Current Status of *Buckleya distichophylla* in Tennessee

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Introduction

The U.S. Fish and Wildlife Service (USFWS) funded the Tennessee Natural Heritage Program (TNHP), Division of Resource Management to relocate and monitor known occurrences of *Buckleya distichophylla* in Tennessee.

A member of the Santalaceae family, the genus *Buckleya* was first described from material collected along the French Broad River in Tennessee. Worldwide, four species comprise the genus, all of which are root parasitic, dioecious shrubs. *B. distichophylla* (pirate bush / sapsuck) is the only species from North America and parasitizes hemlocks, pines, and a variety of hardwood tree species (Musselman and Mann 1979). The other three species occur in China (two species) and Japan (one species) (Carvell and Eshbaugh 1982[1]).

Known only from North Carolina, Tennessee, and Virginia, *Buckleya distichophylla* is a Southern Appalachian endemic occurring in the Blue Ridge Physiographic province with a few populations in the adjacent Ridge and Valley Physiographic Province[2] of Virginia and Tennessee. Each of the states where it occurs considers the species rare and imperiled both at the state and global level (S2 / G2) (NatureServe 2009). Virginia tracks the species as rare (Townsend 2009), Tennessee lists the species as threatened, and North Carolina lists the species as endangered, but it is being considered for down-listing to threatened (Franklin and Finnegan 2006; Crabtree 2008).

In his "Notes on Some Rare Plants of Tennessee" H.M. Jennison (1935) noted the rarity of *Buckleya* in Tennessee and provided a summary of its then-current distribution in the state, based primarily on his collections and those of W.W. Ashe, E.T. Wherry, and A.J. Sharp and J.K. Underwood. Two decades later, Robert James (1955; 1958) published his observations and collections of *Buckleya* including the first reported occurrence from Johnson County in the vicinity of Watauga Lake and occurrences along the Nolichucky River in Unicoi County. More recent records from Tennessee include observations from Paul Somers, past State Heritage Botanist, reports from U.S. Forest Service and other government biologists, Eugene Wofford's (1980) report on rare plants of the Cherokee National Forest, and surveys along the Appalachian Trail in Tennessee (e.g. Heiman and LeGrand 1993).

Based on current literature and natural heritage data from North Carolina, Tennessee, and Virginia, NatureServe Explorer (2009) succinctly summarizes the species' habitat requirements.

> *Buckleya distichophylla* occurs in mountain woods at lower elevations (450-1100 m) within a variety of habitats including Virginia pine and white pine and acidic mixed-oak

[1] Carvell and Eshbaugh (1982), Mowbray (1985), and Harper (1947) each provide a rather complete summary of the taxonomic history of the genus and species, thus it is not repeated herein.
[2] Occurrences from the Cumberland Plateau of Tennessee are addressed below.

forests. The plants can be found scattered among host trees within openings of hemlock forests [both *Tsuga canadensis* and *T. caroliniana*], but habitats also include south-facing slopes and chestnut oak forests (Mowbray 1985). Many of the known occurrences contain a dense understory of *Rhododendron maximum.* Although some of the current element occurrences are found within heavily shaded areas, Mowbray (1985) notes that the most robust plants occur in areas with more sunlight and "the other very predictable physical feature of its habitat is a shallow, rocky soil. . ." Botanical guides list the habitat as mountain forests or rich woods (Gleason and Cronquist 1991; Wofford and Chester 2002). It was thought that *B. distichophylla* was host specific to hemlocks, but subsequent investigations have shown otherwise (Mussleman and Mann 1979).

Partly due to its pale green appearance as a semi-parasite and its distichous branching (giving the appearance of a large compound leaf), *Buckleya* is rather easy to distinguish afield. It reaches a height of up to 3.5 meters and the young stems are green. The staminate flowers occur in umbels of 3 – 7 flowers while the pistillate flowers are solitary; both types lack petals and are 4-mereous. The fruit is a distinctive pale green drupe, 2 – 3 cm long and 1 – 1.4 cm wide (Mowbry 1985).

