

Status Report

2001-2003

**Grassland Bird Monitoring at Agate Fossil Beds National Monument,
Nebraska and Tallgrass Prairie National Preserve, Kansas**



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EXECUTIVE SUMMARY

During the breeding seasons of 2001 through 2003, a total of 517 variable circular plots were surveyed for birds and assessed for habitat composition at Agate Fossil Beds National Monument, Nebraska and Tallgrass Prairie National Preserve, Kansas. Systematic 400 x 400 meter grids, originating from random start points, were used to locate 40 permanent variable circular plots in upland habitat at Agate Fossil Beds National Monument and 242 at Tallgrass Prairie National Preserve. An additional 14 permanent plots were established in the less common but important riparian habitat at Agate Fossil Beds National Monument, and 18 plots were added in riparian areas at Tall grass Prairie National Preserve. Variable circular plots in riparian habitat were spaced at 250 meter intervals throughout each area.

Surveys were conducted at Agate Fossil Beds National Monument in 2001 (27 plots) and 2003 (54 plots) and at Tallgrass Prairie National Preserve in 2001 (176 plots) and 2002 (260 plots). A total of 46 species of birds were observed at Agate Fossil Beds National Monument and 82 at Tallgrass Prairie National Preserve. The predominate species found at Agate Fossil Beds National Monument were: western meadowlark, grasshopper sparrow, lark sparrow and red-winged blackbirds in the upland bird community and red-winged blackbird, western meadowlark, common yellowthroat, killdeer and common snipe in the riparian community. The predominate species found at Tall grass Prairie National Preserve were: grasshopper sparrows, dickcissel, western meadowlark and brown-headed cowbird in the upland bird community and eastern wood-pewee, great crested flycatcher, black-capped chickadee, northern cardinal, red-bellied woodpecker, (eastern) tufted titmouse, and yellow-billed cuckoo in the riparian community.

Permanent plot and subplot measures were recorded the first time a plot was visited but not in subsequent years. Semi-permanent plot features and habitat measures were assessed each time a plot was visited. Habitat conditions at each plot varied minimally between years. Therefore, data within each park and habitat type (upland or riparian) were combined across years and reported as such. The diversity of vertical structure within habitats at each NPS unit is low. Vertical structure provides both screening cover from predators and nesting cover as well as nesting sites. Low vertical structure diversity is to be expected in the mixed grass-shortgrass prairie of Agate Fossil Beds National Monument. However, in the absence of fire and grazing, low vertical structure diversity at Tallgrass Prairie National Preserve would be less expected. Therefore, as the park General Management Plan at Tallgrass Prairie National Preserve is implemented, greater structural diversity and improved bird habitat should be observed. Upland plots at Tallgrass Prairie National Preserve are vegetated predominantly by warm-season grasses and to a lesser extent by forbs during the bird breeding season. Riparian plots at Tallgrass Prairie National Preserve and all plots at Agate Fossil Beds National Monument are vegetated predominantly by cool-season grasses and forbs.

1.0 INTRODUCTION

1.1 Background

Birds are an important component of park ecosystems, as their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems. It has been suggested that management activities aimed at preserving habitat for bird populations, such as for neotropical migrants, can have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991, Maurer 1993). Moreover, birds have a tremendous following among the public and many parks provide information on the status and trends of birds in their parks through their interpretive programs.

Once covering vast areas of the North American continent, native Great Plains grasslands are rapidly disappearing. During the last century, large portions of grassland landscapes were plowed for cropland or converted to livestock pasture (29% of shortgrass, 41% of mixed-grass, and 99% of tallgrass prairie; Knopf and Sampson 1997). Remaining grasslands have been altered through continued fragmentation and isolation, interruption of driving ecological processes such as periodic wildfire, and loss of significant faunal species, including bison (*Bos bison*), elk (*Cervus elaphus*), and wolves (*Canis lupus*).

While not affected to the extent of large native ungulates and mammalian predators, many grassland bird species have also demonstrated declining abundance as prairie habitat loss continues. Data collected during the U.S. Geological Survey's annual North American Breeding Bird Surveys (BBS) between 1966 and 1999 indicates that 70% of 29 grassland bird species show evidence of population declines (Sauer et al. 2000). Many prairie species such as the grasshopper sparrow (*Ammodramus savannarum*), eastern meadowlark (*Sturnella magna*), horned lark (*Eremophila alpestris*), bobolink (*Dolichonyx oryzivorus*), lark bunting (*Calamospiza melanocrys*) and dickcissel (*Spiza americana*) have declined at alarming rates. The destruction and fragmentation of prairie landscapes, as well as structural degradation (e.g. fire suppression, changes in grazing regimes) of remaining prairie habitats have contributed to these declines.

Accumulation of litter and standing dead material are significant components in the structural development of tallgrass prairie. In the absence of fire and grazing, tallgrass prairie develops a homogeneous canopy dominated by big bluestem (*Andropogon gerardii*) and indiangrass (*Sorghastrum nutans*), with eventual invasion by woody plants where precipitation permits (Vinton and Collins 1997). The accumulation of dead material decreases availability of nutrients and reduces solar radiation reaching the ground for shade intolerant plants. Fire tends to remove accumulated dead material more evenly in grasslands than grazing, which produces a heterogeneous mix of live and dead plant material. The timing and frequency of both fire and grazing events have varying influences on litter and standing dead material accumulation, and thus the structural development of prairie systems. Natural variations in structural development and accumulation of litter and standing dead material follow a "high" east (tallgrass) to "low" west (shortgrass) gradient with mixed-grass prairies falling somewhere in between. Net annual production and the accumulation of dead materials are significantly greater in eastern tallgrass prairies than western shortgrass prairies. The shortgrass prairie canopy, dominated by bunch grasses such as blue grama (*Bouteloua gracilis*) and shrubs, is more heterogeneous than the canopy of the tallgrass prairie (Lane 1995, Vinton and Collins 1997). Consequently, the

accumulation of litter and standing dead material in shortgrass prairie systems is minor, resulting in insignificant influences on structural prairie development.

Responses of bird communities to changes in habitat structure have received much attention in recent years (Cody 1981, 1985; Zimmerman 1997; Fitzgerald and Pashley 2000; Tappe et al. 2001). Much of this work has been carried out in forested systems, which are structurally more diverse than grassland systems. However, work done by Zimmerman (1982, 1988 and 1993) on the Konza Prairie Research Natural Area in the Flint Hills of Kansas has demonstrated how bird species respond to fire and grazing in a tallgrass prairie system. Zimmerman (1997) categorized three types of bird species: grass/forb-dependent, woody-dependent and habitat-independent inhabiting tallgrass prairie, and recorded their responses to grazing and fire. Woody-dependent species disappear from the bird community when fire and/or grazing remove woody plants from the landscape. Often these woody plants have invaded the prairie as a result of fire suppression. Grass/forb-dependent species in tallgrass prairie generally respond well to moderate grazing that increases structural diversity. Annual spring burns to promote warm-season grass production, on the other hand, have a negative influence on structural development by removing cool-season grasses and forbs, litter and standing dead material, thus reducing habitat quality for grass/forb-dependent species. While some elements of habitat-bird community relationships are clearly understood for prairie systems, such as the response following removal of woody plants, others are not. The influence of habitat alterations on invertebrate communities and the birds that feed upon them is one component that is not fully understood.

It is against a backdrop of vanishing or altered prairie ecosystems and declining grassland bird communities that we initiated a bird monitoring project on National Park Service lands. Long-term trends in bird community composition and abundance of breeding bird populations provide one measure for assessing the ecological integrity and sustainability of prairie systems. Trends in the composition and abundance of grassland bird populations have been proposed as a long-term indicator of prairie ecosystem integrity, which is defined as the capability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of natural habitat of the region (Karr and Dudley 1981). During 1998 and 1999, as part of the design phase of the Prairie Cluster Prototype Long-term Ecological Monitoring (PC-LTEM) program, the U.S. Geological Survey conducted bird inventories and pilot monitoring work in eight prairie parks to identify species present at each park and assess the feasibility of using grassland birds as indicators of ecosystem integrity (Powell 2000). Work was conducted at Agate Fossil Beds National Monument (AGFO), Badlands National Park (BADL), Homestead National Monument of America (HOME), Pipestone National Monument (PIPE), Scotts Bluff National Monument (SCBL), Tallgrass Prairie National Preserve (TAPR), Theodore Roosevelt National Park (THRO) and Wilson's Creek National Battlefield (WICR). Powell (2000) concluded that Agate Fossil Beds National Monument and Tallgrass Prairie National Preserve were of sufficient size to support healthy grassland bird communities, but recommend against bird community monitoring in other PC-LTEM parks (HOME, PIPE, SCBL and WICR) because of their small size. Following Powell's recommendation, the PC-LTEM Program initiated a pilot project in the spring of 2001 to monitor bird communities at Agate Fossil Beds National Monument and Tallgrass Prairie National Preserve. Also, long-term patterns in bird community composition and abundance of bird populations in relation to changing vegetation patterns and structural diversity resulting from different fire and grazing regimes will improve our understanding of the

effects of various management actions on bird populations. Grassland bird monitoring may be of particular importance at Tallgrass Prairie National Preserve, where current management includes annual prescribed fire and heavy cattle grazing. As the park General Management Plan is implemented, greater structural diversity and improved bird habitat may be observed.

1.2 Objectives

There are two primary objectives for monitoring breeding birds at Agate Fossil Beds National Monument and Tallgrass Prairie National Preserve:

- Determine annual changes in bird community composition and abundance at each park.
- Improve our understanding of breeding bird – habitat relationships and the effects of management actions such as grazing and prescribed fire regimes on bird populations by correlating changes in bird community composition and abundance with changes in specific habitat variables.

This report summarizes two years of survey results.

2.0 METHODS

2.1 Site Selections

Permanent sampling locations or 'plots' were selected by overlaying a systematic grid of 400 x 400 meter cells (originating from a random start point) on a park. The orientation of each grid was rotated 45 degrees to prevent sampling sites from being influenced by man-made features (roads, fences, etc.) oriented along cardinal directions. If any habitat subplot extended beyond park boundaries, the plot was dropped from sampling. Using a systematic grid we established 40 permanent plots at Agate Fossil Beds National Monument (13 were sampled in 2001) and 242 plots at Tallgrass Prairie National Preserve (158 were sampled in 2001), see Figures 1 and 2, respectively.

In each park, the riparian corridor was identified as a separate stratum, with sampling extending 125 m on either side of the stream channel (Niobrara River, AGFO; Palmer and Fox Creeks, TAPR). The riparian stratum makes up 15.6% of the total park area (965 ha) at Agate Fossil Beds National Monument, and 5.3% of the total park area (4398 ha) at Tallgrass Prairie National Preserve. Within the riparian stratum, plots were located at 250 meter intervals along the extent of the stream. Plots were placed 10 meters south of the main stream channel on west-east flowing streams (Niobrara River, AGFO and Palmer Creek, TAPR) and 10 meters west of north-south flowing streams (Fox Creek, TAPR). Any plots from the overall park grid that fell within the riparian stratum were discarded. We established a total of 14 permanent riparian plots at Agate Fossil Beds National Monument and 18 plots at Tallgrass Prairie National Preserve, see Figures 1 and 2, respectively.

The site selection approach used allows us flexibility in choosing the appropriate reference frame to answer different monitoring questions. When making park-wide inferences, estimates for the two habitats are weighted according to each stratum's proportionate area contribution to give an overall park mean and variance. At the same time, the more intensive sampling in the riparian corridor ensured an adequate sample to describe habitat relationships specific to this less common, but important stratum. The systematic grid will also allow us to limit the reference frame appropriately when asking more specific monitoring questions in the

future (e.g. only those sampling plots within a particular management unit would be used to compare responses of birds to different fire or grazing regimes within that unit).

During bird surveys, sampling plots were located using a GPS unit and temporarily marked with 36 inch pin flags to aid in re-locating the plots for habitat assessment, eliminating the need for permanent plot markers. Pin flags were collected from a plot once the habitat work at that plot was completed. Each year, sampling plots were re-located.

2.2 Grassland Bird Surveys

Variable circular plot counts, a point count methodology that incorporates a measure of detectability into population estimates, were used to survey birds present (Fancy 1997). All birds seen or heard at plots during 5 minute sampling periods were recorded with their corresponding distance from observer. Bird observations were separated into two time segments: those detected during the first 3 minutes of the count (to allow future comparisons with the national Breeding Bird Survey data), and any new birds detected during the final 2 minutes of the count. All birds, regardless of distance detected from the observer are counted and recorded. For most species, each individual bird was recorded as a separate observation. For species that usually occur in clusters or flocks, the units recorded were cluster or flock size, and not the individual bird. Once a count was completed at a plot and the data sheet filled out, the observers navigate to the next plot using GPS. Twelve to 20 plots were sampled on a typical morning during a period when it was light enough to observe birds to four hours post sunrise. Therefore, a birder arrived at the first plot each day before sunrise and began sampling as soon as it was light enough to do so. Bird surveys were conducted between 7 May and 6 June at Agate Fossil Beds National Monument and 22 May and 15 June at Tallgrass Prairie National Preserve.

When we conducted a variable circular plot count, we were attempting to get an “instantaneous count” of all birds present. Birds flushed from the plot when approached by the observer were recorded and counts started as soon as the observer reached plot center. That way our method took into account the fact that birds close to the observer have a higher probability of being detected (if they are not flushed) than birds far from the observer, and that different species have different detection functions (i.e., the probability of detecting a bird at different distances from the observer). An important assumption of the method is that a bird exactly at the center of the plot has a probability of $p = 1$ of being detected, and that there is a high probability of detecting birds within the first 5-10 or so meters of the plot center. The most important birds to detect are those very close to the observer (within the first 5-10 meters), and it is highly desirable that estimated distances be within 1-2 meters of actual distances for any bird within 20 m of the observer. However, all birds seen or heard were recorded with an estimate of distance from the observer when possible. For this report, all birds seen or heard during the full 5 minute survey were included in the analysis.

2.3 Grassland Bird Habitat Estimates

The collection of habitat data started each morning after the first variable circular plot Count was completed. In order to avoid disturbing birds on plots where bird counts had not been completed, plots were sampled for habitat measures in the same order they were surveyed for birds. Once the habitat crew arrived at a plot, they set up subplot one (plot center) and completed all habitat measures for this subplot and the 50 meter radius plot, before locating and completing habitat measures on subplots two, three and four (Figure 3). The azimuth ($^{\circ}$) to subplot two was determined randomly, subplots three and four were positioned 120 degrees on

either side of two. Azimuths were determined the first year subplots were sampled and then maintained in subsequent years. In order to correlate bird count data with habitat conditions, an attempt was made to complete all habitat work on plots the same day they were sampled for birds. In some cases this was not possible. However, all habitat data collections were completed by 20 June.

Habitat available for bird species were characterized at a number of different scales. First, slope ($^{\circ}$), slope variability, aspect ($^{\circ}$), aspect variability and topographic position of each 50 meter radius plot were determined and recorded. These measures were taken the first time a plot was visited and not repeated in subsequent years. Vegetation types and amount of road and water cover on each plot were recorded each time a plot was visited. Second, azimuth ($^{\circ}$) to and slope ($^{\circ}$) and aspect ($^{\circ}$) of each 5 meter subplot (Figure 3) were recorded. These measures were taken the first time a plot was visited and not repeated in subsequent years. Also, for riparian subplots at Tallgrass Prairie National Preserve, trees were tallied by diameter at breast height (DBH) classes (<1.0 cm, 1.1-2.5 cm, 2.6-8.0 cm, 8.1-15.0 cm, 15.1-23.0 cm, 23.1-38.0 cm and >38.0 cm) and canopy height, canopy cover and basal area were recorded. Horizontal vegetation coverage between 0 – 0.5, 0.5 – 1.0, 1.0 – 1.5 and 1.5 – 2.0 meters were recorded each year as well as vertical structure in one meter increments to 7.5 meters in height. Vertical structure was recorded for deciduous, coniferous and herbaceous vegetations. Third, within each subplot ground and foliar cover were recorded in 1.78 meter radius nested sample plots. Ground cover included deciduous, conifer and grass litter, bare soil, rock, woody debris (>2.5 cm DBH) and un-vegetated. Foliar cover was estimated for seven plant guilds and included warm- and cool-season grasses, forbs, moss and lichens, shrubs and vines, tree seedlings and total foliar cover (<1.5 m tall).

2.4 Data Analysis

Prior to summary analysis, the resident status (permanent resident, summer resident, migrant) of each bird species recorded at Agate Fossil Beds National Monument and Tallgrass Prairie National Preserve was determined. Identifying the residency of each species was needed in order to exclude migrants from analysis of breeding birds within each park. Also the likelihood of encountering a species during a plot visit (individuals / plot visit) was determined, and results plotted from most to least common species within habitat on a park.

Bird diversity, richness and distribution evenness were calculated by plot with mean values (\pm SE) estimated for prairie and riparian areas from these calculations. Bird diversity for each plot was calculated using Shannon Diversity Index:

$$H' = -\sum(n_i/N)\ln(n_i/N)$$

where n_i/N is the proportion of the total number of individuals in a population consisting of the i^{th} species (Shannon, 1949). Species richness was determined as the total number of bird taxa recorded per plot. Species distribution evenness was calculated by plot using Pielou (J):

$$J' = H' / H_{\text{max}}$$

where H' is the Shannon Diversity Index and H_{max} is the maximum possible diversity for a given number of species if all species are present in equal numbers ($(\ln(\text{species richness}))$). J' is a measure of how evenly individuals are distributed within a community when compared to the equal distribution and maximum diversity a community can have (Pielou, 1969).

Location and permanent abiotic measures on each plot and habitat subplot were recorded. Mean values (\pm SE) for semi-permanent plot data including road and water cover were calculated from the plot estimates for both prairie and riparian areas in each NPS unit. For riparian subplots

at Tallgrass Prairie National Preserve, trees tallied in DBH classes (<1.0 cm, 1.1-2.5 cm, 2.6-8.0 cm, 8.1-15.0 cm, 15.1-38.0 cm and >38.0 cm) were summed to illustrate size distribution of riparian trees. Average canopy height, canopy cover and basal area were also calculated for each riparian plot at Tallgrass Prairie National Preserve with a mean (\pm SE) estimated for this habitat. Using calculated plot averages or values, mean values (\pm SE) for horizontal vegetation cover between 0 – 0.5, 0.5 – 1.0, 1.0 – 1.5 and 1.5 – 2.0 meters and vertical structure diversity were estimated for prairie and riparian areas. Structural diversity values were determined for each plot using a modified Shannon Diversity Index:

$$H' = -\sum(n_i/N)\ln(n_i/N)$$

where n_i/N is the proportion of vegetation touching a measuring rod in the i^{th} meter increment to the total number of touches from vegetation along the rod.

Within each plot, ground cover, including deciduous, conifer and grass litter, bare soil, rock, woody debris (>2.5 cm DBH) and unvegetated were averaged across subplots with mean values (\pm SE) estimated for prairie and riparian areas using these averages. Foliar cover, by guild of warm- and cool-season grasses, forbs, mosses and lichens, shrubs and vines, tree seedlings and total foliar cover (<1.5 m tall) were averaged across subplots with mean values (\pm SE) estimated for prairie and riparian areas using these averages.

Analyses performed in this report were completed using MicroSoft Access 97® (Litwin et al. 1997) queries and/or NCSS 97® (Hintze 1997).

3.0 RESULTS

3.1 Grassland Bird Surveys

Forty-six species of birds were recorded at Agate Fossil Beds National Monument during 2001 and 2003 surveys (Table 1 and 2). Thirty-three of these species are summer residents, eleven species are year round residents and the remaining two are late season migrants that happened to be recorded during our surveys. Eighty-two species of birds were recorded at Tallgrass Prairie National Preserve during 2001 and 2002 surveys (Table 1 and 2). Forty of these species are summer residents, forty-one are year round residents and the remaining one a late season migrant that happened to be recorded during our survey.

Western meadowlark (2.0 / plot), grasshopper sparrow (0.87 / plot), lark sparrow (0.36 / plot) and red-winged blackbirds (0.34 / plot) were encountered most often during plot visits in the upland habitat at Agate Fossil Beds National Monument; and red-winged blackbird (3.79 / plot), western meadowlark (0.82 / plot), common yellowthroat (0.50 / plot), killdeer (0.25 / plot) and common snipe (0.25 / plot) encountered most commonly in the riparian habitat (Table 3). Grasshopper sparrows (0.93 / plot), dickcissel (0.73 / plot), western meadowlark (0.72 / plot) and brown-headed cowbird (0.24 / plot) were encountered most often during plot visits in the upland habitat at Tallgrass Prairie National Preserve; and eastern wood-pewee (0.53 / plot), great crested flycatcher (0.42 / plot), black-capped chickadee (0.39 / plot), northern cardinal (0.36 / plot), red-bellied woodpecker (0.33 / plot), (eastern) tufted titmouse (0.33 / plot) and yellow-billed cuckoo (0.31 / plot) encountered most commonly in the riparian habitat (Table 3). Average bird diversity per plot by habitat ranged from 0.82 ± 0.03 (TAPR, upland) to 1.19 ± 0.10 (TAPR, riparian), species richness ranged from 2.74 ± 0.07 (TAPR, upland) to 4.06 ± 0.37 (TAPR, riparian) and distribution evenness ranged from 0.72 ± 0.06 (AGFO, riparian) to 0.90 ± 0.04 (TAPR, riparian; Table 4).

3.2 Grassland Bird Habitat Estimates

Slope, slope variability, aspect, aspect variability, topographic position and habitat type (prairie or riparian) of each 50 meter radius plot are reported in Table 5. Direction (azimuth) from the center of the primary plot to the position of the subplot and the slope and aspect of each 5 meter subplot are reported in Table 6. Average cover of upland prairie, riparian woodland, paved roads, pasture roads, streams and ponds on plots are reported for prairie and riparian areas at Agate Fossil Beds National Monument and Tallgrass Prairie National Preserve in Table 7. Average values ranged from $97.5 \pm 0.00\%$ upland prairie cover on upland plots at Agate Fossil Beds National Monument to no coverage of several habitat types on other plots.

Two trees < 1.0 cm DBH were observed on 5 meter radius subplots in the riparian area of Tallgrass Prairie National Preserve, 11 trees in the 1.1-2.5 cm size class, 44 trees in the 2.6-8.0 cm size class, 63 trees in the 8.1-15.0 cm size class, 37 trees in the 15.1- 23.0 cm size class, 24 trees in the 23.1-38.0 cm size class and 27 trees in the >38.0 cm size class. Canopy height averaged 10.9 ± 0.63 m, canopy coverage $39.3 \pm 2.78\%$ and basal area 25.8 ± 1.66 m² for the riparian plots.

