




APPENDIX C-3 DWARF-FLOWERED HEARTLEAF REPORT FOR THE KINGS MOUNTAIN LITHIUM MINE, CLEVELAND COUNTY, NORTH CAROLINA

The logo for SWCA is positioned vertically on the left side of the page. It consists of the letters 'S', 'W', 'C', and 'A' in a large, light blue, serif font, stacked one above the other.

Dwarf-flowered Heartleaf Report for the Kings Mountain Lithium Mine, Cleveland County, North Carolina

JUNE 2024

PREPARED FOR
Albemarle U.S., Inc.

PREPARED BY
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DWARF-FLOWERED HEARTLEAF REPORT FOR THE KINGS MOUNTAIN LITHIUM MINE, CLEVELAND COUNTY, NORTH CAROLINA

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June 2024

CONTENTS

1	Introduction	1
1.1	Location	1
1.2	Project Area Description.....	1
2	Species Background	4
2.1	Description.....	4
2.2	Habitat.....	4
2.3	Range	5
2.4	Threats	5
2.5	Status.....	5
3	Methods	5
3.1	Desktop Analysis	5
3.2	Field Surveys	6
4	Results.....	8
4.1	Project Area Habitats	8
4.1.1	Forested Upland.....	9
4.1.2	Palustrine Forested Wetland	9
4.1.3	Palustrine Shrub-Scrub Wetland.....	9
4.1.4	Palustrine Emergent Wetland	10
4.1.5	Herbaceous Upland.....	10
4.2	Survey Results	10
5	Summary and Conclusions	13
6	Literature Cited.....	14

Appendices

Appendix A. Photographs

Appendix B. Detailed Survey Area Maps

Figures

Figure 1.	Project location.	2
Figure 2.	Aerial imagery of the Project area.	3
Figure 3.	Representative photo of <i>Hexastylis naniflora</i> . Photo credit: Alan M. Cressler.....	4
Figure 4.	Example of SWCA’s measuring methodology for the calyx tube opening during a survey. The yellow line indicates the measured portion.	7
Figure 5.	Example of SWCA’s measuring methodology for calyx tube length during a survey. The yellow line indicates the measured portion.....	8
Figure 6.	2024 Dwarf-flowered heartleaf plant survey overview map.	12

Tables

Table 1. Results of 2024 Dwarf-flowered Heartleaf (*Hexastylis naniflora*) Presence/Absence
Survey within the Project Area..... 10

1 INTRODUCTION

On behalf of Albemarle U.S., Inc. (Albemarle), SWCA Environmental Consultants (SWCA) conducted dwarf-flowered heartleaf (*Hexastylis naniflora*) presence/absence surveys for the Kings Mountain Lithium Mining Project (Project) located in southeastern Cleveland County, North Carolina.

The dwarf-flowered heartleaf is a federally threatened species under the Endangered Species Act of 1973, as amended (ESA). A desktop review and field reconnaissance determined that approximately 47 acres of suitable dwarf-flowered heartleaf habitat are present in the Project area. No dwarf-flowered heartleaf populations were observed during presence/absence surveys conducted during the plant's flowering season in April and May of 2024 or in the previous survey conducted during May of 2022.

1.1 Location

The Project is on private land owned or leased by Albemarle and consists of approximately 1,146 acres (Project area). The Project is approximately 2 miles south of downtown Kings Mountain, North Carolina, and is located on the U.S. Geological Survey (USGS) Kings Mountain, North Carolina, 7.5-minute quadrangle (Figure 1). The Project area is divided by Interstate-85 (I-85), with the main parcel on the north side of the highway and a smaller parcel on the south side of the highway. The main parcel is bordered by South Battleground Avenue (Highway 216), Parkgrace Road, and Tin Mine Road to the west, Quarry Road to the north, and I-85 to the south and east.

1.2 Project Area Description

The northern and central portions of the main parcel are mostly developed/disturbed from historic mine use and include Albemarle's processing facility and Global Technical Center as well as the historic mining operations. The northern portion includes a closed drive-in movie theater and campground, and remnants of a textile mill and a school. The western portion of the main parcel north of I-85 is largely undeveloped forested land. Five utility rights-of-way (ROWs) cross the northern and central portions of the parcel. The parcel directly south of I-85 is mostly undeveloped but historically has been used for tailings placement in the eastern portion. Undeveloped land in the Project area consists primarily of forest and aquatic habitats. The Project area is surrounded by residential, commercial, and industrial development to the north, west, and south (Figures 1 and 2). The Martin Marietta aggregate quarry borders the Project area to the northeast. To the east is primarily undeveloped land associated with Crowders Mountain State Park.

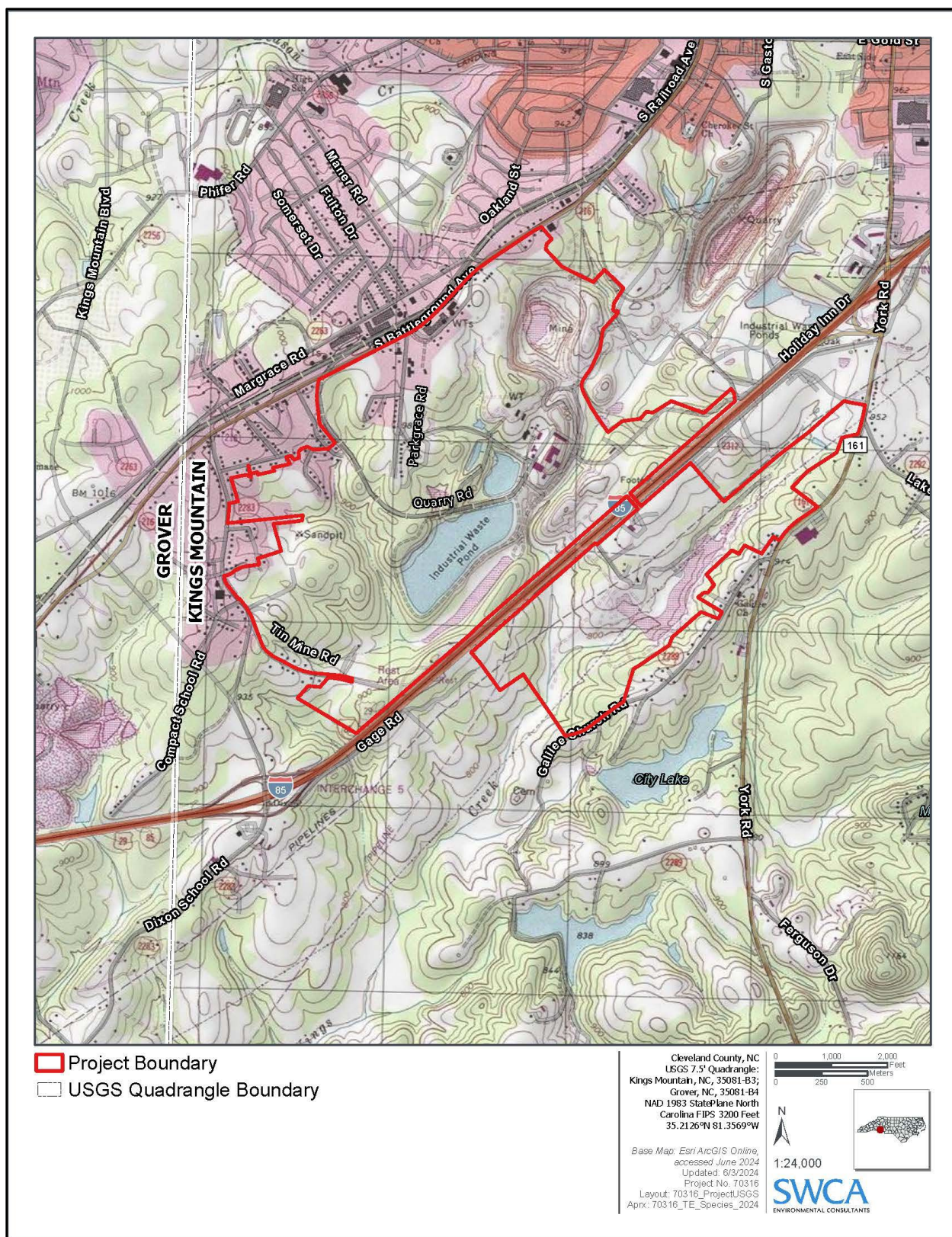


Figure 1. Project location.



Figure 2. Aerial imagery of the Project area.

