

**NON-VOLANT MAMMAL INVENTORY FOR GUILFORD COURTHOUSE
NATIONAL MILITARY PARK (GCNMP) WITHIN THE CUMBERLAND
PIEDMONT NETWORK**

PREPARED FOR:
NATIONAL PARK SERVICE
Guilford Courthouse National Military Park
Greensboro, NC

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ABSTRACT

We were interested in surveying Guilford Courthouse National Military Park for non-volant mammals during summer 2007. In order to document as many non-volant mammal species as possible within GCNMP, a variety of methods were used including small and medium sized mammal traps, dry pit-fall traps, automated digital wildlife cameras, and visual encounters. Sampling along 100m trap lines took place in 3 habitat types (grassland, riparian edge, forest) during the morning (5:30am-10:00am) and during the night (10pm-5am) twice weekly over 8 weeks from May through July 2007. We used the existing 15 plots established by NatureServe as starting points for establishing our trap lines. During our study, we recorded 12 species of non-volant mammals from 141 individual observations. No federal or state endangered, threatened, candidate listing species, or species of special concern were documented. The 12 species of non-volant mammals recorded represent 34 percent of the 35 species of non-volant mammals expected. We captured the following species in traps: northern short-tailed shrew, eastern chipmunk, white-footed mouse, hispid cotton rat, and northern raccoon. We visually identified the following species: Virginia opossum, eastern cottontail, eastern chipmunk, woodchuck, eastern gray squirrel, white-footed mouse, gray fox, domestic cat, northern raccoon, and white-tailed deer. All species found during the survey are relatively widespread and considered common in North Carolina. When compared to two previous surveys of GCNMP, insectivore and rodent diversity has declined, while abundance of common urban species such as white-tailed deer, gray squirrels, and raccoon has increased. Recommendations include monitoring of raccoon and deer populations, maintaining long grass where possible, and remaining vigilant against the establishment of non-native rats and mice.

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INTRODUCTION

Guilford Courthouse National Military Park (GCNMP) is a National Military Park (NMP) that commemorates the Battle of Guilford Courthouse (15 March 1781) during the Revolutionary War. GCNMP is characterized by mature mixed-hardwood forest typical of the Piedmont region of North Carolina and managed (mowed) grasslands (fields) surrounding monuments (Figure 1). Small streams run through GCNMP, creating small riparian zones mainly within the forest fragments (Figure 1). Thus, habitat in the park can be generally classified as forest, riparian zone, and grassland.

GCNMP is located within urban Greensboro, NC. Greensboro lies in the headwaters of the Cape Fear River Basin and population growth in the area has resulted in a major increase in developed land in the basin (43% increase from 1982-1992), with the most populated regions of the basin being near the headwaters (NC-DENR, 2000). In Greensboro alone, development has lead to a substantial decrease in tree cover within the city limits (18% decrease from 1984-2000; City of Greensboro Department of Planning). As an urban NMP, GCNMP has the potential to act as an island of mature Piedmont mixed hardwood forest in the midst of urban Greensboro. However, because of the extensive trail system, much of the contiguous grassland and forest areas that once comprised the GCNMP (Dietrich 1976) are fragmented (Figure 1).

As an NMP in an urban area, it is not surprising that GCNMP is heavily used by residents of Greensboro in addition to the national and international tourists that visit the NMP. Use by local residents is common because the park is nearby and affords extensive walking, running, and biking trails as well as a

scenic drive-through road for vehicle traffic (Figure 1). GCNMP is especially attractive to dog-walkers. Visitors can be seen on the trails from sun-rise to sunset.

Two previous studies have investigated the terrestrial mammals in GCNMP (Dietrich 1976; Shahady and Zirkle 1983). In 1976, the park was not nearly as fragmented as it is today, and two contiguous tracts (Area A and C in Dietrich 1976) of forest existed that were of particular importance for vertebrate activity. In addition, a substantial marsh existed within the park boundary that no longer exists. Rodent diversity was high with many rodents native to the Piedmont region of North Carolina being present (Dietrich 1976; Appendix 1). Insectivore diversity was also high with every native insectivore expected in the area documented (Dietrich 1976; Appendix 1). In addition, opossums (*Didelphis virginiana*), eastern cottontails (*Sylvilagus floridanus*), raccoon (*Procyon lotor*) and red fox (*Vulpes vulpes*) were documented either through sightings, tracks, or scat (Dietrich 1976; Appendix 1). In 1983, GCNMP had been fragmented by the extensive trail system (Shahady and Zirkle 1983). Rodent and insectivore diversity was lower than previously documented in 1976 (Shahady and Zirkle 1983; Appendix 1). Common urban species such as opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), and raccoon (*Procyon lotor*) were documented (Shahady and Zirkle 1983; Appendix 2).

We were interested in surveying GCNMP for non-volant mammals during summer 2007. Our specific goals were to 1) document 90% of the mammals expected to occur in the GCNMP, 2) describe the habitat associated with mammals in the GCNMP, 3) describe the distribution and relative abundance of species of special concern known to occur in the GCNMP, and 4) provide baseline information on the distribution, abundance and habitats associated with the mammals that occur in the GCNMP.

METHODS

Our initial visit to GCNMP was on May 2, 2007, when we met with National Park Service personnel. During our visit, we obtained maps of the park, located sampling sites near the existing plots, and surveyed roads for access points. In order to document as many non-volant mammal species as possible within GCNMP, a variety of methods were used including small and medium sized mammal traps (Longworth and Sherman traps for rodents; Tomahawk and Havahart traps for rodents and mesocarnivores; dry pit-fall traps for insectivores; and Fitch traps for rodents and insectivores), automated digital wildlife cameras (Bushnell Trail Scout 3.0 Megapixel Scouting Cameras), and visual encounters.

Sampling Design

Sampling took place during the morning (5:30am-10:00am) and during the night (10:00 pm-5:00 am) twice weekly over 8 weeks from May through July 2007. On a sampling day, trap-lines were run during the morning to sample diurnal species and during the night to sample nocturnal species. We sampled all non-volant mammals in GCNMP 32 times (2 days/week, 2 times/day over 8 weeks) in 2007. This translated into 96 separate trap lines (2 days/week, 2 times/day in 3 different habitat types over 8 weeks).

We used the existing 15 plots established by NatureServe as starting points for establishing our trap lines (see comment below). As mentioned above, the three types of habitat are: managed grassland/fields, mature mixed hardwood forest, and riparian edge. We attempted to rotate through pre-established NatureServe plots so as to sample, in a balanced design, the 3 habitat types (Table 1).

During each sampling event, 3 trap lines were set (1 trap line in each habitat type). Each trap line was 100 m long with a trap station every 10 m (10 trap stations on each of 3 lines for a total of 30 trap stations/sampling period). At each trap station there were 2 rodent traps (1 Sherman and 1 Longworth). On each trap line there were 2 Tomahawk or Havahart traps along the mature mixed hardwood forest trap line and the riparian edge trap line. Tomahawk and Havahart traps were not set in the managed grassland-fields because they were very accessible and easily seen by the general public. In addition, there were 3 Fitch traps (at trap stations #1, #5 and #10), and 5 dry pitfall traps (at stations #1, #2, #3, #4, and #5) set along each trap line. In addition, 4 automated digital camera systems were set at 4 trap lines in the park. Cameras were placed near trap lines #3, #5, #7, #14. Details of trap line locations can be seen in Figure 1 and Appendices 3 & 4. The location of each trapping station on each trap line was recorded using a Global Positioning System (GPS) unit (Magellan Map 330). All maps were created using ArcMap v9.1.

Comment on Historic NatureServe Sites vs. Actual Sampling Sites

There were 15 trap lines set throughout GCNMP. All trap lines were near existing NatureServe plots. However, trap lines and NatureServe plots are not perfectly matched (see Figure 1). Historic NatureServe plots were used as a guide but actual sampling sites were chosen specifically for the aims of this study. Sampling sites were in locations that contained suitable habitat for capturing terrestrial mammals. Sampling sites along trap lines, and trap lines themselves, were constrained to being in locations with ideal trapping habitat that was also far enough from trails and roads so that people and dogs were not harmed by the traps (i.e., stepping into pitfall traps, dogs being captured in larger traps).

Details of Trapping

As described above, mammals were trapped using six different trapping methods: Sherman live-traps, Longworth live-traps, Fitch live-traps, dry pitfall traps, Tomahawk traps, and Havahart traps (see above for trapping schedule and location of trap sites). To minimize the possibility of capturing pet dogs, Havahart traps were not set during the morning (5:30am-10:00am). The number of trap hours (how long a trap was open at a given trap station) varied because each trap line was differentially affected by the amount of disturbance the traps received from northern raccoons (*Procyon lotor*). Raccoons were often captured at sites where traps were disturbed and many traps had evidence of muddy raccoon prints or tooth markings. Traps that were obviously visited by raccoons (moved, seeds were removed, prints were evident, or traps were closed and/or taken apart) were considered to be disturbed.

Sherman, Longworth, Fitch, Havahart and Tomahawk traps were baited with a combination of rolled oats and sunflower seeds (Southern States, Greensboro, NC). We chose not to bait with any other food types to minimize disturbance of our traps by raccoons.

Once captured, all individuals were identified using standard keys for mammals in the area (Reid 2006, Webster et al. 1958, and Whitaker 1996). Where possible, standard body measurements (total length, ear length, tail length, and hind foot length), weight, age class, reproductive condition and sex were taken. Where possible, photographs of all captured individuals were taken. After processing (identification, measurements, and photographs) all live individuals were released at the site of capture. Individuals that died in traps or during processing were identified, measured, photographed, and submitted to the Curator of Mammals (Dr. David Webster) of the Vertebrate Collection at the

University of North Carolina Wilmington (UNCW), in Wilmington, North Carolina. Where necessary, we sought expert (Dr. David Webster) identification on shrew species because they are very difficult to identify and GCNMP lies at the southernmost and northernmost species boundary of closely related allopatric species which complicates identification by standard external characters alone.

Details of Visual Encounters (by Field Identification or Cameras)

Automated digital cameras and field observations were used to informally document mammals throughout GCNMP during June and July 2007. Visual encounters included documentation in field notes of all terrestrial mammals sighted by researchers throughout GCNMP. When possible, photographs of visual encounters were taken to document the event.

Throughout the sampling period, we checked the automated digital wildlife cameras for any mammals that may have been photographed. All photos were downloaded to computer throughout the sampling period. Identification of mammals in the photos was made using diagnostic characters from standard guides to mammals of the region (Reid 2006, Webster et al. 1958, and Whitaker 1996). Where necessary, we sought expert opinion (Dr. Frank van Manen) on the identification of photographed mammals especially foxes.

Weather Conditions

Weather conditions were monitored throughout using the Weather Channel website (www.weather.com) and Weather Underground (www.wunderground.com). The main reason for this was to avoid setting traps during inclement weather, especially during heavy rain.

RESULTS

Weather

Weather was typical for a North Carolina summer, however precipitation was lower than average. Temperatures ranged from mid 60°F (15.6°C) in the evenings to 95°F (35°C) during the afternoons. When rain occurred, it ranged from thunder storms with high winds to mild showers. Rain duration never lasted longer than 8 hours. The region received a total rainfall of 2.2 and 2.8 inches in June and July 2007, respectively.

Species Recorded Overall

Sampling sites with trap lines, habitat type, and dates of trapping can be found in Table 1. We captured the following five species in traps: northern short-tailed shrew (*Blarina brevicauda*), eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), and northern raccoon (*Procyon lotor*; Table 2). We visually identified (either through automated cameras or field observations) the following 10 species: Virginia opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), woodchuck (*Marmota monax*), eastern gray squirrel (*Sciurus carolinensis*), white-footed mouse (*Peromyscus leucopus*), gray fox (*Urocyon cinereoagenteus*), domestic cat (*Felis catus*), northern raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*; Table 3).

Therefore, during our study, we recorded 12 species of non-volant mammals from 141 individual observations (including those captured, observed, or documented by automated digital cameras; Appendix 2). No endangered, threatened, or candidate listing species were documented. The 12 species of non-

volant mammals recorded represent 34 percent of the 35 species of non-volant mammals that were expected to occur at GCNMP: marsupial (1 documented of 1 expected; 100%); insectivores (1 documented of 5 expected; 20%) included one of the four species of shrews (25%); lagomorphs (1 documented of 1 expected; 100%); rodents (5 documents of 17 expected, 29%) included one of the three species of tree squirrels (33%), one of the five species of mice (20%), one of the three species of rats (33%), the single expected woodchuck (100%) and the single expected chipmunk (100%); carnivores (3 documented of 10 expected, 30%) including one of the two expected foxes (50%), one of the two expected cats (50%) and the single expected raccoon (100%); Artiodactyla (1 documented of 1 expected; 100%).

All species found during the survey are relatively widespread and considered common in North Carolina (Webster et al., 1985; Whitaker, 1996; Brown, 1997; Bowers et al., 2004; Reid, 2006). There were mammals known to live in Guilford County that were not expected to be encountered that, as expected, we did not document. Those mammals were: beaver (*Castor canadensis*), long-tailed weasel (*Mustela frenata*), American mink (*Mustela vison*), river otter (*Lontra canadensis*), and bobcat (*Lynx rufus*). However, we still consider these species in our list of 35 expected species (see Appendix 1).

Habitat and Abundance Details of Trapping Results

During the survey, traps were open as follows: Sherman traps 960 times, Longworth nights 960 times, Fitch traps 288 times, dry pitfall traps 480 times, Havahart traps 32 times, and Tomahawk traps 32 times. Each habitat type (managed grassland-fields, mature mixed hardwood, and riparian edge) was set 32 times. A total of 35 percent of the open traps showed evidence of disturbance during the study.

