



South Carolina Conservation Bank
Conservation Priority Mapping
June 5, 2019



Prepared for the South Carolina Conservation Bank
by the South Carolina Department of Natural Resources

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Introduction

The South Carolina Conservation Bank (SCCB) has been tasked with developing statewide conservation priority maps that will be submitted to the South Carolina General Assembly as identified in South Carolina House Bill 4727 Section 48-59-50, B(5):

“ (5) develop conservation criteria to be used, in addition to the criteria set forth in Section 48-59-70(D), that advance and support federal, state, and local conservation goals, plans, objectives, and initiatives. In order to assist in the development of conservation criteria, the bank must coordinate with the appropriate groups to integrate the goals, plans, objectives, and initiatives, as well as land use patterns, into a statewide conservation map. The map must be created by July 1, 2019, and the criteria and map must be reviewed no less than every ten years thereafter. The criteria list and map must be submitted to the General Assembly annually.”

The statewide conservation priority map consists of five sub-maps for different conservation categories and a final conservation priority model map, which is the output of combining all five sub-maps. The five sub-maps include: public access, ecological conservation priorities, cultural resources, private working lands, and water resources. Each of these sub-maps include two or more data layers representative of the conservation category.

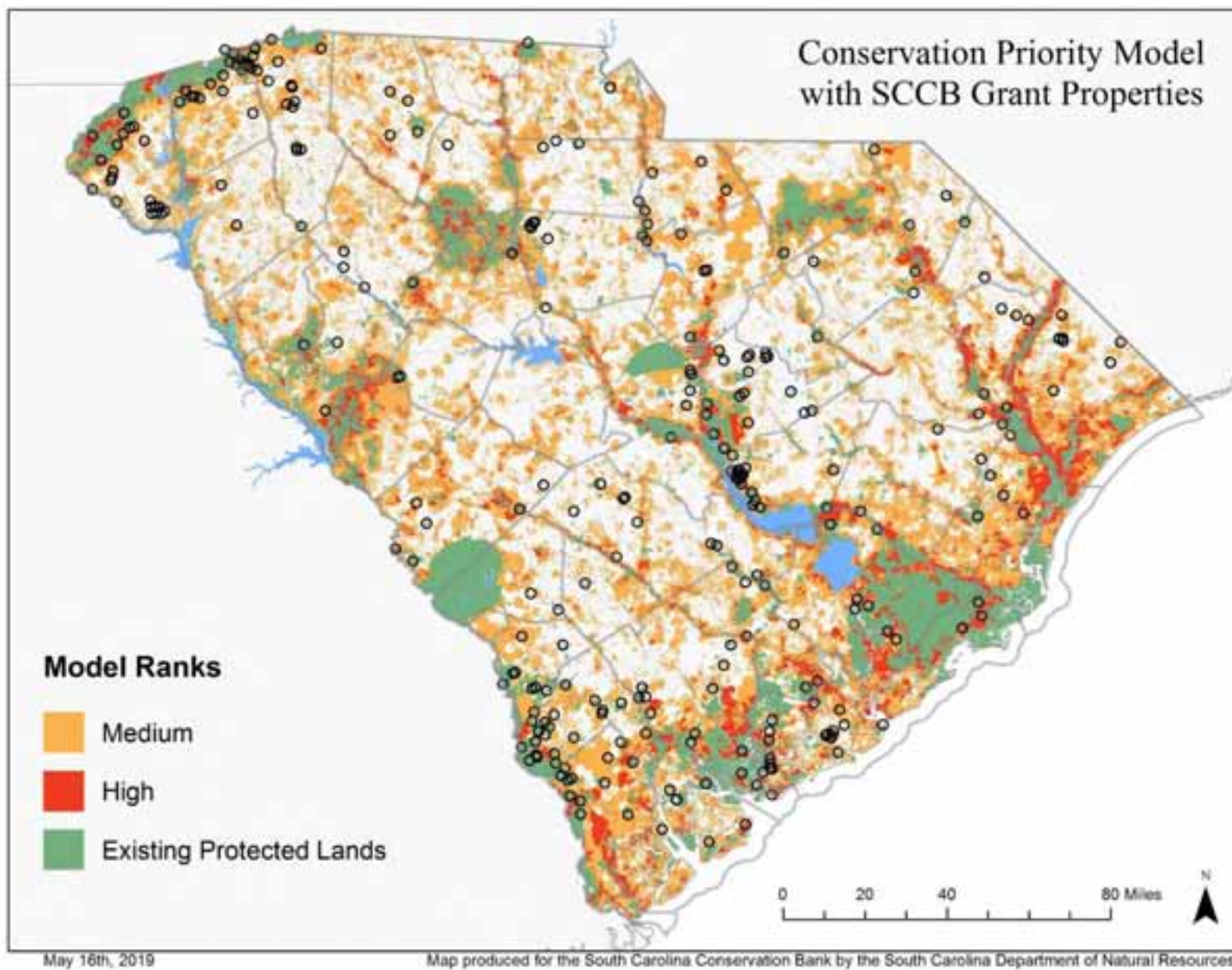
This document outlines the development of statewide conservation priority map by the South Carolina Department of Natural Resources (SCDNR) for the SCCB. Included in this document are maps and statistics for current conservation conditions in South Carolina, the final statewide conservation priority map, each of the 5 sub-maps, and maps for each data layer that went into developing the sub-map (Appendix A). Finally, each data layer used is documented with source information, how it was ranked for the sub-map, and how the data were processed.

Statewide Conservation Priority Model

South Carolina's land area is about 20.5 million acres. Currently, approximately 3 million acres of South Carolina's land area is under some form of protection. Approximately 2.5 million acres are developed. Both of these numbers increase annually.

This project has identified **7.7 million acres of South Carolina's landscape as medium priority (6.4 million acres) and high priority (1.3 million acres) for conservation** (Map-1, Statewide Conservation Priority Model), which will help guide the South Carolina Conservation Bank's conservation funding activities. A county by county breakdown of conservation priority acreage is found in Appendix B.

Map-1: Conservation Priority Model with SCCB Grant Properties (up to FY 2017)



Current Conservation Conditions

The current status of conservation and land protection in the state provides context for conservation priority mapping and a baseline against which future conservation efforts can be measured.

There are approximately 20.5 million acres of land in South Carolina. Almost 3 million acres are under some form of protection, representing more than 14% of the total land area.

Land Protection Over Time

Land protection has increased in the last three decades (Figure 1 and Map-B1), with the largest increase in private land protection. Significant increases are also seen in state protected land. The South Carolina Conservation Bank was established in 2002 and began grants for conservation in 2004, bolstering the upward trend of increased conservation acreage.

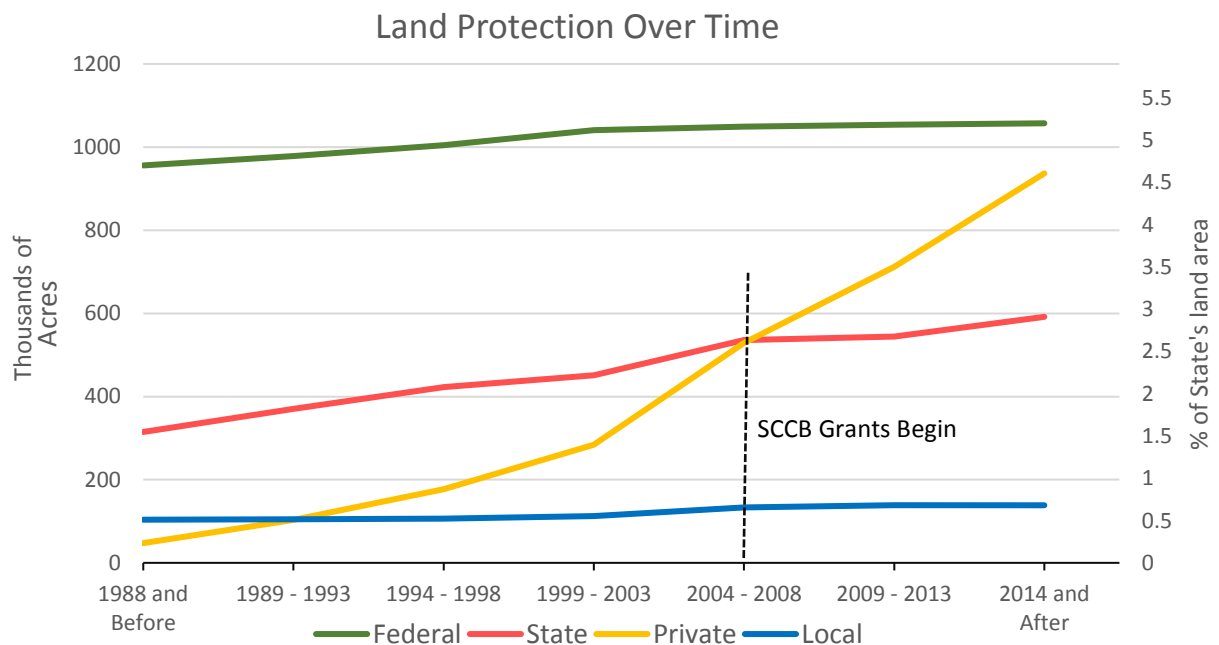
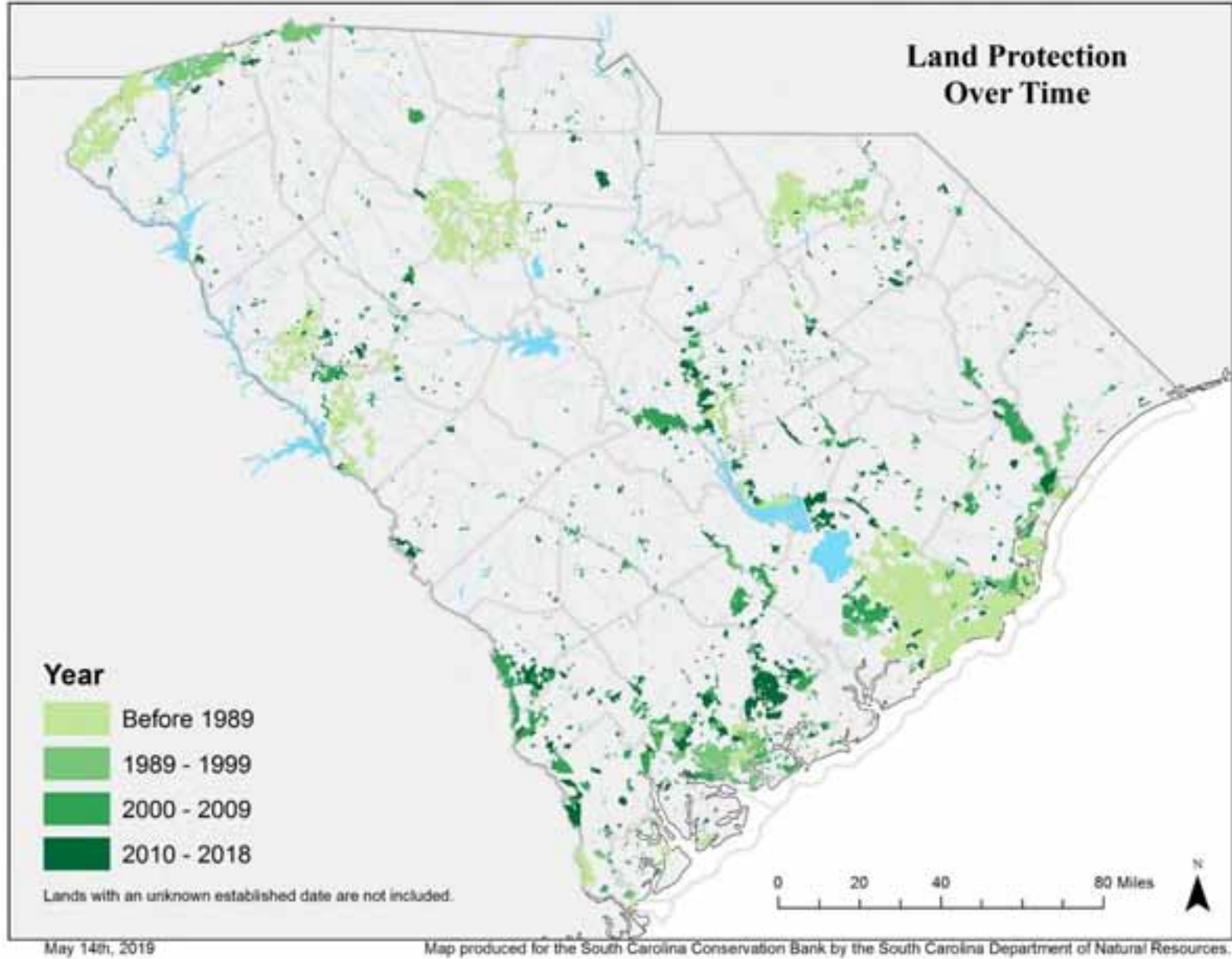


Figure 1: Land Protection Over Time, beginning in 1989. ^[1, 2]

Map-B1: Land Protection Over Time



Current Land Protection by Entity

Protected lands in South Carolina are managed by different entities. While the largest percentage of protected lands are managed by the federal government, private and state protected lands together contribute to more than half of total protection (Figure2, Table 1, Map-B2).

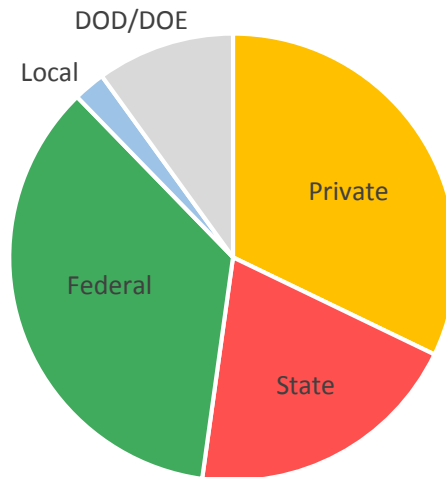


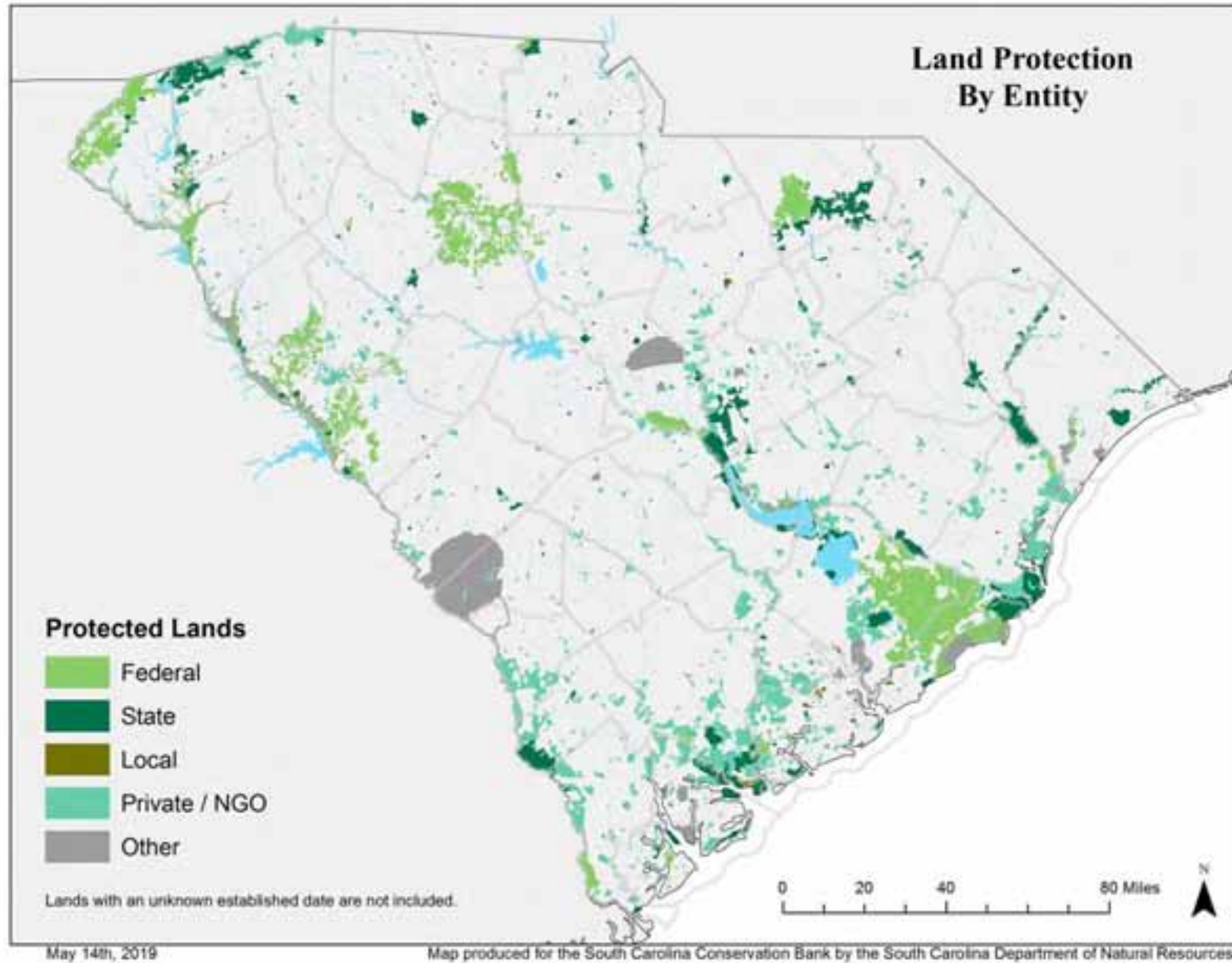
Figure 2: Land Protection by Entity. ^[1, 2]

