2nd Rufford Report

Conservation of palmita cycad (*Zamia inermis*) and its habitat through ecology and sensitizing local people

Jorge Antonio Gómez Díaz[1,2], César Isidro Carvajal Hernández[1], Merbin Jafet Tornero Conde[3] and Brenda Izabeth Perea Valencia[3]

[1]Instituto de Investigaciones Biológicas, Universidad Veracruzana
[2]Centro de Investigaciones Tropicales, Universidad Veracruzana
[3]Facultad de Biología, Universidad Veracruzana

Activities

During this period, we did the following actions:

- Workshop with local people
- Study the phenological and pollination process of the species.
- Generate information on abundance and spatial/geographical distribution.
- Determine population size.
- Assess the habitats (in condition, suitability, and threats)
- Identify the forest fragments which are a priority for the conservation of the species

Workshop with local people

We continued with presentations of the project with the local people. We held a workshop introducing them to the basic knowledge of cycads, the family Zamiaceae of Mexico, and the genera of cycads of Veracruz (Fig. 1). We discussed the species and the options to promote its conservation of it. They give us their concern and the history of bringing some plants to the field and propagating them. In the end, we gave them some published information about the conservation of the species and a manual on cultivating and propagating cycads (Fig. 2).

Figure 1. Workshop held with local people.

Figure 2. Delivery of didactic material on the conservation of the species.

Phenology of the species

We placed dataloggers and timelapse cameras to record and monitor the cones' temperature and development (Fig. 3 and 4). We have collected data about the most important phases of the cone development of the species. We plan to collect the data when the plants finish developing cones in the next months. This information will be extremely helpful in understanding the biology of the plant and developing the following programs for the cultivation and conservation of the species (Fig. 5).

Figure 3. Placement of the dataloggers to monitor the reproductive phenology process of the species

Figure 4. Placement of the time-lapse cameras to monitor the reproductive phenology process of the species.

Figure 5. Don Lencho shows and explaining us about the reproductive phenology process of the species.

Pollinators of the species

Thanks to the help of the inhabitants of Mozomboa, we have collected the pollinators of the species (Fig. 6). This is very important because it was believed that the pollinator was extinct and therefore was no possibility of natural reproduction of the species. The group's expert (Dr. William Tang) will analyze the pollinator.

Figure 6. Possible pollinator of the species.

Habitat evaluation

Spatio-temporal analysis

Using all the information of the available Landsat satellite images of the zone, we have analyzed the spatiotemporal dynamics of the forest of the study area (Fig. 7). We have found that most of the area's forests are secondary forests with low canopy height (Fig. 8), low aboveground biomass (Fig. 9), and low-quality index (Fig. 10). There are zones covered by old woods, with high canopy height, high values of aboveground biomass, and high-quality index, mainly surrounding the area's hills.