2 SPECIES BACKGROUND

2.1 Description

Dwarf-flowered heartleaf is a clump-forming perennial woodland herb growing from rhizomes (University of Texas 2016). The leaves are supported by long, thin leaf stems that connect to an underground stem. The small jug-shaped flowers found near the base of the leaf stems are usually beige to dark brown or purple and appear from mid-March to early June (U.S. Fish and Wildlife Service [USFWS] 2019, as cited in Blomquist 1957; Gaddy 1980, 1981). The dwarf-flowered heartleaf is not identifiable by its leaves and is best differentiated from other *Hexastylis* species by having the smallest flowers in the *Hexastylis* genus. Dwarf-flowered heartleaf flowers typically have calyx tube openings 4 to 8 millimeters (mm) wide but often 5 mm or less and/or a calyx tube less than 1.1 centimeters (cm) in length (Gaddy 1987; Krings et al. 2024; Weakley and Southeastern Flora Team 2024). The calyx is defined as the flower whorl that consists of all the sepals, often used when the sepals are fused together (Roland et al. 2016). Additionally, another identifying characteristic is the ovary being half-inferior (Krings et al. 2024). The optimal survey window for this species is from March 1 to May 31 (USFWS 2022b). According to multiple county records, the dwarf-flowered heartleaf, the little heartleaf (*Hexastylis minor*), and the large-flower heartleaf (*Hexastylis shuttleworthii*) are the only species in the genus *Hexastylis* documented in Cleveland County (USFWS 2019, as cited in Murrell et al. 2007; LeGrand et al. 2024). Little heartleaf is the only species in Cleveland County likely to be confused with dwarf-flowered heartleaf, but it generally has larger flowers with a calyx tube typically 12 to 25 mm long (Krings et al. 2024; Weakley and Southeastern Flora Team 2024).



Figure 3. Representative photo of *Hexastylis naniflora*. Photo credit: Alan M. Cressler.

2.2 Habitat

Dwarf-flowered heartleaf is an upper Piedmont endemic that occurs in mesic deciduous forests on slopes and bluffs with moderately permeable, acidic sandy-loam soils. It is generally found along moderate to dry bluffs, slopes, or ravines in deciduous forests or within moist soils adjacent to creeks, streams, or

along lakes and rivers (LeGrand et al. 2024; USFWS 2021). This plant is typically associated with mountain laurel (*Kalmia latifolia*) and is often found growing under or next to mountain laurel (LeGrand et al. 2024). Overall, the dwarf-flowered heartleaf has a restricted range based on limiting habitat characteristics, such as slope aspect, soil types and moisture availability, and forest type (Wagner 2013). It appears to be restricted to Pacolet sandy loams, Madison gravelly sandy loams, and Musella fine sandy loams (USFWS 2019, as cited in Gaddy 1981, 1987), and is most commonly predicted to occur on north-facing slopes between 8 to 10.5 percent (Wagner 2013).

2.3 Range

The dwarf-flowered heartleaf is only known to occur in the southwestern Piedmont of North Carolina and adjacent areas of South Carolina (North Carolina Natural Heritage Program [NCNHP] 2003). The current reported range is Cherokee, Greenville, and Spartanburg Counties, South Carolina, and Alexander, Burke, Caldwell, Catawba, Cleveland, Gaston, Iredell, Lincoln, Polk, and Rutherford Counties, North Carolina (NatureServe 2022). Several known populations are in protected areas of Cleveland County, including the Knob Creek Natural Area, West Shelby Mesic Slope, Broad River/Sandy Run Natural Areas, Hicks Hill Bluffs and Forests, First Broad Hop-hornbeam Natural Area Beaverdam Creek Natural Area, and the Rutherford County portion of Rollins/South Mountains Natural Area, which extends into Cleveland County (NCNHP 2003). This species has not been found during surveys of Crowder Mountain State Park (NCNHP 2003; Tompkins and Luckenbaugh 2018), which is the closest natural area to the Project, and there are no documented occurrences within 1 mile of the Project area (NCNHP 2022a, 2024).

2.4 Threats

The greatest threats to the dwarf-flowered heartleaf are from commercial and residential development and road improvements and construction (NatureServe 2022). Other threats include incompatible forestry practices, off-road vehicles, and invasive plants. Many occurrences are appropriately protected and managed by the States of North Carolina and South Carolina, and many of these populations are found on protected conservation land.

2.5 Status

Dwarf-flowered heartleaf was federally listed as threatened in 1989 and currently remains listed as threatened under the ESA. However, on April 21, 2021, the USFWS proposed delisting the species due to an increase in known, stable populations, some of which have more than 1,000 individuals (86 *Federal Register* 21994). According to the proposed delisting, data indicate that the threats to the species have been eliminated or reduced to the point that the species no longer meets the definition of a threatened species. Until the species is formally delisted, all ESA laws and regulations still apply. The dwarf-flowered heartleaf is also state-listed as threatened in North Carolina by the North Carolina Department of Agriculture and Consumer Affairs Plant Conservation Program (PCP). The PCP's mission is to develop regulations, programs, and partnerships to help protect imperiled species in North Carolina.

3 METHODS

3.1 Desktop Analysis

A preliminary desktop analysis was completed for the Project prior to field surveys by using a combination of existing information obtained from available public sources, including reports, published

literature, online databases, and geographic information system (GIS) data. The following publicly available data sources were used to complete a desktop analysis:

- Google Earth aerial imagery (Google 2024)
- USGS National Land Cover Database (USGS 2019a)
- USGS National Hydrology Dataset (USGS 2019b)
- Natural Resources Conservation Service (NRCS) Web Soil Survey maps (NRCS 2024)
- USFWS National Wetlands Inventory maps (USFWS 2022a)
- NCNHP data and planning tools (NCNHP 2021, 2022a, 2022b, 2024)
- Vascular Plants of North Carolina website (LeGrand et al. 2024)

These sources were used to characterize the resources in the Project area and surrounding area.

3.2 Field Surveys

A general field reconnaissance was conducted within the Project area in February and March of 2022 and June of 2023 concurrent with a wetland delineation to find potentially suitable habitat for the dwarf-flowered heartleaf. Additionally, in May 2022, prior to on-site surveys, SWCA's lead biologist visited an off-site area with a known dwarf-flowered heartleaf population approximately 17 miles west of the Project area along a greenway to observe the flowers and known suitable habitat. Between 2022 and 2024 the Project area changed and, as such, SWCA expanded the survey area to include these additions during the 2024 presence/absence survey.

SWCA conducted presence/absence surveys within the identified suitable habitat in the Project area during the flowering period (March 1 through May 31) in 2022 and again in 2024. Surveys were reconducted in 2024 due to a 2-year expiration date on presence/absence surveys for the dwarf-flowered heartleaf (USFWS 2022b). During on-site surveys, two SWCA biologists walked meandering transects throughout potential suitable habitat within the Project area to search for dwarf-flowered heartleaf plants. When plants within the genus *Hexastylis* were encountered, biologists observed the flowers, if present, and measured the calyx tube length and the calyx tube opening to determine if these characteristics were consistent with the dwarf-flowered heartleaf (Figure 4 and 5 below). Representative photos of *Hexastylis* plants and flowers observed were taken for each survey area, as provided in Appendix A, and their locations are shown on detailed survey maps in Appendix B. This method was approved by the USFWS (personal communication, email from Rebeka Reid, USFWS, to Simon King, SWCA, on April 20, 2022). SWCA coordinated with the USFWS, NCNHP, and University of North Carolina Herbarium and utilized the recommended species' keys to determine *Hexastylis* species in the field (Gaddy 1987; Krings et al. 2024; Weakley and Southeastern Flora Team 2024).



Figure 4. Example of SWCA's measuring methodology for the calyx tube opening during a survey. The yellow line indicates the measured portion.



Figure 5. Example of SWCA's measuring methodology for calyx tube length during a survey. The yellow line indicates the measured portion.

4 RESULTS

4.1 Project Area Habitats

Most of the Project area landscape in the northern, central, and eastern portions has been significantly altered due to historic mining. The western and southern portions are generally undeveloped forested lands. Land cover maps (USGS 2019a) indicate the Project area consists primarily of deciduous forest, mixed forest, and evergreen forest with smaller portions of pasture/herbaceous, medium to high intensity development, open water (e.g., ponds, lakes, mining pits), and wetland habitats. Field surveys confirmed that most of these land-cover types are fairly accurate. Outside of developed areas and open water, habitat in the Project area falls into five major communities: forested upland, forested wetland, emergent wetland, shrub-scrub wetland, herbaceous and edge uplands.

