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## Breeding Bird Use of and Nesting Success in Exotic Russian Olive in New Mexico

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**ABSTRACT.**—The exotic tree, Russian olive (*Elaeagnus angustifolia*), has invaded riparian zones throughout much of the western United States. Although promoted as a useful species for wildlife because of its abundant edible fruit, evidence for its value to breeding birds remains sparse. We compared relative rates of usage, nest success, and cowbird parasitism of birds breeding in Russian olive versus native tree species at a site where Russian olive is a minor component. Some species, such as the Mourning Dove (*Zenaida macroura*) and Yellow-breasted Chat (*Icteria virens*), preferentially placed their nests in Russian olive. Nest success was similar for nests in Russian olive and native species. During 1997, nests of the Willow Flycatcher (*Empidonax traillii*) were significantly more likely to be parasitized by Brown-headed Cowbirds (*Molothrus ater*) when placed in Russian olive than in native species, although nest success was not

significantly different. Our results may not apply to areas where Russian olive is common.

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The impacts of invasive exotic species on native biota and ecosystems have become a major concern among conservation biologists and land managers. Almost half of the threatened and endangered species in the United States are imperiled by alien species (Wilcove et al. 1998). In the Southwest, anthropogenic alterations of flood regimes and extensive clearing of riparian woodlands have promoted the invasion and proliferation of several exotic woody plants, particularly saltcedar (*Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*). Much is known about saltcedar and its ecological impacts (Lovich and de Gouvenain 1998), but Russian olive remains relatively poorly known.

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Russian olive is an exotic tree-shrub native to Eurasia that has become widely naturalized in riparian areas of the western United States, partly due to its promotion by agricultural extension boards of western states as a useful species for windbreaks, erosion control, and wildlife habitat (Olson and Knopf 1986). Russian olive thrives and reproduces across a much wider range of soil chemistry and moisture conditions than do native cottonwoods (*Populus* spp.) and willows (*Salix* spp.; Shafroth et al. 1995). In addition, it is both shade tolerant and a nitrogen fixer, giving it a competitive edge (Shafroth et al. 1995, Simons and Seastedt 1999). Consequently, Russian olive is slowly replacing native stands along many regulated rivers in the West (Olson and Knopf 1986, Brown 1990, Howe and Knopf 1991).

Evidence for the value of Russian olive to wildlife is sparse and contradictory. The tree produces large crops of edible berries that are eaten by at least some birds and mammals. Along the Columbia River, more Neotropical migrants were found in native than in Russian olive habitats, while short distance migrants were more abundant in Russian olive (Hudson 2000). Russian olive stands support lower densities and species richness of breeding birds than do native riparian species (Knopf and Olsen 1984, Brown 1990). Kennedy and Wilson (1969) found almost no insect pest species on Russian olive in the northern Great Plains, while Hudson (2000) found greater abundances of most arthropod groups in willow-dominated habitats than in those dominated by Russian olive.

In this paper we describe the relative rates of use and nesting success in Russian olive by breeding birds at a site in southern New Mexico where Russian olive is a minor component. Specifically, we tested whether (1) Russian olive was used in proportion to its availability, and (2) whether there was any penalty (or benefit) associated with nesting in Russian olive compared to native species.

#### METHODS

We studied the breeding bird community of the Gila River Valley in Grant County, New Mexico (32° 58' N, 108° 34' W). This broad floodplain consists primarily of privately owned agricultural land and protected areas of the Gila National Forest at elevations from 1350 to 1420 m. The Gila River here is lined

with corridors of riparian woodland of various ages and sizes. These mostly native woodlands include Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), Arizona sycamore (*Platanus wrightii*), box elder (*Acer negundo*), Arizona walnut (*Juglans major*), velvet ash (*Fraxinus velutina*), seepwillow (*Baccharis glutinosa*), and Arizona alder (*Alnus oblongifolia*). Russian olive occurs both as isolated understory trees within riparian patches and in small monotypic stands on the periphery of patches.

We searched for nests of all bird species daily through the breeding seasons (May through August) of 1997–2000 in six study patches ranging in size from 3.2 to 6.1 ha. Nests were monitored every 3–5 days using pole-mounted mirrors or video cameras, or 15× spotting scopes. We considered a nest successful if (1) parent birds were observed feeding  $\geq 1$  fledged conspecific young, (2) parent birds behaved as if dependent young were nearby when the nest was empty (defensive or agitated behavior near nest), or (3) nestlings were in the nest  $\leq 2$  days of the estimated fledge date and we found no evidence of depredation (feathers or nest damage). We considered a nest failed if nest contents disappeared before fledging of young was possible or if eggs were abandoned. After nesting was completed, we recorded tree species and nest height for every nest. Since nest success often increases with nest height (Best and Stauffer 1980), we considered only those nests  $< 8$  m in height, the maximum nest height we recorded in Russian olive, in comparisons of tree use and nest success.

To calculate the relative abundance of Russian olive within our study patches, we established grids of points 33.5 m apart in each of the six study patches, and randomly selected 220 of those points for vegetation sampling. Within an 8-m radius circle around each sample point we counted the total number of woody stems  $> 5$  cm diameter of each woody plant species. For each bird species with  $> 20$  nests per year, we compared the proportions of nests in Russian olive and native species with the relative proportions of the tree species using binomial tests (Sokal and Rohlf 1981). For each bird species with  $> 5$  nests each in Russian olive and native plants, we compared rates of simple nest success and cowbird parasitism using Fisher exact tests. We conducted separate statistical tests for each year to avoid problems of pseudoreplication. We used Rice's consensus test (Rice 1990) to assess the consensus of each of these sets of statistical tests.

