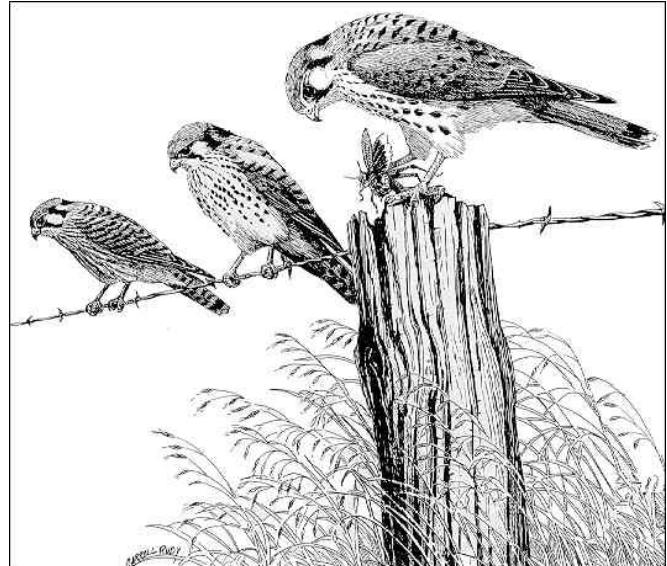


# Decline of American Kestrel (*Falco sparverius*) populations at the Ridgefield National Wildlife Refuge mirrors national trends

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## ABSTRACT

Declines in raptor populations have been well documented based on several measures. These collectively indicate long-term declines of American Kestrel (*Falco sparverius*) populations in numerous regions of North America. We report data from nine years of nestbox monitoring at the Ridgefield National Wildlife Refuge (Clark County) in southwest Washington, USA. American Kestrels occupied boxes 25 times while European Starlings attempted to use boxes 29 times over this period. Of the 25 nesting attempts by American Kestrels 18 were successful (67.2 %) over the nine year period. Kestrels laid 4.6 ±0.6 eggs per box. American Kestrel populations at the Ridgefield National Wildlife Refuge have declined steadily since 2005 as measured by nestbox occupation and productivity. Our limited data suggests that one reason American Kestrels are declining on the refuge is due to the increase in competition for nesting cavities by European Starlings (*Sturnus vulgaris*).



## INTRODUCTION

Declines in raptor populations have been well documented based on several measures (Goodrich *et al.* 2012, Bystrak *et al.* 2012). Data from the US Geological Survey's Breeding Bird Survey, National Audubon Society's Christmas Bird Count, nestbox monitoring programs (Smallwood *et al.* 2009), and Raptor Population Index (migration counts) (Hoffman and Smith 2003), collectively indicate long-term declines of American Kestrel populations in numerous regions of North America (Figure 1). These declines have been noted in western North America including the Pacific Northwest region.

