Survival, Fidelity and Nesting Fates of Translocated Burrowing Owls in Arizona

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Overview

Translocation is a conservation strategy for Burrowing Owls, a declining species that nests in human-altered landscapes. Owls that are expected to be impacted by development activities are captured and released to new environments. Methodologies for translocations have been challenging, and sample sizes typically small.

My goal is to assess the outcomes of a translocation program in Arizona and to evaluate how we can improve the success of these efforts.

Research Objectives:

Evaluate the effects of translocation on:

(1) Survival
(2) Site fidelity
(3) Nesting fates

Background

Wild At Heart (WAH), a non-profit raptor rehabilitation organization, conducts the Burrowing Owl translocations in Arizona with permits from AZ Game and Fish Department. More than 2500 owls have been released into artificial burrows in Arizona since the 1990s.

1. 100-300 owls are captured each year at sites with planned development.
2. Owls are held in groups of 10 owls/aviary for 60+ days until spring (April-May).
3. Owls are taken to new habitat with artificial burrows and are held in soft-release cages and fed mice for 30d before release.
4. Release cages are removed. Expansion burrows opened. Owls are fed for 1wk.

Methods

Survival & Site Fidelity - Monitored owls 1-3x/wk via VHF radio telemetry for 56 wks in 2017 and 2018.
Nesting Fates - Nests were also monitored 1-3x/wk.
- Nest initiation dates were determined by camera probing
- Productivity (#fledglings/nest) was estimated by conducting 3 standardized fledge counts at 35 d of age.

Statistical Analysis:
Survival & Site Fidelity- Developed 2 Burnham joint live encounter & dead recovery model sets in Program MARK. Model Set 1 evaluated the influence of sex, site, translocation on survival and fidelity on survival and fidelity. Model Set 2 evaluated the influence of translocation techniques (# days in captivity, # males/release group, release date).
Nesting- Nest survival models in Program MARK were used to evaluated the influence of site and translocation on daily nest survival (DNS). The average number of days from nest initiation to fledge age is 69 days, thus, cumulative nest survival was calculated as DNS^{69}.

Non-translocated	Translocated
n= 42 (21 in 2017; 21 in 2018)	n= 43 (21 in 2017; 22 in 2018)

Figure 1. Radio transmitters were used to track 85 translocated and non-translocated owls in 2017 and 2018.

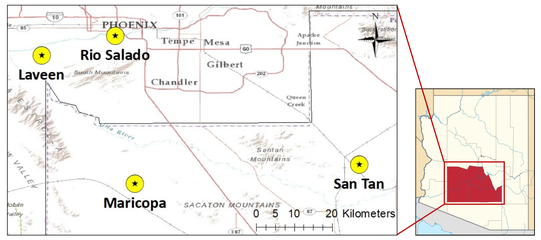
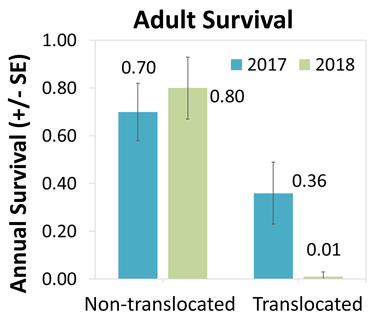


Figure 2. Four release sites were evaluated in Maricopa and Pinal counties, AZ from 2017 to 2019.

Figure 3. Left - VHF radio telemetry used to track owls. Top right - Camera probes were used to help determine nest initiation and nesting status. Bottom - An adult owl fitted with a backpack-mounted transmitter.

Results

Survival and Site Fidelity- Survival (S) and fidelity (F) were lower for translocated owls compared to non-translocated owls (Figure 4, 5). S and F were particularly low in 2018 for translocated owls (estimated as almost 0%). S and F were negatively correlated with the # of males in release groups (Figure 6).



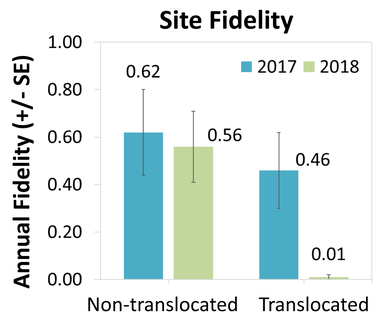


Table 1. Top 5 models based on AIC_C for analysis examining survival and fidelity of translocated and non-translocated owls.

Model	K[a]	ΔAICc	ω[b]
Year + Translocation	10	0.00	1.00
Translocation	6	19.01	0.00
Sex + Translocation	10	24.58	0.00
Null model	4	36.73	0.00
Site	10	37.46	0.00

Table 2. Top 5 models based on AIC_C for analysis examining survival and fidelity of translocated owls.

