Conservation area network of the Monarch butterfly migratory route in Mexico

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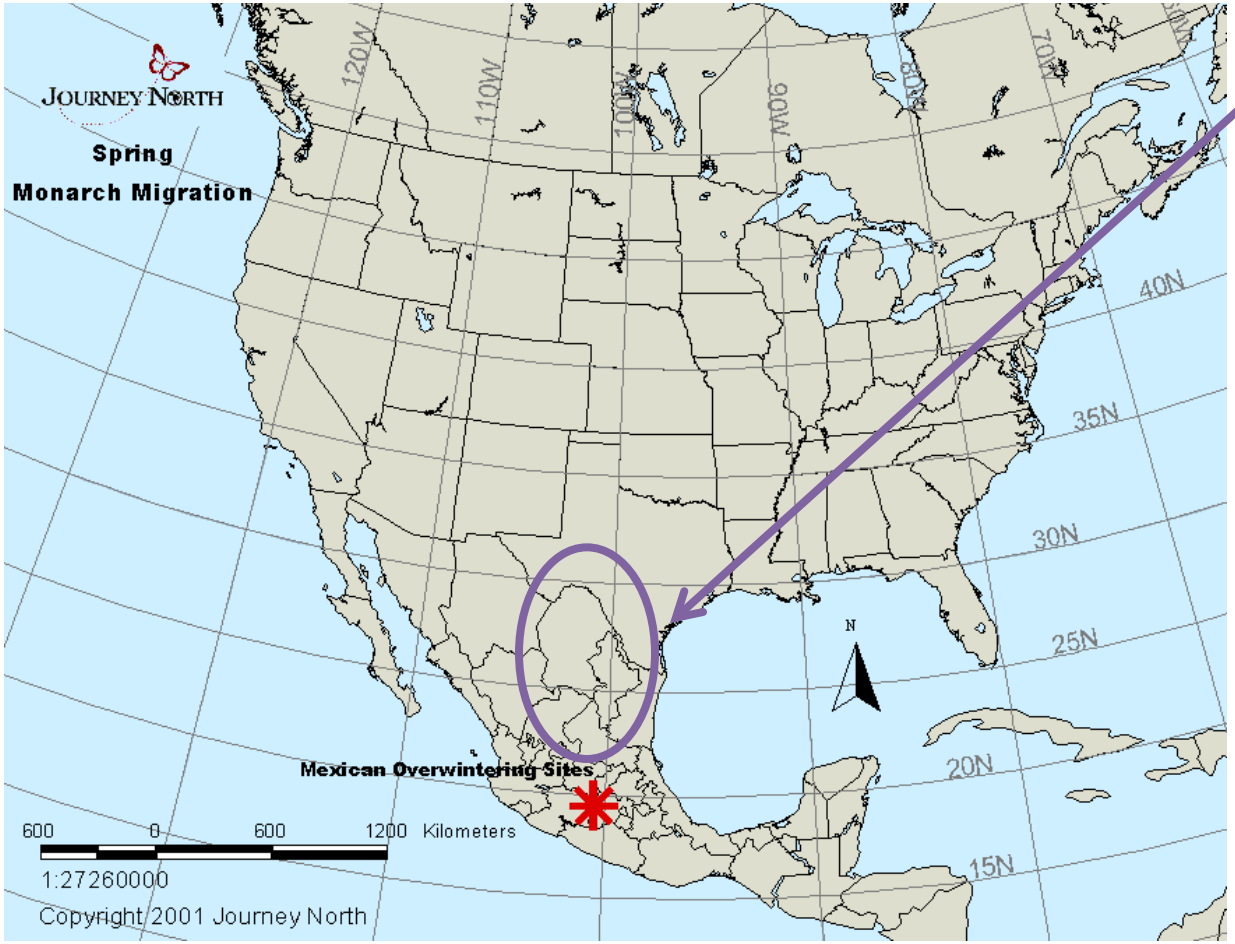


From: http://www.learner.org/jnorth/images/graphics/monarch/monarch_mapBlank.gif

Monarch Migratory route in Mexico

Important Factors:

-Key plant species for feeding (e.g., *Asclepias*) and resting (e.g., *Pinus, Quercus, etc.)*.

We set three goals:

- Produce a SDM model projecting the potential distribution of monarch butterflies in their migratory route in Mexico.