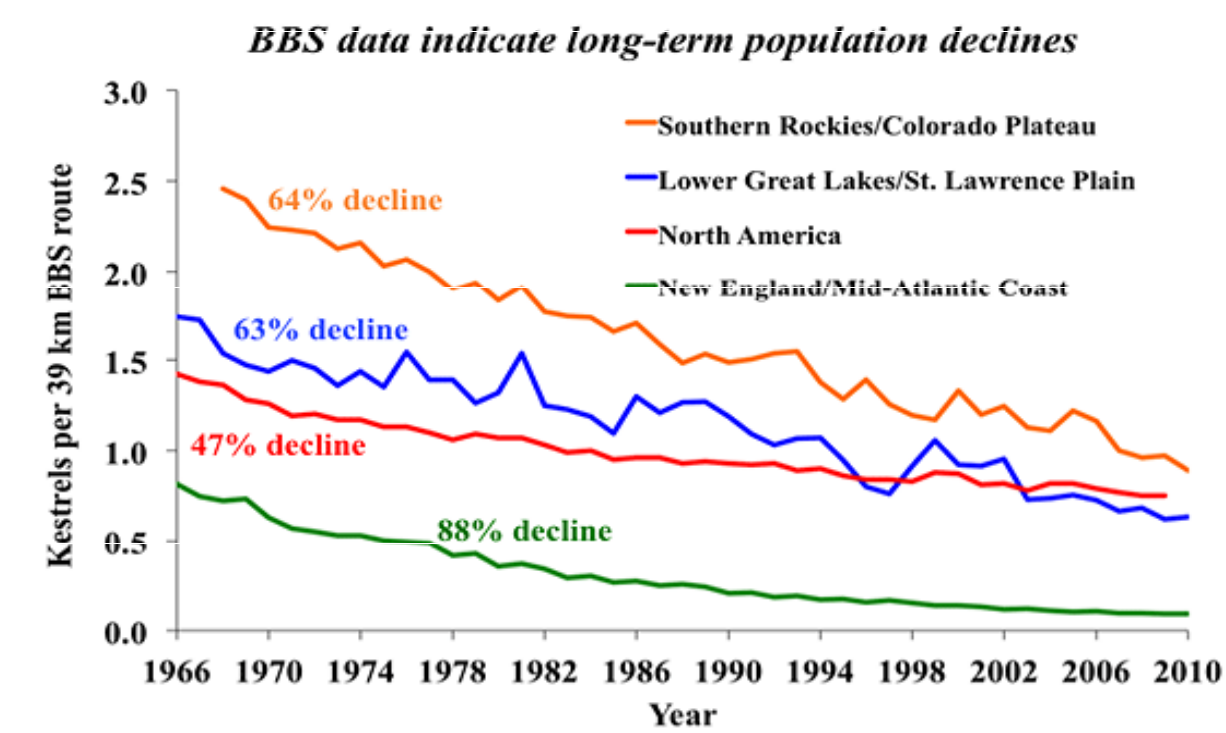


Figure 1. American Kestrel population declines as recorded from USGS banding data reported. (<http://kestrel.peregrinefund.org/docs/pdf/American-Kestrel-Partnership-intro.pdf>)

The American Kestrel is the smallest of the North American falcons; they are one of the most commonly recorded raptors. They range from northern Canada all the way to Tierra del Fuego in South America. They are secondary cavity nesters in that they make their nests within hollowed out cavities created by other birds or mammals they will readily use nest boxes due to lack of available cavities. Nestbox programs have been used as a management tool for the study of kestrels and also in an effort to increase population sizes (Katzner *et al.* 2005).

The literature suggests several possible reasons for raptor population declines and American Kestrel declines in particular: habitat loss and fragmentation, herbicide and pesticide use, disease (including West Nile virus) and in the case of kestrels competition for nest cavities and predation by Cooper's Hawk's (*Accipiter cooperii*) (Smallwood *et al.* 2009). Each of these factors may independently contribute some effect on overall population declines.

Here we report data from 9 years of nestbox monitoring at the Ridgefield National Wildlife Refuge (Clark County) in southwest Washington, USA.

## STUDY SITE

Our study was conducted at the Ridgefield National Wildlife Refuge located in Ridgefield, Washington. The Ridgefield NWR is an area of marshes, wetlands, grasslands and riparian corridors as well as forests of Douglas fir and Oregon white oak that total 2,084 hectares, with the elevation ranging between 3 and 30m (Figure 2)(CCP 2010). Ridgefield NWR is made up of five units: the River "S", the Carty, Bachelor Island, Roth, and Ridgeport Dairy. The purpose of the refuge is to provide habitat for wintering waterfowl, except for the Carty and Roth units as they are managed as a natural floodplain. For this study nest boxes were set up in four of the five units of Ridgefield; River "S", Bachelor Island, Roth, and Ridgeport Dairy.