Potentially suitable habitat for the dwarf-flowered heartleaf was observed within the Project area during field reconnaissance activities in February and March 2022, June 2023, and May 2024. Areas determined to be suitable for the dwarf-flowered heartleaf were generally mature deciduous forests along slopes and bluffs adjacent to aquatic features in the Project area. Areas determined to have low suitability were generally sloped forested areas with loamy soils adjacent to aquatic features but had an herbaceous layer dominated by invasive species such as Japanese honeysuckle (*Lonicera japonica*), Japanese stilt grass (*Microstegium vimineum*), wisteria (*Wisteria sinensis*, *W. floribunda*), and English ivy (*Hedera helix*). Areas determined to have moderate suitability generally included mature deciduous forests with loamy to

sandy loam soils on slopes adjacent to aquatic features that lacked a dominance of invasive species but also lacked mountain laurel and optimal soil types. Areas determined to have high suitability were forested areas on slopes and areas adjacent to streams or lakes with sandy loams, mountain laurel present, and north-facing slopes. Forested areas that were determined to be unsuitable generally included dense, early successional forested habitats, forests dominated by pine trees, forested areas lacking the proper slope and aspect, and forested areas previously heavily disturbed during historic mining activities. Some survey areas had a mix of suitability throughout and, as such, are stated as low to moderate or moderate to high suitability (see Section 4.2, Survey Results; Table 1; Figure 6).

According to the NRCS (2024), no Pacolet sandy loam, Madison gravelly sandy loams, or Musella fine sandy loam soils are mapped within the Project area, which are the soils the species seems restricted to (USFWS 2019, as cited in Gaddy 1981, 1987). Approximately 19.4 percent of the Project area consists of Madison-Bethlehem complex soils with a gravelly sandy clay loam texture which has components of the Madison series (NRCS 2024). However, since most of these soils are classified with slopes between 2 to 8 percent rather than 8 to 10.5 percent and are sandy clay loams rather than sandy loams, they are likely not optimal soils to support the dwarf-flowered heartleaf.

Overall, approximately 10.73 acres of low suitability, 11.29 acres of low to moderate suitability, 1.91 acres of moderate suitability, and 22.81 acres of moderate-to-high suitability habitat for the dwarf-flowered heartleaf was identified and surveyed in the Project area.

4.1.1 Forested Upland

The forested upland community is the dominant habitat present in the Project area. Dominant trees include American sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), tulip tree (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), white oak (*Quercus alba*), red oak (*Quercus* spp.), mockernut hickory (*Carya tomentosa*), and chestnut oak (*Quercus montana*). Understory species commonly observed in the forested areas are flowering dogwood (*Cornus florida*), greenbrier (*Smilax* spp.), blackberry (*Rubus* spp.), spicebush (*Lindera benzoin*), and various successional hardwoods (oaks, hickories, sweetgum, maples). Suitable habitat surveyed includes portions of the forested upland habitat.

4.1.2 Palustrine Forested Wetland

The forested wetland community consists of a prevalence of hydrophytic woody species over 20 feet tall. The tree strata are dominated by red maple, American sycamore (*Platanus occidentalis*), water oak (*Quercus nigra*), sugarberry (*Celtis laevigata*), American elm (*Ulmus americana*), and American sweetgum. The forested wetland habitat was determined not to be suitable for the dwarf-flowered heartleaf and, therefore, was not surveyed. However, some areas immediately adjacent to forested wetlands were suitable and were surveyed.

4.1.3 Palustrine Shrub-Scrub Wetland

The shrub-scrub wetland community consists of a prevalence of hydrophytic woody vegetation less than 20 feet tall. The shrub-scrub strata are dominated by brookside alder (*Alnus serrulata*), American sycamore, black willow (*Salix nigra*), Chinese privet (*Ligustrum sinense*), and red maple. The shrub-scrub wetland habitat in the Project area was determined not to be suitable for the dwarf-flowered heartleaf and, therefore, was not surveyed. However, some areas immediately adjacent to shrub-scrub wetlands were suitable and were surveyed.

4.1.4 Palustrine Emergent Wetland

The emergent wetland community consists of a prevalence of hydrophytic non-woody vegetation less than 3 feet in height. Dominant herbaceous species include giant cane (*Arundinaria gigantea*), bushy bluestem (*Andropogon glomeratus*), lamp rush (*Juncus effusus*), cottongrass bulrush (*Scirpus cyperinus*), lesser poverty rush (*Juncus tenuis*), fowl blue grass (*Poa palustris*), shallow sedge (*Carex lurida*), and goldenrod species (*Solidago* sp.). The emergent wetland habitat was determined not to be suitable for the dwarf-flowered heartleaf and, therefore, was not surveyed. Potentially suitable habitat does not include emergent wetland habitat.

4.1.5 Herbaceous Upland

The herbaceous upland and edge communities consist of non-wetland areas dominated by non-woody vegetation. Dominant herbaceous species include broom-sedge (*Andropogon virginicus*), wild garlic/onion (*Allium* spp.), Kentucky blue grass (*Poa pratensis*), goldenrod, clovers (*Trifolium* spp.), hemp dogbane (*Apocynum cannabinum*), Japanese honeysuckle (*Lonicera japonica*), American burnweed (*Erechtites hieraciifolia*), wild strawberry (*Fragaria virginiana*), and southern crabgrass (*Digitaria ciliaris*). Herbaceous uplands are found primarily within the maintained utilities ROWs. The herbaceous upland habitat was determined not to be suitable for the dwarf-flowered heartleaf and, therefore, was not surveyed.

4.2 Survey Results

SWCA biologists conducted presence/absence surveys during the optimal survey window within potentially suitable habitat on April 8 to 10, 2024 and May 21, 2024. The 15 survey areas covered 46.74 acres of suitable habitat varying from low to high suitability (Table 1; Figure 6).

The threatened dwarf-flowered heartleaf was not identified within any of the survey areas (Table 1). Several populations of the little heartleaf, a common species, were observed during the surveys. This species is noticeably larger than dwarf-flowered heartleaf and has calyx tube lengths generally longer than 1 cm. SWCA biologists encountered some *Hexastylis* plants that lacked flowers and, therefore, prevented identification to species level. However, other flowers that were observed in these areas, or often adjacent to flowerless plants, had calyx tube openings larger than 8 mm and/or a calyx tube longer than 1 cm, which are not characteristics consistent with dwarf-flowered heartleaf (Gaddy 1987; Krings et al. 2024; Weakley and Southeastern Flora Team 2024). SWCA biologists determined that none of the observed flowering *Hexastylis* species were dwarf-flowered heartleaf, as observed flowers never exhibited features consistent with this species. Photographs of suitable habitat and *Hexastylis* plants and flowers observed are provided in Appendix A; additionally, representative photos of unsuitable habitat are also provided.

Table 1. Results of 2024 Dwarf-flowered Heartleaf (*Hexastylis naniflora*) Presence/Absence Survey within the Project Area

Survey Area	Acres	Degree of Suitability	Observations
A	3.68	Low to moderate	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.
B	11.66	Moderate to high	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
C	4.11	Low	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.

Survey Area	Acres	Degree of Suitability	Observations
D	4.04	Low to moderate	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.
E	8.34	Moderate to high	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
F	1.35	Low to moderate	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.
G	1.95	Low to moderate	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.
H	0.22	Moderate	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
I	0.12	Moderate	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
J	0.32	Moderate	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
K	0.80	Moderate	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
L	0.45	Moderate	No <i>Hexastylis naniflora</i> observed. All other <i>Hexastylis</i> plants observed had calyx tube openings >8 mm and/or a calyx tube >1 cm in length.
M	2.81	Moderate to high	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.
N	0.27	Low to moderate	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.
O	6.62	Low	No <i>Hexastylis naniflora</i> or any other <i>Hexastylis</i> species observed.