A total of 55 non-volant individual mammals representing 5 species were captured during the study (Table 2). Morphometric and spatial details of individuals captured can be found in Appendix 2. Sherman live-traps captured 23 individuals of 3 species, Longworth live-traps captured 19 individuals of 2 species, Fitch live-traps captured 1 individual of 1 species, dry pitfall traps captures 1 individual of 1 species, Havahart traps captured 11 individuals of 1 species, and Tomahawk traps did not capture a single species (Appendix 2). The species that were captured most often were the white-footed mouse (n=38) and the northern raccoon (n=11). White-footed mice and northern raccoon were mainly captured in the hardwood forests and the riparian edge, and they were the only two species captured in the hardwood forests (Table 2). Additionally, along the riparian edge we captured the northern short-tailed shrew (Table 2). The northern short-tailed shrew was also captured in the grassland along with the eastern chipmunk, white-footed mouse, and hispid cotton rat. The single capture of the hispid cotton rat occurred before the site (#6) had been mowed when the grass was approximately 1 m high.

All captured animals were easily identified using standard keys except the northern short-tailed shrew. External measurements were not sufficient to distinguish between the northern short-tailed shrew and the southern short-tailed shrew (*Blarina carolinensis*). The former has a record from north Greensboro and the latter has a record from south Greensboro, and there is considerable overlap in external measures (Webster et al. 1985). The defining characters are cranial (condylobasal length and molar tooth row length) and, therefore, final identification was made by Dr. David Webster after specimen preparation in the Vertebrate Collection at UNCW.

Habitat and Abundance Details of Visual Identification

There were 16 mornings and 16 evenings spent at GCNMP with multiple personnel resulting in 36 human-days. A total of 86 individuals from 10 species of non-volant mammals were sighted and/or photographed (Table 3). Morphometric (mainly age) and spatial details of individuals captured can be found in Appendix 2. Automated digital cameras captured photographs of northern raccoon (n=1 photo), gray fox (n=4 photos), and white-tailed deer (n=12 photos). Researchers visually encountered Virginia opossum (n=1 encounter), eastern cottontail (n=7 encounters), eastern chipmunk (n=16 encounters), woodchuck (n=3 encounters), eastern gray squirrel (n=25 encounters), white-footed mouse (n=1 encounter), domestic cat (n=3 encounters), and white-tailed deer (n=13 encounters).

The most common visually identified mammals were white-tailed deer and eastern gray squirrels (Table 3) which were predominantly seen in the hardwood forest. The greatest diversity of species and the majority of visual encounters occurred in the hardwood forest (Table 3)

All visually encountered individuals were easily identified using standard keys. All individuals photographed with the automated wildlife cameras were easily identified. However, because carnivores are not in our area of direct expertise, we sought a second opinion from a carnivore specialist to confirm the identity of the gray fox in our photos. Dr. Frank van Manen, Research Ecologist with the U.S. Geological Survey's Southern Appalachian Field Branch, University of Tennessee, Knoxville, confirmed that we had photographed a gray fox based on the clear photos of the tail which in gray foxes is characterized by black hair along the dorsum of the tail.

DISCUSSION

Northern raccoon, eastern gray squirrels, eastern cottontails, and Virginia opossums were the only species that were documented in all three mammal/vertebrate studies in GCNMP (current, Dietrich 1976, Shahady and Zirkle 1983; Appendix 1). All 4 species represent common urban mammals. Many of the other species we documented also represent common urban mammals that we expected to find in GCNMP. Germane to our discussion of mammals present in GCNMP, is a comparison with lists of mammals previously recorded in GCNMP by Dietrich (1976) and Shahady and Zirkle (1983; see Appendix 1). Below, we comment on trends and patterns over time and the significance of some of the findings of our study. We go through relevant taxa, by Order as they appear in Appendix 1.

Insectivores. The diversity of insectivores appears to have markedly declined since the first mammal study in GCNMP (Dietrich 1976; see Appendix 1). Three species of shrew and 1 species of mole were observed in 1976 (Dietrich 1976), whereas only 1 species of shrew and 1 species of mole were observed in 1983 (Shahady and Zirkle 1983). We found no evidence of moles during our study; not only did we not capture moles in our traps, but we also did not notice any mole activity in any of the habitat types (i.e., mole runs or upturned dirt). We did observe the northern short-tailed shrew which is consistent with the findings of Dietrich (1976).

Rodents. Compared with rodent diversity reported in Dietrich (1976), rodent diversity in our study was very low. Sciurids aside, the only abundant rodent in GCNMP is the white-footed mouse. Although we documented the presence of the hispid cotton-rat, this was a single capture from unusual habitat in

the park (very high grass in a field that was subsequently mowed). A trend through the three studies is an increase in white-footed mice (11 captures in 1976, 0 captures in 1983, 38 captures in 2007; Dietrich 1976; Shahady and Zirkle 1983; this study) and an absence of most other non-sciurid rodent species. Noticeably absent were the harvest mice and meadow voles that were present in 1976 and 1983 (Dietrich 1976; Shahady and Zirkle 1983) and, if present today, should have been captured given our trapping efforts. It is not clear why rodent diversity has apparently declined in GCNMP, however, white-footed mice tend to increase in number after a disturbance (e.g., Greenberg et al. 2006). This increase in white-footed mice, combined with a decrease in overall non-sciurid rodent diversity suggests that resource availability (i.e., decreased food and/or nest availability) and or community dynamics (i.e., increased competition or predation) may have changed in the recent past.

During our study, we were very encouraged by the lack of non-native murid rodents (*Rattus* and *Mus*) in GCNMP. We had predicted that we would capture non-native rodent species because of the proximity of GCNMP to Battleground Avenue, where there are many garbage dumpsters associated with different businesses (i.e., restaurants and fast food chains). We have had reports from citizens living in and around Battleground Avenue that rats (*Rattus* spp.) are present. Despite the fact that rats (*Rattus* spp.) and house mice (*Mus musculus*) are present in urban Greensboro, they have apparently not established residency in GCNMP. The lack of non-native rodents in the park may be due to a lack of food waste and other non-natural food sources in the park.

Sciurid rodents including the eastern chipmunk, woodchuck, and eastern gray squirrel were all documented in our study. Gray squirrels were documented in all three studies (current, Dietrich 1976, Shahady and Zirkle 1983; Appendix 1) and are common in urban areas. Ours was the first study to document eastern

chipmunk and woodchuck, both of which are common in urban areas, including Greensboro, and expected in the GCNMP. It is very likely that the southern flying squirrel is present in GCNMP, as it occurs in Greensboro and was documented in Shahady and Zirkle (1983). We did not place our traps in trees, or bait appropriately for flying squirrels (because of raccoon disturbance) therefore the likelihood of our capturing flying squirrels in GCNMP was low.

Carnivores. Northern raccoons were documented in GCNMP during all three studies (current, Dietrich 1976, Shahady and Zirkle 1983; Appendix 1). The most abundant carnivore in GCNMP is the northern raccoon. This species was problematic during this study because it disturbed our traps, especially in the mixed hardwood forest and riparian edge habitats. Although it is difficult to estimate raccoon population size, without mark-recapture techniques, it is clear from our trapping success and evidence such as traps tracks, markings, and tooth marks on disturbed traps, that they were abundant in GCNMP. Our success rate at trapping raccoons was very high when compared to rodents and insectivores. We had a trap success rate in Havahart traps of 42% (after accounting for disturbance to the traps) whereas our success rate in Fitch, Pitfall, Longworth, and Sherman traps was 0%, 1%, 3%, and 3% respectively. This relatively high trap success rate for raccoons is striking because the traps were not baited with anything but a small amount of rolled oats to discourage trap disturbance by raccoons. We are confident that a high density of breeding raccoons exists in GCNMP even though we were unable to obtain population estimates. We captured adults (males and females) and juveniles. Depending on their specific diet in GCNMP, raccoon densities may be negatively affecting diversity of other terrestrial mammals in the park (due to competition for food resources and predation). Northern raccoons are particularly amenable to urban areas and it was not surprising that they were abundant in GCNMP (Nowak 1999).

This is the first study to document a gray fox in GCNMP. Photographs of the gray fox are unequivocal. Gray foxes are known to inhabit interiors of mixed hardwood forest (Nowak 1999) throughout their range. A red fox was documented in the GCNMP in 1976 through scat identification (Dietrich 1976). However, distinguishing between these two species through scat alone is virtually impossible (F. van Manen personal communication). Moreover, staff at GCNMP have not positively identified either species of fox (G. Hensen personal communication), although park visitors have mentioned seeing foxes. Therefore, it is possible that the fox scat previously recorded (Dietrich 1976) was from a gray fox. Despite the propensity for gray foxes to be forest dwelling, they are tolerant of urbanization (Riley 2006).

Ours was the first study to document cats in the park; however there is mention of domestic dogs and cats in Dietrich (1976). Because of the raccoon population, the likelihood of a significant feral cat population is relatively low within GCNMP. Moreover, the cats were observed on the margin of the park as opposed to the interior of the park.

Artiodactyls. Like the northern raccoon, white-tailed deer are very abundant in the GCNMP and the park surely acts as an island of forested habitat for the deer in the surrounding urban landscape. During the study, we observed two fawns and on several occasions more than five deer were observed at the same time. Although it is difficult to estimate total population size, the frequency of encounter with white-tailed deer suggest that the population within GCNMP are very high.

RECOMMENDATIONS

1. Do not mow grassland (Site 6; Figure 1) between Stewart Monument and Cavalry Monument until late fall (after the breeding season for many small mammals) because this long grass provides good cover for native rodents, like the hispid cotton rat (*Sigmodon hispidus*), and is not suitable habitat for common urban rodents like the eastern gray squirrel (*Sciurus carolinensis*). Long grass will also discourage woodchucks (*Marmota monax*). This is the only site where we captured a cotton rat and many of the noticeably absent rodents from GCNMP are grassland species such as meadow voles (*Microtus pennsylvanicus*) and, especially the eastern harvest mouse (*Reithrodontomys humulis*) that prefer longer grass.
2. Monitor the raccoon population. High raccoon populations have implications for human health (as rabies vectors) and ecosystem health (as predators of, and competitors with, other species).
3. Monitor the deer population. High deer populations have implications for human health [hosts for deer ticks (*Ixodes* spp.) and potential for vehicle accidents] and ecosystem health (as major browsers in this GCNMP). We noticed a relatively sparse understory in the forest. This may or may not be related to deer browse or the low small mammal diversity we found; however it is likely that these are not completely independent.
4. Continue to be vigilant against food waste and other trash items. The park is extraordinarily free of trash given the high number of people that use the park in this urban setting. The cleanliness of the park is probably why invasive rats (*Rattus* spp.) and mice (*Mus* spp.) have not yet established themselves in GCNMP.

LITERATURE CITED

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TABLES

Table 1. Sampling sites, habitat type represented at each sampling site, and dates of sampling during our study at Guilford Courthouse National Military Park (GCNMP), Guilford County, North Carolina May – July, 2007. For coordinates for each site refer to Appendix 3.

										UTM (Zone 17 North)	
Site	Habitat Type	Wildlife Camera	Dates Surveyed							Easting	Northing
1	Grassland	Camera	30-May-07	31-May-07	10-Jul-07	11-Jul-07				604379	3999003
2	Riparian		27-Jun-07	28-Jun-07	12-Jul-07					604351	3999412
3	Hardwood		10-Jul-07	11-Jul-07						604070	3999127
4	Hardwood		12-Jul-07							604060	3999401
5	Hardwood	Camera	30-May-07	31-May-07	20-Jul-07					604357	3999085
6	Grassland	Camera	13-Jun-07	14-Jun-07	27-Jun-07	28-Jun-07	18-Jul-07	19-Jul-07	20-Jul-07	604335	3999427
7	Riparian		13-Jun-07	14-Jun-07	18-Jul-07	19-Jul-07				604645	3999413
8	Grassland		20-Jun-07	21-Jun-07						604860	3999496
10	Hardwood		27-Jun-07	28-Jun-07						603707	3998932
11	Hardwood		6-Jun-07	7-Jun-07						604995	3999360
12	Riparian		6-Jun-07	7-Jun-07	10-Jul-07	11-Jul-07				604530	3999536
13	Riparian		30-May-07	31-May-07	20-Jun-07	21-Jun-07	20-Jul-07			604140	3999029
14	Hardwood	Camera	20-Jun-07	21-Jun-07	18-Jul-07	19-Jul-07				603766	3998829
15	Grassland		6-Jun-07	7-Jun-07	12-Jul-07					604864	3999407
16	Hardwood		13-Jun-07	14-Jun-07						603646	3999174

Camera = Automated digital cameras were set from 7 June to 20 July, 2007

Table 2. Summary of non-volant mammal species captured in traps in relation to habitat type represented during our study at Guilford Courthouse National Military Park (GCNMP), Guilford County, North Carolina May – July, 2007. For scientific names refer to Appendix 1. For morphometric and spatial details of individuals captured refer to Appendix 2.