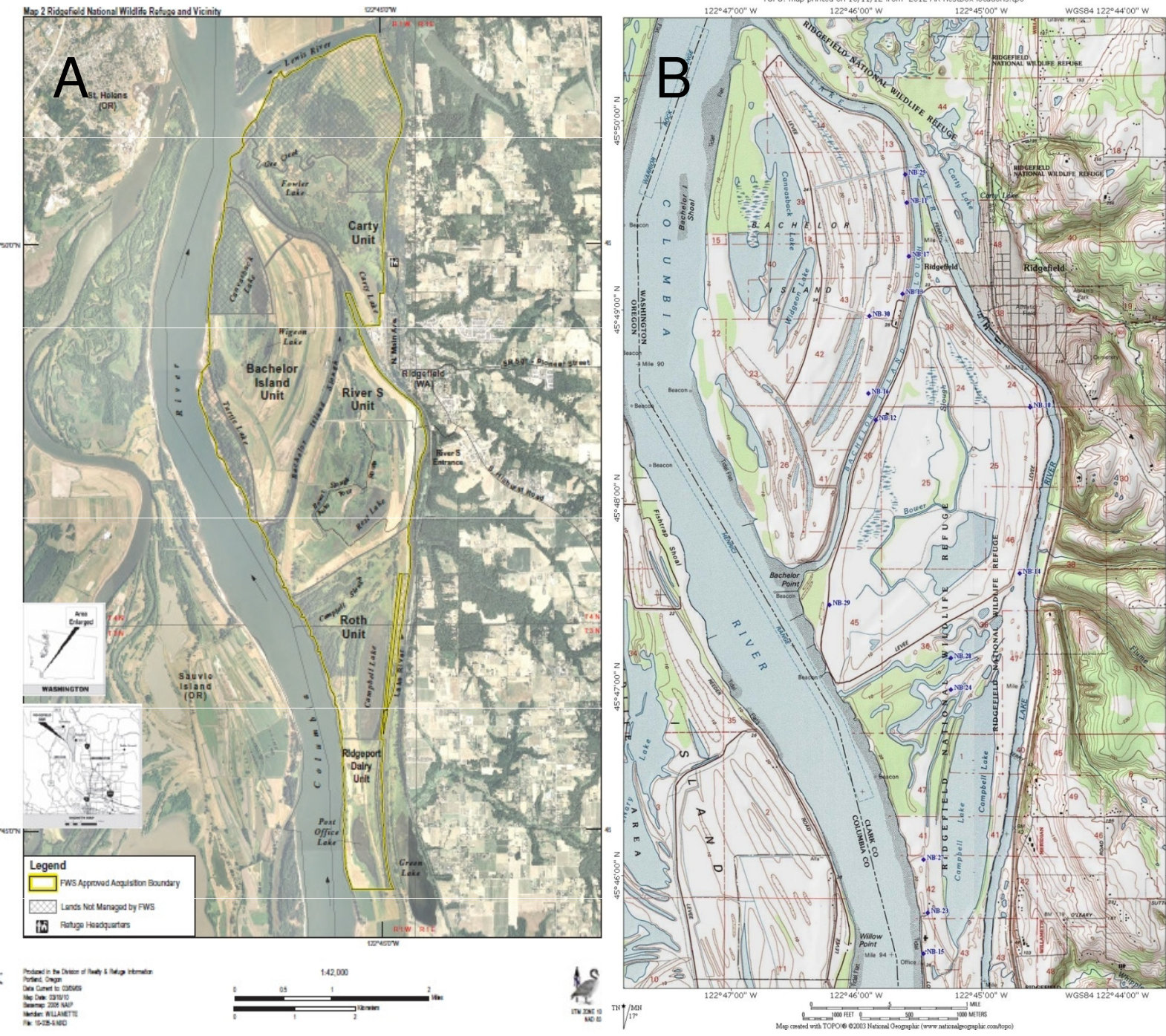


Figure 2. Aerial map(A) of the Ridgefield National Wildlife Refuge (WA) with units identified and 2012 American Kestrel nestbox locations (B) identified.

