Interim Core Map Documentation for the Everglade Snail Kite

Date Uploaded to EPA's Geoplatform: August 2025

Draft Interim core map developer: Center for Biological Diversity (CBD)[1]
Documentation supplemented by the U.S. Environmental Protection Agency's (EPA) Office of Pesticide Programs

Species Summary

The Everglade snail kite (*Rostrhamus sociabilis plumbeus;* EntityID 1221) is an endangered medium-sized raptor. This species occurs in Florida, Cuba (including Isla de la Juventud) and northwestern Honduras. The current distribution of the Everglade snail kite in Florida is limited to central and southern portions of the State. There is a designated critical habitat for this species. Additional information is provided in **Appendices 1-3**.

Description of Core Map

The interim core map for the Everglade snail kite is biological information type, consisting of the species critical habitat and recent known locations. The species range covers most of the state of Florida and includes large areas of non-habitat where individuals may be observed flying through but does not represent the wetland habitat required for feeding or nesting. FWS designated a critical habitat in 1977 and it has not been updated. The old critical habitat areas are occupied and are the base of the core map. Known locations from published surveys and e-bird data were added. **Figure 1** depicts the interim core map for the Everglade snail kite. The core map represents approximately 2,023,486 acres.

Snail kites inhabit areas with their main food source the Florida apple snail (*Pomacea maculata*), freshwater marshes and the shallow vegetated edges of lakes (natural and man-made) in humid, tropical ecoregions of peninsular Florida and are characterized as palustrine-emergent, long-hydroperiod wetlands often on an organic peat substrate overlying oolitic limestone or sand or directly on limestone or marl. Landcover categories within the core map area are included in **Table 1**. Landcover within the core map is predominantly emergent herbaceous wetlands and woody wetlands which is consistent with the habitat of this species.

The core map developed for the Everglade snail kite is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include the Everglade snail kite. This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has a "moderate" (4) best professional judgment classification because it consists of the species' critical habitat and known locations compiled from online databases with a degree of uncertainty. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.

[1] CBD sent EPA the core map for this species before EPA released its mapping process document and example documentation. EPA supplemented the documentation and supporting analysis for consistency with EPA's most recent documentation examples made available after CBD developed this core map

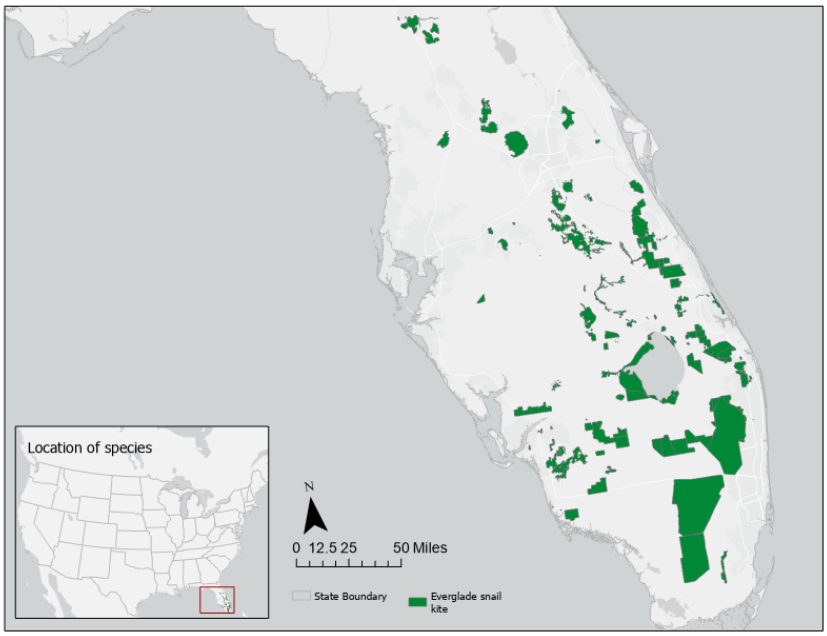

Figure 1. Core map for the Everglade snail kite. Total acreage of core map is approximately 2,023,486 acres.

Table 1. Percentage of Core Map Represented by NLCD[2] Land Covers and Associated Example Pesticide Use Sites/Types.

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
Forestry	Deciduous Forest (41)	0%	2%
Forestry	Evergreen Forest (42)	2%	2%
Forestry	Mixed Forest (43)	0%	2%
Agriculture	Pasture/Hay (81)	11%	11%
Agriculture	Cultivated Crops (82)	0%	11%
Mosquito adulticide, residential	Developed Open Space (21)	3%	5%
Mosquito adulticide, residential	Developed Low Intensity (22)	1%	5%

[2] Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, https://doi.org/10.5066/P9JZ7AO3

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
Mosquito adulticide, residential	Developed Medium Intensity (23)	1%	5%
Mosquito adulticide, residential	Developed High Intensity (24)	0%	5%
Invasive species control	Woody Wetlands (90)	23%	82%
Invasive species control	Emergent Herbaceous Wetlands (95)	44%	82%
Invasive species control	Open Water (11)	11%	82%
Invasive species control	Grassland/Herbaceous (71)	2%	82%
Invasive species control	Shrub/Scrub (52)	2%	82%
Invasive species control	Barren Land (31)	0%	82%
Total Acres	Interim Core Map Acres	~ 2,023,486	

Evaluation of Known Location Information

There are five datasets with known location information for this species:

- Descriptions of locations provided by FWS 2023 5-Year Review[3]
- Occurrence locations in iNaturalist
- Occurrence locations in NatureServe[4]
- Occurrence locations in eBird
- Occurrence locations in Snail Kite Demography 2022 Annual Report on the 2021 Breeding Season

CBD used known locations described in the FWS 2023 5-Year Review, occurrence locations in eBird, and occurrence locations in the Snail Kite Demography Annual Report. EPA evaluated three additional sets of data to ensure all populations are captured in the core map. iNaturalist observations were robust and assumed to be accounted for in the core map. Occurrences in NatureServe did not support expanding the core map. **Appendix 1** includes more information on the available known location information.

[3] U.S. Fish and Wildlife Service. 2023. Everglade Snail Kite *Rostrhamus sociabilis plumbeus* 5-Year Review: Summary and Evaluation. Atlanta, Georgia. (/https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/4500.pdf)

[4] https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.102826/Rostrhamus_sociabilis_plumbeus

Approach Used to Create Core Map

CBD compiled available information for the Everglade snail kite from FWS as well as observational information available from various publicly available sources (discussed in previous section). The information compiled for the Everglade snail kite is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- Current existing populations occur in locations consistent with the critical habitat;
- The species' critical habitat is highly refined.
- Existing populations documented by known locations

CBD used the compiled information to identify the core map type, including the species range, critical habitat, and known location information. CBD compared known location data to the range and critical habitat and found that the FWS known locations of currently existing (extant) populations are in habitats that support the Everglade snail kite population and will be added to the core map.

The species range follows geopolitical boundaries (i.e., counties) and is not likely limited to the areas containing habitat of the species. The range is also much larger than the areas where known locations occur. Based on this information, CBD used the designated critical habitat and known locations as the core map.

CBD used the designated critical habitat provided by FWS for the Everglade snail kite and downloaded the critical habitat from FWS's ECOS (https://ecos.fws.gov/ecp/).

Appendix 2 provides more details on the GIS analysis and data used to generate the core map. Cultivated lands were removed from the final core map because the species is considered as occurring off cultivated lands, the procedure described in Appendices 3 and 4 of the December 2024 "Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats" was applied.

Discussion of Approaches and Data that were Considered but not Included in Core Map

Alternative approaches and data not already described in this document were not explored in the development of this interim core map.