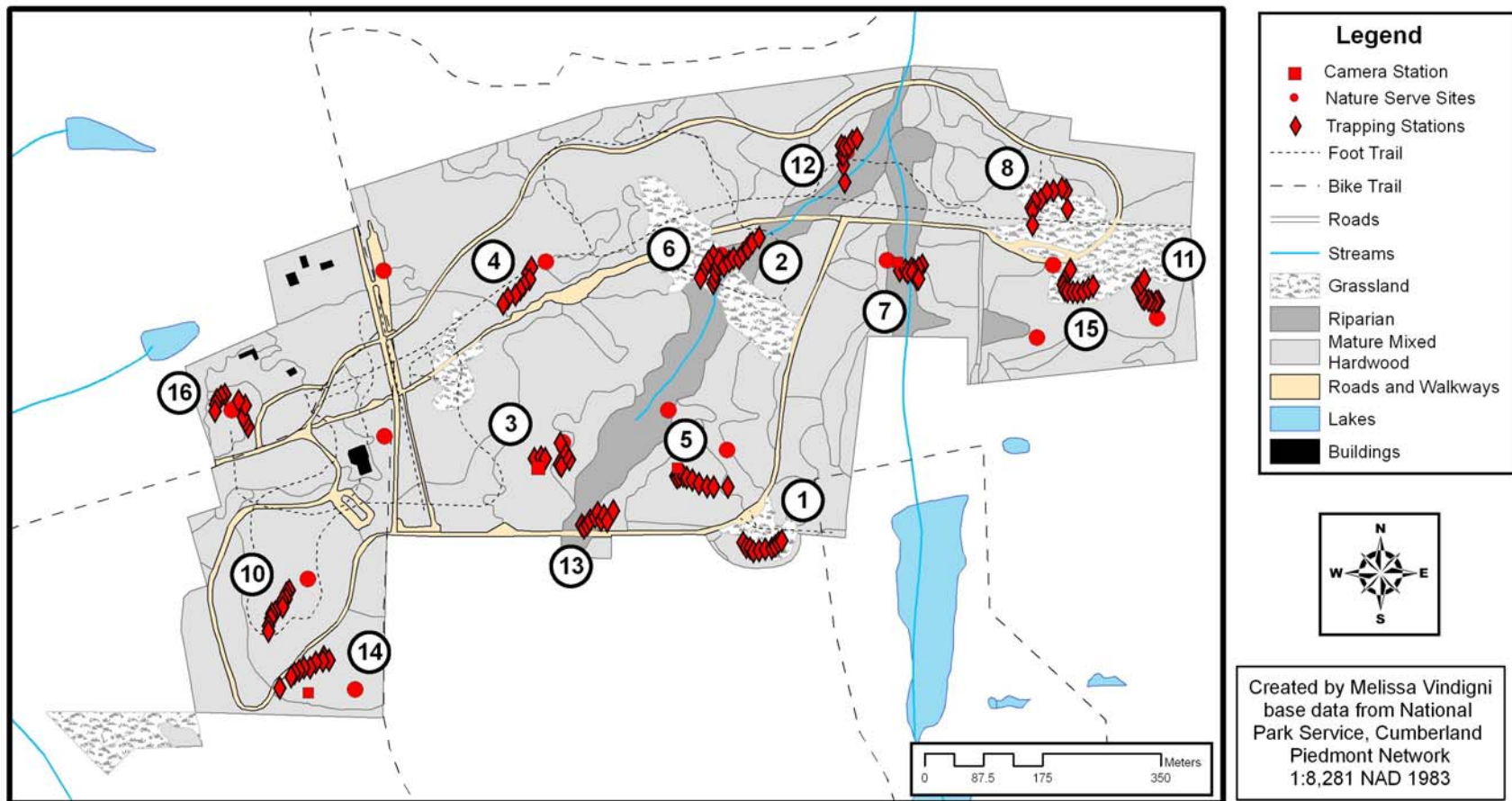
Species	Grassland	Hardwood	Riparian Edge	Total
Northern short-tailed shrew	1	0	3	4
Eastern chipmunk	1	0	0	1
White-footed mouse	1	26	11	38
Hispid Cotton rat	1	0	0	1
Northern Raccoon	0	6	5	11
Total Individuals	4	32	19	55
Total Species	4	2	3	5
Total Sites	3 of 4	6 of 7	4 of 4	13 of 15

Table 3. Summary of non-volant mammal species visually identified or photographed in relation to habitat type represented during our study at Guilford Courthouse National Military Park (GCNMP), Guilford County, North Carolina May – July, 2007. For scientific names refer to Appendix 1. For morphometric (mainly age) and spatial details of individuals captured refer to Appendix 2.

Species	Grassland	Hardwood	Riparian Edge	Total
Virginia opossum	1	0	0	1
Eastern cottontail	4	3	0	7
Eastern chipmunk	4	12	0	16
Woodchuck	3	0	0	3
Eastern gray squirrel	5	20	0	25
White-footed mouse	0	1	0	1
Gray fox	0	4	0	4
Northern raccoon	0	1	0	1
Domestic cat	2	1	0	3
White-tailed deer	4	17	4	25
Total Individuals	23	59	4	86
Total Species	7	8	1	10

FIGURES

Figure 1. Location of Guilford Courthouse National Military Park, Guilford County, North Carolina. Also shown are historic NatureServe Sites and the sites for our study at Guilford Courthouse National Military Park, Guilford County, North Carolina, May - July 2007. Trap stations are indicated by red diamonds and site numbers are indicated by number in circle.



APPENDICES

Appendix 1. Non-volant mammal species expected and known to occur at Guilford Courthouse National Military Park, Guilford County, North Carolina. This list was compiled from Bowers et al. 2004, Brown 1997, Reid 2006, Webster et al. 1958, and Whitaker 1996. Included are occurrences from this study (Kalcounis-Rüppell et al. 2007) and the two legacy studies for GCNMP (Shahady and Zirkle 1983; Dietrich 1976). The closed circle (●) indicates presence of species.

Common Name and Classification	Latin Name	Kalcounis-Rüppell et al. 2007	Shahady and Zirkle 1983	Dietrich 1976
Order: Didelphimorphia				
Family: Didelphidae				
Virginia Opossum	<i>Didelphis virginiana</i>	●	●	●
Order: Insectivora				
Family: Soricidae (Shrews)				
Southeastern shrew	<i>Sorex longirostris</i>		●	●
Northern short-tailed shrew	<i>Blarina brevicauda</i>	●		●
Southern short-tailed shrew	<i>Blarina carolinensis</i>			
Least shrew	<i>Cryptotis parva</i>			●
Family: Talpidae				
Eastern Mole	<i>Scalopus aquaticus</i>		●	●
Order: Lagomorpha				
Family: Leporidae				
Eastern Cottontail	<i>Sylvilagus floridanus</i>	●	●	●
Order: Rodentia				
Family: Sciuridae				
Eastern chipmunk	<i>Tamias striatus</i>	●		
Woodchuck	<i>Marmota Manax</i>	●		
Eastern Gray squirrel	<i>Sciurus carolinensis</i>	●	●	●
Eastern Fox squirrel	<i>Sciurus niger</i>			
Southern flying squirrel	<i>Glaucomys volans</i>		●	
Beaver	<i>Castor canadensis</i>			

Family: Cricetidae				
Eastern Harvest mouse	<i>Reithrodontomys humulis</i>		•	•
White-footed mouse	<i>Peromyscus leucopus</i>	•		•
Golden Mouse	<i>Ochrotomys nuttali</i>			•
Hispid cotton rat	<i>Sigmodon hispidus</i>	•		•
	<i>Microtus</i>			
Meadow Vole	<i>pennsylvanicus</i>		•	•
Woodland Vole	<i>Microtus pinetorum</i>			•
Muskrat	<i>Ondatra zibethicus</i>			
Family: Muridae				
Norway rat	<i>Rattus norvegicus</i>			
Black rat	<i>Rattus rattus</i>			
House mouse	<i>Mus musculus</i>			
Family: Zapodidae				
Meadow jumping mouse	<i>Zapus hudsonius</i>			•
Order: Carnivora				
Family: Canidae				
Red fox	<i>Vulpes vulpes</i>			•
	<i>Urocyon</i>			
Gray fox	<i>cinereoagenteus</i>	•		
Coyote	<i>Canis latrans</i>			
Family: Procyonidae				
Northern raccoon	<i>Procyon lotor</i>	•	•	•
Family: Mustelidae				
Long-tailed weasel	<i>Mustela frenata</i>			
American mink	<i>Mustela vison</i>			
Striped skunk	<i>Mephitis mephitis</i>			
River otter	<i>Lontra canadensis</i>			
Family: Felidae				
Bobcat	<i>Lynx rufus</i>			
Domestic cat	<i>Felis catus</i>	•		
Order: Artiodactyla				
Family: Cervidae				
White-tailed deer	<i>Odocoileus virginianus</i>	•	•	

Appendix 2. Specimen details (morphometrics and spatial data) for all non-volant mammals observed or captured during our study at Guilford Courthouse National Military Park, Guilford County, North Carolina, May-July 2007. 'Rep. Cond.' (reproductive condition) is defined as NR: non-reproductive, PL: post lactating, Pr.L: pregnant and lactating, R: scrotal (males only). 'Age' is defined as A: adult, SA: subadult, and J: juvenile. 'Obs. Type' (Observation Type) is defined as 1: Sherman trap, 2: Longworth trap; 3: Fitch trap, 4: dry pitfall trap, 5: Havahart trap, 7: visual sighting, and 8: camera photo. 'Habitat type' is defined as G: Grassland, R: Riparian, and H: Harwood. 'Photo' refers to the number of each photograph on the GuCo 2007 Mammal Pictures CD included with this report. '(V)' indicates that specimen was kept as a voucher and accession numbers listed with specimens.

Order															
Species		Lengths (mm)													
Date	Site	Station	Easting	Northing	Sex	Rep. Cond	Age	Body	Tail	Hindfoot	Ear	Weight (g)	Obs. Type	Habitat Type	Photo
Didelphimorphia															
Virginia Opossum (<i>Didelphis virginiana</i>)															
7-Jun-07	-	-			-	-	-	-	-	-	-	-	7	G	-
Insectivora															
Northern short-tailed shrew (<i>Blarina brevicauda</i>)															
31-May-07	13	6	604164	3999047	F	-	A	111	21	12	-	13	2	R	1
1-Jun-07	13	6	604164	3999047	F	-	A	103	22	13	-	13	2	R	2
UNCW17962	22-Jun-07 (V)	13	6	604164	3999047	F	NR	A	105	21	12	-	13	R	-
UNCW17963	13-Jul-07 (V)	15	4	604856	3999376	F	NR	A	88	14	12	-	10	G	-
Lagomorpha															
Eastern cottontail (<i>Sylvilagus floridanus</i>)															
31-May-07	-	-			-	-	A	-	-	-	-	-	7	G	3
31-May-07	-	-			-	-	A	-	-	-	-	-	7	G	4
14-Jun-07	-	-			-	-	A	-	-	-	-	-	7	G	5
15-Jun-07	-	-			-	-	A	-	-	-	-	-	7	G	6
18-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-
18-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-
19-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-

Order																
Species																
	Lengths (mm)												Weight	Obs.	Habitat	
Date	Site	Station	Easting	Northing	Sex	Rep. Cond	Age	Body	Tail	Hindfoot	Ear	(g)	Type	Type	Photo	
Rodentia																
Eastern chipmunk (<i>Tamias striatus</i>)																
31-May-07	1	-			-	-	A	-	-	-	-	-	7	G		
1-Jun-07	1	4	604395	3998990	F	-	SA	135	81	32	-	64	1	G	7	
6-Jun-07	-	-			-	-	-	-	-	-	-	-	7	H		
6-Jun-07	-	-			-	-	-	-	-	-	-	-	7	H		
8-Jun-07	-	-			-	-	-	-	-	-	-	-	7	H		
14-Jun-07	-	-			-	-	-	-	-	-	-	-	7	G	8	
14-Jun-07	-	-			-	-	-	-	-	-	-	-	7	G		
20-Jun-07	-	-			-	-	-	-	-	-	-	-	7	G		
21-Jun-07	-	-			-	-	A	-	-	-	-	-	7	H		
21-Jun-07	-	-			-	-	-	-	-	-	-	-	7	H		
28-Jun-07	-	-			-	-	A	-	-	-	-	-	7	H		
12-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H		
12-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H		
13-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H		
18-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H		
18-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H		
20-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H		
Woodchuck (<i>Marmota monax</i>)																
31-May-07	-	-			-	-	J	-	-	-	-	-	7	G	9	
31-May-07	-	-			-	-	J	-	-	-	-	-	7	G	-	
31-May-07	-	-			-	-	A	-	-	-	-	-	7	G	-	

Order																
Species																
						Lengths (mm)							Weight (g)	Obs. Type	Habitat Type	Photo
Date	Site	Station	Easting	Northing	Sex	Rep. Cond	Age	Body	Tail	Hindfoot	Ear					
Rodentia (continued)																
Eastern gray squirrel (<i>Sciurus carolinensis</i>)																
31-May-07	-	-			-	-	-	-	-	-	-	-	7	H	10	
18-Jun-07	-	-			-	-	A	-	-	-	-	-	7	H		
7-Jun-07	14	-			-	-	A	-	-	-	-	-	7	H	11	
7-Jun-07	11	-			-	-	A	-	-	-	-	-	7	H	-	
8-Jun-07	11	-			-	-	A	-	-	-	-	-	7	H	-	
20-Jun-07	-	-			-	-	A	-	-	-	-	-	7	G	-	
13-Jun-07	-	-			-	-	A	-	-	-	-	-	7	G	-	
13-Jun-07	5	-			-	-	A	-	-	-	-	-	7	H	-	
14-Jun-07	5	-			-	-	A	-	-	-	-	-	7	H	-	
21-Jun-07	5	-			-	-	A	-	-	-	-	-	7	H	-	
21-Jun-07	-	-			-	-	-	-	-	-	-	-	7	G	-	
21-Jun-07	-	-			-	-	-	-	-	-	-	-	7	G	-	
22-Jun-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
18-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
18-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
18-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
19-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
19-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
19-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
19-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
19-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H	-	
19-Jul-07	-	-			-	-	-	-	-	-	-	-	7	G	-	
20-Jul-07	-	-			-	-	-	-	-	-	-	-	7	H	-	
20-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	
20-Jul-07	-	-			-	-	A	-	-	-	-	-	7	H	-	

