Monitoring of High Priority Bird Species at Camp Grayling, Michigan

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Cover: Early successional forest surveyed during golden-winged warbler surveys. Photo by M.J. Monfils.

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EXECUTIVE SUMMARY

Federal military facilities, such Camp Grayling Joint Maneuver Training Center (CGJMTC), are important in sustaining biodiversity, including threatened and endangered species and numerous migratory bird species. With many bird species continuing to decline, having current information on the status of bird species of conservation concern is vital to facilitating proactive management and minimizing possible conflicts between conservation measures and military training activities. The Michigan Natural Features Inventory (MNFI) partnered with the Michigan Department of Military and Veterans Affairs (DMVA) to design a bird survey program to gather information on bird species of high conservation concern using CGJMTC, such as listed, special concern, and declining species. The program will provide baseline data on these species and the overall bird communities using CGJMTC lands and a mechanism to monitor changes in relative abundance and distributions over time.

The MNFI worked with DMVA to develop a program that would meet their information needs and targeted the following bird species/groups: rare raptors, secretive marsh birds, golden-winged warbler (*Vermivora chrysoptera*, State special concern), red-headed woodpecker (*Melanerpes erythrocephalus*, State special concern), grassland birds, and pine barrens birds. For each target species/group, we created a three-year panel design of point-count stations to allow broad spatial coverage of CGJMTC on an annual, rotating basis. We used standardized point count methodologies for the target species/groups consistent with other monitoring efforts within the state and region. In 2022, staff from MNFI and DMVA completed the second year of the three-year sample frame designed to be used as part of a long-term monitoring program.

With help from DMVA staff, we conducted 615 points counts for raptors, marsh birds, and at-risk bird species within CGJMTC in 2022. Across all surveys, 114 bird species were recorded, including endangered, threatened, and special concern species, species of greatest conservation need, featured species of the Michigan Department of Natural Resources (Wildlife Division), and focal species of the Upper Mississippi / Great Lakes Joint Venture. Data gathered on several rare species will be incorporated into MNFI's Natural Heritage Database. In 2022, we documented new element occurrences of red-shouldered hawk (*Buteo lineatus*), red-headed woodpecker, and eastern whip-poor-will (*Antrostomus vociferus*). Other survey results will be used to update existing occurrences of northern goshawk (*Accipiter gentilis*, State special concern), red-headed woodpecker, Kirtland's warbler (*Setophaga kirtlandii*, State endangered), and golden-winged warbler.

The results of the first two years of monitoring highlight the value of CGJMTC to a variety of breeding bird species. The data gathered will provide valuable baseline information for evaluating trends in bird distributions and relative abundances as surveys are implemented in the future, as well as creating opportunities to explore questions related to bird habitat use and response to management. We recommend continuing with the same sample design and survey protocols for the third year of monitoring.

INTRODUCTION

Military installations serve as refuges for several at-risk wildlife species. For example, the intact wildlife habitats found on U.S. Department of Defense (DoD) lands support greater densities of threatened and endangered species than any other federal agency (Stein et al. 2008). Migratory bird species, even those once considered common and widespread, have been experiencing demonstrable population declines (Rosenberg et al. 2019), despite protection under the Migratory Bird Treaty Act. As more species become a conservation concern, it is increasingly important for land managers at military facilities to document the species that currently exist on their lands and, through proactive management, avoid potential conflicts between conservation measures and military training. Baseline surveys are a critical first step in making informed management decisions and, if repeated over time, can be used to document population changes. Surveys can also play an important part in helping installations to meet regulatory requirements.

Camp Grayling Joint Maneuver Training Center (CGJMTC) is an approximately 147,000-acre military installation used for military training that consists of a mosaic of lands owned by the Michigan Department of Military and Veterans Affairs (DMVA) and Michigan Department of Natural Resources (DNR). The facility provides a variety of habitats for migratory and resident breeding birds. The objective of this ongoing project was to develop and implement a bird monitoring program across CGJMTC to better document the species that occur on the installation and the distributions and relative abundances of at-risk and migratory species. Ultimately, these data will be incorporated into the CGJMTC Integrated Natural Resources Management Plan (INRMP) and used to provide guidelines for species management. In 2021 the Michigan Natural Features Inventory (MNFI), a program of Michigan State University Extension, worked with the DMVA to design and begin implementation of a bird survey program to gather information on bird species of high conservation concern, such as state and federally listed, special concern, and declining species. The program is providing baseline data on these species and the broader bird communities using CGJMTC lands and a mechanism to monitor changes in relative abundance and distributions over time. In 2022, MNFI and DMVA staff completed the second year of bird surveys of what was designed to be an annual, long-term program. In this report, we describe the monitoring program, methods used, and summarize the results of the second year of surveys.

METHODS

Sample Design

We developed bird surveys to evaluate the status (e.g., relative abundance, occupancy, trends) of the following rare or declining species with potential to occur at CGJMTC: 1) rare raptors; 2) secretive marsh birds; 3) golden-winged warbler (*Vermivora chrysoptera*, State special concern); 4) red-headed woodpecker (*Melanerpes erythrocephalus*, State special concern); 5) rare grassland birds; and 6) rare pine barrens species. Michigan Forest Inventory (MiFI) data were used to classify potential habitats for each bird species/group (Table 1). Based on cover type and size, we identified suitable stands and created spatial layers of potential habitat in ArcMap (ESRI 2017). Next, we created layers of potential survey points by overlaying point grids with appropriate spacing over the stands. We used a 250 m x 250 m point grid for late successional forest areas and a wider spaced, 400 m x 400 m point grid for early successional forest, shrub, and open cover types to reduce the likelihood of double counting (Ralph et al. 1995). Those points falling within the potential survey stands formed the sample frame for each species/group. Except for secretive marsh birds, there were more survey points than could be covered in one year, so we developed a panel sampling approach in which approximately one third of all points are covered in a year and all points are surveyed over three years. This approach could be applied on an ongoing, rotational basis, resulting in each point being surveyed every three years.

To develop our three survey panels while providing a spatially balanced and logistically efficient sample, we created a layer of 100-hectare hexagons to serve as our primary sample units (PSU) for CGJMTC. We used 100 hectares as our PSU size because it represents the approximate maximum area an individual can survey in a day under the various protocols used in this project. Each PSU was assigned a random number and after putting them in numerical order, we created the three survey panels for each bird species/group as follows: Panel 1 – first third of PSUs, Panel 2 – second third of PSUs, and Panel 3 – last third of PSUs. In this sample design, survey points are our secondary sample units, so when a PSU is selected for survey, all secondary sample units, or point count stations, falling within the PSU are to be surveyed (Figure 1). The first panel was surveyed in 2021, the second in 2022, and the third panel is scheduled to be surveyed in 2023.

Table 1. Michigan Forest Inventory (MiFI) stand descriptors used to identify potential habitats for the bird species or groups targeted in the Camp Grayling monitoring program.

Habitat Descriptor	Rare Raptors	Secretive Marsh Birds	Golden-winged Warbler	Red-headed Woodpecker	Grassland Birds
Cover type and code					
Aspen (A)	X		X		
Treed bog (D)			X		
Lowland deciduous (E)	X				
Herbaceous openland (G)					X
Hemlock (H)	X				
Lowland shrub (L)			X		
Lowland mixed forest (LM)	X			X	
Northern hardwood (M)	X			X	
Natural mixed pines (MC)	X				
Mixed upland deciduous (MD)	X			X	
Marsh (N)		X			
Oak (O)				X	
Lowland aspen/ balsam popular (P)	X		X	X	
Red pine (R)	X				
Upland mixed forest (UM)	X			X	
Low-density trees (U)				X	
Bog (V)		X			
Urban (X)				X	
White pine (W)	X				
Size density class	9	NA	All	All	NA
Minimum patch area (hectares)	4.0	4.0	2.0	NA	10.0

Figure 1. Examples of primary sample units (green hexagons) and secondary sample units (point count stations, yellow points) used in designing Camp Grayling bird surveys.