## RESULTS

American Kestrels are found year round both on the refuge and in the surrounding area. During the nine years of study nest boxes were available for use 96 times. American Kestrels occupied boxes 25 times while European Starlings attempted to use boxes 29 times (Table 1). American Kestrel production was highest in 2005 when 4 pairs fledged 19 chicks, followed closely by 2007 when 4 pairs fledged 18 chicks (Figure 3). Production was lowest in 2004 and 2011 when no chicks were fledged. Two other native species used nestboxes successfully Purple Martins (*Progne subis*) and Tree Swallows (*Tachycineta bicolor*). American Kestrels had a total mean percent occupation of 29.1±17.3 while European Starlings had a 27.8 ± 18.5 total mean percent occupation over the nine years of the study, however, year to year occupation varied greatly.

Table 1. Occupation data and American Kestrel (*Falco sparverius*) productivity at the Ridgefield National Wildlife Refuge (WA) from 2004-2012.

Year	Number of Boxes	Number Occupied by Kestrels	Number Occupied by Starlings	Number Occupied by Other	American Kestrel Eggs	American Kestrel Chicks	American Kestrel Fledged	Pairs Successful in fledging
2004	7	2	2	0	9	5	0	0
2005	7	4	1	0	19	19	19	4
2006	9	4	1	0	17	6	6	3
2007	11	5	1	1	25	23	18	4
2008	11	3	1	0	15	15	13	3
2009	11	2	6	4	6	5	2	1
2010	11	3	3	1	15	8	8	2
2011	14	1	7	1	5	0	0	0
2012	15	1	7	2	5	4	3	1
Total	96	25	29	9	116	85	69	18

