Interim Core Map Documentation for Attwater's Greater Prairie-Chicken

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Species Summary

The Attwater's Greater Prairie-Chicken (*Tympanuchus cupido attwateri*; Entity ID 83) is a bird species that was federally listed as endangered in 1967. FWS has not designated a critical habitat for this species. This species occurs in coastal prairie habitat, generally preferring open areas of vegetation 24 inches or less in height but sometimes uses densely vegetated areas over 24 inches in height for purposes such as fall feeding grounds. Its diet consists of insects, fruit, leaves, shoots, flowers, seeds, and grain. This species is known to occur on pasture and agricultural fields including corn, rice, and peanuts, which represent potential pesticide use sites. FWS has indicated that this species is not expected to occur on cotton fields. Additional information is provided in **Appendix 1**. This species is currently included in the Vulnerable Species Action Plan.

Description of Core Map

The core map for the Attwater's Greater Prairie-Chicken (AGPC) is based on biological information, which includes suitable habitat and known locations. The outer extent of the core map is based on a map generated by USFWS during the 2022 malathion registration review consultation because it accounted for area where the AGPC is known to occur. The map generated from that consultation was a contiguous area, accompanied by a narrative that described relevant habitats of the AGPC. For this core map, EPA explicitly mapped relevant habitats within the area that USFWS delineated so that pesticide users would not need to interpret a narrative that described relevant habitats. There is no critical habitat for this species. A range core map type was not chosen because the range includes areas where populations of the species are extirpated. **Figure 1** depicts the interim core map for the AGPC. The core map represents approximately ~557,000 acres in Texas.

Landcover categories within the core map area are included in **Table 1**. Landcover is predominantly represented by scrub/shrub areas and pasture/hay pesticide use sites. This species is also known to use Rights of Way.

The core map developed for the AGPC is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include this species. 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 an "average" best professional judgment classification with respect to data interpretation made regarding species habitat. During the malathion consultation FWS provided feedback on where these species is known to occur. When FWS reviews this interim core map, it may be possible to improve the confidence in this core map by reducing the uncertainty associated with the resolution of the known locations and habitat assumptions. This core map does not replace or revise the range or critical habitat developed by FWS for the AGPC.



Figure 1. Interim core map for Attwater's Greater Prairie Chicken.

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

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type
	Deciduous Forest (41)	2	
Forestry	Evergreen Forest (42)	1	7
	Mixed Forest (43)	4	
Agriculturo	Pasture/Hay (81)	51	E 2
Agriculture	Cultivated Crops (82)	2	55
	Open space, developed (21)	1	
Mosquito adulticide residential	Developed, Low intensity (22)	0	1
	Developed, Medium intensity (23)	0	-
	Developed, High intensity (24)	0	

¹ Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <u>https://doi.org/10.5066/P9JZ7AO3</u>

Example pesticide use sites/types	NLCD Class/Value	% Area	Total area for landcover type	
Invasive species control	Woody Wetlands (90)	2		
	Emergent Herbaceous Wetlands (95)	2		
	Open water (11)	0	39	
	Grassland/herbaceous (71)	2		
	Scrub/shrub (52) 33			
	Barren land (rock/sand/clay; 31)	0		
Total Acres	Interim Core Map Acres	ore Map Acres ~557,000 acres		

Evaluation of Known Location Information

There are three datasets with known location information:

- Descriptions of locations provided by FWS;
- Occurrence locations in iNaturalist and GBIF (these were equivalent);
- Occurrence locations in NatureServe.

EPA evaluated these sets of data for potential utility in informing the interim core map. iNaturalist included 108 research grade observations, which were equivalent to observations available through the Global Biodiversity Information Facility (GBIF). These 108 locations were consistent with the locations available through NatureServe and FWS. No significant clusters dating after the most recent 5-year review fell outside of the two identified areas that were used to create the malathion BiOp species PULA (used as the core map outer extent). Any deviations from that area are from observations dating before the last 5-year review, and those populations are known to be currently extirpated based on the5-year review. The occurrence data further supports using the malathion BiOp PULA as the boundaries as the core map outer extent for AGPC. Additional information is included in Appendix 1.

Approach Used to Create the Core Map

The core map was developed using the "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".² (referred to as "the process"). This core map was developed by EPA using the 4 steps described in the process document:

- 1. Compile available information for a species;
- 2. Identify core map type;
- 3. Develop the core map for the species; and
- 4. Document the core map.

For step 1, EPA compiled available information for the AGPC from FWS, as well as observational information available from various publicly available sources (including iNaturalist, GBIF, and

² Dated 2024, available online at: <u>https://www.epa.gov/endangered-species/process-epa-uses-develop-core-maps-pesticide-use-limitation-areas</u>

NatureServe). The information compiled for the AGPC and relevant data sources are included in **Appendix 1**. Influential information that impacted the development of the core map includes:

- PULA created by FWS for the 2022 malathion BiOp;
- The species will enter and feed in lands containing pasture, corn, rice, and peanuts.
- The species prefers open grasslands with vegetation less than 24 inches tall overall, but it may use dense vegetation over 24 inches tall for fall feeding.
- NLCD habitat confirmed by FWS, including Grassland/Herbaceous, Barren Land, Shrub/Scrub, Mixed Forest, Evergreen Forest, and Deciduous Forest.