Rare Raptors

Raptor surveys were designed to target red-shouldered hawk (*Buteo lineatus*, State threatened) and northern goshawk (*Accipiter gentilis*, State special concern). Deciduous, mixed, and coniferous forest stands (except for pine plantations) of size-density class 9 and at least 4 hectares (10 acres) were considered potential habitat for these species. We surveyed raptors using a four-minute point count (Mosher et al. 1990, Anderson 2007, Bruggeman et al. 2011) consisting of two, two-minute broadcast periods (one for red-shouldered hawk, one for northern goshawk). Each broadcast period consisted of approximately 10 sec of broadcasted calls followed by 30 sec of silent listening, which was repeated three times for a total of two minutes. Calls were broadcasted using a FoxPro NX4 at a volume that produced a sound pressure of approximately 95 dB at one meter from the unit. The broadcast unit was rotated about 120 degrees for each series of calls to ensure 360-degree coverage.

We conducted surveys from 5 April to 6 May 2022 during daylight hours (sunrise to sunset). Weather conditions that can reduce the detectability of raptors were avoided (e.g., strong winds, moderate to heavy precipitation). Although red-shouldered hawk and northern goshawk were the focus of surveys, we recorded all raptor observations. For each raptor observation, we recorded the species, approximate distance when first detected (using distance bins of 0-50 m, 51-100 m, 101-250 m, 251-500 m, and > 500 m), and direction (i.e., N, NW, NE, S, SW, SE). When red-shouldered hawks or northern goshawks were observed, we searched the vicinity surrounding the survey point and location of the detection for potential nests. Trees were also visually inspected for stick nests while walking and driving between survey stations. We documented nest locations using tablet computers along with information on the species detected, activity observed (e.g., territorial behavior, incubation), nest status (e.g., decorated,

feathers, whitewash), tree species, and approximate nest height. When an active nest was confirmed (e.g., bird seen incubating or flushed from nest), we discontinued surveys at nearby points (i.e., within the same contiguous forest stand or nearest on the 250-meter point grid) to minimize disturbance to the nesting pair.

Secretive Marsh Birds

Open wetlands (e.g., marshes, wet meadows) of at least 4 hectares (10 acres) were surveyed for a suite of rare, declining, and secretive marsh bird species. We followed the North American Marsh Bird Monitoring Protocols (Conway 2011), which were further described for the Michigan Marsh Bird Survey (Michigan Bird Conservation Initiative [MiBCI] 2015). The survey methods target 10 primary species (e.g., rails, bitterns, grebes) and eight secondary species (e.g., selected songbirds, marsh-nesting terns) that occur in marshes and other wetlands dominated by emergent vegetation.

We conducted three visits during the breeding season (mid-May to late June) at points separated by at least 400 m (Conway 2011). Surveys were done in the morning between 30 minutes before to 3 hours after sunrise. During each visit, we completed a 10-minute point count consisting of a five-minute passive listening period followed by one-minute broadcast periods for the following five species: Least bittern (*Ixobrychus exilis*, State threatened), yellow rail (*Coturnicops noveboracensis*, State threatened), sora (*Porzana carolina*), Virginia rail (*Rallus limicola*), and American bittern (*Botaurus lentiginosus*, State special concern). Calls were broadcasted using an MP3 player (Oakton MP100) and portable wireless speaker (Ultimate Ears Wonderboom 2) at the recommended sound pressure of 80-90 dB at one meter from the speaker. Observations of primary target species were recorded by individual bird across each minute of the 10-min survey and the distance at first detection was estimated to the nearest five meters with aid of a laser rangefinder. Secondary species were tracked at the species level, with only the period of first observation of the species noted and the total number of individuals were recorded within three distance bins (0-50 m, 51-100 m, and > 100 m). Please refer to the Michigan Marsh Bird Survey Protocol (MiBCI 2015) for detailed survey methods.

At-risk Bird Surveys

We used the same point-count methodology for surveys targeting golden-winged warbler, red-headed woodpecker, grassland birds, and pine barrens birds. Areas of early successional aspen and balsam poplar, shrub wetlands, and treed bogs at least 2 hectares (5 acres) in size were the focus of golden-winged warbler surveys. Stands of deciduous, mixed, and oak-dominated forests, and areas with low tree densities within the Hanson Forest and Cantonment were surveyed for red-headed woodpeckers. We identified grasslands (herbaceous openlands in MiFI) of at least 10 hectares (25 acres) as potential grassland bird habitats where surveys were conducted. Surveys for rare pine barrens species were conducted within the Pine Barrens Management Area.

Surveys occurred during late May through early July and from sunrise to 4 hours after sunrise (Ralph et al. 1995). We avoided conducting surveys during weather conditions that can reduce bird detectability (e.g., winds ≥ 20 km/hr [13 mph], moderate to heavy precipitation). All birds seen or heard were recorded during 10-minute point counts. The 10-minute point count consisted of three periods: 2 minutes, 3 minutes, and 5 minutes (Ralph et al. 1995). Use of the three survey periods provides flexibility in making comparisons with other surveys and studies of varying time lengths (e.g., North American Breeding Bird Survey). During each time period, we assigned each bird observation to one of four distance categories at the time of first observation (0-25 m, 26-50 m, 51-100 m, and >100 m) based on the estimated distance of the bird from the

observer. Having observations assigned to distance bins facilitates analyses to estimate density and population size.

RESULTS

Below we provide a summary of our 2022 survey results according to the target bird species or group. A complete list of the bird species detected with scientific names is provided in Table A1 (Appendix A).

Rare Raptors

We surveyed all 137 points in our Year 2 raptor survey panel for northern goshawk and red-shouldered hawk (Figure 2). In addition, we surveyed six points from the Year 1 panel that had northern goshawk/red-shouldered hawk activity or were not visited in 2021. We also checked the two active northern goshawk nests documented in 2021 for nesting activity.

Red-shouldered hawks were detected at seven (5%) of the Year 2 panel points, three of the six Year 1 points visited, and incidentally at three additional locations while traveling between points. We also heard red-shouldered hawks at seven points surveyed for golden-winged warbler. After searching for nests near points with responses, we found two active red-shouldered hawk nests. The first nest was located near point RA087 in NTA21 to the east of Range Road and north of Fruit Farm Road (Figure 2). The nest was in a 48 cm (19 in) DBH big-toothed aspen (*Populus grandidentata*), about 17 m (55 ft) above the ground; the nest was decorated and had down visible. A pair of adults was seen and heard in the vicinity of the nest. The second nest was located near point RA239 from the Year 1 panel just west of Old US-27 in STA07 (Figure 2). The decorated nest was in a 55 cm (22 in) DBH red pine approximately 14 m (45 ft) above the ground. Two adults were seen and heard calling in the vicinity of the nest. These nest records resulted in two new element occurrences being entered into the Natural Heritage Database.

