Anna Frisbie | Cartography Portfolio

I am a detail-oriented cartographer with seven years of geographic information system (GIS) and remote sensing experience. I am committed to understanding and advancing sustainable human engagement with natural landscapes.

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As an undergraduate student at University of Richmond, I was a team leader for the Amazon Borderlands Spatial Analysis Team (ABSAT) chapter of the NASA-SERVIR Amazonia Project. I used GIS and remote sensing to determine the impacts of a disjointed, transboundary road proposal to the ecosystem services provided by the intact tropical rainforest of the Sierra del Divisor region.

I. Hydroshed Analysis

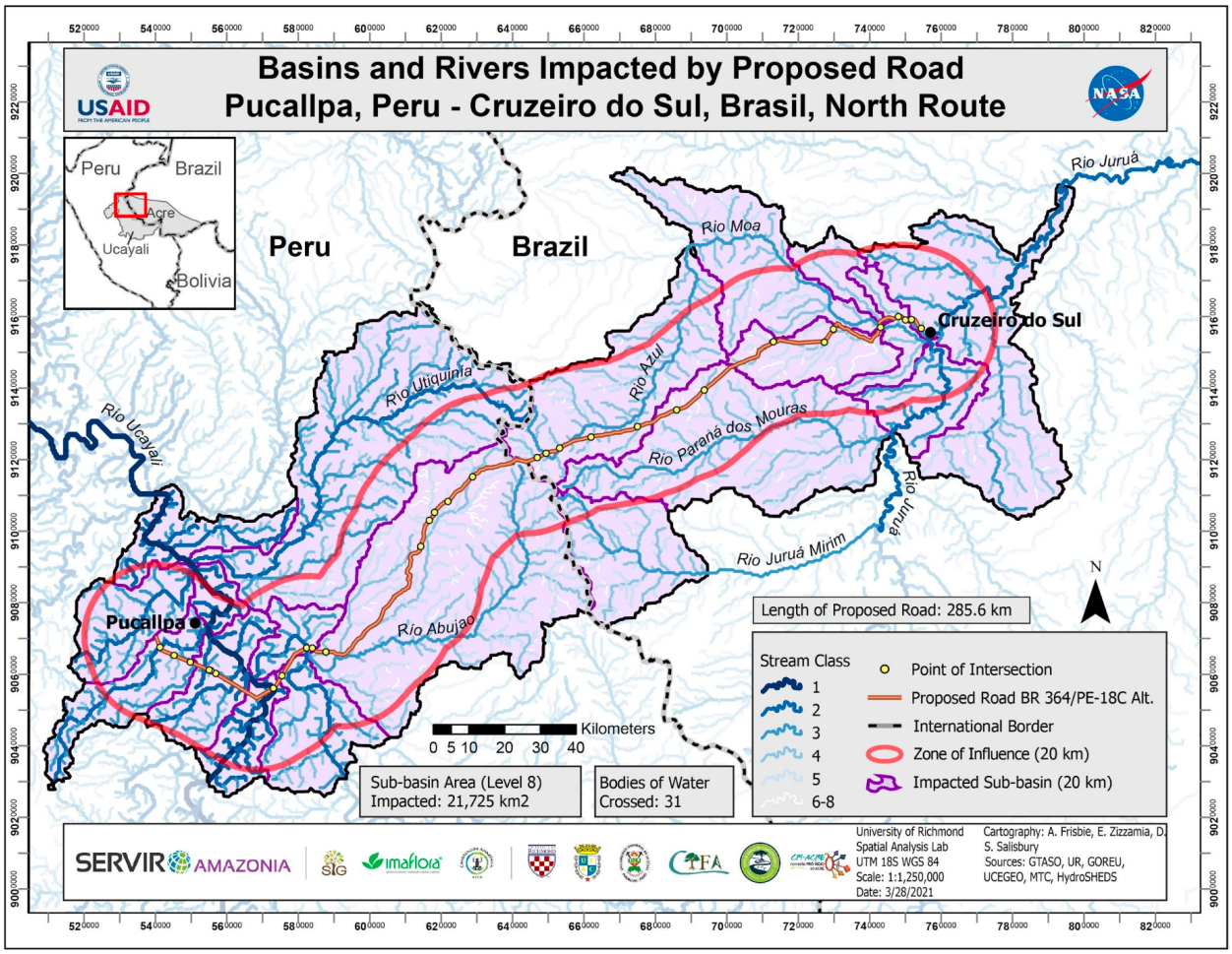

Figure 1. Rivers and watersheds potentially impacted from the construction of the proposed road BR-364/PE-18C Alt. (north/Brazilian-based route) within a 20 km impact zone (highlighted in red). Data: HydroRIVERS rivers, steam orders 1-8 (2020) and HydroBASINS sub-basin, level 8 (2020).

II. Indigenous Territories and Conservation Areas

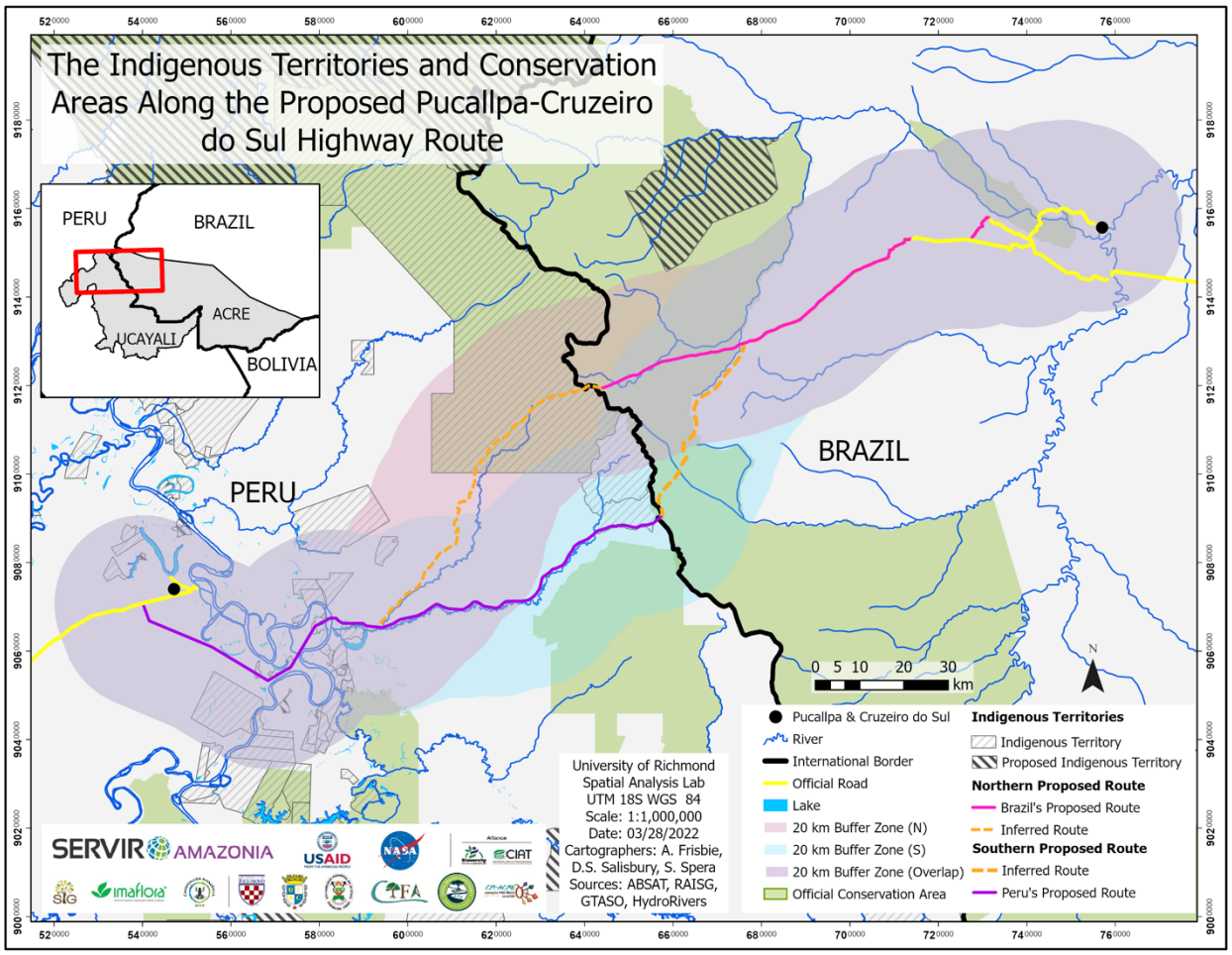

Figure 2. Study area and proposed routes between Pucallpa, Peru and Cruzeiro do Sul, Brazil. Indigenous territories are highlighted in black and white hatching. Conservation areas, including the Sierra del Divisor and Serra do Divisor National Parks, are shown in green. Yellow lines indicate official paved roads. Brazil's proposed northern route is shown in pink and our3 inferred continuation of the route is highlighted with an orange dotted line. Peru's proposed southern route is shown in purple and our inferred route to Cruzeiro do Sul is represented with an orange dotted line. 20 km buffers around each route are shown in pink (northern Brazilian route), blue (southern Peruvian route), and purple (overlap). Data: GTASO, 2019; RAISG, 2020; HydroRivers, 2013.