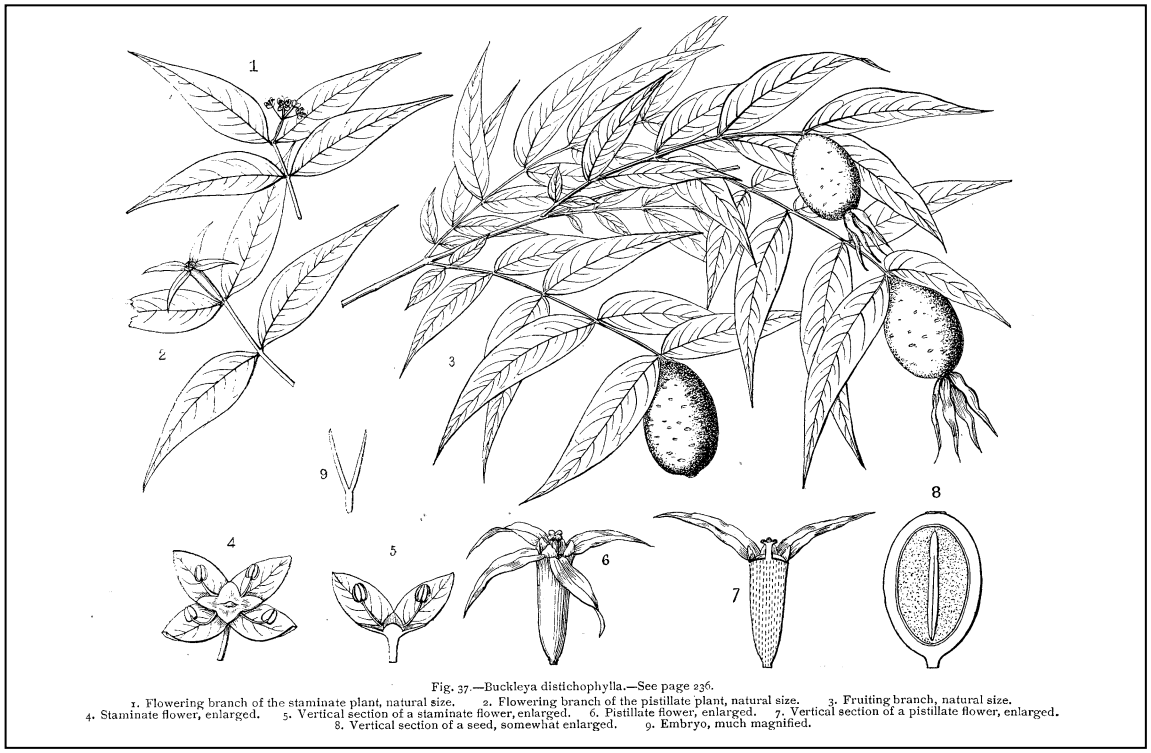

Fig. 37.—Buckleya distichophylla.—See page 236.
1. Flowering branch of the staminate plant, natural size. 2. Flowering branch of the pistillate plant, natural size. 3. Fruiting branch, natural size.
4. Staminate flower, enlarged. 5. Vertical section of a staminate flower, enlarged. 6. Pistillate flower, enlarged. 7. Vertical section of a pistillate flower, enlarged.
8. Vertical section of a seed, somewhat enlarged. 9. Embryo, much magnified.

Figure 1. *Buckleya distichophylla*. Image from *Garden and Forest*: 3. p. 327. 1890

Prior to this project, only 15 of the 21 Tennessee occurrences of *Buckleya distichophylla* had been documented in the last 20 years, with the most recent occurrence dating from 2002. Herbarium specimens provided the basis of many records, and only seven of the records contained information on population number or size, and most lacked detailed directions or habitat information. A number of occurrences (e.g. those in the Paint

Creek/Paint Rock area) appeared to be multiple observations of a larger occurrence, thus inflating the actual number of occurrences. Two occurrences from the Big South Fork National River and Recreation Area caught our attention for these plotted over 150 km west of the closest occurrences and represent the only reports of *Buckleya* from the Cumberland Plateau, yet no herbarium vouchers exist (TENN 2009).