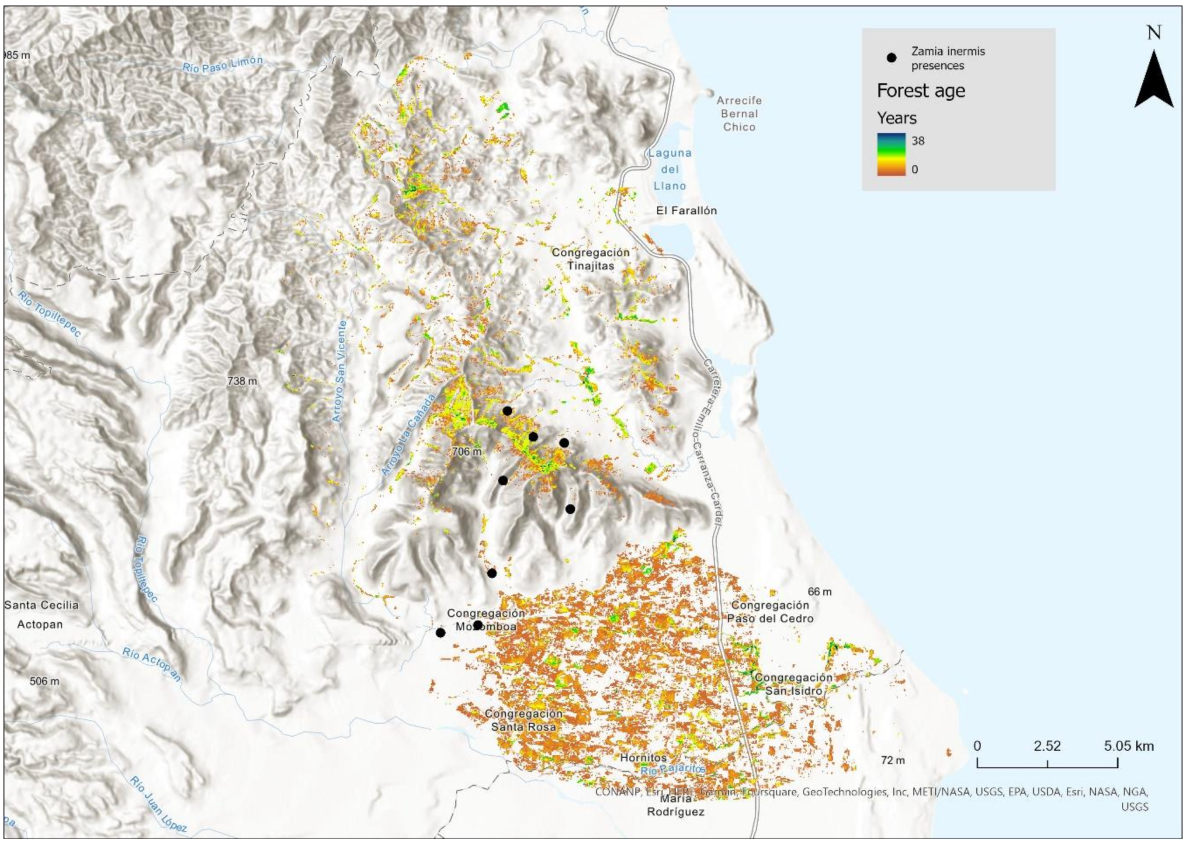

Figure 7. Forest age of the study area.

