Nicholas Institute for Environmental Policy Solutions
Scoping Document
Part 3
Exploratory Analysis of Characteristics and Trends of At-Risk Species in the Southeast U.S.

Patterns of Petitioned and Candidate Species Numbers with Landscape Trends

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Most of the spatial information on species used in this analysis is provided by NatureServe (www.natureserve.org) and its network of natural heritage member programs, a leading source of information about rare and endangered species, and threatened ecosystems.

The National Atlas of the United States also provided some data layers used in this analysis.

This document is the result of an internal scoping and exploratory analysis based on publically available data and has not been peer-reviewed. We hope it will initiate discussion on effective and efficient pre-compliance management for at-risk species in the southeast.

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This section overlaps spatial distributions of petitioned and candidate species with patterns of current land use and protection. These overlays can help inform which communities, activities, or sectors could be important collaborators for each group of species. They can also identify potential for leveraging investments and actions targeting impaired waters, conservation of working lands, or changes in management of public resources which might be worth further exploration.

PETITIONED AND CANDIDATE SPECIES AND URBANIZATION

Generally, as percent urban area increases, the number of petitioned and candidate species decreases (Figure 14). Only 105 counties (out of 1009) have total urban areas exceeding 25%. The average number of petitioned and candidate species in these counties is 2-3, with a maximum number of species of 12. Watersheds with at least 25% urban area are few, but clusters occur near Atlanta, Georgia and Tampa, Florida. Of watersheds with at least 25% urban area, the one with the highest number of petitioned and candidate species is along the Atlantic coast of southern coast of Florida, and includes the city of Miami (Figure 15). Predicted development risk is highest near areas of current high urbanization, but the majority of the southeast is under at least a low level of development risk by 2030, including areas through northern Florida and the Appalachian Mountains that have relatively high numbers of petitioned and candidate species (Figure 16). In these areas, sensitivity of at-risk species to the environmental impacts of development could be a consideration.

Methods Overview

Urban areas were identified from U.S. Census Bureau TIGER/Line data (2012). Urbanized areas are defined as those with at least 50,000 people while urban clusters have at least 2,500 people, but less than 50,000. Total urban area (both urbanized and clusters) was summed by watershed and county and a threshold of 25% was selected to define areas of high proportion urban area. Urbanizing areas were identified from Dr. David Theobald's Development Risk layer (2007). Total area of risk was summarized by county and watershed to highlight areas under varying levels of development risk.

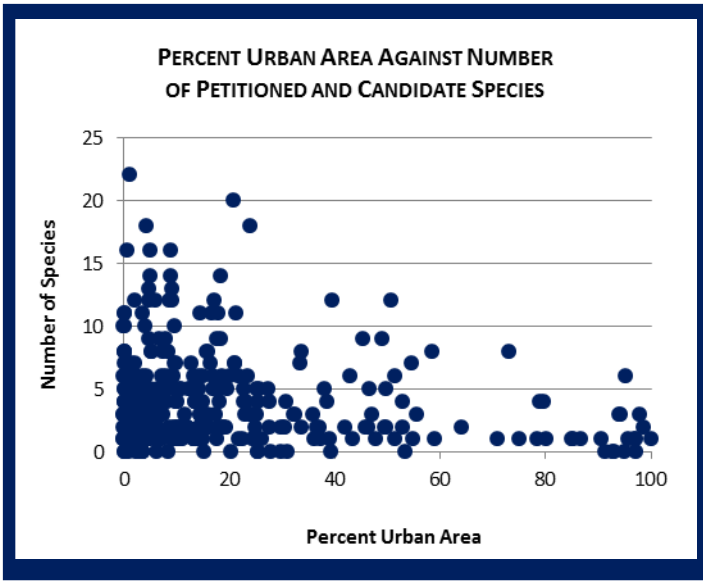

Figure 14: Petitioned and candidate species richness compared to percent urban development. Overall, as urbanization increases, species richness decreases.