III. Land Cover and Elevation

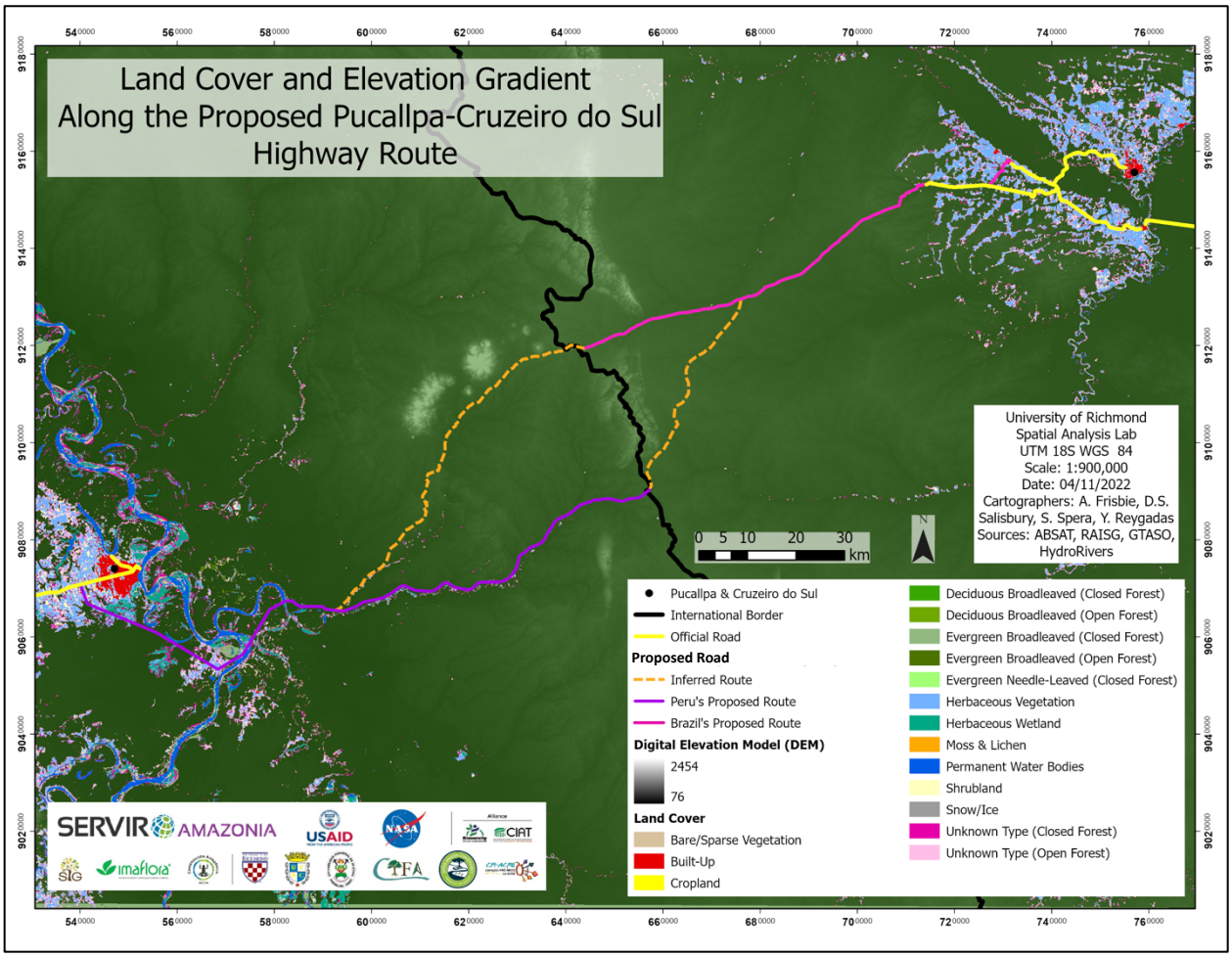

Figure 3. Land cover and elevation gradient along the proposed Pucallpa-Cruzeiro do Sul Road (northern and southern routes, shown in pink, dotted orange, and purple). DEM units are in meters. Data: GTASO, 2019; RAISG, 2020; USGS Global Ecosystem Data, 2017.

IV. Nighttime Lights

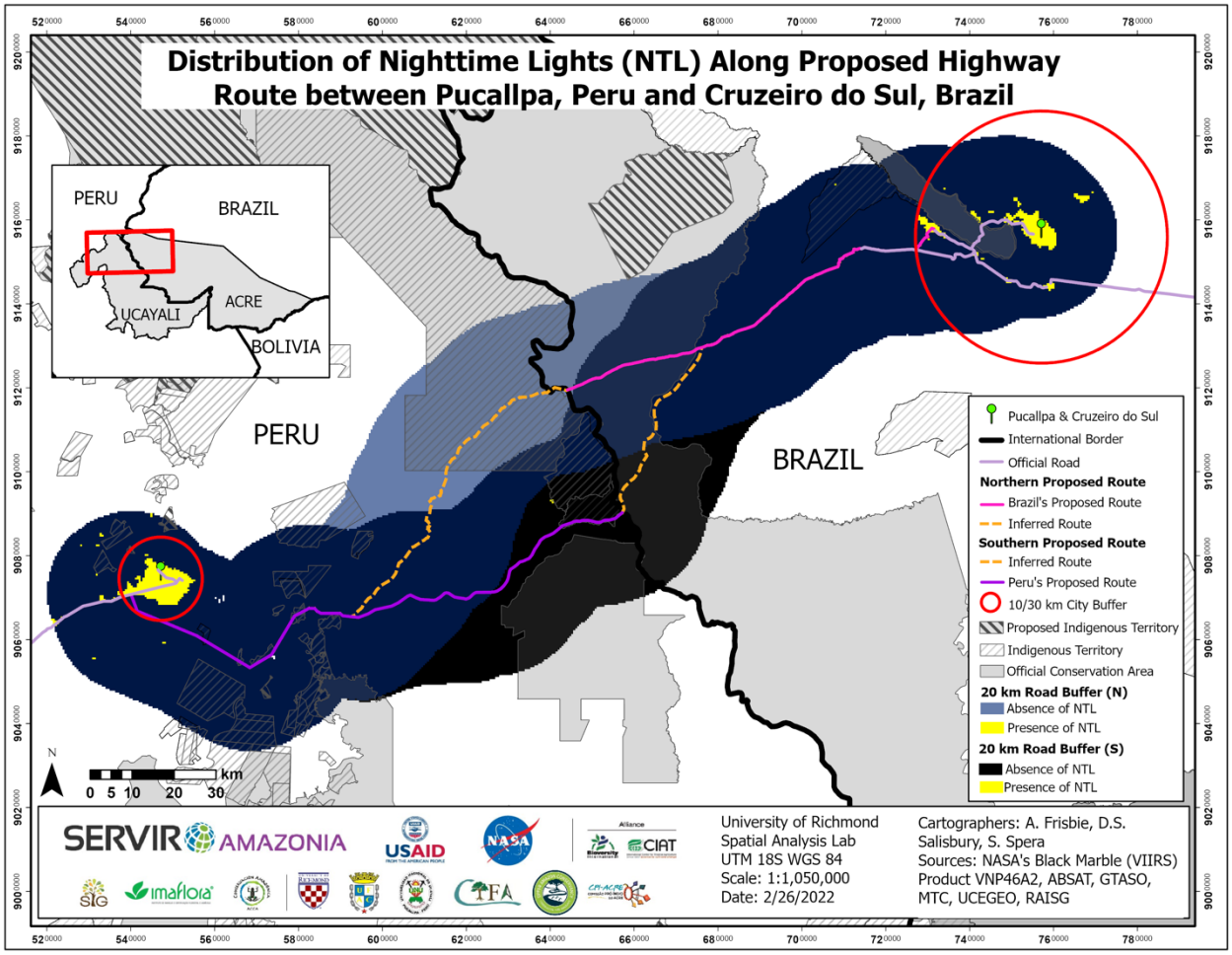

Figure 4. Nighttime lights (shown in yellow) in the 20 km buffer zones surrounding the proposed road from Pucallpa, Peru to Cruzeiro do Sul, Brazil (northern and southern routes). This map showcases the characteristic remoteness of the Sierra del Divisor region. Data: RAISG, 2020; GTASO, 2019; NASA's Black Marble (VIIRS) Product VNP46A2 (09/10/2020-09/17/2020).

V. Ethnolinguistic Diversity

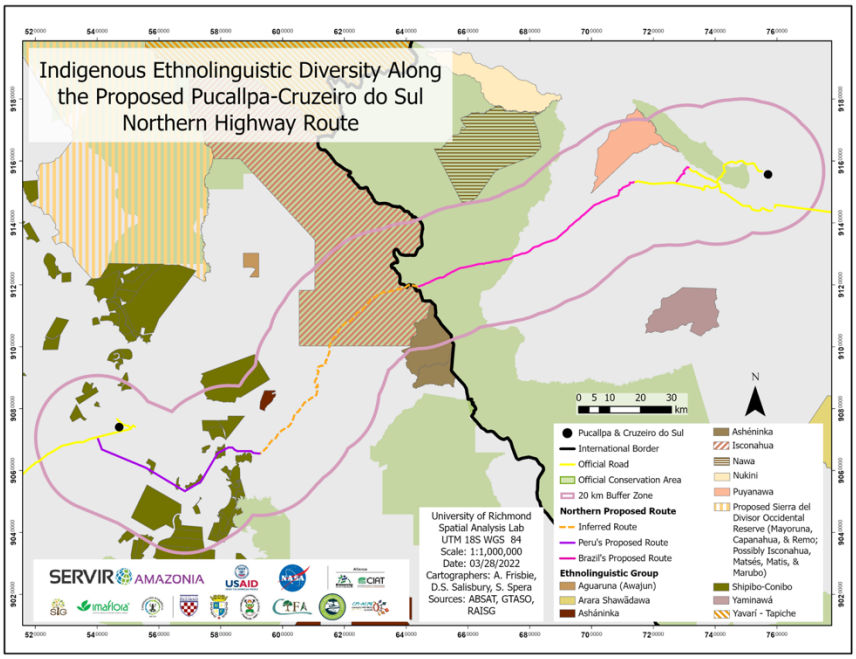

Figure 5. Indigenous ethnolinguistic diversity along the northern route of the proposed Pucallpa-Cruzeiro do Sul Road. Data: GTASO (2019), RAISG (2020), ABSAT (2022)