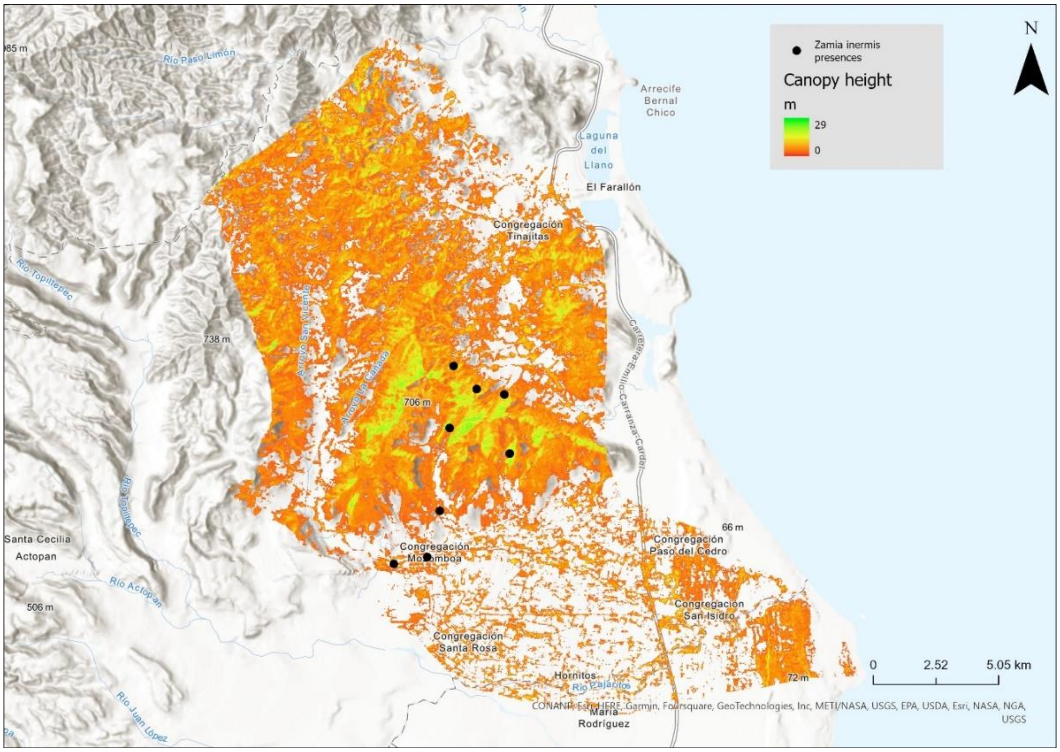

Figure 8. Canopy height of the forests of the study area.

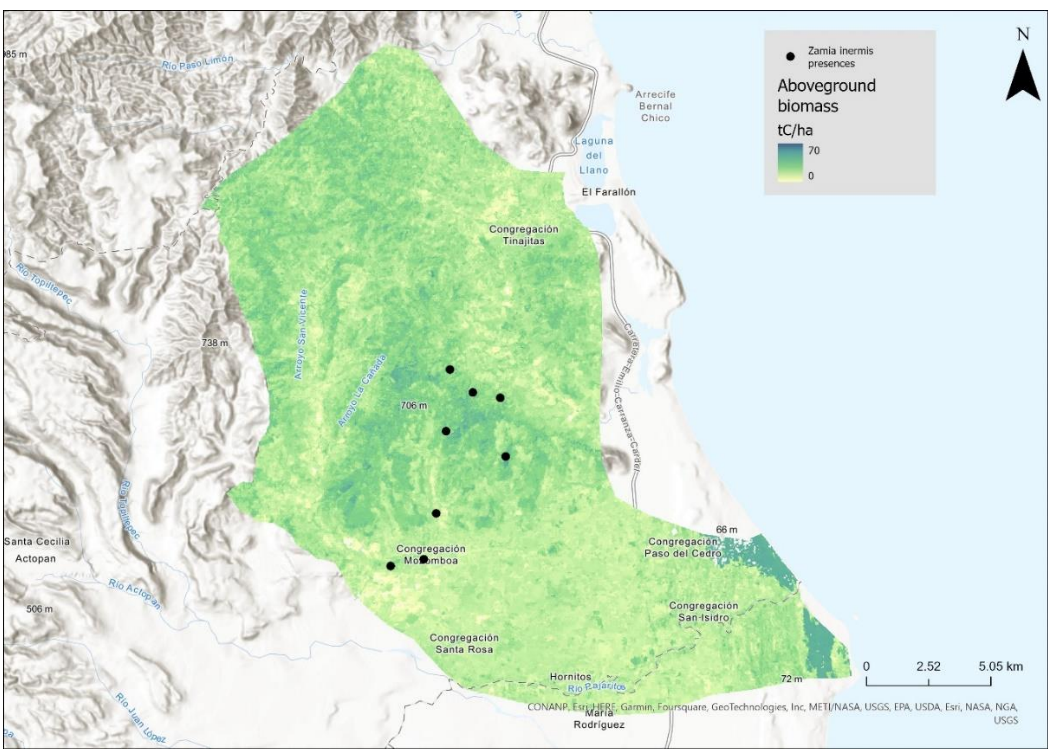

Figure 9. Aboveground biomass of the study area.

