Final Report

Allegheny Portage Railroad National Historic Site and Johnstown Flood National Memorial

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PROJECT TITLE: Inventory of Bird and Butterfly Diversity at Allegheny Portage Railroad National Historic Site and Johnstown Flood National Memorial

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Introduction

We surveyed birds from May to July 1997 and butterflies and skippers (hereafter referred to as butterflies) from May to September 1998 to provide a baseline database of these species in two national parks in Pennsylvania: Allegheny Portage Railroad National Historic Site (ALPO) and Johnstown Flood National Memorial (JOFL). This database is critical to future studies that may be designed to develop a long-term monitoring and management program for such species at these national parks. Information on presence, relative abundance, and distribution of wildlife resources, including birds and butterflies, on these public lands is important to National Park Service (NPS) personnel who are mandated to manage the biodiversity of natural resources (Yahner et al. 1994a, 1994b). As large tracts of public lands, such as national parks, become more insular with increased habitat fragmentation because of agriculture, urbanization, or other land use, they will be increasingly valuable for the long-term maintenance of faunal diversity and the functional integrity of landscapes and ecosystems in the eastern United States (Ambrose and Bratton 1990, Yahner 1995). In this report, we present information on our efforts to obtain a baseline inventory of bird diversity during the spring migratory and breeding seasons in 1997 and butterfly diversity during summer 1998 at ALPO and JOFL.

Study Areas

Allegheny Portage Railroad National Historic Site

Allegheny Portage Railroad National Historic Site is located in Cambria and Blair Counties, central Pennsylvania, and comprises 500 ha (Fig. 1). It is approximately 10 km west of the city of Altoona (population = 53,300) (Rand McNally 1993). The park is located within the Allegheny Mountain Section of the Appalachian Plateau Province, which corresponds to the Transitional Life Zone (Rhoads 1903, Genoways and Brenner 1985).

The park is long and narrow, following the historic railroad trace northwest to southeast. Elevation within the park ranges from 346 m near Duncansville to 734 m at Cresson Summit near the visitors center. There is one small pond (less than 0.2 ha) and numerous small or intermittent streams.

Forested habitat dominates the park (76%) and is composed of plateau, pioneer, and northern hardwoods. Sixteen percent of the park is early-successional habitat. Grass and forbs (5%) and coniferous forest (<1%) comprise a small portion of the park.

Johnstown Flood National Memorial

Johnstown Flood National Memorial is located in Cambria County, central Pennsylvania, and comprises 63 ha (Fig. 1). It is located approximately 13 km east of the city of Johnstown (population = 31,600) (Rand McNally 1993). The park is located within the Allegheny Mountain Section of the Appalachian Plateau Province, which corresponds to the Transitional Life Zone (Rhoads 1903, Genoways and Brenner 1985).

The topography of JOFL is gentle. The main drainage in the park is the Little Conemaugh River, and wetlands and river acreage compose approximately 3 ha. Elevation within the park ranges from 479 m at river level to 552 m near the visitors center.

JOFL is dominated by early-successional habitat (43%, 27 ha) which is located primarily adjacent to the river. Herbaceous habitat (grass and forbs) accounts for 23% (15 ha), and it is located near the visitors center. Thirty-three percent (21 ha) of the habitat at the park is deciduous forest (plateau and pioneer hardwood).

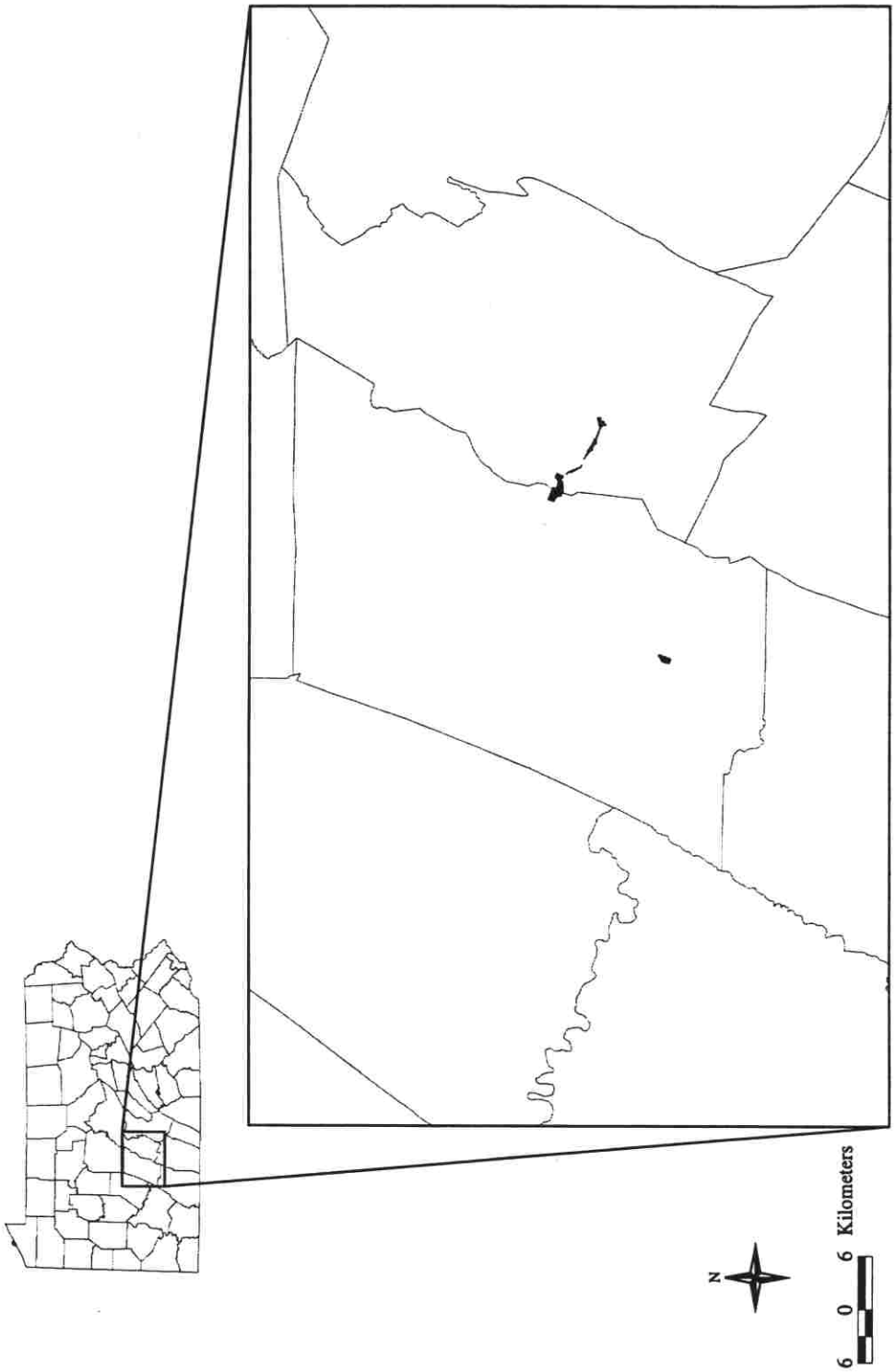


Fig. 1. Locations of Allegheny Portage Railroad National Historic Site and Johnstown Flood National Memorial.

Methods

Transects

We established two transects at ALPO (No. 9 and Visitors Center) and one transect at JOFL during April 1997 (Figs. 2-4). Transects at ALPO corresponded to the historic railroad trace; ALPO No. 9 transect was at low elevation (approximately 394 m) and ALPO Visitors Center was at high elevation (approximately 734 m). Because of the small size and the large amount of roadway within the park, the transect at JOFL was located along park roads. Each transect was 1.6 km (1 mile) in length and encompassed a variety of representative habitats within the parks. Transects were marked with surveyor's flagging at the starting points and at 100-m intervals.

Because of the potential importance for butterfly species, 100-m sections of each transect at ALPO were classified as either open or wooded (hereafter referred to as habitat sections). Open habitat sections were dominated by herbaceous vegetation, had open or no canopy cover, and contained few or no overstory trees. Wooded habitat sections had closed canopies and were dominated by overstory trees $\geq$ 7.5 cm diameter at breast height. The ALPO No. 9 transect contained 500 m of open habitat and 1100 m of wooded habitat. The ALPO Visitors Center transect contained 400 m of open habitat and 1200 m of wooded habitat. The JOFL transect was not divided into sections because 100-m sections were relatively similar and were comprised of both wooded and open habitats.

Butterfly Surveys

Butterflies were surveyed five times (once per month) from late spring to early fall (15 May to 15 September) 1998. Transects were conducted between 0900 and 1530 hours only if temperatures exceeded 15° C at starting time on days with no precipitation and little wind (<15 kph) to maximize butterfly observations (Sparrow et al. 1994, Sutton 1994, Yahner 1996a).

Butterflies were counted along each transect by walking slowly and stopping frequently to identify individuals when encountered. To minimize conspicuousness differences of butterflies among habitats, only individuals seen within 10 m perpendicular to either side of the transect were recorded and mapped (Yahner 1996a). Butterflies greater than 10 m away from the transect were recorded but not included in analysis. Butterflies were collected with a butterfly net and transferred to a clear plastic handling bag if closer inspection was necessary to identify species (Yahner 1996b). Butterflies were released after identification. In addition, if butterflies were feeding on a nectar source, we recorded the flower species and the number and species of foraging butterflies. Common and scientific names of butterflies were taken from North American Butterfly Association 1995 and are presented in Appendix 1.

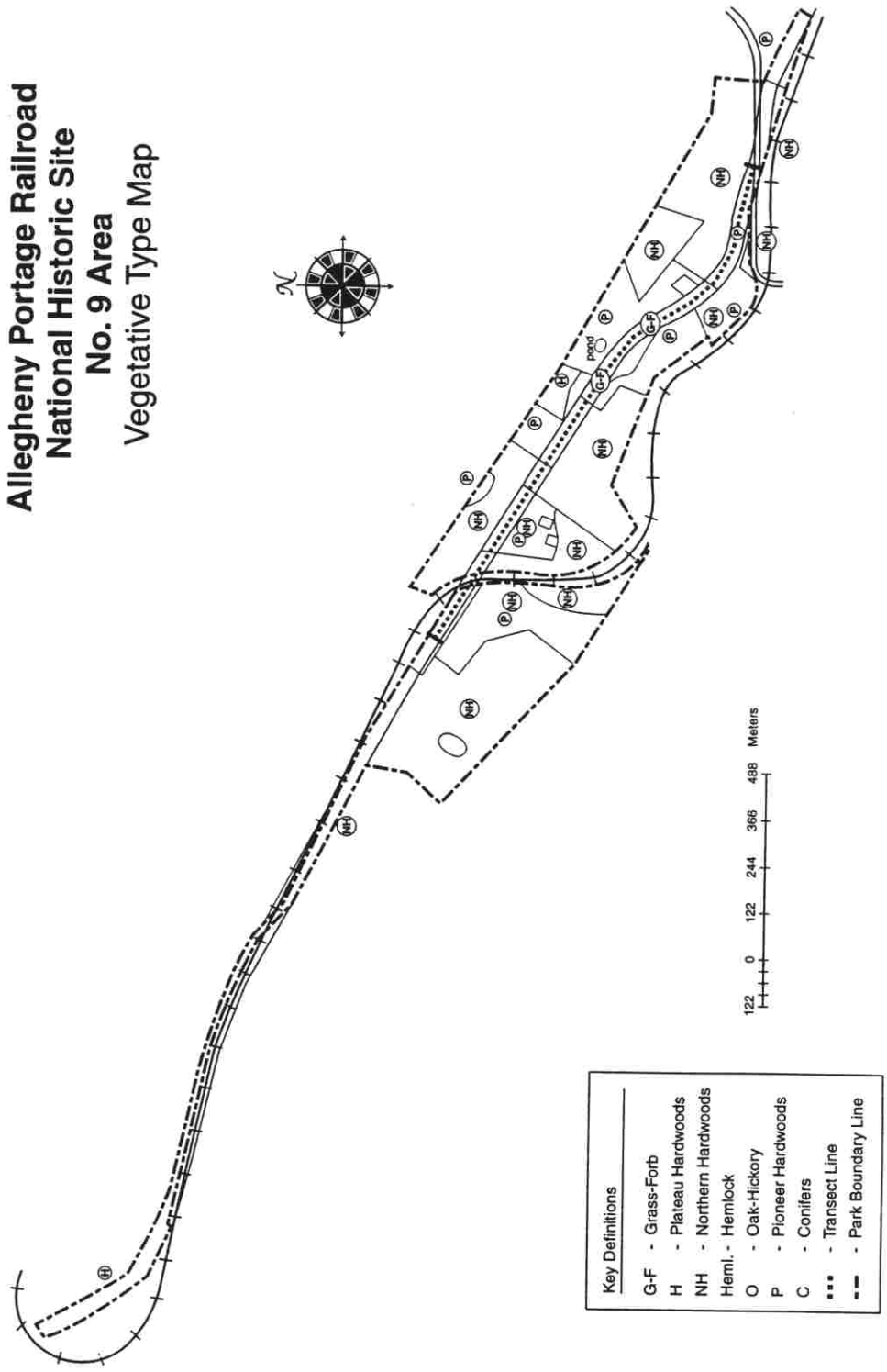


Fig. 2. Location of the ALPO No. 9 transect at Allegheny Portage Railroad National Historic Site.