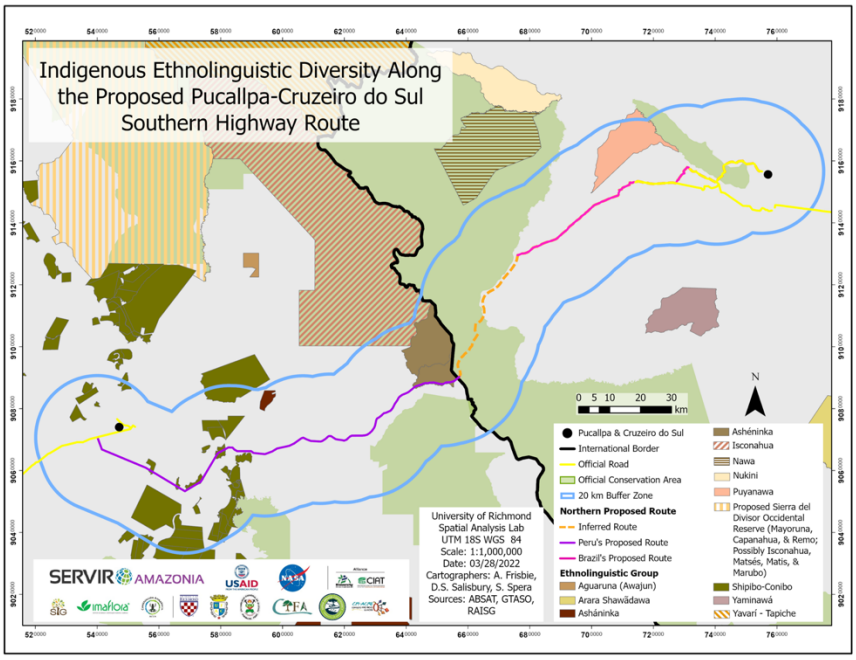

Figure 6. Indigenous ethnolinguistic diversity along the southern route of the proposed Pucallpa-Cruzeiro do Sul Road. Data: GTASO (2019), RAISG (2020), ABSAT (2022)

VI. Trans-Amazon Conservation Corridor

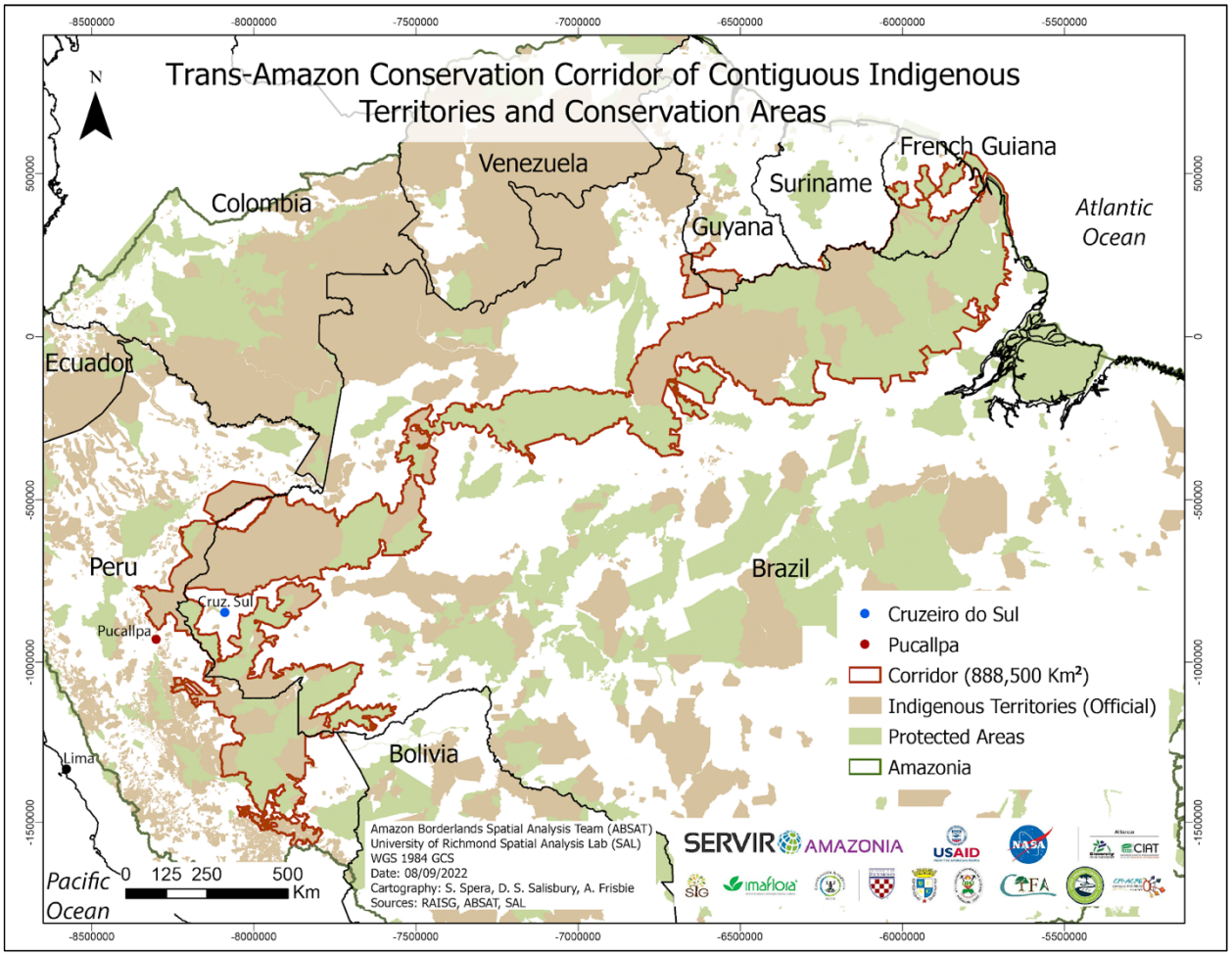

Figure 7. Contiguous Indigenous territories and conservation areas within 50 km of the proposed Pucallpa-Cruzeiro do Sul Road route form a macro-corridor of 884,567 km^2 or protected land from eastern Peru to the Atlantic Ocean. Data: RAISG, 2020.

For my **Environmental Studies Senior Capstone Project**, I compared the habitat potential for red wolf reintroduction in the Albemarle Peninsula and the Delmarva Peninsula. I evaluated variables such as land ownership and protection status and used maps to display my findings.

I. Area of Interest

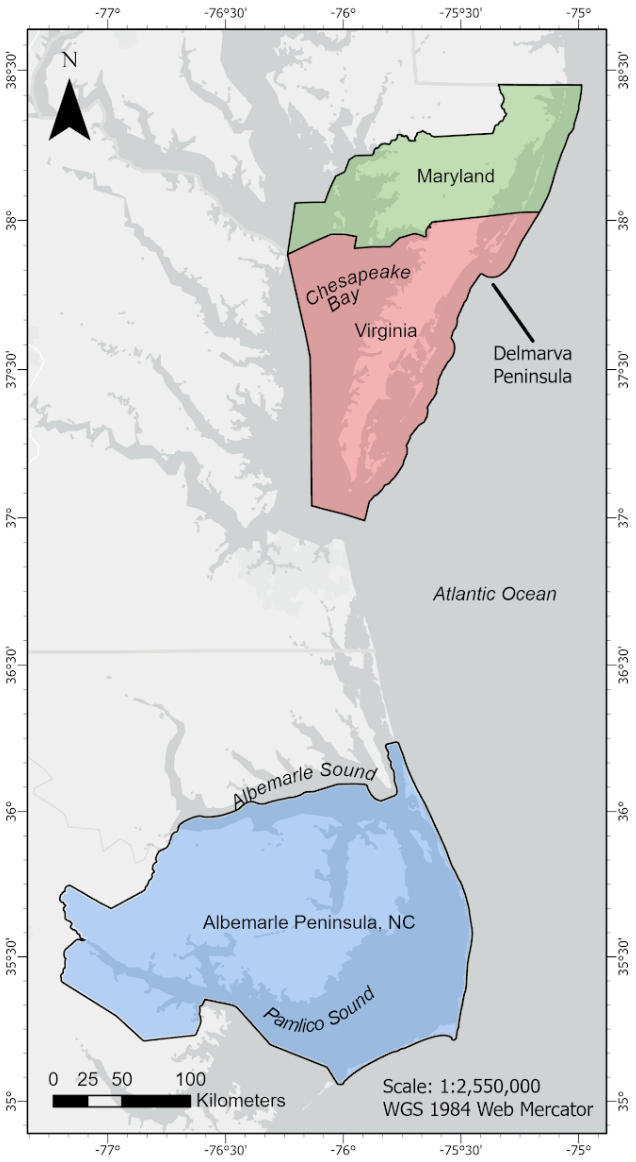

Figure 1. Map of the Albemarle Peninsula of North Carolina (blue) and the Maryland (green) and Virginia (red) portions of the Delmarva Peninsula used as the area of interest. Land area: Albemarle Peninsula, NC– 6,632 km^2; Delmarva Peninsula, VA– 1,712 km^2; Delmarva Peninsula, MD– 2,041 km^2. Map created by Anna Frisbie (University of Richmond) on 04/19/2022. Data: TIGER, 2021.