We observed northern goshawk at two (1%) of the Year 2 raptor survey points, at one of the nest sites found in Year 1, and at one of our grassland bird survey points (detected a bird flying nearby). No new northern goshawk nests were found in 2022. We reconfirmed northern goshawk activity at a nest found in 2021 in STA18 within a planted red pine stand north of Six Point Road and west of Pine Road (Figure 2). The nest was about 12 meters (40 feet) above the ground in a red pine with an estimated DBH of 33 cm (13 inches). We saw evidence of new construction on the nest and observed two territorial adults in the area. The second active northern goshawk nest found in 2021 was located northwest of Lake Margrethe near McIntyre Landing and just south of STA05. We visited this site in 2022 to check for nesting activity and found the nest had been destroyed during a timber harvest operation occurring outside of the nesting season.

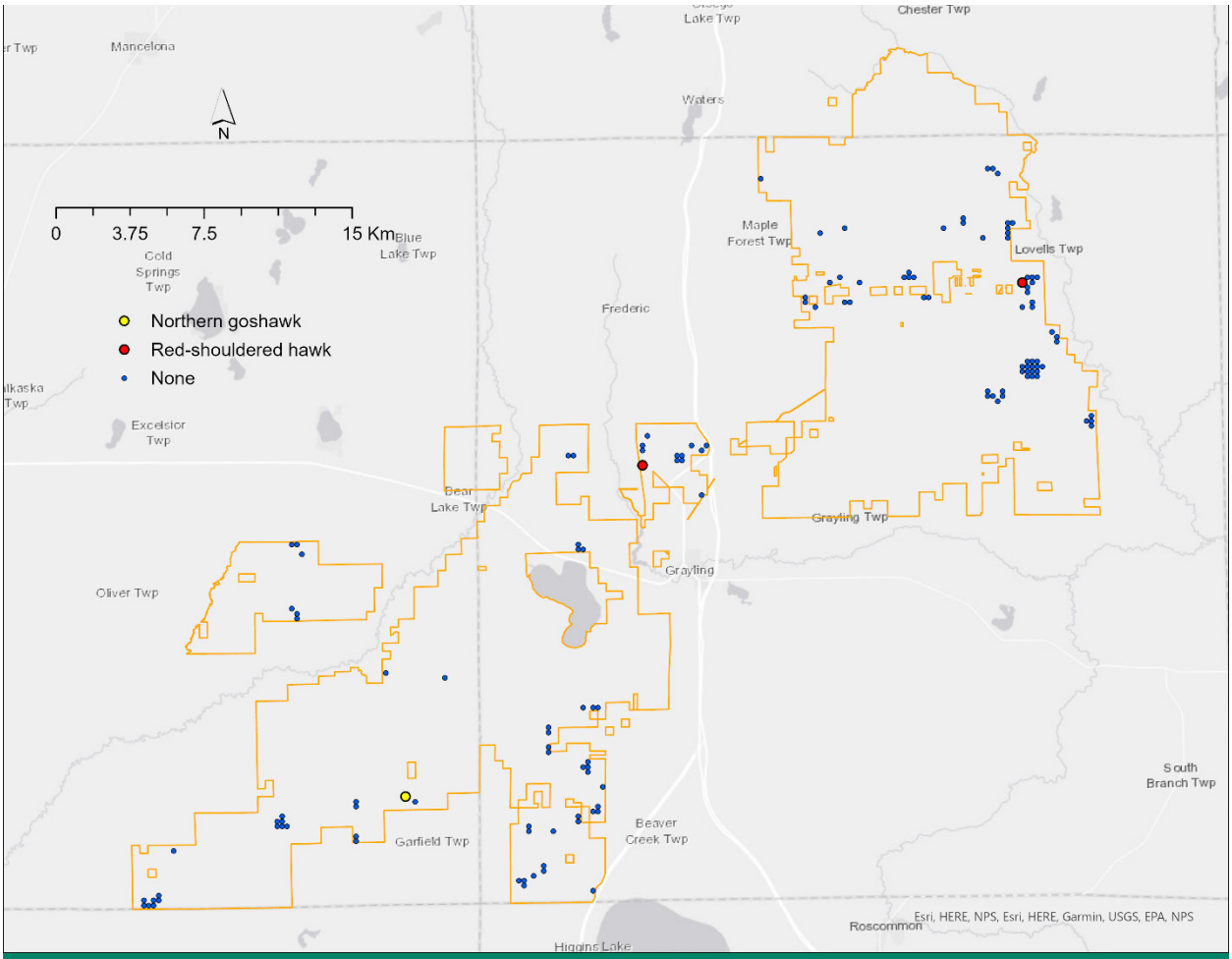

Figure 2. Rare raptor point-count stations where surveys were conducted within Camp Grayling in 2022. Locations are indicated where nesting was confirmed for northern goshawk (yellow points) and red-shouldered hawk (red points).

Secretive Marsh Birds

In 2021, we surveyed eight secretive marsh bird points but determined only four points had enough potential habitat to warrant continued surveys. Based on feedback from DMVA, we created new survey points in preparation for 2022 surveys in a wetland complex along Barker Creek not surveyed in 2021 (Figure 3). An additional five points were developed for the Barker Creek complex, so we conducted three surveys at all nine points in 2022 (Figure 4).

Five target species, American bittern, Wilson's snipe, sandhill crane, sedge wren, and swamp sparrow, were recorded during surveys. We did not detect American bittern this year at the existing element occurrence near Black Creek, which was first observed in 2004 and then reconfirmed in 2021. A single American bittern was heard calling within the Barker creek wetland when surveying two points (MB19 and MB20) located near Dyer Truck Trail during the third survey; however, the bird was a long distance away to the south (≥ 400 m), so we were unable to determine its location. Without a more specific location, we did not consider this a new element occurrence; however, future surveys may produce the information needed to create a

new occurrence. We observed sandhill crane, sedge wren, and swamp sparrow in both the Black Creek and Barker Creek complexes, but only detected Wilson's snipe in the latter wetland.

Figure 3. New secretive marsh bird point-count stations (blue points) added in the Barker Creek wetland complex within Camp Grayling in 2022.