Appendix 1. Information Compiled for Species During Species Summary

Compile available information for species

1. **Recent FWS documents**
   - FWS, "*South Florida Multi-Species Recovery Plan,"* 1999, https://ecos.fws.gov/docs/recovery_plan/140903.pdf
   - Fletcher et al., "SNAIL KITE DEMOGRAPHY 2022 Annual Report on the 2021 Breeding Season", 2022.
   - FWS, "Everglade Snail Kite (Rostrhamus Sociabilis Plumbeus) 5-Year Review: Summary and Evaluation," 2023, https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/4500.pdf.
   - FWS, "Everglade Snail Kite Recovery Plan Amendment." 2019 https://ecos.fws.gov/docs/recovery_plan/Everglades%20Snail%20Kite%20Recovery%20Plan%20Amendment_1.pdf)

2. **Background information**
   - Status: Federally listed as endangered in 1967
   - Resiliency, redundancy, and representation (the 3Rs) (Everglade Snail Kite Recovery Plan Amendment 2019 https://ecos.fws.gov/docs/recovery_plan/Everglades%20Snail%20Kite%20Recovery%20Plan%20Amendment_1.pdf)

   These criteria address what is necessary to ensure resiliency, redundancy, and representation by addressing factors that threaten the species. In achieving these criteria, we expect the snail kite to have a low probability of extinction for the foreseeable future and have stable populations needed for long-term recovery.

   Criterion 1. Providing redundancy through populations in multiple important areas throughout the historical range (i.e., northern, central, and southern areas) and sufficient habitat and demographic parameters that allow for resilient and stable populations. Snail kite persistence depends on maintaining hydrologic conditions that support apple snails, sparsely distributed emergent vegetation, and suitable nesting substrate in wetlands across the region each year (Martin et al. 2008).

   Criterion 2. Providing a long-term solution to significantly reduce or eliminate the threat of nonnative species. Prolonged periods of high and low water have impacted the native apple snail populations that the snail kites rely upon for food.

   Criterion 3. Ensuring sufficient habitat is expected to remain for long-term persistence, despite habitat changes and habitat loss due to climate change. Short-term natural disturbances and long-term habitat degradations (e.g., the conversion of wet prairies to sloughs in WCA 3A) may alter both prey density and habitat conditions for foraging and successful reproduction for snail kites.

   Criterion 4. Providing a long-term solution to significantly reduce or eliminate the threat of human disturbance and predation.

Criterion 5. Providing a long-term solution to significantly reduce or eliminate any potential new threats, such as diseases like AVM, caused by a cyanobacteria that has been confirmed in portions of the snail kite's range.

- **Habitat, life history and ecology**
  - "Snail kite habitat consists of freshwater marshes and the shallow vegetated edges of lakes (natural and man-made) where apple snails can be found. These habitats occur in humid, tropical ecoregions (Bailey 1978) of peninsular Florida and are characterized as palustrine-emergent, long-hydroperiod wetlands (Cowardin et al. 1979) often on an organic peat substrate overlying oolitic limestone or sand or directly on limestone or marl (Davis 1946). Suitable foraging habitat for the snail kite is typically a combination of low profile (< 3 m) marsh with an interdigitated matrix of shallow (0.2-1.3 m deep) open water, which is relatively clear and calm." (FWS 1999 p. 4-294)

- **Taxonomy**
  - "In an early description of species, the race or subspecies "plumbeus" was attributed to Everglade Kites (Rostrhamus sociabilis) that occurred in Southern Florida and the West Indies (Baird et al. 1874). Based on morphology, Friedman (1933, 1950) then separated the West Indies individuals into the "levis" subspecies (race). Therefore, at the time of the species listing under the Preservation Act, experts considered four subspecies 1) R. s. levis occurring in Cuba and Isle of Pines; 2) R. s. plumbeus in Florida; 3) R. s. major in Mexico and Central America; and 4) R. s. sociabilis in South America (Friedmann 1950). In 1975, the species was reorganized by experts into three subspecies: 1) R. s. sociabilis in South and Central America north through Honduras; 2) R. s. major in Mexico, Guatemala, and Belize; and 3). R. s. plumbeus in Florida, Cuba, and Isle of Pines (currently called Isla de Juventud, off the coast of Cuba) (Amadon 1975). This reorganization combined the levis subspecies with the plumbeus. This was supported by lack of distinctive differences in color or size of individuals. Assessment of movements of kites in Florida and the geographic nearness of Cuba, well within dispersal and flying ability of kites, would support the inclusion of Cuba and the Isles of Pines in the subspecies range (Beissinger et al. 1983). However, currently there is no evidence that dispersal occurs between Florida and Cuba (Bennetts and Kitchens 1997, Reichert et al. 2020). (FWS 2023 p. 3)
  - Currently, based on Reichert et. al. (2020), there are three recognized subspecies of snail kite:
    - R. s. sociabilis "locally in Central America from S Nicaragua through Costa Rica and Panama to South America, occurring in Colombia and Ecuador and, E of Andes, throughout Venezuela, the Guianas and Brazil to EC Argentina and Uruguay."
    - R. s. major in "E Mexico (C Veracruz to Yucatán Peninsula), N Guatemala (Petén), Belize and NW Honduras"
    - R. s. plumbeus in Florida Everglades (SE USA), Cuba and Isle of Pines (currently recognized as Isla de la Juventud). Based on this information, the subspecies R. s. plumbeus includes individuals in Florida, Cuba, and Isla de la Juventud."
- **Overall threat statement**
  - Threats to this species and the apple snail include habitat loss from changes in hydrology, invasive vegetation, pollution, and other threats. (FWS 2023 p. 7)

- **Evidence of pesticide threat**
    - "Threats to the snail kites' native food resources, Florida apple snails, include water levels, hydroperiods, vegetation structure, non-native apple snails, and the presence of contaminants in Florida waters." FWS 2023 p. 7
    - "Threats to the subspecies outside of Florida in addition to those described above could include pesticides, toxins, and environmental contaminants that may be more strictly controlled or banned in the United States (see Conservation and Management/Effects of Human Activities in Reichert et. Al. 2020 for additional details)." FWS 2023 p. 8

- **Relevant pesticide use sites**
    - Degradation of water quality, particularly runoff of phosphorous from agricultural and urban sources, is another threat to the snail kite. The Everglades was historically an oligotrophic system, but major portions have become eutrophic. The concentration of total phosphorus in Lake Okeechobee almost doubled from 49 µg/L in 1973 to 98 µg/L in 1984 (Janus et al. 1990). Most of this increase has been attributed to non-point source runoff from agricultural lands north of the lake, in the Kissimmee River, Taylor Slough and Nubbin Slough drainages (Federico el al. 1981). Eutrophication also is a concern in the Kissimmee chain of lakes. Nutrient enrichment leads to growth of dense stands of herbaceous emergent vegetation, floating vegetation (primarily water hyacinth and water lettuce) and woody vegetation, which inhibits the ability of snail kites to find food (See also Habitat section above). (Source: FWS 1999 p4-303)

3. Description of Species Range

- The current distribution of the Everglade snail kite in Florida (**Figure 1**) is limited to central and southern portions of the State. Six large freshwater systems are located within the current range of the snail kite: Upper St. Johns drainage, Kissimmee Valley, Lake Okeechobee, Loxahatchee Slough, the Everglades, and the Big Cypress basin (Beissinger and Takekawa 1983, Sykes 1984, Rodgers et al.1988, Bennetts and Kitchens 1992, Rumbold and Mihalik 1994, Sykes et al.1995). (FWS 1999 p 4-293)
    - **Figure A1-1** depicts the current FWS species range (last updated September 22, 2023).
    - The species range is approximately 22,646,848 acres.