For step 2, the developer used the compiled information to identify the core map type, including the species range known location information and available biological information from FWS species reports and the malathion consultation. EPA compared the known location data to the range and existing PULA from malathion. **Figure A1-1** in **Appendix 1** depicts the range. **Figure A1-2 through A1-6** in **Appendix 1** depicts known locations. **Figure A1-7** in **Appendix 1** depicts the PULA developed during the malathion consultation which includes currently occupied areas. The data suggests that the 2022 map developed as part of the malathion BiOp is still appropriate to use as an outer boundary of the core map, and that the map could be further refined using habitat information for the species found in FWS species reports and provided by FWS during the malathion consultation.

For step 3, the developer used the best available data sources to generate the core map. Data sources are discussed in the process document. NLCDhabitat data were used to select species suitable habitat for the core map, which is described in detail in **Appendix 2**. The outer extent of this core map was the PULA provided by FWS for the malathion BiOp. EPA performed additional refinements to ensure areas of vegetation over 24 inches tall and pasture, corn, rice, and peanuts were included in the core map. Since this species may feed in areas over 24 inches tall in the fall, those areas were included in the map using the 2020 Global Canopy Height.³ raster dataset. EPA's Use Data Layers (UDLs) were included in the core map to capture the cultivated crops and pasture used by AGPC, including the Pasture UDL, Corn UDL, Rice UDL, and Other Row Crops UDL.

Appendix 1 includes additional information on the AGPC, and **Appendix 2** provides more details on the GIS analysis and data used to generate the core map.

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

In addition to considering the NLCD for habitat data, the GAP and Landfire were considered. They were excluded from the core map only because they did not alter the shape of the core map from what was determined by the NLCD.

There were multiple datasets from which to choose when including pasture and certain agricultural crops in the AGPC core map, which are discussed in **Appendix 2**. More specific crop data was considered more useful and informative for refining the core map than less specific crop data. EPA's pesticide risk assessments use its Use Data Layers (UDLs) and are more specific than NLCD/GAP/Landfire General

³ Dated 2020, available online at:

https://epa.maps.arcgis.com/home/item.html?id=2a3dfb00c2c6425f85bd70da420d58eb additional summary information can be found here: https://hub.arcgis.com/maps/esri::global-canopy-height-2020/about

Cultivated Crop and Pasture Attributes. Therefore, the core map uses UDLs to identify types of crops or landcover when it more closely matched habitat descriptions of the AGPC.

The AGPC uses taller vegetation in the Fall. Therefore, EPA considered developing different core maps for different seasons (e.g., one core map that features only areas of open vegetation less than 24 inches tall). However, it is unclear if seasonal core maps could feasibly be integrated into pesticide labeling processes. Also, the core map is already limited in its spatial extent, which reduces any potential benefit from the additional complexities of multiple core maps for a species.

Appendix 1. Information compiled for species during Step 1

1. Recent FWS documents

- Attwater's Prairie-Chicken (*Tympanuchus cupido attwateri*) Recovery Plan, Second Revision (2010), <u>https://ecos.fws.gov/docs/recovery_plan/100426.pdf</u>
- Attwater's Greater Prairie-Chicken (*Tympanuchus cupido attwateri*) 5-Year Review: Summary and Evaluation (2021), <u>https://ecosphere-documents-production-</u> <u>public.s3.amazonaws.com/sams/public_docs/species_nonpublish/995.pdf</u>
- Recommended Protection Measures for Pesticide Applications in Region 2 of the U. S. Fish and Wildlife Service (2004), <u>https://azdot.gov/sites/default/files/media/2022/10/USFWS-2007-</u> <u>Recommended-Protections-for-Pesticide-Applications-in-Region-2.pdf</u>
- Malathion Biological Opinion (2022), <u>https://www.fws.gov/sites/default/files/documents/Executive-Summary-Malathion-Biological-Opinion.pdf</u>
- Enlist Biological Opinion (2023), <u>https://www.regulations.gov/docket/EPA-HQ-OPP-2021-0957/document</u>

2. Background information

- Status
 - Federally listed as endangered in 1967.
- Resiliency, redundancy, and representation (the 3Rs)
 - \circ $\;$ No information on the 3Rs is available in public documents at this time.
- Habitat: "The Attwater's prairie chicken uses different areas of coastal prairie grassland, preferring a variety of short, mid and tall grass prairie. The habitat is usually dominated by tall dropseed (*Sporobolus asper*), little bluestem (*Schizachyrium scoparium*), sumpweed (*Iva frutescens*), broomweed (*Xanthocephalum texanum*), ragweed (*Ambrosia psilostachya*) and big bluestem (*Andropogon gerardii*) (Recovery Plan, USFWS 1983). They may use grass areas less than 10 inches in height for courtship, feeding, and to avoid moisture. Grass up to 10-16 inches tall is used for roosting and feeding, whereas 16-24 inches of grass (maximum height) are used for nesting, loafing, feeding, and escape. Interspaces between grass clumps should be relatively open to facilitate movement. Densely vegetated areas over 24 inches in height are generally avoided but may be used occasionally for protection from inclement weather and predators, and as fall feeding grounds (Recovery Plan, USFWS 1983)." (Enlist BiOp, USFWS)
- Habitat: Grasslands include savannas, prairies, and rangeland with few woody plants and a diversity of native or introduced grasses and forbs (e.g. non-woody flowering plants) (Malathion BiOp/PULA)
- **Diet**: "The APC diet consists mostly of insects, especially grasshoppers during the summer and at other times eats fruit, leaves, flowers, shoots, seeds, or grain (Campbell 1995)." (Enlist BiOp, USFWS)
- "Lehmann (1941:60) summarized food habits of the APC (scientific names of plants have been added to Lehmann's text): "The food of adult prairie chickens is about 85 percent vegetable matter and 15 percent animal. With young birds the ratio of vegetable to animal is approximately reversed. Favorite sources of plant food are ruellia (*Ruellia* spp.), perennial

ragweed (*Ambrosia psilostachya*), blackberry (*Rubus* spp.), doveweed (*Croton capitatus*), and sensitive briar (*Schrankia* spp.). Leading animal foods are grasshoppers and beetles. Greens (leaves, flowers, buds) are lowest in the diet in November and December; seeds are taken in the smallest proportions in January, February, and March. Insects are least frequently captured in November, December, and January." (Recovery Plan 2010)

