

5-2014

# The Integration of Google Maps into American Kestrel, *Falco sparverius*, Nest Trail Programs

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## Recommended Citation

Harper, Dylan M., "The Integration of Google Maps into American Kestrel, *Falco sparverius*, Nest Trail Programs" (2014).  
*Undergraduate Honors Theses*. Paper 207. <https://dc.etsu.edu/honors/207>

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**The Integration of Google Maps into American Kestrel, *Falco sparverius*, Nest  
Trail Programs**

Thesis Submitted in partial fulfillment of Honors

By

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April 29, 2014

### **Abstract**

American Kestrel Nest Box Programs have been established since the mid 1960's. The population of American Kestrels (*Falco sparverius*) along nest box trails has decreased by 47 percent since their original implementation. There are existing technologies that can help in the location of prime kestrel habitat (open fields with conspicuous perching locations) along highways, which reduces the amount of labor in searching for new box locations. These technologies can also help increase the efficiency of monitoring and maintaining kestrel nest trail programs. This study provides an example of how Google Maps (Maps) can be implemented into a kestrel trail and explains the multiple benefits of the integration.

## Introduction

American Kestrels are obligate secondary cavity nesters, meaning they require natural cavities or holes bored by woodpeckers to use for nesting sites, yet they will willingly accept man-made nest boxes (Hamerstrom et al., 1973). Kestrels also require open ground for hunting, as well as conspicuous places to perch to watch for prey (McCollough, 2001). Kestrel nest box trails have been implemented and monitored, and population data have been recorded since the 1960's (Sauer 2012). The population data reported show a 47% decrease in the kestrel population along kestrel nest box trails between 1966 and 2012. (American Kestrel Partnership 2013).