II. Land Ownership: Albemarle Peninsula vs. Delmarva Peninsula

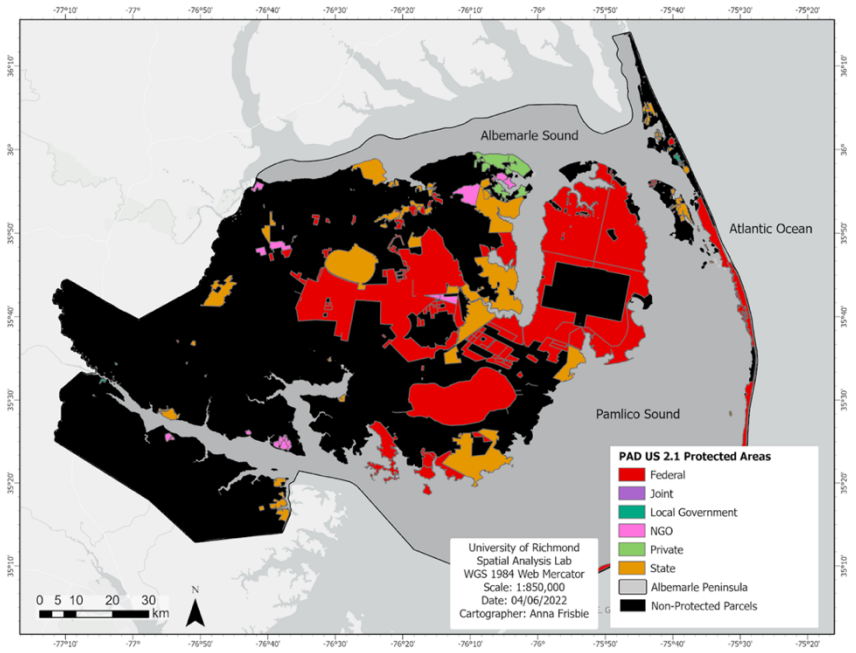

Figure 2. Map of land ownership of the Albemarle Peninsula, NC. The Albemarle Peninsula consists of mostly (66.58%) non-protected, privately owned land, although almost one-fourth (24.174%) of land is owned by the federal government. Data: GAP Analysis PAD-US 2.1, 2020.

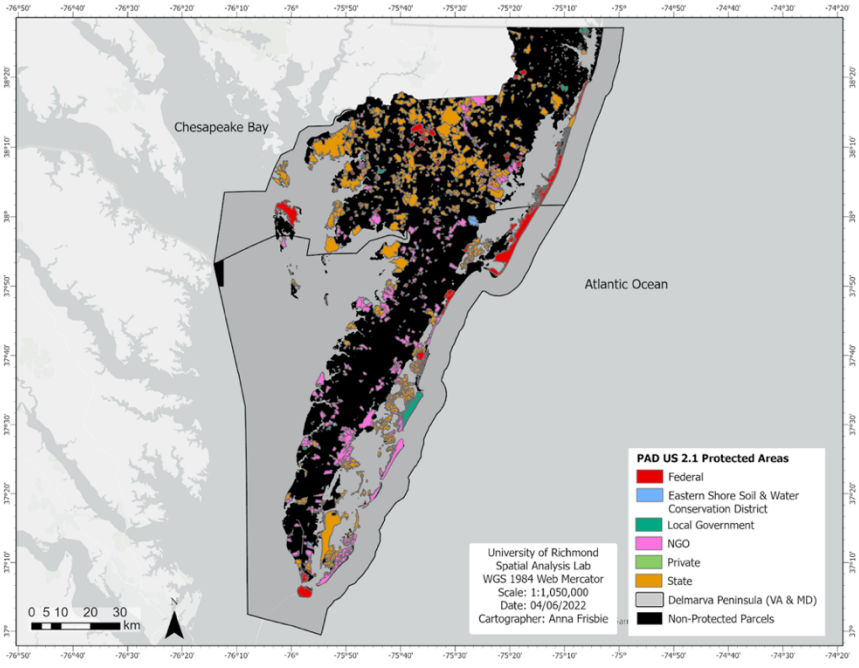

Figure 3. Map of land ownership of the Delmarva Peninsula (VA & MD). The Delmarva Peninsula consists of mostly (VA- 65.40%, MD- 67.51%) non-protected, privately owned land. Data: GAP Analysis PAD-US 2.1, 2020.

III. Protected Areas: Albemarle Peninsula

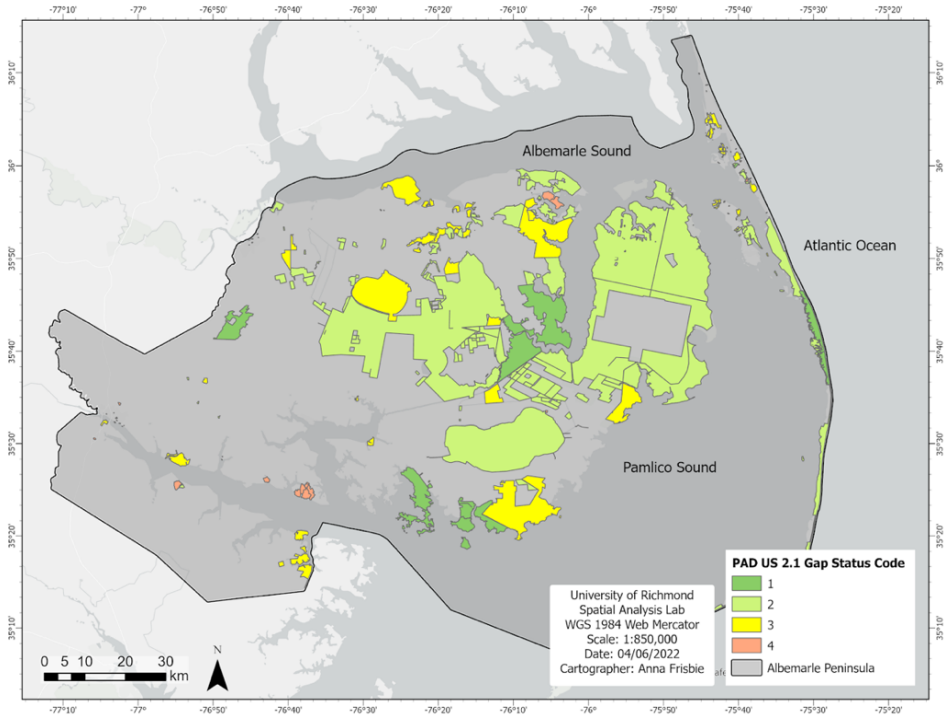

Figure 4. Map showing the Pad US 2.1 Gap Status Codes of protected areas in the Albemarle Peninsula, NC. Key: 1 – managed for biodiversity – disturbance events proceed or are mimicked, 2 – managed for biodiversity – disturbance events suppressed, 3 – managed for multiple uses – subject to extractive (e.g. mining or logging) or OHV use, 4 – no known mandate for biodiversity protection. Approximately one-third of the Albemarle Peninsula (33%) is protected, and the majority of protected land is classified as GAP Status 2 (NC- 73%). Data: GAP Analysis PAD-US 2.1, 2020.

IV. Protected Areas: Delmarva Peninsula

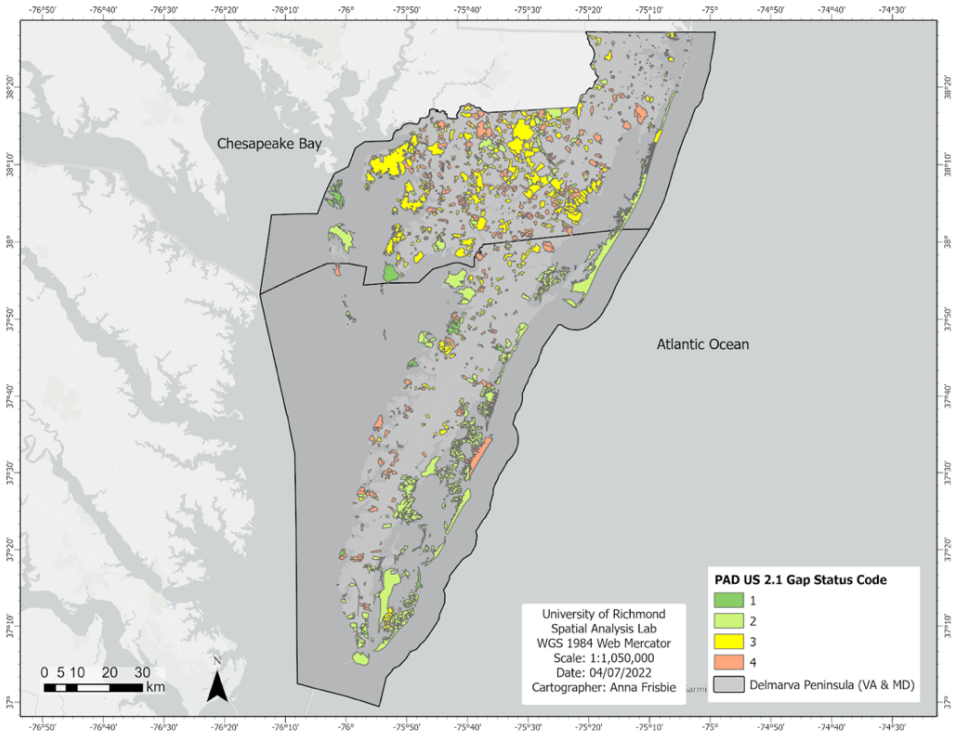

Figure 5. Map showing the Pad US 2.1 Gap Status Codes of protected areas in the Delmarva Peninsula (VA & MD). Key: 1 – managed for biodiversity – disturbance events proceed or are mimicked, 2 – managed for biodiversity – disturbance events suppressed, 3 – managed for multiple uses – subject to extractive (e.g. mining or logging) or OHV use, 4 – no known mandate for biodiversity protection. Approximately one-third of the Delmarva Peninsula (VA- 35%, MD- 32%) is protected, and the majority of protected land is classified as GAP Status 2 (VA- 66%, MD- 55%). Data: GAP Analysis PAD-US 2.1, 2020.

