appear to be the most abundant species in this section.

4.2.1.2 Sheep Pen Branch (B2)

Sheep Pen branch flows between steep slopes through this moist mixed hardwood/hemlock forest site. The canopy cover is thick, being comprised mainly of hardwood species such as black birch, tulip poplar, red oak, red maple, and sourwood. The hemlocks in the canopy are located along the edge of the branch. Hemlocks make up most of the subcanopy with rhododendrons, flowering dogwoods, and red maples being present also. Poison ivy, Virginia creeper, and smilax occur but are not abundant. Ground cover species are diverse but are not abundant. Plants observed included Christmas and cinnamon fern, striped pipsissewa, violet, elephant's foot, rattlesnake plantain, aster, foamflower, nightshade, and speedwell.

4.2.1.3 Webb Mountain (B3)

This predominantly hardwood forest is located at the top of Webb Mountain. The canopy cover is thick and dominated by mainly chestnut oak and secondarily by northern red oak. Other canopy species include red maple and mockernut hickory. Snags are also common in the area. Both live and dead table mountain pine are present in the surrounding area. Sourwood is common in the subcanopy along with chestnut oak and snags. The most common low shrub species is chestnut oak with table mountain pine, American chestnut, alternate leaf dogwood, tulip poplar, red maple, striped maple, mockernut hickory, sassafras, blueberry, and snags also present. Groundcover is sparse, consisting mainly of bracken fern.

4.2.1.4 Lower Webb Mountain (B4)

This young hardwood forest sits atop a ridge. The canopy cover is dense and has a variety of species. Chestnut oak is the most abundant canopy species with striped maple, flowering dogwood, sourwood, tupelo, northern red oak, red maple, and others filling in the lower level of the canopy. Shrub species in the subcanopy include buffalo-nut, blueberry, grape, and smilax. These are sparse in their coverage. Ground cover was sparse. Solomon's seal, false Solomon's seal, and striped pipsissewa are the most common herbaceous species on the plot. Christmas fern, bracken fern, and rattlesnake plantain are sparsely scattered on the plot.

4.2.1.5 Branam Hollow Road (B5)

This survey point is a hardwood/pine forest habitat located on a slope. Red maple is the dominant hardwood canopy species although scarlet oak, chestnut oak, blackgum, and sourwood are present as well. The two evergreen canopy species are eastern hemlock and Virginia pine. The main subcanopy species present are rosebay rhododendron and mountain laurel. Galax, clubmoss, and striped pipsissewa were the only ground cover species identified. Leaf litter covers the ground on this site.

4.2.1.6 Rocky Flats Road (B6)

This site is hemlock/hardwood forest. It is in a low-lying wet area with a small stream flowing through it. The eastern hemlocks present in the canopy are large (one measuring over 50 inches in diameter). Tulip poplars are interspersed among the hemlocks. Two small white ashes are located at the edge of the plot. The main subcanopy species are American holly, eastern hemlock, rosebay rhododendron, and privet. Honeysuckle, poison ivy, and Virginia creeper are abundant as well. Herbaceous ground covers are abundant in the moist habitat. Clubmoss, Christmas fern, bracken fern, periwinkle, partridgeberry, *microstegium*, and several species of violets are included in this category.

4.2.1.7 Apple Tree Lane (B7)

Located on a flat area near the base of a forested slope and within sight of a small creek, this survey plot has a diversity of vegetation species. In this hardwood forest habitat, the main canopy species are red maple and tulip poplar. Sweetgum, sweet birch, river birch, flowering dogwood, and sourwood are also present. The subcanopy consists of saplings of the species listed above along with eastern hemlock, holly, Virginia creeper, and an abundance of poison ivy. The ground cover species are many; only a few will be listed in this description. They are *microstegium*, cinquefoil, violet species, false Solomon's seal, and clubmoss species.

4.2.1.8 Cosby (B8)

This survey plot is old field habitat (a successional stage between open field and hardwood forest). The canopy trees are young and the majority of them are either black locust or boxelder. Black cherry, tulip poplar, and sweetgum are on the plot as well. There are some areas of dense shrubby vegetation. Multiflora rose, poison ivy, and honeysuckle constitute the vegetation types in these areas. The ground cover is dense on the site in all areas. The alien grass, *microstegium*, is thick in the more open areas of the site and vegetation such as bedstraw, bittercress, and *glechoma* dominate much of the site. There are other numerous herbaceous species present.

4.2.2 Non-circular Plot Sites

This section summarizes the vegetative habitat of each site for which circular plots were not completed.

4.2.2.1 Little Pigeon River (LPR)

This small disturbed piece of land lies between State Route 416 and the Little Pigeon River. Representative tree species along the riverbank are tulip poplar, river birch, sycamore and hackberry. The vegetation under these trees and along the road edge are typical disturbed area species such as multiflora rose, honeysuckle, poison ivy and various species of sedges, grasses, and wildflowers. Miami-mist, wild geranium, sage, dog violet, and aster species were abundant.

4.2.2.2 Matthews Branch (MB)

Located at the bottom of slopes where a drainage swale intersects Matthews Branch, this is a moist hardwood forest habitat. It is close (i.e., less .25 mile) to the Lower Webb Mountain site. The hardwood canopy consists mainly of northern red oak and chestnut oak with red maples and flowering dogwoods in the understory. Other subcanopy species include eastern hemlock, rosebay rhododendron, flame azalea, and buffalo-nut. False Solomon's seal, galax, Christmas fern, cinnamon fern, violets, coreopsis, whorled loosestrife, and wild hydrangea are representative of the ground cover species.

4.2.2.3 Costner Road (CR)

This hardwood forest habitat lies between steep slopes which form a drainage swale. The canopy trees are large and consist almost exclusively of tulip poplars. In the lower canopy black birch is present. Shrubs such as black cohosh and wild hydrangea are found along the edge of the swale. The ground cover species include an abundance of wild geranium along with Christmas, cinnamon and bracken fern, whorled loosestrife, white snakeroot, false Solomon's seal, orchid, and elephant's foot. Most of these species are located along the drainage swale also.

5. CONCLUSIONS

Section 8B of the Foothills Parkway is frequented by typical forest and forest-edge avian species. No threatened, endangered, or federal candidate species were identified during the survey. One Cooper's hawk (Tennessee species "*In need of management*") was identified near the Sheep Pen Branch area.

It is noteworthy that along the ridges and on Webb Mountain there has been a dieoff of most of the pine trees. This has created openings for forest-edge bird species such as the indigo bunting and Carolina wren. Prior to the pine dieoff these areas did not provide as much habitat for forest-edge species. As hardwoods replace the pines in the future, the area will return to a predominantly forested habitat.

Encroachment of residential development is evident in many areas adjacent Section 8B. This development has fragmented the forest habitats in the area. As development increases fragmentation of the forest will also increase.

The predominant habitat present on the Section 8B ROW is contiguous forest. Many forest dependent (area-sensitive) bird species use the ROW. It is important that the Environmental Impact Statement for Section 8B analyze the impacts of the proposed action and alternatives on these forest habitats and the birds that live there, along with the cumulative impacts of this action in association with other disturbance activities in the area.

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APPENDIX A

LISTING OF ALL BIRDS

	Forest								Riparian		Field	Floodplain	Wetland
Species[1]	B2T	B3	B3T	B4	B5	B7	B8	CR	B2	MB	B1	LPR	B6
Mallard *Anas platyrynchos*												X	
Turkey Vulture *Cathartes aura*			X					X				X	
Cooper's Hawk[2] *Accipiter cooperii*	X												
Red-tailed Hawk *Buteo jamaicensis*	X												
Northern Bobwhite *Colinus virginianus*							X						
Rock Dove *Columba livia*											X		
Mourning Dove *Zenaida macroura*	X		X					X			X	X	X
Yellow-billed Cuckoo *Coccyzus americanus*	X	X		X		X	X		X	X			X
Great-horned Owl[3] *Bubo virginianus*											X		
Chimney Swift *Chaetura pelagica*	X		X				X					X	X
Belted Kingfisher *Ceryle alcyon*												X	
Red-bellied Woodpecker *Melanerpes carolinus*	X						X						
Northern Flicker *Colaptes auratus*		X	X	X	X	X				X	X	X	X
Downy Woodpecker *Picoides pubescens*	X	X	X	X	X	X				X			

	Forest								Riparian		Field	Floodplain	Wetland
Species[1]	B2T	B3	B3T	B4	B5	B7	B8	CR	B2	MB	B1	LPR	B6
Hairy Woodpecker *Picoides villosus*	X		X			X							
Pileated Woodpecker *Dryocopus pileatus*	X	X	X	X	X	X	X	X	X		X	X	X
Eastern Wood-Pewee *Contopus virens*	X	X	X										X
Eastern Phoebe *Sayornis phoebe*			X	X		X	X						
Acadian Flycatcher *Empidonax virescens*						X							
Barn Swallow *Hirundo rustica*											X		
Blue Jay *Cyanocitta cristata*	X	X	X	X	X	X	X					X	X
American Crow *Corvus brachyrhynchos*	X	X	X	X	X	X	X	X	X	X	X	X	X
Tufted Titmouse *Parus bicolor*	X	X	X	X	X	X	X	X		X			X
Carolina Chickadee *Parus carolinensis*	X		X	X	X	X	X	X	X		X	X	X
Black-capped Chickadee *Parus atricapillus*			X										
White-breasted Nuthatch *Sitta carolinensis*	X		X	X	X				X				
Red-breasted Nuthatch *Sitta canadensis*			X		X								
Carolina Wren *Thryothorus ludovicianus*		X	X	X	X	X	X	X		X	X	X	

	Forest								Riparian		Field	Floodplain	Wetland
Species[1]	B2T	B3	B3T	B4	B5	B7	B8	CR	B2	MB	B1	LPR	B6
Blue-gray Gnatcatcher *Polioptila caerulea*	X						X				X		X
Wood Thrush *Hylocichla mustelina*	X	X	X	X	X	X					X		X
American Robin *Turdus migratorius*					X	X							X
Gray Catbird *Dumetella carolinensis*						X						X	X
Northern Mockingbird *Mimus polyglottos*												X	
Brown Thrasher *Toxostoma rufum*					X								X
White-eyed Vireo *Vireo griseus*							X				X		
Solitary Vireo *Vireo solitarius*	X		X	X	X								
Red-eyed Vireo *Vireo olivaceous*	X	X	X	X	X	X	X	X	X		X	X	X
Northern Parula *Parula americana*	X					X					X	X	
Black & White Warbler *Mniotilta varia*	X	X	X	X	X	X		X	X	X			
Blackburnian Warbler *Dendroica fusca*			X	X									
Yellow-rumped Warbler *Dendroica magnolia*			X	X									
Black-throated Green Warbler *Dendroica virens*	X	X	X	X	X	X			X	X			X

	Forest								Riparian		Field	Floodplain	Wetland
Species[1]	B2T	B3	B3T	B4	B5	B7	B8	CR	B2	MB	B1	LPR	B6
Pine Warbler *Dendroica pinus*			X		X								
Yellow Warbler *Dendroica petechia*												X	X
Kentucky Warbler *Oporornis formosus*													X
Hooded Warbler *Wilsonia citrina*	X		X	X	X	X		X		X	X		X
Worm-eating Warbler *Helmitheros vermivorus*	X	X	X	X				X	X	X			
Ovenbird *Seiurus aurocapillus*	X	X	X	X	X	X	X	X	X	X			X
Louisiana Waterthrush *Seiurus motacilla*	X												
Common Yellowthroat *Geothlypis trichas*							X				X		
Yellow-breasted Chat *Icteria virens*							B8						
Rose-breasted Grosbeak *Pheucticus ludovicianus*			X										
Northern Cardinal *Cardinalis cardinalis*	X		X	X	X	X	X	X			X	X	X
Indigo Bunting *Passerina cyanea*	X	X	X	X	X	X				X	X	X	X
Rufous-sided Towhee *Pipilo erythrophthalmus*	X		X	X	X		X	X		X	X		
Song Sparrow *Melospiza melodia*												X	X

	Forest								Riparian		Field	Floodplain	Wetland
Species[1]	B2T	B3	B3T	B4	B5	B7	B8	CR	B2	MB	B1	LPR	B6
White-throated Sparrow *Zonotricia leucophrys*			X				X				X		
Eastern Meadowlark *Sturnella magna*												X	
Red-winged Blackbird *Agelaius phoeniceus*												X	
Brown-headed Cowbird *Molothrus ater*		X	X				X						
Common Grackle *Quiscalus quiscula*						X							X
Scarlet Tanager *Piranga olivacea*	X	X	X	X	X	X		X	X				X
American Goldfinch *Carduelis tristis*	X										X		

Key to Symbols:

B1—Webb Creek, B2—Sheep Pen Branch, B2T—Sheep Pen Branch transect, B3—Webb Mountain, B3T—Webb Mountain transect, B4—Lower Webb Mountain, B5—Branam Hollow Road, B6—Rocky Flats Road, B7—Apple Tree Lane, B8—Cosby, LPR—Little Pigeon River, MB—Matthews Branch, CR—Costner Road

[1]Latin names and systematic order according to National Geographic Society 1987
[2]Identified by nocturnal survey using owl tapes.
[3]Seen on road driving up to site.

APPENDIX B

VEGETATION PLOT RESULTS

The following summarizes the results of the .04 hectare plots established for the measurement of vegetation structural parameters for each survey area. A complete description of the methods used can be found in Section 3 of this report. The raw data sheets follow this summary.

WEBB CREEK B1

The most frequently encountered tree species (greater than or equal to 3 cm dbh) on the site was black walnut in the >8–15 cm size class. The most common shrub (<3 cm dbh) species on the site was multiflora rose with a count of 23 stems along the shrub transects. Privet was almost as prevalent with a stem count of 17. *Festuca* species was the dominant herbaceous species accounting for an average of 33% across the 8 half meter square plots. Miami mist was the second most prevalent herbaceous species averaging 16.8% across all of the plots. All canopy cover (measured as a percentage) was deciduous and recorded at 35%. Groundcover (measured in percent, 1 m in height and below) was all deciduous and recorded at 95%. The entirely deciduous canopy averaged 5.75 m in height, with a maximum height of 10 m.

SHEEP PEN BRANCH B2

The most frequently encountered tree species on the site were eastern hemlock and black birch in the 3–8 cm and >8–15 cm size categories. Flowering dogwood, rosebay rhododendron and snags were also prevalent in the 3–8 cm size category. The most prevalent shrub was rosebay rhododendron with a count of 11 stems. Leaf litter dominated the herbaceous plots averaging 81.3% across all plots. The total canopy cover was recorded at 97.5%, consisting of 67.5% deciduous cover and 30% coniferous cover. The total groundcover was recorded at 32.5%, consisting of 10% deciduous cover and 22.5% evergreen cover. The mixed deciduous/coniferous canopy averaged 15.6 m in height, with a maximum coniferous tree height of 19 m.

WEBB MOUNTAIN B3

The most frequently encountered tree species on the site was chestnut oak in the >15–23 cm and >23–38 cm size categories. Northern red oak was also present, mainly in the >23–38 cm size category. Sourwood and snags were present in the 3–8 cm category and >8–15 cm category. The dominant shrub was chestnut oak with a stem count of 6. Leaf litter dominated the herbaceous plots, averaging 99.5%. The entirely deciduous canopy cover was recorded at 90%. The entirely deciduous groundcover was recorded at 17.5%. The deciduous canopy averaged 18 m in height with a maximum height of 19 m.

LOWER WEBB MOUNTAIN B4

The most frequently encountered tree species was chestnut oak present in the 3–8 cm, >8–15 cm and >15–23 cm size categories. Striped maple and snags were also common in the 3–8 cm size categories. The dominant shrubs were flowering dogwood and striped maple with counts of 12 and 8 stems, respectively. The herbaceous plots were dominated by leaf litter which averaged 86.75% for all plots.

The entirely deciduous canopy cover was recorded at 100%. The entirely deciduous groundcover was recorded at 15%. The deciduous canopy averaged 12.5 m in height with a maximum height of 13 m.

BRANAM HOLLOW ROAD B5

The most frequently encountered tree species was rosebay rhododendron present almost exclusively in the 3–8 cm size category. Red maple was also fairly common in the 3–8 cm and >8–15 cm size categories, along with eastern hemlock mainly in the >8–15 cm size category. The dominant shrubs were mountain laurel and rosebay rhododendron, each having stem counts of 5. Leaf litter was dominant in the herbaceous plots, averaging 92.5% across all plots. The total canopy cover was recorded at 100%, with deciduous cover accounting for 10% and coniferous cover accounting for 90%. The total groundcover was recorded at 12.5%, with deciduous cover accounting for 7.5% and evergreen cover accounting for 5%. The mixed deciduous/coniferous

canopy averaged 15 m in height with a maximum deciduous and coniferous tree height of 15 meters.

ROCKY FLATS ROAD B6

The most frequently encountered tree species was eastern hemlock, mainly in the 3–8 cm, >8–15 cm and >15–23 cm size categories. Tulip poplar was also quite common in the >8–15 cm and >15–23 cm size categories. The dominant shrub species were rosebay rhododendron and eastern hemlock with stem counts of 10 and 7, respectively. The herbaceous plots were dominated by leaf litter, averaging 76% across all plots. Club moss was also common in patches, averaging 15% across all plots. The total canopy cover was recorded at 97.5%, with deciduous cover accounting for 17.5% and coniferous cover accounting for 80%. The total groundcover was recorded at 35%, with deciduous cover accounting for 22.5% and evergreen cover accounting for 12.5%. The mixed deciduous/coniferous canopy averaged 15.75 m in height, with a maximum coniferous tree height of 17 m.

APPLE TREE LANE B7

The most frequently encountered tree species was red maple, predominantly in the 3–8 cm size category. Tulip poplar was also common in the >23–38 cm size category. Flowering dogwood was also common in the 3–8 cm and >8–15 cm size categories. The most common shrub encountered was red maple with a stem count of 7. The herbaceous plots were dominated by leaf litter, averaging 79% across all plots. The entirely deciduous canopy cover was recorded at 100%. The entirely deciduous groundcover was recorded at 32.5% The deciduous canopy averaged 17.75 m in height, with a maximum height of 20 m.

COSBY B8

The most frequently encountered tree species was black locust, predominantly in the >8–15 cm and >15–23 cm size categories. Box elder was also common in the 3–8 cm and >8–15 cm size

categories. The most common shrub species was multiflora rose with a stem count of 95. Leaf litter dominated the herbaceous plots, averaging 56.25% across all plots. Bedstraw species and *Microstegium vimineum* were also common, averaging 18% and 10% across all plots, respectively. The entirely deciduous canopy cover was recorded at 67.5%. The entirely deciduous groundcover was recorded at 100%. The deciduous canopy averaged 10.3 m in height.

APPENDIX C

VEGETATION ANALYSIS FIELD SHEETS

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-1 cont. Webb Creek
DATE: 5/2/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPO GRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	

SHRUBS (# OF WOODY STEMS < 3 cm DBH INTERCEPTED IN 2 ARM LENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Rock		90%							
Red clover				20%			10%	50%	
Fescue spp.			89%	40%			85%	50%	
Vetch				1%			5%		
Dandelion			5%	15%					
Violet sp.			1%						

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID				
CONIF.				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-1 cont. Webb Creek
DATE: 5/2/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	

SHRUBS (# OF WOODY STEMS < 3 cm DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Tumble mustard				1%					

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID				
CONIF				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-2 cont. Sheep Pen Branch
DATE: 5/1/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES≥3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
F. Dogwood	8	2								
R. Rhododendron	7									
Sourwood			1							
Red Oak	2	1	1							
Black Locust		1								

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
V. creeper		1%							
Christmas fern				1%				5%	
S. pipsissewa								1%	
Rock			25%	99%					

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW	
DECID					
CONIF					

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-3 Webb Mountain
DATE: 4/27/95
HABITAT DESCRIPTION: Oak Forest

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102
Chestnut Oak	11		5	6	1				
Sourwood	8	6							
Red Maple	3								
Snag	10	4	3		1				
N. Red Oak	2	1	1	5		2			
A.L. Dogwood	1								
M. Hickory	2								

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W
Chestnut Oak	3		3	
Snag	1			
Am. Chestnut	1	1		
A.L. Dogwood				2
T.M. Pine			1	3
Tulip Poplar				1

* Chestnut saplings in plot.

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W	
	1	2	1	2	1	2	1	2
Leaf litter	100%	100%	100%	98%	100%	99%	99%	100%
Unknown 1							1%	
Bracken fern				2%		1%		

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID.	+++++++ ++++	- - - - - +++ +++	+++++++ +++	+++++++ +++
CONIF.				

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID	- - - - - - - - - - - -	++++ - - - - - - -	++ - - - - - - - - -	- - - - - - - - - - - +
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID	16	19	18	19
CONIF				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-3 cont. Webb Mountain
DATE: 4/27/95
HABITAT DESCRIPTION: Oak forest

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
T.M. Pine	1									
Sassafras	1									
V. Pine	1									

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		
Red Maple				1		
Striped Maple				1		
M. Hickory				1		
Sassafras			1			
Blueberry		1				

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW	
DECID					
CONIF.					

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-4 Lower Webb Mountain
NEAREST TOWN:
DATE: 5/2/95
LAT/LONG:
HABITAT DESCRIPTION:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
Chestnut Oak	12	14	10	3						
Striped Maple	22	1								
E. Dogwood	10	1								
Snag	23	4	1							
N. Red Oak	5	3	1							
T. M. Pine	1									
? Serviceberry	3									

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARM LENGTH TRANSECTS)

SPECIES	N	S	E	W	
Chestnut Oak	1				
Striped Maple	4		4		
Red Maple	1	1	1	2	
E. Dogwood	1		12		
Blueberry	2				
E. Hemlock			3		

Additional Species

False Solomon's seal — Bracken fern
Rattlesnake plantain
Striped pipsissewa
Smilax sp.
Grape
Christmas fern
Viburnum sp.

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Solomon's Seal	1%				1%				
Leaf Litter	99%	100%	100%	1%	94%	100%	100%	100%	
Clubmoss									
Bare ground				99%					

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.	++++++ ++++	++++++ ++++	++++++ ++++	++++++ ++++	
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID	- - - - - - - - - - +	- - - - - - - - - - +	- - - - - - - - - - + + + +	- - - - - - - - - - - - - - +
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID	13	13	12	12
CONIF				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-4 cont. Lower Webb Mountain
DATE: 5/2/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
Sweet Birch	2									
Sourwood		3								
Red Maple	3									
Black Locust		5								
Tupelo	4									

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		
Buffalo-nut		1				

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW	
DECID					
CONIF					

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-5 Branam Hollow Rd.
DATE: 5/1/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
R. Rhododendron	91	9	1							
Scarlet Oak		1	1							
Snag	3	3		1						
V. Pine	1	1	2	2						
Chestnut Oak	3	2	2							
E. Hemlock		5	3	1	3					
Red Maple	10	5	1							

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W	
Mt. Laurel	5	0		0	
Buffalo nut	1	↓		↓	
R. Rhododendron			5		

Additional Species
Galax
Striped pipsissewa
Blueberry
Smilax sp.

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Leaf litter	100%	100%	100%	90%	100%	50%	100%	100%	
Clubmoss				10%		50%			

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.		+++		+	
CONIF./Ever-green	++++++	++++++	++++++	++++++	

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID	+ - - - - -	+ - - - - -		- - - - - +
EVERG.			+ + - - -	

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID		15		
CONIF.	15		15	15

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-5 cont. Branam Hollow Rd.
DATE: 5/1/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
Frasier Magnolia	1									
Blackgum	1	1	1							
Sourwood			1							
N. Red Oak		1								
White Oak	1									

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW	
DECID					
CONIF.					

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-6 Rocky Flats Rd.
DATE: 5/2/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPO GRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102
E. Hemlock	6	7	6	4		1			
Tulip Poplar	1	8	6				1		
Snag	6	2	1	2					
White Ash	2								
Am. Holly		1	1						
R. Rhododendron	7								

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARM LENGTH TRANSECTS)

SPECIES	N	S	E	W
E. Hemlock	3	1	3	
R. Rhododendron	4	1	1	4
Am. Holly	1			
Privet				1

Additional species
Cinnamon fern
Partridgeberry
Marsh blue violet

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N 1	N 2	S 1	S 2	E 1	E 2	W 1	W 2
Poison ivy	5%							
Bracken fern	1%				5%			
Clubmoss	1%		95%	25%				
Viola sp.	2%	1%	1%	1%				
Unknown 1						2%		
Unknown 2	5%			40%				

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID.	+ + +	+ +	+	+ −
CONIF./Ever-green	+ + + + +	+ + + + + +	+ + + + + +	+ + + + + +

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID	+ + + + − −	+ + − − −	+ + − −	+ + − − −
EVERG.	+	− − − − −	+ +	+ + − − −

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID		15	17	15
CONIF.	16			

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-10 cont. Rocky Flats Rd.
DATE: 5/2/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPO GRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Leaf litter	86%	96%	4%	34%	95%	97%	97%	99%	
V. Creeper		2%							
Smilax sp		1%							
Christmas fern							3%		
Periwinkle						1%		1%	

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW	
DECID					
CONIF.					