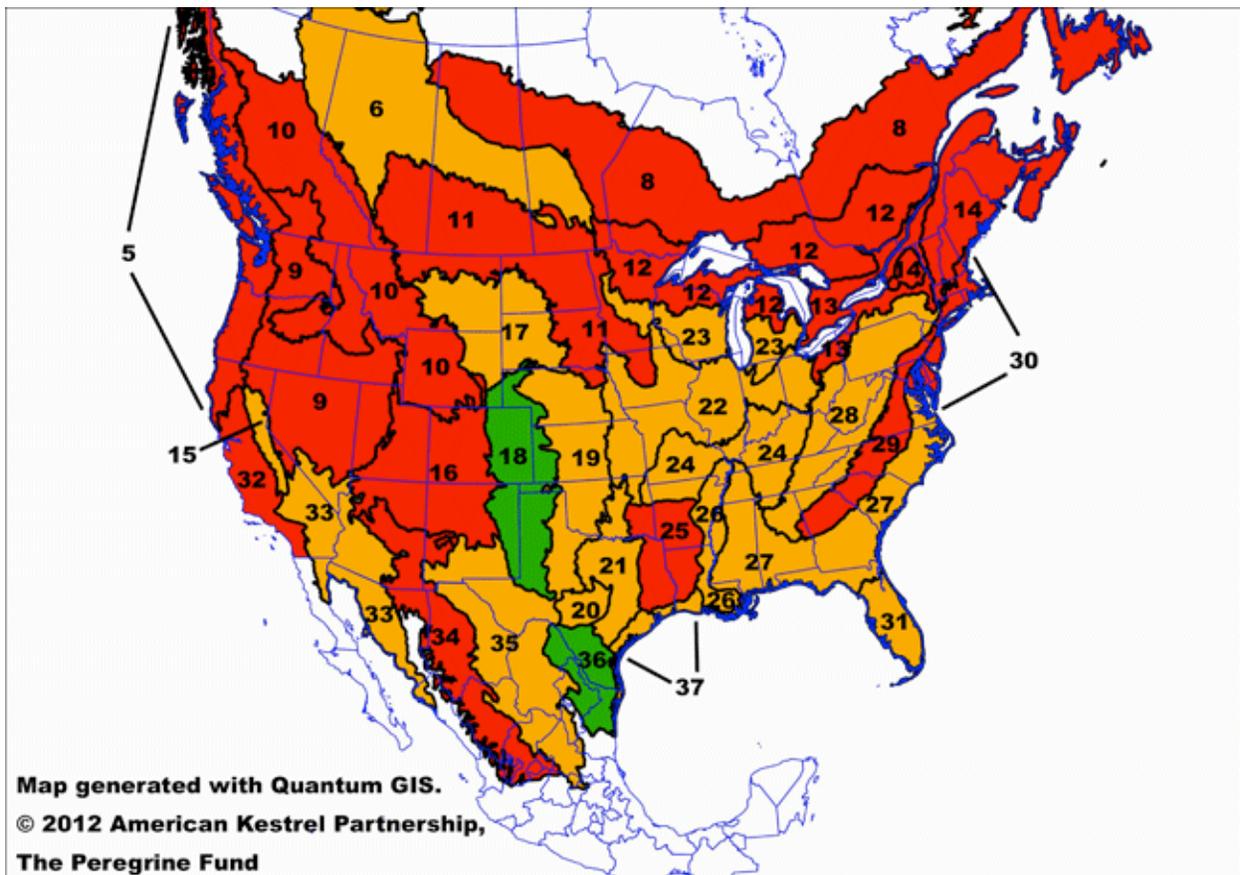


Figure 1: Population Dynamics form 1966-2012: Red: population decline, Orange: population uncertain, Green: Population increase

The Interstate Highway 26 (I-26) Kestrel Nest Box Trail maintained by students at East Tennessee State University was started by Dr. Fred J. Alsop III along with a group of students in 1997. It originally contained 20 nest boxes between mile markers 3 and 42, but has been expanded over the years to include 29 nest boxes as of 2014. The nesting successfulness of the kestrel nest boxes of the I-26 trail has been falling over the past few years, from 25% in 1998 to 8% in 2009 (Powers, 2009), and dropped substantially in 2013 (Harper et al., 2013), with only one box out of 27 containing a kestrel pair. However, their eggs inexplicably disappeared roughly three weeks after being laid.

There are multiple speculations on why such a decrease has occurred across the nation. These include: predation on adult kestrels (e.g. Cooper's Hawks (*Accipiter cooperii*) and Sharp-shinned Hawks (*Accipiter striatus*)); kestrel nest predation, being outcompeted for nest cavities (e.g. European Starlings (*Sturnus vulgaris*), Northern Flicker (*Colaptes auratus*), screech-owls, and squirrels); and the ingestion of insecticides (Hawk Mountain, 2013). Whatever the reason for the decline, there are steps that need to be implemented to counteract these problems. Some steps are already being taken to help kestrels, including: providing the boxes, cleaning all nest boxes before the start of the breeding season, and clearing out competing bird nests if they happen to try to select a nest box (The Peregrine Fund, 2013).

## Objective

With the technology available today, the potential exists to vastly improve the procedure of getting fledgling nest box programs started, as well as maintaining current kestrel box programs. This study will illustrate how Google Maps™ can be implemented into kestrel nest trail setup procedure. It will show how using Maps for a kestrel trail benefits the program by increasing efficiency in monitoring, maintaining, and sharing a nest box trail with the public. This study will also explain the benefits of Google Maps over other GIS programs.

## **Materials and Methods**

### Locating Habitat and Starting a Kestrel Nest Box Trail

(Congruently: Scouting New Locations for Current Kestrel Nest Box Trails)

For the ease of access of box locations and because kestrels are not deterred by moving vehicles, the Northern Prairie Wildlife Research Center (NPWRC) recommends placing nest boxes on signs along an interstate or other highway (Varland, 1992 ). Also, as stated in the introduction, kestrels require open ground for hunting and conspicuous places to perch to watch prey (McCullough, 2001). Using Google Maps before scouting locations firsthand is very beneficial. While surveying for potential box locations using a drive-along method, open fields that are adjacent to the highway can be obscured by embankments, trees, or other obstacles. By using a monitor in the lab, open fields along the highway were able to be viewed from a bird's eye perspective and therefore unhindered by obstacles. With previous knowledge of the kestrel's most sought after habitat, Google Maps was used to scout locations for nest boxes by selecting the Satellite section of Google Maps. Open fields for kestrel hunting and foraging along the highway were found, as shown in Figure 2.

