Monarch Butterfly Habitat Assessment for the Kings Mountain Lithium Mine, Cleveland County, North Carolina

NOVEMBER 2022

PREPARED FOR

Albemarle U.S., Inc.

PREPARED BY

SWCA Environmental Consultants

MONARCH BUTTERFLY HABITAT ASSESSMENT FOR THE KINGS MOUNTAIN LITHIUM MINE, CLEVELAND COUNTY, NORTH CAROLINA

Prepared for

Albemarle U.S., Inc.
348 Holiday Inn Drive
Kings Mountain, North Carolina 28086
Attn: Trevor Chesal

Prepared by

SWCA Environmental Consultants
113 Edinburgh South Drive, Suite 120
Cary, North Carolina 27511
(919) 212-2200
www.swca.com

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1 INTRODUCTION

On behalf of Albemarle Corporation (Albemarle), SWCA Environmental Consultants (SWCA) has prepared an assessment of monarch butterfly (*Danaus plexippus*) habitat for the Kings Mountain Lithium Mining Project (Project) located in southeastern Cleveland County, North Carolina. As described in this report, the monarch butterfly is a candidate species for listing under the Endangered Species Act of 1973, as amended (ESA) and could become listed as threatened or endangered prior to the start of Project construction. A desktop review and field observations were used to assess the quantity and quality of habitat in the Project area to determine the potential for monarch butterfly to occur, assess potential impacts, and provide conservation measures should the species become listed.

1.1 Location

The Project is on private land owned or leased by Albemarle and consists of approximately 1,403 acres (Project area). The Project is located 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 two smaller parcels 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 main parcel is mostly developed/disturbed and includes Albemarle's lithium salts and compound processing facility and Albemarle's Global Technical Center. The west side along South Battleground Avenue includes an active drive-in theater, remnants of a textile mill, old school building, and recreational vehicle campground. Five utility rights-of-way (ROWs) cross the northern and central portions of the parcel. The Kings Mountain Gateway Trail goes around main parcel and includes a butterfly garden at the plateau. The parcel directly south of I-85 is mostly undeveloped. The Kings Mountain Gateway Trail goes around the northern and eastern boundaries of this parcel with trailheads off Galilee Church Road and Battleground Road. Additionally, three utility ROWs cross the parcel running northeast–southwest. The easternmost parcel, east of York Road, is undeveloped with only a few unpaved roads for access. Undeveloped land in the three parcels consists primarily of forest and wetland habitats.

The Project area is surrounded by residential, commercial, and industrial development to the north, west, and south (Figure 2). The Martin Marietta mine borders the Project area to the north. To the east is primarily undeveloped land associated with Crowders Mountain State Park.