In short, the goal of this project was to relocate and better assess each occurrence in the field. This will aid in our understanding of the species, provide guidance for future environmental reviews, management, and conservation planning, and assist future researchers wishing to locate additional occurrences. Monitoring this shrub that parasitizes trees including hemlocks will allow researchers to assess the impacts should hemlock trees continue to decline - as predicted - due to the hemlock wooly adelgid infestations.

Methods

In 2009, we consulted our rare species database and data from North Carolina and Virginia and reviewed in-house files and literature germane to the project. We then contacted biologists from Big South Fork National River and Recreation Area, Cherokee National Forest, and Great Smoky Mountains National Park, as well other knowledgeable botanists including Dr. Eugene Wofford, University of Tennessee, Knoxville and Mr. Jamey Donaldson, East Tennessee State University. I reviewed each *Buckleya distichophylla* herbarium specimen at the UT Herbarium (TENN) to ensure our database contained all of the known Tennessee occurrences.

We visited the occurrences on three separate trips totaling fourteen days of travel and field work. I updated each rare species occurrence record accordingly with coordinates, number of plants, current directions, and notes on the site conditions and surrounding vegetation. I based all element occurrence viability ranks on NatureServe (2009) guidelines for *Buckleya*. As needed, I merged duplicate records and deleted erroneous records, as noted below.

Results

Merging and Deletion of Records

The TNHP database contained two *Buckleya distichophylla* occurrences mapped from the Big South Fork National River and Recreation Area (BSF) along the Clear Fork River in both Morgan and Fentress Counties. Steve Leonard's (1975) draft environmental impact statement (EIS) for the area was the reference listed in each occurrence. Additional information in each record stated that National Park Service Staff searched these areas but did not relocate any *Buckleya* plants. I had hoped to search this area and secured the appropriate collection permit to do so. However, I encountered a 1987 letter in our files from Paul Somers, then TNHP botanist, to National Park Service staff in which Dr.

Somers noted the report of *Buckleya* from BSF was erroneous. The letter gave no other explanation as to the basis of Dr. Somers' conclusions and it is unclear why he did not remove the records from the database then.

I could not locate the 1975 EIS, but did correspond with Steve Leonard, the individual to whom the *Buckleya* report was attributed. Mr. Leonard wrote "I suggest you (or database managers) remove [the records] from the database." He noted that during the 1970s project, he observed that the habitat along the slopes of Clear Fork appeared like good habitat for *Buckleya*, but "this got translated that the bush was definitely there." He also wrote that as he knew of the plant's rarity, he would have collected herbarium vouchers had he seen it. As no vouchers exist of *Buckleya* from this area, and the sole source of the records confirmed he did not observe the plants, we have deleted the two records from BSF from our database.

The appendix table (p. 10) provides summary data for the existing *Buckleya* occurrences in Tennessee. Prior to this project, our database contained 21 mapped occurrence records that we have since reduced to 17. The reduction results from the two erroneous records deleted from BSF and two others from the Paint Rock area of Greene County (former occurrence numbers 3 and 19) that we merged into another record (occurrence number 2).

The records from the Paint Rock area appeared to be duplicates of each other. Located along the French Broad River, Paint Rock is the likely site of the type specimen collected by Nuttall in 1816 (Nuttall 1818). Paint Rock and Paint Creek are easily accessible by automobile, thus various botanists have since collected and observed *Buckleya* here. This resulted in multiple herbarium specimens with slightly different directions, which in turn resulted in multiple occurrence records in our database. Two of the records were mapped in different locations, but after careful review, we concluded they were indeed referencing the same spot in close proximity to another record. Although we reduced the number of actual occurrences the updated record spatially reflects the present location of plants in the area.

There is another occurrence mapped from the Cocke County side of the Paint Rock area (occurrence number 18) that we did not merge into the other records. The actual Paint Rock feature occurs in Greene County approximately 100 meters from the Cocke County line. At this site I carefully searched the area inside Cocke County but did not locate any *Buckleya.* In order to ensure the validity of the Cocke County location, I reviewed the 1966 Sharp *et al.* specimen on which the record was based, and as it indeed indicates Cocke County, we have no reason to doubt its location therein. Although likely very close to extant Greene County plants, we chose to keep this record separate and rank as historic in order to guide researchers to the Cocke County side of Paint Rock during future monitoring.

