



Response of Forest Songbird Abundance to Invasive Plant Management

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A major concern of land managers today is combating the rapid invasion of exotic (nonnative) plant species into natural areas. The adverse effects of exotic plants on ecosystem function have been well documented and include impacts to local hydrology, breeding birds, native herbs and nutrient cycling.^{1,2,3,4} In northeastern Illinois, such species as common buckthorn (*Rhamnus cathartica*), Amur honeysuckle (*Lonicera maackii*), and multiflora rose (*Rosa multiflora*) are receiving particular management attention.

Natural woodlands within northeastern Illinois that do not receive proper management often diminish in floristic quality as exotic species invade. A decade ago, buckthorn was noted as the most common tree in the Chicago area, accounting for over 12% of the total tree population.⁵ Regular fire management, however, will gradually exclude many introduced buckthorns from natural areas.⁶ Therefore, woodlands not properly managed through prescription fire or other methods and where buckthorn is abundant may slowly succeed to a buckthorn-dominated landscape.

To combat this trend, land managers employ various management techniques including hand clearing and mechanical removal of exotics, herbicide application, and prescription fire. Dramatic improvements in native plant communities are often observed after such management, yet the wildlife response has not been thoroughly documented. The objective of this study was to determine if avian populations respond to exotic plant management by observing differences in bird assemblages between managed and unmanaged woodlands.



METHODS

Experienced volunteers completed point counts⁷ from 1997 through 2003 throughout FPDDC forest preserves. Monitors recorded all birds seen or heard within a 50 m radius from a pre-determined point for 10 minutes. Volunteers were asked to conduct surveys once per week for six weeks during the breeding season: June through mid-July. Surveys were conducted between sunrise and 9:00 am during good weather conditions (i.e. no precipitation and minimal winds).

Survey points were classified into two categories: managed or unmanaged. Points categorized as managed occurred in habitat that has been actively managed through prescription fire, mechanical removal of non-desirable native and invasive species, herbicide application, or combinations of all three. Unmanaged points occurred in habitat that had not received any management activity and were often dense with buckthorn, honeysuckle, and other non-desirable species.

Data was statistically analyzed to determine differences in species richness and abundance between management categories. Percent change in abundance from unmanaged points to managed points was also calculated for every species that was detected on at least 10 occasions.

RESULTS

From 1997-2003, 1,074 surveys were conducted at 32 different forest preserves; 747 surveys were conducted in managed woodlands, while 327 surveys were conducted at unmanaged sites. Volunteers counted 6,701 individual birds of 81 species.



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Mean number of birds and mean number of species detected per survey differed significantly between management treatments (Table 1). In managed areas 6.5 birds were detected per survey, while 5.7 birds per survey were observed in unmanaged woodlands. The mean number of species detected at managed sites was 4.3 per survey, while only 3.9 species were detected in unmanaged woodlands.

Individual species also differed between management treatments. Thirty-nine species of birds were observed on more than 10 occasions during the entire study, and over two-thirds (27) of those species were found in greater abundance in managed woodlands. Positive changes in abundance were significant for seven species including: eastern bluebird, eastern wood-pewee, scarlet tanager, indigo bunting, white-breasted nuthatch, red-bellied woodpecker, and northern flicker (Table 2). Conversely, six species were more abundant in unmanaged woodlands including: house sparrow, ovenbird, common grackle, wood thrush, red-winged blackbird, and red-eyed vireo.

Bird populations respond to management. Our results indicate that abundance and species richness is greater in woodlands that have undergone management and are maintained as high-quality natural woodlands compared to unmanaged sites dominated by buckthorn, honeysuckle, and aggressive native species.

However, the 6 species that were significantly more abundant in unmanaged woodlands may generate concern among land managers. If these species prefer unmanaged habitat, land managers may potentially be reducing their habitat by removing exotic woody plants. Quick and total elimination of exotic plants could potentially lead to local extirpation of the species using non-desirable plants.⁸

Three of these are house sparrow, common grackle, and red-winged blackbird.