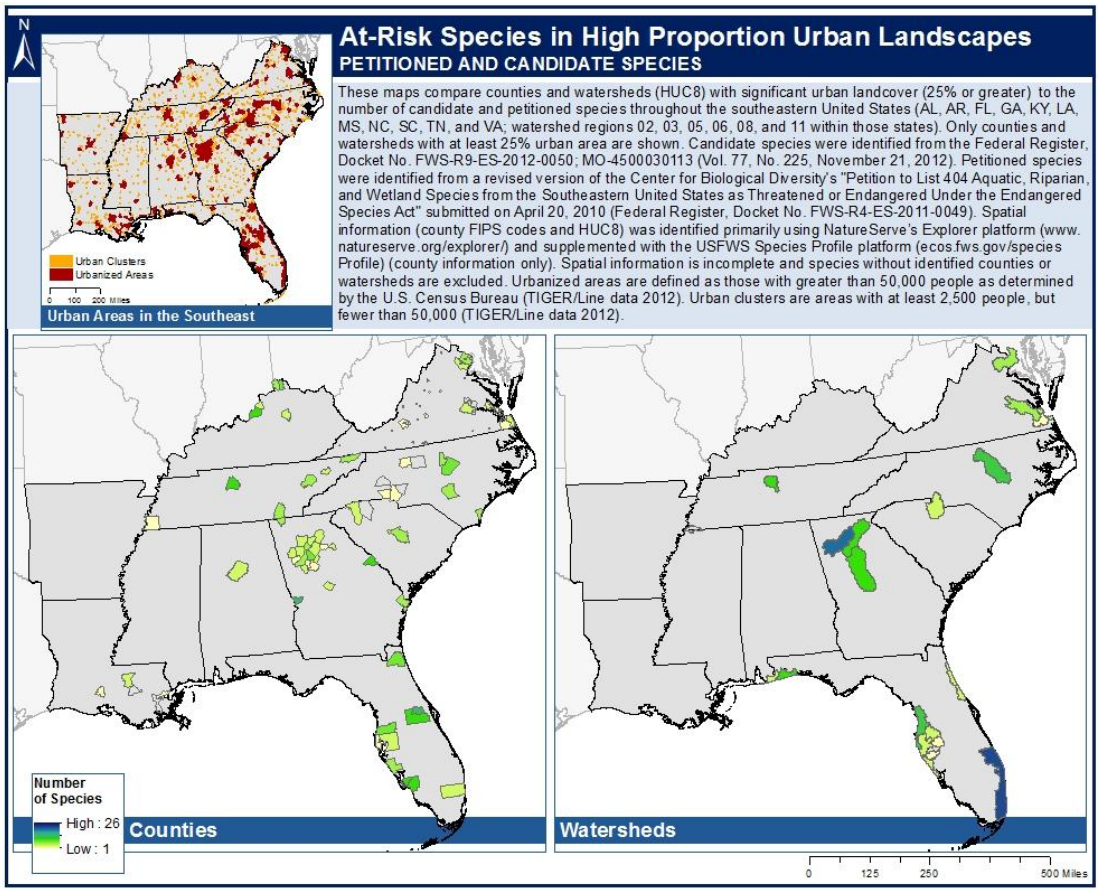

Figure 15: Petitioned and candidate species numbers in areas with significant urban development.