#### RESULTS

Russian olive constituted a mean of 3.7% of woody stems  $> 5$  cm diameter in our six focal patches ( $n = 2301$  stems of all species). We found 904 nests  $< 8$  m high of 29 bird species, excluding ground nests. Of these, 11 species placed 61 nests in Russian olive, but we found  $> 20$  nests per year for only five species (Table 1). No nests were found in Rus-

TABLE 1. Number of nests  $\leq 8$  m high in Russian olive and native trees in the Gila River Valley, New Mexico, 1997–1999, for birds with  $\geq 20$  nests in at least one year. Dash indicates  $< 20$  nests were found within a year.

Species	1997		1998		1999		2000	
	Native	Olive	Native	Olive	Native	Olive	Native	Olive
Mourning Dove ( <i>Zenaida macroura</i> )	55	4	50	8	48	3	—	—
Black-chinned Hummingbird ( <i>Archilochus alexandri</i> )	40	0	72	0	39	0	—	—
Southwest Willow Flycatcher ( <i>Empidonax traillii extimus</i> )	53	8	86	8	68	1	44	2
Yellow-breasted Chat ( <i>Icteria virens</i> )	26	3	18	11	35	2	37	0
Blue Grosbeak ( <i>Guiraca caerulea</i> )	—	—	—	—	34	0	27	0

sian olive for the remaining 18 species, which included all primary and secondary cavity nesters. We found  $> 5$  nests in both Russian olive and native trees for just three species: Mourning Dove (*Zenaida macroura*), Willow Flycatcher (*Empidonax traillii*), and Yellow-breasted Chat (*Icteria virens*; Table 1).

During 1998, Mourning Doves and Yellow-breasted Chats nested disproportionately more in Russian olive relative to the abundance of that tree species (14% and 38%; binomial tests, both  $P < 0.01$ ). This pattern was evident over all years: consensus tests indicated significant overuse of Russian olive by doves (consensus test  $P = 0.037$ ) and chats (consensus test  $P = 0.018$ ). Willow Flycatchers nested disproportionately more in Russian olive in both 1997 and 1998 (13% and 9%; binomial tests,  $P < 0.01$  and  $P = 0.025$ , respectively), and over all years (consensus test  $P = 0.021$ ). Russian olive nests were not significantly closer to habitat edges than were nests in native species (mean distance 5.5 versus 6.3 m;  $t = 1.5$ ,  $df = 202$ ,  $P = 0.14$ ).

Mean rates of nest success did not differ significantly between nests placed in Russian olive and nests in native trees for Mourning Doves, Willow Flycatchers, or Yellow-breasted Chats in any one year (Fisher exact tests, all  $P > 0.17$ ), or over all years (consensus tests, all  $P > 0.50$ ). Brown-headed Cowbirds at our site regularly parasitized two species for which we found  $> 5$  nests in Russian olive. Yellow-breasted Chat nests in Russian olive were about as likely to be parasitized as in native plants in all years (Fisher exact tests, all  $P > 0.90$ ). In contrast, during 1997, Willow Flycatcher nests were more likely to be parasitized in Russian olive (40% parasitized) than in natives (9%; Fisher exact test  $P =$

0.018), although this tendency was not apparent over all 4 years (consensus test  $P > 0.50$ ).

## DISCUSSION

Although exotic Russian olive comprised only a minor component of riparian woodlands in the Gila Valley of New Mexico, it was used by over one-third of the bird species that nested below 8 m. Three species nested disproportionately in Russian olive. Two of those, Mourning Doves and Yellow-breasted Chats, also were especially abundant in monotypic stands of Russian olive at two Idaho sites (Knopf and Olsen 1984, Brown 1990). Why some species appear to prefer Russian olive is unclear. Compared to the common native species at our study site, Russian olive has a more spreading, thicket-forming growth pattern, and its branches are armed with spines. The species may be selected because it provides good protective cover for nests. Despite these potential benefits, many breeding birds did not use Russian olive. Black-chinned Hummingbirds never nested in Russian olive during our study, although we were unable to demonstrate statistically any underutilization.

Those birds that nested in Russian olive seemed to incur no penalty for doing so in terms of reduced nest success. However, during one year, Willow Flycatcher nests were significantly more likely to be parasitized by cowbirds when built in Russian olive. Brood parasitism has been identified as a key factor impacting some populations of this critically endangered southwestern subspecies (Harris 1991, Whitfield and Sogge 1999). If Willow Flycatcher nests are more vulnerable to parasitism when placed in Russian olive, then the presence and use of this exotic may negatively

affect flycatcher productivity. This hypothesis should be evaluated at flycatcher breeding sites where Russian olive is a major component of the habitat (e.g., the upper Rio Grande in New Mexico), and where any negative impacts are likely to be exacerbated.

In conclusion, although Russian olive was used as a nesting substrate by a subset of the breeding bird community on the Gila River, its use did not appear to provide any particular advantages or disadvantages over native plants for most bird species. It appeared to be inappropriate for all cavity nesters. Higher rates of nest parasitism on Willow Flycatchers nesting in Russian olive during one year appeared to be offset by reduced rates of nest predation. Although our results from a site where Russian olive is relatively uncommon provide limited justification for eradication of this exotic species, we encourage similar investigations in regions where Russian olive has become a co-dominant species of the local plant community.

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