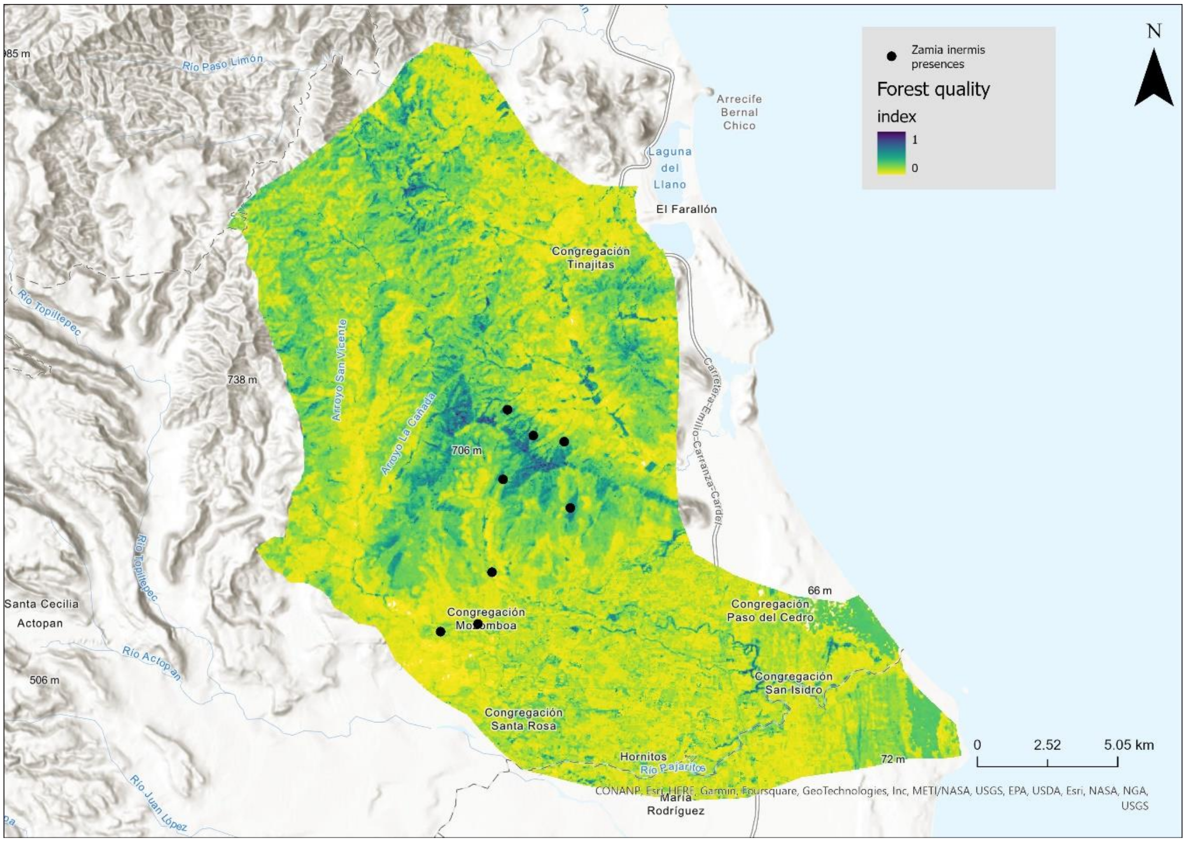

Figure 10. Forest quality index of the study area.

Fragmentation

The landscape metrics of the study area show a high level of aggregation comprised of pixels sharing the possible edges, good connectance, low edge density and Shannon entropy, high largest patch index, and low landscape shape index (Table 1). We found 434 core areas, and 1257 patches, with a low patch density, high percentage of like adjacencies, low patch richness, and Shannon's and Simpson's indexes. We found a landscape with low fragmentation and a high core area (Table 1).

Index	**Value**
Aggregation index	97.3
Connectance	77.7
Edge density	18.5
Shannon entropy	0.3
Largest patch index	94.5
Landscape shape index	10.0
Number of disjunct core areas	434.0
Number of patches	1257.0
Patch density	3.7
Percentage of like adjacencies	97.3
Patch richness	2.0
Shannon's diversity index	0.2
Shannon's evenness index	0.3
Simpson's diversity index	0.1
Simpson's evenness index	0.2
Total area	33944.2
Total core area	31338.9
Total edge	626923.7

Connectivity

We found that there is a natural corridor connecting the different populations of the species. However, there has yet to be a report of individuals of the species in all the study areas. In the future, a program of reintroduction of the species can be conducted using this information as a basis.