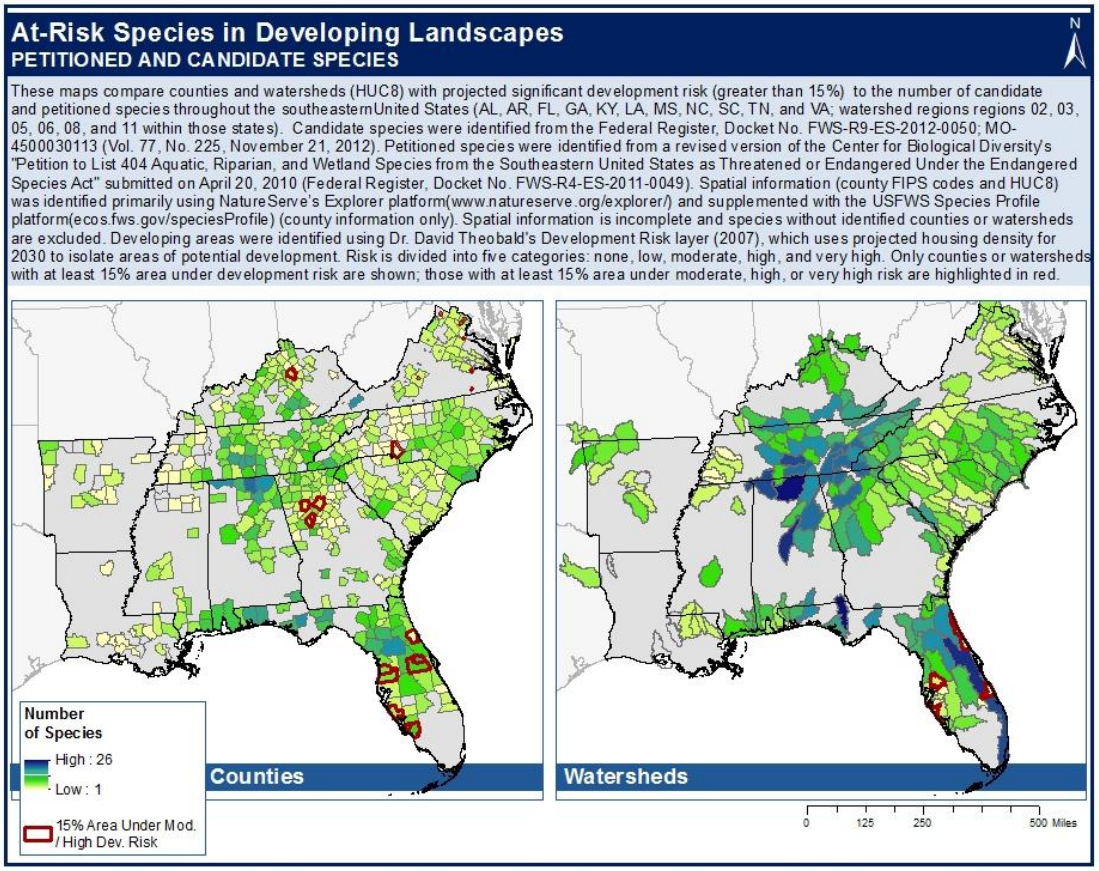

Figure 16: Petitioned and candidate species numbers compared to areas of projected development risk (Theobald 2007).

PETITIONED AND CANDIDATE SPECIES AND AGRICULTURE

Overall in areas of high intensity agriculture (at least 25% total area), the number of petitioned and candidate species is low. Agricultural landscapes are a major feature of the southeast U.S., covering approximately 42% of the total land area. However, most counties with significant proportions of agriculture (25% or greater) have fewer than five petitioned or candidate species (272 counties out of a total of 366). One-hundred forty-five of those counties have only 1 or 2 petitioned or candidate species. Only 23 counties with a high proportion of agriculture have more than 10 petitioned or candidate species. The most significant intersections between counties with high agriculture (25% or more of the total land area) and high at-risk species richness are in northern Alabama and the intersection of Florida, Georgia, and Alabama (Figure 17). In these areas, managers may want to investigate co-management opportunities between agriculture and petitioned and candidate species.

Methods Overview

Agricultural land cover was defined as areas with land cover codes 81 (pasture/hay) and 82 (cultivated crops) from NLCD 2006. Total area was summed by county and watershed and a threshold of 25% was selected to define areas with a high proportion of agricultural lands.