Order																
Species	Lengths (mm)															
						Rep.							Weight	Obs.	Habitat	
Date	Site	Station	Easting	Northing	Sex	Cond	Age	Body	Tail	Hindfoot	Ear	(g)	Type	Type	Photo	
Rodentia (continued)																
White-footed mouse (<i>Peromyscus leucopus</i>)																
14-Jun-07	7	2	604639	3999409	M	-	A	75	70	19	10	17	1	R	12	
14-Jun-07	16	9	603598	3999207	F	PL	A	80	63	18	-	17	1	H	13	
14-Jun-07	16	6	603612	3999222	F	-	J	75	60	18	-	11	2	H	14	
14-Jun-07	16	2	603642	3999182	F	PL	J	85	75	15	-	17	1	H	15	
15-Jun-07	7	8	604630	3999403	F	-	J	55	50	15	-	10	1	R	16	
15-Jun-07	16	3	603639	3999189	F	Pr.L	A	78	72	20	11	10.5	1	H		
15-Jun-07	16	4	603642	3999206	M	-	SA	73	64	19	9	18	1	H		
15-Jun-07	16	6	603612	3999222	M	R	A	85	75	19	10	24.5	1	H		
15-Jun-07	16	10	603597	3999197	M	-	A	77	70	20	9	16.5	1	H		
15-Jun-07	16	10	603597	3999197	M	-	J	60	61	18	9	13	2	H		
21-Jun-07	14	5	604291	3999101	M	-	A	65	74	14	12	17	2	H		
21-Jun-07	14	1	603758	3998834	M	-	J	68	64	20	16	-	1	H		
21-Jun-07	13	7	604169	3999036	M	-	A	70	65	20	12	20.5	1	R		
21-Jun-07	13	5	604160	3999041	-	-	A	-	-	-	-	14.5	1	R		
22-Jun-07	14	3	603757	3998828	M	-	A	74	77	13	11	15.5	1	H		
22-Jun-07	14	2	603766	3998829	F	-	J	65	64	14	10	16	2	H		
22-Jun-07	14	1	603758	3998834	M	-	A	83	74	15	10	18.5	2	H		
22-Jun-07	13	7	604169	3999036	M	-	A	65	69	18	12	21	1	R		
22-Jun-07	13	8	604173	3999043	F	-	A	67	64	19	11	16	1	R		
22-Jun-07	13	8	604173	3999043	-	-	-	-	-	-	-	-	2	R		
28-Jun-07	10	9	603676	3998880	F	-	A	65	68	14	12	20	2	H		
28-Jun-07	10	10	603676	3998872	F	-	J	60	50	16	9	14.5	2	H		
29-Jun-07	10	6	604686	3998900	F	-	A	65	60	18	13	16	1	H		
29-Jun-07	10	6	604686	3998900	M	-	A	67	63	15	12	21	2	H		
11-Jul-07	3	1	604070	3999127	M	-	A	50	50	14	13	15.5	1	H		
11-Jul-07	3	2	604080	3999129	M	-	A	85	85	18	14	20.5	2	H		

White-footed mouse (*Peromyscus leucopus*) continued

11-Jul-07	12	7	604530	3999588	F	-	J	79	58	17	14	13	1	R
12-Jul-07	3	1	604070	3999127	F	-	A	77	58	16	12	9.5	2	H
12-Jul-07	12	1	604530	3999536	M	-	A	87	60	15	13	16	1	R
13-Jul-07	15	4	604856	3999376	F	-	A	88	60	17	13	22	2	G
18-Jul-07	14	8	603715	3998810	M	-	A	87	66	15	12	16	1	H
18-Jul-07	14	6	603729	3998818	F	-	A	82	65	17	13	27	2	H
18-Jul-07	14	2	603766	3998829	F	-	A	70	66	17	16	17	2	H
19-Jul-07	14	2	603766	3998829	F	-	A	80	66	20	13	15.5	2	H
19-Jul-07	14	5	603738	3998818	M	-	A	83	67	18	12	23	3	H
20-Jul-07	5	9	604326	3999086	M	-	A	80	60	15	13	20	1	H
20-Jul-07	13	5	604160	3999041	F	-	A	60	65	15	10	15	1	R
20-Jul-07	13	1	604140	3999029	M	-	J	65	60	15	11	12	2	R
18-Jul-07	14	-			-	-	A	-	-	-	-	-	7	H

Hispid cotton rat (*Sigmodon hispidus*)

14-Jun-07	6	7	604337	3999392	F	-	A	130	110	26	-	>100	1	G	17
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Order																
Species																
	Lengths (mm)										Weight	Obs.	Habitat			
Date	Site	Station	Easting	Northing	Sex	Rep. Cond	Age	Body	Tail	Hindfoot	Ear	(g)	Type	Type	Photo	
Carnivora																
Gray fox (<i>Urocyon cinereoagenteus</i>)																
24-Jun-07	14	-	603805	3998786	-	-	-	-	-	-	-	-	8	H	18	
17-Jul-07	14	-	603805	3998786	-	-	-	-	-	-	-	-	8	H	19	
17-Jul-07	14	-	603805	3998786	-	-	-	-	-	-	-	-	8	H	20	
17-Jul-07	14	-	603805	3998786	-	-	-	-	-	-	-	-	8	H	21	
Northern raccoon (<i>Procyon lotor</i>)																
1-Jun-07	5	2	604280	3999101	M	-	A	-	-	-	-	-	5	H	22	
1-Jun-07	13	2	604144	3999025	M	-	J	-	-	-	-	-	5	R	23	
7-Jun-07	11	2	604991	3999359	M	-	J	-	-	-	-	-	5	H	-	
7-Jun-07	11	10	604974	3999392	-	-	A	-	-	-	-	-	5	H	-	
14-Jun-07	16	10	603597	3999197	M	-	J	-	-	-	-	-	5	H	24	
14-Jun-07	7	2	604639	3999409	-	-	J	-	-	-	-	-	5	R	25	
14-Jun-07	16	-	603626	3999245	M	-	J	-	-	-	-	-	5	H	26	
15-Jun-07	7	8	604630	3999403	-	-	A	-	-	-	-	-	5	R	27	
21-Jun-07	13	1	604140	3999029	F	-	A	-	-	-	-	-	5	R		
22-Jun-07	13	-	604138	3999022	M	-	J	-	-	-	-	-	5	R		
12-Jul-07	14	-	603805	3998786	M	-	A	-	-	-	-	-	8	H	28	
18-Jul-07	14	-	603727	39998785	M		A	-	-	-	-	-	5	H		
Domestic cat (<i>Felis catus</i>)																
31-May-07	3	-			-	-	A	-	-	-	-	-	7	H		
7-Jun-07	-	-			-	-	A	-	-	-	-	-	7	G		
24-Jun-07	-	-			-	-	A	-	-	-	-	-	7	G		

Order															
Species															
	Lengths (mm)														
						Rep.						Weight	Obs.	Habitat	
Date	Site	Station	Easting	Northing	Sex	Cond	Age	Body	Tail	Hindfoot	Ear	(g)	Type	Type	Photo
Artiudactyla															
White-tailed deer (<i>Odocoileus virginianus</i>)															
31-May-07	1	-			-	-	A	-	-	-	-	-	7	G	
31-May-07	1	-			-	-	A	-	-	-	-	-	7	G	
31-May-07	-	-			-	-	A	-	-	-	-	-	7	H	
31-May-07	5	-	604283	3999109	-	-	J	-	-	-	-	-	7	H	
31-May-07	13	-			-	-	A	-	-	-	-	-	7	R	
31-May-07	13	-			-	-	A	-	-	-	-	-	7	R	
31-May-07	13	-			-	-	A	-	-	-	-	-	7	R	
31-May-07	13	-			-	-	A	-	-	-	-	-	7	R	
1-Jun-07	-	-			-	-	A	-	-	-	-	-	7	H	
7-Jun-07	5	-	604283	3999109	F	-	A	-	-	-	-	-	8	H	29
10-Jun-07	3	-	604072	3999116	-	-	J	-	-	-	-	-	8	H	30
12-Jun-07	3	-	604072	3999116	F	-	A	-	-	-	-	-	8	H	31
17-Jun-07	5	-	604283	3999109	F	-	A	-	-	-	-	-	8	H	32
20-Jun-07	5	-	604283	3999109	F	-	A	-	-	-	-	-	8	H	33
21-Jun-07	5	-	604283	3999109	-	-	A	-	-	-	-	-	8	H	34
22-Jun-07	14	-	603805	3998786	M	-	A	-	-	-	-	-	8	H	35
24-Jun-07	5	-	604283	3999109	-	-	J	-	-	-	-	-	8	H	36
24-Jun-07	5	-	604283	3999109	F	-	A	-	-	-	-	-	8	H	36
24-Jun-07	5	-	604283	3999109	F	-	A	-	-	-	-	-	8	H	37
25-Jun-07	5	-	604283	3999109	F	-	A	-	-	-	-	-	8	H	38
27-Jun-07	6	-			F	-	A	-	-	-	-	-	7	G	
28-Jun-07	3	-	604072	3999116	F	-	A	-	-	-	-	-	8	H	39
28-Jun-07	10	-			-	-	A	-	-	-	-	-	7	H	
29-Jun-07	10	-			-	-	A	-	-	-	-	-	7	H	
19-Jul-07	6	-			F	-	A	-	-	-	-	-	7	G	

Appendix 3. Coordinates for all sites, trap stations, and camera locations during our study at Guilford Courthouse National Military Park (GCNMP), Guilford County, North Carolina May – July, 2007.

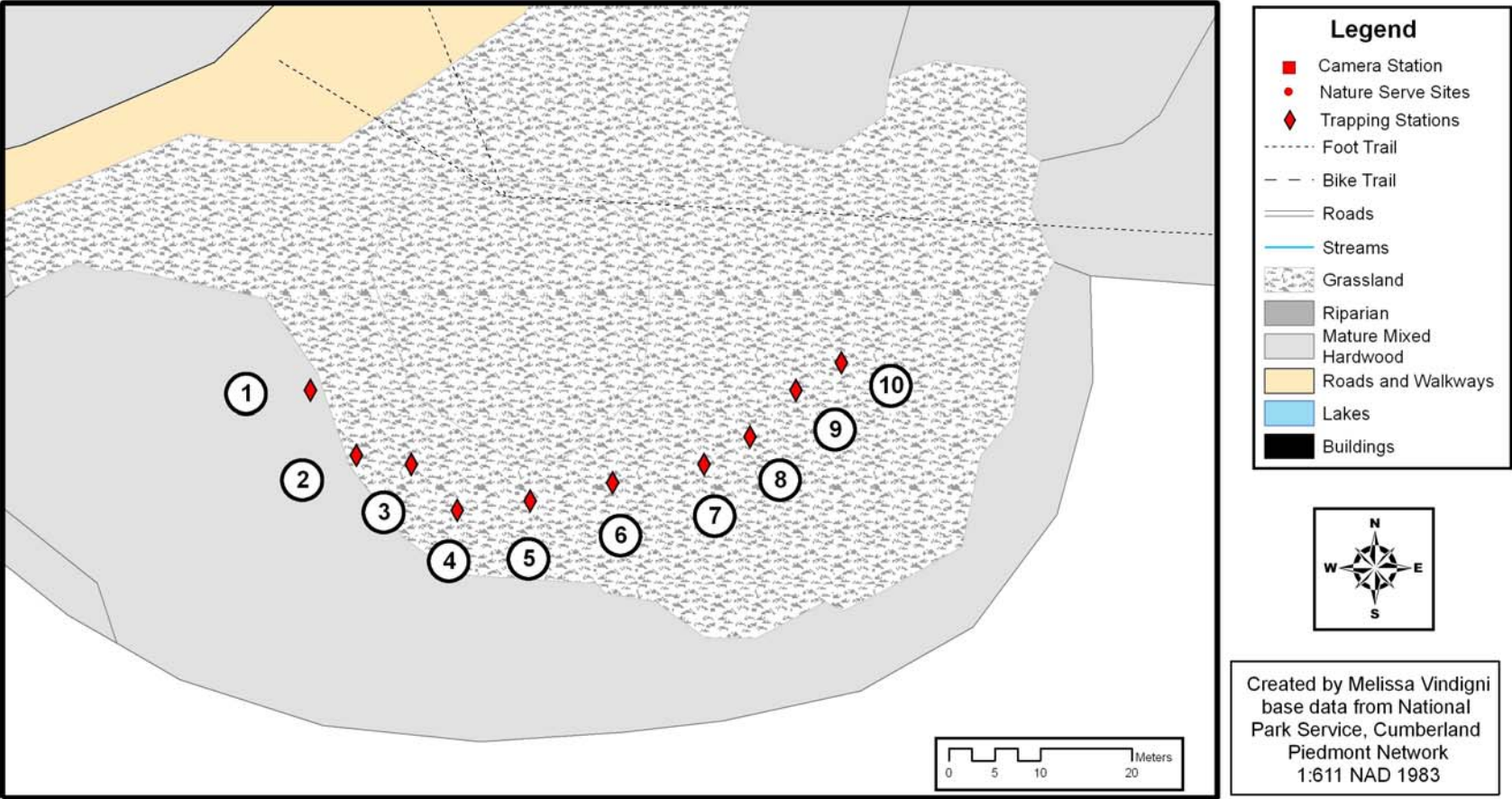
Sampling Site	Trap Station	Easting	Northing	Sampling Site	Trap Station	Easting	Northing
1	1	604379	3999003	10	1	603707	3998932
	2	604384	3998996		2	603703	3998928
	3	604390	3998995		3	603702	3998920
	4	604395	3998990		4	603697	3998917
	5	604403	3998991		5	603697	3998908
	6	604412	3998993		6	603686	3998900
	7	604422	3998995		7	603681	3998898
	8	604427	3998998		8	603680	3998891
	9	604432	3999003		9	603676	3998880
	10	604437	3999006		10	603676	3998872
2	1	604351	3999412	11	1	604995	3999360
	2	604359	3999419		2	604991	3999359
	3	604365	3999424		3	604984	3999359
	4	604374	3999423		4	604980	3999361
	5	604379	3999431		5	604974	3999363
	6	604385	3999438		6	604971	3999365
	7	604390	3999444		7	604969	3999373
	8	604387	3999438		8	604964	3999380
	9	604393	3999446		9	604969	3999385
	10	604403	3999454		10	604974	3999392
3	1	604070	3999127	12	1	604530	3999536
	2	604080	3999129		2	604528	3999561
	3	604086	3999127		3	604526	3999576
	4	604110	3999120		4	604528	3999578
	5	604107	3999119		5	604528	3999576
	6	604110	3999116		6	604525	3999590
	7	604122	3999126		7	604530	3999588
	8	604118	3999133		8	604536	3999589
	9	604113	3999142		9	604541	3999597
	10	604109	3999150		10	604548	3999600