V. Case Study: Weyerhaeuser Co.

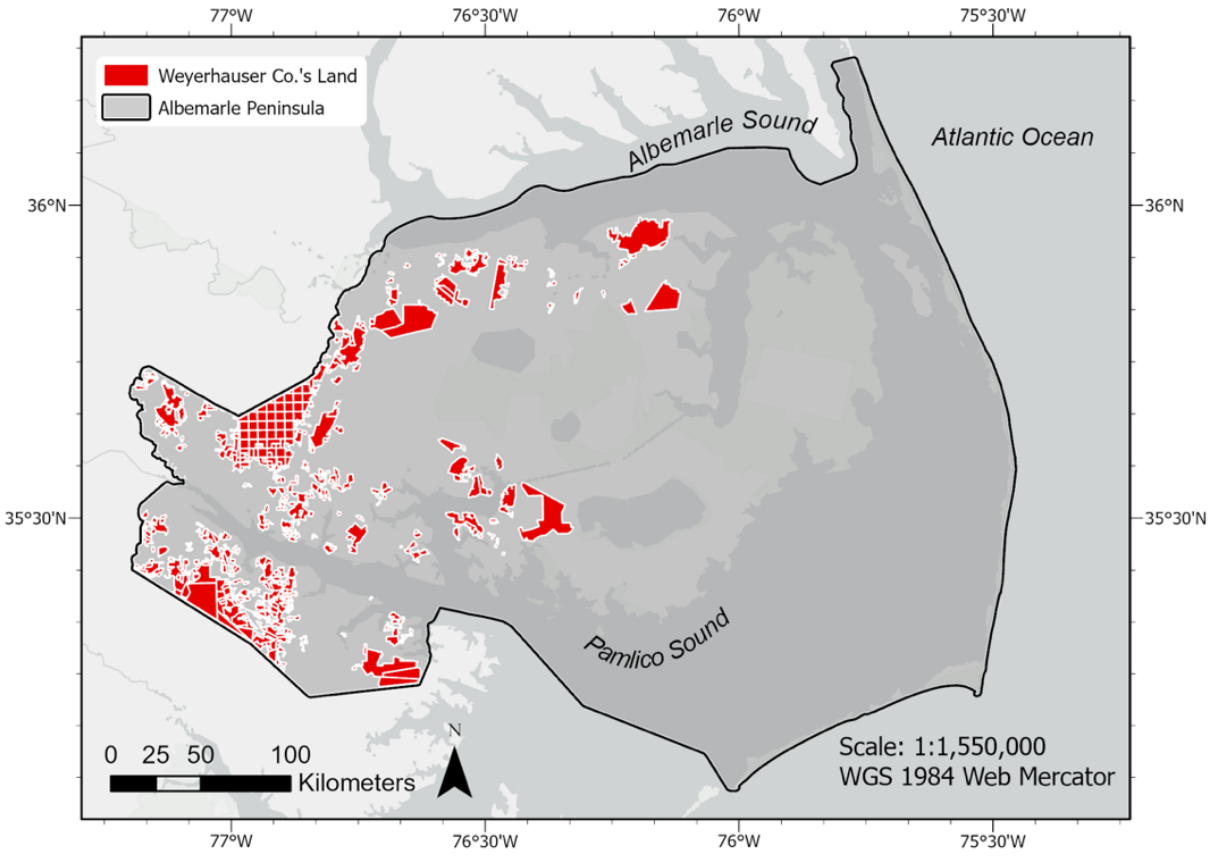

Figure 6. Map showing land owned by Weyerhaeuser Company in the Albemarle Peninsula. Weyerhaeuser Company owns 20.69% of non-protected privately owned land, an area 913.6 km^2 in size. The average size of their parcels is 1.32 km^2, and many are adjacent, forming large tracts of land, which is a preferred habitat of red wolves. Data: NC OneMap.

VI. Private Land on the Delmarva Peninsula, Maryland

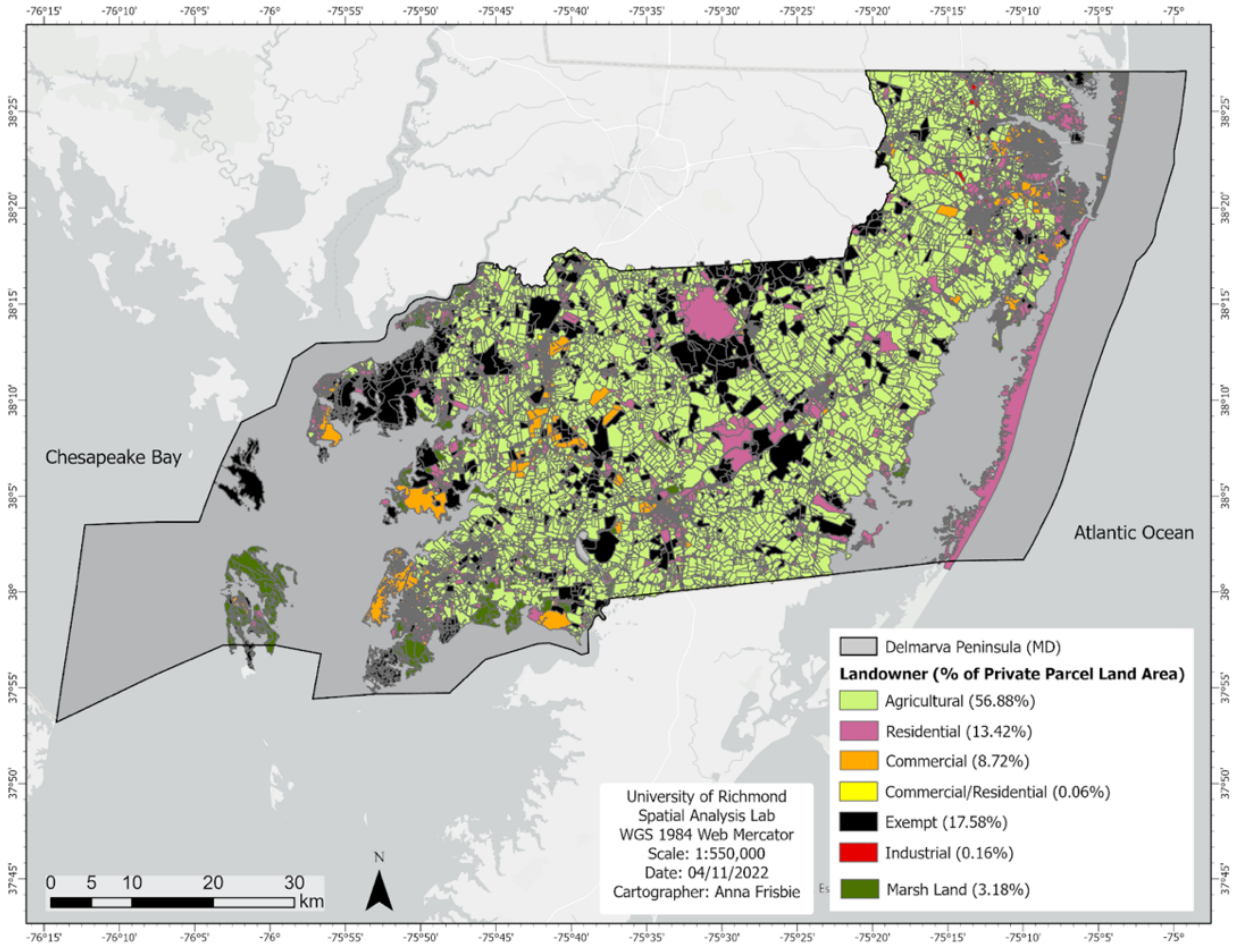

Figure 7. Privately owned parcels in the Delmarva Peninsula, Maryland. Legend shows the percentage each landowner category makes up of the total privately owned land in the MD portion of the Delmarva Peninsula. In the MD portion of the Delmarva Peninsula, the majority of privately owned land belongs to agriculturalists (56.88%). The VA portion of the Delmarva Peninsula is not included due to lack of data. Data: MD Department of Planning.

For an independent project, I created a predictive model to map **Wilderness Soundscapes in the White Mountain National Forest**.

I. White Mountain National Forest Wilderness Areas

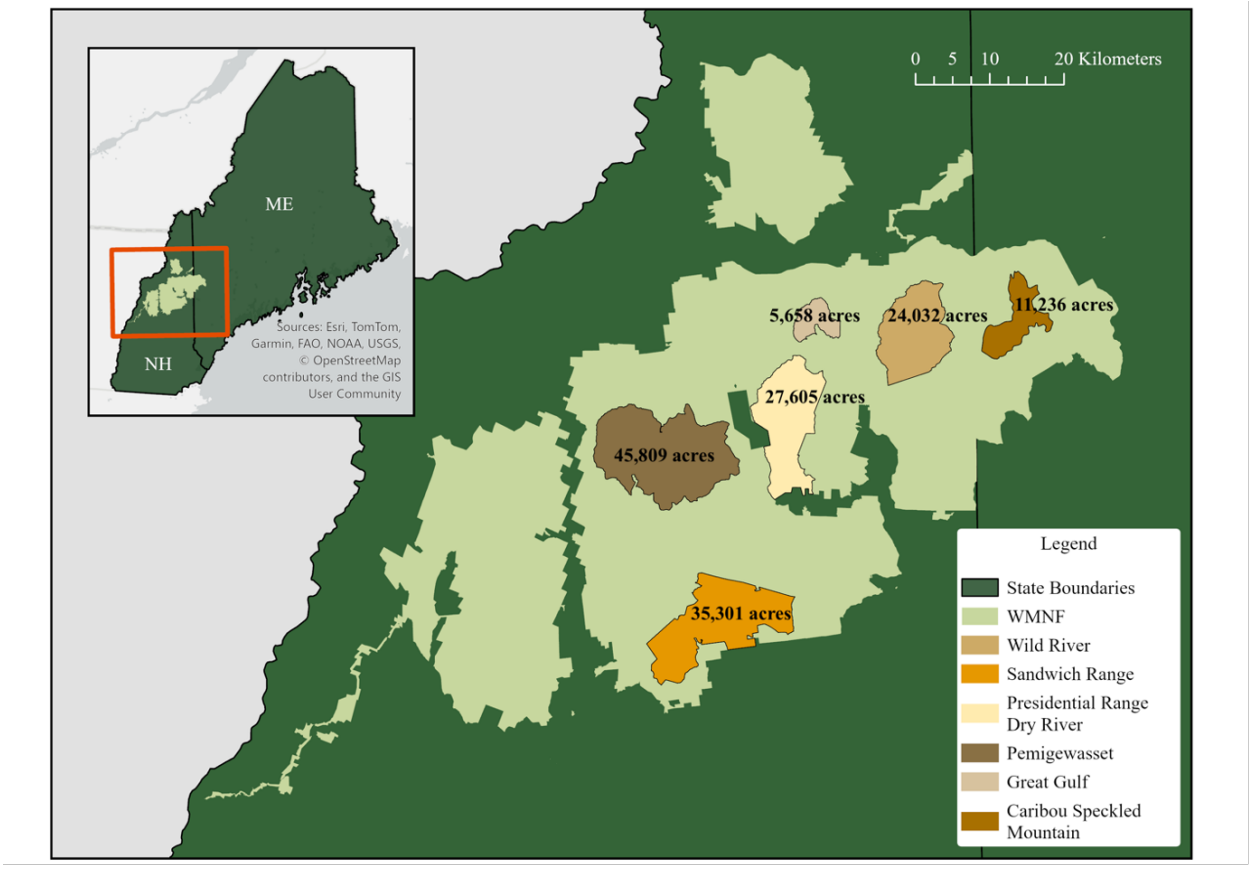

Figure 1. Map of wilderness areas in the White Mountain National Forest, totaling 149,641 acres. Map information: scale—1:600,000, projection—WGS 1984 UTM 19N, cartography—Anna Frisbie on 12/13/2024 at University of New Hampshire, data sources—US Forest Service, US Census Bureau.