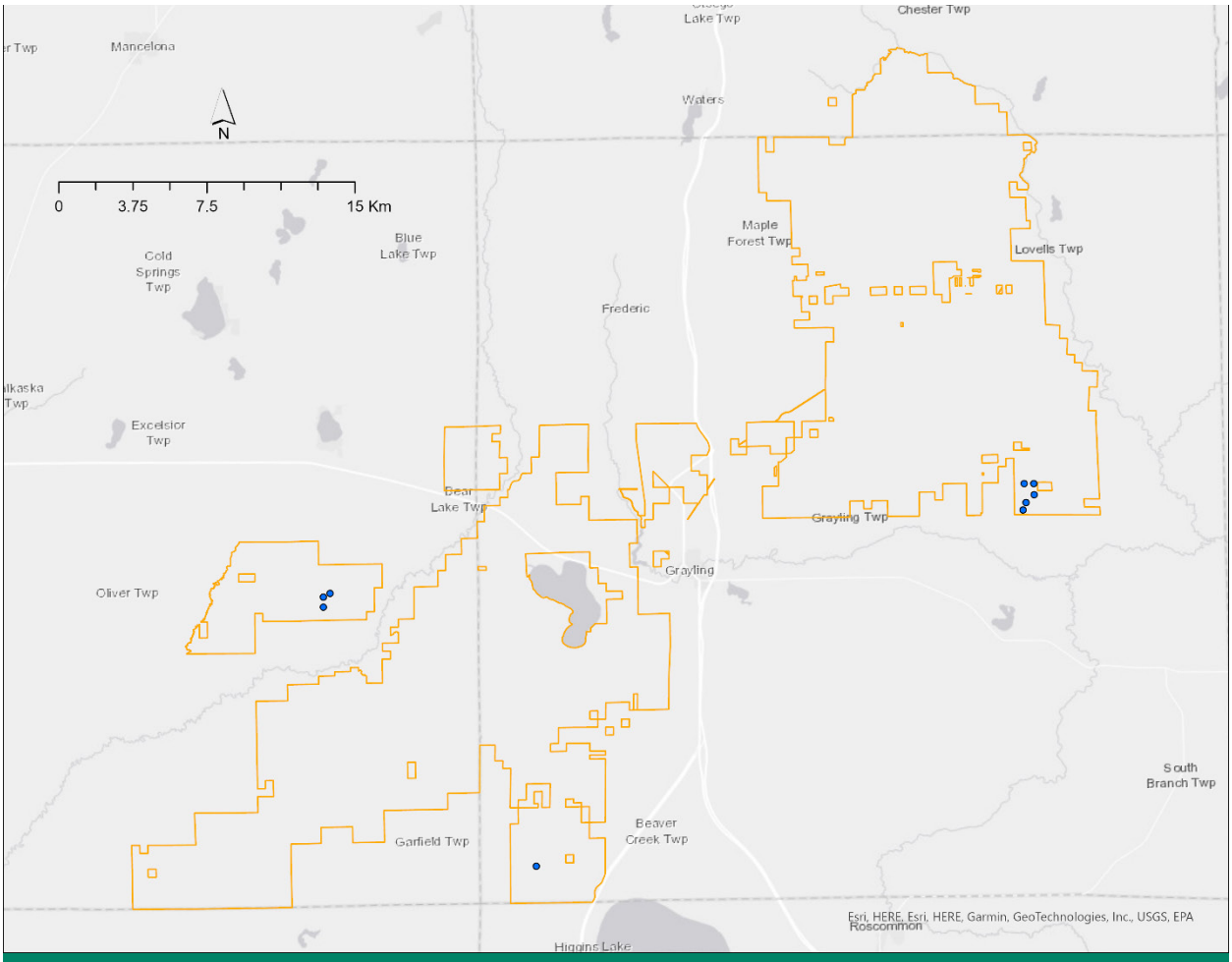

Figure 4. Secretive marsh bird point-count stations (blue points) where surveys were conducted within Camp Grayling in 2022.

At-risk Bird Species

We completed 451 point counts for all targeted at-risk bird species or groups in 2022, consisting of 242 golden-winged warbler points, 147 red-headed woodpecker points, 29 grassland bird points, and 33 pine barrens points. Surveys were conducted between 23 May and 7 July 2022, with 404 points surveyed by MNFI and 47 points covered by DMVA. We recorded 113 bird species across all 451 points surveyed (Table 2). During 2022 surveys, we documented new occurrences of golden-winged warbler and eastern whip-poor-will (State special concern), while also gathering substantial information to update existing occurrences of red-headed woodpecker, golden-winged warbler, and Kirtland's warbler. The Kirtland's warbler observations do not represent all occurrences for CGJMTC as additional targeted surveys are conducted annually by DMVA across the installation. Several other rare species, such as raptor species and waterbirds, were recorded during surveys but the information was not suitable to create new or update existing element occurrences. In addition, we recorded several featured species of the DNR, Wildlife Division, and focal species of the Upper Mississippi / Great Lakes Joint Venture (JV; Table 2).

Table 2. Proportion of points having bird species detected during 2022 at Camp Grayling by target species or group.

Species	Special Status[1]	Golden-winged Warbler	Red-headed Woodpecker	Grassland and Pine Barrens Birds
Alder flycatcher	---	0.050	0.007	0.016
American crow	---	0.165	0.156	0.161
American goldfinch	---	0.120	0.054	0.097
American kestrel	---	---	---	0.032
American redstart	---	0.277	0.136	0.113
American robin	---	0.302	0.449	0.339
American woodcock	DNR	0.004	---	---
Bald eagle	SC, SGCN	0.004	---	---
Baltimore oriole	---	0.045	0.061	0.016
Barred owl	---	0.004	---	0.016
Black-and-white warbler	---	0.128	0.027	---
Black-billed cuckoo	---	0.066	0.061	0.113
Blackburnian warbler	---	0.008	---	---
Black-capped chickadee	---	0.302	0.156	0.274
Blackpoll warbler	---	0.008	---	---
Black-throated bl. warbler	DNR	0.004	---	---
Black-throated gr. warbler	---	0.017	---	---
Blue jay	---	0.674	0.748	0.903
Blue-headed vireo	---	0.025	0.014	0.016
Blue-winged warbler	---	0.004	---	---
Bobolink	DNR	0.004	---	---
Brewer's blackbird	---	0.008	0.007	0.048
Brown creeper	---	0.008	0.048	---
Brown thrasher	---	0.157	0.136	0.435
Brown-headed cowbird	---	0.058	0.068	0.032
Canada goose	DNR	0.066	0.007	0.129
Cape May warbler	---	---	0.007	---
Cedar waxwing	---	0.298	0.224	0.274
Chestnut-sided warbler	---	0.132	0.034	0.016
Chimney swift	---	---	0.007	---
Chipping sparrow	---	0.041	0.082	0.484
Clay-colored sparrow	---	---	---	0.032
Common grackle	---	0.087	0.048	0.226
Common loon	T, SGCN	0.004	0.014	0.032
Common raven	---	0.310	0.211	0.661
Common yellowthroat	---	0.153	0.020	0.016
Dark-eyed junco	---	0.029	0.048	0.081
Downy woodpecker	---	0.012	0.027	---
Eastern bluebird	---	0.058	0.088	0.161
Eastern kingbird	---	0.025	0.034	0.161
Eastern meadowlark	DNR	---	---	0.016
Eastern phoebe	---	0.004	---	0.016
Eastern towhee	---	0.360	0.422	0.339
Eastern whip-poor-will	SC, SGCN	0.004	---	---
Eastern wood-pewee	---	0.289	0.497	0.129
European starling	---	0.004	0.007	0.016
Evening grosbeak	---	0.004	---	---

Table 2. Continued.