House sparrow – Originating in Europe, this species can be aggressive towards other birds, interrupting breeding of many native species and even causing direct death.^{9,10} Detering house sparrows from using natural areas through management will likely benefit native birds.

Common grackle and red-winged blackbird – Both are Icterids, a family whose members are mostly common and have adapted well to human-created habitats.¹¹ Neither of these species are considered woodland-dependent birds, and they often nest and forage in a variety of habitat.¹² The potential benefits to woodland bird species through management likely outweigh the minimal impacts that may incur to grackles and red-winged blackbirds.

The final three species that were observed more frequently in unmanaged woodlands are conservative and may cause greater concern: ovenbird, wood thrush, and red-eyed vireo.

Ovenbird – Ovenbirds typically inhabit mature, open, deciduous forests with thick leaf litter where they forage and conceal their nests.¹³ Repeated burning reduces this litter and thus ovenbird habitat. Artman et al.¹⁴ observed a decline in ovenbird densities in response to repeated burning. Land managers, however, rely on a frequent burn cycle to prevent exotic plants from re-colonizing after those non-desirable species have been removed, and thus may be adversely impacting ovenbirds.



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Wood thrushes and red-eyed vireos –

Wood thrushes prefer moist deciduous forests and will place nests in dense shrubbery 3 m above ground.¹⁵ Red-eyed vireos similarly occur in deciduous habitats where the understory is well developed and an abundance of large shrub stems are present.^{16,17} In landscapes where established exotic understory species have out-competed the native shrub layer, there are often very few, if any, mature native shrubs present once the exotic species have been removed. Also, a frequent burn cycle must often be prescribed in restored areas to deter the re-establishment of exotic species. This practice, however, also precludes young native shrubs from becoming established. The lack of native understory anecdotally observed in this study and therefore lack of nesting habitat for wood thrushes and red-eyed vireos may prohibit these species from breeding in certain areas.



Woodland cleared of exotic brush has little native understory remaining immediately post-management.

Prior to drawing conclusions regarding the effects of management on population dynamics, it is important to realize that this study focused solely at bird abundance and did not attempt to quantify breeding success, which can be a better measure of population health. If birds are present but cannot nest successfully, the habitat in which they attempt breeding can be classified as a sink. It has been suggested that fragmented landscapes, such as those that dominate northeastern Illinois, may be sink habitat for both ovenbirds and wood thrushes,¹⁸ and these landscapes may be more detrimental than beneficial for these species. Sinks can be caused by various factors, including predation, parasitism, lack of food availability, and others. Schmidt and Whelan² concluded that birds experienced higher nest predation when nesting in exotic species, such as buckthorn and honeysuckle, than in comparable native shrubs. In this study, the lack of a diverse, native shrub layer may hamper certain species from realizing their reproductive potential. Further research is needed to confirm this hypothesis.

MANAGEMENT IMPLICATIONS

Land managers should continue to conduct management in a manner that reduces the abundance of exotic species and increases vegetative biodiversity. While most of the breeding bird species in our study responded to management positively, the potential adverse effects to certain species should not be overlooked. A thorough inventory of all wildlife species inhabiting an area should be recorded prior to management. Managers should be leery of altering habitat if it provides a favorable environment for sustaining a species, especially if that species is regionally uncommon.

Where habitat alteration is needed, managers should be quick to provide suitable alternative habitat for any species that may be adversely impacted through management. Efforts should be made to quickly restore a managed area so that it provides a variety of habitats for a diverse group of wildlife. In this study, a mid-story shrub layer is often slow to naturally return after management, which may be adversely affecting select species. Managers in this situation may consider supplemental planting of native shrubs soon after exotic species are under control.



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Table 1. Mean bird abundance and species abundance (\pm SE) in managed and unmanaged woodlands within between 1997-2003.