II. Building a Predictive Natural Soundscape Model

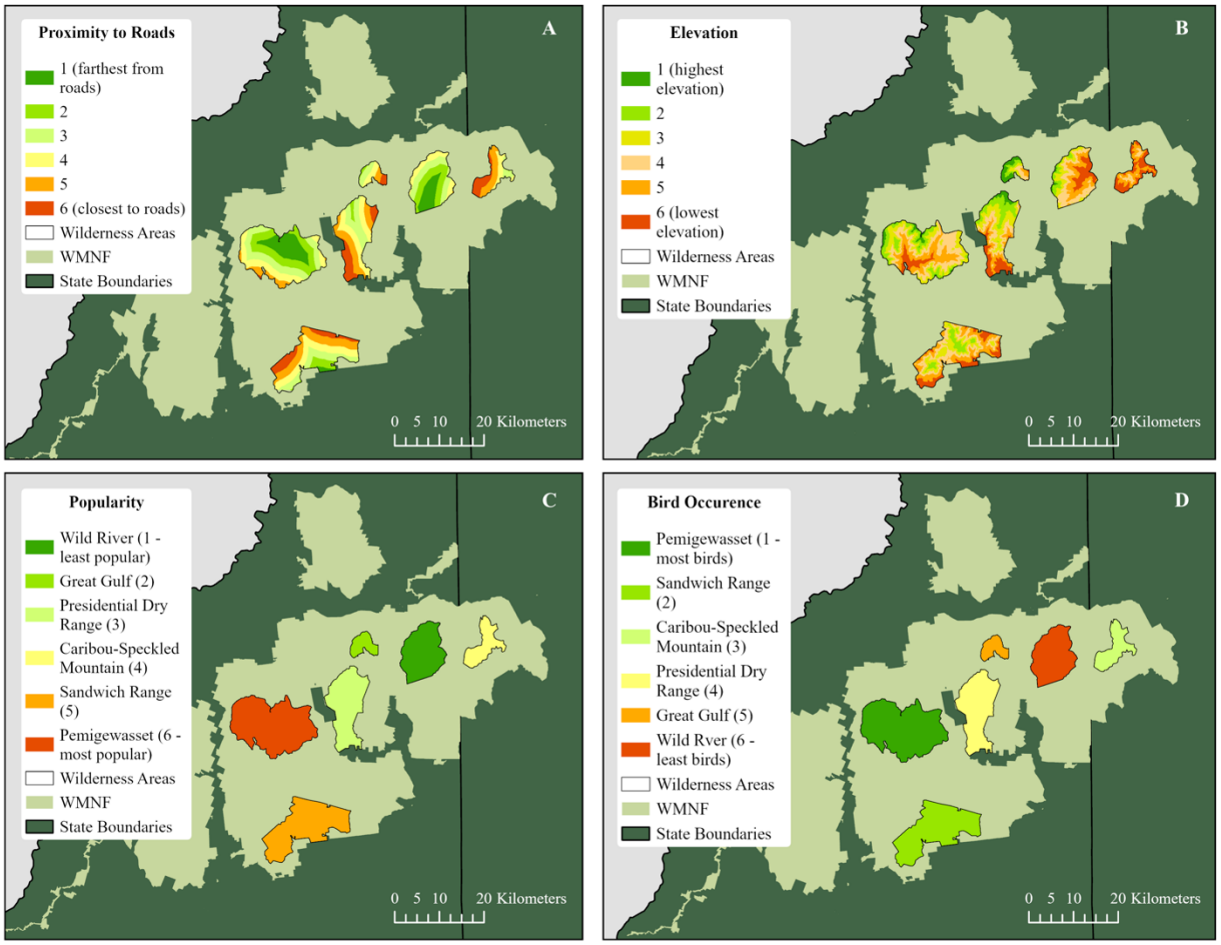

Figure 2. Maps showing input layers for the predictive soundscape contentment model, including proximity to roads (A), elevation (B), popularity (C), and bird occurrence (D). Map information: scale—1:1,000,000, projection—WGS 1984 UTM 19N, cartography—Anna Frisbie on 12/16/2024 at University of New Hampshire, data sources—Applied Recreation Research Lab, iNaturalist, NASA, US Forest Service, US Census Bureau.

III. Predicted Soundscape Contentment in WMNF Wilderness Areas

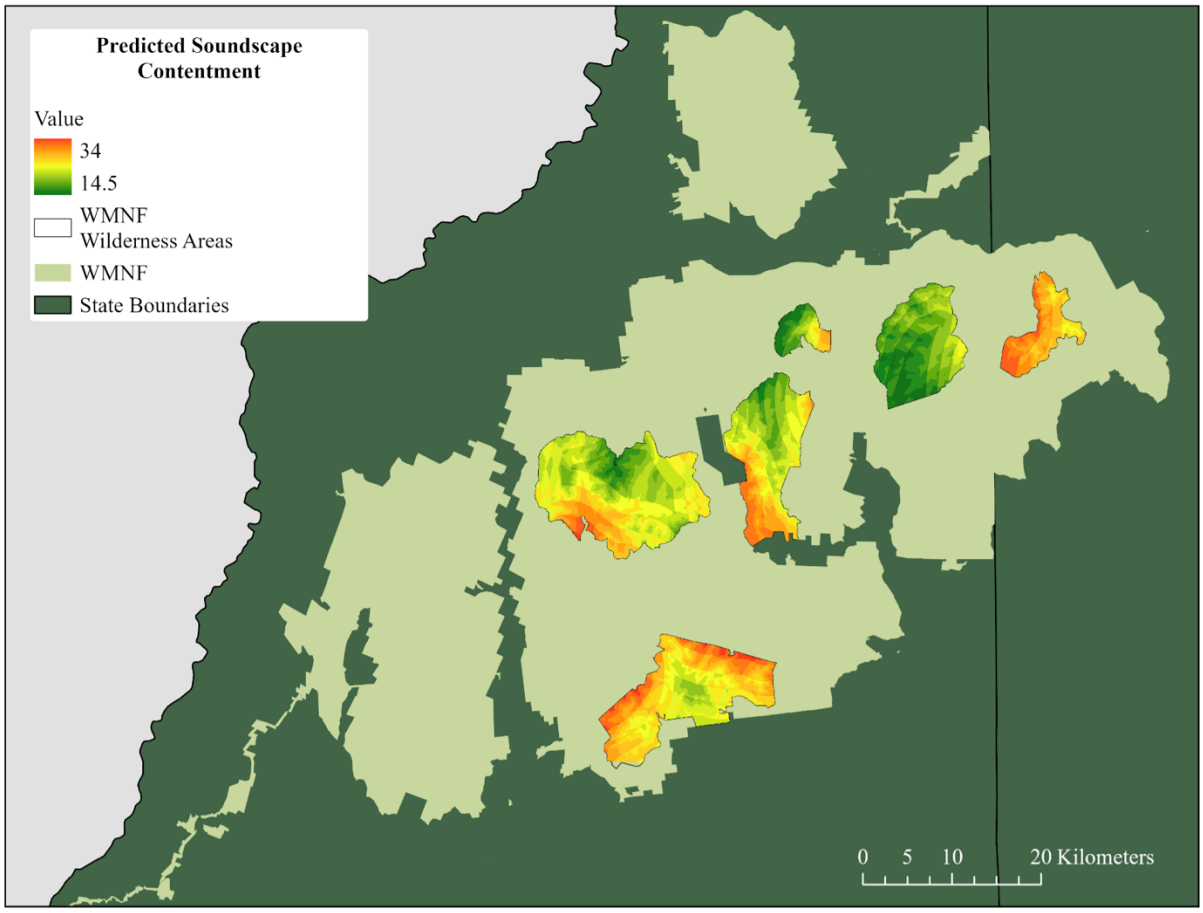

Figure 3. Map showing predicted soundscape contentment in WMNF wilderness areas. Green indicated regions of quiet/pleasant/natural sounds while red indicates loud/unpleasant/unnatural sounds. Map information: scale—1:500,000, projection—WGS 1984 UTM 19N, cartography—Anna Frisbie on 12/16/2024 at University of New Hampshire, data sources—Applied Recreation Research Lab, iNaturalist, NASA, US Forest Service, US Census Bureau.