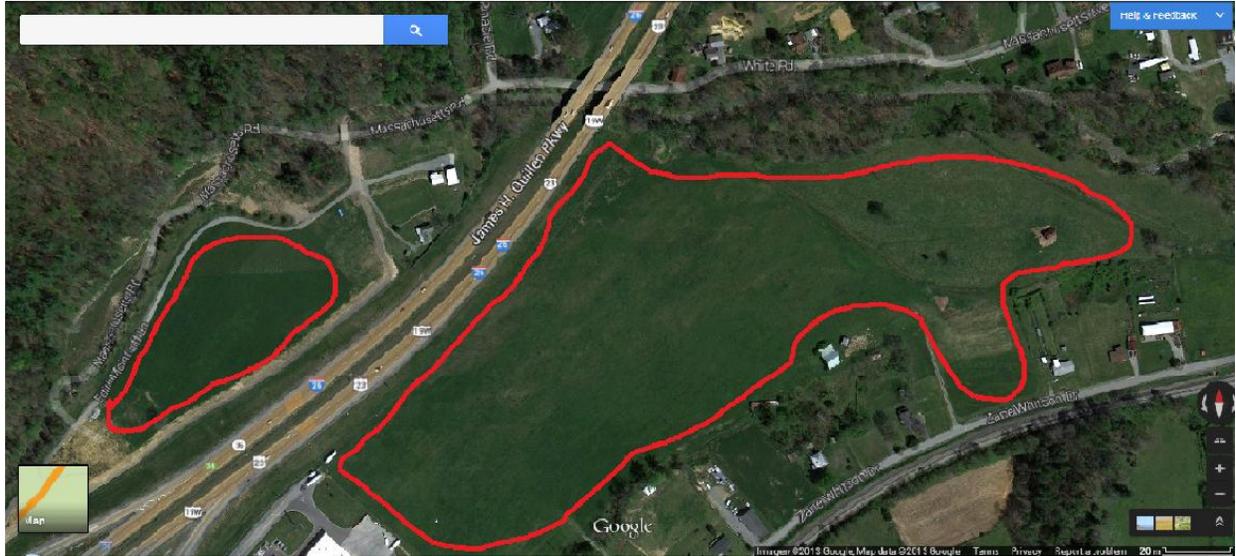


Figure 2: Hunting ground along Interstate 26

Once a proper habitat for the American Kestrel has been located, a sign suitable for supporting a nest box was found by zooming in and scanning along the highway. Then, Google Street View was used to ascertain if the sign is of an appropriate size and easily accessible, as shown in Figure 3 and Figure 4.



Figure 3: Google Maps view of potential sign for nest box placement.



Figure 4: View of the same sign through Google Street View. Note: sign is accessible and large enough for ladder access.

The NPWRC recommends a distance of approximately a mile between boxes and a minimum of half a mile between any two (Varland, 1992). At this point, potential locations are marked on Google Maps (My Places) (as explained in the next section), and the locations are then assessed firsthand. Four new boxes have been placed on the I-26 kestrel nest box trail using this procedure.

For those creating a new trail, when the potential locations have been checked, creating a final map of the trail will be as easy as going back and omitting any locations deemed unsatisfactory. From here, the NPWRC has a very thorough explanation of setting up a kestrel nest box program which includes: obtaining the proper permits, building kestrel nest boxes, attaching said boxes, and maintenance of the trail itself (Varland, 1992).

### Use in a Current Nest Box Program

For current nest box programs with an established nest box trail, the integration of Google maps can increase efficiency in monitoring and maintaining nest boxes trails. To create the Google Map, My Places was selected from the settings tool, and locations of the current nest boxes were plotted. This was done by zooming into the map where each sign was located and dragging a place-marker to each point on the map, as shown in Figure 5.

When the place-markers had been set, they were clicked on to be given a title and description, and the color and shape of the markers were changed to denote which boxes were new, had been moved, needed to be moved, etc. by clicking the place-marker icon as shown in Figure 6. When each place-marker had been set, the overall map was given a title and description, and the map was saved.

From here, there are multiple steps that can be taken. Other members of the kestrel trail team can be given ability to edit the map by selecting Collaborate and entering their email addresses, and depending on whether the map is needed to be kept private or public, the map can be emailed to selected individuals or made public in the settings tool.