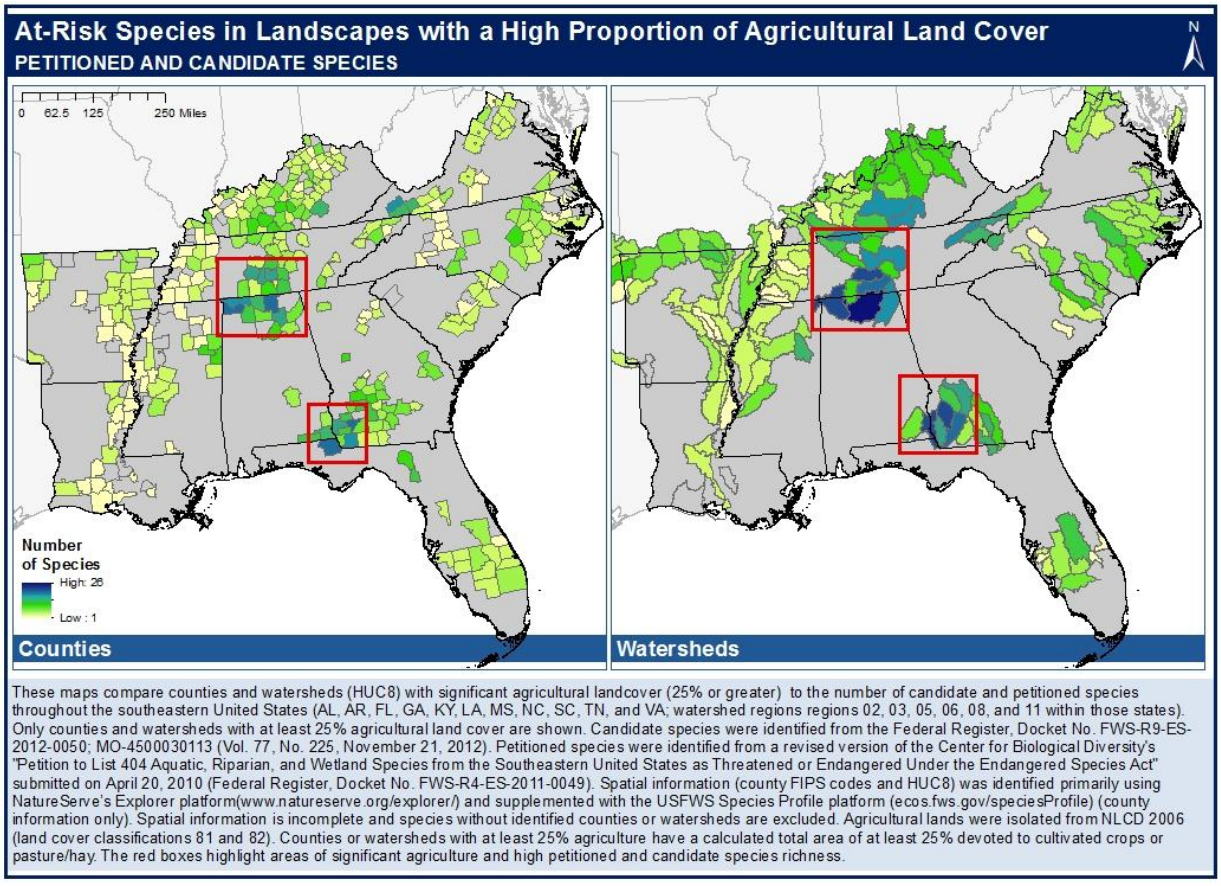

Figure 17: Petitioned and Candidate Species Numbers in High Density Agricultural Landscapes. Species numbers are only shown for counties/watersheds with at least 25% agricultural land cover. The red boxes highlight areas with high percentages of agricultural lands and high numbers of petitioned and candidate species.

PETITIONED AND CANDIDATE SPECIES AND IMPACTED WATERS

Waterways in the southeast are generally impacted in two ways: they can become impaired via pollution (by nutrients, metals, or hazardous/invasive biota) or they can be altered via the presence of dams. Both of these can pose threats to at-risk species.

The number of impaired waterways appears to be much higher in the northern states of the region than the middle states. However, this information should be considered with caution as reporting requirements for 303d impairment are not standardized. Therefore, northern states may simply have more stringent requirements. Watersheds with at least 5% of waterways impaired are spread throughout the region, with the highest concentrations being in Kentucky/Virginia/North Carolina region and the state of Florida (Figure 18). Not all impairments are of equal threat to individual species. Therefore, managers may want to investigate areas that appear to have higher concentrations of impaired waters to assess the validity of that threat to the species in that particular area. Further, areas undergoing treatment for impaired waters may be benefitting at-risk species. However, that conclusion would need to be evaluated on a case by case basis. Overlap between impaired waters and high petitioned and candidate species numbers is greatest along the Atlantic coast of Florida and in the northern Appalachians.

Methods Overview

Impaired waters are those identified by the EPA as being 303d impaired. These waterways are self-reported by the states and qualifying requirements are not standardized. Percent impaired waterways was derived using the total length of waterways and length of impaired waterways by HUC12 as reported by EPA's EnviroAtlas. Lengths were calculated at the HUC12 level and then aggregated to the HUC8 level.

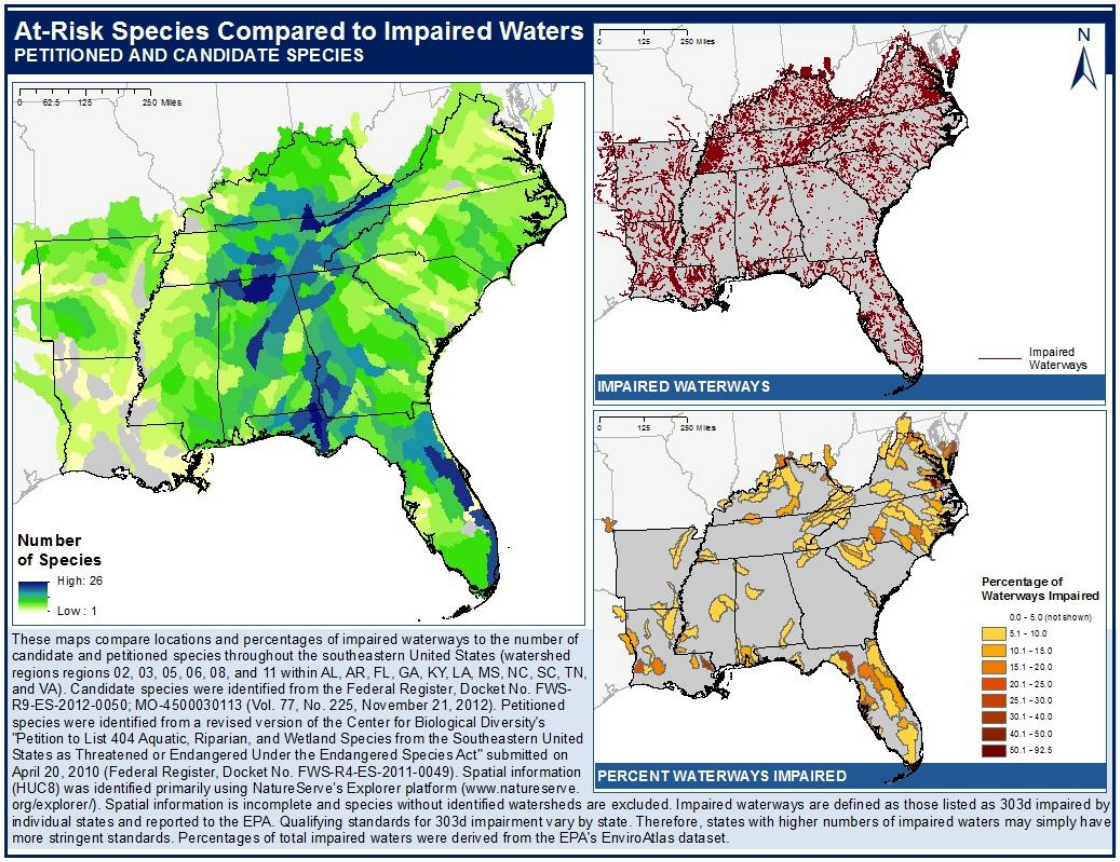

Figure 18: Petitioned and candidate species numbers compared to EPA 303d impaired waterways.