Sampling Site	Station	Easting	Northing	Sampling Site	Station	Easting	Northing
4	1	604060	3999401	13	1	604140	3999029
	2	604066	3999410		2	604144	3999025
	3	604063	3999392		3	604149	3999030
	4	604055	3999384		4	604153	3999036
	5	604049	3999377		5	604160	3999041
	6	604042	3999369		6	604164	3999047
	7	604031	3999364		7	604169	3999036
	8	604024	3999356		8	604173	3999043
	9	-	-		9	604178	3999035
	10	-	-		10	604187	3999050
5	1	604357	3999085	14	1	603758	3998834
	2	604280	3999101		2	603766	3998829
	3	604282	3999099		3	603757	3998828
	4	604285	3999101		4	603746	3998826
	5	604291	3999101		5	603738	3998818
	6	604296	3999099		6	603729	3998818
	7	604304	3999096		7	603722	3998814
	8	604314	3999090		8	603715	3998810
	9	604326	3999086		9	603710	3998805
	10	604336	3999085		10	603693	3998788
6	1	604335	3999427	15	1	604864	3999407
	2	604328	3999419		2	604855	3999390
	3	604323	3999411		3	604854	3999384
	4	604319	3999401		4	604856	3999376
	5	604316	3999394		5	604860	3999374
	6	604335	3999386		6	604868	3999373
	7	604337	3999392		7	604875	3999373
	8	604339	3999403		8	604883	3999374
	9	604342	3999413		9	604891	3999379
	10	604344	3999420		10	604898	3999382
7	1	604645	3999413	16	1	603646	3999174
	2	604639	3999409		2	603642	3999182
	3	604629	3999408		3	603639	3999189
	4	604611	3999405		4	603642	3999206
	5	604620	3999406		5	603632	3999213
	6	604623	3999402		6	603612	3999222
	7	604632	3999406		7	603606	3999219

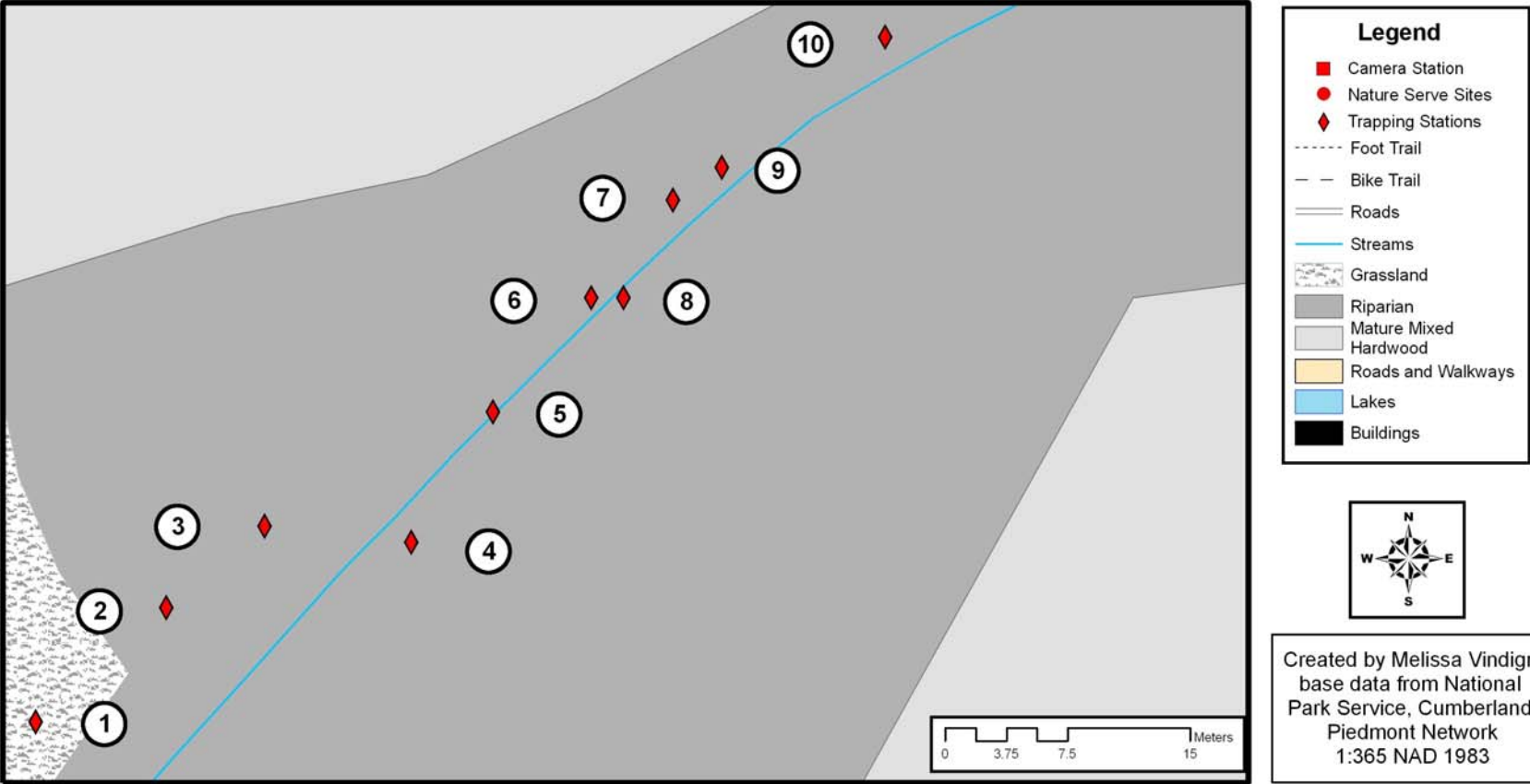
Sampling Site	Station	Easting	Northing	Sampling Site	Station	Easting	Northing
8	8	604630	3999403		8	603600	3999214
	9	604637	3999392		9	603598	3999207
	10	604639	3999393		10	603597	3999197
	1	604860	3999496				
	2	604858	3999524				
	3	604852	3999527				
	4	604839	3999523				
	5	604829	3999521				
	6	604820	3999510				
	7	604812	3999508				
	8	604806	3999498				
	9	604808	3999493				
	10	604808	3999473				
				Sampling Site	Camera	Easting	Northing
				5	Camera 1	604283	3999109
				3	Camera 2	604072	3999116
				7	Camera 3	604611	399406
				14	Camera 4	603805	3998786

Appendix 4. Maps of each sampling site 1-8, & 10-16 with trapping stations indicated from our study at Guilford Courthouse National Military Park (GCNMP), Guilford County, North Carolina May – July, 2007.

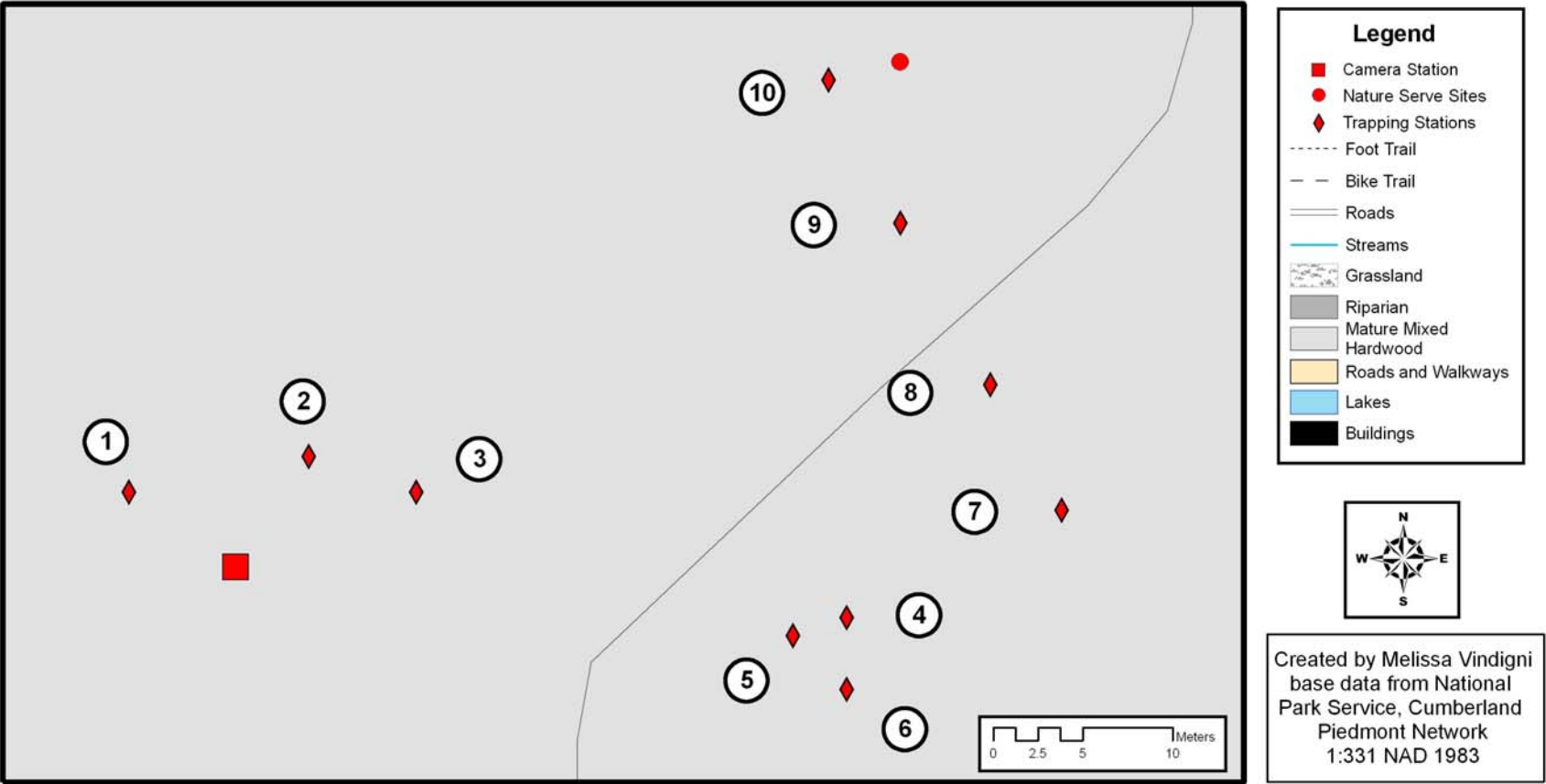
Sampling Site 1: Managed Grassland-Field



