

Northern Virginia Piedmont Kestrel Project: What Have We Learned So Far?

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Introduction

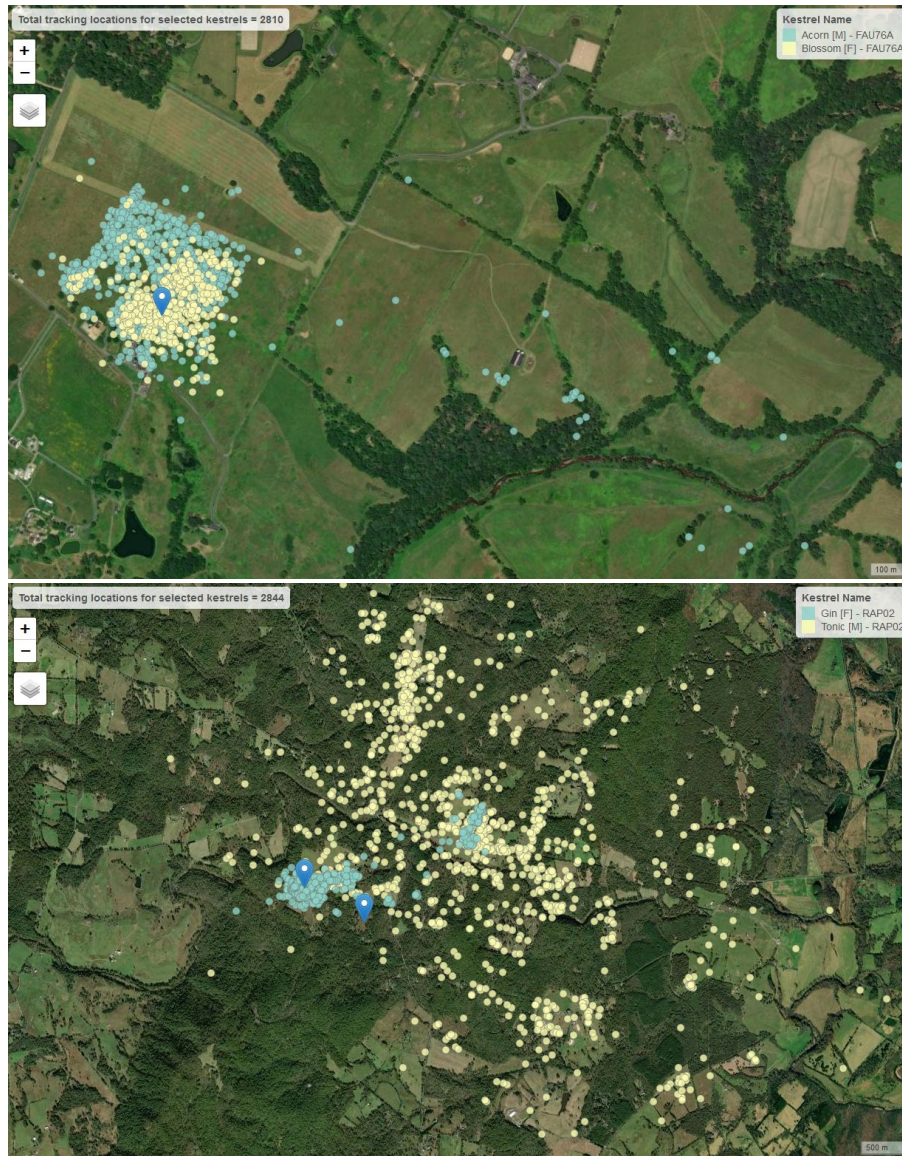
- American Kestrels are small falcons that inhabit wide-open fields in Virginia. Kestrels have declined by 73% in the Piedmont of the eastern United States since 1966. Habitat degradation, insecticides (killing prey), rodenticides (toxic to kestrels), mortality during migration, and low fledgling survival may all be contributing to the decline. But the relative importance of these diverse factors is poorly known. We began the Northern Virginia Piedmont Kestrel Project in 2021 to study what's behind the decline in our area and to learn what landowners can do to help.
- Our focus is on tagging adult kestrels to understand which kind of fields are the best habitat and how this changes through the seasons. We are also monitoring nest success, fledgling survival, prey abundance in different kinds of fields, diet, and pesticides in the blood.



Female kestrel with a backpack GPS transmitter.