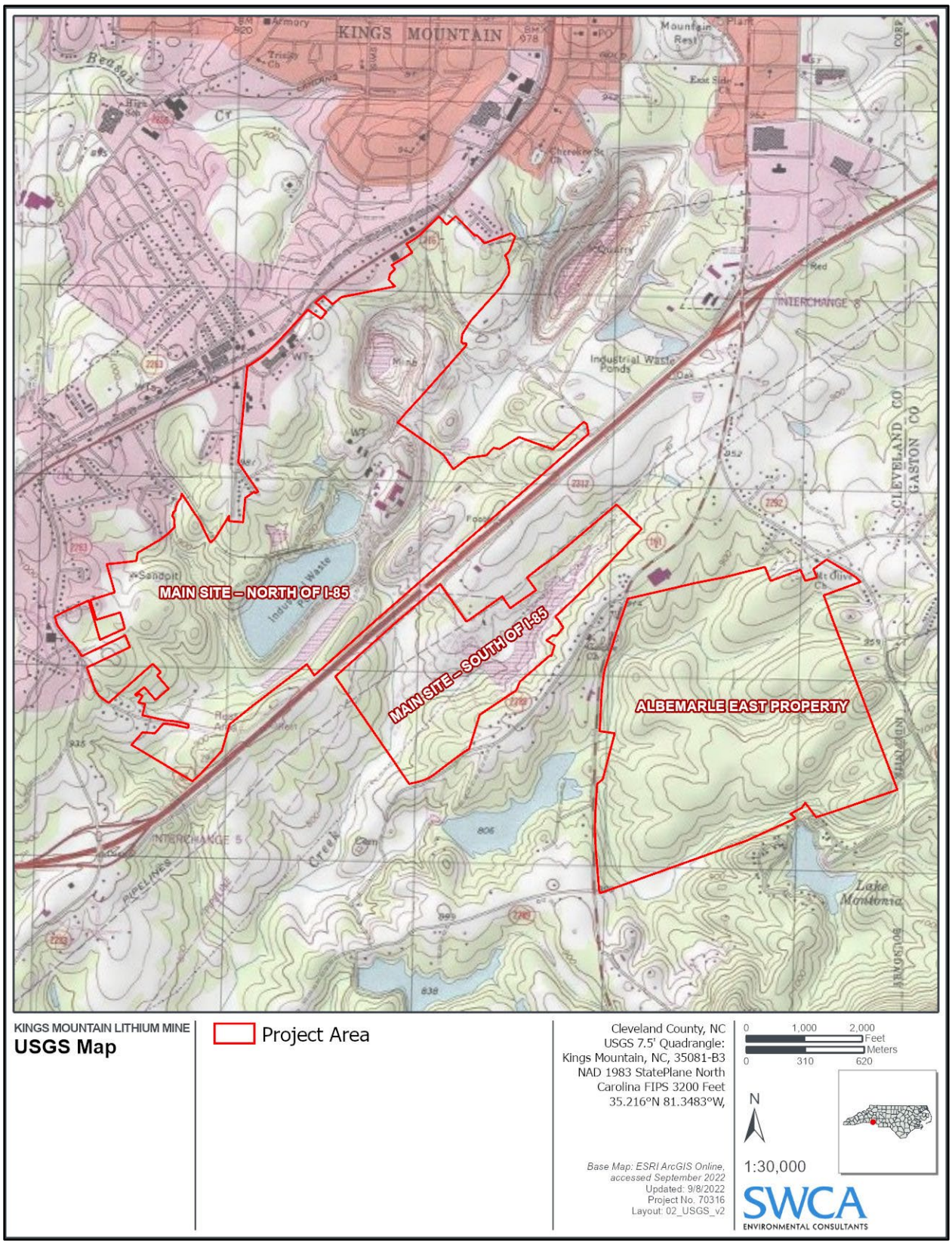

Figure 1. Project location.