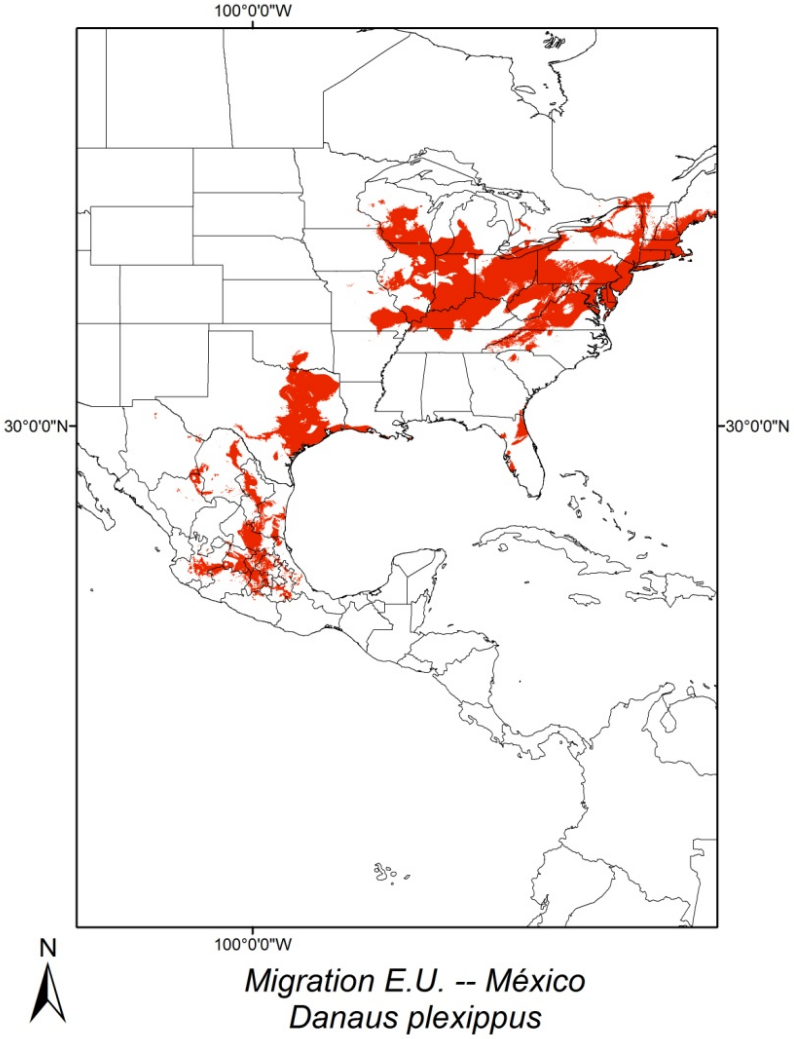
- Produce an ecological niche model (abiotic and biotic), including SDM of key plant species used by monarch butterflies in their migratory route.

- Produce an inter-connected geographical conservation model (Conservation area network), including the ecological niche model of monarch butterflies in their migratory route, decreed protected areas, land use and vegetation map, and climate change scenarios (RCP 6.0).

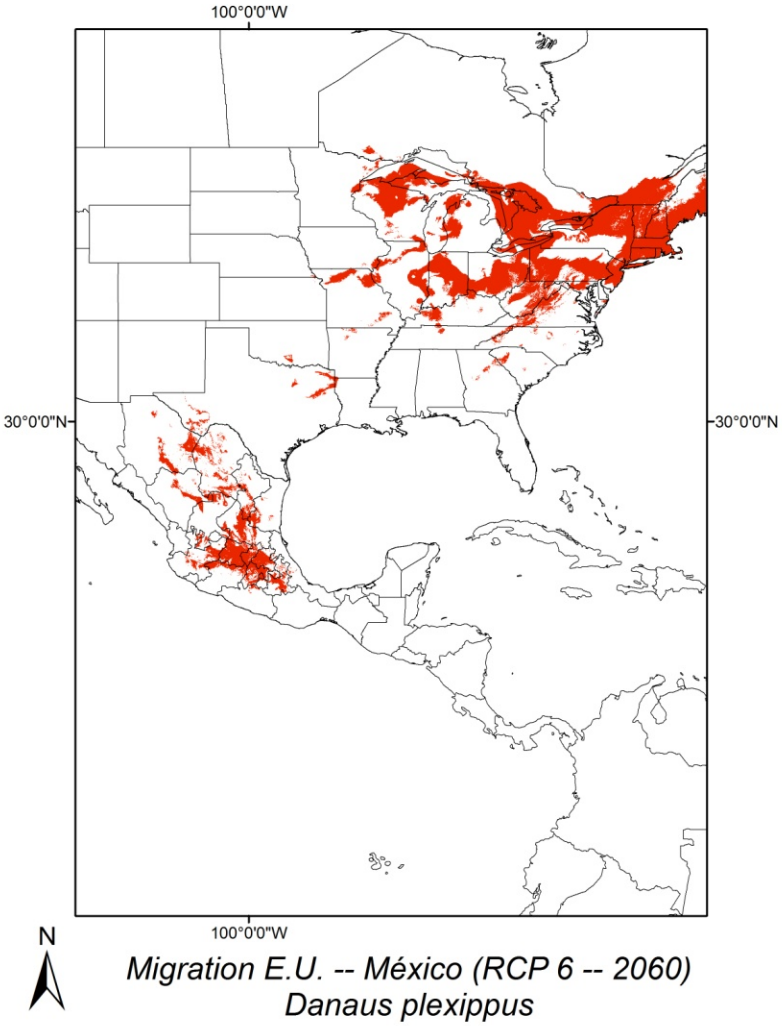
Methods

- Produce a species distribution model (using MaxEnt) of monarch butterflies under current and climate change scenarios (2060), including point occurrence data throughout their range and environmenal variables in a GIS platform.

