



## A Preliminary Study of the Avifauna of Lake George, NY

*A report submitted to the Lake George Land Conservancy by the Center for Adirondack Biodiversity, Paul Smith's College, Paul Smith's NY*

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Lake George avifaunal photos by Nathaniel Child

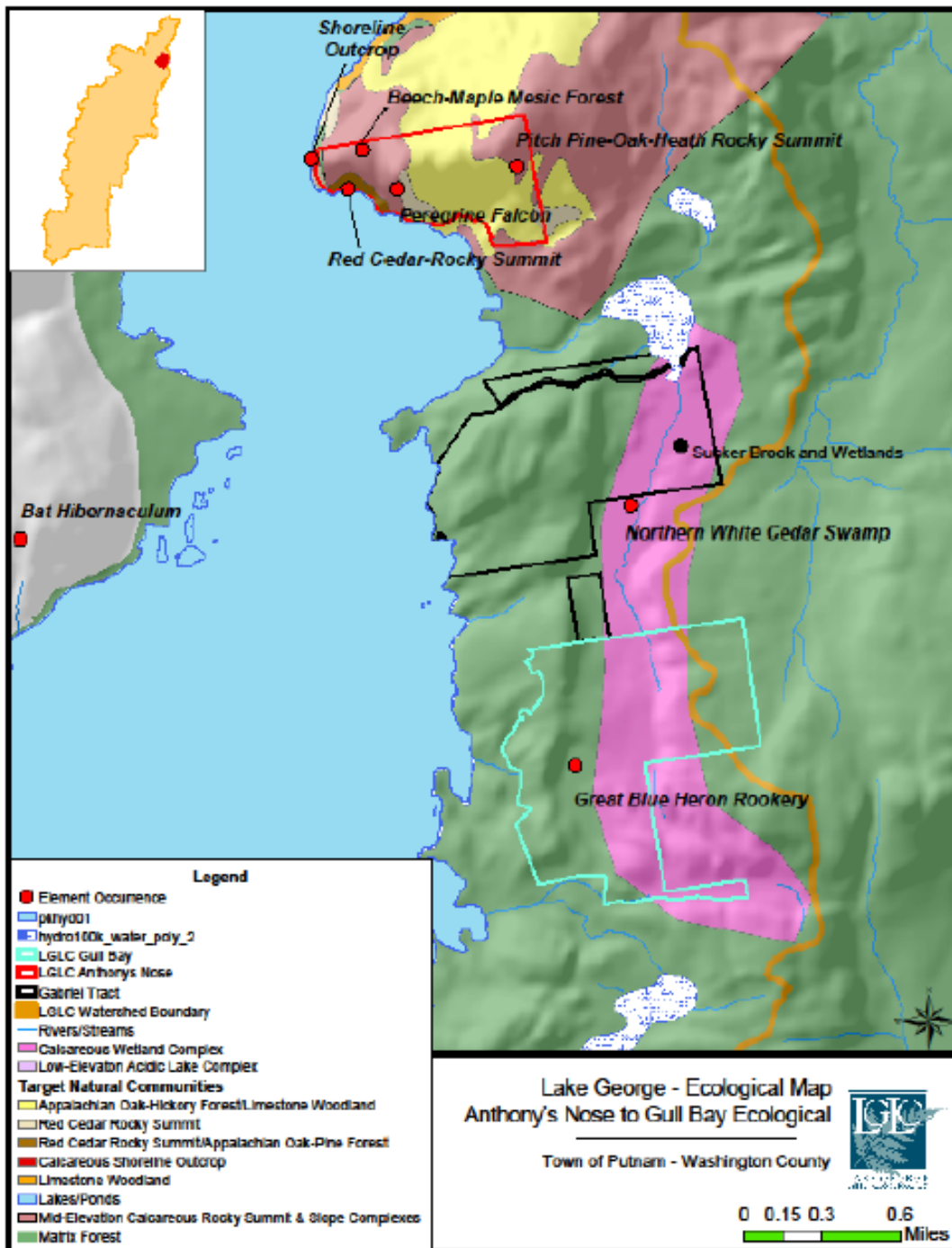
Map by LGLC

Report revised with photos and maps additions by Nancy Williams, LGLC

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Map prepared by  
 LGLC-GIS  
 2005  
 Bolton Landing, New York  
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NOTE: Some areas depicted within the “Gabriel Tract” remain private property. Please contact LGLC for further information and see map at end of this report.