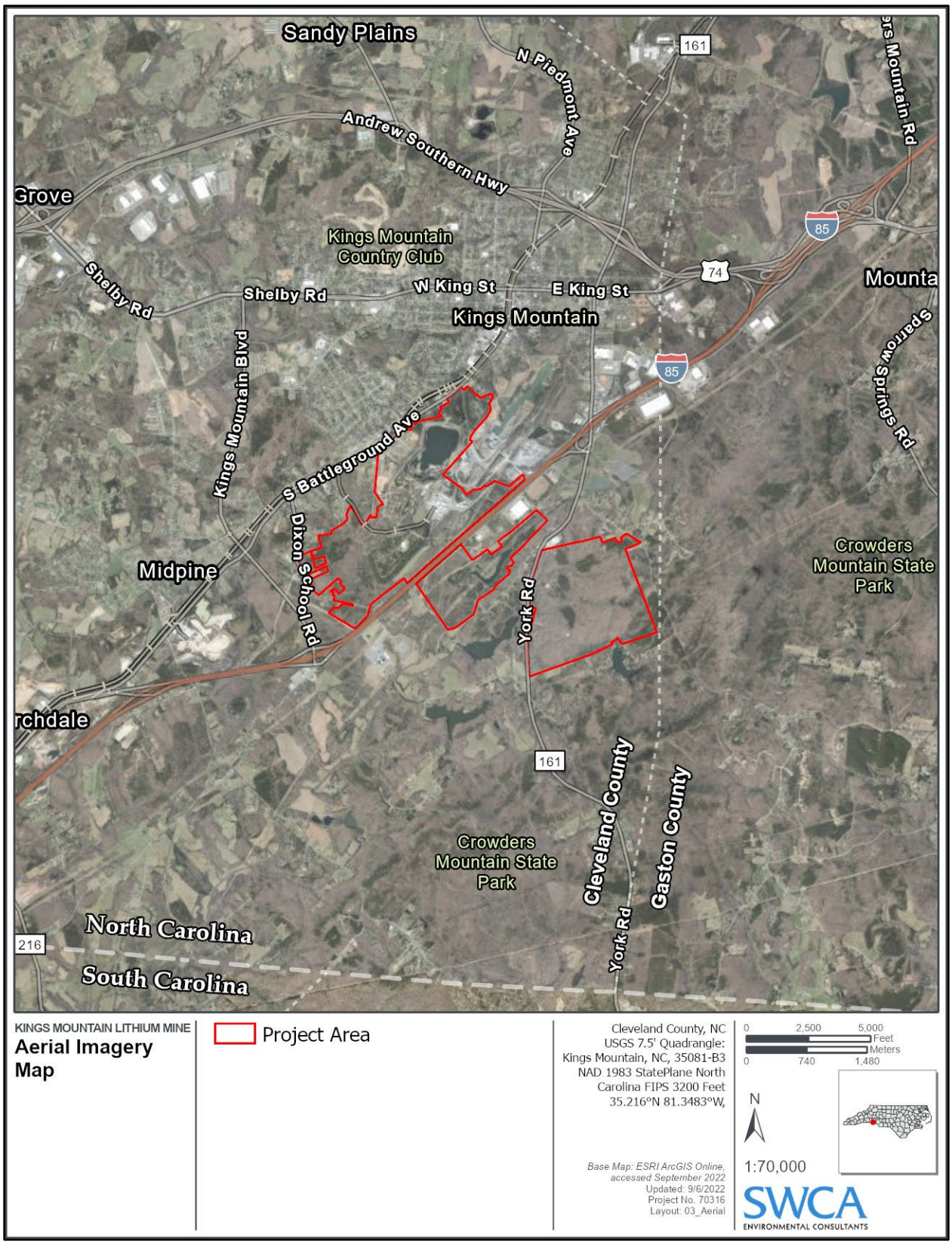

Figure 2. Aerial imagery of the Project area.

2 SPECIES BACKGROUND

2.1 Life History

The monarch butterfly is predominantly a migratory insect with four life stages: egg, larva, pupae, and adult (NatureServe 2022). Monarch butterfly breeding habitat occurs throughout most of the United States, including throughout North Carolina, in open habitats where milkweed (*Asclepias* spp.) plants are found. Milkweed plants are the sole host plant for monarch eggs and larvae (U.S. Fish and Wildlife Service [USFWS] 2020a). The monarch butterfly occurs within North Carolina during spring migration from its overwintering habitat in Mexico. When monarch reach the southern U.S. during their spring migration, they begin mating and laying eggs. Then migration continues to their northern breeding grounds where the second, third, and fourth generations reproduce throughout the summer (U.S. Forest Service 2017).

Suitable habitat includes fields, meadows, weedy areas, marshes, roadsides, pastureland, and urban and suburban residential gardens. According to USFWS (2020b) and Monarch Joint Venture (2022), milkweed abundance and diversity is important for breeding habitat, and foraging habitat includes cover and diversity of flowering nectar plants. Suitable monarch habitat in the southern United States is composed of two or more milkweed stems per 1,500-square-foot plot, or 58 stems per acre, or requires that greater than 10% cover is flowering nectar plants. Unsuitable habitat includes areas such as grasslands dominated by invasive grass species or woody thickets too dense to support herbaceous flowering vegetation.

2.2 Range

Three known monarch populations are native to continental North America. Two migratory populations are located east and west of the Rocky Mountains, and a third population is a non-migratory population located in southern Florida (USFWS 2020b). North Carolina is within the range of the eastern migratory population. The USFWS has mapped core conservation units that encompass the species' primary summer breeding range and migration routes. North Carolina is outside of the core conservation units mapped by USFWS within the eastern range (Monarch Joint Venture 2021). The core conservation units for the eastern population includes the Midwest states (Kansas, Nebraska, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, and Ohio).