Horizontal vegetation coverage between 0.0 – 0.5 m averaged from $60.7 \pm 3.24\%$ (AGFO, upland) to $72.9 \pm 1.06\%$ (TAPR, upland), coverage between 0.5 – 1.0 m from $3.3 \pm 0.79\%$ (AGFO, upland) to $30.4 \pm 3.15\%$ (TAPR, riparian), coverage between 1.0 – 1.5 m from 0.0% (AGFO, upland) to $15.6 \pm$ undefined% (AGFO, riparian) and between 1.5 – 2.0 m from 0.0% (AGFO, upland and riparian) to $17.0 \pm 1.76\%$ (TAPR, riparian; Table 7). Vertical structure diversity was highest on Tallgrass Prairie National Preserve riparian plots (1.27 ± 0.03) and lowest on Agate Fossil Beds National Monument upland plots (0.01 ± 0.01 ; Table 7).

Deciduous litter coverage averaged from $0.6 \pm 0.07\%$ (TAPR, upland) to 19.3 ± 1.88 (TAPR, riparian), conifer litter from 0.0% (AGFO, upland and riparian) to $9.4 \pm$ undefined (TAPR, riparian) and grass litter from $6.9 \pm 0.98\%$ (TAPR, riparian) to 33.7 ± 3.56 (AGFO, riparian; Table 7). Bare soil averaged from $23.6 \pm 3.21\%$ (TAPR, riparian) to $51.4 \pm 0.89\%$ (TAPR, upland), rock coverage from $0.6 \pm 0.23\%$ (AGFO, riparian) to $9.0 \pm 0.42\%$ (TAPR, riparian), woody debris (>2.5 cm DBH) coverage from $0.1 \pm 0.97\%$ (AGFO, upland) to $3.5 \pm$ undefined (AGFO, riparian) and un-vegetated area from $23.6 \pm 3.21\%$ (TAPR, riparian) to 51.4 ± 2.57 (TAPR, upland; Table 7). Foliar coverage of warm-season grasses averaged $0.5 \pm 0.07\%$ (AGFO, riparian) to $32.1 \pm 0.77\%$ (TAPR, upland), cool-season grasses from $5.2 \pm 0.62\%$ (TAPR, upland) to $15.3 \pm 2.31\%$ (TAPR, riparian), forbs from $8.1 \pm 1.61\%$ (AGFO, upland) to $14.8 \pm 0.50\%$ (TAPR, upland), moss and lichens from $0.7 \pm 0.16\%$ (TAPR, upland) to $1.5 \pm 0.31\%$ (AGFO, upland), shrubs and vines from $1.4 \pm 0.28\%$ (AGFO, riparian) to $7.1 \pm 1.83\%$ (TAPR, riparian), tree seedlings from 0.0% (AGFO, upland and riparian) to $0.5 \pm 0.02\%$ (TAPR, upland) and total foliar coverage (<1.5 m tall) from $18.2 \pm 2.45\%$ (AGFO, riparian) to $47.7 \pm 0.67\%$ (TAPR, upland; Table 7).

3.3 Other Observations

It was difficult to record the distance of some bird species from the observer as is required for Distance analysis (Buckland et al. 2001). These species include common snipe, northern harrier hawk, turkey vulture and upland sandpiper at Agate Fossil Beds National Monument and upland sandpiper, northern harrier hawk, American crow and common nighthawk at Tallgrass Prairie National Preserve. Often, we were unable to estimate distance for these species as they were records are of flyover. Birds such as upland sandpiper and common snipe call and display in flight. Other species such as American crow can be recorded at great

distances with accurate estimates of this distance rarely possible. It can also be difficult to determine whether or not crows are in flight or calling from trees, often both instances occur. Nevertheless, these species were recorded frequently, suggesting they are using habitats within each NPS unit.

4.0 DISCUSSION

It is of interest to note that of the 46 species of birds recorded at Agate Fossil Beds National Monument (Table 1 and 2), 76 % (35 species) are migrants. However, of the 82 species of birds recorded at Tallgrass Prairie National Preserve (Table 1 and 2) only 50% (41 species) are migrants. Both the geographic location and available habitat may play a role in these differences. Agate Fossil Beds National Monument is located approximately 445 km north of Tallgrass Prairie National Preserve and 625 km west. Agate Fossil Beds National Monument is a mixed grass-shortgrass prairie with little wooded riparian habitat for species to use year round. Tallgrass Prairie National Preserve, on the other hand, is tallgrass prairie with significant wooded riparian habitat. While differences in the numbers of year round residents is of interest, it has little influence on our bird monitoring within each park, as these differences between NPS unit will not be compared in future analysis. However, future trends in bird numbers and community composition may be influenced more by factors outside the park at Agate Fossil Beds National Monument than at Tallgrass Prairie National Preserve do to a greater percentage of migrants using the monument during the breeding season.

Knowledge of the most commonly encountered species in each habitat is valuable in that any population change here is more readily noticed and significant than less common species. Greater variability in the observations of rarely encountered species than common species, hinder their use in detecting changes related to environmental factors. Also, using Distance software to more accurately estimate population size of a species requires observations of 60 or more individuals. Rare species will require several years to accumulate enough observations to accurately estimate population sizes and a number of years more before changes in the population can be detected. Common species will also have the most influence on future analysis of bird community trends. For instance, changes in western meadowlark, grasshopper sparrow, lark sparrow and red-winged blackbirds numbers influence the bird community composition more than less commonly encountered species in the upland habitat at Agate Fossil Beds National Monument. Red-winged blackbird, western meadowlark, common yellowthroat, killdeer and common snipe influence the bird community composition more on riparian plots. At Tallgrass Prairie National Preserve, changes in grasshopper sparrows, dickcissel, western meadowlark and brown-headed cowbird numbers have more influence on the bird community composition in upland areas than less common species. Eastern wood-pewee, great crested flycatcher, black-capped chickadee, northern cardinal, red-bellied woodpecker, (eastern) tufted titmouse and yellow-billed cuckoo have the most influence on the bird community on riparian plots.

Higher average bird diversity, species richness and distribution evenness per plot in the riparian area at Tallgrass Prairie National Preserve may relate to higher vertical structure diversity when compared to the other habitats at Tallgrass Prairie National Preserve and Agate Fossil Beds National Monument. Greater structural diversity provides greater nesting opportunities for a wider range of bird species. Seventeen percent (14 species) of the 82 bird species recorded at Tallgrass Prairie National Preserve were found only on riparian plots. Only

thirty-five percent (8 species; cattle egret, eastern kingbird, field sparrow, greater prairie-chicken, grasshopper sparrow, horned lark, northern harrier hawk and western kingbird) of the 23 species recorded on upland plots can be considered prairie obligates, most of the remaining 15 species could easily be recorded on riparian plots in future surveys. Forty-five species of birds were recorded on both prairie and riparian areas at Tallgrass Prairie National Preserve.

Higher accumulations of litter on plots at Agate Fossil Beds National Monuments than upland plots at Tallgrass Prairie National Preserve may give some indication of how litter accumulation on upland plots at Tallgrass Prairie National Preserve may progress if prescribed fires occur less frequently. With net annual production, thus accumulation of dead materials significantly greater in eastern tallgrass prairies than western shortgrass prairies, the greater potential for litter accumulation on upland plots at Tallgrass Prairie National Preserve exists. Short and mixed-grass prairies such as that at Agate Fossil Beds National Monument develop a more heterogeneous and sparser canopy layer than tallgrass prairie (Lane 1995, Vinton and Collins 1997). With reduced fire and grazing, upland plots at Tallgrass Prairie National Preserve will develop a more homogeneous canopy of taller grasses when compared to the mixed-grass prairie of Agate Fossil Beds National Monument. With prolonged absence of fire and grazing, upland plots may eventually be invaded by woody plants if precipitation permits. If fire and/or grazing is introduced into the management regime at Agate Fossil Beds National Monument then litter accumulation may decrease. However, the sparser nature of mixed-grass prairie may be limiting litter accumulation already. Therefore the effects of fire and grazing may be less discernable than in a tallgrass prairie.

The use of annual prescribed fire on upland plots at Tallgrass Prairie National Preserve may be seen in the high percent of warm-season grasses compared to cool-season grasses. Fire in tallgrass prairie is used to promote warm-season grasses for cattle grazing. Cool-season grasses dominated riparian plots at Tallgrass Prairie National Preserve and all plots at Agate Fossil Beds National Monument during late spring.

Responses of bird communities to changes in habitat structure have received much attention in recent years (Cody 1981, 1985; Zimmerman 1997; Fitzgerald and Pashley 2000; Tappe et al. 2001). While some elements of habitat-bird community relationships are clearly understood for prairie systems, such as the response following removal of woody plants, others are not. Although habitats and management practices within each park have remained relatively unchanged for many years, future management action may alter habitats available to birds. In particular, if Tallgrass Prairie National Preserve lengthens their burning cycle from annual to three or more years, reduces cattle stocking rates and introduces other year round grazers, significant effects on habitats can be expected. The introduction of burning and large grazers into the management regime at Agate Fossil Beds National Monument will also influence available bird habitat. Within each park, proposed changes in management strategies will move the parks toward more heterogeneous landscapes, thus making them more appealing to a wider range of bird species. Numbers of individuals of certain species may drop but the overall species richness can be expected to increase. Our sampling design will effectively capture changes in bird community compositions related to variations in available habitat.

5.0 PLANS FOR 2004

- a) Using power analysis, determine the required intensity and frequency of our bird monitoring effort in order to detect changes within a breeding bird community.

- b) Utilize Distances Software to estimating bird species abundance adjusted for detectability. May not be fully able to develop until after several years (> 5 yr.) of data have been collected.
- c) Examining species-habitat relationships using correlation analysis. May not be fully able to develop until after several years (> 5 yr.) of data have been collected.
- d) Explore other possible approaches for data analysis including, but not limited to; data visualization, geostatistics and time-series analysis. May not be fully able to develop until after several years (> 5 yr.) of data have been collected.

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Table 1. Species recorded at Agate Fossil Beds National Monument, Nebraska (2001 and 2003) and Tallgrass Prairie National Preserve, Kansas (2001 and 2002) during breeding bird surveys by habitat type.

| Common name | Species name | AOU code | AGFO | | TAPR | |
|------------------------|----------------------------------|----------|--------|----------|-----------------|----------|
| | | | Upland | Riparian | Upland | Riparian |
| Acadian flycatcher | <i>Empidonax virescens</i> | ACFL | | | SR ¹ | SR |
| American crow | <i>Corvus brachyrhynchos</i> | AMCR | | | R ² | R |
| American goldfinch | <i>Carduelis tristis</i> | AMGO | | | R | R |
| Bank swallow | <i>Riparia riparia</i> | BANS | SR | SR | SR | |
| Barred owl | <i>Strix varia</i> | BDOW | | | | R |
| Barn swallow | <i>Hirundo rustica</i> | BARS | | SR | SR | |
| Black-billed cuckoo | <i>Coccyzus erythrophthalmus</i> | BBCU | | | | SR |
| Black-capped chickadee | <i>Parus atricapillus</i> | BCCH | | | R | R |
| Belted kingfisher | <i>Ceryle alcyon</i> | BEKI | | | | R |
| Bewick's wren | <i>Thryomanes bewickii</i> | BEWR | | | R | R |
| Blue-grey gnatcatcher | <i>Polioptila caerulea</i> | BGGN | | | SR | SR |
| Brown-headed cowbird | <i>Molothrus ater</i> | BHCO | SR | SR | R | R |
| Blue jay | <i>Cyanocitta cristata</i> | BLJA | | R | R | R |
| Brown thrasher | <i>Toxostoma rufum</i> | BRTH | | | R | R |
| Blue-winged teal | <i>Anas discors</i> | BWTE | | SR | | |
| Cattle egret | <i>Bubulcus ibis</i> | CAEG | | | SR | |
| Canada goose | <i>Branta canadensis</i> | CAGO | | | R | |
| Carolina wren | <i>Thryothorus ludovicianus</i> | CARW | | | | R |
| Chipping sparrow | <i>Spizella passerina</i> | CHSP | SR | SR | | |
| Clay-colored sparrow | <i>Spizella pallida</i> | CCSP | SR | | | |
| Cliff swallow | <i>Hirundo pyrrhonota</i> | CLSW | SR | | SR | SR |
| Common grackle | <i>Quiscalus quiscula</i> | COGR | SR | | R | |
| Common nighthawk | <i>Chordeiles minor</i> | CONI | SR | | SR | SR |
| Common snipe | <i>Gallinago gallinago</i> | COSN | SR | SR | | |
| Common yellowthroat | <i>Geothlypis trichas</i> | COYE | SR | SR | SR | SR |
| Dickcissel | <i>Spiza americana</i> | DICK | SR | | SR | SR |
| Downy woodpecker | <i>Picoides pubescens</i> | DOWO | | | R | R |
| Eastern bluebird | <i>Sialia sialis</i> | EABL | | | R | |
| Eastern kingbird | <i>Tyrannus tyrannus</i> | EAKI | SR | SR | SR | |

Table 1. Species recorded, cont'd.

| Common name | Species name | AOU code | AGFO | | TAPR | |
|-------------------------------|-----------------------------------|----------|--------|----------|--------|----------|
| | | | Upland | Riparian | Upland | Riparian |
| Eastern meadowlark | <i>Sturnella magna</i> | EAME | | | R | |
| Eastern phoebe | <i>Sayornis phoebe</i> | EAPH | | | | SR |
| Eastern wood-pewee | <i>Contopus virens</i> | EAWP | | | SR | SR |
| Field sparrow | <i>Spizella pusilla</i> | FISP | | | R | |
| Great crested flycatcher | <i>Myiarchus crinitus</i> | GCFL | | | SR | SR |
| Great horned owl | <i>Bubo virginianus</i> | GHOW | | | R | |
| Gray catbird | <i>Dumetella carolinensis</i> | GRCA | | | | SR |
| Greater prairie-chicken | <i>Tympanuchus cupido</i> | GRCH | | | R | |
| Grasshopper sparrow | <i>Ammodramus savannarum</i> | GRSP | SR | SR | SR | |
| Great blue heron | <i>Ardea herodias</i> | GBHE | | SR | R | |
| Great-tailed grackle | <i>Quiscalus mexicanus</i> | GTGR | | | SR | |
| Hairy woodpecker | <i>Picoides villosus</i> | HAWO | | | R | |
| Horned lark | <i>Eremophila alpestris</i> | HOLA | | | R | |
| House wren | <i>Troglodytes aedon</i> | HOWR | | SR | | |
| Indigo bunting | <i>Passerina cyanea</i> | INBU | | | SR | SR |
| Killdeer | <i>Charadrius vociferus</i> | KILL | R | R | R | |
| Lark bunting | <i>Calamospiza melanocorys</i> | LARB | SR | SR | | |
| Lark sparrow | <i>Chondestes grammacus</i> | LASP | SR | SR | SR | |
| Loggerhead shrike | <i>Lanius ludovicianus</i> | LOSH | | | R | |
| Mallard | <i>Anas platyrhynchos</i> | MALL | | R | | |
| Marsh wren | <i>Cistothorus palustris</i> | MAWR | | SR | | |
| Mourning dove | <i>Zenaida macroura</i> | MODO | R | R | R | |
| Northern bobwhite | <i>Colinus virginianus</i> | NOBO | | | R | |
| Northern cardinal | <i>Cardinalis cardinalis</i> | NOCA | | | R | R |
| Northern flicker | <i>Colaptes auratus</i> | NOFL | | | R | |
| Northern parula | <i>Parula americana</i> | NOPA | | | | SR |
| Northern rough-winged swallow | <i>Stelgidopteryx serripennis</i> | NRWS | | SR | SR | |
| Orchard oriole | <i>Icterus spurius</i> | OROR | | | SR | SR |
| Prothonotary warbler | <i>Protonotaria citrea</i> | PROW | | | | SR |
| Red-bellied woodpecker | <i>Melanerpes carolinus</i> | RBWO | | | R | R |

Table 1. Species recorded, cont'd.

| Common name | Species name | AOU code | AGFO | | TAPR | |
|---------------------------|--------------------------------------|----------|--------|----------------|--------|----------|
| | | | Upland | Riparian | Upland | Riparian |
| Red-eyed vireo | <i>Vireo olivaceus</i> | REVI | | | | SR |
| Red-headed woodpecker | <i>Melanerpes erythrocephalus</i> | RHWO | | | | R |
| Red-tailed hawk | <i>Buteo jamaicensis</i> | RTHA | R | | R | R |
| Ring-necked pheasant | <i>Phasianus colchicus</i> | RPHE | R | R | R | |
| Red-winged blackbird | <i>Agelaius phoeniceus</i> | RWBL | R | R | R | R |
| Rock wren | <i>Salpinctes obsoletus</i> | ROWR | SR | | | |
| Say's pheobe | <i>Sayornis saya</i> | SAPH | SR | | | |
| Sedge wren | <i>Cistothorus platensis</i> | SEWR | | | SR | |
| Scarlet tanager | <i>Piranga olivacea</i> | SCTA | | | SR | |
| Scissor-tailed flycatcher | <i>Tyrannus forficatus</i> | STFL | | | SR | |
| Sharp-tailed grouse | <i>Tympanuchus phasianellus</i> | STGR | R | | | |
| Sora | <i>Porzana carolina</i> | SORA | SR | | | |
| Summer tanager | <i>Piranga rubra</i> | SUTA | | | SR | SR |
| (Eastern) Tufted titmouse | <i>Parus bicolor</i> | ETTI | | | R | R |
| Turkey vulture | <i>Cathartes aura</i> | TUVU | | | SR | SR |
| Upland sandpiper | <i>Bartramia longicauda</i> | UPSA | SR | | SR | SR |
| Vesper sparrow | <i>Pooecetes gramineus</i> | VESP | SR | | | |
| White-breasted nuthatch | <i>Sitta carolinensis</i> | WBNU | | | R | R |
| Western kingbird | <i>Tyrannus verticalis</i> | WEKI | SR | SR | SR | |
| Western meadowlark | <i>Sturnella neglecta</i> | WEME | R | R | R | R |
| White-eyed vireo | <i>Vireo griseus</i> | WEVI | | | | SR |
| Wild turkey | <i>Meleagris gallopavo</i> | WITU | | | R | R |
| Wood duck | <i>Aix sponsa</i> | WODU | | M ³ | | |
| Yellow-breasted chat | <i>Icteria virens</i> | YBCH | | | SR | |
| Yellow-billed cuckoo | <i>Coccyzus americanus</i> | YBCU | | | SR | SR |
| Yellow-headed blackbird | <i>Xanthocephalus xanthocephalus</i> | YHBL | SR | SR | | |
| Yellow-throated vireo | <i>Vireo flavifrons</i> | YTVI | | | SR | SR |
| Yellow warbler | <i>Dendroica petechia</i> | YWAR | SR | SR | SR | SR |

¹ SR = summer resident.² R = year round resident.³ M = late migrant.

Table 2. Additional bird species observed at Agate Fossil Beds National Monument, Nebraska (2001 and 2003) and Tallgrass Prairie National Preserve, Kansas (2001 and 2002) during the breeding season but outside of variable circular plot counts.

| Common name | Species name | AOU code | AGFO | TAPR |
|------------------------------|--------------------------------|----------|-----------------|----------------|
| American avocet | <i>Recurvirostra Americana</i> | AMAV | SR ¹ | |
| American robin | <i>Turdus migratorius</i> | AMRO | | R ² |
| Baltimore (Northern) oriole | <i>Icterus galbula</i> | BAOR | | SR |
| Belted kingfisher | <i>Ceryle alcyon</i> | BEKI | R | |
| Blue grosbeak | <i>Guiraca caerulea</i> | BLGR | | SR |
| Common snipe | <i>Gallinago gallinago</i> | COSN | | M ³ |
| Gray partridge | <i>Perdix perdix</i> | GRPA | R | |
| Green (Green-backed) heron | <i>Butorides virescens</i> | GRHE | | SR |
| House finch | <i>Carpodacus mexicanus</i> | HOFI | | R |
| Northern harrier hawk | <i>Circus cyaneus</i> | NOHA | SR | R |
| Pileated woodpecker | <i>Dryocopus pileatus</i> | PIWO | | R |
| Spotted (Rufous-side) towhee | <i>Pipilo maculates</i> | SPTO | SR | |
| Swainson's hawk | <i>Buteo swainsoni</i> | SWHA | SR | |
| Turkey vulture | <i>Cathartes aura</i> | TUVU | SR | |
| Whip-poor-will | <i>Caprimulgus vociferus</i> | WPWI | | SR |
| White-crowned sparrow | <i>Zonotrichia leucophrys</i> | WCSP | M | |
| Wood duck | <i>Aix sponsa</i> | WODU | | R |

¹ SR = summer resident.

² R = year round resident.

³ M = late migrant.