Ranging behavior

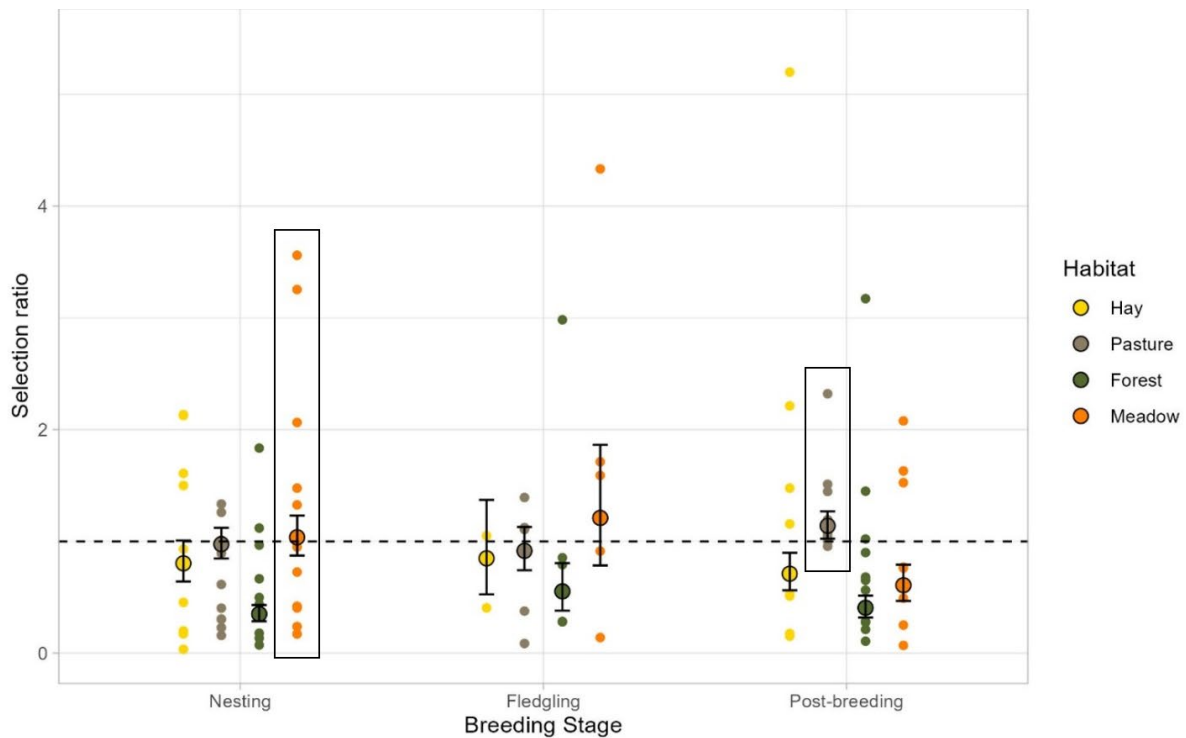
- We have tracked 61 adult kestrels (37 females, 24 males) with GPS transmitters since 2021.
- Females have small, non-overlapping territories (average of 80 acres).
- Many kestrels make trips (forays) outside their home range during the breeding season.
- Some females shift to new home ranges after the fledglings become independent. Foray flights appear to be related to identifying these late season home ranges.
- We published the above results in an [article in the Journal of Raptor Research](#).
- We still have a lot of data to analyze, but males appear to have much larger home ranges than females.



Different kestrel pairs are showing remarkably different movement behavior. Teal dots are males, yellow dots are females, and blue pins show nest box locations. The top panel shows a very small home range at the Oak Spring Garden Foundation and the bottom panel shows a pair from the Raines property. We are working with Master's student Caylen Wolfer to understand how available habitat is related to these dramatic differences in movements.

Habitat selection

- On average, hay fields are less suitable foraging habitat than pastures or native meadows.
- Native meadows are preferred over other field types during the nestling period (April-May).
- Pastures are strongly preferred over other field types later in the breeding season (July onward).