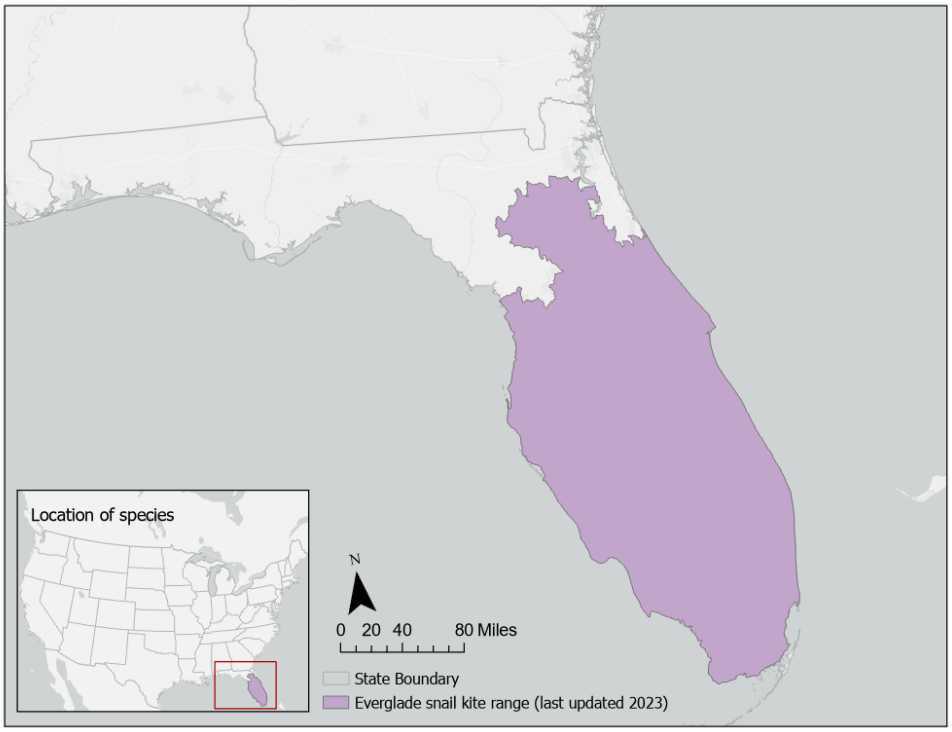

Figure A1-1. FWS range of the Everglade snail kite.

4. Critical habitat

- Critical habitat for the Everglade snail kite was designated on August 22, 1977 (42 FR 47840). About 841,635 acres of critical habitat are located within nine critical habitat units that include the littoral zone of Lake Okeechobee, portions of the Water Conservation Areas (WCA; 1,350 square miles of area developed to regulate water in the open areas of the Everglades and help alleviate flooding from Lake Okeechobee in order to better manage water flows and usage), and Everglades National Park. (FWS 2019)
- In recent years, use of the originally designated critical habitat units by snail kites has decreased significantly. Snail kites have been documented to use areas not originally designated as critical habitat, such as the Kissimmee Chain of Lakes (KCOL; i.e., Lake Tohopekaliga, East Lake Tohopekaliga, Lake Kissimmee, Lake Hatchineha, Lake Istokpoga, and Lake Jackson), the Kissimmee River Basin in central Florida, Stormwater Treatment Areas (living wetland treatment areas used to remove nutrients from stormwater runoff), and other various wetlands in the Upper St. Johns marshes. (FWS 2019)
- **Figure A1-2** depicts the current critical habitat.

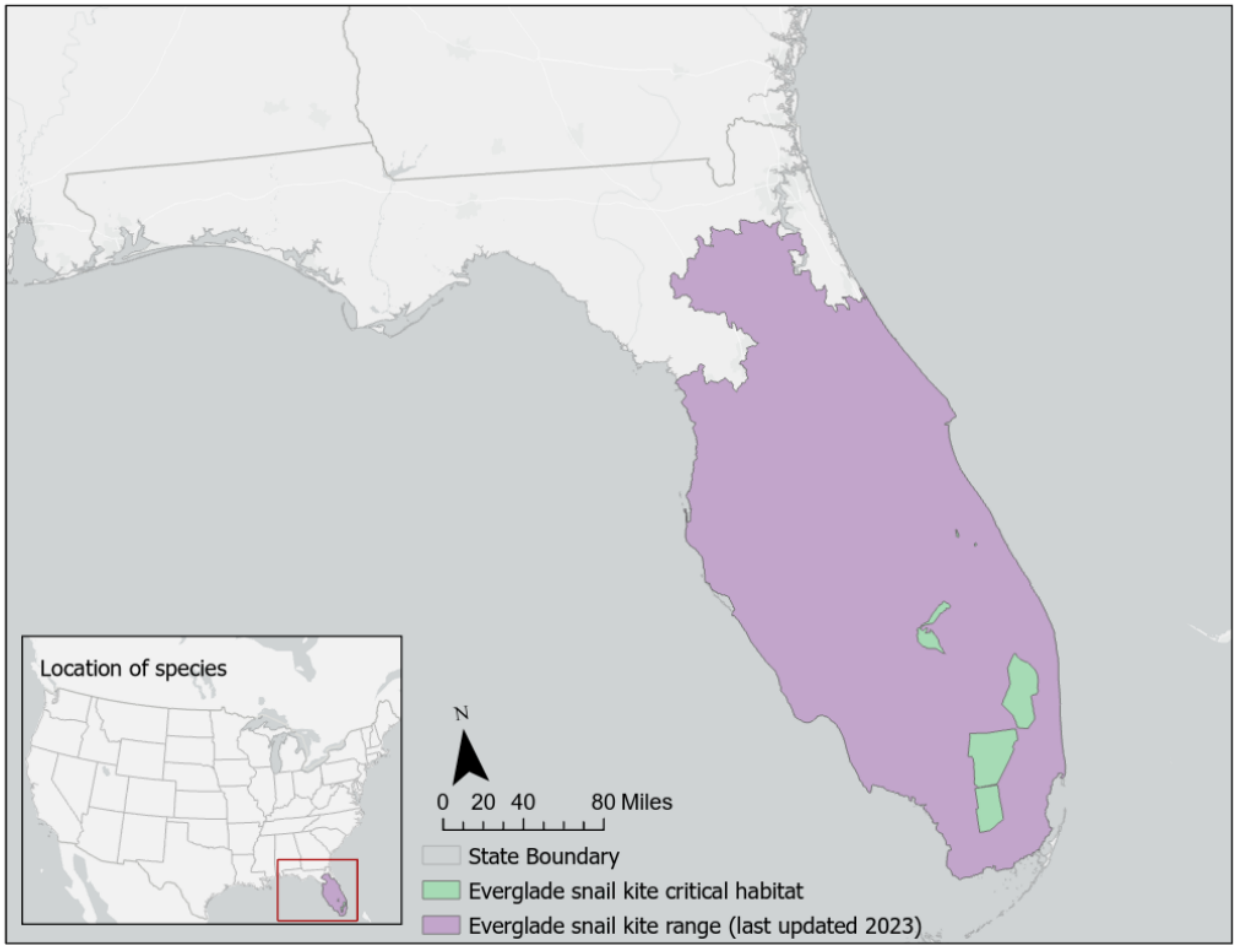

Figure A1-2. FWS critical habitat of the Everglade snail kite. Range also included for reference.

5. Known locations

- **Known Locations Described in FWS Recovery Documents**
  - At listing, the snail kite was only found in the Everglades, but populations there have decreased over time. The species has been increasing in Paynes Prairie, Kissimmee River Valley, St. John's Marsh, southeastern Florida, and around Lake Okeechobee. (FWS 2023 pp. 4-6)
  - **Figure A1-3** depicts the known location data in FWS' most recent 5 year review (FWS 2023 p. 6)