- "Lehmann (1941) also noted APCs used cultivated crops such as corn, peanuts, and rice as food sources." (Recovery Plan 2010)
- Taxonomy: Bird
- Relevant Potential Pesticide Use Sites Noted in FWS Documents
 - Attwater's is known to enter cropland adjacent to its habitat, as well as grassland, pasture and rights-of-way. <u>https://azdot.gov/sites/default/files/media/2022/10/USFWS-2007-Recommended-Protections-for-Pesticide-Applications-in-Region-2.pdf</u> has an abundant amount of information on pesticide use and Attwater's prairie chicken (see page 110, number 44).
 - "Lehmann (1941) also noted APCs used cultivated crops such as corn, peanuts, and rice as food sources." (Recovery Plan 2010)
 - FWS noted in the Enlist BiOp (Appendix B): "We expect some individuals of the Attwater's greater prairie-chicken will occur and forage on agricultural fields, and thus, are at risk of dietary exposure to Enlist One or Enlist Duo (primarily through ingestion of contaminated food items). Corn, cotton, or soybean fields overlap with 5% of the species' range (Table 4). While Attwater's prairie-chickens are known to forage on agricultural land, information solicited from species experts indicate that individuals are not likely to use cotton fields at all as these fields do not match preferred foraging areas. Thus, we only consider overlap with corn or soybean fields as likely areas for on-field exposure."
 - Pesticide Sensitive Areas are noted in **Table A1-1**.

Pesticide Sensitive Area
The area bounded on the north side by Interstate
Highway 10, on the east side by State Highway 36,
on the south side by Porter Chapel Road which is
extended westward by a straight line to Bernard
Creek and then southward along the creek to the
San Bernard River, and on the west side by the San
Bernard River.
The area bounded on the north side by Interstate
Highway 10; on the east side by the San Bernard
River; on the south side by FM 3013; and on the
west side by County Roads 96, 101, 253, 172, and
218.
The area bounded on the west side by State
Highway 146, on the south side by Dickinson
Bayou and Dickinson Bay, and on the north side by
Moses Lake.

Table A1-1. Pesticide Sensitive Areas noted by FWS (2007).

• Recovery Criteria/Objectives (Recovery Plan 2010)

- "Downlist to threatened status when the overall population maintains a minimum of 3,000 breeding adults annually over a 5-year period and there is sufficient habitat of coastal prairie grasslands (approximately 150,000 ac (60,702 ha)) to support this population. These 3,000 breeding adults should be distributed along a linear distance of no less than 50 miles (80 km) to mitigate for environmental stochasticity (*e.g.,* hurricanes) while maintaining genetic flow."
- "Delist when the overall population reaches a minimum of 6,000 breeding adults annually over a 10-year period and occupying approximately 300,000 ac (121,457 ha) of maintained or improved coastal prairie grassland habitat along a linear distance of no less than 100 miles."

• Recovery Actions (2010 Recovery Plan)

- "Objective 1: Maintain and improve 300,000 ac (121,457 ha) of coastal prairie habitat for APC throughout the bird's historical range on both private and public lands. APC recovery will require a network of large, high quality coastal prairie habitats containing multiple core areas distributed along at least 100 linear miles (160 km). A core area is defined as an area of habitat capable of supporting a population of 500 (250 displaying males), or approximately 25,000 ac (10,121 ha) (assuming a carrying capacity of 1 bird/50 ac (20 ha) (Lehmann 1941).
- **Objective 2:** Enhance propagation and release efforts to boost wild populations to viable levels and reestablish physically and behaviorally healthy birds to their former range, as measured by the following criteria:
 - (a) Maintain 90% of original gene diversity for 20 years with a minimum of 200 birds in the captive flock.
 - (b) Produce enough chicks annually to release at multiple sites (approximately 100 birds per release site).
 - Increase capacity of breeding pairs to a minimum of 100 pairs within 2 years.
 - Increase survival in the captive environment so that 50% of eggs produced survive to 8 weeks of age.
 - (c) When number of young available for release exceeds 100, pilot releases of no fewer than 30 should be considered on private lands.
- **Objective 3:** Establish populations of at least 500 birds in multiple core areas, providing for gene flow between populations (see Objective 1).
- **Objective 4:** Broaden public support and partner in efforts to conserve the APC and its coastal prairie ecosystem."

3. Description of Attwater's Greater Prairie Chicken Range

 Current USFWS range map (Figure A1-1), last updated in the USFWS Environmental Conservation Online System (ECOS) March 19, 2018, includes 16 counties in Texas including: Aransas, Austin, Bee, Calhoun, Colorado, DeWitt, Fayette, Fort Bend, Goliad, Jackson, Lavaca, Nueces, Refugio, San Patricio, Victoria and Waller.



Figure A1-1. USFWS Range for Attwater's Greater Prairie Chicken. Species range is 3 million acres and was last updated 03-19-2018.

4. Designated Critical Habitat

• Critical Habitat has not been designated for the Attwater's greater prairie chicken.

