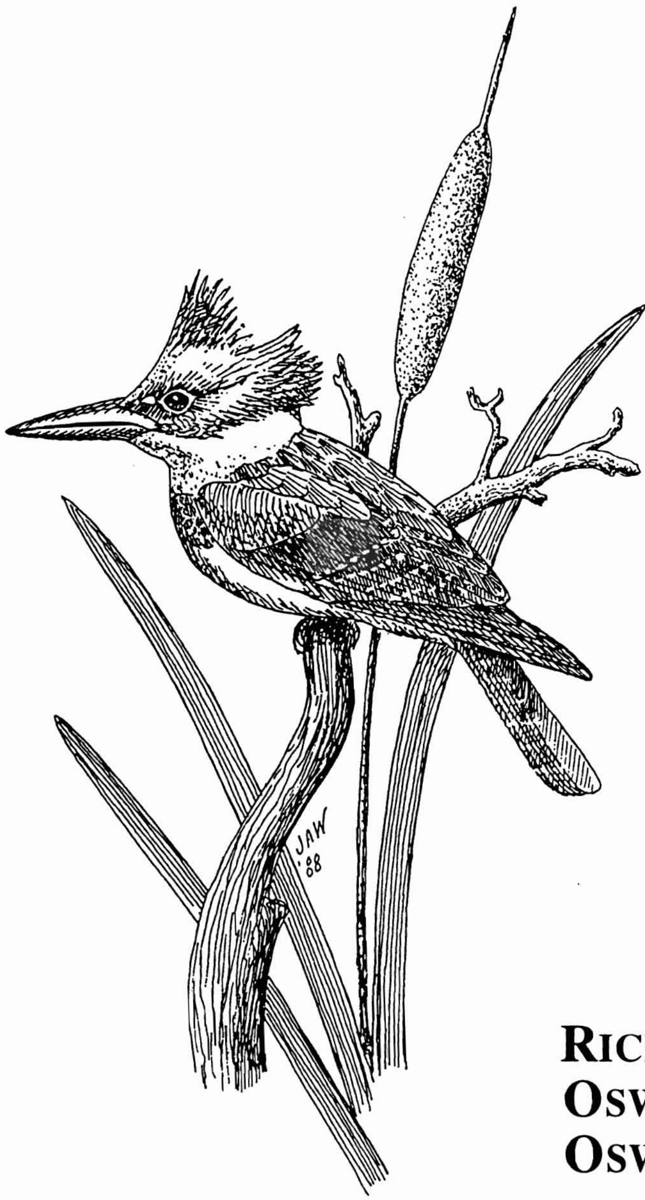
RICE CREEK RESEARCH REPORTS

1997



RICE CREEK FIELD STATION
OSWEGO STATE UNIVERSITY
OSWEGO, NEW YORK 13126

JUNE 19, 1998

Rice Creek Research Reports

1997

The summer of 1997 marked the second season of field research at Rice Creek Field Station under the Rice Creek Associates small grants program. Support from Rice Creek Associates was again supplemented by a contribution from the Division of Continuing Education at Oswego State University. With additional support from the University's Office of Research and Sponsored Programs and an increase in the level of funding from Rice Creek Associates, it was possible to underwrite four research projects in 1997. Diane Chepko-Sade and Peter and Nicholas Weber continued their investigations of the Field Station's small mammal and butterfly populations. Jennifer Frank, a graduate student in biology at the State University at Albany, investigated the possibility of using our hardwood forest as a point of comparison in ongoing studies of the interactions between salamanders, earthworms, and decomposition of forest litter at the E. N. Huyck Preserve in Albany County. Jennifer did not find a population of salamanders adequate to make our site a meaningful addition to the Huyck Preserve study. Not long ago, our small patch of old growth forest was an isolated farm woodlot in the midst of pastures and cultivated fields. I am led to consider the potential for monitoring our site to see if salamander populations characteristic of larger forest areas will be established in the Rice Creek forest as the successional woodlands now surrounding it grow to maturity. John Weeks, an old friend and supporter of Rice Creek and one who was instrumental in the establishment of the Field Station, undertook to update our knowledge of the populations of birds breeding in the wetlands bordering Rice Pond. John's study speaks of both continuity and change in these populations and will serve as a benchmark for further such surveys in years to come. The job of editing and formatting these reports of research during the 1997 season has provided me with valuable new insights into the ecology of Rice Creek Field Station.

Andrew P. Nelson, Director
Rice Creek Field Station
June 21, 1998

Contents

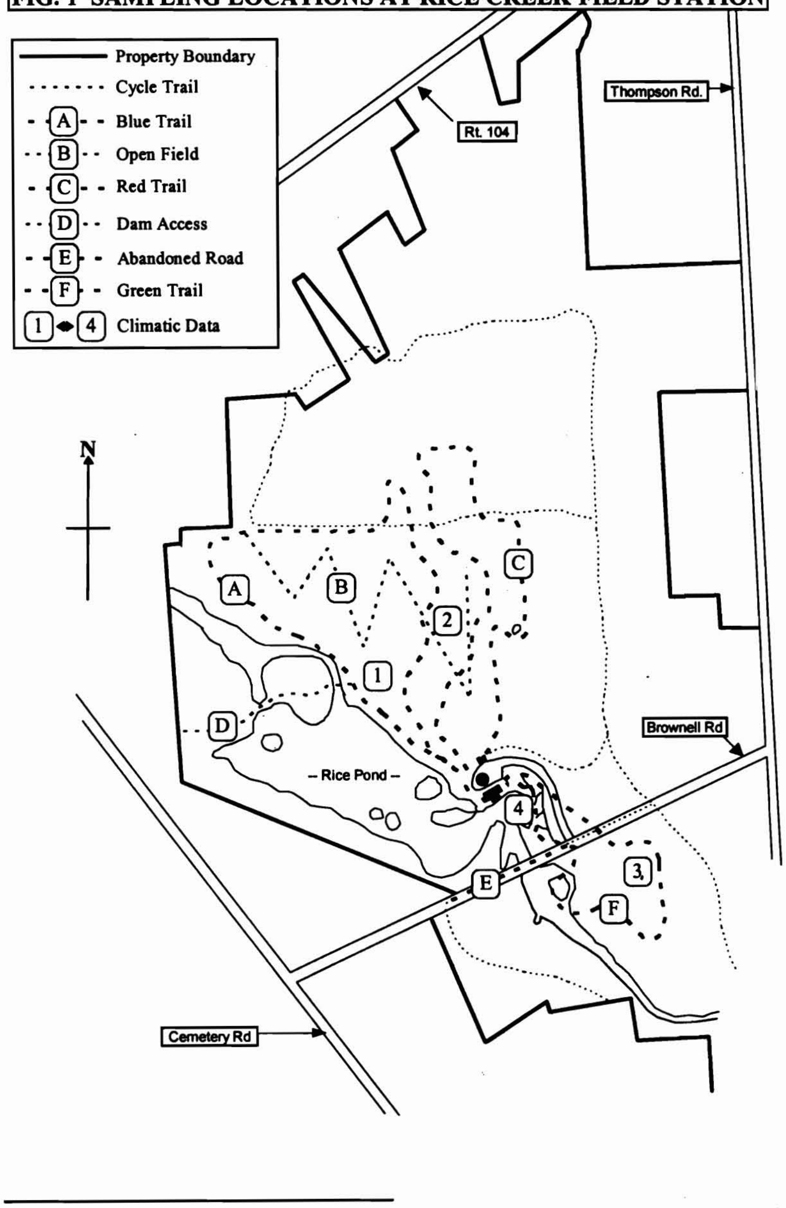
Butterfly Populations at Rice Creek Field Station: The 1997 Season[1]

Nicholas F. A. Weber, LaFayette College, Easton, PA
Peter G. Weber, Professor of Biology, Oswego State University

Purpose and Scope of Project:

The details of the species composition and population numbers of Rice Creek Field Station (RCFS) butterflies were first systematically described by Weber and Weber (1997). Prior to their study the only account of North Central New York butterflies were the county by county maps of species' presence given in Shapiro (1974). The purpose of our 1997 study, was to continue to describe in detail the RCFS butterfly fauna. In the long term we intend to create an annotated monograph characterizing the butterflies of the RCFS grounds, similar to that which exists for Oswego Co. birds (Fosdick 1995). The monograph will characterize the Station's butterfly community in terms of relative population abundance for each species over several seasons in each habitat. It will be a valuable resource for entomologists interested in butterfly diversity, to visitors to RCFS interested in butterfly natural history, and to the Station's director who is responsible for habitat management decisions. The theme of this report will be comparisons between the two years of sampling. Such assessment should give an idea of where more data might be required.

FIG. 1 SAMPLING LOCATIONS AT RICE CREEK FIELD STATION



[1] Financial support provided by Rice Creek Associates and Oswego State University's Division of Continuing Education and Office of Research and Sponsored Programs.

Materials and Methods:

As in 1996, our initial sampling commenced on May 18, from which time on we sampled twice per week until the end of August when sampling became weekly. Weekly sampling continued until October 19, after which weather conditions for butterfly activity deteriorated, as the autumn of 1997 was unusually cold and wet. Both of us participated in all sampling sessions until August 18, after which one of us (PW) sampled. We estimated the relative population abundance of each butterfly species by means of transect sampling (Pollard, Elias et al. 1975; Pollard 1977; Pollard 1979). We used the existing RCFS trails as transects, counting each butterfly encountered within 5M on either side of the transect (Fig. 1). Fields were sampled by fixed zigzagged transects.

Our sampling technique provides an index of relative abundance for each species in each habitat on a given date. We tried to ensure that the same individual butterfly was not counted twice by not counting those individuals we were unsure of in adjacent parts of a transect. Thus we tried to err on the conservative side if there was any doubt. In addition to recording the number of individual butterflies, we also recorded the number of herb and shrub species in bloom along the transects.

Unusual, new, or difficult to identify species were captured, cooled in an ice chest, photographed, and released. This provided a permanent visual record of the butterfly, for identification and verification, without removing it from the population. We were able to obtain adequate photos for all but four butterfly and two skipper species encountered during the 1997 season.

We measured the length of transects as well as the periphery of fields and woodland openings using a Rolatape Dual Counter Metric Distance Measuring Wheel (Model 415 MD). The periphery measures may be used in future analyses of butterfly patch dynamics. As Table 1 shows, somewhat in excess of 5,500 M of total transect lengths were sampled during each sampling session. Of these lengths, somewhat over 70% traversed forested habitats, which provide less than ideal environments for most butterfly species. The remaining transect lengths, about 27%, traversed open habitats which are very suitable for butterflies.

Table 1. Transect Length and Percent of Length per Community

Ecological Communities	Transect Length (M)	% Transect
Forested Communities		
Conifer Plantation	239	3.77%
Hardwood Swamp	454	7.15%
Mature Deciduous Forest	637	10.04%
Successional Deciduous Forest	2807	44.23%
Open Communities		
Lawn & Gardens	110	1.73%
Marsh	331	5.22%
Fields & Wood Openings	1768	27.86%
Sum	6346	100.00%

As in 1996, we monitored physical conditions in order to assess whether butterfly abundance is related to microclimatic conditions. Air temperature was taken with a Barnant thermocouple thermometer (model 100), wind speed measured with a Sims hand-held anemometer (model BTC), relative humidity was taken with a Taylor sling psychrometer and insolation measured with an A.W. Sperry digital light meter (model SLM-110). These measurements were taken in the same two lowland, wooded upland and upland field locations as in 1996 (Fig. 1).

Results:

Overall Description of the RCFS Butterfly Community

As shown in Figure 2, the cumulative number of species over sampling effort was similar in 1996 and 1997. In both years the curves essentially leveled off after the 17th sampling session. Approximately at this point a 1% increase in sampling effort would yield less than a 1% increase in new species. This implies that our sampling effort in each year was adequate in estimating the number of species on the Station grounds.

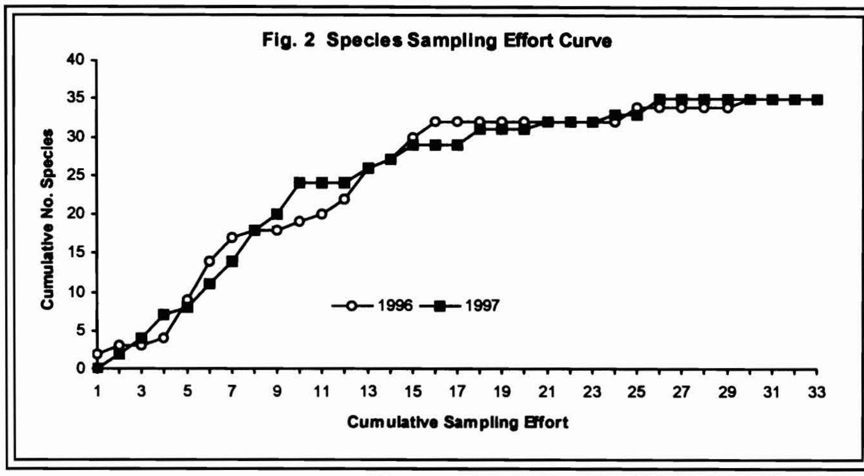


Fig. 2 Species Sampling Effort Curve

The pattern of butterfly species diversity over the season was also remarkably similar between 1996 and 1997 (Figure 3). In 1997 the peak number of species of 20 was reached on 11 July; in 1996 the peak, also on 11 July, was 17 species. In both years the seasonal pattern of butterfly species diversity mimicked the pattern of the number of herb and shrub species in bloom. The peak in the number of herb and shrub species in bloom, however, was reached around the beginning of August, later than the butterfly species peak (Figure 4).

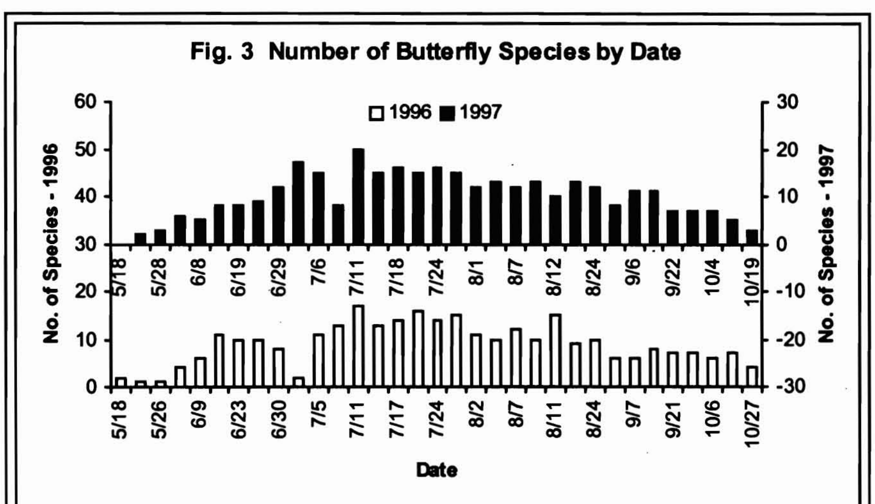


Fig. 3 Number of Butterfly Species by Date

In both years the pattern of relative butterfly abundance was bimodal with peaks in early June and late September (Figure 5). The June peak was due to the appearance of skippers, especially large numbers of European skippers. The later peak was due to monarch migration and the emergence of sulphurs.