Species	Special Status[1]	Golden-winged Warbler	Red-headed Woodpecker	Grassland and Pine Barrens Birds
Field sparrow	---	0.207	0.286	0.581
Golden-crowned kinglet	---	0.004	---	---
Golden-winged warbler	SC, SGCN, DNR, DoD, JV	0.062	0.007	---
Gray catbird	---	0.029	0.027	0.032
Great blue heron	---	0.004	---	---
Great crested flycatcher	---	0.161	0.116	0.081
Hairy woodpecker	---	0.050	0.116	0.161
Hermit thrush	---	0.339	0.224	0.403
House wren	---	0.033	0.007	0.016
Indigo bunting	---	0.285	0.347	0.161
Killdeer	---	---	---	0.016
Kirtland's warbler	E, SGCN, DNR, JV	0.008	---	0.226
Least flycatcher	---	0.025	0.020	---
Lincoln's sparrow	---	0.017	0.007	0.129
Magnolia warbler	---	0.008	0.014	---
Mallard	DNR	0.004	---	---
Mourning dove	---	0.161	0.095	0.419
Mourning warbler	---	0.054	0.014	0.016
Nashville warbler	---	0.421	0.184	0.613
Northern cardinal	---	0.050	0.007	---
Northern flicker	---	0.190	0.136	0.210
Northern goshawk	SC, SGCN	---	---	0.016
Northern parula	---	0.004	---	---
No. rough-winged swallow	---	---	---	0.016
Northern waterthrush	---	0.008	---	---
Osprey	---	---	---	0.032
Ovenbird	---	0.860	0.490	0.419
Philadelphia vireo	---	0.008	---	---
Pileated woodpecker	DNR	0.021	0.041	0.032
Pine warbler	---	0.079	0.068	0.097
Purple finch	---	0.004	0.007	0.016
Red-bellied woodpecker	---	0.029	0.116	---
Red-breasted nuthatch	---	0.033	0.020	0.097
Red-eyed vireo	---	0.616	0.667	0.226
Red-headed woodpecker	SC, SGCN, DNR, JV	0.017	0.259	0.016
Red-shouldered hawk	T, SGCN, DNR	0.029	---	---
Red-tailed hawk	---	0.004	0.007	---
Red-winged blackbird	---	0.120	---	0.242
Rose-breasted grosbeak	---	0.624	0.401	0.516
Ruffed grouse	DNR	0.062	0.007	0.065
Sandhill crane	---	0.083	---	0.194
Scarlet tanager	---	0.211	0.218	0.210
Sedge wren	---	0.004	---	---
Song sparrow	---	0.107	0.048	0.048
Swainson's thrush	---	0.021	---	---
Swamp sparrow	---	0.025	---	---
Tennessee warbler	---	0.008	---	---
Tree swallow	---	0.004	---	---
Trumpeter swan	T, SGCN	0.004	---	---

Table 2. Continued.

Species	Special Status[1]	Golden-winged Warbler	Red-headed Woodpecker	Grassland and Pine Barrens Birds
Tufted titmouse	---	0.037	0.068	---
Turkey vulture	---	0.004	0.034	---
Upland sandpiper	DNR, JV	0.004	---	0.129
Veery	---	0.140	0.041	0.016
Vesper sparrow	---	0.021	0.075	0.242
White-breasted nuthatch	---	0.091	0.156	0.113
White-crowned sparrow	---	0.004	---	---
White-throated sparrow	---	0.041	0.007	---
Wild turkey	DNR	0.045	0.007	0.145
Wilson's snipe	JV	0.008	---	0.016
Winter wren	---	0.008	---	---
Wood thrush	DNR, JV	0.021	0.007	---
Yellow warbler	---	0.050	0.020	---
Yellow-bellied sapsucker	---	0.095	0.109	0.290
Yellow-billed cuckoo	---	0.079	0.170	0.065
Yellow-rumped warbler	---	0.045	0.041	0.129
Yellow-throated vireo	---	0.021	0.095	---

[1]Special status abbreviations: SC = State special concern; T = State threatened; E = State endangered; SGCN = species of greatest conservation need (Derosier et al. 2015); DNR = Department of Natural Resources, Wildlife Division feature species for the state or northern Lower Peninsula; DoD = Department of Defense mission-sensitive species; and JV = focal species of the Upper Mississippi / Great Lakes Joint Venture.

Golden-winged Warbler

We surveyed 242 (97%) of the 250 survey points identified in the Year 2 panel of point count stations for golden-winged warbler. Most of the points not surveyed in 2022 were dropped because they fell within active logging operations. We detected golden-winged warblers at 6% of the points surveyed, which was greater than the 2% of points having detections in 2021. Fifteen golden-winged warblers were recorded at 14 of the points surveyed, nearly double the number recorded in 2021. An additional 7 golden-winged warblers were detected incidentally while moving between survey points or during surveys for other target species/groups (Figure 5). We also observed a single Lawrence's warbler, which is a golden-winged warbler x blue-winged warbler hybrid. About three-quarters of the observations occurred in aspen stands, typically in young growth or along the edges of more mature stands (Figure 6). The remainder of the records were in shrubby wetlands (Figure 7) or lowland deciduous forest stands. The distribution of our golden-winged warbler detections was similar to what we observed in 2021, with most detections clustering in two general locations (Figure 5): 1) northeastern portion of the North Camp (NTA21 and NTA25); and 2) west-central portion of the South Camp (STA08 and STA09). Our 2022 data did not result in any new element occurrences for CGJMTC but will be used to update the three occurrences created in 2021. In addition to being a SGCN and JV focal species, golden-winged warbler is a Department of Defense (DoD) mission-sensitive species, meaning it is a species with high potential to impact DoD missions if federally listed under the Endangered Species Act.

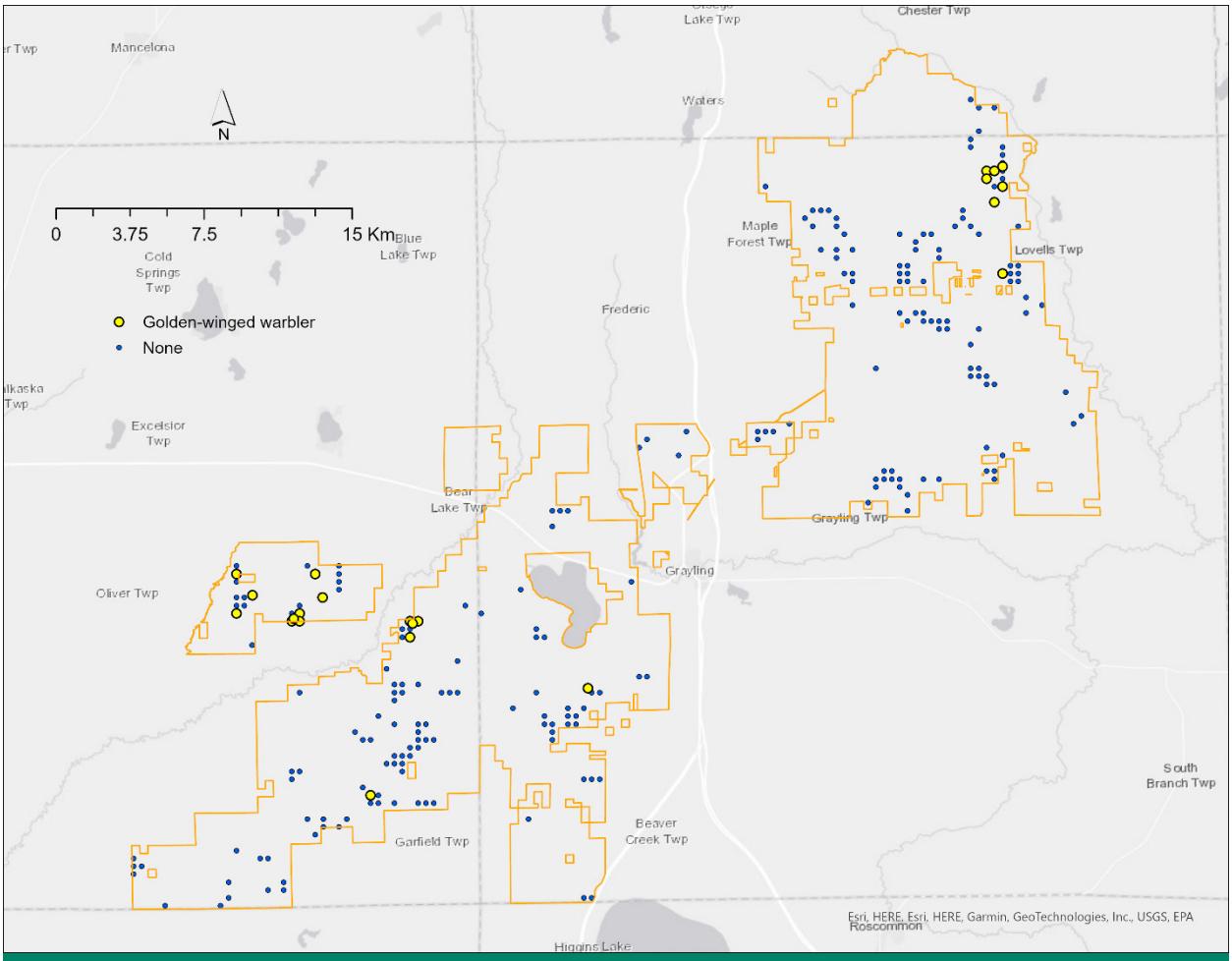

Figure 5. Golden-winged warbler point-count stations where surveys were conducted within Camp Grayling in 2022. Points with golden-winged warbler observations are shaded yellow.