5. Known Locations

- "The Attwater's prairie chicken was formerly found throughout Gulf Coast prairies of southwestern Louisiana and Texas, south to the Rio Grande. Presently, less than 200,000 fragmented acres of coastal prairie habitat remain and it is restricted to a narrow band along the Texas coast, some offshore islands, and remnant inland populations (NatureServe website 2007). Currently only two APC populations exist in the wild, one at the Attwater Prairie Chicken National Wildlife Refuge in Colorado/Austin County and one on private lands in Goliad County, Texas. There are no known populations of APCs in Aransas, Calhoun, Refugio, and Victoria counties (personal communication, T. Rossignol, Attwater Prairie Chicken National Wildlife Refuge, August 2015)." (Enlist BiOp, USFWS)
- "The APC represents the southern-most subspecies of *T. cupido*, and currently occurs in the wild at only three locations - the Attwater Prairie Chicken National Wildlife Refuge (Colorado County, Texas), the Texas City Prairie Preserve (Galveston County, Texas), and a private ranch in Goliad County, Texas." (Figure A1-2, Recovery Plan 2010)

 "Attwater's prairie-chickens were last observed in 2012 at the Texas City Prairie Preserve (Galveston County). Prairie-chickens have not been released at that location since 2010. Small populations remain at the Attwater Prairie Chicken National Wildlife Refuge (Colorado County) and on private ranchlands in Goliad County (Figure A1-3, 5-year Review)." Both of these populations continue to be supplemented with captive-reared birds.

Figure 1. Approximate distribution of Attwater's prairie-chicken in southeast Texas historically, 1937, 1963, and 2009 (from Morrow et al. 2004 with modification).



Figure A1-2. Maps of the species locations from the FWS Recovery Plan 2010.



Figure 4. Current and historic (from Lehmann 1941) range of Attwater's prairie-chickens in Texas.

Figure A1-3. Map of the species locations from the FWS 5-year Review 2021.

• USFWS developed a Pesticide Use Limitation Area (PULA) including primary management units containing necessary habitat based on the known locations within the species range for the Attwater's Prairie Chicken (see screenshot below, **Figure A1-7**). This PULA was built based on the

following information from the most recent 2021 USFWS 5-year review and was verified again by USFWS species experts in 2022 for the malathion BiOp and 2023 for the Enlist BiOp: "Small populations remain at the Attwater Prairie Chicken National Wildlife Refuge (Colorado County) and on private ranchlands in Goliad County."



Figure A1-7. Map developed by FWS for implementing the 2022 malathion BiOp and 2023 Enlist BiOp (approximately 940,000 Acres).

iNaturalist: Link for research grade observations

- iNaturalist includes 107 research grade observations dated between January 2009 and November 2024.
- 4 observations between February 1986 and March 1996 were not considered due to the age and the number of recent research grade observations.
- The majority of these occurrences are found on the Attwater Prairie Chicken National Wildlife Refuge as described in available FWS reports, the area in Goliad County captured by the species range. There is 1 occurrence from 2012 in the in the area of Galveston Texas; however, FWS noted that the Attwater Prairie Chicken have not been released to this area since 2012. The remaining single occurrence found outside of the range is also likely to be found on the Attwater Prairie Chicken National Wildlife Refuge when considering the point accuracy. Given this, no additional areas were added to the core map for this species, see Figure A1-4 for occurrences.



Figure A1-4. Points of the species occurrences from iNaturalist

- GBIF: Link for species
 - GBIF included <u>68 observations or occurrences</u> dated since 2009 with coordinates. All of these occurrences are research grade iNaturalist observations. No additional areas to add to the core map are identified based on this data.



Figure A1-5. Points of the species occurrences from GBIF.

• NatureServe Explorer Pro.⁴: <u>Link for species results</u>

 Available public occurrences from NatureServe Explorer Pro are in the same general areas as the range and occurrences from iNaturalist. A few historical occurrences from the 80s are found outside of the current range; however, these areas were not considered to be currently occupied due to the age and the more recent information describe in the FWS reports. The occurrence found in the Galveston area does not have a date. For this reason, it was assumed to represent the area without recent bird releases described by FWS. The remaining areas capture the Attwater Prairie Chicken National Wildlife Refuge and the occupied area of Goliad County as described in available FWS reports. No additional areas to the core map are identified based on this data.

⁴ https://explorer.natureserve.org/pro/Welcome

Appendix 2. GIS Data Review and Method to Develop Core Map (Step 3)

1. References and Software

- Attwater's Greater Prairie Chicken PULA for malathion BiOp (2022) and Enlist BiOp (2023): delivered to EPA by FWS, shown in the system https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins
- iNaturalist: <u>https://www.inaturalist.org/</u>
- NatureServe: <u>https://explorer.natureserve.org/pro/?page=Welcome/</u>
- USA National Landcover Database (NLCD): <u>https://epa.maps.arcgis.com/home/item.html?id=3ccf118ed80748909eb85c6d262b426f</u>
- EPA Corn UDL: <u>https://epa.maps.arcgis.com/home/item.html?id=f30c8dc0cd024198aaa9bea8d41d8659</u>
- EPA Rice UDL: <u>https://epa.maps.arcgis.com/home/item.html?id=711cbc2b4a1545ab95a3345d7eac1aa5</u>
- EPA Other Row Crops UDL: <u>https://epa.maps.arcgis.com/home/item.html?id=2b62517253904fa595ab11882c60652f</u>
- EPA Pasture UDL: <u>https://epa.maps.arcgis.com/home/item.html?id=73386e572a5040c99bcb86f1df05d665</u>
- Global Canopy Height 2020: <u>https://epa.maps.arcgis.com/home/item.html?id=2a3dfb00c2c6425f85bd70da420d58e</u> <u>b</u> additional summary information can be found here: <u>https://hub.arcgis.com/maps/esri::global-canopy-height-2020/about</u>
- Software used: ArcGIS Pro version 3.