For my master's thesis, I conducted a public participation GIS (PPGIS) study in Saguaro National Park to gain insight into best practices for **soundscape management in national parks.**

I. Study Context

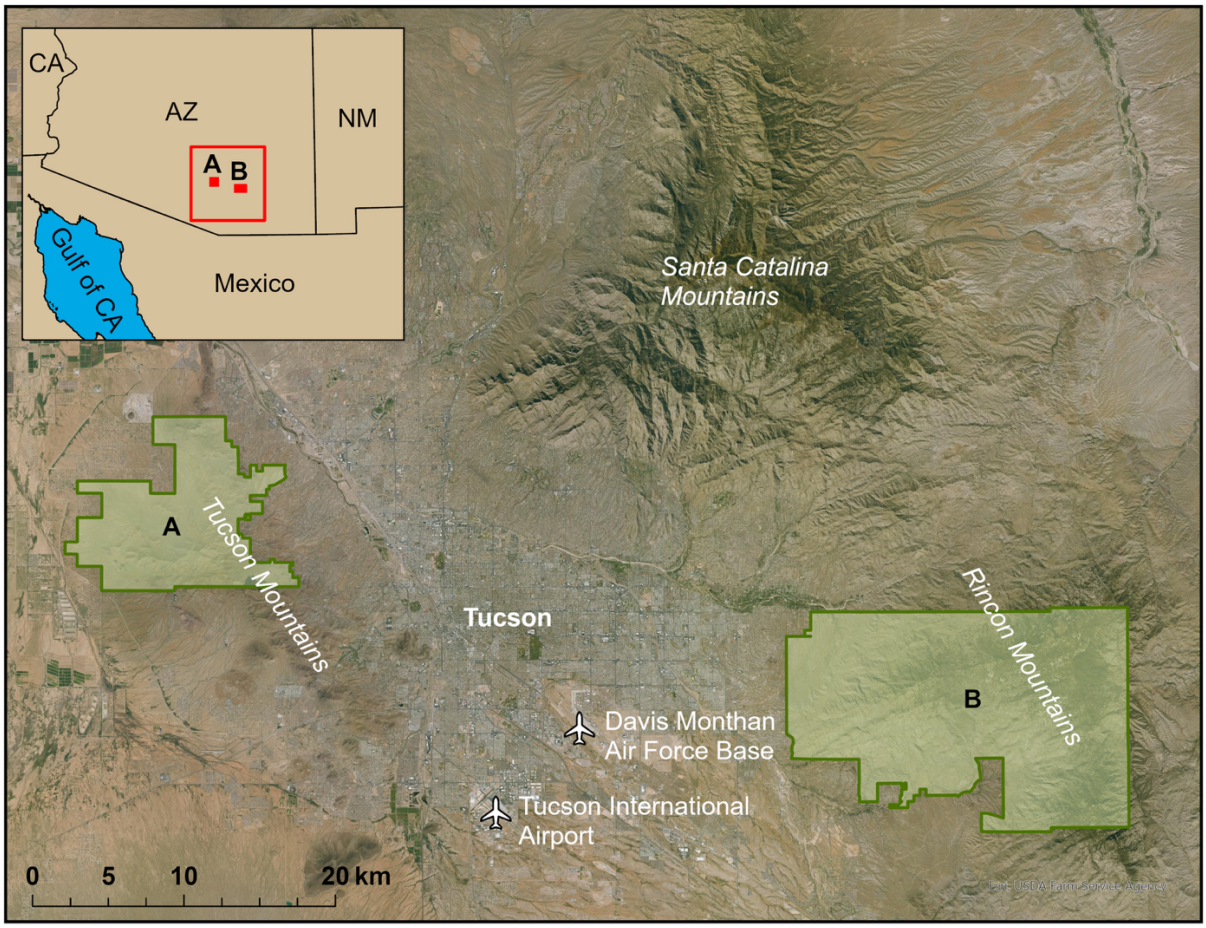

Figure 1. Map of SAGU within the Tucson, AZ region (A = Tucson Mountain District, B = Rincon Mountain District). Data sources: ESRI, NPS, OCHA, USDA, US Census Bureau. Map details: scale 1:300,000, projection NAD 83 UTM 12N, created on 4/22/25 by Anna Frisbie.

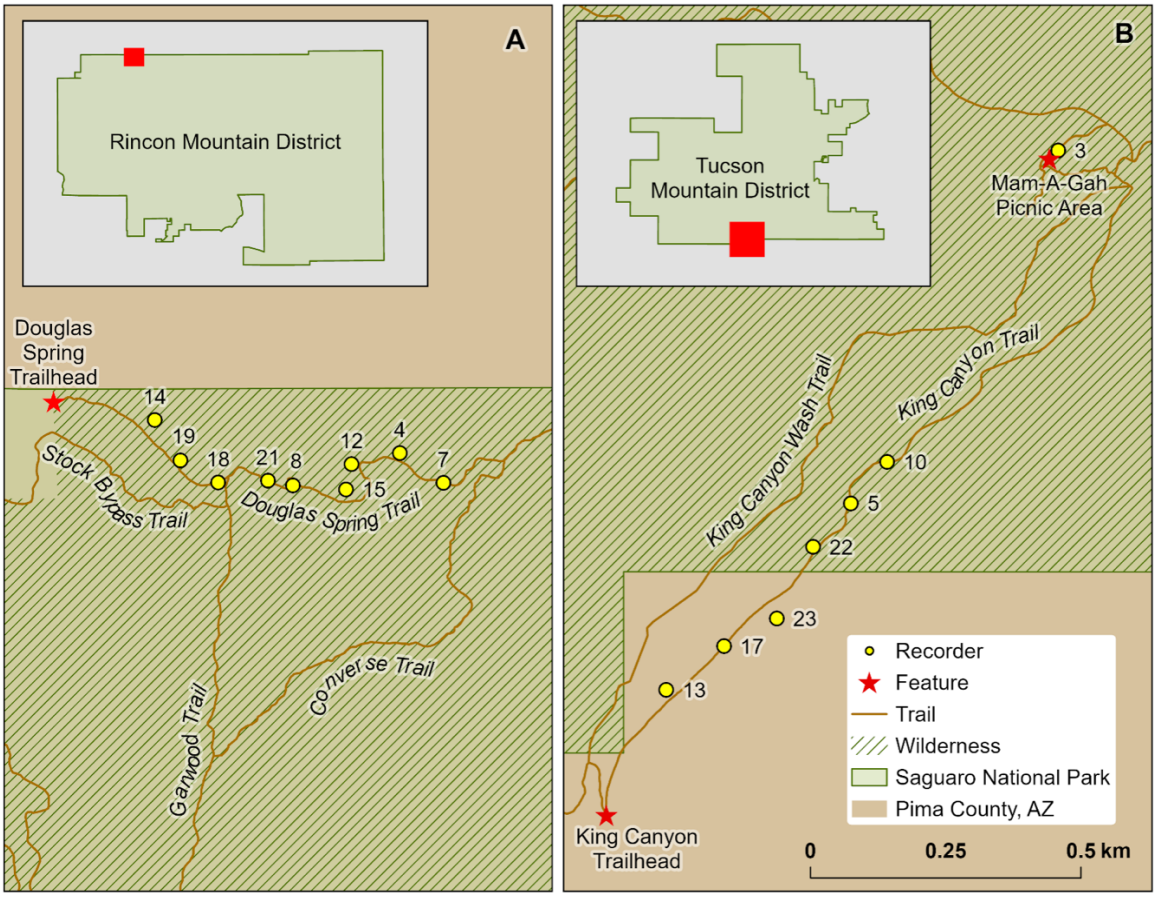

Figure 2. Map of acoustic recorders deployed in A) Rincon Mountain District and B) Tucson Mountain District. Data sources: NPS, US Census Bureau. Map details: scale 1:8,000, projection NAD 83 UTM 12N, created on 4/26/25 by Anna Frisbie.

II. Participatory Mapping

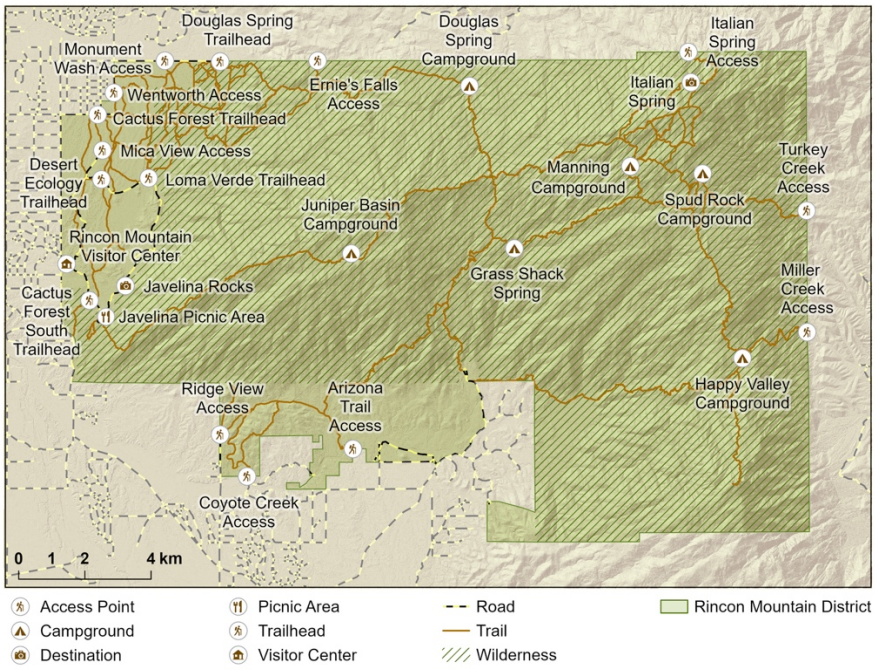

Figure 3. Map of the Rincon Mountain District used in the PPGIS exercise. Data sources: NPS, Open Topography. Map details: scale 1:100,000, projection NAD 83 UTM 12N, created on 4/24/25 by Anna Frisbie.