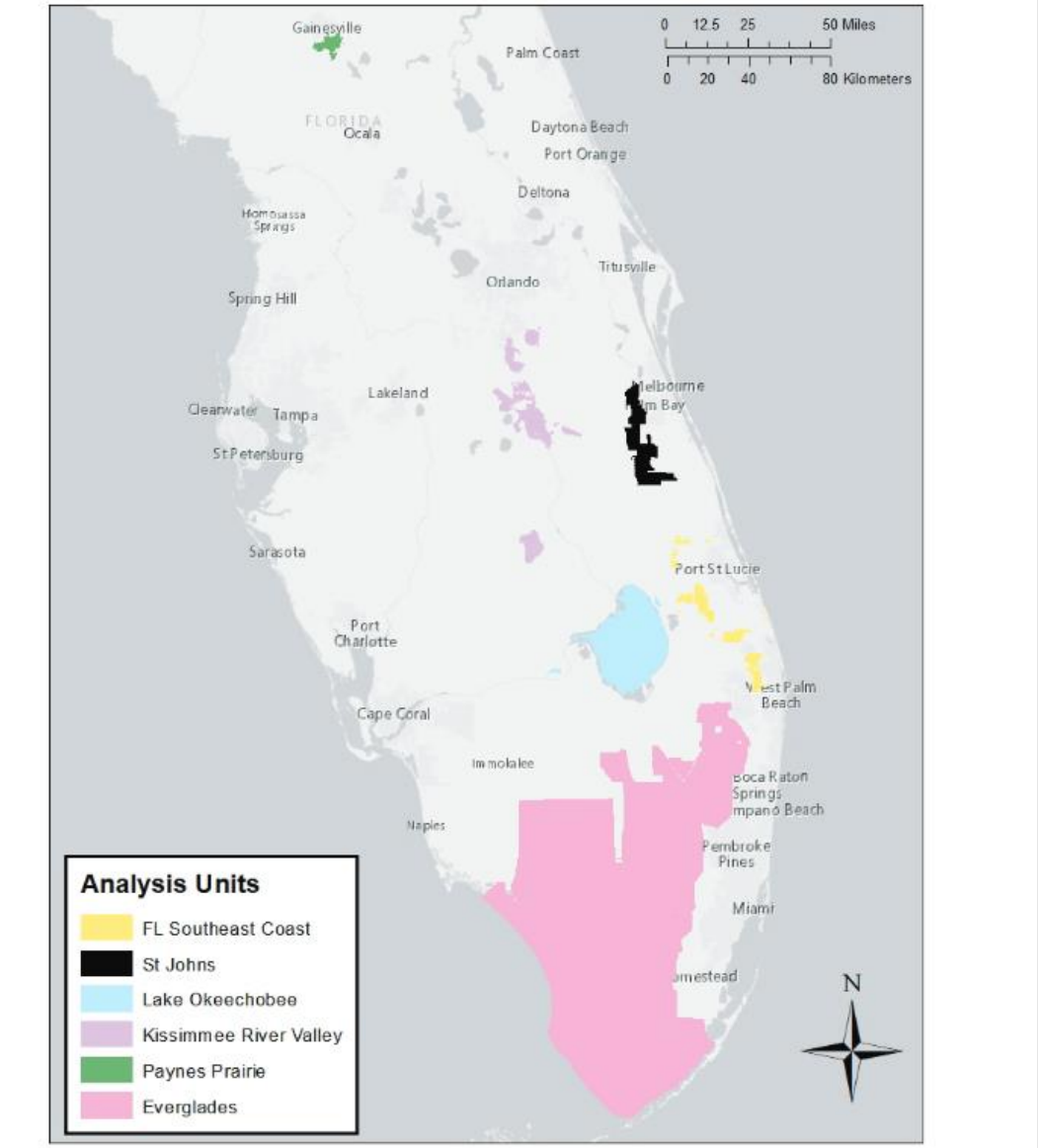

Figure A1-3. FWS 2023 5YR map analysis units used for assessing the snail kite in Florida.

- **Occurrences in eBird**
  - Searched on June 2018 **(EPA)**
  - Website: https://ebird.org/species/snakit/US-FL (EPA)
  - There are a total 38,093
  - **Figure A1-4** depicts the locations of these observations.

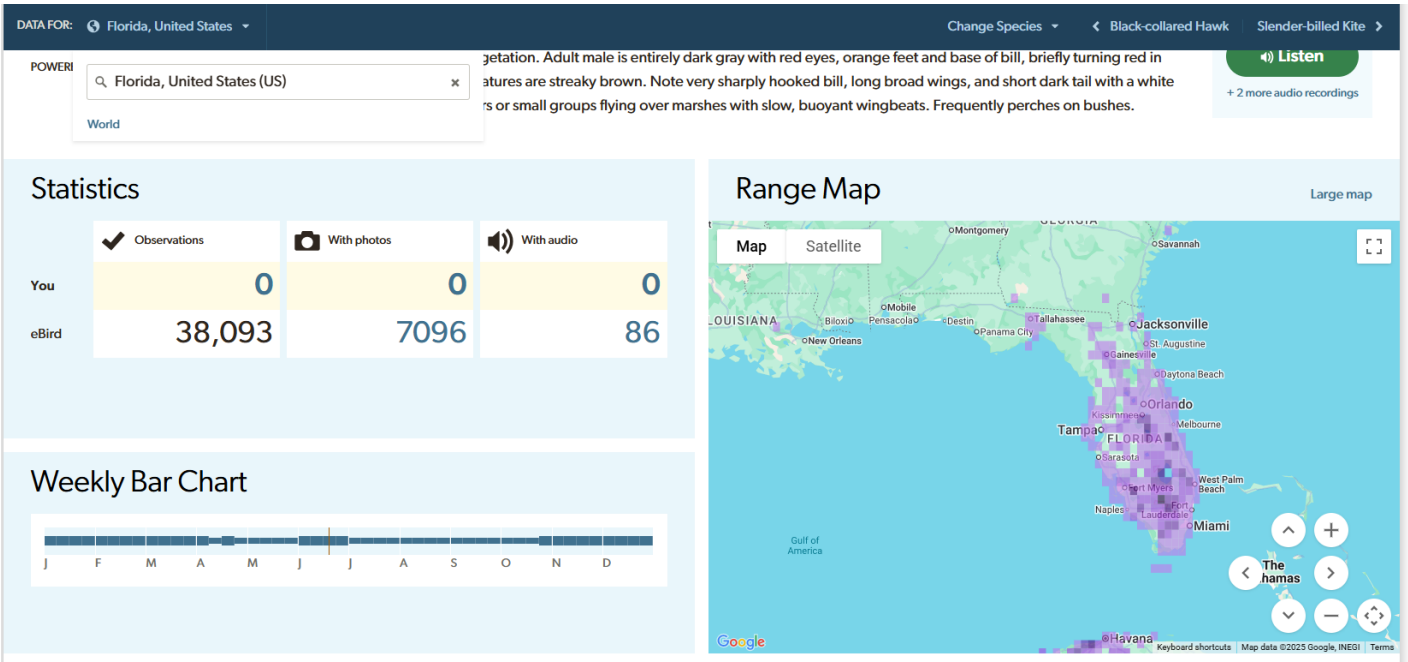

Figure A1-4. EBird Observation Map (https://ebird.org/species/snakit/US-FL)

- Occurrences in Nature Serve
  - Occurrences in the public access Nature Serve (Natureserve.org) were not at a level of resolution to allow for map refinement.
- Occurrences in SNAIL KITE DEMOGRAPHY 2022 Annual Report on the 2021 Breeding Season (Fletcher 2022 p. 56)
  - **Figure A1-5** depicts the locations of the survey.

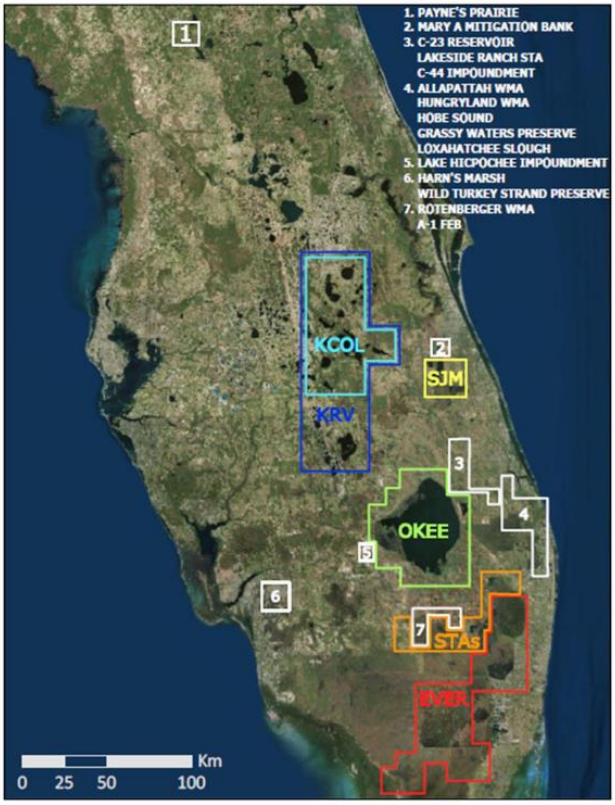

Figure A1-5 Areas of annual survey (Fletcher 2022).