2. Datasets Used in Core Map Development

2.1. Confirming the core map outer extent as the malathion BiOp PULA

First, the GIS file for the USFWS-provided malathion BiOp 2022 PULA for the Attwater's Prairie Chicken was added to the map (**Figure A2-1**). Next, research grade observations were considered, but were not ultimately used because any observations that were outside of the malathion PULA were prior to the last 5-year review, and those populations are known to be currently extinct. Consequently, EPA used the malathion BiOp PULA as the boundaries of the known location data and outer extent of the core map for AGPC. This malathion BiOP PULA that includes the most up to date information as of 2022 totals 941,013 acres, while the current species range in ECOS last updated 03-19-2018 is 3 million acres. The species range that includes more historic information and extinct populations, prior to 2018, totals 6 million acres.



Figure A2-1. Malathion BiOp 2022 PULA, which served as the outer bound of the interim core map

2.2. NLCD and EPA Use Data Layers (UDLs)

The steps of overlapping the AGPC habitat layers are described in detail below and are specific to ArcGIS Pro 3.2. This interim core map used the NLCD landcover dataset and Global Canopy Height 2020 dataset to map species habitat-based information found in the FWS 2021 5-year Review that included the NLCD habitat and canopy requirements for this species. This species is also known to occur on pasture and agriculture fields, include corn, rice and peanuts as noted in the FWS 2010 Recovery Plan so these areas are also considered habitat for this species. Due to the specificity of the crops name in the FWS report, the EPA UDLs were used to identify these additional habitat areas.

2.3. Habitat Suitability GIS Procedures

For each of the raster datasets the "Export Raster" tool was used to limit the extent of each raster datasets to the malathion PULA for AGPC. Limiting the extent was necessary for efficient data processing. The named habitat classes from the NLCD and UDLs were extracted, converted to polygons then merged using the "Merge" geoprocessing tool to develop the interim core map. Additional details on theses step can be found below. Unless otherwise specified, all rasters were already limited to the extent of the malathion PULA before converting raster data to vector (polygon) format. **Table A2-1** summarizes the landcover datasets and specific layers selected for creating the AGPC core map.

Section 3 includes additional datasets and procedures that were explored during the development process that ultimately were not included in the interim core map.

Table A2-1. Data type, habitat description, spatial data utilized, justification, and sources for habitat parameters of Attwater's Greater Prairie Chicken. This table includes only the map selected to be the core map (named Attwaters_CoreMap_tallveg in the geodatabase). See section 5 of this Appendix for additional datasets that were explored during development.

Data Type	Habitat Description	Spatial Data Set	Justification	Source
Landcover Classification	The Attwater's prairie chicken (APC) uses different areas of coastal prairie grassland, preferring a variety of short, mid and tall grass prairie. Densely vegetated areas over 24 inches in height are generally avoided but may be used occasionally for protection from inclement weather and predators, and as fall feeding grounds.	National Landcover Database (NLCD) 2021	Based on the specific habitat descriptions of this species, the following NLCD land classes were selected for inclusion (setting the "Select by Attributes" to say "ClassName is equal toOR"): Grassland/Herbaceous, Barren Land, Shrub/Scrub, Mixed Forest, Evergreen Forest, Deciduous Forest (FWS 2021 5-year Review). Note pasture areas were added using EPA pasture UDL, see next row.	The NLCD was accessed through ESRI Living Atlas. The main webpage for NLCD can be accessed through MRLC.
Cultivated Areas	APCs use cultivated crops such as corn, peanuts, and rice. Attwater's is known to enter cropland adjacent to its habitat, as well as grassland, pasture and rights-of-way	EPA Corn Use Data Layer (UDL) EPA Rice Use Data Layer (UDL) EPA Other Row Crops Use Data Layer (UDL) EPA Pasture Use Data Layer (UDL)	EPA's pesticide risk assessments are built around its Use Data Layers (UDLs). Since the purpose of a species core map is to be used to build pesticide use limitation area(s), or PULA(s), it is appropriate to use the crop data that EPA uses for its risk assessments rather than crop data from an alternative source. The specific mention of corn, rice, peanuts, and pasture in the specific habitat descriptions of the species led to the inclusion of four UDLs.	The UDLs were accessed through the EPA Office of Pesticide Programs (OPP) Image Service in ArcGIS Online.
Canopy Height	Densely vegetated areas over 24 inches in height are generally avoided but may be used occasionally for	Global Canopy Height 2020	Based on the specific habitat descriptions of this species, exclude areas of greater than 2% canopy cover (this repeats an analysis that was done by FWS using the Global Canopy Height data in the 5-	The Global Canopy Height 2020 data was accessed through the Esri Living Atlas.

Data Type	Habitat Description	Spatial Data Set	Justification	Source
	protection from inclement		year review). Include all vegetation heights due to	The main webpage for the
	weather and predators, and as		the use of taller vegetation as fall feeding grounds	data can be accessed through
	fall feeding grounds.		(Recovery Plan, USFWS 1983).	the Ecovision Lab in the Zurich
				Department of Civil,
	Interspaces between			Environmental and Geomatic
	vegetation should be			Engineering.
	relatively open to facilitate			
	movement.			

The default settings were maintained in geoprocessing tools unless otherwise specified.