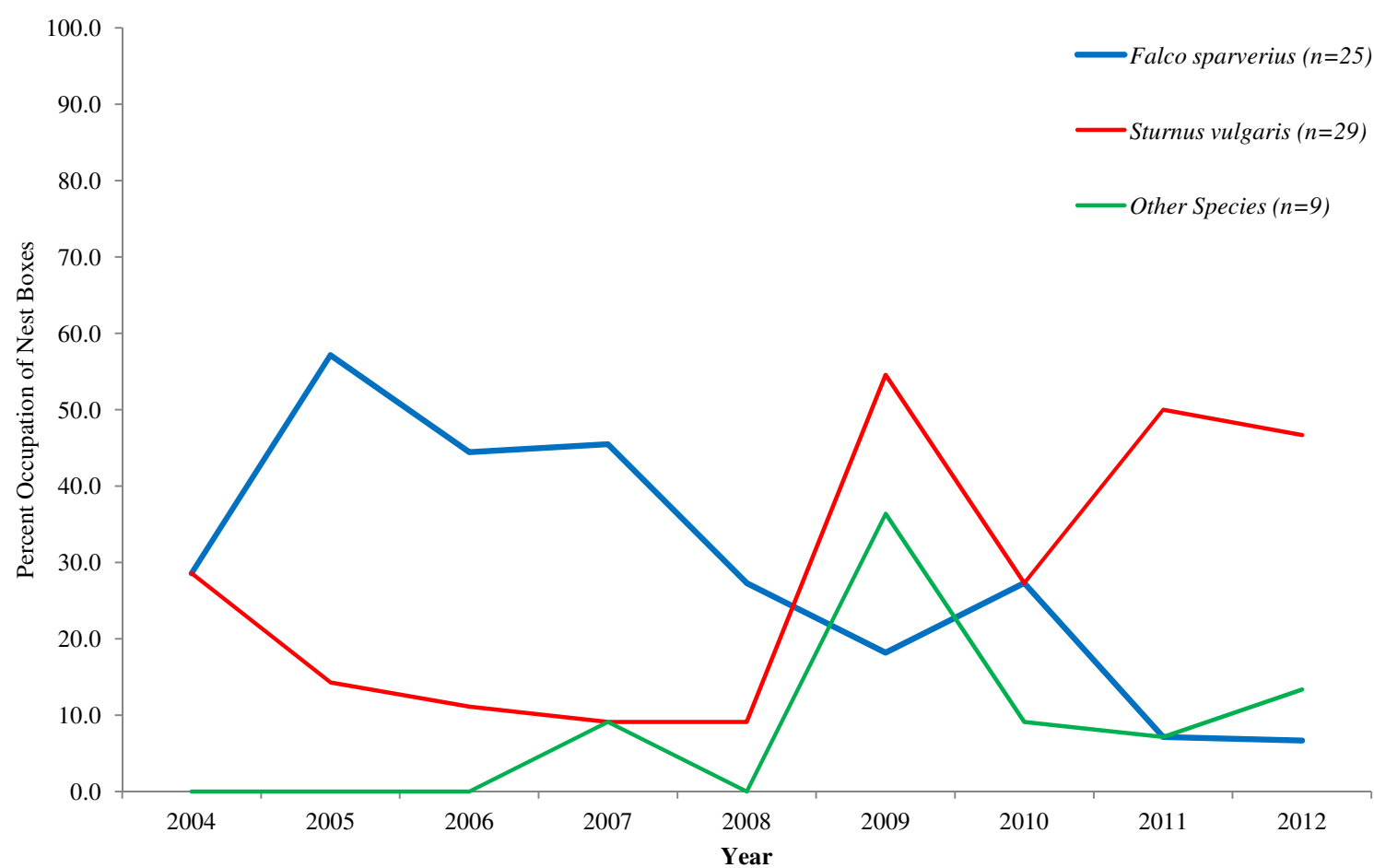


Figure 3. The percent occupation of nestboxes housing American Kestrels, European Starlings and other species at the Ridgefield National Wildlife Refuge (WA) from 2004-2012.



Of the 25 nesting attempts by American Kestrels 18 were successful (67.2 %) over the nine year period. Kestrels' laid 4.6 ±0.6 eggs per box. The conversion rate of eggs to chicks was 73.2 %; the conversion rate of chicks to fledglings you was 81.1% (Figure 4). While several nesting attempts failed no kestrel pairs engaged in a documented second attempt. While there were individual adults that were recorded year to year, one male used the same box in three successive seasons with different females. Three females nested on the refuge in two successive years. No pair of adult birds attempted nesting in subsequent years. One female chick from 2004 successfully nested as an adult in 2005. One band recovery occurred from a male chick hatched in 2005 was found dead in Yamhill County Oregon, 78km southwest of the refuge.