List of public lands that are “in”? habitat

- Critical Habitat areas
    - Everglades National Park
    - Loxahatchee National Wildlife Refuge (= Water Conservation Area 1)
    - Water Conservation Areas 2 and 3
    - Areas in western Lake Okeechobee
    - Fort Durham Wildlife Management Area
    - Small area southeast of Fort Durhman WMA
- Areas outside of Critical Habitat
    - Big Cypress National Preserve
    - West Palm Beach Water Catchment Area
    - Holey Land Wildlife Management Area
    - Florida Panther National Wildlife Refuge
    - Lake Kissimmee + Kissimmee Chain of Lakes Area
        - Lake Tohopekaliga
        - East Lake Tohopekaliga
        - Lake Runnymeade
        - Cypress Lake
        - Lake Hatchineha
        - Rolling Meadows
        - Tiger Lake
        - Jackson Lake
        - Parker Lake

        - Marian Lake
    - Other Kissimmee River Valley (KRV) sites
        - Kissimmee Restoration Area
        - Lake Istokpoga
    - St. John's Marsh Area
        - Blue Cypress Conservation Area
        - Fellsmere Canal
        - Fellsmere Areas 1, 2, and 4
        - Sixmile Restoration Area Unit 3
        - Kenansville Lake
    - Mary A. Mitigation Bank
    - Allapattah WMA
    - Hungryland WMA
    - Grassy Waters Preserve
    - Loxahattche Slough
    - Rotenberger Wildlife Management Area
    - Payne's Prairie Preserve State Park
    - C-23 Reservoir Lakeside Ranch STA
    - C-44 Impoundment
    - A-1 Flow Equalization Basin (FEB)
    - Lake Hicpochee Impoundment
    - Stormwater treatment areas 1, 2, 5
    - Harn's Marsh
    - Wild Turkey Strand Preserve

- **Occurrences in iNaturalist**

The iNaturalist data were only used to determine if it supported changes to the draft core map. iNaturalist data do not support changing the draft core map based on the 213 iNaturalist research grade and verifiable occurrences that were observed January 1, 2010- March 12, 2025. https://www.inaturalist.org/observations?d1=2010-01-01&d2=2025-03-12&quality_grade=research&subview=map&taxon_id=238323

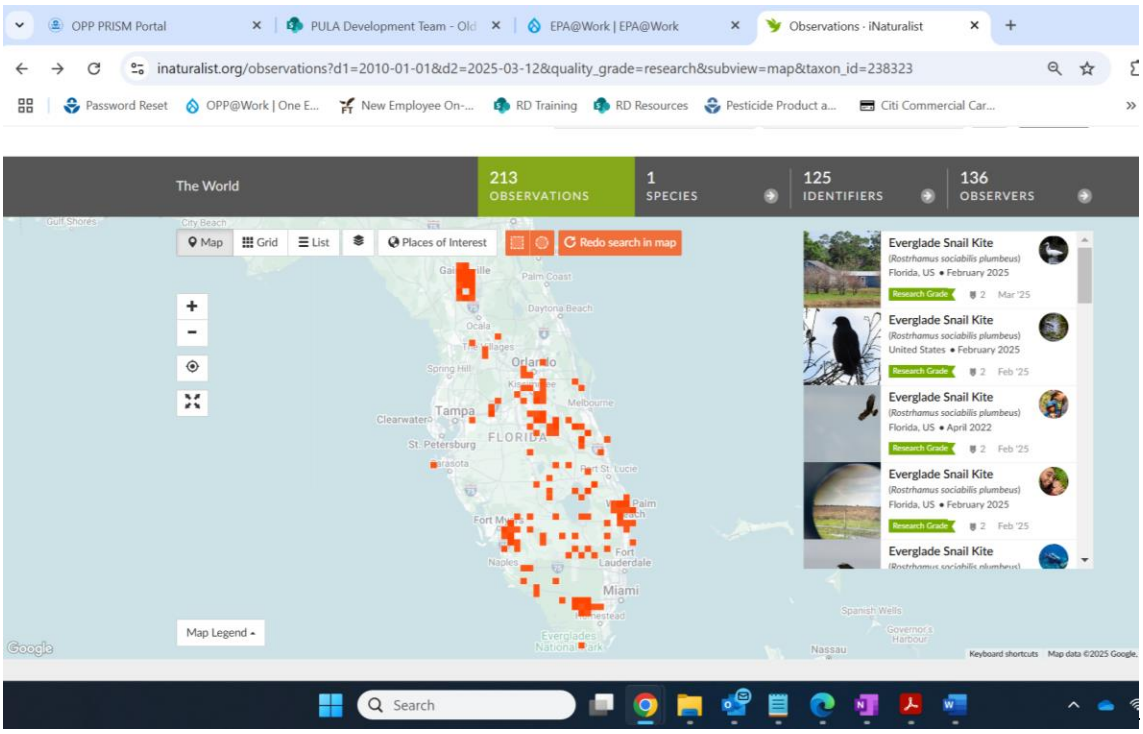

Figure A1-6. iNaturalist occurrences for the Everglade Snail Kite.

Appendix 2. GIS Data Review and Method to Develop Core Map

Identify core map type

This core map was created based on critical habitat plus recent known locations. The ECOS range map covers most of the state of Florida and includes large areas of non-habitat for the bird where they may incidentally be observed flying through and do not necessarily represent the wetland habitat they need to find food or nest. FWS designated critical habitat in 1977 and is still occupied and were included in the core map. Newly discovered nesting and suitable wetland habitats have been discovered and monitored.

Dataset References and Software

- Species Range—last updated September 22, 2023.
- Critical habitat—designated in 1977.
- Known locations
    - Descriptions of locations provided by FWS 2023 5-year review
    - Occurrence locations in eBird
    - Occurrence locations in SNAIL KITE DEMOGRAPHY 2022 Annual Report on the 2021 Breeding Season
- Software used: ArcGIS Pro 3.3, QGIS 3.34.10

Core Map Development

1. Use the critical habitat as a basis for the core map
    a. Areas on federal lands in critical habitat (primarily within Everglades National Park) were removed, as it is assumed that federal national parks will follow a pesticide management plan. If this assumption changes, the map can be easily adapted.

2. Add to the core map the following public land areas. These areas are identified within EVERGLADE SNAIL KITE analysis areas.
    a. Big Cypress National Preserve (as above Big Cypress was ultimately excluded, as we are assuming that it will be subject to a federal pesticide management plan. For other, smaller areas of public lands, our decision to include was based on its proximity to agricultural or use pattens that could impact habitat.)
    b. West Palm Beach Water Catchment Area
    c. Holey Land Wildlife Management Area
    d. Florida Panther National Wildlife Refuge
    e. Mary A. Mitigation Bank
    f. Allapattah WMA
    g. Hungryland WMA
    h. Grassy Waters Preserve
    i. Loxahatchee Slough
    j. Rotenberger Wildlife Management Area
    k. Payne's Prairie Preserve State Park
    l. C-23 Reservoir Lakeside Ranch STA
    m. C-44 Impoundment
    n. A-1 Flow Equalization Basin (FEB)

o. Lake Hicpochee Impoundment
p. Stormwater treatment areas 1, 2, 5
q. Harn's Marsh
r. Wild Turkey Strand Preserve

3. Georeference and digitize Figure 1 from Fletcher 2022 p. 56
    a. Core Survey and Analysis areas are used to determine the outer bounds of the core map in step 4 (use of e-Bird data)