3.sdf

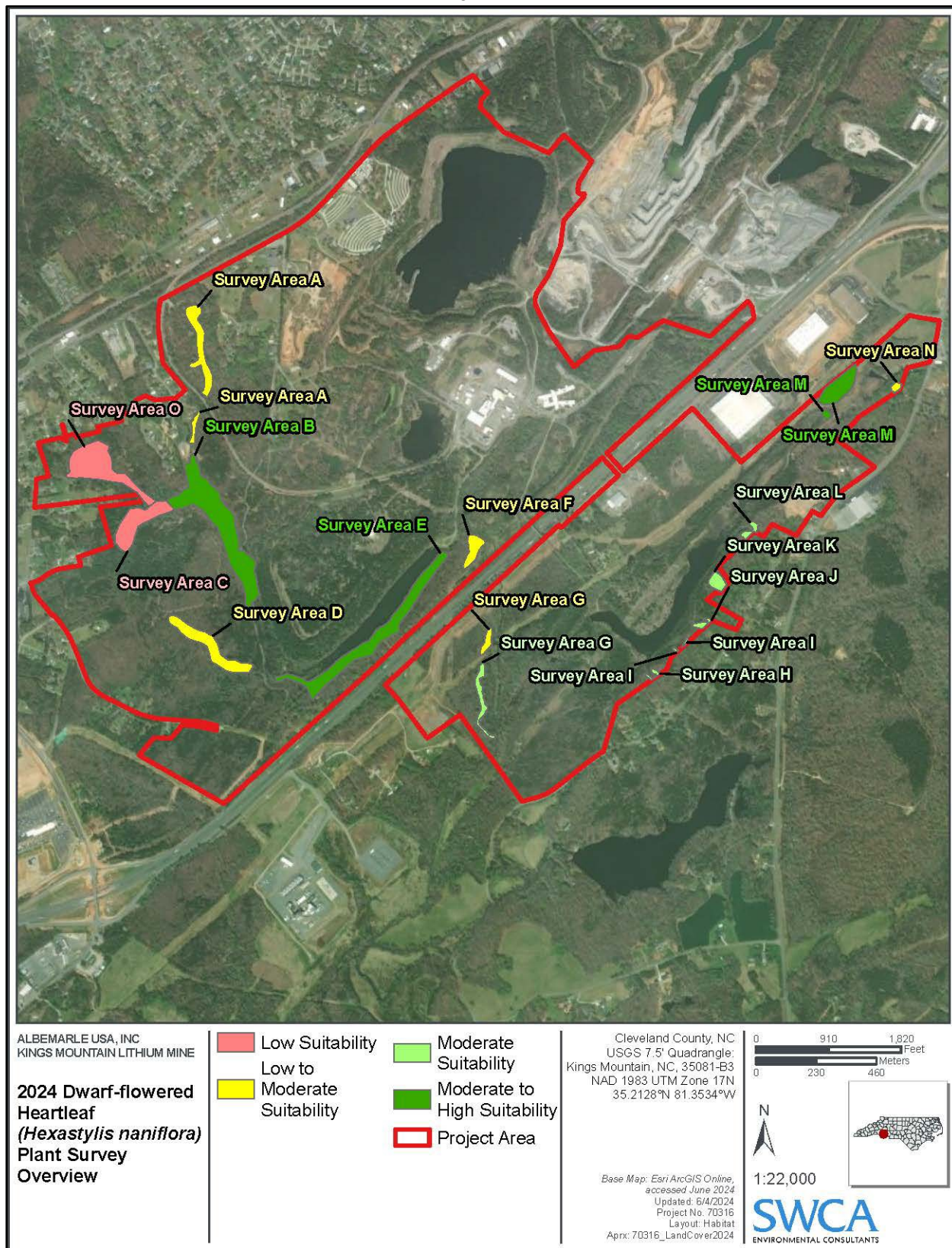


Figure 6. 2024 Dwarf-flowered heartleaf plant survey overview map.

5 SUMMARY AND CONCLUSIONS

Approximately 47 acres of suitable dwarf-flowered heartleaf habitat are present within the Project area. SWCA conducted presence/absence surveys in these suitable habitats during the optimal survey window, and no dwarf-flowered heartleaf populations were observed in the April and May 2024 surveys or the previous May 2022 survey. As such, based on the results of these presence/absence surveys, it is SWCA's professional opinion the Project will have no effect on the federally listed dwarf-flowered heartleaf. If this species is subsequently identified, any occupied habitat should be avoided until after consultation with the USFWS. According to the USFWS, surveys are valid for 2 years and would be required again, starting in April 2026, if the species is still listed at that time (USFWS 2022b). If the species is removed from the federal list, the dwarf-flowered heartleaf may remain a state-listed species.

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APPENDIX A

Photographs



Photo Point 1. Representative low/moderate suitability habitat surveyed at the northern portion of Survey Area A. No *Hexastylis* observed. Location: 35.21921, -81.365206.



Photo Point 2. Representative low/moderate suitability habitat surveyed along the central portion of Survey Area A. No *Hexastylis* observed. Location: 35.218343, -81.365335.



Photo Point 3. Moderate suitability habitat surveyed along the southern portion of Survey Area A north of railroad. No *Hexastylis* observed. Location: 35.217646, -81.365074.

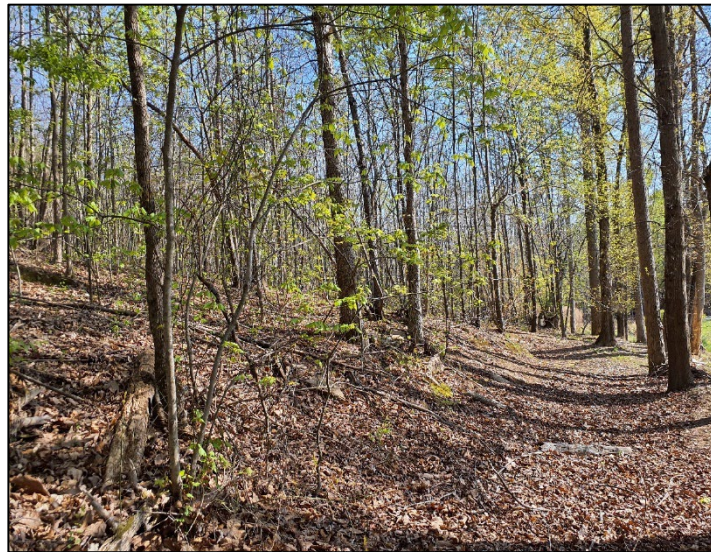


Photo Point 4. Low/moderate suitability habitat surveyed along the southern portion of Survey Area A south of railroad. No *Hexastylis* observed. Location: 35.215642, -81.365552.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 5. High suitability habitat surveyed along the northern portion of Survey Area B. Location: 35.214058, -81.365509.



Photo Point 6. Additional photo of high suitability habitat surveyed within the northern portion of Survey Area B. Location: 35.213867, -81.365608.



Photo Point 7. Moderate suitability habitat in the northwestern portion of Survey Area B. Location: 35.213372, -81.36637.



Photo Point 8. Common *Hexastylis minor* flowers observed in the northern portion of Survey Area B. Location: 35.214913, -81.365665.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 9. Common *H. minor* flowers observed in the northern portion of Survey Area B. Location: 35.213653, -81.36499.



Photo Point 10. Common *H. minor* flowers observed in the northwestern portion of Survey Area B. Location: 35.213484, -81.365851.



Photo Point 11. Moderate suitability habitat surveyed in the central portion of Survey Area B. Location: 35.212182, -81.364193.



Photo Point 12. Common *H. minor* flowers observed in the central portion of Survey Area B. Location: 35.212287, -81.364172.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 13. Common *H. minor* growing along the stream in the southern portion of Survey Area B. Location: 35.210753, -81.362938.



Photo 14. Unsuitable habitat not surveyed just east of Survey Area B. Location: 35.210243, -81.362753.



Photo Point 15. Low suitability habitat surveyed in the eastern portion of Survey Area C. Location: 35.213093, -81.366703.



Photo Point 16. Common *H. minor* observed in the eastern portion of Survey Area C. Location: 35.213158, -81.366757.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 17. Low suitability habitat surveyed in the central portion of Survey Area C. No *Hexastylis* spp. observed. Location: 35.212751, -81.367814.



Photo Point 18. Low suitability habitat surveyed in the western portion of Survey Area C. No *Hexastylis* spp. observed. Location: 35.212448, -81.368635.



Photo Point 19. Low suitability habitat surveyed in the southeastern portion of Survey Area D. No *Hexastylis* spp. observed here. Location: 35.207733, -81.36309.



Photo Point 20. Moderate suitability habitat observed in the central portion of Survey Area D. No *Hexastylis* spp. observed. Location: 35.208285, -81.364807.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 21. Moderate suitability habitat surveyed in the central portion of Survey Area D. No *Hexastylis* spp. observed. Location: 35.208601, -81.364947.



Photo Point 22. Low to moderate suitability habitat surveyed in the northwestern portion of Survey Area D. No *Hexastylis* spp. observed. Location: 35.20939, -81.366416.