Entity	Acres	% of Protected Acres	% of State Land Area
Federal	1,048,147	39.5	5.1
Private	948,588	35.7	4.6
State	591,746	22.3	2.9
DOD/DOE	294,158	11.1	1.4
Local	67,975	2.6	0.3
Total	2,950,614	100	14.4%

SC Total Land Area 20,492,800 acres

Table 1: Land Protection by Entity, with percentages of protected acres and total state land area. ^[1, 2]

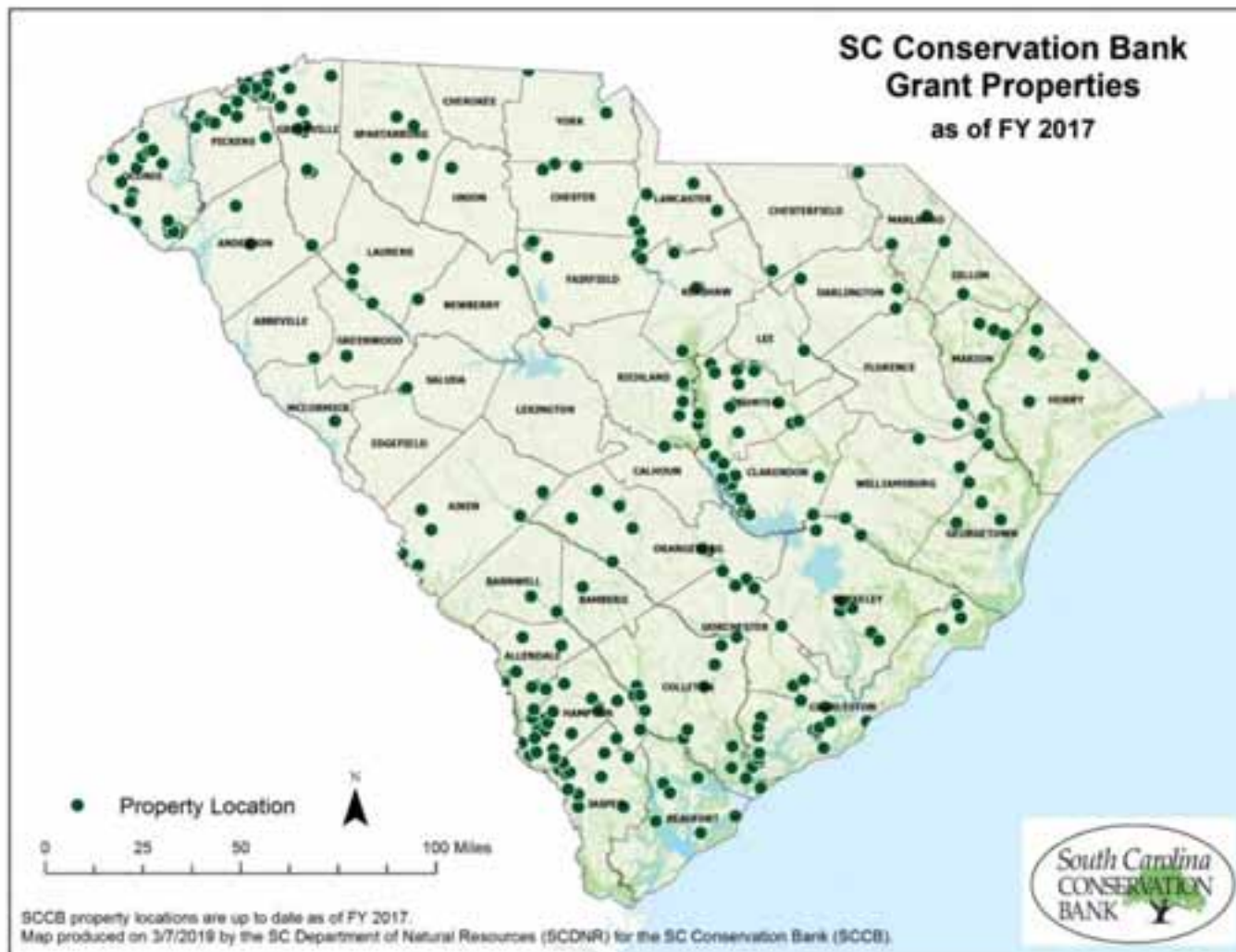
Map-B2: Land Protection by Entity



South Carolina Conservation Bank Projects

As of fiscal year 2017, the South Carolina Conservation Bank has conserved 287,307 acres in the State.

Map-B3: Current South Carolina Conservation Bank Grant Properties



Land Cover Conditions

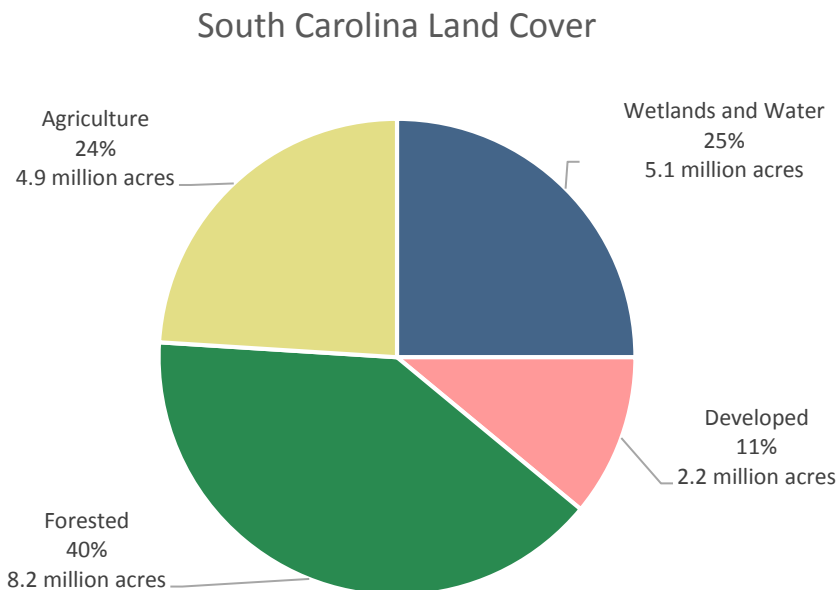


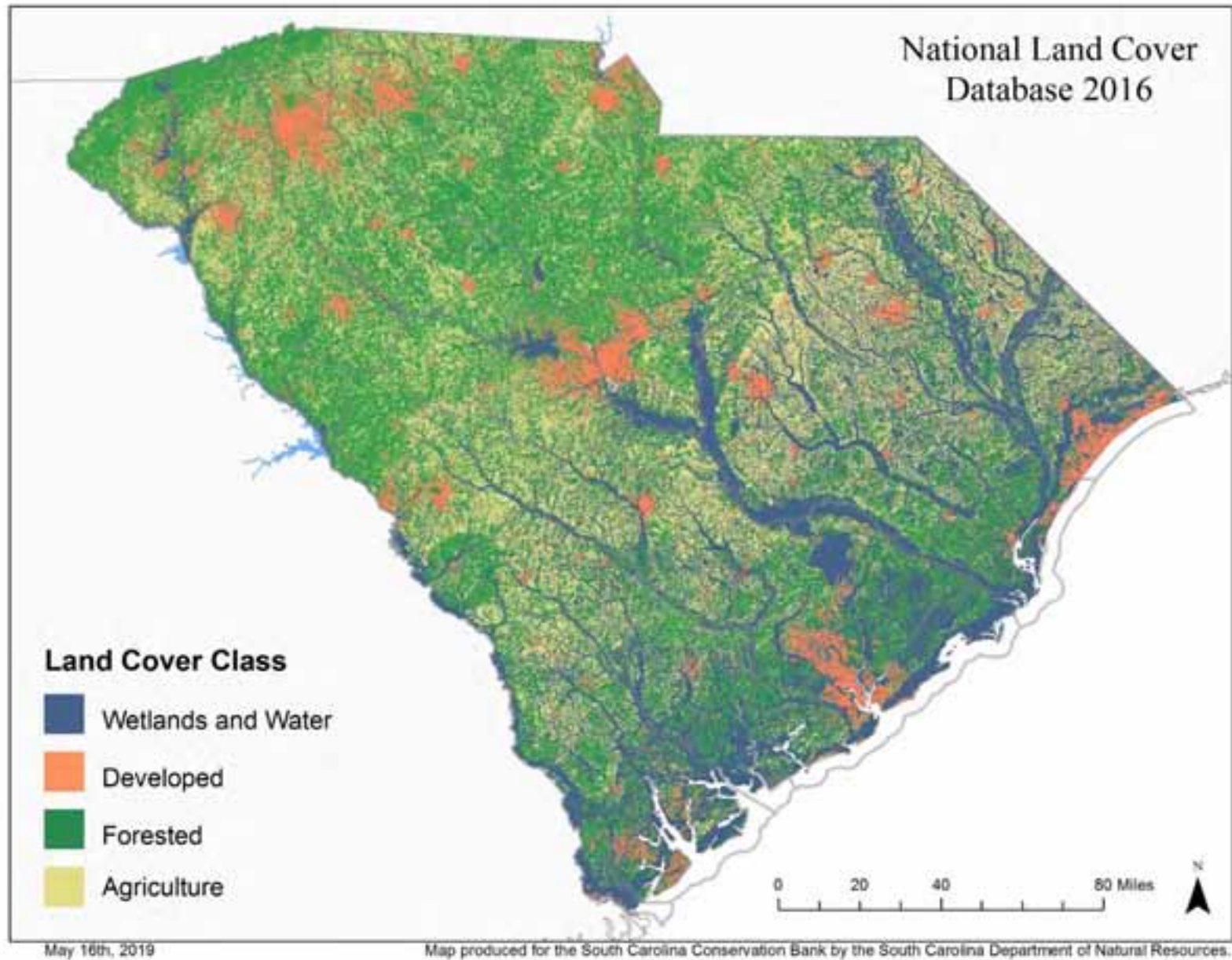
Figure 3: South Carolina Land Cover, grouped into four basic categories*. [3]

In reviewing the land cover changes between 2011 and 2016, there are three key trends:

- 1) **Developed land has increased by 158,000 acres.** The percentage of developed land increased from 9.6% to 10.4% of the state's total land area.
- 2) **Forested land has increased 850,000 acres.** The percentage of forested land (of any forest class) has increased from 35.5% to 39.8% of the states total land area. The forested land increase is seen in Evergreen and Mixed forest, whereas deciduous forest has decreased. The increase in forested land possibly relates to a decrease of shrub/scrub land; that is, shrub/scrub land could be returning to a forested condition.
- 3) **Protected lands increased by 284,000 acres in the same time period,** based on the protected lands dataset.

*The data are from the 2016 release of the National Land Cover Database (NLCD), the latest available data (released May 2019). This data release can be compared to the prior release (2011), and a land cover change index dataset can be reviewed to see where land cover change has occurred over multiple NLCD datasets.

Map-B4: 2016 National Land Cover Database



Current Conservation Conditions References

1. The Nature Conservancy Private Protected Lands – accessed by personal request to The Nature Conservancy, March 2019.
2. United States Geological Survey Gap Analysis Project – Protected Areas Database of the U.S. version 2.0. Accessed February 2019.
3. Multi-Resolution Land Characteristics Consortium - National Land Cover Database 2016. Accessed March 2019.

Priority Mapping Data and Methodology

General Methodology

The statewide conservation priority map was developed using an occurrence modeling method. Best-available datasets representing each sub-map's category were obtained. With guidance from the Technical Advisory Committee (TAC), it was determined how the attributes of each dataset would be ranked. These ranks are outlined in this section of this document. The datasets were processed into raster datasets with values according to their attribute ranking. To generate each sub-map model, the data layers were 'stacked', or summed on a per-pixel basis. The resulting sub-map raster was divided into low, medium, and high priority categories based on Jenks Natural Breaks classification and feedback from the Technical Advisory Committee.

The final summed priority model is a combination of all five sub-maps. Each sub-map model was given a normalized value for their low, medium, and high ranking pixels. A normalized value was used so that each sub-map model had equal weight in the summed priority model. The normalized sub-map models were summed on a per-pixel basis to produce the summed priority model.

All data were re-projected to NAD83 UTM Zone 17, clipped to the extent of South Carolina, rasterized to 30 meters spatial resolution, snapped to the cell alignment of and masked by the National Land Cover Dataset. The areas that were already under protection were merged with each dataset and assigned a value of 99. Finally, all areas that had no data or were not determined to be priority were assigned a value of 0.

Sub-Map 1 – Public Access

To attract the public to South Carolina’s protected lands, and possibly generate funds, accessibility to protected lands needs to exist. In order to identify areas of public access interests, two models are used: one for land, the other on water. Public Lands Access represents lands of interest for developing public access. Lands of higher rankings are more cost effective for maintaining public access due to the proximity to existing protected lands, or fill a public access “desert” – e.g. an area where public access is particularly lacking. Boating Access identifies river segments with poor boating access. Placing boat ramps or hand-carry boat launches on stretches with poor boating access can encourage the public to recreate on South Carolina’s rivers, as well as providing boating access for law enforcement.

Data Layers

Public Lands Access and Gaps (Federal, State, and Local)

Attribute	Ranking	Explanation
“Donut holes” and public-access deserts.	3	Properties surrounded by existing public land by at least 75% ¹ ; Areas with no access to a park within 10 miles ² .
Adjacent properties and areas of limited public access.	2	Properties adjacent to existing public land and within a 1 mile buffer of public lands ¹ ; Areas that have access to only small parks (< 10 acres) within 3 to 10 miles ² .

Data Sources

Two datasets were used to represent priority conservation areas for providing public access.

1. Public Accessible Lands
Sources: SCDNR, PADUS
2. Open Space Recreation
Source: Katie Warnell, Duke University, Nicholas Institute for Environmental Policy Solutions

Processing Steps

Public Lands

First, parcels that were surrounded by 75% or existing publicly accessible lands were isolated. Parcels were then selected if they were adjacent to existing public lands.

Open Space Recreation

Data were reclassified to represent the gaps in publicly accessible lands – areas where large publicly accessible tracts of land are not available for public recreation. These areas may also be called ‘public access deserts’. See the table above for the attributes used to classify this dataset.

