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The Impact of Organic Farms: Biodiversity and Climate Change Resilience in the Southeast

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Introduction

In 2015, the National Organic Program and United States Department of Agriculture updated their organic certification requirement standards. This change included initiatives that seek to incorporate biodiversity into organic certifiers' organic systems plans (OSPs), the document with which farms are evaluated to achieve organic certification. Biodiversity is linked to, and potentially dependent upon, organic farming practices, especially given the fact that traditional farming techniques tend to pose a severe threat to species diversity and protection (Fuller).

When a farm is certified organic, it must practice farming techniques that do not harm desirable plants or the surrounding biota, including native plants and animals (Bengtsson). Ways of doing this include providing habitats for natural enemies to pests, allowing native plants to grow in the farm's surrounding areas and hedgerows, and utilizing cover crop soil protection techniques (USDA). These techniques not only benefit the farm by providing pest control, food for pollinators and enhancing the soil, but also serve to increase the biodiversity of the farm's surrounding ecosystem (Tscharntke).

Resilience to climate change also serves as an indicator of the effectiveness of organic farming practices. Resilience means that an area is able to return to a stable state after a disturbance. In this context, it means that the area is able to function regularly even in the face of climate change, an instance that affects species health and biodiversity. By mapping the locations of organic farms across the southeastern United States along with the resilience scores of areas as evaluated by The Nature Conservancy and comparing this map to farm locations and biodiversity measures, we are able to determine the correlation between organic farming and overall ecosystem health.

Methods

First, data was collected and compiled to show the physical addresses of organic farms across the southeast, including Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Tennessee, Virginia, West Virginia and Kentucky. These addresses were then geocoded to create points on a map. Next, a new layer was imported that shows the biodiversity priority levels across these same states. The priority level was determined by the need for increased biodiversity. Areas ranked 3 or lower hold low to no priority standing, meaning they contain sufficient biodiversity levels. Areas ranked 6 to 12 have a below-average priority status. Areas ranked 12 to 21 have above-average priority ranking, meaning they have below-average biodiversity levels. Areas that are ranked 21 to 27 are in need of biodiversity conservation, they are significantly lacking in biodiversity levels. Areas ranked over 27 are severely lacking in biodiversity levels.

A similar procedure was followed to show the correlation between organic farm locations and resilience. Once again, the locations of organic farms throughout Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Tennessee, Virginia, West Virginia and Kentucky. A raster layer of resilience scores, as evaluated by The Nature Conservancy, shows each area's 'resilience to climate change' score.

References

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USDA Guidance: Natural Resources and Biodiversity Conservation

Organic Farms and Biodiversity Priority Index

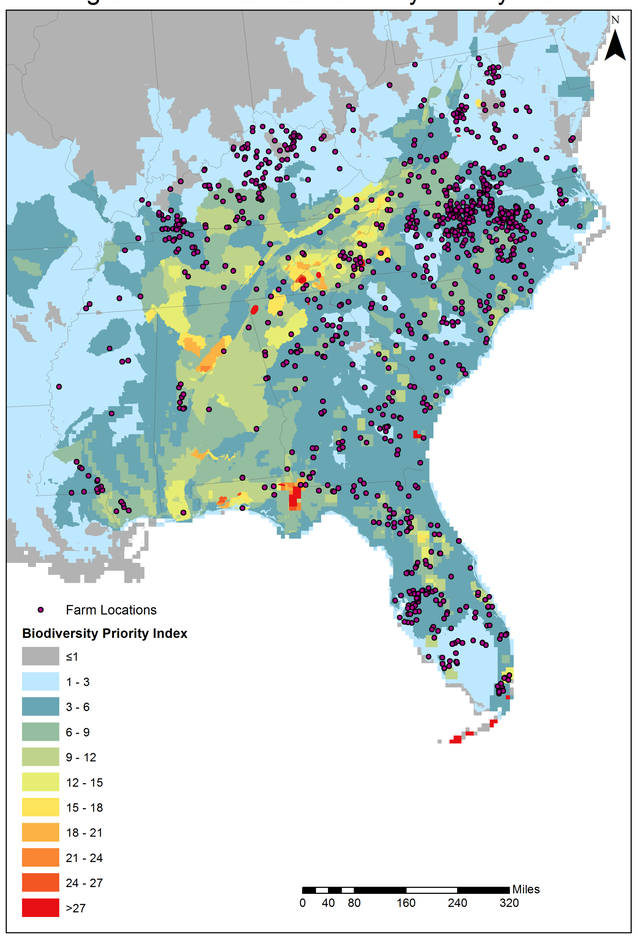

Figure 1:Biodiversity priority index on a scale of 1 (low priority) to 27 (high priority) compared to the locations of organic farms in the southeastern United States.