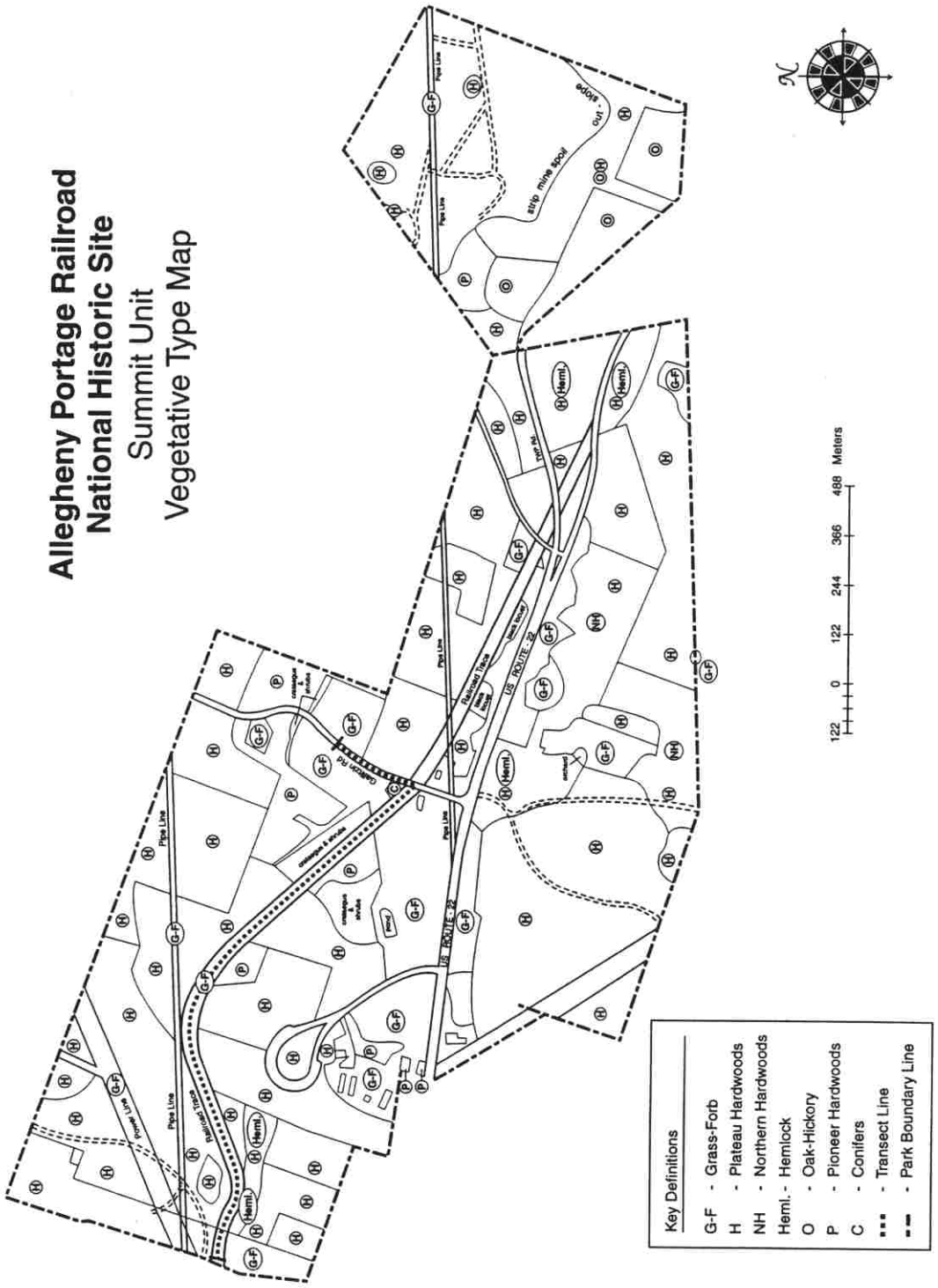


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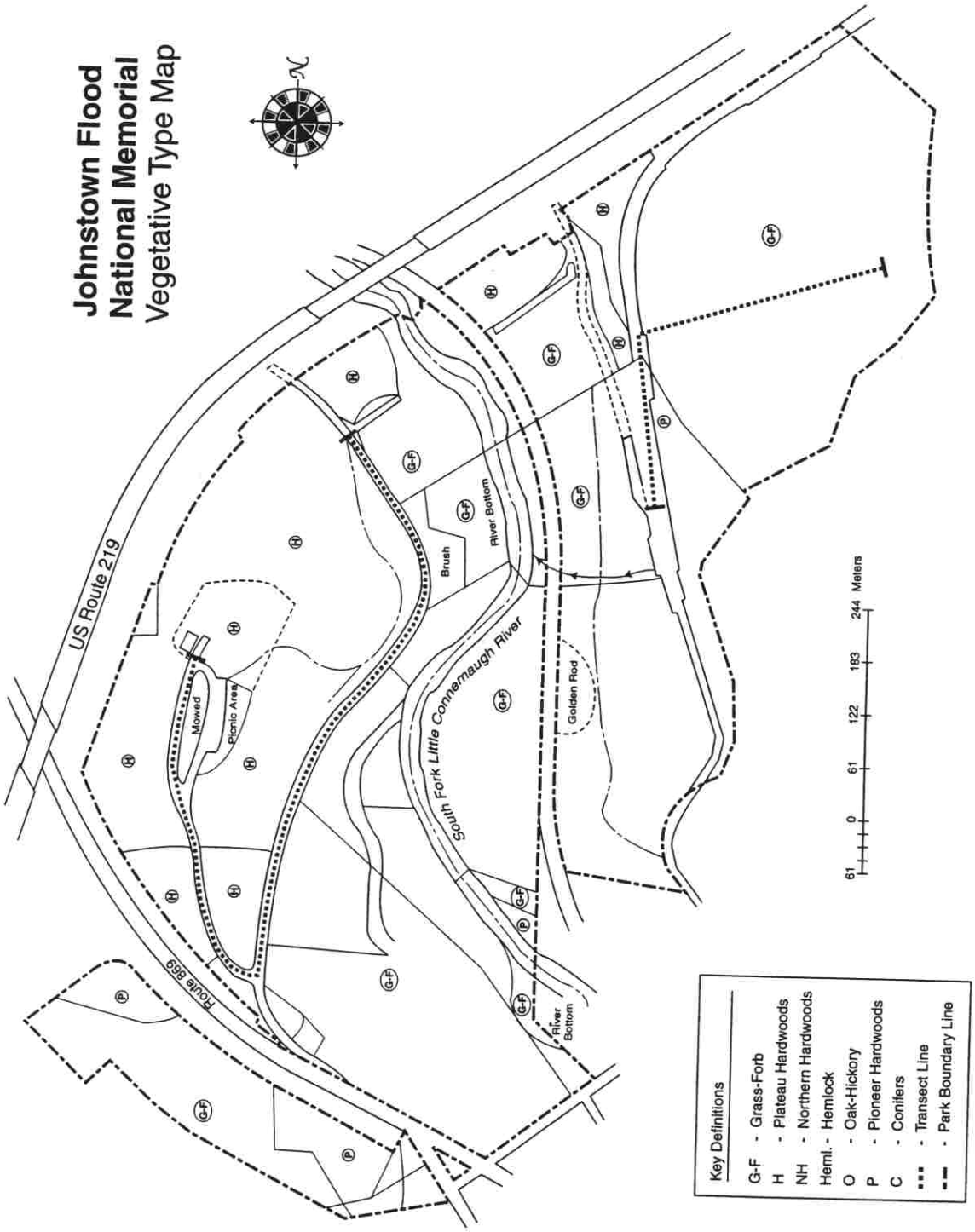


Fig. 4. Location of the JOFL transect at Johnstown Flood National Memorial.

Flowering-Plant Abundance Surveys

During each butterfly survey, we estimated abundance of flowering plants (i.e., species of plants in flower at time of the survey) as potential nectar sources. Flowering plants within 10 m perpendicular to each transect were identified to species and ranked as abundant, common, or uncommon in 100-m sections of each transect. Abundance rankings were converted to scores, where abundant species were scored as 3, common as 2, and uncommon as 1 (Yahner 1996c). Along a 1600-m transect, maximum abundance score for a flowering-plant species was 48 (16 x 3) per visit. Scores were divided by transect length to determine abundance scores for open and wooded habitat sections. Only flowering plants along a particular transect or during a given visit were noted for that transect. For example, if yarrow (scientific names are given in Appendix 1) were found flowering in four 100-m sections at JOFL, and if it were abundant (3) in two sections, common (2) in one section, and uncommon (1) in one section, the abundance score for yarrow at JOFL for one visit would be 9 (3 + 3 + 2 + 1). If yarrow were present but not flowering in a given section, it received a score of 0. Abundance scores were averaged over surveys and compared to butterfly abundance to determine important areas and nectar sources along each transect.

Bird Surveys

Birds were surveyed using the 50-m, fixed-width transect protocol (Emlen 1971, Conner and Dickson 1980, Franzreb 1981, Hutto and Mosconi 1981) during the spring migratory (1-25 May) and breeding (25 May-15 July) seasons in 1997. Transects were conducted four times each season at both ALPO and JOFL on days with no precipitation and wind less than 15 kph.

Following a 1-minute equilibrium period at the start of the transect, birds along each transect were surveyed by walking at a moderate pace (approximately 2-3 km/hr). Frequent stops were made to identify and record the species of each bird heard or seen. For each bird noted within 50 m of either side of the transect, the observer recorded its location along the transect and distance (m) perpendicular to the transect. Species observed more than 50 m from the transect were recorded but not included in analyses. Birds were surveyed in the morning (30 minutes after sunrise to 1100 hr). In addition, starting time and ending time, temperature (° C), wind velocity (kph), and percent cloud cover were maintained on a standardized data form. Scientific names of birds are given in Appendix 2.

Each bird observed within 50 m of the transect during the survey was mapped on park habitat maps drawn originally between 1980-82 by R. E. Melton. Maps (1:5000 scale for ALPO, 1:2500 for JOFL) were ground-truthed in 1998 to identify changes in habitat through succession or habitat modification. Total amounts of each habitat type for each park were calculated within 50 m of the transects using a transparent malar grid superimposed on park maps.

Results and Discussion

Butterflies

Allegheny Portage Railroad National Historic Site No. 9

We detected 309 individuals of 19 butterfly species along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) transect (Appendix 3). Most individuals (n = 293) and species (S = 19) were found in the open sections of the transect. Although the wooded habitat section was 1100 m in length, it contained a small fraction of the individuals (n = 16) and species (S = 6) compared to the open habitat section. We found an average of 58.6 individuals/100 m along the open habitat section and 1.45 individuals/100 m along the wooded habitat section. The five most abundant species along the open habitat section were pearl crescent (n = 68) (scientific names are given in Appendix 1), meadow fritillary (n = 59), European skipper (n = 51), dun skipper (n = 22), and silver-spotted skipper (n = 19). In contrast, the six most abundant species along the wooded habitat section were cabbage white (n = 4), tiger swallowtail (n = 4), spicebush swallowtail (n = 3), red-spotted purple (n = 2), silver-spotted skipper (n = 2), and great spangled fritillary (n = 2).