2.3.1. Selecting species suitable habitat with the NLCD habitat layer

 Added the NLCD dataset to the map and converted from raster to vector format (Figure A2-2) in order to be able to create a new layer that only represents the area within the USFWS malathion BiOp species boundaries:

Raster to Polygon (tool):

- Input raster: USA_NLCD_Land_Cover
- Field: ClassName
- Simplify polygons: yes
- Multipart features: no
- Output: *NLCD_Tympanuchus_polygon*



Figure A2-2. Changed the NLCD data into polygon format.

- 2) Within the new vector dataset, used the "Select by Attribute" function to select the suitable NLCD land classes within the attribute table for the AGPC and clipped the dataset to the USFWS malathion BiOp species boundaries. - Select by Attribute:
 - Input rows: *NLCD_Tympanuchus*
 - Selection Type: New Selection
 - Expression to include areas of both shorter and taller vegetation described in Table A2-1.
 - Output: *NLCD_tallveg*. Vegetation including both less than 24 inches and 24 inches or more is depicted in dark green in **Figure A2-3**. The black boundaries in **Figure A2-3** show



the extent of the two known location areas that USFWS verified to EPA for use as the malathion BiOp 2022 PULA.

Figure A2-3. Selection of NLCD vegetation including taller vegetation (greater than 24 inches).

2.3.2. Selecting species suitable habitat from the Pasture and Cultivated Crop Use Data Layers (UDLs)

- Created three new cultivated crop layers and one new pasture layer that are clipped to the boundaries of the species. Each contains only the corn (Figure A2-11), rice (Figure A2-12), or peanut (Figure A2-13) cultivated crop data or the pasture data (Figure A2-14) found within the extent of the USFWS-provided malathion BiOp PULA.
 - Raster to Polygon (tool):
 - Input raster: Corn UDL OCSPP/Corn (repeat this for Pasture UDL, Rice UDL, and Peanut aka "Other Row Crops" UDL, making sure to only have fields, indicated by Distance 0, selected)
 - Field: Value
 - Output polygon features: *Corn_Tympanuchus* (also *Rice_Tympanuchus* and *Peanut_Tympanuchus* and *Pasture_Tympanuchus*)
 - Simplify polygons: yes
 - Multipart features: no

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Figure A2-11. Example Raster to Polygon Processing Tool used on the Corn, Rice, Other Crops (peanuts) and Pasture UDLs.

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- -Pairwise Clip (tool):
 - Note that before this tool was run, the raster was successfully clipped to the
 extent of the USFWS-provided malathion BiOp PULA during the "Export Raster"
 step before the earlier "Raster to Polygon" step. The core map creator had to
 adjust the default number of rows and columns to the maximum allowed by
 ArcGIS Pro in order for the "Export Raster" tool to work adjusting this did not
 appear to affect the mapped presence/absence of the use.
 - There was extra area outside of the malathion BiOp PULA boundary captured before converting to polygon, so another clip operation was run after the data transformation.
 - Input features: *Corn_Tympanuchus* (repeat for other three crop layers)
 - Clip features: PULA_Tympanuchus_cupido_attwateri
- Output feature classes: Corn_Tympanuchus_clip,Rice_Tympanuchus_clip, Peanut_Tympanuchus_clip, Pasture_Tympanuchus_clip

2.4. Selecting species suitable habitat with the Global Canopy Height Layer

 To be consistent with an assessment that FWS completed for this species using satellitebased lidar canopy height data, which is summarized on page 10 of the 2021 5-year review document, created a new layer that only represents the area within the USFWS malathion BiOp species boundaries for quantitative Global Canopy Height 2020 GIS data, transformed that to polygon format, then selected by attributes. To include taller vegetation in the interim core map to account for the description in the USFWS 1983 Recovery Plan about fall feeding grounds, selecting by attributes should remove only areas of greater than 2% canopy cover. Here, the "Clip Raster" tool was used instead of the "Export Raster" tool since that sped up processing in the case of this dataset (but the result of using either is the same).
 Figure A2-15 shows this – the canopy data is in black/white/gray, and the thick light yellow boundaries show the boundaries of the malathion BiOp PULA for this species.



Figure A2-15. Global Canopy Height Layer clipped to the species extent.

Figure A2-16 is an image showing the result of the raster to vector transformation of the canopy data (magenta represents areas where vegetation height was not detected, gray represents areas where vegetation height was detected, and the thick light yellow boundaries show the boundaries of the malathion BiOp PULA for this species):



Figure A2-16. Global Canopy Height Layer turned into polygon format.

2.5. Combining the habitat datasets

- Created a new shapefile that represents the overlap of NLCD, Pasture, Corn, Rice, and Peanut, and Canopy processed datasets. GAP and Landfire data are mentioned in the names of the features because those datasets were considered in addition to the NLCD but did not change the shape of the area from what the NLCD determined, so they were considered by this point but did not technically impact the interim core map.
 - Merge (tool):
 - Input features: NLCD_GAP_Landfire_tall + Canopy_tall + Corn_Tympanuchus_clip + Rice_Tympanuchus_clip + Peanut_Tympanuchus_clip + Pasture_Tympanuchus_clip
 - Output features: NLCD_GAP_Landfire_Crops_Pasture_tall and NLCD_GAP_Landfire_Crops_Pasture_short

2.6. Clean-up the core map

- 1) Created a smooth polygon without slivers or other stacked parts:
- Dissolve (tool):
 - 1) Input feature: NLCD_GAP_Landfire_Crops_Pasture_tall

Output feature class: *Attwaters_CoreMap_tallveg*The interim core map selected for the Attwater's Greater Prairie Chicken (represented as a feature class named Attwaters_CoreMap_tallveg in the submitted geodatabase) was produced by this step and appears as Figure 1 in the main document. It was built with UDL data used in EPA pesticide risk assessments and is inclusive of both shorter vegetation and vegetation 24 inches or taller.