	Managed (n = 747)	Unmanaged (n = 327)	P
Birds/survey	6.5 \pm 0.2	5.7 \pm 0.3	0.011
Species/survey	4.3 \pm 0.1	3.9 \pm 0.1	0.011

Table 2. Total number of observations (1997-2003) and percent change in abundance from unmanaged woodlands to managed woodlands by species. Differences in mean birds per survey by species were tested with ANOVA. Significant differences ($P \leq 0.05$) are indicated in bold. Species are listed in order of decreasing change in abundance.

Species	Total Observations		% Change in Abundance	P
	Unmanaged (n = 327)	Managed (n = 747)		
Eastern Bluebird <i>Sialia sialis</i>	0	20	N/A	0.03
Yellow warbler <i>Dendroica petechia</i>	0	11	N/A	0.06
Field sparrow <i>Spizella pusilla</i>	1	15	557	0.10
Warbling vireo <i>Vireo gilvus</i>	2	18	294	0.33
Eastern wood pewee <i>Contopus virens</i>	44	316	215	<0.01
Scarlet tanager <i>Piranga olivacea</i>	14	85	166	<0.01
Rufous-sided towhee <i>Pipilo erythrophthalmus</i>	5	29	154	0.08
Indigo bunting <i>Passerina cyanea</i>	64	330	126	<0.01
Song sparrow <i>Melospiza melodia</i>	15	72	110	0.10
White-breasted nuthatch <i>Sitta carolinensis</i>	43	180	84	<0.01
Common yellowthroat <i>Geothlypis trichas</i>	7	29	81	0.24
Red-bellied woodpecker <i>Melanerpes carolinus</i>	50	205	80	<0.01
Northern flicker <i>Colaptes auratus</i>	35	143	79	0.01
Baltimore oriole <i>Icterus galbula</i>	16	64	75	0.09
American goldfinch <i>Carduelis tristis</i>	23	83	60	0.27



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Table 2 continued.

Species	Total Observations		% Change in Abundance	P
	Unmanaged (n = 327)	Managed (n = 747)		
Gray catbird <i>Dumetella carolinensis</i>	41	137	46	0.07
Mourning dove <i>Zenaida macroura</i>	3	10	46	0.59
House wren <i>Troglodytes aedon</i>	68	210	36	0.10
Brown-headed cowbird <i>Molothrus ater</i>	23	71	35	0.41
Blue-gray gnatcatcher <i>Polioptila caerulea</i>	10	29	27	0.60
Blue jay <i>Cyanocitta cristata</i>	159	439	21	0.15
Great-crested flycatcher <i>Myiarchus crinitus</i>	47	119	11	0.59
Great-horned owl <i>Bubo virginianus</i>	8	20	10	0.86
Downy woodpecker <i>Picoides pubescens</i>	73	180	8	0.61
Hairy woodpecker <i>Picoides villosus</i>	19	45	4	0.91
Black-capped chickadee <i>Poecile atricapillus</i>	184	429	3	0.88
Cedar waxwing <i>Bombycilla cedrorum</i>	16	37	1	0.98
American robin <i>Turdus migratorius</i>	224	508	-1	0.95
Northern cardinal <i>Cardinalis cardinalis</i>	143	324	-2	0.94
Red-eyed vireo <i>Vireo olivaceus</i>	128	228	-28	0.03
Cooper's hawk <i>Accipiter cooperii</i>	4	7	-30	0.73
European starling <i>Sturnus vulgaris</i>	22	35	-43	0.38
American crow <i>Corvus brachyrhynchos</i>	59	80	-68	0.12
Rose-breasted grosbeak <i>Pheucticus ludovicianus</i>	12	16	-71	0.19
Red-winged blackbird <i>Agelaius phoeniceus</i>	107	116	-110	0.01
Wood thrush <i>Hylocichla mustelina</i>	48	41	-167	<0.01
Common grackle <i>Quiscalus quiscula</i>	57	44	-195	<0.01
Ovenbird <i>Seiurus aurocapillus</i>	8	4	-356	0.01
House sparrow <i>Passer domesticus</i>	52	2	-5839	<0.01