Allegheny Portage Railroad National Historic Site Visitors Center

We detected 130 individuals of 20 butterfly species along the Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transect (Appendix 3). Like ALPO No. 9, most of the transect was wooded (1200 m), but the wooded habitat section contained fewer species (S = 9) and individuals (n = 27) than the open habitat section (103 individuals of 18 species). We found 25.75 individuals/100 m along the open habitat section compared to 2.25 individuals/100 m along the wooded habitat section. In the open habitat section, the six most abundant species were silver-spotted skipper (n = 18), tiger swallowtail (n = 18), spring azure (n = 14), great spangled fritillary (n = 9), cabbage white (n = 7), and hobomok skipper (n = 7). The five most abundant species along the wooded habitat section were spring azure (n = 9), tiger swallowtail (n = 6), great spangled fritillary (n = 3), monarch (n = 3), and mourning cloak (n = 2).

Johnstown Flood National Memorial

We detected a total of 86 individuals (5.36 individuals/100 m) of 13 butterfly species at Johnstown Flood National Memorial (JOFL) (Appendix 3). The five most abundant species were European skipper (n = 36), cabbage white (n = 11), silver-spotted skipper (n = 9), tiger swallowtail (n = 7), northern pearly-eye (n = 5).

All Transects Combined

We compared species richness, total abundance, and relative abundance (number individuals/100 m) of butterflies for all five habitat sections (including the entire JOFL transect) using analyses-of-variance based on five visits to each transect (Appendices 4-8). Because of the short life span of butterflies and the length of time between visits (one month), visits were treated as independent samples. To account for large differences in variances among habitat sections, total abundance and relative abundance scores were transformed using logarithmic transformations (Neter et al. 1990, Sokal and Rohlf 1995).

We found significant differences in species richness ($p = 0.006$), total abundance ($p < 0.001$), and relative abundance ($p < 0.001$) among all habitat sections (Table 1). Sections of open habitat along both ALPO transects consistently had significantly higher numbers of species, individuals, and relative abundances than wooded habitat sections and the JOFL transect based on Tukey's pairwise comparisons. The JOFL transect, which had both open and wooded habitats, was intermediate between the open and wooded habitat sections.

Table 1. Mean (± SE) number of butterfly species, butterfly individuals, and individuals/100 m observed during five surveys in the open and wooded habitat sections of the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) and Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transects and Johnstown Flood National Memorial (JOFL) transect during summer 1998.

Transect	Number species	Number individuals (Log transformed)	Individuals/100 m (Log transformed)
ALPO No. 9 open	7.0 ± 2.55^{a}	1.69 ± 0.28^{a}	1.01 ± 0.28^{a}
ALPO No. 9 wooded	2.4 ± 1.32^{b}	0.42 ± 0.26^{b}	-0.34 ± 0.21^{b}
ALPO V. C. open	6.0 ± 2.00^{ab}	1.29 ± 0.16^{ac}	0.69 ± 0.16^{a}
ALPO V. C. wooded	3.0 ± 1.41^{b}	0.68 ± 0.24^{bc}	-0.40 ± 0.24^{b}
JOFL	5.4 ± 2.30^{ab}	1.09 ± 0.35^{c}	-0.11 ± 0.35^{b}
ANOVA	$F = 4.98$, df = 4, 20; $p = 0.006$	$F = 18.01$, df = 4, 20; $p < 0.001$	$F = 31.33$, df = 4, 20; $p < 0.001$

[abc] Habitat sections with the same superscript are not significantly different from each other.

Flowering-Plant Abundance

Allegheny Portage Railroad National Historic Site No. 9

We found 55 species of flowering plants (i.e., species of plants in flower at time of the survey) along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) transect (Appendix 9). The open habitat section contained 47 species and a relative abundance score (score/100 m) of 44.8, whereas the wooded habitat section contained 29 species and a relative abundance score of 8.26. Total abundance scores and relative abundance scores were consistently higher during each visit along the open versus wooded habitat sections (Table 2). The seven most abundant species along the open habitat section, based on abundance rankings (maximum score of 15 = 5 surveys x 3 for abundant) were goldenrod (4.2), ox-eye daisy (3.4), yarrow (2.8), crown-vetch (2.2), Queen Anne's lace (2.2), crooked-stemmed aster (2.0), and hairy woodmint (2.0) (Appendix 9). Along the wooded habitat section, the seven most abundant species were white snakeroot (0.91), yellow sweet-clover (0.73), garlic mustard (0.64), dame's rocket (0.55), goldenrod (0.55), spotted jewelweed (0.55), and aster (0.46).

Allegheny Portage Railroad National Historic Site Visitors Center

We detected 59 species of flowering plants along the Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transect (Appendix 9). The open habitat section contained 46 species and a relative abundance score (score/100 m) of 64.75. The wooded habitat section contained 27 species and a relative abundance score of 5.95. Except early in summer, total and relative abundance scores were considerably higher in open habitat (Table 2). Along the open habitat section, the nine most abundant species were crown-vetch (7.0), white clover (5.0), goldenrod (4.5), dame's rocket (3.5), ox-eye daisy (3.5), aster (3.0), black-eyed susan (2.75), Queen Anne's lace (2.75), and yarrow (2.5) (Appendix 9). The eight most abundant species along the wooded habitat section were common violet (0.91), goldenrod (0.58), dame's rocket (0.42), yellow wood-sorrel (0.42), dwarf ginseng (0.33), halberd-leaved violet (0.33), painted trillium (0.33), and aster (0.33).

Johnstown Flood National Memorial

We observed 72 species of flowering plants with a relative abundance score of 41.83 at Johnstown Flood National Memorial (JOFL) (Appendix 9). The eight most abundant species were crown-vetch (6.68), goldenrod (3.21), hairy woodmint (2.52), aster (2.39), yarrow (2.39), white clover (2.14), daisy fleabane (1.89), and ox-eye daisy (1.58).

Table 2. Total abundance score and relative abundance score (abundance score/100 m) for plants in flower detected during five visits in the open and wooded habitat sections along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) and Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transects and Johnstown Flood National Memorial (JOFL) transect during summer 1998.

Visit	ALPO No. 9 (open)	ALPO No. 9 (wooded)	ALPO V. C. (open)	ALPO V. C. (wooded)	JOFL
1	31 (6.2)	26 (2.36)	28 (7.0)	38 (3.17)	62 (3.875)
2	50 (10.0)	26 (2.36)	65 (16.25)	15 (1.25)	127 (7.94)
3	53 (10.6)	11 (1.0)	58 (14.5)	4 (0.33)	198 (12.38)
4	37 (7.4)	11 (1.0)	56 (14.0)	6 (0.5)	139 (8.69)
5	53 (10.6)	23 (2.09)	52 (13.0)	9 (0.75)	139 (8.69)

All Transects Combined

We compared total abundance scores and relative abundance scores (score/100 m) of flowering plants for all five habitat sections (open and wooded sections of the ALPO No. 9 and ALPO Visitors Center transects and the JOFL transect) using analyses-of-variance based on five visits to each transect. Because of large differences in variances among transects, total abundance and relative abundance scores were transformed using logarithmic transformations (Neter et al. 1990).

We found significant differences in total abundance scores ($p < 0.001$) and relative abundance scores ($p < 0.001$) among all habitat sections (Table 3). As with butterflies, open habitats sections along both ALPO transects consistently had significantly higher total and relative abundance scores than wooded habitat sections based on Tukey's pairwise comparisons. The JOFL transect had the highest total abundance scores but was intermediate between wooded and open habitat sections based on relative abundance scores.

Nectar Sources Used by Butterflies

We observed 200 butterfly individuals using 27 nectar sources during five surveys at all parks combined (Table 4). The seven most commonly used nectar sources were Indian hemp (n = 69 butterfly observations), hairy woodmint (n = 16), crown-vetch (n = 14), heal-all (n = 13), rough hawkweed (n = 12), ox-eye daisy (n = 11), and raspberry (n = 11). The eight most common butterfly species detected using nectar sources were European skipper (n = 68 butterfly observations), silver-spotted skipper (n = 32), meadow fritillary (n = 30), dun skipper (n = 19), pearl crescent (n = 16), great spangled fritillary (n = 8), spring azure (n = 5), and tiger swallowtail (n = 5).

Butterfly Discussion

These results indicate the importance of maintaining open, unmowed habitats for butterfly species. Although wooded habitat sections comprised more than twice as much area as open habitat sections along both ALPO transects, we observed half of the species richness compared to open habitat sections and consistently provided habitat for significantly fewer individuals. Even though JOFL had extensive open habitat and relatively high abundance scores for flowering plants, relative abundance of butterflies was significantly lower than in open habitats along the ALPO transects. This may be due to the location of the transect at JOFL along park roads; Yahner (1996c) found significantly lower species richness and total abundance along road edges compared to forest, woodlot, and hedgerow edges. Future research at JOFL should be conducted away from roads if possible.

Table 3. Mean (± SE) abundance scores (log) and relative abundance (log abundance score/100 m) for plants in flower detected during five surveys along the open and wooded habitat sections along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) and Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transects and Johnstown Flood National Memorial (JOFL) transect during summer 1998.

Transect	Flowering plant abundance scores	Abundance scores/100m
ALPO No. 9 open	1.64 ± 0.11^{ab}	0.94 ± 0.11^{a}
ALPO No. 9 wooded	1.25 ± 0.20^{ac}	0.21 ± 0.20^{b}
ALPO V. C. open	1.70 ± 0.14^{bd}	1.10 ± 0.14^{b}
ALPO V. C. wooded	1.02 ± 0.37^{c}	-0.06 ± 0.38^{b}
JOFL	2.10 ± 0.19^{d}	0.89 ± 0.19^{a}
ANOVA	$F = 17.55$, $df = 4, 20$; $p < 0.001$	$F = 25.92$, $df = 4, 20$; $p < 0.001$

[abcd] Sections with the same superscript are not significantly different from each other.

Table 4. Nectar sources used by butterflies, butterfly species, and, in parentheses, number of individual butterflies observed using a given nectar source for all transects and all surveys combined during summer 1998.

Nectar Source	Butterflies Species	Total Butterfly Individuals
Indian Hemp	Meadow Fritillary (26), Silver-spotted Skipper (14), European Skipper (13), Dun Skipper (7), Pearl Crescent (3), Great Spangled Fritillary (2), Spring Azure (1), Pearl Crescent (1), Hobomok Skipper (1), Common Woodnymph (1)	69
Hairy Woodmint	European Skipper (10), Dun Skipper (5), Horace's Duskywing (1)	16
Crown-vetch	European Skipper (11), Silver-spotted Skipper (3)	14
Heal-all	European Skipper (8), Dun Skipper (5)	13
Rough Hawkweed	European Skipper (10), Spring Azure (1), Hobomok Skipper (1)	12
Ox-eye Daisy	Pearl Crescent (8), Great Spangled Fritillary (1), European Skipper (1), Dun Skipper (1)	11
Raspberry	Silver-spotted Skipper (9), Spring Azure (2)	11
Goldenrod	Meadow Fritillary (4), Monarch (3), Pearl Crescent (1)	8
Rough-fruited Cinquefoil	European Skipper (7), Cabbage White (1)	8
Viper's Bugloss	European Skipper (6), Silver-spotted Skipper (1)	7
Teasel	Tiger Swallowtail (3), Silver-spotted Skipper (2)	5
Daisy Fleabane	Pearl Crescent (3), European Skipper (1),	4
Butterfly-weed	Great Spangled Fritillary (3)	3
Mountain Laurel	Tiger Swallowtail (1), Peck's Skipper (1), Silver-spotted Skipper (1)	3
Bladder Campion	Hobomok Skipper (1), Silver-spotted Skipper (1)	2
Musk Mallow	Peck's Skipper (1), Silver-spotted Skipper (1)	2
White Aster	Cabbage White (1), Tiger Swallowtail (1)	2
Birdsfoot Trefoil	Spring Azure (1)	1
Common Fleabane	Hobomok Skipper (1)	1
Dame's Rocket	Cabbage White (1)	1

Table 4 cont.

