Golden-winged Warbler Reproductive Success and Habitat Assessment on Sparta Mountain Wildlife Management Area

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Since 1966, the Golden-winged Warbler (GWWA) population has been suffering significant declines in the United States, with a decrease of 7.9 percent per year (from 1980 to 1999) in the Northern Ridge and Valley (Sauer et al. 2001). Loss of habitat and increased competition with Blue-winged Warblers (BWWA) have been suggested as potential causes of the decline of GWWA (Confer 1992, Dettmers and Rosenberg 2000, Confer et al. 2003). Because of these factors, Partners in Flight listed the GWWA as continental priority and a focal species for scrub-shrub habitat with Action II priority (immediate management or policy needed rangewide) in the physiographical areas of Southern New England (9) and Northern Ridge and Valley (17). Furthermore, the GWWA is listed as a species of special concern in New Jersey and pending status review for federal listing.

At a recent workshop to discuss coordinated bird monitoring in the mid-Atlantic region of the United States, early -uccessional habitat was one of the habitats identified for short-term monitoring programs due to important management issues that states must address (see Niles unpub.). These proposed programs would guide researchers into one of four modeling approaches, depending upon the researcher's needs. It was recommended that site-specific models were needed to determine the best management practices for the creation of appropriate scrub-shrub habitat within utility right-of-ways (ROWs). One of the parameters for this model was an analysis of productivity for selected species with a methodology of assessing "how management history, size and dimension of ROW, vegetation composition, and landscape context affect current abundance, diversity, and productivity of the early-successional suite of bird species."

In New Jersey, we initiated a study in 2000 and 2001 to determine the distribution and abundance of GWWA breeding in the northwestern part of the state. Approximately 80-90 pairs of GWWA were estimated to breed in New Jersey, with the majority of individuals occurring in the Southern New England region of the state (Benzinger unpub.). This is a sharp decline from a previous study done in the 1920s-30s, where the GWWA was recorded as very common in northwestern New Jersey and more abundant than the BWWA (Eaton 1934).

Habitat analyses from these earlier surveys indicated that herb height and cover, tree cover, shrub cover, elevation, wetland type, and habitat type played a significant role in the presence of breeding individuals in scrub-shrub habitat (see appendix). Specifically, golden-winged warblers tended to breed in areas with approximately 40% herb cover, 30% shrub cover, 25% tree cover, and an average herb height of 0.3 meters. They also appeared to avoid areas of scrub-shrub habitat in the earlier stages of succession (more herb cover and higher herb height, less shrub and tree cover). GWWA were also shown to occur in wetland gradients at higher elevation in either utility right-of-ways (ROWs) or swamps, but not in old fields or disturbed sites.

The possibility of hybridization and competition between GWWA and BWWA has been an ongoing concern and appeared to be a minor factor involved in population declines (Scully unpub.). However, it may be a problem for small populations. With only 80-90 pairs of GWWA breeding in a few consistent sites in New Jersey, it is difficult to determine the extent of impact BWWA have on the population. We documented one hybrid (Lawrence's) during the two years of study, and a few GWWA were observed singing BWWA songs (Benzinger unpub.). We also found a 1:4 GWWA:BWWA ratio overall, with one half (14) of the GWWA sightings in 2000 and 2001 within 50 meters of a BWWA sighting. This leads us to believe that competition and hybridization with BWWA is occurring, thus a potential threat for the GWWA population in New Jersey (Walsh et al. 1999).