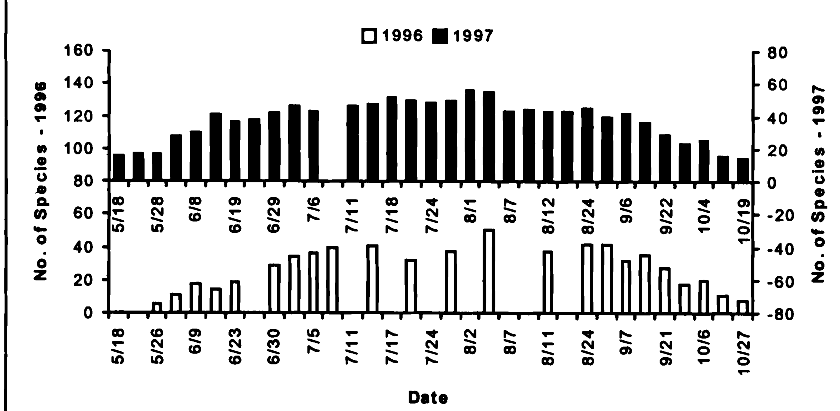


Fig. 4 Number of Blooming Plant Species by Date

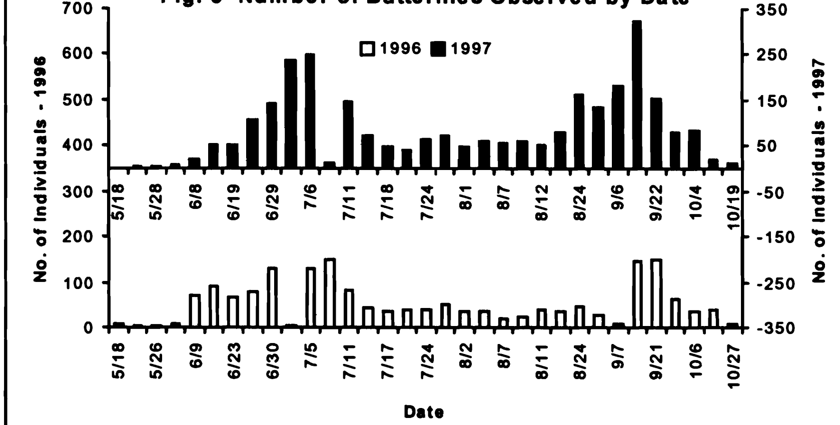


Fig. 5 Number of Butterflies Observed by Date

As Figure 6 shows, the relationship between the number of butterfly species and the number of plant species in bloom was significantly positive (in 1997, $F_{(1,31)} = 90.5$, $p < 0.0001$; in 1996 $F_{(1,21)} = 8.7$, $p < 0.008$). Moreover, in 1997 the correlation showed a marked , and significant, relationship ($r = 0.863$, $z = 7.1$, $p < 0.0001$), while in 1996 the correlation was moderate, but significant ($r = 0.541$, $z = 2.7$, $p < 0.007$). In 1997 approximately 75% of the variation in butterfly species diversity was explained by the number of plant species in bloom, in 1996 only 29% was thus explained.

In contrast, butterfly relative abundance (number of individuals) and the number of plant species in bloom (Figure 7) showed no such relationship in either year (in 1997, $F_{(1,31)} = 3.1$, N.S.; in 1996, $F_{(1,21)} = 1.1$, N.S.). In both years the correlations were low and not statistically significant (1997, $r = 0.302$, $z = 1.7$, N.S.; 1996, $r = 0.225$, $z = 1.02$, N.S.).

Table 2. Percent of Species in Family and Percent of Individuals in Family

Family	% of Species		% of Individuals	
	1996	1997	1996	1997
Papilionidae (swallowtails)	8.57	5.71	2.74	1.61
Pieridae (whites,sulphurs)	8.57	8.57	19.00	17.31
Danaidae (monarch)	2.86	2.86	15.55	30.19
Satyridae (satyrs,nymphs)	11.43	11.43	7.83	5.25
Nymphalidae (brushfoots)	31.43	31.43	13.47	11.08
Lycaenidae (hairsteaks,blues)	11.43	14.29	1.70	0.73
Hesperiidae (skippers)	25.71	25.71	39.70	33.82

Table 2 compares the two years in terms of the percent of species in each family and percent of relative abundance (individuals) in each family. The species composition by family was nearly identical in the two years, with one fewer Papilionid and one more Lycaenid species in 1997.

Fig. 6 Number of Butterfly Species as Function of Plant Species in Bloom

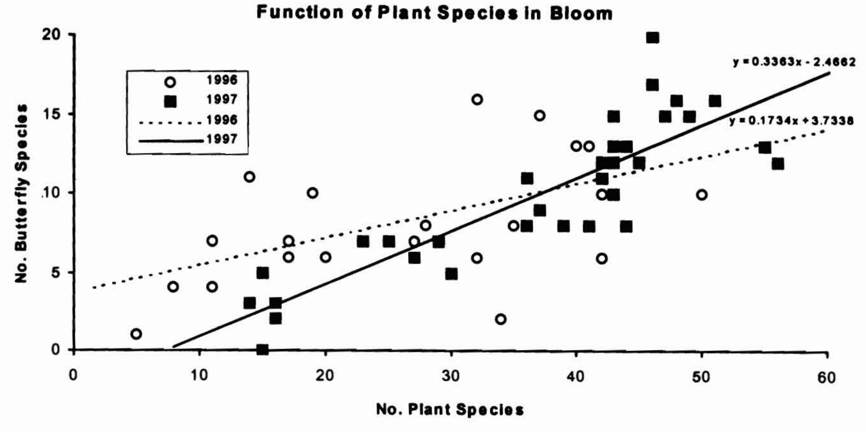
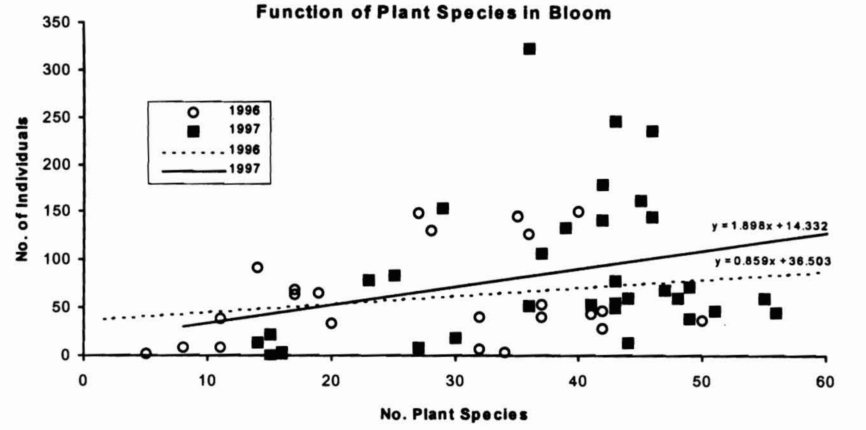


Fig. 7 Number of Butterflies as Function of Plant Species in Bloom



Not unexpectedly, the relative abundance within families was not consistent between years. While the proportion of relative abundance in most families declined, that of the Danidae nearly doubled in 1997. The proportion of abundance in Papilionids and Lycaenids was nearly halved in 1997.

Detailed Description of the RCFS Butterfly Fauna

Table 3 shows that the same nine skipper species were recorded from the Station grounds in both years. If we consider Oswego County to harbor 21 skipper species, that is, the 18 given in Shapiro (1974) and our three new species, the Station grounds were inhabited by about 43% of all species found in the County in the two years of the study.

Table 4 shows that 26 species of true butterflies were present in both years. However, the species composition was not identical each year. Ringlets and spicebush swallowtail were absent in 1997 and eyed brown and American copper were present.

In the two years of sampling, then, we have recorded 28 species of true butterflies on the Station grounds. This represents about 61% of Oswego County's 46 species of true butterflies [43 given in Shapiro (1974) plus our three new species for the County].

Skipper Phenology: Appendix A shows estimated abundance, arranged in the order of phenological appearance, of the nine skipper species found on the Station grounds. The earliest appearing skipper was the Hobomok, the latest the Peck's skipper. In general all of the skippers showed similar patterns of abundance between years. Only the least skipper was multi-brooded. It, the smallest skipper on the Station grounds, and the silver-spotted skipper, the largest, had the longest seasonal presence. The Delaware and Peck's skippers had the shortest seasonal presence.

Table 3. Skipper Species at Rice Creek Field Station
1996 &1997 Seasons Compared to Total Oswego Co. Species

		Rice Creek 1996	Rice Creek 1997	Total Oswego Co.*
Family Hesperiidae				
Silver-spotted Skipper	*(Epargyreus clarus)*	X	X	X
Northern Cloudy Wing	*(Thorybes pylades)*			X
Checkered Skipper	*(Pyrgus communis)*			X
Dreamy Dusky Wing	*(Erynnis icelus)*			X
Common Dusky Wing	*(Gesta gesta)*			X
Persius Dusky Wing	*(Erynnis persius)*			X
Arctic Skipper	*(Carterocephalus palaemon)*			X
European Skipper	*(Thymelicus lineola)*	**X**	X	
Least Skipper	*(Ancyloxypha numitor)*	X	X	X
Leonard's Skipper	*(Hesperia leonardus)*			X
Indian Skipper	*(Hesperia sassacus)*			X
Little Glassywing	*(Pompeius verna)*			X
Tawny-edged Skipper	*(Polites themistocles)*			X
Peck's Skipper	*(Polites peckius)*	X	X	X
Long Dash	*(Polites mystic)*	X	X	X
Northern Broken Dash	*(Wallengrenia egerement)*	**X**	X	
Hobomok Skipper	*(Poanes hobomok)*	X	X	X
Delaware Skipper	*(Atrytone logan)*	**X**	X	
Dun Skipper	*(Euphyes vestris)*	X	X	X
Pepper and Salt Skipper	*(Amblyscirtes hegon)*			X
Roadside Skipper	*(Amblyscirtes vialis)*			X
	Total	**9**	**9**	**18**
	New since 1974	**3**	**0**	

* Taken from Shapiro, A.M. 1974. Butterflies and Skippers of New York State.

True Butterfly Phenology: Appendices B - G present the estimated abundance over the season of all 28 true butterfly species found on the Station grounds over the two years. These Figures are arranged in phenological order within family.

Four species of Satyrids are definite residents of the Station grounds (Appendix B). The status of the Ringlet, a new Oswego County record, is uncertain as it was recorded on only one occasion in 1996 and could have represented passing migrants. The Appalachian eyed brown and the eyed brown are very similar in appearance and easily confused. The presence of the eyed brown, a slightly lighter brown version of the Appalachian eyed brown, was overlooked in 1996. Unlike the forest-dwelling Appalachian eyed brown the eyed brown is restricted to open habitats (Shapiro 1974; Opler 1992). We, thus, *a posteriori* considered any Appalachian eyed brown recorded from a field habitat in 1996 to have been an eyed brown.

Monarchs, the only representative of the Danaidae, were present in low numbers throughout the summer when eggs and larvae were also found. In mid to late September monarch numbers increased rapidly as migrants moved through the Station grounds (Appendix C). At this time many were seen nectaring on milkweeds (*Asclepias sp.*), Joe-pye-weed (*Eupatorium maculatum*), brown knapweed (*Centaurea jacea*), asters (*Aster sp.*) and goldenrods (*Solidago sp.*).

Table 4. Butterfly Species at Rice Creek Field Station 1996 &1997 Seasons Compared to Total Oswego Co. Species				
		Rice Creek 1996	1997	Total Oswego Co.*
Family Satyridae				
Northern Pearly Eye	*(Enodia anthedon)*			X
Appalachian Eyed Brown	*(Satyrodes appalachia)*	**X**	X	
Eyed Brown	*(Satyroides eurydice)*		X	X
Little Wood Satyr	*(Megisto cymela)*	X	X	X
Ringlet	*(Coenonympha tullia)*	**X**		
Common Wood Nymph	*(Cercyonis pegala)*	X	X	X
Family Danaidae				
Monarch	*(Danaus plexippus)*	X	X	X
Family Nymphalidae				
Atlantis Fritillary	*(Speyeria atlantis)*			X
Great Spangled Fritillary	*(Speyeria cybele)*	X	X	X
Aphrodite Fritillary	*(Speyeria aphrodite)*			X
Silver-bordered Fritillary	*(Clossiana selene)*			X
Meadow Fritillary	*(Clossiana bellona)*			X
Baltimore	*(Euphydryas phaeton)*	X	X	X
Harris' Checkerspot	*(Charidryas harrisii)*			X
Silver Checkerspot	*(Charidryas nycteis)*			X
Tawny Crescent	*(Phyciodes batesii)*			X
Pearl Crescent	*(Phyciodes tharos)*	X	X	X
Question Mark	*(Polygonia interrogationis)*	**X**	X	
Painted Lady	*(Vanessa cardui)*			X
American Painted Lady	*(Vanessa virginiensis)*	X	X	X
Red Admiral	*(Vanessa atalanta)*	X	X	X
Hop Merchant	*(Polygonia comma)*	X	X	X
Gray Comma	*(Polygonia progne)*			X
Compton Tortoise Shell	*(Nymphalis vaualbum)*	X	X	X
Milbert Tortoise Shell	*(Nymphalis milberti)*			X
Mourning Cloak	*(Nymphalis antiopa)*	X	X	X
Viceroy	*(Basilarchia archippus)*	X	X	X
White Admiral	*(Basilarchia arthemis)*	X	X	X
Family Lycaenidae				
Coral Hairstreak	*(Harkenclenus titus)*			X
Acadia Hairstreak	*(Satyrium acadicum)*			X
Banded Hairstreak	*(Satyrium calanus)*	X	X	X
Striped Hairstreak	*(Satyrium liparops)*	X	X	X
Brown Elfin	*(Incisalia augustinus)*			X
Eastern Pine Elfin	*(Incisalia niphon)*			X
American Copper	*(Lycaena phlaeas)*		X	X
Bronze Copper	*(Hyllolycaena thoe)*			X
Bog Copper	*(Epidemia epixanthe)*			X
Eastern Tailed Blue	*(Everes comyntas)*	X	X	X
Spring Azure	*(Celastrina argiolus)*	X	X	X
Harvester	*(Feniseca tarquinius)*			X
Family Papilionidae				
Black Swallowtail	*(Papilio polyxenes)*	X	X	X
Tiger Swallowtail	*(Pterourus glaucus)*	X	X	X
Spicebush Swallowtail	*(Pterourus troilus)*	X		X
Family Pieridae				
Cabbage Butterfly	*(Pieris rapae)*	X	X	X
Clouded Sulphur	*(Colias philodice)*	X	X	X
Alfalfa Butterfly	*(Colias eurytheme)*	X	X	X
	Total	**26**	**26**	**43**
	New Since 1974	**3**	**0**	

*Taken from Shapiro, A.M. 1974. Butterflies and Skippers of New York State.