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-7 Apple Tree Lane
DATE: 5/2/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPO GRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102
River Birch	1	1							
Red Maple	16	5	1	2					
Tulip Poplar			2	16	1				
Flowering Dogwood	5	5							
Snag		5	1	1					
Am. Holly		1							
Sourwood		1							

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARM LENGTH TRANSECTS)

SPECIES	N	S	E	W
E.R. Cedar	1		1	2
Flowering Dogwood				1
Tulip Poplar				1
Red Maple	2	1	3	1
White Ash		1		

Main Understory	Other Species
① Poison ivy	Wild strawberry
② Red maple	Bird's foot violet
③ Virginia Creeper	Solomon's seal
	Black cherry
Clubmoss	Rattlesnake plantain
Shining clubmoss	Christmas fern
	Northern red oak

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N 1	N 2	S 1	S 2	E 1	E 2	W 1	W 2
Leaf litter	10%	92%	87%	49%	93%	63%	99%	90%
Cinquefoil	1%	5%	2%	1%	5%		1%	5%
Unknown	1%		1%					5%
Periwinkle		2%				2%		
Violet	2%	1%			2%			
Rotting tree bark	86%							

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID.	+ + + + + + + +	+ + - + + + + +	+ + + + + + + +	+ + + + + + + +
CONIF.				

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID	- + - - +	+ + - - -	- - - + +	- - + + - +
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID	17	16	20	18
CONIF				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-7 Apple Tree Lane
NEAREST TOWN:
DATE: 5/2/95
LAT/LONG:
HABITAT DESCRIPTION:
TOPOGRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
Sweetgum				3						
Sweet Birch	1									
R. Rhododendron	1									

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Tree stump						35%			
Violet (V. trilobata)			3%						
Unknown			4%						
Nightshade (Circaea sp.)			5%						
Grass			2%						

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.					
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID.				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID				
CONIF.				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-8 Cosby
DATE: 5/1/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPO GRAPHY:

.04 HA CIRCLES (TREES ≥ 3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	
Boxelder	7	6	1	1						
Black locust	1	9	9	3						
Black cherry		1								
Tulip Poplar			1							
Sweetgum	1									
Snag		1								

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARM-LENGTH TRANSECTS)

SPECIES	N	S	E	W	
M. Rose	35	43	13	4	
Boxelder	2			1	
Black locust		1			

Additional Species
Poison ivy
Honeysuckle

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Morning glory		1%							
Leaf litter	100%		63%	71%	91%	63%	34%	28%	
Microstegium		80%							
Bittercress		19%							
Bedstraw			30%	15%		10%	60%	30%	
Purple dead-nettle			2%	2%	2%	1%	1%	2%	

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.	+ - + - + - + -	+ - + + + - + -	+ - + + - + + +	+ + - + + - + -	
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID	+ + + + + + + +	+ + + + + + + +	+ + + + + + + +	+ + + + + + + +
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW
DECID.	10.2	11.5	9.4	10
CONIF.				

VEGETATION ANALYSIS FIELD SHEET

LOCATION: B-8 cont. Cosby
DATE: 5/1/95
HABITAT DESCRIPTION:

NEAREST TOWN:
LAT/LONG:
TOPO GRAPHY:

.04 HA CIRCLES (TREES ≥3 cm DBH)

SPECIES	3-8 cm	>8-15	>15-23	>23-38	>38-53	>53-69	>69-84	>84-102	>102	

SHRUBS (# OF WOODY STEMS < 3 cm. DBH INTERCEPTED IN 2 ARMLENGTH TRANSECTS)

SPECIES	N	S	E	W		

HERBACEOUS (% COVER BY SPECIES IN 8 HALF METER SQ PLOTS)

SPECIES	N		S		E		W		
	1	2	1	2	1	2	1	2	
Glechoma sp.			5%	10%	5%		5%	40%	
Wild geranium				2%	1%	1%			
Skullcap					1%				
Unknown 1						15%			
Horseradish						10%			

CANOPY COVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W	
DECID.		-			
CONIF.					

GROUNDCOVER (40 + OR - SIGHTINGS THRU AN OCULAR TUBE)

	N	S	E	W
DECID				
EVERG.				

CANOPY HT (MAX. CANOPY HT IN METERS)

	NE	NW	SE	SW	
DECID.					
CONIF.					

Appendix G

SURVEY REPORT FOR LISTED WILDLIFE

Michael J. Harvey
Private Consultant
Cookeville, Tennessee

February 1995

Report

to

MARTIN MARIETTA ENERGY SYSTEMS, INC.
SUBCONTRACT 62X-SR762V

SURVEY FOR LISTED WILDLIFE (MAMMALS, REPTILES, AMPHIBIANS) PRESENT ON THE PROPOSED RIGHT-OF-WAY OF SECTION 8B OF THE FOOTHILLS PARKWAY

by

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1014 East Sixth Street
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February 1995

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SURVEY FOR LISTED WILDLIFE (MAMMALS, REPTILES, AMPHIBIANS) PRESENT ON THE PROPOSED RIGHT-OF-WAY OF SECTION 8B OF THE FOOTHILLS PARKWAY

Michael J. Harvey

INTRODUCTION

Proposed Section 8B of the 72 mile long Foothills Parkway, traversing the western and northern perimeters of Great Smoky Mountains National Park (GSMNP), Tennessee, extends from Cosby to Pittman Center, a distance of ca. 14.2 miles. The corridor is ca. 1000 ft wide and includes a widened right-of-way (ROW) for a spur road at Webb Mountain. Elevations on Section B range from less than 1300 ft near Pittman Center to over 3000 ft on Webb Mountain.

Habitat types are diverse along Section 8B of the ROW, ranging from pastureland to relatively mature upland hardwood forest. Much of the area is relatively rocky with some boulder fields at higher elevations. No caves are known to occur on or near the ROW.

Forest types consist primarily of upland hardwood and hemlock, cove hardwood, mesic hardwood, pine-oak, and young stands of numerous mixed species. Several streams are present along the ROW, ranging in size from small upland drainages to the Little Pigeon River near Pittman Center.

The primary objective of this study was to survey mammal species occurring along proposed Section 8B of the ROW that could be affected by construction or operation of the Parkway. Emphasis was concentrated on obtaining data on distribution and status of the 19 small mammal (rabbit size or smaller) species possibly present that are listed as endangered, threatened, candidate species for listing as endangered or threatened, deemed in need of management, of special concern, or sensitive species (Table 1). Additional emphasis was placed on obtaining data on distribution and status of three herptile species also possibly present on the ROW, the northern pine snake (*Pituophis melanoleucas melanoleucas*), Junaluska salamander (*Eurycea junaluska*), and the green salamander (*Aneides aeneus*), all three candidate species (C2) for listing as endangered or threatened. Information was also obtained on additional mammal species present in the area.

Table 1. Mammals present (or possibly present) in the area of the Foothills Parkway that are listed as endangered, threatened, candidate species for listing as endangered or threatened, deemed in need of management, of special concern or sensitive species

Order Insectivora
- Family Soricidae
  - *Sorex cinereus* (Masked shrew)
  - *Sorex longirostris* (Southeastern shrew)
  - * *Sorex palustris punctulatus* (Water shrew)
  - *Sorex fumeus* (Smoky shrew)
  - *Sorex dispar* (Long-tailed or rock shrew)
- Family Talpidae
  - *Parascalops breweri* (Hairy-tailed mole)
  - *Condylura cristata* (Star-nosed mole)

Order Chiroptera
- Family Vespertilionidae
  - ** *Myotis grisescens* (Gray bat)
  - ** *Myotis sodalis* (Indiana bat)
  - * *Myotis austroriparius* (Southeastern bat)
  - * *Myotis leibii* (Eastern small-footed bat)
  - * *Plecotus rafinesquii* (Rafinesque's big-eared bat)

Order Rodentia
- Family Sciuridae
  - ** *Glaucomys sabrinus coloratus* (Carolina northern flying squirrel)
- Family Muridae
  - *Neotoma floridana* (Eastern woodrat)
  - *Synaptomys cooperi* (Southern bog lemming)
  - * *Microtus chrotorrhinus carolinensis* (Southern rock vole)
- Family Dipodidae
  - *Zapus hudsonius* (Meadow jumping mouse)
  - *Napaeozapus insignis* (Woodland jumping mouse)

Order Lagomorpha
- Family Leporidae
  - * *Sylvilagus obscurus* (Appalachian rabbit)

Order Carnivora
- Family Mustelidae
  - *Lutra canadensis* (River otter)
- Family Canidae
  - ** *Canis niger* (Red wolf)
- Family Felidae
  - ** *Felis concolor* (Eastern cougar)

* Candidate species for listing as endangered or threatened.
** Endangered species.

Several previous mammal studies have been conducted in the eastern Tennessee area, some of which focused on mammals of GSMNP (Neuhauser 1971, Linzey and Linzey 1968, Schwartz 1956, Conaway and Pfitzer 1952, Komarek and Komarek 1938). Kennedy and Harvey (1979) summarized distribution data on 24 Tennessee mammal species listed in some category of concern by the U.S. Fish and Wildlife Service (USFWS), Tennessee Wildlife Resources Agency (TWRA), and the Heritage Program (THP) of the Tennessee Department of Conservation, including numerous records from GSMNP. Additional literature on eastern Tennessee mammals includes Smith et al. (1974), Jones (1974), Giles (1969), Stucki (1967), Linzey and Linzey (1966), Conaway and Howell (1953), and Howell and Conaway (1952). Harvey et al. (1991, 1992) reported numerous records on distribution of small mammals in the Cherokee National Forest in Tennessee, adjacent to GSMNP. Other records of small mammals from or near eastern Tennessee include Dueser and Shugart (1979, 1978), Whitaker et al. (1975), Tuttle (1968, 1064a, 1964b), Wharton (1967), and Dusi (1959).

MATERIALS AND METHODS

The study was conducted during late August through early October 1994. Collecting was concentrated at seven sites scattered along the ROW. Sites were selected that represented a diversity of habitat types along the ROW.

Standard mammal collecting techniques were utilized. These included live trapping, snap trapping, pitfall trapping, and mist netting (for bats). Specimens captured were identified and released, or prepared as study skins (and skulls). Reptiles and amphibians were surveyed by searching under rocks, logs, etc.; a few salamanders were also captured in pitfall traps intended primarily to capture shrews.

Mist netting for bats and pitfall trapping for shrews were also conducted at a few selected sites, in addition to the seven primary collecting sites.

PRIMARY TRAPPING SITES

Study sites and dates trapped were as follows:

1. **Copeland Creek**—1230–1330 ft, 24–26 Aug. 1994.
   An old field type habitat on a hillside near Copeland Creek and Little Pigeon River. Numerous small trees were present, primarily maple, poplar, pine, and hemlock. The area was relatively dry. Copeland Creek at this site ran through a pasture with little mammal habitat present.
2. **Mill Dam Branch**—2150–2250 ft, 26–28 Aug. 1994.
   A mature mixed mesophytic forest habitat consisting of maple, poplar, oak, pine, and hemlock, along a small creek. Numerous large boulders were present.
3. **Jones Gap**—2470–2570 ft, 28–30 Aug. 1994.
   (+ 1320 pitfall trap nights—30 Aug.–1 Oct.)
   A xeric forested ravine habitat dominated by pine with some maple and oak, and with numerous large boulders present. A small stream was present and flowed into Matthew Creek below the study site. This was the highest elevation study site.
4. **Black Gum Gap**—2000–2100 ft, 30 Aug.–1 Sep. 1994.
   (+ 1240 pitfall trap nights—1 Sep.–1 Oct.)
   A relatively dry forested area dominated by pine.
5. **Apple Tree Lane**—1780–1830 ft, 1–3 Sep. 1994.
   (+ 1160 pitfall trap nights—3 Sep.–1 Oct.)
   A forested habitat dominated by hemlock, poplar, and maple, and through which a small stream flowed.
6. **Big Ridge**—2050–2130 ft, 10–12 Sep. 1994.
   (+ 800 pitfall trap nights—12 Sep.–1 Oct.)
   A mature forested habitat dominated by oak and maple.
7. **Cosby Creek**—1380–1420 ft, 30 Sep.–2 Oct. 1994.
   An old field habitat near a power line ROW and the power line ROW itself. Mature hardwood forest was located along the upper side of the ROW.

ADDITIONAL TRAPPING SITE

Branam Hollow Road—1970–2050 ft, 4 Sep.–1 Oct. 1994

A forested hillside dominated by hemlock. Twenty pitfall traps were used at this site (560 trap nights).

MIST NETTING SITES

1. **Copeland Creek at Highway 416**—1280 ft, 25, 26 Aug. and 10, 11 Sep. 1994 (4 net nights).
2. **Copeland Creek Confluence with Little Pigeon River**—1280 ft, 26 Aug. and 11 Sep. 1994 (2 net nights).
3. **Cosby Creek near Cub Motel**—1400 ft, 28 Aug. and 3 Sep. 1994 (2 net nights).
4. **Webb Creek at Highway 321 Bridge**—1300 ft, 1, 2, 10 Sep. 1994 (3 net nights).
5. **Webb Creek at Cobbly Knob Golf Course**—1440 ft, 30 Sep. 1994 (1 net night).

Locations of primary trapping sites are shown on Figures 1–4 in Attachment 1; field sketch maps of all collecting sites are shown in Figures 5–13 in Attachment 1.

Two-night trapping efforts were conducted at each of the seven primary trapping sites during the study. Standard mammal collecting techniques utilized included pitfall trapping, live-trapping, snap-trapping, and mist-netting for bats. Pitfall traps used for the study were 32 oz. plastic drink cups measuring 7 inches deep, 4 inches in diameter at the mouth, and 3 inches in diameter at the base. Live-traps used were 9 × 3 × 3 inch collapsible Sherman traps. Snap-traps used were 5-1/2 × 3 inch Museum Special traps and 4 × 1-3/4 inch Victor rodent traps. Mist nets 18 × 7 ft, 30 × 7 ft, 42 × 7 ft, and 60 × 7 ft were used.

During each trap night 200 traps were set, consisting of 80 Sherman live-traps, 40 Museum Special snap-traps, 40 Victor snap-traps and 40 pitfall traps. At each trap site, five traps were used, two Sherman live traps, one Museum Special snap trap, one Victor snap trap, and one pitfall

trap. Traps were set in lines and flagged with high visibility marking tape. Specific placement and trap interval varied with habitat type and available cover.

Live-traps were baited with rolled oats; snap-traps were baited with a mixture of rolled oats and peanut butter. Pitfall traps were not baited.

Attempts were made throughout the study to locate northern pine snakes, Junalusca salamanders, and green salamanders by searching under rocks and logs.

Mammal specimens captured in live-traps were identified and released at the collection sites or were retained as voucher specimens. Snap-trapped specimens were retained as voucher specimens. Small mammals caught in pitfall traps were almost always found dead and often badly decomposed. They were also kept as voucher specimens. Bats captured in mist nets were identified and released where captured.

All specimens not released that were in good condition were taken to the laboratory and prepared as standard museum specimens. If the skin was in poor condition, as was usually the case with pitfall-trapped specimens, only the skull was kept. All specimens not released were placed in the mammal museum collection of GSMNP.

RESULTS AND DISCUSSION

A total of 2240 non-pitfall trap nights, 5640 pitfall trap nights, and 12 mist net nights was recorded during the study.

A total of 40 specimens was captured during the study, consisting of 15 shrews, 5 bats, and 20 rodents (Table 2). No endangered, threatened, or candidate species for listing as endangered or threatened, were captured. Five species of special concern were captured; masked shrews at two sites (N=3), smoky shrews at two sites (N=2), meadow jumping mice at one site (N=1), woodland jumping mice at two sites (N=3), and southern bog lemmings at one site (N=1). Additional species captured that are considered to be rare in GSMNP (a checklist for the mammals of GSMNP, Roger A. Powell and Jane Farmer, undated) were the pigmy shrew at one site (N=1), the northern

Table 2. Species and numbers of small mammals captured at 13 collecting sites along the proposed right-of-way of Section 8B of the Foothills Parkway during the period of 24 August through 3 October 1994.

	Sorex cinereus Masked shrew	*Sorex fumeus* Smoky shrew	*Sorex hoyi* Pigmy shrew	*Blarina brevicauda* Short-tailed shrew	*Peromyscus leucopus* White-footed mouse	*Ochrotomys nuttalli* Golden mouse	*Synaptomys cooperi* Southern bog lemming	*Zapus hudsonius* Meadow jumping mouse	*Napaeozapus insignis* Woodland jumping mouse	*Myotis septentrionalis* Northern long-eared bat	*Lasiurus borealis* Eastern red bat
Trap Sites											
Copeland Creek				2	1						
Mill Dam Branch											
Jones Gap	2	1		2	1						
Black Gum Gap	1				2				1		
Apple Tree Lane				2	2				2		
Big Ridge			1	1	3						
Cosby Creek				2	4	1	1	1			
Branham Hollow		1			1						
Net Sites											
Copeland Creek at Hwy 416										1	
Copeland Cr/Little Pigeon River											
Cosby Creek at Cub Motel											1
Webb Creek at Highway 321											3
Webb Creek at Cobbly Knob											
TOTAL - 40	3	2	1	9	14	1	1	1	3	1	4

long-eared bat at one site (N=1), and the golden mouse at one site (N=1). The white-footed mouse was captured in the largest numbers, 14 from seven sites, followed by the short-tailed shrew, 9 from five sites (Table 2).

SPECIES ACCOUNTS

Following are accounts of 19 listed small mammal species, one snake, and two salamander species present or possibly present on the proposed ROW of Section 8B of the Foothills Parkway. Also included are accounts of three additional species captured during the study that are considered rare in GSMNP.

Sorex cinereus—Masked shrew

The masked shrew was captured at two sites (N=3). This species is present in a variety of habitat types throughout the area. In GSMNP it has been reported from several locations, primarily above 3000 ft. It is likely present along the entire ROW.

Sorex longirostris—Southeastern shrew

This shrew was not captured during this study. It is considered rare in GSMNP, having been reported only from the lower elevations. It is likely present at lower elevations throughout the region and may occur along the ROW.

Sorex palustris punctulatus—Appalachian water shrew

This shrew was not captured during the study. It has been reported from only two locations in Tennessee, GSMNP and Monroe County; all records are from above 3700 ft. Although some sites along the ROW are similar in habitat type to areas where this species has been taken, it is not likely present at the relatively low elevations of the ROW.

Sorex fumeus—Smoky shrew

This shrew was captured at two sites (N=2). It is likely present along the entire ROW. In GSMNP, it occurs at all elevations, primarily at middle and higher elevations.

Sorex dispar—Long-tailed or rock shrew

This shrew was not captured during the study. Except for three specimens captured near Greenbrier at ca. 2200 ft., all GSMNP records are from above 3700 ft. This species might possibly occur at higher elevations along the ROW, but it is unlikely.

Sorex hoyi—pigmy shrew

This shrew was captured at one sites (N=1). It is considered rare in GSMNP, the only record being from Newfound Gap, Swain County, North Carolina.

Parascalops breweri—Hairy-tailed mole

No moles were captured during the study. This species has been reported from several locations in GSMNP at elevations as low as 1565 ft. Mole runs were observed at several locations along the ROW. They may have been constructed by this species or by the eastern mole, *Scalopus aquaticus*, which is common in the region. Hairy-tailed moles might possibly occur along the ROW.

Condylura cristata—Star-nosed mole

This species was not captured during the study. It is considered rare in GSMNP, although there are records from elevations ranging from 1600 to 5500 ft.

Myotis grisescens—Gray bat

The endangered gray bat was not captured during this study. It occurs primarily in areas where caves are abundant. There are no records of this bat from GSMNP. It is unlikely that it is present in the ROW area.

Myotis sodalis—Indiana bat

The endangered Indiana bat was not observed during this study. The largest known hibernating colony of this species in the GSMNP region (ca. 8500) occupies Whiteoak Blowhole Cave in the northwestern section of GSMNP. Another small colony of ca. 200 hibernates in Bull Cave, also in the northwestern section of GSMNP. It is possible that this species might be present along the ROW during summer.

Myotis austroriparius—Southeastern bat

The southeastern bat was not captured during this study. Although there is a slight possibility that it could occur along the ROW, it is unlikely. There are no records of this species from GSMNP.

Myotis leibii—Eastern small-footed bat

This species was not observed during the study. This bat is apparently rare in GSMNP region, although there is a single record from GSMNP, from Greenbrier Cove. It is possible, but not likely, that this bat would occur along the ROW during summer.

Myotis septentrionalis—Northern long-eared bat

One northern long-eared bat was captured during this study. This bat, until recently known as Keen's bat (*Myotis keenii*), is considered rare in GSMNP.

Plecotus rafinesquii—Rafinesque's big-eared bat

This species was not observed during the study. However, a single specimen was reported from Myhr Cave, on Section 8D the ROW, by Richard Wallace, on 6 January 1990. Rafinesque's big-eared bat is considered to be one of the most common bats occurring in GSMNP. The largest known hibernating colony (N=570), as well as smaller maternity colonies, of this species occupy abandoned mines in the southwestern section of GSMNP. It is likely that this bat would be present during summer along the ROW.

Glaucomys sabrinus coloratus—Carolina northern flying squirrel

This endangered species was not captured during the study. This species has been reported from only a few sites in Tennessee and GSMNP, all above 4000 ft. It is not likely present along the ROW.

Neotoma floridana—Eastern woodrat

This species was not captured during the study. They are fairly common in GSMNP up to elevations of 2500 ft. It is likely that they are present along the ROW, especially in rocky areas.

Synaptomys cooperi—Southern bog lemming

This species was captured at one site (N=1). It is considered uncommon in GSMNP, but has been taken at elevations ranging from 1700 to 5500 ft.

Ochrotomys nuttalli—Golden mouse

A single golden mice was captured during this study. This species is considered to be rare in GSMNP, and has been taken only at elevations below 2700 ft.

Microtus chrotorrhinus carolinensis—Southern rock vole

This species was not captured during the study. It is considered uncommon in GSMNP, having been taken only above 2650 ft. It could possibly occur at higher elevations along the ROW.

Zapus hudsonius—Meadow jumping mouse

This species was captured at one site along the ROW (N=1). It is considered to be uncommon in GSMNP.

Napaeozapus insignis—Woodland jumping mouse

This species was captured at two sites during the study (N=3). It is considered to be common in GSMNP above 1600 ft.

Sylvilagus obscurus—Appalachian rabbit

This species was not captured during the study. It has been captured in GSMNP only above 2100 ft. It is possible that this species occurs along the ROW. Rabbits were observed along the ROW, but since none were captured, it was impossible to determine whether they were Appalachian rabbits or the more common eastern cottontail, *Sylvilagus floridanus*.

Pituophis melanoleucas melanoleucas—Northern pine snake

This species was not observed during this study. It is not known to occur in the GSMNP area, although it could possibly be present.

Eurycea junaluska—Junaluska salamander

No Junaluska salamanders were observed during this study. The species is known primarily from the Cheoah River Valley in Graham County, North Carolina. It has been reported from Fighting Creek near Sugarlands in GSMNP.

Aneides aeneus—Green salamander

This species was not observed during this study. It is not known to be present in GSMNP, although there are historic records from Sevier County and from Cherokee Orchard, south of Gatlinburg.

CONCLUSIONS

Construction and operation of Section 8B of the Foothills Parkway would impact several small mammal species listed as of special concern to the NPS, by destroying portions of their habitat or by disturbance (noise, etc.) during construction and operation. Overall, however, I feel that there would be relatively little actual impact on the status of those species occurring along the ROW, since species present are quite likely present in significant numbers and are distributed over a very large area of the Foothills and GSMNP region.

Although no listed bat species were captured during this study, the ROW has the potential to serve as habitat for several bat species, both listed and non-listed.

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ATTACHMENT 1

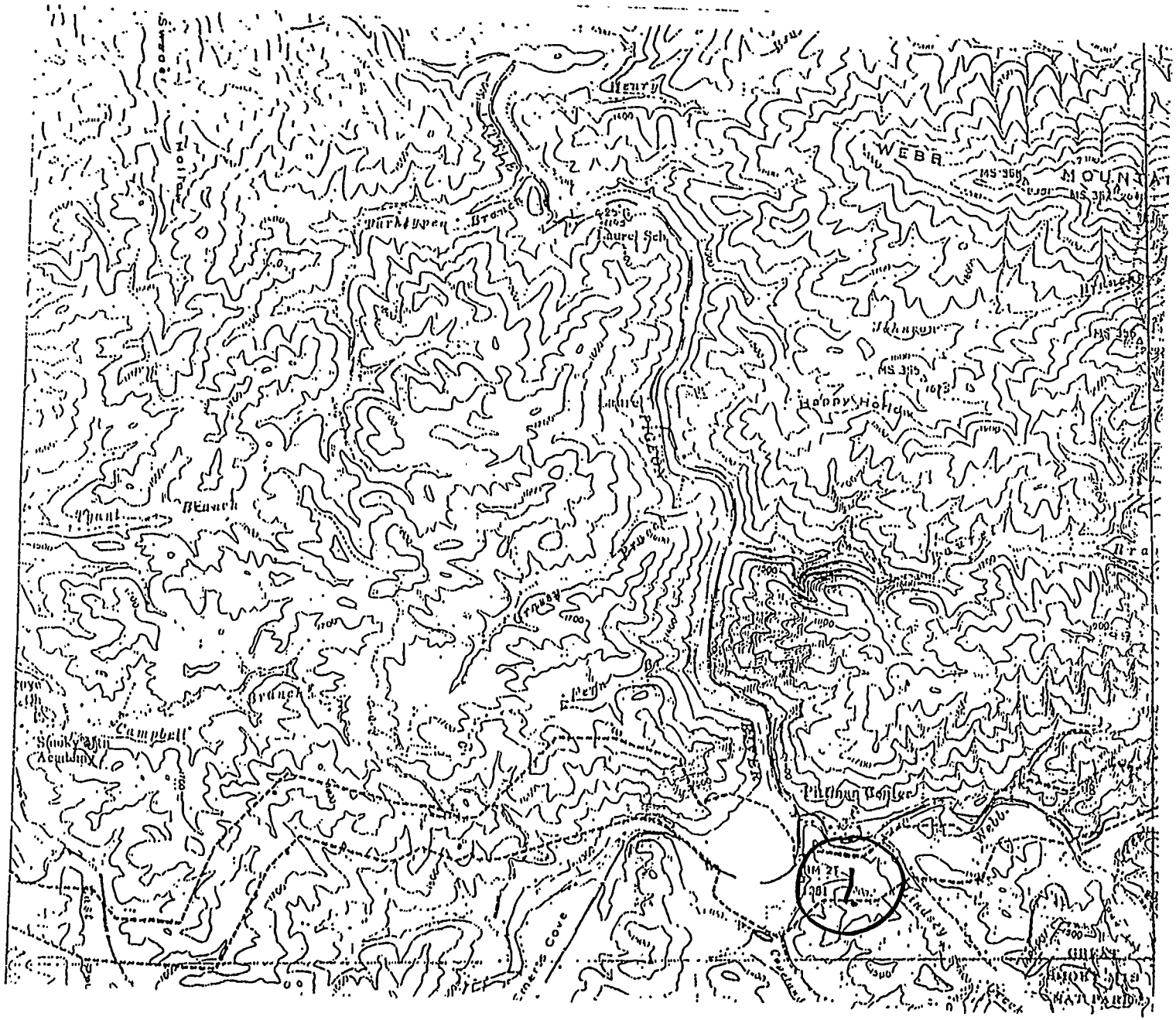


Fig. 1. Location of primary collecting site 1.