2.3 Threats

Once one of the most common butterflies in North America, the total population of monarchs has decreased. The loss of habitat resulting from land conversion, herbicide use, and mowing are key threats to the species (USFWS 2020b). Loss of milkweed within breeding habitat is believed to be a primary threat to eastern monarchs (NatureServe 2022). Roadkill during migration has been noted as a threat to monarch populations, particularly on highways in the southern migration area where the migrating butterflies become concentrated (Alvarez et al. 2019).

2.4 Status

The monarch butterfly is currently listed as a candidate species. Candidate species are species with sufficient information on their biological status and threats for USFWS to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by

other higher priority listing activities. In December 2020, the USFWS announced their 12-month finding on a petition to list the monarch butterfly as a threatened or endangered species was warranted but precluded by higher priority actions (USFWS 2020c). A proposed listing determination is now expected in fiscal year 2024 (USFWS 2022).

There are no ESA requirements while a species is a candidate. However, the Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands (USFWS 2020b) and Monarch Butterfly Conservation Strategy for the Eastern Region of the U.S. Department of Agriculture (U.S. Forest Service 2017) provide voluntary conservation measures to protect this species. These documents focus on enhancing populations and habitat in core conservation units, particularly along ROWs.

3 METHODS

3.1 Desktop Analysis

A preliminary desktop analysis was completed for the Project prior to field surveys by using 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.

- USGS National Land Cover Database (USGS 2019)
- Google Earth aerial imagery

These sources were used to characterize the habitat in the Project area and surrounding area to determine potential open, herbaceous habitats preferred by monarch butterflies.

3.2 Field Surveys

The USFWS and other agencies do not provide protocols for surveying monarch butterfly habitat or conducting presence/absence surveys. SWCA conducted habitat surveys in line with standard methods for other species. In February and March 2022, biologists identified areas of potential suitable monarch butterfly habitat within the Project area. In spring and summer 2022, biologists returned to the previously identified habitat and completed a monarch butterfly habitat assessment, which involved meandering surveys focused on identifying milkweed and nectar plants. The survey assessed the quantity and quality of habitat, not the presence or absence of individual butterflies or larva; however, biologists looked for monarch butterflies during the habitat assessment.

The survey did not include surveys of the planted butterfly garden along the Kings Mountain Gateway Trail, since it was already known to provide approximately 1 acre of suitable habitat for monarch butterflies and includes a 2,000-square-foot pollinator garden. SWCA biologists visited the butterfly garden during other survey efforts and did not observe monarch butterflies. No Project activities are proposed that would impact the butterfly garden.

4 RESULTS

4.1 Project Area Habitats

The landscape has been significantly altered in the main parcel and the parcel south of I-85 due to historic mining. Land cover maps (USGS 2019) 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 have 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.

4.1.1 Forested Upland

The forested upland community is the dominant habitat present in the Project area. Approximately 1,000 acres of forested uplands (i.e., deciduous, mixed, and evergreen forest) are 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). Monarch butterfly does not typically use forested habitat other than during overwintering in Mexico.

4.1.2 Palustrine Forested Wetland

The forested wetland community consist 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. Approximately 43 acres of forested wetlands are present in the Project area (SWCA 2022). The monarch butterfly does not typically use forested habitat other than during overwintering in Mexico.

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 serrulate*), American sycamore, black willow (*Salix nigra*), Chinese privet (*Ligustrum sinense*), and red maple. Approximately 10 acres of shrub-scrub wetlands are present in the Project area (SWCA 2022). Monarch butterfly is not expected to use shrub-scrub wetlands.

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.). Approximately 6 acres of emergent wetlands are present in the Project area (SWCA 2022). Some less common North Carolina milkweed species occur in wet soils along

waterbodies (Xerces Society 2019); however, no milkweed species were recorded in these emergent wetlands.