Monarch potential distribution in migratory route

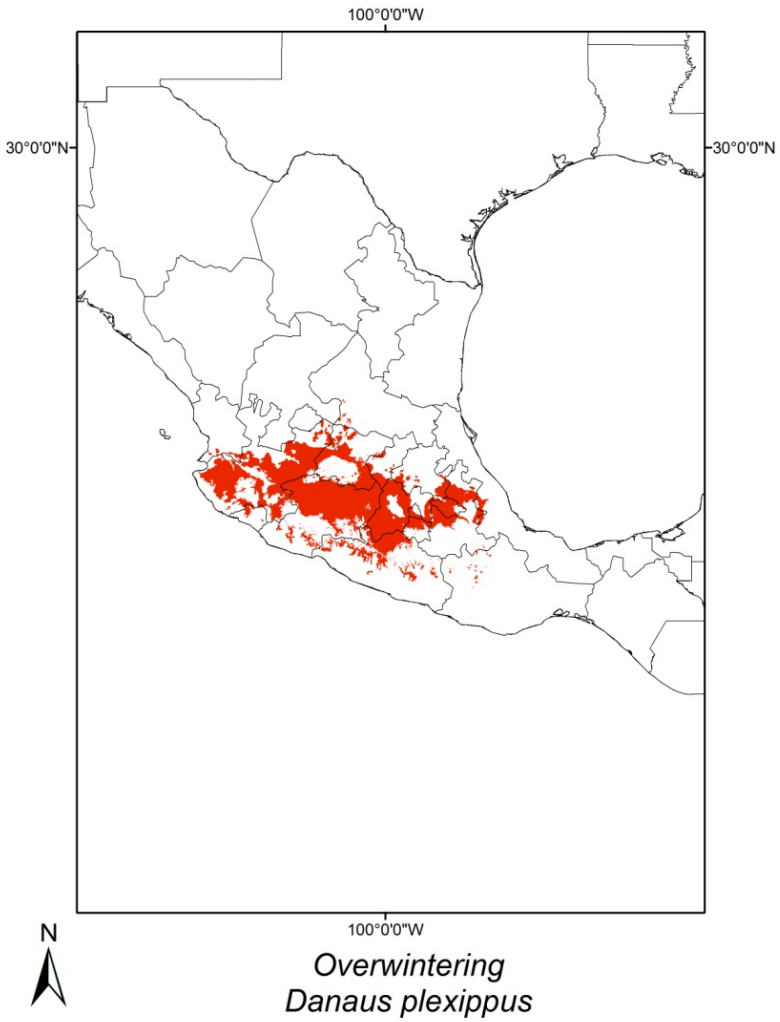


Current



2060

Monarch potential distribution in overwintering sites



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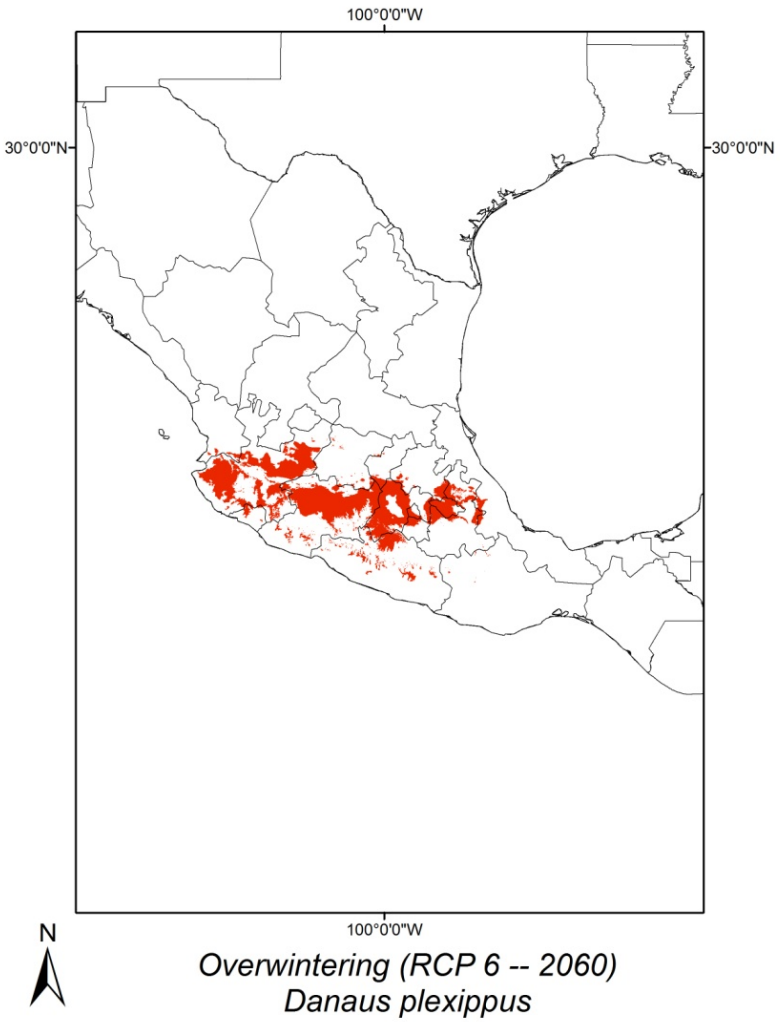