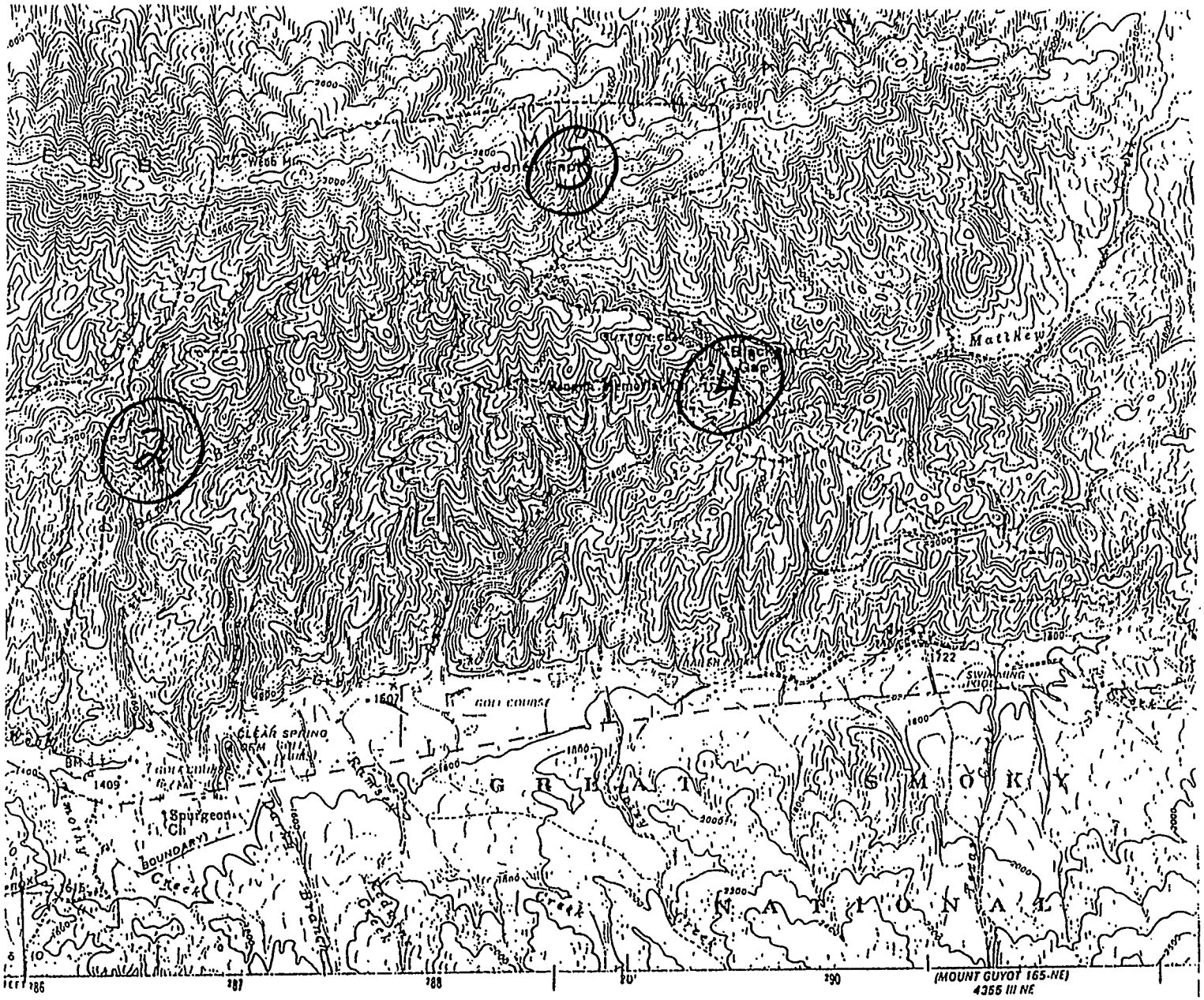


Fig. 2. Location of primary collecting sites 2, 3, and 4.

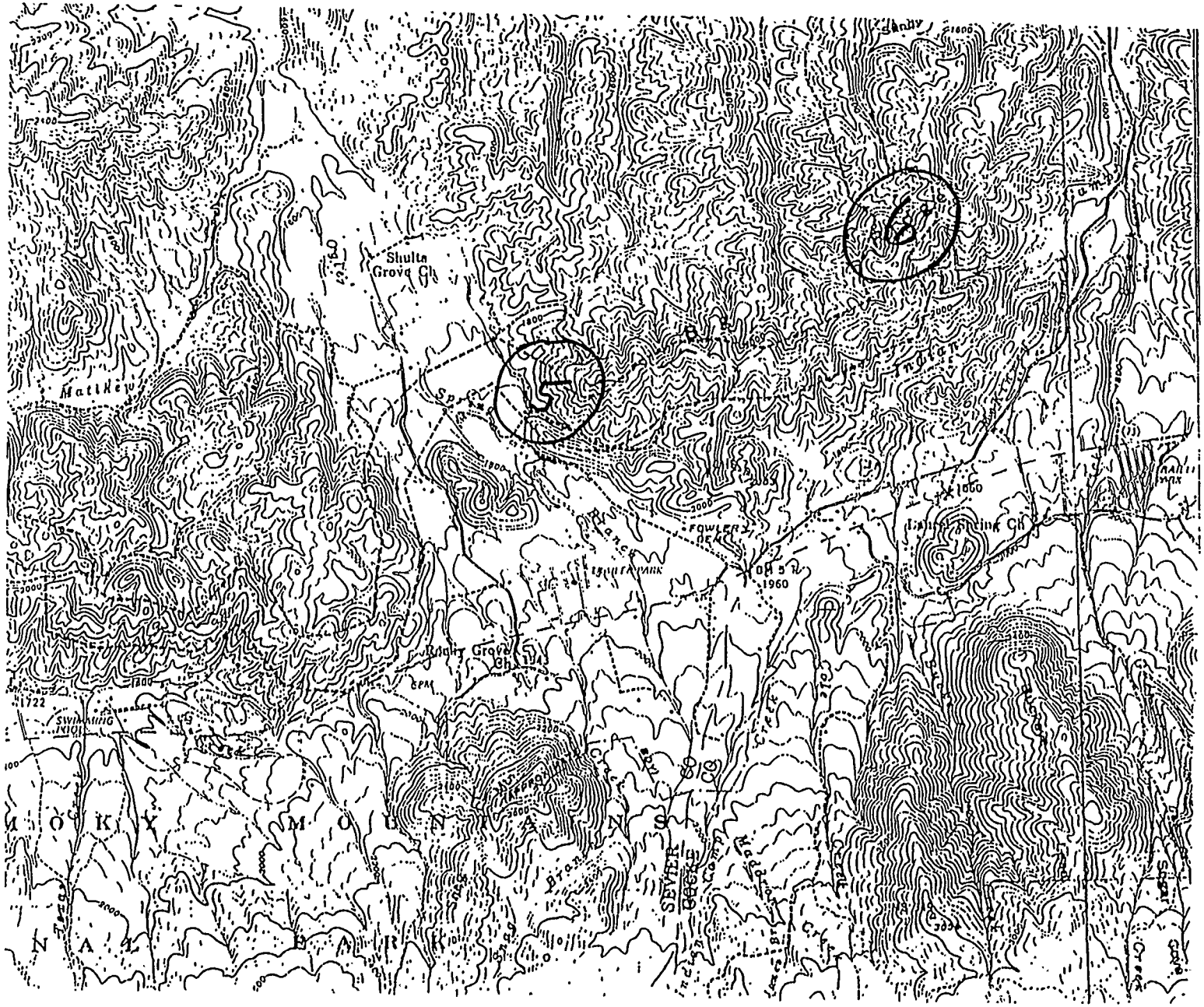


Fig. 3. Location of primary collecting sites 5 and 6.

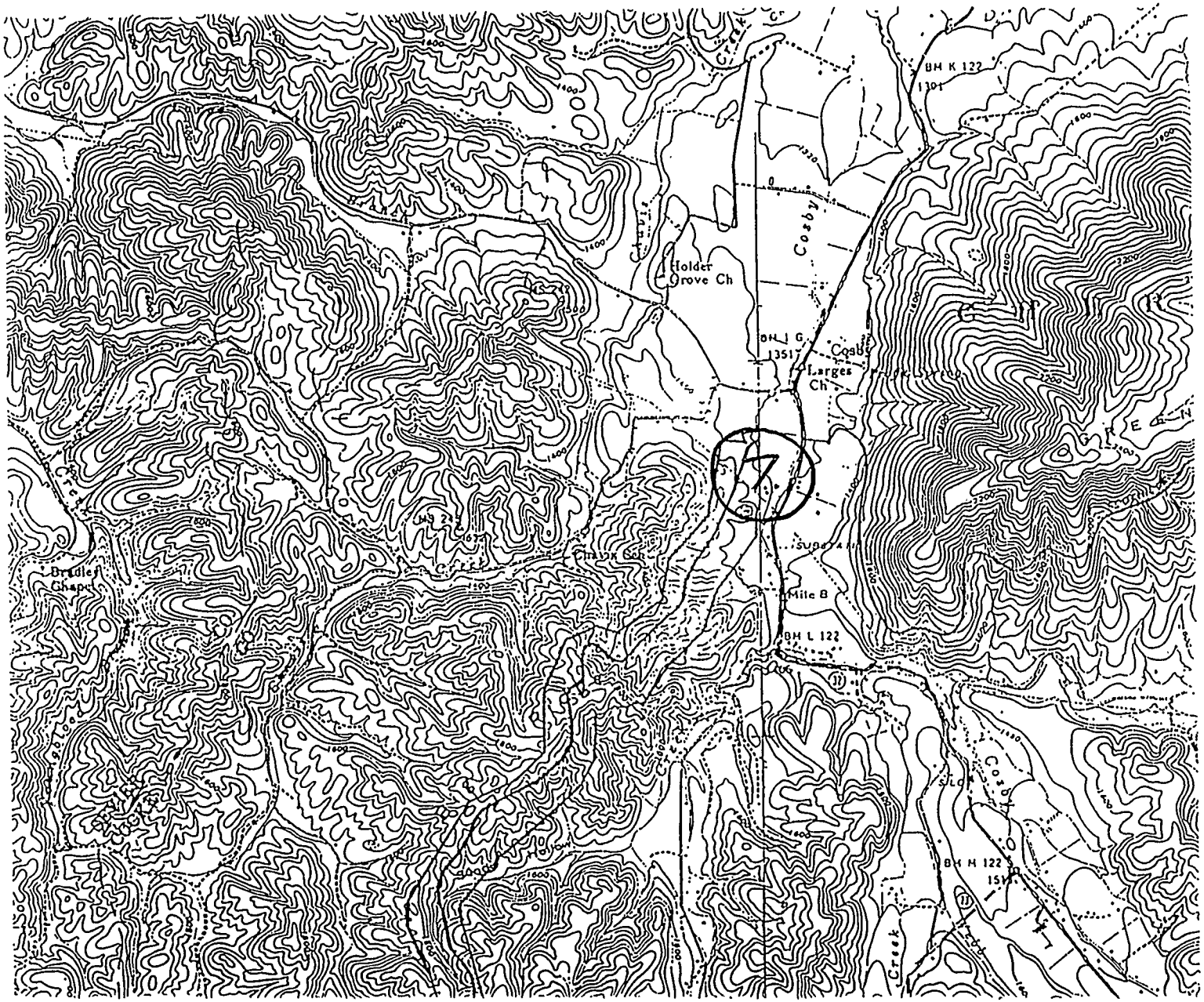


Fig. 4. Location of primary collecting site 7.

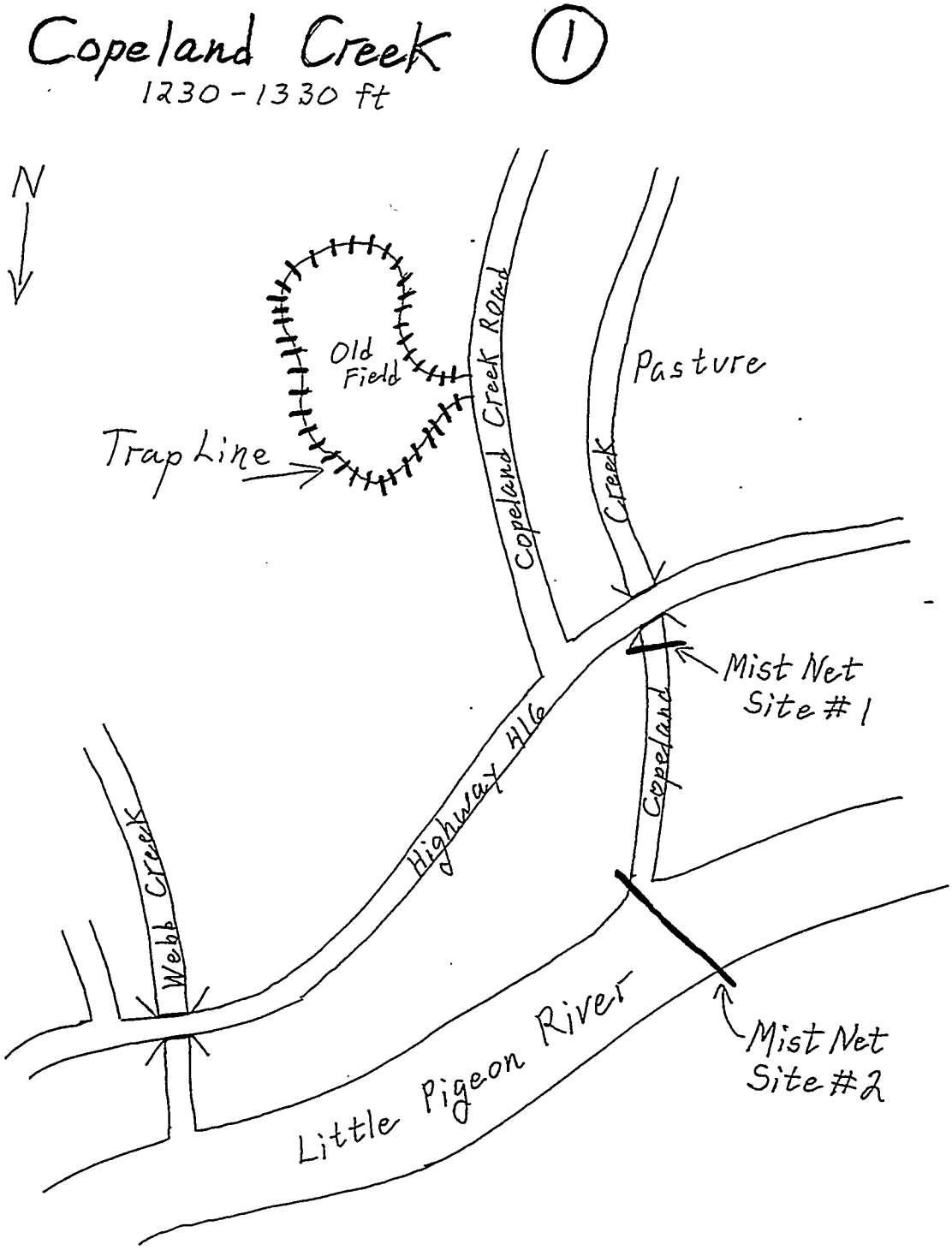


Fig. 5. Field sketch map of Copeland Creek site.

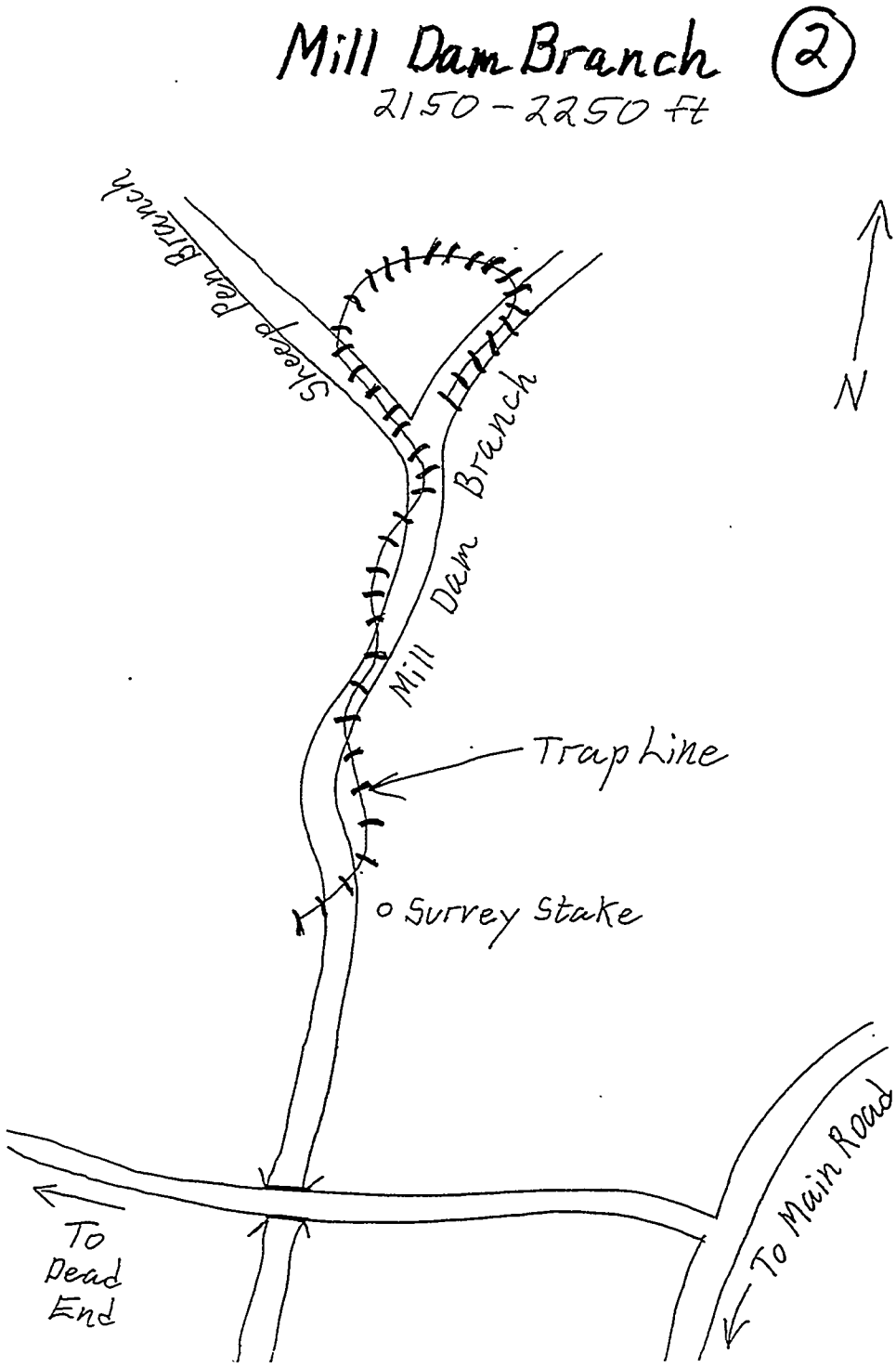


Fig. 6. Field sketch map of Mill Dam Branch site.

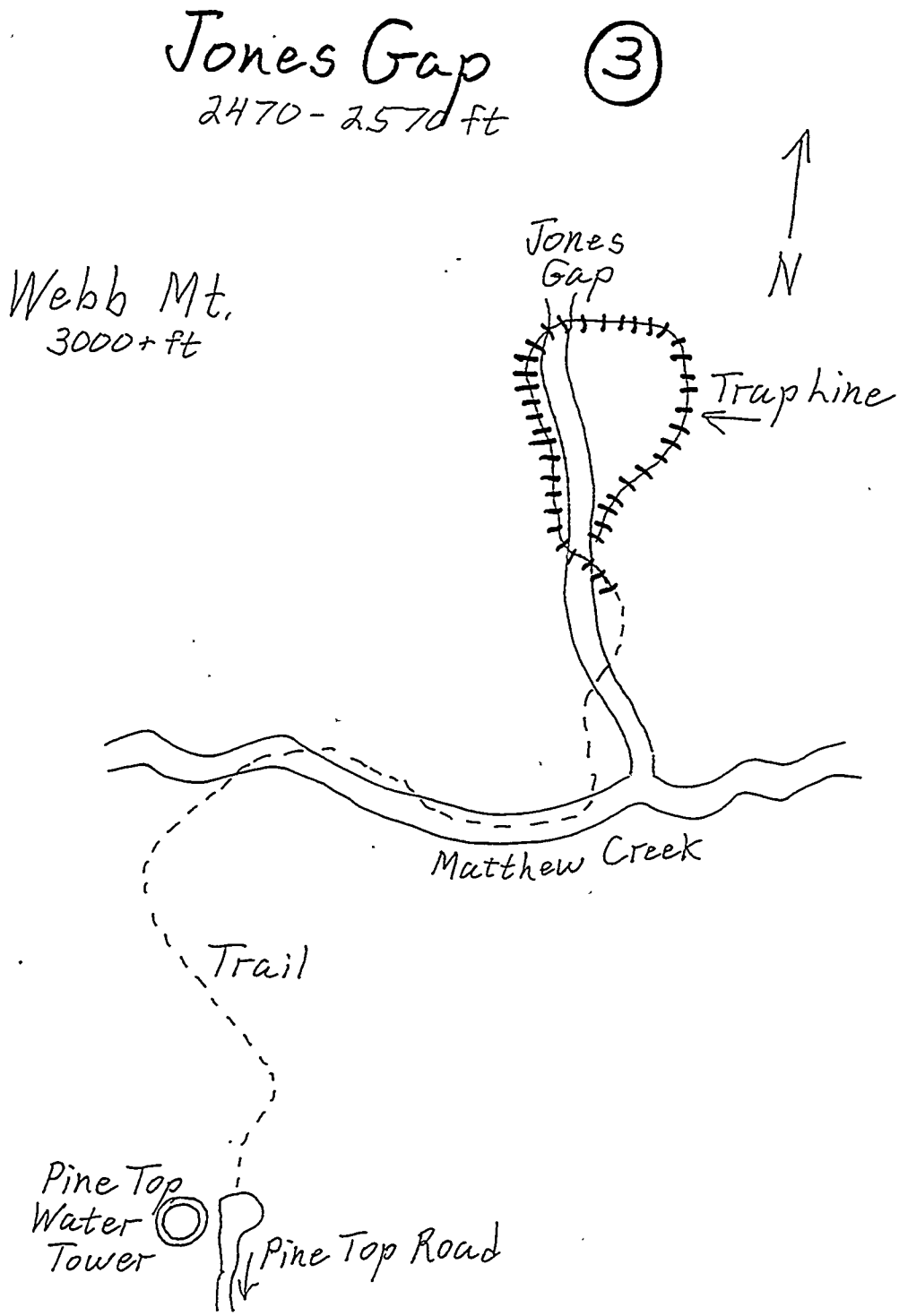


Fig. 7. Field sketch map of Jones Gap site.