Boating Access

Attribute	Ranking	Explanation
Areas greater than 10 river miles from boat ramp to boat ramp	3	Identify areas greater than 10 river miles from boat ramp to boat ramp as high priority areas
Between 5 and 10 miles from boat ramp to boat ramp	2	Identify areas greater than 10 river miles from boat ramp to boat ramp as medium priority areas

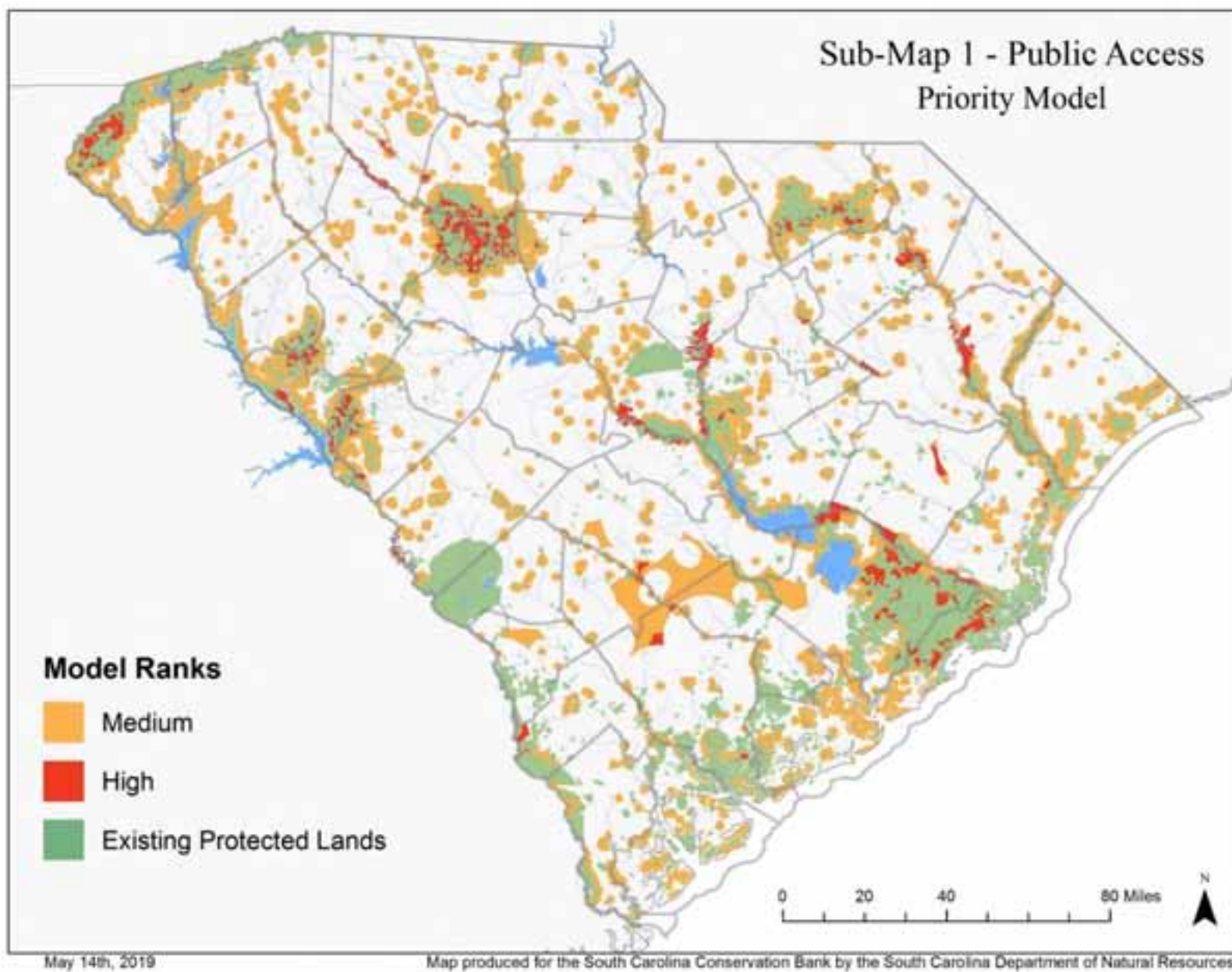
Data Sources

SCDNR

Processing Steps

Points were created across rivers that represented river mileage. Boat ramps were merged to these river mileage points. River segments that were greater than ten miles long between boat ramp points were found. River mile points 5 and 10 miles from existing boat ramps were calculated and used to split the river segments once more into regions that represent stretches without boating access. Parcels were selected along these stretches.

Sub-Map 1: Public Access Priority Model



Sub-Map 2 – Ecological Conservation Priorities

South Carolina faces various ecological challenges. Many species are being driven out from their natural habitat due to invasive species, deforestation, or urbanization. By identifying lands that can support wildlife populations, South Carolina can conserve these lands for natural wildlife. Areas that have existing endangered species also have priority for conservation

Data Layers

TNC and SECAS Conservation Modeling

Attribute	Ranking	Explanation
TNC SC Conservation Vision - cores, buffers, and restoration areas.	3	See TNC SC Conservation Vision for more details.
TNC SC Conservation Vision - corridors or patches of resilience not already captured.	2	See TNC SC Conservation Vision for more details.
Southeast Conservation Blueprint - high and medium ranks not coincident with TNC SC Conservation Vision.	1	The areas of the SE Conservation Blueprint that are not coincident with the TNC Conservation Vision are represented to capture areas of more local, or finer scale importance. See SE Conservation Blueprint for more details.

Data Sources

1. The Nature Conservancy (TNC) – An Updated Conservation Vision for South Carolina (2018).
2. Southeast Conservation Adaption Strategy (SECAS) – The Southeast Conservation Blueprint version 3.0.

Processing Steps

The TNC Conservation Vision was reclassified as above. SECAS Blueprint raster values of High and Medium were reclassified into one value. The SECAS dataset was then merged with the TNC Conservation Vision dataset. Appropriate ranks were assigned to the merged raster dataset.

State Species of Concern

Attribute	Ranking	Explanation
State Rank 1	3	Species with a very high priority ranking (State Rank 1) have been reported in this area.
State Rank 2	2	Species with a high priority ranking (State Rank 2) have been reported in this area.
State Rank 3	1	Species with a medium priority ranking (State Rank 3) have been reported in this area.

Data Sources

SCDNR

Processing Steps

Original data are point data with varying spatial certainty. Data were aggregated into a hexagon grid based on T and E data manager recommendations. The hexagon grid was ranked according to the highest ranking species found within the boundaries of that grid cell.

Historic Rice Fields and Carolina Bays

Attribute	Ranking	Explanation
Historic Rice Fields and Carolina Bays of Conservation Priority	1	Identifies parcels/areas that have rice fields and Carolina bays that directly intersect within them.

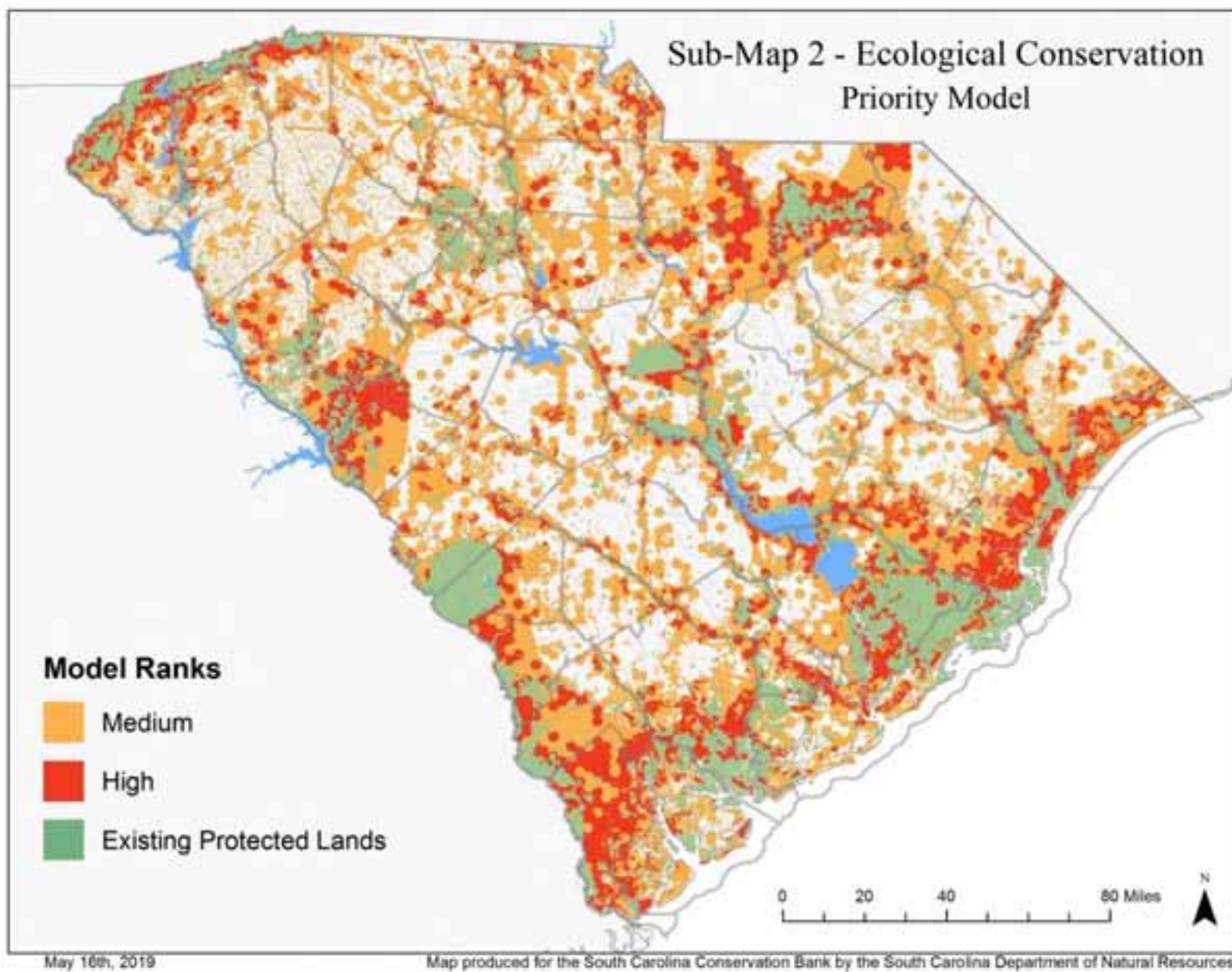
Data Sources

1. Neumors Wildlife Foundation/Clemson University
2. SCDNR – Advance Identification of Carolina Bays for South Carolina Wetlands Protection (1999).

Processing Steps

Carolina Bays of interests were digitized into polygons. Parcels that intersected Carolina Bays or Ricefield polygons were selected and rasterized.

Sub-Map 2: Ecological Conservation Priorities



Sub-Map 3 – Cultural Resources

Growth and urbanization in South Carolina can threaten our cultural heritage and opportunities for scientific knowledge of the past. By preserving historical sites and scenic pathways, South Carolina offers opportunities for the public to engage with cultural resources and state heritage, as well as protecting scientifically important cultural resources.

Data Layers

Historic Areas

Attribute	Ranking	Explanation
Listed in NRHP	3	Cultural resources already listed in the NRHP
Eligible for NRHP	2	Cultural resources determined to be eligible for NRHP
Other	1	Other cultural resources not eligible for NRHP

Data Sources

National Register of Historic Places (NRHP); South Carolina ArchSite Public Data

Processing Steps

The source data were four separate shapefiles, which included points and polygons. The appropriate ranking was assigned to each record in each feature class as described in the above table. Point data were spatially joined to SC parcels, creating a new layer of parcels that intersected with historic points. Features were then converted from polygon to raster, using the ranking field for the pixel values. The Cell Statistics tool was used to combine the raster layers into one raster layer, using the maximum value of each cell as the output.

Scenic Highways

Attribute	Ranking	Explanation
All	3	Adjacency to scenic highways

Data Sources

South Carolina Department of Natural Resources

Processing Steps

KML files were downloaded from the SCDOT's website and converted into shapefiles. Parcels within 200ft of the scenic highway segments were selected. The parcels were rasterized and were given a ranking of 3.

Scenic Rivers

Attribute	Ranking	Explanation
All	3	Adjacency to SC state scenic rivers

Data Sources

SCDNR

Processing Steps

Parcels within 1000 ft. of a scenic river were selected. The rasterized parcels are given a ranking of 3.

National Battlefield Trust – SC Revolutionary War and Civil War Battlefields

Attribute	Ranking	Explanation
Battlefield Core Area	3	Core area of battlefield
Battlefield Boundary	2	Boundary of battlefield

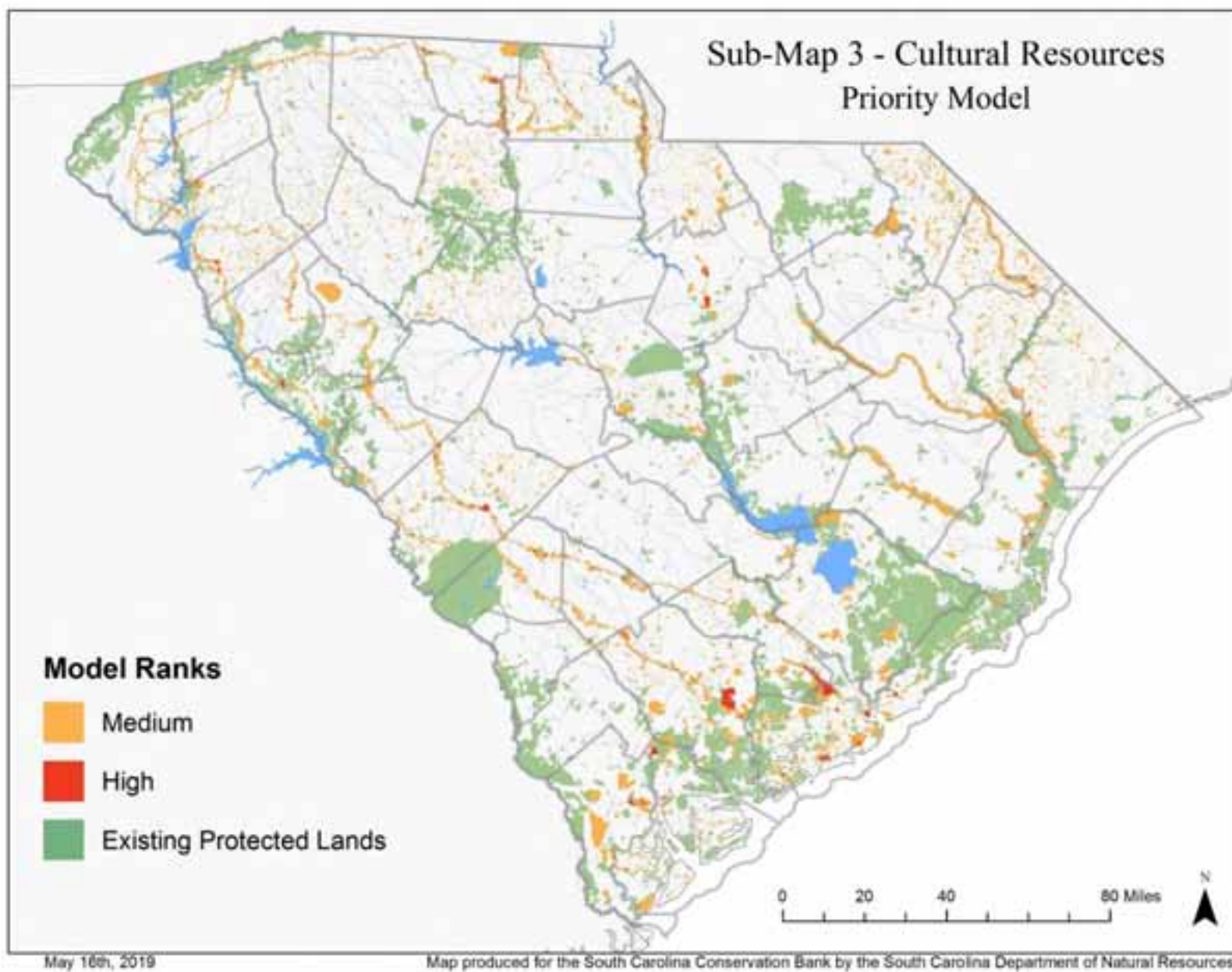
Data Sources

National Battlefield Trust

Processing Steps

Battlefield data were obtained from the National Battlefield Trust. Each battlefield was a separate dataset. First, battlefield layers merged into one layer. Rankings were given to the battlefield core areas and battlefield boundaries. They were then converted from polygon to raster, using the ranking field for the pixel values. The rasterized layers are the final products.