NOTE: Please find pictures of properties at end of the report.

### **Acknowledgements**

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### **Cover Photo**

Black-throated Blue Warbler, *Dendroica caerulescens*

## Introduction



Eastern Kingbird, *Tyrannus tyrannus*

Habitat change, including loss of area, fragmentation of once continuous areas of habitat, and degradation of remaining patches, is recognized as one of the leading causes of declines in biodiversity worldwide (Meffe 1997). In recent years, there has also been a growing recognition that shifts in global climate largely attributable to anthropogenic pollution are altering the underlying structure of the landscape. These changes in patterns of precipitation (Brown 2000; Milly et al. 2005), temperature (DeGaetano 1996), and nutrient cycling (Davidson & Janssens 2006) interact with direct anthropogenic alteration of habitat, often leading to synergistic rather than additive effects (Pyke 2004; Travis 2003). Understanding fundamental shifts in ecosystem structure and function due to habitat change is incredibly important both for our long-term survival as a species, and for the continued conservation of biodiversity in general: We are reliant on functioning ecosystems for a continual supply of clean air, water, atmospheric carbon sequestration (i.e., maintenance of global climate), nutrient cycling, and food. Similarly, other species rely on certain attributes of the ecosystem for their survival both as individuals and populations, for example maintenance of critical thermal maxima and minima, and availability of food and shelter.

Given the importance of maintaining ecosystem integrity, there is a clear need for monitoring changes in structure and function. Keeping track of all of the changes in the abiotic and biotic components of an ecosystem over time is extremely challenging,

however. One solution to this problem is to identify suitable ecological indicators as proximate measures of changes in ecosystem structure and function (Allen et al. 2003; Nielsen et al. 2007; Tierney et al. 2009). Criteria for selecting suitable indicators include that they are comprehensive enough to assess composition, structure and function across multiple spatial scales (Tierney et al. 2009); readily interpreted (Allen et al. 2003); sufficiently sensitive to changes in environmental conditions that they will exhibit a measurable change within a time-scale appropriate to monitoring efforts; and readily measured using standardized techniques. If species are used as ecological indicators, selecting from a variety of taxa and with a variety of life-history strategies can help assure that the inferences drawn from indicators are appropriate to the overall condition of the ecosystem (Carignan & Villard 2002).

The spatial distribution and abundance of bird species, guilds and communities are widely recognized as a suitable indicator of ecosystem structure and function due to their meeting the criteria listed above (Campbell 2007; Canterbury et al. 2000; O'Connell et al. 2000). For example the abundance and diversity of cavity-nesting birds can be closely linked to abundance of mature trees and large snags (Land et al. 1989) and the distribution of understory bird has been found to be greater in forests with large canopy gaps (Schemske & Brokaw 1981). Recent research has also shown that the distribution of bird species over large spatial scales is indicative of changing patterns of global climate, with a gradual northwards shift of species in the northern hemisphere (Crick 2004).