Results of Farm Locations and Biodiversity Priority Index	
Biodiversity Priority Index	Farms
≤ 1	676
1 – 3	291
3 - 6	124
6 - 9	0
9 - 12	5
12 - 15	7
15 - 18	0
18 - 21	0
21 - 24	0
24 - 27	0
≥ 27	15

Figure 3: Results of Farm Locations and Biodiversity Priority Index: number of farms per biodiversity priority index level

Organic Farm Locations and Climate Change Resilience

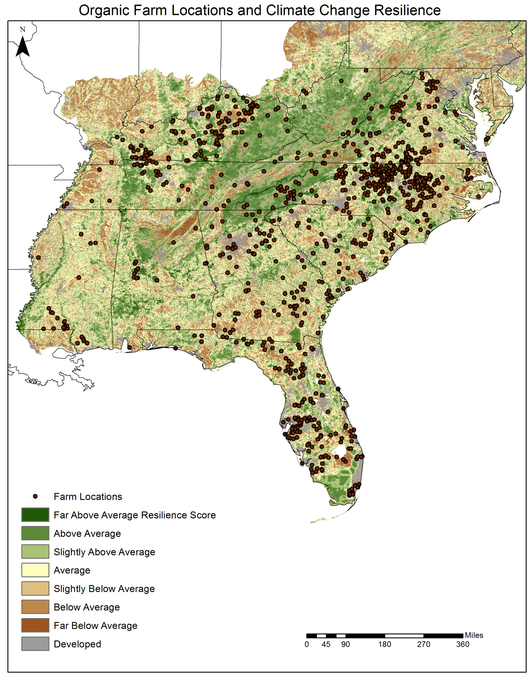

Figure 2: Resilience to climate change on a scale of far above average resilience score (SD) to far below average and developed compared to the locations of organic farms in the southeastern United States.

Results

The majority of organic farms in the southeast are located in areas ranked with low biodiversity priority index scores. This correlation indicates that the regions within which organic farms are located are more diverse than areas that are not in close proximity to an abundance of organic farms (See Figure 3). 676 of the 1,118 farms represented on the map (Figure 1) were located in areas of low to no priority, meaning their biodiversity levels were comparatively high. 291 farms were in areas with designated priority scores between 1 and 3. 124 farms were in areas with priority scores of 3 to 6. These farms (totaling 1091 farms) are all ranked within the low priority range. The remaining 27 farms were distributed between the 9 to 12, 12 to 15, and over 27 ranges. 15 farms are in areas of high biodiversity priority index scores (27 or higher); all of these farms are located in Florida, 13 have been certified by Quality Certification Services. The remaining 2 farms were certified by Americert and International Certification Services. Overall, the results support the hypothesis that organic farms benefit biodiversity levels. Biodiversity levels are significantly lower in areas with an absence of organic farms.

The locations of organic farms in proximity to areas of high climate change resilience showed similar results. Areas designated with scores far above average climate change resilience levels contained 1025 farms. The remaining 94 farms are located in areas of average climate change resilience. No farms are in areas of slightly below, below, or far below average climate change resilience.

The locations of organic farms across the southeastern United States correlates with areas of high biodiversity levels and high climate change resilience. This could be due, in part, to the techniques practiced on organic farms that enhance, preserve and protect a variety of native species, therefore increasing the overall biodiversity of the farm's surrounding area.

Data Sources

Data that was compiled for the Farm Locations layers was derived from: "USDA-AMS-OID." USDA-AMS-OID. Accessed November 20, 2016. https://organic.ams.usda.gov/Integrity/.
Data layer for Biodiversity Priority Levels was downloaded from: @nasa_space_ant. "Priority Areas for Biodiversity Conservation in the USA." BiodiversityMapping.org. Accessed December 01, 2016. http://biodiversitymapping.org/wordpress/index.php/usa-priorities/.
Data for Resiliency Scores was downloaded from: "Conservation By Geography." Reports and Data. Accessed December 04, 2016. http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/Downloads.aspx.
All maps developed using Environmental Systems Research Institute (ESRI) ArcDesktop, 10.4.3.

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