2060

Methods

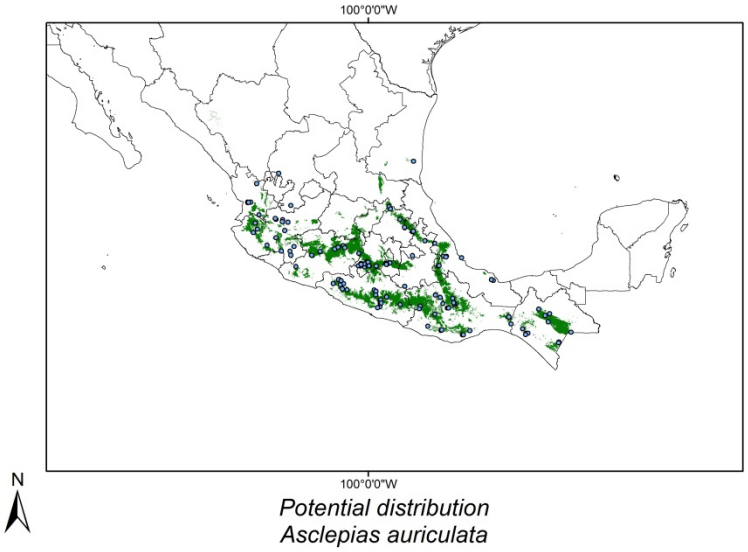
- We modeled species distributions projected as potential distributions of 52 identified key plant species (literature and field work), under current and climate change scenarios (2060).

Key plant species for monarchs

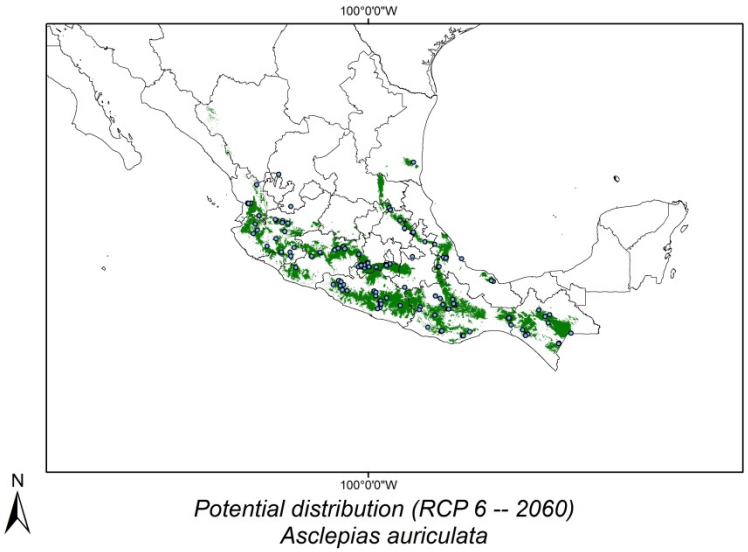
División	Class	Order	Family	Species	Number of records
Pinophyta	Pinopsida	Pinales	Cupressaceae	Cupressus lindleyi	44
				Juniperus deppeana	432
				Juniperus monticola	57
			Pinaceae	Pinus ayacahuite	120
				Pinus hartwegii	124
				Pinus michoacana	47
				Pinus oocarpa	139
				Pinus pseudostrobus	294
				Pinus rudis	35
				Pinus teocote	194
				Abies religiosa	111
			Taxodiaceas	Taxodium distichum	227
				Taxodium mucronatum	222