Summary of Extant Occurrences

There are eleven known occurrences of *Buckleya* in Tennessee, nine of which are located on Cherokee National Forest lands. The elevation for these extant occurrences averages 1700' (ranging from 1300' – 2250') and they are within five different ecological systems based on Southeastern GAP data (USGS 2008):

Southern Appalachian Low-Elevation Pine Forest (CES202.332)
Southern Appalachian Oak Forest (including Xeric Type) (CES202.886)
Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
Appalachian Hemlock / Hardwood Forest (CES202.593)
Southern and Central Appalachian Cove Forest (CES202.373)

Although we encountered both *Tsuga canadensis* (eastern hemlock) and the state-listed *T. caroliniana* (Carolina hemlock) in the general area of most occurrences, few sites had *Tsuga* as a dominant or co-dominant overstory species. The best ranked populations (A-excellent / B-good) that contained hundreds of *Buckleya* shrubs were located along drier mid to upper slopes, primarily in Southern Appalachian Oak Forest (including Xeric Type) and Southern Appalachian Low-Elevation Pine Forest. The most common overstory species at these highly ranked occurrences include *Quercus prinus* (chestnut oak) and *Pinus virginiana* (Virginia pine). Shrubs included *Kalmia latifolia* (mountain laurel), *Rhododendron maximum*, *Hamamelis virginiana* (witch hazel), and *Viburnum acerifolium* (maple-leaved viburnum). All occurrences (including those historic occurrences we could accurately map) are associated with bluffs and banks of a stream or river system.

Historic and Extirpated Occurrences

With the exception of Todd Crabtree's documentation of an occurrence based on an 1893 Kearney specimen along the French Broad River, we had little success in relocating those not observed after 1960. This was, in part, due to the lack of detailed directions and the likely extirpation of two occurrences.

After field investigations, we consider occurrence numbers 5 and 7 extirpated. Based on herbarium specimens from the 1940s, both of these records are mapped in presently impounded sites: South Fork Holston River (now Holston Lake) and Watauga River (now Boone Lake). We ranked occurrence number 7 as possibly extirpated for the vague directions of "Bluffs of Watauga River, ca 3 mi above jct with S Fork Holston R" provided doubt as to the exact location of this station. Andrea Bishop and I searched a steep, xeric slope that overlooks Boone Lake approximately three miles upstream from the confluence of the South Fork Holston River[3]. However, rather than containing suitable

[3] For reference this site is latitude 36.421873 and longitude -82.397271.

Buckleya habitat, this site consisted of a calcareous forest dominated by *Quercus muhlenbergii* (chinquapin oak) and *Acer saccharum* (sugar maple).

The occurrence data field in the appendix table details the extent to which we searched for those records now ranked historic. With its vague directions "Paint Mnt. near Wolf Creek," it remains unclear as just where occurrence 4 should be mapped. This possibly represents another report from the Paint Creek / Paint Rock Area, but Paint Rock is located upstream and opposite the French Broad River from Wolf Creek. The fact that Wolf Creek is not only a stream but a former community provides further confusion. The only other topographic feature resembling the name is "Paint Mountain" located near the two occurrences near Paint Creek Campground. However, this is clearly in Greene County, yet the basis of occurrence 4 is a 1941 collection from Cocke County.

Occurrence 1 warrants additional explanation as well. Based on a 1956 collection, it was later falsely reported that Jamey Donaldson observed this occurrence during his inventory along the Appalachian Trail (A.T.) of northeast Tennessee (Donaldson 1996). Mr. Donaldson and Joe McGuiness, biologist with the U.S. Forest Service, informed me of the areas they searched for this occurrence, and I did not search where they had done so. However, based on old topographic maps and information provided by a member of the Tennessee Eastman Hiking Club, we searched the historic route of the A.T. in the vicinity. We had success locating the old trail route and habitat that appeared suitable for *Buckleya,* but we observed no *Buckleya* plants. Although difficult to discern, it is possible this collection was made at or near the extant occurrence near Horseshoe Church (occurrence number 8) as *Buckleya* grows along an old section of the A.T. here.