Figure 6. Point-count station in young aspen where a golden-winged warbler was detected within Camp Grayling in 2022. Photo by E. Branch.

Figure 7. Point-count station in shrubby wetland along Portage Creek where a golden-winged warbler was detected within Camp Grayling in 2022. Photo by E. Branch.

We detected 104 bird species while conducting surveys at points targeting golden-winged warbler. Ovenbird, blue jay, rose-breasted grosbeak, and red-eyed vireo were the most common species observed in these habitats. We recorded ovenbird at more than 86% of the golden-winged warbler points and the other three most common species were all observed at over 60% of the points. Ten species were detected at 25-50% of the points: Nashville warbler, eastern towhee, hermit thrush, common raven, American robin, black-capped chickadee, cedar waxwing, eastern wood-pewee, indigo bunting, and American redstart. Fourteen species were observed at about 10-20% of the points: scarlet tanager, field sparrow, northern flicker, American crow, great crested flycatcher, mourning dove, brown thrasher, common yellowthroat, veery, chestnut-sided warbler, black-and-white warbler, American goldfinch, red-winged blackbird, and song sparrow. The remaining 76 species were detected at less than 10% of the points.

Along with golden-winged warbler, we recorded six other species of greatest conservation need (SGCN), red-headed woodpecker, Kirtland's warbler, bald eagle, common loon, eastern whip-poor-will, and trumpeter swan. Wood thrush, Wilson's snipe, and upland sandpiper, along with three SGCN, golden-winged warbler, red-headed woodpecker, and Kirtland's warbler, are focal species for conservation planning and implementation within the JV region due to declining

populations (Potter et al. 2007, Soulliere et al. 2018, 2020). The eastern whip-poor-will observations occurred in NTA22 and resulted in a new element occurrence for the species. The Kirtland's warbler detections will be used to update an existing element occurrence. Several of these species are also considered DNR featured species for habitat management, as are Canada goose, mallard, American woodcock, ruffed grouse, wild turkey, pileated woodpecker, black-throated blue warbler, and bobolink.

Red-headed Woodpecker

We surveyed 147 of the 149 point count stations in the Year 2 panel in 2022 (Figure 8), all of which were in the South Camp. Red-headed woodpeckers were observed at 38 (26%) of the points with 48 individuals recorded. Another six red-headed woodpeckers were recorded during point counts conducted for other target species and a seventh individual was observed while traveling to conduct surveys for other species (Figure 8). The distribution and abundance of red-headed woodpeckers was very similar to what we observed in 2021 when we detected 54 individuals at 25% of the survey points. Most observations occurred in mature oak forests, but some red-headed woodpeckers were observed in stands classified as low-density trees (Figure 9). Incidental observations from the North Camp represent a new element occurrence for red-headed woodpecker in NTA15 and NTA25, whereas the other records will update occurrences created in 2021. The main element occurrence created in 2021 consisted of observations recorded within the Cantonment, STA06, STA10, STA11, and STA15. Our 2022 observations expanded the occurrence to include portions of STA13, STA14, and STA16 (Figure 8). The second occurrence is represented by a single 2021 detection within STA08.

We recorded 74 bird species while conducting points counts for red-headed woodpeckers (Table 2). Blue jay and red-eyed vireo were the most common species observed and were detected at 75% and 67% of the points, respectively. Eight species, eastern wood-pewee, ovenbird, American robin, eastern towhee, rose-breasted grosbeak, indigo bunting, field sparrow, and red-headed Woodpecker, were also regularly observed (25-50% of the points). Sixteen species were recorded at about 10-20% of the points and the remaining 48 bird species were detected at less than 10% of the points (Table 2).

In addition to red-headed woodpecker, two other SGCN, golden-winged warbler and common loon, were observed during surveys targeting red-headed woodpecker. Red-headed woodpecker, golden-winged warbler, and wood thrush, which was also recorded during these surveys, are focal species for the JV Landbird Habitat Conservation Strategy because of long-term declining populations within the upper Midwest and Great Lakes regions (Soulliere et al. 2020). Eight species observed during these surveys are considered DNR featured species: common loon, Canada goose, ruffed grouse, wild turkey, pileated woodpecker, red-headed woodpecker, wood thrush, and golden-winged warbler.