Dams and impoundments can also negatively impact waterways by changing the timing, depth, and duration of water flow. These alterations can in turn impact the survival of species dependent on these conditions. In the southeast U.S., dams are generally most heavily concentrated in watersheds just to the east of the Appalachian Mountains (Figure 19).

Methods Overview

Major dams are defined as those at least 50 feet in height, with at least 50,000 acre feet in storage (National Atlas of the United States). Dams were intersected with watersheds to provide a number of dams per watershed. Note: a single location could have multiple structures that count as individual dams.

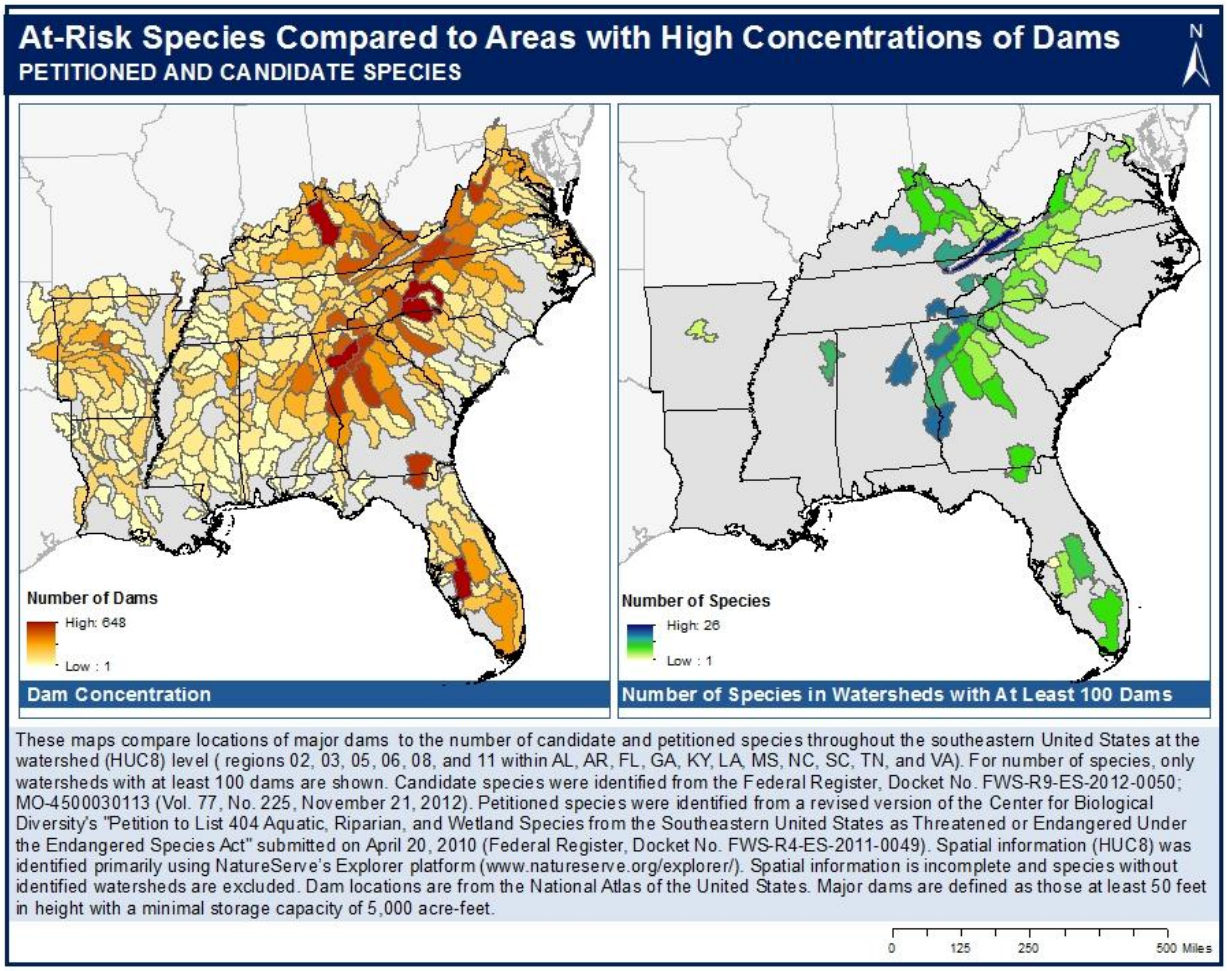

Figure 19: Petitioned and candidate species richness compared to concentrations of major dams (defined as at least 50 feet in height and with a minimal storage capacity of 5,000 acre-feet.

