The relationship between agricultural land use and threatened-endangered plant species in Hawaii island, United States.

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GEOG 2220 Term project
Wednesday 9:30 am
GEOG 2220 Winter 2022
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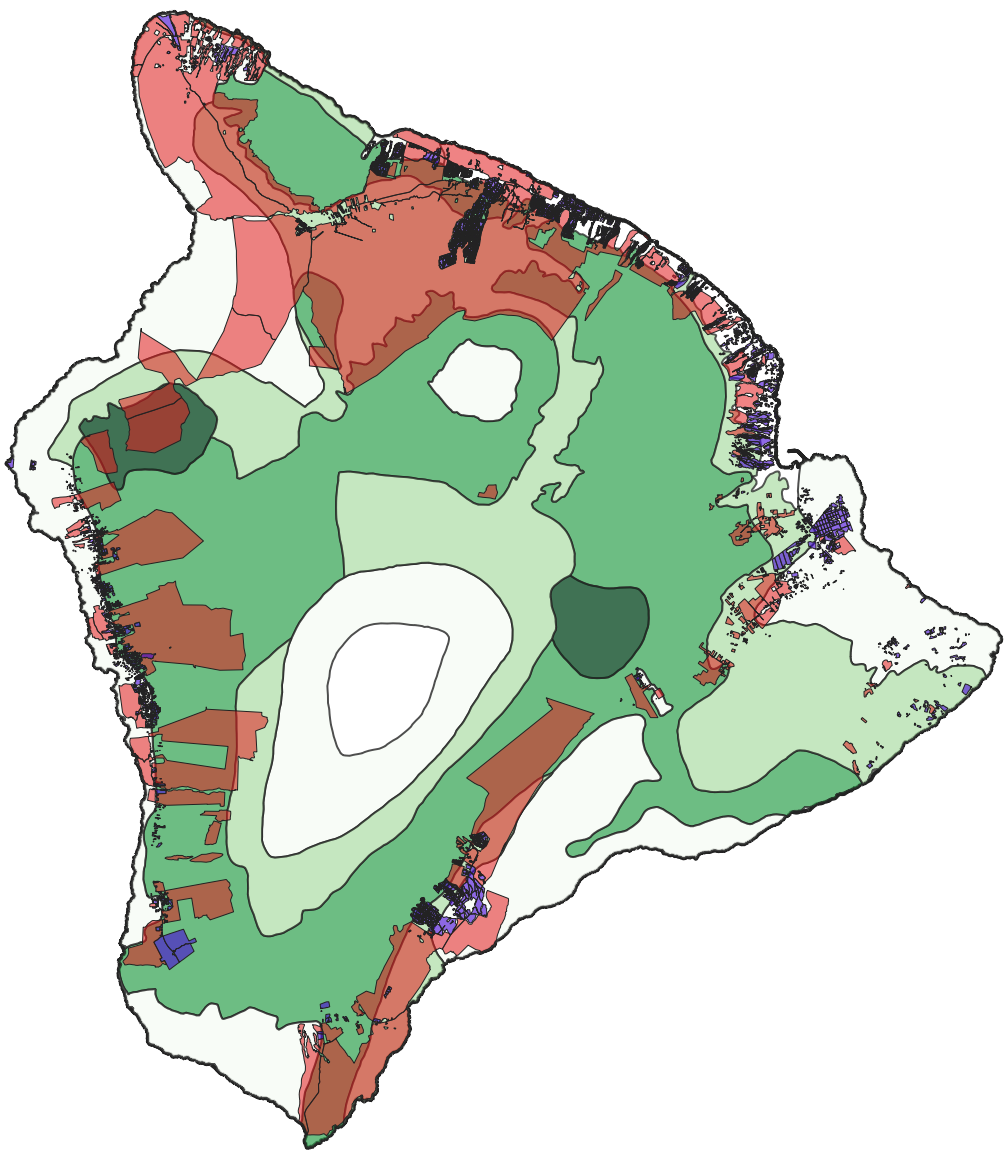
Thre Overlap Between Current Agricutral Land Use and Hisotrically Threatened-Endangered Plant species as of 1992 in Hawaii Island, United States.



Legend

- The boundary of Hawaii

Agricultural Land Use
- Pastures
- Other agricultrual practices

Concentration of Threatened and Endangered Species
- Low
- Medium
- High
- Very High

0 10 20 km

1:1,000,000

Data sources: Hawaii Statewide GIS Program
Caratographer: Inaara Savnani (251022564)
Geography 2220 Term project
Geog 2220 Wed, 9:30
April 12, 2022

Spatial question: What is the relationship between agricultural land use and the historically threatened-endangered plant species on Hawaii Island (Do current agricultural land-use practices enable the conservation of historically threatened-endangered plant species on Hawaii Island?)