The Nymphalid family was represented by 11 species on the Station grounds (Appendix D). Mourning cloaks, question marks, red admirals and hop merchants were found in modest numbers from spring to autumn. Pearl crescent, also a species with a long flying period over the season, was double brooded with a main brood in late summer and another in the fall. Viceroy, white admiral, Baltimore and great spangled fritillary were mid to late summer flying species. Compton tortoise shell and American painted lady have been recorded too few times to discern a phenological pattern.

Five species of Lycaenids have been recorded from the Station grounds. None were very abundant and none showed a very clear phenological pattern (Appendix E). The spring azure, as the name implies, was one of the earliest flying species on the Station grounds. The hairstreaks seem to be midsummer flying species and the eastern tailed blue may be a late season Lycaenid. Only a single specimen of the widespread American copper has been sampled from the Station grounds, in 1997.

Of the three species of swallowtails recorded from the Station grounds, only tiger swallowtails occurred in any number or showed a definitive seasonal pattern (Appendix F).

The three species of Pierids exhibited somewhat similar abundance patterns over the season. That is, they were present in small or moderate numbers over the entire season then reached high numbers at the end of the summer or early autumn. The cabbage butterfly was clearly double brooded, the clouded sulphur and alfalfa butterfly may be double brooded in some years, although more data is required to confirm this (Appendix G).

Conservation Status of Rice Creek Field Station Butterflies

The New York Natural Heritage Program monitors the status of plant and animal species in New York State. According to their ranking, the *Gobal rank* of RCFS butterfly and skipper species is either G5, "Demonstrably secure globally..." or, in the case of the Baltimore and eyed brown, G4,"Apparently secure globally...". Likewise, the *State rank* for all Station species is either S5, "Very common, demonstrably secure in New York" or, in the case of Baltimore and eyed brown, S4, "Common, apparently secure in New York State...". The state rank of the dun skipper and striped hairstreak are presently uncertain (New York Natural Heritage Program 1997). To date the Station grounds harbor no protected butterfly species.

Future Work

We have not performed statistical analyses comparing the phenological population patterns between years for any skipper or butterfly species. However, inspection of the Figures in Appendices A - G can, in a preliminary way, indicate if and where further information might be desirable in order to discern more than a provisional phenological pattern in abundance for a given species. Table 5 lists species phenologies which, by inspection, appear similar between years and those which do not.

In general the skippers seem to show consistent, clear abundance patterns

Table 5. Skipper and butterfly species which have shown similar phenological patterns between 1996 & 1997 and species which have not.

Similar 1996, 1997 Phenology	Dissimilar 1996,1997 Phenology or Not Enough Data for a Pattern	
SKIPPERS		
Hobmok	Silver-spotted	
European	Delaware	
No. Broken Dash	Peck's	
Long Dash		
Least		
Dun		
BUTTERFLIES		
Little Wood Satyr	Ringlet	Comp. Tortoise Shell
Common Wood Nymph	Eyed Brown	Am. Painted Lady
Appalachian Eyed Brown	Mourning Cloak	Spring Azure
Monarch	Question Mark	Striped Hairstreak
Pearl Crescent	Hop Merchant	Banded Hairstreak
Tiger Swallowtail	Red Admiral	American Copper
Cabbage Butterfly	Viceroy	E. Tailed Blue
Clouded Sulphur	White Admiral	Black Swallowtail
	Blatimore	Spicebush Swallowtail
	Gr. Spangled Fritillary	Alfalfa Butterfly
TOTAL: 14	23	

between years. It would be desirable to have further data on the Delaware, Peck's and silver-spotted skippers, each of which is widely distributed throughout N.Y. State (Shapiro 1974). Only eight of the 28 butterfly species show clear and consistent abundance patterns between years. For the majority of species the need for at least another season or two of data would seem evident.

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Appendix A: Population estimates of Hesperiidae (skipper) species over time

Fig. A 1: *Poanes hobomok* (Hobomok Skipper)

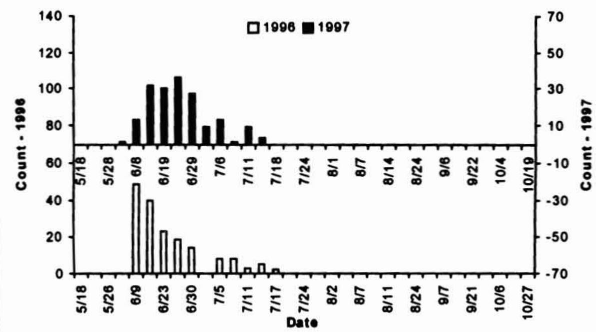


Fig. A 5: *Thymelicus lineola* (European Skipper)

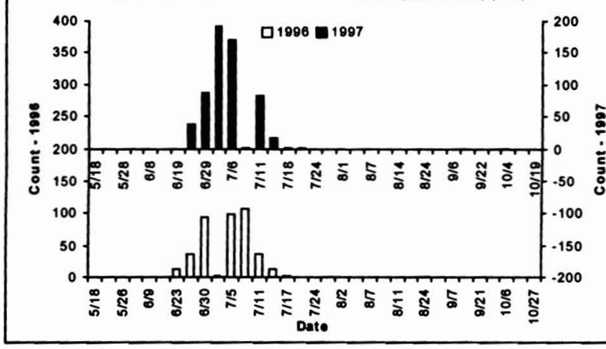


Fig. A 2: *Epargyreus clarus* (Silver-spotted Skipper)

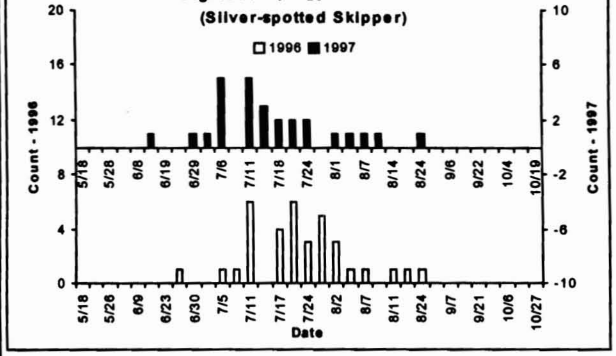


Fig. A 6: *Wallengrenia egeremet* (Northern Broken Dash)

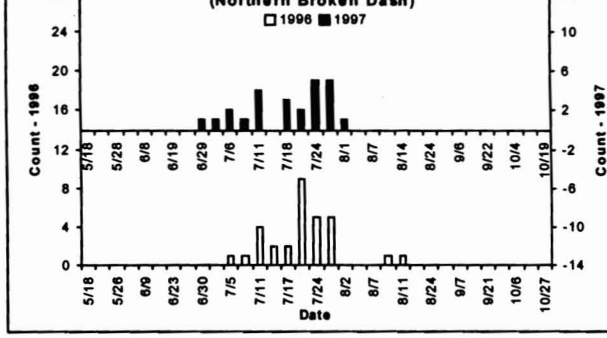


Fig. A 3: *Polites mystic* (Long Dash)

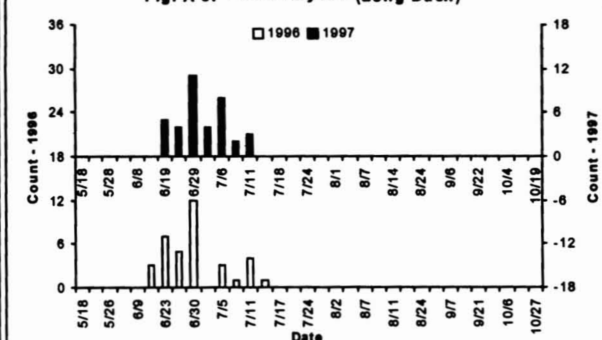


Fig. A 7: *Atrytone logan* (Delaware Skipper)

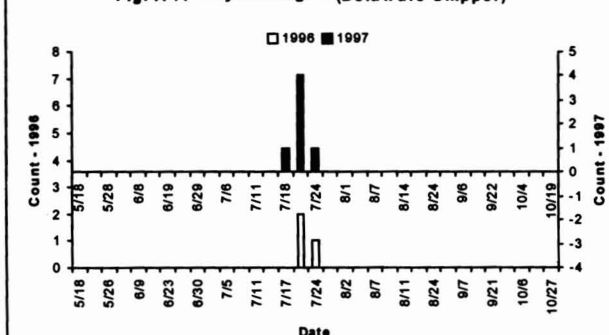


Fig. A 4: *Ancyloxypha numitor* (Least Skipper)

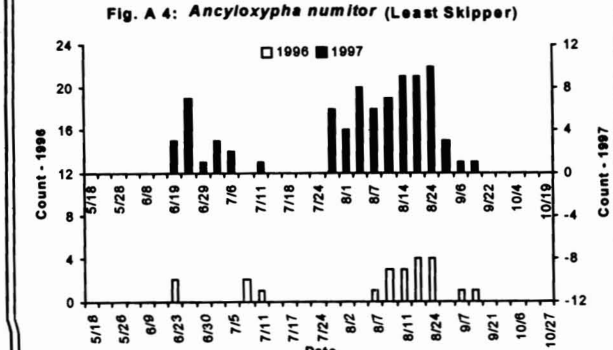
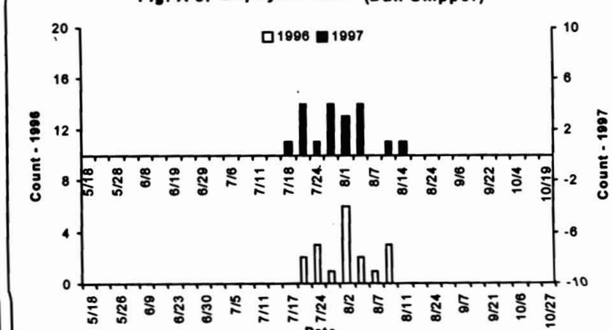


Fig. A 8: *Euphyes vestris* (Dun Skipper)



Appendix A: (continued)

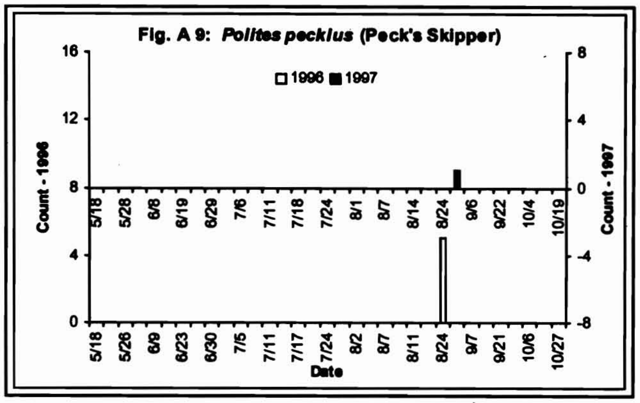


Fig. A 9: ***Polites peckius*** **(Peck's Skipper)**

Appendix B: Population estimates of Satyridae (nymph) species over time

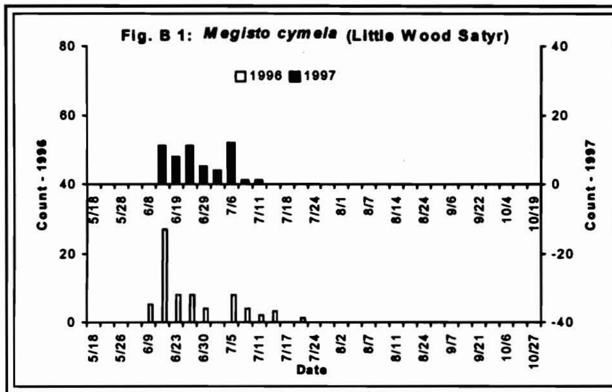


Fig. B 1: ***Megisto cymela*** **(Little Wood Satyr)**

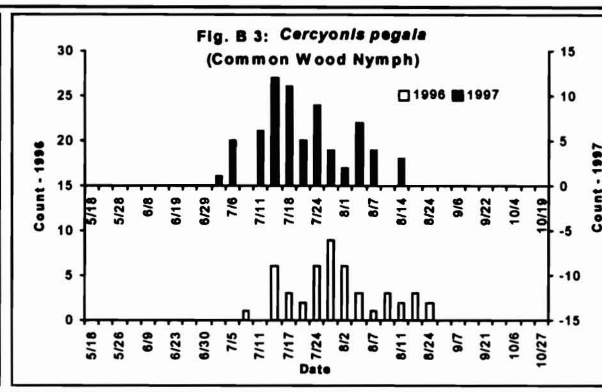


Fig. B 3: ***Cercyonis pegala*** **(Common Wood Nymph)**

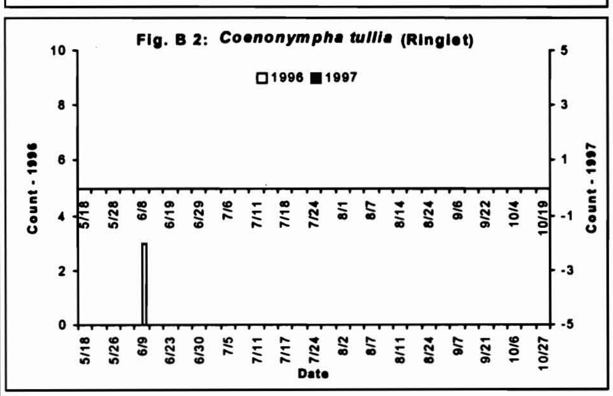


Fig. B 2: ***Coenonympha tullia*** **(Ringlet)**

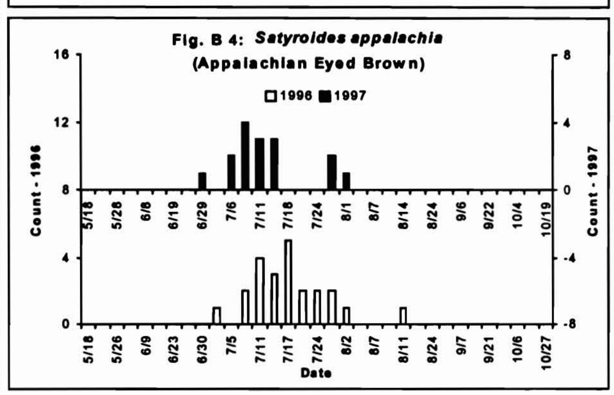


Fig. B 4: ***Satyroides appalachia*** **(Appalachian Eyed Brown)**

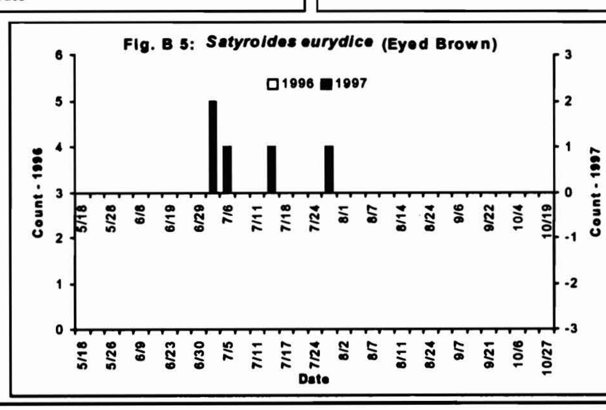


Fig. B 5: ***Satyroides eurydice*** **(Eyed Brown)**

Appendix C: Population estimates of Danaidae (monarch) species over time

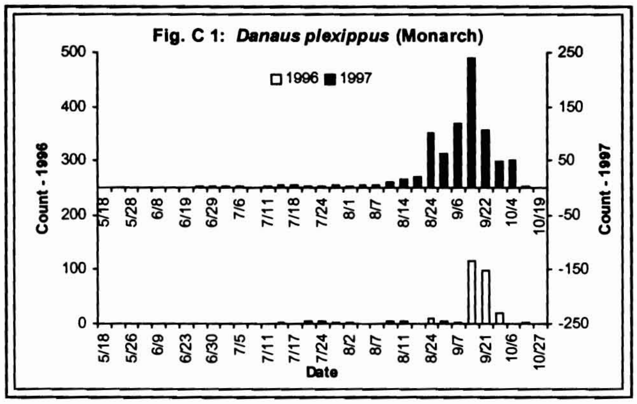


Fig. C 1: *Danaus plexippus* (Monarch)