We also failed to find the small population of *Buckleya* along Fishdam Creek, Sullivan County (occurrence number 22). Based on directions in the record and a map in our hardcopy files, I am confident we searched the correct area. However, after searching along Fishdam Creek for approximately three hours, Andrea Bishop and I observed no *Buckleya.* As the occurrence dates from within the last 25 years, we ranked it F (failed to find) rather than H (historic). This occurrence, along with the extirpated occurrences mentioned above, constitute the only known occurrences from the Ridge and Valley of Tennessee. Therefore, until additional populations are documented, we know of no extant occurrences in the Ridge and Valley of Tennessee.

Summary

With 10 *Buckleya distichophylla* occurrences ranked as viable[4], the Tennessee state-listing of threatened and the state rank of S2 appear to accurately reflect the species rarity. Range-wide, there are 43 extant occurrences (30 ranked as viable), therefore we suggest NatureServe adjust the global rank from G2 (very rare and imperiled, generally 6

[4] A viable occurrence is one ranked A (excellent), B (good), or C (fair).

to 20 occurrences) to G3 (very rare and local throughout its range, generally 21 to 100 occurrences).

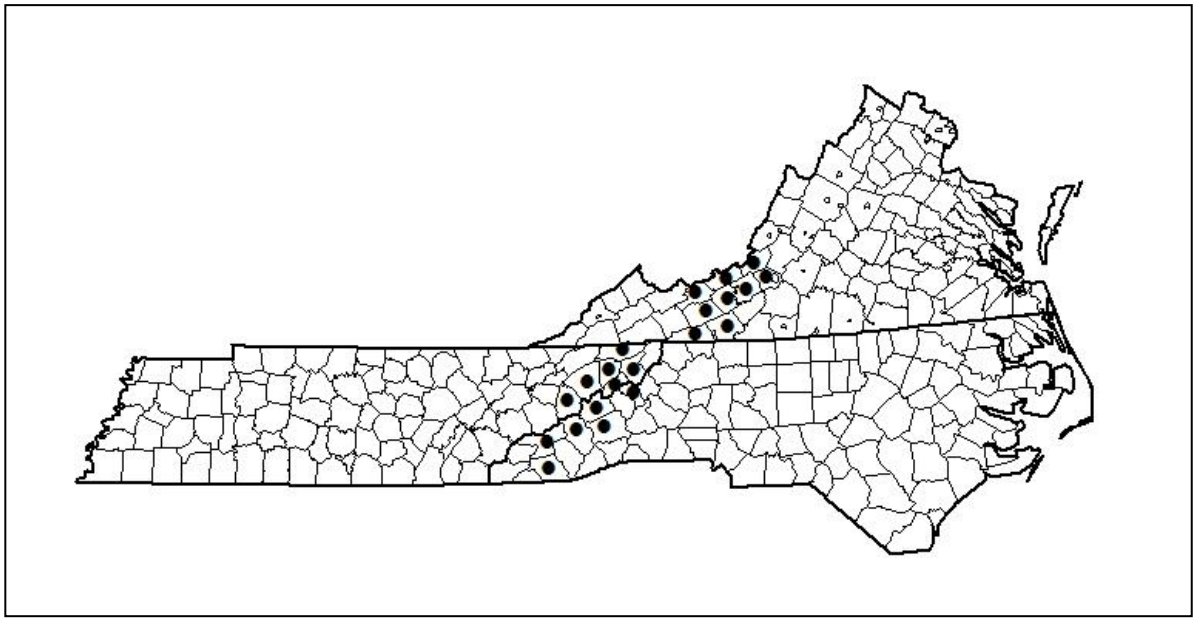

Figure 2. County distribution map of *Buckleya distichophylla.*

As the known habitat for *Buckleya* does not appear rare and the plants can occur in isolated, rugged areas, we suspect other, yet-to-be discovered occurrences, exist. However, such broad habitat requirements make targeting discrete habitats for searches difficult. As *Buckleya* is not difficult to identify while afield and often occurs on steep river bluffs, searching for new occurrences along the larger rivers of the region via canoe or kayak and using binoculars may be a fruitful approach.