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 hieraciifolius*), wild strawberry (*Fragaria virginiana*), and southern crab grass (*Digitaria ciliaris*). Herbaceous uplands are primarily found within the maintained utilities ROWs. Approximately 100 acres of herbaceous uplands are present in the Project area. Herbaceous uplands are suitable for the monarch butterfly if they contain milkweed or other nectar plants (Xerces Society 2019). During the initial field visits in February and March 2022, biologists determined that approximately 39 acres of the herbaceous uplands were potentially suitable monarch butterfly habitat. These areas were the focus of the spring and summer habitat assessment.

4.2 Habitat Assessment

In spring and summer of 2022, previously identified areas of potential suitable habitat were surveyed to determine whether they contained milkweed and other nectar plants capable of supporting the monarch butterfly and its life cycle. Fourteen areas totaling 38.9 acres were surveyed and are described in Table 1. Surveys focused on utility ROWs and roadsides that may provide open herbaceous habitat with nectar plants (Figure 3).

Butterfly milkweed (*Asclepias tuberosa*), swamp milkweed (*Asclepias incarnata*), and common milkweed (*Asclepias syriaca*) were observed during summer surveys, but these host plants were generally uncommon with sparse distribution where observed. A total of 102 milkweed plants were observed within the Project area (see Table 1). Many of the areas surveyed were densely populated with blackberry and other shrubby briers (*Rubus* spp.) and lacked the open, herbaceous habitat preferred by monarch butterflies. Overall, 24.6 acres were low-quality suitable habitat, and 14.3 acres were moderately suitable.

Common vegetation observed included sedges (*Carex* spp.), switchgrass (*Panicum virgatum*), Johnson grass (*Sorghum halepense*), goldenrod, blackberry, Chinese bushclover (*Lespedeza cuneata*), Joe Pye weed (*Eupatorium dubium*), dog fennel (*Eupatorium capillifolium*), and hemp dogbane. Some of these flowering species may provide nectar for foraging butterflies when in bloom.

Photographs of potential habitat and observed milkweed are provided in Appendix A.

Table 1. Results of Monarch Habitat Survey within the Project Area

Survey Area	Acres Surveyed	General Location	Degree of Suitability	Number of Milkweed Plants	Observations
1	2.53	Southern portion of the Main Site – North of I-85	Low	None	Maintained ROW primarily consisting of goldenrod (*Solidago* spp.), Joe Pye weed (*Eupatorium dubium*), and various grasses. Most portions of this ROW had been recently mowed prior to survey.
2	8.08	Eastern portion of the Main Site – North of I-85	Low	1	Maintained ROW primarily consisting of Johnson grass (*Sorghum halepense*), goldenrod, ragweed (*Ambrosia* spp.), kudzu (*Pueraria montana*), blackberry (*Rubus* spp.), bull thistle (*Cirsium vulgare*), and bear's foot (*Smallanthus uvedalia*). One butterfly milkweed (*Asclepias tuberosa*) was observed.
3	1.60	Central portion of the Main Site – North of I-85	Low	None	Maintained ROW along sand tailings. Sparsely vegetated with various grass species.
4	0.60	Eastern portion of the Main Site – North of I-85	Low	None	Small open area primarily consisting of Chinese bushclover (*Lespedeza cuneata*).
5	1.93	Western portion of the Main Site – South of I-85	Moderate	5	Maintained ROW primarily consisting of switchgrass (*Panicum virgatum*), Johnson grass, Chinese bushclover, dog fennel (*Eupatorium capillifolium*), hemp dogbane (*Apocynum cannabinum*), blackberry, and goldenrod. Five individual plants of swamp milkweed (*Asclepias incarnata*) were observed.
6	3.50	Western portion of the Main Site – South of I-85	Moderate	37	Maintained ROW primarily consisting of switchgrass, Johnson grass, Chinese bushclover, dog fennel, hemp dogbane, blackberry, goldenrod butterfly milkweed and common milkweed (*Asclepias syriaca*). A total of 37 milkweed plants were observed in three separate areas.
7	1.34	North-central portion of the Main Site – South of I-85	Low	None	Maintained ROW primarily consisting of goldenrod, hemp dogbane, lervain (*Verbena* spp.), Johnson grass, and blackberry.
8	3.39	North-central portion of the Main Site – South of I-85	Moderate	12	Maintained ROW primarily consisting of goldenrod, kudzu, Johnson grass, and blackberry. A total of 12 butterfly milkweed were observed in one area.
9	6.53	Central portion of the Main Site – South of I-85	Low	None	ROW primarily consisting of ragweed, Chinese bushclover, Johnson grass, mullein (*Verbascum* sp.), common mullein (*Verbascum thapsus*), American burnweed (*Erechtites hieraciifolius*), blackberry, goldenrod, and camphorweed (*Heterotheca subaxillaris*). Portions of the survey area have dense blackberry thickets.
10	2.87	South-central portion of the Main Site – South of I-85	Low	None	ROW primarily consists of switchgrass, goldenrod, and blackberry thickets.
11	4.67	South portion of the Main Site – South of I-85	Moderate	4	Maintained ROW primarily consisting of sedges, blackberry, mullein, goldenrod, maypop (*Passiflora incarnata*), and hemp dogbane. Four individual plants of butterfly milkweed were observed in southwestern portion of the survey area.