With the help from Google Maps, the nest box program was critiqued from a bird's eye view, which enhanced the overall nest trail. The habitats around each box were observed, and if locations were found that were deemed to be improvements over current box positions, they were marked for relocation. Furthermore, if nest boxes in too close proximity to one another were found, they could be spread further apart to decrease overlapping habitat. Two boxes on the I-26 trail have been relocated using this method. Also, new locations were found for boxes that were ready to be placed and for boxes yet to be constructed.

When the Google Map was created and distributed, members of the kestrel trail team that owned a smartphone were able to access the map wherever they were. This allowed them to access the Kestrel trail map as they went out into the field and gave them the ability to receive accurate directions to each nest box location. Also, as they were in the field, the map showed which locations needed to be moved, where they would be relocated, and where new boxes should be placed.

Also, if one of the team members that was checking the boxes was selected as a Collaborator, he or she would have the ability to make notes in the description box of the place-marker for each nest location. He or she could also update the map as they proceeded with the day's work. This includes keeping track of the activity around the box, changing the size or color of place-markers to denote kestrels inhabiting a box, and changing color of the place-markers to indicate the need of maintenance.

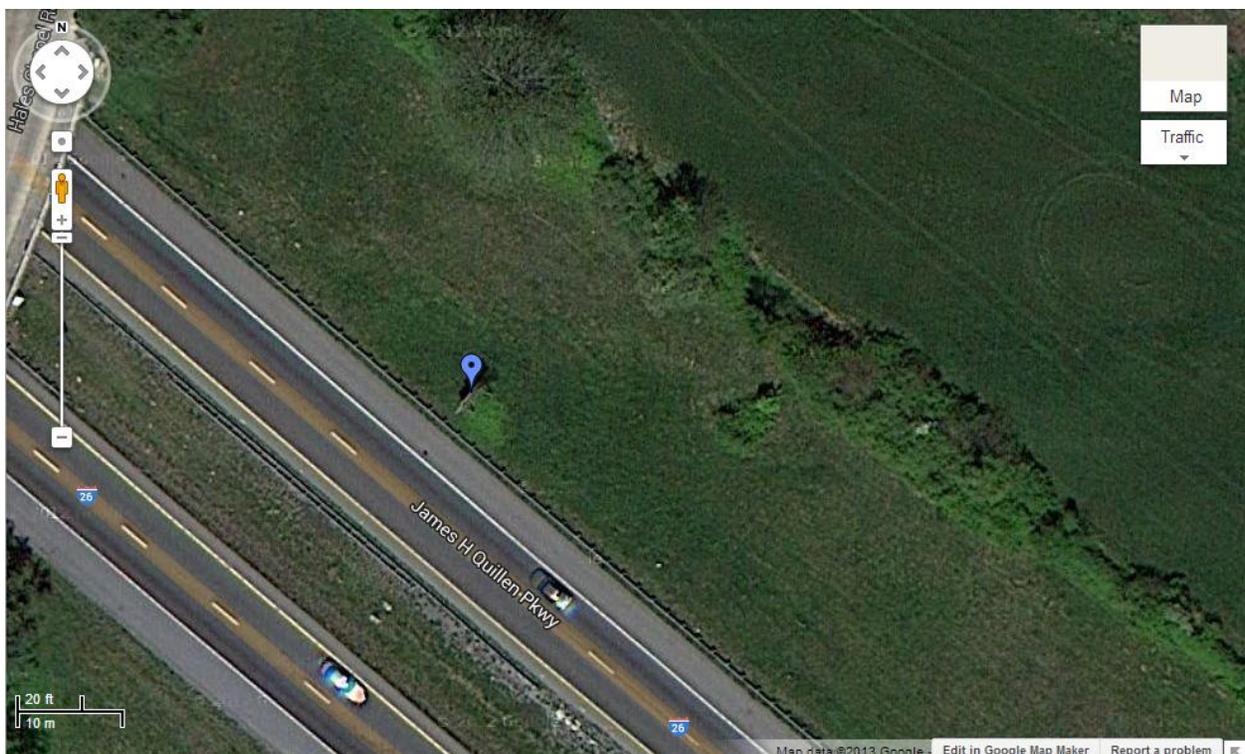


Figure 5: Adding a place-marker to Google Maps

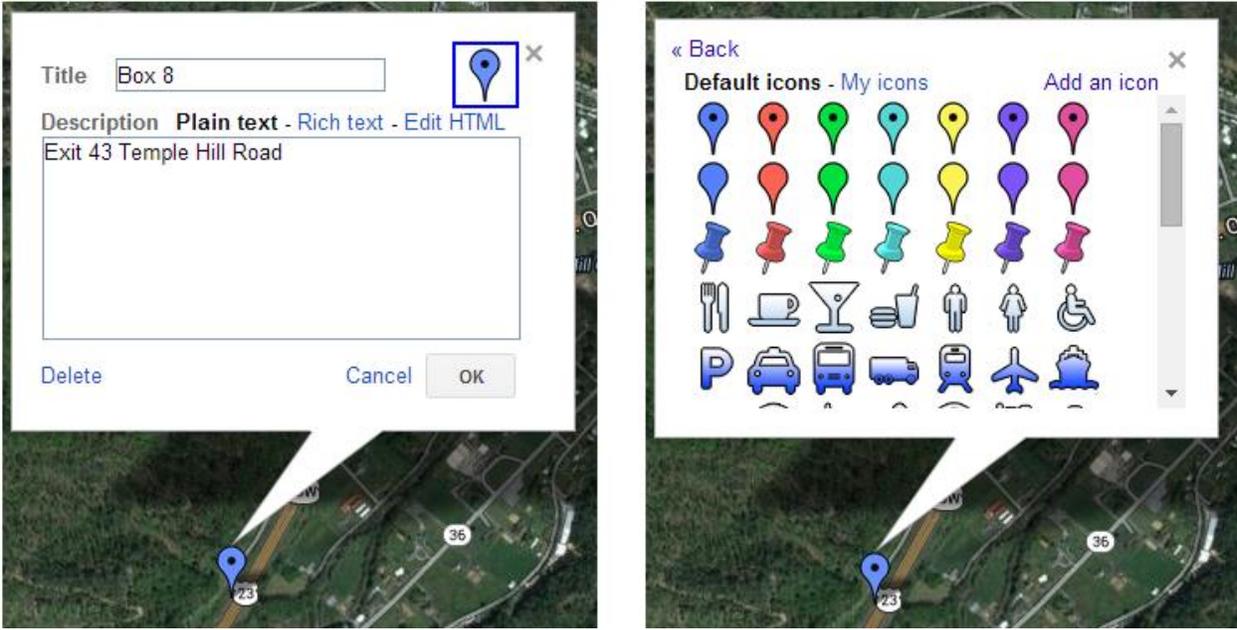


Figure 6: Giving a title and description and changing the place-marker's color or shape