Acknowledgements

Andrea Bishop and Todd Crabtree, Tennessee Heritage Program, assisted with much of the field work. Jamey Donaldson, East Tennessee State University and Joe McGuiness, U.S. Forest Service provided directions and maps to a number of occurrences, and Mr. Donaldson assisted in the field. Aaron Floden, University of Tennessee, provided data on the Temple Ridge occurrence and Max Lanning, U.S. Forest Service, assisted with field work at the occurrence along State Route 81. Steve Leonard helped clarify the status of erroneous Cumberland Plateau Records. We are grateful to the U.S. Fish and Wildlife Service for funding.

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Appendix. Brief Summary of Known Tennessee Occurrences

EO NUM	COUNTY	QUADRANGLE	SITE	LAST OBS	EO RANK[5]	OCCURRENCE DATA
8	Carter	Watauga Dam	HORSESHOE LAKE BAPTIST CHURCH	6/2/2009	B	2009-06-02: J.T. Donaldson and R. McCoy counted 43 plants, some up to 2 m tall with as many as 5 stems. It was estimated that at least this many, if not more, occur on the inaccessible steep slopes from the old trail to the lake. 1979-05-09: The data provided from the past may have been for the site atop the bluff (EO#021) above Wilbur lake.
21	Carter	Watauga Dam	WILBUR CLIFFS	6/3/2009	AB	2009-06-03 (McCoy): Scores of plants observed along this dry bluff and hundreds likely occur downslope, but area is too steep to access. Plants vegetative. 1979-05-31 (Wofford and Boom): (V).
1	Carter	Watauga Dam	APPALACHIAN TRAIL - IRON MOUNTAIN	9/25/1954	H	2009-07-10: MCCOY SEARCHED A.T. (TRAIL NORTH) FROM ROAD TO WATAGUA LK. NO PLANTS SEEN. LATER, HE AND A. BISHOP SEARCHED ALONG THE A.T. (HEADED TRAIL SOUTH) WEST OF ROAD TO WAT. LAKE. WE ALSO SEARCHED THE OLD A.T. (ABANDONED IN 1960) THAT RUNS OUT NARROW RIDGELINE AND LOOPS BACK DOWN TO ROADWAY NEAR HORSESHOE. IN ADDITION, WE SEARCHED THE BLUFF AREA LOCATED ~300 METERS NE OF DAM JUST SOUTH OF INTERSECTION OF A.T. AND GATED ACCESS ROAD. NO BUCKLEYA OBSERVED. 1995: IT WAS THOUGHT DONALDSON SAW THIS DURING HIS RESEARCH, BUT DONALDSON SAID THIS WAS A FALSE REPORT. 1954-09-25: ANNOTATED BY J. R. MASSEY AND R. O. WHETSTONE IN APRIL 1978.
18	Cocke	Paint Rock	PAINT CREEK - COCKE COUNTY	5/21/1966	H	2009-09-03: MCCOY SEARCHED ALONG FRENCH BROAD RIVER ~0.25 MILES DOWNSTREAM FROM PAINT CREEK; NO PLANTS FOUND. DID NOT SEARCH HIGH ATOP BLUFFS. 1966-05-21: (V). ANNOT. BY J.R. MASSEY AND R.D. WHETSTONE, 1978-04.
4	Cocke	Paint Rock	PAINT MOUNTAIN	10/1/1941	H	2009-09-03: General area along upper Wolf Creek Road where record is mapped was searched by McCoy and Crabtree, but nothing found. We also walked a portion of the "Paint Mnt. Trail" upslope from the road. Most likely this record is not mapped correctly. It's possible this was collected at the Paint Creek Area where the species is extant. 1941-10-00: NO HEMLOCK PRESENT. DRY SLOPES (FRTS ONLY).