3. Datasets Reviewed but Not Used in Core Map Development

- USGS Gap Analysis Project (GAP): <u>https://www.usgs.gov/programs/gap-analysis-project/science/land-cover-data-overview</u>
- USGS Landfire: <u>https://lfps.usgs.gov/arcgis/rest/services/Landfire_LF230/US_230EVT/ImageServer</u>
- USDA NASS USA Cropland: <u>https://epa.maps.arcgis.com/home/item.html?id=6d9c03213d874def89663afc26189acf</u>
- In addition, the steps described for creating the interim core map were run to create a draft that considered shorter vegetation only (this included specifying canopy height less than 24 inches from the 2020 Global Canopy Height Data and excluding forests when the "Select by Attibutes" was applied to the NLCD), and that analysis was distinguished by the word "short" appearing in the names of feature classes in the submitted geodatabase. Note that any feature classes with the word "tall" in the name were included in the core map. Any "short" feature classes were considered, but ultimately not included in the interim core map because considering only short vegetation (less than 24 inches in height) did not account for the fall feeding grounds described by the USFWS 1983 Recovery Plan for the species.

3.1. Selecting a recommended core map from the options created

During the development process several habitat and crop datasets were considered. As described in the previous section, the interim core map is based on the NLCD, EPA UDLs, and 2020 Global Canopy Height Data. However, six different options for the species core map were created and reviewed before making this selection, and their area differences are summarized in **Table A2-2**. These additional considerations

focused on other habitat datasets such as alternative crop datasets, as well as vegetation height. The habitat datasets were considered to determine which one best represented the habitat for the Attwater's Prairie Chicken. Ultimately, incorporating this information didn't offer enough refine to warrant the additional complexity and the core map was based on the NLCD, Global Canopy Height, and EPA's UDLs.

Crop Data Used	Total Acres (tall vegetation included)	Total Acres (tall vegetation excluded)
UDLs	557,143	508,226
USDA NASS USA Cropland	549,263	493,500
NLCD/GAP/Landfire General		
Cultivated Crop and Pasture	605,960	522,305
Attributes		

Table A2-2. The core map drafts created from different crop datasets were compared.

After reviewing all of the available GIS data, two questions needed to be resolved in order to decide the core map:

- 1. Should the core map include areas of vegetation greater than 24 inches or not?
- 2. Which case of cultivated crop data should be selected?

To address the first question, the USFWS documentation was carefully reviewed again to consider what is known about the species use of areas where the vegetation is 24 inches or taller. These areas are used in the fall season specifically, when mating activity is occurring. It's not too common for pesticide applications to occur during this season. Initially, it seemed reasonable to exclude the tall vegetation areas (defined as areas with vegetation 24 inches or taller here) from the species core map both when considering when pesticide applications typically occur and when considering only the information that tall vegetation is used for temporary shelter purposes such as from weather or predators. Pesticide applications don't normally take place during weather events, and predator escape is a relatively short-term event. However, the information that areas of tall vegetation could be important feeding grounds in the fall season is key. Pesticide use limitations may be in place wherever the species may feed. Consequently, the core map draft(s) that were selected were the more inclusive options that feature both short and tall vegetation.

EPA considered the possibility of alternative maps based on seasonal changes. For example, a core map with short vegetation instead of long vegetation to represent different seasons. The areas of taller vegetation could be isolated and treated as a fall season core map, where applicable. The areas of shorter vegetation could be treated as the main core map for agricultural limitations, active during the growing season. Because EPA does not currently know if the pesticide use limitations for this species moving forward will be seasonal in nature, this approach was not used.

To address the second question about which core map to select based on the cultivated crop dataset used, there were two determining factors:

More specific crop data was considered more useful and informative for refining the core map than less specific data. This meant the core maps that should be selected should either be based on the UDL information or based on the USDA NASS USA Cropland information, as those singled out the particular crops favored by the species.

EPA's pesticide risk assessments are built around its Use Data Layers (UDLs). Since the purpose of a species core map is to be used to build pesticide use limitation area(s), or PULA(s), it is appropriate to use the crop data that EPA uses for its risk assessments rather than crop data from an alternative source. This meant that the core map options that directly included the UDL data were chosen as the recommendation.

The following sections describe the steps take to generate the different options, many of these steps are similar to those used in the interim core map.

3.2. Considerations of Other Habitat Datasets and GIS Procedures

The steps of overlapping the AGPC habitat layers are specific to ArcGIS Pro 3.2. When reviewing available GIS data, three landcover datasets were considered: the NLCD, GAP, and Landfire. The GAP and Landfire were considered, but they were excluded from the core map only because they did not alter the shape of the core map from what was determined by the NLCD. The available crop and pasture information from these datasets were also considered in addition to the EPA UDLs, but the EPA UDLs were included in the interim core map instead of the broad NLCD, GAP, and Landfire cultivated categories since the UDLs were more specific to crops used by the species. Ultimately, the interim core map used the NLCD and the UDLs. **Table A2-3** summarizes the landcover datasets and specific layers explored during the development process but not included in the interim core map.