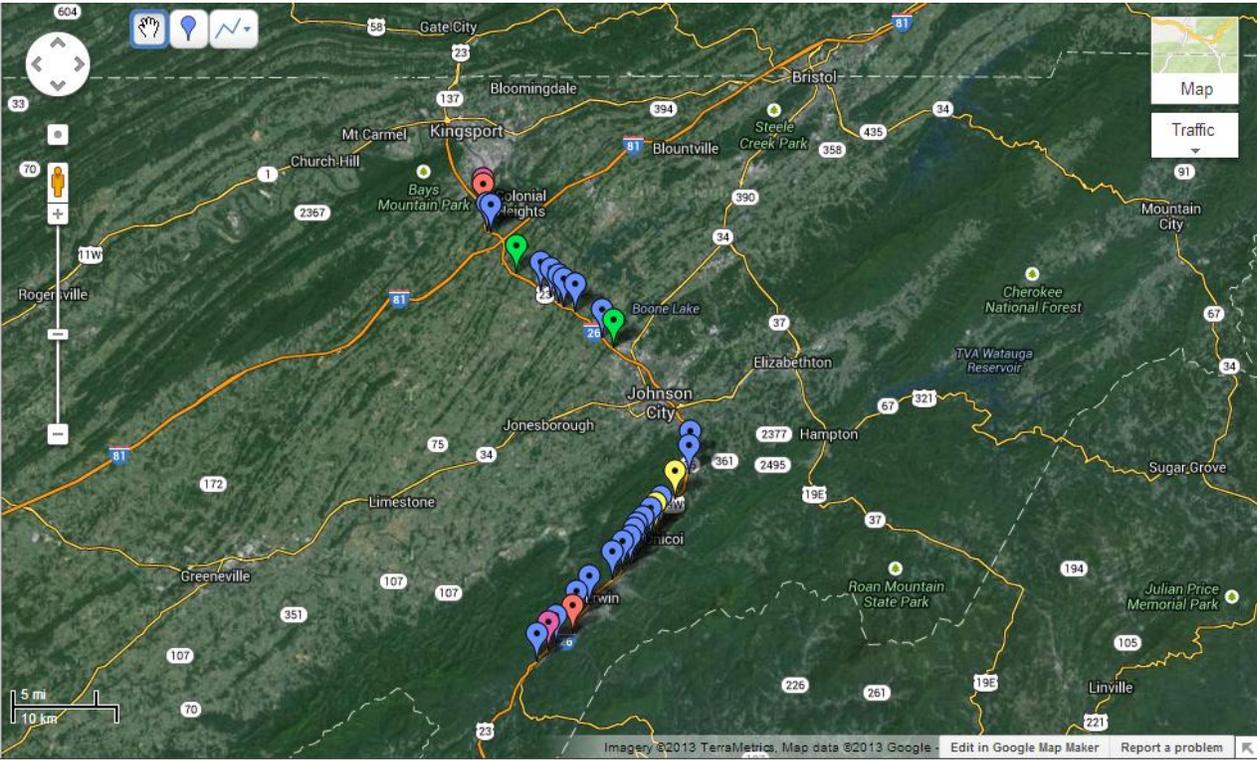


Figure 7: A version of a completed map of the I-26 Kestrel Nest Box Trail. Blue: regular nest box, Red: box that needs maintenance, Yellow: new box, Purple: box needing to be moved, Green: location for a new nest box.

Finally, the map can be shared with the general public by selecting Public under the Privacy and Sharing settings. This feature not only allowed the map to be shared with the public but also made it simpler for members of the team to access the map by searching for the title of the map on Google. Publicity and awareness can be raised about the kestrel trail by making the map public, as anyone interested in the program can take a look into its inner workings. If a website was established alongside the kestrel nest box trail program, the map could be embedded into it.

### **Data/Results**

East Tennessee State University's Interstate 26 Kestrel Nest Box Trail is coordinated by Dr. Fred J. Alsop III, and has been monitored for 17 years. The trail consists of 29 nest boxes on signs along 38 miles of highway. Google Maps has now been integrated into the program and the map has been made public. The ease of access to the map has made checking the boxes easier and more efficient as new and existing members can be led to each location with their smartphones without having to constantly check a written map.

Since the implementation, Google Maps has been used to locate habitats for four new nest boxes that have been erected. Also, we were able to assess the map for the relocation of nest boxes. Better locations with larger fields and superior perching locations were found for two of the nest boxes using Google Maps, and the relocations for these boxes have been carried out. There has yet to be any data recorded for these new and relocated boxes as they were set up during the breeding season is still in progress.

Lastly, by making the map public, we were able to share the map with the community. This has helped let people know about the program and keep track of what is happening along the trail. Since the map was made public, over 475 people have viewed the map, and this number has been increasing daily.

## **Discussion**

Google Maps was chosen for multiple reasons. First, the fact that Google Maps is free to the public weighed into the decision heavily. With software like ArcGIS ranging from \$1,500 to over \$10,000 (Esri 2013), these programs would not fit into our budget (or most any community's that is trying to start a nest box trail). The features and sharing capabilities of Google Maps were also very useful to our program. We were able to accomplish all of our locating, plotting, and sharing goals through the use of Maps. An additional reason Google Maps was chosen over Google Earth was that the satellite option and Google Street View on Google Maps was sufficient to fill our needs for imaging without having to download Earth. Also, we do not have the ability to share from Google Earth and have the map appear in Google Search results the way Google Maps does. The location of prime habitat and the mapping of locations using Google Maps, as used in this study, can also be implemented into many other biological projects. These could include creating a map for any type of study using man made nest boxes such as those with Wood Ducks (*Aix sponsa*), Tree Swallows (*Tachycineta bicolor*), Barn Owls (*Tyto alba*), and bluebirds as well as habitat location for many types of birds or mammals.