Appendix D: Population estimates of Nymphalidae (brushfoot) species over time

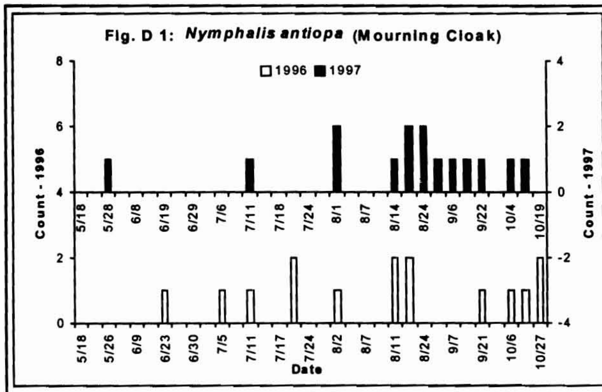


Fig. D 1: *Nymphalis antiopa* (Mourning Cloak)

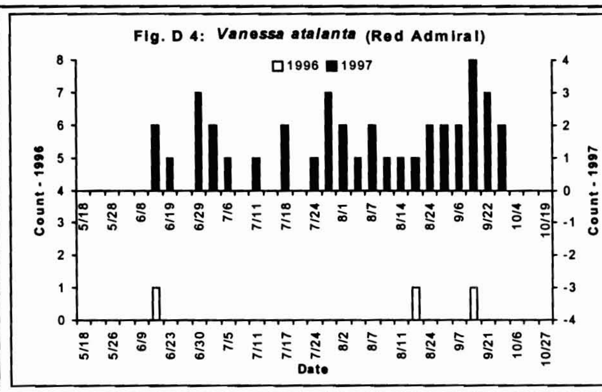


Fig. D 4: *Vanessa atalanta* (Red Admiral)

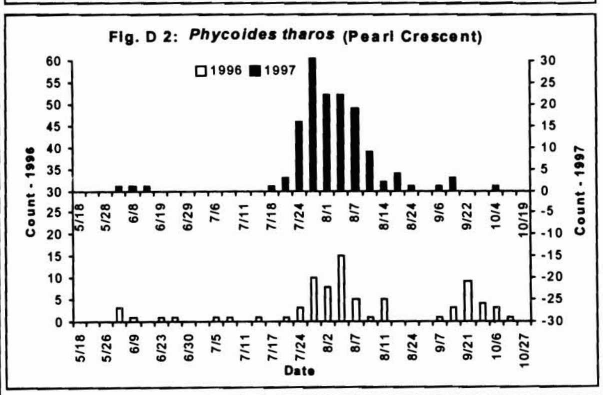


Fig. D 2: *Phycoides tharos* (Pearl Crescent)

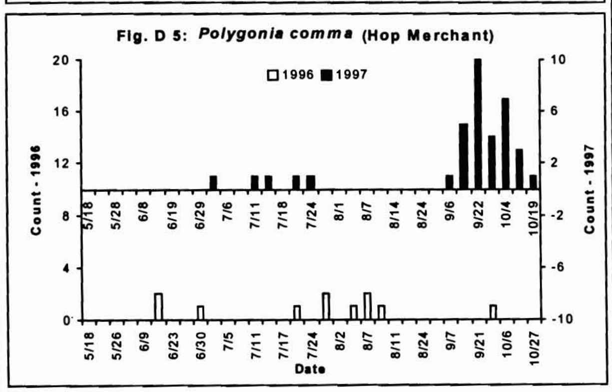


Fig. D 5: *Polygonia comma* (Hop Merchant)

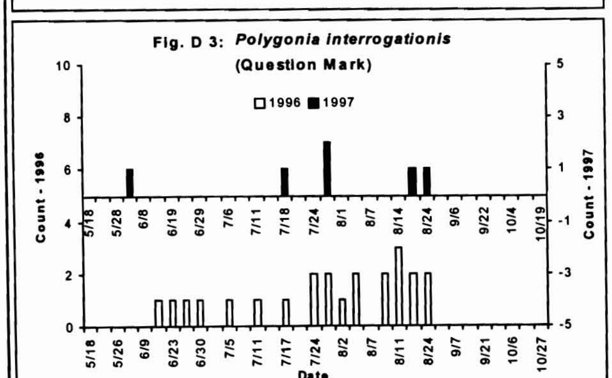


Fig. D 3: *Polygonia interrogationis* (Question Mark)

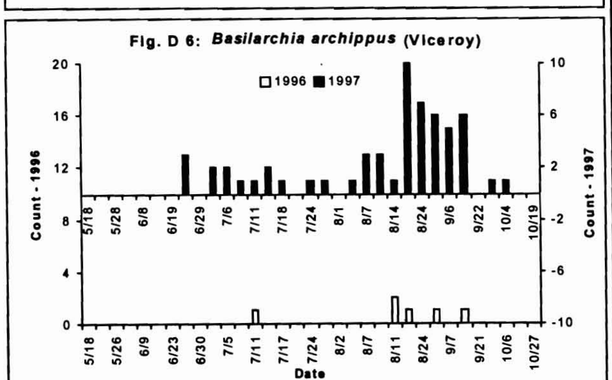


Fig. D 6: *Basilarchia archippus* (Viceroy)

Appendix D: (continued)

Fig. D 7: ***Basilarchia arthemis*** **(White Admiral)**

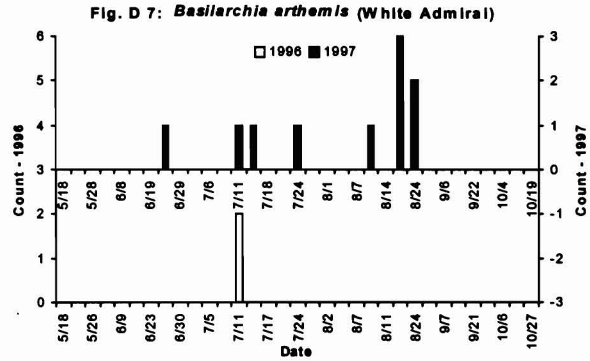


Fig. D 10: ***Nymphalis vaualbum***
(Compton Tortoise Shell)

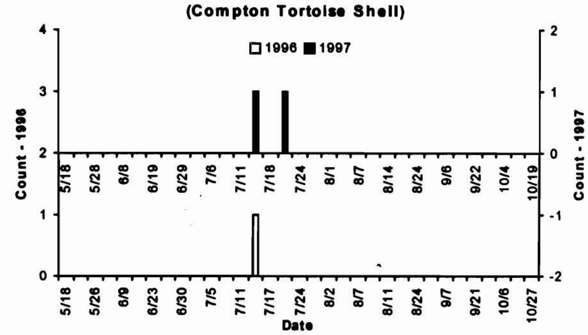


Fig. D 8: ***Euphydryas phaeton*** **(Baltimore)**

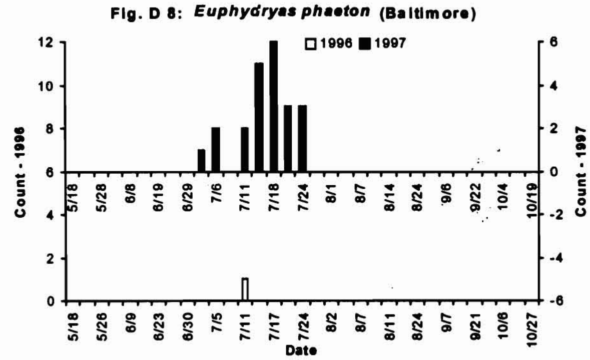


Fig. D 11: ***Vanessa virginiensis***
(American Painted Lady)

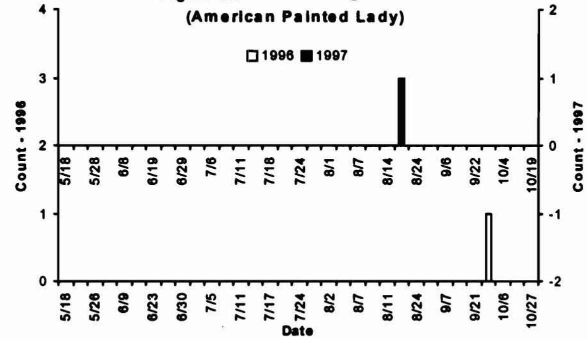
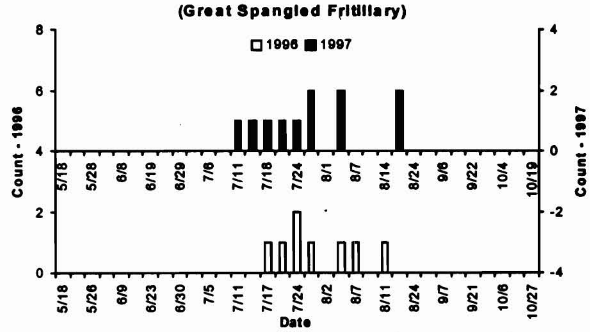


Fig. D 9: ***Speyeria cybele***
(Great Spangled Fritillary)



Appendix E: Population estimates of Lycaenidae (blue and hairstreak) species over time

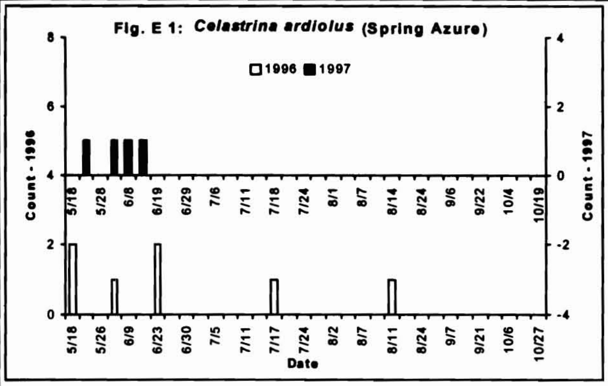


Fig. E 1: *Celastrina ardiolus* (Spring Azure)

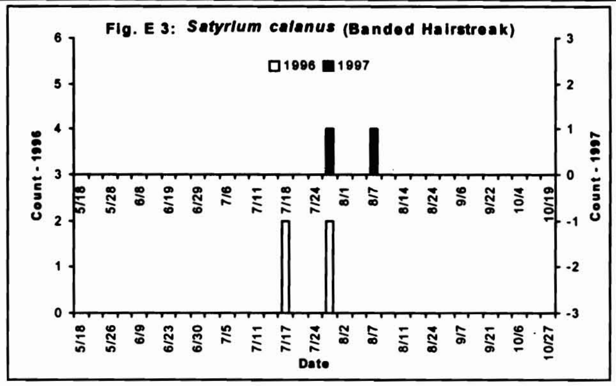


Fig. E 3: *Satyrium calanus* (Banded Hairstreak)

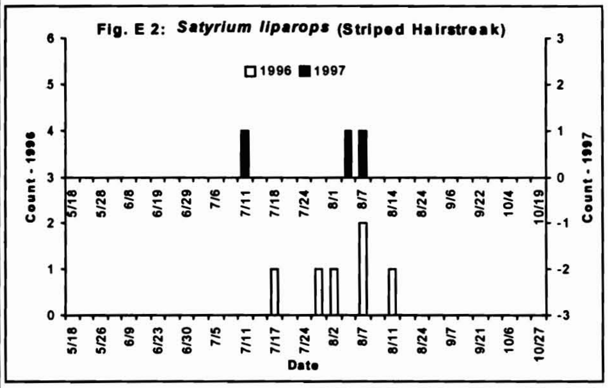


Fig. E 2: *Satyrium liparops* (Striped Hairstreak)

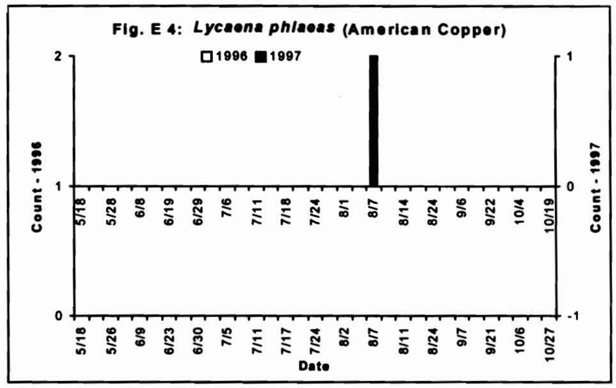


Fig. E 4: *Lycaena phlaeas* (American Copper)

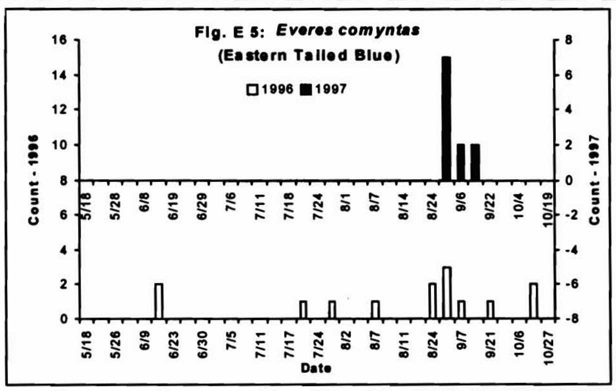


Fig. E 5: *Everes comyntas* (Eastern Tailed Blue)

Appendix F: Population estimates of Papilionidae (swallowtail) species over time

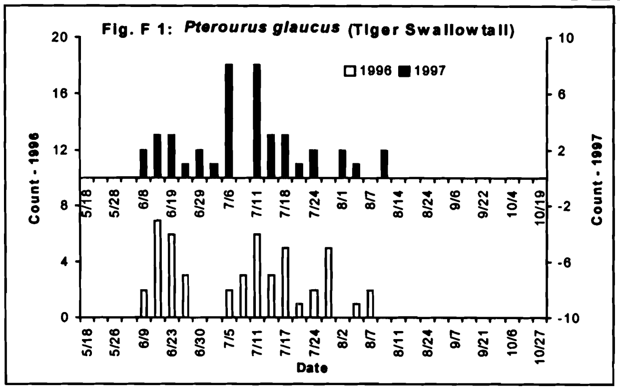


Fig. F 1: *Pterourus glaucus* (Tiger Swallowtail)