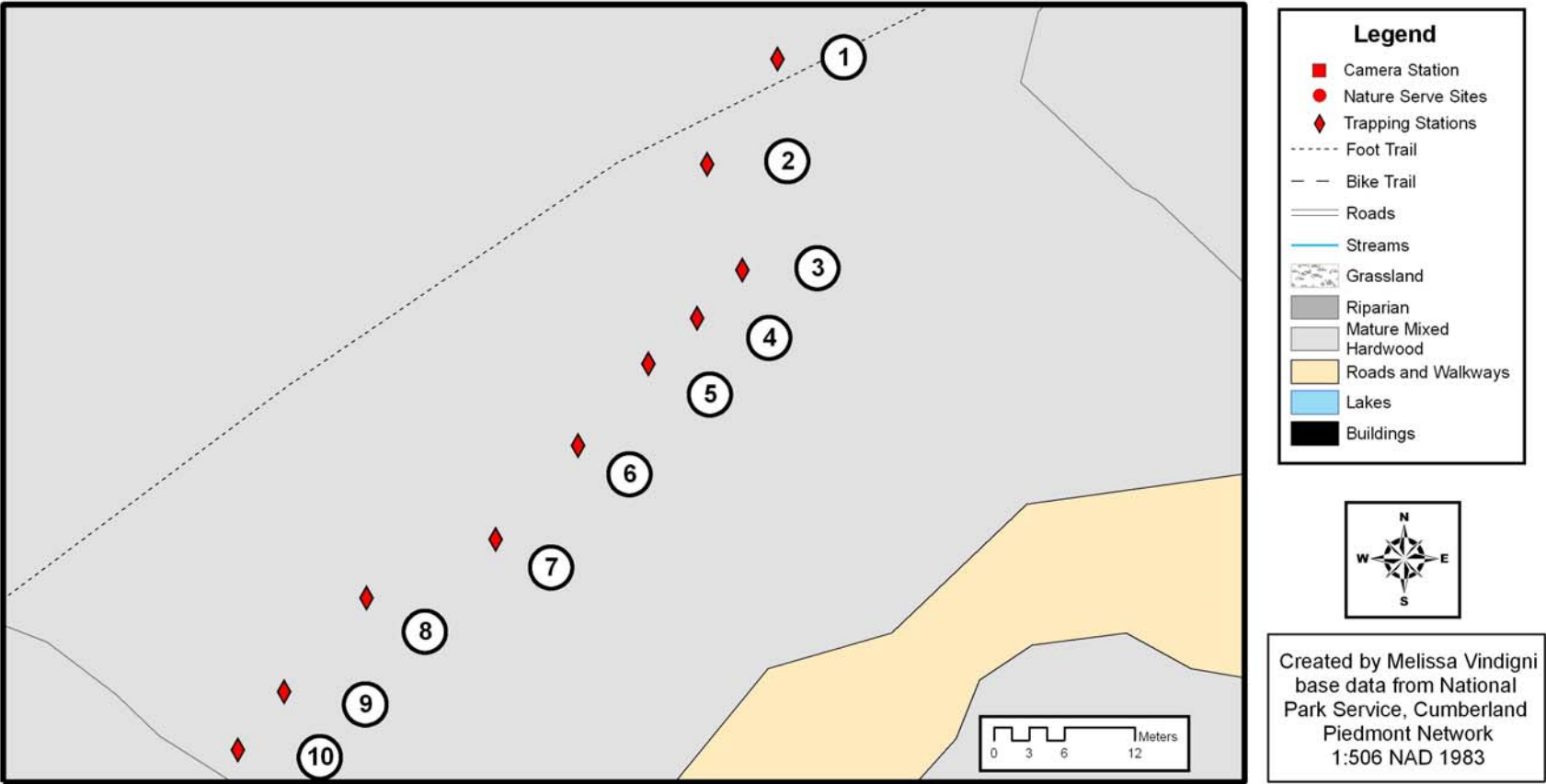
Sampling Site 2: Riparian Edge



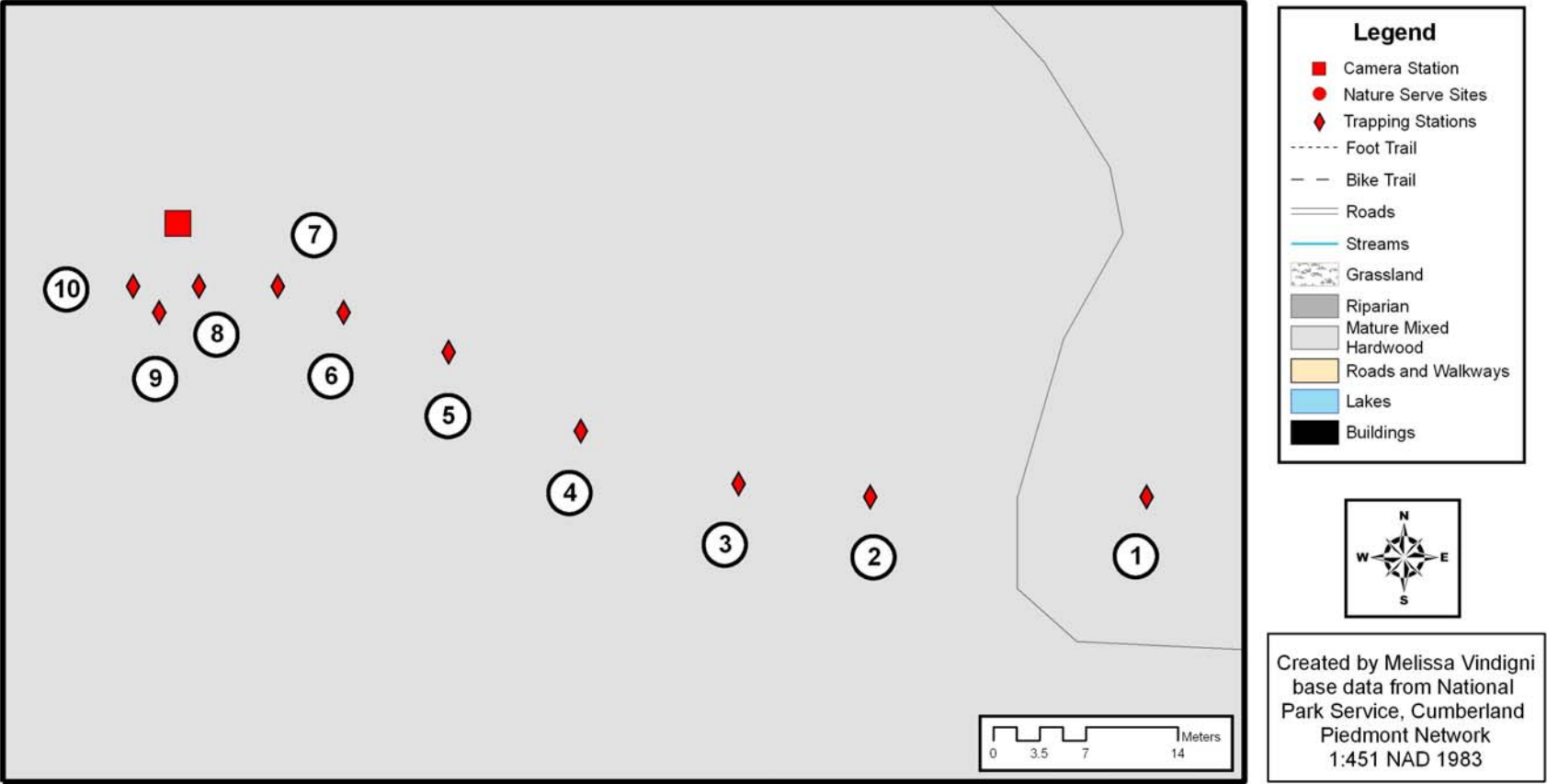
Sampling Site 3: Mature Mixed Hardwood Forest



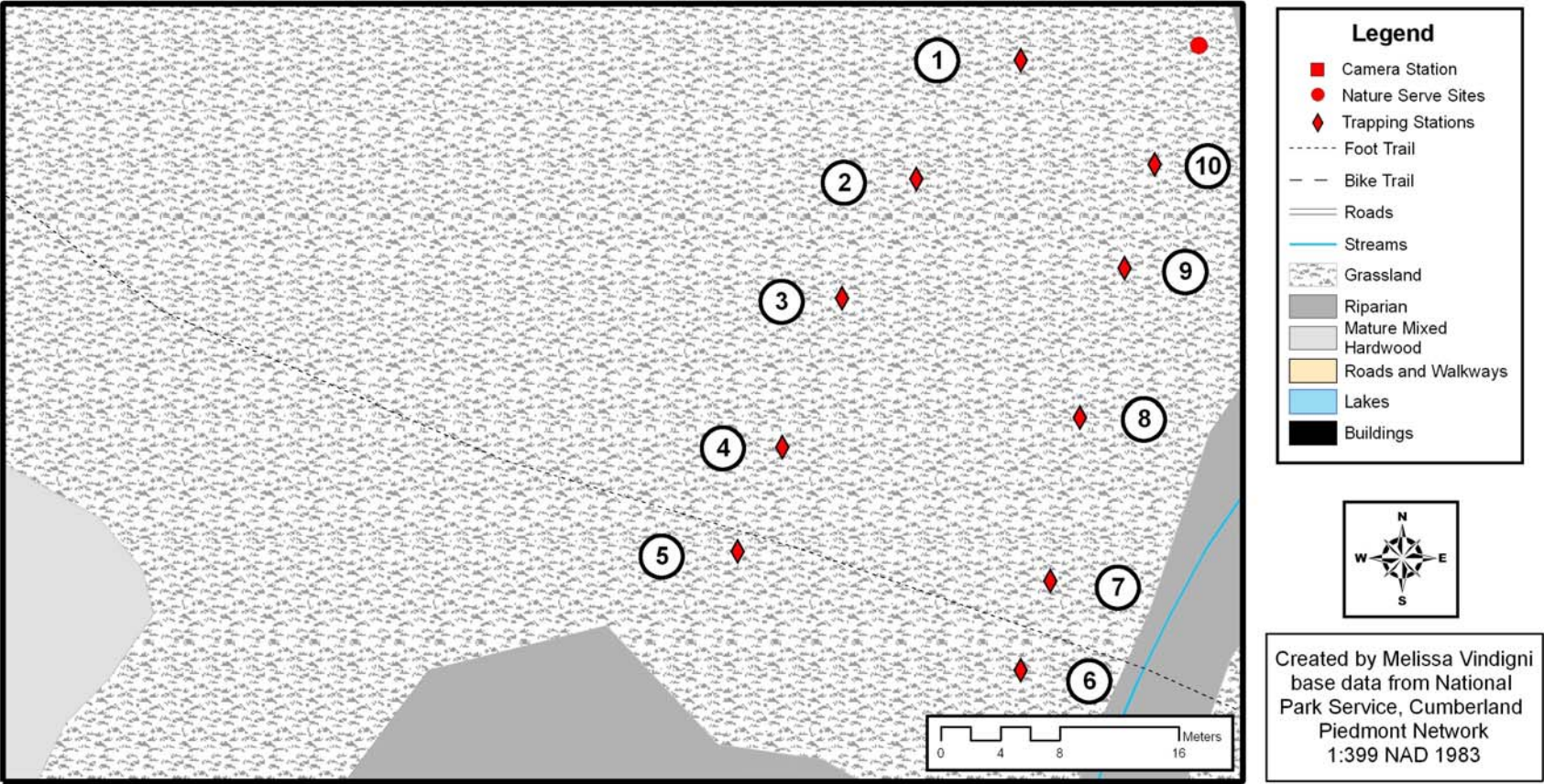
Sampling Site 4: Mature Mixed Hardwood Forest



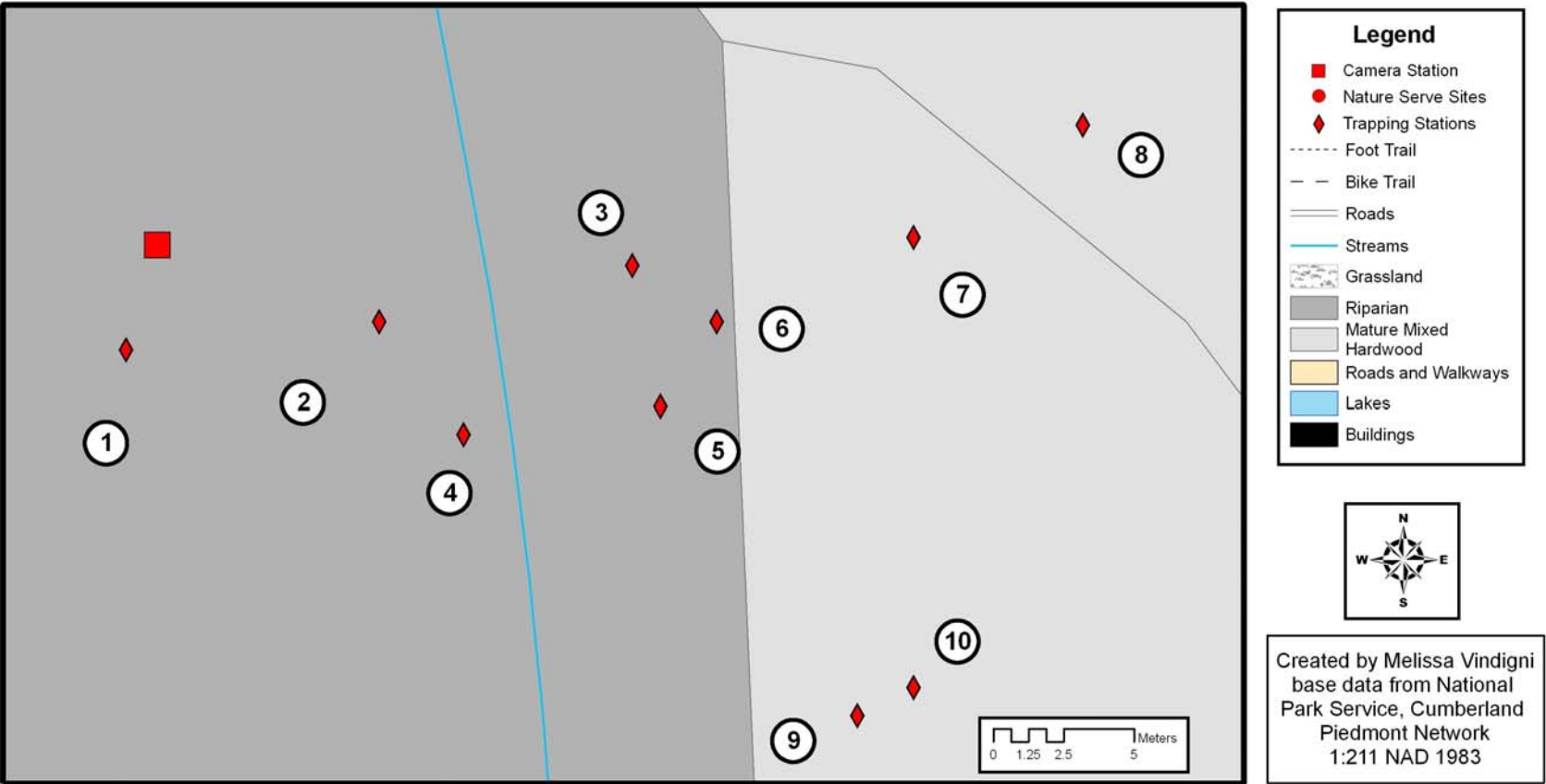
Sampling Site 5: Mature Mixed Hardwood Forest