Sub-Map 3: Cultural Resources



Sub-Map 4 – Private Working Lands

With the population of South Carolina growing, the demand for food also continues to grow. Conservation of agricultural resources needs to be identified for future food demands.

Data Layers

Prime Farmland Soils

Attribute	Ranking	Explanation
Prime Farmland Soils	3	Prime Farmland Soils

Data Sources

Natural Resources Conservation Service (NRCS)

Processing Steps

Ranks were assigned to the appropriate soil attributes.

Privately Owned Parcel Analysis

Attribute	Ranking	Explanation
1,000 Acre Parcels Privately Owned	3	Select parcels with a size of 1,000 acres that were not currently protected and were not government owned

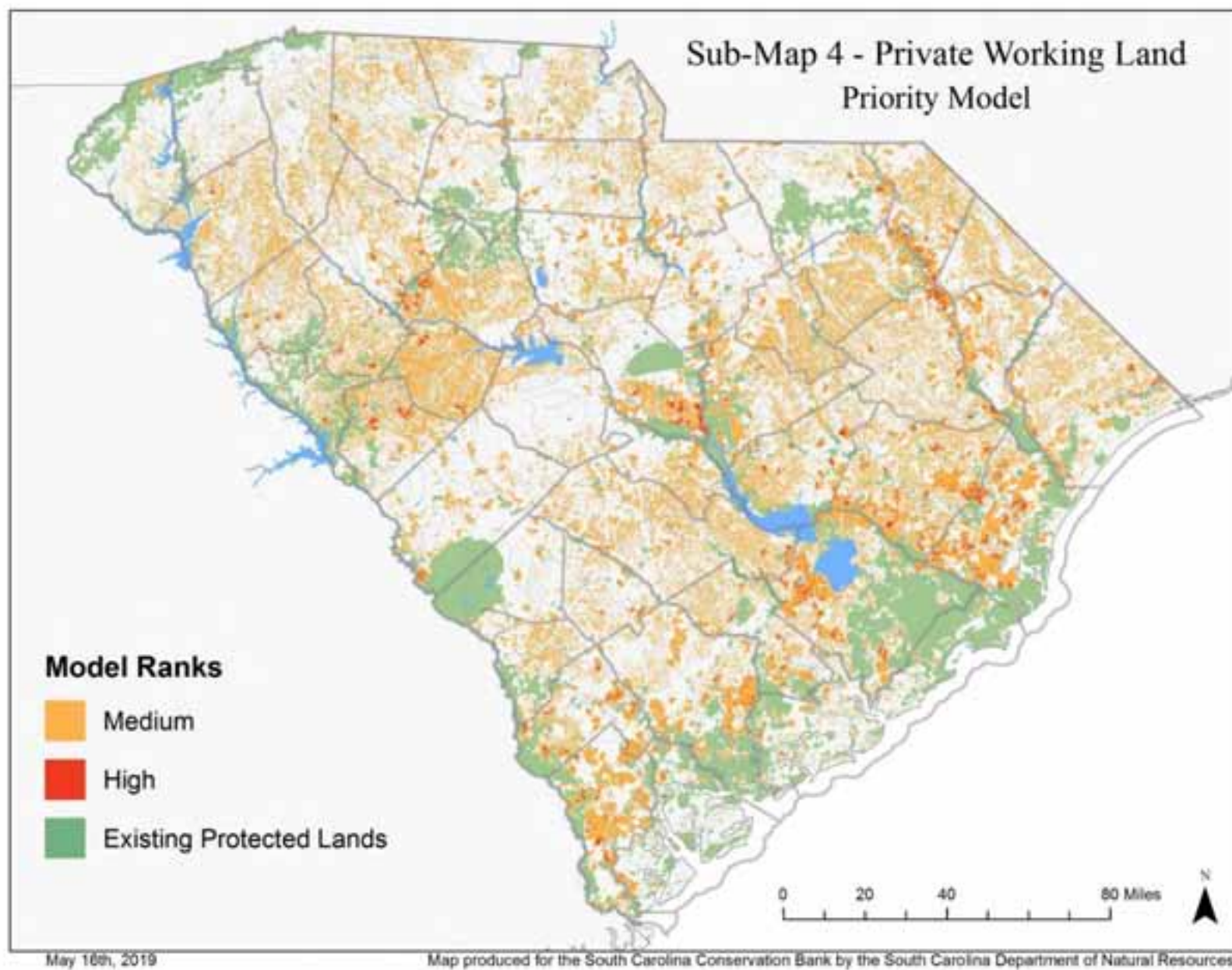
Data Sources

SC Geographic Information Council; SCDNR

Processing Steps

Parcels 1000 acres or larger in size were selected and assigned a rank.

Sub-Map 4: Private Working Lands



Sub-Map 5 – Water Resources

As the population of South Carolina continues to grow, the state needs to plan for future water needs. Water is a critical resource, both for the ecosystem and the developed landscape. By identifying areas of the state that have water resources impact, South Carolina conservation efforts can contribute to protection of and smart use of water resources.

Data Layers

Estimated Floodplain

Attribute	Ranking	Explanation
All	3	Used as a way to incorporate streams and waterbodies, plus areas along their course that are important.

Data Sources

Environmental Protection Agency Estimated Floodplain for the Conterminous United States

Processing Steps

All pixel values for this raster layer were given the same rank.

High Modeled Potential Recharge Areas

Attribute	Ranking	Explanation
All	3	Areas of high recharge rates on soil-water-balance modeling between 1979 to 2016

Data Sources

SCDNR, SCDHEC, and USGS

Processing Steps

The source raster represented modeled potential recharge (USGS soil-water balance model) recharge rates between 1979 and 2016. The areas that were higher than 1 standard-deviation above mean recharge across the entire area were subset and used as “high potential recharge areas” for this map.

Water Quality – Source Water Protection Areas

Attribute	Ranking	Explanation
All	3	Areas determined by SCDHEC to be important for protection drinking water sources. Datasets for groundwater and surface water.

Data Sources

SCDHEC Source Water Protection Areas and Groundwater Protection Zones

Processing Steps

State-wide parcels that intersected the Source Water Protection Areas and Groundwater Zone shapefiles were selected, given a rank, and rasterized.

Water Quality – TMDL Watersheds and Watershed Based Plans

Attribute	Ranking	Explanation
TMDL Watershed and Watershed Based Plan	3	Watersheds that have been identified as a TMDL, and an area for which a Watershed Based Plan is in place. Conserving land in these watersheds would be viewed as an opportunity to address water quality issues and support a community's watershed plan.
TMDL Watershed or Watershed based plan only.	2	Watersheds that have TMDL. Conserving land in these watersheds would be viewed as an opportunity to address water quality issues.

Data Sources

SCDHEC

Processing Steps

The TMDL Watershed and Watershed Based Plan shapefiles were both given a new field rank of 1. After rasterizing these two shapefiles, they were merged together using the sums of their rank fields.

Water Quality – Outstanding Resource Waters

Attribute	Ranking	Explanation
ORW	3	Outstanding Resource Waters

Data Source

SCDHEC

Processing Steps

Lines that had an attribute of ORW were selected. A search by location query selected state-wide parcels that intersected these ORW lines. The parcels were then given a rank, exported, and rasterized.

Marsh Migration Space

Attribute	Ranking	Explanation
2ft	3	2ft sea level rise – highest rank because would occur first
4ft	2	4ft sea level rise
6ft	1	6ft sea level rise

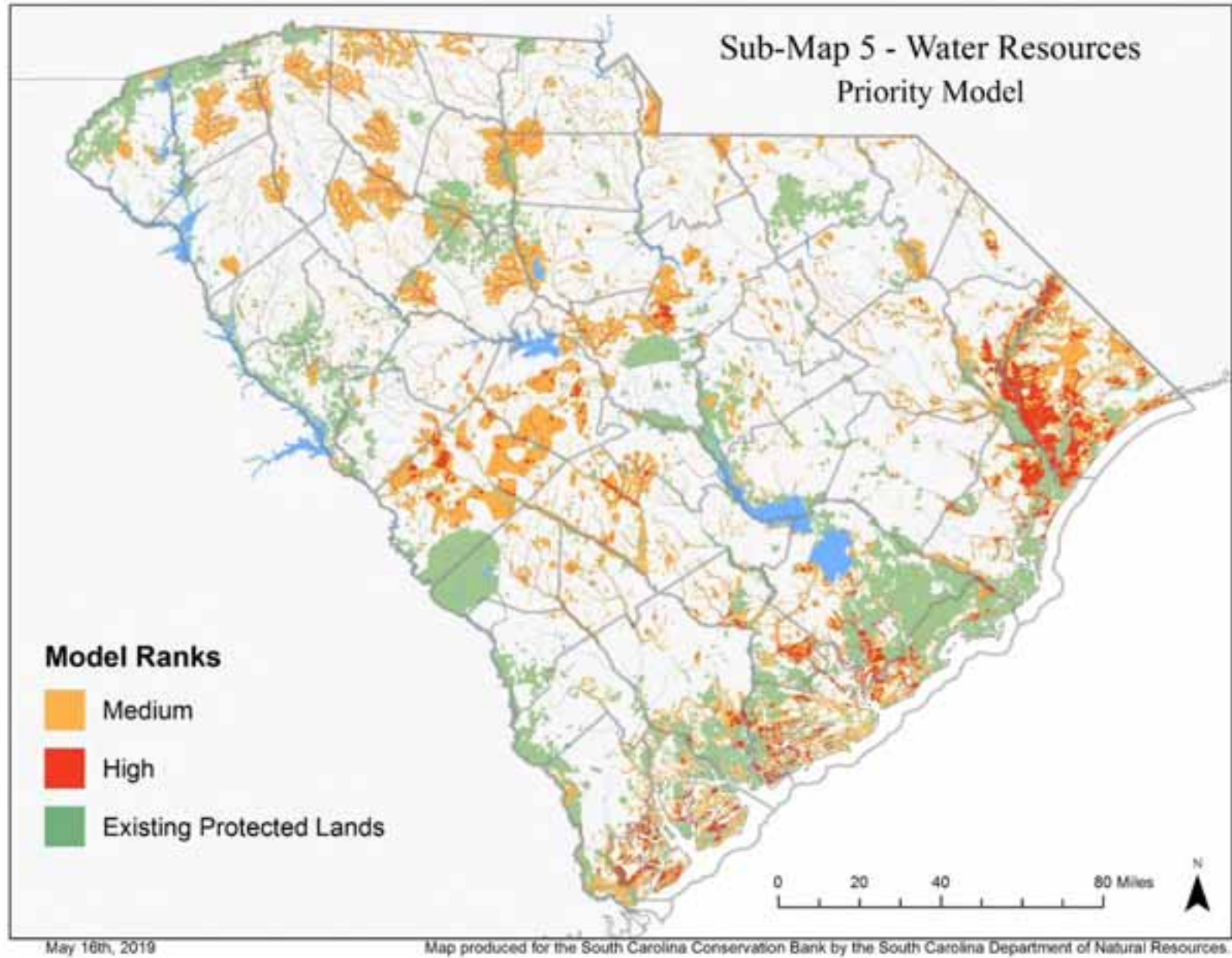
Data Sources

National Oceanic and Atmospheric Association

Processing Steps

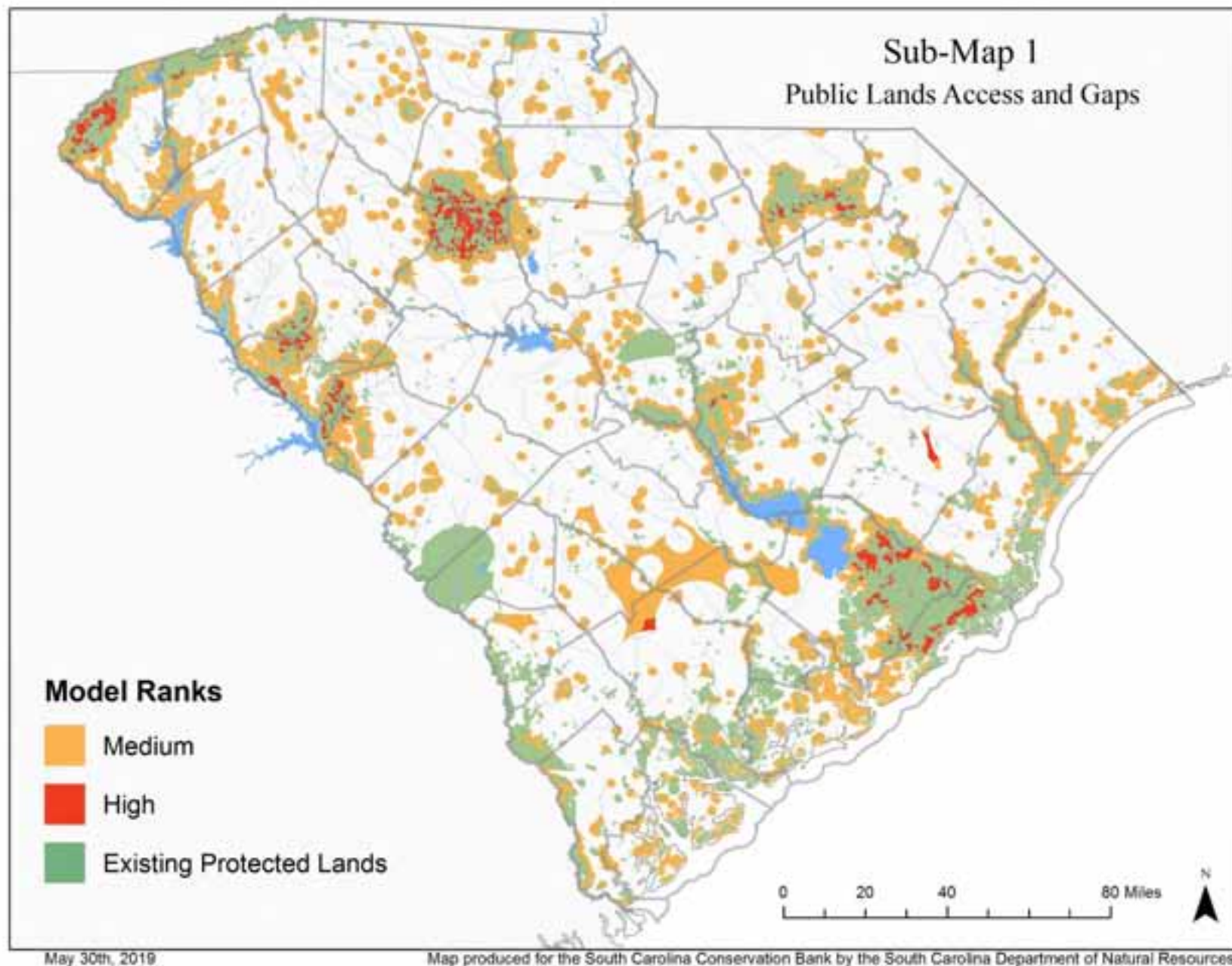
Ranks were assigned to the merged shapefiles in a new field based on their sea level rise value. They were then converted into raster layers and merged, using the maximum ranking value for the pixel value.