4. E-Bird Data
    a. First, e-Bird occurrences were narrowed to between February and July, which is the nesting period for the Everglade snail kite. This helps filter out isolated occurrences outside of core populations. Data were requested September 9, 2024, and accessed on September 10, 2024. A total of 45,425 occurrences were received (3,839 reviewed; 41,586 not reviewed).
        i. eBird tracks the general snail kite data since the species occurs worldwide. Occurrences in Florida are all the subspecies, and while it is potentially possible, though extremely unlikely, that a snail kite from South America was lost in Florida and misidentified, our review was meant to target breeding populations (which would only be Everglade snail kite). The only difference between Everglade snail kite and snail kite is the beak size (email clarification from CBD May 23, 2025).
    b. Second, occurrences on federal lands were excluded, given the same justification above, though areas where the Everglade snail kite was identified on the margins of federal land that abut usage areas were ultimately added back in. This removed approximately 964 occurrences.
    c. Third, occurrences on tribal land were removed. This excludes 74 occurrences
    d. Fourth, occurrences within 500 feet from federal highways were removed – these accounts typically for flyover sightings on roadsides, an inherent issue with e-Bird data. This excludes 2410 occurrences.
    e. Fifth, occurrences were aggregated by the day. This is to account for multiple birds seeing the same bird on the same day which would improperly determine that area to be a hotspot. Later in the analysis, we manually determined whether the same group of birds were sighting a "continuing" bird over a week period instead of a core population of birds.
    f. Sixth, we placed one mile by one mile grid over the entire state of Florida and set a hot-spot parameters whereby five occurrences would flag a hotspot.
    g. Seventh, in Core Survey and Analysis Areas from Fletcher 2022, we included all wetlands that overlapped with a hotspot.
    h. The remaining approximately 200 occurrences required manual review. The results of which areas were excluded or included are laid out in **Appendix 3**. In this review we considered the following factors:
        i. Whether suitable habitat appeared on satellite imagery, this was most often used to exclude birdwatchers in suburban areas who may have been observing Everglade snail kites travelling through marshes.
        ii. Whether occurrences of the Everglade snail kite happened year over year, or whether they were singular occurrences or sporadic occurrences over a single month.

iii. Were possible, we relied upon e-Bird picture documentation and notes. If nesting activity was reported or feeding behavior was observed, we factored that into consideration.
iv. The proximity to core populations or critical habitat, we used this to determine whether sightings might represent an expansion of the core population or isolated birds flying to stop-over marshes accidentally.
v. Proximity to use sights and land designation. We excluded some protected areas that were clearly disjunct from any potential insecticide use, though may have include lands immediately adjacent that would not be protected.

5. iNaturalist Data
    - Accessed March 12, 2025, iNaturalist: https://www.inaturalist.org/
    - Explore: Rostrhamus sociabilis ssp. plumbeus
    - Filters: research grade and verifiable
    - Filters: date range January 1, 2010-March 12, 2025
        - https://www.inaturalist.org/observations?d1=2010-01-01&d2=2025-03-12&quality_grade=research&subview=map&taxon_id=238323
        - 213 observations
    - Downloaded points if needed from the filter pane
        - EvergladeSnailKiteiNaturalistobservations-538460.csv exported
        - Added “delimited text layer” to EvergladesSnailKiteQGIS.qgz
        - Geometry CRS Project CRS: EPSG:4326-WGS 84
    - Notes
        - Occurrences are generally accounted for within the core map. Most outliers are in protected areas/national parks/conservation areas.

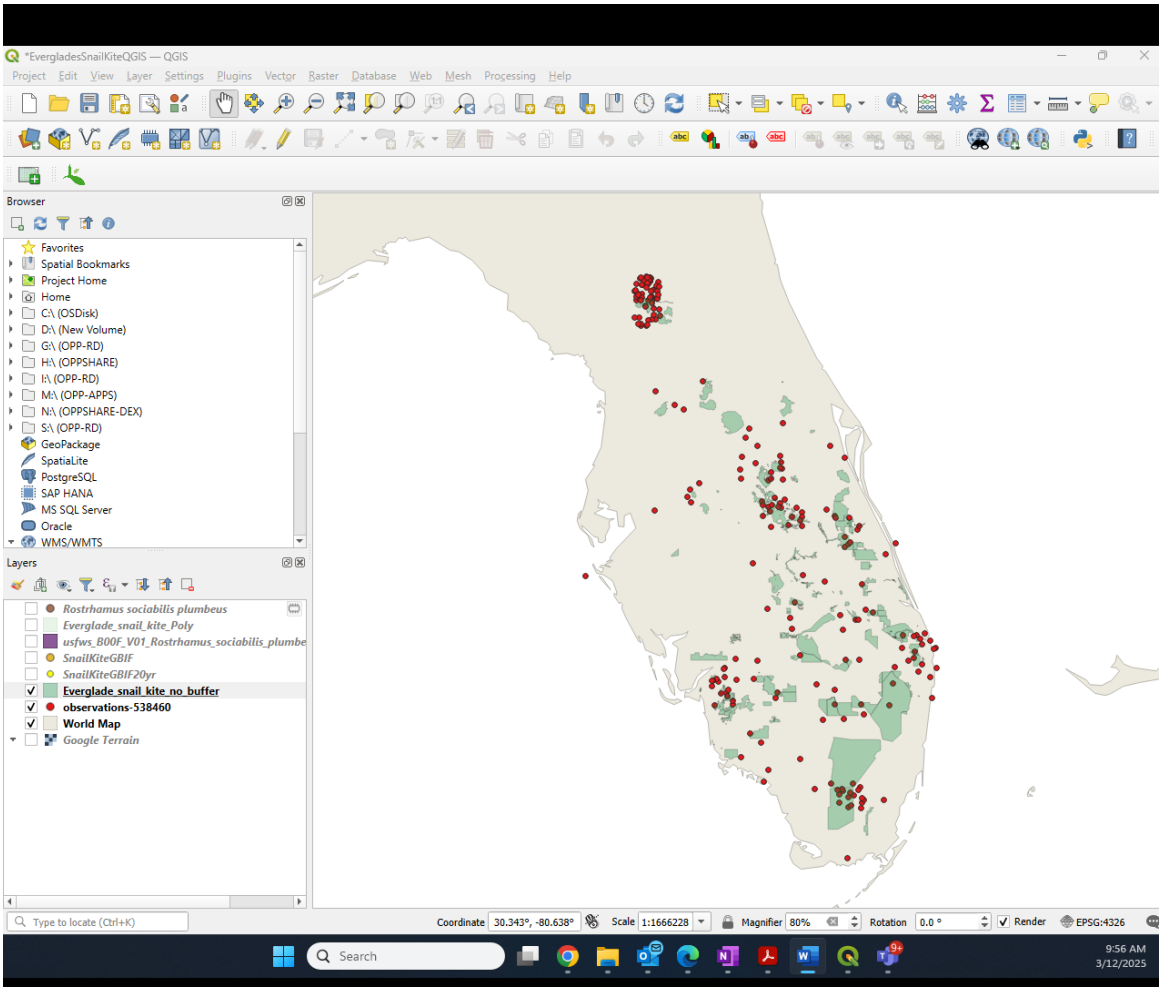

Figure A2-1. Overlap of iNaturalist points with the Everglade Snail Kite core map.

Deviations from process

CBD employed a best professional judgement standard in evaluation e-Bird data and determining occupied habitat.

Appendix 3: E-Bird Occurrences that informed core map development

INCLUDED AREAS

Gainesville Area

- Occurrence near Bivens Lake, reliable based on number of occurrences and proximity to core survey range. Included Bivens lake and surrounding wetlands.
- Occurrence near Lake Kanapaha, over multiple years. Included lake and surrounding wetlands.
- Orange Lake, multiple occurrences over many years in a wetland complex, including Orange Lake, surrounding wetlands, with a cut-off at the highway.
- Lochloosa Lake, multiple occurrences, including airboat surveys denoting nesting activity. Included Lake and surrounding wetland complexes cutting off at highway.

Leesburg Area

- Lake Griffin and Emerald Marsh, multiple occurrences surrounding and within the areas. Most occurrences to the West of the lake. Included the entire lakeshore, given that Everglade snail kites have been seen circling the lake.
- Lake Harris, multiple recent sightings since 2019 (last time Army Corp concluded Everglade snail kite was not in the area). The Everglade snail kite has been seen eating apple snails and flying around lake. Most occurrences are from a highly trafficked garden, meaning the entire lake is more indicative of occupancy.

Sanford Area

- Colby Lake, multiple sightings over 2 years, some with pictures. Area is representative of Everglade snail kite habitat on GIS imagery.
- Lake Jesup and Lake Monroe, sightings within breeding season over 2 years, multiple non-breeding season occurrences.