QGIS procedure:

1. **Downloaded data and loaded it into QGIS:** I locally downloaded the *"Threatened-Endangered Plants"*, *"Agricultural Land Use-2020 update,"* and the *"2020 Census County Boundaries*" datasets from the Hawaii Statewide GIS program website and placed them into a folder. I then opened a qgis project and dragged all the shapefiles into the layers panel.

2. **Set the layer and project Coordinate Reference System:** I made sure that all the layers are set to the same coordinate reference system (CRS). The *"Threatened-Endangered Plants*" and *"Agricultural Land Use-2020 update,*" layers had a default CRS of WGS 84 and the boundaries layer had a default of NAD 83(HARN)/ UTM zone 4N. Since the datasets were not aligning when I put them, I carried out a Datum transformation so that I can manually define the transformation to use. I set the destination CRS for all layers to be EPSG: 2782 = NAD83/(HARN)/ Hawaii Zone 1, rather than their defaults, because it would provide an accuracy of better than 1m for Hawaii Island. To save each layer with the new projection, I then right-clicked on each layer, then clicked on the "export" and chose the "save feature as" option from the drop-down menu. I then chose EPSG: 2782 = NAD83(HARN) Hawaii Zone 1 which created new layers for the *"Threatened-Endangered Plants - new*" and *"Agricultural Land Use-2020 update - new,*" and then removed all the old layers. I made sure to check that the project CRS was set to EPSG: 2782 = NAD83(HARN) Hawaii Zone 1.

3. **Filtering out all islands except Hawaii.** For this project, I am only focusing on Hawaii Island and will filter out all the other islands using a Query Builder. To filter out the other islands in the County boundaries shapefile, I opened the attribute table, clicked on the "Toggle editing mode" and then clicked on the "select by Expression" button. I inputted the expression "'*NAME20" = 'Hawaii*'". I selected the Hawaii feature, turned off the toggle editing mode, right-clicked on the county boundary layer, and exported the selected features using the "save selected features as" option. This created a new layer named *"Hawaii Filtered"* that only has the Hawaii island boundaries. I then removed the old consensus boundary layer.

4. **Buffered the Hawaii Boundary line.** I buffered the Hawaii boundary line by selecting the "vector" icon, then the "geoprocessing tool" option and then clicking on "buffer." I set the input later as the Hawaii county boundary and created a buffer of 10,000m. This created a new layer, that I named "buffered Hawaii", with an additional circumference of 10,000 meters around the "Filtered Hawaii" island layer.

5. **Clipping the "Threatened-Endangered Plants - new" and "Agricultural Land Use-2020 update - new," layers to the "Buffered Hawaii" layer.** I clipped the *"Agricultural Land Use-2020 update – new"* onto the *"Buffered Hawaii"* layer by going clicking the "vector" icon, then the "geoprocessing tools", then "clip". I made the input later as the Agricultural land use layer and set the output layer as the *"Buffered Hawaii"* Island layer to create a new *"clipped agricultural land use - Hawaii"* layer. This created a layer with all the Agricultural land use data that falls within Hawaii island, removing all the data points that lay outside the island. I repeated this step for the *"Threatened-Endangered Plants - new*" layer.

6. **Dissolving the *"Clipped Threatened-Endangered Plants"* layer.** To visually show the concentration of plant species that were threatened or endangered, I went into layer styling, selected the clipped *"Clipped Threatened-Endangered Plant",* changed the symbology to categorized, and got rid of unnecessary variables and selected a green colour ramp. I noticed that there were some adjacent boundaries with a similar colour. I, therefore, dissolved the *"Clipped Threatened-Endangered Plant"* layer by going to the "vector" menu, clicking on "geoprocessing tools" and selecting the "Dissolve" option. This allowed me

to unify adjacent boundaries based on common attributes. I chose to dissolve the boundaries because I wanted to simplify the boundaries as much as possible.

7. **Intersecting the *"Clipped Threatened-Endangered Plants"* layer and the "*clipped agricultural land use – Hawaii" layers.*** I intersected the *"Clipped Threatened-Endangered Plants"* layer and the "*clipped agricultural land use – Hawaii"* layers by going to "vector", "geoprocessing tools", and "intersection." I set the input later at the "*clipped agricultural land use – Hawaii"* as the input layer and the overlay later as the *"Dissolved Threatened-Endangered Plants."* This would give me parts of the layers that overlapped and an opportunity to carry out statistical calculations on areas that intersected in both layers.