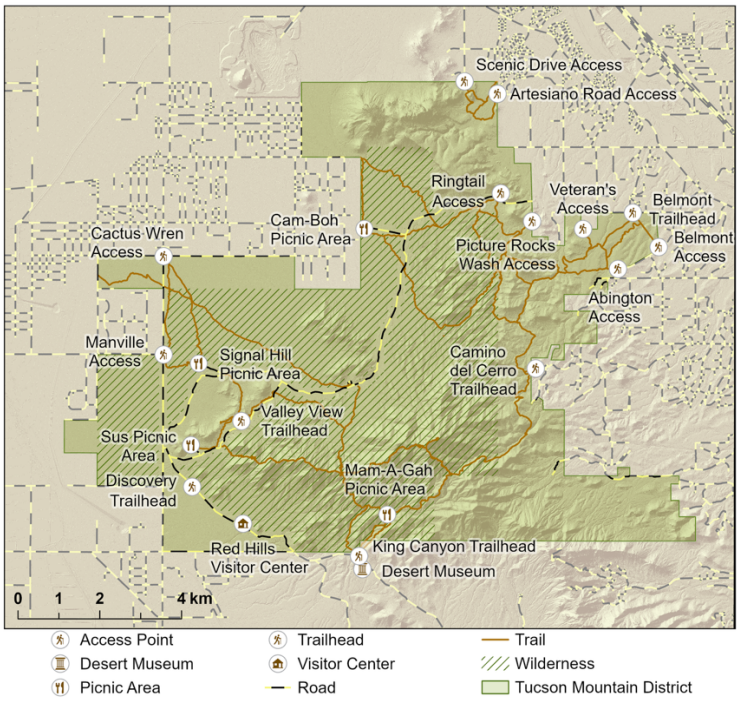

Figure 4. Map of the Tucson Mountain District used in the PPGIS exercise. Data sources: NPS, Open Topography. Map details: scale 1:80,000, projection NAD 83 UTM 12N, created on 4/24/25 by Anna Frisbie.

III. Hotspots of Visitor Preferences

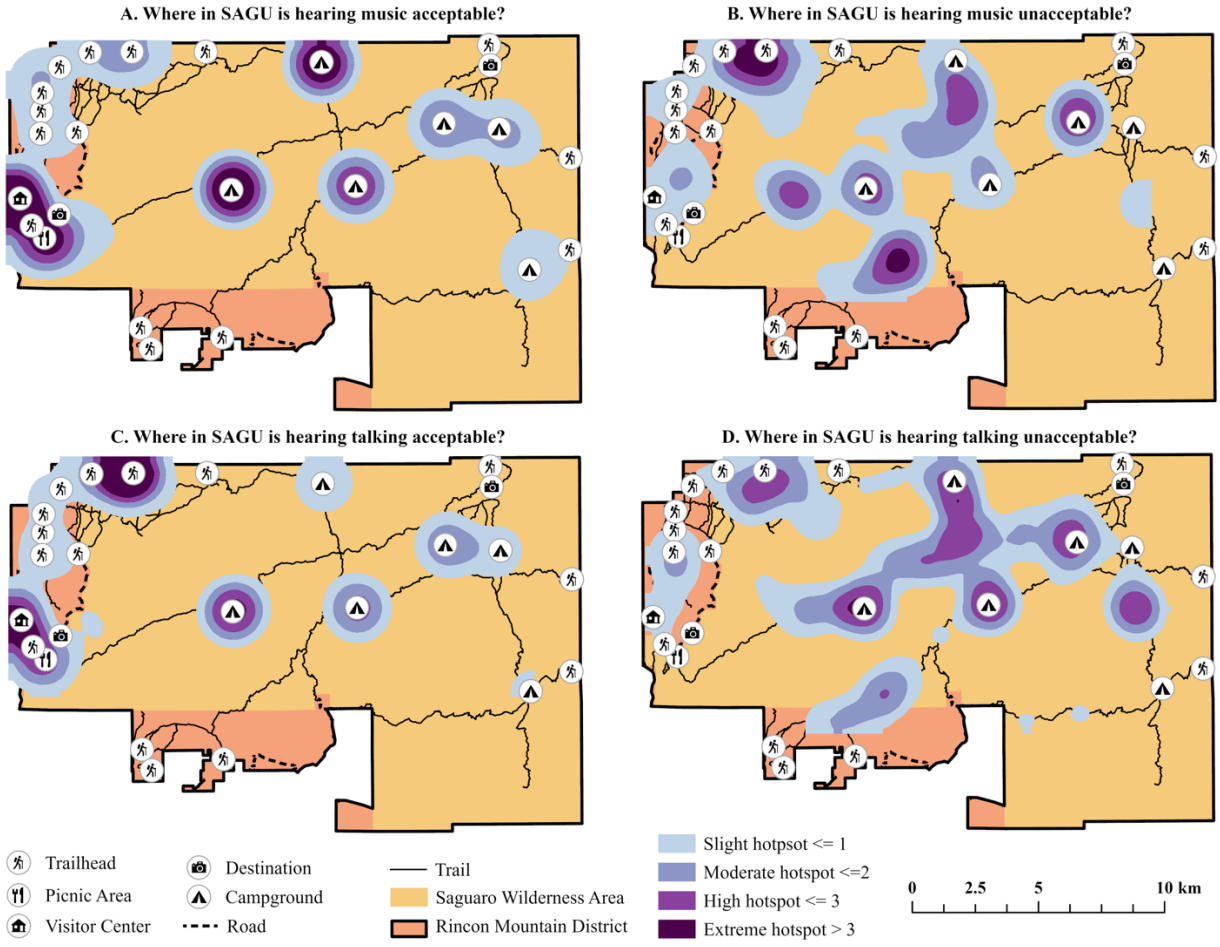

Figure 5. Kernel density clusters show where Saguaro National Park visitors find music and talking acceptable or unacceptable in the Rincon Mountain District. Kernel density clusters are normalized with z-scores, which scales each map to it's own mean and standard deviation, resulting in a standardized scale of slight hotspots (less than or equal to 1 standard deviation from the mean) to extreme hotspots (more than 3 standard deviations from the mean). Map specifications: projection—WGS 1984 UTM Zone 12N; scale—1:175,000; data sources—National Park Service (2025) & UNH People and Nature Lab (2025); cartography—A. Frisbie, 11/04/2025.

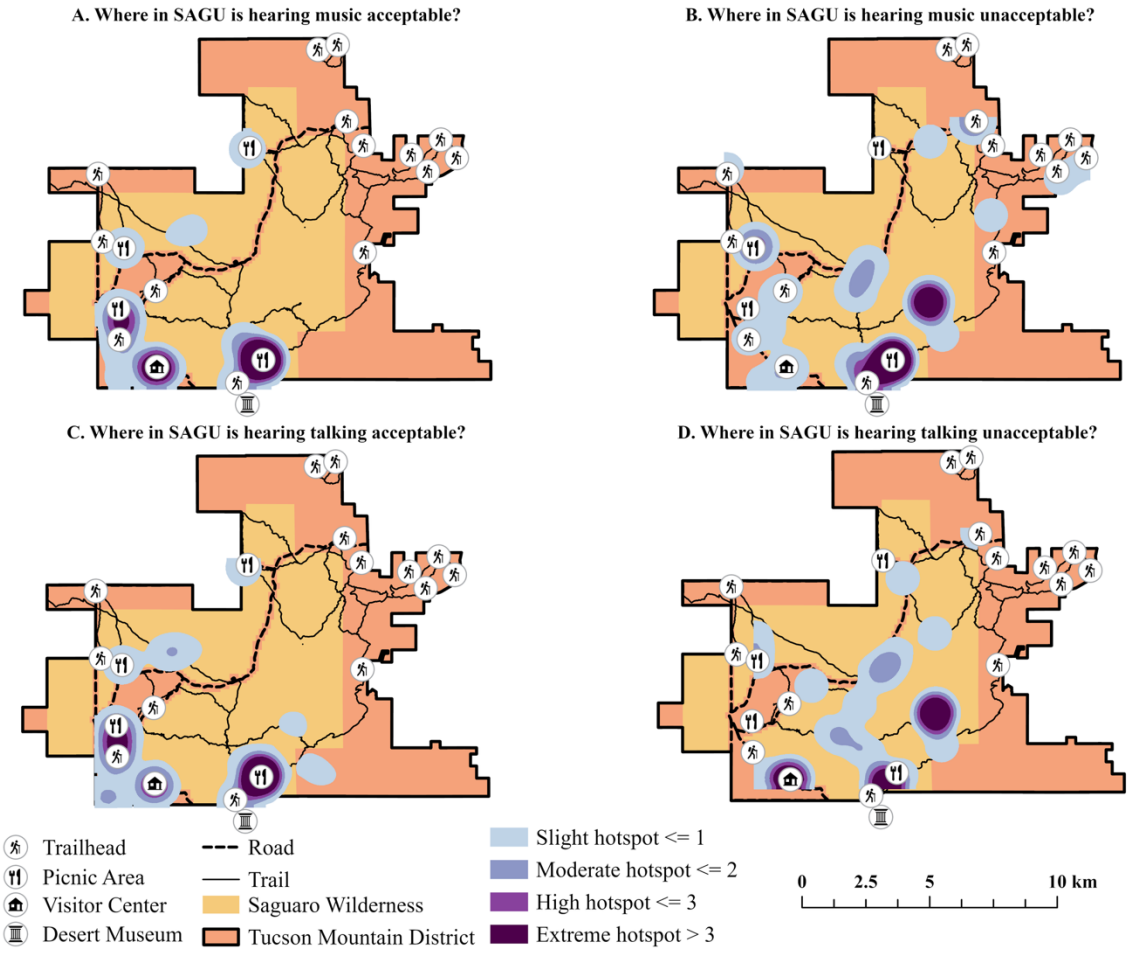

Figure 6. Kernel density clusters show where Saguaro National Park visitors find music and talking acceptable or unacceptable in the Tucson Mountain District. Kernel density clusters are normalized with z-scores, which scales each map to it's own mean and standard deviation, resulting in a standardized scale of slight hotspots (less than or equal to 1 standard deviation from the mean) to extreme hotspots (more than 3 standard deviations from the mean). Map specifications: projection—WGS 1984 UTM Zone 12N; scale—1:175,000; data sources—National Park Service (2025) & UNH People and Nature Lab (2025); cartography—A. Frisbie, 11/04/2025.