Red-winged Blackbird, *Agelaius phoeniceus*

In this study we assessed the distribution of avifauna, particularly songbirds, in forest surrounding Lake George, NY, with the goal of using these data as an indicator of both current ecosystem integrity, and as a baseline for continued ecological monitoring in the future. Our specific objectives were to: (1) catalogue the species found in this area; (2) document the spatial distribution of species and relative abundances; and (3) provide baseline data for long-term monitoring of avifauna at the site. Lake George represents an important location for monitoring forest ecosystem integrity: The area in which Lake George is located is under considerable pressure from land development, with the

forested habitats surrounding the lake offering some of the few remaining areas of intact ecosystems in the immediate vicinity. The lake, associated wetlands, and surrounding terrestrial habitat also perform a number of important and economically valuable services including providing a famous source of clean water, and recreation for example hiking and bird-watching. The value of Lake George to the local community is clearly recognized by the formation of the Lake George Land Conservancy, a land trust dedicated to working with willing land-owners to conserve the Lake and surrounding habitat. The data gathered by this project represents an important first step in providing the necessary ecological data to ensure the continued ecological integrity of this valuable area.

## Methods



Black and White Warbler, *Mniotilta varia*

### *Study sites and bird surveys*

Bird surveys were conducted at four locations around Lake George, NY, namely Anthony's Nose Preserve, Gull Bay Preserve, Last Great Shoreline, and Sucker Brook Swamp. These locations were chosen to ensure spatial independence, and to include the diversity of terrestrial habitat found at Lake George. Surveys were conducted by a single

observer from 18<sup>th</sup> May to 12<sup>th</sup> June 2009 for a total of 143 survey hours. Each site was surveyed at least twice during the study period, but survey effort did vary between the four locations (Table 1). Surveys began between 7 and 9am and were completed by 6:30pm at the latest. Each site was surveyed such that as much area was covered in one visit as possible. Using a map, compass, and GPS unit, a route was chosen to visit any different habitat types in each site, as well as come within hearing or visual range of any point in the plot. At regular intervals, a point was chosen to stop and watch for birds in order to increase the likelihood of encountering a bird that wasn't vocalizing. All birds observed or heard calling were recorded to species. Details were also recorded of the weather conditions throughout the period of study.



Common Yellowthroat, *Geothlypis trichas*

## Results

A total of 623 birds were positively identified during the duration of the study, representing 87 species (Appendix 1 and 2). The most common species of bird recorded was the Hermit Thrush (N = 20), with Black-capped Chickadee, Blue Jay, Ovenbird, and Red-eyed Vireo all recorded on 18 occasions. When considering occurrence of the



species recorded at Lake George, there was a mixture of widespread and spatially restricted species: 24 were only found at one site, 11 were found at two sites, 22 were found at three sites, and 29 were found at all four sites. Examples of species only occurring at one site include Canada Warbler, Chestnut-sided Warbler and Indigo Bunting. Examples of widespread species occurring at all sites include Yellow-rumped Warbler, Song Sparrow, and Ovenbird.

The number of individuals and species recorded varied between sites, but trends in these data are not clear when differences in survey effort are considered (Table 1). Anthony's Nose Preserve does appear to have lower species diversity and fewer birds in general. Based on a species accumulation curve (Fig. 1), the study effort appears to have been sufficient to have recorded the majority of species occurring at the sites, but there is a likelihood of new species being recorded had the surveys been increased in duration. This trend may not represent insufficient survey effort *per se*, but seasonal differences in the birds occurring in the area- this is suggested by the slight increase in new species recorded in the final days of the study. There were limitations to the study including the challenges of positively identifying birds with very similar calls, or birds that were not clearly seen. The latter factor is likely to have varied with habitat type and therefore may represent a potential bias between sites.



Peregrine Falcon, *Falco peregrinus*

## Discussion

Our research demonstrates that Lake George has a diverse bird community including many species that are of conservation concern both in New York State and nationwide. Within this category, we documented species that are imperiled due to a number of different reasons: Birds such as the Canada Warbler, Chestnut-sided Warbler and Black-throated Green Warbler are migratory species that have shown declines in populations across Eastern North America in recent decades primarily due to habitat loss (Robbins et al. 1989). Other species found at Lake George, such as Peregrine Falcon and Bald Eagle, have been affected by specific agents of decline, in this case the legacy of widespread use of dichlorodiphenyltrichloroethane (DDT). Not all of the birds seen at Lake George are in decline, however; species such as the Turkey Vulture have shown a steady northwards trend in range, likely in response to a warming climate, and are now common in the Adirondacks whereas once they would have been rare or absent altogether (Bagg & Parker 1951).