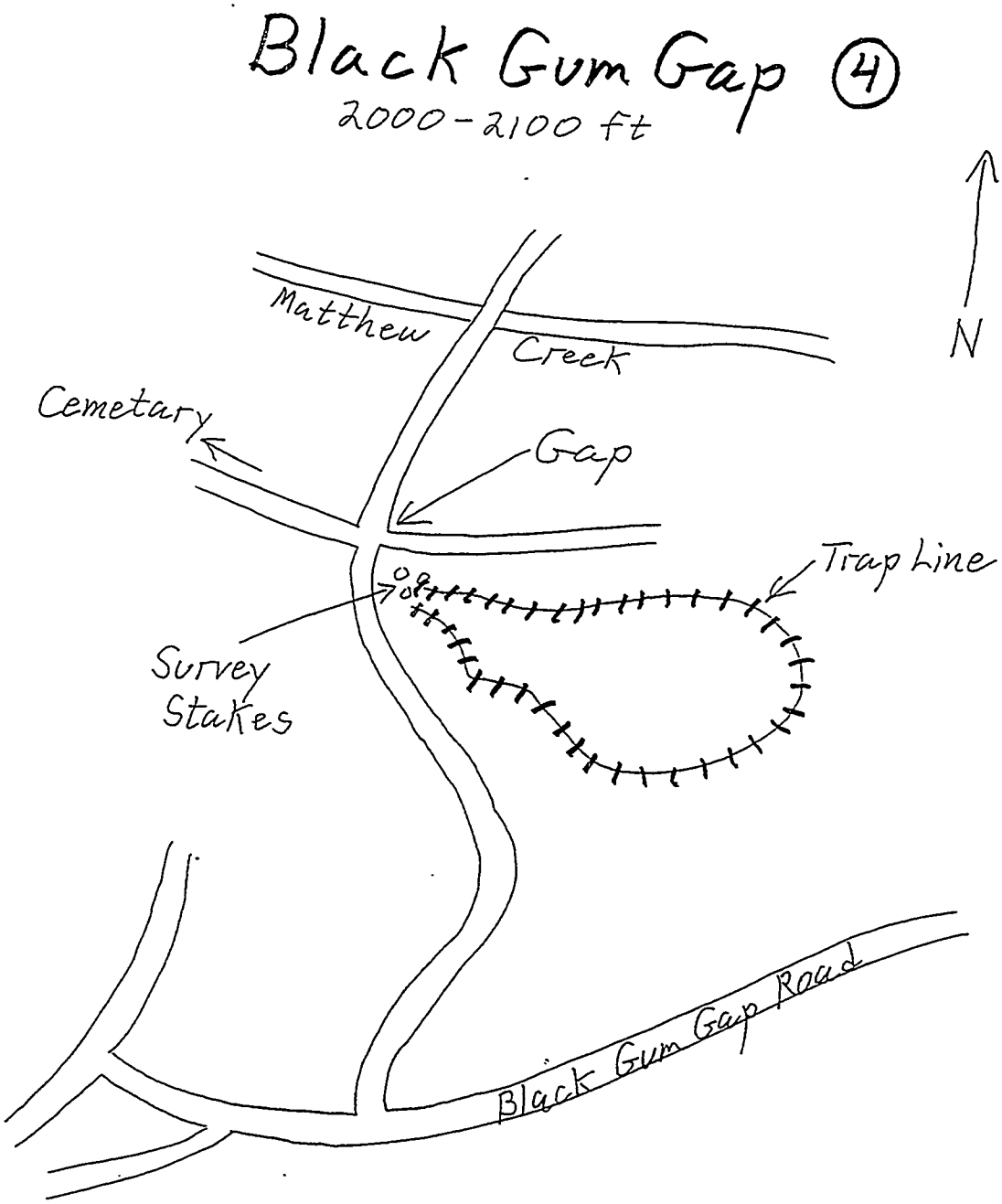


Fig. 8. Field sketch map of Gum Gap site.

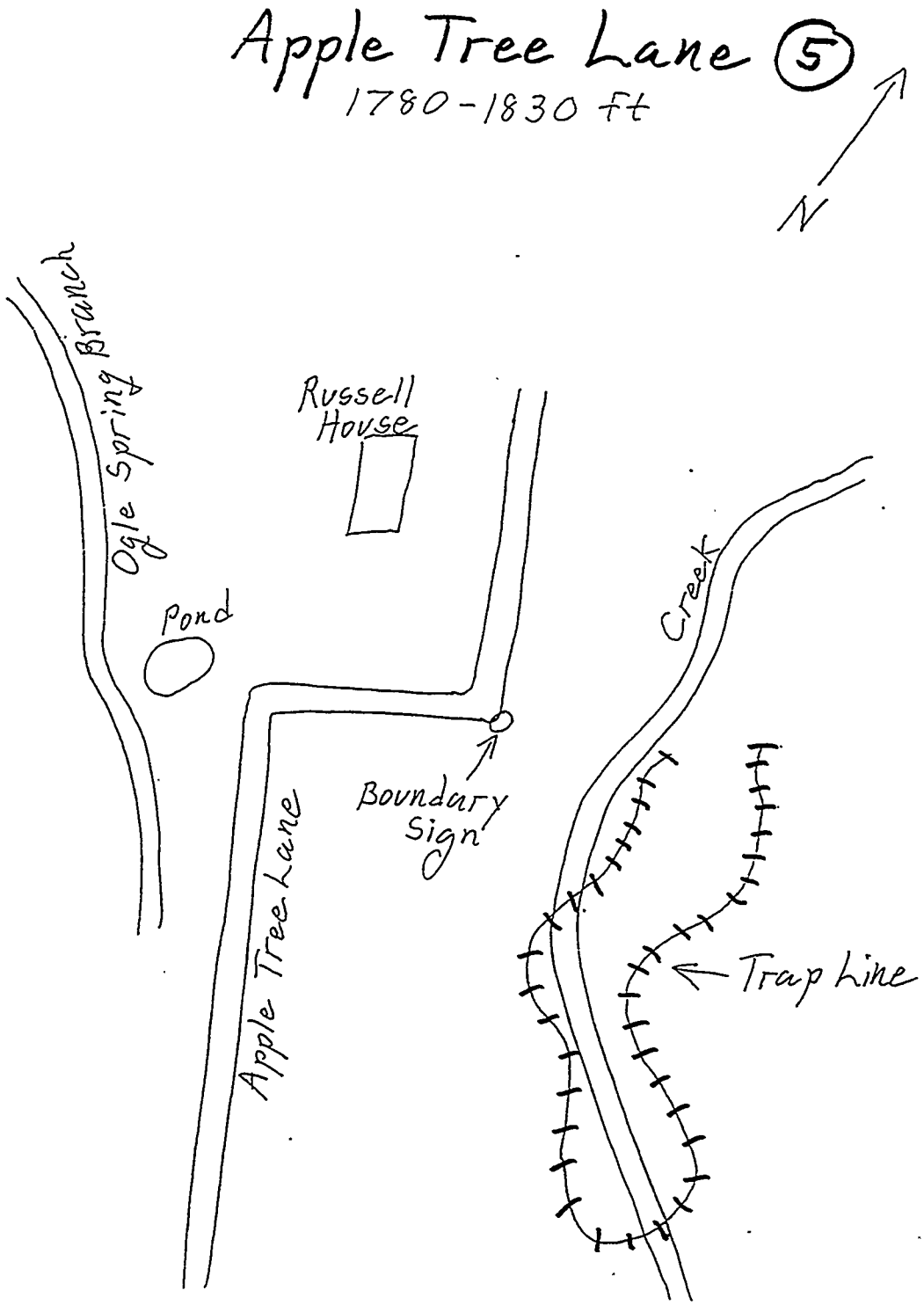


Fig. 9. Field sketch map of Apple Tree Lane site.

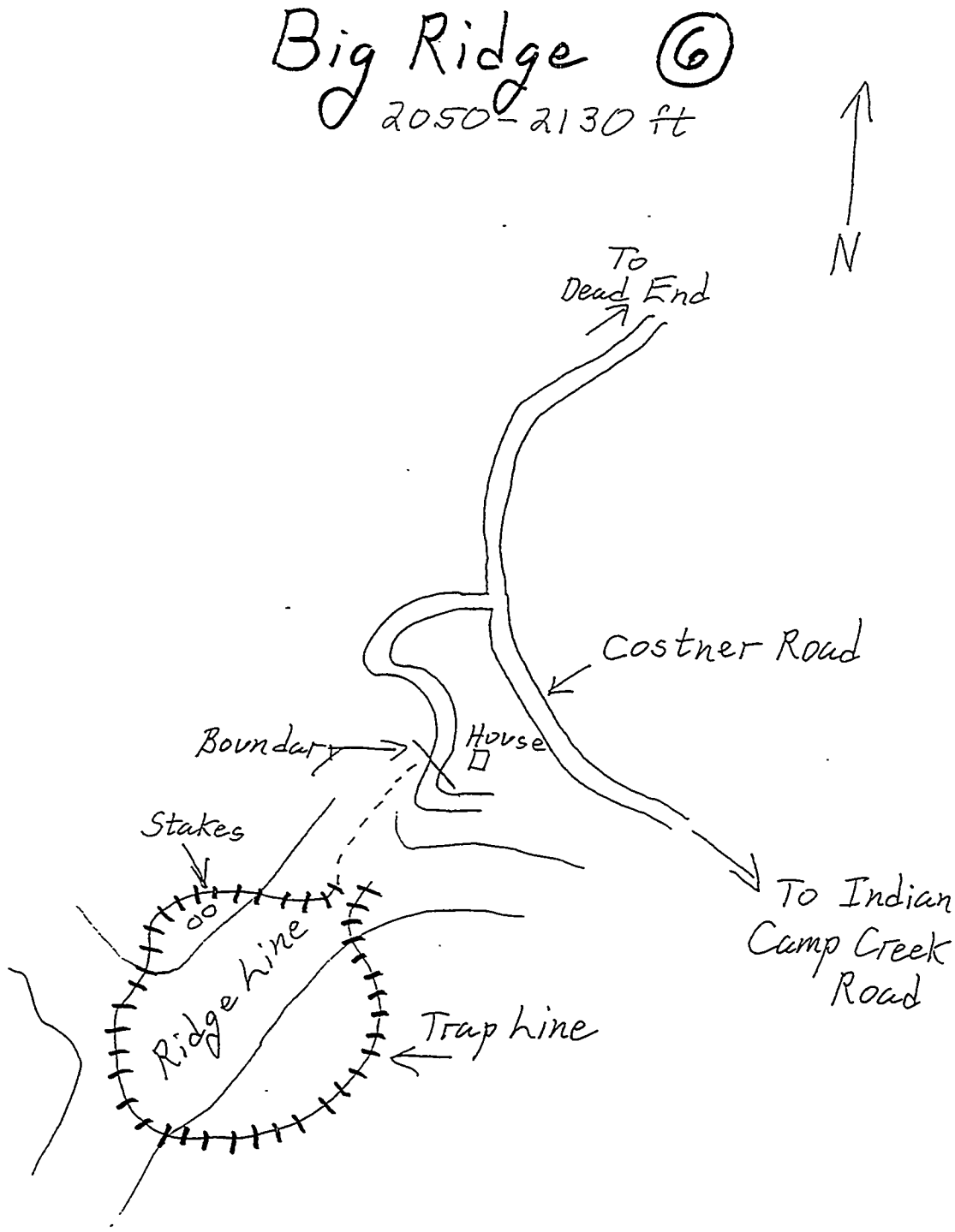


Fig. 10. Field sketch map of Big Ridge site.

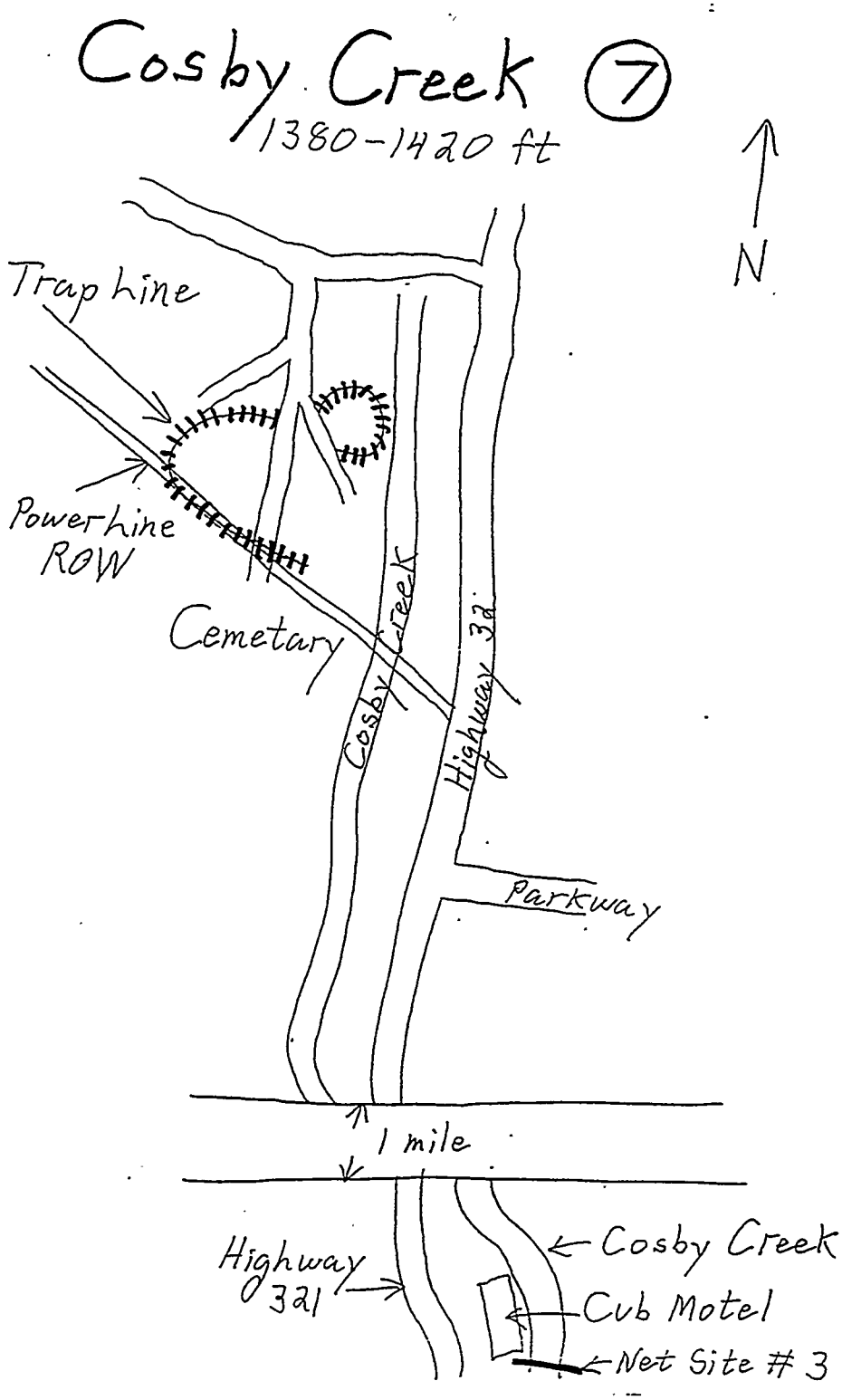


Fig. 11. Field sketch map of Cosby Creek site.

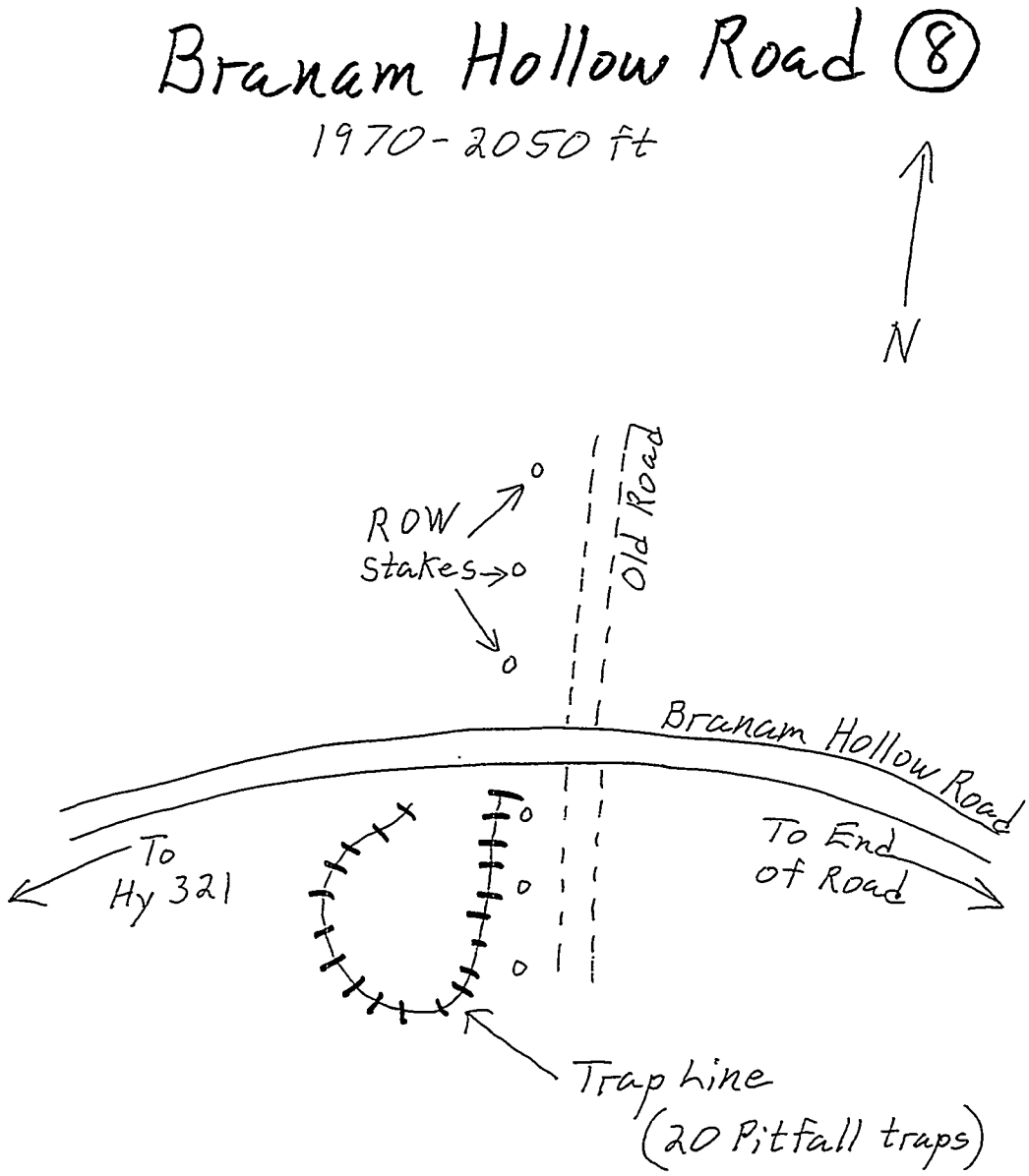


Fig. 12. Field sketch map of Branam Hollow Road site.

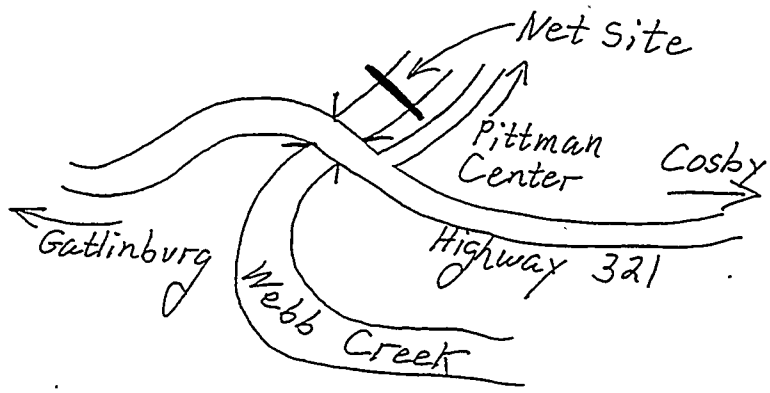
Mist Netting Sites

#1 See Field Map (1) Fig. 5

#2 See Field Map (1) Fig. 5

#3 See Field Map (7) Fig 11

#4



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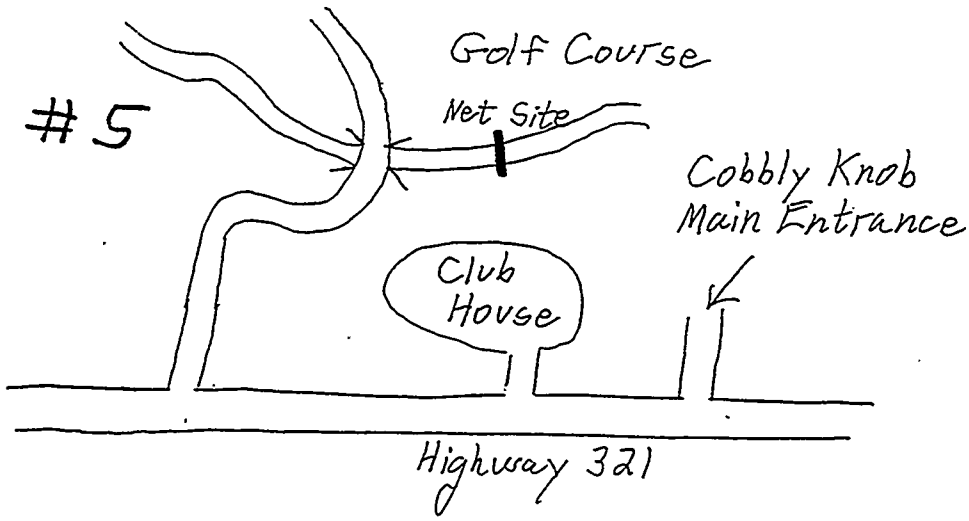

Fig. 13. Field sketch map of mist netting site.

Appendix H

BRYOPHYTE AND LICHEN SURVEY REPORT

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May 1995

BRYOPHYTE AND LICHEN SURVEY OF FOOTHILLS PARKWAY, SECTION 8B—COSBY-PITTMAN CENTER, GREAT SMOKY MOUNTAINS NATIONAL PARK

Subcontract 11X-SR982V

Submitted to

Environmental Sciences Division
Oak Ridge National Laboratory
Martin Marietta Corporation

22 May 1995

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Final Report of Bryophyte and Lichen Survey of Foothills Parkway, Section 8B—Cosby-Pittman Center, Great Smoky Mountains National Park

22 May 1995

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INTRODUCTION

Field surveys were conducted along selected portions of the Foothills Parkway, Section 8B, to inventory bryophytes and to survey for bryophytes and lichens officially listed as federal candidate taxa [1993 Federal Register 58(188)] of known or potential occurrence in the southern Appalachian region.

Areas were surveyed by site inspection to vocally record occurrence of taxa by substrate and to collect specimens for laboratory verified identifications. Each taxon listed in the checklist of hornworts, liverworts, and mosses (Attachment 1) has been verified by at least one specimen examined in the laboratory. The areas surveyed from west to east included (see maps 1, 2, 3; pp. 19–21):

1. Webb Creek—Little Pigeon River confluence and floodplain
2. Sheep Pen Branch, watershed on Webb Mountain
3. Warden Branch, upper watershed on Webb Mountain
4. Matthew Branch, upper watershed on Webb Mountain
5. Webb Mountain summit and east to Jones Gap
6. Webb Mountain, north slope below Jones Gap
7. Blackgum Gap, east right-of-way
8. Branam Hollow Gap, west and east right-of-way
9. Dunn Creek wetland, west of Rocky Flats Rd.
10. Spring Branch, east of Rocky Flats Rd. to the eastern edge of Big Ridge
11. Big Ridge, central section between Indian Camp Creek and Sandy Hollow
12. Big Ridge, north section at Waters Cemetery
13. Cosby Creek floodplain, at Hwy. 32

GENERAL SITE DESCRIPTIONS

Site descriptions are a synthesis of the characteristics of vegetation noted in individual **Field Reports** (Attachment 2). Common names of vascular plants comprising the dominant aspect of the vegetation for the various sites are coded by ACRONYMS for scientific names (in parentheses) denoted by the first three letters of genus and specific epithet (i.e. yellow poplar LIR TUL). Table 1 lists all ACRONYMS, scientific names and common names used throughout this report, and other substrates of bryophyte occurrence.

Wetland and Bottomland Sites. These sites consist of riparian habitats and adjacent flat ground, found in survey areas **1, 9, 10, 11 (Sandy Hollow), and 13**. All of these areas are successional, recovering bottomland woods previously cultivated or pastured. Canopy structure is mixed hardwoods of yellow poplar, red maple, sycamore, hop hornbeam, box elder, black locust, black cherry, white oak, and buckeye (LIR TUL, ACE RUB, PLA OCC, CAR CAR, ACE NEG, ROB PSE, PRU SER, QUE ALB, AES OCT), invasive hemlock (TSU CAN), and rather open in the understory with dogwood, spicebush, paw paw, and Japanese honeysuckle (COR FLO, LIN BEN, ASI TRI, LON JAP).

Streams. Permanently flowing streams through upland wooded slopes are Sheep Pen Branch, Mill Dam Branch, Warden Branch, Matthew Branch and tributaries, and upper Sandy Hollow Branch in survey areas **2, 3, 4, and 11**. These areas represent wet riparian and adjacent mesic strips of mixed hardwoods consisting of yellow poplar, red maple, hop hornbeam, river birch, hemlock (LIR TUL, ACE RUB, CAR CAR, BET NIG, TSU CAN) and shrubby heaths as great laurel and mountain laurel (RHO MAX, KAL LAT).