Model	K[a]	ΔAICc	ω[b]
#Males/Group	6	0.00	0.83
Year	6	4.34	0.09
Sex + #Males/Group	10	4.86	0.07
Site	10	23.35	0.00
Captivity duration	6	24.37	0.00

[a]No. of parameters, [b]ω = AIC_C weight

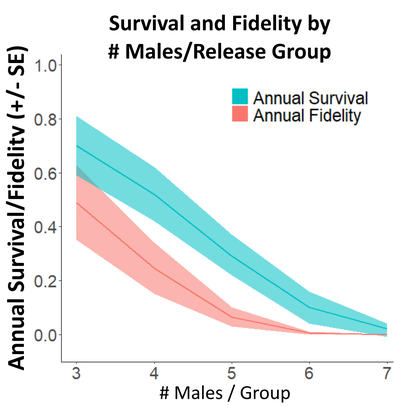
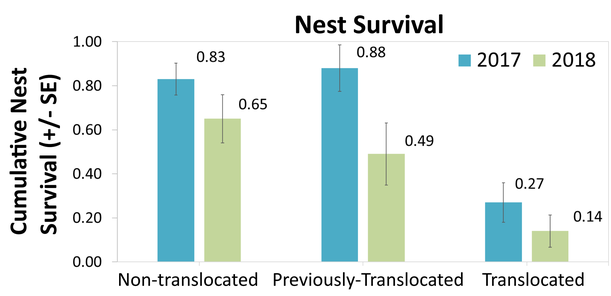


Figure 4. (Top Left) Estimated annual survival of translocated and non-translocated owls.
Figure 5. (Top Right) Estimated annual fidelity of translocated and non-translocated owls.
Figure 6. (Bottom) Annual survival and fidelity of translocated owls by the # males in release groups.

Nesting Fates– We monitored 129 nests of non-translocated owls (n=62), previously-translocated owls (n=26) and translocated owls (n=41). Nest survival and productivity were lower for translocated owls but were similar for non- and previously-translocated owls (Figure 7, 8). On average, nest initiation was on 20 Apr (range: 20 Mar - 20 Jun).



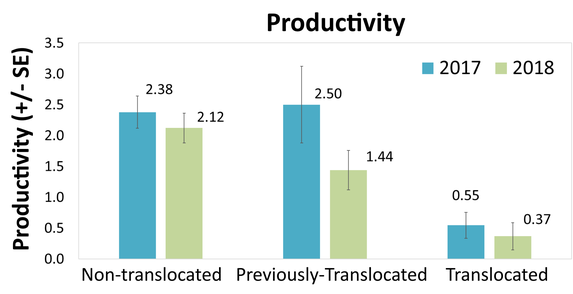


Table 4. Top 5 models based on AIC_C for analysis examining nest survival.

Model	K[a]	ΔAIC$_C$	ω[b]
Year + Translocation	6	0.00	0.61
Translocation	3	0.92	0.39
Year	2	24.51	0.00
Date	2	25.05	0.00
Nest Age	2	26.39	0.00

[a]No. of parameters, [b]ω = AIC_C weight

Figure 7. (Top) Estimated cumulative nest survival of non-translocated, previously-translocated, and translocated owls.
Figure 8. (Bottom) Estimated productivity (fledglings/nest) of non-translocated, previously-translocated, and translocated owls.

Discussion

Translocation techniques such as holding and releasing multiple males in groups poses challenges for the owls. Male owls are territorial and confining them together leads to conflict. In 2018, owls were released in groups that included 5, 6, and 7 males/group, which explains the poor outcomes that year.

Releasing owls after the breeding season starts makes for an even more demanding transition period since the owls have reduced time to establish territories at sites that may already be saturated with owls (see Figure 9).

Owls that survive the 1st year of translocation thereafter successfully join the breeding population. The goal now is to maximize survival and fidelity of relocated owls following release.

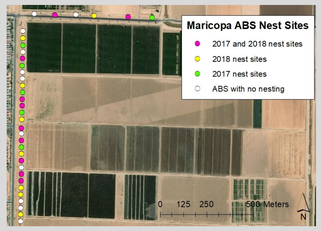


Figure 9. Nest burrow locations at the Artificial Burrow Systems (ABS) at the Maricopa release site.

Management Recommendations

(1) Hold/release owls individually or as pairs.
(2) Release timing should be earlier as to avoid releasing owls during the breeding season.
(3) High quality habitat to be secured to ensure the long-term sustainability of the program.

Figure 6. Proposed ecologically-based translocation timing.

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