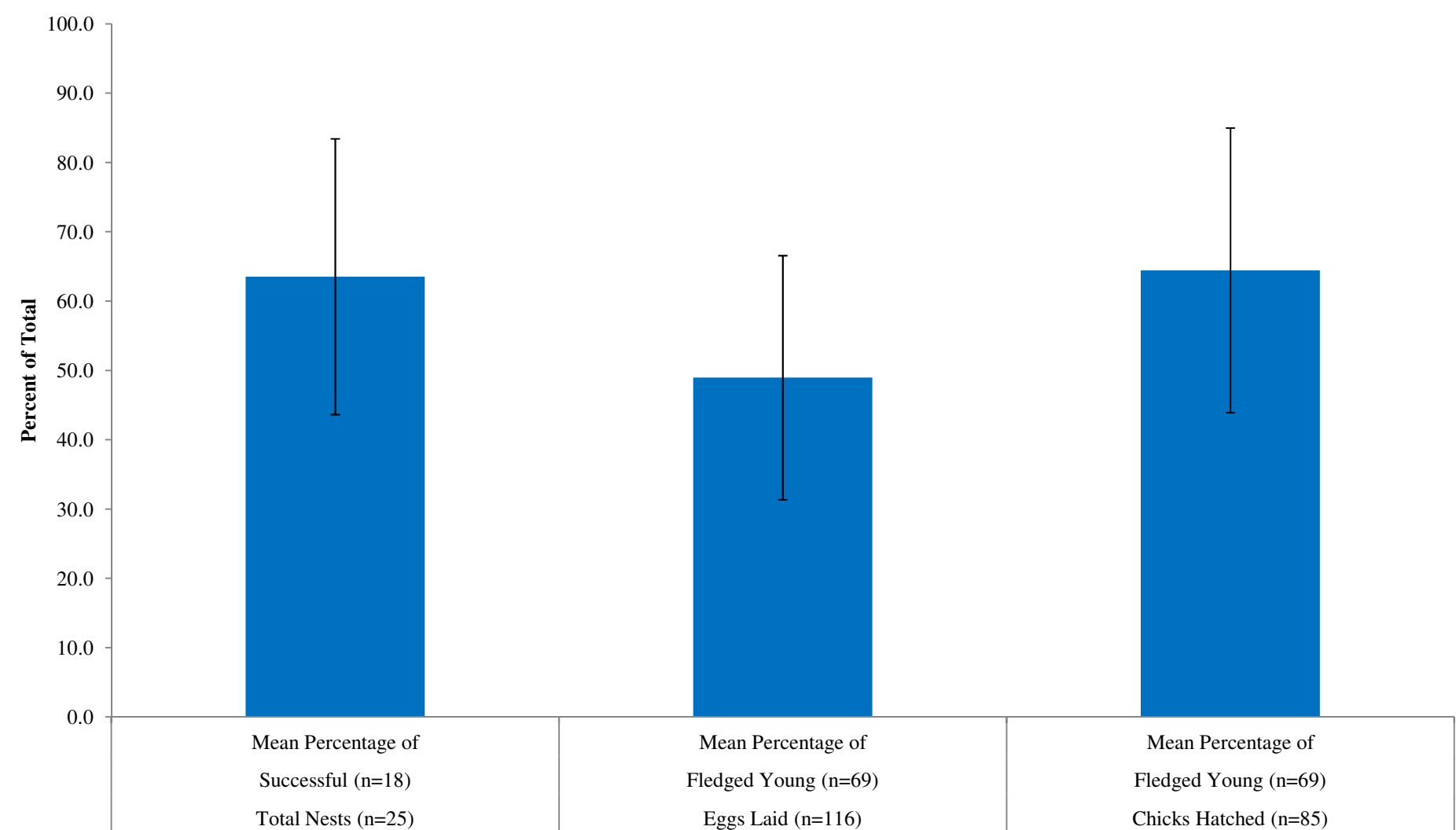


Figure 4. Mean American Kestrel productivity measures of nesting success rate, fledged young to eggs laid, and fledged young to chicks hatched with standard deviation at the Ridgefield National Wildlife Refuge (WA) from 2004-2012.

## METHODS

Nestboxes suitable for American Kestrels were placed at the Ridgefield National Wildlife Refuge (WA) in 2004 during subsequent years additional nest-boxes were added and others repaired and occasionally relocated (Fig. 3 current locations). The number of boxes ranged from 7 to 15 with a mean of 10.6.. Nestboxes were cleaned and 5-7 cm of new wood shavings added each March. All nestboxes were monitored weekly for occupation in the spring of each year. Kestrel pairs were observed during the breeding season records of nesting chronology and occupation of other species were recorded. European Starling (*Sturnus vulgaris*) nesting material and eggs, if present, were removed while native species were not otherwise disturbed. During 2004 -2008, blood samples from this population (0.05 ml) were collected from the brachial vein as part of a paternity study. Adult birds were trapped via a *bal-chatri* trap or within the nestbox; nestlings were sampled prior to fledging. All subjects were banded with U.S. Fish and Wildlife Service bands to allow for the identification of individual birds and standard morphometric data was collected for all individuals including: age, sex, tarsus length, beak length and weight. All samples were collected in accordance with *Guidelines to the use of wild birds in research* (Gaunt and Lewis 1999). We report productivity measures and reproductive output following Smallwood, 1989 and Katzner *et al.* 2005.