Slopes and Woodlands. These sites consist of successional forested slopes, principally on Webb Mountain and Big Ridge of survey areas **2, 3, 4, 6, 11, and 12**. Slope topography with east, west, and south aspects are dissected by upper order tributaries of Sheep Pen Branch, Mill Dam Branch, Matthew Creek, Sandy Hollow Branch, and many unnamed (seasonally dry) feeder steams. Lower slope woods consist of successional mixed hardwoods of yellow poplar, red maple, oaks, hickorys, pine (LIR TUL, ACE RUB, QUE spp., CAR spp., PIN spp.) with hemlock, mountain laurel, great laurel heath, dogwood, buffalo nut, striped maple, blueberry, greenbriar, teaberry and other

Table 1. Acronyms for vascular plant taxa of site descriptions and substrates for bryophytes listed in field reports

Acronym	Scientific name	Common name
ABI FRA	*Abies fraseri*	Fraser fir
AES OCT	*Aesculus octandra*	yellow buckeye
ACE NEG	*Acer negundo*	box elder
ACE PEN	*Acer pennsylvanica*	striped maple
ACE RUB	*Acer rubrum*	red maple
ASI TRI	*Asimina triloba*	paw paw
BET LEN	*Betula lenta*	sweet birch
BET NIG	*Betula nigra*	river birch
CAR CAR	*Carpinus caroliniana*	hop hornbeam
CAR spp.	*Carya* spp.	hickory
COR AME	*Corylus americana*	hazelnut
COR FLO	*Cornus florida*	dogwood
EPI REP	*Epigaea repens*	trailing arbutus
FRA AME	*Fraxinus americana*	ash
GAL APH	*Galax aphylla*	galax
GAU PRO	*Gaultheria procumbens*	teaberry
ILE OPA	*Ilex opaca*	holly
JUG NIG	*Juglans nigra*	black walnut
JUN VIR	*Juniperus virginiana*	cedar
KAL LAT	*Kalmia latifolia*	mountain laurel
LEU REC	*Leucothoe recurva*	deciduous leucothoe
LIN BEN	*Lindera benzoin*	spice bush
LIQ STY	*Liquidambar styraciflua*	sweet gum
LIR TUL	*Liriodendron tulipifera*	yellow poplar
LON JAP	*Lonicera japonica*	Japanese honeysuckle
NYS SYL	*Nyssa sylvatica*	black gum
OXY ARB	*Oxydendrum arboreum*	sourwood
PIC RUB	*Picea rubens*	red spruce
PIN PUN	*Pinus pungens*	table mountain pine
PIN RIG	*Pinus rigida*	pitch pine
PIN STR	*Pinus strobus*	white pine
PIN VIR	*Pinus virginiana*	scrub pine
PLA OCC	*Platanus occidentalis*	sycamore
PRU SER	*Prunus serotina*	black cherry
PYR PUB	*Pyrularia pubera*	buffalo nut
QUE ALB	*Quercus alba*	white oak
QUE PRI	*Quercus prinus*	chestnut oak
RHO MAX	*Rhododendron maximum*	great laurel
ROB PSE	*Robinia pseudo-acacia*	black locust
SMI spp.	*Smilax* spp.	greenbrier
TUS CAN	*Tsuga canadensis*	hemlock
ULM ALA	*Ulmus alata*	winged elm
VAC spp.	*Vaccinium* spp.	blueberry

Other substrates of bryophyte occurrence

L	Log	S	Soil
R	Rock	S/R	Soil over Rock
Rs	Rock, siliceous	S-stream	Soil in stream
R-stream	Rock in stream	T	Tree
		T-base	Tree base

understory shrubs (TSU CAN, KAL LAT, RHO MAX, COR FLO, PYR PUB, ACE PEN, VAC spp., SMI spp., GAU PRO). Upper slope woods are drier, consisting of mixed pine-hardwoods with scrub, Table Mountain, pitch pine, chestnut oak and other oaks, hickorys, black gum, red maple (PIN VIR, PIN PUN, PIN RIG, QUE PRI + spp., CAR spp., NYS SYL, ACE RUB) and low shrubs of mountain laurel, blueberries, and greenbriar (KAL LAT, VAC spp., SMI spp.).

Ridgelines and Summits. These sites consist of the watershed divides of Webb Mountain, Blackgum Gap to Branam Hollow Gap, and Big Ridge in survey areas **5, 7, 8, and 11**. Most of the summit and ridgeline forests are pine dominated with mixed hardwoods including Table Mountain, pitch, scrub pines, chestnut oak, black gum, red maple (PIN PUN, PIN RIG, PIN VIR, QUE PRI, NYS SYL, ACE RUB) and dry-adapted shrubs as mountain laurel, blueberries, greenbriar, holly, sourwood, deciduous leucothoe, galax, teaberry, and trailing arbutus (KAL LAT, VAC spp., SMI spp., ILE OPA, OXY ARB, LEU REC, GAY APH, GAU PRO, EPI REP). All three areas are experiencing severe decline of pines. Webb Mountain and Big Ridge are the most xeric expressions, and the section from Blackgum Gap to Branam Hollow Gap is more mesic-xeric.

SITE SURVEYS

Seven field surveys were conducted during the period from October 1994 through April 1995. Seventeen professional staff man days and four field assistant man days comprised the field effort to inventory the bryophytes along the right-of-way. Descriptions of sites visited and inventories of taxa occurring at each site are recorded in the **Field Reports** for each survey day [see Attachment 2].

TAXONOMIC INVENTORY

One hundred and fifty taxa (2 hornworts, 43 liverworts, and 105 mosses) are reported to occur within the boundaries of the right-of-way (see Attachment 1). Four taxa are officially reported for the first time in Great Smoky Mountains National Park: one hornwort *Megaceros aenigmaticus*,

two liverworts *Frullania ebroracensis* subsp. *virginica*, *Frullania ericoides*, and one moss *Dicranum spurium*. No new state records for Tennessee have resulted from this study.

The bryophyte flora of Great Smoky Mountains National Park consists of 463 taxa with the addition of the four taxa as a result of this report. The first comprehensive inventory for the park in 1991 (Smith et al. 1991) reported 435 taxa. The 1992 survey of the Foothills Parkway Extension 8D added 20 taxa new to the park, including seven as new Tennessee state records (Smith and Davison 1992). The 1993 survey of the Sinks/Little River parking area and overlook to assess impacts due to proposed construction added four more taxa (Smith and Risk 1993).

TAXA OF FEDERAL, STATE, AND PARK STATUS

Federal- and North Carolina-Listed Taxa. Table 2 lists status and rank for bryophytes and lichens of known or possible occurrence in the region of the Foothills Parkway that are federal-listed C2 species [1993 Federal Register 58(188)] and North Carolina-listed candidate, threatened, or endangered species (Weakley 1990).

No bryophytes or lichens of federal candidate status or state-listed for North Carolina were discovered within the boundaries of the right-of-way. There is no listing of bryophytes and lichens for Tennessee.

Tennessee State and Park "Noteworthy Taxa." A number of bryophytes are regarded as "Noteworthy Taxa" due to infrequent or restricted occurrence in Tennessee and Great Smoky Mountains National Park.

Table 3 lists taxa with special collection restrictions in GSMNP created by The Inventory and Monitoring Branch of Resource Management, GSMNP for park taxa with Federal- or Park P1-status listing. **None** of the taxa listed in Table 3 were discovered in the survey of the Foothills Parkway Section 8B.

Table 4 lists forty-nine taxa ranked according to the guidelines of The Nature Conservancy (1982, revised 1988) as P1 or P2 (Park status 1 or 2) or taxa unlisted in Smith et. al. (1991) and now reported with revised 1995 Park and State status. Many of these taxa occurring along Foothills

Table 2. Federal candidate species of bryophytes (liverworts and mosses) and lichens, and state listing for North Carolina for the Foothills Parkway region

Liverworts	North Carolina	Federal
Bazzania nudicaulis		C2
Cephaloziella obtusilobula	CAND	C2*
Cheilolejeunea evansii	CAND	C2*
Lejeunea blomquistii	CAND	C2
Lophocolea appalachiana		C2
Plagiochila caduciloba	END	C2
Plagiochila columbiana	CAND	C2
Plagiochila echinata		C2
Plagiochila sharpii		C2
Plagiochila sullivantii		C2
Plagiochila virginica		
var. *caroliniana*		C2
var. *euryphylla*	CAND	C2
Porella appalachiana		C2
Sphenolobopsis pearsonii		C2
Mosses		
Brachymenium andersonii		C2*
Bryocrumia vivicolor	END	C2
Eurhynchium pringlei		C2
Mnium carolinianum		C2
Orthotrichum keeverae	END	C2
Pterigynandrum sharpii		C2
Schlotheimia lancifolia	THR	C2
Tortula ammonsiana	END	C2
Lichens		
Cladonia psoromica	CAND	C2
Gymnoderma lineare	THR	PE

*indicates taxa whose continued existence is in doubt.
PE indicates taxa already proposed to be listed and endangered.

Parkway Section 8B that are considered **noteworthy taxa** due to infrequent or restricted occurrence in Great Smoky Mountains National Park; but are widespread and common to the west in Tennessee especially in the Ridge and Valley and Cumberland Mountain districts. Comments concerning these taxa follow Table 4.

Table 3. Taxa with special collection restrictions in GSMNP

Mosses	Liverworts
Brachydontium trichodes	*Anastrophyllum saxicola*
Buxbaumia aphylla	*Aneura sharpii*
Campylopus atrovirens	*Bazzania nudicaulis*
Coscinodon cribrosa	*Cephaloziella spinicaulis*
= Grimmia cribrosa	*Cephaloziella hampeana*
Dichodontium pellucidum	*Chiloscyphus appalachiana*
Entodon concinnus	= Lophocolea appalachiana
Entodon sullivantii	*Drepanolejeunea appalachiana*
Hygrohypnum closteri	*Lophozia excisa*
Leptodontium excelsum	*Mylia taylori*
Leptohymenium sharpii	*Pedinophyllum interruptum*
= Pterigynandrum sharpii	*Plagiochila caudiciloba*
Orthodontium pellucens	*Plagiochila echinata*
Mnium carolinianum	*Plagiochila sharpii*
= Plagiomnium carolinianum	*Porella wataugensis*
Sphagnum capillifolium	*Porella urogea*
Sphagnum pylaesii	*Sphenolobopsis pearsonii*
Sphagnum subsecundum	
Sphagnum squarrosum	
Tortula ammonsoniana	

COMMENTS

P1–S1 Taxa. The following taxa of P1 status appear to be restricted to the eastern Blue Ridge mountain district of Tennessee.

Brachythecium rutabulum (a moss) is known in Tennessee only from the eastern mountain district. It occurs along stream margins and seepage areas; known in the park from Little Cove Creek, Wears Valley, and School House Gap wetland. It is probably more abundant than records indicate and overlooked due to its non-descript habitat other than moisture. It occurs in the wetland woods of Dunn Creek in Rocky Flats.

Fissidens appalachensis (a moss) is a narrowly restricted southern Appalachian endemic of the Blue Ridge mountains of North Carolina and Tennessee. This tiny aquatic moss occurs on rocks in flowing water of several drainages of GSMNP in North Carolina and Tennessee. It occurs in the stream of Sandy Hollow well outside the path of proposed road construction.

Table 4. Noteworthy taxa of P1 or P2 Great Smoky Mountains National Park ranking occurring along Foothills Parkway Section 8B

	1991 status	1995 status	State status
Hornworts			
Anthoceros laevis ssp. *carolinianus*	P1?	P2	S2
Megaceros aenigmaticus	(unlisted)	P1	S1
Liverworts			
Calypogeia fissa subsp. *neogaea*	P1	P2P3	S2S3
Calypogeia sullivantii	(unlisted)	P1P2	S2
Frullania brittoniae	P2P3	P2P3	S2S3?
Frullania eboracensis subsp. *eboracensis*	P2P3	P2P3	S2S3?
Frullania eboracensis subsp. *virginica*	(unlisted)	P1P2	P1P2?
Frullania ericoides	(unlisted)	P3	S3
=Frullania squarrosa	P2		
Frullania kunzei	(unlisted)	P1	S1
Lejeunea ruthii	P2	P3	S3?
Lophocolea cuspidata	P2	P2P3	S2S3?
Metzgeria myriopoda	P2	P2	S2?
Odontoschisma denudatum	P2P3	P3	S3
Pallavicinia lyellii	P2	P2P3	S4
Radula mollis	P2	P2P3	S2S3
Riccardia jugata	(unlisted)	P2	S3
Solenostoma pumilum	P1	P1P2	S1S2
Mosses			
Brachythecium rutabulum	P1	P1	S1
Campylium hispidulum	P2	P2P3	S3
Clasmatodon parvulus	(unlisted)	P1	S4
Climacium kindbergii	P2P3	P3	S3

Table 4. Continued

	1991 status	1995 status	State status
Mosses cont'd			
Cryphaea glomerata	P2	P2	S3S4
Dicranum sabuletorum =Dicranum condensatum	P1	P1	S3
Dicranum spurium	(unlisted)	P1	S2S3
Dicranum viride	P1?	P1P2	S2
Ditrichum pallidum	P1?	P2?	S3
Drummondia prorepens	P2	P2P3	S4
Eurhynchium hians	P2	P2P3	S3
Eurhynchium pulchellum	P2P3	P2P3	S3
Fissidens appalachensis	P1	P1	S1
Fissidens bryoides	P1	P2	S4
Fissidens bushii	P1	P1	S1
Fissidens subbasilaris	P1P2	P2P3	S4S5
Fissidens taxifolius	P2	P3	S4
Fontinalis novae-angliae	P2	P2	S5
Grimmia alpicola =Schistidium rivulare	P2	P2P3	S2S3
Haplocladium virginianum =Bryohaplocladium virginianum	P2	P2	S4
Hypnum lindbergii	P1	P2?	S3?
Isopterygium tenerum	P2	P2P3	S5
Leptodictyum riparium	(unlisted)	P1	S3?
Leskea gracilescens	(unlisted)	P1	S3
Leucodon julaceus	P1	P1P2	S4
Mnium rostratum =Plagiomnium rostratum	P1	P1	S3
Orthotrichum ohioense	P1	P1	S3
Plagiothecium denticulatum	P2	P2	S3

Table 4. Continued

	1991 status	1995 status	State status
Pleurozium schreberi	P2P3	P2	S3
Pylaisiella spp.	P1P2	P2	S2
Sematophyllum adnatum	P2	P2P3	S4
Taxiphyllum deplanatum	P2?	P2P3	S4

Unlisted—refers to taxa not known to occur in Great Smoky Mountains National Park in 1991.
?—indicates questionable status due to insufficient knowledge of the distribution of the taxon within park or state domains.

Fissidens bushii (a moss) is known from only several collections in the State. It can be found in temporary, highly disturbed habitats such as soil spoils from excavations and tree mounds and can be expected to appear and disappear through successional changes to site. It occurs along Warden Branch on disturbed soil and was discovered once in Section 8D in Wears Valley.

Frullania kunzei (a liverwort) is currently known from three localities in Tennessee, one along the Foothills Parkway Section 8D on Crooked Arm Ridge, and McMinn and Polk Counties. It occurs on tight-grained, non-calcareous surface boulders (rarely on trunks of hardwoods), along Section 8B on the eastern upslope of Sheep Pen Branch near the edge of the proposed construction path.

Megaceros aenigmaticus (a hornwort) is a narrow endemic of the southern Appalachians known only from streams of the Slick Rock Creek watershed, NC; Tellico River and Citico Creek watersheds of TN; and Great Smoky Mountains National Park. In GSMNP it occurs in many of the streams originating in the park from Roaring Fork east to Big Creek. It requires clear permanently wet habitat from seepage or side rills of streams; and probably is intolerant of high sedimentation loads or severely altered water chemistry. Its occurrence in Spring Branch (through the proposed centerline) is most likely due to downstream transport from the main park domain.

P1–S2,S3,S4 Taxa. The following taxa of P1 status are uncommon in GSMNP; but more widespread to the west in Tennessee, and generally in the southeastern region under conditions of habitat and on substrates uncommon in the Blue Ridge district. Their occurrence on the Parkway

and therefore in GSMNP is an artifact of the physiographic disjunction of the Parkway corridor along the eastern edge of the Ridge and Valley district.

Corticolous species of bark: *Clasmatodon parvulus, Leskea gracilescens,* and *Orthotrichum ohioense* characteristic of mixed hardwoods.

Riparian species of streams: *Leptodictyum riparium* of sporadic occurrence in flowing water attached to stable inorganic and organic substrates.

Saxicolous species over rock: *Mnium rostratum* associated with calcareous to circum-neutral substrates.

Terricolous species of soil: *Dicranum sabuletorum,* and *Dicranum spurium* characteristic of dry oak-pine woodlands.

P1P2/P2–S2,S3,S4,S5 Taxa. The following taxa of P1P2 or P2 status are infrequent in their occurrence within GSMNP; but clearly more widespread in the state, either generally distributed in the Blue Ridge of Tennessee (and North Carolina), or to the west in Tennessee and generally in the southeastern region where suitable habitats and substrates prevail.

Corticolous species of bark: *Cryphaea glomerata, Dicranum viride, Frullania eboracensis* ssp. *virginica, Leucodon julaceus, Metzgeria myriopoda, Pylaisiella* spp. characteristic of mixed hardwood and red cedar woodlands.

Organic species of decayed wet wood: *Riccardia jugata* on moist to wet downed wood often in or along streams.

Riparian species of streams or soggy soils: *Anthoceros laevis* subsp. *carolinianus, Fontinalis novae-angliae, Hypnum lindbergii* in flowing water attached to stable inorganic and organic substrates or saturated soils adjacent to streams or of wetlands.

Saxicolous species over rock: *Fissidens bryoides, Solenostoma pumilum* on mesic to moist non-specific rock substrates.

Terricolous species of soil: *Calypogeia sullivantii, Ditrichum pallidum, Haplocladium virginianum* characteristic of disturbed mineralized soils.

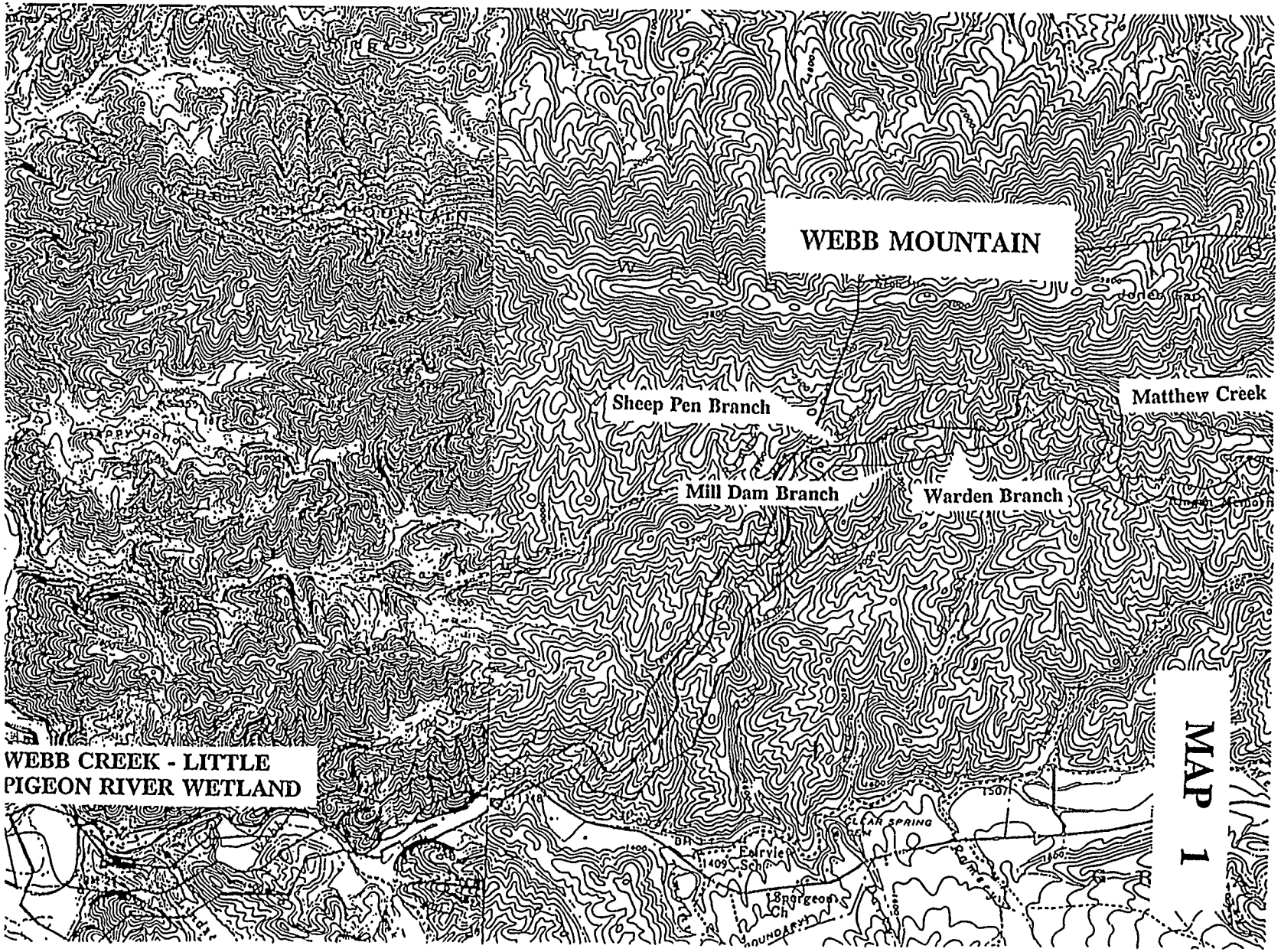
P2P3/P3–S2,S3,S4,S5 Taxa. The following taxa of P2P3 or P3 status are regarded as common in their occurrence within GSMNP; but are not supported by an extensive collection record. They are generally distributed within the park, and widely more occurring in the state and southeastern region.

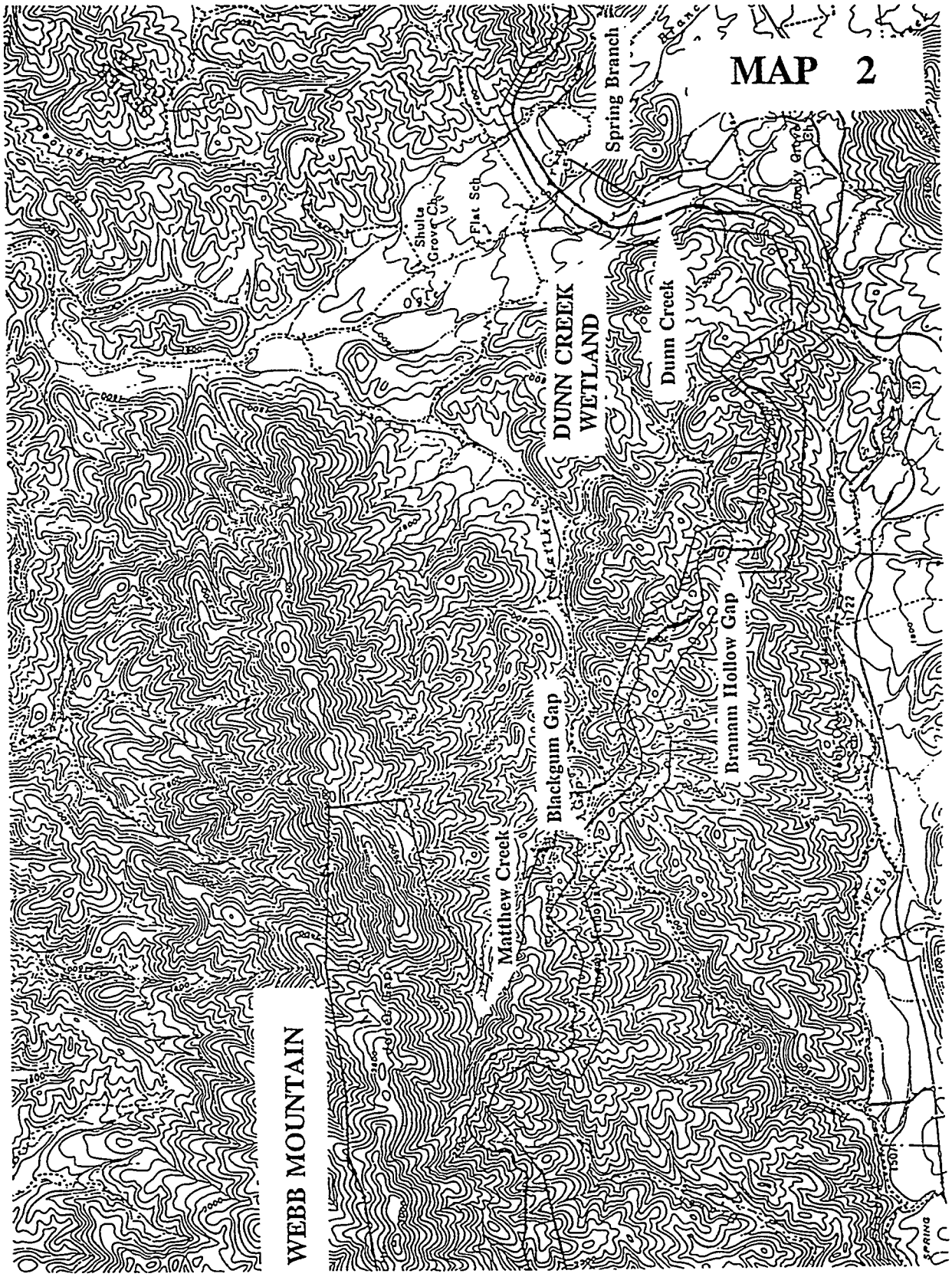
Corticolous species of bark: *Drummondia prorepens*, *Frullaina brittoniae*, *Frullania eboracensis* ssp. *eboracensis*, *Frullania ericoides*, *Lejeunea ruthii*, *Radula mollis*, *Sematophyllum adnatum* characteristic of mixed hardwood woodlands.