División	Clase	Orden	Familia	Especie	Número de registros revisados y utilizados para modelar
			Apocynaceae	Asclepias asperula	393
				Asclepias auriculata	133
				Asclepias brachystephana	171
				Asclepias circinalis	25
				Asclepias coulteri	47
				Asclepias curassavica	1701
				Asclepias elata	69
				Asclepias engelmanniana	123
				Asclepias fournieri	41
				Asclepias glaucescens	345
				Asclepias jaliscana	160
				Asclepias linaria	1038
				Asclepias mexicana	96
				Asclepias oenotheroides	312
				Asclepias otarioides	51
				Asclepias ovata	161
				Asclepias pellucida	83
				Asclepias similis	149
				Asclepias sperryi	45
				Asclepias subverticillata	363
				Asclepias texana	20
				Asclepias tuberosa	686
				Asclepias verticillata	473
				Asclepias viridis	286
				Asclepias virletii	12
		Fagales	Juglandaceae	Carya illinoinensis	154
				Juglans hirsuta	14
				Juglans major	175
				Juglans microcarpa	53
				Juglans mollis	73
				Juglans pyriformis	40
			Fagaceae	Quercus acutifolia	123
				Quercus candicans	23
				Quercus castanea	311
				Quercus crassifolia	263
				Quercus laurina	236
				Quercus obtusata	267
				Quercus rugosa	395
				Quercus salicifolia	24

Asclepias auriculata

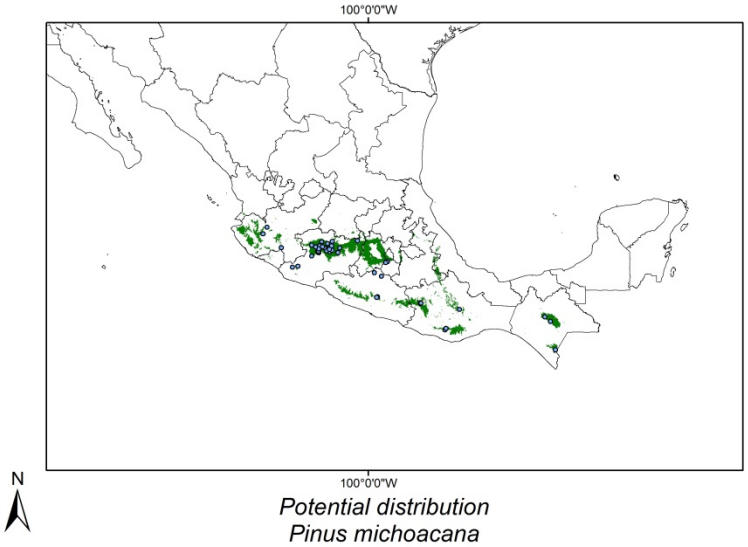


Current



2060

Pinus michoacana



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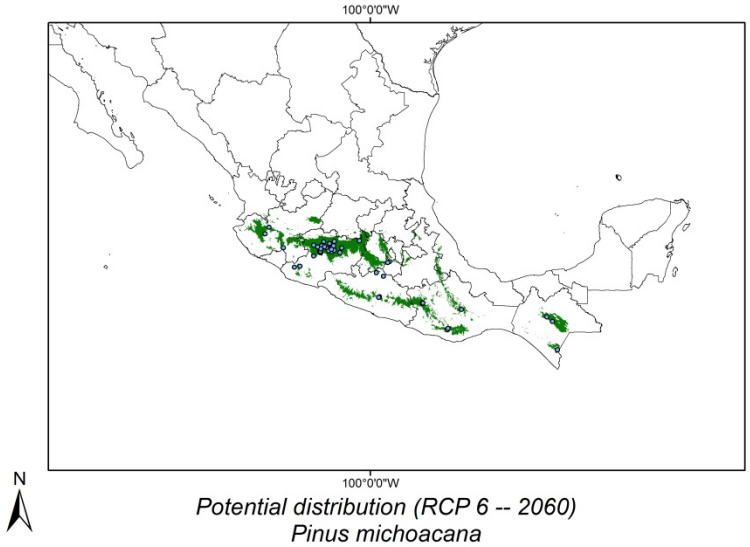
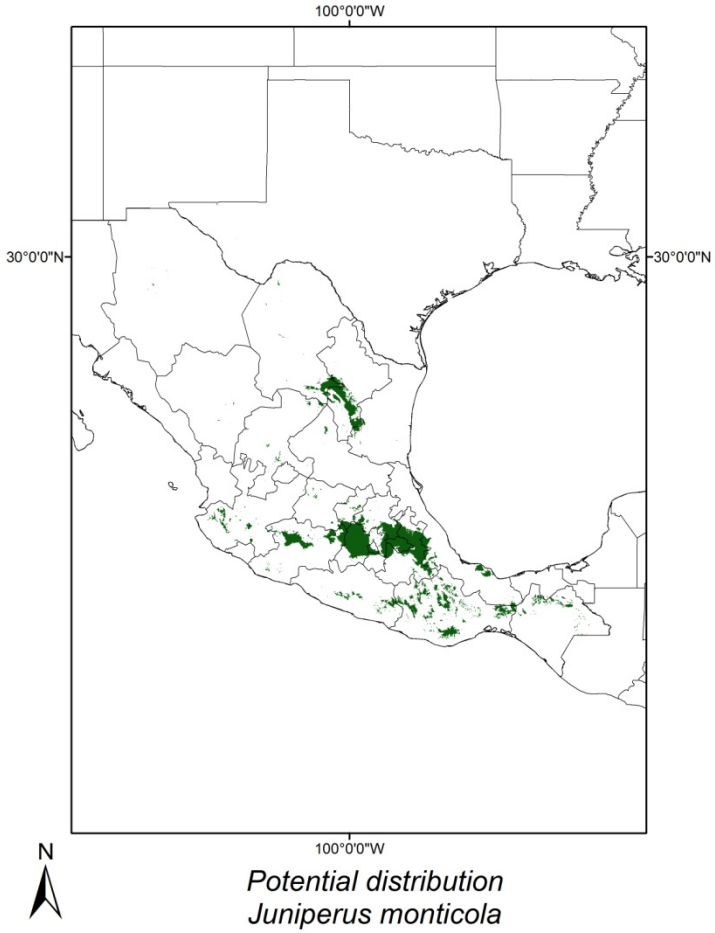