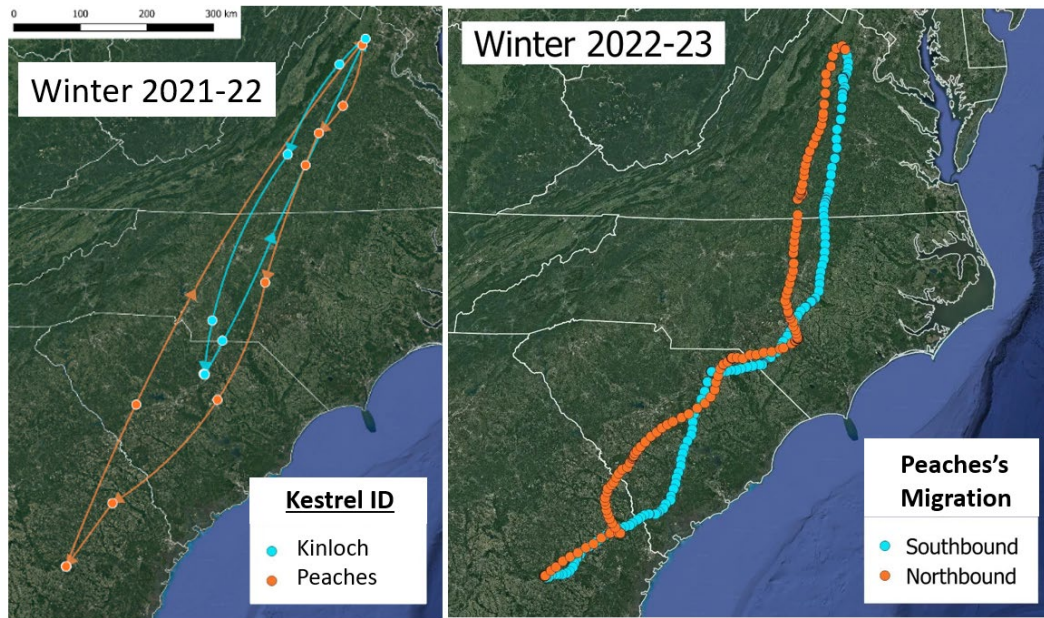
Habitat selection by GPS-tagged kestrels throughout the breeding season. Kestrels significantly preferred native meadows over other field types during the nestling period, but strongly selected pastures during the post-breeding period, when meadows tend to grow tall.

Fledgling mortality and toxicology

- Out of 42 fledglings that we've tracked, only 1 (2.4%) died while being tracked. This is a much higher fledgling survival rate than previously reported in the literature.
- We are still waiting on lab results but so far it seems that very few pesticides are present in the blood of nestlings.
- Our results do not support the hypothesis that fledgling mortality is a major cause of population decline in this part of the eastern US.

Long-distance movements

- We documented a few "summer vacations" where kestrels went as far as Pennsylvania after their fledglings became independent. In these cases, the birds returned to overwinter in our study area.
- We documented three long-distance winter migrations to the southeastern US (Georgia and South Carolina). "Peaches" the kestrel has twice wintered in Georgia (on the same farm). Both times she returned to breed in our study area. Her second trip was recorded in unprecedented detail including two long-term stopover locations further south in Virginia. Another interesting tidbit is that a kestrel that was banded at Oxbow Farm near Front Royal turned up in Florida this fall.
- The proportion of our population that winters locally versus migrates is still unknown, but so far it seems that approximately half the birds overwinter in our region.



Migration routes of Peaches and a kestrel from Kinloch Farm. The path in 2022/23 is the highest resolution migration route of an American Kestrel to have ever been recorded.

Prey abundance

- Preliminary results suggest that voles are not more abundant in cattle pastures compared to native meadows or hay fields. If this trend holds up after we collect more data, it seems that the catchability of prey may be more important than prey abundance in determining where kestrels hunt.
- Dragonflies are equally abundant in meadows, hay fields, and pastures. Video analysis will determine how important they are to the diet of Virginia kestrels.

Nest predation and clutch reduction

- Nest-box checks and security camera footage documented significant clutch reduction during the nestling period. Most previous estimates of nestling survival (i.e., nest success) come from banding data that are collected 1-2 weeks before fledging. Therefore, it's possible that death of nestlings just before fledging may be an overlooked contributor to the decline.
- The nest-box cameras documented kestrel nest predation by Red-bellied Woodpeckers and Northern Flickers. This is the first documentation of kestrel nest predation by any woodpecker species.
- The cameras also documented kestrel nestlings killing each other, dead kestrel nestlings being fed by adults to other nestlings, and kestrels killing starlings in boxes. These behaviors are also poorly documented for the species.

Land management recommendations

- Meadows should ideally be bushhogged or burned annually in February or March. Bushhogging or burning at this time creates ideal nesting habitat for kestrels leaves habitat standing for wintering sparrows, and avoids killing breeding grassland birds.
- Hay fields should ideally not be hayed in between April 15th and July 1st. 80% of grassland birds in our area are finished nesting by July 1st (Virginia Working Landscapes data).

- We recommend that landowners who have big fields install kestrel boxes that are spaced every $\frac{1}{3}$ of a mile. Information on how to build or buy a box and how to install a predator guard is here: <https://cliftoninstitute.org/restoration/resources/>. The Virginia Grassland Bird Initiative will often install boxes for free (<https://www.vagrasslandbirds.org/nest-boxes/>).