Table 3. Species ranked by park, habitat type and frequency of encounter (individuals/plot visit). Species were recorded at Agate Fossil Beds National Monument, Nebraska (2001 and 2003) and Tallgrass Prairie National Preserve, Kansas (2001 and 2002) during breeding bird surveys. Individuals recorded as flyovers were not included in these frequency estimates.

| Agate Fossil Beds National Monument | | | | Tallgrass Prairie National Preserve | | | |
|-------------------------------------|-------|--------------------------|-------|-------------------------------------|-------|---------------------------|-------|
| Upland n = 53 plots | | Riparian n = 28 plots | | Upland n = 400 plots | | Riparian n = 36 plots | |
| Species | Freq. | Species | Freq. | Species | Freq. | Species | Freq. |
| Western meadowlark | 2.000 | Red-winged blackbird | 3.786 | Grasshopper sparrow | 0.925 | Eastern wood-pewee | 0.528 |
| Grasshopper sparrow | 0.868 | Western meadowlark | 0.821 | Dickcissel | 0.733 | Great crested flycatcher | 0.417 |
| Lark sparrow | 0.358 | Common yellowthroat | 0.500 | Western meadowlark | 0.715 | Black-capped chickadee | 0.389 |
| Red-winged blackbird | 0.340 | Killdeer | 0.250 | Brown-headed cowbird | 0.368 | Northern cardinal | 0.361 |
| Lark bunting | 0.245 | Common snipe | 0.250 | Red-winged blackbird | 0.238 | Red-bellied woodpecker | 0.333 |
| Rock wren | 0.132 | Marsh wren | 0.143 | Upland sandpiper | 0.230 | (Eastern) Tufted titmouse | 0.333 |
| Sharp-tailed grouse | 0.113 | Grasshopper sparrow | 0.143 | Eastern meadowlark | 0.110 | Yellow-billed cuckoo | 0.306 |
| Ring-necked pheasant | 0.113 | Chipping sparrow | 0.143 | Lark sparrow | 0.080 | White-breasted nuthatch | 0.250 |
| Mourning dove | 0.094 | Eastern kingbird | 0.143 | Greater prairie-chicken | 0.065 | Wild turkey | 0.194 |
| Brown-headed cowbird | 0.075 | Yellow warbler | 0.107 | Brown thrasher | 0.043 | American crow | 0.194 |
| Chipping sparrow | 0.075 | Blue-winged teal | 0.107 | (Eastern) Tufted titmouse | 0.043 | Bewick's wren | 0.167 |
| Yellow warbler | 0.057 | Lark bunting | 0.107 | Eastern kingbird | 0.038 | Acadian flycatcher | 0.167 |
| Killdeer | 0.038 | Mourning dove | 0.071 | Canada goose | 0.035 | Downy woodpecker | 0.167 |
| Western kingbird | 0.038 | Ring-neck pheasant | 0.036 | Killdeer | 0.035 | Red-eyed vireo | 0.139 |
| Red-tailed hawk | 0.038 | House wren | 0.036 | Blue jay | 0.028 | Common yellowthroat | 0.139 |
| Vesper sparrow | 0.038 | Mallard | 0.036 | Northern cardinal | 0.023 | Dickcissel | 0.139 |
| Clay-colored sparrow | 0.038 | | | Mourning dove | 0.023 | Indigo bunting | 0.139 |
| Common yellowthroat | 0.019 | | | Northern bobwhite | 0.023 | American goldfinch | 0.111 |
| Sora | 0.019 | | | Red-bellied woodpecker | 0.020 | Yellow warbler | 0.111 |
| Say's phoebe | 0.019 | | | American crow | 0.018 | Northern parula | 0.111 |
| Cliff swallow | 0.019 | | | Yellow-breasted chat | 0.018 | Western meadowlark | 0.111 |
| Upland sandpiper | 0.019 | | | Yellow-billed cuckoo | 0.018 | Eastern phoebe | 0.083 |
| Eastern kingbird | 0.019 | | | Common nighthawk | 0.015 | White-eyed vireo | 0.083 |
| Dickcissel | 0.019 | | | Great crested flycatcher | 0.015 | Blue jay | 0.083 |
| Common snipe | 0.019 | | | Summer tanager | 0.010 | Brown-headed cowbird | 0.083 |
| | | | | Horned lark | 0.008 | Carolina wren | 0.083 |
| | | | | Orchard oriole | 0.008 | Orchard oriole | 0.083 |
| | | | | Eastern bluebird | 0.008 | Prothonotary warbler | 0.060 |
| | | | | White-breasted nuthatch | 0.008 | Red-tailed hawk | 0.060 |
| | | | | Black-capped chickadee | 0.008 | Yellow-throated vireo | 0.060 |
| | | | | Yellow warbler | 0.005 | Barred owl | 0.060 |
| | | | | Great blue heron | 0.005 | Black-billed cuckoo | 0.060 |
| | | | | Acadian flycatcher | 0.005 | Red-winged blackbird | 0.060 |

Table 3. Species ranked, cont'd.

| Agate Fossil Beds National Monument | | | | Tallgrass Prairie National Preserve | | | |
|-------------------------------------|-------|----------|-------|-------------------------------------|-------|-----------------------|-------|
| Upland | | Riparian | | Upland | | Riparian | |
| Species | Freq. | Species | Freq. | Species | Freq. | Species | Freq. |
| | | | | Downy woodpecker | 0.005 | Gray catbird | 0.028 |
| | | | | Eastern wood-pewee | 0.005 | Red-headed woodpecker | 0.028 |
| | | | | American goldfinch | 0.005 | Summer tanager | 0.028 |
| | | | | Common yellowthroat | 0.003 | Brown thrasher | 0.028 |
| | | | | Blue-gray gnatcatcher | 0.003 | Blue-gray gnatcatcher | 0.028 |
| | | | | Bewick's wren | 0.003 | | |
| | | | | Western kingbird | 0.003 | | |
| | | | | Yellow-throated vireo | 0.003 | | |
| | | | | Wild turkey | 0.003 | | |
| | | | | Ring-necked pheasant | 0.003 | | |
| | | | | Great horned owl | 0.003 | | |
| | | | | Field sparrow | 0.003 | | |
| | | | | Indigo bunting | 0.003 | | |
| | | | | Loggerhead shrike | 0.003 | | |
| | | | | Northern flicker | 0.003 | | |
| | | | | Scarlet tanager | 0.003 | | |
| | | | | Scissor-tailed flycatcher | 0.003 | | |
| | | | | Sedge wren | 0.003 | | |
| | | | | Hairy woodpecker | 0.003 | | |

Table 4. Plots “n” (plots surveyed) and mean (\pm SE) bird diversity, richness and evenness by habitat type at Agate Fossil Beds National Monument, Nebraska (2001 and 2003) and Tallgrass Prairie National Preserve, Kansas (2001 and 2002) during the bird breeding season. Plots were dropped from the analysis if no individuals or only flyovers were recorded for that plot.

| | n | Diversity | Richness | Evenness |
|----------|-----------|------------------|-----------------|-------------------|
| AGFO | 80 (81) | 0.83 \pm 0.051 | 2.85 \pm 0.15 | 0.767 \pm 0.036 |
| Upland | 52 (53) | 0.83 \pm 0.064 | 2.79 \pm 0.19 | 0.794 \pm 0.049 |
| Riparian | 28 (28) | 0.83 \pm 0.089 | 2.96 \pm 0.25 | 0.716 \pm 0.061 |
| TAPR | 416 (436) | 0.85 \pm 0.025 | 2.85 \pm 0.07 | 0.788 \pm 0.017 |
| Upland | 381 (400) | 0.82 \pm 0.025 | 2.74 \pm 0.07 | 0.778 \pm 0.018 |
| Riparian | 35 (36) | 1.19 \pm 0.095 | 4.06 \pm 0.37 | 0.899 \pm 0.039 |

Table 5. Abiotic features of plots sampled for breeding birds at Agate Fossil Beds National Monument, Nebraska and Tallgrass Prairie National Preserve, Kansas.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|--------------|-----------|-------------------|------------|--------------------|----------------------|--------------|
| AGFOTweety1 | 2 | medium | 165 | medium | mid-slope | upland |
| AGFOTweety2 | 15 | high | 45 | high | mid-slope | upland |
| AGFOTweety3 | 15 | high | 240 | high | upper-slope | upland |
| AGFOTweety4 | 5 | medium | 355 | high | mid-slope | upland |
| AGFOTweety5 | 5 | medium | 215 | high | mid-slope | upland |
| AGFOTweety6 | 4 | low | 217 | high | mid-slope | upland |
| AGFOTweety7 | 2 | low | 333 | low | lower-slope | upland |
| AGFOTweety8 | 1 | low | 313 | low | lower-slope | upland |
| AGFOTweety9 | 13 | medium | 348 | high | mid-slope | upland |
| AGFOTweety10 | 1 | low | 335 | medium | lower-slope | upland |
| AGFOTweety11 | 2 | medium | 300 | high | mid-slope | upland |
| AGFOTweety12 | 4 | medium | 327 | medium | mid-slope | upland |
| AGFOTweety13 | 6 | low | 31 | low | mid-slope | upland |
| AGFOTweety14 | 4 | medium | 310 | high | mid-slope | upland |
| AGFOTweety15 | 2 | medium | 310 | high | mid-slope | upland |
| AGFOTweety16 | 1 | low | 355 | medium | mid-slope | upland |
| AGFOTweety17 | 1 | low | 335 | medium | lower-slope | riparian |
| AGFOTweety18 | 3 | medium | 0 | low | level | riparian |
| AGFOTweety19 | 2 | low | 317 | low | level | riparian |
| AGFOTweety20 | 0 | low | 135 | low | level | riparian |
| AGFOTweety21 | 0 | low | 85 | low | level | riparian |
| AGFOTweety22 | 1 | low | 155 | low | level | riparian |
| AGFOTweety23 | 2 | medium | 300 | high | mid-slope | riparian |
| AGFOTweety24 | 0 | low | 97 | low | level | riparian |
| AGFOTweety25 | 0 | medium | 104 | medium | level | riparian |
| AGFOTweety26 | 2 | low | 289 | low | level | riparian |
| AGFOTweety27 | 0 | low | 105 | low | level | riparian |
| AGFOTweety28 | 0 | low | 120 | low | level | riparian |
| AGFOTweety29 | 1 | low | 10 | low | level | riparian |
| AGFOTweety30 | 1 | low | 32 | low | level | riparian |
| AGFOTweety31 | 2 | low | 130 | medium | lower-slope | upland |
| AGFOTweety32 | 5 | medium | 85 | high | mid-slope | upland |
| AGFOTweety33 | 5 | medium | 125 | medium | mid-slope | upland |
| AGFOTweety34 | 1 | low | 90 | low | lower-slope | upland |
| AGFOTweety35 | 4 | medium | 198 | medium | mid-slope | upland |
| AGFOTweety36 | 2 | medium | 97 | medium | lower-slope | upland |
| AGFOTweety37 | 3 | low | 171 | medium | mid-slope | upland |
| AGFOTweety38 | 4 | low | 122 | low | lower-slope | upland |
| AGFOTweety39 | 1 | low | 155 | low | lower-slope | upland |
| AGFOTweety40 | 6 | low | 153 | medium | lower-slope | upland |
| AGFOTweety41 | 5 | low | 122 | medium | lower-slope | upland |
| AGFOTweety42 | 8 | medium | 150 | medium | mid-slope | upland |
| AGFOTweety43 | 3 | low | 168 | low | lower-slope | upland |
| AGFOTweety44 | 3 | low | 151 | low | lower-slope | upland |
| AGFOTweety45 | 23 | low | 148 | low | level | upland |
| AGFOTweety46 | 0 | low | 120 | low | level | upland |
| AGFOTweety47 | 6 | medium | 341 | medium | lower-slope | upland |
| AGFOTweety48 | 1 | low | 150 | low | lower-slope | upland |
| AGFOTweety49 | 1 | low | 165 | low | level | upland |
| AGFOTweety50 | 6 | medium | 19 | high | mid-slope | upland |
| AGFOTweety51 | 1 | low | 130 | low | level | upland |

Table 5. Abiotic features, cont'd.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|--------------|-----------|-------------------|------------|--------------------|----------------------|--------------|
| AGFOTweety52 | 0 | high | 20 | high | crest | upland |
| AGFOTweety53 | 13 | high | 320 | high | lower-slope | upland |
| AGFOTweety54 | 7 | high | 233 | high | mid-slope | upland |
| TAPRTweety1 | 2 | medium | 226 | medium | upper-slope | upland |
| TAPRTweety2 | 8 | medium | 318 | medium | lower-slope | upland |
| TAPRTweety3 | 4 | medium | 33 | low | upper-slope | upland |
| TAPRTweety4 | 9 | low | 105 | low | upper-slope | upland |
| TAPRTweety5 | 6 | high | 100 | high | draw | upland |
| TAPRTweety6 | 6 | medium | 351 | low | upper-slope | upland |
| TAPRTweety7 | 3 | medium | 96 | medium | mid-slope | upland |
| TAPRTweety8 | 4 | low | 279 | low | upper-slope | upland |
| TAPRTweety9 | 4 | low | 95 | low | upper-slope | upland |
| TAPRTweety10 | 3 | low | 245 | low | upper-slope | upland |
| TAPRTweety11 | 5 | low | 150 | low | upper-slope | upland |
| TAPRTweety12 | 4 | -- | 50 | -- | crest | upland |
| TAPRTweety13 | 1 | low | 354 | low | upper-slope | upland |
| TAPRTweety14 | 8 | low | 343 | low | mid-slope | upland |
| TAPRTweety15 | 5 | high | 42 | high | mid-slope | upland |
| TAPRTweety16 | 7 | medium | 171 | medium | upper-slope | upland |
| TAPRTweety17 | 0 | low | 251 | medium | upper-slope | upland |
| TAPRTweety18 | 9 | high | 8 | high | upper-slope | upland |
| TAPRTweety19 | 6 | medium | 360 | low | -- | upland |
| TAPRTweety20 | 5 | medium | 322 | high | draw | upland |
| TAPRTweety21 | 1 | low | 98 | low | upper-slope | upland |
| TAPRTweety22 | 2 | low | 90 | low | upper-slope | upland |
| TAPRTweety23 | 2 | high | 127 | high | draw | upland |
| TAPRTweety24 | 11 | low | 334 | low | upper-slope | upland |
| TAPRTweety25 | 6 | high | 178 | high | draw | upland |
| TAPRTweety26 | 3 | medium | 135 | high | draw | upland |
| TAPRTweety27 | 8 | low | 213 | low | upper-slope | upland |
| TAPRTweety28 | 5 | low | 69 | low | upper-slope | upland |
| TAPRTweety29 | 2 | high | 93 | high | draw | upland |
| TAPRTweety30 | 5 | low | 136 | low | upper-slope | upland |
| TAPRTweety31 | 4 | medium | 236 | medium | upper-slope | upland |
| TAPRTweety32 | 4 | low | 183 | low | upper-slope | upland |
| TAPRTweety33 | 8 | low | 50 | medium | upper-slope | upland |
| TAPRTweety34 | 2 | low | 200 | low | upper-slope | upland |
| TAPRTweety35 | 3 | low | 227 | low | draw | upland |
| TAPRTweety36 | 0 | high | 295 | high | crest | upland |
| TAPRTweety37 | 4 | high | 22 | high | draw | upland |
| TAPRTweety38 | 8 | medium | 322 | medium | upper-slope | upland |
| TAPRTweety39 | 3 | low | 156 | low | mid-slope | upland |
| TAPRTweety40 | 4 | high | 19 | high | draw | upland |
| TAPRTweety41 | 3 | low | 6 | medium | draw | upland |
| TAPRTweety42 | 7 | medium | 52 | low | upper-slope | upland |
| TAPRTweety43 | 6 | low | 25 | medium | upper-slope | upland |
| TAPRTweety44 | 6 | medium | 167 | low | upper-slope | upland |
| TAPRTweety45 | 4 | medium | 144 | high | draw | upland |
| TAPRTweety46 | 2 | low | 182 | low | upper-slope | upland |
| TAPRTweety47 | 4 | medium | 37 | high | draw | upland |
| TAPRTweety48 | 5 | high | 200 | high | draw | upland |
| TAPRTweety49 | 2 | high | 333 | high | draw | upland |
| TAPRTweety50 | 4 | low | 123 | low | upper-slope | upland |

Table 5. Abiotic features, cont'd.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|---------------|-----------|-------------------|------------|--------------------|----------------------|--------------|
| TAPRTweety51 | 8 | high | 141 | low | upper-slope | upland |
| TAPRTweety52 | 8 | medium | 25 | medium | upper-slope | upland |
| TAPRTweety53 | 2 | low | 67 | low | crest | upland |
| TAPRTweety54 | 2 | medium | 200 | medium | draw | upland |
| TAPRTweety55 | 2 | low | 22 | low | upper-slope | upland |
| TAPRTweety56 | 3 | low | 125 | low | mid-slope | upland |
| TAPRTweety57 | 2 | low | 154 | medium | upper-slope | upland |
| TAPRTweety58 | 12 | low | 35 | low | upper-slope | upland |
| TAPRTweety59 | 6 | medium | 190 | high | -- | upland |
| TAPRTweety60 | 1 | low | 193 | low | -- | upland |
| TAPRTweety61 | 2 | low | 243 | low | upper-slope | upland |
| TAPRTweety62 | 3 | low | 56 | low | mid-slope | upland |
| TAPRTweety63 | 8 | low | 71 | low | upper-slope | upland |
| TAPRTweety64 | 3 | high | 209 | high | draw | upland |
| TAPRTweety65 | 2 | low | 60 | low | upper-slope | upland |
| TAPRTweety66 | 9 | medium | 128 | medium | upper-slope | upland |
| TAPRTweety67 | 2 | low | 150 | low | crest | upland |
| TAPRTweety68 | 1 | low | 192 | low | crest | upland |
| TAPRTweety69 | 5 | low | 129 | low | mid-slope | upland |
| TAPRTweety70 | 3 | medium | 101 | high | mid-slope | upland |
| TAPRTweety71 | 2 | low | 253 | low | mid-slope | upland |
| TAPRTweety72 | 7 | high | 49 | low | mid-slope | upland |
| TAPRTweety73 | 10 | high | 260 | high | mid-slope | upland |
| TAPRTweety74 | 12 | medium | 100 | low | upper-slope | upland |
| TAPRTweety75 | 2 | low | 195 | low | mid-slope | upland |
| TAPRTweety76 | 4 | low | 29 | low | mid-slope | upland |
| TAPRTweety77 | 4 | low | 295 | low | mid-slope | upland |
| TAPRTweety78 | 11 | high | 329 | high | upper-slope | upland |
| TAPRTweety79 | 7 | high | 63 | high | mid-slope | upland |
| TAPRTweety80 | 4 | low | 215 | low | mid-slope | upland |
| TAPRTweety81 | 2 | low | 31 | low | crest | upland |
| TAPRTweety82 | 5 | low | 255 | medium | upper-slope | upland |
| TAPRTweety83 | 1 | low | 57 | low | crest | upland |
| TAPRTweety84 | 9 | high | 230 | high | mid-slope | upland |
| TAPRTweety85 | 1 | low | 73 | low | lower-slope | upland |
| TAPRTweety86 | 4 | medium | 175 | medium | mid-slope | upland |
| TAPRTweety87 | 3 | low | 52 | low | upper-slope | upland |
| TAPRTweety88 | 7 | high | 190 | medium | lower-slope | upland |
| TAPRTweety89 | 2 | high | 204 | high | -- | upland |
| TAPRTweety90 | 3 | medium | 159 | high | upper-slope | upland |
| TAPRTweety91 | 2 | high | 122 | medium | crest | upland |
| TAPRTweety92 | 1 | low | 326 | medium | upper-slope | upland |
| TAPRTweety93 | 2 | medium | 155 | low | upper-slope | upland |
| TAPRTweety94 | 8 | high | 218 | high | mid-slope | upland |
| TAPRTweety95 | 3 | medium | 138 | medium | upper-slope | upland |
| TAPRTweety96 | 4 | high | 43 | high | mid-slope | upland |
| TAPRTweety97 | 2 | high | 169 | high | mid-slope | upland |
| TAPRTweety98 | 2 | low | 35 | medium | upper-slope | upland |
| TAPRTweety99 | 0 | high | 211 | high | crest | upland |
| TAPRTweety100 | 2 | high | 107 | high | lower-slope | upland |
| TAPRTweety101 | 1 | low | 126 | low | upper-slope | upland |
| TAPRTweety102 | 1 | low | 57 | low | lower-slope | upland |
| TAPRTweety103 | 1 | low | 61 | low | crest | upland |

Table 5. Abiotic features, cont'd.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|---------------|-----------|-------------------|------------|--------------------|----------------------|--------------|
| TAPRTweety104 | 5 | medium | 257 | high | mid-slope | upland |
| TAPRTweety105 | 11 | high | 195 | medium | upper-slope | upland |
| TAPRTweety106 | 3 | low | 216 | low | mid-slope | upland |
| TAPRTweety107 | 3 | medium | 35 | medium | upper-slope | upland |
| TAPRTweety108 | 4 | high | 164 | high | draw | upland |
| TAPRTweety109 | 4 | high | 122 | high | mid-slope | upland |
| TAPRTweety110 | 3 | low | 59 | low | lower-slope | upland |
| TAPRTweety111 | 10 | high | 285 | high | upper-slope | upland |
| TAPRTweety112 | 8 | high | 220 | high | draw | upland |
| TAPRTweety113 | 3 | low | 41 | low | upper-slope | upland |
| TAPRTweety114 | 0 | low | 0 | low | level | upland |
| TAPRTweety115 | 2 | high | 104 | high | mid-slope | upland |
| TAPRTweety116 | 5 | medium | 114 | low | draw | upland |
| TAPRTweety117 | 4 | low | 227 | low | -- | upland |
| TAPRTweety118 | 5 | low | 115 | low | upper-slope | upland |
| TAPRTweety119 | 1 | low | 25 | low | crest | upland |
| TAPRTweety120 | 2 | low | 60 | low | upper-slope | upland |
| TAPRTweety121 | 3 | low | 22 | low | mid-slope | upland |
| TAPRTweety122 | 2 | low | 69 | low | crest | upland |
| TAPRTweety123 | 8 | medium | 320 | medium | -- | upland |
| TAPRTweety124 | 8 | low | 1 | low | mid-slope | upland |
| TAPRTweety125 | 13 | high | 259 | high | upper-slope | upland |
| TAPRTweety126 | 3 | high | 241 | high | draw | upland |
| TAPRTweety127 | 5 | low | 101 | low | upper-slope | upland |
| TAPRTweety128 | 2 | low | 130 | low | lower-slope | upland |
| TAPRTweety129 | 6 | high | 40 | low | upper-slope | upland |
| TAPRTweety130 | 0 | medium | 225 | high | draw | upland |
| TAPRTweety131 | 1 | low | 135 | high | -- | upland |
| TAPRTweety132 | 7 | low | 205 | low | -- | upland |
| TAPRTweety133 | 2 | low | 201 | low | crest | upland |
| TAPRTweety134 | 4 | low | 326 | low | upper-slope | upland |
| TAPRTweety135 | 4 | medium | 124 | low | mid-slope | upland |
| TAPRTweety136 | 5 | high | 275 | high | upper-slope | upland |
| TAPRTweety137 | 7 | low | 140 | medium | mid-slope | upland |
| TAPRTweety138 | 9 | high | 75 | high | draw | upland |
| TAPRTweety139 | 5 | high | 358 | high | mid-slope | upland |
| TAPRTweety140 | 3 | low | 171 | low | mid-slope | upland |
| TAPRTweety141 | 3 | high | 197 | high | mid-slope | upland |
| TAPRTweety142 | 2 | low | 109 | medium | upper-slope | upland |
| TAPRTweety143 | 3 | low | 355 | low | upper-slope | upland |
| TAPRTweety144 | 4 | low | 125 | low | upper-slope | upland |
| TAPRTweety145 | 7 | medium | 120 | high | upper-slope | upland |
| TAPRTweety146 | 4 | medium | 58 | low | mid-slope | upland |
| TAPRTweety147 | 3 | low | 149 | low | lower-slope | upland |
| TAPRTweety148 | 0 | medium | 94 | medium | crest | upland |
| TAPRTweety149 | 5 | high | 355 | high | draw | upland |
| TAPRTweety150 | 3 | high | 253 | medium | mid-slope | upland |
| TAPRTweety151 | 1 | low | 41 | low | crest | upland |
| TAPRTweety152 | 8 | high | 232 | high | -- | upland |
| TAPRTweety153 | 3 | medium | 133 | high | draw | upland |
| TAPRTweety154 | 5 | medium | 13 | low | -- | upland |
| TAPRTweety155 | 1 | medium | 193 | medium | lower-slope | upland |
| TAPRTweety156 | 1 | low | 316 | low | crest | upland |