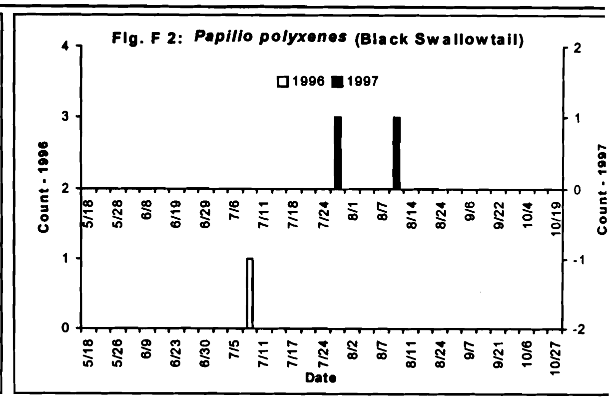


Fig. F 2: *Papilio polyxenes* (Black Swallowtail)

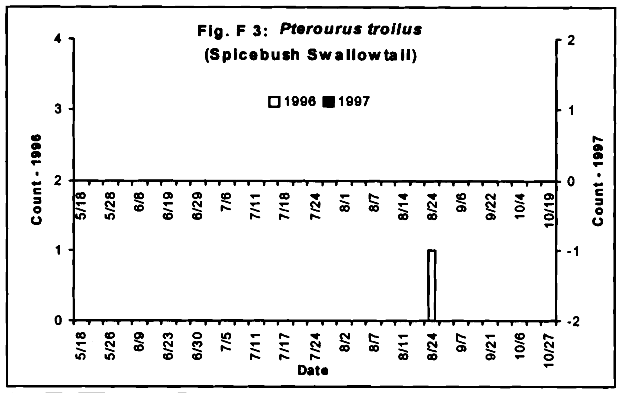


Fig. F 3: *Pterourus troilus* (Spicebush Swallowtail)

Appendix G: Population estimates of Pieridae (white and sulphur) species over time

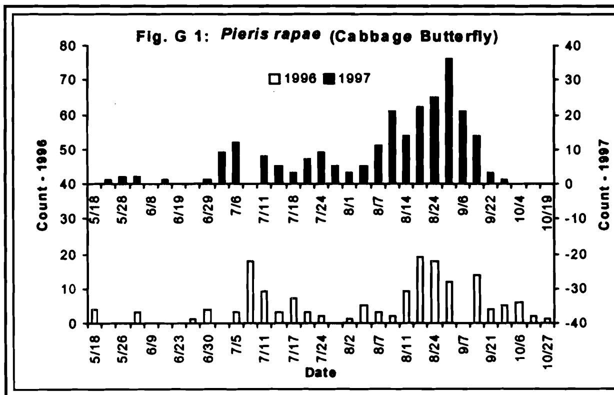


Fig. G 1: *Pieris rapae* (Cabbage Butterfly)

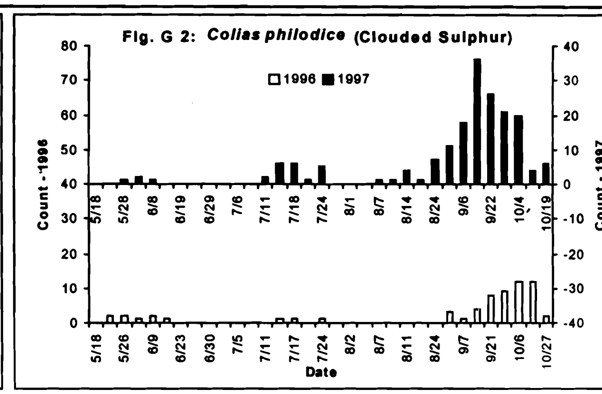


Fig. G 2: *Colias philodice* (Clouded Sulphur)

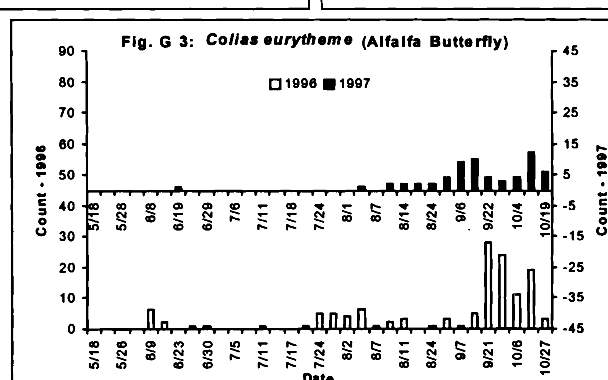


Fig. G 3: *Colias eurytheme* (Alfalfa Butterfly)

Survey of the Amphibian and Earthworm Species at Rice Creek Field Station[1]

Jennifer A. Frank[2], Department of Biological Sciences, State University at Albany

Earthworms are long lived animals but field data on longevity are rare. Life spans of common species have been estimated to be between 1 and 10 years (Hendrix, 1995). Earthworms are hermaphroditic and produce cocoons during the warmer months. The behavior and feeding habits of earthworms vary and three ecological groupings have been defined based primarily on feeding habits and burrowing strategies (Coleman and Crossley, 1996). Epigenic species live in the surface litter and are adapted to a variable environment. They are typically small and feed on the coarse particulate matter found on the soil surface. Endogenic species are active in the mineral soil layer and inhabit temporary burrows. Anecic species live in permanent vertical burrows that extend several meters into the soil. They pull leaf litter from the surface into their burrows to be consumed.

Many have recognized earthworms as potentially the most significant members of the soil fauna (Darwin, 1881; Coleman, 1996). Numerous studies have established the importance of earthworms as biological agents in soil formation, organic litter decomposition, and the redistribution of organic matter in the soil (Edwards and Lofty, 1977; Lee, 1985). In North America there are twelve families of earthworms with 147 species. Of these 47% were introduced from either Europe or Asia.

In addition to their role in decomposition, earthworms are often an abundant resource used by birds, invertebrates, reptiles, mammals, and amphibians. These predators consume the earthworm tissue that has a high protein content (approximately 60%-70% dry weight) and is rich in essential amino acids (Lee, 1985). One such organism for which earthworms are an essential part of the diet is the yellow spotted salamander, *Ambystoma maculatum* (Bishop, 1941). The salamander is most abundant in deciduous and mixed deciduous forests where permanent ponds, slow streams, or temporary ponds offer suitable breeding sites. Adults average 15-17 cm and wander considerable distances away from sources of water. They use rocks and fallen trees as retreat sites. They are nocturnal and prey on earthworms they encounter on the soil surface and in their burrows.

Presently there is little quantitative data on the effects of predation on earthworms. A few studies (e.g., Bengston, 1976; Satchell, 1983) found that earthworm populations could be reduced by predation in agricultural ecosystems. None have correlated population declines with decomposition rates or other effects on the ecosystem. The turnover of matter in terrestrial systems and what regulates them must be investigated to better understand the global carbon cycle. This cycle is driven by photosynthesis and respiration. Carbon dioxide is the main vehicle of the carbon flux between the atmosphere, hydrosphere, and biota. Records show that the concentration of carbon dioxide has increased dramatically and the trend continues.

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[1] Financial support provided by Rice Creek Associates and Oswego State University's Division of Continuing Education and Office of Research and Sponsored Programs.

[2] Ms. Frank was assisted in this investigation by field assistant Geoff Gardner.

Considering what is known about how much carbon dioxide is released into the atmosphere by human activities and the increase in atmospheric carbon dioxide, the equation is not balanced. We are releasing carbon dioxide that cannot be accounted for and terrestrial systems could be acting as a net sink for atmospheric carbon. Information gathered in this study will contribute to a better understanding of the decomposition of forest litter. As global changes occur and biodiversity is threatened, understanding this process and the interactions among members of the forest floor community becomes more critical. Both the extirpation of amphibians that prey on detritivores such as earthworms and the expansion of introduced earthworm populations could alter the rate of decomposition.

Objectives:

The objective of this study was to survey the earthworm and amphibian species occurring at the Rice Creek Field Station. The data was gathered to better understand earthworm distributions in deciduous forests and to determine if the site was suitable for a study of the effects of predation by amphibians on earthworms. Future work would be an expansion of a project already begun at the E. N. Huyck Preserve in Albany County, New York.

Methods:

In June of 1997, twelve 100 m transects were established perpendicular to the grade of the slope in a beech maple stand on the Rice Creek Field Station. At this time three transects were searched. Throughout the survey all selections were made using the random numbers table. One meter by two meter subsections along each transect were randomly chosen every 10m and thoroughly searched for amphibians. Within each subsection, every rock, piece of wood, and leaf was turned. Earthworm searches were performed by establishing one 25 cm x 25 cm quadrat from the first 50m and one quadrat from the second 50m of each transect. These quadrats were first treated with a mustard powder solution to extract earthworms such as *Lumbricus terrestris* that could potentially move out of the quadrat before the soil was removed. The soil in the quadrat was then excavated to a depth of 25 cm and hand sorted to remove earthworms. The earthworms collected were preserved in 10% formalin and identified in the laboratory using a dissecting microscope. The survey was repeated in October and four of the 12 original transects were searched.

The forest at the site was described by sampling trees along each transect during the June survey. The four closest trees to each amphibian plot were identified and the diameter at breast height measured (DBH).

Results:

No amphibians were found in the seventy 1m x 2m plots searched during this survey. Bullfrogs (*Rana catesbiana*), green frogs (*Rana clamitans*), and grey treefrogs (*Hyla versicolor)* were found in field and pond habitats adjacent to the site. Of the 336 earthworms collected 288 were juveniles, 49 were adults, and 44 of these were identified. An average of 25.67 juveniles per quadrat and an average of 4.67 adults per quadrat were collected in June. There was a mean density of 121 earthworms / m^2. During the October survey fewer earthworms were found with an average of 16.75 juveniles per quadrat and 2.5 adults per quadrat. There was a mean density of 77 / m^2. A total of 8 *L. terrestris,* 6 *L. castaneus*, 18 *Aporrectodea caliginosa*, 10 *Bimastos* *longicintus*, 1 *A. tuberculata*, and 1 *Bimastos sp.* were found (Table 1). The number of individuals of each species varied between surveys as well as among quadrats. Slope did not have an effect on species composition.

TABLE 1:

SURVEY	TOTAL	JUVENILES	ADULTS	*L. terrestris*	*L. castaneus*	*A. caliginosa*	*A. tuberculata*	*B. longicintus*	*B. sp.*	*Unknown*
June	182	154	29	3	6	9	0	9	0	2
STD		±21.18	±9.38							
October	154	134	20	7	0	9	1	1	1	1
STD		±5.75	±2.62							

The site was found to be primarily a beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*) stand with some mountain ash (*Sorbus aucuparia*), white ash (*Fraxinus americana*), hop horn beam (*Ostrya virginiana*), black cherry (*Prunus serotina*), and yellow birch (*Betula alleghaniensis*) (Figure 1). 120 trees were sampled and the average DBH calculated for each species is presented in Table 2.

FIGURE 1: Tree Species Frequency

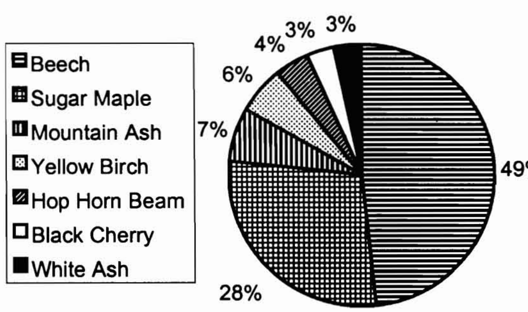

TABLE 2:

Species	Average DBH
Beech	9.41
Black Cherry	8.85
Horn Beam	16.36
Mountain Ash	15.56
Sugar Maple	31.91
White Ash	23.18
Yellow Birch	11.03

Discussion:

Amphibian Survey:

The lack of amphibians at the site was surprising. The mixed deciduous forest appeared to offer an ideal habitat with retreat sites, moist soil, a forest canopy, and a nearby pond. It is possible that salamander populations were reduced when the forest became fragmented and conditions unfavorable. Farming likely reduced the amount of suitable habitat when forests were converted to fields. A reduced area would have been able to support fewer individuals as well as possibly changed the microclimate of the fragment. Farming would have also likely increased pollution at the site with the use of fertilizers. It is possible that the increased activity of both humans and grazing cattle stressed the amphibians further. The mammal populations at the site may have increased with the increase in fields and decrease of forest habitat. With all of these factors negatively effecting amphibians, populations could not be maintained.

More work is required to better understand the lack of amphibians at this site. Historical records should be examined more closely to determine if the proposed explanation is likely. Why amphibians have not moved back into the forest since farming has ceased should be considered. There are several possibilities for this and it may be a combination of factors preventing amphibian populations from being reestablished. There may not be large enough populations in surrounding areas for individuals to immigrate from. Since most individuals return to their natal pond to breed the chance that amphibian populations will be established in an isolated patch of forest is less likely than is the case with other organisms which would move into the area and remain there. Individuals would have to locate the patch, return to the breeding site, and survive the migration back. To breed in a new water source many individuals would have to migrate to the site. Another possibility is that individuals are entering the forest but are either preyed upon by small mammals before populations are established or soil conditions make the habitat unsuitable.

Earthworm Survey:

Six earthworm species were identified based on the morphology of sexually mature individuals. *L. terrestris*, the largest of the earthworms found, is an anecic species that would significantly accelerate the breakdown and disappearance of surface leaf litter. The other five species identified were smaller and found in the humus or mineral soil. The distribution of the earthworms varied between samples as well as between surveys. The differences between quadrats sampled was likely due to natural variation in earthworm distributions. This variation could be the result of the patchiness of the habitat. More favorable conditions such as increased soil moisture or a higher concentration of organic matter could have been varied between the quadrats sampled. The decrease in earthworms from June to October was likely the result of increased mortality caused by harsh environmental conditions and predation. In June conditions were favorable for earthworms. The earthworms which survived the winter were able to reproduce in early spring and feed on the leaf litter which had accumulated the previous autumn. By June juveniles of most species would have hatched from cocoons but many of these earthworms however would not be able to avoid predation or survive the changing environmental conditions of the summer.

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Flora of Rice Creek Field Station

Andrew P. Nelson, Visiting Assistant Professor
Oswego State University

The list of plants known from the properties of Rice Creek Field Station was increased in 1997 to 560 species. Additions included a moss, a fern, 13 dicots, and 11 monocots. The floristic list on the Field Station's website at <http://www.oswego.edu/~rcreek> has been updated to reflect these changes.

The four areas being utilized as trapping sites in the study of small mammals at Rice Creek (see page 30) were surveyed and the plant species present in each quadrat recorded. These sites will be monitored periodically in order to explore relationships between any changes in mammal populations and plant species composition.