Downy Woodmint	Horace's Duskywing (1)	1
Flowering Woody Shrub	Common Woodnymph (1)	1
Rough Cinquefoil	European Skipper (1)	1
Sweet Joe Pye-weed	Great Spangled Fritillary (1)	1
White Clover	Wood Satyr (1)	1
Wild Bergamot	Great Spangled Fritillary (1)	1
Yarrow	Dun Skipper (1)	1
Total Number Nectar Sources		27
Total Number Butterflies		200

Birds

Spring Migration

Allegheny Portage Railroad National Historic Site No. 9: We detected a total of 260 individuals (65.0/survey) of 61 bird species during four spring migration surveys along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) transect (Appendix 10). The eight most abundant species (given as number per survey) were red-eyed vireo (10.5), ovenbird (5.75), American redstart (4.75), scarlet tanager (3.0), Louisiana waterthrush (2.25), blue-gray gnatcatcher (2.0), common yellowthroat (2.0), and northern cardinal (2.0). Most individuals and species were long-distance migrants (165 individuals of 33 species). Permanent residents (40 individuals of 14 species) and short-distance migrants (55 individuals of 14 species) comprised smaller proportions of the total avian community.

We found differences in relative abundance (no. individuals/ha) of birds among habitats along the ALPO No. 9 transect (Table 5). In particular, permanent residents were more abundant in grass/forb habitat; however, there was little difference in total, short-distance migrant, and long-distance migrant abundances based on habitat. In addition, although less than 15% of habitat along the transect was grass/forbs (Table 6), we found little difference in the number of permanent resident species. Long-distance migratory abundance was highest in northern hardwoods (3.16/ha), followed by grass/forbs (1.81/ha) and pioneer hardwoods (1.66/ha) (Table 5).

Allegheny Portage Railroad National Historic Site Visitors Center: We found a total of 153 individuals (38.25/survey) of 43 species along the Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transect during spring migration (Appendix 10). The seven most abundant species (no./survey) were black-throated green warbler (3.50), brown-headed cowbird (3.50), ovenbird (2.75), chipping sparrow (2.75), American redstart (2.0), American goldfinch (1.75), and magnolia warbler (1.50). Permanent residents were relatively uncommon (25 individuals of 7 species), whereas long-distance migrants (76 individuals of 21 species) and short-distance migrants (52 individuals of 15 species) composed the majority of species and individuals.

We found a difference in relative abundance (no. individuals/ha) of short-distance migrants among habitats along the ALPO Visitors Center transect (Table 7). Grass/forb habitat contained the highest average number of short-distance migrants (2.06/ha), followed by shrubs (1.57/ha) and pioneer hardwood (1.28/ha). However, there was no difference in relative abundance of permanent residents or long-distance migrants. Although pioneer-hardwood and shrub habitats contained a higher number of long-distance migrants compared to other habitats, there was considerable variation among surveys. Although plateau hardwoods comprised nearly three times as much habitat as grass/forbs (Table 6), grass/forb habitat contained an average of twice as many short-distance migrants compared to plateau-hardwood habitat.

Table 5. Mean (± SE) number of species (S) and relative abundance (no. individuals/ha) (n) of all birds and of permanent residents (PR), short-distance migrants (SM), and long-distance migrants (LM) observed in three habitats during four surveys along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) transect during the 1997 spring migration season.

Transect	Total S	Total n	PR S	PR n	SM S	SM n	LM S	LM n
Northern Hardwood	17.0 ± 4.97	4.71 ± 2.06	3.0 ± 1.41	0.49 ± 0.32	4.0 ± 2.83	1.05 ± 1.08	10.0 ± 1.82	3.16 ± 1.18
Pioneer Hardwood	12.25 ± 6.45	2.49 ± 1.51	2.5 ± 1.0	0.41 ± 0.19	2.25 ± 1.71	0.41 ± 0.34	7.5 ± 4.44	1.66 ± 1.14
Grass/Forbs	7.0 ± 2.83	3.92 ± 2.00	2.75 ± 0.96	1.15 ± 0.44	1.75 ± 2.06	0.95 ± 1.15	2.5 ± 1.73	1.81 ± 2.12

Table 6. Number of hectares (ha) of each habitat type and, in parentheses, percent of total habitat, within 50 m of each transect along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) and Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transects and Johnstown Flood National Memorial (JOFL) transect. Habitats include plateau hardwood, northern hardwood, pioneer hardwood, coniferous forest, hemlock, shrub, early-successional, grass/forbs, river, and road. Total habitat available along each transect is 16 ha. Plateau hardwood along the ALPO No. 9 transect, coniferous forest along the ALPO Visitors Center (V. C.) transect, and road and river habitats along the JOFL transect were not used in analysis because they totaled less than 5% of the habitat.

	Plateau	Northern	Pioneer	Conifer	Hemlock	Shrub	Early Success.	Grass/ Forbs	River	Road
ALPO No. 9	0.32 (2.0%)	6.82 (42.6%)	6.51 (40.7%)	**	**	**	**	2.35 (14.7%)	**	**
ALPO V. C.	8.96 (56.0%)	**	1.41 (8.8%)	0.11 (0.7%)	0.9 (5.6%)	1.44 (9.0%)	**	3.18 (19.9%)	**	**
JOFL	6.61 (41.3%)	**	1.70 (10.6%)	**	**	**	3.39 (21.2%)	3.78 (23.6%)	0.16 (1.0%)	0.37 (2.3%)

Table 7. Mean (± SE) number of species (S) and relative abundance (no. individuals/ha) (n) of all birds and of permanent residents (PR), short-distance migrants (SM), and long-distance migrants (LM) observed in five habitats during four surveys along the Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transect during the 1997 spring migration season.

Transect	Total S	Total n	PR S	PR n	SM S	SM n	LM S	LM n
Plateau Hardwood	9.25 ± 5.56	1.29 ± 1.12	1.25 ± 1.50	0.13 ± 0.15	2.0 ± 1.41	0.25 ± 0.24	6.0 ± 2.94	0.91 ± 0.76
Pioneer Hardwood	4.0 ± 2.94	3.69 ± 2.74	0.25 ± 0.50	0.32 ± 0.64	1.25 ± 1.26	1.28 ± 1.38	2.5 ± 1.92	2.08 ± 1.42
Hemlock	1.0 ± 1.41	1.0 ± 1.41	0.25 ± 0.50	0.25 ± 0.50	0.0 ± 0.0	0.0 ± 0.0	0.75 ± 0.96	0.75 ± 0.96
Shrubs	4.75 ± 2.97	3.78 ± 2.67	0.50 ± 0.58	0.31 ± 0.36	1.75 ± 0.50	1.57 ± 1.09	2.5 ± 2.38	1.88 ± 1.99
Grass/Forbs	6.75 ± 1.71	3.41 ± 1.21	1.75 ± 1.26	1.07 ± 0.75	4.0 ± 0.82	2.06 ± 1.10	1.0 ± 0.82	0.28 ± 0.23

Johnstown Flood National Memorial: We detected more individuals (351 individuals, 87.75/survey) and species (67 species) during four surveys along the Johnstown Flood National Memorial (JOFL) transect than at either of the ALPO transects (Appendix 10). The eight most abundant species (no./survey) were red-winged blackbird (13.75), chimney swift (5.0), yellow warbler (4.5), chestnut-sided warbler (4.0), song sparrow (4.0), American goldfinch (3.75), indigo bunting (3.5), and common yellowthroat (3.0). As with the transects at ALPO, we found more long-distance migrants (149 individuals of 34 species) than either permanent residents (66 individuals of 14 species) or short-distance migrants (36 individuals of 19 species).

Total abundance (no. individuals/ha) varied among habitats along the JOFL transect (Table 8). Like at ALPO Visitors Center, there were high levels of variation in abundance within each migratory group during visits. Total abundance was highest in early successional habitat (7.79/ha), followed by plateau hardwood (5.57/ha) and grass/forbs (5.01/ha). Short-distance migrants were most abundant in grass/forb habitat (3.96/ha), and long-distance migrants were most abundant in early successional (3.52/ha) and plateau-hardwood (3.42/ha) habitats. Average species richness of short-distance migrants was highest in early successional habitat (5.0) even though plateau hardwood comprised twice as much habitat (Table 6). We found an average of 14.0 species of long-distance migrants in plateau hardwoods, more than three times as many as in early successional habitat and more than 14 times as many as in pioneer hardwood and grass/forbs; plateau hardwood comprised 41.3% of the total habitat.

Breeding Season

Allegheny Portage Railroad National Historic Site No. 9: We detected a total of 187 individuals (46.75/survey) of 37 bird species during four breeding-season surveys along this transect (Appendix 11). The eight most abundant species (given as number per survey) were red-eyed vireo (10.5), ovenbird (4.75), chipping sparrow (3.0), indigo bunting (2.25), black-capped chickadee (2.0), scarlet tanager (1.75), song sparrow (1.75), and wood thrush (1.5). Most individuals and species were long-distance migrants (110 individuals of 17 species), followed by permanent residents (45 individuals of 12 species), and short-distance migrants (32 individuals of eight species).

We found differences in relative abundance (no. individuals/ha) of permanent residents and long-distance migrants among habitats along the ALPO No. 9 transect (Table 9). As with the spring migratory season, grass/forb habitat contained higher abundance of permanent residents (1.43/ha) compared to northern hardwood (0.66/ha) and pioneer hardwood (0.28/ha). In contrast, abundance of long-distance migrants was twice as high in northern hardwood (2.17) than in pioneer hardwood (1.14/ha) and four times as high than in grass/forbs (0.57/ha). Although less than 15% of habitat along the transect was grass/forbs (Table 6), we found little difference in the number of short-distance migrants compared to other habitats.

Table 8. Mean (± SE) number of species (S) and relative abundance (no. individuals/ha) (n) of all birds and of permanent residents (PR), short-distance migrants (SM), and long-distance migrants (LM) observed in four habitats during four surveys along the Johnstown Flood National Memorial (JOFL) transect during the 1997 spring migration season.

Transect	Total S	Total n	PR S	PR n	SM S	SM n	LM S	LM n
Plateau Hardwood	22.25 ± 6.13	5.57 ± 0.82	4.25 ± 2.22	0.81 ± 0.34	4.0 ± 0.82	1.34 ± 0.70	14.0 ± 5.35	3.42 ± 1.21
Pioneer Hardwood	2.0 ± 1.41	2.55 ± 2.36	0.5 ± 0.58	0.45 ± 0.57	0.5 ± 0.57	1.5 ± 2.27	1.0 ± 0.82	0.6 ± 0.49
Early Successional	11.5 ± 2.64	7.79 ± 3.21	2.5 ± 0.58	1.87 ± 0.96	5.0 ± 0.82	2.4 ± 0.95	4.0 ± 2.71	3.52 ± 3.89
Grass/Forbs	5.5 ± 1.73	5.01 ± 1.47	1.25 ± 1.26	0.8 ± 0.95	3.75 ± 1.71	3.96 ± 1.72	0.5 ± 0.58	0.36 ± 0.40

Table 9. Mean (± SE) number of species (S) and relative abundance (no. individuals/ha) (n) of all birds and of permanent residents (PR), short-distance migrants (SM), and long-distance migrants (LM) observed in three habitats during four surveys along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) transect during the 1997 breeding season.

Transect	Total S	Total n	PR S	PR n	SM S	SM n	LM S	LM n
Northern Hardwood	13.75 ± 1.71	3.2 ± 0.5	4.0 ± 1.16	0.66 ± 0.22	2.0 ± 0.82	0.36 ± 0.22	7.75 ± 0.5	2.17 ± 0.41
Pioneer Hardwood	9.0 ± 4.4	1.97 ± 0.81	1.75 ± 2.06	0.28 ± 0.32	2.75 ± 1.71	0.55 ± 0.44	4.5 ± 1.92	1.14 ± 0.41
Grass/Forbs	4.75 ± 2.63	2.67 ± 1.56	2.0 ± 0.82	1.43 ± 0.79	1.75 ± 1.5	0.67 ± 0.57	1.0 ± 0.82	0.57 ± 0.49

Allegheny Portage Railroad National Historic Site Visitors Center: We found a total of 152 individuals (38.0/survey) of 33 species along the Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transect during four breeding-season surveys (Appendix 11). The nine most abundant species (no./survey) were red-eyed vireo (7.75), ovenbird (3.75), chipping sparrow (2.75), black-throated green warbler (1.75), brown-headed cowbird (1.75), blue-headed vireo (1.5), American redstart (1.5), indigo bunting (1.5), and song sparrow (1.5). Few permanent residents (15 individuals of 7 species) were detected, whereas long-distance migrants (93 individuals of 15 species) and short-distance migrants (44 individuals of 11 species) composed the majority of individuals and species.