The diversity of life-history strategies found in the avifauna at Lake George demonstrates the vertical and horizontal habitat heterogeneity present at the site. We observed a number of species that are closely associated with mature forest (see images below), either due to the availability of suitable cavity nesting sites in the case of the Barred Owl, or species that feed in the canopy, for example the Black-Throated Green Warbler and Blackburnian Warbler (the latter species also nests high in the canopy of conifer trees) (Boreal Songbird Initiative 2009; Campbell 2007). Other species observed indicate the presence of more dense forest, for example the single Canada Warbler observed was likely present due to the moist thickets that it is known to prefer. We also documented species typical of the mixed forest found at Lake George, for example Blackburnian Warbler are closely associated with coniferous forests (~55% of the breeding population of this species nests in the boreal forests of Canada), whereas Alder Flycatcher primarily occupy moist areas dominated by birch (*Betula* sp.) and alder (*Alnus* sp.).



Species of bird found in mature forest at Lake George (clockwise from top left: Black-throated green warbler, *Dendroica virens*, Blackburnian warbler, *D. fusca*, American Redstart, *Setophaga ruticilla*, juvenile Barred Owl, *Strix varia*).

In addition to forested habitat, Lake George also offers a diversity of wetlands with associated avifauna. An active Osprey nest was located in a large pond in the Sucker Brook Swamp complex, and the adults were frequently seen flying over the swamp hunting or carrying food. Nest building behavior was also observed on multiple occasions. Yellow warblers were also seen on 6 occasions: This species is closely associated with wetlands, particularly marshes and swamps. Great Blue Heron were also ubiquitous across Lake George, including an impressive heron rookery at Gull Bay

Preserve. Additional wetland species include the aforementioned Alder Flycatcher, Black Duck, Mallard Duck, Wood Duck, and Canada Geese.



Yellow warbler in a Spotted Alder

In conclusion, it is clear that Lake George represents an important site for avifaunal conservation in New York State, especially given the location of the protected area in a region with high pressure for land-development. The diversity of avifauna at the site is directly attributable to the diversity of intact terrestrial and aquatic habitats, including mature forest, rocky shorelines and cedar swamp. The birds documented at the site also offer an important indication of the overall integrity of the ecosystem: The mature heterogeneous forest found in protected areas at Lake George is an important habitat type for many species of flora and fauna, with structural legacies such as coarse woody debris and snags playing an important role in providing both habitat and the cycling of nutrients. Similarly the diversity of wetlands not only plays a valuable role in maintaining biodiversity, but also contributes towards maintaining clean water in the lake and intact aquatic ecosystems.

The research documented in this study offers a brief window into the ecology of Lake George, but clearly more work is needed both to understand current ecological integrity and to ensure that management priorities can be set in the future. Summer breeding birds represent one important component of the system, with continued

monitoring of this taxa in the future providing a valuable tool for assessing how the ecosystems at Lake George change over time. There are other taxa that would also be of particular benefit for ecological monitoring due to their known sensitivity to habitat change, for example herpetofauna (amphibians and reptiles). One important question that remains is how data from long-term monitoring are to be integrated with management: Setting acceptable benchmarks in terms of levels of change in species distributions or abundance is a vital step in adaptive management, followed by the development of alternative strategies for management if these benchmarks are reached.