Table 5. Abiotic features, cont'd.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|---------------|-----------|-------------------|------------|--------------------|----------------------|--------------|
| TAPRTweety157 | 1 | high | 311 | high | crest | upland |
| TAPRTweety158 | 4 | low | 64 | low | mid-slope | upland |
| TAPRTweety159 | 1 | -- | 131 | -- | -- | riparian |
| TAPRTweety160 | 24 | high | 345 | high | mid-slope | riparian |
| TAPRTweety161 | 2 | medium | 354 | medium | lower-slope | riparian |
| TAPRTweety162 | 2 | low | 18 | low | lower-slope | riparian |
| TAPRTweety163 | 0 | low | 115 | low | level | riparian |
| TAPRTweety164 | 0 | low | 64 | low | level | riparian |
| TAPRTweety165 | 3 | low | 82 | low | level | riparian |
| TAPRTweety166 | 1 | medium | 247 | low | level | riparian |
| TAPRTweety167 | 2 | medium | 127 | low | lower-slope | riparian |
| TAPRTweety168 | 1 | medium | 164 | low | level | riparian |
| TAPRTweety169 | 3 | medium | 84 | low | level | riparian |
| TAPRTweety170 | 2 | medium | 116 | low | level | riparian |
| TAPRTweety171 | 1 | medium | 31 | low | level | riparian |
| TAPRTweety172 | 2 | low | 112 | low | level | riparian |
| TAPRTweety173 | 5 | low | 33 | low | level | riparian |
| TAPRTweety174 | 1 | low | 75 | low | lower-slope | riparian |
| TAPRTweety175 | 10 | low | 70 | low | lower-slope | riparian |
| TAPRTweety176 | 2 | low | 149 | low | lower-slope | riparian |
| TAPRTweety177 | 1 | medium | 205 | medium | crest | upland |
| TAPRTweety178 | 2 | low | 241 | low | upper-slope | upland |
| TAPRTweety179 | 8 | medium | 52 | medium | mid-slope | upland |
| TAPRTweety180 | 1 | low | 212 | low | mid-slope | upland |
| TAPRTweety181 | 9 | low | 192 | low | lower-slope | upland |
| TAPRTweety182 | 2 | low | 155 | low | lower-slope | upland |
| TAPRTweety183 | 4 | medium | 115 | medium | upper-slope | upland |
| TAPRTweety184 | 5 | low | 35 | low | upper-slope | upland |
| TAPRTweety185 | 5 | high | 30 | high | draw | upland |
| TAPRTweety186 | 2 | low | 234 | low | upper-slope | upland |
| TAPRTweety187 | 8 | high | 205 | high | draw | upland |
| TAPRTweety188 | 2 | low | 170 | low | upper-slope | upland |
| TAPRTweety189 | 5 | low | 241 | low | upper-slope | upland |
| TAPRTweety190 | 2 | low | 233 | medium | upper-slope | upland |
| TAPRTweety191 | 4 | medium | 140 | medium | draw | upland |
| TAPRTweety192 | 6 | low | 156 | low | upper-slope | upland |
| TAPRTweety193 | 8 | high | 292 | high | upper-slope | upland |
| TAPRTweety194 | 2 | low | 199 | low | lower-slope | upland |
| TAPRTweety195 | 2 | medium | 349 | medium | lower-slope | upland |
| TAPRTweety196 | 3 | low | 83 | medium | upper-slope | upland |
| TAPRTweety197 | 2 | low | 290 | low | upper-slope | upland |
| TAPRTweety198 | 11 | medium | 250 | low | upper-slope | upland |
| TAPRTweety199 | 2 | low | 62 | low | mid-slope | upland |
| TAPRTweety200 | 7 | high | 355 | high | draw | upland |
| TAPRTweety201 | 2 | high | 282 | medium | crest | upland |
| TAPRTweety202 | 3 | low | 274 | low | mid-slope | upland |
| TAPRTweety203 | 13 | high | 283 | low | upper-slope | upland |
| TAPRTweety204 | 4 | medium | 101 | medium | mid-slope | upland |
| TAPRTweety205 | 2 | high | 185 | high | draw | upland |
| TAPRTweety206 | 2 | low | 105 | low | lower-slope | upland |
| TAPRTweety207 | 4 | low | 225 | medium | mid-slope | upland |
| TAPRTweety208 | 5 | medium | 80 | medium | lower-slope | upland |
| TAPRTweety209 | 5 | medium | 330 | medium | upper-slope | upland |

Table 5. Abiotic features, cont'd.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|---------------|-----------|-------------------|------------|--------------------|----------------------|--------------|
| TAPRTweety210 | 5 | low | 45 | low | mid-slope | upland |
| TAPRTweety211 | 4 | medium | 80 | low | lower-slope | upland |
| TAPRTweety212 | 9 | high | 222 | medium | mid-slope | upland |
| TAPRTweety213 | 3 | low | 245 | low | mid-slope | upland |
| TAPRTweety214 | 7 | low | 132 | low | upper-slope | upland |
| TAPRTweety215 | 7 | high | 240 | high | mid-slope | upland |
| TAPRTweety216 | 4 | high | 178 | high | mid-slope | upland |
| TAPRTweety217 | 4 | low | 69 | low | lower-slope | upland |
| TAPRTweety218 | 3 | high | 295 | high | mid-slope | upland |
| TAPRTweety219 | 1 | low | 218 | low | upper-slope | upland |
| TAPRTweety220 | 6 | medium | 210 | low | lower-slope | upland |
| TAPRTweety221 | 1 | low | 209 | low | mid-slope | upland |
| TAPRTweety222 | 5 | medium | 132 | medium | mid-slope | upland |
| TAPRTweety223 | 2 | low | 169 | low | level | upland |
| TAPRTweety224 | 8 | medium | 55 | low | upper-slope | upland |
| TAPRTweety225 | 1 | low | 55 | low | lower-slope | upland |
| TAPRTweety226 | 2 | high | 40 | high | draw | upland |
| TAPRTweety227 | 5 | medium | 256 | medium | upper-slope | upland |
| TAPRTweety228 | 10 | high | 240 | high | draw | upland |
| TAPRTweety229 | 4 | low | 132 | low | mid-slope | upland |
| TAPRTweety230 | 13 | high | 290 | high | upper-slope | upland |
| TAPRTweety231 | 2 | low | 113 | low | lower-slope | upland |
| TAPRTweety232 | 0 | medium | 55 | medium | lower-slope | upland |
| TAPRTweety233 | 7 | high | 298 | high | draw | upland |
| TAPRTweety234 | 1 | low | 43 | low | crest | upland |
| TAPRTweety235 | 5 | high | 115 | medium | mid-slope | upland |
| TAPRTweety236 | 8 | medium | 218 | high | -- | upland |
| TAPRTweety237 | 8 | high | 140 | low | mid-slope | upland |
| TAPRTweety238 | 6 | low | 40 | low | upper-slope | upland |
| TAPRTweety239 | 8 | medium | 106 | medium | upper-slope | upland |
| TAPRTweety240 | 5 | medium | 136 | medium | mid-slope | upland |
| TAPRTweety241 | 3 | high | 140 | high | draw | upland |
| TAPRTweety242 | 1 | low | 150 | medium | crest | upland |
| TAPRTweety243 | 3 | low | 222 | low | mid-slope | upland |
| TAPRTweety244 | 2 | medium | 144 | medium | upper-slope | upland |
| TAPRTweety245 | 3 | medium | 185 | medium | upper-slope | upland |
| TAPRTweety246 | 1 | medium | 196 | low | lower-slope | upland |
| TAPRTweety247 | 2 | low | 21 | low | lower-slope | upland |
| TAPRTweety248 | 4 | medium | 202 | medium | draw | upland |
| TAPRTweety249 | 3 | low | 180 | low | mid-slope | upland |
| TAPRTweety250 | 3 | high | 135 | high | lower-slope | upland |
| TAPRTweety251 | 12 | medium | 358 | medium | upper-slope | upland |
| TAPRTweety252 | 4 | medium | 301 | medium | draw | upland |
| TAPRTweety253 | 6 | medium | 221 | low | mid-slope | upland |
| TAPRTweety254 | 0 | low | 248 | low | level | upland |
| TAPRTweety255 | 12 | high | 238 | high | mid-slope | upland |
| TAPRTweety256 | 5 | low | 142 | low | upper-slope | upland |
| TAPRTweety257 | 1 | low | 136 | low | lower-slope | upland |
| TAPRTweety258 | 7 | high | 116 | high | upper-slope | upland |
| TAPRTweety259 | 4 | high | 193 | medium | lower-slope | upland |
| TAPRTweety260 | 4 | medium | 231 | low | mid-slope | upland |

-- Indicates missing data.