We detected a difference in relative abundance (no. individuals/ha) of total individuals, permanent residents, and short-distance migrants among habitats along the ALPO Visitors Center transect (Table 10). Grass/forb habitat contained the highest average number of total individuals (4.26/ha), permanent residents (0.71/ha), and short-distance migrants (2.41/ha). In contrast, long-distance migrants were more abundant in shrubs (1.89/ha) and pioneer hardwoods (1.76/ha). Although plateau hardwoods comprised nearly three times as much habitat as grass/forbs (Table 6), grass/forb habitat contained more species of each group except long-distance migrants compared to plateau-hardwood habitat.

Johnstown Flood National Memorial: As with spring migration surveys, we detected more individuals (269 individuals, 67.25/survey) and species (43 species) during four surveys along the Johnstown Flood National Memorial (JOFL) transect during the breeding season than at either of the ALPO transects (Appendix 11). The 10 most abundant species (no./survey) were red-winged blackbird (6.5), song sparrow (6.25), red-eyed vireo (4.75), indigo bunting (4.75), common yellowthroat (4.5), American robin (3.75), chestnut-sided warbler (2.75), eastern towhee (2.75), yellow warbler (2.5), and American goldfinch (2.5). However, unlike all other surveys during spring migration and breeding seasons, we found more short-distance migrant individuals (107 individuals of 14 species) and more permanent resident species (73 individuals of 17 species) than long-distance migrants (89 individuals of 12 species).

We found differences in relative abundance (no. individuals/ha) for each migratory group along the JOFL transect (Table 11). Abundance of permanent residents was highest in early successional habitat (2.25/ha), followed by plateau hardwood (1.08/ha) and grass/forbs (0.8/ha). Plateau hardwood contained less than one third of the abundance of short-distance migrants but more long-distance migrants compared to other habitats. Average species richness of short-distance migrants was highest in early successional habitat (5.5) even though plateau hardwood comprised twice as much habitat (Table 6). We found an average of 5.5 species of long-distance migrants in plateau hardwoods, more than twice as many as in other habitats.

Table 10. Mean (± SE) number of species (S) and relative abundance (no. individuals/ha) (n) of all birds and of permanent residents (PR), short-distance migrants (SM), and long-distance migrants (LM) observed in five habitats during four surveys along the Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transect during the 1997 breeding season.

Transect	Total S	Total n	PR S	PR n	SM S	SM n	LM S	LM n
Plateau Hardwood	7.5 ± 1.0	1.36 ± 0.33	1.25 ± 0.5	0.13 ± 0.05	1.25 ± 1.25	0.18 ± 0.17	5.0 ± 1.15	1.06 ± 0.34
Pioneer Hardwood	3.0 ± 1.16	2.24 ± 0.64	0.0 ± 0.0	0.0 ± 0.0	0.75 ± 0.5	0.48 ± 0.32	2.25 ± 0.96	1.76 ± 0.81
Hemlock	0.75 ± 0.96	0.75 ± 0.96	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.75 ± 0.96	0.75 ± 0.96
Shrubs	3.5 ± 1.29	2.52 ± 0.88	0.0 ± 0.0	0.0 ± 0.0	1.0 ± 0.82	0.63 ± 0.51	2.5 ± 0.58	1.89 ± 0.51
Grass/Forbs	10.25 ± 2.63	4.26 ± 1.35	1.75 ± 0.96	0.71 ± 0.28	5.75 ± 0.96	2.41 ± 0.68	2.75 ± 0.96	1.14 ± 0.52

Table 11. Mean (± SE) number of species (S) and relative abundance (no. individuals/ha) (n) of all birds and of permanent residents (PR), short-distance migrants (SM), and long-distance migrants (LM) observed in four habitats during four surveys along the Johnstown Flood National Memorial (JOFL) transect during the 1997 breeding season.

Transect	Total S	Total n	PR S	PR n	SM S	SM n	LM S	LM n
Plateau Hardwood	13.5 ± 1.0	3.88 ± 0.55	5.0 ± 1.41	1.08 ± 0.73	3.0 ± 0.82	0.81 ± 0.19	5.5 ± 1.29	2.0 ± 0.65
Pioneer Hardwood	3.0 ± 1.41	3.44 ± 1.33	0.0 ± 0.0	0.0 ± 0.0	2.0 ± 0.82	2.54 ± 0.57	1.0 ± 1.15	0.9 ± 1.15
Early Successional	9.0 ± 2.0	6.14 ± 2.19	2.75 ± 0.96	2.25 ± 1.13	3.5 ± 1.73	2.25 ± 0.86	2.75 ± 0.5	1.65 ± 0.93
Grass/Forbs	9.0 ± 3.56	4.02 ± 1.74	2.0 ± 0.82	0.8 ± 0.58	5.5 ± 2.38	2.61 ± 1.57	1.5 ± 1.0	0.6 ± 0.4

Bird Discussion

During spring migration, we found little difference in relative abundance among habitats, particularly for long-distance migrants. Most likely, this is due to very high levels of variance among visits. Surprisingly, long-distance migrants were abundant in a variety of habitats during spring migration, including northern, plateau, and pioneer hardwood, early successional, and shrubs. Although there was little difference in migrant abundance, habitats were dominated by different species. In particular, plateau- and northern-hardwood habitats, especially at JOFL, contained an assemblage of interior-forest species (e.g., acadian flycatcher, ovenbird, scarlet tanager) and dominated by warblers. In contrast, grass/forbs habitat was dominated by open-field (e.g., barn and tree swallows, chimney swift) and edge (e.g., warbling vireo, chestnut-sided warbler, indigo bunting) species along all transects. Shrub, early-successional, and pioneer-hardwood habitats at each park were intermediate in species composition and contained a variety of flycatchers, thrushes, vireos, warblers, grosbeaks, and tanagers.

We found similar patterns during the breeding season at all parks. Only one transect, ALPO No. 9, exhibited differences in long-distance migrant abundance, but habitats were dominated by different species. As with the spring migration, northern and plateau hardwoods contained the greatest number of migrants, and grass/forbs contained typical edge species. However, pioneer-hardwood, early-successional, and shrub habitats were not used by long-distance migrants as much during the breeding season as they were during spring migration. This seasonal difference may be due to the constraints of breeding, such as nest-site selection, brood parasitism, and nest predation.

Differences in species richness and abundance among transects during the spring migration and breeding seasons may have been due to differences in detectability, elevation, or habitat diversity. We found the highest number of species during both seasons at JOFL, followed by ALPO No. 9, and ALPO Visitors Center. Because the JOFL transect contained large amounts of open habitat compared to other transects, differences in species richness and abundance may have been due to differences in detection of species among habitats. In contrast, species may have been less conspicuous in closed habitats, particularly in forested habitats along the ALPO Visitors Center transect. However, because birds were more often observed by song rather than by sight, and because we limited our analysis to birds observed within 50 m, it is unlikely that differences in species richness and abundance were due to differences in detectability among habitats and transects.

Although ALPO Visitors Center had a variety of habitats, the majority of habitat (62.3%) was high elevation contiguous forest (i.e., plateau hardwood, coniferous forest, and hemlock), and the remaining habitat (pioneer hardwood, shrubs, and grass/forbs) was contained in one large patch. In contrast, the transect at JOFL traversed a variety of small habitat patches, including an early-successional/forest edge, where migrants were concentrated during spring migration. Large patches of habitat are important to breeding forest-interior bird species, particularly long-distance migrants such as wood thrush, black-throated green warbler, and ovenbird, but these large

patches do not necessarily contain the largest number of species. The interspersion of habitat patches at JOFL likely resulted in the observed higher number of species compared to the other transects. In addition to the early-successional and edge species, this mixture of habitats attracted a large number of migratory transients during spring migration.

Conclusions and Recommendations

This study illustrates the compatibility of managing for two aesthetic taxonomic groups on public lands. Because of the size and location of JOFL, management for forest-interior birds should not be the primary objective. Given the large amounts of early-successional and grass/forb habitat and the abundance of flowering-plant species at the park, management efforts should focus on populations of grassland (e.g., eastern meadowlark, bobolink, grasshopper sparrow) and early-successional (e.g., yellow-breasted chat, eastern towhee) bird species, many of which are declining. In addition, efforts should be made to develop mowed lawns into unmowed grasslands to increase the use by butterfly species by providing a permanent sources of wildflowers (nectar sources). These grasslands should remain unmowed through September to accommodate migratory butterflies (e.g., monarch) and birds. Areas that should be the focus of these efforts are the lawns and grasslands adjacent to the visitors center and the early-successional habitat along the river.

Given the larger size of ALPO (500 ha versus 63 ha for JOFL) and the abundance of forest habitat, emphasis could be placed on all taxa with special focus on forest-interior species. Large patches of forest, such as plateau hardwood along the ALPO Visitors Center transect (Fig. 3), contained a large portion of the documented forest-interior species, such as acadian flycatcher, eastern wood-pewee, black-throated green warbler, and ovenbird. Additionally, given the large patches of grass/forbs near the visitors center, near the Lemon House, and from 400 to 800 m and 1500-1699 m along the ALPO No. 9 transect, management opportunities exist to increase butterfly species use and early-successional bird species use of these habitats (Fig. 2). Given the abundance of nectar sources and the abundance of butterflies using these open habitats, efforts to inventory and monitor butterfly populations should be concentrated at these and similar sites throughout the park. As in JOFL, grasslands should remain unmowed through September to accommodate migratory butterflies and birds.

In conclusion, additional inventorying and monitoring of birds should be conducted at the parks to increase the number of documented species. Particular emphasis should be placed on migratory and winter seasons to increase the number of documented rare transients (e.g., olive-sided flycatcher, orange-crowned warbler, Connecticut warbler) and irruptive species (red-breasted nuthatch, common redpoll, and evening grosbeak) using the parks as stopover or wintering habitat. Additional inventorying and monitoring of butterflies should be conducted following minor habitat modification to increase open and unmowed habitats at the parks.

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Appendix 1. Common and scientific names of butterfly, skipper, and plant species presented in the text (Gleason and Cronquist 1963, Peterson and McKenny 1968, Rhoads and Klein 1993, NABA 1995, Cassie et al. 1995).

Butterfly Species:	
American Copper	*Lycaena phlaeas*
American Lady	*Vanessa virginiensis*
Black Swallowtail	*Papilio polyxenes*
Cabbage White	*Pieris rapae*
Common Wood-nymph	*Cercyonis pegala*
Dreamy Duskywing	*Erynnis icelus*
Dun Skipper	*Euphyes vestris*
Eastern-tailed Blue	*Everes comyntas*
Eastern Tiger Swallowtail	*Papilio glaucus*
European Skipper	*Thymelicus lineola*
Great Spangled Fritillary	*Speyeria cybele*
Hobomok skipper	*Poanes hobomok*
Horace's Duskywing	*Erynnis haratius*
Juvenal's Duskywing	*Erynnis juvenalis*
Least Skipper	*Ancyloxypha numitor*
Little Wood Satyr	*Megisto cymela*
Meadow Fritillary	*Boloria bellona*
Monarch	*Danaus plexippus*
Mourning Cloak	*Nymphalis antiopa*
Northern Pearly-eye	*Enodia anthedon*
Orange Sulphur	*Colias eurytheme*
Pearl Crescent	*Phyciodes tharos*
Peck's Skipper	*Polites peckius*
Question Mark	*Polygonia interrogationis*
Red-spotted Purple	*Limenitis arthemis*
Silver-spotted Skipper	*Epargyreus clarus*
Spicebush Swallowtail	*Papilio troilus*
Spring Azure	*Celastrina ladon*

Appendix 1 cont.