2060

Juniperus monticola



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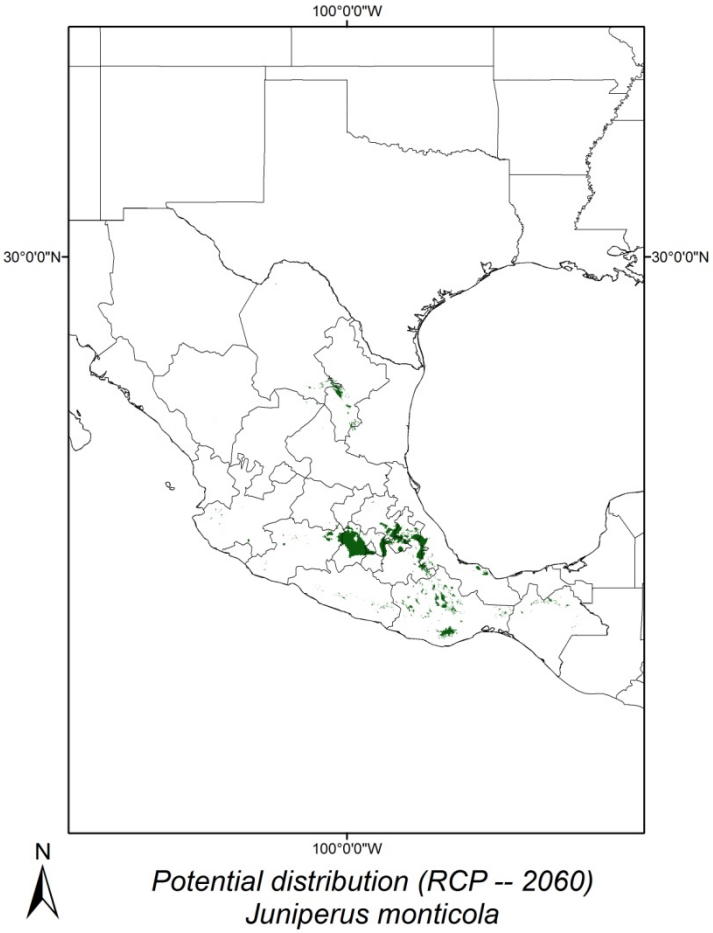
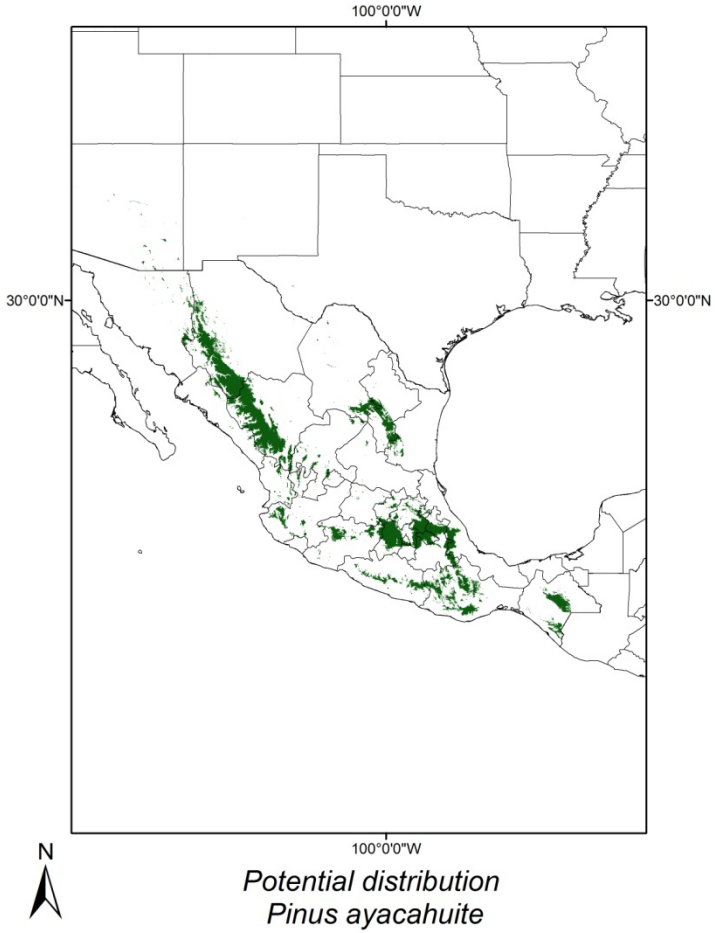