Greater Orlando Area

- Lake Apopka, including marshes surrounding the lake and up to the North shore at Jones Road. Multiple occurrences year of year suggest the area is a hotspot not included in any surveys.
- Withlacoochee River, Outlet River, and Associated Marshes. Occurrences along river, Everglade snail kite known to be in area. Sightings are year over year and include sightings of Everglade snail kite eating snails.
- Orlando Wetlands Park, although most occurrences a likely within the adjacent Seminole Ranch Conservation Area, sightings have occurred in this park, which is at the boundary of developed land. Our assumption is that the entirety of the Wildlife Management Area will be protected from pesticides.
- River Lakes Conservation area, including area outside the conservation area where the Everglade snail kite has been sighted.
- Sawgrass Lake, multiple sightings, likely part of core St. Johns River population or feeding habitat.

- Three Forks Conservation Area, including additional areas outside the conservation area, official survey data shows this area represents an extension of the core ACOE survey population to the south to a hotspot population to the north at Sawgrass Lake.
- Near Fort Drum Wildlife Management, from the critical habitat to the wastewater treatment plant, Everglade snail kites are seen consistently eating around canals.
- N Florida Turnpike near critical habitat, occurrences on roadside, but proximity to critical habitat warrants considerations.

Lakeland Area

- Sawgrass Lake - multiple sightings, included wetlands complexes around the lake.
- Lake Alfred, multiple sightings around wetland complex.
- Lake Gwyn Park, marsh inside the park, many sightings, though none since 2018, site identified as a "known location" in eBird documentation. Potential safe haven for larger populations.
- Blue Lake, former nesting habitat of the Everglade snail kite, though recent sightings in 2023 where Everglade snail kite is still fishing the lake for snails.

Tampa Area

- Mosaic Four Corners, recent sightings and known in the area near Altman tract conservation area. Area between roadways considered as occupied site.

Lake O Area

- Near Lake Placid, many occurrences can be seen from the roadway into what is described as "extensive habitat" in the Everglade tailwaters NWR. Also includes recently developed impoundment that is reportedly attracting Everglade snail kites.
- Lower Kissimmee River, multiple occurrences below core survey region in known habitat.
- Yates marsh, multiple occurrences near known habitat. Occurrences are also recent
- South of State Road 70, multiple and recent occurrences near Wetland Reserve Program land.
- State Road 70, include wetlands between canals.
- NE 39th Blvd, recent year over year occurrences on Wetland Reserve Program land.
- North shore of Lake O, high number of occurrences adjacent to critical habitat and within historical habitat, included shoreline wetlands as well as adjacent wetland reserve program land with multiple occurrences.
- Dupuis Reserve, multiple sightings, and although it is a protected area, it is immediately adjacent to agriculture, where most sights have occurred.
- South Lake O, included marsh habitat along the shoreline.
- Included Cowbone marsh, suitable habitat with known occurrences adjacent to critical habitat.

Port St. Lucie Area

- Ten-mile creek, although reports that most nesting trees were cut down some years ago, a small population seemingly persists, with recent occurrences. In 2016, 46 Everglade snail kites were spotted on a survey that included nesting Everglade snail kites. Data reports heavy apple snail infestation in wetlands.
- Savanna Preserve, occurrences at top bottom, with limited occurrences in middle, likely represents a population.

- Hackberry Hammock, occurrences outside of the critical habitat in suitable habitat.

Charlotte County/Sarasota/Fort Myers Area

- Multiple occurrences, known wetlands, suitable habitat.
- Fred C. Babcock Park, park identified as a hotspot, but presumably the park boundaries will cover known populations, though areas outside the park should still be protected with a PULA.
- Powell Creek Preserve, Everglade snail kites recently seen hunting the marsh, year after year occurrence, potential foraging ground for nearby populations.
- Six Mile Cypress Slough Preserve, a decade of occurrences, clear occupied area.
- Lake Regional Park, nearly a decade of Everglade snail kite occurrences.
- Corkscrew Road subdivision, occurrences around residential areas are evidence of a larger population existing nearby. Unbroken marsh provides suitable habitat for snail kites.

Palm Beach Areas

- Bee Line Hwy, significant areas of occurrence abutting ACOE survey lands.
- Riverbend Park, year over year occurrences in protected park surrounded by suburban habitat.
- Kitching Creek, occurrences year over year, with recent occurrences in 2022.
- Winding Waters, significant occurrences, adjacent to core populations noted by ACOE .

Immokalee/Naples Area

- Near Dinner Island Wildlife Management Area, since occurrences are in proximity to agriculture, and since these areas have multiple occurrences, a PULA is warranted that extends over private land as well.
- Near Immokalee Airport, reliable sightings near suitable habitat.
- Lake Trafford and Corkscrew Swamp, multiple sightings year over year on the edges of the swamp and around Lake Trafford indicate potential populations within.
- Flint Pen Stand, significant sightings in suitable habitat bordering other areas with significant sightings.
- Conservation easements near Quail Creek Country club have suitable habitat and occur near more core populations.
- Conservation lands surrounding James and Linda White Birding Tower although relatively isolated, multiple occurrences of snail kite seem to stop here when heading north.
- Eagle Lake Community Park, multiple occurrences year over year, likely represents a stopping point for raptors moving north based on E-bird comments.

Everglades Area

- Florida panther NWR, included given smaller size even though it is federal lands, given its proximity to agriculture and its notation as a survey area, unlike Big Cypress and Everglades.
- Frog Ponds/ L-31 Transition Lands, multiple occurrences, including juveniles, likely represents some remaining population.
- Off Oil-Well Road, multiple sightings near suitable habitat year over year likely represent expansion from Big Cypress that warrant protection.
- Outside Collier-Seminole State Park, high level of year of year occurrences in wetlands outside of protected areas surrounding Old Marco Junction. Within those areas, we included all USGS identified wetlands.

Boca Raton Area/South Florida Area

- Added in Loxahatchee NWR to cover occurrences near the edge of Loxahatchee reserve, some of which are on wire, but some are reported to occur on field.
- Green Cay Nature Center Preserve, include, recent occurrences, near some remnant agriculture.
- Fran Reich Preserve, multiple occurrences year over year and adjacent to core survey area.

EXCLUDED AREAS

Gainesville Area

- Newberry - isolated occurrence seem only in one year, in proximity to limestone mining, no likely habitat from GIS imagery
- 39th St Gainesville - occurrences in residential area, comments suggest data not reliable

Sanford Area

- Three sightings on one day of a banded bird spotted from a boat ramp, not within the survey range.

Orlando Area

- Lake Lucy, rarity observed two years in a row. The bird was continuing, and did not appear to be nesting.
- Lake Russell near Disney, issues with veracity of sightings, all occurring away from suitable habitat. Likely these occurrences are flyovers from nearby core populations in survey zones.
- Canaveral Marshes Conservation Area, excluded with the understanding that habitat will be protected under the land designation.
- Malabar excluded - one sighting in 2018, where five were reported.
- South County Regional Park and adjacent occurrence, likely represent flyovers from core populations nearby. Small regional parks.

Brooksville Area

- Coastal sightings, almost all occurring over a one-month period. Likely not representative of a population.

Lakeland Area

- Lake Smart - no occurrences since 2016, last occurrences were isolated.

Lake O

- Excluded sightings away from South shoreline directly in ag, seemingly not suitable habitat, and likely species from core populations in adjacent critical habitat.
- Excluded areas near Lake Hipochee, as existing surveys note occupancy in lake nearby. Occurrences are roadside sightings.

Port St. Lucie

- One recent sighting of five "raptors" near critical habitat. If credible, likely represents sightings of critical habitat population.
- South or Rim Ditch, as data from eBird is one person birding in the same area every day.

Tampa Area

- Sarasota Springs, unreliable ebird occurrences, what narrative is included shows the birds may have been travelling.

Palm Beach Area

- Occurrence in Jupiter farms, likely flyovers from nearby core. Large suburban area.
- J.W. Corbett, excluded from PULA despite occurrences as potential errant populations are protected by virtue of state park designation.
- Areas of occurrence around Harns Marsh - Harns Marsh is a core population, and occurrences outside of the marsh most likely represent soaring birds instead of new populations.