Plant Species:	
Agrimony	*Agrimonia spp.*
Alfalfa	*Medicago sativa*
Aster	*Aster spp.*
Barren Strawberry	*Waldsteinia fragarioides*
Birdsfoot Trefoil	*Lotus corniculatus*
Bittersweet Nightshade	*Solanum dulcamara*
Blackberry	*Rubus spp.*
Black Cohosh	*Cimicifuga racemosa*
Black-eyed Susan	*Rudbeckia hirta*
Bladder Campion	*Silene vulgaris*
Blue Lettuce	*Lactuca biennis*
Blue Vervain	*Verbena hastata*
Blue-eyed Grass	*Sisyrinchium angustifolium*
Butter-and-eggs	*Linaria vulgaris*
Buttercup	*Ranunculus spp.*
Butterfly-weed	*Asclepias tuberosa*
Celandine	*Chelidonium majus*
Chickweed	*Stellaria corei*
Cleaver	*Galium spp.*
Climbing False Buckwheat	*Polygonum scandens*
Common Burdock	*Arctium minus*
Common Evening Primrose	*Oenothera biennis*
Common Fleabane	*Erigeron philadelphicus*
Common Milkweed	*Asclepias syriaca*
Common Saint Johnswort	*Hypericum perforatum*
Common Stitchwort	*Stellaria graminea*
Common Violet	*Viola sororia*
Cow Cress	*Lepidium virginicum*
Crooked-stemmed Aster	*Aster prenanthoides*
Crown-vetch	*Coronilla varia*
Daisy Fleabane	*Erigeron annuus*
Dame's Rocket	*Hesperis matronalis*
Dandelion	*Taraxacum officinale*
Deptford Pink	*Dianthus armeria*
Downy Woodmint	*Blephilia ciliata*
Dwarf Ginseng	*Panax trifolius*
Elderberry	*Sambucus canadensis*

Appendix 1 cont.

Flat-topped White Aster	*Aster infirmus*
Fleabane	*Conyza spp.*
Flowering woody shrub	
Fringed Polygala	*Polygala paucifolia*
Fringed Loosestrife	*Lysimachia ciliata*
Garden Phlox	*Phlox paniculata*
Garlic Mustard	*Alliaria petiolata*
Goldenrod	*Solidaga spp.*
Ground Ivy	*Glechoma hederacea*
Hairy Woodmint	*Blephilia hirsuta*
Halberd-leaved Violet	*Viola hastata*
Hawthorn	*Crataegus spp.*
Heal-all	*Prunella vulgaris*
Hedge Bindweed	*Calystegia sepium*
Honewort	*Cryptotaenia canadensis*
Indian Hemp	*Apocynum cannabinum*
Japanese Honeysuckle	*Lonicera japonica*
Kidney-leafed Buttercup	*Ranunculus abortivus*
Lesser Stitchwort	*Stellaria graminea*
Lilac	*Syringa vulgaris*
Mayapple	*Podophyllum peltatum*
Mayweed	*Anthemis cotula*
Moneywort	*Lysimachia nummularia*
Mountain Azalea	*Rhododendron prinophyllum*
Mountain Laurel	*Kalmia latifolia*
Mullein	*Verbascum spp.*
Multiflora Rose	*Rosa multiflora*
Musk Mallow	*Malva moschata*
New England Aster	*Aster novae-angliae*
Ox-eye Daisy	*Chrysanthemum leucanthemum*
Painted Trillium	*Trillium undulatum*
Pale Jewelweed	*Impatiens pallida*
Pennsylvania Bittercress	*Cardamine pensylvanica*
Pokeweed	*Phytolacca americana*
Purple Dead Nettle	*Lamium purpureum*
Purple-leaved Willow-herb	*Epilobium coloratum*
Queen Anne's Lace	*Daucus carota*
Raspberry	*Rubus spp.*

Red Clover	*Trifolium pratense*
Rough Cinquefoil	*Potentilla norvegica*
Rough Hawkweed	*Hieracium scabrum*
Rough-fruited Cinquefoil	*Potentilla recta*
Seedbox	*Ludwigia alternifolia*
Smaller Hop Clover	*Trifolium campestre*
Smartweed	*Polygonum pensylvanicum*
Smooth Yellow Violet	*Viola eriocarpa*
Spotted Jewelweed	*Impatiens capensis*
Spotted Knapweed	*Centaurea maculosa*
Square-stemmed Monkeyflower	*Mimulus ringens*
Swamp Dewberry	*Rubus hispidus*
Sweet Joe-pye-weed	*Eupatorium purpureum*
Sweet White Violet	*Viola blanda*
Tall Cinquefoil	*Potentilla arguta*
Tartarian Honeysuckle	*Lonicera tatarica*
Teasel	*Dipsacus sylvestris*
Thistle	*Carduus spp.*
Viper's Bugloss	*Echium plantagineum*
White Avens	*Geum canadense*
White Clover	*Trifolium repens*
White Snakeroot	*Eupatorium rugosum*
Whorled Loosestrife	*Lysimachia quadrifolia*
Wild Bergamot	*Monarda fistulosa*
Wild Lily-of-the-valley	*Pyrola americana*
Wild Strawberry	*Fragaria virginiana*
Wild Yellow Lily	*Lilium canadense*
Winter-cress	*Barbarea vulgaris*
Yarrow	*Achillea millefolium*
Yellow Goat's-beard	*Tragopogon pratensis*
Yellow Sweet-clover	*Melilotus officinalis*
Yellow Wood-sorrel	*Oxalis strict*

Appendix 2. Common and scientific names, residency status (PR = permanent resident, SD = short-distance migrant, LD = long-distance migrant), and legal status (SE = State Endangered, ST = State Threatened, CR = Candidate Rare, NN = non-native, GM = game species, X = extirpated breeding species, and P = protected) of bird species presented in the text.

Common Name	Scientific Name	Residency Status	Legal Status
Turkey Vulture	*Cathartes aura*	PR	P
Mallard	*Anas platyrhynchos*	PR	GM
Cooper's Hawk	*Accipiter cooperii*	PR	P
Broad-winged Hawk	*Buteo platypterus*	LD	P
Red-tailed Hawk	*Buteo jamaicensis*	PR	P
Ruffed Grouse	*Bonasa umbellus*	PR	GM
Yellow-billed Cuckoo	*Coccyzus americana*	LD	P
Chimney Swift	*Chaetura pelagica*	LD	P
Belted Kingfisher	*Ceryle alcyon*	PR	P
Red-bellied Woodpecker	*Melanerpes carolinus*	PR	P
Downy Woodpecker	*Picoides pubescens*	PR	P
Hairy Woodpecker	*Picoides villosus*	PR	P
Northern Flicker	*Colaptes auratus*	SD	P
Pileated Woodpecker	*Dryocopus pileatus*	PR	P
Eastern Wood-pewee	*Contopus virens*	LD	P
Olive-sided Flycatcher	*Contopus borealis*	LD	P-X
Acadian Flycatcher	*Empidonax virescens*	LD	P
Willow Flycatcher	*Empidonax traillii*	LD	P
Least Flycatcher	*Empidonax minimus*	LD	P
Eastern Phoebe	*Sayornis phoebe*	SD	P
Tree Swallow	*Tachycineta bicolor*	LD	P
Barn Swallow	*Hirundo rustica*	LD	P
Blue Jay	*Cyanocitta cristata*	PR	P
American Crow	*Corvus brachyrhynchos*	PR	GM
Common Raven	*Corvus corax*	PR	P
Black-capped Chickadee	*Poecile atricapillus*	PR	P
Tufted Titmouse	*Baeolophus bicolor*	PR	P
Red-breasted Nuthatch	*Sitta canadensis*	SD	P
White-breasted Nuthatch	*Sitta carolinensis*	PR	P
Brown Creeper	*Certhia americana*	PR	P
Carolina Wren	*Thryothorus ludovicianus*	PR	P
House Wren	*Troglodytes aedon*	SD	P
Golden-crowned Kinglet	*Regulus satrapa*	SD	P

Appendix 2 cont.

Ruby-crowned Kinglet	*Regulus calendula*	SD	P
Blue-gray Gnatcatcher	*Polioptila caerulea*	SD	P
Eastern Bluebird	*Sialia sialis*	SD	P
Veery	*Catharus fuscescens*	LD	P
Swainson's Thrush	*Catharus ustulatus*	LD	P-CR
Wood Thrush	*Hylocichla mustelina*	LD	P
American Robin	*Turdus migratorius*	SD	P
Gray Catbird	*Dumetella carolinensis*	SD	P
Cedar Waxwing	*Bombycilla cedrorum*	PR	P
European Starling	*Sturnus vulgaris*	PR	NN
White-eyed Vireo	*Vireo griseus*	LD	P
Blue-headed Vireo	*Vireo solitarius*	SD	P
Warbling Vireo	*Vireo gilvus*	LD	P
Philadelphia Vireo	*Vireo philadelphicus*	LD	P
Red-eyed Vireo	*Vireo olivaceus*	LD	P
Blue-winged Warbler	*Vermivora pinus*	LD	P
Golden-winged Warbler	*Vermivora chrysoptera*	LD	P
Tennessee Warbler	*Vermivora peregrina*	LD	P
Orange-crowned Warbler	*Vermivora celata*	SD	P
Nashville Warbler	*Vermivora ruficapilla*	LD	P
Northern Parula	*Parula americana*	LD	P
Yellow Warbler	*Dendroica petechia*	LD	P
Chestnut-sided Warbler	*Dendroica pensylvanica*	LD	P
Magnolia Warbler	*Dendroica magnolia*	LD	P
Cape May Warbler	*Dendroica tigrina*	LD	P
Black-throated Blue Warbler	*Dendroica caerulescens*	LD	P
Yellow-rumped Warbler	*Dendroica coronata*	SD	P
Black-throated Green Warbler	*Dendroica virens*	LD	P
Blackburnian Warbler	*Dendroica fusca*	LD	P
Palm Warbler	*Dendroica palmarum*	SD	P
Bay-breasted Warbler	*Dendroica castanea*	LD	P
Blackpoll Warbler	*Dendroica striata*	LD	P
Black-and-white Warbler	*Mniotilta varia*	LD	P
American Redstart	*Setophaga ruticilla*	LD	P
Worm-eating Warbler	*Helmitheros vermivorus*	LD	P
Ovenbird	*Seiurus aurocapillus*	LD	P
Northern Waterthrush	*Seiurus noveboracensis*	LD	P
Louisiana Waterthrush	*Seiurus motacilla*	LD	P

Appendix 2 cont.

Kentucky Warbler	*Oporornis formosus*	LD	P
Mourning Warbler	*Oporornis philadelphia*	LD	P
Connecticut Warbler	*Oporornis agilis*	LD	P
Common Yellowthroat	*Geothlypis trichas*	SD	P
Hooded Warbler	*Wilsonia citrina*	LD	P
Wilson's Warbler	*Wilsonia pusilla*	LD	P
Canada Warbler	*Wilsonia canadensis*	LD	P
Yellow-breasted Chat	*Icteria virens*	LD	P
Summer Tanager	*Piranga rubra*	LD	P-CR
Scarlet Tanager	*Piranga olivacea*	LD	P
Northern Cardinal	*Cardinalis cardinalis*	PR	P
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	LD	P
Indigo Bunting	*Passerina cyanea*	LD	P
Eastern Towhee	*Pipilo erythrophthalmus*	SD	P
Grasshopper Sparrow	*Ammodramus savannarum*	LD	P
Chipping Sparrow	*Spizella passerina*	SD	P
Field Sparrow	*Spizella pusilla*	SD	P
Savannah Sparrow	*Passerculus sandwichensis*	SD	P
Song Sparrow	*Melospiza melodia*	PR	P
Swamp Sparrow	*Melospiza georgiana*	PR	P
White-throated Sparrow	*Zonotrichia albicollis*	SD	P
White-crowned Sparrow	*Zonotrichia leucophrys*	SD	P
Red-winged Blackbird	*Agelaius phoeniceus*	SD	P
Bobolink	*Dolichonyx oryzivorus*	LD	P
Eastern Meadowlark	*Sturnella magna*	SD	P
Common Grackle	*Quiscalus quiscula*	SD	P
Brown-headed Cowbird	*Molothrus ater*	SD	P
Baltimore Oriole	*Icterus galbula*	LD	P
Common Redpoll	*Carduelis flammea*	SD	P
American Goldfinch	*Carduelis tristis*	PR	P
Evening Grosbeak	*Coccothraustes vespertinus*	SD	P

Appendix 3. Number of butterfly individuals detected during five surveys in open and wooded habitat sections along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) and Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transects and the Johnstown Flood National Memorial transect during summer 1998.