## DISCUSSION/CONCLUSION

American Kestrel populations at the Ridgefield National Wildlife Refuge have declined steadily since 2005 as measured by nestbox occupation and productivity. This decline mirrors data reported in the literature (Goodrich *et al.* 2012, Bystrak *et al.* 2012, Smallwood 2009 and Katzner *et al.* 2005). Smallwood 2009 postulates several reasons for declines. American Kestrels are found year round both on the refuge and in the surrounding areas it is unlikely that the predominant portion of the population is migratory as in other parts of their range. Migration mortality is probably not a cause of decline in our study area.

Disease (including West Nile virus) is another possible cause of American Kestrel decline. We did not test our birds for WNV but it has been commonly found in American Crows (*Corvus brachyrhynchos*) and other birds in the area in the area. As Smallwood suggest WNV should have resulted in a sharp major decline rather than a slow steady decline. Toxic contamination, pesticides and herbicides, may have led to declines but as these are controlled on the refuge they may be reasonably excluded. Predation by Cooper's Hawks could lead to population declines. Within in our study site Cooper's Hawks occur however we found no evidence of predation by Cooper' Hawks but Great Horned Owls (*Bubo virginianus*) were commonly observed and they will also hunt kestrels.

Habitat loss and fragmentation are often cited as possible causes while the area surrounding the refuge has been transformed from mainly rural to semi-suburban with several large housing subdivisions and smaller housing developments during the course of the study. This may have affected the quality of wintering areas adjacent to the refuge. The refuge size and habitat management have remained consistent; haying and grazing have even been increased. This should have provided more suitable habitat for kestrels, however, the increase in short grass areas and the presence of cattle may have increased the prevalence of European Starlings.

Our limited data suggests that one reason American Kestrels are declining on the refuge is due to the increase in competition for nesting cavities by European Starlings. Starlings can be aggressive and we witnessed kestrels being mobbed by starlings on several occasions often in near proximity to nestboxes. We actively tried to evict starlings from nestboxes by removing material and eggs or young, and one kestrel pair did successfully breed in box from which starlings had been repeatedly evicted. More research need to be conducted to determine if a saturation point of European Starlings is a major contributing factor to this decline.

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## LITERATURE CITED

- Bystrak D, Nakash E, Luterding JA. 2012. Summary of raptor banding records at the birding banding lab. Journal of Raptor Research 46: 12-16.
- Farmer CJ, Smith JP. 2009. Migration monitoring indicates widespread declines of American Kestrels (*Falco Sparverius*) in North America. Journal of Raptor Research 43: 263-273
- Goodrich LJ, Farmer CJ, Barber DR, Bildstein KL. 2012. What banding tells us about the movement of ecology of raptors. Journal of Raptor Research 46: 27-35.
- Hoffman SW, Smith JP. 2003. Population trends of migratory raptors in western North America, 1977-2001. Condor 105: 397-419.
- Katzner T, Robertson S, Robertson B, Klucasaris J, McCarty K, Bildstein KL. 2005. Results from a long-term nest-box program for American Kestrels: implications for improved population monitoring and conservation. Journal of Field Ornithology 76: 217-226.
- Koenig WD. 2003. European Starlings and their effect on native cavity-nesting birds. Conservation Biology 17: 1134-1140.
- Ridgefield National Wildlife Refuge Complex, & U.S. Fish and Wildlife Service. (2010, September). Ridgefield National Wildlife Refuge Comprehensive Conservation Plan.
- Smallwood, JA, MF Causey, DH Mossop, JR Klucasaris, B Robertson, S Robertson, J Mason, M. Maurer, RJ Melvin, RD Dawson, GR Bortolotti, JW Parrish, Jr., TF Breen, and K Boyd. 2009. Why are American Kestrel (*Falco sparverius*) populations declining in North America? Evidence from nest-box programs. Journal of Raptor Research 43: 274-282.
- Smallwood, JA., 1989. Age determination of American kestrels: a revised key. J. Field Ornithology. 60: 510-519