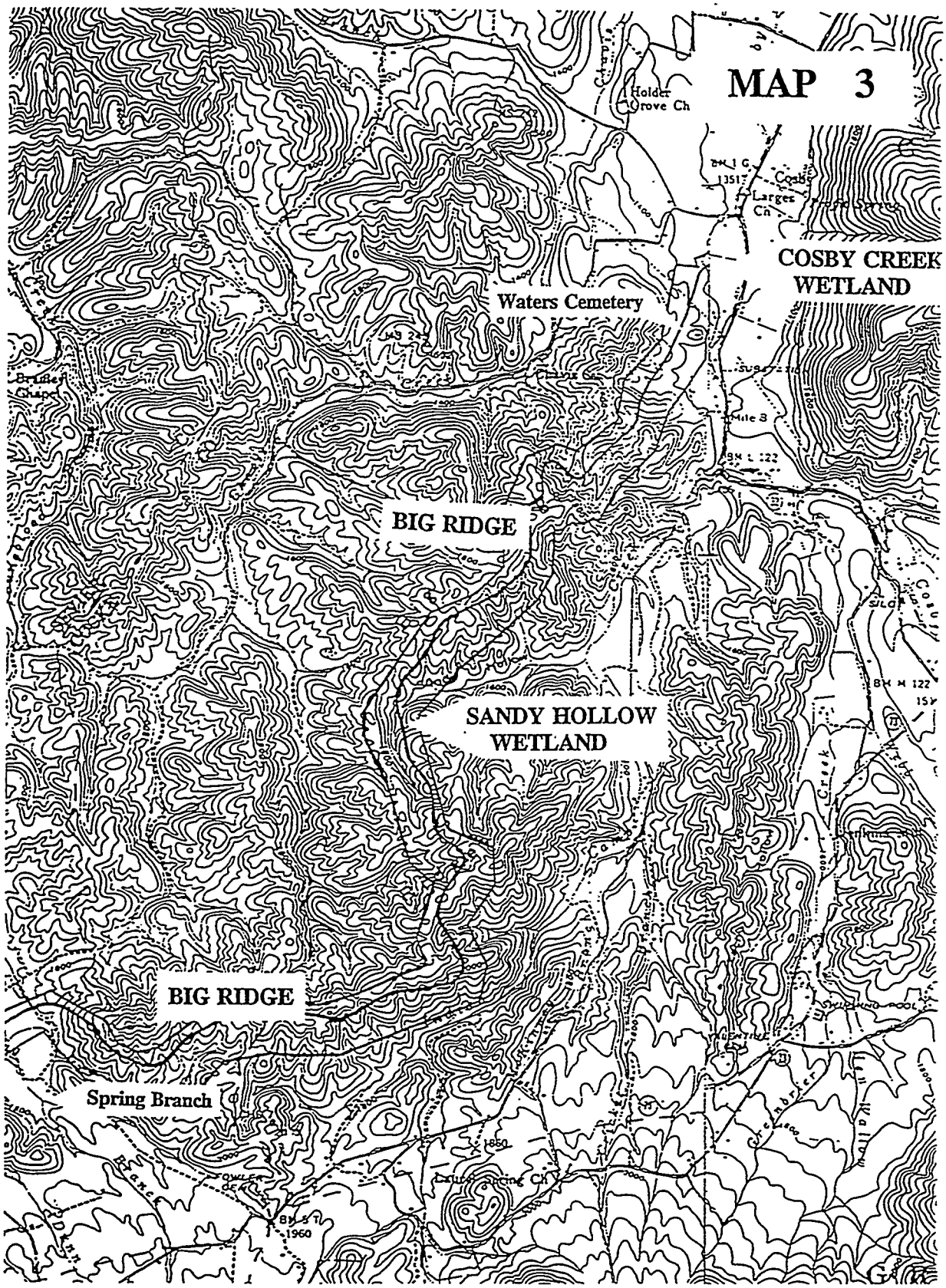
Organic species of decayed wood and humus: *Eurhynchium hians*, *Eurhynchium pulchellum*, *Fissidens subbasilaris*, *Fissidens taxifolius*, *Lophocolea cuspidata*, *Odontoschisma denudatum* of downed and decayed wood or organically enriched soils.

Saxicolous species over rock: *Grimmia alpicola* on mesic to dry non-specific rock substrates.

Terricolous species of soil: *Calypogeia fissa* ssp. *neogaea*, *Isopterygium tenerum*, *Pallavicinia lyellii*, *Plagiothecium denticulatum*, *Pleurozium schreberi*, *Taxiphyllum deplanatum* characteristic of minerotrophic soils in mature woodlands.


WEBB MOUNTAIN
Sheep Pen Branch
Matthew Creek
Mill Dam Branch
Warden Branch
WEBB CREEK - LITTLE
PIGEON RIVER WETLAND
MAP 1


MAP 2
WEBB MOUNTAIN
Matthew Creek
Blackgum Gap
DUNN CREEK
WETLAND
Dunn Creek
Branam Hollow Gap
Spring Branch
Shulta
Grove Ch
Flat Sch


MAP 3
Holder Grove Ch
Cosby
Larges Ch
COSBY CREEK WETLAND
Waters Cemetery
BIG RIDGE
SANDY HOLLOW WETLAND
BIG RIDGE
Spring Branch

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ATTACHMENT 1

HORNWORTS, LIVERWORTS, AND MOSSES ALONG FOOTHILLS PARKWAY—SECTION 8B GREAT SMOKY MOUNTAINS NATIONAL PARK

HORNWORTS

Anthoceros laevis ssp. *carolinianus*	(L.) Schust.
Megaceros aenigmaticus	Schust.

LIVERWORTS

Bazzania trilobata	(L.) S. Gray
Calypogeia fissa subsp. *neogaea*	Schust.
Calypogeia muelleriana	(Schiffn.) K.Muell.
Calypogeia sullivantii	Aust.
Cephalozia catenulata	(Hueben.) Lindb.
Cephalozia lunulifolia	(Dum.) Dum.
Cololejeunea biddlecomiae	(Aust.) Evans
Conocephalum conicum	(L.) Lindb.
Diplophyllum apiculatum	(Evans) Steph.
Frullania brittoniae	Evans
Frullania eboracensis subsp. *eboracensis*	Gott.
Frullania eboracensis subsp. *virginica*	(Gott.) Schust.
Frullania ericoides =*Frullania squarrosa*	(Nees) Mont.
Frullania kunzei	Lehm. & Lindb.
Frullania tamarisci subsp. *asagrayana*	(Mont.) Hatt.
Jamesoniella autumnalis	(DeCand.) Steph.
Jubula pennsylvanica	(Steph.) Evans
Kurzia sylvatica	(Evans) Grolle
Lejeunea laetevirens	Nees & Mont.
Lejeunea ruthii	(Evans) Schust.
Lejeunea ulicina	(Tayl.) Gott.
Leucolejeunea clypeata	(Schrad.) Dum.
Lophocolea cuspidata	(Nees) Limpr.
Lophocolea heterophylla	(Schrad.) Dum.
Metzgeria conjugata	Lindb.
Metzgeria crassipilis	(Lindb.) Evans

LIVERWORTS (cont.)

Metzgeria cf. furcata	(L.) Dum.
Metzgeria cf. myriopoda	Lindb.
Nowellia curvifolia	(Dicks.) Mitt.
Odontoschisma denudatum	(Nees) Dum.
Pallavicinia lyellii	(Hook.) S. Gray
Pellia epiphylla	(L.) Lindb.
Plagiochila asplenioides subsp. *porelloides*	(Torrey ex Nees) Schust.
Porella pinnata	L.
Porella platyphylloidea	(Schwein.) Lindb.
Radula cf. australis	Aust.
Radula mollis	Lindenb. & Gott.
Radula obconica	Sull.
Riccardia jugata	Schust.
Riccardia multifida	(L.) S. Gray
Scapania nemorosa	(L.) Dum.
Solenostoma pumilum	(With.) K. Muell.
Trichocolea tomentella	(Ehrh.) Dum.

MOSSES

Amblystegium serpens	(Hedw.) Schimp. *in* B.S.G.
Amblystegium varium	(Hedw.) Lindb.
Anacamptodon splachnoides	(Fröl. *ex* Brid.) Brid.
Anomodon attenuatus	(Hedw.) Hüb.
Anomodon rostratus	(Hedw.) Schimp.
Atrichum angustatum	(Brid.) Bruch & Schimp. *in* B.S.G.
Atrichum oerstedianum	(C. Müll.) Mitt.
Atrichum undulatum	(Hedw.) P. Beauv.
Aulacomnium heterostichum	(Hedw.) Bruch & Schimp. *in* B.S.G.
Bartramia pomiformis	Hedw.

Brachythecium oxycladon	(Brid.) Jaeg.
Brachythecium plumosum	(Hedw.) Schimp. *in* B.S.G.
Brachythecium rivulare	Schimp. *in* B.S.G.
Brachythecium rutabulum	(Hedw.) Schimp. *in* B.S.G.
Brachythecium salebrosum	(Web. & Mohr) Schimp. *in* B.S.G.
Brotherella recurvans	(Michx.) Fleisch.
Brotherella tenuirostris	(Bruch & Schimp. *in* Sull.) Broth.
=*Pylaisiadelpha tenuirostris*	(Bruch & Schimp. *ex* Sull.) Buck
Bryhnia novae-angliae	(Sull. & Lesq. *in* Sull.) Grout
Bryoandersonia illecebra	(Hedw.) Robins.
Bryum capillare	Hedw.
Campylium chrysophyllum	(Brid.) J. Lange
Campylium hispidulum	(Brid.) Mitt.
Clasmatodon parvulus	(Hampe) Hook. & Wils. *ex* Sull. *in* Gray
Climacium kindbergii	(Ren. & Card.) Grout
Cryphaea glomerata	Bruch & Schimp. *ex* Sull.
Ctenidium molluscum	(Hedw.) Mitt.
Dicranella heteromalla	(Hedw.) Schimp.
Dicranum flagellare	Hedw.
Dicranum fulvum	Hook.
Dicranum montanum	Hedw.
Dicranum sabuletorum	Ren. & Card.
=*Dicranum condensatum*	Hedw.
Dicranum scoparium	Hedw.
Dicranum spurium	Hedw.
Dicranum viride	(Sull. & Lesq. *in* Sull.) Lindb.
Diphyscium foliosum	(Hedw.) Mohr
Ditrichum pallidum	(Hedw.) Hampe
Drummondia prorepens	(Hedw.) Britt.
Entodon macropodus	(Hedw.) C. Müll.
Entodon seductrix	(Hedw.) C. Müll.
Eurhynchium hians	(Hedw.) Sande Lac.

Eurhynchium pulchellum	(Hedw.) Jenn.
Eurhynchium riparioides	(Hedw.) P. Rich.
=*Platyhypnidium riparioides*	(Hedw.) Dix.
Fissidens appalachensis	Zander
Fissidens bryoides	Hedw.
Fissidens bushii	(Card. & Ther.) Card. & Ther.
Fissidens cristatus	Wils. *ex* Mitt.
=*Fissidens dubius*	P. Beauv.
Fissidens subbasilaris	Hedw.
Fissidens taxifolius	Hedw.
Forsstroemia trichomitria	(Hedw.) Lindb.
Fontinalis novae-angliae	Sull.
Grimmia alpicola	*auct.* Amer.
=*Schistidium rivulare*	(Brid.) Podp.
Grimmia alpicola var. *rivularis*	(Brid.) Wahlenb.
=*Schistidium rivulare*	(Brid.) Podp.
Haplocladium virginianum	(Brid.) Broth.
=*Bryohaplocladium virginianum*	(Brid.) Wat. & Iwats.
Haplohymenium triste	(Ces. *in* De Not.) Kindb.
Hedwigia ciliata	(Hedw.) P. Beauv.
Heterophyllium affine	(Hook. *in* Kunth) Fleisch.
Homalotheciella subcapillata	(Hedw.) Broth.
Homomallium adnatum	(Hedw.) Broth.
Hygroamblystegium tenax	(Hedw.) Jenn.
Hylocomium brevirostre	(Brid.) Schimp. *in* B.S.G.
=*Loeskeobryum brevirostre*	(Brid.) Fleisch. *in* Broth.
Hypnum curvifolium	Hedw.
Hypnum fertile	Sendtn.
Hypnum imponens	Hedw.
Hypnum lindbergii	Mitt.
Hypnum pallescens	(Hedw.) P. Beauv.
Isopterygiopsis muelleriana	(Schimp.) Iwats.

Isopterygium elegans	(Brid.) Lindb.
=*Pseudotaxiphyllum elegans*	(Brid.) Iwats.
Isopterygium tenerum	(Sw.) Mitt.
Leptodictyum riparium	(Hedw.) Warnst.
Leskea gracilescens	Hedw.
Leucobryum albidum	(Brid. *ex* P. Beauv.) Lindb.
Leucodon julaceus	(Hedw.) Sull.
Leucodon brachypus	Brid.
Mnium ciliare	(C. Muell.) Schimp.
=*Plagiomnium ciliare*	(C. Müll.) T. Kop.
Mnium cuspidatum	Hedw.
=*Plagiomnium cuspidatum*	(Hedw.) T. Kop.
Mnium hornum	Hedw.
Mnium punctatum	Hedw.
=*Rhizomnium punctatum*	(Hedw.) T. Kop.
Mnium rostratum	Schrad.
=*Plagiomnium rostratum*	(Schrad.) T. Kop.
Neckera pennata	Hedw.
Orthotrichum ohioense	Sull. & Lesq. *in* Aust.
Physcomitrium cf. pyriforme	(Hedw.) Hampe
Plagiothecium cavifolium	(Brid.) Iwats.
Plagiothecium denticulatum	(Hedw.) Schimp. *in* B.S.G.
Platygyrium repens	(Brid.) Schimp. *in* B.S.G.
Pleurozium schreberi	(Brid.) Mitt.
Pogonatum pensilvanicum	(Hedw.) P. Beauv.
Polytrichum commune	Hedw.
Polytrichum ohioense	Ren. & Card.
Ptychomitrium incurvum	(Schwaegr.) Spruce
Pylaisiella sp.	
Racomitrium aciculare	(Hedw.) Brid.
Rhodobryum roseum	(Hedw.) Limpr.

MOSSES (cont.)

Rhynchostegium serrulatum	(Hedw.) Jaeg.
=*Steerecleus serrulatus*	(Hedw.) Robins.
Schwetschkeopsis fabronia	(Schwaegr.) Broth.
Sciaromium lescurii	(Sull. *in* Gray) Broth.
=*Platylomella lescurii*	(Sull. *in* Gray) Andrews
Sematophyllum adnatum	(Michx.) Britt.
Sematophyllum demissum	(Wils.) Mitt.
Sematophyllum marylandicum	(C. Müll.) Britt.
Taxiphyllum deplanatum	(Bruch & Schimp. *ex* Sull.) Fleisch.
Tetraphis pellucida	Hedw.
Thelia hirtella	(Hedw.) Sull. *in* Sull. & Lesq.
Thuidium delicatulum	(Hedw.) Schimp. *in* B.S.G.
Tortella humilis	(Hedw.) Jenn.
Trichostomum tenuirostre	(Hook. & Tayl.) Lindb.
=*Oxystegus tenuirostris*	(Hook. & Tayl.) A. JK. E. Sm.
Ulota crispa	(Hedw.) Brid.
Weissia controversa	Hedw.

ATTACHMENT 2

FIELD REPORTS

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 12 October 1994

PERSONNEL: D. K. Smith and Allen C. Risk

SITE(S): Initial road survey of west end of Foothills Right-of-Way from Pittman Center to Sheep Pen Branch (Webb Mountain).

Beginning at Webb Creek Road (Pitmann Center) and proceeding east to junction with Highway 321; proceeding east on 321 to Cemetery Rd. (at Fairview Community) and north on county residential road following Warden Branch onto Webb Mountain; left on gravel road (west) parking ca. 1900 ft. elevation.

Foot access along gravel road (ca. 200 yds.) to pilot road bearing left and descending to the confluence of Mill Creek Dam Branch-Sheep Pen Branch; then bearing north on pilot road up Sheep Pen Branch to Right-of-Way Boundary. Foot survey along pilot road and stream (1800–2200 ft. elevation).

Mesic hemlock hardwoods forest along stream ravine (Hemlock, Yellow Poplar, Beech, Red Maple, Carpinus, Rhododendron). Upslope communities transition rapidly to drained slopes of oak, hickory, mountain laurel, and pine.

Rain!

Taxa	**Sheep Pen Branch**
Liverworts	
Anthoceros carolinianus	S
Leucolejeunea clypeata	LIR TUL, Rs
Lophocolea cuspidata	Rs-stream
Lophocolea heterophylla	S-bank
Nowellia curvifolia	L
Odontoschisma denudatum	L
Pallavicinia lyellii	L
Porella platyphylloidea	T-base
Radula cf. mollis	LIR TUL

Mosses	Sheep Pen Branch
Amblystegium varium	Rs-stream
Atrichum undulatum var. oerstedianum	S
Bryhnia novae-angliae	S
Bryoandersonia illecebra	S
Dicranum montanum	LIR TUL
Dicranum scoparium	S
Fissidens cristatus	S-bank
Forrstroemia trichomitria	LIR TUL
Hygroamblystegium tenax	S
Hypnum aff. fertile	L
Leucobryum albidum	L
Mnium ciliare	S
Orthotrichum (scrap) sp.	ACE RUB
Platygyrium repens	L
Pogonatum pensilvanicum	S-bank
Polytrichum ohioense	S
Schwetschkeopsis fabronia	Rs
Sciaromium lescurii	Rs-stream
Tetraphis pellucida	L
Thelia hirtella	LIR TUL
Thuidium delicatulum	S/R, T

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 04 November 1994

PERSONNEL: D.K. Smith, K.D. McFarland, Nancy Fraley, Steve Killifer

SITE(S): Field surveys of west end of Foothills Right-of-Way—Webb Creek flood plain and Sheep Pen Branch upper watershed (Webb Mountain).

Site 1. The flood plain of the confluence of Webb Creek and Middle Prong of the Little Pigeon River was intensively surveyed. Only access to the flood plain is by wading the active channel of the Little Pigeon River. Vocal and collected specimen records were made to census the area. The flood plain is dissected by one intermittent overflow channel and several flood-stage channels in the interior woods. Canopy structure consists of CAR CAR, PLA OCC, LIR TUL, ACE RUB, COR FLO, JUG NIG, and sapling TSU CAN.

Site 2. Sheep Pen Branch was accessed by a pilot road crossing into the right of way. Survey worked the upper reaches (elevation 2000–2600 ft.) of the watershed where the stream bends east to near its origin; then onto the ridge between Mill Dam Branch, along the ridge (proceeding SW) to the centerline, and continuing back to Sheep Pen Branch downslope to its centerline crossing. Streamside woods consisting of LIR TUL, QUE PRI, COR AME, PYR PUB, COR FLO, RHO MAX, KAL LAT. Slope woods of secondary growth consisting of QUE spp., Car spp., KAL LAT, SMI sp. Ridge woods of secondary growth of PIN (pitch pine), QUE spp., CAR spp., KAL LAT, VAC spp., SMI sp. and essentially barren of bryophytes.

Taxa	**Floodplain**	**Sheep Pen Branch**
Liverworts		
Cephalozia catenulata	Log	
Conocephalum conicum	S	
Diplophyllum apiculatum		Rs!
Frullania spp. CAR CAR	ACE RUB	
Frullania kunzei		Rs
Jamesoniella autumnalis		Rs!
Lejeunea laetevirens		Rs!
Leucolejeunea clypeata		Rs!
Lophocolea heterophylla	Log	
Metzgeria crassipilis		R!
Nowellia curvifolia	Log	Log
Odontoschisma denudatum		Log
Pallavicinia lyellii		Log
Pellia epiphylla S!		
Phaeoceros laevis		Log

Liverworts (cont.)	Floodplain	Sheep Pen Branch
Porella platyphylloidea	COR FLO	
Radula obconica		R!
Radula sp.	CAR CAR	
Scapania (aquatic)	Rs	
Scapania nemorosa		Rs
Trichocolea tomentella	S	

Mosses		
Anomodon attenuatus	PLA OCC	
Atrichum undulatum var. oerstedianum	S	S
Aulacomnium heterostichum		S/R
Brachythecium oxycladon	S	
Brotherella tenuirostris		QUE PRI
Bryhnia novae-angliae	S/R	
Bryoandersonia illecebra	S	S
Campylium chrysophyllum	S/R	
Climacium americanun var. kindbergii	S	
Cryphaea glomerata	CAR CAR	
Ctenidium molluscum	R	
Dicranella heteromalla		S
Dicranum flagellare		Log
Dicranum fulvum		Rs!
Dicranum montanum		QUE PRI
Dicranum scoparium	Log	S
Diphyscium foliosum	S	S/R!
Drummondia prorepens		QUE PRI
Entodon seductrix	LIR TUL	
Eurhynchium riparioides	S/R-stream	
Fissidens bryoides	R-stream	R-stream
Fissidens cristatus		S
Forrstroemia trichomitria	CAR CAR	
Haplohymenium triste	CAR CAR	QUE PRI
Hedwigia ciliare		Rs
Homalotheciella subcapillare	LIR TUL	
Hygroamblystegium tenax	R-stream	R-stream
Hypnum fertile	Log, S	
Isopterygiopsis muelleriana		Rs!
Leskea gracilescens	CAR CAR	
Leucobryum albidum	Log	S, Log
Leucodon brachypus	CAR CAR	
Leucodon julaceus		QUE PRI
Mnium affine var. ciliare S	S	
Mnium rostratum	S	S/R

Mosses (cont.)	Floodplain	Sheep Pen Branch
Orthotrichum (scrap) sp.	CAR CAR	
Physcomitrium (sterile)	S	
Platygyrium repens	Log	Log
Pogonatum pensilvanicum		S
Polytrichum ohioense		S
Ptychomitrium incurvum		Rs
Racomitrium aciculare	R-stream	
Schwetschkeopsis fabronia	CAR CAR	Rs
Sciaromium lescurii	R-stream	
Sematophyllum adnatum	Log	
Sematophyllum demissum	R-Stream	Rs
Tetraphis pellucida	S	
Thelia hirtella LIR TUL		
Trichostomum tenuirostre		R!
Thuidium delicatulum	S/R	S/R
Ulota crispa	CAR CAR	

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 02 December 1994

PERSONNEL: D.K. Smith, K.D. McFarland, Allen Risk, Steve Killifer, Teresa Nette

SITE(S): Field surveys of Webb Mountain, by access from Cobly Knob, Pine Mtn. Road (2000 ft. elev.), up Warden Branch to ridgeline, west along ridge to summit, and east along ridge to double knobs (@ 2800–3000 ft. elevation), descending by east spur of upper Matthew Creek to the boundary line of Matthew Creek.

Warden Branch is one of several all season streams that originates on the high slope (just below the ridge) of the south-facing flank of Webb Mountain. It is typical of other drainages (Sheep Pen Branch, and Mill Dam Branch) in aspect, directional course of drainage, and macro-vegetation. The creek cuts deeply and steeply with little flexure. The dominant vegetation consists of Oak/Hickory, and Mixed pine (Table Mtn., pitch, virginia) with a sparse understory of mountain laurel, Smilax, Vaccinium, scattered rhododendron, trailing arbutus, galax—some regenerant hemlock.

Webb Mountain (ridge and summit woods) and the northfacing upper slope are extremely low in bryophyte diversity. The summit ridge is mixed hardwoods, mostly oak, hickory, maple, some scattered pine and sourwood, vaccinium, smilax, mountain laurel, and spotty rhododendron.

Matthew Creek originates high on the flank of Webb Mountain, and turns in a northwest direction running across the right of way. The watershed drained in the right of way is highly disturbed, pines above and second growth hardwoods below. The seam of the stream is mesic with constant drainage. Upslope is well-drained and dry.

Taxa	**Warden Branch**	**Webb Mtn.**	**Matthew Creek**
Liverworts			
Bazzania trilobata			S
Calypogeia fissa/neogaea	S		
Cephalozia catenulata			S
Cololejeunea biddlecomiae	ACE RUB		
Diplophyllum apiculatum	R		S
Frullania eboracensis	CAR sp.		
Frullania tamarisci ssp. asagrayana	QUE PRI	QUE sp.	
Jubula pennsylvanica	R-stream		R-stream
Lejeunea laetevirens			Rs
Lejeunea ulicina			ACE RUB
Leucolejeunea clypeata	R		
Lophocolea cuspidata			R
Lophocolea heterophylla	S		R-stream
Metzgeria crassipilis	ACE RUB		

Liverworts (cont.)	**Warden Branch**	**Webb Mtn.**	**Matthew Creek**
Nowellia curvifolia	Log		Log
Odontoschisma denudatum			S
Pallavicinia lyellii	S/R		S/R
Porella pinnata	R		
Porella platyphylloidea			ACE RUB
Radula obconica	R		ACE RUB
Riccardia multifida	R		R
Scapania nemorosa	R		S
Solenostoma pumilum	R-stream		

Mosses

Amblystegium serpens	S		
Amblystegium varium	R		
Anomodon attenuatus	Rs		
Atrichum angustatum	S	S	
Atrichum undulatum var. oerstedianum	R		S/R
Aulacomnium heterostichum	S	S	
Bartramia pomiformis	S/R		R
Brachythecium oxycladon	S		
Brotherella recurvans	R,S		S
Brotherella tenuirostris	R		
Bryoandersonia illecebra	S		S
Ctenidium molluscum			S
Dicranella heteromalla	S/R		S
Dicranum condensatum			S
Dicranum flagellare	Log	Log	
Dicranum fulvum	R		R
Dicranum montanum	L	Log	L,tree
Dicranum spurium			Soil
Dicranum scoparium	S/R	Rs	S
Diphyscium foliosum	S	S	
Ditrichum pallidum		S	S
Drummondia prorepens	QUE sp.	QUE sp.	COR FLO
Entodon macropodus	R		
Entodon seductrix	ACE RUB		
Eurhynchium pulchellum			S
Eurhynchium riparioides	R-stream		R-stream
Fissidens bryoides	R-stream		
Fissidens bushii	S		S
Fissidens cristatus	S		
Forrstroemia trichomitria	COR FLO		
Grimmia alpicola	Rs		
Grimmia pilifera	Rs		
Haplocladium virginianum	S/R		
Haplohymenium triste	ROB PSE		COR FLO

Mosses (cont.)	Warden Branch	Webb Mtn.	Matthew Creek
Hedwigia ciliare	Rs	Rs	
Homomallium adnatum	?R		
Hypnum imponens	S/R	Log	S
Isopterygium elegans			S
Isopterygium tenerum	S/R		
Isopterygiopsis muelleriana	R-shale		R
Leucobryum albidum	T-base	S	S
Leucodon julaceus		QUE PRI	
Mnium cuspidatum	S/R		
Mnium affine			
var. ciliare			S
Mnium punctatum			R
Orthotrichum ohioense	CAR sp.		
Plagiothecium denticulatum	S/R		
Platygyrium repens	Log, ACE	QUE sp.	Rs
Pogonatum pensilvanicum		S	S
Polytrichum commune	S		
Polytrichum ohioense	S	S	S
Ptychomitrium incurvum	Rs		
Rhynchostegium serrulatum	S	S	
Rhodobryum roseum		S	
Schwetschkeopsis fabronia	R		
Sciaromium lescurii	R-stream		R-stream
Sematophyllum demissum	Rs		Rs
Taxiphyllum cf. deplanatum	S		
Tetraphis pellucida	Log		S
Thelia hirtella	ACE RUB		
Thuidium delicatulum	R	S	S
Tortella humilis	QUE sp.	S	
Ulota crispa	CAR sp.	QUE sp.	COR FLO

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 13 December 1994

PERSONNEL: K.D. McFarland and Allen C. Risk

SITE(S): Field surveys of Webb Mountain, by access from Cobbly Knob, Pine Mtn. Road (2000 ft. elev.): 1) northwest portion of Matthew Creek up an unnamed branch west of Jones Gap Branch, 2) crossing the summit ridge onto the north side of Webb Mtn. into the origin of unnamed Branch flowing to Jones Cove, 3) east along northern boundary to Jones Gap and descended along Jones Gap Branch to 4) Matthew Creek.