[5] Viability of each occurrence is ranked from A (excellent) to D (poor); H indicates a historic occurrence, but one where habitat exists in the area; F indicates that a we failed to find a record, even though we had good directions; X indicates population is thought to be extirpated.

EO NUM	COUNTY	QUADRANGLE	SITE	LAST OBS	EO RANK[5]	OCCURRENCE DATA
9	Cocke	Paint Rock	WOLF CREEK - FRENCH BROAD RIVER	9/2/2009	C	2009-09-02: Crabtree observed one shrub near a driveway and some large cultivated boxwoods. ANNOT. MASSEY & WHETSTONE, 3-78. (VEG).PLOTTED BY SHARP 10-7 8. ALSO A. RUTH 92, GH 8-19-04 & 5-7-04, FR. BROAD AT WOLF C R.; BILT. HERB. 122D, US 9-15-04, WOLF CR.; RUTH 149-16, VDB ; TH KEANEUY, TENN, 5-14-1893, RUTH 13, 6-1894, TENN.
10	Cocke	Paint Rock	FRENCH BROAD RIVER - FUGATE ROAD	9/2/2009	C	2009-09-02 (Crabtree): ~22 clumps of shrubs observed with 2 bearing fruits. 1934-06-10 (SHARP AND HESLER): VEG, ALSO KEARNEY 882 (VDB) ON 26 AUG 1897. (V). ANNOT. BY J.R. MASSEY, R.D. WHETSTONE, 4-1978.
20	Cocke	Hartford	PIGEON RIVER - HARTFORD ROAD	9/1/2009	CD	2009-09-01: McCoy and Crabtree observed 18 clumps (4 w/ fruits) at the site upstream of point where road crosses under I-40 and 2 female plants with fruits at site downstream of I-40. 2002-06-15: ABOUT 20 SHRUBS. 1988-10-09: 1 MALE AND 1 FEMALE, CA. 150-200 UNRIPE DRUPES.
2	Greene	Paint Rock	PAINT ROCK	9/3/2009	C	2009-09-03 (MCCOY AND CRABTREE); 50+ SHRUBS OBSERVED AT VARIOUS SPOTS. MOST CONCENTRATED JUST ABOVE CONFLUENCE OF THE TWO ROADS JUST UP THE ROAD FROM THE BRIDGE OVER PAINT CREEK. CRABTREE DID NOT LOCATE THE 200+ PLANTS REPORTED BY LEONARD YET HE SEARCHED THE SLOPE UP TO 1800'. 1981: STEVE LEONARD MENTIONED FINDING 200+ PLANTS. THIS WAS RECORDED IN A LETTER TO LEO COLLINS AND PAUL SOMERS FROM JULIE MORE, NC HERITAGE PROGRAM. 1979: OBSERVED BY WOFFORD (1980). 1966-05-22: "ROADBANK ABOUT 1 MI FROM PAINT ROCK, NEAR PAINT CREEK, GROWING WITH PINUS VIRGINIANA . . .IN AREA WHERE COLLECTED BY NUTTALL IN 1816."
13	Greene	Hot Springs	PAINT CREEK CAMPGROUND	9/3/2009	C	2009-09-03 (CRABTREE): CA. 65 CLUMPS OF PLANTS WITH LESS THAN FIVE OBSERVED WITH FRUITS. 1991-08-04 (SOMERS):CA. 15 CLUMPS OF MULTIPLE STEMS OBS IN BRIEF SEARCH ON 4 AUG 91 BY P. SOMERS, SOME WITH FRUITS; ADDITIONAL PLANTS MAY OCCUR ABOVE THOSE IN VIEW FROM ROAD, AS WELL AS DOWN SLOPE.
12	Greene	Hot Springs	PAINT CREEK CAMPGROUND	9/3/2009	AB	2009-09-03: MCCOY STOPPED COUNTING AT 125 LARGE PLANTS AND THERE WERE MANY MORE ON STEEP, INACCESSIBLE SLOPE. A CONSERVATIVE ESTIMATE IS THERE ARE AT LEAST 300 LARGE MULTI-STEMMED PLANTS AND LIKELY MORE SEEDLINGS. 1991-07-25: ABOUT 15 GENETS ESTIMATED AND ABOUT 51 RAMETS COUNTED WITHIN SITE OF ROAD, INCLUDING A FEW SE OF GATE ON FS #31, ON 25 JUL 91 BY P. SOMERS. A COUPLE OF THE ROADSIDE CLUMPS BEING MOWED BUT UNCUT STEMS BEARING MANY FRUITS.