Survey Area	Acres Surveyed	General Location	Degree of Suitability	Number of Milkweed Plants	Observations
12	0.26	Central portion of the Main Site – South of I-85	Low	None	Small open area primarily consisting of Chinese bushclover and camphorweed.
13	0.81	Northeastern portion of the Albemarle East Property	Moderate	33	Maintained ROW primarily consisting of grasses and goldenrod. A total of 33 individual common milkweed plants were observed in one area.
14	0.79	West-central portion of the Main Site – North of I-85	Low	10	Maintained roadside area for an access road into the Main Site. Vegetation primarily consisted of grasses, goldenrod, and ragweed. Five individual butterfly milkweed plants were observed in one area.
Total	**38.90 acres**			**102 plants**	

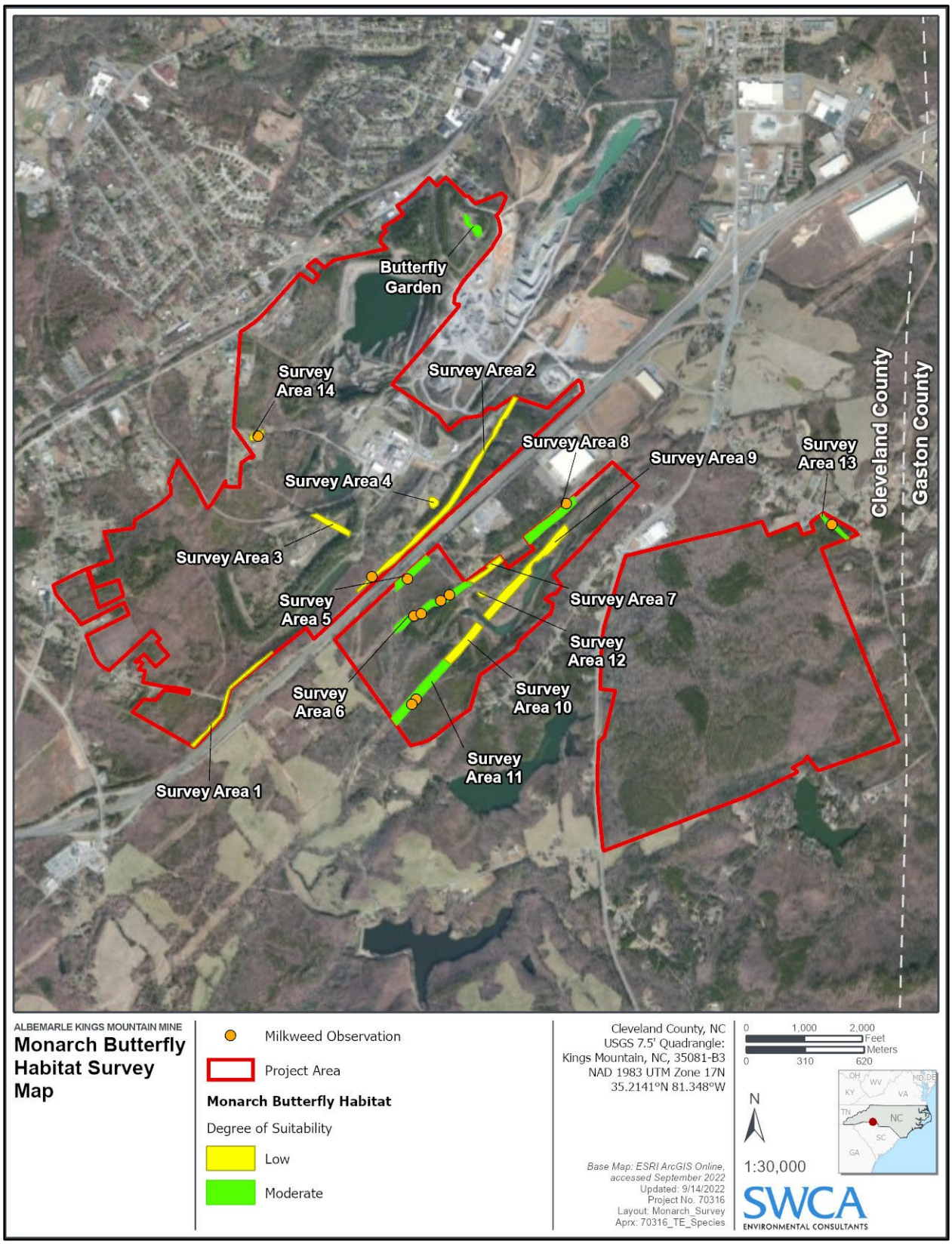

Figure 3. Monarch habitat within the Project area.

5 SUMMARY AND CONCLUSIONS

Based on data review and field reconnaissance, the potential for the monarch butterfly to occur within the Project area is low due to the limited quantity and quality of the habitat. No monarch individuals were observed during 2022 spring and summer surveys. A total of 102 milkweed plants were observed during the surveys, with most observations occurring in the southern portion of the Main Site – South of I-85. All milkweed observations were in maintained ROWs and along roadsides. Monarch butterflies are not anticipated to regularly breed within the Project area but may occasionally migrate through and use ROWs for foraging.

The final Project design is not known at this time; however, removal or degradation of the 24.6 acres of habitat with low suitability and 14.3 acres habitat with moderate suitability would not significantly impact the monarch. The habitat loss would result in a very small reduction in the total available habitat for monarch butterfly breeding and foraging, but populations would not be impacted.