Our goal is to identify areas and habitat characteristics that allow for high productivity with little threat to reproductive success (source habitat). From this information, we will be able to better instruct land managers how to manage for breeding GWWA and identify parameters to be used in a predictive model to locate potential GWWA habitat that are difficult to access. Our objectives were to look at site fidelity and productivity of GWWA and assess differences between utility ROWs and natural habitats. We observed GWWA interactions with neighboring BWWA to assess the extent of interspecific competition and hybridization on the GWWA population. Specifically, we intended to answer the following questions with our study:

1) Are GWWA successful in fledging young in utility ROWs and natural habitats (shrub swamp)?
2) Are birds returning to known breeding locations; (what are the return rates)?
3) Do BWWA compete/interbreed with GWWA on known breeding sites
4) What are breeding habitat characteristics (vegetative composition and configuration)?
5) What is the landscape-level configuration surrounding breeding sites?
6) What is the composition of the scrub-shrub bird community on study sites?

Methods

We set up 50-meter grids, marked with colored flagging tape, along the utility ROWs and within non-ROW wetland areas where GWWA were located on Sparta Mountain WMA. GWWA were lured with call-playbacks into mist-nets and individually marked with colored bands made of Darvic PVC.

Each individual GWWA located was observed from a distance every 1-3 days. The locations of the individual were mapped during the observation period (minimum 20 minutes), and other scrub-shrub species breeding on the study site, as well as presence of predators, competitors, and any other interspecific interactions with GWWA were documented.

GWWA nests were located by manual searching and following male and female GWWA. Once found, each nest was monitored every 2-3 days until fledging or nest failure. Vegetation characteristics were measured at least 3 weeks after the nest fledged/failed.

Habitat characteristics were measured along transect lines within utility ROWs (see Confer 2000 for details) for occupied and unoccupied habitats.

Results

A total of ten out of sixteen individual male GWWA were color-banded in the vicinity of Sparta Mountain Wildlife Management Area (Figure 1). Six out of the sixteen males were confirmed breeding with three nests located. Two of the three nests fledged, and three other males were observed feeding fledglings (Table 1). Sixty-three percent of the sixteen males (10) were located on utility ROWs with the remaining individuals located in a scrub-shrub swamp. All of the cases of confirmed breeding were on utility ROWs.

Threats breeding. Ten BWWA males were identified with one confirmed breeding. Only two of the ten were located in utility ROWs. One female Brewster's hybrid was located and confirmed breeding with an unbanded GWWA male (unbxbr). Their nest of four chicks failed days before fledging, and no attempt to re-nest was observed. None of the four GWWA nests had evidence of cowbird parasitism, but cowbirds were present on the ROW and one out of two yellow warbler nests contained a cowbird egg.

Territories. All GWWA located were spot-mapped. Only ten territories contained enough data to predict boundaries using Adaptive Kernels at a 65 percent probability, and all but one territory was in a utility ROW. In general, territories ranged from 0.29 to almost four hectares, with the mean territory size of 1.60 (± 0.35) hectares (Table 1). Territories in ROWs averaged 1.75 (± 0.58) hectares with the minimum territory size of 0.64 hectares.

Habitat characteristics. Vegetation characteristics were measured at 409 points within nine GWWA territories along the utility ROW and 345 points along the ROW where GWWA did not occur. Based upon Kruskal-Wallis, MANOVA, and correlation analyses, GWWA territories tended to be in lower altitudes (X^2=43.3, P<0.001; correlation = -0.32), but no individual habitat characteristic differed significantly with GWWA occupancy. However, there was a tendency for occupied territories to contain a higher proportion of herbaceous vegetation and lower proportion of shrubs than unoccupied territories (Figure 2).

Scrub-shrub bird community. Fifty-four different species of birds were using the utility ROWs on Sparta Mountain within GWWA territories to breed and forage. One species is on New Jersey's endangered list (red-shouldered hawk), six species are listed as special concern, and twenty species are designated as regional priority (Table 2). Potential nest predators (blue jay, American crow) occurred in five territories, and two territories contained a potential adult bird predator (sharp-shinned hawk). Brown-headed cowbirds occurred in all nine territories.