Charlotte County/Sarasota/ Fort Myers

- Occurrences mention high-flyers, not within. Lee County Park inventory does not include snail kite.
- North of SR 82, degraded wetland within agricultural lands, one sighting in 2019 of multiple birds.
- South of SR 82 off Alexander Graham Bell, degraded habitat abutting an active mine.
- SR 82 near SR 29, two occurrences in 2019, road-sightings not indicative of active habitat.
- SR 29, one occurrence with an observation count of 5.

Everglades Area

- Big Cypress Preserve and Everglades National Park, as we assume that federal conservation lands will be managed under appropriate pesticide management plans.
- Big Cypress and Francis S. Taylor WMA and associated complex of protected lands do have occurrences near critical habitat but are distinct from agriculture and likely protected by virtue of their conservation status. Other areas are on tribal land.
- North of Stormwater Water Treatment Area, one occurrence on field in 2019, likely a flyover from protected lands.
- Excluded occurrences west of STA 5, likely flyovers from nesting populations in protected areas, will be protected by buffer.
- Directly east of critical habitat in water conservation area, nesting populations may occur, but occurrences are represented by roadside sightings. Land likely protected by virtue of its conversation status and provides a buffer from critical habitat.
- South of the park, in Navy Wells Park, only one occurrence in 2016.
- Far south of the park, roadside occurrences likely do not represent core populations in need of protection.
- Further along Oil Well Road, occurrence hotspot near non-suitable habitat likely represents soaring individuals. Comments in e-bird data references this.
- Weaver's Station, exclude occurrences along Tamiami Trail and Fakahatchee Strand State Park. These occurrences likely represent individuals seeing birds along roadside while entering the park, which if it does have core populations, is protected from pesticide use and also isolated from agriculture.

Boca Raton Area/South Florida Area

- Excluded subdivision occurrences near Hidden Valley Canal, while recent occurrences, hot spot is only representative of one sighting of 13 individuals with no historical sightings.
- Excluded subdivision occurrences near Boca Tierra Park, all sightings were over the course of a month in 2024 and likely do not represent core populations.
- Boca Dunes Golf and Country Club, occurrences potential occurred along a canal, but area has no suitable habitat for the Everglade snail kite.
- Pine Trails Park, no occurrences since 2018, no nesting activity, occurrences likely represent stopovers from core populations areas nearby.
- Pine Island Ridge Natural Area, small patch of suitable habitat, occurrences, but noting flyovers, likely a stopping point for Everglade snail kites flying outside nesting populations.

Naples Area

- Excluding isolated occurrences along water.
- Off Picayune Strand State Forest, excluded one isolated sighting of 7 birds.

Bulleted GIS Process for Everglade Snail Kite Core Map

1. Converted eBird .txt file to excel.
2. Used lat and long with create points (EBirk_ESK)
3. Extract month from "observed date" (Month($feature.OBSERVATION_DATE)) + 1
4. Definition query to Filter for months 2 – 7 and exported these records. (EBird_ESK_ExportFeeatuesFeb_July)
5. Filtered USGS PAD-US on "Owner Type = "FED" or "Owner Type = "TRIB"
6. Intersected filtered GIS data and exported bird point data with filtered USGS PAD-US
7. Switched intersected result and exported data .(EBird_ESK_ExportFeaturesFeb_July_NonFed_NonTribal)
8. Select Layer by Location where EBird intersects 500 us survey feet of Interstates_TDA. Switch intersected result and exported.
9. Use "Generate grid from Area" on Florida state cell. Width and height cell units are 1 and the Cell units are miles. This created a 1 mile grid.
10. Intersect "Ebird_ESK_ExportFeaturesFeb_July_NonFed_NonTribal_ExportFeatures_Non500Inter" with "FL_1MileGrid". Output is "EBird_Filter_Intersect_FLGrid"
11. Dissolve "EBird_Filter_Intersect_FLGrid" to "EBird_Filter_Intersect_FLGrid_Dissolve".
12. Use "Summarize within" result is EBird_Filter_Intersect_FLGrid_Dissolve_SumWithin
13. Create a field named, "Mean_Observ_CountByDate"
14. Calculate this field by "Sum_MEAN_OBSERVATION_COUNT"
15. Select where Mean_Observ_CountyByDate is greater than 0
16. Export this as an excel table as EBird_Filter_Intersect_FLGrid_Dissolve_SumWithin.xls
17. Join the "EBird_Filter_Intersect_FLGrid_Dissolve_SumWithin.xls" table to the "FL_1MileGrid" by "Grid" field
18. Definition Query "Mean_Observ_CountyByDate is >= to "5" (this is 436 records)

19. Export this as “FL_1MileGrid_ExportFeatures”

20. Use all Everglade Snail Kite Critical Habitat and copy and paste them into “Everglade_snail_kite_Poly_NoEbird.shp”. (a-f are named description of critical habitat areas)
    a. Everglade snail kite critical habitat. Arthur R. Marshall Loxahatchee National Wildlife Refuge and Water ConservationArea 2A
    b. Everglade snail kite critical habitat. Everglades National Park
    c. Everglade snail kite critical habitat. Section of Water ConservationArea 3A
    d. Everglade snail kite critical habitat. T34S R38E S1/2 Sec. 10, N1/2 Sec. 21
    e. Everglade snail kite critical habitat. T33S, 437E SW1/4 Sec. 6, W1/2 Sect. 7, Sec. 18, Sec. 19
    f. Everglade snail kite critical habitat. Western area of Lake Okeechobee.
21. Add to the “Everglade_snail_kite_Poly_NoEbird.shp” the following public land areas
    a. “USGS PADUS 4.0 Big Cypress National Preserve”
    b. “USGS PADUS 4.0 Holey Land Wildlife Management Area”
    c. “USGS PADUS 4.0 Florida Panther National Wildlife Refuge”
    d. “USGS PADUS 4.0 Mary A Ranch Mitigation Bank”
    e. “USGS PADUS 4.0 Allapattah Flats”
    f. “USGS PADUS 4.0 John C. and Mariana Jones/Hungryland Wildlife and Environmental Area”
    g. “USGS PADUS 4.0 Grassy Waters Preserve”
    h. “USGS PADUS 4.0 Loxahatchee Slough Natural Area”
    i. “USGS PADUS 4.0 Rotenberger Wildlife Management Area”
    j. “USGS PADUS 4.0 Paynes Prairie Preserve State Park”
    k. “GIS Union of USGS PADUS 4.0 and South Florida Water Management District with C-23 Reservoir or STA in the name”
    l. “USGS PADUS 4.0 Lakeside Ranch STA”
    m. “USGS PADUS 4.0 C-44 Stormwater Treatment Area”
    n. “South Florida Water Management District A-1 Flow Equalization Basin (FEB)”
    o. “USGS NHD Lake Hicpochee and surrounding marsh area”
    p. “South Florida Water Management District Stormwater Treatment Areas 1, 2, and 5.”
    q. “USGS PADUS 4.0 Harn's Marsh”
    r. “USGS PADUS 4.0 Wild Turkey Strand Preserve”
22. Geo-referenced and digitize Figure 1 from Fletcher 2022 p. 56
    a. From the Figure 1 map select areas labeled as the Kissimmee River Valley (KRV) and St. John’s Marsh (SJM)
    b. Within these areas clip USGS NHD marshes, lakes and pond
    c. Add them to “Everglade_snail_kite_Poly_NoEbird.shp”
23. Select by Location where “FL_1MileGrid_ExportFeatures” intersects “Everglade_snail_kite_Poly_NoEbird.shp” intersects. Then switch selection and export to “EBird_Filter_Intersect_FLGrid_Dissolve_SumWithin__Non_CurrentAOO”
24. Zoom to each record in “EBird_Filter_Intersect_FLGrid_Dissolve_SumWithin__Non_CurrentAOO”. Made a determination based on the imagery and Ebird data, what record area to create.
25. Removed the records created from step 22.
26. Added back in “U.S. Army Corps of Engineers 2022 Annual Report Kissimmee River Valley study area where Sept Ebird data aggregated by date & summarized to 1 mile grids that are = to or greater than 5 & intersect USGS NHD swamp/marsh and lake/pond area”

Note: At some point a decision was made to not Include Big Cypress National Preserve in the final Poly submission. The two “FL_1MileGrid_ExportFeatures” within the Big Cypress National Preserve were reviewed and found no likely presence or habitat.