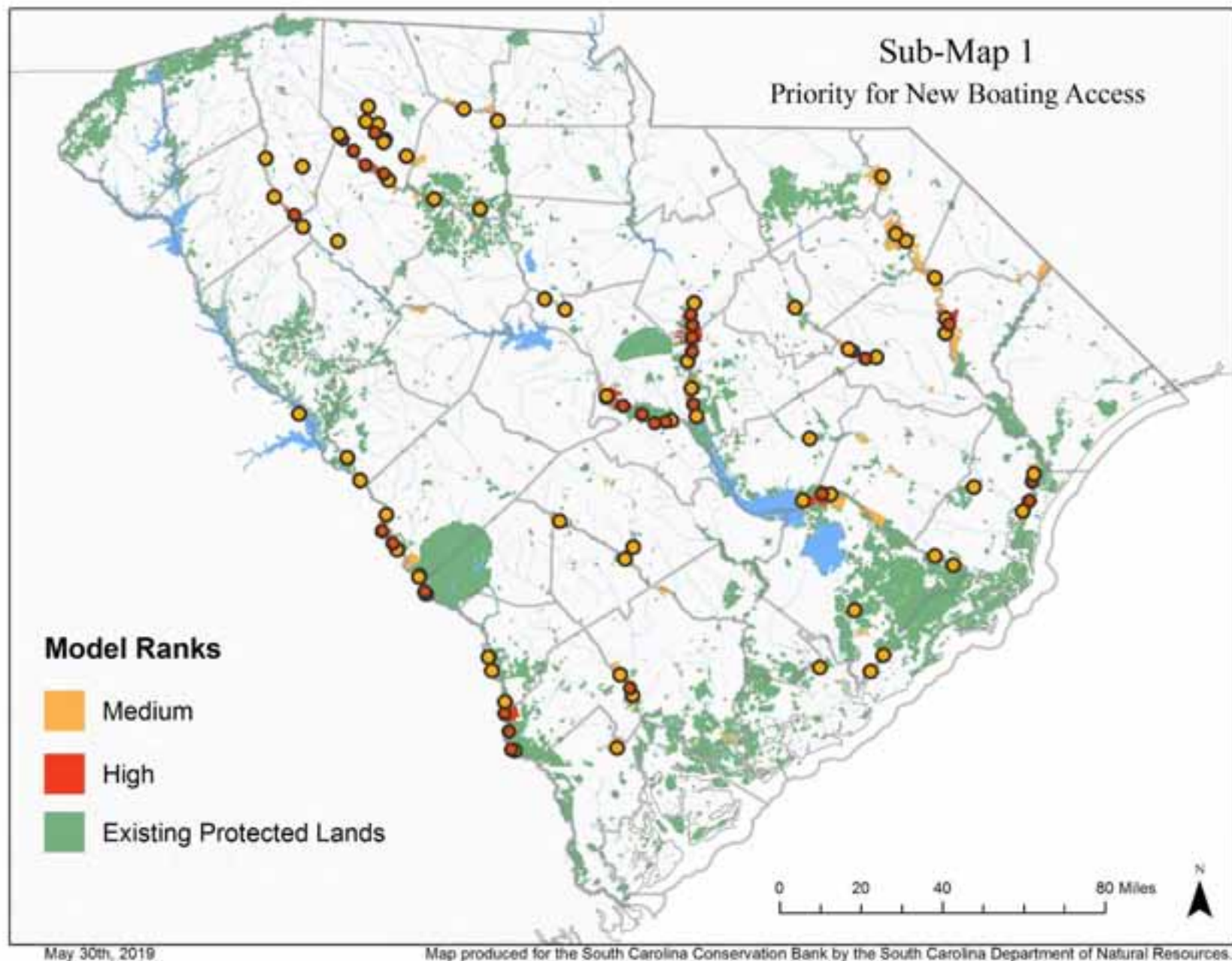
Sub-Map 5: Water Resources

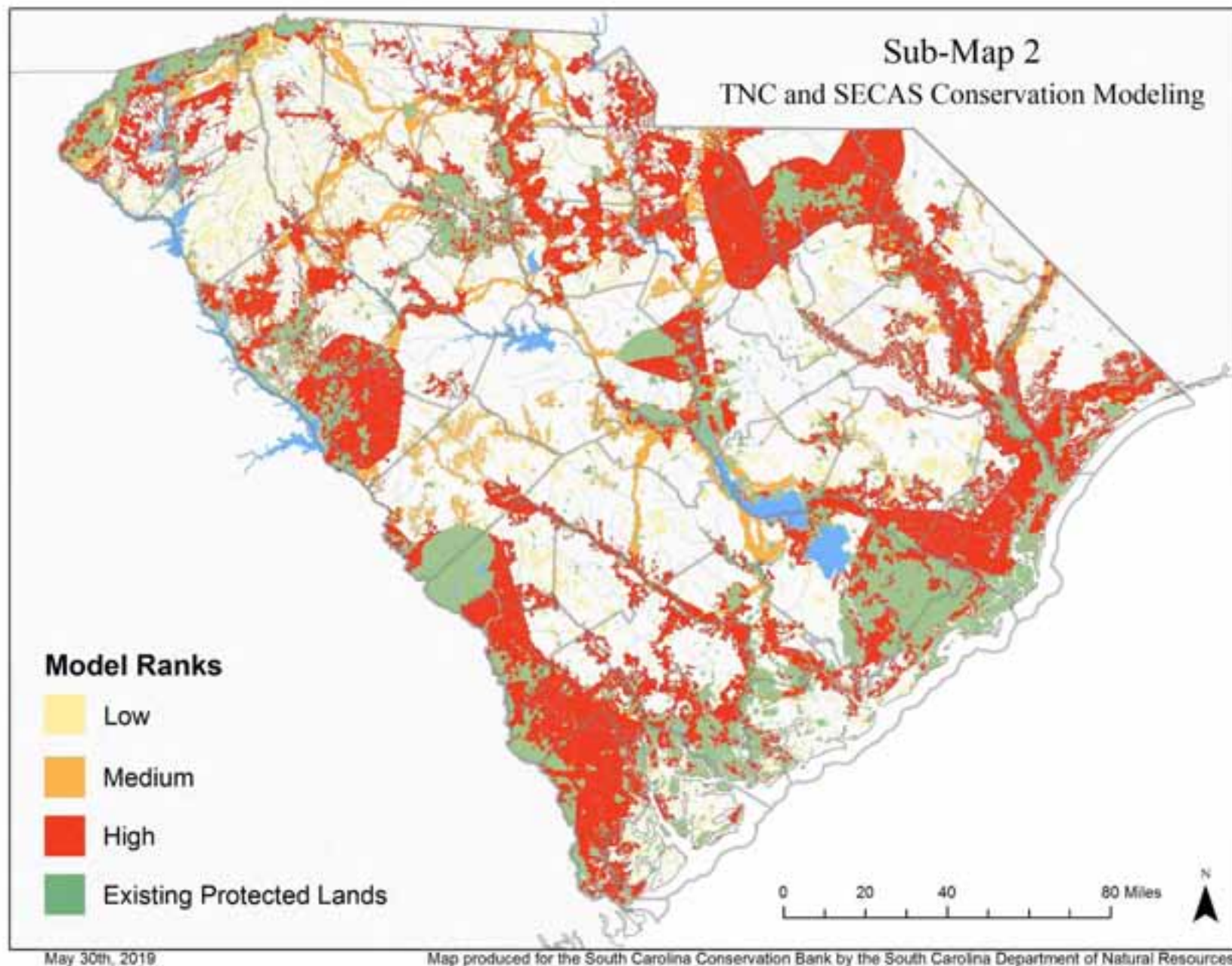


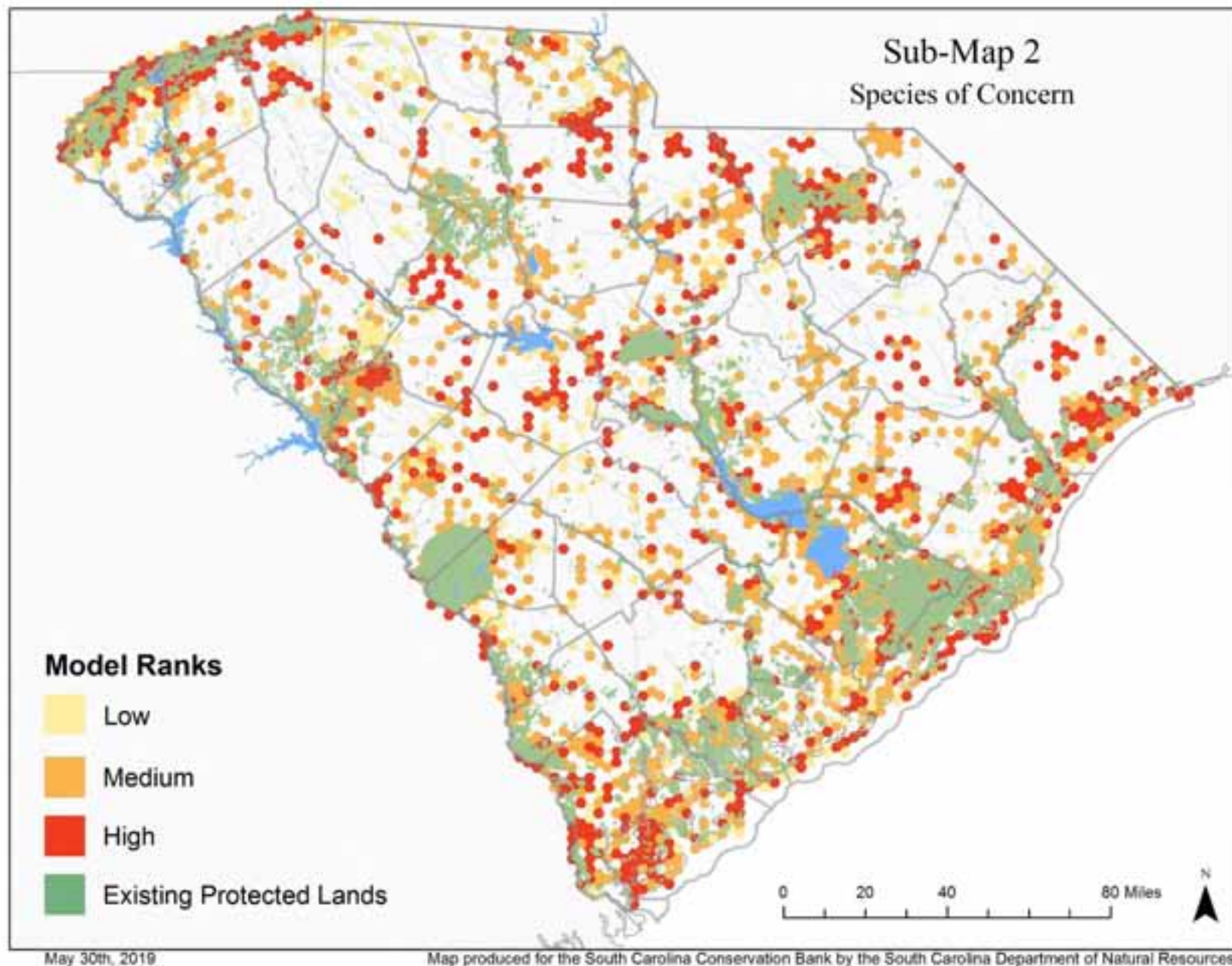
Appendix A – Sub-Map Data Layer Maps

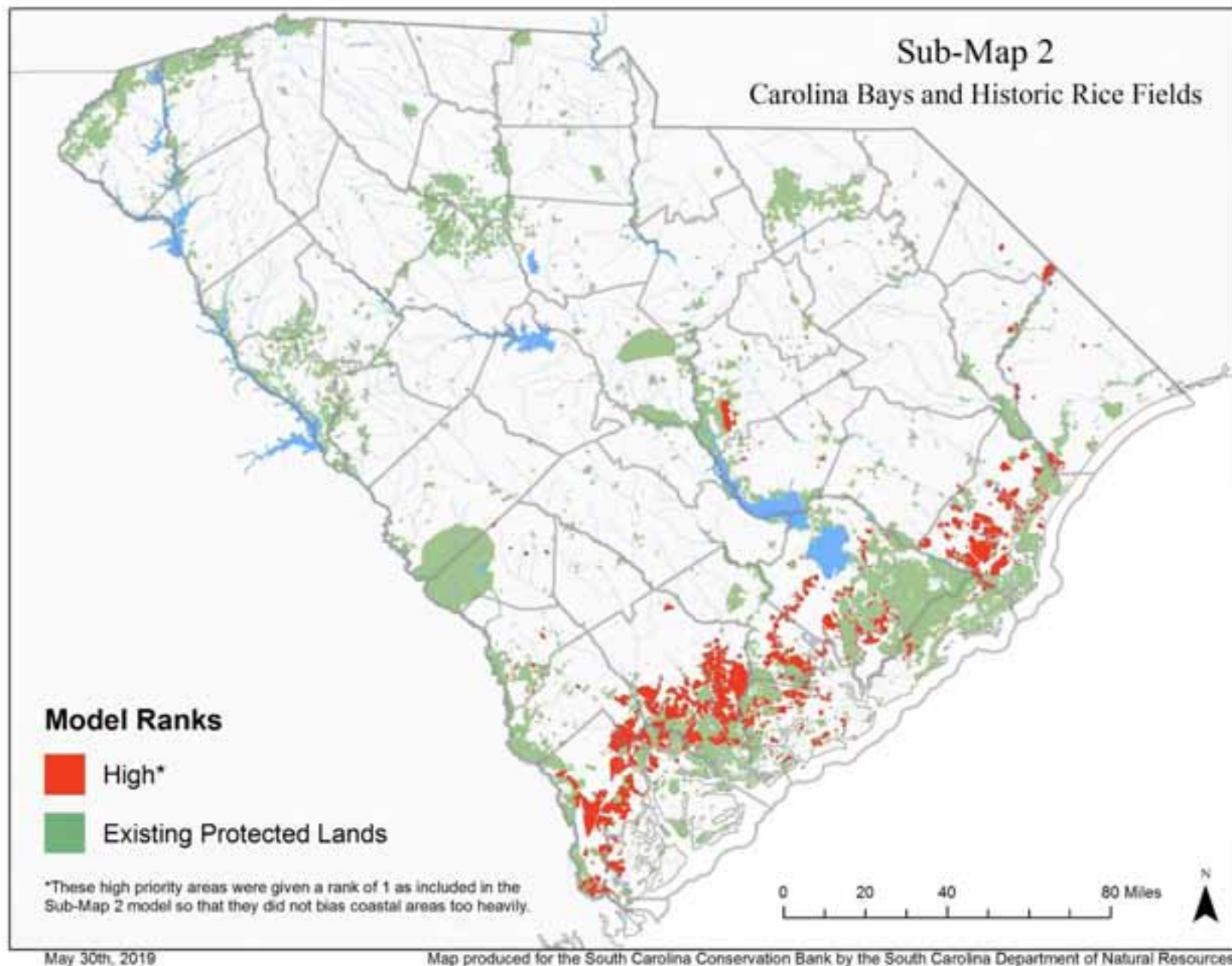
Appendix A presents maps of each data layer used to develop sub-map models, corresponding to the layer descriptions above.