In July 1997, Niagara Mohawk Power Company mowed the power line right of way leading from Thompson Road to the Field Station buildings. The right of way, which runs through second growth woodlands and along the edge of a white spruce plantation, had filled in with shrubs and small trees two to three meters tall. A heavy-duty rotary mower was used to clear the area. Only the herbaceous vegetation in the wettest sections of the right of way escaped mowing. On July 11, 1997, within a week of mowing, the right of way was surveyed and a list of surviving plants compiled. This list was updated on August 26 and again on October 8. We will continue to monitor the development of this vegetation in coming years.

A Study of Bird Nesting on Rice Pond and Adjoining Habitats[1]

Spring and Summer 1997

John A. Weeks

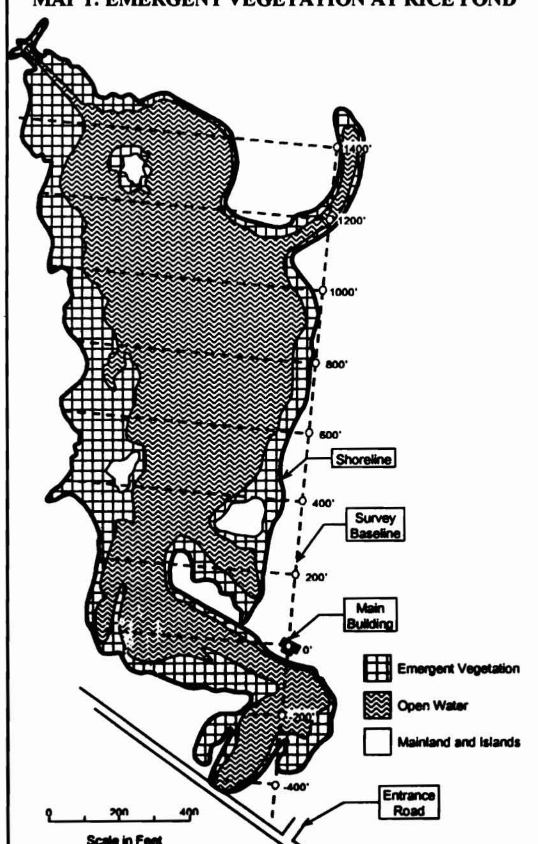
INTRODUCTION:

Oswego State University purchased the property that now contains the pond at Rice Creek Field Station (Rice Pond) in 1962. At the time of acquisition, the property had a long history as pasture and cropland. Although agriculture ceased in 1960, a portion of the land was used as horse pasture until just before initial surveys and planning for the creation of Rice Pond by the damming of Rice Creek were completed in 1965.

Throughout its long agricultural history, the land was flooded for brief periods in the spring. "During a 5 year period of observation (1960-65), flooding occurred every year. The duration varied from two days to two weeks, the area flooded from about 5 to 15 acres." (Weeks 1988)

When the pond was flooded in March of 1966, the habitat was immediately changed. There was a rapid disappearance of upland plants from the permanent flood zone and gradual establishment of wetland species, most of which were previously present only along the fringes of Rice Creek as it meandered through the pasture.

MAP 1: EMERGENT VEGETATION AT RICE POND



As the pond filled in 1966, 80% of the shoreline was herbaceous (Weeks 1988). Within a few years emergent wetland plants such as cat-tails (*Typha*), bur-reeds (*Sparganium*), rushes (*Scirpus*) and sedges (*Carex*) became established along the shoreline. By 1985, aquatic species existed throughout the flood zone, forming 5.5 acres of emergent herbaceous vegetation. The extent of emergent plants has increased little since then (Map 1). During the period from 1966 to 1985, shoreline vegetation changed from 80% herbaceous to 75% wooded, extending right down to the water line (Weeks 1988).

These habitat changes produced obvious adjustments in bird life. Table 1 compares pre-flood and post-flood species. Smith and Ryan (Smith and Ryan 1978), and Fosdick (Fosdick 1996) make some references to wetland and shoreline bird species at Rice Creek Field Station, but no systematic surveys of nesting within the flood zone exist to document this change.

[1] **Financial support provided by Rice Creek Associates and Oswego State University's Division of Continuing Education and Office of Research and Sponsored Programs.**

This author made brief surveys of the emergent zones in 1985 and 1986. They revealed the presence of marsh wren, red-winged blackbird, common grackle, mallard, wood duck, blue-winged teal, black duck, Canada goose and alder flycatcher. Other species of wetland birds were observed, but their nests were not found. None of the nests found were documented.

TABLE 1: Comparison of Bird Populations Before and After flooding of Rice Pond

Pre-Flood 1964-66	Post-flood 1986	Post-flood 1997	Species	Pre-Flood 1964-66	Post-flood 1986	Post-flood 1997	Species
0	FL	FL	Canada Goose	P	P	0	Eastern Bluebird
FL	FL	FL	Mallard Duck	NE	X	X	Cedar Waxwing
0	0	FL	Green-Winged Teal	ON	X	0	European Starling
0	FL	0	Blue-winged Teal	S	0	0	Red-eyed Vireo
0	FL	0	Black Duck	FY	0	S	Warbling Vireo
FL	FL	FL	Wood duck	NE	S	NE	Yellow Warbler
X	0	0	Kestral	DD	DD	DD	Common Yellowthroat
NE	0	0	Ring-necked Pheasant	NE	0	0	Bobolink
X	0	0	Woodcock	DD	0	0	Eastern Meadowlark
NE	0	NE	Mourning Dove	NE	NE	NE	Red-winged Blackbird
X	0	0	Yellow-billed Cuckoo	NE	NE	ON	Northern Oriole
0	0	UN	Black-billed cuckloo	NE	NE	NE	Common Grackle
X	0	0	Ruby-throated Hummingbird	NE	NE	NE	Brown-headed cowbird
X	0	S	Kingbird	X	0	0	Scarlet Tanager
X	0	S	Great-crested Flycatcher	X	P	UN	Cardinal
NE	NE	NE	Phoebe	P	0	UN	Indigo Bunting
NE	X	S	Alder Flycatcher	NE	0	0	Goldfinch
X	0	S	Least Flycatcher	S	0	0	Savannah Sparrow
ON	ON	ON	Tree Swalow	S	0	0	Vesper Sparrow
NE	X	0	Barn Swallow	S	0	0	Grasshopper Sparrow
ON	0	S	House Wren	S	0	0	Henslow's Sparrow
0	NE	0	Marsh Wren	S	0	0	Field Sparrow
NE	S	NE	Gray CatBird	0	X	S	Swamp Sparrow
NE	S	NE	American Robin	NE	S	NE	Song Sparrow

Legend:

X	Species observed in breeding season	ON	Adults at nest hole
P	Pair observed in breeding habitat	NE	Nest and eggs
S	Singing or calling male	DD	Distraction Display
UN	Used nest	0	none observed
FY	Adults with food for young	FL	Fledged young

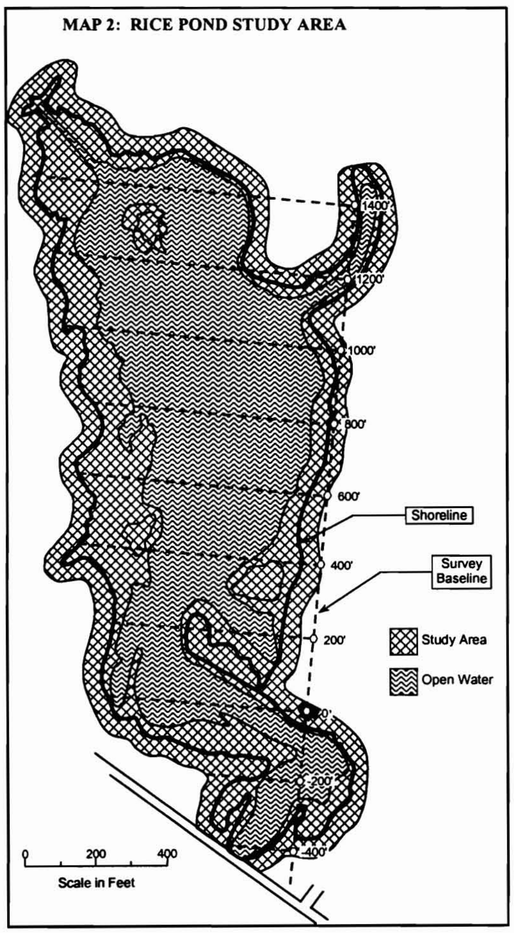
During the 1997 nesting season, a detailed study was made of bird nesting in the emergent wetlands, the islands, and the fringing shoreline zone within 50 feet of the water level (Map 2).

In addition to providing the first published list of nesting birds since the pond was constructed, this study creates baseline information and a method of study that can be reproduced if future research of this sort is done at Rice Pond. The study and the method could also be used for measurement of the effects of any shoreline management that may be practiced in the future.

OBJECTIVES:

- Establish a method for studying bird nesting associated with Rice Pond which could be reproduced in the future, or could be used for comparison with future studies. Orientation points will be developed so that 1997 nest sites can be pinpointed in future years.

- Develop a base map and grid system upon which the location of all nests discovered can be plotted. This map will also give an indication of the present extent of emergent vegetation within the study zone.
- Compile a list of bird species including notes on any behavior that might indicate nesting for those species and individuals whose nests are not found. Notation used will be that employed by the NYS Atlas of Breeding Birds (Andrle and Carroll 1988).



SAMPLING METHODS:

The original plan for surveying areas of emergent marsh was to set up grids and to work the grids regularly in order to discover all nests. Because of the nature of the bottom, which consists of a floating mat of cat-tails, reeds and rushes, this proved to be physically difficult and very disruptive to the cover. Ground predators, such as raccoons, apparently followed the pathways left by the researchers, and several nests were destroyed after the first field trip. It was decided that a better approach would be to circumnavigate the pond by canoe, watching carefully for the activities of territorial males and especially the activities of females. All subsequent nests in the marsh were located by this method. Those in the 50 foot wide fringe of upland shoreline were located by walking the 1.2 mile strip and checking shrubs and trees for nests.

All shrubs within the study area were checked whether there were territorial birds present or not. Only a few nests were located where territorial birds were not present.

Field observations were made on a total of fifteen dates (Table 2). A diary of these trips is on file at Rice Creek Field Station.

When nests were located on the ground or in herbaceous vegetation, they were marked with a numbered tag posted 3 feet north the actual nest site. Shrub and tree nests were marked on the ground with instructions on how to locate them. This procedure avoids drawing attention to the exact location of the nest and avoids the necessity of approaching the nest so close that screening cover is destroyed. Waterfowl broods observed on the water were also noted and information on species, age and number of young recorded.

TABLE 2: Observation Dates

01-May-97	04-Jun-97	25-Jun-97
14-May-97	09-Jun-97	02-Jul-97
20-May-97	12-Jun-97	30-Jul-97
22-May-97	18-Jun-97	13-Aug-97
28-May-97	21-Jun-97	15-Aug-97

In order to facilitate the survey and provide for relocation of nest sites in future years, permanent benchmarks were installed on the east shoreline of the pond and a temporary grid system was set up (Map 1). Coordinates for the relocation of the nest sites are noted in the field notes and on the base maps.

Symbols used for noting birds (Table 3) and their activities (Table 1) are from the "NYS Atlas of Breeding Birds" (Andrle and Carroll 1988).

TABLE 3: Monograms of Bird Species	
ALFL - Alder Flycatcher	MADU - Mallard Duck
AMRO - American Robin	MODO - Mourning Dove
BBCU - Black-billed Cuckoo	NOCA - Northern Cardinal
CAGO - Canada Goose	NOOR - Northern Oriole
COGE - Common Grackle	RWBL - Red-winged Blackbird
COYE - Common Yellowthroat	SOSP - Song Sparrow
EAKI - Eastern Kingbird	SWSP - Swamp Sparrow
EAPH - Eastern Phoebe	TRSW - Tree Swallow
GCFS - Great-crested Flycatcher	WAVI - Warbling Vireo
GRCA - Gray Catbird	WODU - Wood Duck
GWTE - Green-winged Teal	YEWA - Yellow Warbler
HOWR - House Wren	

RESULTS:

During the fifteen survey trips, 15 nests were located in the emergent vegetation along the edge of the pond. Twenty-three (23) nests were located in the trees and shrubs that fringe the pond. One (1) nest, that of a song sparrow was located on the ground among the grasses. Three (3) nests were located in bird boxes and 5 were located on man made structures. Twelve (12) broods of waterfowl were observed on the water or resting along the shoreline. This tally of 47 nests and 12 broods of waterfowl includes 17 species of nesting birds (Table 4, Map 3).

TABLE 4: Nest Identifications

No.	Species	No.	Species	No.	Species	No.	Species
1	CAGO	16	RWBL	31	YEWA	46	NOCA
2	RWBL	17	RWBL	32	GRCA	47	NOCA
3	RWBL	18	GRCA	33	GRCA	48	GRCA
4	RWBL	19	GRCA	34	RWBL	49	GCFL
5	RWBL	20	AMRO	35	RWBL	50	MADU
6	EAPH	21	GRCA	36	EAPH	51	WODU
7	GRCA	22	EAPH	37	MODO	52	WODU
8	TRSW	23	TRSW	38	RWBL	53	MADU
9	CAGO	24	GRCA	39	GRCA	54	MADU
10	CAGO	25	RWBL	40	RWBL	55	MADU
11	GRCA	26	NOOR	41	GRCA	56	GWTE
12	NOOR	27	RWBL	42	NOOR	57	WODU
13	RWBL	28	NOOR	43	GRCA	58	WODU
14	COGR	29	SOSP	44	BBCU	59	MADU
15	GRCA	30	RWBL	45	NOCA		

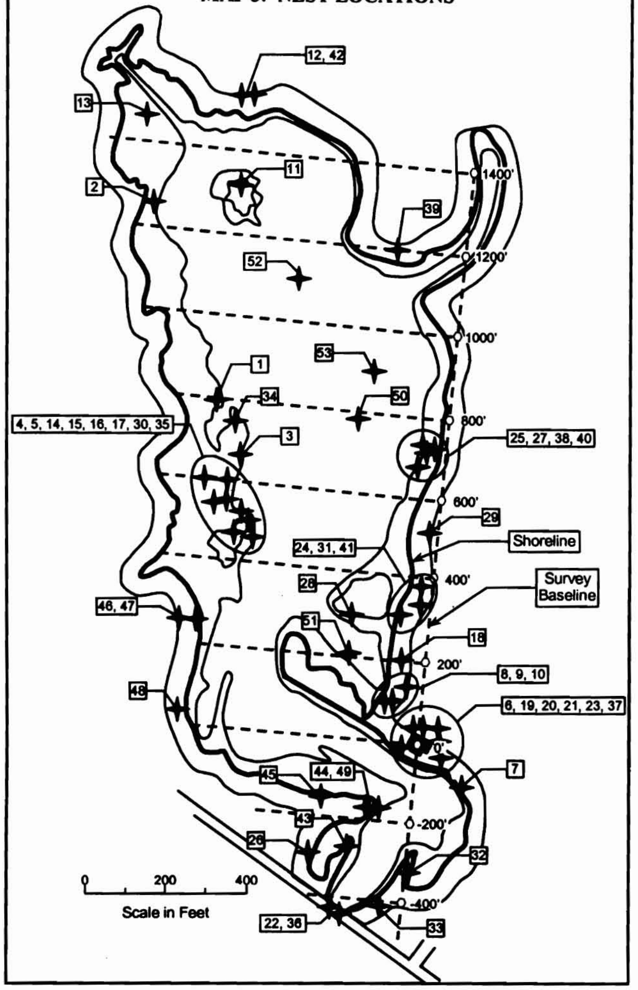
In addition to nests and broods discovered, notes were kept of singing, protesting and foraging birds observed within the study area, if their activities seemed to relate to territory or nesting. These activities are considered to indicate probable nesting (Andrle and Carroll 1988). Species included in this group of possible or probable nesters were: house wren, common yellowthroat, eastern kingbird, alder fly catcher, warbling vireo and swamp sparrow. The major areas of this activity are indicated in Map 4.