Site 1. Access to Webb Mountain ridgeline and Jones Gap Branch along an unnamed first order branch that feeds into Matthew Creek. Vegetation similar to and typical of the south-facing aspect of Webb Mountain. Wooded slopes consist of Oak-Hickory (QUE spp., CAR spp.) and mixed pine (PIN PUN, PIN RIG, PIN VIR). Along the stream crease, is scattered rhododendron and mountain laurel (RHO MAX, KAL LAT). See habitat descriptions for Field Report 02 December 1994.

Site 2. The north side of Webb Mountain is well-drained with statuesque, open mesic forest of mature mixed hardwoods; principally Oak, Hickory, Yellow Poplar, Red Maple (QUE spp., CAR spp., LIR TUL, ACE RUB). Understory is open and scattered with rhododendron, striped maple, and sapling hemlock (RHO MAX, ACE PEN, TSU CAN).

Site 3. Jones Gap Branch is a first order tributary draining into Matthew Creek. Vegetation is similar to that of the upper watershed on the south side of Webb Mountain (see Site 1 description).

Site 4. Matthew Creek east toward Blackgum Gap is a permanently flowing stream, flanked by successional rhododendron and hemlock-hardwoods. The well-drained, dry, south-facing upslope woods shift rapidly to mixed oak-hickory-pine with mountain laurel, vaccinium, greenbrier scrub-shrub understory. The north-facing slopes are mesic of mixed hardwood-regenerating hemlock forest with rhododendron understory.

Bryophyte diversity and richness is greatest in and along the seams of the streams, becoming depauperate on dry slopes. The upper north slope of Webb Mountain is a mesic, maturing woodland with low habitat diversity for bryophytes due to the uniformity of the woodland. Matthew Creek supports a noticeably richer community of bryophytes in and along the stream due to persistent moisture, cool air drainage, and non-exposed aspect; but overall diversity is poor due to the disturbance history of logging, road, and trail access along the stream.

Taxa	First Drainage	N. Webb Mtn.	Jones Gap Branch	Matthew Creek
Liverworts				
Calypogeia fissa/neogaea		S		
Cephalozia catenulata	S			
Cololejeunea biddlecomiae	QUE PRI			
Diplophyllum apiculatum	Rs			
Frullania tamarisci ssp. asagrayana	Rs			
Jubula pennsylvanica			R-stream	R-stream
Leucolejeunea clypeata		Rs		
Lophocolea heterophylla			R-Stream	
Metzgeria crassipilis	QUE PRI			
Nowellia curvifolia				Log
Odontoschisma denudatum			Log	
Pallavicinia lyellii			Log	S
Porella platyphylloidea	COR FLO			
Riccardia multifida	R-Stream			R-Stream
Mosses				
Amblystegium				
Anomodon attenuatus		COR FLO	S/R	
Anomodon rostratus		LIR TUL		
Atrichum angustatum				S
Atrichum undulatum var. oerstedianum			S/R	
Aulacomnium heterostichum	COR FLO			
Bartramia pomiformis				S/R
Brachythecium plumosum			R-Stream	
Brachythecium salebrosum	T-base			
Brotherella tenuirostris		COR FLO		
Bryhnia novae-angliae			S/R	
Bryoandersonia illecebra	S	S	S/R	S
Campylium chrysophyllum				
Campylium hispidulum		ROB PSE	R-Stream	
Cryphaea glomerata			Tree	
Ctenidium molluscum		S		
Dicranella heteromalla				S
Dicranum flagellare	QUE PRI			
Dicranum fulvum				
Dicranum montanum	Log			
Dicranum scoparium	Rs			S
Dicranum viride		QUE PRI		
Diphyscium foliosum	S			
Drummondia prorepens	QUE sp.		ACE RUB	

Mosses (cont.)	First Drainage	N. Webb Mtn.	Jones Gap Branch	Matthew Creek
Eurhynchium riparioides			R-Stream	
Fissidens bryoides			R-Stream	
Fissidens cristatus			S/R	
Fissidens taxifolius		S/R		
Grimmia alpicola	Rs			
Haplohymenium triste		COR FLO	COR FLO	
Hedwigia ciliata	Rs			
Hygroamblystegium tenax	R-stream			
Hypnum imponens	S/R	Log	Rs, Log	Log
Isopterygium tenerum	S			
Leucobryum albidum	T-base	S		S
Leucodon julaceus	Tree	COR FLO		
Mnium affine var. ciliare	S	S		S
Mnium punctatum		R-Stream	R-Stream	
Neckera pennata			Tree	
Orthotrichum sp.		COR FLO		
Plagiothecium denticulatum	S			
Platygyrium repens	QUE PRI			
Pogonatum pensilvanicum				S
Polytrichum ohioense	S			S
Ptychomitrium incurvum	Rs			
Rhynchostegium serrulatum		T-base		S
Sciaromium lescurii				R-Stream
Tetraphis pellucida		Log		Log
Thelia hirtella	QUE sp.	CAR sp.		
Thuidium delicatulum	Log	S	S	S
Tortella humilis		T-base		
Ulota crispa	QUE sp.		Tree	

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 04 March 1995

PERSONNEL: D.K. Smith, K.D. McFarland, Paul G. Davison, Allen Risk

SITE(S): Field surveys of middle section of Foothills Right-of-Way: 1) Blackgum Gap (southeast of gap ca. 1/4 mile), 2) Branam Hollow Gap (north and south from road crossing), 3) Dunn Creek wetland of Rocky Flats Road.

Site 1. Blackgum Gap by access road through Cobbly Knob development. Survey beginning on the knob southeast of the gap (elev. 2000 ft.) and traversing southeasterly along the center line across two east-facing coves and over two ridges.

The ridgeline woods consist of dead, severely distressed or dying virginia pine (PIN VIR) and successional stages of chesnut oak (QUE PRI), blackgum (NYS SYL), red maple (ACE RUB), scattered hickory (CAR spp.), and hemlock (TSU CAN). Understory shrubs and small trees are more diverse than Webb Mountain: mountain laurel, rhododendron, deciduous leucothoe, huckleberry, greenbrier, blackgum, sourwood, hemlock, dogwood, red maple, striped maple, holly, buffalo nut (KAL LAT, RHO MAX, LEU REC, VAC spp., SMI spp., NYS SYL, OXY ARB, TSU CAN, COR FLO, ACE RUB, ACE PEN, ILE OPA, PYR PUB).

Cove woods consist of second-growth, mixed hardwood-hemlock: yellow poplar, red maple, oak, hickory, white pine, hemlock, dogwood, striped maple, and red spruce sapling! (LIR TUL, ACE RUB, QUE spp., CAR ssp., PIN STR, TSU CAN, COR FLO, ACE PEN, PIC RUB).

This section of the right-of-way is of well-defined floristic character not encountered elsewhere along the proposed path of the road. Despite the lack of permanently flowing water, the compressed ridge-valley, undulating topography with east-facing aspect supports a more diverse vegetation than Webb Mountain. The ridgeline woods are in a transitional stage from a pine-heath-dominated recovered woodland of good diversity; rapidly shifting toward an upland mixed hardwoods. The covelike hardwoods in the downslope areas have already achieved a stable canopy structure. Two mosses, in particular, are remnants of an originally rich mesic woods—*Pleurozium schreberi* and *Hylocomium brevirostre*. Both taxa are refugial in this site, more commonly occurring in the mid- to higher elevations of the main park domain. The presence of red spruce below 2000 ft. elevation is a somewhat unusual occurrence.

Red Spruce in right-of-way!

Site 2. At Branam Hollow Gap the right-of-way crosses Branam Hollow Rd. Surveys were conducted into the right-of-way on both the north and south sides of the road.

The north side right-of-way is a drier phase of the Blackgum Gap ridgeline forest; predominantly with a virginia pine-black gum, chestnut oak, red maple canopy (PIN VIR, NYS SYL, QUE PRI, ACE RUB) and understory with mountain laurel, rhododendron, greenbrier, huckleberry, holly, dogwood, tea berry, galax, hemlock, and hardwood saplings (KAL LAT, RHO MAX, SMI spp., VAC spp., ILE OPA, COR FLO, GAU PRO, GAL APH, TSU CAN). The vegetation changes markedly about 200 yds. north where virginia pine is sparse and dying; shrubby vegetation

dominates as a thicket of mountain laurel, scattered rhododendron, leucothoe, sourwood, huckleberry, greenbrier (KAL LAT, RHO MAX, LEU REC, OXY ARB, VAC spp., SMI ssp.) and diffuse, open stand, regenerant black gum and chestnut oak (NYS SYL, QUE PRI).

One red spruce seedling, and one red spruce sapling were recorded. Bryophyte diversity very low; indicating a high degree of disturbance.

The woodland on the south side of Branam Hollow Gap is more mesic hemlock-hardwood forest with overall bryophyte diversity similar to the north side of Branam Hollow Rd.

Site 3. Survey conducted on west side of Rocky Flat Rd. in Dunn Creek floodplain. The floodplain site is centered where Dunn Creek and an unnamed spur branch (to the west) join. A treeless powerline right-of-way crosses the proposed road right-of-way. A delapidated stacked stone wall divides the floodplain woods; to the south as a youthful regenerating yellow poplar-mixed hardwood forest (LIR TUL, BET LEN, CAR CAR, ACE RUB, ROB PSE, TSU CAN) of abandoned pasture; to the north as an older growth mixed hardwood-rhododendron stand (RHO MAX) and hemlock-pine (TSU CAN, PIN VIR) boggy woods along the apron of Dunn Creek.

Bryophyte diversity and cover rich due to the compression of habitats: the lower end boggy woods, regenerating hardwoods, streamside (rupestral) habitats, disturbed power line swath, east-facing wooded slopes, and stacked rock walls.

Taxa	**Blackgum Gap**	**Branam Hollow**	**Dunn Creek**
Liverworts			
Bazzania trilobata		ACE RUB	S
Calypogeia fissa/neogaea	S	S	
Calypogeia muelleriana			S
Calypogeia sullivantii	S,R		
Cephalozia catenulata	Log		Log
Cephalozia lunulifolia	S		S
Cololejeunea biddlecomiae	CAR sp.		ILE OPA
Diplophyllum apiculatum		S	
Frullania brittoniae	NYS SYL		
Frullania eboracensis	QUE PRI	ACE RUB	LIR TUL
F. eboracencis ssp. virginica		ACE sp.	
Frullania ericoides	ACE RUB	NYS SYL	COR FLO
Frullania tamarisci ssp. asagrayana	QUE PRI	QUE PRI	
Frullania sp.		ILE OPA	LIR TUL
Jamesoniella autumnalis	S		
Jubula pennsylvanica			R-stream
Kurzia sylvatica			S
Lejeunea ulicina		QUE PRI	RHO MAX
Lejeunea ruthii			RHO MAX
Leucolejeunea clypeata			RHO MAX
Lophocolea heterophylla	ROB PSE		Log
Metzgeria conjugata	ROB PSE		Rs

Liverworts (cont.)	Blackgum Gap	Branam Hollow	Dunn Creek
Metzgeria crassipilis	ACE RUB	QUE PRI	Rs
Metzgeria cf. furcata			RHO MAX
Metzgeria myriopoda (form)	CAR sp.		
Nowellia curvifolia	Log	Log	Log
Odontoschisma denudatum	Log		
Plagiochila asplenioides ssp. porelloides			SR-stream
Porella pinnata			R-stream
Porella platyphylloidea	NYS SYL	ACE RUB	LIR TUL
Radula cf. australis	COR FLO	COR FLO	
Radula mollis			BET LEN
Radula obconica			Rs
Radula sp.	CAR spp.	ACE RUB	
Riccardia jugata	Log		
Trichocolea tomentella			S

Mosses			
Amblystegium serpens		NYS SYL	
Anacamptodon splachnoides	COR FLO		ACE RUB
Anomodon attenuatus	NYS SYL	ACE RUB	ROB PSE
Anomodon rostratus	ACE RUB	CAR spp.	CAR CAR
Atrichum undulatum var. oerstedianum			S
Aulacomnium heterostichum	T-base	T-base	
Bartramia pomiformis	T-base		
Brachythecium oxycladon	S		
Brachythecium plumosum			Rs
Brachythecium rutabulum			?Rs
Brotherella tenuirostris	T-base, S	NYS SYL	T-base
Bryoandersonia illecebra	ACE RUB	Log	Rs
Bryum capillare			S/R
Campylium chrysophyllum	NYS SYL		
Campylium hispidulum	S		
Climacium americanun var. kindbergii			S
Cryphaea glomerata		NYS SYL	LIR TUL
Ctenidium molluscum	S		S
Dicranum flagellare	Log	NYS SYL	
Dicranum montanum	QUE PRI	PIN VIR	
Dicranum scoparium	S	S	
Dicranum viride		QUE PRI	
Ditrichum pallidum	S		
Drummondia prorepens	QUE PRI	NYS SYL	
Entodon macropodus			Rs
Entodon seductrix			Rs
Eurhynchium hians	S		S/R

Mosses (cont.)	Blackgum Gap	Branam Hollow	Dunn Creek
Fissidens cristatus	T-base		T-base
Fissidens subbasilaris	COR FLO		T-base
Fissidens taxifolius			S
Fissidens	ROB PSE		
Forrstroemia trichomitria		ACE RUB	COR FLO
Grimmia alpicola			Rs
Grimmia alpicola var. rivularis		R-stream	
Haplohymenium triste	QUE PRI	NYS SYL	LIR TUL
Hedwigia ciliare			Rs
Heterophyllium affine	Rs	S	
Hylocomium brevirostre	T-base	QUE PRI	
Hypnum imponens	Log, S	Log	
Hypnum lindbergii		S	
Hypnum pallescens		T-base	
Isopterygium elegans			S
Isopterygium tenerum	S	ACE RUB	
Isopterygium	TSU CAN		
Leskea gracilescens			T-base
Leucobryum albidum	S	S	S
Leucodon julaceus	QUE PRI	NYS SYL	
Mnium affine			
var. ciliare			S
Mnium cuspidatum	T-base		S/R
Mnium hornum			S
Neckera pennata			ACE RUB
Orthotrichum (scrap) sp.	NYS SYL		
Platygyrium repens	QUE PRI	NYS SYL	Log
Pleurozium schreberi	S		
Pogonatum pensilvanicum	S		
Polytrichum commune			S
Polytrichum ohioense	S		
Racomitrium aciculare			R-stream
Rhynchostegium serrulatum	S		
Sematophyllum demissum			Rs
Sematophyllum marylandicum			?R-stream
Tetraphis pellucida	Log		S
Thelia hirtella	NYS SYL	ACE RUB	LIR TUL
Thuidium delicatulum	S	S	
Tortella humilis	T-base		COR FLO
Ulota crispa	QUE PRI	ILE OPA	LIR TUL

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 24 March 1995

PERSONNEL: D.K. Smith, K.D. McFarland

SITE(S): Field surveys of the eastern and middle section of Foothills Right-of-Way: 1) Right-of-way terminus at Cosby Creek Floodplain, 2) Waters Cemetery Road, 3) Spring Branch wetland of Rocky Flats Road.

Site 1. Cosby Creek floodplain accessed from jct. with Jones Cove Rd., from the streamside west across floodplain community (elev. 1350 ft.).

The streamside and floodplain is highly disturbed secondary woods successional from abondoned farm use. Canopy consists of mixed riverine hardwoods: yellow poplar (LIR TUL), sycamore (PLA OCC), sweet gum (LIQ STY), hop hornbeam (CAR CAR), blackgum (NYS SYL), box elder (ACE NEG), red maple (ACE RUB), scattered buckeye (AES FLA), black locust (ROB PSE), green ash (FRA AME), black walnut (JUG NIG), black cherry (PRU SER), hickory (CAR spp.), and hemlock (TSU CAN). Understory shrubs and small trees are scattered within the open parkland aspect consisting of dogwood (COR FLO), cedar (JUN VIR), spicebush (LIN BEN).

Bryophyte diversity poor on the floodplain due to the highly disturbed nature of recovering field and pasture setting; along the edge of Cosby Creek, bryophytes more abundant and typical of riparian sites, similar to Webb Creek confluence to Little Pigeon River on the Pittman Center end of the right-of-way.

Site 2. Chavez Rd. off of Jones Cove Rd., onto Waters Cemetery Rd. Dry east facing slopes of secondary forest in transition from old field lower slopes to upper slopes with virginia pine declining and mixed hardwoods-hemlock reclaiming upper slopes. Forest consists mainly of: virginia pine (PIN VIR), chestnut oak (QUE MON), yellow poplar (LIR TUL) box elder (ACE NEG), black cherry (PRU SER), sweet gum (LIQ STY), red maple (ACE RUB); understory sparse and poorly recovered from land use as hillside pastures.

Bryophyte cover and diversity very poor and weedy.

Site 3. Spring Branch floodplain (including unnamed spur) consists of a regenerating hemlock-hardwood-rhododendron low woods along the streams (TSU CAN, LIR TUL, RHO MAX) and scattered white pine, dogwood, and birch (PIN STR, COR FLO, BET LEN) with remnant successional sourwood (OXY ARB).

Megaceros aenigmaticus an extremely rare, restricted endemic hornwort occurs in both streambeds of the Spring Branch drainage. This species globally is known only to occur in the Blue Ridge Province of the southern Appalachians from Slick Rock Creek, NC; Tellico River drainage, TN; and Great Smoky Mountains National Park.

Survey was continued east along the right-of-way up Spring Branch approximately 1/2 mile through bottomland woods returning into old fields and pastures of abandoned homesteads. Forest structure consists of mixed hemlock-hardwoods with understory of scattered rhododendron,

mountain laurel, dogwood, and holly. Centerline stake C/L 20565 +50 marks the location of one stray Fraser fir (*Abies fraseri*) sapling at six feet in height.

Bryophyte cover and diversity low.

Taxa	Cosby Floodplain	Waters Cemetery	Spring Branch
Liverworts			
Bazzania trilobata			S
Calypogeia fissa/neogenae			S
Cephalozia lunulifolia		Log	
Conocephalum conicum	S-stream		
Dumortiera hirsuta			R-stream
Frullania asagrayana			RHO MAX
Frullania sp.	CAR CAR	ACE RUB	
Jubula pennsylvanica			R-stream
Lejeunea latevirens			RHO MAX
Leucolejeunea clypeata	AES FLA		
Lophocolea heterophylla		Log	
Megaceros aenigmaticus			R-stream
Metzgeria myriopoda (form)		ACE RUB	
Metzgeria sp.	AES FLA	ACE RUB	PRU SER
Metzgeria sp.	CAR CAR		
Nowellia curvifolia		Log	OXY ARB
Odontoschisma denudatum			S
Pallavicinia lyellii			S
Pellia epiphylla			S
Plagiochila asplenioides			R-stream
Porella pinnata.	R-stream		R-stream
Porella platyphylloidea	FRA AME		ACE RUB
Radula sp.	COR FLO		
Radula sp.	Rs		
Riccardia sp.			R-stream
Trichocolea tomentella			S
Mosses			
Anacamptodon splachnoides		Log	
Anomodon attenuatus	Rs	Rs	ACE RUB
Anomodon rostratus	COR FLO		Log
Atrichum angustatum		S	S
Atrichum undulatum var. oerstedianum	S-stream		S
Aulacomnium heterostichum		S	S
Brachythecium oxycladon	T-bases	LIR TUL	
Brachythecium rivulare	R-stream	S-seep	
Brachythecium salebrosum	S-stream		Log

Mosses (cont.)	Cosby Floodplain	Waters Cemetery	Spring Branch
Bryoandersonia illecebra	Rs		S
Campylium chrysophyllum		Rs	
Campylium hispidulum	COR FLO		
Clasmatodon parvulus	JUG NIG		
Climacium americanun var. kindbergii	S-stream		
Cryphaea glomerata	COR FLO		
Ctenidium molluscum			S
Dicranum flagellare		Log	
Dicranum scoparium		S	S
Ditrichum pallidum		S	
Entodon seductrix	CAR CAR	ACE RUB	
Eurhynchium hians	S-stream	S-seep	S-stream
Forrstroemia trichomitria			ULM ALA
Grimmia alpicola var. rivula	Rs		
Haplohymenium triste	COR FLO	ACE RUB	ACE RUB
Hedwigia ciliata	Rs		Rs
Homalotheciella subcapillata	ACE NEG		
Hygroamblystegium tenax			R-Stream
Hypnum imponens		Log	Rs
Leptodictyum riparium		S-seep	
Leskea gracilescens	COR FLO		
Leucobryum albidum		S	S
Leucodon julaceus	ACE NEG		COR FLO
Mnium affine var. ciliare	S-stream		S
Mnium punctatum			R-stream
Mnium cuspidatum	S	Log	
Orthotrichum (scrap) sp.	CAR CAR		
Platygyrium repens	Rs	LIR TUL	Wood
Pogonatum pensilvanicum		S	
Polytrichum commune			S
Pylaisiella	ACE NEG		
Rhynchostegium serrulatum	S		
Schwetschkeopsis fabronia			OXY ARB
Sciaromium lescurii			R-stream
Sematophyllum adnatum			RHO MAX
Sematophyllum demissum	S-stream		
Tetraphis pellucida		Log	Log
Thelia hirtella		ACE RUB	COR FLO
Thuidium delicatulum	PRU SER	T-base	S
Tortella humilis		Rs	
Ulota crispa	PRU SER	ACE RUB	OXY ARB

FIELD REPORT
COSBY-PITTMAN CENTER FIELD INVENTORY

DATE: 07 April 1995

PERSONNEL: D.K. Smith, K.D. McFarland

SITE(S): Field surveys of the eastern and middle section of Foothills Right-of-Way: 1) Big Ridge, Cocke Co., from Indian Camp Creek to Sandy Hollow Branch, and 2) Dunn Creek, Sevier Co. wetland of Rocky Flats Road.

Site 1. This section of the right-of-way is located along the western edge of Cocke County. The section is directed mostly S–N along the ridge, with centerline located on the western side of the divide. Access was from Indian Camp Creek Road onto Costner Road onto the ridge by newly cut access for development (elevation 2200 ft.). The west-facing watershed, flowing toward Jones Cove was traversed along and near centerline; then returning along the east-facing watershed of Sandy Hollow Branch.

The ridge top divide consists of declining pitch pine (PIN RIG) mixed with chestnut oak, hickory, black gum, and red maple (QUE PRI, CAR spp., NYS SYL, ACE RUB); understory of low-bush blueberry (VAC VAC) and scattered mountain laurel, greenbrier, rhododendron, leucothoe, sourwood (KAL LAT, SMI spp., RHO MAX, LEU REC, OXY ARB); herb layer of patchy ericaceous ground cover and galax (EPI REP, GAL APH). West-bearing spur ridges consist of north-facing slopes of rhododendron (RHO MAX) and south-facing slopes of pine-oak-hickory-gum transitional forest (PIN RIG, QUE MON, CAR spp., NYS SYL) and heath-greenbrier shrubby understory (KAL LAT, RHO MAX, LEU REC, SMI spp.).

Sandy Hollow Branch is a permanently flowing stream that heads on the east slope of Big Ridge and flows north through the right-of-way, then bends east through private land into Indian Camp Creek. Steep east-facing slopes are dominated by hemlock (TSU CAN) with scattered white pine (PIN STR) and a few mixed hardwoods, yellow poplar, red maple, dogwood, holly (LIR TUL, ACE RUB, COR FLO, ILE OPA). Sandy Hollow Branch and floodplain is a successional hardwood forest to previous agrarian and spirit-making use with yellow poplar, red maple, box elder (LIR TUL, ACE RUB, ACE NEG), scattered white oak, black birch, dogwood (QUE ALB, BET LEN, COR FLO) and several persisting fruit trees. The upper watershed is constricted to the stream and adjacent mixed hardwoods on slopes.

Site 2. The Dunn Creek wetland is described in Field Report March 1995.

The emphasis of the return visit to the Dunn Creek was to search for *Sphagnum sp.* reported by Larry Pounds to exist in boggy sites near the north boundary line on the west side of Rocky Flats Rd. Both the north and south boundary lines were inspected along with the interior woods and Dunn Creek floodplain. No *Sphagnum* was discovered. The boggy areas are dominated by *Polytrichum commune, Thuidium delicatulum,* and *Climacium americanum* var. *kindbergii*; the latter taxon exhibiting an erect, tufted growth habit that is sphagnum-like in appearance during annual growth periods.

