Re-introduction of brown-headed nuthatch & eastern bluebird to South Florida pine rocklands, USA

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Introduction

The Eastern bluebird (*Sialia sialis*) inhabits a variety of open forest types, both deciduous and coniferous, in eastern North America. The brown-headed nuthatch (*Sitta pusilla*), a cooperative breeder, is endemic to pine forests in the southeastern United States. Both species remain common and widespread in appropriate habitat and are not included on any regional or national conservation lists. They are listed by the IUCN as species of Least Concern. Although both species require cavities for nesting, their breeding and foraging ecologies differ. The bluebird relies on existing cavities, while the nuthatch is capable of excavation. Bluebirds forage on a variety of ground-dwelling insects and during the winter consume small fruits. The nuthatch's diet is dominated by pine seeds, which it caches, and insects gleaned from the trunk and branches of trees. Both species, along with three other cavity-nesting bird species, were extirpated from Everglades National Park (EVER), Florida, USA following large-scale habitat loss and degradation of the pine rockland (slash pine; *Pinus elliottii* var. *densa*) ecosystem. The re-introduction of these two species was viewed as a test of the progress made in the recovery of this fire-dependent ecosystem from logging and the implementation of a natural fire-management program.

Goals

- Goal 1: Develop and implement translocation strategies for Eastern bluebird and brown-headed nuthatch.
- Goal 2: Monitor reproduction and survival rates in the re-introduced population to evaluate translocation methods and re-introduction success.
- Goal 3: Establish viable breeding populations in EVER with a population size of >200 breeding

Eastern bluebird © Skip Snow

Brown-headed nuthatch © Gary Slater

territories for each species.

Success Indicators

- Indicator 1: Short-term: Released individuals and their offspring breed successfully.
- Indicator 2: Short-term: Population size increases annually.
- Indicator 3: Short-term: Demographic measures (reproduction and survival) in the re-introduced population are similar to a high-quality reference population (i.e., the donor population).
- Indicator 4: Long-term: Populations maintain a growth rate ≥1.0.

Project Summary

Feasibility: A qualitative feasibility assessment indicated that pine-rockland habitat in EVER could support breeding populations of Eastern bluebirds and brown-headed nuthatches and that without re-introduction these species were unlikely to recolonize on their own (Slater, 1997). Vegetation characteristics of the forest in EVER appeared comparable to those where large populations of nuthatches and bluebirds thrived. In addition, snags, which often limit cavity-nesters, were unusually abundant after Hurricane Andrew in 1992. The estimated carrying capacity of EVER forests was ≥200 breeding pairs of each species.

Implementation: We conducted translocations from 1998 - 2001 (Slater, 2001). We captured all nuthatches and most (76%) bluebirds from nearby source populations in Big Cypress National Preserve, approximately 40 km from the re-introduction site; remaining bluebirds were captured from golf courses in Naples, Florida, approximately 140 km away. Translocations of nuthatches, which maintain year-round territories, were conducted from November to February to avoid the peak of breeding activity, ensuring sufficient time to excavate nest cavities. Because they are monomorphic and cooperative breeders, we only conducted translocations when the entire group was captured. Nuthatches were placed in small (1 m x 1 m x 2 m) aviaries and held for 1 - 10 days. In Year 2, we attempted to use large (2 m x 2 m x 2 m) aviaries; however, several nuthatches died and we returned to original methods. For bluebirds, we captured pairs as they established territories (March - April), although we moved a few pair with dependent young (~10 days old) later in the breeding season. Bluebird pairs were placed in large aviaries and held for 1 - 3 weeks, except two pairs that nested and remained in captivity until the young fledged. We released bluebird pairs with nestlings once the young had fledged and were capable of sustained flight.

Aviaries were constructed to be mobile and permit open views, while providing protection from the elements. They contained multiple perches, a nestbox for roosting, and food (mealworms, crickets) and water. Release sites were selected based on the presence of suitable habitat, and upon establishment releases were conducted adjacent to occupied territories.

Pine rockland habitat
© Lauren MacDade

We captured and translocated 53 nuthatches. Six individuals died in the aviary, all within 24 hours, and 5 individuals were released when their condition appeared to deteriorate. Of the 42 released in good condition, 25 (60%) established a breeding territory. We captured, translocated, and released 47 eastern bluebird adults: 17 breeding pairs, 1 single female, and 6 pairs with dependent young. Overall, 31 of 47 (66%) adults established a breeding territory. Five of 18 juveniles were killed inside the aviary by snakes or other predators, presumably crows, that attacked them through the hardware cloth. Only one juvenile released established a territory in the subsequent year.