VEGETATION AND NESTING:

Fourteen kinds of plants were chosen for nest sites (Table 5, Fig. 1). A record was kept of the heights of nests above the ground or above the water level. Measurements were adjusted to take into account fluctuations in water level that occurred during the study period. Average heights and limits are shown in Figure 2.

It is difficult to make accurate measurements of nest heights in heavy cover without serious disruption of the cover. Nest heights were estimated using a calibrated rod as a standard and sighting the nest top across the measuring stick. Nests higher than 6 feet were measured using a mirror on an extendable pole. Heights were recorded to the nearest half foot. Actual heights might be 2-3 inches above or below the recorded height. Red-winged blackbird nests were recorded to the nearest inch.

MAP 3: NEST LOCATIONS



MAP 4: TERRITORIAL BEHAVIORS

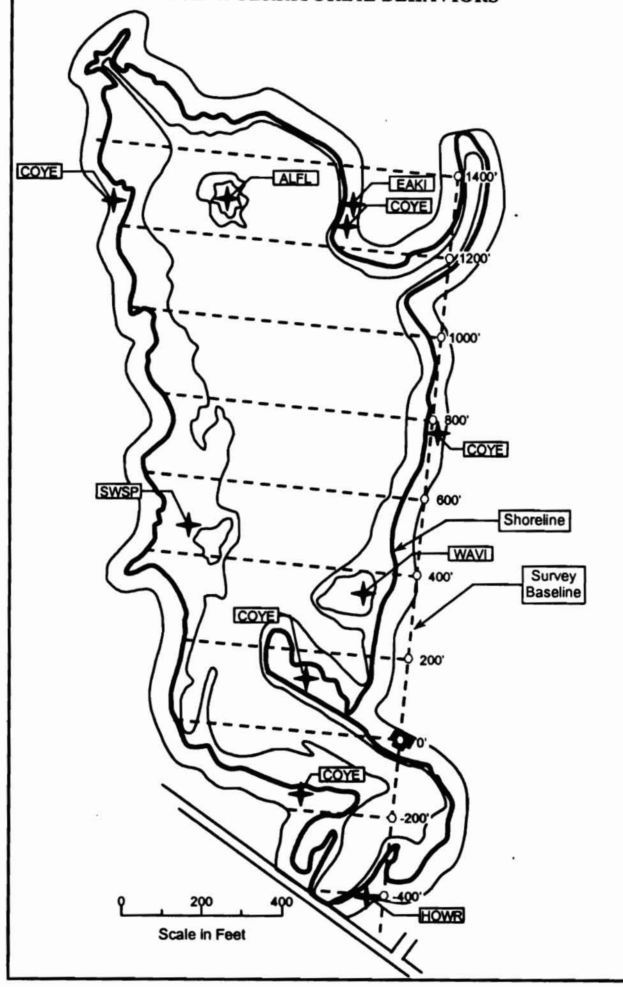


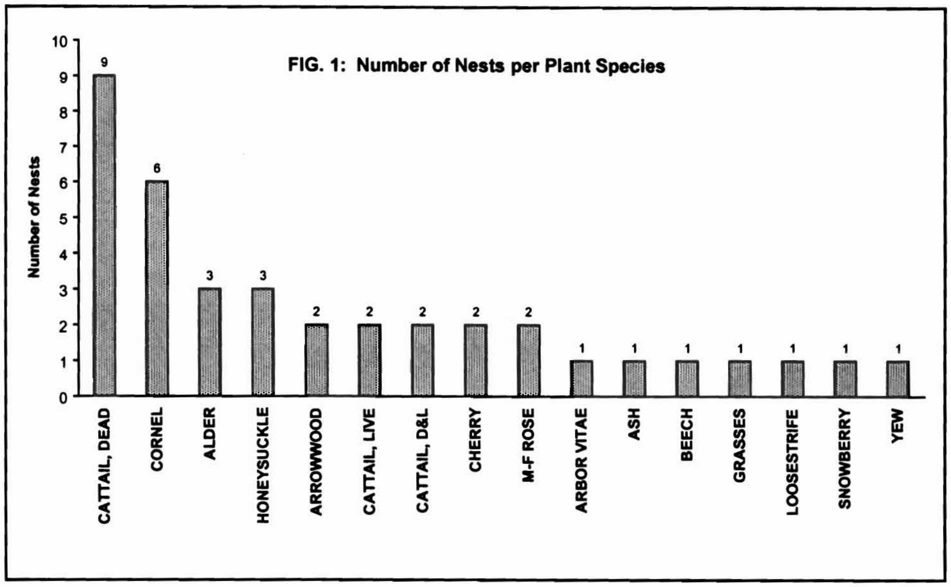
TABLE 5: Plants Used for Nesting

ALDER	*Alnus incana*	CORNEL	*Cornus amomum, C. sericea*
ARBOR VITAE	*Thuja occidentalis*	GRASSES	Various
ARROWWOOD	*Viburnum dentatum*	HONEYSUCKLE	*Lonicera morrowii, L. tartarica*
ASH	*Fraxinus pennsylvanica*	LOOSESTRIFE	*Lythrum salicaria*
BEECH	*Fagus grandifolia*	M-F ROSE	*Rosa multiflora*
CATTAIL	*Typha sp.*	SNOWBERRY	*Symphoricarpos albus*
CHERRY	*Prunus avium, P. serotina*	YEW	*Taxus x media*

DISCUSSION:

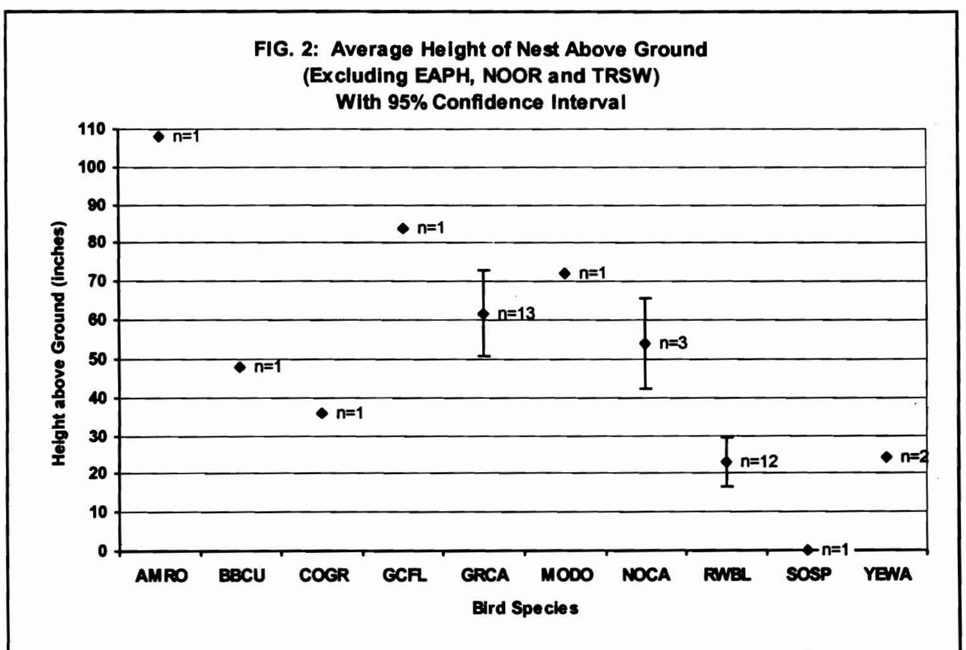
PRE-FLOOD CONDITIONS:

A prime goal of this study was to measure changes in bird populations in the flood zone of Rice Pond since a pre-flooding study completed in 1964-1966. Previous to the creation of the pond, the flood zone was a cow pasture until 1960, after which a few horses were pastured there. During the years when the first bird census was done, the flood zone was covered with perennial grasses and weeds. Adjacent uplands to the west had been planted to corn and small grains. To the east, the adjacent uplands were mostly old fields following pasture.



The only wooded portion of the flood zone was south and east of the field station building site. About one acre of mature woodland occupied a knoll across the creek south of the building site. All of the acreage east of the creek and the building site was abandoned orchard or pasture dominated by young hardwoods. Along the banks of Rice Creek, as it meandered through the pasture, were scattered discontinuous band of small shrubs. The wetlands bordering the creek occupied a channel from 15 to 30 feet wider than the stream itself. In small marshy or swampy pockets were bur-reed, swamp milk weed, cat-tail, broad-leafed arrowhead, lizard tail, pickerelweed and sweet flag. Some water holes were deep enough to harbor potamogetons, anacharis and water smartweeds.

This varied habitat accounts for the relatively long list of birds recorded by the early morning bird walk groups and by students doing independent study work on the pre-flood acres.



POST-FLOOD CONDITIONS:

When it was filled, the pond occupied just under 26 acres counting the islands. Flooding of this area produced sweeping changes in cover types, flooding out and killing all but about 9 acres of the grasses and perennial weeds. In the 35 years since the first survey was completed, the pond has developed nearly 6 acres of emergent wetland vegetation. The shoreline, once over 80% in herbaceous cover, is now about 90% wooded.

PRE-FLOOD AND POST-FLOOD BIRD POPULATIONS COMPARED:

Considering these major changes in habitat, it is interesting to note that 23 of the 41 species listed as present during the 1964-1966 nesting seasons were still present in 1997. Of the 18 species present in 1964-66 but missing in the 1997 survey, 8 species are considered meadow or cropland birds, some requiring large expanses of grasslands. Today there is no true meadowland adjacent to the pond. In addition, no true woodcock or field sparrow habitat remains. Despite the fact that there is suitable cover today for the remaining 9 species missing in 1997 but present in 1964, no adults of these species were seen or heard in the study area.

Apparently the most important factor in these population shifts was the disappearance of meadow habitat. Only four species appear in the 1997 study which did not appear in the earlier surveys. Three of these are aquatic or wet meadow dwellers. The swamp sparrow will occasionally nest in small wet pockets adjacent to streams, but it is more often found nesting in more extensive fens or wet meadows, where it may form small informal colonies. It is unlikely that the pre-flood stream provided enough suitable cover. Both Canada goose and green-winged teal choose nest sites at the edges of ponds or on wetlands with a good deal of open land. The black-billed cuckoo could have found suitable nesting cover in the pre-flood shrub clumps, but it was the yellow-billed cuckoo which was found in the area in 1966.

The most unusual record in the 1997 nesting season was the green-winged teal. It was recorded in only 32 of the 5300 5 k^2 blocks surveyed for the NYS Breeding Bird Census during the 1980's (Andrle and Carroll 1988). It should be noted that 8½ week old teal are capable of flight and could not be counted as confirmed products of Rice Pond nesting. Broods of downy chicks have been identified in Rice Pond in recent years.

Despite expectations, there was no sign of marsh wrens in 1997. In field surveys, completed in 1985 in connection with the development of a management plan, a small colony of marsh wrens was located at the northwest corner of the study area. Two nests were collected by the author at the end of the nesting season and added to the Field Station nest collection.

More catbird territories were located than had been predicted. These, of course, were found in the 50 foot wide upland fringe surveyed along the margin of the pond. Analysis of the changes in this habitat since 1966 helps to explain the abundance of catbirds. In 1966, less than 500 feet of the 6100 feet of shoreline was suitable for catbird nesting. Today over 3600 feet of shoreline is covered with scattered young trees which admit enough light for the dense shrubs which the catbird prefers for nesting. The population average of one nest for every 276 feet is above the minimum distance between nests observed in 1997, so the population might actually have been larger than that actually observed.

Some of the shoreline trees are becoming mature enough to begin to reduce the number of suitably thick shrubs due to shading. It is predictable that cat-bird populations within the study area will be greatly reduced in future years. Within a decade the only suitable shrubs will be right along the shoreline where adequate light can reach them.

INTRA- AND INTER-SPECIES DYNAMICS:

We desired to determine the extent of cowbird parasitism in the study area. Since cowbirds do not normally lay their eggs in the nests of host species until one to several eggs of the host species are laid (Bent 1958; Stokes and Stokes 1983), it was necessary to observe some nests until the full clutch of eggs was laid and incubation begun. The cowbird egg usually hatches from 1 to 3 days earlier than the eggs of the host species, therefore cowbirds may successfully parasitize a species even after incubation has begun. This is believed to be rare, but even should the cowbird hatch a day later than its much smaller hosts, it has a good chance of succeeding. Harrison (Harrison 1975) reports that over half of 214 species hosting cowbird eggs raised the young cowbirds successfully. This is about normal for songbird survival in local studies completed by the author.

Only one case of cowbird parasitism was discovered during the 1997 survey. That was a yellow warbler's nest (nest 31). In this case the single cowbird's egg was laid 3 or 4 days after incubation was started. Although the cowbird egg remained in the nest throughout the nesting period, it did not hatch and was still in the nest after the young warblers had left.

Although Bent (Bent 1958) cites reports of gray catbirds incubating cowbird eggs, there are many records in the literature of catbirds throwing cowbird's eggs out of their nests, and this appears to be a common practice (Harrison 1975).

Red-winged blackbirds are known to be parasitized by cowbirds (Friedmann 1929). Since the red-wing incubation period is identical to that of the cowbird, and the nestlings appear to be as large and as strong as the cowbirds, the hatchling cowbirds do not have the same advantage that they do with smaller hosts such as song sparrows or warblers. In addition, the author has more than once observed both male and female red-wings harassing female cowbirds which have entered their territories, giving them no rest until they left (Johnson-Marsh Oswego - 1963; Channels Marsh, Sherburne - 1968).

The unusual non-uniform nesting of red-wings also invited follow-up. Map #3 shows that 10 red-wing nests were concentrated in the territories of two of the six males. These two territories were the first occupied by females in late April.