### **Cited Literature**

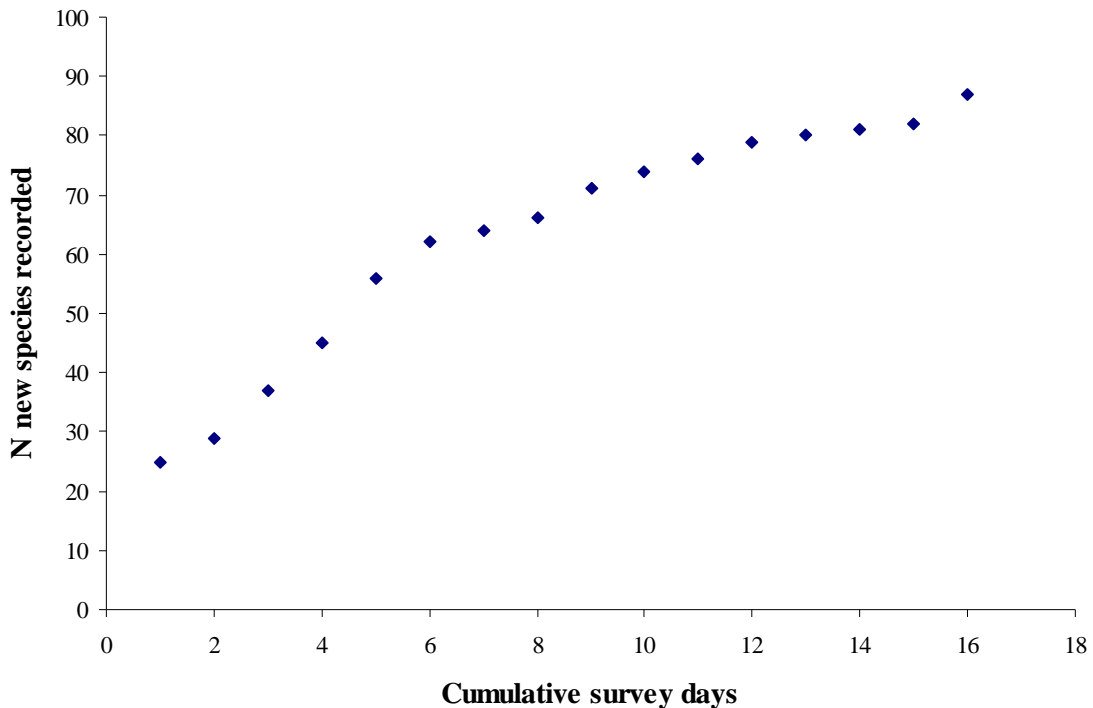
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## Tables and Figures

**Table 1.** Attributes of four avifaunal sampling locations at Lake George, NY, namely Anthony’s Nose Preserve, Gull Bay Preserve, Last Great Shoreline, and Sucker Brook Swamp.

Sampling location	Survey hours	N individuals recorded	N species recorded	N individuals recorded/ survey hour	N species /survey hour
Anthony’s Nose Preserve	43.75	139	50	3.2	1.1
Gull Bay Preserve	44.5	218	68	4.9	1.5
Last Great Shoreline	39.75	186	62	4.7	1.6
Sucker Brook Swamp	15	80	52	5.3	3.5
<b>Total</b>	<b>143</b>	<b>626</b>	<b>98</b>	<b>4.4</b>	<b>0.7</b>



**Figure 1.** Species accumulation curve documenting the number of new species of avifauna recorded during sampling at four sites in the vicinity of Lake George, NY, from 18<sup>th</sup> May to 12<sup>th</sup> June 2009

**Appendix 1.** Species and frequency (N) of birds recorded at four sites around Lake George, NY, from 18<sup>th</sup> May to 12<sup>th</sup> June 2009. Species are listed from the most to least common in columns from left to right.