Photo Point 23. Example of habitat south of Survey Area D; determined to be not suitable. Area not surveyed. Location: 35.207008, -81.363195.



Photo Point 24. Moderate suitability habitat surveyed in the western portion of Survey Area E. Location: 35.207426, -81.361552.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 25. Representative photo of common *H. minor* observed in western portion of Survey Area E.
Location: 35.207308, -81.361155.



Photo Point 26. Representative moderate to high suitability habitat surveyed in the southwestern portion of Survey Area E. Location: 35.206826, -81.360581.



Photo Point 27. Representative common *H. minor* observed in the southwestern portion of Survey Area E.
Location: 35.206867, -81.36061.



Photo Point 28. Representative high suitability habitat surveyed in the southwestern portion of Survey Area E. Lower end of slope. Location: 35.207527, -81.360022.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 29. Representative *H. minor* observed in the high suitability habitat in the southwestern portion of Survey Area E. Location: 35.207614, -81.359765.



Photo Point 30. Representative high suitability habitat surveyed in the southwestern portion of Survey Area E. Upper end of slope. Location: 35.207574, -81.359405.



Photo Point 31. Representative *H. minor* observed in the upper slope high suitability habitat in the southwestern portion of Survey Area E. Location: 35.207505, -81.359511.



Photo Point 32. Representative moderate suitability habitat surveyed in the central portion of Survey Area E. Location: 35.20917, -81.357107.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 33. Representative *H. minor* observed in the moderate suitability habitat in the central portion of Survey Area E. Location: 35.2091, -81.357129.



Photo Point 34. Representative moderate suitability habitat surveyed in the northern portion of Survey Area E. Location: 35.210266, -81.35627.



Photo Point 35. Representative *H. minor* observed in the moderate suitability habitat in the northern portion of Survey Area E. Location: 35.210739, -81.355895.



Photo Point 36. Additional example of *H. minor* observed in the moderate suitability habitat in the northern portion of Survey Area E. Location: 35.211011, -81.355734.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 37. Additional example of *H. minor* observed in the southwestern portion of Survey Area E. Location: 35.207049, -81.360712.



Photo Point 38. Representative moderate suitability habitat surveyed in the northern portion of Survey Area F. No *Hexastylis* spp. observed. Location: 35.212244, -81.353701.



Photo Point 39. Representative moderate suitability habitat surveyed in the central portion of Survey Area F. No *Hexastylis* spp. observed. Location: 35.211798, -81.353748.



Photo Point 40. Representative low suitability habitat in the southern portion of Survey Area F. No *Hexastylis* spp. observed. Location: 37.294375, -77.281546.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 41. Representative unsuitable habitat along Kings Creek north of Survey Area E and F. Area was not surveyed. Location: 35.213052, -81.354248.



Photo Point 42. Additional example of unsuitable habitat along Kings Creek north of Survey Area E and F. Area was not surveyed. Location: 35.215288, -81.352612.



Photo Point 43. Example of low to moderate suitability habitat in the northern portion of Survey Area G. No *Hexastylis* spp. observed. Location: 35.208331, -81.353402.



Photo Point 44. Example of moderate suitability habitat in the central portion of Survey Area G. No *Hexastylis* spp. observed. Location: 35.20682, -81.353398.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 45. Representative moderate suitability habitat surveyed in the southern portion of Survey Area G. No *Hexastylis* spp. observed. Location: 35.206229, -81.353336.



Photo Point 46. Moderate suitability habitat surveyed in the southern portion of Survey Area G. No *Hexastylis* spp. observed. Location: 35.205698, -81.353454.



Photo Point 47. Representative unsuitable successional habitat east of the Kings Creek floodplain. Area not surveyed. Location: 35.20689, -81.35134.



Photo Point 48. Additional representative unsuitable successional habitat east of the Kings Creek floodplain. Area not surveyed. Location: 35.207232, -81.350933.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 49. Representative moderate suitability habitat surveyed in Survey Area H. Location: 35.207508, - 81.346508.



Photo Point 50. Representative common *H. minor* observed in Survey Area H. Location: 35.207464, - 81.346459.



Photo Point 51. Additional representative common *H. minor* observed in Survey Area H. Location: 35.20758, - 81.346124.



Photo Point 52. Moderate suitability habitat in the southern portion of Survey Area I. Location: 35.208332, - 81.345284.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 53. Representative *H. minor* observed in the southern portion of Survey Area I. Location: 35.208347, -81.345337.



Photo Point 54. Moderate suitability habitat in the northern portion of Survey Area I. Location: 35.208332, -81.345284.



Photo Point 55. Representative *H. minor* observed in the southern portion of Survey Area I. Location: 35.20855, -81.344961.



Photo Point 56. Representative moderate suitability habitat surveyed in the western portion of Survey Area J. Location: 35.209211, -81.344366.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 57. Representative common *H. minor* observed Survey Area J. Location: 35.209229, -81.344026.



Photo Point 58. Example of unsuitable habitat not surveyed to the north of Survey Area J. Location: 35.209494, -81.344138.



Photo Point 59. Representative moderate suitability habitat surveyed in Survey Area K. Location: 35.210831, -81.343513.



Photo Point 60. Representative common *H. minor* observed in Survey Area K. Location: 35.210559, -81.343783.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 61. Representative moderate suitability habitat surveyed in Survey Area L. Location: 35.212279, -81.342458.



Photo Point 62. Representative *H. minor* observed in Survey Area L. Location: 35.212553, -81.342064.



Photo Point 63. Example of unsuitable successional pine habitat north of Survey Area L. Area not surveyed. Location: 35.21354, -81.34153.



Photo Point 64. Moderate suitability habitat surveyed in the southern portion of Survey Area M. No *Hexastylis* spp. observed. Location: 35.216503, -81.339074.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 65. Moderate suitability habitat surveyed in the south-central portion of Survey Area M. No *Hexastylis* spp. observed. Location: 35.216887, -81.339186.



Photo Point 66. Representative high suitability habitat surveyed in the central portion of Survey Area M. No *Hexastylis* spp. observed. Location: 35.217496, -81.338722.



Photo Point 67. Representative high suitability habitat surveyed in the eastern portion of Survey Area M. No *Hexastylis* spp. observed. Location: 35.217522, -81.338191.



Photo Point 68. Representative moderate suitability habitat surveyed in the northern portion of Survey Area M. No *Hexastylis* spp. observed. Location: 35.217965, -81.337837.

*Refer to Appendix B for locations of Survey Areas and Photo Points.



Photo Point 69. Representative unsuitable habitat between Survey Area M and Survey Area N. Area was not surveyed. Location: 35.21807, -81.336914.



Photo Point 70. Representative low to moderate suitability habitat surveyed in Survey Area N. No *Hexastylis* spp. observed. Location: 35.217349, -81.336149.

