Summary Report 2020
Western Bluebird Recovery in the Cowichan Valley, BC

Prepared by:

Gary L. Slater
Karla Kelly

For:
Jacquie Taylor
British Columbia Conservation Foundation

Submitted: 30 September 2020

INTRODUCTION

Since 2007, numerous partners in the United States and Canada have been working to reestablish a breeding population of Western bluebirds (*Sialia mexicana*) via reintroduction to areas of their historic range on San Juan Island, WA and Vancouver Island, BC. Western bluebirds were considered common on the mainland and the San Juan and Gulf islands in western Washington and southwest British Columbia during the first half of the twentieth century, but were extirpated from the mainland by the 1970s, from the San Juan Islands by the 1960s, and from Vancouver Island by the mid-1990s (Altman 2011). Although habitat loss and degradation of their primary habitat, oak-prairie, played an important role in the decline and regional extirpations of Western bluebirds, the ultimate factor was likely the loss of a particular habitat element - cavities for nesting.

Reintroductions were initiated because natural recolonization in the region seemed unlikely. The closest donor population, which lies in south Puget Sound, WA, was >150 km away over mostly unsuitable habitat (water and urban/residential). Qualitative assessments indicated there was enough habitat on San Juan and Vancouver Island and adjacent smaller islands to support a viable population of Western bluebirds. There had also been a considerable amount of oak-prairie habitat conservation implemented through traditional strategies of land protection, habitat management, and education and outreach. The use of nest boxes as a management tool was considered key to successful establishment. Indeed, nest box programs to replace the loss of cavities in snags had been used successfully to restore bluebird populations in many areas of North America, including in south Puget Sound. Local partners worked to establish nest boxes on private land in areas with bluebird habitat prior to, and during, the reintroduction efforts.

Annual releases of Western bluebirds from 2007 to 2011 and 2012 to 2016 established small populations on San Juan Island and Vancouver Island, respectively (Slater and Altman 2012, Slater 2016). Reintroduction efforts at both sites met initial reintroduction goals: 1) released individuals and their offspring bred successfully and reestablished migratory pathways between wintering grounds and the reintroduction site; and 2) population size increased annually. Moreover, comparative analysis following translocations on San Juan Island indicated that fecundity and survival estimates in the reintroduced population did not differ significantly from previously published estimates from other populations in the Pacific Northwest (Slater and Altman 2012).

However, upon cessation of translocations, both reintroduced populations declined precipitously. On San Juan Island, the decline coincided with random environmental factors (El Nino induced cold and wet springs), which impacted reproduction and survival rates and led to negative population growth, rather than remnant deterministic factors that previously caused the species to disappear from the region (Slater 2013). In both reintroduced populations, nesting bluebird pairs experienced increasing rates of nest failure that also included mortality of adult

females, most likely due to the fact that these populations were established in areas with substantial human development and associated mesopredators (raccoon, cats, house sparrow) (Slater 2016). The cause of population decline on Vancouver Island is less clear, as reproduction rates have been relatively high following management actions to deter predators at nest boxes. The most likely explanation is that the population size is too small to overcome those effects associated with small populations, including allee effects.

Emergency translocations on San Juan Island from 2014 to 2018 and management actions to deter nest predation boosted the population back to its original level (Slater 2018) and the population has remained stable for the last two years (Slater and Kelly 2020). Emergency translocations were planned to begin in 2020 on Vancouver Island, but restrictions on travel due to Covid-19 caused those to be cancelled.

In this report, we summarize results from demographic monitoring that occurred in 2020 in the reintroduced population in the Cowichan Valley.

METHODS

Demographic monitoring in reintroduced and donor populations

The Cowichan Valley (48° 47' N, 123° 41' W), near Duncan, is where fieldwork was conducted. Over 200 nest boxes have been placed in open habitats on residential and agricultural lands that appear suitable for bluebirds. Fieldwork was coordinated and conducted by Jacquie Taylor and Brielle Reidlinger with British Columbia Conservation with assistance from volunteers associated with the Cowichan Valley Naturalist's Society.

Population size. – We determined population size by counting uniquely-identified territorial and non-territorial adults through a combination of systematic and targeted playback surveys: on territories previously occupied by bluebirds, in unoccupied but apparently suitable habitat, and where bluebird sightings were reported by private landowners. Most nest boxes were placed on private lands. In general, we tried to survey all apparently suitable habitat that could be observed from roads or walked following permission of landowners, acknowledging that some private lands were not surveyed due to their inaccessibility. We consider our measure of adult population size an index rather than a census. While we believe few individuals escaped detection, this index should be viewed as a minimum estimate of population size.