Post-release monitoring: We met our short-term indicators of success. We found evidence of breeding in each year, with both translocated individuals and locally-produced offspring reproducing successfully. Population size increased in each year of the translocation period, reaching 31 and 38 adults, respectively, for nuthatches and bluebirds. Reproduction and survival estimates were either higher (reproduction) or did not differ (survival) in the re-introduced populations compared to a high-quality reference populations during the translocation period and two-year post-translocation period (Slater, 2003).

We conducted post-translocation monitoring from 2002 - 2003 and 2005 - 2007 for nuthatches and through 2009 for bluebirds. Success, based on population growth rate estimates, following the cessation of translocations was mixed. Following translocations, annual counts of adult nuthatches increased dramatically, reaching a high of 87 adults in 2005, but then declined to 52 adults in the following two years. Reverse-time capture-recapture models found population growth rate estimates were, on average, >1.0, although estimates varied annually (Lloyd *et al.*, 2009). Models indicated that population declines in 2006 - 2007 were due to low survival. We suspect that the effect of two hurricanes in the fall of 2005 may have reduced food availability in subsequent winters by stripping pine trees of their cones. Qualitative monitoring after 2007 indicated that nuthatch population size and distribution increased in subsequent years.

Bluebird populations following translocations increased to 46 adults in 2002, but then declined and varied from 34 to 39 adults until 2009. Population models yielded a population growth rate estimate of 0.92 (95% CI = 0.83 - 1.00), indicating we failed to meet our criteria of success. Monitoring revealed two potential factors stemming population growth. First, bluebird fecundity declined substantially after translocations were discontinued, apparently from high levels of predation, possibly mediated by declining cavity availability. Second, bluebirds, especially juveniles, appeared vulnerable to mortality via vehicle collisions due to their propensity to nest and forage along roadsides. Efforts to identify specific limiting factors in 2008 - 2009 were unsuccessful and we failed to obtain additional funding for further research.

Major difficulties faced

- Successfully capturing the complete pair (bluebirds and nuthatches) or cooperative group (nuthatch).
- Nuthatches mortality in the aviary due to stress inside the aviaries, particularly for those individuals that were captured closer to the breeding season.
- Vulnerability of bluebird nestlings to predation inside the aviary, both from predators that gained entry into the aviary and those external to the aviary.
- Increasing predation rates of bluebird nests after the cessation of translocations.
- Identifying limiting factors hindering population growth of eastern bluebirds in the re-introduced population.

Major lessons learned

- The use of a lure bird to capture bluebirds increased capture success dramatically.
- Translocation success increased as population size increased for nuthatches; in the final two years of translocations, success increased to 73%.
- Most nuthatch groups and bluebird pairs did not maintain pair bonds following release, indicating that future translocations may not need to focus on capturing established breeding pairs.
- In the case of nuthatches, a relatively small number of translocated birds (42) was sufficient to establish a population.
- Long-term monitoring (>10 years) is required to fully evaluate re-introduction success, and long-term funding is required to address unforeseen problems and address causes for why re-introductions fail.

Success of project

Brown-headed Nuthatch:

Highly Successful	Successful	Partially Successful	Failure
√			

Reason(s) for success/failure:

- The development of effective release strategies.

- High rates of reproduction and survival leading to positive population growth rate, acknowledging the population did not reach the estimated carrying capacity during our monitoring period.
- Population resiliency, which allowed the population to recover following a strong decline.
- The nuthatch's ability to excavate its own cavities, particularly in snags of smaller size that are not desirable by other cavity-nesting species.

Eastern bluebird:

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reason(s) for success/failure:

- The development of successful translocation strategies that resulted in a bluebird population that initially grew following translocations; however, the population remained small and did not grow as expected leading us to describe the re-introduction as only partially successful.
- We suspect a combination of factors may be hindering population growth, including cavity availability and road mortality factors.
- The declining cavity and snag availability in years following Hurricane Andrew, perhaps in response to prescribed fires that consume more snags than they create.
- We failed to identify limiting factors in the population that could be addressed through habitat management.

References

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