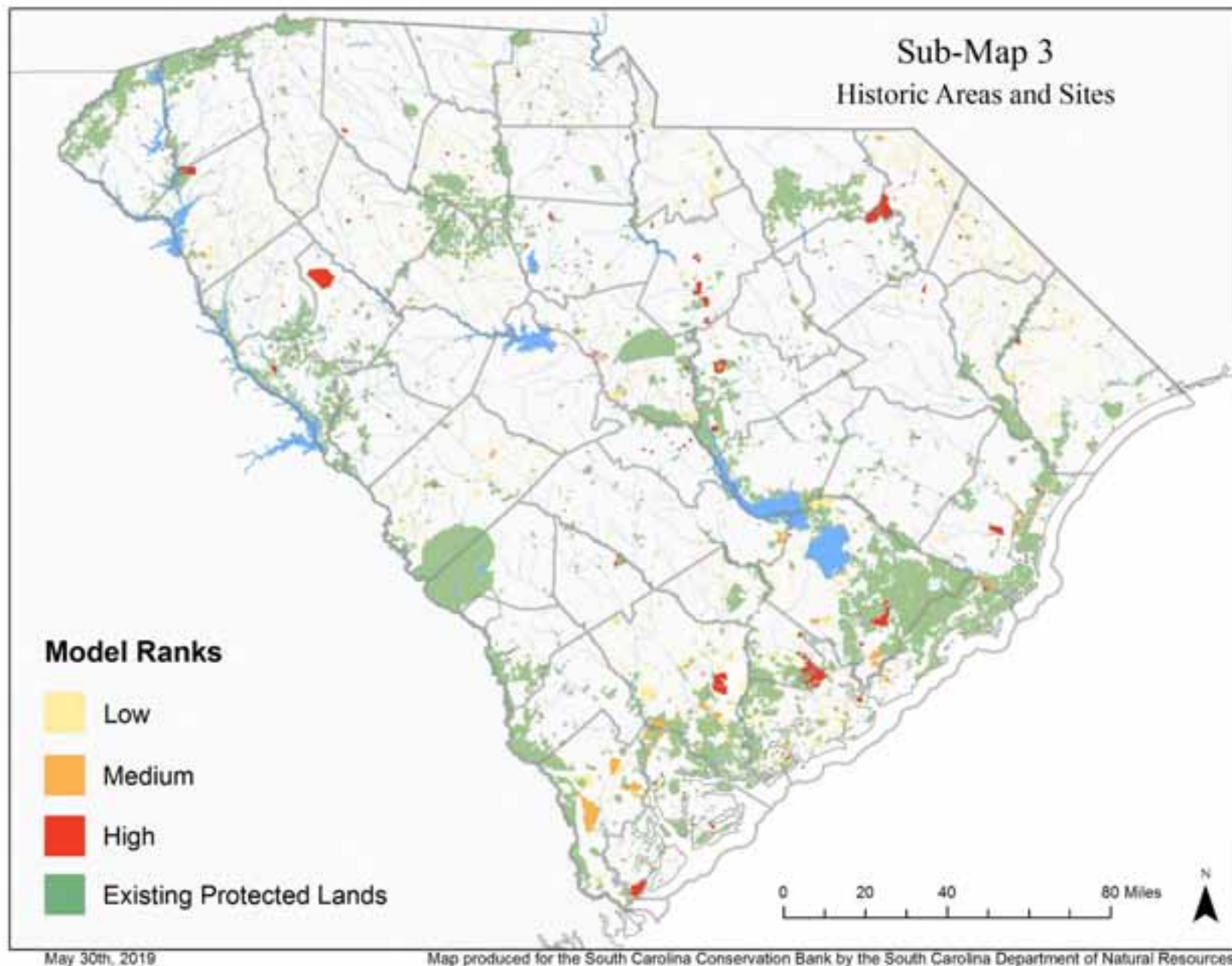


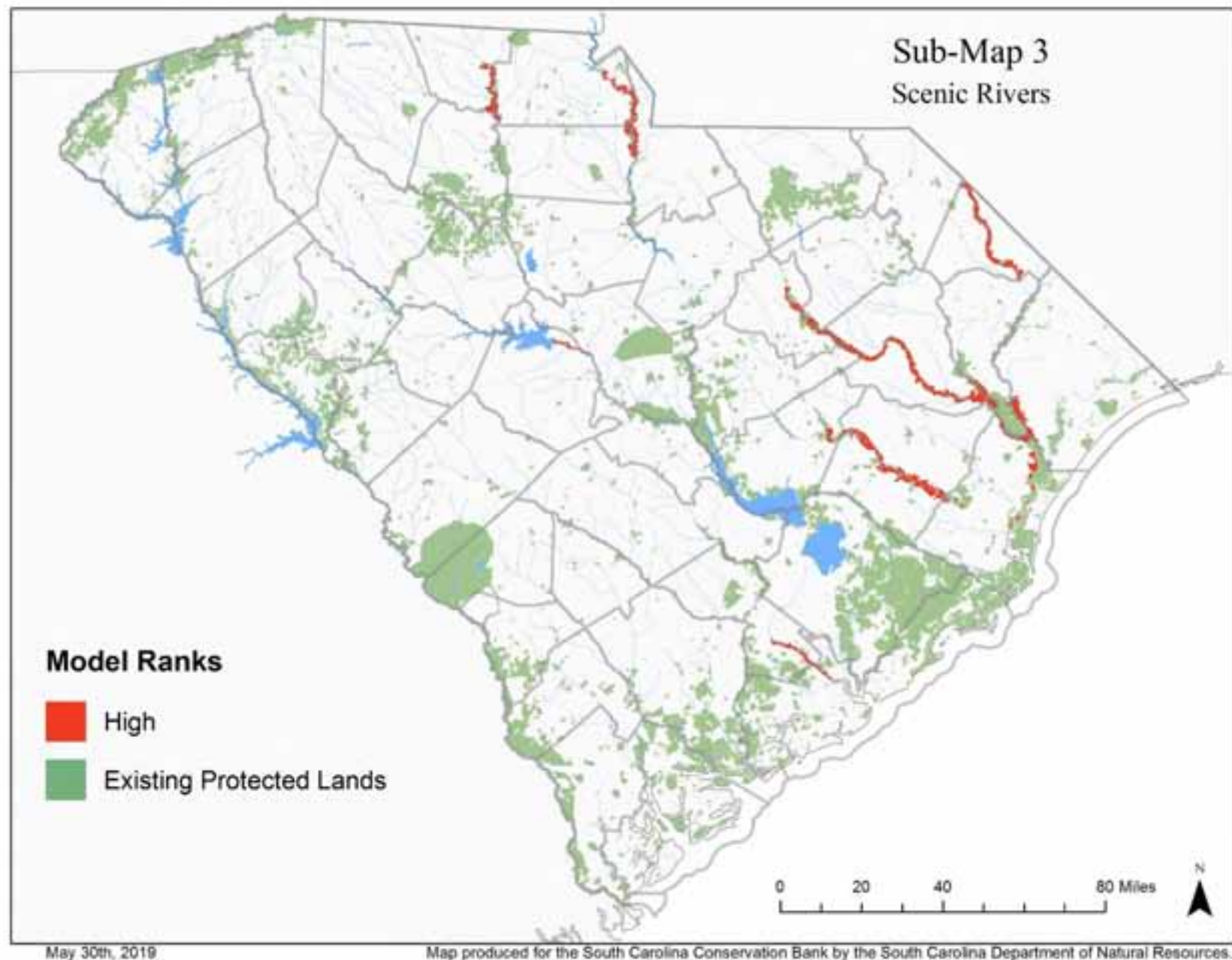


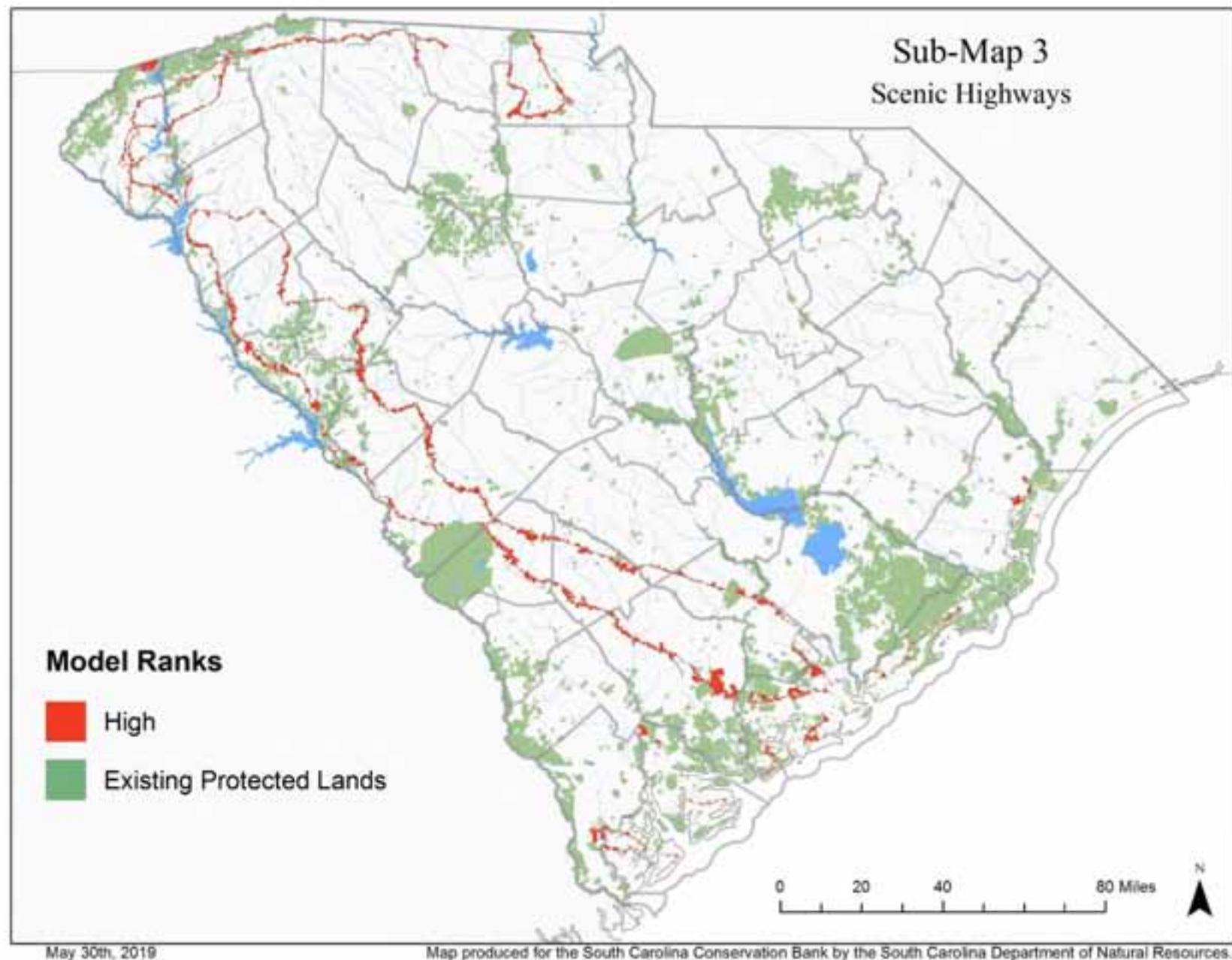


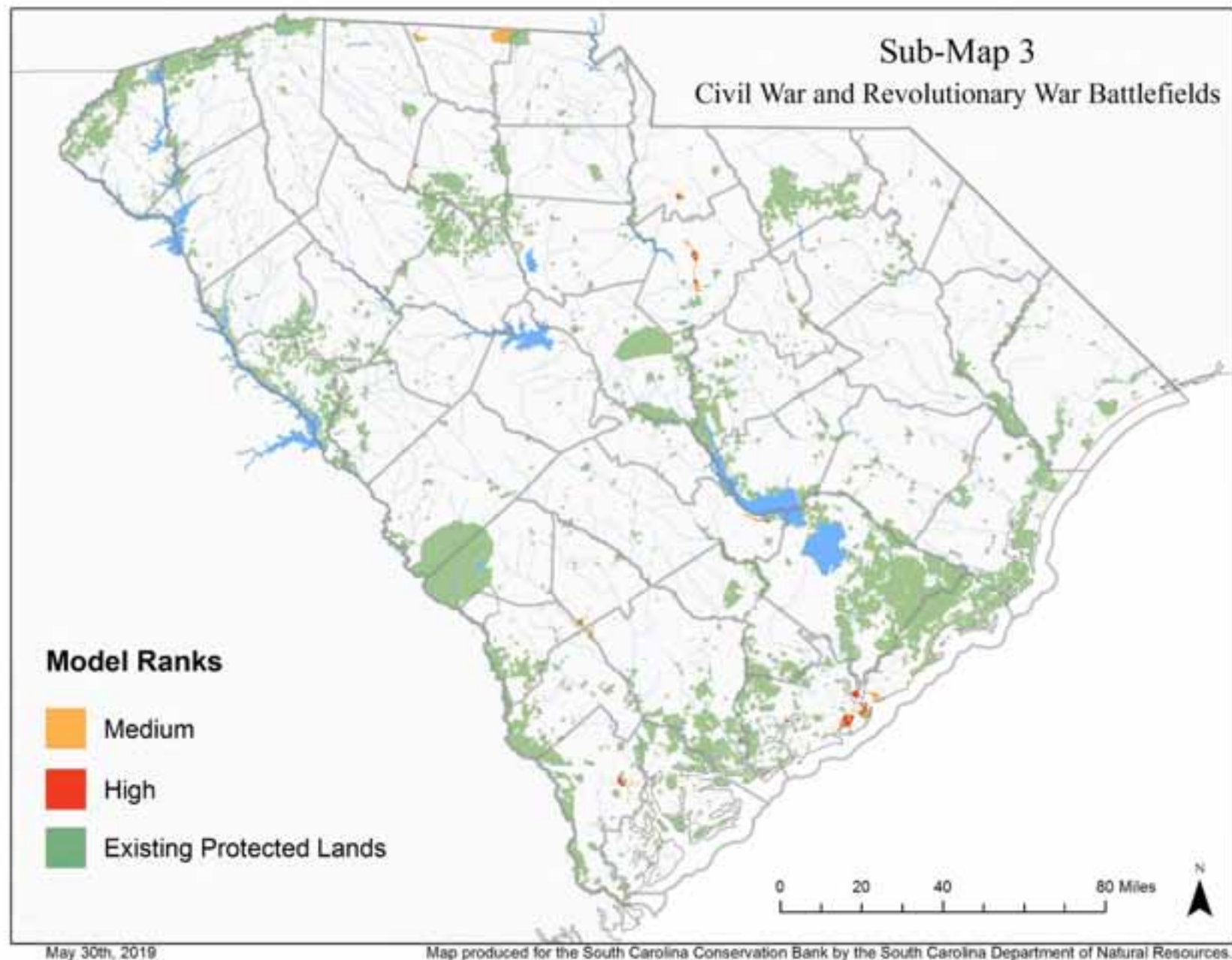


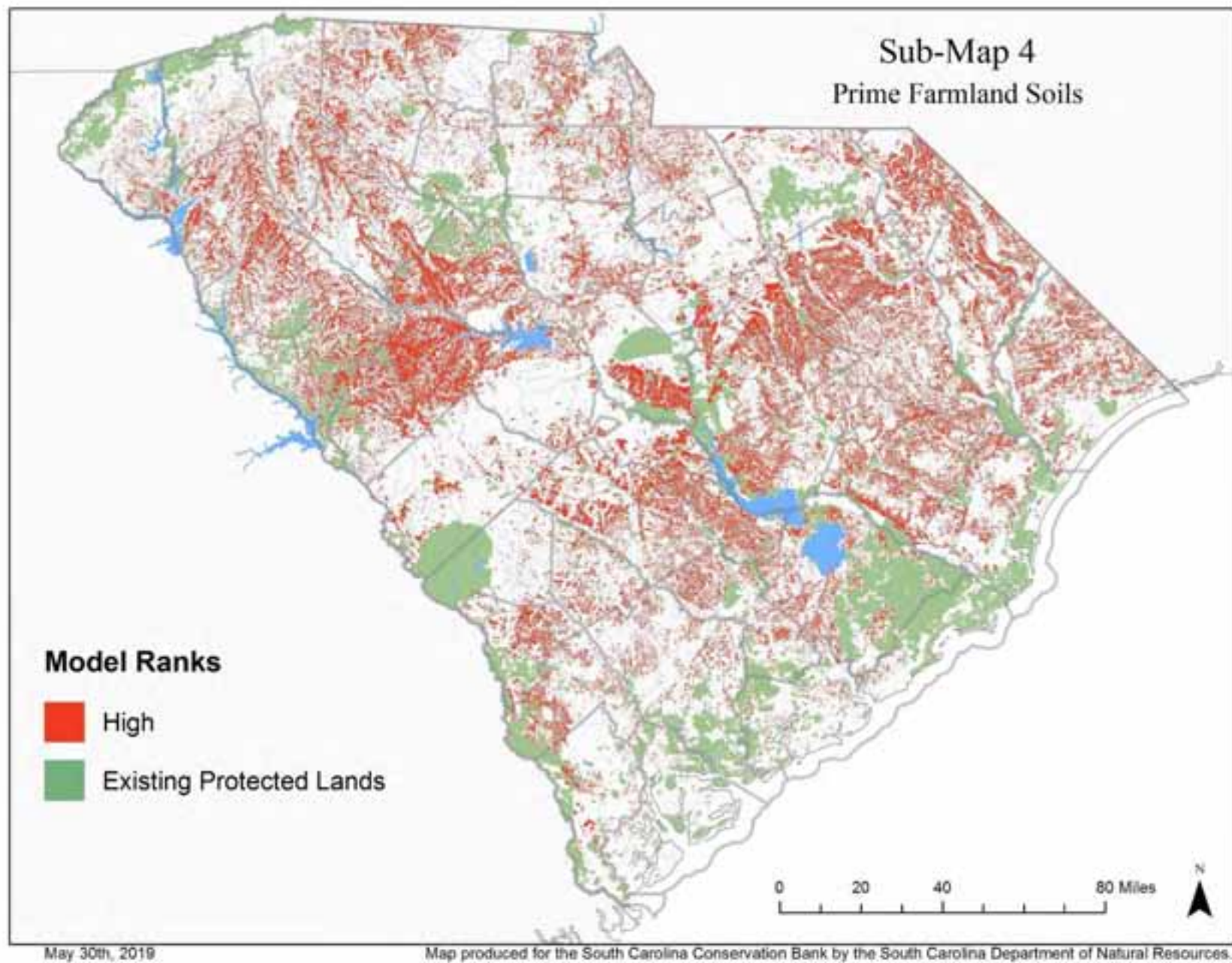


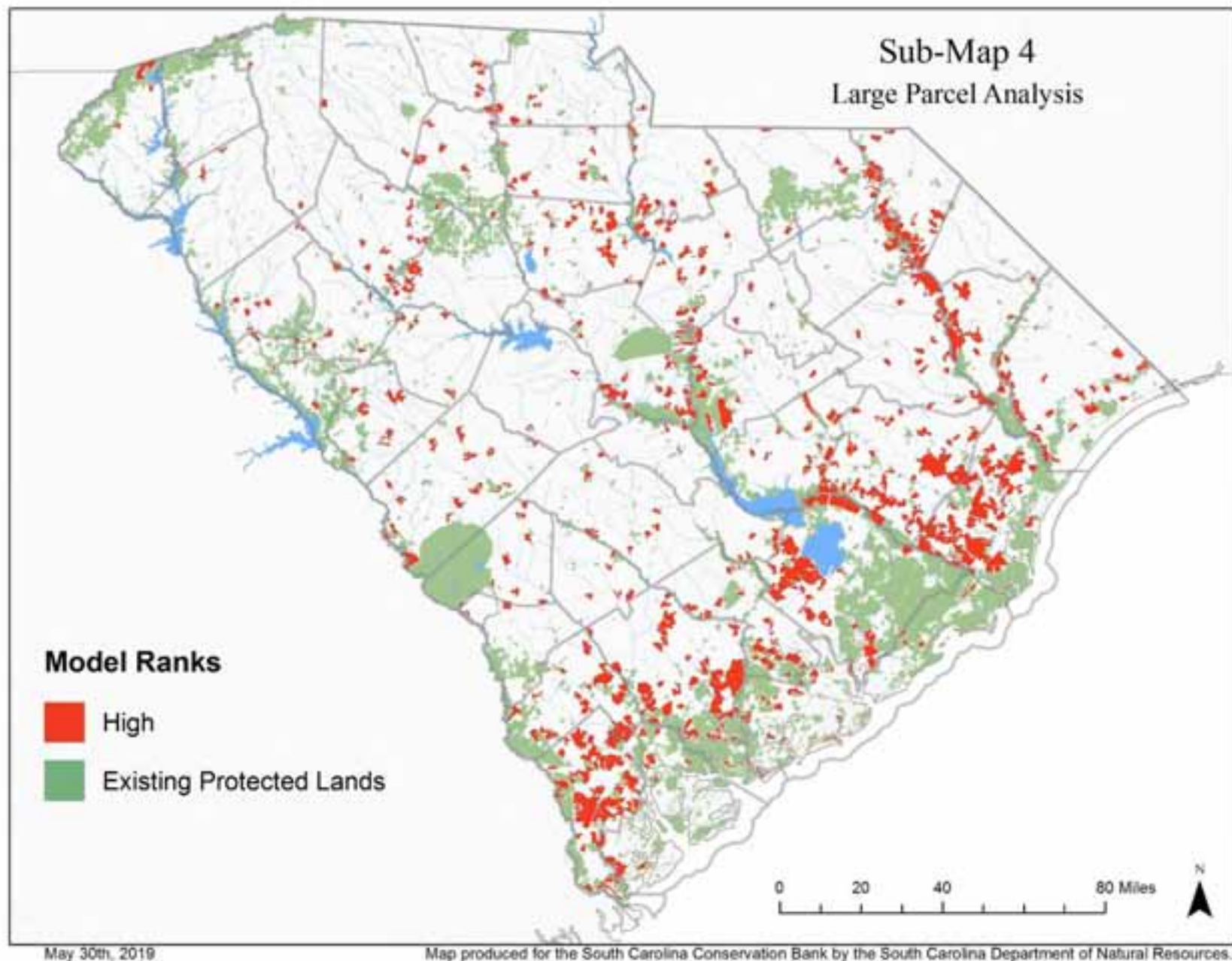


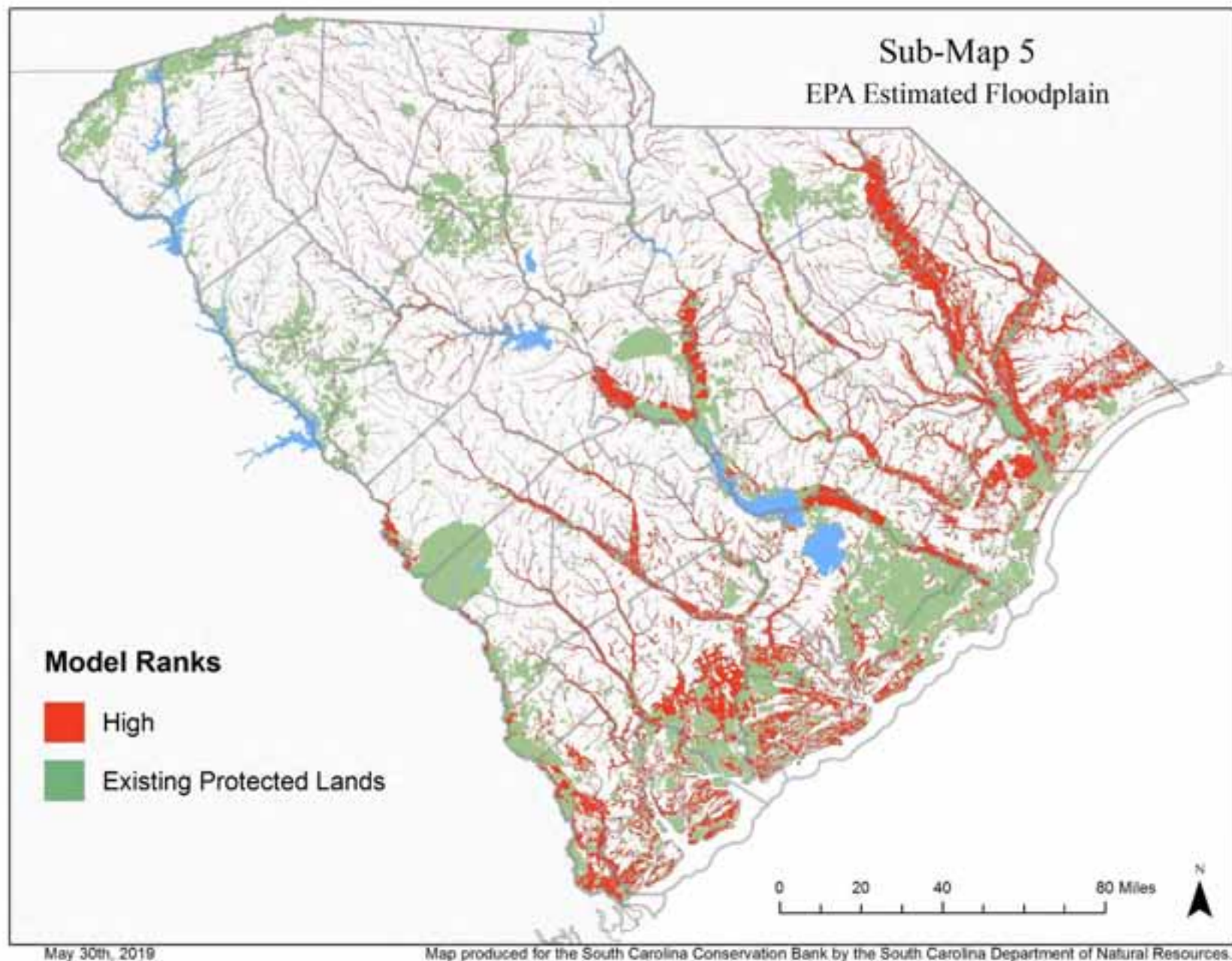


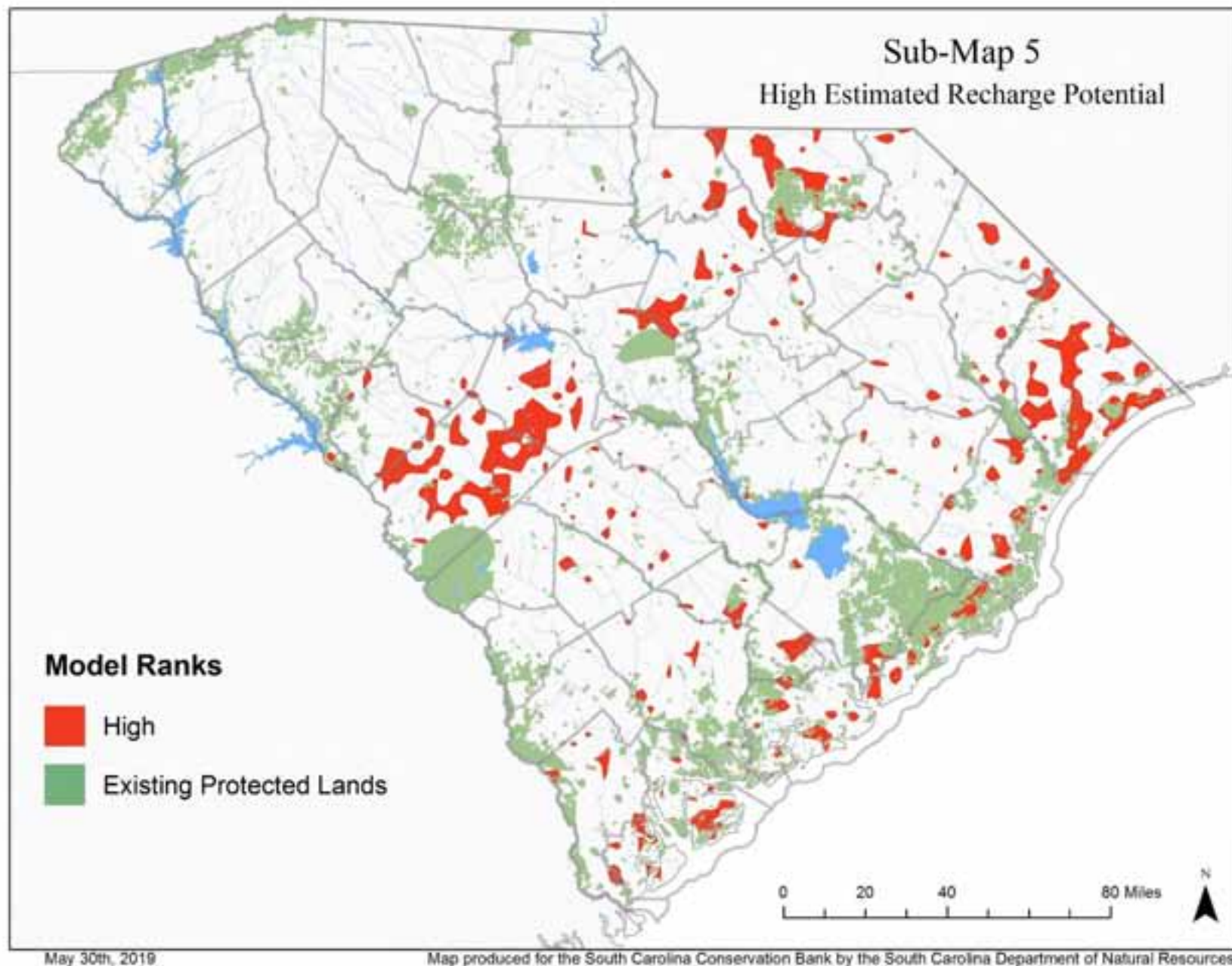


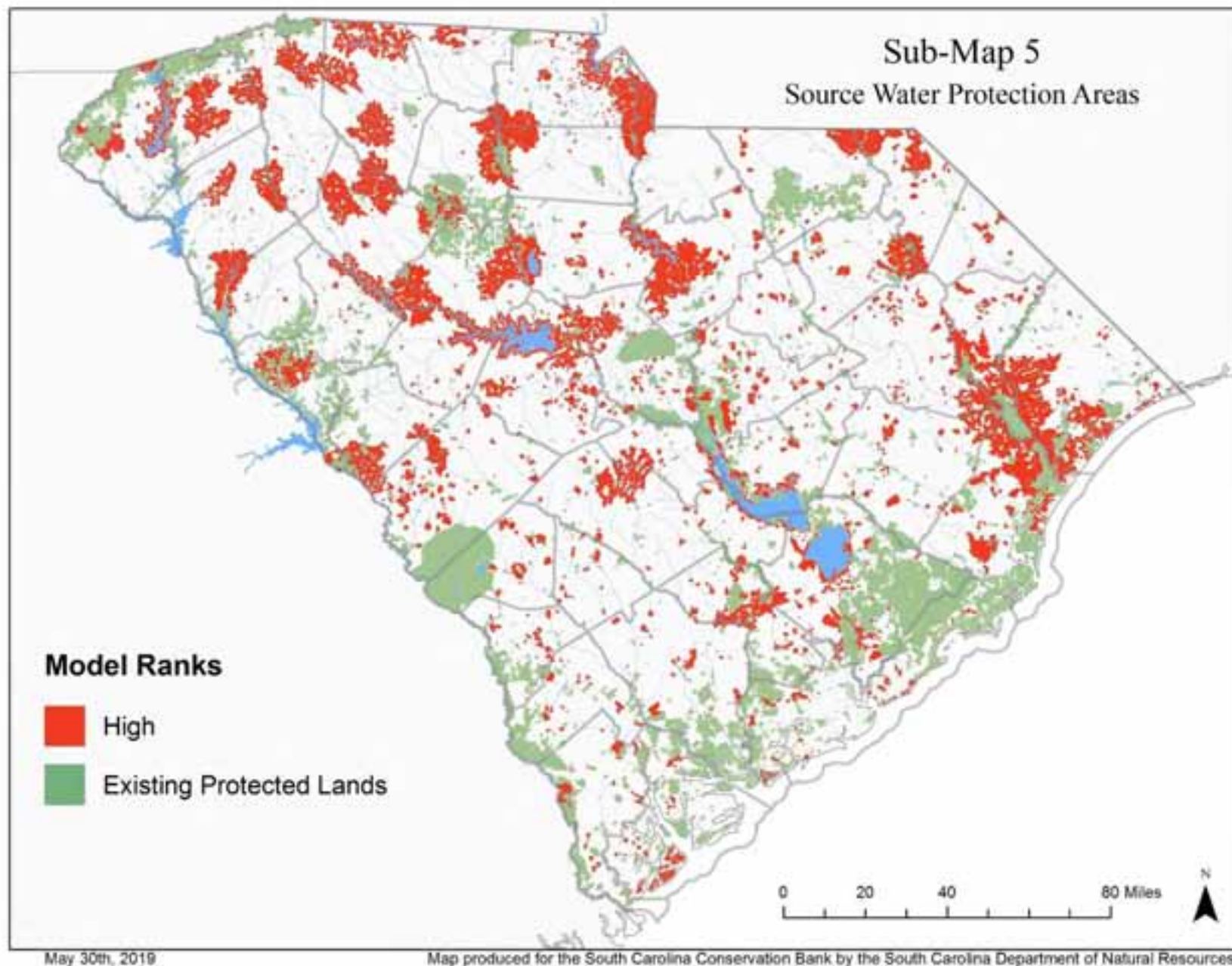


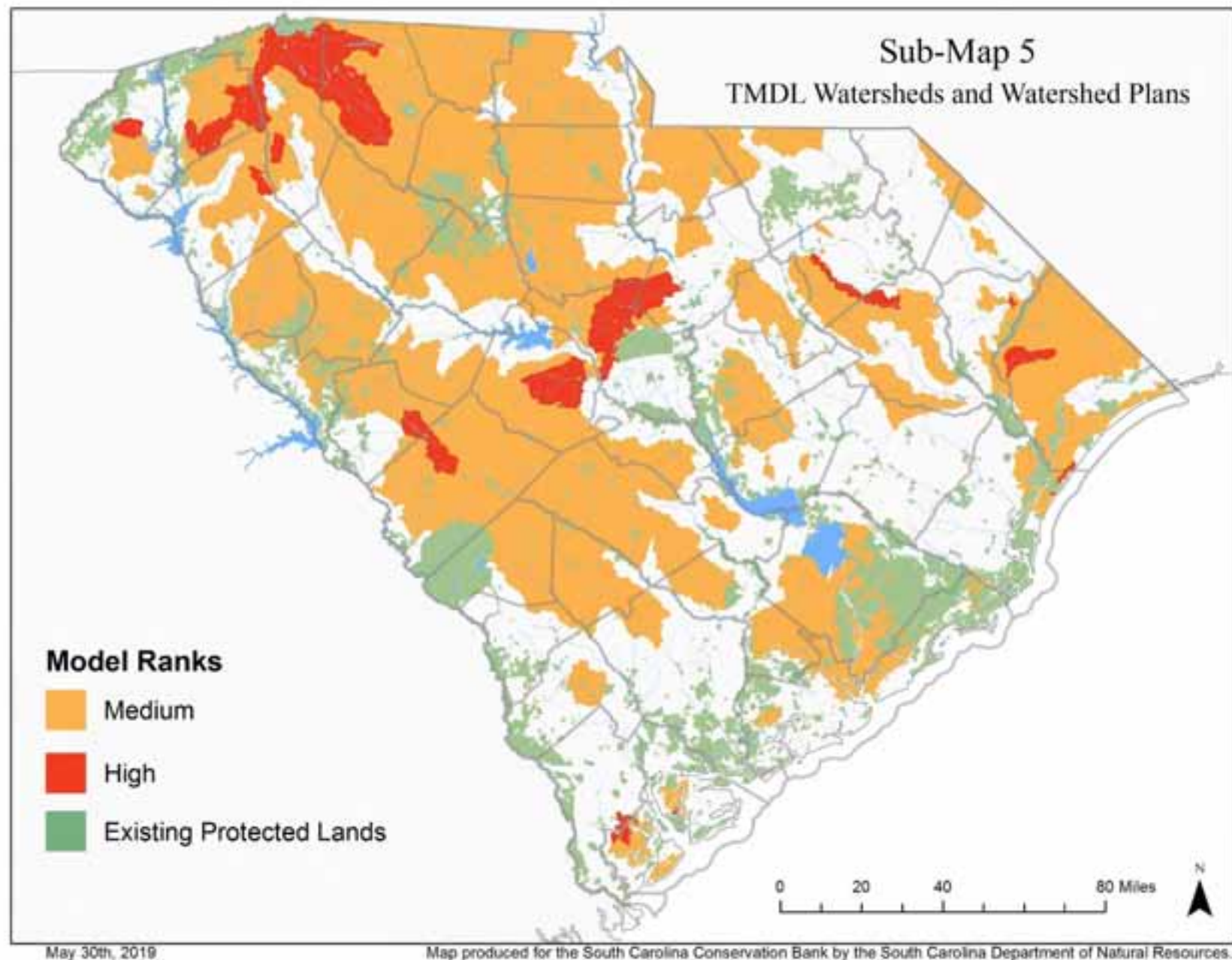


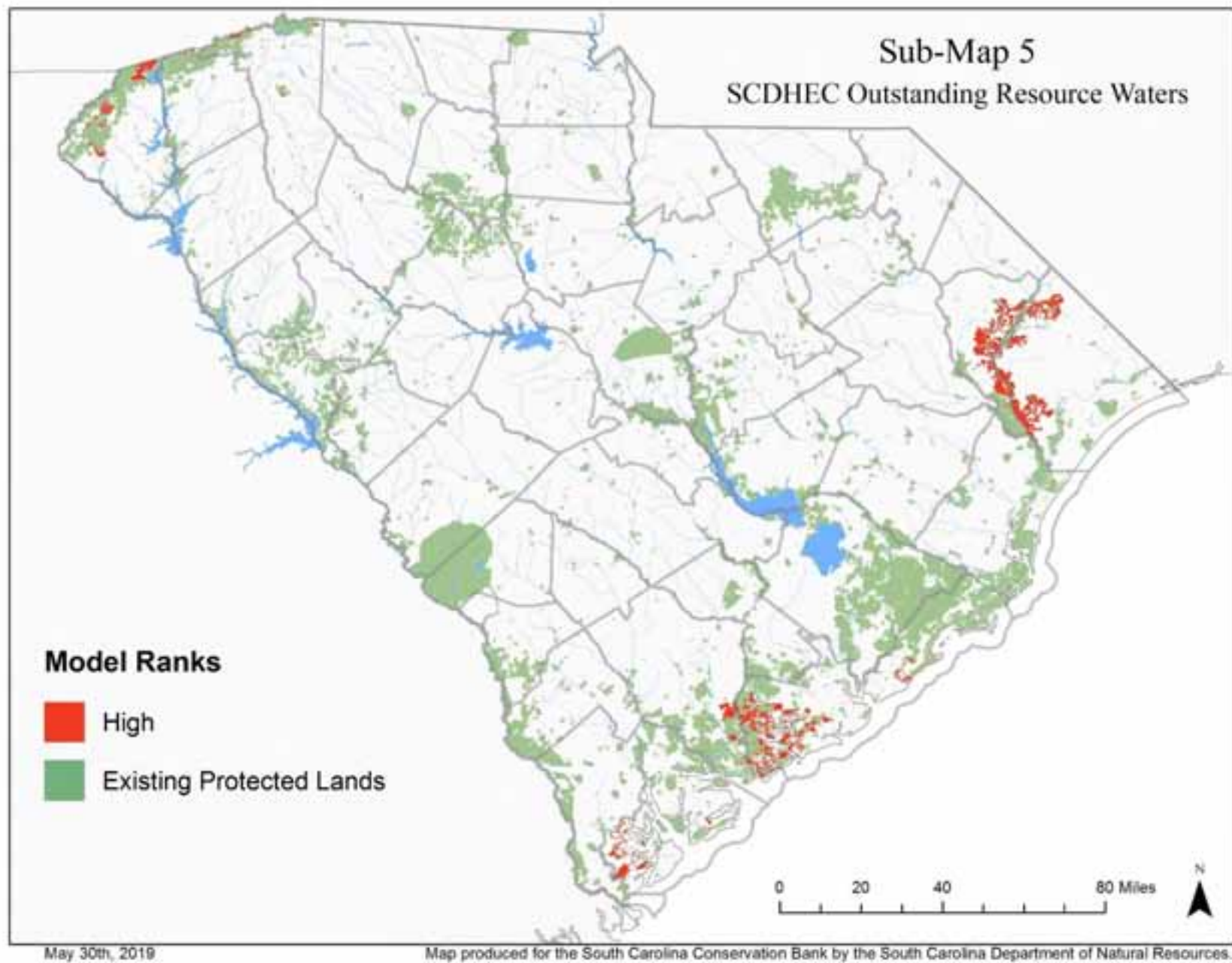


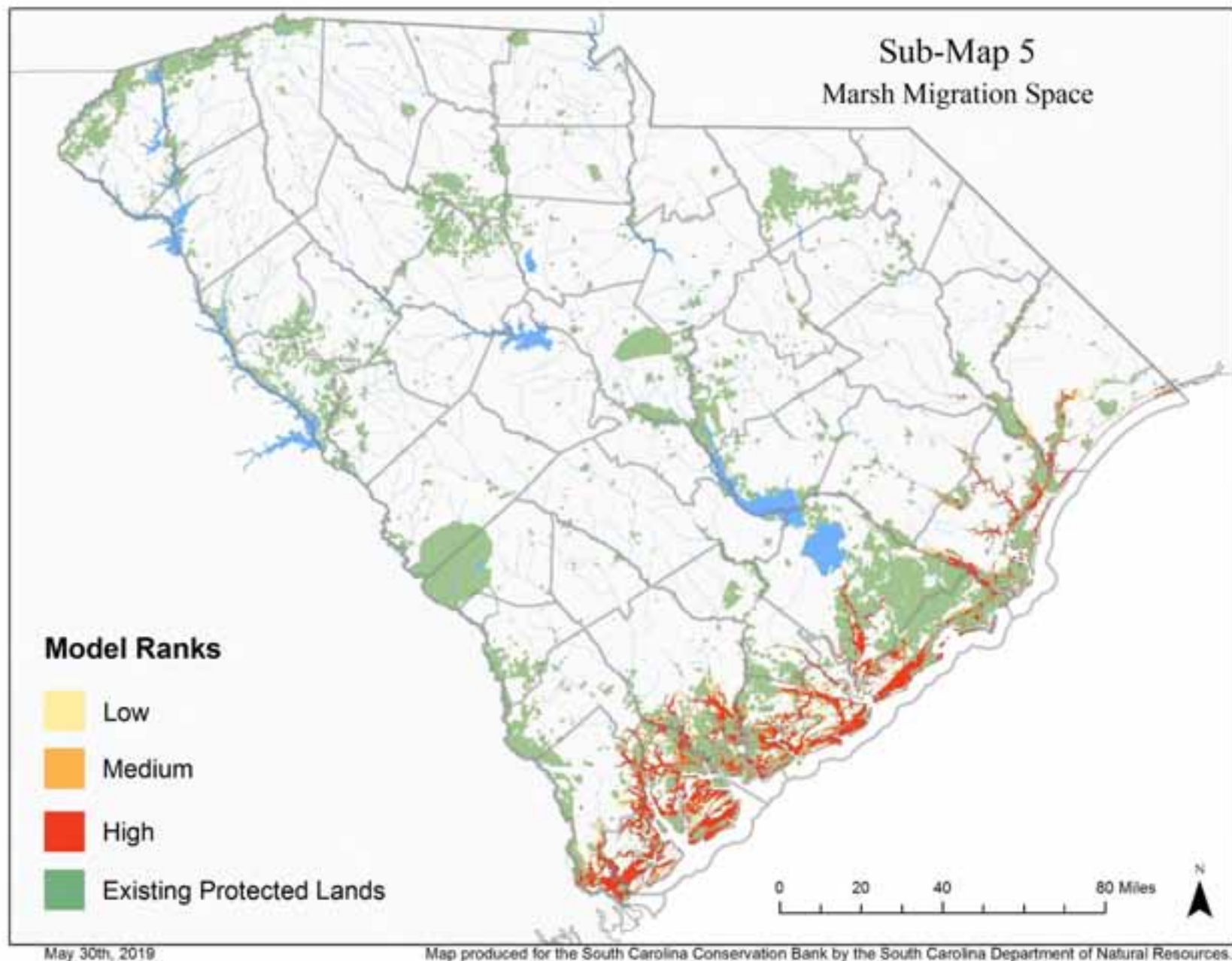












Appendix B – Table of Priority Area by County

County	County Total Acres	Total Conservation Priority Acres	% county area	Current Protected Acres	% county area	All Developed Land Cover Acres	% county area
Abbeville	327,221	127,022	39	43,600	13	21,917	7
Aiken	689,761	271,363	39	94,423	14	77,053	11
Allendale	262,583	110,842	42	47,935	18	11,937	5
Anderson	482,725	149,169	31	22,764	5	90,830	19
Bamberg	252,960	84,154	33	7,853	3	14,801	6
Barnwell	356,228	87,261	24	120,870	34	20,594	6