Reproduction. – Upon the location of a breeding territory, we identified color-marked individuals, searched for evidence of breeding behavior (e.g., mate feeding, nest-building), and checked nest boxes. Territories were visited about once a week until egg-laying was initiated; thereafter, nest checks were more frequent, particularly near transition dates so nestling age could be better estimated. We estimated clutch size when two consecutive counts yielded the same number of eggs. Nestlings were banded at 10 to 16 days old. In most cases, we provided supplemental food (mealworms) to birds on established breeding territories during periods of cool (< 16° C), windy, and rainy weather, conditions often associated with nest failure (Herlugson

1980), and after eggs hatched until approximately 2- weeks post-fledging. Supplemental feeding was conducted to increase population growth rate via improved fecundity and survival rates.

We considered a nest successful if it fledged ≥ one nestling. If eggs or young disappeared before the anticipated time of fledging (< 18 days old), we assumed the nest failed and we searched the immediate vicinity for clues to the cause of nest failure. We measured productivity as the mean (± S.D.) number of young fledged per nest. Where possible, we also report number of young fledged per successful nest.

Survival. - Throughout the project we have attached colored leg bands to both translocated individuals and nestlings and unbanded adults in the reintroduced population to estimate annual survival measures. During the breeding season, we record all resights of color-banded birds during the period from 15 April – 15 July with the goal of obtaining two 100% confirmation of each individual.

We calculated annual return rates by site, age, and sex by calculating the number of individuals alive in breeding season *t* +1 divided by the number of individuals alive in breeding season *t*. This simple estimate does not consider recapture probability (*p*; i.e., the probability of resighting an individual assuming it is present). Previous analyses using Program MARK on San Juan Island indicated that recapture probability was very high (nearly 100%) indicating return rates closely follow apparent survival rates (Slater 2012, Slater 2013).

RESULTS

Demographic monitoring

Population Size - In 2020, the size of the reintroduced population in the Cowichan Valley was six adult Western Bluebirds, down from nine in 2019 and 28 in 2016, the last year of translocations (Fig. 1). The decline between 2019 and 2020 was not as strong as the previous years. The population is slightly male sex-biased with 4 males and 2 females. One of the adult males may have dispersed from JBLM, where it originally fledged in 2017. This individual has never been reported on a territory as an adult prior to this year. Capturing this bird should be a priority as a better explanation is that a previously banded bird was recorded inaccurately. While the Cowichan Valley population declined, the overall regional population increased due to an increase in the San Juan Island reintroduced population (Fig. 2).

As in previous years, we did have reports of bluebirds from areas away from the population center in the Cowichan valley. Just prior to the breeding season (late – March), a group of four Western bluebirds was detected near Courtney, BC, about 150 km north of Duncan. At least two of these individuals, a male and female, were banded and presumably from the Cowichan population. Neither individual was resighted during the breeding season. A pair of bluebirds was also detected on 19 May in Victoria but never resighted.

Reproduction - We monitored breeding activity on two territories, each of which attempted 2 broods. Two nests (50%) were successful and eight nestlings fledged (Table 1). Mean (± S.D.) productivity (young/nest) was 2.0 (± 2.3). Reproduction measures were slightly

lower than in previous years. However, reproduction measures are generally similar to those found on San Juan Island and JBLM.

Survival - We calculated return rates for adults and juveniles in the Cowichan Valley (Table2). Of the six banded adults observed in 2019, three returned in 2020, yielding an adult return rate of 50%. For juvenile survival, three of 15 (20%) juveniles banded in 2019 returned as adults in 2020, with males at 40% and females at 11%.

DISCUSSION

The continued decline in the population size of adult Western bluebirds in the Cowichan Valley, BC, following the cessation of translocations in 2016 remains a significant cause of concern. There is a strong need for emergency translocations on Vancouver Island as the population is at risk of re-extirpation. Unfortunately, the planned translocations in 2020 were cancelled due to logistical issues associated with Covid-19, including the closing of the border with the United States, which is where the donor population occurs. On a positive note, the augmentation effort that occurred on San Juan Island following its decline appears to have been very effective. The population size returned to its original high and has remained stable for the last two years without additional augmentation.