<b>Species</b>	<b>N</b>	<b>Species</b>	<b>N</b>	<b>Species</b>	<b>N</b>
Hermit Thrush	20	Goldfinch	8	Northern Harrier	2
Black-capped Chickadee	18	Red-breasted Nuthatch	8	Sharp-shinned Hawk	2
Blue Jay	18	Winter Wren	8	Tree Sparrow	2
Ovenbird	18	Wood Duck	8	White-throated Sparrow	2
				Rose-breasted	
Red-eyed Vireo	18	Canada Goose	7	Grosbeak	2
Great Crested					
Flycatcher	17	Osprey	7	Bald Eagle	1
American Robin	16	Veery	7	Black Duck	1
Black and White Warbler	16	Yellow-bellied Sapsucker	7	Brown-headed Cowbird	1
Black-throated Green					
Warbler	16	Grey Catbird	6	Canada Warbler	1
Blackburnian Warbler	15	Hairy Woodpecker	6	Chestnut-sided Warbler	1
Northern Flicker	15	Red-tailed Hawk	6	Eastern Towhee	1
Chipping Sparrow	14	Swamp Sparrow	6	Least Flycatcher	1
Turkey Vulture	14	White-breasted Nuthatch	6	Mockingbird	1
Black-throated Blue					
Warbler	13	Yellow Warbler	6	Nashville Warbler	1
Cedar Waxwing	13	American Crow	5	Northern Waterthrush	1
Common Yellowthroat	13	Barred Owl	5	Phoebe	1
Mourning Dove	13	Dark-eyed Junco	5	Pine Warbler	1
Red-winged Blackbird	13	Eastern Kingbird	5	Prothonotary Warbler	1
Ruffed Grouse	13	Peregrine Falcon	5	Purple Finch	1
		Ruby-throated			
Eastern Wood-pewee	12	Hummingbird	5	Red-bellied Woodpecker	1
Scarlet Tanager	12	Tufted Titmouse	5	Savannah Sparrow	1
Song Sparrow	11	Turkey	5	Tennessee Warbler	1
Yellow-rumped Warbler	11	American Redstart	4	White-crowned Sparrow	1
Blue-headed Vireo	10	Belted Kingfisher	4		
Common Grackle	10	Cardinal	4		
Downy Woodpecker	10	Indigo Bunting	4		
Great Blue Heron	10	Mallard Duck	4		
Pileated Woodpecker	10	Alder Flycatcher	3		
Baltimore Oriole	9	American Raven	3		
Broad-winged Hawk	9	Cooper's Hawk	3		
Common Raven	9	Eastern Phoebe	3		
Tree Swallow	9	Common Merganser	2		



**Appendix 2.** Species and frequency (N) of birds recorded at four sites around Lake George, NY, from 18<sup>th</sup> May to 12<sup>th</sup> June 2009. Species are listed alphabetically based on the number of individuals that were found to occur at each of the four study sites.

Species	Anthony's Nose Preserve	Gull Bay Preserve	Last Great Shoreline	Sucker Brook Swamp	Total
Alder Flycatcher	0	1	1	1	3
American Crow	0	1	2	2	5
American Raven	1	0	2	0	3
American Redstart	4	0	0	0	4
American Robin	5	6	4	1	16
Bald Eagle	0	1	0	0	1
Baltimore Oriole	1	3	2	3	9
Barred Owl	0	1	3	1	5
Belted Kingfisher	0	2	1	1	4
Black and White Warbler	5	5	5	1	16
Black Duck	0	0	1	0	1
Blackburnian Warbler	3	5	6	1	15
Black-capped Chickadee	4	6	6	2	18
Black-throated Blue Warbler	2	5	5	1	13
Black-throated Green Warbler	3	6	6	1	16
Blue Jay	5	6	6	1	18
Blue-headed Vireo	3	4	2	1	10
Broad-winged Hawk	1	4	2	2	9
Brown-headed Cowbird	0	1	0	0	1
Canada Goose	1	3	2	1	7
Canada Warbler	0	1	0	0	1
Cardinal	0	1	3	0	4
Cedar Waxwing	4	5	2	2	13
Chestnut-sided Warbler	0	0	1	0	1
Chipping Sparrow	5	4	3	2	14
Common Grackle	0	5	2	3	10
Common Merganser	0	2	0	0	2
Common Raven	2	3	3	1	9
Common Yellowthroat	0	6	5	2	13
Cooper's Hawk	0	1	1	1	3
Dark-eyed Junco	5	0	0	0	5
Downy Woodpecker	3	2	5	0	10
Eastern Kingbird	0	3	0	2	5
Eastern Phoebe	1	1	1	0	3
Eastern Towhee	1	0	0	0	1
Eastern Wood-pewee	5	4	3	0	12
Goldfinch	1	2	3	2	8
Great Blue Heron	1	6	1	2	10
Great Crested Flycatcher	5	5	6	1	17
Grey Catbird	0	1	3	2	6
Hairy Woodpecker	1	2	2	1	6
Hermit Thrush	5	6	6	3	20