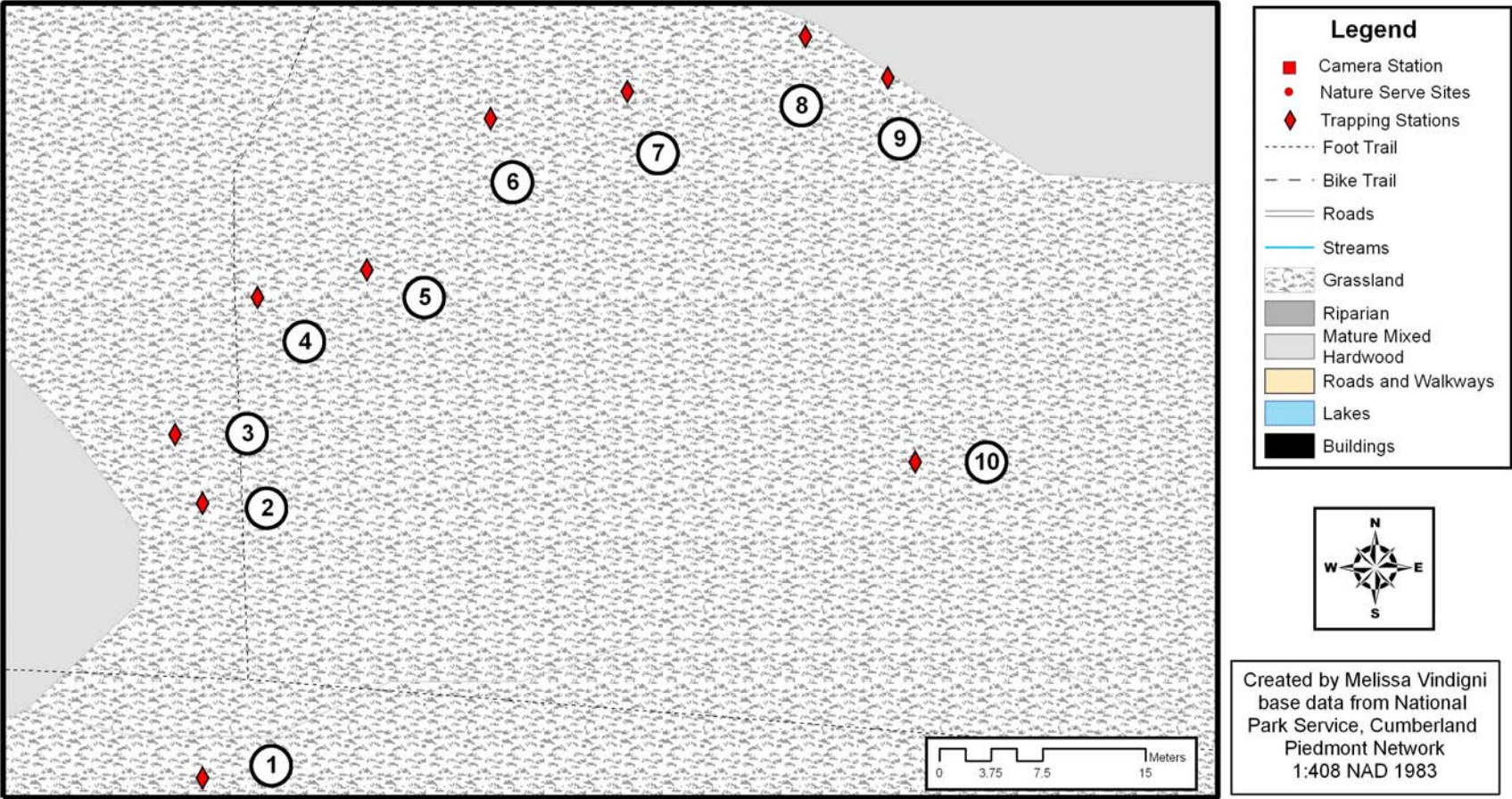
Sampling Site 6: Managed Grassland-Field



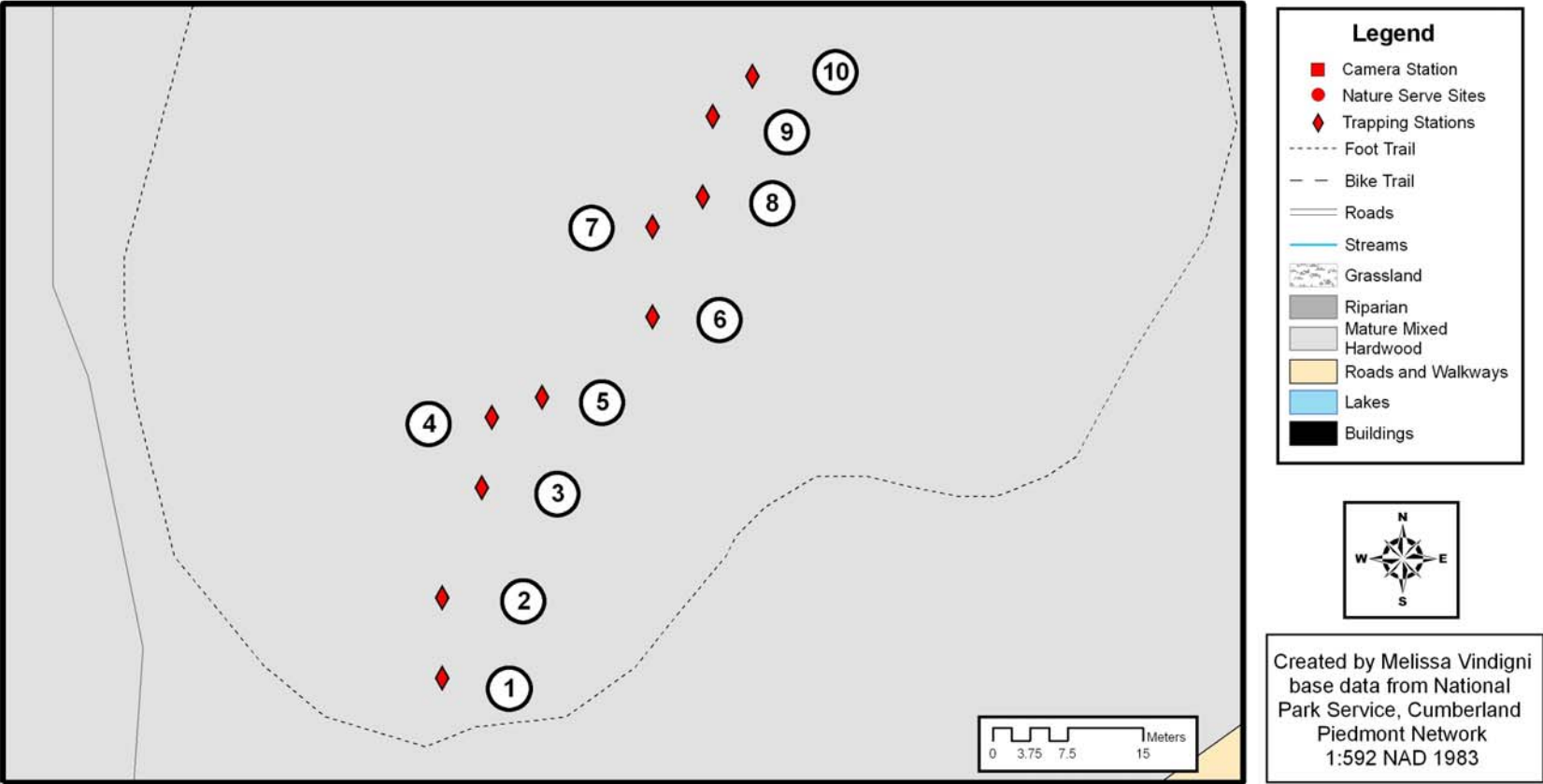
Sampling Site 7. Riparian Edge



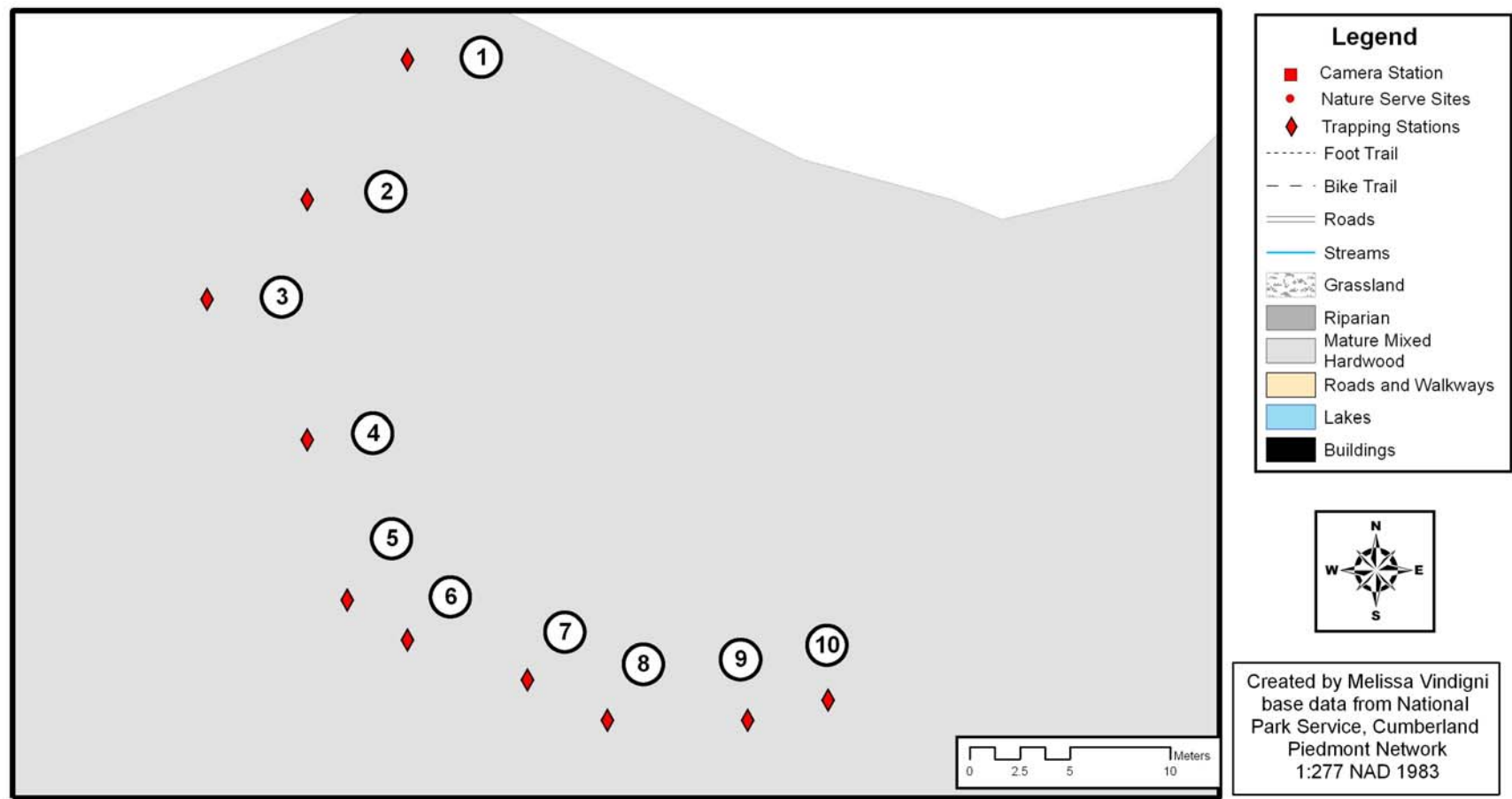
Sampling Site 8: Managed Grassland Field



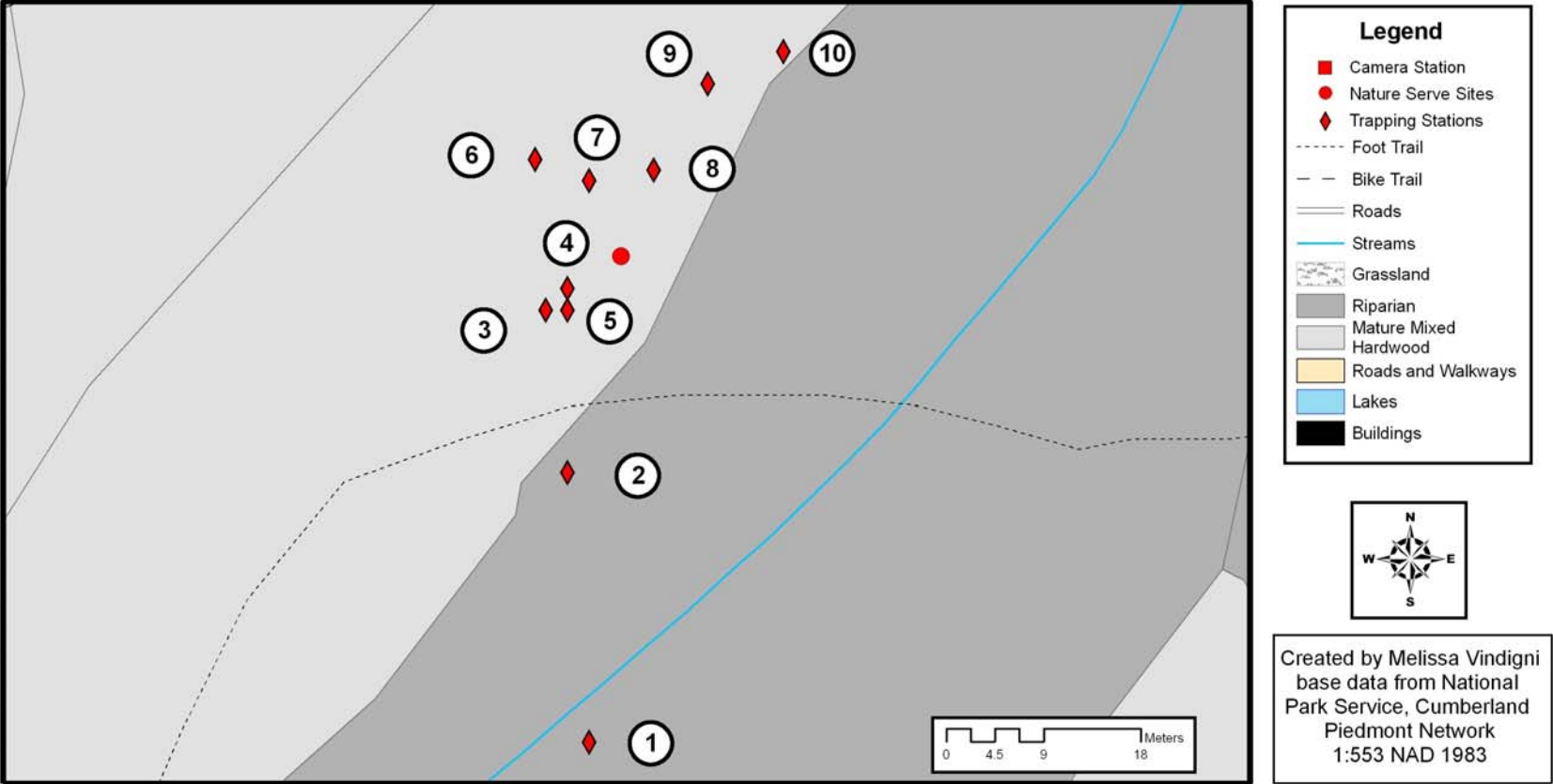
Sampling Site 10: Mature Mixed Hardwood Forest