PETITIONED AND CANDIDATE SPECIES AND PUBLIC LANDS OR PROTECTED AREAS

Comparing public lands and protected areas to petitioned and candidate species richness can provide a sense of how well these species may already be protected or where public land managers can play a role. Density of public lands and protected areas is greatest throughout the Appalachian Mountains and the state of Florida, areas that overlap reasonably well with higher concentrations of petitioned and candidate species (Figure 20). In counties and watersheds with at least 25% public lands or protected area, petitioned and candidate species richness is moderate (an average of approximately 5 and 8 species respectively) (Figures 21 and 22).

Methods Overview

Public lands were identified from the National Atlas of the United States and include national protected areas, department of defense lands, and other public properties (includes historic sites, national monuments, as well as a variety of other designations. Protected areas were identified via the Protected Areas Database (PADUS) and categorized by designating party (federal, state/local, private, or other). Only designated protected areas are included. In these maps, the size of public lands and protected areas has been exaggerated so they can be seen at this scale. (Note: Although national protected areas exist in each dataset, the total area differs significantly. For consistency, the public lands map uses national protected areas as defined by the National Atlas and the protected areas map uses national protected areas as defined by PADUS.)

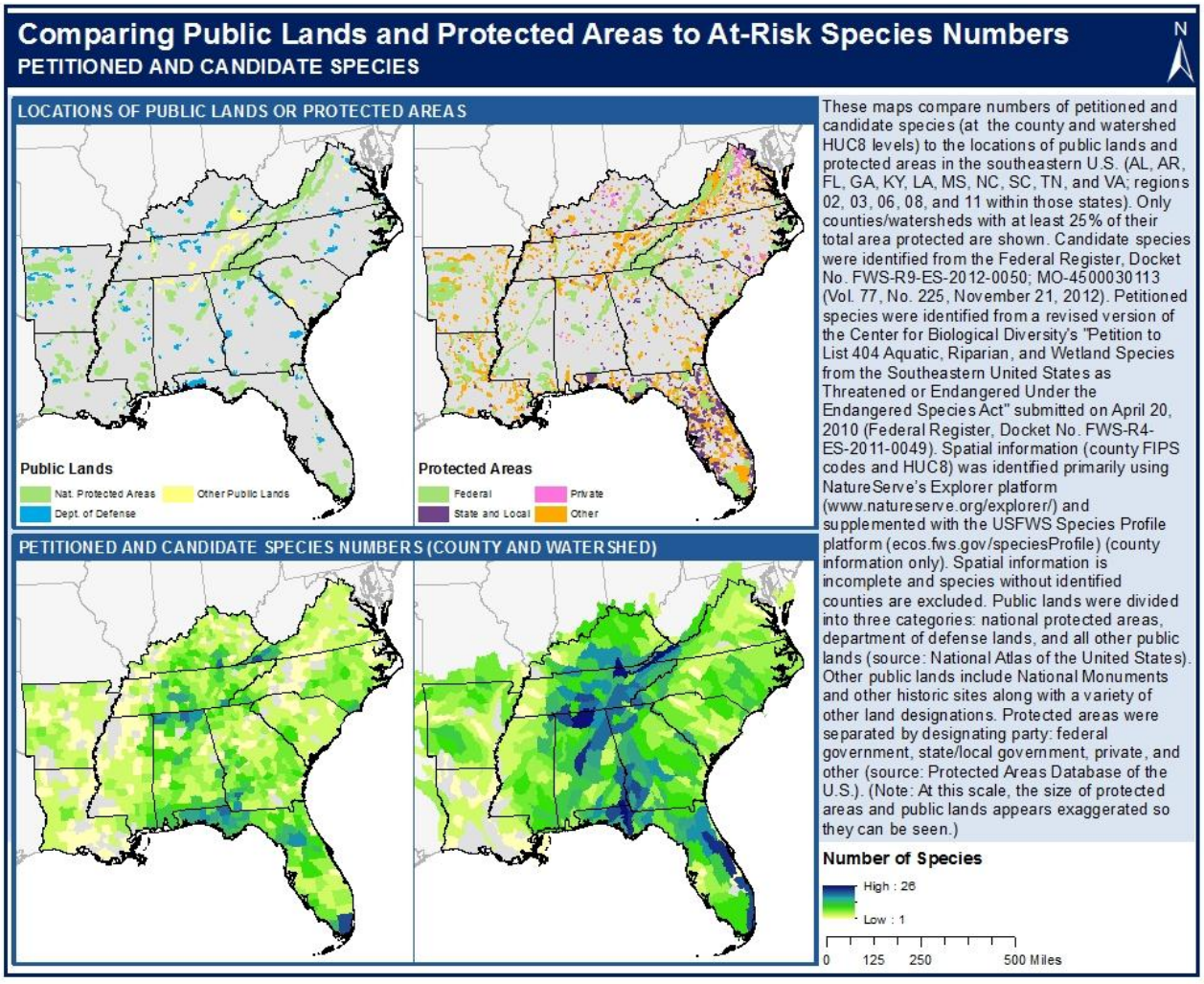

Figure 20: Petitioned and candidate species numbers compared to locations of public lands and protected areas. The size of both public lands and protected areas has been exaggerated so they can be seen at this scale.

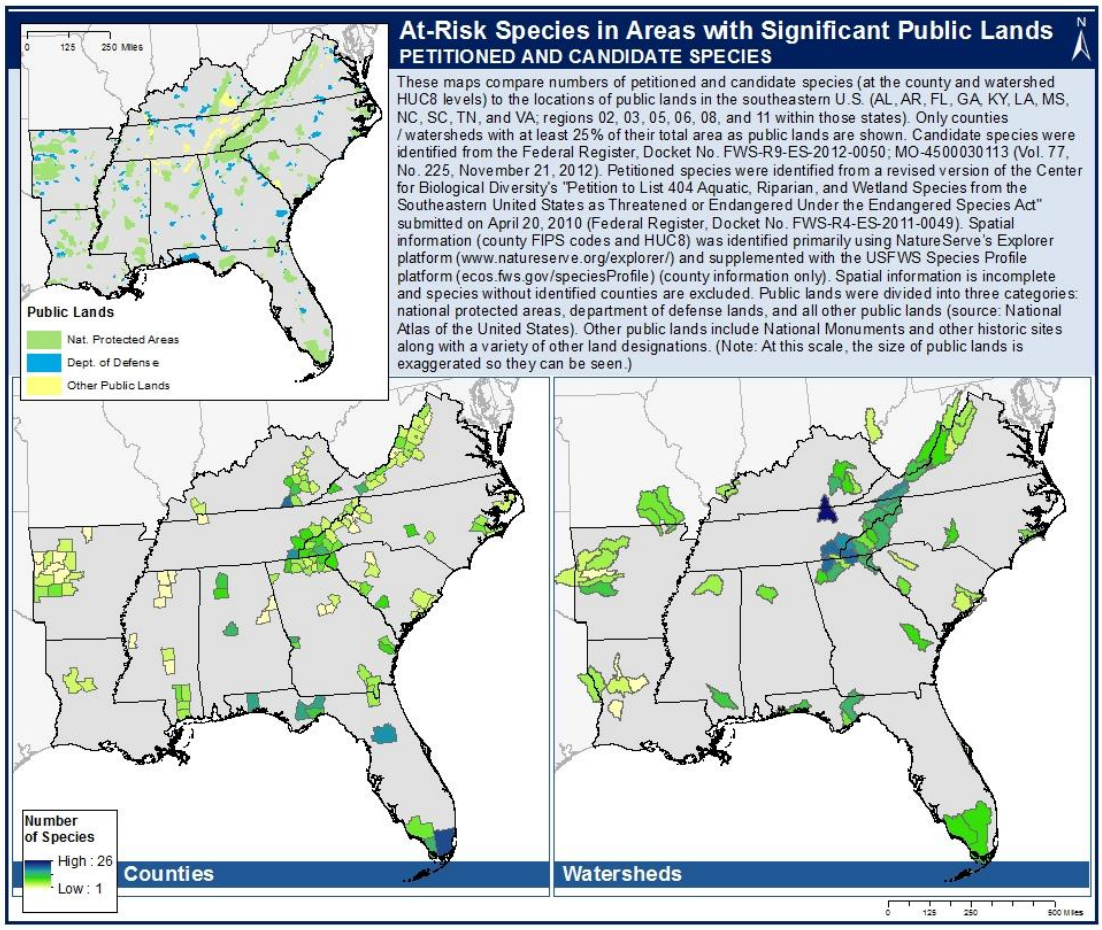

Figure 21: Petitioned and candidate species numbers in counties and watersheds with at least 25% public lands. (The size of public lands has been exaggerated so they can be seen at this scale.)