Table 6. Location and abiotic features of subplots sampled for breeding bird habitat at Agate Fossil Beds National Monument, Nebraska and Tallgrass Prairie National Preserve, Kansas.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| AGFOTweety1 | 1 | C | 1 | 165 | |
| AGFOTweety1 | 2 | 340 | 3 | 160 | |
| AGFOTweety1 | 3 | 220 | 12 | 92 | |
| AGFOTweety1 | 4 | 100 | 9 | 170 | |
| AGFOTweety2 | 1 | C | 18 | 47 | |
| AGFOTweety2 | 2 | 340 | 5 | 24 | |
| AGFOTweety2 | 3 | 100 | 10 | 71 | |
| AGFOTweety2 | 4 | 220 | 26 | 194 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety3 | 1 | C | 10 | 217 | |
| AGFOTweety3 | 2 | 290 | 7 | 263 | |
| AGFOTweety3 | 3 | 170 | 21 | 25 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety3 | 4 | 50 | 25 | 130 | |
| AGFOTweety4 | 1 | C | 9 | 31 | |
| AGFOTweety4 | 2 | 300 | 6 | 338 | |
| AGFOTweety4 | 3 | 180 | 17.5 | 102 | |
| AGFOTweety4 | 4 | 60 | 1.5 | 267 | |
| AGFOTweety5 | 1 | C | 5 | 76 | |
| AGFOTweety5 | 2 | 58 | 10 | 54 | |
| AGFOTweety5 | 3 | 178 | 16 | 28 | |
| AGFOTweety5 | 4 | 298 | 6 | 244 | |
| AGFOTweety6 | 1 | C | 5 | 216 | |
| AGFOTweety6 | 2 | 123 | 8 | 242 | |
| AGFOTweety6 | 3 | 243 | 3 | 211 | |
| AGFOTweety6 | 4 | 3 | 7 | 177 | Subplot partially on pasture road. |
| AGFOTweety7 | 1 | C | 4 | 6 | |
| AGFOTweety7 | 2 | 330 | 3 | 316 | |
| AGFOTweety7 | 3 | 210 | 3 | 328 | |
| AGFOTweety7 | 4 | 90 | 3 | 9 | |
| AGFOTweety8 | 1 | C | 2 | 316 | |
| AGFOTweety8 | 2 | 86 | 3 | 210 | |
| AGFOTweety8 | 3 | 326 | 3 | 203 | |
| AGFOTweety8 | 4 | 206 | 2 | 8 | |
| AGFOTweety9 | 1 | C | 9 | 26 | |
| AGFOTweety9 | 2 | 162 | 7 | 37 | |
| AGFOTweety9 | 3 | 282 | 10 | 0 | |
| AGFOTweety9 | 4 | 42 | 6 | 274 | |
| AGFOTweety10 | 1 | C | 8 | 116 | |
| AGFOTweety10 | 2 | 268 | 3 | 194 | |
| AGFOTweety10 | 3 | 148 | 4.5 | 7 | |
| AGFOTweety10 | 4 | 28 | 14 | 247 | |
| AGFOTweety11 | 1 | C | 6 | 237 | |
| AGFOTweety11 | 2 | 310 | 6 | 274 | |
| AGFOTweety11 | 3 | 70 | 10 | 238 | |
| AGFOTweety11 | 4 | 190 | 8 | 39 | |
| AGFOTweety12 | 1 | C | 6 | 213 | |
| AGFOTweety12 | 2 | 69 | 5 | 179 | |
| AGFOTweety12 | 3 | 189 | 3 | 308 | |
| AGFOTweety12 | 4 | 309 | 6 | 156 | |
| AGFOTweety13 | 1 | C | 6 | 77 | |
| AGFOTweety13 | 2 | 306 | 8 | 85 | |
| AGFOTweety13 | 3 | 66 | 2 | 18 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| AGFOTweety13 | 4 | 186 | 10 | 53 | |
| AGFOTweety14 | 1 | C | 5 | 324 | |
| AGFOTweety14 | 2 | 172 | 9.5 | 22 | |
| AGFOTweety14 | 3 | 52 | 9 | 262 | |
| AGFOTweety14 | 4 | 292 | 4 | 344 | |
| AGFOTweety15 | 1 | C | 6 | 20 | Subplot in gravel wash. |
| AGFOTweety15 | 2 | 210 | 5 | 220 | |
| AGFOTweety15 | 3 | 330 | 1 | 320 | |
| AGFOTweety15 | 4 | 90 | 0 | 345 | |
| AGFOTweety16 | 1 | C | 1 | 355 | |
| AGFOTweety16 | 2 | 270 | 1 | 305 | |
| AGFOTweety16 | 3 | 30 | 2 | 350 | |
| AGFOTweety16 | 4 | 150 | 1 | 325 | |
| AGFOTweety17 | 1 | C | 14 | 297 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety17 | 2 | 173 | 6 | 254 | |
| AGFOTweety17 | 3 | 53 | 4.5 | 9 | |
| AGFOTweety17 | 4 | 293 | 0 | 210 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety18 | 1 | C | 12 | 327 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety18 | 2 | 256 | 2.5 | 331 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety18 | 3 | 136 | 7 | 26 | |
| AGFOTweety18 | 4 | 16 | -- | -- | Subplot in Niobrara River, not sampled. |
| AGFOTweety19 | 1 | C | 29 | 272 | |
| AGFOTweety19 | 2 | 122 | 2 | 291 | |
| AGFOTweety19 | 3 | 242 | 0 | 358 | |
| AGFOTweety19 | 4 | 2 | 1 | 333 | |
| AGFOTweety20 | 1 | C | 1.5 | 147 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety20 | 2 | 325 | 0 | 143 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety20 | 3 | 205 | 1 | 96 | |
| AGFOTweety20 | 4 | 85 | 0.5 | 173 | |
| AGFOTweety21 | 1 | C | 1 | 34 | |
| AGFOTweety21 | 2 | 131 | 4 | 23 | Subplot partially in water. |
| AGFOTweety21 | 3 | 251 | 3 | 12 | |
| AGFOTweety21 | 4 | 11 | 0 | 184 | |
| AGFOTweety22 | 1 | C | 2 | 246 | Subplot partially in water. |
| AGFOTweety22 | 2 | 308 | -- | -- | Subplot in Niobrara River, not sampled. |
| AGFOTweety22 | 3 | 188 | 1 | 124 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety22 | 4 | 68 | 1 | 168 | |
| AGFOTweety23 | 1 | C | 3 | 326 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety23 | 2 | 162 | 0 | 356 | |
| AGFOTweety23 | 3 | 42 | 0.5 | 315 | |
| AGFOTweety23 | 4 | 282 | 1 | 180 | Subplot partially in water. |
| AGFOTweety24 | 1 | C | 0.5 | 66 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety24 | 2 | 167 | 9.5 | 188 | |
| AGFOTweety24 | 3 | 287 | 1 | 12 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety24 | 4 | 47 | 0.5 | 180 | |
| AGFOTweety25 | 1 | C | 1 | 83 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety25 | 2 | 173 | 2 | 312 | |
| AGFOTweety25 | 3 | 53 | 2.5 | 155 | |
| AGFOTweety25 | 4 | 293 | 3 | 142 | |
| AGFOTweety26 | 1 | C | 2 | 273 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety26 | 2 | 93 | 1.5 | 279 | |
| AGFOTweety26 | 3 | 213 | 1 | 8 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| AGFOTweety26 | 4 | 333 | 6 | 281 | Subplot partially in water. Horizontal vegetation profile read from south (180°). |
| AGFOTweety27 | 1 | C | 1.5 | 35 | |
| AGFOTweety27 | 2 | 290 | -- | -- | Subplot in Niobrara River, not sampled. |
| AGFOTweety27 | 3 | 170 | 0.5 | 154 | Subplot partially in water. |
| AGFOTweety27 | 4 | 50 | 1 | 166 | |
| AGFOTweety28 | 1 | C | 1 | 175 | Subplot partially in water. Horizontal vegetation profile read from south (180°). |
| AGFOTweety28 | 2 | 37 | 4 | 200 | |
| AGFOTweety28 | 3 | 157 | -- | -- | Subplot in Niobrara River, not sampled. |
| AGFOTweety28 | 4 | 277 | 0 | 22 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety29 | 1 | C | 0.5 | 17 | Subplot partially in water. Horizontal vegetation profile read from south (180°). |
| AGFOTweety29 | 2 | 159 | 6 | 21 | |
| AGFOTweety29 | 3 | 39 | 2 | 27 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety29 | 4 | 279 | 4 | 126 | |
| AGFOTweety30 | 1 | C | 0.5 | 14 | |
| AGFOTweety30 | 2 | 202 | 1 | 288 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety30 | 3 | 82 | 2.5 | 96 | |
| AGFOTweety30 | 4 | 322 | 13 | 248 | |
| AGFOTweety31 | 1 | C | 3 | 100 | |
| AGFOTweety31 | 2 | 140 | 1 | 290 | |
| AGFOTweety31 | 3 | 260 | 14 | 109 | Subplot north of highway. |
| AGFOTweety31 | 4 | 20 | 1 | 115 | Subplot north of highway. |
| AGFOTweety32 | 1 | C | 6 | 74 | |
| AGFOTweety32 | 2 | 90 | 4 | 40 | |
| AGFOTweety32 | 3 | 210 | 20 | 5 | |
| AGFOTweety32 | 4 | 330 | 3 | 110 | |
| AGFOTweety33 | 1 | C | 6 | 118 | |
| AGFOTweety33 | 2 | 54 | 2 | 295 | |
| AGFOTweety33 | 3 | 174 | 1 | 210 | |
| AGFOTweety33 | 4 | 294 | 9 | 310 | |
| AGFOTweety34 | 1 | C | 0 | 150 | |
| AGFOTweety34 | 2 | 330 | 0 | 110 | Subplot north of highway. |
| AGFOTweety34 | 3 | 90 | 1 | 240 | Subplot north of highway. |
| AGFOTweety34 | 4 | 210 | 1 | 240 | |
| AGFOTweety35 | 1 | C | 3 | 195 | |
| AGFOTweety35 | 2 | 350 | 4 | 210 | |
| AGFOTweety35 | 3 | 110 | 5 | 195 | |
| AGFOTweety35 | 4 | 230 | 3 | 200 | |
| AGFOTweety36 | 1 | C | 3 | 172 | Subplot on top of underground sewage tanks. |
| AGFOTweety36 | 2 | 215 | 2 | 2 | |
| AGFOTweety36 | 3 | 335 | 2 | 147 | |
| AGFOTweety36 | 4 | 95 | 3 | 191 | |
| AGFOTweety37 | 1 | C | 1 | 165 | |
| AGFOTweety37 | 2 | 160 | 2 | 169 | |
| AGFOTweety37 | 3 | 40 | 4 | 198 | |
| AGFOTweety37 | 4 | 280 | 10 | 185 | |
| AGFOTweety38 | 1 | C | 3 | 107 | |
| AGFOTweety38 | 2 | 305 | 5 | 124 | |
| AGFOTweety38 | 3 | 65 | 11 | 140 | |
| AGFOTweety38 | 4 | 185 | 4 | 145 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety39 | 1 | C | 1 | 150 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| AGFOTweety39 | 2 | 43 | 1 | 178 | |
| AGFOTweety39 | 3 | 163 | 2 | 145 | |
| AGFOTweety39 | 4 | 283 | 1 | 145 | |
| AGFOTweety40 | 1 | C | 6 | 151 | |
| AGFOTweety40 | 2 | 175 | 6 | 157 | |
| AGFOTweety40 | 3 | 295 | 8 | 165 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety40 | 4 | 55 | 2 | 165 | |
| AGFOTweety41 | 1 | C | 1 | 226 | |
| AGFOTweety41 | 2 | 185 | 5 | 147 | |
| AGFOTweety41 | 3 | 305 | 2 | 190 | |
| AGFOTweety41 | 4 | 65 | 0 | 282 | |
| AGFOTweety42 | 1 | C | 10 | 190 | |
| AGFOTweety42 | 2 | 30 | 8 | 130 | |
| AGFOTweety42 | 3 | 150 | 6 | 140 | |
| AGFOTweety42 | 4 | 270 | 4 | 260 | |
| AGFOTweety43 | 1 | C | 2 | 170 | |
| AGFOTweety43 | 2 | 100 | 0 | 140 | |
| AGFOTweety43 | 3 | 220 | 0 | 120 | |
| AGFOTweety43 | 4 | 340 | 11 | 144 | |
| AGFOTweety44 | 1 | C | 2 | 141 | |
| AGFOTweety44 | 2 | 185 | 3 | 170 | |
| AGFOTweety44 | 3 | 305 | 3 | 132 | |
| AGFOTweety44 | 4 | 65 | 2 | 190 | |
| AGFOTweety45 | 1 | C | 9 | 351 | Subplot partially on highway. |
| AGFOTweety45 | 2 | 350 | 1 | 195 | |
| AGFOTweety45 | 3 | 110 | 0 | 137 | |
| AGFOTweety45 | 4 | 230 | 4 | 353 | |
| AGFOTweety46 | 1 | C | 2 | 21 | |
| AGFOTweety46 | 2 | 25 | 1 | 120 | |
| AGFOTweety46 | 3 | 145 | 2 | 122 | |
| AGFOTweety46 | 4 | 265 | 0 | 120 | |
| AGFOTweety47 | 1 | C | 9 | 137 | |
| AGFOTweety47 | 2 | 115 | 16 | 179 | |
| AGFOTweety47 | 3 | 235 | 5 | 284 | |
| AGFOTweety47 | 4 | 355 | 3 | 304 | |
| AGFOTweety48 | 1 | C | 1 | 148 | |
| AGFOTweety48 | 2 | 300 | 3 | 120 | |
| AGFOTweety48 | 3 | 60 | 1 | 192 | |
| AGFOTweety48 | 4 | 180 | 0 | 140 | |
| AGFOTweety49 | 1 | C | 0 | 170 | |
| AGFOTweety49 | 2 | 130 | 1 | 322 | |
| AGFOTweety49 | 3 | 250 | 1 | 111 | |
| AGFOTweety49 | 4 | 10 | 1 | 205 | |
| AGFOTweety50 | 1 | C | 6 | 195 | |
| AGFOTweety50 | 2 | 60 | 4 | 186 | |
| AGFOTweety50 | 3 | 180 | 10 | 230 | |
| AGFOTweety50 | 4 | 300 | 11 | 245 | |
| AGFOTweety51 | 1 | C | 0 | 165 | |
| AGFOTweety51 | 2 | 50 | 0 | 90 | |
| AGFOTweety51 | 3 | 170 | 10 | 35 | Subplot partially in water. Horizontal vegetation profile read from south (180°). |
| AGFOTweety51 | 4 | 290 | 5 | 210 | |
| AGFOTweety52 | 1 | C | 1 | 331 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| AGFOTweety52 | 2 | 156 | 28 | 145 | |
| AGFOTweety52 | 3 | 276 | -- | -- | Subplot on cliff face, not sampled. |
| AGFOTweety52 | 4 | 36 | 0 | 10 | |
| AGFOTweety53 | 1 | C | 8 | 330 | |
| AGFOTweety53 | 2 | 320 | 11 | 190 | |
| AGFOTweety53 | 3 | 80 | 9 | 115 | Horizontal vegetation profile read from south (180°). |
| AGFOTweety53 | 4 | 200 | 1 | 85 | |
| AGFOTweety54 | 1 | C | 8 | 200 | |
| AGFOTweety54 | 2 | 230 | 8 | 270 | |
| AGFOTweety54 | 3 | 350 | 13 | 200 | |
| AGFOTweety54 | 4 | 110 | 20 | 3 | |
| TAPRTweety1 | 1 | C | 1.5 | 189 | |
| TAPRTweety1 | 2 | 14 | 2.5 | 182 | |
| TAPRTweety1 | 3 | 134 | 3 | 122 | |
| TAPRTweety1 | 4 | 254 | 3 | 256 | |
| TAPRTweety2 | 1 | C | 5 | 294 | |
| TAPRTweety2 | 2 | 320 | 2.5 | 15 | Subplot partially in water. |
| TAPRTweety2 | 3 | 200 | 4 | 342 | |
| TAPRTweety2 | 4 | 80 | 15.5 | 251 | |
| TAPRTweety3 | 1 | C | 5 | 54 | |
| TAPRTweety3 | 2 | 144 | 2.5 | 41 | |
| TAPRTweety3 | 3 | 24 | 14 | 67 | |
| TAPRTweety3 | 4 | 264 | 2 | 354 | |
| TAPRTweety4 | 1 | C | 10 | 97 | |
| TAPRTweety4 | 2 | 60 | 6 | 98 | |
| TAPRTweety4 | 3 | 300 | 3.5 | 93 | |
| TAPRTweety4 | 4 | 180 | 9.5 | 98 | |
| TAPRTweety5 | 1 | C | 6.5 | 56 | |
| TAPRTweety5 | 2 | 243 | 3.5 | 84 | |
| TAPRTweety5 | 3 | 3 | 6.5 | 82 | |
| TAPRTweety5 | 4 | 123 | 10 | 300 | |
| TAPRTweety6 | 1 | C | 5 | 316 | |
| TAPRTweety6 | 2 | 223 | 8 | 327 | |
| TAPRTweety6 | 3 | 103 | 8 | 350 | |
| TAPRTweety6 | 4 | 343 | 16 | 331 | |
| TAPRTweety7 | 1 | C | 2.5 | 140 | |
| TAPRTweety7 | 2 | 245 | 3 | 145 | |
| TAPRTweety7 | 3 | 5 | 3 | 77 | |
| TAPRTweety7 | 4 | 125 | 5 | 165 | |
| TAPRTweety8 | 1 | C | 4 | 284 | |
| TAPRTweety8 | 2 | 359 | 4 | 260 | |
| TAPRTweety8 | 3 | 239 | 7 | 260 | |
| TAPRTweety8 | 4 | 119 | 2 | 271 | |
| TAPRTweety9 | 1 | C | 3 | 94 | |
| TAPRTweety9 | 2 | 15 | 3 | 88 | |
| TAPRTweety9 | 3 | 135 | 5 | 71 | |
| TAPRTweety9 | 4 | 255 | 1 | 23 | |
| TAPRTweety10 | 1 | C | 3 | 209 | |
| TAPRTweety10 | 2 | 10 | 2.5 | 303 | |
| TAPRTweety10 | 3 | 130 | 3 | 130 | |
| TAPRTweety10 | 4 | 250 | 3 | 198 | |
| TAPRTweety11 | 1 | C | 6 | 175 | |
| TAPRTweety11 | 2 | 128 | 8 | 151 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| TAPRTweety11 | 3 | 8 | 0.5 | 100 | |
| TAPRTweety11 | 4 | 248 | 5 | 147 | |
| TAPRTweety12 | 1 | C | 0 | 40 | |
| TAPRTweety12 | 2 | 164 | 2 | 140 | |
| TAPRTweety12 | 3 | 44 | 1.5 | 44 | |
| TAPRTweety12 | 4 | 284 | 2 | 277 | |
| TAPRTweety13 | 1 | C | 1 | 351 | |
| TAPRTweety13 | 2 | 18 | 1.5 | 357 | |
| TAPRTweety13 | 3 | 258 | 1.5 | 264 | |
| TAPRTweety13 | 4 | 138 | 0.5 | 354 | |
| TAPRTweety14 | 1 | C | 7 | 325 | |
| TAPRTweety14 | 2 | 66 | 5 | 320 | |
| TAPRTweety14 | 3 | 306 | 5 | 320 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety14 | 4 | 186 | 5 | 325 | |
| TAPRTweety15 | 1 | C | 5 | 52 | |
| TAPRTweety15 | 2 | 223 | 4 | 11 | |
| TAPRTweety15 | 3 | 103 | 2 | 348 | |
| TAPRTweety15 | 4 | 343 | 4 | 38 | |
| TAPRTweety16 | 1 | C | 7.5 | 171 | |
| TAPRTweety16 | 2 | 70 | 8 | 187 | |
| TAPRTweety16 | 3 | 190 | 8 | 30 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety16 | 4 | 310 | 3 | 164 | |
| TAPRTweety17 | 1 | C | 0.5 | 229 | |
| TAPRTweety17 | 2 | 3 | 1 | 32 | |
| TAPRTweety17 | 3 | 243 | 1 | 210 | |
| TAPRTweety17 | 4 | 123 | 1 | 50 | |
| TAPRTweety18 | 1 | C | 10 | 10 | |
| TAPRTweety18 | 2 | 68 | 9 | 324 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety18 | 3 | 308 | 10 | 346 | |
| TAPRTweety18 | 4 | 188 | 9 | 59 | |
| TAPRTweety19 | 1 | C | 9 | 337 | |
| TAPRTweety19 | 2 | 133 | 8 | 120 | |
| TAPRTweety19 | 3 | 253 | 6 | 346 | |
| TAPRTweety19 | 4 | 13 | 11 | 352 | |
| TAPRTweety20 | 1 | C | 6 | 353 | |
| TAPRTweety20 | 2 | 210 | 4 | 341 | |
| TAPRTweety20 | 3 | 90 | 9.5 | 262 | |
| TAPRTweety20 | 4 | 330 | 3 | 272 | |
| TAPRTweety21 | 1 | C | 2 | 109 | |
| TAPRTweety21 | 2 | 40 | 2 | 42 | |
| TAPRTweety21 | 3 | 160 | 0 | 135 | |
| TAPRTweety21 | 4 | 280 | 2 | 224 | |
| TAPRTweety22 | 1 | C | 2.5 | 86 | |
| TAPRTweety22 | 2 | 148 | 5 | 121 | |
| TAPRTweety22 | 3 | 268 | 2.5 | 102 | |
| TAPRTweety22 | 4 | 28 | 5 | 42 | |
| TAPRTweety23 | 1 | C | 7 | 181 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety23 | 2 | 177 | 4.5 | 94 | |
| TAPRTweety23 | 3 | 297 | 4 | 142 | |
| TAPRTweety23 | 4 | 57 | 3 | 180 | |
| TAPRTweety24 | 1 | C | 11 | 345 | |
| TAPRTweety24 | 2 | 40 | 5 | 18 | |
| TAPRTweety24 | 3 | 280 | 6.5 | 307 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| TAPRTweety24 | 4 | 160 | 0 | 339 | |
| TAPRTweety25 | 1 | C | 11 | 212 | |
| TAPRTweety25 | 2 | 315 | 10 | 218 | |
| TAPRTweety25 | 3 | 195 | 8 | 63 | |
| TAPRTweety25 | 4 | 75 | 5 | 204 | |
| TAPRTweety26 | 1 | C | 7 | 202 | |
| TAPRTweety26 | 2 | 293 | 6 | 168 | |
| TAPRTweety26 | 3 | 53 | 4 | 205 | |
| TAPRTweety26 | 4 | 173 | 3.5 | 359 | |
| TAPRTweety27 | 1 | C | 8 | 202 | |
| TAPRTweety27 | 2 | 95 | 9 | 214 | |
| TAPRTweety27 | 3 | 215 | 5 | 193 | |
| TAPRTweety27 | 4 | 335 | 3 | 203 | |
| TAPRTweety28 | 1 | C | 4 | 76 | |
| TAPRTweety28 | 2 | 10 | 2.5 | 98 | |
| TAPRTweety28 | 3 | 130 | 5 | 84 | |
| TAPRTweety28 | 4 | 250 | 8 | 83 | |
| TAPRTweety29 | 1 | C | 0.5 | 131 | |
| TAPRTweety29 | 2 | 10 | 5.5 | 165 | |
| TAPRTweety29 | 3 | 130 | 7.5 | 14 | |
| TAPRTweety29 | 4 | 250 | 11 | 14 | |
| TAPRTweety30 | 1 | C | 6 | 134 | |
| TAPRTweety30 | 2 | 248 | 7 | 134 | |
| TAPRTweety30 | 3 | 128 | 4 | 156 | |
| TAPRTweety30 | 4 | 8 | 7 | 147 | |
| TAPRTweety31 | 1 | C | 5 | 222 | |
| TAPRTweety31 | 2 | 43 | 1.5 | 186 | Subplot on pasture road. |
| TAPRTweety31 | 3 | 283 | 1 | 220 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety31 | 4 | 163 | 4.5 | 300 | |
| TAPRTweety32 | 1 | C | 4 | 215 | |
| TAPRTweety32 | 2 | 72 | 3 | 193 | |
| TAPRTweety32 | 3 | 192 | 5 | 209 | |
| TAPRTweety32 | 4 | 312 | 4.5 | 214 | |
| TAPRTweety33 | 1 | C | 11 | 14 | |
| TAPRTweety33 | 2 | 129 | 9 | 82 | |
| TAPRTweety33 | 3 | 9 | 7 | 8 | |
| TAPRTweety33 | 4 | 249 | 3 | 50 | |
| TAPRTweety34 | 1 | C | 2 | 204 | |
| TAPRTweety34 | 2 | 145 | 2 | 199 | |
| TAPRTweety34 | 3 | 265 | 3 | 218 | |
| TAPRTweety34 | 4 | 25 | 0 | 230 | |
| TAPRTweety35 | 1 | C | 2 | 206 | |
| TAPRTweety35 | 2 | 295 | 3 | 226 | |
| TAPRTweety35 | 3 | 175 | 3 | 334 | |
| TAPRTweety35 | 4 | 55 | 2 | 215 | Subplot on pasture road. |
| TAPRTweety36 | 1 | C | 1 | 104 | |
| TAPRTweety36 | 2 | 20 | 6.5 | 4 | |
| TAPRTweety36 | 3 | 140 | 12 | 194 | |
| TAPRTweety36 | 4 | 260 | 6 | 171 | |
| TAPRTweety37 | 1 | C | 1.5 | 34 | |
| TAPRTweety37 | 2 | 253 | 12 | 9 | |
| TAPRTweety37 | 3 | 13 | 1 | 79 | |
| TAPRTweety37 | 4 | 133 | 8 | 30 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| TAPRTweety38 | 1 | C | 8.5 | 307 | |
| TAPRTweety38 | 2 | 282 | 4.5 | 299 | |
| TAPRTweety38 | 3 | 42 | 5.5 | 1 | |
| TAPRTweety38 | 4 | 162 | 9 | 107 | |
| TAPRTweety39 | 1 | C | 4.5 | 161 | |
| TAPRTweety39 | 2 | 245 | 3 | 161 | |
| TAPRTweety39 | 3 | 125 | 2 | 142 | |
| TAPRTweety39 | 4 | 5 | 8 | 161 | |
| TAPRTweety40 | 1 | C | 5.5 | 358 | |
| TAPRTweety40 | 2 | 258 | 4 | 64 | |
| TAPRTweety40 | 3 | 18 | 15 | 100 | |
| TAPRTweety40 | 4 | 138 | 3 | 0 | |
| TAPRTweety41 | 1 | C | 3 | 343 | |
| TAPRTweety41 | 2 | 197 | 9 | 0 | |
| TAPRTweety41 | 3 | 317 | 3 | 4 | |
| TAPRTweety41 | 4 | 77 | 3 | 241 | |
| TAPRTweety42 | 1 | C | 6 | 65 | |
| TAPRTweety42 | 2 | 52 | 6 | 86 | |
| TAPRTweety42 | 3 | 292 | 9 | 19 | |
| TAPRTweety42 | 4 | 172 | 9 | 76 | |
| TAPRTweety43 | 1 | C | 6 | 5 | |
| TAPRTweety43 | 2 | 304 | 6 | 339 | |
| TAPRTweety43 | 3 | 184 | 2 | 294 | |
| TAPRTweety43 | 4 | 64 | 6 | 12 | |
| TAPRTweety44 | 1 | C | 6 | 143 | |
| TAPRTweety44 | 2 | 142 | 5.5 | 149 | |
| TAPRTweety44 | 3 | 262 | 4 | 148 | |
| TAPRTweety44 | 4 | 22 | 2 | 97 | |
| TAPRTweety45 | 1 | C | 5.5 | 148 | |
| TAPRTweety45 | 2 | 4 | 4 | 97 | |
| TAPRTweety45 | 3 | 124 | 4 | 121 | |
| TAPRTweety45 | 4 | 244 | 4 | 170 | |
| TAPRTweety46 | 1 | C | 1 | 165 | Was not sampled in 2001 |
| TAPRTweety46 | 2 | 272 | 2 | 173 | Was not sampled in 2001 |
| TAPRTweety46 | 3 | 152 | 4 | 193 | Was not sampled in 2001 |
| TAPRTweety46 | 4 | 32 | 1 | 185 | Was not sampled in 2001 |
| TAPRTweety47 | 1 | C | 6 | 32 | |
| TAPRTweety47 | 2 | 6 | 14 | 13 | Subplot located in deep ravine. |
| TAPRTweety47 | 3 | 126 | 5 | 330 | |
| TAPRTweety47 | 4 | 246 | 8 | 16 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety48 | 1 | C | 4 | 193 | |
| TAPRTweety48 | 2 | 4 | 7.5 | 163 | |
| TAPRTweety48 | 3 | 124 | 4.5 | 227 | |
| TAPRTweety48 | 4 | 244 | 5 | 198 | |
| TAPRTweety49 | 1 | C | 11.5 | 76 | |
| TAPRTweety49 | 2 | 318 | 14 | 273 | |
| TAPRTweety49 | 3 | 78 | 7 | 247 | |
| TAPRTweety49 | 4 | 198 | 10 | 37 | |
| TAPRTweety50 | 1 | C | 2 | 198 | |
| TAPRTweety50 | 2 | 195 | 1 | 172 | |
| TAPRTweety50 | 3 | 75 | 2 | 156 | |
| TAPRTweety50 | 4 | 315 | 3 | 164 | |
| TAPRTweety51 | 1 | C | 7.5 | 154 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| TAPRTweety51 | 2 | 358 | 4 | 114 | |
| TAPRTweety51 | 3 | 118 | 5 | 153 | |
| TAPRTweety51 | 4 | 238 | 4 | 170 | |
| TAPRTweety52 | 1 | C | 9 | 5 | |
| TAPRTweety52 | 2 | 17 | 8 | 11 | |
| TAPRTweety52 | 3 | 257 | 11 | 349 | |
| TAPRTweety52 | 4 | 137 | 4 | 99 | |
| TAPRTweety53 | 1 | C | 2.5 | 83 | |
| TAPRTweety53 | 2 | 203 | 2 | 61 | |
| TAPRTweety53 | 3 | 323 | 1.5 | 342 | |
| TAPRTweety53 | 4 | 83 | 4 | 96 | |
| TAPRTweety54 | 1 | C | 1.5 | 305 | |
| TAPRTweety54 | 2 | 312 | 3.5 | 251 | |
| TAPRTweety54 | 3 | 192 | 3 | 178 | |
| TAPRTweety54 | 4 | 72 | 2.5 | 335 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety55 | 1 | C | 2 | 11 | |
| TAPRTweety55 | 2 | 26 | 2 | 358 | |
| TAPRTweety55 | 3 | 146 | 3 | 352 | Subplot partially on pasture road. |
| TAPRTweety55 | 4 | 266 | 2 | 5 | |
| TAPRTweety56 | 1 | C | 2.5 | 131 | |
| TAPRTweety56 | 2 | 119 | 2.5 | 181 | |
| TAPRTweety56 | 3 | 239 | 2.5 | 173 | |
| TAPRTweety56 | 4 | 359 | 2 | 132 | |
| TAPRTweety57 | 1 | C | 3 | 170 | |
| TAPRTweety57 | 2 | 204 | 2 | 190 | |
| TAPRTweety57 | 3 | 84 | 3 | 158 | |
| TAPRTweety57 | 4 | 324 | 4 | 144 | |
| TAPRTweety58 | 1 | C | 8.5 | 8 | |
| TAPRTweety58 | 2 | 8 | 5 | 20 | |
| TAPRTweety58 | 3 | 128 | 8 | 34 | |
| TAPRTweety58 | 4 | 248 | 9 | 6 | |
| TAPRTweety59 | 1 | C | 8 | 181 | |
| TAPRTweety59 | 2 | 35 | 7 | 121 | |
| TAPRTweety59 | 3 | 275 | 6 | 239 | |
| TAPRTweety59 | 4 | 155 | 6 | 163 | |
| TAPRTweety60 | 1 | C | 1 | 232 | |
| TAPRTweety60 | 2 | 149 | 4 | 129 | |
| TAPRTweety60 | 3 | 269 | 5 | 266 | |
| TAPRTweety60 | 4 | 29 | 2.5 | 201 | |
| TAPRTweety61 | 1 | C | 2 | 259 | |
| TAPRTweety61 | 2 | 146 | 3 | 187 | |
| TAPRTweety61 | 3 | 266 | 5 | 259 | |
| TAPRTweety61 | 4 | 26 | 2 | 239 | |
| TAPRTweety62 | 1 | C | 4 | 53 | |
| TAPRTweety62 | 2 | 298 | 5 | 83 | |
| TAPRTweety62 | 3 | 178 | 8 | 56 | |
| TAPRTweety62 | 4 | 58 | 3 | 38 | |
| TAPRTweety63 | 1 | C | 11 | 52 | |
| TAPRTweety63 | 2 | 195 | 9 | 63 | |
| TAPRTweety63 | 3 | 75 | 4.5 | 71 | |
| TAPRTweety63 | 4 | 315 | 5 | 77 | |
| TAPRTweety64 | 1 | C | 8 | 269 | |
| TAPRTweety64 | 2 | 183 | 6 | 225 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| TAPRTweety64 | 3 | 303 | 8.5 | 139 | |
| TAPRTweety64 | 4 | 63 | 2 | 233 | |
| TAPRTweety65 | 1 | C | 2 | 84 | |
| TAPRTweety65 | 2 | 43 | 3 | 42 | |
| TAPRTweety65 | 3 | 283 | 1 | 63 | |
| TAPRTweety65 | 4 | 163 | 2 | 92 | |
| TAPRTweety66 | 1 | C | 14 | 107 | |
| TAPRTweety66 | 2 | 2 | 6 | 92 | |
| TAPRTweety66 | 3 | 122 | 11 | 108 | |
| TAPRTweety66 | 4 | 242 | 2 | 223 | |
| TAPRTweety67 | 1 | C | 2 | 147 | |
| TAPRTweety67 | 2 | 128 | 3 | 163 | |
| TAPRTweety67 | 3 | 8 | 2 | 163 | |
| TAPRTweety67 | 4 | 248 | 1 | 121 | |
| TAPRTweety68 | 1 | C | 1.5 | 183 | |
| TAPRTweety68 | 2 | 119 | 4 | 243 | |
| TAPRTweety68 | 3 | 239 | 4 | 202 | |
| TAPRTweety68 | 4 | 359 | 1 | 224 | |
| TAPRTweety69 | 1 | C | 5 | 114 | |
| TAPRTweety69 | 2 | 150 | 3 | 126 | |
| TAPRTweety69 | 3 | 30 | 3.5 | 98 | |
| TAPRTweety69 | 4 | 270 | 7.5 | 135 | |
| TAPRTweety70 | 1 | C | 3 | 47 | |
| TAPRTweety70 | 2 | 85 | 1.5 | 70 | Subplot partially in a spring with standing water. |
| TAPRTweety70 | 3 | 325 | 12 | 200 | |
| TAPRTweety70 | 4 | 205 | 7 | 75 | |
| TAPRTweety71 | 1 | C | 1.5 | 254 | |
| TAPRTweety71 | 2 | 123 | 2.5 | 234 | |
| TAPRTweety71 | 3 | 243 | 2 | 241 | |
| TAPRTweety71 | 4 | 3 | 2 | 265 | |
| TAPRTweety72 | 1 | C | 3 | 47 | |
| TAPRTweety72 | 2 | 57 | 2 | 148 | |
| TAPRTweety72 | 3 | 297 | 2 | 35 | |
| TAPRTweety72 | 4 | 177 | 9.5 | 38 | |
| TAPRTweety73 | 1 | C | 10 | 77 | Subplot partially in pond. Horizontal vegetation profile read from west (270°). |
| TAPRTweety73 | 2 | 292 | 0 | 178 | |
| TAPRTweety73 | 3 | 52 | -- | -- | Subplot in pond, not sampled. |
| TAPRTweety73 | 4 | 172 | 8 | 3 | |
| TAPRTweety74 | 1 | C | 8.5 | 116 | |
| TAPRTweety74 | 2 | 78 | 5 | 96 | |
| TAPRTweety74 | 3 | 198 | 7 | 115 | |
| TAPRTweety74 | 4 | 318 | 3 | 108 | |
| TAPRTweety75 | 1 | C | 3 | 180 | |
| TAPRTweety75 | 2 | 259 | 2.5 | 201 | |
| TAPRTweety75 | 3 | 139 | 2.5 | 192 | |
| TAPRTweety75 | 4 | 19 | 2 | 211 | |
| TAPRTweety76 | 1 | C | 3 | 26 | |
| TAPRTweety76 | 2 | 263 | 4 | 56 | |
| TAPRTweety76 | 3 | 23 | 2.5 | 55 | |
| TAPRTweety76 | 4 | 143 | 8 | 349 | |
| TAPRTweety77 | 1 | C | 2 | 263 | |
| TAPRTweety77 | 2 | 140 | 2 | 263 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|--------------|----------------|-------------|-----------|------------|---|
| TAPRTweety77 | 3 | 20 | 2 | 270 | |
| TAPRTweety77 | 4 | 260 | 1 | 263 | |
| TAPRTweety78 | 1 | C | 12 | 312 | |
| TAPRTweety78 | 2 | 16 | 13.5 | 338 | |
| TAPRTweety78 | 3 | 256 | 4 | 28 | |
| TAPRTweety78 | 4 | 136 | 2 | 41 | |
| TAPRTweety79 | 1 | C | 9 | 75 | Horizontal vegetation profile read from east (90°). |
| TAPRTweety79 | 2 | 7 | 3.5 | 149 | |
| TAPRTweety79 | 3 | 127 | 6 | 338 | |
| TAPRTweety79 | 4 | 247 | 8 | 48 | Horizontal vegetation profile read from east (90°). |
| TAPRTweety80 | 1 | C | 1 | 173 | |
| TAPRTweety80 | 2 | 227 | 1.5 | 243 | |
| TAPRTweety80 | 3 | 107 | 1.5 | 124 | |
| TAPRTweety80 | 4 | 347 | 0.5 | 128 | |
| TAPRTweety81 | 1 | C | 3 | 36 | |
| TAPRTweety81 | 2 | 88 | 4 | 31 | |
| TAPRTweety81 | 3 | 328 | 2 | 16 | |
| TAPRTweety81 | 4 | 208 | 1 | 10 | |
| TAPRTweety82 | 1 | C | 2 | 318 | |
| TAPRTweety82 | 2 | 229 | 4 | 303 | |
| TAPRTweety82 | 3 | 349 | 1.5 | 169 | |
| TAPRTweety82 | 4 | 109 | 2 | 296 | |
| TAPRTweety83 | 1 | C | 1 | 62 | |
| TAPRTweety83 | 2 | 296 | 1 | 26 | |
| TAPRTweety83 | 3 | 56 | 2 | 55 | |
| TAPRTweety83 | 4 | 176 | 1 | 115 | |
| TAPRTweety84 | 1 | C | 14 | 229 | |
| TAPRTweety84 | 2 | 15 | 5 | 276 | |
| TAPRTweety84 | 3 | 255 | 9 | 255 | |
| TAPRTweety84 | 4 | 135 | 8.5 | 181 | |
| TAPRTweety85 | 1 | C | 1 | 80 | |
| TAPRTweety85 | 2 | 160 | 1.5 | 81 | |
| TAPRTweety85 | 3 | 280 | 1 | 78 | |
| TAPRTweety85 | 4 | 40 | 1 | 77 | |
| TAPRTweety86 | 1 | C | 5 | 167 | |
| TAPRTweety86 | 2 | 25 | 2 | 145 | |
| TAPRTweety86 | 3 | 265 | 4.5 | 207 | |
| TAPRTweety86 | 4 | 145 | 4.5 | 172 | |
| TAPRTweety87 | 1 | C | 3 | 49 | |
| TAPRTweety87 | 2 | 26 | 4 | 57 | |
| TAPRTweety87 | 3 | 266 | 2.5 | 59 | |
| TAPRTweety87 | 4 | 146 | 2 | 57 | |
| TAPRTweety88 | 1 | C | 4 | 186 | |
| TAPRTweety88 | 2 | 317 | 17 | 174 | |
| TAPRTweety88 | 3 | 77 | 4 | 183 | |
| TAPRTweety88 | 4 | 197 | 4 | 343 | |
| TAPRTweety89 | 1 | C | 2.5 | 99 | Subplot partially in flowing water. |
| TAPRTweety89 | 2 | 3 | 20 | 93 | Subplot partially in flowing water. |
| TAPRTweety89 | 3 | 123 | 12.5 | 283 | |
| TAPRTweety89 | 4 | 243 | 11.5 | 98 | |
| TAPRTweety90 | 1 | C | 2.5 | 148 | |
| TAPRTweety90 | 2 | 200 | 3 | 167 | |
| TAPRTweety90 | 3 | 80 | 7 | 111 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|-------------------------------|
| TAPRTweety90 | 4 | 320 | 3 | 170 | |
| TAPRTweety91 | 1 | C | 2.5 | 57 | |
| TAPRTweety91 | 2 | 206 | 9 | 159 | |
| TAPRTweety91 | 3 | 326 | 2.5 | 15 | |
| TAPRTweety91 | 4 | 86 | 5 | 75 | |
| TAPRTweety92 | 1 | C | 1.5 | 323 | |
| TAPRTweety92 | 2 | 46 | 0.5 | 72 | |
| TAPRTweety92 | 3 | 286 | 1.5 | 219 | |
| TAPRTweety92 | 4 | 166 | 1 | 344 | |
| TAPRTweety93 | 1 | C | 3 | 142 | |
| TAPRTweety93 | 2 | 232 | 1 | 177 | |
| TAPRTweety93 | 3 | 112 | 6 | 113 | |
| TAPRTweety93 | 4 | 352 | 2 | 135 | |
| TAPRTweety94 | 1 | C | 6 | 225 | |
| TAPRTweety94 | 2 | 140 | 6 | 211 | |
| TAPRTweety94 | 3 | 260 | 4 | 243 | |
| TAPRTweety94 | 4 | 20 | 4 | 258 | |
| TAPRTweety95 | 1 | C | 2 | 154 | |
| TAPRTweety95 | 2 | 298 | 1 | 103 | |
| TAPRTweety95 | 3 | 178 | 4 | 117 | |
| TAPRTweety95 | 4 | 58 | 3 | 141 | |
| TAPRTweety96 | 1 | C | 6 | 35 | |
| TAPRTweety96 | 2 | 36 | -- | -- | Subplot in pond, not sampled. |
| TAPRTweety96 | 3 | 276 | 4 | 33 | |
| TAPRTweety96 | 4 | 156 | 9 | 316 | |
| TAPRTweety97 | 1 | C | 3.5 | 160 | |
| TAPRTweety97 | 2 | 143 | 6.5 | 181 | |
| TAPRTweety97 | 3 | 263 | 4.5 | 203 | |
| TAPRTweety97 | 4 | 23 | 2 | 74 | |
| TAPRTweety98 | 1 | C | 2 | 43 | |
| TAPRTweety98 | 2 | 37 | 4.5 | 37 | |
| TAPRTweety98 | 3 | 157 | 1.5 | 59 | |
| TAPRTweety98 | 4 | 277 | 2 | 56 | |
