

Avian Pesticide Exposure on Golf Courses

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Objectives:

1. To determine the extent of pesticide exposure in nestling bluebirds and to determine if these insectivorous songbirds are able to obtain sufficient invertebrate food on golf courses treated with insecticides.

Start Date: 2007

Project Duration: one year

Total Funding: \$27,500

Several studies have illustrated the abundance and diversity of birds that can be found at golf courses, but less is known about nesting success. In addition, the chemicals often employed by golf course managers are known to negatively affect wildlife, including reproductive and behavioral impairments, yet the extent of avian exposure on golf courses remains largely unknown.

Studies indicate that eastern bluebirds can breed successfully in nest boxes installed on golf courses, but there is also evidence that the nestling birds weigh less than same-aged counterparts at suburban sites with no pesticide inputs. Our research objectives were to determine the extent of pesticide exposure in nestling bluebirds and to determine if these insectivorous songbirds are able to obtain sufficient invertebrate food on golf courses treated with insecticides.

Experimental design consisted of monitoring and comparing breeding activity in more than 500 nest boxes at 8 golf courses and 7 non-golf course reference sites. Our reference sites consisted of suburban locales with some level of human activity (e.g. local parks), but which were confirmed to not apply pesticides. Participating golf courses shared their

detailed chemical application logs, allowing us to know specifically which type, where, and when pesticides were applied.

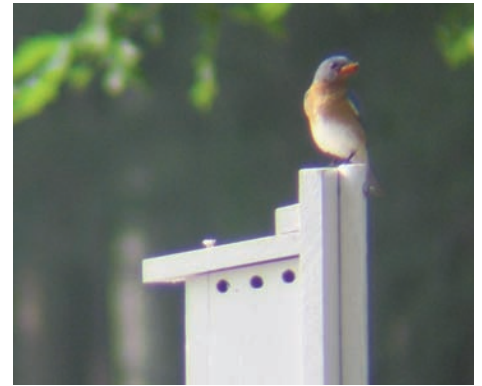
During the 2007 and 2008 breeding seasons, we collected and analyzed 290 blood samples from nestling birds to assess cholinesterase enzyme activities, the standard method for determining exposure to many common insecticides. All nestlings were measured and banded during sampling efforts. We collected more than 450 prey items directly from nests through use of esophageal ligatures and an additional 20 insects were collected from turf areas 24 hours after insecticide application. These 20 insects and 30 insects from nests after pesticide applications were analyzed for pesticide residues.



Physical measurements of nestlings revealed that, as previously reported, golf course chicks weighed less than birds on reference sites of the same developmental age.

Lab analyses found no evidence of enzyme inhibition in golf course nestlings, suggesting they had not been exposed to enough pesticide to detect any direct effects. No pesticide residues were detected in 50 prey items insects. Nestling diet and parental feeding rates were the same at golf courses and reference sites. However, physical measurements of nestlings revealed that, as previously reported, golf course chicks weighed less than birds on reference sites of the same developmental age.

Much of the application of pesti-



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cides occurred after nestlings fledged from nests. Because the nestlings we sampled appear not to have been exposed to pesticides, additional research efforts are underway to track survival of fledgling bluebirds after they leave the nest.

These young, inexperienced birds may be more likely to be exposed to pesticides through ingestion of dead or moribund insects. If these young birds have a low survival rate, it may be that the successful nesting efforts observed for adult birds overestimate the habitat quality of golf courses. Only by measuring condition and survivorship at every stage of the life cycle can we gain confidence that golf courses are not ecological traps.

Summary Points

- Nestling eastern bluebirds are at low risk of pesticide exposure on golf courses.
- Eastern bluebirds are able to forage comparable type and amount of insect prey on golf courses compared to other suburban environments.
- Nestling bluebirds tend to be lower weight than reference birds, potentially affecting post-fledging survivorship.
- Continued research will track survival and pesticide exposure in juvenile birds.
- Additional work is needed to assess pesticide exposure and associated effects in other golf course wildlife and at other stages of the life cycle.



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