Since the monarch is a candidate species and not yet listed or proposed for listing, consultation with USFWS under section 7 of the ESA is not required. Additionally, the Project area is outside of USFWS core units containing primary breeding and migrating habitat that are the focus of conservation efforts by federal agencies. Should the monarch become listed as threatened or endangered, consultation with the USFWS is recommended to determine suitable measures, such as habitat conservation or enhancement, to address any adverse effects. Revegetating disturbed areas with a seed mix that includes milkweeds and/or other nectar producing plants could mitigate potential impacts to monarch butterfly foraging habitat, similar to the existing butterfly garden.

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APPENDIX A

Photographs

Photo 1. Representative photo of Survey Area 1.

Photo 2. Representative photo of Survey Area 2.

Photo 3. Additional representative photo of Survey Area 2.

Photo 4. Representative photo of milkweed observed in Survey Area 2.

Photo 5. Representative photo of Survey Area 3.

Photo 6. Representative photo of Survey Area 4.

Photo 7. Representative photo of Survey Area 5.

Photo 8. Representative photo of milkweed in Survey Area 5.

Photo 9. Representative photo of Survey Area 6.

Photo 10. Representative milkweed in Survey Area 6.

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Photo 12. Representative habitat in Survey Area 7.

Photo 13. Representative photo of Survey Area 8.

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Photo 16. Additional representative photo of Survey Area 9.

Photo 17. Representative photo of Survey Area 10.

Photo 18. Additional representative photo of Survey Area 10.

Photo 19. Representative photo of Survey Area 11.

Photo 20. Additional representative photo of Survey Area 11.

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Photo 22. Representative photo of Survey Area 12.

Photo 23. Representative photo of Survey Area 13 and observed milkweed.

Photo 24. Representative photo of observed milkweed in Survey Area 14.