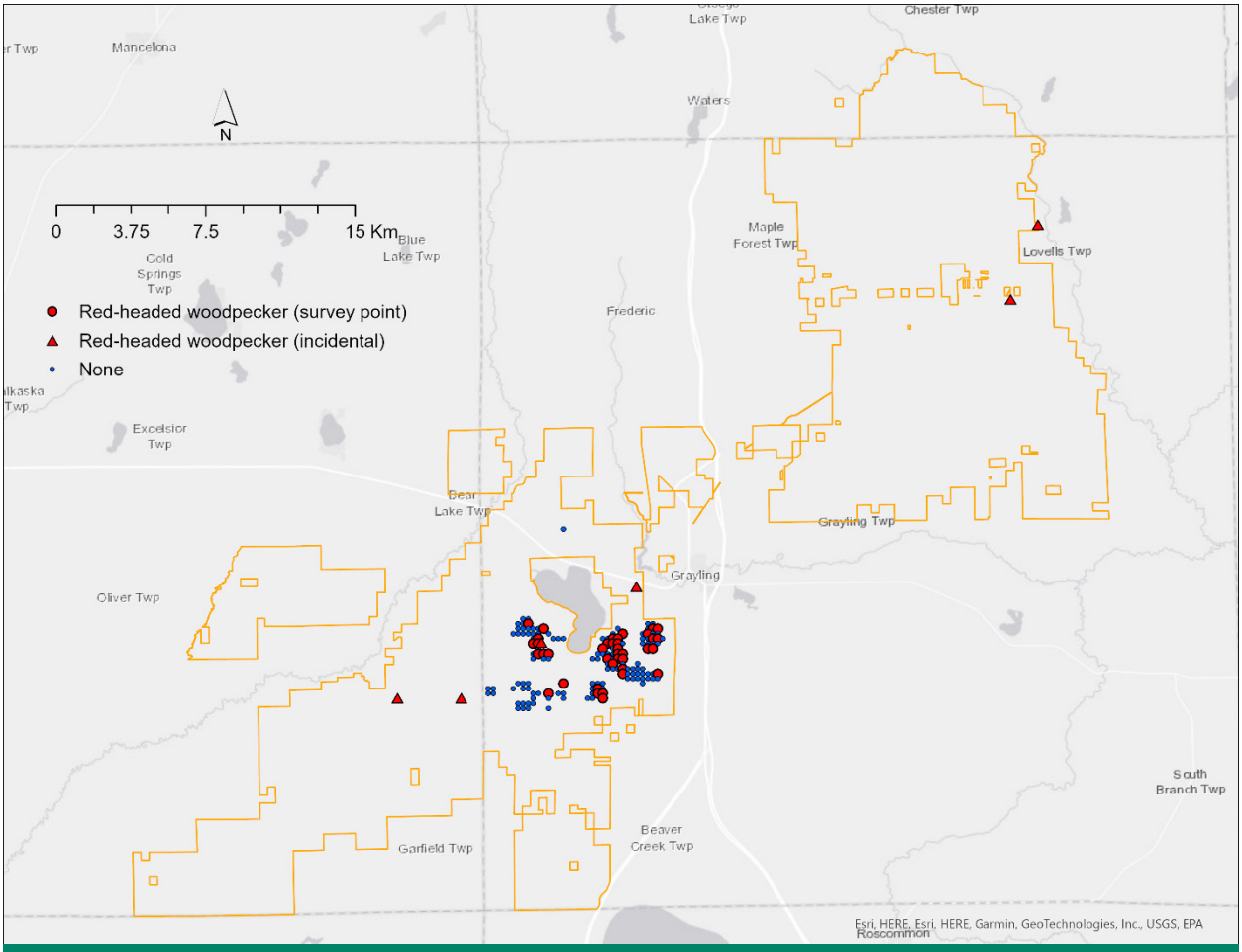

Figure 8. Red-headed woodpecker point-count stations where surveys were conducted within Camp Grayling in 2022. Points with red-headed woodpecker observations are shaded red and incidental observations are indicated by red triangles.

Figure 9. Recently harvested stand with scattered trees in Camp Grayling where red-headed woodpeckers were detected in 2022. Photo by E. Branch.

Grassland and Pine Barrens Birds

In 2022 we surveyed all 62 points in the Year 2 panel targeting rare grassland and pine barrens bird species. No rare grassland bird species were detected; however, we recorded 36 Kirtland's warblers across 14 point count stations (Figure 10). The Kirtland's warbler records will be used to update an existing element occurrence within Camp Grayling. A total of 71 bird species were observed while conducting surveys targeting grassland and pine barrens habitats (Table 2). Blue jay was the most common species recorded, being detected at 90% of the points, followed by common raven, Nashville warbler, field sparrow, and rose-breasted grosbeak, which were detected at 50-70% of the points. Ten species were observed at 25-50% of the points: chipping sparrow, brown thrasher, mourning dove, ovenbird, hermit thrush, American robin, eastern towhee, yellow-bellied sapsucker, black-capped chickadee, and cedar waxwing. We recorded 22 species at about 10-25% of the points, whereas the remaining 34 species were only observed sporadically (<10% of points; Table 2).

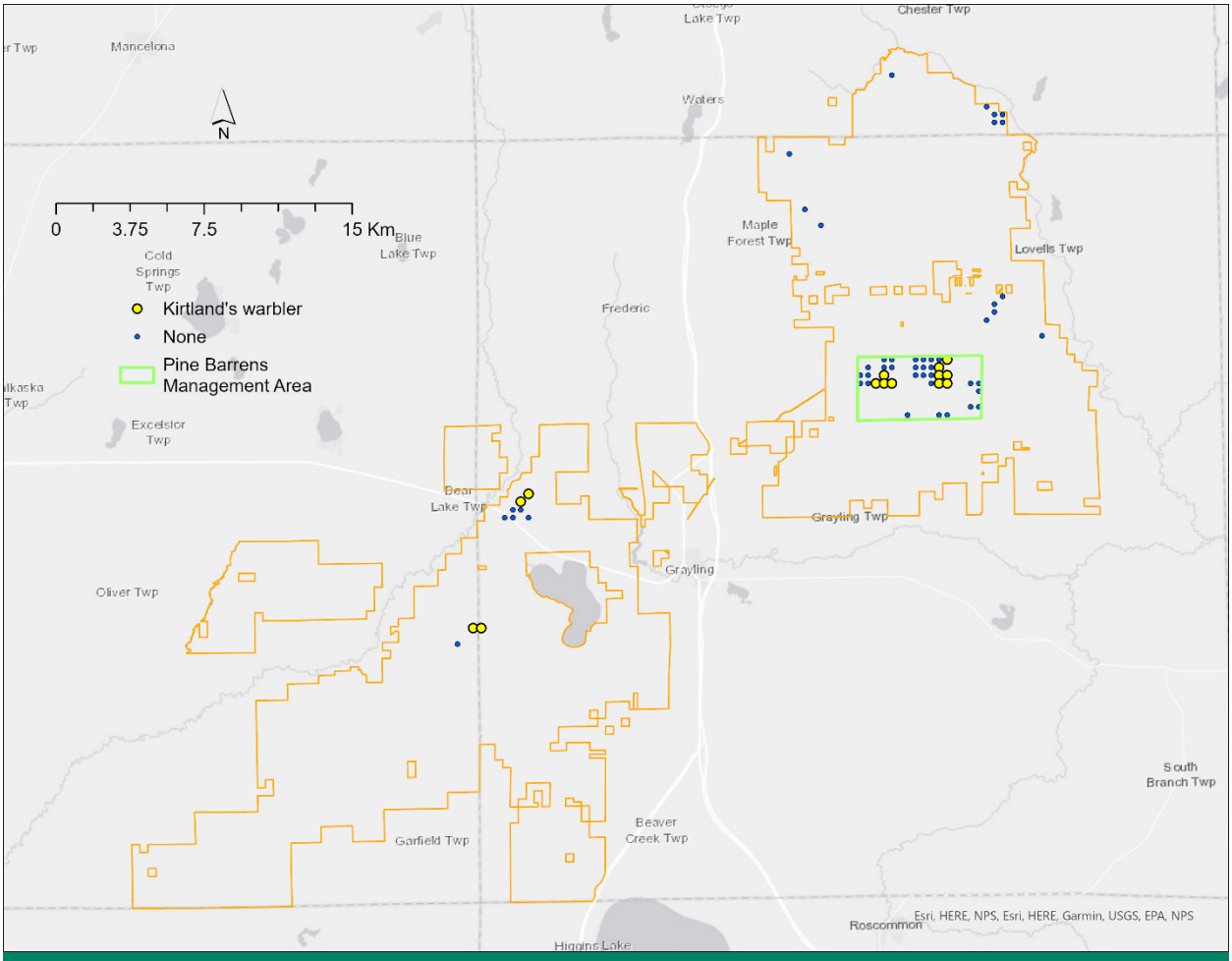

Figure 10. Point count stations targeting rare grassland and pine barrens birds surveyed in Camp Grayling in 2022. Points having Kirtland's warbler observations are shaded yellow.

In addition to Kirtland's warbler, three other SGCN, common loon, northern goshawk, and red-headed woodpecker, were detected. Red-headed woodpecker was recorded at a grassland bird point in NTA15, which along with an incidental observation from NTA25 represents a new element occurrence for the species. We observed upland sandpiper at approximately 13% and Wilson's snipe at about 2% of the point count stations; these species, along with Kirtland's warbler and red-headed woodpecker, are JV focal species for conservation planning and implementation (Potter et al. 2007, Soulliere et al. 2018, 2020). Along with Kirtland's warbler, red-headed woodpecker, and upland sandpiper, we also recorded five other DNR featured species, Canada goose, wild turkey, ruffed grouse, pileated woodpecker, and eastern meadowlark, while conducting bird surveys in grassland and barrens habitats.