Google Maps also gives an aerial view of the kestrel trail. Using Maps makes it much easier to initially find kestrel habitat along the trail than doing a drive along approach. By using Maps on a computer, open fields as well as accompanying signs for nest boxes can be found in quick succession compared to driving the length of the trail searching for kestrel habitats and road signs. Also by using Maps, open fields can be spotted adjacent to the trail that would otherwise be obscured by embankments or trees if viewed along the roadside. Maps also gives the opportunity to review an established kestrel trail from a bird's eye view and make box placement corrections if boxes are too close together or if a better habitat is found.

The use of Google Maps has made monitoring and maintaining the nest box trail easier and more efficient. As the map was made public, the team that checks the nest boxes can access the map on their smartphones as they go from box to box, and receive precise directions to each one. This was extremely helpful to new members who went out to check the nest boxes for their first time. The map also directs them to the locations that were selected for new boxes placement, as well as to the boxes that needed to be relocated and their respective new locations. It also gives them the ability to update information about the trail as they go through the process of checking boxes. The team members are able to change the shapes or colors of the pins on the map to denote if a box needs maintenance or if a kestrel has nested in the box, as well as write notes for each box as they go through the routine of checking boxes.

Aside from the efficiency and ease of access, the map has helped us gain publicity. The most surprising aspect of creating the map was the number of views it received upon making the map public. The map has received over 475 views since it was made public in May 2013 and is the first result on Google when searching: Kestrel Project Map. By telling people about the

map, it gives them a chance to check up on the progress of the, and see where kestrels are nesting.

All in all, Google Maps has greatly increased the I-26 kestrel trail's efficiency and publicity. It has helped make the program run more smoothly and has made maintaining the trail much easier. We are excited to see what results the new box locations and the relocated box locations bring during this, the first nesting season we have been using this technique, and we look forward to seeing more kestrel trail maps created.

## References

- American Kestrel Partnership. 2013. "Declines of American Kestrel populations." Accessed October 17, 2013 at <http://kestrel.peregrinefund.org/kestrel-decline>
- Esri. 2013. ArcGIS Pricing. Accessed October 2, 2013. Available at <http://www.esri.com/software/arcgis/arcgis-for-desktop/pricing>.
- Hamerstrom F, Hamerstrom FN, Hart J. 1973. Nest boxes: an effective management tool for kestrels. *J Wildl Manage* 37(3):400-3.
- Harper, D. et al. Kestrel Box Research Study. 2013. Accessible upon request by email from [harperd@goldmail.etsu.edu](mailto:harperd@goldmail.etsu.edu)
- Hawk Mountain. 2013. American Kestrel. Accessed September 27, 2013. Available at <http://www.hawkmountain.org/raptorpedia/hawks-at-hawk-mountain/hawk-species-at-hawk-mountain/american-kestrel/page.aspx?id=498>.
- McCullough, K. 2001. "Falco sparverius" (On-line), Animal Diversity Web. Accessed October 17, 2013 at [http://animaldiversity.ummz.umich.edu/accounts/Falco\\_sparverius/](http://animaldiversity.ummz.umich.edu/accounts/Falco_sparverius/).
- Powers, J., Alsop F. Reproductive Success of American Kestrels (*Falco sparverius*) Nesting in Boxes along an Interstate in Northeastern Tennessee. 2009.
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2012. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2011*. Version 07.03.2013. USGS Patuxent Wildlife Research Center, Laurel, MD.
- The Peregrine Fund. American Kestrel. Accessed October 12, 2013. Available at <http://www.peregrinefund.org/explore-raptors-species/American%20Kestrel#sthash.gWxEtrCb.3VmiPJFZ.dpbs>.
- Varland, Daniel E., Ronald D. Andrews, and Bruce L. Ehresman. 1992. Establishing a Nest Box Program for American Kestrels Along an Interstate Highway. Iowa Department of Natural Resources. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwr.usgs.gov/resource/birds/kestrel/index.htm> (Version 16JUL97).