Species	ALPO #9 (open) 500 m	ALPO #9 (wooded) 1100 m	ALPO V.C. (open) 400 m	ALPO V.C. (wooded) 1200 m	JOFL 1600 m
American Copper	1	0	0	0	0
American Lady	0	0	0	1	0
Black Swallowtail	0	0	0	0	1
Cabbage White	8	4	7	0	11
Common Woodnymph	5	0	1	0	3
Dreamy Duskywing	18	0	0	0	0
Dun Skipper	22	0	2	0	1
Eastern-tailed Blue	0	0	1	0	0
European Skipper	51	0	4	0	36
Great Spangled Fritillary	11	2	9	3	0
Hobomok skipper	0	0	7	0	1
Horace's Duskywing	2	0	3	0	0
Juvenal's Duskywing	0	0	1	0	0
Least Skipper	2	0	0	0	0
Meadow Fritillary	59	0	0	0	0
Monarch	1	0	5	3	0
Mourning Cloak	0	0	0	2	0
Northern Pearly-eye	0	0	0	0	5
Orange Sulphur	1	0	6	0	3
Pearl Crescent	68	0	2	1	2
Peck's Skipper	0	0	3	1	0
Question Mark	0	0	1	1	0
Red-spotted Purple	1	2	1	0	0

Appendix 3 cont.

Silver-spotted Skipper	19	2	18	0	9
Spicebush Swallowtail	1	3	0	0	0
Spring Azure	9	1	14	9	3
Tiger Swallowtail	12	3	18	6	7
Wood Satyr	1	0	0	0	4
Total Abundance	292	17	103	27	86
Total Species Richness	19	6	18	9	13
Number individuals/100 m	58.4	1.54	25.75	2.25	5.36

Appendix 4. Number of individuals of each species, total abundance, total species richness, and relative abundance (number of individuals/100 m) of butterflies detected during five surveys in the open habitat section along the Allegheny Portage Railroad National Historic Site No. 9 transect (500 m) during summer 1998.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
American Copper	0	0	1	0	0
Cabbage White	1	1	0	4	2
Common Woodnymph	0	0	4	1	0
Dreamy Duskywing	18	0	0	0	0
Dun Skipper	0	0	22	0	0
European Skipper	0	33	18	0	0
Great Spangled Fritillary	0	0	7	4	0
Horace's Duskywing	0	0	0	0	2
Least Skipper	0	2	0	0	0
Meadow Fritillary	0	0	40	19	0
Monarch	0	0	0	1	0
Orange Sulphur	0	0	0	1	0
Pearl Crescent	17	0	23	12	16
Red-spotted Purple	0	0	1	0	0
Silver-spotted Skipper	1	10	5	3	0
Spicebush Swallowtail	0	1	0	0	0
Spring Azure	7	2	0	0	0
Tiger Swallowtail	4	6	0	2	0
Wood Satyr	0	1	0	0	0
Total Abundance	48	56	121	47	20
Total Species Richness	6	8	9	9	3
Number individuals/100 m	9.6	11.2	24.2	10.8	4.0

Appendix 5. Number of individuals of each species, total abundance, total species richness, and relative abundance (number of individuals/100 m) of butterflies detected during five surveys in the wooded habitat section along the Allegheny Portage Railroad National Historic Site No. 9 transect (1100 m) during summer 1998.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
Cabbage White	0	1	0	3	0
Great Spangled Fritillary	0	0	2	0	0
Red-spotted Purple	0	1	1	0	0
Silver-spotted Skipper	0	0	1	1	0
Spicebush Swallowtail	2	0	0	1	0
Spring Azure	1	0	0	0	0
Tiger Swallowtail	2	1	0	0	0
Total Abundance	5	3	4	5	0
Total Species Richness	3	3	3	3	0
Number individuals/100 m	0.45	0.27	0.36	0.45	0.0

Appendix 6. Number of individuals of each species, total abundance, total species richness, and relative abundance (number of individuals/100 m) of butterflies detected during five surveys in the open habitat section along the Allegheny Portage Railroad National Historic Site Visitors Center transect (400 m) during summer 1998.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
Cabbage White	1	0	1	4	1
Common Woodnymph	0	0	1	0	0
Dun Skipper	0	0	2	0	0
Eastern-tailed Blue	0	0	0	0	1
European Skipper	0	0	4	0	0
Great Spangled Fritillary	0	0	5	4	0
Hobomok skipper	0	7	0	0	0
Horace's Duskywing	0	0	0	3	0
Juvenal's Duskywing	1	0	0	0	0
Monarch	0	0	0	0	5
Orange Sulphur	0	0	0	1	5
Pearl Crescent	0	0	0	2	0
Peck's Skipper	0	3	0	0	0
Question Mark	0	1	0	0	0
Red-spotted Purple	0	0	1	0	0
Silver-spotted Skipper	0	13	3	2	0
Spring Azure	9	4	0	1	0
Tiger Swallowtail	6	2	1	9	0
Total Abundance	17	30	18	26	12
Total Species Richness	4	6	8	8	4
Number individuals/100 m	4.25	7.5	4.5	6.5	3.0

Appendix 7. Number of individuals of each species, total abundance, total species richness, and relative abundance (number of individuals/100 m) of butterflies detected during five surveys in the wooded habitat section along the Allegheny Portage Railroad National Historic Site Visitors Center transect (1200 m) during summer 1998.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
American Lady	1	0	0	0	0
Great Spangled Fritillary	0	0	1	1	0
Monarch	0	0	0	0	3
Mourning Cloak	1	1	0	0	0
Pearl Crescent	0	0	0	1	0
Peck's Skipper	0	1	0	0	0
Question Mark	0	0	1	0	0
Spring Azure	5	1	0	2	0
Tiger Swallowtail	4	1	0	2	0
Total Abundance	11	4	3	6	3
Total Species Richness	4	4	2	4	1
Number individuals/100 m	0.92	0.33	0.25	0.5	0.25

Appendix 8. Number of individuals of each species, total abundance, total species richness, and relative abundance (number of individuals/100 m) of butterflies detected during five surveys at Johnstown Flood National Memorial (1600 m) during summer 1998.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
Black Swallowtail	1	0	0	0	0
Cabbage White	1	1	0	2	7
Common Woodnymph	0	0	2	1	0
Dun Skipper	0	0	1	0	0
European Skipper	0	35	1	0	0
Hobomok skipper	0	1	0	0	0
Northern Pearly-eye	0	0	5	0	0
Orange Sulphur	0	1	0	1	1
Pearl Crescent	1	1	0	0	0
Silver-spotted Skipper	1	6	2	0	0
Spring Azure	2	1	0	0	0
Tiger Swallowtail	1	1	0	4	1
Wood Satyr	0	4	0	0	0
Total Abundance	7	51	11	8	9
Total Species Richness	6	9	5	4	3
Number individuals/100 m	0.44	3.19	0.69	0.50	0.56

Appendix 9. Relative abundance scores of each species (per 100 m), total abundance, and total species richness of flowering plants detected during five surveys in the open and wooded habitat sections along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9) and Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.) transects and the Johnstown Flood National Memorial (JOFL) transect during summer 1998.

Flower Species	ALPO #9 (open) 500 m	ALPO #9 (wooded) 1100 m	ALPO V.C. (open) 400 m	ALPO V.C. (wooded) 1200 m	JOFL 1600 m
Agrimony	0.0	0.0	0.0	0.0	0.13
Alfalfa	0.0	0.0	0.0	0.0	0.06
Aster	1.4	0.46	3.0	0.33	2.39
Barren Strawberry	1.2	0.18	1.0	0.25	0.32
Birdsfoot Trefoil	0.0	0.0	0.75	0.0	0.0
Bittersweet Nightshade	0.0	0.0	0.0	0.0	0.25
Blackberry	0.0	0.0	0.75	0.17	0.13
Black Cohosh	0.0	0.09	0.0	0.0	0.0
Black-eyed Susan	0.0	0.0	2.75	0.0	0.0
Bladder Campion	0.0	0.0	2.25	0.0	0.19
Blue Lettuce	0.0	0.0	0.0	0.0	0.32
Blue Vervain	0.2	0.0	0.0	0.0	0.0
Blue-eyed Grass	0.0	0.0	0.0	0.0	0.32
Butter-and-eggs	0.2	0.09	0.25	0.0	0.13
Buttercup	0.0	0.0	0.0	0.08	0.13
Butterfly-weed	0.2	0.0	0.0	0.0	0.0
Celandine	0.0	0.36	0.0	0.0	0.0
Chickweed	0.0	0.0	0.0	0.0	0.06
Cleaver	0.8	0.0	0.0	0.08	0.13
Climbing False Buckwheat	0.0	0.0	0.0	0.25	0.06
Common Burdock	0.0	0.0	0.0	0.0	0.13
Common Evening Primrose	0.2	0.0	0.0	0.0	0.06

Appendix 9 cont.

Common Fleabane	1.0	0.27	1.75	0.0	0.38
Common Milkweed	0.0	0.0	0.0	0.0	0.06
Common Saint Johnswort	0.0	0.0	1.0	0.0	0.69
Common Stitchwort	0.0	0.0	0.0	0.08	0.19
Common Violet	1.0	0.18	0.0	0.91	0.06
Cow Cress	0.0	0.0	0.0	0.0	0.38
Crooked-stemmed Aster	2.0	0.09	0.0	0.0	1.32
Crown-vetch	2.2	0.0	7.0	0.0	6.68
Daisy Fleabane	0.8	0.36	0.25	0.0	1.89
Dame's Rocket	0.2	0.55	3.5	0.42	0.0
Dandelion	1.6	0.18	0.0	0.0	0.95
Deptford Pink	0.4	0.0	1.0	0.0	0.19
Downy Woodmint	0.2	0.0	0.0	0.0	0.0
Dwarf Ginseng	0.0	0.0	0.0	0.33	0.0
Elderberry	0.2	0.0	0.75	0.08	0.19
Flat-topped White Aster	0.0	0.0	0.5	0.08	0.0
Fleabane	0.0	0.0	0.0	0.0	0.06
Flowering woody shrub	0.4	0.0	0.0	0.0	0.0
Fringed Polygala	0.0	0.0	0.0	0.08	0.0
Fringed Loosestrife	0.0	0.0	0.0	0.0	0.32
Garden Phlox	0.0	0.0	0.0	0.0	0.13
Garlic Mustard	1.0	0.64	0.0	0.08	0.44
Goldenrod	4.2	0.55	4.5	0.58	3.21
Ground Ivy	0.4	0.27	1.5	0.0	0.32
Hairy Woodmint	2.0	0.0	0.5	0.08	2.52
Halberd-leaved Violet	0.0	0.0	0.0	0.33	0.0
Hawthorn	0.0	0.0	0.25	0.0	0.0
Heal-all	1.4	0.27	0.5	0.0	0.44

Appendix 9 cont.