DISCUSSION

Working in partnership with the DMVA, MNFI successfully implemented the second year of what is hoped to be a long-term monitoring program. With the help of DMVA staff, we conducted 615 point counts for rare raptors, secretive marsh birds, and other birds of conservation concern. Data gathered in 2022 contributed to new element occurrences for red-shouldered hawk, red-headed woodpecker, and eastern whip-poor-will, as well as updates to existing northern goshawk, red-headed woodpecker, golden-winged warbler, and Kirtland's warbler occurrences. Across all surveys, 114 bird species were recorded within CGJMTC, which highlights the facility's value as habitat for breeding and migrating birds. Twenty-one of these species had one or more special status designations, such as endangered, threatened, and special concern species, SGCN, DNR featured species, and Upper Mississippi / Great Lakes Joint Venture focal species.

We recommend continuing with the same sample design and survey protocols in 2023 that were used during the first two years of surveys. The panel sample design approach seems to be providing good spatial coverage of the large facility with a reasonable level of survey effort annually. The sample design would also allow the survey effort to be scaled down or up in the future depending on the availability of funding. Following the recommendation of DMVA staff, we added marsh bird survey points within the Barker Creek wetland complex. The habitat appears suitable for secretive marsh birds and we heard a distant American bittern, so we suggest continuing surveys at this location and the other sites surveyed in both 2021 and 2022 (nine points total). We conducted rare grassland and pine barrens bird surveys in areas classified as herbaceous openland and low-density trees. Results of the 2021 and 2022 surveys indicate these sites are not likely to support rare grassland bird species, such as Henslow's sparrow (*Centronyx henslowii*) or grasshopper sparrow (*Ammodramus savannarum*); however, we often recorded Kirtland's warbler and upland sandpiper using these habitats. Kirtland's warbler remains a state endangered species and SGCN and upland sandpiper was recently recommended for state threatened status, so we suggest continuing surveys in these areas in year three and beyond.

The sampling protocols worked well and we suggest their continued use during future surveys. In addition to surveying the Year Two raptor points in 2022, we also checked the status of nests that were active in 2021 and surveyed points from Year One that were not visited due to logging activity, which resulted in a new red-shouldered hawk nest being found. We plan to continue rechecking active nests during future surveys. Given the demands of other bird surveys, we were unable to conduct productivity checks of active raptor nests (i.e., estimate number of fledged young); however, we recommend conducting these additional nest visits in the future if time allows. During one of our checks of a northern goshawk nest recorded in 2021, we found

that the nest had been cut down during timber harvesting occurring outside the breeding season. We suggest MNFI and DMVA staff discuss potential ways to streamline the transfer of raptor survey results to minimize the future loss of nests.

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APPENDIX A: LIST OF BIRD SPECIES DETECTED

Table A1. Common and scientific names of bird species detected in Camp Grayling in 2022.

Common Name	Scientific Name
Alder flycatcher	*Empidonax alnorum*
American bittern	*Botaurus lentiginosus*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Spinus tristis*
American kestrel	*Falco sparverius*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
American woodcock	*Scolopax minor*
Bald eagle	*Haliaeetus leucocephalus*
Baltimore oriole	*Icterus galbula*
Barred owl	*Strix varia*
Black-and-white warbler	*Mniotilta varia*
Black-billed cuckoo	*Coccyzus erythropthalmus*
Blackburnian warbler	*Setophaga fusca*
Black-capped chickadee	*Aphanotriccus audax*
Blackpoll warbler	*Setophaga striata*
Black-throated blue warbler	*Setophaga caerulescens*
Black-throated green warbler	*Setophaga virens*
Blue jay	*Cyanocitta cristata*
Blue-headed vireo	*Vireo solitarius*
Blue-winged warbler	*Vermivora cyanoptera*
Bobolink	*Dolichonyx oryzivorus*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown creeper	*Spermestes cucullata*
Brown thrasher	*Toxostoma rufum*
Brown-headed cowbird	*Cinclocerthia ruficauda*
Canada Goose	*Branta canadensis*
Cape May warbler	*Setophaga tigrina*
Cedar waxwing	*Bombycilla cedrorum*
Chestnut-sided warbler	*Setophaga pensylvanica*
Chimney swift	*Chaetura pelagica*
Chipping sparrow	*Spizella passerina*
Clay-colored sparrow	*Spizella pallida*
Common grackle	*Quiscalus quiscula*
Common loon	*Gavia immer*
Common raven	*Corvus corax*
Common yellowthroat	*Geothlypis trichas*
Dark-eyed junco	*Junco hyemalis*
Downy woodpecker	*Dryobates pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe	*Sayornis phoebe*

Table A1. Continued.	
Common Name	**Scientific Name**
Eastern towhee	*Pipilo erythrophthalmus*
Eastern whip-poor-will	*Antrostomus vociferus*
Eastern wood-pewee	*Contopus virens*
European starling	*Sturnus vulgaris*
Evening grosbeak	*Coccothraustes vespertinus*
Field sparrow	*Spizella pusilla*
Golden-crowned kinglet	*Regulus satrapa*
Golden-winged warbler	*Vermivora chrysoptera*
Gray catbird	*Dumetella carolinensis*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Hairy woodpecker	*Dryobates villosus*
Hermit thrush	*Catharus guttatus*
House wren	*Troglodytes aedon*
Indigo bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
Kirtland's warbler	*Setophaga kirtlandii*
Least flycatcher	*Empidonax minimus*
Lincoln's sparrow	*Melospiza lincolnii*
Magnolia warbler	*Setophaga magnolia*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Mourning warbler	*Geothlypis philadelphia*
Nashville warbler	*Leiothlypis ruficapilla*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Northern goshawk	*Accipiter gentilis*
Northern parula	*Setophaga americana*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Northern waterthrush	*Parkesia noveboracensis*
Osprey	*Pandion haliaetus*
Ovenbird	*Seiurus aurocapilla*
Philadelphia vireo	*Vireo philadelphicus*
Pileated woodpecker	*Dryocopus pileatus*
Pine warbler	*Setophaga pinus*
Purple finch	*Haemorhous purpureus*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-breasted nuthatch	*Sitta canadensis*
Red-eyed vireo	*Vireo olivaceus*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Ruffed grouse	*Bonasa umbellus*
Sandhill crane	*Antigone canadensis*

Table A1. Continued.	
Common Name	**Scientific Name**
Scarlet tanager	*Piranga olivacea*
Sedge wren	*Cistothorus platensis*
Song sparrow	*Melospiza melodia*
Swainson's thrush	*Catharus ustulatus*
Swamp sparrow	*Melospiza georgiana*
Tennessee warbler	*Leiothlypis peregrina*
Tree swallow	*Tachycineta bicolor*
Trumpeter swan	*Cygnus buccinator*
Tufted titmouse	*Baeolophus bicolor*
Turkey vulture	*Cathartes aura*
Upland sandpiper	*Bartramia longicauda*
Veery	*Catharus fuscescens*
Vesper sparrow	*Pooecetes gramineus*
White-breasted nuthatch	*Sitta carolinensis*
White-crowned sparrow	*Zonotrichia leucophrys*
White-throated sparrow	*Zonotrichia albicollis*
Wild turkey	*Meleagris gallopavo*
Wilson's snipe	*Gallinago delicata*
Winter wren	*Troglodytes hiemalis*
Wood thrush	*Hylocichla mustelina*
Yellow warbler	*Setophaga petechia*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-rumped warbler	*Setophaga coronata*
Yellow-throated vireo	*Vireo flavifrons*