2060

Pinus ayacahuite



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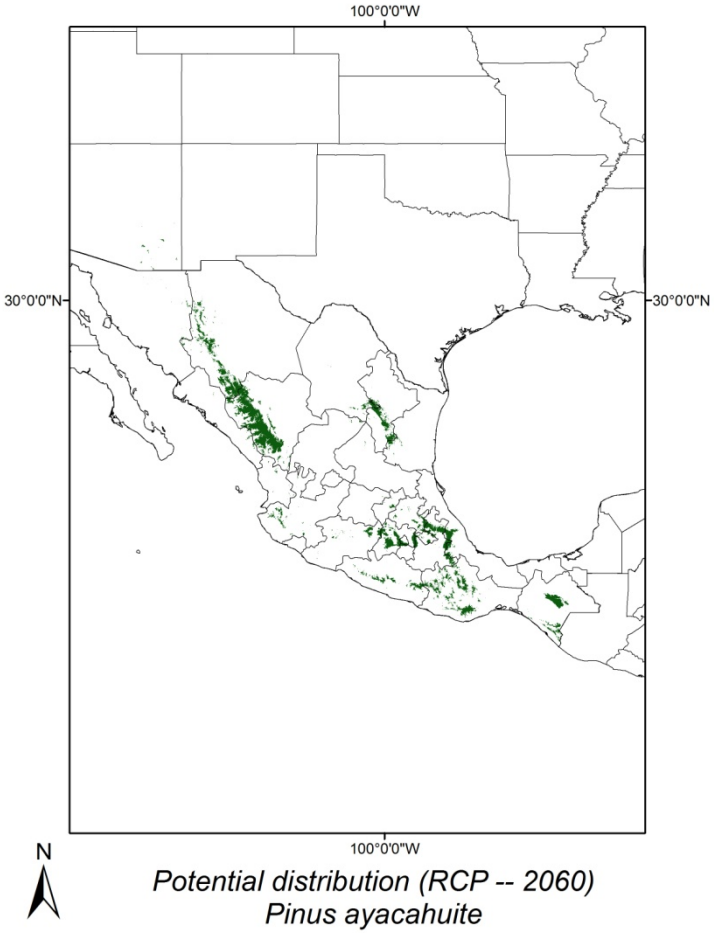
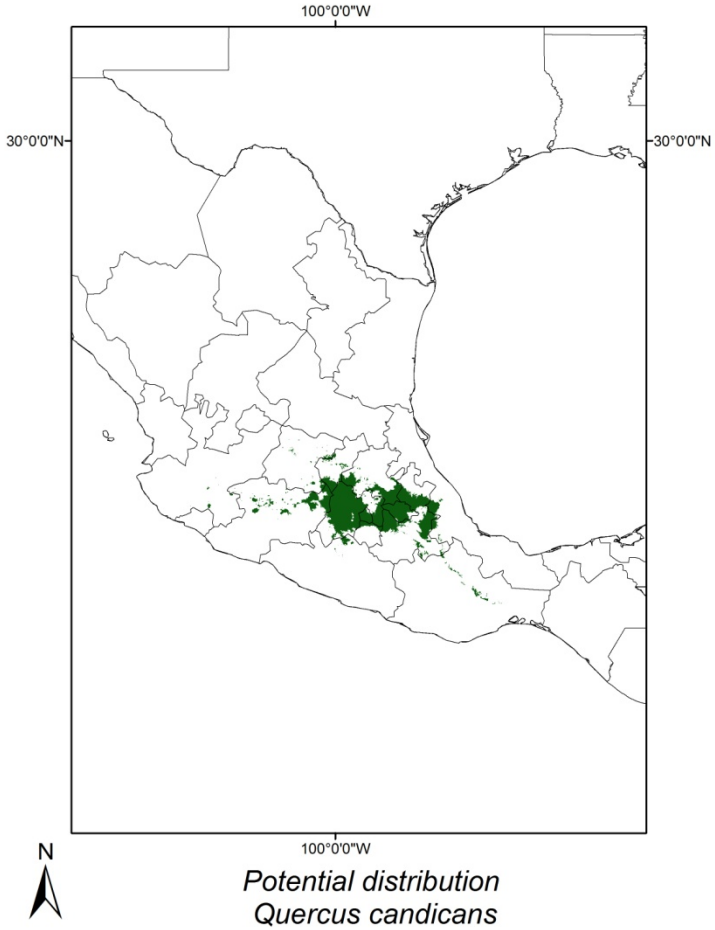