EO NUM	COUNTY	QUADRANGLE	SITE	LAST OBS	EO RANK[5]	OCCURRENCE DATA
5	Sullivan	Holston Valley	SOUTH FORK HOLSTON RIVER	7/20/1948	X	2009-07-09: AREA IMPOUNDED, BUT BISHOP AND MCCOY SEARCHED AREAS JUST EAST OF BRIDGE, BUT HABITAT DEGRADED AND NO PLANTS FOUND. EITHER 1934 OR 1940: ON ROOTS OF HEMLOCK IN LIGHT SANDY SOIL NEAR BRIDGE 10 MI ABOVE BRISTOL. (VEG). ANNOT BY MASSEY AND WHETSTONE IN 1978. ALSO COLL BY SHARP AND SHANKS 1126, AT TENN, FOUND 10-13-40; SHARP, JENNISON AND UNDERWOOD 844, AT TENN, FOUND 5-20-34.
22	Sullivan	Holston Valley	FISHDAM CREEK	7/15/1988	F	2009-07-09: Andrea Bishop and Roger McCoy did not relocate the plants. 1988-07-15: Paul Somers and Tom Crews (USFS) observed ~14 plants and 50-70 ramets [stems]. "Most plants small, but with many shoots." 1987-07-07: Arthur Smith, Joe Dabney, and Tom Crews reported 6 - 8 plants.
6	Unicoi	Chestoa	APPALACHIAN TRAIL - CHESTOA	7/8/2009	A	2009-07-08 (MCCOY AND BISHOP): THE DRY RIDGETOP HAD AT LEAST 250 SHRUBS, MOST ALL VEGETATIVE. ALONG THE A.T., THE SHRUBS WERE TOO NUMEROUS TO COUNT, BUT BUCKLEYA WAS A CO-DOMINATE SHRUB FOR ~0.3 MILES OF TRAIL. 1992-06: (VEG). (USDAFS - KARIN HEIMAN, 20-30 INDIV.).
11	Unicoi	Chestoa	TEMPLE RIDGE #51	6/26/2009	A	2009-06-26: AARON FLODEN OBSERVED AT LEAST 200 PLANTS IN A QUICK VISIT. 1999:(C. NORDMAN & M. WILLIAMS) HUNDREDS OF PLANTS SEEN BETWEEN 2200' AND 2600' ON CLIFF RIDGE, NONE ON TEMPLE RIDGE. 1992: (KARIN HEIMAN) "THIS IS THE LARGEST POP THE SURVEYOR HAS EVER SEEN, IT IS OFF GREAT IMPORTANCE FOR THIS REASON", 300-600 INDIVIDUALS (ELEVATION STATED AS 2100'-3100'AND POPULATION PLOTTED ON TEMPLE RIDGE AND CLIFF RIDGE).
7	Washington	Boone Dam	WATAUGA RIVER NEAR HOLSTON RIVER	10/26/1949	X?	2009-07-09: BISHOP AND MCCOY SEARCHED THIS BLUFF AREA (IF MAPPED CORRECTLY, BUT MUCH IS NOW DEVELOPED) AND THE STEEP SLOPES DID NOT APPEAR TO HAVE SUITABLE HABITAT AS THE AREA IS LIMESTONE WITH CALCIPHILLIC PLANTS. 1949-10-26: (VEG, 1 DUPL-VDB)
17	Washington	Erwin	SR 81 - NOLICHUCKY RIVER	6/4/2009	C	2009-06-04: ROGER MCCOY AND MAX LANNING OBSERVED 30 - 40 MULTI-STEMMED PLANTS THAT WERE 1 - 2 METERS TALL. 1979: NO EO-DATA GIVEN. OBSERVED BY WOFFORD.