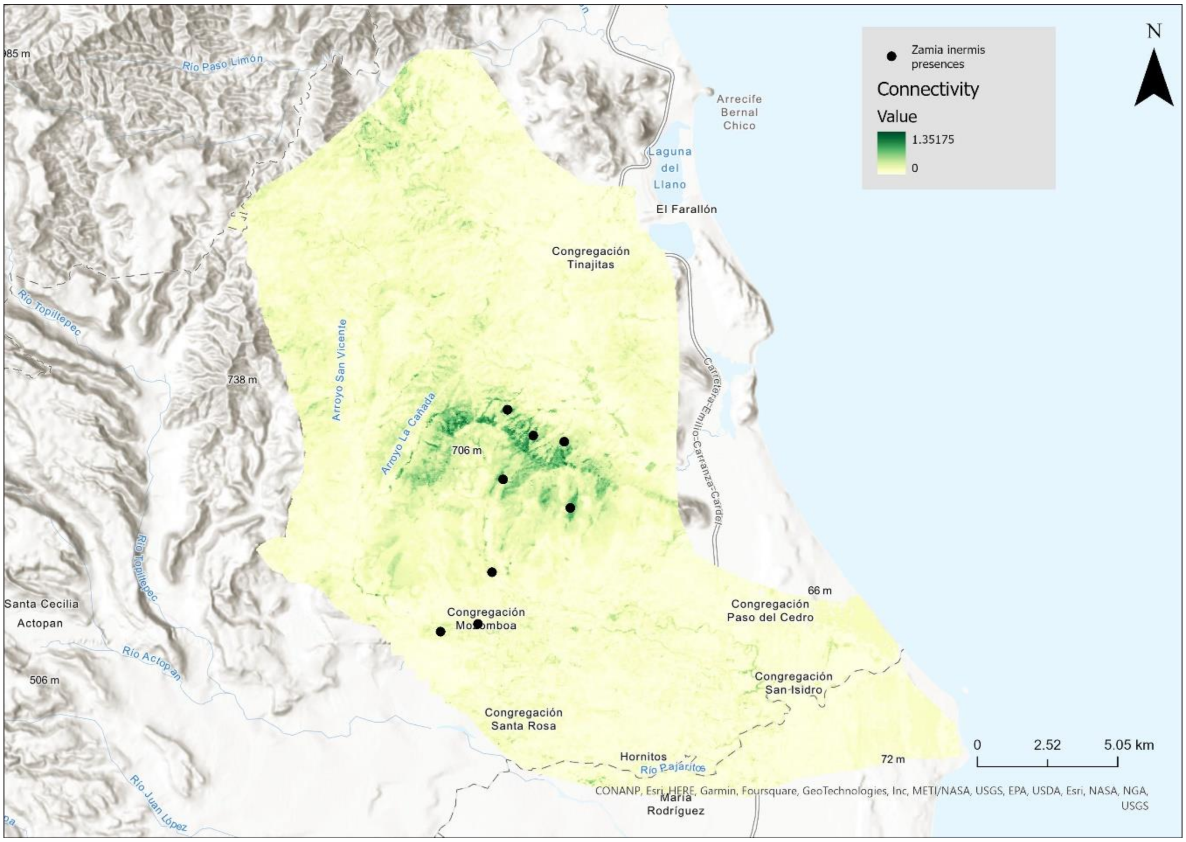

Figure 11. Connectivity and corridor for the species in the study area.

Prioritization of forest fragments

Using all the generated information, we identified the areas that should be prioritized and incorporated into the state's protected areas. This area is located mainly in the mountain, where the species still inhabit and where there are still two viable populations. The areas of high importance are those where at least four parametrizations have a consensus (red pixels; Fig. 12 and 13).