Beaufort	393,819	200,312	51	85,465	22	56,537	14
Berkeley	784,740	313,657	40	297,564	38	69,596	9
Calhoun	250,996	53,455	21	15,807	6	15,659	6
Charleston	621,505	265,114	43	223,704	36	94,337	15
Cherokee	254,310	78,815	31	3,093	1	31,223	12
Chester	374,834	108,010	29	22,975	6	22,698	6
Chesterfield	514,496	191,987	37	101,266	20	38,748	8
Clarendon	444,922	107,586	24	48,892	11	25,198	6
Colleton	681,613	266,558	39	114,939	17	31,617	5
Darlington	362,218	120,531	33	19,701	5	34,484	10
Dillon	260,136	65,258	25	3,333	1	18,937	7
Dorchester	365,302	173,658	48	63,716	17	40,339	11
Edgefield	323,978	181,468	56	37,927	12	20,524	6
Fairfield	453,965	134,208	30	21,455	5	22,673	5
Florence	514,518	174,005	34	5,997	1	55,598	11
Georgetown	532,354	320,320	60	114,768	22	43,020	8
Greenville	507,674	155,002	31	57,302	11	145,992	29
Greenwood	296,114	124,973	42	27,371	9	35,187	12

Hampton	358,307	147,048	41	65,032	18	17,166	5
Horry	730,649	421,536	58	56,200	8	116,746	16
Jasper	422,469	277,164	66	75,316	18	23,006	5
Kershaw	473,410	229,245	48	12,724	3	40,601	9