Conclusion and Need for Research in 2004

There are insufficient data from this year's study to conclude with any reliability whether utility ROWs are beneficial or detrimental to the reproductive success of GWWA. However, the presence of successful nesting attempts of GWWA and the scarce number of BWWA on the ROWs suggest that utility ROWs may not be habitat sinks for GWWA and, when managed properly, could aid in maintaining the state's GWWA population. This possibility evokes a need to accurately identify potentially suitable habitat as well as appropriate management practices for breeding habitat. Managing properties for GWWAs will also benefit other species of priority that use scrub-shrub habitat (see Confer and Pascoe unpub.). There were also not enough data in this first year of the study to determine which habitat characteristics in a utility ROW were preferred by GWWA, although the trend matched that of our preliminary studies (see Appendix). Further years of research in an increased number of sites in New

Jersey are needed to determine return rates of GWWA and number of nests and territories on utility ROWs and shrub swamps. This information will determine 1) overall reproductive success in utility ROWs in comparison with natural shrub swamps, 2) vegetation characteristics associated with successful and unsuccessful nesting attempts (site-specific model), and 3) landscape context of source habitats (regional model). After a few years of data collection, we should have enough information to determine which habitat characteristics and other variables can be used to predict source habitats likely to be utilized by GWWA.

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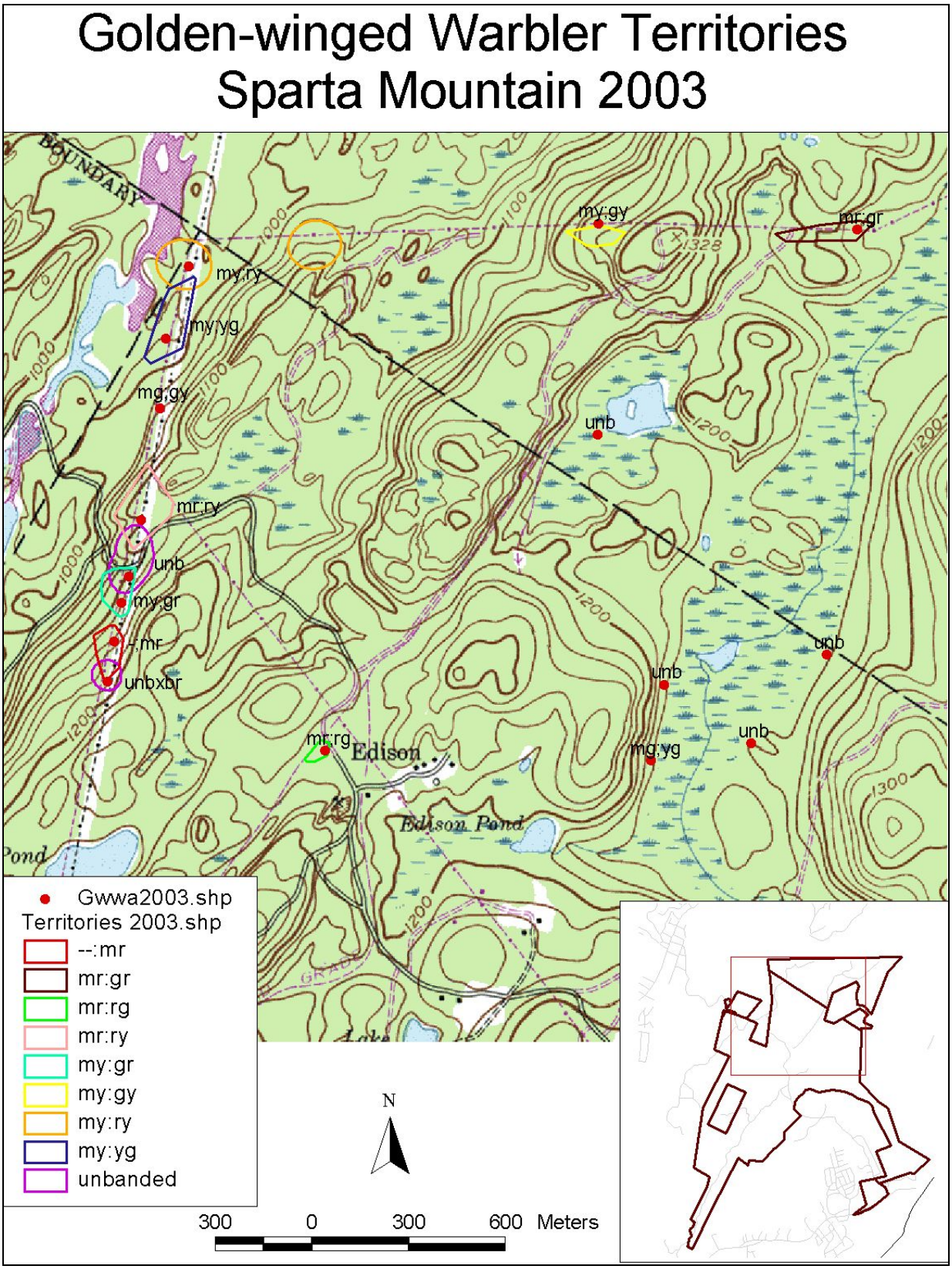