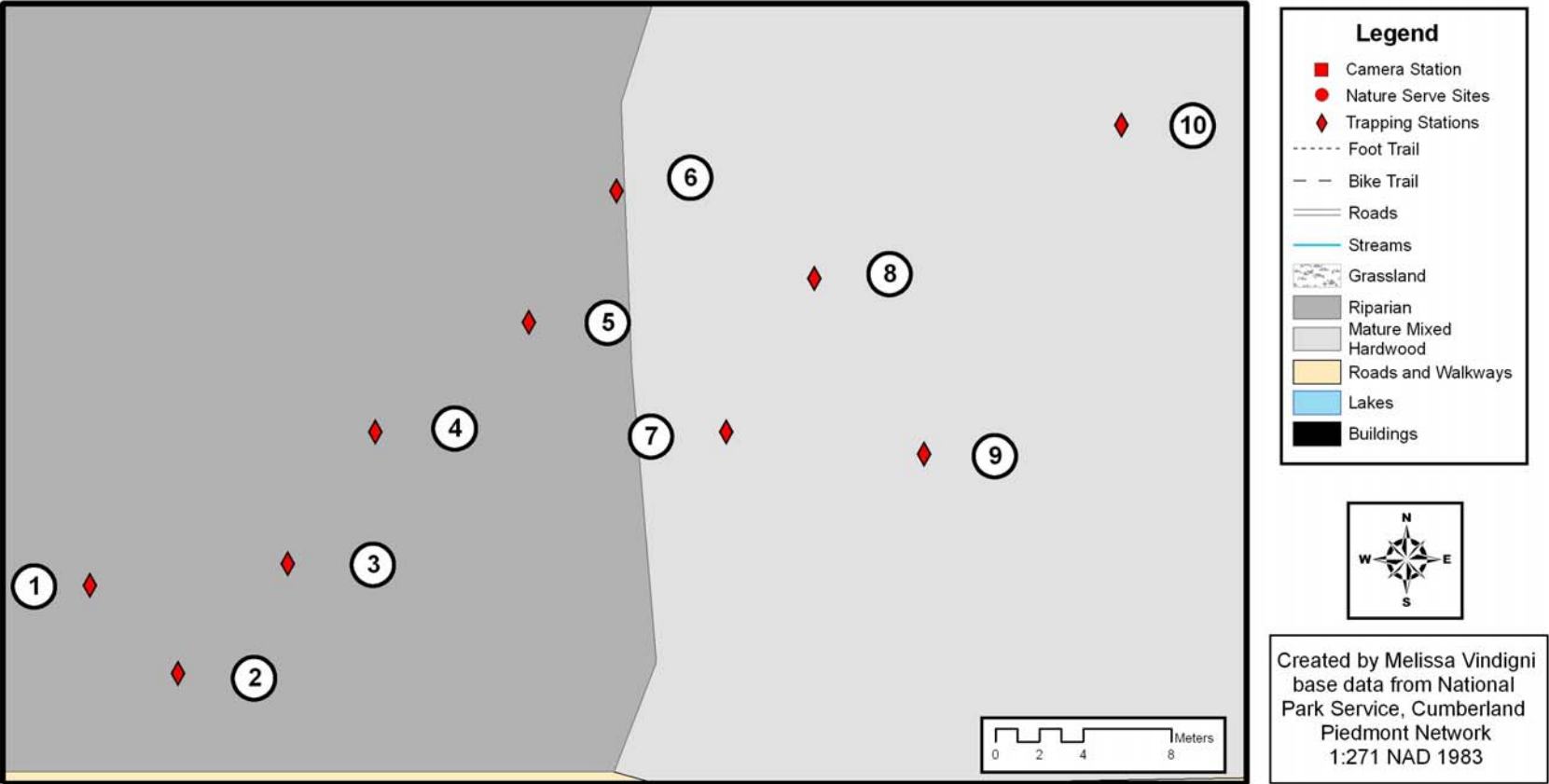
Sampling Site 11: Mature Mixed Hardwood Forest



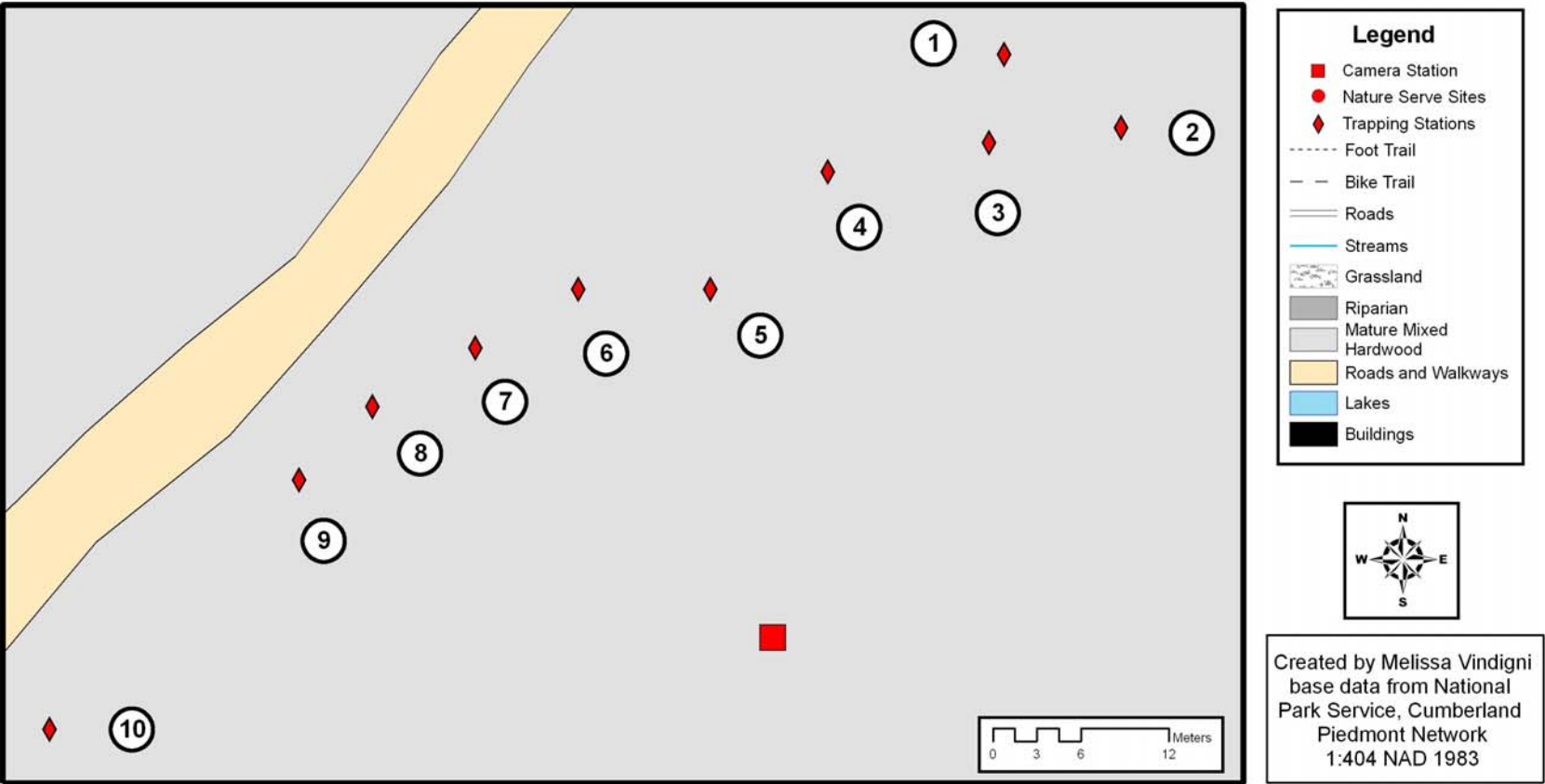
Sampling Site 12: Riparian Edge



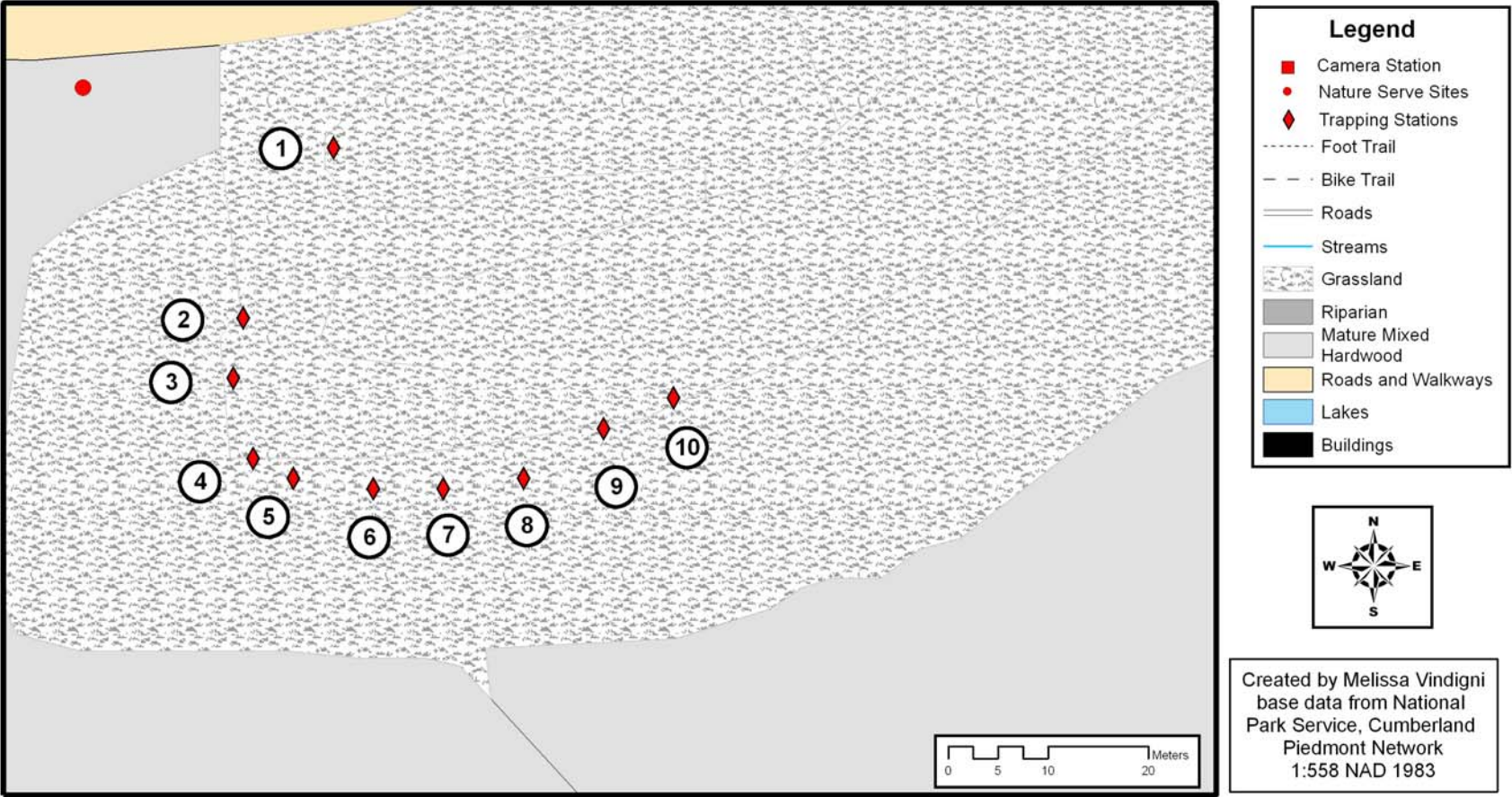
Sampling Site 13: Riparian Edge



Sampling Site 14: Mature Mixed Hardwood Forest



Sampling Site 15: Managed Grassland-Field



Sampling Site 16: Mature Mixed Hardwood Forest

