**APPENDIX 4-6. Analysis Method and Results for Downstream Monitoring**

After a species has been classified as an No Effect or Not Likely to Adversely Affect, EPA conducted a final analysis to ensure that no sources upstream of a species range or critical habitat would affect the species. To do this, evaluated the monitoring data with regards to the location to the species range/critical habitat (e.g., upstream or downstream) to determine if any detections of the pesticide had occurred.

To do this analysis, EPA first used Esri ArcGIS tools to identify streams (NHDPlus Version 2[[1]](#footnote-2)) that crossed the boundary of the species range/critical habitat. EPA then used the latitude and longitude data for monitoring sites obtained from the Water Quality Portal (<https://www.waterqualitydata.us/portal/>) to index the sites to NHDPlus stream segments. EPA developed Python scripts that utilize NHDPlus to identify monitoring sites that hydrologically connected to each species range/critical habitat and provide a corresponding upstream/downstream distance and hydrologic travel time between the monitoring site and the range/critical habitat. EPA then categorized the connected monitoring sites into three areas: those sites that occurred within the borders of the species range/critical habitat; those sites that occurred within 68 -stream miles upstream of the species range/critical habitat; and those sites that occurred greater than 68- stream miles upstream of the species range/critical habitat. The 68-stream mile limit was initially used to identify those sites that were within a 1-day travel time of the species range/critical habitat. Only upstream locations were categorized for the analysis as there is uncertainty in the downstream monitoring sites as to where the pesticide originated. Given the chemical’s persistence, it would also be important to evaluate sites beyond this distance, as the pesticide still might reach the species range/critical habitat.

Results of the analysis for carbaryl for species ranges are provided in **Table 1.** For species ranges, one species (with two separate entity IDs, 135 and 136) had monitoring samples upstream of the range that were detectable. This species was the Roseate tern, which feeds on fish. However, this species has a relatively high threshold for effects to the species and impacts to PPHD vectors, such that effects were not predicted using modeled EECs. Therefore, this species will remain NLAA. No monitoring samples were collected in or upstream of any critical habitats with an NE or NLAA designation.

**Table 1. Summary of Monitoring Data Findings for NLAA Species, Range**

| **Entity ID / Common Name** | **Were there sites in range?** | **Were there detections in range?** | **Were there sites w/i 68 mi upstream of range?** | **Were there detections w/i 68 mi upstream of range?** | **Summary** | **Were there sites > 68 mi upstream of range?** | **Were there detections at > 68 mi upstream of range?** | **Summary** | **Distance Info** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 135Roseate tern | No | No | Yes | Yes | There were 106 sites within 68 stream miles upstream of the species range, with a detection frequency of 16% (n=1927), collected between 1993 and 2019. Concentrations ranged from 0.00172 to 13.7 ug/L, with a time of travel ranging from < 1 and > 365 days. | Yes | Yes | There were 81 sites greater than 68 stream mi upstream of the species range, with a detection frequency of 10% (n=2045), collected between 1994 and 2019. Concentrations ranged from 0.00166 to 1.1 ug/L, with a time of travel ranging from < 1 and > 365 days. | Distances for monitoring sites were from 68 to 383 stream miles upstream of the species range.  |
| 136Roseate tern | No | No | Yes | Yes | There were 1 sites within 68 stream miles upstream of the species range, with a detection frequency of 11% (n=103), collected between 1996 and 2013. Concentrations ranged from 0.003 to 0.414 ug/L, with a time of travel ranging from > 365 days.  | Yes | Yes | There were 16 sites greater than 68 stream mi upstream of the species range, with a detection frequency of 1% (n=158), collected between 2009 and 2014. Concentrations ranged from 2.06 to 2.06 ug/L, with a time of travel ranging from 1 and > 365 days.  | Distances for monitoring sites were from 145 to 677 stream miles upstream of the species range.  |

1. U.S. Geological Survey, 2011, National Hydrography Dataset (ver. NHDPlusV2), now maintained at  URL <https://www.epa.gov/waterdata/nhdplus-national-hydrography-dataset-plus>  [↑](#footnote-ref-2)