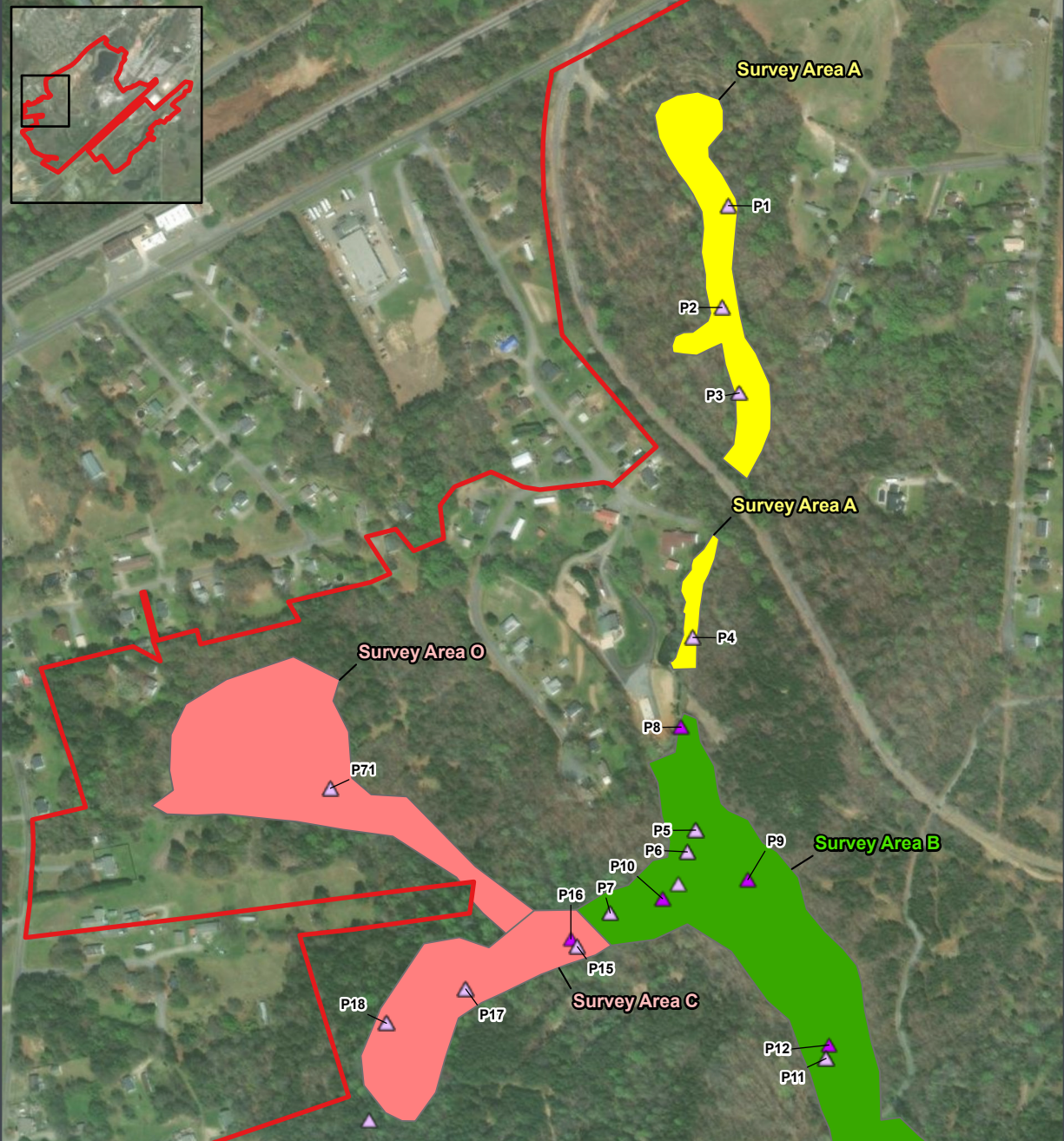


Photo Point 71. Representative low suitability habitat in the central portion of Survey Area O. No *Hexastylis* spp. observed. Location: 35.214615, -81.369533.

*Refer to Appendix B for locations of Survey Areas and Photo Points.

APPENDIX B

Detailed Survey Area Maps

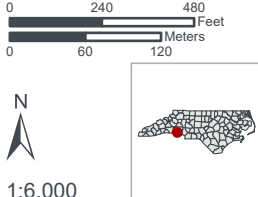


ALBEMARLE USA, INC
KINGS MOUNTAIN LITHIUM MINE

**2024 Dwarf-flowered
Heartleaf
(*Hexastylis naniflora*)
Plant Survey
Detail Map**

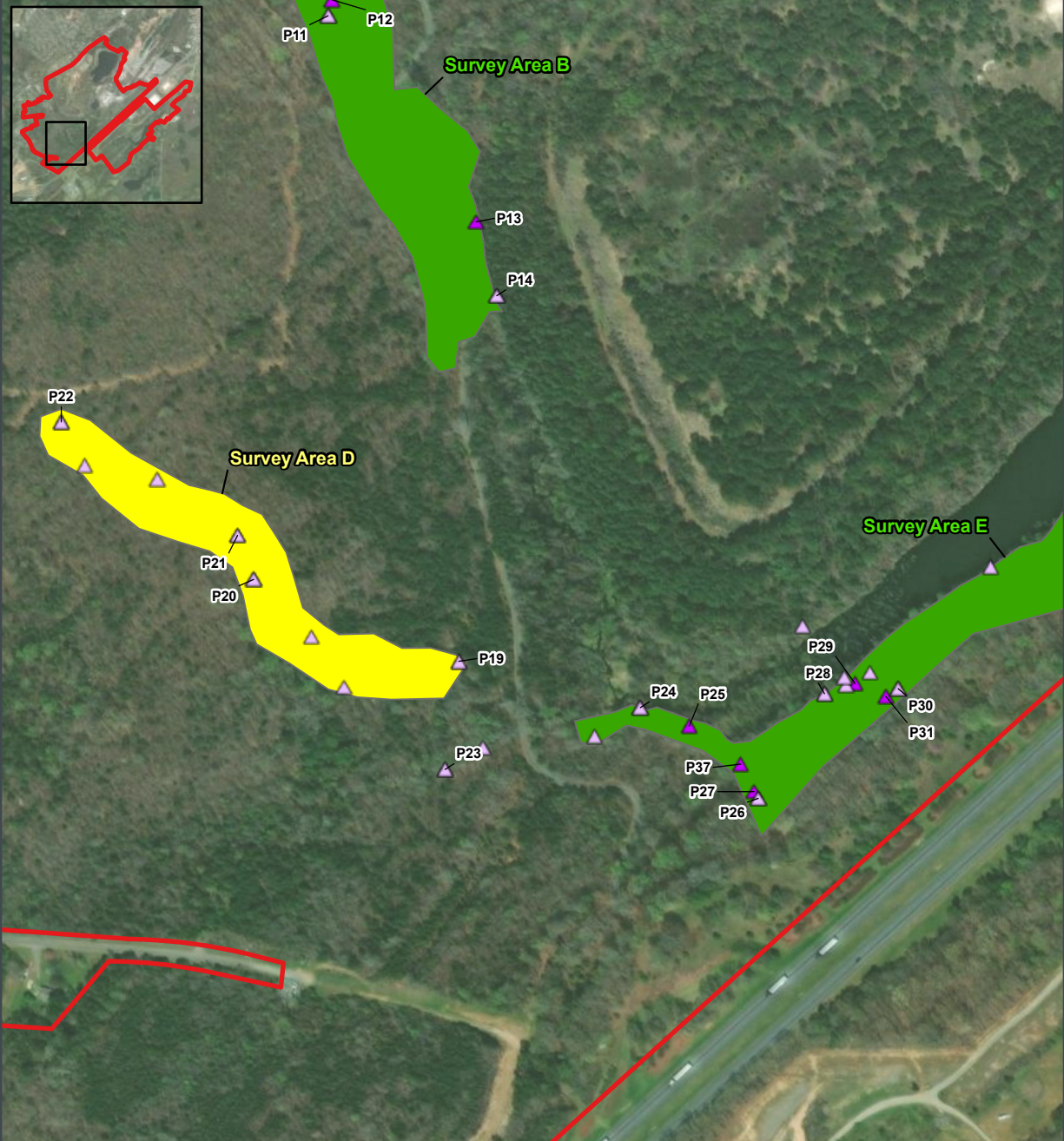
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- Plant Photo Point
- Low Suitability
- Low to Moderate Suitability
- Moderate to High Suitability

Cleveland County, NC
USGS 7.5' Quadrangle:
Kings Mountain, NC, 35081-B3
NAD 1983 UTM Zone 17N
35.2162°N 81.3672°W







Base Map: Esri ArcGIS Online,
accessed June 2024
Updated: 6/4/2024
Project No. 70316
Layout: Habitat_series
Aprx: 70316_LandCover2024

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SWCA
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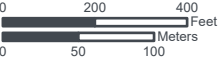
ALBEMARLE USA, INC
KINGS MOUNTAIN LITHIUM MINE

**2024 Dwarf-flowered
Heartleaf
(*Hexastylis naniflora*)
Plant Survey
Detail Map**

-  Habitat Photo Point
-  Plant Photo Point
-  Low to Moderate Suitability
-  Moderate to High Suitability


Cleveland County, NC
USGS 7.5' Quadrangle:
Kings Mountain, NC, 35081-B3
NAD 1983 UTM Zone 17N
35.2084°N 81.3625°W

Base Map: Esri ArcGIS Online,
accessed June 2024
Updated: 6/4/2024
Project No. 70316
Layout: Habitat_series
Aprx: 70316_LandCover2024