| TAPRTweety99 | 1 | C | 0 | 283 | |
| TAPRTweety99 | 2 | 230 | 2 | 301 | |
| TAPRTweety99 | 3 | 350 | 1.5 | 295 | |
| TAPRTweety99 | 4 | 110 | 3.5 | 107 | |
| TAPRTweety100 | 1 | C | 1 | 116 | |
| TAPRTweety100 | 2 | 63 | 2 | 174 | |
| TAPRTweety100 | 3 | 303 | 3.5 | 157 | |
| TAPRTweety100 | 4 | 183 | 3 | 46 | |
| TAPRTweety101 | 1 | C | 2 | 147 | |
| TAPRTweety101 | 2 | 271 | 2 | 164 | |
| TAPRTweety101 | 3 | 31 | 2.5 | 28 | |
| TAPRTweety101 | 4 | 151 | 1.5 | 155 | |
| TAPRTweety102 | 1 | C | 1 | 85 | |
| TAPRTweety102 | 2 | 117 | 1 | 127 | |
| TAPRTweety102 | 3 | 357 | 1 | 58 | |
| TAPRTweety102 | 4 | 237 | 1 | 67 | |
| TAPRTweety103 | 1 | C | 1 | 109 | |
| TAPRTweety103 | 2 | 32 | 2 | 32 | |
| TAPRTweety103 | 3 | 152 | 0 | 198 | |
| TAPRTweety103 | 4 | 272 | 1 | 117 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety104 | 1 | C | 4 | 249 | |
| TAPRTweety104 | 2 | 95 | 1 | 235 | |
| TAPRTweety104 | 3 | 215 | 5 | 244 | |
| TAPRTweety104 | 4 | 335 | 3 | 268 | |
| TAPRTweety105 | 1 | C | 9 | 209 | |
| TAPRTweety105 | 2 | 126 | 14 | 233 | |
| TAPRTweety105 | 3 | 246 | 9 | 135 | |
| TAPRTweety105 | 4 | 6 | 5 | 198 | |
| TAPRTweety106 | 1 | C | 4 | 208 | |
| TAPRTweety106 | 2 | 19 | 5 | 201 | |
| TAPRTweety106 | 3 | 139 | 3 | 198 | |
| TAPRTweety106 | 4 | 259 | 2 | 219 | |
| TAPRTweety107 | 1 | C | 2 | 34 | |
| TAPRTweety107 | 2 | 276 | 0 | 63 | |
| TAPRTweety107 | 3 | 36 | 11.5 | 36 | |
| TAPRTweety107 | 4 | 156 | 0 | 141 | |
| TAPRTweety108 | 1 | C | 5 | 168 | |
| TAPRTweety108 | 2 | 117 | 4.5 | 212 | |
| TAPRTweety108 | 3 | 237 | 6 | 95 | |
| TAPRTweety108 | 4 | 357 | 5 | 201 | |
| TAPRTweety109 | 1 | C | 3.5 | 123 | |
| TAPRTweety109 | 2 | 45 | 8.5 | 74 | |
| TAPRTweety109 | 3 | 165 | 13 | 39 | |
| TAPRTweety109 | 4 | 285 | 3 | 132 | |
| TAPRTweety110 | 1 | C | 3 | 109 | |
| TAPRTweety110 | 2 | 55 | 2 | 205 | |
| TAPRTweety110 | 3 | 295 | 2 | 78 | |
| TAPRTweety110 | 4 | 175 | 1 | 103 | |
| TAPRTweety111 | 1 | C | 11 | 276 | |
| TAPRTweety111 | 2 | 146 | 17 | 306 | |
| TAPRTweety111 | 3 | 266 | 16.5 | 295 | |
| TAPRTweety111 | 4 | 26 | 14 | 219 | |
| TAPRTweety112 | 1 | C | 7.5 | 186 | |
| TAPRTweety112 | 2 | 116 | 6 | 217 | |
| TAPRTweety112 | 3 | 356 | 0 | 189 | |
| TAPRTweety112 | 4 | 236 | 9.5 | 188 | |
| TAPRTweety113 | 1 | C | 3.5 | 7 | |
| TAPRTweety113 | 2 | 300 | 4 | 6 | |
| TAPRTweety113 | 3 | 60 | 2.5 | 30 | |
| TAPRTweety113 | 4 | 180 | 4 | 15 | |
| TAPRTweety114 | 1 | C | 3 | 240 | |
| TAPRTweety114 | 2 | 60 | 1.5 | 239 | Subplot partially in spring with flowing water. |
| TAPRTweety114 | 3 | 180 | 0 | 294 | |
| TAPRTweety114 | 4 | 300 | 1.5 | 115 | |
| TAPRTweety115 | 1 | C | 2 | 86 | |
| TAPRTweety115 | 2 | 70 | 5 | 204 | |
| TAPRTweety115 | 3 | 310 | 3 | 130 | |
| TAPRTweety115 | 4 | 190 | 2.5 | 139 | |
| TAPRTweety116 | 1 | C | 5 | 132 | |
| TAPRTweety116 | 2 | 52 | 5.5 | 180 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety116 | 3 | 292 | 12 | 107 | |
| TAPRTweety116 | 4 | 172 | 5 | 115 | |
| TAPRTweety117 | 1 | C | 3 | 235 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety117 | 2 | 113 | 2 | 222 | |
| TAPRTweety117 | 3 | 233 | 11 | 257 | |
| TAPRTweety117 | 4 | 353 | 3 | 225 | |
| TAPRTweety118 | 1 | C | 5 | 98 | |
| TAPRTweety118 | 2 | 334 | 8.5 | 116 | |
| TAPRTweety118 | 3 | 94 | 4 | 119 | |
| TAPRTweety118 | 4 | 214 | 5 | 170 | |
| TAPRTweety119 | 1 | C | 2 | 48 | |
| TAPRTweety119 | 2 | 132 | 2 | 18 | |
| TAPRTweety119 | 3 | 12 | 4 | 46 | |
| TAPRTweety119 | 4 | 252 | 1 | 172 | |
| TAPRTweety120 | 1 | C | 1 | 105 | |
| TAPRTweety120 | 2 | 166 | 2 | 84 | |
| TAPRTweety120 | 3 | 46 | 2 | 45 | |
| TAPRTweety120 | 4 | 286 | 1.5 | 63 | |
| TAPRTweety121 | 1 | C | 3 | 14 | |
| TAPRTweety121 | 2 | 28 | 5 | 10 | |
| TAPRTweety121 | 3 | 148 | 3 | 23 | |
| TAPRTweety121 | 4 | 268 | 5 | 45 | |
| TAPRTweety122 | 1 | C | 1 | 356 | |
| TAPRTweety122 | 2 | 57 | 3 | 18 | |
| TAPRTweety122 | 3 | 297 | 2.5 | 45 | |
| TAPRTweety122 | 4 | 177 | 2 | 157 | |
| TAPRTweety123 | 1 | C | 9 | 322 | |
| TAPRTweety123 | 2 | 272 | 6 | 346 | |
| TAPRTweety123 | 3 | 32 | 6 | 309 | |
| TAPRTweety123 | 4 | 152 | 1.5 | 329 | |
| TAPRTweety124 | 1 | C | 5 | 11 | |
| TAPRTweety124 | 2 | 33 | 5.5 | 13 | |
| TAPRTweety124 | 3 | 153 | 10.5 | 20 | |
| TAPRTweety124 | 4 | 273 | 7.5 | 12 | |
| TAPRTweety125 | 1 | C | 15 | 257 | |
| TAPRTweety125 | 2 | 117 | 17 | 121 | |
| TAPRTweety125 | 3 | 237 | 13 | 262 | |
| TAPRTweety125 | 4 | 357 | 6 | 226 | |
| TAPRTweety126 | 1 | C | 18.5 | 155 | |
| TAPRTweety126 | 2 | 42 | 5 | 170 | |
| TAPRTweety126 | 3 | 162 | 7 | 308 | |
| TAPRTweety126 | 4 | 282 | 5.5 | 205 | |
| TAPRTweety127 | 1 | C | 8 | 110 | |
| TAPRTweety127 | 2 | 51 | 4 | 84 | |
| TAPRTweety127 | 3 | 291 | 2 | 85 | |
| TAPRTweety127 | 4 | 171 | 5 | 124 | |
| TAPRTweety128 | 1 | C | 2.5 | 191 | |
| TAPRTweety128 | 2 | 340 | 2.5 | 178 | |
| TAPRTweety128 | 3 | 220 | 5.5 | 63 | |
| TAPRTweety128 | 4 | 100 | 1.5 | 165 | |
| TAPRTweety129 | 1 | C | 6 | 65 | |
| TAPRTweety129 | 2 | 353 | 16 | 49 | |
| TAPRTweety129 | 3 | 113 | 9 | 343 | |
| TAPRTweety129 | 4 | 233 | 3 | 54 | |
| TAPRTweety130 | 1 | C | 1 | 195 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety130 | 2 | 2 | 19 | 143 | Horizontal vegetation profile read from south (180°). |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety130 | 3 | 242 | 5 | 136 | |
| TAPRTweety130 | 4 | 122 | 2 | 288 | |
| TAPRTweety131 | 1 | C | 0 | 50 | |
| TAPRTweety131 | 2 | 142 | 2.5 | 158 | |
| TAPRTweety131 | 3 | 262 | 2 | 2 | |
| TAPRTweety131 | 4 | 22 | 3 | 0 | |
| TAPRTweety132 | 1 | C | 5 | 174 | |
| TAPRTweety132 | 2 | 60 | 11.5 | 203 | |
| TAPRTweety132 | 3 | 300 | 6.5 | 197 | |
| TAPRTweety132 | 4 | 180 | 1 | 98 | |
| TAPRTweety133 | 1 | C | 2 | 187 | |
| TAPRTweety133 | 2 | 45 | 1.5 | 173 | |
| TAPRTweety133 | 3 | 165 | 5 | 166 | |
| TAPRTweety133 | 4 | 285 | 7 | 266 | |
| TAPRTweety134 | 1 | C | 2.5 | 356 | |
| TAPRTweety134 | 2 | 193 | 1.5 | 288 | |
| TAPRTweety134 | 3 | 313 | 8.5 | 348 | |
| TAPRTweety134 | 4 | 73 | 3 | 313 | |
| TAPRTweety135 | 1 | C | 1.5 | 111 | |
| TAPRTweety135 | 2 | 131 | 5 | 16 | |
| TAPRTweety135 | 3 | 251 | 3 | 152 | |
| TAPRTweety135 | 4 | 11 | 1 | 150 | |
| TAPRTweety136 | 1 | C | 11 | 339 | |
| TAPRTweety136 | 2 | 20 | 16.5 | 238 | |
| TAPRTweety136 | 3 | 260 | 9 | 335 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety136 | 4 | 140 | 12 | 1 | Horizontal vegetation profile read from east (90°). |
| TAPRTweety137 | 1 | C | 7 | 135 | |
| TAPRTweety137 | 2 | 300 | 11 | 149 | |
| TAPRTweety137 | 3 | 180 | 8 | 123 | |
| TAPRTweety137 | 4 | 60 | 5 | 125 | |
| TAPRTweety138 | 1 | C | 9 | 85 | |
| TAPRTweety138 | 2 | 330 | 15 | 44 | |
| TAPRTweety138 | 3 | 90 | 9 | 313 | |
| TAPRTweety138 | 4 | 210 | 7 | 65 | |
| TAPRTweety139 | 1 | C | 10 | 42 | |
| TAPRTweety139 | 2 | 350 | 3 | 333 | |
| TAPRTweety139 | 3 | 110 | 0.5 | 70 | Horizontal vegetation profile read from east (90°). |
| TAPRTweety139 | 4 | 230 | 5 | 355 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety140 | 1 | C | 2 | 154 | |
| TAPRTweety140 | 2 | 307 | 3 | 172 | |
| TAPRTweety140 | 3 | 187 | 2 | 169 | |
| TAPRTweety140 | 4 | 67 | 3 | 129 | |
| TAPRTweety141 | 1 | C | 17 | 271 | |
| TAPRTweety141 | 2 | 52 | 5 | 251 | |
| TAPRTweety141 | 3 | 292 | 4.5 | 139 | |
| TAPRTweety141 | 4 | 172 | 18 | 239 | |
| TAPRTweety142 | 1 | C | 2 | 124 | |
| TAPRTweety142 | 2 | 172 | 6 | 48 | |
| TAPRTweety142 | 3 | 292 | 0.5 | 80 | |
| TAPRTweety142 | 4 | 52 | 4 | 56 | |
| TAPRTweety143 | 1 | C | 3 | 356 | |
| TAPRTweety143 | 2 | 202 | 4.5 | 316 | |
| TAPRTweety143 | 3 | 82 | 3 | 344 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|----------|
| TAPRTweety143 | 4 | 322 | 1.5 | 348 | |
| TAPRTweety144 | 1 | C | 3.5 | 68 | |
| TAPRTweety144 | 2 | 305 | 3 | 113 | |
| TAPRTweety144 | 3 | 185 | 5 | 89 | |
| TAPRTweety144 | 4 | 63 | 3 | 213 | |
| TAPRTweety145 | 1 | C | 12.5 | 104 | |
| TAPRTweety145 | 2 | 274 | 3 | 148 | |
| TAPRTweety145 | 3 | 154 | 10.5 | 141 | |
| TAPRTweety145 | 4 | 34 | 8.5 | 101 | |
| TAPRTweety146 | 1 | C | 4.5 | 78 | |
| TAPRTweety146 | 2 | 5 | 3.5 | 63 | |
| TAPRTweety146 | 3 | 245 | 7 | 63 | |
| TAPRTweety146 | 4 | 125 | 5 | 350 | |
| TAPRTweety147 | 1 | C | 3 | 148 | |
| TAPRTweety147 | 2 | 190 | 4 | 148 | |
| TAPRTweety147 | 3 | 70 | 2.5 | 178 | |
| TAPRTweety147 | 4 | 310 | 3.5 | 203 | |
| TAPRTweety148 | 1 | C | 0 | 127 | |
| TAPRTweety148 | 2 | 303 | 1.5 | 30 | |
| TAPRTweety148 | 3 | 183 | 2 | 184 | |
| TAPRTweety148 | 4 | 63 | 0 | 94 | |
| TAPRTweety149 | 1 | C | 3.5 | 37 | |
| TAPRTweety149 | 2 | 303 | 4.5 | 65 | |
| TAPRTweety149 | 3 | 183 | 7 | 326 | |
| TAPRTweety149 | 4 | 63 | 5.5 | 307 | |
| TAPRTweety150 | 1 | C | 2.5 | 271 | |
| TAPRTweety150 | 2 | 282 | 2 | 230 | |
| TAPRTweety150 | 3 | 162 | 2 | 265 | |
| TAPRTweety150 | 4 | 42 | 3 | 274 | |
| TAPRTweety151 | 1 | C | 1 | 40 | |
| TAPRTweety151 | 2 | 282 | 0.5 | 340 | |
| TAPRTweety151 | 3 | 162 | 1 | 41 | |
| TAPRTweety151 | 4 | 42 | 2 | 25 | |
| TAPRTweety152 | 1 | C | 6 | 278 | |
| TAPRTweety152 | 2 | 3 | 5 | 216 | |
| TAPRTweety152 | 3 | 243 | 8 | 100 | |
| TAPRTweety152 | 4 | 123 | 10 | 250 | |
| TAPRTweety153 | 1 | C | 4 | 122 | |
| TAPRTweety153 | 2 | 201 | 2 | 161 | |
| TAPRTweety153 | 3 | 81 | 9 | 160 | |
| TAPRTweety153 | 4 | 321 | 2 | 150 | |
| TAPRTweety154 | 1 | C | 3.5 | 9 | |
| TAPRTweety154 | 2 | 209 | 7 | 7 | |
| TAPRTweety154 | 3 | 329 | 6 | 356 | |
| TAPRTweety154 | 4 | 89 | 2 | 41 | |
| TAPRTweety155 | 1 | C | 2.5 | 335 | |
| TAPRTweety155 | 2 | 51 | 8.5 | 297 | |
| TAPRTweety155 | 3 | 171 | 8 | 265 | |
| TAPRTweety155 | 4 | 291 | 3.5 | 180 | |
| TAPRTweety156 | 1 | C | 1.5 | 273 | |
| TAPRTweety156 | 2 | 252 | 1 | 323 | |
| TAPRTweety156 | 3 | 132 | 1 | 160 | |
| TAPRTweety156 | 4 | 12 | 3 | 321 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety157 | 1 | C | 0 | 302 | |
| TAPRTweety157 | 2 | 192 | 8 | 252 | |
| TAPRTweety157 | 3 | 312 | 3.5 | 3 | |
| TAPRTweety157 | 4 | 72 | 1.5 | 333 | |
| TAPRTweety158 | 1 | C | 4 | 56 | |
| TAPRTweety158 | 2 | 225 | 5 | 84 | |
| TAPRTweety158 | 3 | 105 | 3 | 96 | |
| TAPRTweety158 | 4 | 345 | 4 | 50 | |
| TAPRTweety159 | 1 | C | 5 | 26 | |
| TAPRTweety159 | 2 | 12 | 0 | 204 | |
| TAPRTweety159 | 3 | 252 | 17 | 356 | |
| TAPRTweety159 | 4 | 132 | 7.5 | 74 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety160 | 1 | C | 25 | 345 | |
| TAPRTweety160 | 2 | 300 | 3 | 105 | Subplot partially in Fox Creek. |
| TAPRTweety160 | 3 | 60 | 0 | 45 | |
| TAPRTweety160 | 4 | 180 | 5 | 5 | |
| TAPRTweety161 | 1 | C | 0.5 | 88 | |
| TAPRTweety161 | 2 | 135 | 0.5 | 68 | |
| TAPRTweety161 | 3 | 15 | 2.5 | 180 | |
| TAPRTweety161 | 4 | 255 | 1 | 60 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety162 | 1 | C | 1 | 103 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety162 | 2 | 293 | 2.5 | 51 | Subplot partially in Fox Creek. |
| TAPRTweety162 | 3 | 173 | 14 | 5 | |
| TAPRTweety162 | 4 | 53 | 0 | 70 | |
| TAPRTweety163 | 1 | C | 1 | 20 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety163 | 2 | 99 | 0 | 72 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety163 | 3 | 339 | 3 | 131 | |
| TAPRTweety163 | 4 | 219 | 19 | 14 | |
| TAPRTweety164 | 1 | C | 0.5 | 191 | Horizontal vegetation profile read from west (270°). |
| TAPRTweety164 | 2 | 177 | 15 | 233 | |
| TAPRTweety164 | 3 | 57 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety164 | 4 | 297 | 0.5 | 173 | |
| TAPRTweety165 | 1 | C | 3 | 83 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety165 | 2 | 43 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety165 | 3 | 163 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety165 | 4 | 283 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety166 | 1 | C | 5 | 166 | |
| TAPRTweety166 | 2 | 320 | 4 | 256 | |
| TAPRTweety166 | 3 | 80 | -- | -- | Subplot in Fox Creek, not sampled. |
| TAPRTweety166 | 4 | 200 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety167 | 1 | C | 2.5 | 123 | |
| TAPRTweety167 | 2 | 182 | -- | -- | Subplot in Fox Creek, not sampled. |
| TAPRTweety167 | 3 | 302 | 1 | 292 | |
| TAPRTweety167 | 4 | 62 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety168 | 1 | C | 3 | 216 | |
| TAPRTweety168 | 2 | 96 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety168 | 3 | 216 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety168 | 4 | 336 | 0 | 159 | |
| TAPRTweety169 | 1 | C | 6 | 33 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety169 | 2 | 295 | -- | -- | Subplot in Fox Creek, not sampled. |
| TAPRTweety169 | 3 | 55 | -- | -- | Subplot in Fox Creek, not sampled. |
| TAPRTweety169 | 4 | 175 | 1.5 | 201 | |
| TAPRTweety170 | 1 | C | 4 | 102 | Horizontal vegetation profile read from south (180°). |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety170 | 2 | 105 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety170 | 3 | 225 | 2 | 103 | |
| TAPRTweety170 | 4 | 345 | 2 | 89 | |
| TAPRTweety171 | 1 | C | 2 | 40 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety171 | 2 | 283 | 0 | 92 | |
| TAPRTweety171 | 3 | 43 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety171 | 4 | 163 | -- | -- | Subplot in Fox Creek, not sampled. |
| TAPRTweety172 | 1 | C | 4 | 142 | |
| TAPRTweety172 | 2 | 144 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety172 | 3 | 264 | 0.5 | 305 | |
| TAPRTweety172 | 4 | 24 | 1 | 136 | |
| TAPRTweety173 | 1 | C | 0 | 192 | |
| TAPRTweety173 | 2 | 224 | 22 | 226 | |
| TAPRTweety173 | 3 | 104 | -- | -- | Subplot in Fox Creek, not sampled. |
| TAPRTweety173 | 4 | 344 | 2 | 173 | |
| TAPRTweety174 | 1 | C | 1 | 199 | |
| TAPRTweety174 | 2 | 359 | 1.5 | 219 | |
| TAPRTweety174 | 3 | 119 | -- | -- | Subplot east of Fox Creek, not sampled. |
| TAPRTweety174 | 4 | 239 | 1.5 | 178 | |
| TAPRTweety175 | 1 | C | 6 | 49 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety175 | 2 | 267 | 12 | 268 | |
| TAPRTweety175 | 3 | 27 | -- | -- | Subplot in or east of Fox Creek, not sampled. |
| TAPRTweety175 | 4 | 147 | 5.5 | 5 | |
| TAPRTweety176 | 1 | C | 4 | 153 | |
| TAPRTweety176 | 2 | 130 | 4.5 | 100 | Subplot partially in flowing water. |
| TAPRTweety176 | 3 | 250 | 4 | 77 | |
| TAPRTweety176 | 4 | 10 | 3.5 | 197 | |
| TAPRTweety177 | 1 | C | 0 | 154 | |
| TAPRTweety177 | 2 | 301 | 1 | 260 | |
| TAPRTweety177 | 3 | 61 | 3 | 98 | |
| TAPRTweety177 | 4 | 181 | 1 | 210 | |
| TAPRTweety178 | 1 | C | 2 | 251 | |
| TAPRTweety178 | 2 | 282 | 5 | 248 | |
| TAPRTweety178 | 3 | 42 | 1 | 260 | |
| TAPRTweety178 | 4 | 162 | 2 | 275 | |
| TAPRTweety179 | 1 | C | 1 | 56 | |
| TAPRTweety179 | 2 | 345 | 3 | 12 | |
| TAPRTweety179 | 3 | 105 | 14 | 89 | |
| TAPRTweety179 | 4 | 225 | 1 | 56 | |
| TAPRTweety180 | 1 | C | 1 | 215 | |
| TAPRTweety180 | 2 | 140 | 3 | 145 | |
| TAPRTweety180 | 3 | 260 | 1 | 262 | |
| TAPRTweety180 | 4 | 20 | 1 | 223 | |
| TAPRTweety181 | 1 | C | 5 | 198 | Subplot on seep with standing water. |
| TAPRTweety181 | 2 | 159 | 2 | 74 | |
| TAPRTweety181 | 3 | 279 | 4 | 195 | |
| TAPRTweety181 | 4 | 39 | 22 | 199 | Horizontal vegetation profile read from east (90°). |
| TAPRTweety182 | 1 | C | 2 | 150 | |
| TAPRTweety182 | 2 | 296 | 2 | 170 | |
| TAPRTweety182 | 3 | 56 | 2 | 185 | |
| TAPRTweety182 | 4 | 176 | 2 | 187 | |
| TAPRTweety183 | 1 | C | 4 | 120 | |
| TAPRTweety183 | 2 | 46 | 5 | 110 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety183 | 3 | 166 | 8 | 118 | |
| TAPRTweety183 | 4 | 286 | 3 | 65 | |
| TAPRTweety184 | 1 | C | 2 | 40 | |
| TAPRTweety184 | 2 | 173 | 2 | 44 | |
| TAPRTweety184 | 3 | 293 | 5 | 2 | |
| TAPRTweety184 | 4 | 53 | 2 | 42 | |
| TAPRTweety185 | 1 | C | 4 | 29 | |
| TAPRTweety185 | 2 | 22 | 5 | 96 | |
| TAPRTweety185 | 3 | 142 | 5 | 43 | |
| TAPRTweety185 | 4 | 262 | 6 | 353 | |
| TAPRTweety186 | 1 | C | 1 | 250 | |
| TAPRTweety186 | 2 | 155 | 2 | 58 | |
| TAPRTweety186 | 3 | 275 | 2 | 250 | |
| TAPRTweety186 | 4 | 35 | 1 | 241 | |
| TAPRTweety187 | 1 | C | 6 | 201 | |
| TAPRTweety187 | 2 | 108 | 1 | 241 | |
| TAPRTweety187 | 3 | 228 | 2 | 25 | |
| TAPRTweety187 | 4 | 348 | 2 | 235 | |
| TAPRTweety188 | 1 | C | 2 | 172 | |
| TAPRTweety188 | 2 | 334 | 2 | 173 | |
| TAPRTweety188 | 3 | 214 | 2 | 160 | |
| TAPRTweety188 | 4 | 94 | 7 | 92 | |
| TAPRTweety189 | 1 | C | 7 | 223 | |
| TAPRTweety189 | 2 | 340 | 9 | 240 | |
| TAPRTweety189 | 3 | 220 | 6 | 220 | Subplot in Gas House pasture. |
| TAPRTweety189 | 4 | 100 | 6 | 205 | |
| TAPRTweety190 | 1 | C | 2 | 236 | |
| TAPRTweety190 | 2 | 318 | 2 | 294 | |
| TAPRTweety190 | 3 | 198 | 2 | 228 | |
| TAPRTweety190 | 4 | 78 | 5 | 198 | |
| TAPRTweety191 | 1 | C | 4 | 262 | |
| TAPRTweety191 | 2 | 85 | 2 | 180 | |
| TAPRTweety191 | 3 | 205 | 2 | 334 | |
| TAPRTweety191 | 4 | 325 | 2 | 163 | |
| TAPRTweety192 | 1 | C | 5 | 147 | |
| TAPRTweety192 | 2 | 14 | 6 | 116 | |
| TAPRTweety192 | 3 | 134 | 6 | 153 | |
| TAPRTweety192 | 4 | 254 | 4 | 125 | |
| TAPRTweety193 | 1 | C | 8 | 290 | |
| TAPRTweety193 | 2 | 215 | 6 | 256 | |
| TAPRTweety193 | 3 | 95 | 6 | 135 | |
| TAPRTweety193 | 4 | 335 | 4 | 311 | |
| TAPRTweety194 | 1 | C | 2 | 196 | |
| TAPRTweety194 | 2 | 25 | 2 | 195 | |
| TAPRTweety194 | 3 | 145 | 1 | 178 | |
| TAPRTweety194 | 4 | 265 | 0 | 129 | |
| TAPRTweety195 | 1 | C | 2 | 40 | |
| TAPRTweety195 | 2 | 224 | 4 | 314 | |
| TAPRTweety195 | 3 | 104 | 11 | 303 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety195 | 4 | 344 | 8 | 146 | Horizontal vegetation profile read from west (270°). |
| TAPRTweety196 | 1 | C | 1 | 88 | |
| TAPRTweety196 | 2 | 120 | 2 | 40 | |
| TAPRTweety196 | 3 | 240 | 2 | 63 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|--|
| TAPRTweety196 | 4 | 0 | 3 | 175 | |
| TAPRTweety197 | 1 | C | 2 | 284 | |
| TAPRTweety197 | 2 | 68 | 1 | 310 | |
| TAPRTweety197 | 3 | 188 | 4 | 266 | |
| TAPRTweety197 | 4 | 308 | 3 | 309 | |
| TAPRTweety198 | 1 | C | 11 | 250 | |
| TAPRTweety198 | 2 | 310 | 8 | 248 | |
| TAPRTweety198 | 3 | 190 | 8 | 264 | |
| TAPRTweety198 | 4 | 70 | 1 | 219 | |
| TAPRTweety199 | 1 | C | 1 | 78 | |
| TAPRTweety199 | 2 | 27 | 3 | 30 | |
| TAPRTweety199 | 3 | 147 | 1 | 134 | |
| TAPRTweety199 | 4 | 267 | 1 | 82 | |
| TAPRTweety200 | 1 | C | 7 | 302 | |
| TAPRTweety200 | 2 | 269 | 3 | 354 | |
| TAPRTweety200 | 3 | 149 | 3 | 352 | Subplot in Windmill pasture. |
| TAPRTweety200 | 4 | 29 | 17 | 329 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety201 | 1 | C | 1 | 280 | |
| TAPRTweety201 | 2 | 133 | 1 | 150 | |
| TAPRTweety201 | 3 | 13 | 1 | 259 | Subplot in Gas House pasture. |
| TAPRTweety201 | 4 | 253 | 11 | 304 | |
| TAPRTweety202 | 1 | C | 3 | 289 | |
| TAPRTweety202 | 2 | 48 | 4 | 282 | |
| TAPRTweety202 | 3 | 168 | 3 | 284 | |
| TAPRTweety202 | 4 | 288 | 2 | 269 | |
| TAPRTweety203 | 1 | C | 15 | 270 | |
| TAPRTweety203 | 2 | 350 | 14 | 269 | |
| TAPRTweety203 | 3 | 230 | 10 | 270 | |
| TAPRTweety203 | 4 | 110 | 1 | 325 | |
| TAPRTweety204 | 1 | C | 5 | 57 | |
| TAPRTweety204 | 2 | 178 | 3 | 122 | |
| TAPRTweety204 | 3 | 298 | 5 | 67 | |
| TAPRTweety204 | 4 | 58 | 6 | 144 | |
| TAPRTweety205 | 1 | C | 0 | 271 | |
| TAPRTweety205 | 2 | 68 | 6 | 222 | |
| TAPRTweety205 | 3 | 188 | 3 | 67 | Subplot partially in stream, Horizontal vegetation profile read from east (90°). |
| TAPRTweety205 | 4 | 308 | 32 | 52 | Subplot partially in stream. |
| TAPRTweety206 | 1 | C | 2 | 115 | |
| TAPRTweety206 | 2 | 30 | 2 | 88 | |
| TAPRTweety206 | 3 | 150 | 3 | 98 | |
| TAPRTweety206 | 4 | 270 | 2 | 38 | |
| TAPRTweety207 | 1 | C | 5 | 224 | |
| TAPRTweety207 | 2 | 123 | 3 | 230 | |
| TAPRTweety207 | 3 | 243 | 2 | 156 | |
| TAPRTweety207 | 4 | 3 | 4 | 240 | |
| TAPRTweety208 | 1 | C | 1 | 142 | |
| TAPRTweety208 | 2 | 136 | 9 | 60 | |
| TAPRTweety208 | 3 | 256 | 10 | 60 | |
| TAPRTweety208 | 4 | 16 | 2 | 350 | |
| TAPRTweety209 | 1 | C | 2 | 335 | |
| TAPRTweety209 | 2 | 105 | 2 | 355 | |
| TAPRTweety209 | 3 | 225 | 2 | 325 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety209 | 4 | 345 | 6 | 337 | |
| TAPRTweety210 | 1 | C | 3 | 40 | |
| TAPRTweety210 | 2 | 338 | 12 | 45 | |
| TAPRTweety210 | 3 | 218 | 9 | 30 | |
| TAPRTweety210 | 4 | 98 | 3 | 35 | |
| TAPRTweety211 | 1 | C | 8 | 10 | |
| TAPRTweety211 | 2 | 275 | 5 | 65 | |
| TAPRTweety211 | 3 | 155 | 4 | 20 | |
| TAPRTweety211 | 4 | 35 | 3 | 94 | |
| TAPRTweety212 | 1 | C | 13 | 203 | |
| TAPRTweety212 | 2 | 82 | 5 | 209 | |
| TAPRTweety212 | 3 | 202 | 7 | 226 | |
| TAPRTweety212 | 4 | 322 | 8 | 234 | |
| TAPRTweety213 | 1 | C | 1 | 216 | |
| TAPRTweety213 | 2 | 332 | 2 | 210 | |
| TAPRTweety213 | 3 | 92 | 1 | 205 | |
| TAPRTweety213 | 4 | 212 | 1 | 217 | |
| TAPRTweety214 | 1 | C | 5 | 133 | |
| TAPRTweety214 | 2 | 200 | 6 | 148 | Subplot on seep with standing water. |
| TAPRTweety214 | 3 | 80 | 6 | 116 | Subplot on seep with standing water. |
| TAPRTweety214 | 4 | 320 | 4 | 157 | |
| TAPRTweety215 | 1 | C | 4 | 245 | |
| TAPRTweety215 | 2 | 127 | 3 | 157 | |
| TAPRTweety215 | 3 | 247 | 5 | 90 | |
| TAPRTweety215 | 4 | 7 | 4 | 165 | |
| TAPRTweety216 | 1 | C | 5 | 118 | |
| TAPRTweety216 | 2 | 150 | 8 | 234 | |
| TAPRTweety216 | 3 | 270 | 4 | 123 | |
| TAPRTweety216 | 4 | 30 | 7 | 241 | |
| TAPRTweety217 | 1 | C | 3 | 42 | |
| TAPRTweety217 | 2 | 268 | 4 | 30 | |
| TAPRTweety217 | 3 | 28 | 1 | 45 | |
| TAPRTweety217 | 4 | 148 | 1 | 102 | |
| TAPRTweety218 | 1 | C | 2 | 285 | |
| TAPRTweety218 | 2 | 7 | 1 | 313 | Subplot in Windmill pasture. |
| TAPRTweety218 | 3 | 127 | 2 | 115 | |
| TAPRTweety218 | 4 | 247 | 4 | 311 | |
| TAPRTweety219 | 1 | C | 1 | 214 | |
| TAPRTweety219 | 2 | 224 | 4 | 234 | |
| TAPRTweety219 | 3 | 344 | 5 | 269 | Horizontal vegetation profile read from east (90°). |
| TAPRTweety219 | 4 | 104 | 1 | 172 | |
| TAPRTweety220 | 1 | C | 6 | 198 | |
| TAPRTweety220 | 2 | 308 | 5 | 208 | |
| TAPRTweety220 | 3 | 68 | 5 | 195 | |
| TAPRTweety220 | 4 | 188 | 2 | 225 | Subplot partially on pasture road. |
| TAPRTweety221 | 1 | C | 1 | 198 | |
| TAPRTweety221 | 2 | 333 | 1 | 224 | |
| TAPRTweety221 | 3 | 93 | 1 | 190 | |
| TAPRTweety221 | 4 | 213 | 1 | 180 | |
| TAPRTweety222 | 1 | C | 4 | 127 | |
| TAPRTweety222 | 2 | 296 | 3 | 152 | |
| TAPRTweety222 | 3 | 176 | 7 | 137 | |
| TAPRTweety222 | 4 | 56 | 2 | 212 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety223 | 1 | C | 2 | 162 | |
| TAPRTweety223 | 2 | 120 | 2 | 177 | |
| TAPRTweety223 | 3 | 240 | 2 | 170 | |
| TAPRTweety223 | 4 | 0 | 2 | 172 | |
| TAPRTweety224 | 1 | C | 14 | 57 | |
| TAPRTweety224 | 2 | 136 | 6 | 105 | |
| TAPRTweety224 | 3 | 256 | 9 | 226 | |
| TAPRTweety224 | 4 | 16 | 8 | 52 | Subplot on seep with standing water. |
| TAPRTweety225 | 1 | C | 0 | 40 | |
| TAPRTweety225 | 2 | 152 | 0 | 80 | |
| TAPRTweety225 | 3 | 272 | 0 | 99 | |
| TAPRTweety225 | 4 | 32 | 2 | 109 | |
| TAPRTweety226 | 1 | C | 2 | 98 | Subplot partially in stream. |
| TAPRTweety226 | 2 | 0 | 1 | 161 | Subplot partially in stream. |
| TAPRTweety226 | 3 | 120 | 3 | 17 | |
| TAPRTweety226 | 4 | 240 | 5 | 358 | |
| TAPRTweety227 | 1 | C | 4 | 254 | |
| TAPRTweety227 | 2 | 280 | 12 | 220 | |
| TAPRTweety227 | 3 | 40 | 2 | 25 | |
| TAPRTweety227 | 4 | 160 | 6 | 243 | |
| TAPRTweety228 | 1 | C | 5 | 340 | |
| TAPRTweety228 | 2 | 264 | 4 | 15 | |
| TAPRTweety228 | 3 | 24 | 5 | 200 | |
| TAPRTweety228 | 4 | 144 | 4 | 351 | |
| TAPRTweety229 | 1 | C | 3 | 119 | |
| TAPRTweety229 | 2 | 282 | 6 | 110 | Subplot on seep with standing water. |
| TAPRTweety229 | 3 | 42 | 3 | 98 | Subplot partially on cow trail. |
| TAPRTweety229 | 4 | 162 | 5 | 171 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety230 | 1 | C | 15 | 308 | |
| TAPRTweety230 | 2 | 10 | 8 | 325 | |
| TAPRTweety230 | 3 | 130 | 16 | 272 | |
| TAPRTweety230 | 4 | 250 | 15 | 274 | |
| TAPRTweety231 | 1 | C | 2 | 116 | Subplot partially on cow trail. |
| TAPRTweety231 | 2 | 46 | 1 | 75 | |
| TAPRTweety231 | 3 | 166 | 1 | 83 | |
| TAPRTweety231 | 4 | 286 | 2 | 99 | |
| TAPRTweety232 | 1 | C | 1 | 240 | |
| TAPRTweety232 | 2 | 220 | 0 | 297 | |
| TAPRTweety232 | 3 | 340 | 0 | 34 | |
| TAPRTweety232 | 4 | 100 | 1 | 54 | |
| TAPRTweety233 | 1 | C | 9 | 355 | |
| TAPRTweety233 | 2 | 136 | 8 | 8 | Horizontal vegetation profile read from west (270°). |
| TAPRTweety233 | 3 | 256 | 3 | 0 | |
| TAPRTweety233 | 4 | 16 | 5 | 294 | |
| TAPRTweety234 | 1 | C | 0 | 55 | |
| TAPRTweety234 | 2 | 60 | 2 | 74 | |
| TAPRTweety234 | 3 | 180 | 0 | 44 | |
| TAPRTweety234 | 4 | 300 | 0 | 49 | |
| TAPRTweety235 | 1 | C | 5 | 113 | |
| TAPRTweety235 | 2 | 294 | 4 | 131 | |
| TAPRTweety235 | 3 | 54 | 1 | 124 | |
| TAPRTweety235 | 4 | 174 | 11 | 85 | |
| TAPRTweety236 | 1 | C | 10 | 214 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|--|
| TAPRTweety236 | 2 | 282 | 8 | 180 | |
| TAPRTweety236 | 3 | 42 | 9 | 6 | |
| TAPRTweety236 | 4 | 162 | 8 | 201 | Subplot on seep with standing water. |
| TAPRTweety237 | 1 | C | 4 | 145 | |
| TAPRTweety237 | 2 | 269 | 3 | 169 | |
| TAPRTweety237 | 3 | 149 | 7 | 96 | Horizontal vegetation profile read from west (270°). |
| TAPRTweety237 | 4 | 29 | 5 | 150 | |
| TAPRTweety238 | 1 | C | 5 | 38 | |
| TAPRTweety238 | 2 | 101 | 6 | 39 | |
| TAPRTweety238 | 3 | 341 | 7 | 42 | |
| TAPRTweety238 | 4 | 221 | 3 | 68 | |
| TAPRTweety239 | 1 | C | 4 | 110 | |
| TAPRTweety239 | 2 | 188 | 2 | 176 | Subplot in Crusher Hill pasture. |
| TAPRTweety239 | 3 | 308 | 3 | 116 | |
| TAPRTweety239 | 4 | 68 | 7 | 75 | |
| TAPRTweety240 | 1 | C | 6 | 141 | |
| TAPRTweety240 | 2 | 200 | 6 | 335 | |
| TAPRTweety240 | 3 | 320 | 4 | 149 | |
| TAPRTweety240 | 4 | 80 | 18 | 242 | |
| TAPRTweety241 | 1 | C | 3 | 141 | |
| TAPRTweety241 | 2 | 80 | 8 | 261 | |
| TAPRTweety241 | 3 | 320 | 3 | 146 | |
| TAPRTweety241 | 4 | 200 | 5 | 117 | |
| TAPRTweety242 | 1 | C | 1 | 144 | |
| TAPRTweety242 | 2 | 128 | 0 | 125 | |
| TAPRTweety242 | 3 | 248 | 1 | 211 | |
| TAPRTweety242 | 4 | 8 | 1 | 330 | |
| TAPRTweety243 | 1 | C | 2 | 240 | |
| TAPRTweety243 | 2 | 320 | 3 | 234 | |
| TAPRTweety243 | 3 | 80 | 2 | 251 | |
| TAPRTweety243 | 4 | 200 | 2 | 192 | |
| TAPRTweety244 | 1 | C | 8 | 259 | |
| TAPRTweety244 | 2 | 280 | 2 | 161 | |
| TAPRTweety244 | 3 | 40 | 4 | 250 | |
| TAPRTweety244 | 4 | 160 | 2 | 94 | |
| TAPRTweety245 | 1 | C | 4 | 186 | |
| TAPRTweety245 | 2 | 29 | 3 | 204 | |
| TAPRTweety245 | 3 | 149 | 11 | 308 | |
| TAPRTweety245 | 4 | 269 | 2 | 198 | |
| TAPRTweety246 | 1 | C | 1 | 193 | |
| TAPRTweety246 | 2 | 45 | 1 | 163 | |
| TAPRTweety246 | 3 | 165 | 5 | 152 | |
| TAPRTweety246 | 4 | 285 | 2 | 139 | |
| TAPRTweety247 | 1 | C | 2 | 21 | |
| TAPRTweety247 | 2 | 250 | 2 | 1 | |
| TAPRTweety247 | 3 | 10 | 1 | 66 | |
| TAPRTweety247 | 4 | 130 | 4 | 37 | |
| TAPRTweety248 | 1 | C | 6 | 275 | |
| TAPRTweety248 | 2 | 70 | 6 | 255 | |
| TAPRTweety248 | 3 | 310 | 5 | 168 | |
| TAPRTweety248 | 4 | 190 | 3 | 198 | |
| TAPRTweety249 | 1 | C | 3 | 185 | |
| TAPRTweety249 | 2 | 109 | 3 | 164 | |