With such small sample sizes it is hard to evaluate the demographic rates in 2020. In general reproduction appears similar to previous years. In a more extensive analysis using all data from 2012 to 2019, bluebird reproduction did not differ between the reintroduced populations and the donor population (i.e., high-quality reference population (Slater 2020). Return rates continue to be the biggest concern, especially for females. The primary explanation for the decline in population size has been generally low return rates for both adults and juveniles, as reproduction measures appear relatively robust. It remains unclear if this is due to mortality at a specific stage (e.g., nesting or migration) or if this is simply an Allee effect where population size is too small for individuals to locate each other.

Although the population has decreased in size, we did observe bluebirds in other areas away from the monitored population, including a pair in Victoria. In previous years, bluebirds have been seen in the Greater Victoria area, where they formerly occurred as early as 1995. Broadening the population distribution may be one of the best strategies to counteract an Allee effect. By increasing the number of occupied sites, there is greater probability of dispersers, especially females, to locate breeding partners. If future translocations are considered, identifying new sites for releases should be a priority.

Management recommendations

- Conduct emergency management translocations in the Cowichan Valley. Emergency translocation on San Juan Island increased the population size quickly at this site, especially with new methods that have success rates near 80% (i.e., moving family groups). This action will be critical to ensure the current population is not re-extirpated.

- Continue to protect nest boxes from predators and competitors, both mammalian and avian. To date this has been very successful in the Cowichan Valley and San Juan Island as nesting success has, on average, been over 70% the last several years.

- Use infra-red/motion sensor cameras to identify nest predators at nest boxes. With more knowledge about the types of predators, we may be able to better target nest box management that results in higher nest success. The added value in doing this is that it also could identify the situations where adult females are being killed at nest sites.

- Continue to engage with other local partners on Vancouver Island. Efforts to broaden the population through translocations or creating safe nestbox trails will be critical to long-term population persistence. Broadening the population distribution may be one of the best strategies to counteract a potential Allee effect. Creating bluebird trails in areas where bluebirds are regularly seen during the non-breeding season encourage dispersal into these areas (e.g., Mechosin, Whidbey Island).

LITERATURE CITED

Altman, B. 2011. Historical and Current Distribution and Populations of Bird Species in Prairie-Oak Habitats in the Pacific Northwest. Northwest Science 85:194-222.

Bocetti, C. I. 1994. Techniques for prolonged confinement and transport of small insectivorous passerines. Journal of Field Ornithology 65:232-236.

Burnham, K. P., and D. R. Anderson. 1998. Model selection and inference: a practical information-theoretic approach. Springer-Verlag, New York.

Griffith, B., J. M. Scott, J. W. Carpenter, and C. Reed. 1989. Translocation as a species conservation tool: status and strategy. Science 245:411-480.

Herlugson, C. J. 1980. Biology of sympatric populations of Western and Eastern bluebirds. Ph.D. Dissertation, Washington State University, Pullman, WA.

Keyser, A. J., M. T. Keyser, and D. E. L. Promislow. 2004. Life-history variation and demography in Western bluebirds (*Sialia mexicana*) in Oregon. The Auk 121:118-133.

Slater, G.L. and B. Altman. 2012. Avian restoration in the prairie-oak ecosystem: a reintroduction case study of Western bluebirds to San Juan Island, Washington. Northwest Science 85:223-232.

Slater, G.L. and K. Kelly. 2020. Summary Report 2020 Western Bluebird Recovery in the Pacific Northwest. Report to British Columbia Conservation Fund, Ecostudies Institute, WA.

Slater, G. L. 2001. Avian Restoration In Everglades National Park, Phase II: Translocation methodology and demographic monitoring (1997-2001). Final Report to National Park Service, Ecostudies Institute, Mount Vernon,WA.

Slater, G.L. 2012. Reintroduction of Western Bluebirds to San Juan Island (2007-2011): translocation methodology and evaluating success. Report for American Bird Conservancy. Ecostudies Institute, Mount Vernon.

Slater, G.L. 2013. Evaluating restoration progress during the two-year post-translocation period (2012-2013). Report for American Bird Conservancy. Ecostudies Institute, Mount Vernon.

Slater, G.L. 2016. Western bluebird recovery in the Pacific Northwest: Summary Report 2016. Report for GOERT Society, San Juan Preservation Trust, and Joint Base-Lewis McChord Military Base. Center for Natural Lands Management, Olympia.