Figure 1. Map of golden-winged warbler occurrences and territories on Sparta Mountain Wildlife Management Area. Golden-winged warblers are referenced by their band combinations.

Table 1. Information about golden-winged warblers banded on Sparta Mountain Wildlife Management Area in 2003.

Band combination	Territory size (ha)	Confirmed breeding?	Clutch Size	Clutch Status
unbxbr	0.64	yes	4	Failed
unbanded1	2.15	yes	4	Fledged
mr:ry	2.58	yes	4	Fledged
my:yg	2.19	yes	unknown	Fledged
mr:gr	1.25	yes	unknown	Fledged
:mr	1.06	yes	unknown	unknown
my:ry	3.99	unknown	unknown	unknown
my:gy	0.71	unknown	unknown	unknown
my:gr	1.18	unknown	unknown	unknown
mr:rg	0.29	probable	unknown	unknown

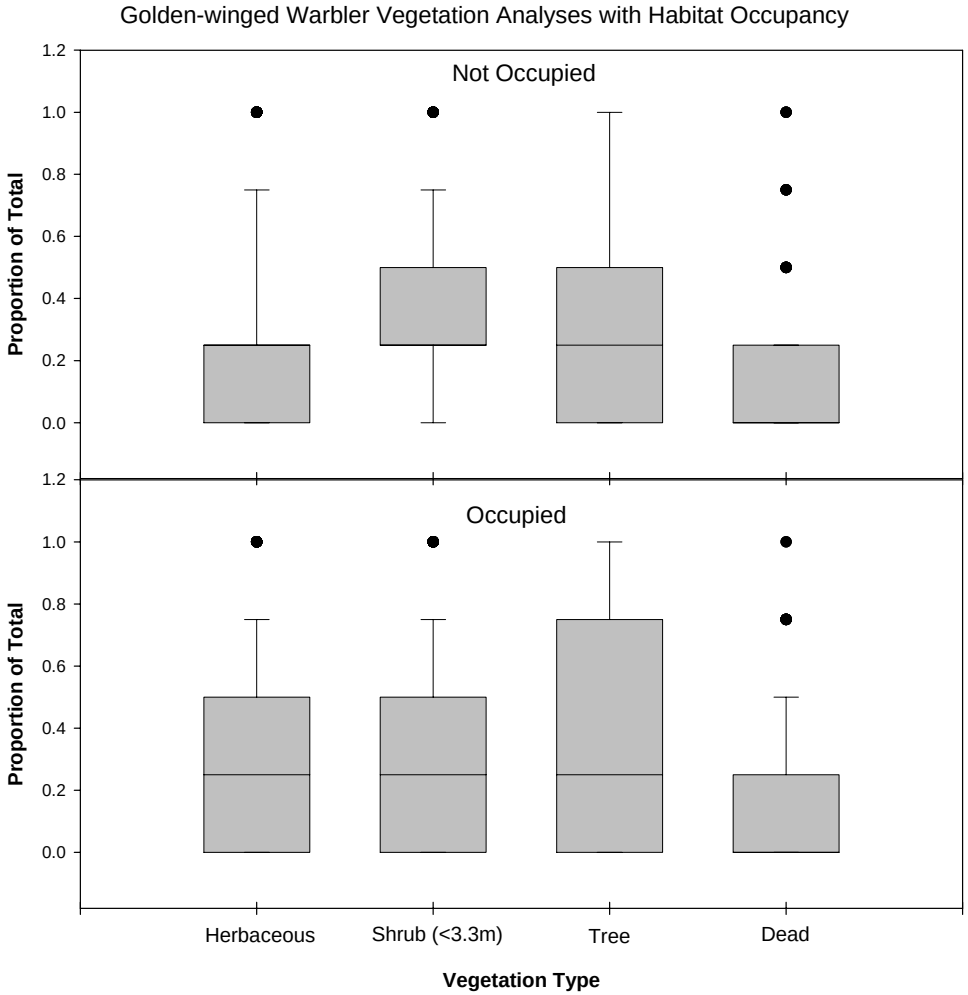


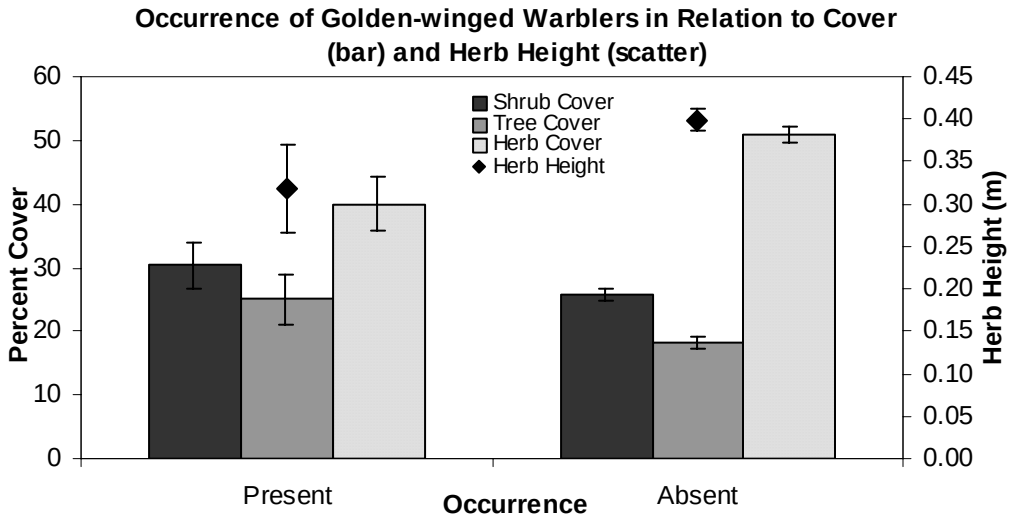
Figure 2. Boxplot of vegetation cover measured on a utility right-of-way in Sparta Mountain Wildlife Management Area. Occupied areas (n=409) were within known golden-winged warbler territories and unoccupied areas (n=345) were beyond golden-winged warbler territory borders and in areas golden-winged warblers were not detected.

Table 2. List of bird species detected within golden-winged warbler territories on Sparta Mountain Wildlife Management Area.