Hedge Bindweed	0.0	0.0	0.0	0.0	0.06
Honewort	0.0	0.27	0.0	0.0	0.0
Indian Hemp	0.6	0.0	0.0	0.0	0.76
Japanese Honeysuckle	0.2	0.0	0.0	0.0	0.0
Kidney-leafed Buttercup	0.0	0.09	0.0	0.08	0.0
Lesser Stitchwort	0.0	0.0	0.25	0.0	0.25
Lilac	0.2	0.0	0.25	0.0	0.0
Mayapple	0.0	0.09	0.0	0.0	0.06
Mayweed	0.2	0.0	0.0	0.0	0.0
Moneywort	1.2	0.09	0.0	0.0	0.0
Mountain Azalea	0.0	0.0	0.25	0.0	0.0
Mountain Laurel	0.0	0.0	0.25	0.0	0.0
Mullein	0.0	0.0	0.0	0.0	0.06
Multiflora Rose	0.0	0.0	0.25	0.0	0.06
Musk Mallow	0.0	0.0	1.75	0.0	0.0
New England Aster	0.0	0.0	1.0	0.0	0.06
Ox-eye Daisy	3.4	0.0	3.5	0.0	1.58
Painted Trillium	0.0	0.0	0.0	0.33	0.0
Pale Jewelweed	0.0	0.0	0.0	0.0	0.19
Pennsylvania Bittercress	0.0	0.0	0.25	0.08	0.0
Pokeweed	0.0	0.0	0.0	0.0	0.25
Purple Dead Nettle	0.0	0.0	0.0	0.0	0.19
Purple-leaved Willow-herb	0.0	0.0	0.0	0.0	0.06
Queen Anne's Lace	2.2	0.18	2.75	0.0	1.39
Raspberry	0.0	0.0	1.25	0.17	0.06
Red Clover	0.0	0.0	0.75	0.0	0.44
Rough Cinquefoil	0.8	0.0	0.5	0.0	0.44
Rough Hawkweed	0.6	0.0	1.5	0.17	0.25

Appendix 9 cont.

Rough-fruited Cinquefoil	0.4	0.0	0.25	0.0	0.44
Seedbox	0.6	0.0	0.0	0.0	0.0
Smaller Hop Clover	0.4	0.0	0.5	0.0	0.38
Smartweed	0.0	0.0	0.0	0.0	0.06
Smooth Yellow Violet	0.0	0.09	0.0	0.0	0.0
Spotted Jewelweed	1.0	0.55	0.0	0.0	1.01
Spotted Knapweed	0.4	0.0	0.0	0.0	0.0
Square-stemmed Monkeyflower	0.2	0.0	0.0	0.0	0.0
Swamp Dewberry	0.0	0.0	0.25	0.0	0.0
Sweet Joe-pye-weed	0.8	0.0	0.0	0.08	0.63
Sweet White Violet	0.0	0.0	0.0	0.25	0.0
Tall Cinquefoil	0.0	0.0	0.0	0.0	0.06
Tartarian Honeysuckle	0.0	0.0	0.0	0.0	0.63
Teasel	0.0	0.0	0.75	0.0	0.0
Thistle	0.4	0.0	1.25	0.0	0.57
Viper's Bugloss	0.6	0.0	0.0	0.0	0.0
White Avens	0.0	0.0	0.0	0.0	0.06
White Clover	0.4	0.18	5.0	0.0	2.14
White Snakeroot	1.4	0.91	0.0	0.0	0.25
Whorled Loosestrife	0.0	0.0	0.25	0.0	0.0
Wild Bergamot	0.0	0.0	1.0	0.0	0.0
Wild Lily-of-the-valley	0.0	0.09	0.0	0.0	0.13
Wild Strawberry	0.4	0.09	0.5	0.08	0.19
Wild Yellow Lily	0.0	0.0	0.0	0.0	0.06
Winter-cress	1.0	0.27	2.0	0.0	0.50
Yarrow	2.8	0.09	2.5	0.08	2.39
Yellow Goat's-beard	0.0	0.0	0.0	0.0	0.06

Appendix 9 cont.

Yellow Sweet-clover	1.4	0.73	0.0	0.0	0.25
Yellow Wood-sorrel	0.0	0.0	2.25	0.42	0.63
Total Abundance	44.8	8.26	64.75	5.95	41.83
Total Species Richness	47	29	46	27	72

Appendix 10. Number of individuals of each species per survey, total abundance, and total species richness of bird species observed during four 1997 spring migration surveys along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9), Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.), and Johnstown Flood National Memorial (JOFL) transects.

Species	ALPO No. 9	ALPO V.C.	JOFL
Mallard	0.75	0.0	1.0
Cooper's Hawk	0.5	0.0	0.0
Broad-winged Hawk	0.25	0.25	0.0
Red-tailed Hawk	0.0	0.0	0.25
Yellow-billed Cuckoo	0.0	0.0	0.25
Chimney Swift	1.0	0.0	5.0
Belted Kingfisher	0.0	0.0	0.25
Red-bellied Woodpecker	0.75	0.0	0.0
Downy Woodpecker	0.25	0.25	0.5
Northern Flicker	0.25	0.25	0.75
Pileated Woodpecker	0.25	0.0	0.25
Eastern Wood-pewee	0.75	0.0	0.25
Acadian Flycatcher	0.25	0.0	0.0
Least Flycatcher	0.5	0.0	0.0
Empidonax	0.25	0.0	0.5
Eastern Phoebe	0.5	0.25	0.0
Tree Swallow	0.0	0.25	1.0
Barn Swallow	0.0	0.0	1.75
Blue Jay	0.5	0.0	0.5
American Crow	0.75	1.0	0.5

Appendix 10 cont.

Common Raven	0.5	0.0	0.0
Black-capped Chickadee	0.75	1.25	1.75
Tufted Titmouse	1.25	0.0	1.0
White-breasted Nuthatch	0.0	0.0	0.25
House Wren	0.25	0.5	0.25
Carolina Wren	0.25	0.0	0.0
Brown Creeper	0.0	0.25	0.0
Ruby-crowned Kinglet	1.0	0.5	0.0
Golden-crowned Kinglet	0.0	0.0	0.25
Blue-gray Gnatcatcher	2.0	0.25	0.75
Eastern Bluebird	0.0	0.0	0.5
Swainson's Thrush	0.25	0.25	0.0
Wood Thrush	0.25	0.5	0.25
American Robin	1.0	1.25	1.5
Gray Catbird	0.25	0.25	2.25
European Starling	0.0	0.0	2.0
White-eyed Vireo	0.0	0.0	0.25
Blue-headed Vireo	0.25	1.25	0.0
Warbling Vireo	0.25	0.0	0.0
Philadelphia Vireo	0.25	0.0	0.0
Red-eyed Vireo	10.5	0.75	0.75
Blue-winged Warbler	0.0	0.0	0.25
Golden-winged Warbler	0.0	0.0	0.25
Tennessee Warbler	0.0	0.0	0.5

Appendix 10 cont.

Nashville Warbler	0.0	0.25	0.5
Northern Parula	0.25	0.25	0.25
Yellow Warbler	0.25	0.0	4.5
Chestnut-sided Warbler	1.0	0.75	4.0
Magnolia Warbler	0.75	1.5	0.75
Cape May Warbler	0.25	0.0	0.25
Black-throated Blue Warbler	0.25	1.0	0.25
Yellow-rumped Warbler	0.25	0.0	2.25
Black-throated Green Warbler	1.0	3.5	1.0
Blackburnian Warbler	0.5	0.5	1.25
Palm Warbler	0.0	0.75	0.0
Bay-breasted Warbler	0.75	0.0	0.75
Blackpoll Warbler	0.5	0.0	0.5
Black-and-White Warbler	0.5	0.75	0.0
American Redstart	4.75	2.0	2.25
Worm-eating Warbler	0.75	0.0	0.0
Ovenbird	5.75	2.75	1.25
Northern Waterthrush	0.25	0.0	0.0
Louisiana Waterthrush	2.25	0.0	0.0
Kentucky Warbler	0.5	0.25	0.0
Mourning Warbler	0.25	0.0	0.25
Common Yellowthroat	2.0	1.0	3.0
Hooded Warbler	0.0	0.0	0.25
Wilson's Warbler	0.0	0.0	0.5

Appendix 10 cont.

Canada Warbler	0.5	0.25	0.25
Summer Tanager	0.0	0.0	0.25
Scarlet Tanager	3.0	0.0	2.25
Northern Cardinal	2.0	0.5	0.25
Rose-breasted Grosbeak	1.0	0.75	0.25
Indigo Bunting	1.75	1.0	3.5
Eastern Towhee	1.5	0.0	1.5
Chipping Sparrow	1.25	2.75	0.5
Field Sparrow	0.0	0.25	1.5
Savannah Sparrow	0.0	0.0	0.75
Song Sparrow	0.75	1.25	4.0
Swamp Sparrow	0.0	0.0	0.25
White-throated Sparrow	1.5	1.0	0.5
White-crowned Sparrow	0.0	0.25	0.0
Red-winged Blackbird	0.0	0.25	13.75
Eastern Meadowlark	0.0	0.0	1.75
Brown-headed Cowbird	1.75	3.5	2.0
Baltimore Oriole	0.0	0.25	1.25
Common Grackle	0.0	0.0	0.25
American Goldfinch	0.75	1.75	3.75
Total Number Individuals	65.0	38.25	87.75
Total Number Species	61	43	67

Appendix 11. Number of individuals of each species per survey, total abundance, and total species richness of bird species observed during four 1997 breeding season surveys along the Allegheny Portage Railroad National Historic Site No. 9 (ALPO No. 9), Allegheny Portage Railroad National Historic Site Visitors Center (ALPO V. C.), and Johnstown Flood National Memorial (JOFL) transects.

Species	ALPO No. 9	ALPO V. C.	JOFL
Mallard	0.0	0.0	0.5
Turkey Vulture	0.25	0.0	0.25
Broad-winged Hawk	0.75	0.0	0.0
Red-tailed Hawk	0.0	0.0	0.25
Ruffed Grouse	0.25	0.0	0.0
Yellow-billed Cuckoo	0.5	0.0	0.0
Chimney Swift	0.0	0.0	0.75
Downy Woodpecker	1.0	0.0	0.75
Hairy Woodpecker	0.0	0.25	0.0
Northern Flicker	0.5	0.0	1.0
Pileated Woodpecker	0.0	0.25	0.25
Eastern Wood-pewee	0.75	1.0	0.0
Acadian Flycatcher	1.25	0.0	0.0
Willow Flycatcher	0.0	0.0	0.75
Least Flycatcher	0.0	0.25	0.0
Eastern Phoebe	0.0	0.25	0.0
Tree Swallow	0.0	1.0	2.25
Blue Jay	0.0	0.5	0.25
American Crow	1.0	0.25	1.0

Appendix 11 cont.

Common Raven	0.25	0.0	0.25
Black-capped Chickadee	2.0	0.25	0.5
Tufted Titmouse	1.0	0.75	1.0
White-breasted Nuthatch	1.25	0.0	0.75
House Wren	0.0	1.0	0.5
Blue-gray Gnatcatcher	0.5	0.25	0.5
Eastern Bluebird	0.0	0.0	0.25
Veery	0.25	0.0	0.0
Wood Thrush	1.5	0.25	0.0
American Robin	1.25	1.25	3.75
Gray Catbird	0.5	0.75	2.0
Cedar Waxwing	0.25	0.0	1.25
European Starling	0.0	0.0	1.75
Blue-headed Vireo	0.25	1.5	0.0
Red-eyed Vireo	10.5	7.75	4.75
Nashville Warbler	0.0	0.25	0.0
Northern Parula	0.0	0.25	0.0
Yellow Warbler	0.0	0.0	2.5
Chestnut-sided Warbler	0.0	1.25	2.75
Black-throated Green Warbler	0.0	1.75	0.0
Black-and-White Warbler	0.25	0.0	0.0
American Redstart	1.0	1.5	1.0

Appendix 11 cont.

Ovenbird	4.75	3.75	1.75
Louisiana Waterthrush	0.5	0.0	0.0
Kentucky Warbler	0.75	0.0	0.0
Common Yellowthroat	1.0	1.0	4.5
Hooded Warbler	0.25	0.0	0.0
Scarlet Tanager	1.75	1.0	0.5
Northern Cardinal	1.25	0.0	0.5
Rose-breasted Grosbeak	0.25	0.25	0.25
Indigo Bunting	2.25	1.5	4.75
Eastern Towhee	1.0	0.75	2.75
Chipping Sparrow	3.0	2.75	1.0
Field Sparrow	0.0	0.25	1.5
Savannah Sparrow	0.0	0.0	0.5
Song Sparrow	1.75	1.5	6.25
Swamp Sparrow	0.0	0.0	0.25
Red-winged Blackbird	0.0	0.0	6.5
Eastern Meadowlark	0.0	0.0	1.25
Brown-headed Cowbird	0.25	1.75	0.75
Baltimore Oriole	0.0	0.0	0.25
Common Grackle	0.0	1.0	0.0
American Goldfinch	1.0	0.0	2.5
Total Number Individuals	46.75	38.0	67.25
Total Number Species	37	33	43