Taxa	Big Ridge Divide	Sandy Hollow	Dunn Creek
Liverworts			
Bazzania trilobata		T-base	S
Calypogeia fissa/neogenae		S	
Calypogeia muelleriana	R-stream		
Cephalozia lunulifolia		Log	
Conocephalum conicum		S	
Dumortiera hirsuta			Rs-Stream
Frullania asagrayana	QUE PRI	ACE RUB	
Frullania kunzei	?Rs		
Frullania sp.	NYS SYL	COR FLO	
Jamesoniella autumnalis	Rs		
Jubula pennsylvanica		Rs-Stream	Rs-Stream
Lejeunea ruthii		COR FLO	
Lejeunea laetevirens	Rs		
Leucolejeunea clypeata		ACE RUB	
Lophocolea heterophylla		Rs	
Metzgeria sp.	QUE PRI	LIR TUL	
Metzgeria myriopoda (form)	ACE RUB	ACE RUB	
Nowellia curvifolia	Log	Log	Log
Odontoschisma denudatum		Log	
Pallavicinia lyellii		S	
Plagiochila asplenioides		Rs-Stream	
Porella pinnata			Rs-Stream
Porella platyphylloidea		COR FLO	COR FLO
Radula sp. (gemmiparous)	LIR TUL		
Radula sp. (non-gemm)		COR FLO	
Riccardia jugata		Log	
Riccardia sp.		Rs-Stream	
Trichocolea tomentella			S
Mosses			
Anomodon attenuatus		COR FLO	Rs
Anomodon rostratus		T-base	LIR TUL
Atrichum angustatum	S		S
Atrichum undulatum var. oerstedianum	S	S	S
Aulacomnium heterostichum	S/R	Rs	S
Bartramia pomiformis		Rs	
Brachythecium oxycladon		S	
Brachythecium rivulare		Rs-Stream	
Brotherella tenuirostris	QUE PRI	Log	
Brotherella recurvans	RHO MAX		
Bryoandersonia illecebra	QUE PRI	S	S/R
Campylium chrysophyllum		Rs	
Campylium hispidulum	??		

Mosses (cont.)	Big Ridge Divide	Sandy Hollow	Dunn Creek
Climacium americanun var. kindbergii			S
Cryphaea glomerata	NYS SYL	COR FLO	
Dicranum flagellare	QUE PRI		
Dicranum fulvum	Rs		
Dicranum montanum	Log	Log	
Dicranum scoparium	S	S	S
Dicranum viride		LIR TUL	
Ditrichum pallidum	S		
Drummondia prorepens	QUE PRI		LIR TUL
Entodon macropodus			Rs
Entodon seductrix			S/R
Eurhynchium hians		Rs	
Eurhynchium riparioides		Rs-Stream	
Fissidens appalachensis		Rs-stream	
Fissidens cristatus			S
Fontinalis novae-angliae			Rs-Stream
Forrstroemia trichomitria			ACE NEG
Haplohymenium triste	NYS SYL	COR FLO	COR FLO
Hedwigia ciliata	Rs		Rs
Hygroamblystegium tenax		Rs-Stream	
Hypnum fertile	?Log		
Hypnum imponens	Log	Log	Log
Hypnum lindbergii		S	
Leskea gracilescens		COR FLO	
Leucobryum albidum	S	S	
Leucodon julaceus	NYS SYL	BET LEN	LIR TUL
Mnium affine var. ciliare		S	S
Mnium punctatum	Rs-Stream	Rs-Stream	Rs-Stream
Mnium cuspidatum	T-base		S/R
Plagiothecium cavifolium		Rs	
Platygyrium repens	QUE PRI	Log	Rs
Pogonatum pensilvanicum	S		
Polytrichum commune		S	S
Polytrichum ohioense	?S		
Polytrichum pallidisetum	S		
Ptychomitrium incurvum		Rs	
Pylaisiella		BET LEN	
Racomitrium aciculare			Rs-Stream
Rhynchostegium serrulatum		S	
Rhodobryum roseum		Rs	
Sciaromium lescurii	Rs-Stream	Rs-Stream	
Sematophyllum demissum	Rs-Stream	Rs-Stream	
Tetraphis pellucida	Log		
Thelia hirtella	QUE PRI	COR FLO	NYS SYL
Thuidium delicatulum	S	S	S
Ulota crispa	QUE PRI	ACE RUB	

Appendix I

WETLANDS SURVEY FIELD NOTES

Barbara Rosensteel
JAYCOR
Oak Ridge, Tennessee

August 1995

FIELD NOTES FROM THE FOOTHILLS PARKWAY WETLAND SURVEY

Survey notes by Barbara Rosensteel, JAYCOR, Oak Ridge, Tennessee.

Field observations were made in 1994 and 1995. These notes are transcribed with minimal editing.

MAY 1994

Date: May 18, 1994
Weather: Clear, temperature 50's in morning, increasing to mid-70s by afternoon

Site: Webb Creek tributary—small area located on the north side of Rt 321 (by Tuckaleechee Cavern sign) *(1995 note: this area has been identified on the 4/95 version NPS ROW maps.)*

A Webb Creek tributary flows from mountain and splits into two flows across level area at base of hill. The level area has been disturbed in the past. The vegetation community is a post-disturbance community dominated by old field grasses, forbs, and vines, multiflora rose, a few black walnut. Vegetation in the stream riparian zone is dominated by rhododendron, hemlock, also ironwood. One branch of the stream split spreads across what was a roadbed or other graveled, hardened surface. An herbaceous wetland has formed in this area. The flow then continues over the "roadbed" bank into a wider wetland area. The shape of the wetland and the amount of water in it suggests that this wetland probably also receives groundwater inputs. The surface of the wetland was either completely saturated and/or covered with water to various depths (one to several inches). The other channel follows along the base of the hill which forms the northern boundary for the wetland area. All the surface water from the wetland drains into this hillbase channel to form a single channel that continues through the area and exits at a culvert under Rt 321.

Wetlands also occur along the length of the stream in a narrow, riparian band between the stream edge and a moderate bank (1–2 foot elevation difference). The stream widens out a little bit again just before the culvert into an open, emergent wetland (roughly 40 × 75 feet).

Soil Borings: In the area where the water first spreads out across the level area, I hit resistance at about 10 inches with the soil auger. This and the landscape are what suggests that an old road or similar surface was once here. The soil on top of this hard layer, however is a black muck, very silty and highly organic.

The soil in the lower part of the wetland has 10YR 4/1 (dark gray), 10YR 5/1 and 10YR 6/1 (gray) matrix with either "common, faint" or "prominent, many" mottles or 7.5YR 4/6 and 7/5YR 5/8 (strong brown). The soil is a sandy, silt loam.

The upland soil near the stream was a 10YR 4/3 (brown) sandy loam; rocky area.

Also, in the upland field between the wetland and the stream the soil was a 10YR 5/4 (yellowish brown) with no mottles. The soil was dry and crumbly.

Vegetation:

The dominant vegetation in the wetlands include *Glyceria striata* (fowl manna grass), *Carex scabrata* (rough sedge), *Impatiens capensis* (spotted jewelweed), sneezeweed (*Helenium* sp.), *Carex crinita* (fringed sedge), hazelnut, privet (*Ligustrum vulgare*), and ironwood also in the stream riparian zone. In the uplands there were hemlock and rhododendron and tulip poplar and flowering dogwood (along stream), multiflora rose, black walnut, raspberry, goldenrods (not flowering yet), VA creeper, wild grape, golden aster, *Dicanthelium* sp., other grasses,

There were other species that I could not identify because they were not flowering yet and others that I could not remember the ID. Included in this category was a vine that covered the ground nearer the stream (but still in the upland). It had heart-shaped leaves with the top of the heart being deeply cleft.

Rocky Flats Area (Dunn Creek)

West of Rocky Flats Road: Two streams, typical mountain streams (i.e., rock-bottomed; fast, clear water). The land slopes up quickly on the sides of the streams and there are no wetlands associated with these streams in this area. The species in the riparian areas include hemlock and rhododendron, red maple and ironwood (all dominants). The upland areas between the two streams are second-growth hardwoods, although there are many larger tulip poplars and numerous hemlock saplings. Surprisingly, I did not find Japanese honeysuckle in this area.

There are wetland pockets associated with seeps in the downstream portion of the Carson Branch *(1995 note: By "downstream portion" I mean a short stretch of the bottomland located just upstream of the area in which we park; it does not mean that portion of the stream that we surveyed on April 26, 1995)*. Adjacent to these seep wetlands are areas where the top several inches of soil have a lighter chroma (>2), but within 10–12 inches, a gray 1 or 2 chroma soil with common, prominent mottles is found. Upstream, the level bottom supports a forested, riparian wetland. These wetlands are small, being present only in the level areas adjacent to the stream. The wetland receives stream overflow and groundwater from seeps. Functionally, the entire bottom is a wetland (i.e., C and N transformations and export, wildlife habitat).

The wetland soils are: Groundwater seep wetland: 10YR 3/1 (very dark gray) with common, prominent 5YR 4/6 (strong brown) mottles and oxidized root channels. Very fine gravelly silt. The soil in the upstream wetland includes a black silt loam (1 chroma), a 10YR 4/1 (dark gray) and 5/1 (gray) clayey silt loam with 7.5YR 4/6 common, prominent mottles.

Species include *Carex crinita, microstegium,* jewelweed, cinnamon fern, VA creeper, smooth alder, hog peanut, an unid. grass, an unid. violet (marsh blue violet?). Surrounding upland species include rhododendron, hemlock, (and others) Need to return to better map the wetlands and better vegetation description.

APRIL 26, 1995

<u>Cosby Creek section—Sheet 17</u>

Dominant vegetation species in the floodplain and floodplain terrace (not a complete list; some species could not be identified because they were not flowering)

Trees:

Sweetgum (*Liquidambar styriciflua*; FAC)
Ironwood (*Carpinus caroliniana*: FAC)
Buckeye (*Aesculus* sp.; depends on species) [mostly seedlings or small saplings]
Red maple (*Acer rubrum*; FAC)
Tulip poplar (*Liriodendron tulipifera*; FAC)

Shrubs:

Spicebush (Lindera benzoin; FACW)

+Rose (probably multiflora rose; *Rosa multiflora*; not listed)

Herbaceous:

*Jewelweed (*Impatiens capensis*; FACW)

+Microstegium (*Eulalia viminea*; FAC+) [also called Nepal microstegium and Japanese grass]

Allium sp. (depends on species)

Lady's thumb (*Polygonum persicaria*; FACW)

+*Corn salad (*Valerianella olitoria*; not listed) [also called lamb's lettuce]

+*Sandwort (probably thyme-leaved, *Arenaria serpyllifolia*; FAC)

+Star-of-Bethlehem (*Ornithogolum umbellatum*; FACU+)

Bedstraw (*Galium* sp.; depends on species)

* Dominant and/or commonly occurring

+ Not native

Several soil samples were examined. Generally, the floodplain soil has a surface layer of sand underlain (below 2–3 inches) with a dark brown (10YR 3/4) very sandy loam.

PHOTO 1-11 Cosby Creek floodplain. View northwest (340°)

<u>There are no wetlands in the Cosby Creek floodplain section.</u>

<u>**Ogle Springs Branch/Rocky Flats Area**</u>—Sheet 13

Carson branch tributary of Ogle Springs Branch. (We called it Stonewall Branch because of the stone wall than parallels the stream in the middle reach.)

May 18, 1994: Surveyed upstream part of this stream, beginning at our parking place on the gravel access road at the park boundary and proceeding upstream.

In this reach,the stream is located in a narrow "ravine" between steep sideslopes. There are numerous seeps along the stream and near the base of the sideslopes. The high water table in the seep areas is the hydrologic source for wetlands in the riparian zone. There is an interspersion of wetland and non-wetland, the distinguishing difference being the lack of hydric soil indicators within the top 10 inches of the soil profile and lack of hydrologic indicators (i.e., soils not saturated; No free water seeping into or filling the soil borings; No standing surface water; No scour marks, drift lines, surface drainage patterns, etc.) in the non-wetland areas. The non-wetland areas, however, are small areas interspersed between the numerous seeps that form the wetlands. Another way of saying it would be to call the area a wetland/upland mosaic, with, in this case, most of the area in wetland. The entire bottomland area in the upper reach of this stream can be classified as a Palustrine Forested Broad-leaved Deciduous (PFO1) wetland (Carson Branch wetland area 1 on map).

The wetland soils include a black (1 chroma) silt loam and a dark gray (10YR 4/1) clayey silt loam with prominent mottles (strong brown; 7.5YR 4/6). The soil was saturated and at the seeps there was ponded or very slowly flowing water.

Species: include red maple (*Acer rubrum*; FAC), smooth alder (*Alnus serrulata*; FACW+), hog peanut (*Amphicarpaea bracteata*; FAC), fringed sedge (*Carex crinita*; FACW+), jewelweed, microstegium, *Viola* sp.(not sure of species; perhaps Larry would know), cinnamon fern (*Osmunda cinnamonea*; FACW+), Virginia creeper (*Parthenocissus quinquefolia*; FAC), and lady's thumb.

April 27, 1995—Downstream section from "parking spot" to the right-of-way boundary. Wetland areas were identified in the riparian zone in spring and seep areas.

There are three wetland areas in this reach of the stream. All receive hydrologic inputs from springs and/or seeps. In the second wetland, part of the wetland is within the stream channel where a spring channel joins the main stream. Otherwise the wetlands are within the riparian zone of the stream, but not in the main channel of the stream. Wetland areas 2 and 3 can be classified as palustrine persistent emergent (PEM1) wetlands because they are dominated by herbaceous species, but they are surrounded by forest land. Wetland area 4 is a scrub-shrub wetland. It contains many herbaceous species but has greater than a 50% areal coverage of shrubs and saplings.

1. Carson Branch wetland area 2. This is a seep area. Since it is difficult to locate such small areas on the large scale maps available to us, I will try to make reference to nearby features of markers if they can be found. In this case, the wetland is located downslope of road markers 20556 +28.19 and 20557 +50. The wetland location and boundary is approximate on the map.

   The wetland soils are saturated. They consist of a dark gray (10YR 4/1) very silty loam with oxidized root channels and common, prominent, strong brown mottles. Vegetation species include sweetflag (*Acorus calamus*; OBL), leafy bulrush (*Scirpus polyphyllus*;OBL), fringed sedge, cinnamon fern, *microstegium*, poison ivy (*Toxicodendron radicans*; FAC), elderberry (*Sambucus canadensis*; FACW-), smooth alder, ironwood, violet, small-flowered crowfoot (*Ranunculus abortivus*; not listed), and an unidentified sedge.
2. Carson Branch wetland area 3. Approximately 150 feet upstream from the centerline a PEM1 wetland is located in the stream riparian zone on the upstream side of a spring on the east side of the stream. The spring is at the head of a shallow channel. Soil in the wetland is gray (1 chroma) and grayish brown (2 chroma) with mottles, similar to the soil in wetland 2. Species include fringed sedge, unidentified sedge (bulrush form), an unknown fern, violet, *microstegium*, one alder and one elderberry at stream edge. The soil is saturated, but the area does not have the standing or surface water found in wetland 2. The wetland ends at the head of the spring channel which is approximately 70 feet upstream from the centerline.
3. Carson Branch wetland area 4. A hundred feet or so downstream of the centerline there is a spring at the head of a channel that parallels the stream for a short distance, then empties into the stream. The channel is separated from the main stream by an upland berm. The wetland area begins at the head of this spring channel and continues into the area at the stream confluence. At the confluence the wetland widens to include seep areas in the riparian zone. The soil in the wetland is a dark gray (10YR 4/1) sandy silt with mottles. Species include sweetgum, red maple, ironwood, spicebush, alder, spotted joepyeweed (*Eupatoriadelphus maculatus*; FACW-), fringed sedge, jewelweed, violet (species undetermined), other sedges.

PHOTOS

Photo 1-8 Seep wetland number 4 on Carson Branch where the spring channel meets with the stream channel. View looking upstream.

Quiktake photo 1: Seep wetland 2 looking upstream. Note sedges, alder, sweetflag.

Ogle Springs Branch—Sheet 13

The mainstem of Ogle Springs Branch and a tributary (no name but we can call it west branch) flow through this portion of the ROW. Both streams are boulder and stone bottom "mountain" streams. The vegetation on top of the banks and in the riparian zone is predominantly rhododendron (*Rhododendron maximum*; FAC-) and hemlock (*Tsuga canadensis*; FACU). The banks are steep and the channel relatively deep, so that the riparian zone is not at the same elevation as the normal stream water level. The seeps that occur in the riparian zone of the shallow-banked Carson Branch do not occur along the steeper-banked, deeper channel Ogle Springs Branch and west branch. Therefore, no wetlands have developed along Ogle Springs Branch or its tributary in the reach that is within the ROW. (Joyce Dickerman may have taken some photos of these streams)

Dunn Creek—Sheet 12

The Dunn Creek area was surveyed on May 18, 1994. A seep area located by Larry Pounds near the ROW boundary was visited on April 27, 1995.

Dunn Creek and a tributary are located in the valley bottom west of Rocky Flats Road. Both streams are boulder and stone-bottomed. The banks are rocky and steep. They are within a forest dominated by hemlock, red maple, tulip poplar (*Liriodendron tulipifera*; FAC), ironwood (*Carpinus caroliniana*; FAC), rhododendron, and witch hazel (*Hamamelis virginiana*: FACU), jack-in-the-pulpit (*Arisaema* sp.), rattlesnake fern (*Botrychium virginianum*; FACU), Virginia creeper, violets. Found a few lady's slippers growing here. Lady's slipper (*Cypripedium acaule*) is state-listed species.

Seep Area at northwest edge of ROW adjacent to Rocky Flats Road in Dunn Creek Area:

Several seeps are located here and form an emergent (PEM1) wetland. The area drains offsite (e.g., off of the ROW). The soil in the wetland is a dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) organic very silty loam. Strong brown mottles. In one small area there is an impenetrable layer at about 10 inches. Could be an old road bed or old concrete pad, or a large boulder.

Area was saturated and there was ponded water and water slowly flowing across the surface. Vegetation included sweetgum, red maple, sycamore, elderberry, willow in the shrub/sapling layer and *Sphagnum*, spotted joepyeweed, sedges, cinnamon fern, violet, *Juncus* sp. in the herbaceous layer. There were several other species that I could not identify due to small size or lack of flowers. Larry might have a more complete list, and this area might be mentioned in the last report.

Photos:

Quiktake 2—View of wetland, direction 160° (southeast)

1-7: same as Quiktake 2 photo

Quiktake 3: View of wetland, direction southwest

1-6: same as Quiktake 3 photo

1-5: Seep area that is definitely within the park boundary and that is connected to the wetland in photos 1-7 and 1-6.

Photos taken last year of Dunn Creek.

Webb Creek Area—Sheet 4

Viewed from vehicle and from road. The new (?) alignment crosses a pasture on the west side of the creek. The pasture is at a higher elevation than the stream, which has steep, multiflora rose-covered banks. Could see no indication of wetland presence (was looking for low areas near stream, depressions in field, patches of sedges, rushes, or other wetland species). There appears to be no wetlands in the centerline area, nor to the south of the centerline where the elevation

increases from that at the centerline. It is possible that there is a wet meadow (emergent wetland) nearer to the northern edge of the ROW in pastures and woods behind the house and barn (near the western edge of sheet 4. There is a possibility that wetland areas may exist within this area especially in the low elevation areas behind the house and along the small stream on the edge of the area; But I have no idea what this area looks like and there is as good a possibility that there are not wetlands there. This was not one of the priority areas given by Murray.

No photos taken.

Little Pigeon River—Sheet 1

The Little Pigeon River has a broad, level floodplain in this section. The vegetation communities include a meadow-like area with an open canopy of black walnut, sweetgum, elm and ash. The herbaceous layer is dominated by grasses, multiflora rose, and *Phacelia purshii* (Miami mist; I cannot find this listed in the Reed document for Tennessee). The floodplain and floodplain terraces also support forested areas that have a dense understory of ironwood saplings, Japanese honeysuckle (*Lonicera japonica*; FAC-), multiflora rose, flowering dogwood (*Cornus florida*; FACU), American holly (Ilex opaca; FAC-), and hemlock saplings.

The floodplain soil is generally a dark brown (10YR 3/3) silty sand. There are two zones to the floodplain. One is at a slightly higher elevation set back from the stream that appears to be flooded very infrequently (or never)(perhaps it is in the 500 year floodplain?). The other zone is within 200 to 300 feet of the river and appears to be regularly (probably seasonally) flooded. There are backchannels formed by floodwaters, drift and wrack lines (some up in the tree branches several feet from the ground), areas of soil deposition and soil scouring, etc. Although these areas are flooded, the flooding is very flashy with rapid changes in water level. There are no seeps in the floodplain so these areas are wet only during the flooding phase and perhaps for a short time after as the water drains out of the soil. The duration of saturation and inundation is apparently not enough to form hydric characteristics in the soil or to establish hydrophytic vegetation communities. If hydrophytic vegetation communities were present, the lower floodplain could likely be classified as a wetland (Natural Atypical Situation). But, there is very scant vegetation in the scoured backchannels, and the dominant species on the surrounding area are multiflora rose

and Phacelia purshii (both not listed; which is supposed to mean that it is an upland species however, I don't think that the Tennessee list is complete).

There are, however, sand and river stone "islands" [cobble bars] that are within the banks of the river and are separated from the main floodplain by a narrow river channel. These islands can be classified as wetlands. It is a "Natural Atypical Situation" in which one of the wetland criteria is missing. In this case, it is the soil that does not possess any of the hydric soil indicators as described in the ACOE manual. The islands, that are currently supporting a hydrophytic vegetation community, are formed from recently deposited sandy and stony material. The soil is either not in place long enough to develop hydric indicators and/or it is mostly sand which does not develop hydric indicators in the same way as do mineral soils. The dominant vegetation includes sycamore (*Platanus occidentalis*; FACW-), willow (Salix sp.; depends on the species, but is either FAC, FACW, or OBL), sedges, and alder and is classified as a hydrophytic community.

In summary, the only wetlands found in the Little Pigeon River section is on "islands" within the river channel. These islands are located immediately to the right of the centerline.

The "Tuckaleechee Cavern Sign" area: Sheet 5. This area is north of Rte 321 along a Webb Creek tributary. Stream sampling station 31 is on this stream. This area was visited last May.

I did not go to the head of the tributary. I only looked at the section within a level area at the bottom of the road embankment. At the base of the slope, the tributary splits. One branch is the "main" stream and it flows along the base of the steep slope. The other branch flows overland across an old, vegetated road bed and into a large seep area. The water from the seep and the branch drain to the first main branch. The main branch is culverted under Rte 321. In the seep area and where the second branch spreads across the old road bed, wetlands have formed. Wetlands are also present in and adjacent to the stream just upstream of the culvert. There is an upland area that separates the seep area wetland from the downstream portion of the stream by the culvert.

The top 10 inches of soil in the old road bed area is a black muck. At about 10 inches, the auger hit resistance that felt like hard-packed gravel (eg. old road bed). The soil in the seep area into which this flows is a gray (10YR 6/1) silty clay loam with many prominent mottles. Also a gray

(10YR 5/1) and dark gray (10YR 4/1) sandy silt loam with many faint mottles (7.5YR 4/6 and 5/6; strong brown).

I do not have a good species list for this area. Some of the dominant or common species were sycamore, soft rush (*Juncus effusus*; FACW), multiflora rose, sedges (including *Carex scabrata*, rough sedge, which is OBL and was a dominant species), sneezeweed (*Helenium autumnale*; FACW), fowl manna grass (*Glyceria striata*; OBL; dominant species), jewelweed, ironwood.

I have photos of this area taken last year.

Foothills Parkway Photos

April 26, 1995

35 mm:

1-11 Cosby Creek floodplain in Cosby—Sheet 17

1-10 Ogle Springs Branch??

1-9

1-8 Stonewall Branch riparian seep PEM1 wetlands where stream and spring channel meet. View upstream. Wetland area "3".

1-7 Same as Quiktake 2 (see below)
1-6 Same as Quiktake 3 (see below)

1-5 Seep area wetland adjacent to Rocky Flats Road and on northwest side of road, near, but within, the ROW boundary. Noted by Larry as a sphagnum area.

1-4 Same seep area wetland as in 1-5. Different view.

1-3 Little Pigeon River floodplain. Showing wrack lines from flooding. This is about 40–50 feet from the river bank.

1-2 Little Pigeon River floodplain. View SW. Note the meadow and open canopy look of the area. Phacelia purshii is the purplish flower carpeting the ground. Multiflora rose is also common here.

1-1 Island scrub-shrub wetlands. Looking downstream toward islands. Note the sedges on hummocks, willow and alder.

QuikTake digital camera:

Q-1 Riparian seep wetland along Stonewall Branch. Note sedges, alder, sweetflag. Wetland area 2.

Q-2 Seep area scrub-shrub wetland on northwest side of Rocky Flats Road near edge of proposed ROW. View southeast from middle of wetland

Q-3 Same wetland as in Q-2. View southwest from about the same spot.

Q-4 May have taken photo in same area as 1-5 above. Not documented.

Q-5 (or -4) Little Pigeon River floodplain. View southwest as in photo 1-2. Note Phacelia purshii and meadow with open canopy.

Q-6 (or -5) Little Pigeon River floodplain. View northeast from same spot as photo Q-5 (or -4).

Note meadow and open canopy, but also the denser woods in the background that is also in the floodplain.

Q-7 (or -6) Island scrub-shrub wetlands on the margins of the Little Pigeon River. Same as photo 1-1, but slightly different view.