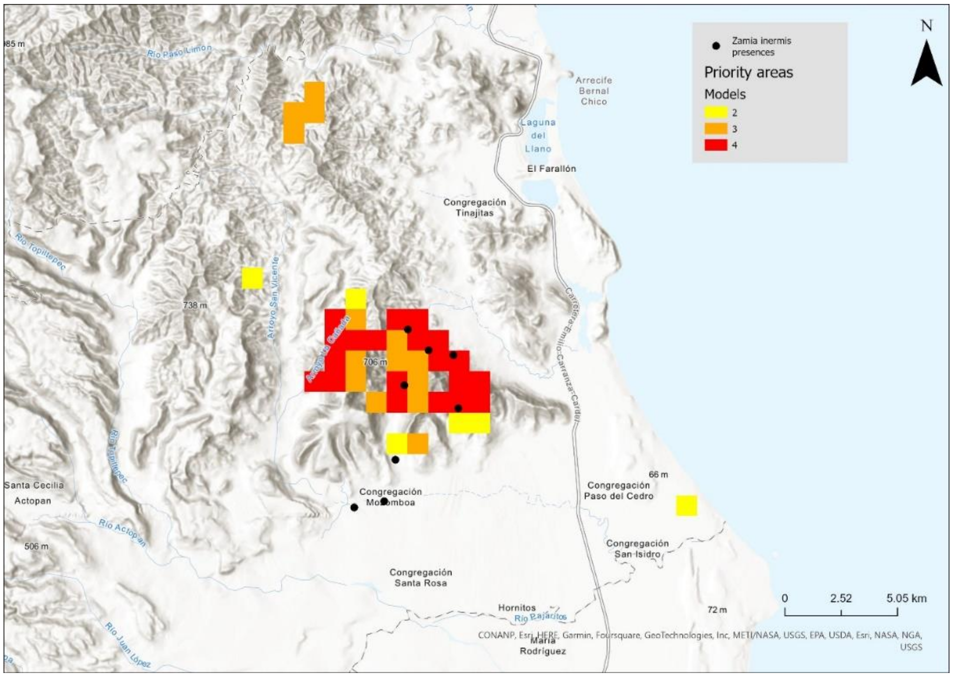

Figure 12. Priority areas were identified by the consensus of different parametrizations of the Zonation software (two = yellow, three = orange, and four = red).

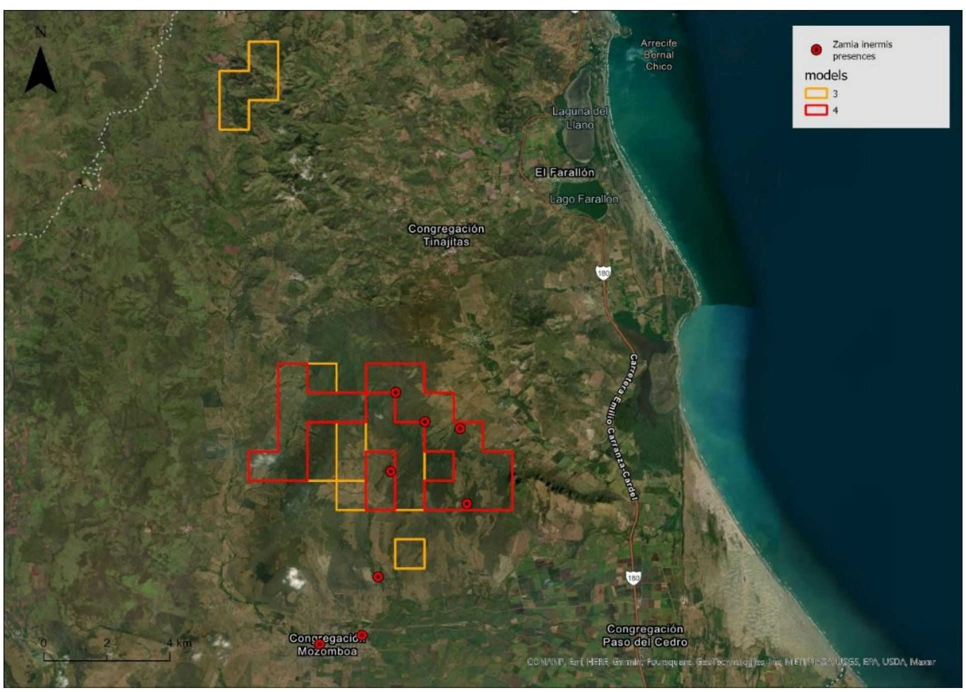

Figure 13. Priority areas identified by the consensus of different parametrizations of the Zonation software (three = orange and four = red), in red, are shown the historical occurrences of the species.