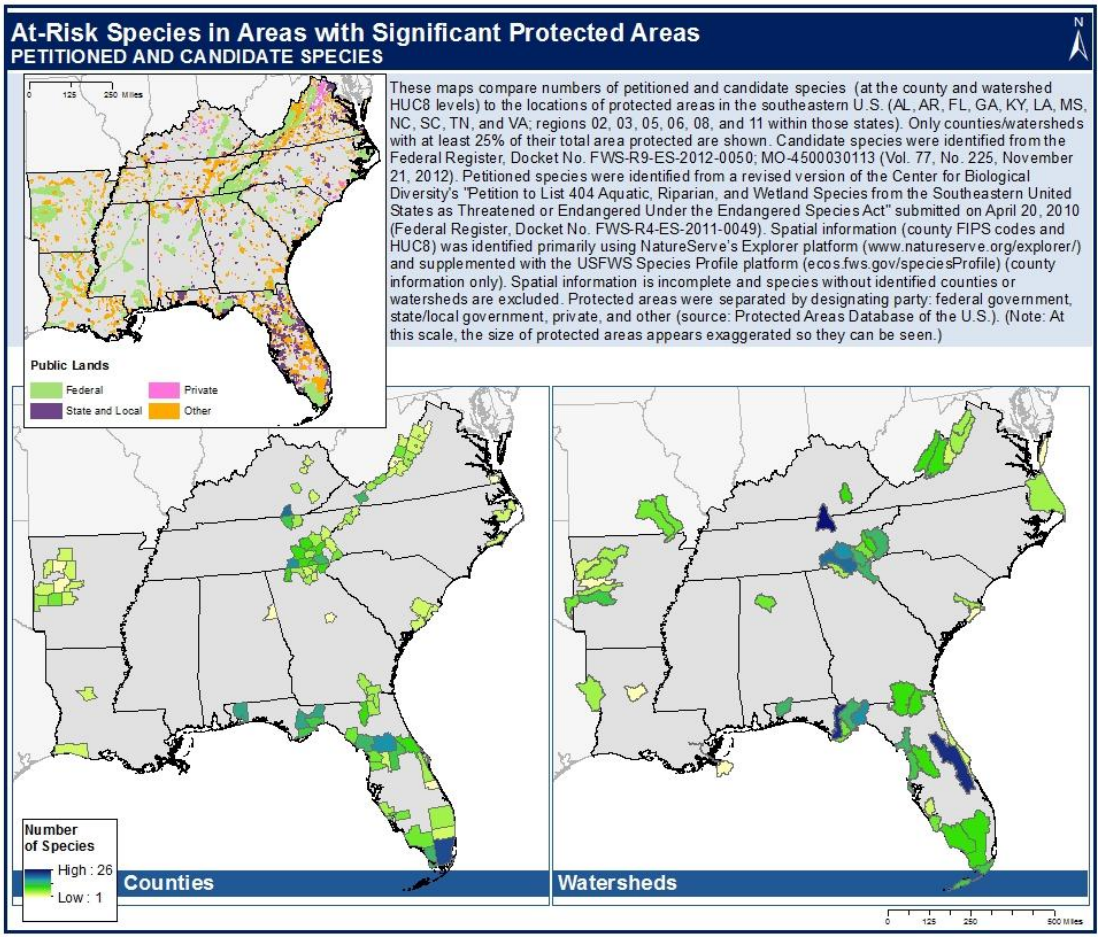

Figure 22: Petitioned and candidate species numbers in counties and watersheds with at least 25% protected area. (The size of protected areas has been exaggerated so they can be seen at this scale.)

CONCLUSIONS

Finding areas where high numbers of petitioned and candidate species intersect with potential threats can help guide managers to consider the sensitivity of individual species to those specific threats. Petitioned and candidate species numbers generally decrease as the percent of urban area in a county or watershed increases. Counties or watersheds with at least 25% urban land cover have on average 2-3 petitioned or candidate species. Over 40% of the land area in the southeast is agricultural, but most counties with at least 25% agricultural land cover have fewer than 5 petitioned or candidate species. Northern Alabama, however, is home to higher numbers of petitioned and candidate species and also is heavily agricultural. This area is an example of where managers may want to consider the sensitivity of at-risk species to agricultural impacts on the landscape. Waterways can be impacted through impairment by pollutants or alternation via dams. Because reporting requirements for 303d impaired waters is not standardized, we cannot draw conclusions regarding the distribution of petitioned and candidate species in relation to these waterways. Unsurprisingly, dam concentrations are highest throughout the Appalachians, and it may be useful for managers in these areas to consider how significant changes in water flow may impact petitioned and candidate species in the mountains.

Caution should be applied when deciding if a particular change in landscape is not a threat. For example, when compared to increasing proportions of urban landscapes, the number of petitioned and candidate species decreases, which could suggest that urban areas are not a strong threat to current petitioned and candidate species. However, given that this analysis is based on current known presence/absence data, it is possible that many at-risk species have already disappeared from urban areas, so protecting those that remain could be a higher priority.

Comparing locations of public lands and protected areas to at-risk species numbers can provide a sense of how well these species are already protected, or where land managers may be able to play a role in protecting these species. While concentrations of protected areas or public lands are highest in areas that also have higher numbers of petitioned and candidate species, we cannot conclude from these overlays alone that individual species are sufficiently protected.