0 200 400 Feet
0 50 100 Meters

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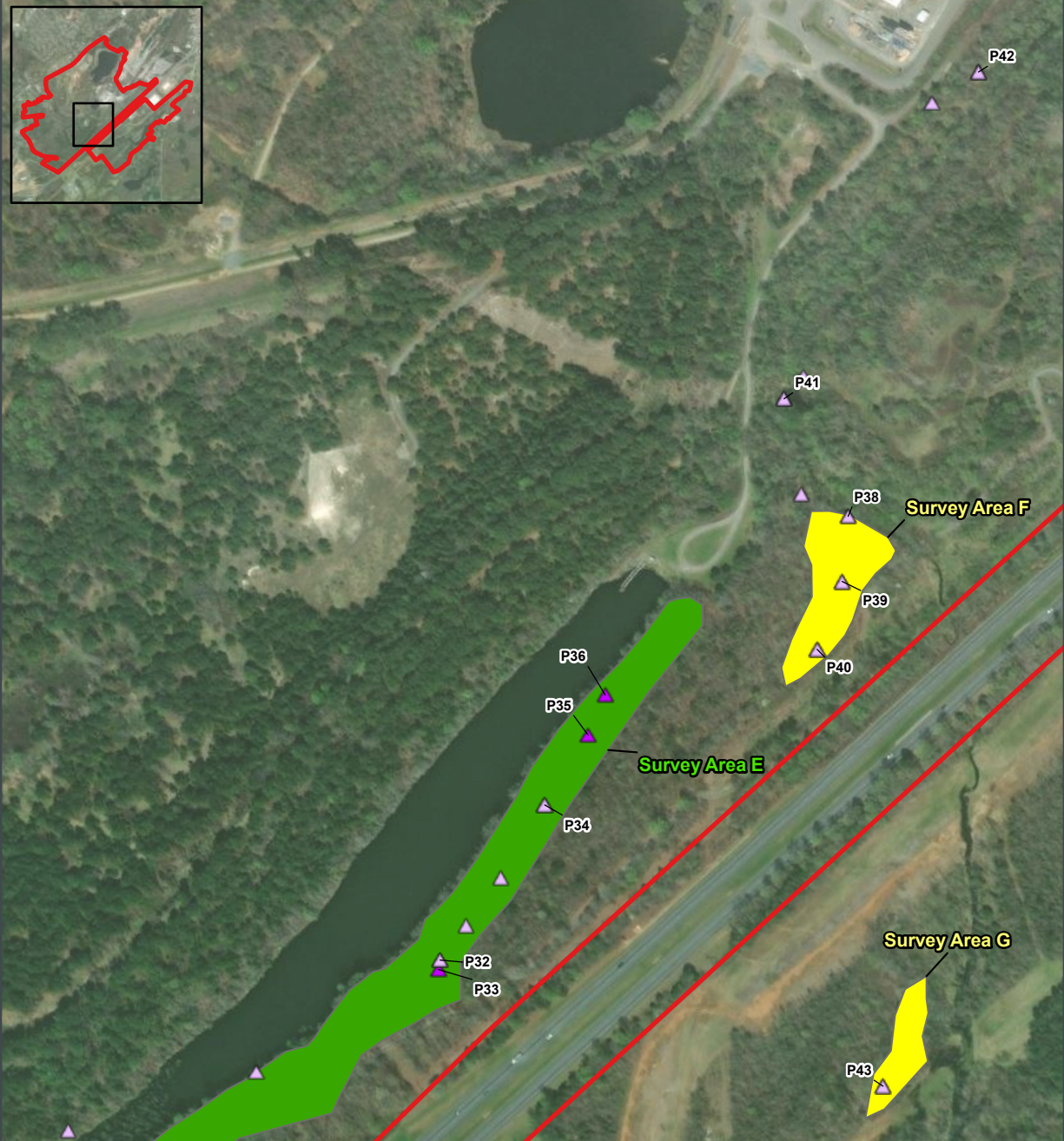


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**2024 Dwarf-flowered
Heartleaf
(*Hexastylis naniflora*)
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Detail Map**

-  Habitat Photo Point
-  Plant Photo Point
-  Low to Moderate Suitability
-  Moderate to High Suitability


Cleveland County, NC
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Kings Mountain, NC, 35081-B3
NAD 1983 UTM Zone 17N
35.2119°N 81.3563°W

Base Map: Esri ArcGIS Online,
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Updated: 6/4/2024
Project No. 70316
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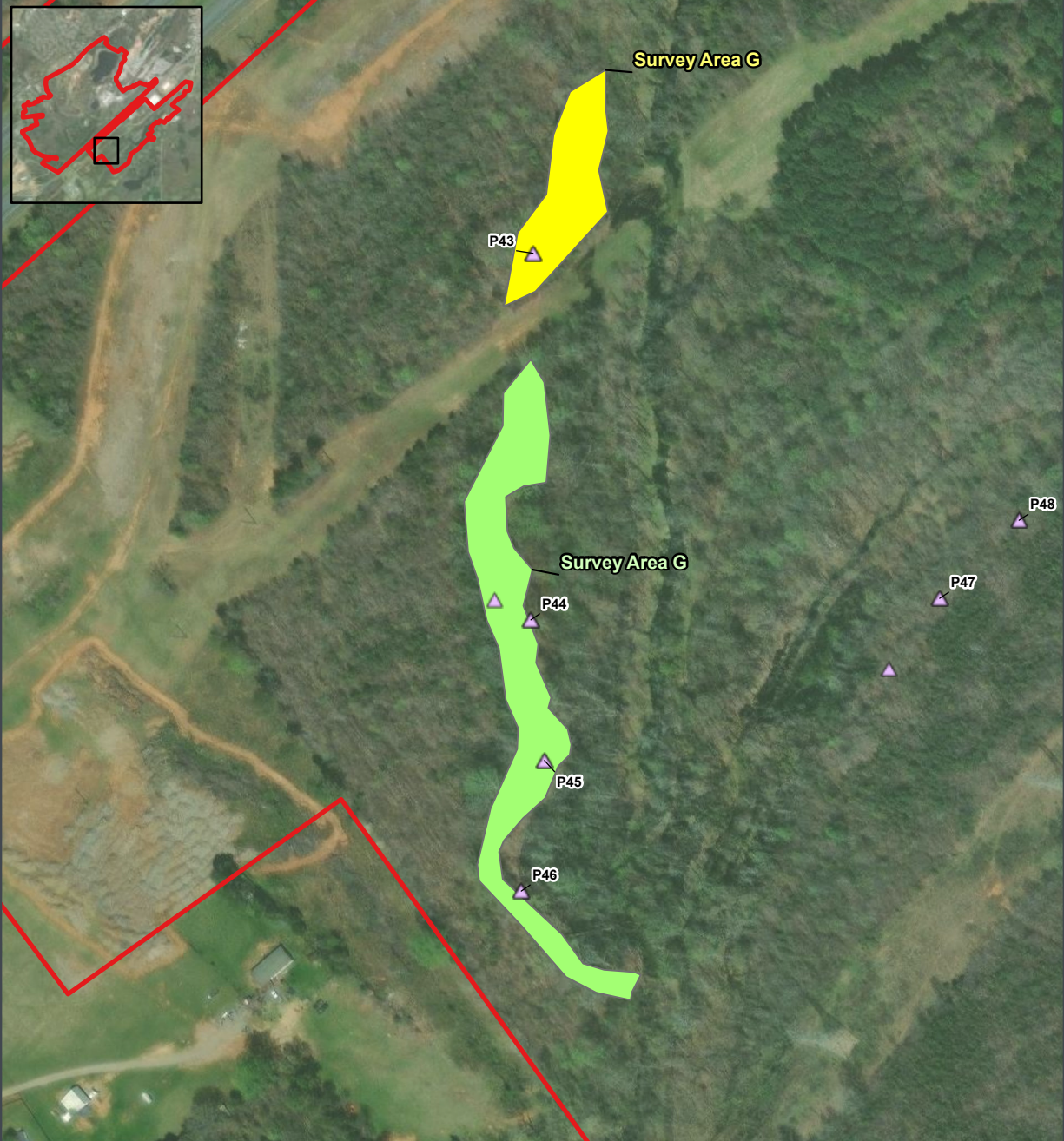
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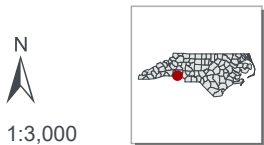


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**2024 Dwarf-flowered
Heartleaf
(*Hexastylis naniflora*)
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Detail Map**