Slater, G.L. 2020. Western bluebird recovery in the Pacific Northwest, a comparative demographic analysis to evaluate retintroduction success. Report to U.S. Fish and Wildlife Service State Wildlife Grant. Center for Natural Lands Management, Olympia.

White, G. C. and K. P. Burnham. 1999. Program MARK: survival estimation from populations of marked animals. Bird Study 46:120-139.

Table 1. Comparison of reproduction measures (S.D.) in the two reintroduced Western bluebird populations in the Cowichan Valley, BC, (COW) and San Juan Island, WA (SJI) and a high quality reference population on Joint Base Lewis McChord Military Base (JBLM) during the period from 2013 to 2020.

	2013			2014			2015			2016		
	Reintro		Donor	Reintro		Donor	Reintro		Donor	Reintro		Donor
	COW	SJI	JBLM	COW	SJI	JBLM	COW	SJI	JBLM	COW	SJI	JBLM
No. Nests	7	10	48	12	4	52	18	5	56	18	4	83
No. Successful Nests	5	6	23	8	3	30	11	4	40	15	2	60
Traditional Nest Success (%)	71%	60%	48%	67%	75%	58%	61%	80%	71%	83%	50%	72%
No. Young/Nest ± SD	3.1 ± 2.6	2.4 ± 2.5	2.0 ± 2.3	2.8 ± 2.3	2.8 ± 1.9	2.4 ± 2.3	2.9 ± 2.6	3.2 ±2.6	3.1 ± 2.4	3.8 ± 2.0	2.6 ± 3.2	3.2 ± 2.2
No. Young/Successful Nest ± SD	4.4 ± 1.8	4.0 ± 1.8	4.3 ± 1.3	4.1 ± 1.5	3.7 ± 0.6	4.1 ± 1.4	4.7 ± 1.4	4.8 ± 1.0	4.3 ± 1.6	4.6 ± 1.1	5.5 ± 0.7	4.4 ± 1.1

	2017			2018			2019			2020		
	Reintro		Donor	Reintro		Donor	Reintro		Donor	Reintro		Donor
	COW	SJI	JBLM	COW	SJI	JBLM	COW	SJI	JBLM	COW	SJI	JBLM
No. Nests	9	13	103	9	22	106	5	25	138	4	18	36
No. Successful Nests	8	6	51	9	15	67	3	17	74	2	13	25
Traditional Nest Success (%)	89%	46%	50%	100%	68%	63%	60%	68%	54%	50%	72%	69%
No. Young/Nest ± SD	3.7 ± 1.9	2.2 ± 2.7	1.7 ± 2.1	4.7 ± 1.2	3.3 ± 2.5	2.5 ± 2.2	2.4 ± 2.3	3.3 ± 2.7	2.2 ± 2.3	2.0 ± 2.3	4.0 ± 2.4	3.0 ± 2.4
No. Young/Successful Nest ± SD	4.1 ± 1.4	4.8 ± 1.6	3.6 ± 1.5	4.7 ± 1.2	4.9 ± 1.2	4.0 ± 1.2	4.0 ± 1.0	4.9 ± 1.6	4.1 ± 1.6	4.0 ± 0.0	5.2 ± 0.8	4.5 ± 1.3

Table 2. Return rates in the reintroduced Western Bluebird population in the Cowichan Valley on Vancouver Island, BC from 2014 to 2020.

		Number of Individuals Alive		
		Time = *t*	Time = *t +1*	Return Rate
2014-2015	Total adults	21	11	0.52
	Adult males	12	7	0.58
	Adult females	9	4	0.44
	Total juveniles	33	9	0.27
	Juvenile males	13	4	0.31
	Juvenile females	13	5	0.38
2015-2016	Total adults	29	11	0.38
	Adult males	17	9	0.53
	Adult females	12	2	0.17
	Total juveniles	52	12	0.23
	Juvenile males	26	6	0.23
	Juvenile females	26	4	0.15
2016-2017	Total adults	28	8	0.29
	Adult males	17	6	0.35
	Adult females	10	2	0.20
	Total juveniles	69	7	0.10
	Juvenile males	35	3	0.09
	Juvenile females	36	4	0.11
2017-2018	Total adults	15	4	0.27
	Adult males	8	2	0.25
	Adult females	6	2	0.33
	Total juveniles	34	7	0.21
	Juvenile males	6	2	0.33
	Juvenile females	17	5	0.29
2018-2019	Total adults	14	1	0.07
	Adult males	6	1	0.17
	Adult females	8	0	0.00
	Total juveniles	42	5	0.12
	Juvenile males	23	3	0.13
	Juvenile females	16	2	0.13
2019-2020	Total adults	6	3	0.50
	Adult males	4	2	0.50
	Adult females	2	1	0.50
	Total juveniles	15	3	0.20
	Juvenile males	5	2	0.40
	Juvenile females	9	1	0.11
2014-2020	Total adults	113	38	0.34
	Adult males	64	27	0.42
	Adult females	47	11	0.23
	Total juveniles	245	43	0.18
	Juvenile males	108	20	0.19
	Juvenile females	117	21	0.18