8. **Carried out Basic statistics for fields.** To analyze the areas that intersected between the "*Clipped agricultural land use – Hawaii"* layer and the "Dissolved *Threatened-Endangered Plants"* I used the "Basic statistics for fields" option found in the "Processing Toolbox." I set the newly developed intersection layer as the target later and looked at the results for the overlap for "*Crops 2020" and "density."*

9. **Produce Map:** To produce the final product, I used the Hawaii County Filtered Boundary Layer, the *"Dissolved Threatened-Endangered Plants"* and the "*clipped agricultural land use – Hawaii."* I styled each later to be appealing while taking into consideration the status of the intellectual hierarchy of the information I intend to convey.
    a. **Rule-Based Layer styling for the *"clipped agricultural land use - Hawaii"* layer**. Looking at the "crops_2020" and "average column" I noticed that "Pastures" covered the largest areas when it comes to agricultural land use compared to other practices. To highlight the impact of agricultural practices such as "pastures" on Threatened-Endangered Plants I used the "Rule-based layer styling" option. I created my own "rules" to differentiate between "pastures" and other agricultural practices. To show the "pastures" I filtered the data using the "crops_2020" = 'Pasture' expression, while to group the rest into one, I used "crops_2020" != 'Pasture'.

Findings:

Based on the above map, current agricultural practices such as pasturing cover overlap with more territories associated with historically threatened and endangered plant species than other agricultural practices. The basic statistics for fields and the attribute table show that the smallest farm is 0.00142516 acres, the mean farm size is 175.4 acres, the median farm size is 6.33 acres, and the largest farm size is 146,452 acres. Although of 3504 features only 201 features were associated with pastures, generally the largest farm areas of agricultural land use are associated with pastures. This is also visually evident given that pastures cover most of the land used for agriculture on the map. The map also shows that other agricultural practices are occurring towards the shores where the concentration of historically threatened-endangered plant species is low while pasturing has some overlap with low, medium-high and very high concentrations of endangered plants. Of all the other agricultural practices, we can see that agricultural land-use practices such as pasturing may pose a threat to historically threatened-endangered plant species and it would be interesting to collect more data on the status of threatened and endangered plant species to truly gauge the feet of agricultural practices over time. But based on the current data, we can see that pasturing poses a bigger threat than other agricultural land-use practices to predominantly low concentrations of historically threatened and endangered plant species which may suggest some caution toward biodiversity conservation. However, there are some areas that have high and very high concentrations of historically threatened-endangered plant species that need to be paid attention to.

Appendix:

Data	Threatened-Endangered Plants
Name of the Data Set	Threatened and Endangered Plants as of 1992
Creator of the Dataset	The state of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW).
Sources of the Dataset	Hawaii Statewide GIS Program
URL of source:	https://geoportal.hawaii.gov/datasets/HiStateGIS::threatened-endangered-plants/about
Currency of data:	4 December 2013 (publish date) 8 November 2021 (last updated)
URL of the data License	Same as the source: https://geoportal.hawaii.gov/datasets/HiStateGIS::threatened-endangered-plants/about

Data	Agricultural Land Use
Name of the Data Set	Agricultural Land Use - 2020 Update
Creator of the Dataset	The University of Hawaii at Hilo Spatial Data Analysis and Visualization (SDAV) Laboratory in conjunction with the Hawaii State Department of Agriculture, 2021.
Sources of the Dataset	Hawaii Statewide GIS Program
URL of source:	https://geoportal.hawaii.gov/datasets/HiStateGIS::agricultural-land-use-2020-update/about
Currency of data:	28 June 2021 (publish date) 7 March 2022 (last updated)
URL of the data License	Same as source: https://geoportal.hawaii.gov/datasets/HiStateGIS::agricultural-land-use-2020-update/about

Data	Census Boundaries
Name of the Data Set	2020 Census County Boundaries with Population
Creator of the Dataset	US Census Bureau, September 2021
Sources of the Dataset	Hawaii Statewide GIS Program
URL of source:	https://geoportal.hawaii.gov/datasets/HiStateGIS::2020-census-county-boundaries/about
Currency of data:	18 November 2021 (publish date & last updated)
URL of the data License	Same as source: https://geoportal.hawaii.gov/datasets/HiStateGIS::2020-census-county-boundaries/about