Table 6. Location, cont'd.

| Plot number | Subplot number | Azimuth (°) | Slope (°) | Aspect (°) | Comments |
|---------------|----------------|-------------|-----------|------------|---|
| TAPRTweety249 | 3 | 229 | 2 | 188 | |
| TAPRTweety249 | 4 | 349 | 3 | 215 | |
| TAPRTweety250 | 1 | C | 4 | 143 | |
| TAPRTweety250 | 2 | 2 | 5 | 38 | |
| TAPRTweety250 | 3 | 122 | 1 | 45 | |
| TAPRTweety250 | 4 | 242 | 4 | 140 | |
| TAPRTweety251 | 1 | C | 18 | 4 | |
| TAPRTweety251 | 2 | 40 | 9 | 4 | |
| TAPRTweety251 | 3 | 160 | 13 | 40 | |
| TAPRTweety251 | 4 | 280 | 15 | 333 | |
| TAPRTweety252 | 1 | C | 4 | 356 | |
| TAPRTweety252 | 2 | 250 | 4 | 11 | |
| TAPRTweety252 | 3 | 130 | 4 | 9 | |
| TAPRTweety252 | 4 | 10 | 3 | 295 | |
| TAPRTweety253 | 1 | C | 5 | 220 | |
| TAPRTweety253 | 2 | 244 | 4 | 148 | |
| TAPRTweety253 | 3 | 4 | 7 | 243 | |
| TAPRTweety253 | 4 | 124 | 6 | 251 | |
| TAPRTweety254 | 1 | C | 0 | 270 | |
| TAPRTweety254 | 2 | 303 | 20 | 342 | Horizontal vegetation profile read from south (180°). |
| TAPRTweety254 | 3 | 183 | 0 | 266 | |
| TAPRTweety254 | 4 | 63 | 1 | 269 | |
| TAPRTweety255 | 1 | C | 12 | 240 | |
| TAPRTweety255 | 2 | 345 | 8 | 264 | |
| TAPRTweety255 | 3 | 105 | 10 | 166 | |
| TAPRTweety255 | 4 | 225 | 7 | 232 | |
| TAPRTweety256 | 1 | C | 4 | 142 | |
| TAPRTweety256 | 2 | 90 | 3 | 131 | |
| TAPRTweety256 | 3 | 210 | 3 | 157 | |
| TAPRTweety256 | 4 | 330 | 5 | 158 | |
| TAPRTweety257 | 1 | C | 2 | 182 | |
| TAPRTweety257 | 2 | 98 | 3 | 68 | |
| TAPRTweety257 | 3 | 218 | 2 | 62 | |
| TAPRTweety257 | 4 | 338 | 0 | 220 | |
| TAPRTweety258 | 1 | C | 6 | 136 | |
| TAPRTweety258 | 2 | 240 | 3 | 104 | |
| TAPRTweety258 | 3 | 0 | 6 | 125 | |
| TAPRTweety258 | 4 | 120 | 8 | 111 | |
| TAPRTweety259 | 1 | C | 4 | 195 | |
| TAPRTweety259 | 2 | 336 | 3 | 225 | |
| TAPRTweety259 | 3 | 96 | 4 | 152 | |
| TAPRTweety259 | 4 | 216 | 5 | 198 | |
| TAPRTweety260 | 1 | C | 4 | 236 | |
| TAPRTweety260 | 2 | 275 | 5 | 277 | |
| TAPRTweety260 | 3 | 155 | 4 | 225 | |
| TAPRTweety260 | 4 | 35 | 10 | 277 | |