Data Type	Habitat Description	Spatial Data Set	Justification	Source
Landcover	The Attwater's prairie	LANDFIRE (LF),	Based on the specific habitat descriptions of this species, the following	The LF was accessed
Classification	chicken (APC) uses	Landscape Fire and	LF land classes were selected for inclusion: Tamaulipan Mixed	through USGS GIS
	different areas of coastal	Resource	Deciduous Thornscrub OR Texas-Louisiana Coastal Prairie OR Western	services:
	prairie grassland,	Management	Warm Temperate Urban Herbaceous OR Western Warm Temperate	https://lfps.usgs.gov/arc
	preferring a variety of	Planning Tools	Urban Shrubland OR Western Warm Temperate Developed Shrubland	gis/rest/services/Landfir
	short, mid and tall grass		OR Western Warm Temperate Developed Herbaceous OR Southeastern	<u>e LF230/US 230EVT/Im</u>
	prairie.		Ruderal Shrubland OR Central Texas Coastal Prairie Riparian Shrubland	<u>ageServer</u>
	Dansaly yagatatad areas		OR Central Texas Coastal Prairie River Floodplain Shrubland OR Central	
	over 24 inches in height		Texas Coastal Priarie Riparian Herbaceous OR Central Texas Coastal	
	are generally avoided but		Prairie River Floodplain Herbaceous OR Southeastern Great Plains	
	may be used occasionally		Floodplain Shrubland OR Southeastern Great Plains Floodplain	
	for protection from		Herbaceous OR Texas Coast Fresh and Oligohaline Tidal Marsh	
	inclement weather and		Shrubland OR Texas Coast Salt and Brackish Tidal Marsh Shrubland OR	
	predators, and as fall		Southeastern Ruderal Grassland OR East-Central Texas Plains Post Oak	
	feeding grounds.		Savanna and Woodland OR Central and South Texas Coastal Fringe	
			Forest and Woodland OR Western Warm Temperate Urban Mixed	
			Forest OR Western Warm Temperate Urban Deciduous Forest OR	
			Western Warm Temperate Evergreen Forest OR Western Warm	
			Temperate Developed Deciduous Forest OR Western Warm Temperate	
			Developed Mixed Forest OR Central Texas Coastal Prairie Riparian	
			Forest OR Central Texas Coastal Prairie River Floodplain Forest OR	
			Columbia Bottomlands Forest and Woodland OR Southeastern Great	
			Plains Floodplain Forest and Woodland OR Southeastern Great Plains	
			Riparian Forest and Woodland OR Southeastern Native Ruderal Forest.	
		Gap Analysis	Based on the specific habitat descriptions of this species, the following	The GAP dataset was
		Project	GAP NVC_Class categories were included: Shrub & Herb Vegetation,	accessed through ESRI
		(GAP)/LANDFIRE	Introduced & Semi Natural Vegetation, Recently Disturbed or Modified,	Living Atlas.
		National Terrestrial	Forest & Woodland	The main webpage for
		Ecosystems Data		GAP can be accessed
				through USGS.

Table A2-3. Data type, habitat description, spatial data utilized, justification, and sources for habitat parameters of Attwater's Greater Prairie Chicken. This table includes datasets that were explored during the development process but not included in the interim core map.

Data Type	Habitat Description	Spatial Data Set	Justification	Source
Cultivated Areas	APCs use cultivated crops such as corn, peanuts, and rice. Attwater's is known to enter cropland adjacent to its habitat, as well as grassland, pasture and rights-of-way	NLCD/GAP/Landfi re General Cultivated Crop and Pasture Attributes	NLCD cultivated area added to "Select by Attributes:" ClassName is equal to Cultivated Crops OR Pasture/Hay GAP cultivated area added to "Select by Attributes:" NVC_CLASS is equal to Agricultural & Developed Vegetation Landfire cultivated area added to "Select by Attributes:" EVT_NAME is equal to Western Warm Temperate Pasture and Hayland, Western Warm Temperate Fallow/Idle Cropland, Western Warm Temperate Row Crop, and Western Warm Temperate Close Grown Crop	NLCD and GAP were accessed through the Esri Living Atlas. T he LF was accessed through USGS GIS Services.
		USDA NASS USA Cropland	Rice, Corn, Peanuts, and Pasture were all selected from this layer based on the specific habitat descriptions of this species.	The USDA NASS USA Cropland dataset was accessed through the ESRI Living Atlas.

The default settings were maintained in geoprocessing tools unless otherwise specified.

3.3. Consideration of shorter and taller vegetation within the suitable habitat from the NLCD habitat layer

The following information prompted EPA to consider two different drafts based on vegetation height: "Densely vegetated areas over 24 inches in height are generally avoided but may be used occasionally for protection from inclement weather and predators, and as fall feeding grounds (Recovery Plan 2010)." One draft would have excluded vegetated areas over 24 inches in height since those are generally avoided, while the other draft included areas over 24 inches since those could be important feeding grounds in the fall season. EPA decided to create the latter draft.

EPA could have included the NLCD's Cultivated Crops as suitable habitat since the 1983 USFWS Recovery Plan (revised 2010) says, "Lehmann (1941) also noted APCs used cultivated crops such as corn, peanuts, and rice as food sources." It also notes that the species is known to enter pasture, so the NLCD's Pasture/Hay could be included as suitable habitat. However, EPA noted that these NLCD categories could include a mix of cultivated crops that are both suitable and unsuitable for the species. Since three cultivated crops and pasture were specifically named by the recovery plan, EPA chose to instead wait until after selecting from the NLCD to overlap more specific corn, peanut, rice, and pasture use data layers (UDLs). After all geoprocessing steps in this list were completed, EPA did go back and run everything again, skipping steps involving the UDL data and instead including the NLCD's Cultivated Crops and Pasture/Hay when selecting by attributes. This was done to evaluate the difference in output that would result from targeting cultivated crops and pasture generally or targeting only certain specific crops and pasture, and to account for the possibility that the species might eat crops other than corn, rice, and peanuts.