Mining activities are in the area to extract basaltic stone for the construction industry. The mining activities are very close to one of the natural populations of the species, which increases the pressure on this species (Fig. 14 and 15).

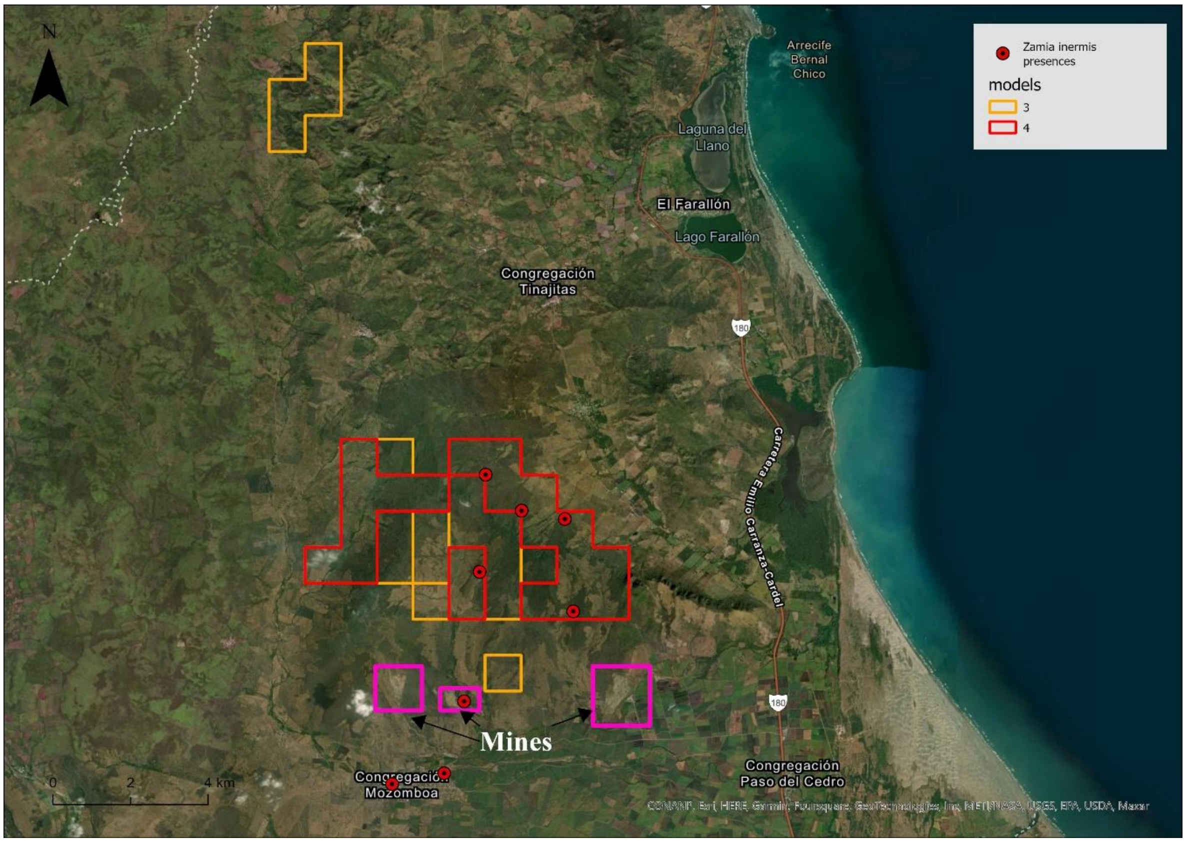

Figure 14. Priority areas for conserving Zamia inermis show the zone's mining activities (purple).

Figure 15. View of the activities for the extraction of basalt stone in the area.

Universidad Veracruzana