Common Name	Alpha Code	# GWWA Territories Occupied	Status
Cedar Waxwing	CEDW	1	Common
Downy Woodpecker	DOWO	1	Common
Eastern Phoebe	EAPH	1	Common
Eastern Tufted Titmouse	ETTI	1	Common
Red-bellied Woodpecker	RBWO	1	Common
Song Sparrow	SOSP	1	Common
Turkey Vuture	TUVU	1	Common
American Crow	AMCR	2	Common
American Redstart	AMRE	2	Common
Mourning Dove	MODO	2	Common
Red-tailed Hawk	RTHA	2	Common
White-breasted Nuthatch	WBNU	2	Common
American Goldfinch	AMGO	3	Common
Black-capped Chickadee	BCCH	3	Common
Blue-gray Gnatcatcher	BGGN	3	Common
Blue Jay	BLJA	3	Common
Ovenbird	OVEN	3	Common
Red-eyed Vireo	REVI	3	Common
Ruby-throated Hummingbird	RTHU	3	Common
Northern Cardinal	NOCA	4	Common
Common Yellowthroat	COYE	5	Common
Yellow Warbler	YWAR	7	Common
Chestnut-sided Warbler	CSWA	8	Common
Brown-headed Cowbird	BHCO	9	Common
Red-shouldered Hawk	RSHA	1	Endangered
Blackpoll Warbler	BLPW	1	Migrant
Black-throated Blue Warbler	BTBW	1	Priority
Louisiana Waterthrush	LOWA	1	Priority
Northern Bobwhite	NOBO	1	Priority
Northern Flicker	NOFL	1	Priority
Worm-eating Warbler	WEWA	1	Priority
Wood Thrush	WOTH	1	Priority
Yellow-billed Cuckoo	YBCU	1	Priority
Yellow-throated Vireo	YTVI	1	Priority
Great-crested Flycatcher	GCFL	2	Priority
Indigo Bunting	INBU	2	Priority
Eastern Wood-pewee	EAWP	3	Priority
Field Sparrow	FISP	3	Priority
Rose-breasted Grosbeak	RBGR	3	Priority
Scarlet Tanager	SCTA	3	Priority
Baltimore Oriole	BAOR	4	Priority
Blue-winged Warbler	BWWA	5	Priority
Black-and-white Warbler	BAWW	7	Priority
Gray Catbird	GRCA	7	Priority
Eastern Towhee	EATO	9	Priority

Prairie Warbler	PRAW	9	Priority
Black-throated Green Warbler	BTNW	1	Special Concern
Cerulean Warbler	CERW	1	Special Concern
Northern Parula	NOPA	1	Special Concern
Broad-winged Hawk	BWHA	2	Special Concern
Sharp-shinned Hawk	SSHA	2	Special Concern
Veery	VEER	2	Special Concern
Hermit Thrush	HETH	1	Uncommon
Magnolia Warbler	MAWA	2	Uncommon

Appendix: Preliminary analyses of golden-winged warbler habitat from presence/absence surveys in New Jersey from 2000-2001.



Comparison of average and standard error of vegetation cover and herb height measurements in areas surveyed for golden-winged warblers.

Category	X^2	P	df	Corr	P
Tree Height	20.08	NS	17		NS
Shrub Height	2.42	NS	3		NS
Herb Height	**5.38**	**NS**	**4**	**-0.12**	**0.021**
Tree Cover	**24.19**	**NS**	**18**	**0.11**	**0.034**
Shrub Cover	**37.49**	**0.002**	**16**		NS
Herb Cover	**41.26**	**0.003**	**20**	**-0.13**	**0.012**
Barren Cover	3.32	NS	7		NS
Water Cover	1.27	NS	6		NS
Other Cover	11.17	NS	7		NS
Habitat Type	**9.87**	**0.007**	**2**	**0.16**	**0.003**
Wetland	**12.25**	**0.002**	**2**		NS
Elevation	**30.19**	**0.002**	**11**	**0.22**	**<0.001**

Chi-squared and correlation analyses of vegetation height and cover with presence of golden-winged warblers during surveys in New Jersey in 2000 and 2001. Categories in bold are statistically significant (P>0.05) in either or both analyses. Only correlation statistics with a P-value <0.05 were reported.