Indigo Bunting	0	4	0	0	4
Least Flycatcher	0	1	0	0	1
Mallard Duck	0	3	0	1	4
Mockingbird	1	0	0	0	1
Mourning Dove	4	3	4	2	13
Nashville Warbler	0	0	0	1	1
Northern Flicker	5	5	3	2	15
Northern Harrier	1	1	0	0	2
Northern Waterthrush	0	0	1	0	1
Osprey	1	3	1	2	7
Ovenbird	5	6	6	1	18
Peregrine Falcon	4	0	1	0	5
Phoebe	1	0	0	0	1
Pileated Woodpecker	5	2	3	0	10
Pine Warbler	1	0	0	0	1
Prothonotary Warbler	0	1	0	0	1
Purple Finch	1	0	0	0	1
Red-bellied Woodpecker	0	0	1	0	1
Red-breasted Nuthatch	2	2	3	1	8
Red-eyed Vireo	5	6	5	2	18
Red-tailed Hawk	3	1	0	2	6
Red-winged Blackbird	1	6	4	2	13
Rose-breasted Grosbeak	2	0	0	0	2
Ruby-throated Hummingbird	0	2	2	1	5
Ruffed Grouse	2	4	5	2	13
Savannah Sparrow	0	1	0	0	1
Scarlet Tanager	4	4	4	0	12
Sharp-shinned Hawk	0	2	0	0	2
Song Sparrow	1	4	3	3	11
Swamp Sparrow	0	4	1	1	6
Tennessee Warbler	0	0	0	1	1
Tree Sparrow	0	1	1	0	2
Tree Swallow	0	5	3	1	9
Tufted Titmouse	3	0	2	0	5
Turkey	3	2	0	0	5
Turkey Vulture	4	6	2	2	14
Veery	0	4	2	1	7
White-breasted Nuthatch	1	2	3	0	6
White-crowned Sparrow	0	0	0	1	1
White-throated Sparrow	0	0	1	1	2
Winter Wren	0	2	6	0	8
Wood Duck	0	3	3	2	8
Yellow Warbler	0	1	3	2	6
Yellow-bellied Sapsucker	0	3	3	1	7
Yellow-rumped Warbler	2	4	4	1	11
<b>Total</b>	<b>139</b>	<b>218</b>	<b>186</b>	<b>80</b>	<b>623</b>

**Last Great Shoreline: Sucker Brook Wetland looking south**



**Last Great Shoreline: Sucker Brook Wetland looking north**



**Last Great Shoreline: Lake George shoreline with view of Anthony's Nose to the north with the Adirondack Camp's peninsula in center**