Lancaster	353,546	172,235	49	8,089	2	34,703	10
Laurens	462,991	170,788	37	27,392	6	43,576	9
Lee	263,000	63,920	24	11,399	4	15,258	6
Lexington	484,513	116,089	24	3,693	1	104,432	22
Marion	316,197	135,371	43	40,748	13	22,262	7
Marlboro	310,489	130,166	42	6,772	2	20,506	7
McCormick	249,587	112,551	45	93,352	37	14,600	6
Newberry	413,958	183,920	44	66,588	16	27,830	7
Oconee	428,781	173,317	40	107,835	25	53,216	12
Orangeburg	721,278	230,884	32	28,557	4	59,562	8
Pickens	327,969	140,639	43	56,244	17	51,792	16
Richland	493,655	180,196	37	102,338	21	108,959	22
Saluda	295,433	86,193	29	7,565	3	18,419	6
Spartanburg	523,847	208,025	40	11,800	2	120,774	23
Sumter	436,226	107,977	25	76,578	18	47,228	11
Union	330,016	113,177	34	67,148	20	18,430	6
Williamsburg	599,435	229,748	38	36,951	6	29,874	5
York	443,798	187,918	42	21,034	5	77,241	17
TOTALS*	19,748,524	7,682,831		2,586,074		2,105,681	

*These totals do not include acreage from open water, so the numbers may differ slightly less than the total area given elsewhere.