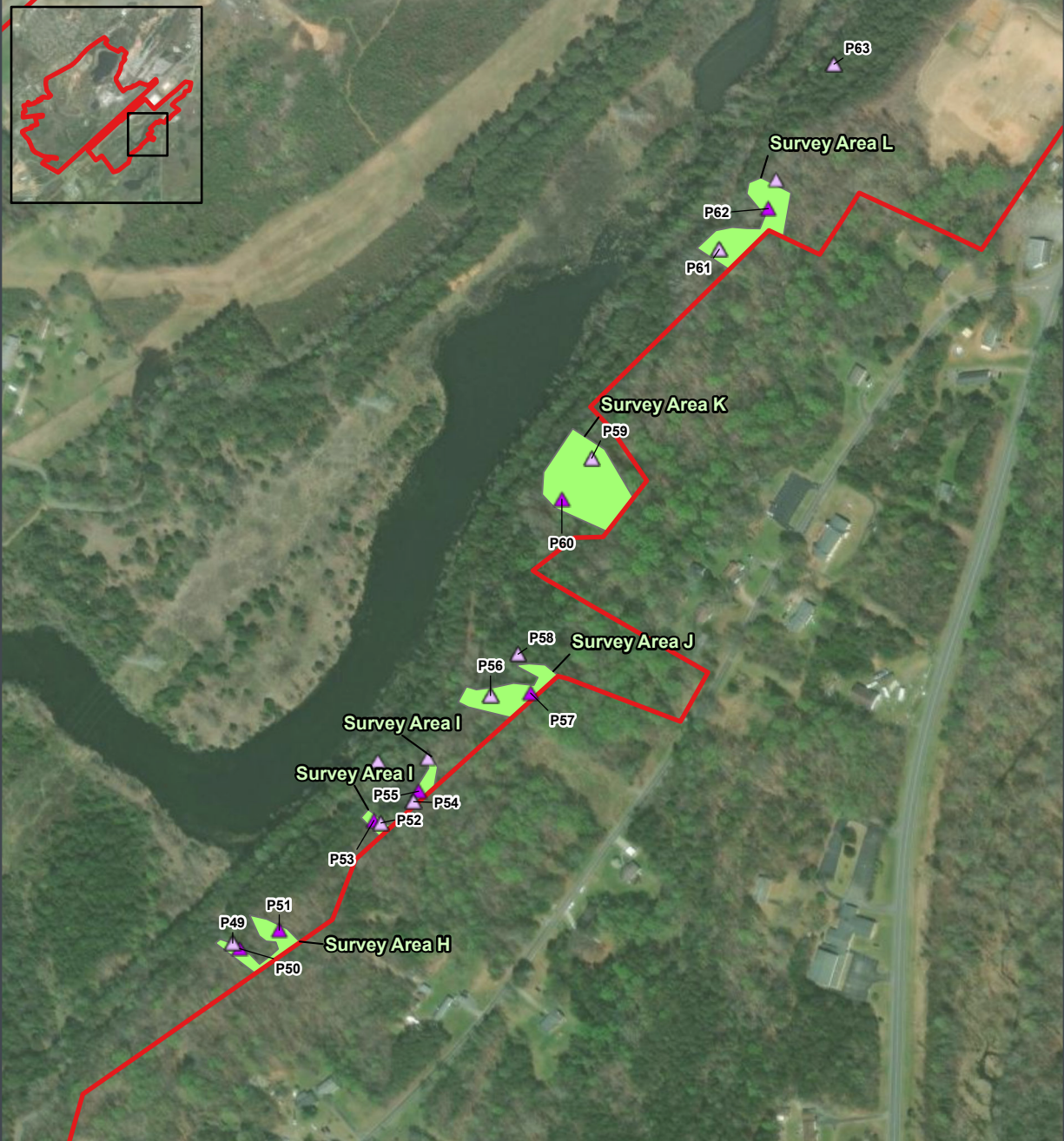
- Habitat Photo Point
- Low to Moderate Suitability
- Moderate Suitability

Cleveland County, NC
USGS 7.5' Quadrangle:
Kings Mountain, NC, 35081-B3
NAD 1983 UTM Zone 17N
35.207°N 81.3534°W






Base Map: Esri ArcGIS Online,
accessed June 2024
Updated: 6/4/2024
Project No. 70316
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Aprx: 70316_LandCover2024

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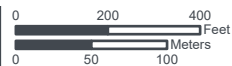


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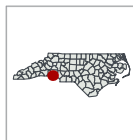
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Heartleaf
(*Hexastylis naniflora*)
Plant Survey
Detail Map**

-  Habitat Photo Point
-  Plant Photo Point
-  Moderate Suitability

Cleveland County, NC
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NAD 1983 UTM Zone 17N
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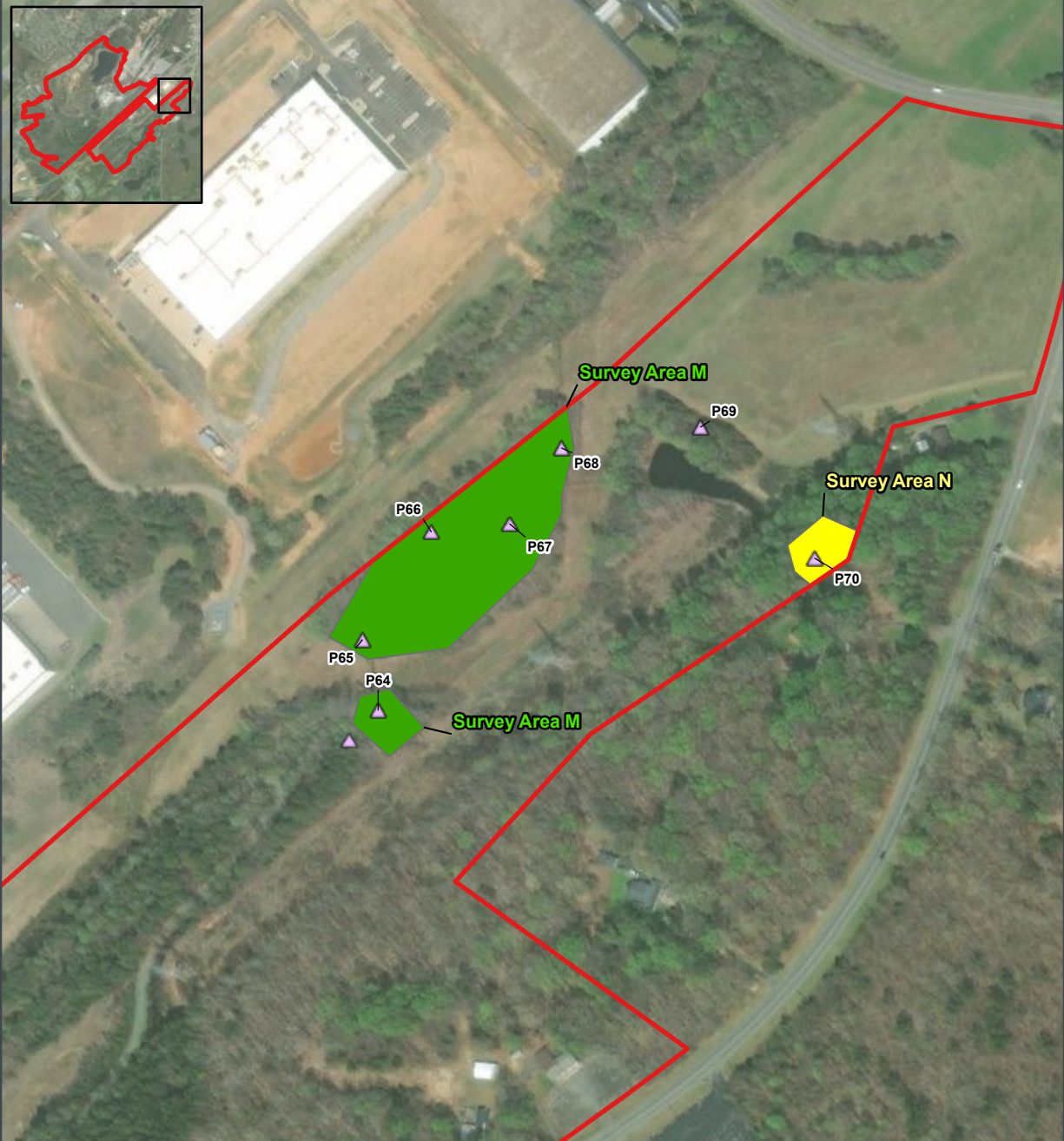


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Base Map: Esri ArcGIS Online,
accessed June 2024
Updated: 6/4/2024
Project No. 70316
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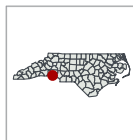
**2024 Dwarf-flowered
Heartleaf
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-  Habitat Photo Point
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-  Moderate to High Suitability

Cleveland County, NC
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Kings Mountain, NC, 35081-B3
NAD 1983 UTM Zone 17N
35.2173°N 81.338°W



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Base Map: Esri ArcGIS Online,
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Updated: 6/4/2024
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