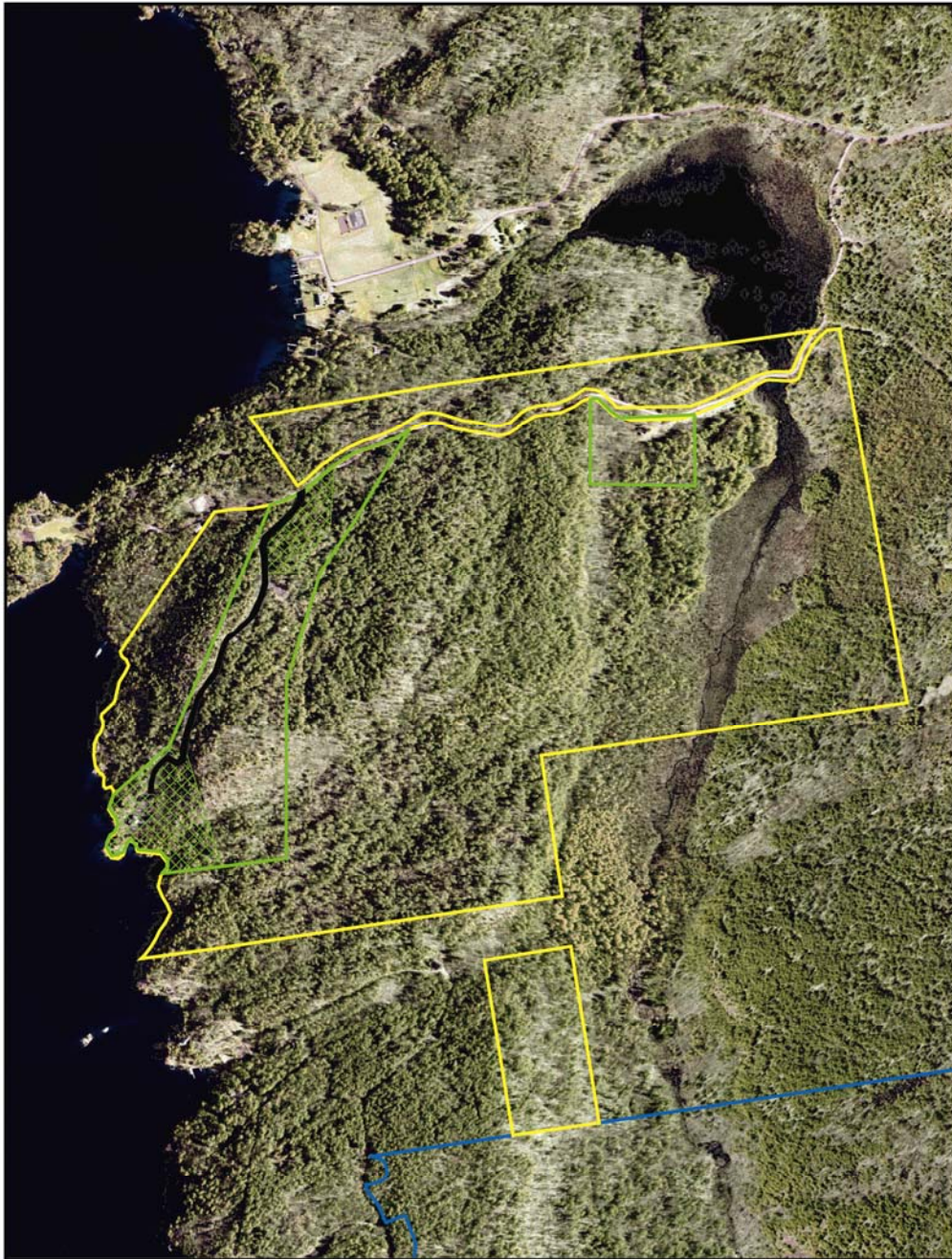


**Anthony's Nose: Peregrine Falcons nest on cliffs.**





**Heron rookery at Gull Bay**



**Last Great Shoreline: Yellow outlines property purchased/protected. Shoreline parcel is open by water or appointment only. Well marked trails are now developed within the largest parcel which are open to visitors. Please stay on trails.**

**Green outline is private property protected by a conservation covenant.**

**Lower right corner with blue outline locates the Gull Bay Preserve. A connector is being planned between Last Great Shoreline and Gull Bay Preserve. Large northern section of Sucker Brook wetland-beaver pond shown north of Last Great Shoreline is privately owned and is hoped to be protected in the future as a Phase 2 project.**