-- Indicates missing data.

Table 7. Mean (\pm SE) values for habitat parameters by habitat type at Agate Fossil Beds National Monument, Nebraska (2001 and 2003) and Tallgrass Prairie National Preserve, Kansas (2001 and 2002) during the bird breeding season.

| Habitat Parameter | AGFO | | TAPR | |
|-----------------------------------|-----------------|----------------------|---------------------|----------------------|
| | Upland | Riparian | Upland | Riparian |
| 50 meter plot | | | | |
| Upland prairie coverage (%) | 97.5 \pm 0.00 | 62.5 \pm 0.00 | 96.6 \pm 0.28 | 37.5 \pm undefined |
| Riparian woodland coverage (%) | N/A | N/A | 4.0 \pm 1.67 | 88.2 \pm 4.01 |
| Paved road coverage (%) | 17.6 \pm 7.20 | N/A | N/A | N/A |
| Pasture road coverage (%) | 3.0 \pm 0.00 | N/A | 3.4 \pm 0.80 | N/A |
| Stream coverage (%) | 3.0 \pm 0.00 | 36.1 \pm 2.97 | 6.3 \pm 2.11 | 25.6 \pm 2.81 |
| Pond coverage (%) | N/A | N/A | 36.2 \pm 6.50 | N/A |
| 5 meter subplot | | | | |
| Horizontal vegetation profile | | | | |
| 0.0 – 0.5 m | 60.7 \pm 3.24 | 61.2 \pm 7.38 | 72.9 \pm 1.06 | 64.7 \pm 2.77 |
| 0.5 – 1.0 m | 3.3 \pm 0.79 | 9.0 \pm 1.91 | 9.4 \pm 1.00 | 30.4 \pm 3.15 |
| 1.0 – 1.5 m | N/A | 15.6 \pm undefined | 6.6 \pm 0.44 | 9.7 \pm 1.95 |
| 1.5 – 2.0 m | N/A | N/A | 14.8 \pm 0.50 | 17.0 \pm 1.76 |
| Vertical structure diversity | 0.01 \pm 0.01 | 0.07 \pm 0.03 | 0.02 \pm 0.01 | 1.27 \pm 0.03 |
| 1.78 meter sample plot | | | | |
| Deciduous litter coverage (%) | 1.5 \pm 0.28 | 5.4 \pm 1.23 | 0.6 \pm 0.08 | 19.3 \pm 1.88 |
| Conifer litter coverage (%) | N/A | N/A | 0.1 \pm undefined | 9.4 \pm undefined |
| Grass litter coverage (%) | 26.1 \pm 1.66 | 33.7 \pm 3.56 | 21.1 \pm 0.96 | 6.9 \pm 0.98 |
| Bare soil (%) | 38.1 \pm 2.01 | 23.7 \pm 3.61 | 51.4 \pm 0.89 | 23.6 \pm 3.21 |
| Rock coverage (%) | 2.6 \pm 0.58 | 0.6 \pm 0.23 | 8.4 \pm 1.40 | 9.0 \pm 0.42 |
| Woody debris coverage (%) | 0.1 \pm 0.97 | 3.5 \pm undefined | 0.6 \pm undefined | 2.5 \pm 0.05 |
| Unvegetated coverage (%) | 38.1 \pm 2.01 | 23.7 \pm 3.61 | 51.4 \pm 2.57 | 23.6 \pm 3.21 |
| Warm-season grass coverage (%) | 0.7 \pm 0.09 | 0.5 \pm 0.07 | 32.1 \pm 0.77 | 9.2 \pm 1.39 |
| Cool-season grass coverage (%) | 14.7 \pm 1.34 | 13.2 \pm 1.78 | 5.2 \pm 0.62 | 15.3 \pm 2.31 |
| Forb coverage (%) | 8.1 \pm 1.61 | 10.8 \pm 0.88 | 14.8 \pm 0.50 | 8.6 \pm 0.97 |
| Moss and lichen coverage (%) | 1.6 \pm 0.31 | 1.1 \pm 0.37 | 0.7 \pm 0.16 | 0.7 \pm 0.05 |
| Woody shrub and vine coverage (%) | 1.5 \pm 0.25 | 1.4 \pm 0.28 | 5.0 \pm 0.27 | 7.1 \pm 1.83 |
| Tree seedling coverage (%) | N/A | N/A | 0.5 \pm 0.02 | 0.3 \pm 0.05 |
| Total foliar coverage (%) | 19.5 \pm 1.49 | 18.2 \pm 2.45 | 47.7 \pm 0.67 | 29.8 \pm 2.12 |

N/A - Not Applicable.

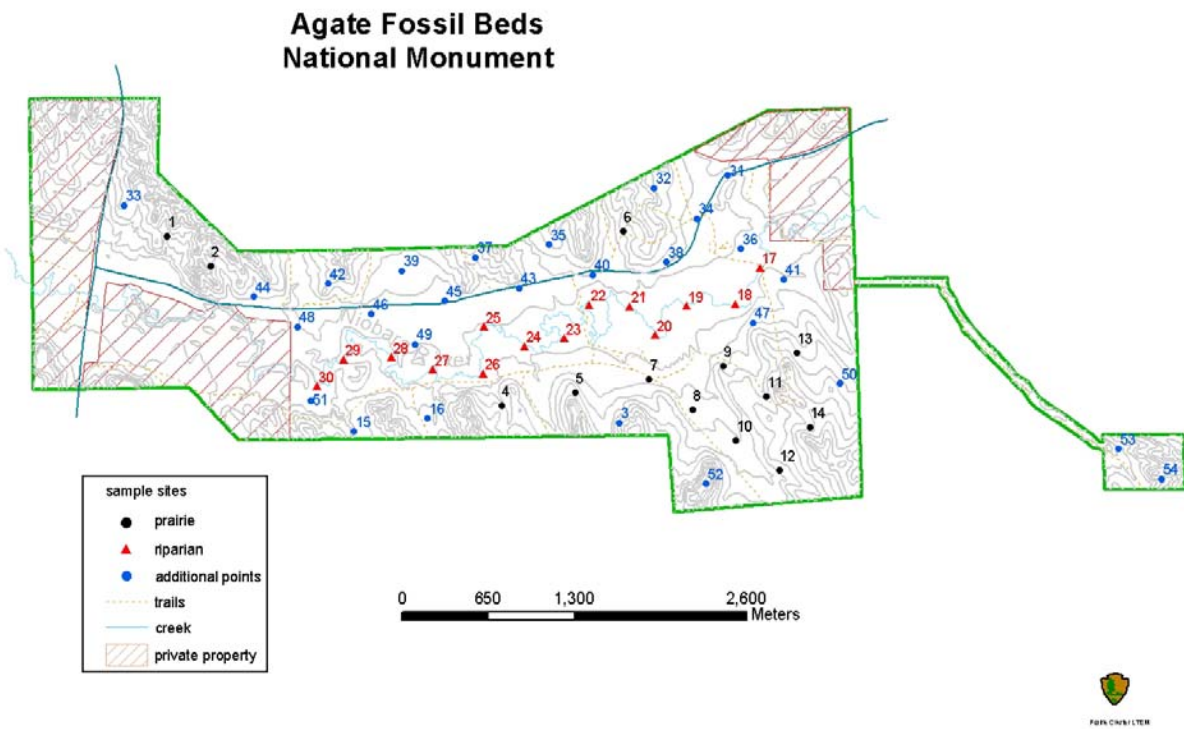


Figure 1. Map showing VCP locations at Agate Fossil Beds National Monument, Nebraska.

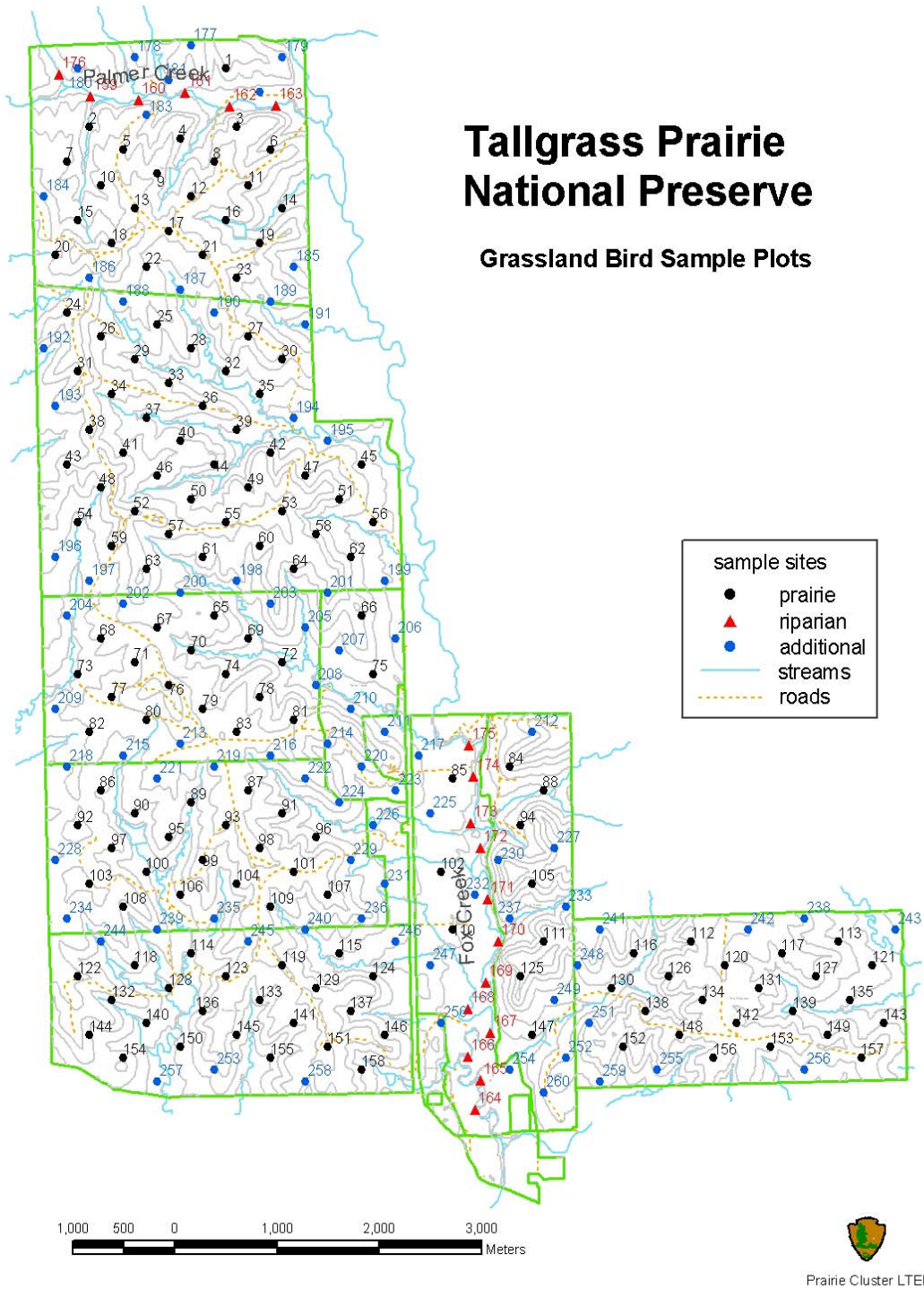


Figure 2. Map showing VCP locations at Tallgrass Prairie National Preserve, Kansas.

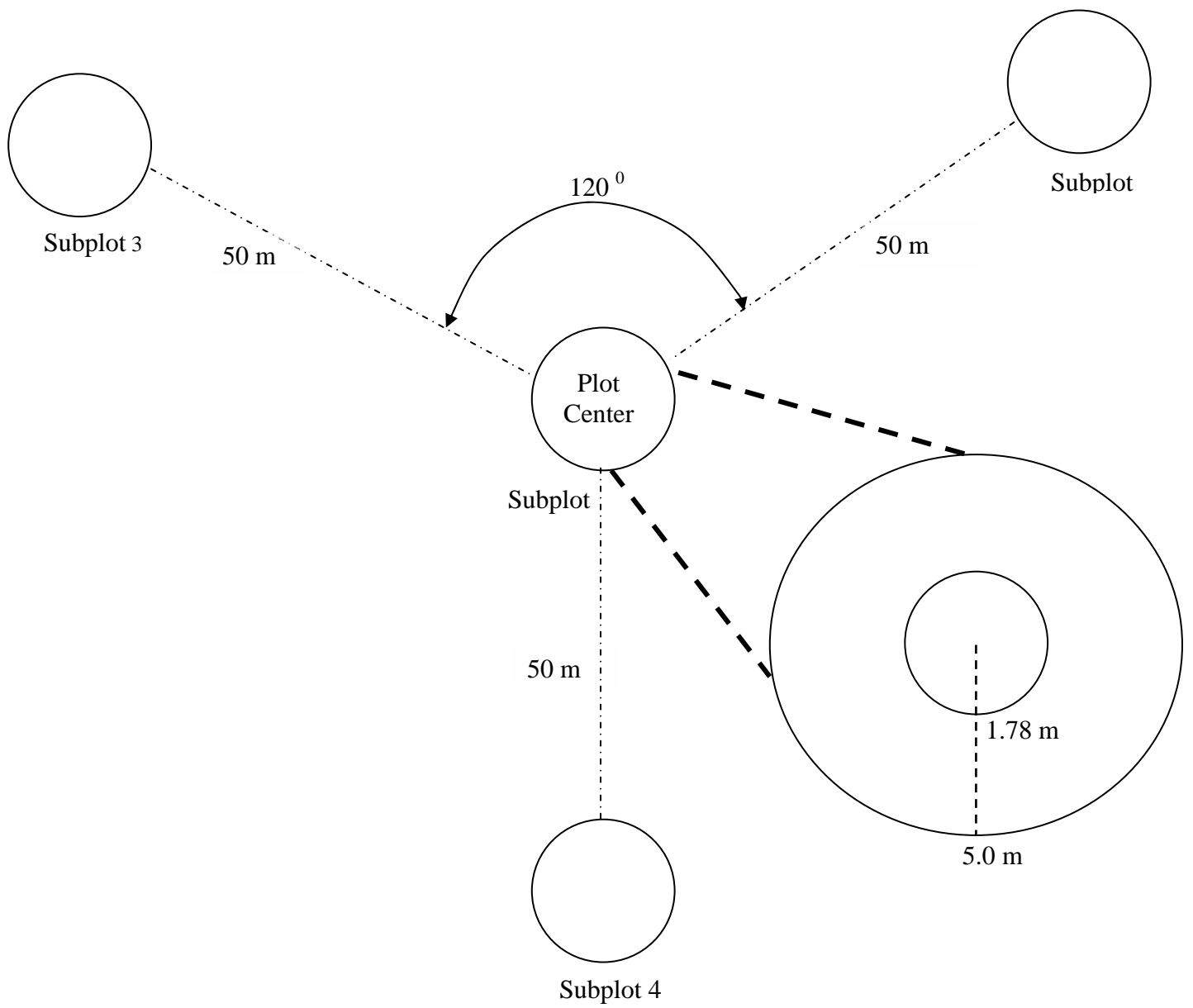


Figure 3. Spatial arrangement of vegetation subplots.