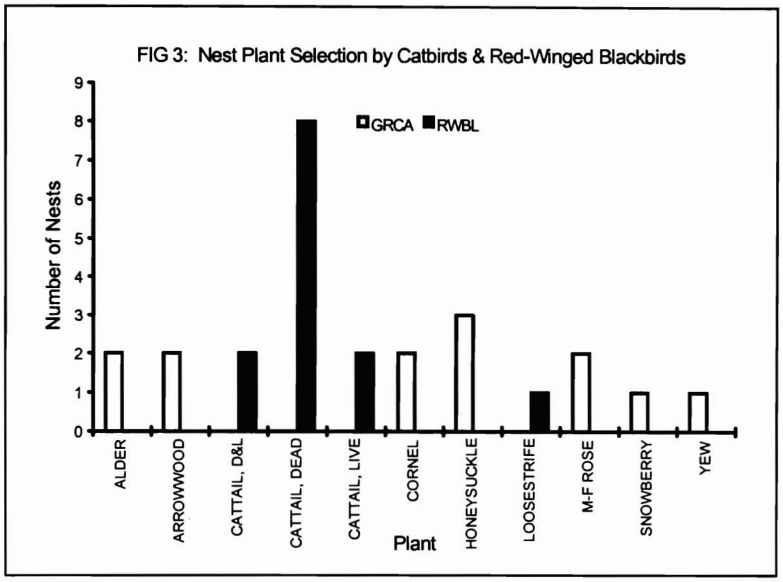
The largest territory extended over 400 feet along the cat-tail stand on the west side of the pond. Included were nests 3, 4, 16, 17, 30, 34 and 35. There appear to have been four separate females within this territory in 1997. Nests 16 and 30 seem to have been renests following the destruction of nests 5 and 17. Nests 34 and 35 were second nests following the fledgling of young from earlier nests. Nest 35 was destroyed before it was completed. Its location is noted on the map, but it was not tagged, since no nests were tagged and logged until the basic structure was completed (not including lining).

The second most productive territory was on the east shoreline, directly across the pond from the previously mentioned territory. Three nests (numbers 25, 27 and 40) were located in this territory (2 females). Nests 25 and 27 produced fledgling young. Nest 40 was a second brood attempt by the nest 25 female.

Nest 38 appears to have been the progeny of a different male whose territory was directly north of nests 25, 27 and 40. However, this male abandoned its territory before the young were completely fledged. While the male from the adjacent territory remained and protested approach to the nest, it did not attack.

CHOICE OF NEST SITES AND NEST HEIGHTS

The red-winged blackbirds in this study clearly preferred dead cat-tails to live cat-tails (Fig. 3). In other studies completed by the author, (Johnson Marsh - 1966-1968; Channels Marsh - 1968-1970), dead cat-tails were the early season choice, but nesting switched to live cat-tails when they reached proper height. Average height above the water increased as the cat-tails grew.



Where both live and dead cat-tails were used together in the Johnson and Channels Marshes, the nests normally tipped as the live cat-tails grew, often leaving the young perching on the lower rim of the nest during the last days before they left the nest. In this study, nests 16 and 24 were lashed to both live and dead cat-tails, but tipping was less than 16 - 20% from the horizontal. This would seem to indicate slow cat-tail growth. Slow growth might also account for the small number of nests sited in live cat-tails, even in late season. Nests 25 and 27 were built in live cat-tails. Dead stalks in that area were flattened and battered and the nests were located nearer the water level than the average shown in figure 2. Nest 40 in the same territory was in dead cat-tails 12 inches above the water.

Gray cat-birds showed a wide acceptance of shrub species as nest sites (Fig. 3). They require dense cover for nest sites and it seems likely that light intensity and suitable support, rather than shrub species, were critical factors in nest site selection. Light intensity may also have been a factor in the selection of nest height. Nest 19 (gray catbird) and nest 31 (yellow warbler) were at the lowest height noted for the species by Harrison (Harrison 1975). In both cases the shrubs chosen were low with dense foliage and the nests were very close to the top of the shrubs.

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A Survey of Small Mammal Populations at Rice Creek Field Station (Year 2)[1]

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In 1996, I initiated a survey of small mammals at Rice Creek field Station (Chepko-Sade, 1997). The intention is to see what small mammals are present, to measure population densities, and to compare these populations with others from similar environments mentioned in the literature. Comparisons will also be made with populations at two other locations in northern New York, Fort Drum and Cranberry Lake Biological Station, where similar annual surveys are in progress. The survey involves repeated captures of marked animals over a five month period in order to follow individuals through at least one breeding season and to begin to develop an estimate of age structure, reproductive rates, mortality, and turnover rates of the populations of different species. Such basic background information can be used in the design of future research projects and field exercises for undergraduate courses. The study was continued during the spring, summer and fall of 1997, and will enter its third year in the 1998 season. This interim report summarizes findings to date.

Trapping at Rice Creek Field Station prior to 1996 had indicated the presence of Eastern chipmunks (*Tamias striatus*), Red Squirrels (*Tamiasciurus hudsonicus*), White-footed mice (*Peromyscus leucopus*), and Northern short-tailed shrews (*Blarina brevicauda*). However, there was no information on abundance or population structure for these species.

A report prepared by John Weeks (Weeks 1988) indicated dramatic changes in the vegetation cover and land use at the station between 1962 and 1986. These changes continue, 12 years since the last cover map of the station was made, with many areas undergoing succession, and reverting to mixed deciduous woodland. As the vegetation matures, we expect to see different species of small mammals in the different habitats present at the station. The major vegetation types indicated on the land use map for the station drawn up in 1986 (Weeks, 1988) are grassland, mature woodland, scrubland and conifer plantation. A part of the grassland area has been maintained by mowing, but much of the scrubland has grown up into young deciduous woodland.

The changes in land use patterns at Rice Creek Field Station mirror those seen in much of Oswego County, and in much of the Northeastern United States, as small farms have been abandoned and allowed to undergo succession back to deciduous woodland. Bird species once common in rural farmlands, such as bobolinks, bluebirds and meadowlarks, are becoming rarer. The grasslands maintained by farmers to grow hay for farm animals are reverting to woodlands, providing more habitat for woodland birds, but less for birds of open meadows. These changes can also be expected to affect small mammal species. Open grasslands favor meadow voles, white-footed mice, and meadow jumping mice, but as grasslands give way to woodlands, the cooler moister environment will favor red-backed voles, deer mice, and woodland jumping mice. It will be interesting to monitor the small mammal population from year to year as these changes

[1] Financial support provided by Rice Creek Associates and Oswego State University's Division of Continuing Education and Office of Research and Sponsored Programs.

[2] Dr. Chepko-Sade was assisted in the field by Julie Mikalajyzck and Adam Howard. Chaula Anjaria assisted in database development.

take place and to track succession in the small mammal population as a function of vegetational succession.

Having a small mammal survey in progress has also been beneficial in teaching students about some of the methods used in field research. Biology student volunteers recruited from the Biology Club and from my Fall semester classes helped with trapping during September of 1996 and 1997, and were enthusiastic about the opportunity for hands-on experience in biological field research.

Methods:

Trapping grids were set up in four areas: 1) mature forest, 2) open field and adjacent scrubland/pioneer woodland, 3) conifer (Scots Pine) plantation, and 4) large open field. Grids are 70 meters by 70 meters, each set with 64 traps placed 10 meters apart. The traps used were medium sized Sherman live traps (3"x3"x9") baited with sunflower seeds. The traps were to be set for approximately one night trapping and one day trapping each week between May and October of 1996. In 1996, time spent in the initial set up of the grids, a severe case of poison ivy contracted by the field assistant, and time required to fulfill other commitments resulted in delay and interruption of the trapping schedule. Nevertheless, all of the grids were surveyed and marked, and trapping was carried out at each site for part of the summer and fall. A total of ten trapping sessions was completed in 1996. The 1996 data are less complete than planned, but do serve as a starting point for further systematic survey in the same sites.

Trapping commenced earlier in the 1997 season, and a total of twenty trapping sessions was completed. There was a modest increase in the number of species observed in 1997 (11 in 1997 compared to 7 in 1996) and a nearly five fold increase in the number of individuals trapped (cf. Tables 1 and 2). These increases almost certainly reflect the increase in trapping activity rather than any significant changes in animal populations.

Small mammals trapped were weighed and measured, age was estimated (adult or juvenile, based on weight and reproductive condition), and reproductive condition was recorded (Larson and Taber, 1980). Where possible, animals were marked with aluminum ear tags and released.

Species found at Rice Creek Field Station in the course of this survey to date include:

- Northern short-tailed shrew (*Blarina brevicauda*)
- Masked shrew (*Sorex cinereus*)
- Star-nosed mole (*Condylura cristata*)
- Meadow jumping mouse (*Zapus hudsonius*)
- Meadow vole (*Microtus pennsylvanicus*)
- White-footed mouse (*Peromyscus leucopus*)
- Southern flying squirrel (*Glaucomys volans*)
- Eastern chipmunks (*Tamias striatus*)
- Red squirrel (*Tamiasciurus hudsonicus*)
- Eastern Gray Squirrel (*Sciurus carolinensis*)
- Short-tailed weasel (*Mustela erminea*)

Results:

1996 Survey:

A total of 131 small mammals were trapped between 3 June and 29 September 1996. The distribution of these captures in the four trapping habitats is reviewed in Table 1.

TABLE 1. Small Mammals Trapped in Four Habitat Areas at Rice Creek Field Station June through September, 1996

	Forest	Field/Shrubland	Pine Wood	Open Field	Totals
Blarina brevicauda	25	6	11	26	68
Peromyscus leucopus	1	1	2	0	4
Sciurus carolinensis	0	0	3	0	3
Sorex cinereus	0	0	1	0	1
Tamias striatus	29	3	5	2	39
Tamiasciurus hudsonicus	1	1	0	0	2
Zapus hudsonius	0	5	1	8	14
TOTALS	56	16	23	36	131

1997 Survey:

Trapping results for the 1997 season are summarized in Table 2. A total of eleven species representing three orders were represented.

TABLE 2. Small Mammals Trapped in Four Habitat Areas at Rice Creek Field Station May through September, 1997

		Forest	Field/Shrubland	Pine Wood	Open Field	Totals
Insectivora	Condylura cristata	0	0	1	0	1
	Sorex cinereus	0	0	1	1	2
	Blarina brevicauda	47	30	50	62	189
Rodentia	Microtus pennsylvanicus	0	34	0	65	99
	Peromyscus leocopus	8	22	39	0	69
	Zapus hudsonius	0	12	1	25	38
	Sciurus carolinensis	2	0	1	0	3
	Tamiasciurus hudsonicus	2	2	2	0	6
	Glaucomys volans	1	0	1	0	2
	Tamias striatus	91	33	53	17	194
Carnivora	Mustela erminea	0	0	0	2	2
	TOTALS	151	133	149	172	605

Table 3 shows the percentage of animals of each species trapped on each grid and percentage of the total number of animals trapped that each species represents. By far the most commonly captured animals were the Short-tailed shrew (*Blarina brevicauda*) and the Eastern Chipmunk (*Tamias striatus*), which together make up over 64% of all animals captured. *Blarina brevicauda* were captured on every grid. They were more frequent on the open field than in other habitats, and least frequent in the field/shrubland area. *Blarina brevicauda* is considered to be perhaps the most abundant and widespread of North American small mammals, both geographically and in terms of habitat occupied. The Eastern chipmunk is also widespread and occurs in a wide variety of habitats, though it clearly prefers wooded areas to open fields and when found in fields is rarely far from wooded areas. *Peromyscus leucopus* was found only in wooded areas. The field/shrubland grid has three transects that occur in early succession northern hardwoods, and the Peromyscus trapped on this grid were found in the wooded area. Other species trapped only in the woods were *Condylura cristata* and *Glaucomys volans* though

Condylura can also be found in wet fields. *Microtus pennsylvanicus* and *Mustela erminea* were only found in open fields. *Microtus pennsylvanicus* is usually found in open fields, though on islands it may be found in wooded areas when not displaced by *Clethrionomys gapperi*, a vole of northern forests. *Mustela erminea* occurs in wooded areas as well as open areas. Individuals tend to have large ranges but are sparsely distributed, as indicated by the low number trapped at Rice Creek.

TABLE 3. Percentage of Small Mammals Trapped in Four Habitat Areas at Rice Creek Field Station May through September, 1997

		Forest	Field/Shrubland	Pine Wood	Open Field	Totals
Insectivora:	Condylura cristata	0%	0%	100%	0%	0.17%
	Sorex cinereus	0%	0%	50%	50%	0.33%
	Blarina brevicauda	25%	16%	26%	33%	31.24%
Rodentia:	Microtus pennsylvanicus	0%	34%	0%	66%	16.36%
	Peromyscus leocopus	12%	32%	57%	0%	11.40%
	Zapus hudsonius	0%	32%	3%	66%	6.28%
	Sciurus carolinensis	67%	0%	33%	0%	0.50%
	Tamiasciurus hudsonicus	33%	33%	33%	0%	0.99%
	Glaucomys volans	50%	0%	50%	0%	0.33%
	Tamias striatus	47%	17%	27%	9%	32.07%
Carnivora:	Mustela erminea	0%	0%	0%	100%	0.33%
	TOTALS	25%	22%	25%	28%	100.00%

Blarina brevicauda and *Tamias striatus* were the dominant small mammals in the mature deciduous woods, as well as the pine woods, though a significant number of *Peromyscus leucopus* were also seen in the pine woods. *Microtus pennsylvanicus* and *Zapus hudsonicus* were more prominent in the two field sites. *Tamias striatus*, though present in the open fields, is represented by reduced numbers of individuals. The field/shrubland site is a problematic area, being about half open field and half early successional deciduous woods. A data base designed for the project in the fall of 1997 will facilitate separating the data from the two habitats included in this grid.

Discussion:

The 1996 and 1997 data give some information regarding the species present and their relative abundance in different environments. This is a necessary starting point. We are now in a position to begin to ask population level questions for different species at Rice Creek. Another season's trapping data will allow us to begin to examine population fluctuations and their relationship to yearly weather fluctuations. Many populations of small mammals undergo cycles of abundance and scarcity which are due to severity of the winter as well as to density dependent population parameters. With the mark and recapture technique, we are beginning to collect data on longevity, number of reproductive cycles per year, and other life history parameters. It will soon be possible to make comparisons between populations at Rice Creek and those in other areas where similar long-term longitudinal studies have been carried out. In particular, *Tomias striatus*, the eastern chipmunk, has been studied in the Adirondacks, Pennsylvania, and Vermont. It will be interesting to compare the longevity and reproductive potential of Rice Creek animals with that of individuals in other Northeastern populations.

The success of the 1979 small mammal survey was due in large part to the work of my two field assistants. We found that having three people available resulted in a significant increase in the number of trapping sessions we were able to complete. We also appreciate very much the assistance of student volunteers at the beginning of the Fall semester. Many of these volunteers received their first introduction to Rice Creek Field Station and field research in the form of pre-dawn trap checks. They found it very rewarding to see animals that they were never aware of before taken out of the traps for examination and measurement. For a few, there was the added bonus of seeing a flying squirrel or a weasel.

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* Publication is out of print. Photocopies may be available on request. A fee will be charged.