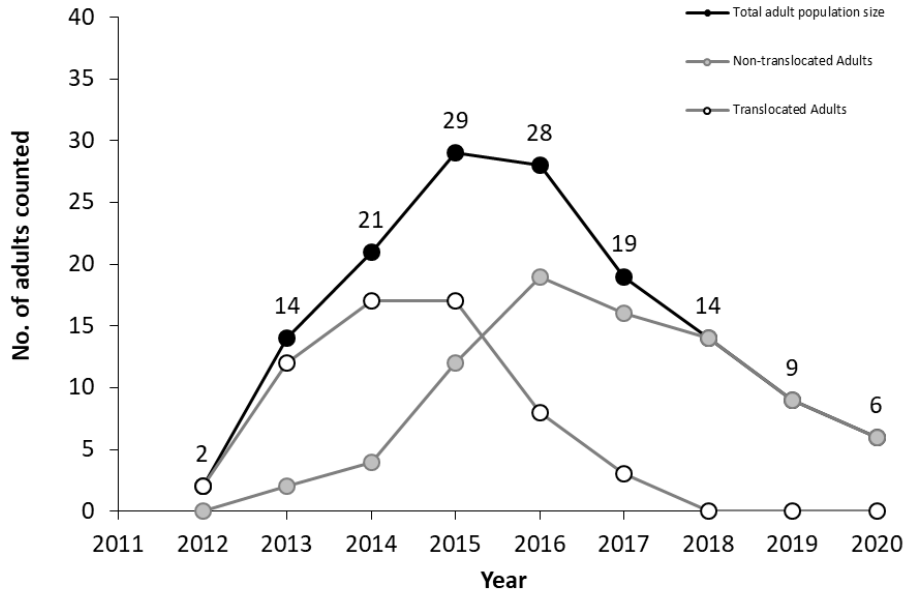

Figure 1. Adult population size of Western bluebirds on Vancouver Island, BC during the period from 2011 to 2020.

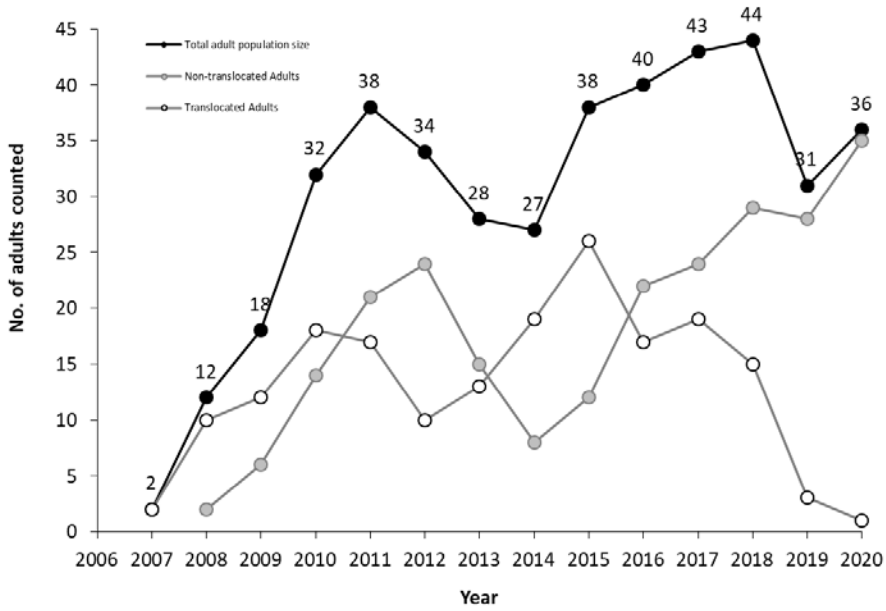

Figure 2. Combined adult population size of Western bluebirds in two reintroduced populations in the Pacific Northwest during the period from 2006 to 2020.