2060

Quercus candicans



Current

2060

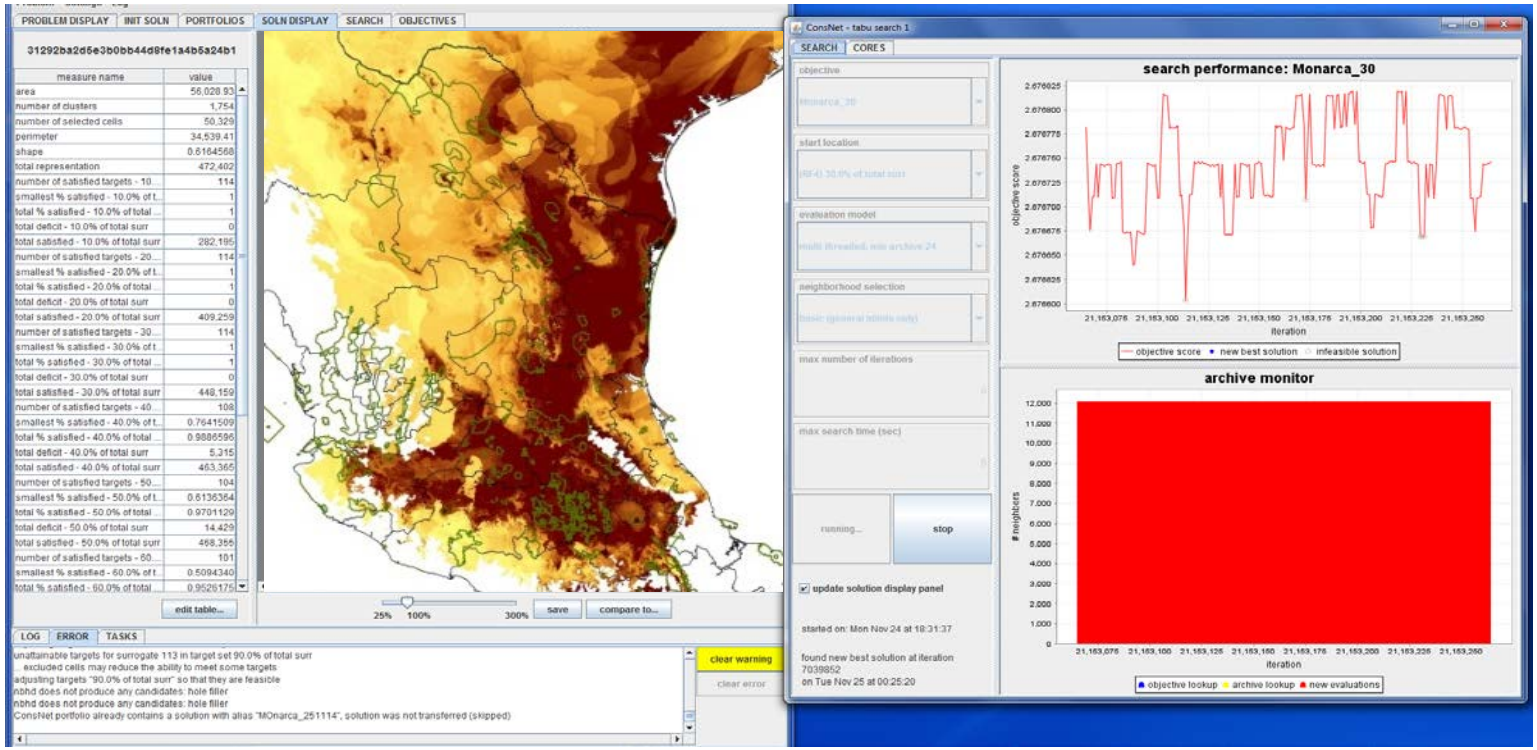
Methods

We used the computer algorithm ConsNet to produce an inter-connected geographical conservation model (Conservation area network) including the ENM of monarch butterfly migratory route, and decreed protected areas, both under current and climate change scenarios.

In our example, we set a conservation target of 20%, 40% and 60% of species distributions that overlapped with the monarch butterfly migratory route. The conservation proposals show, for each conservation target, the common areas identified for current and climate change scenarios.

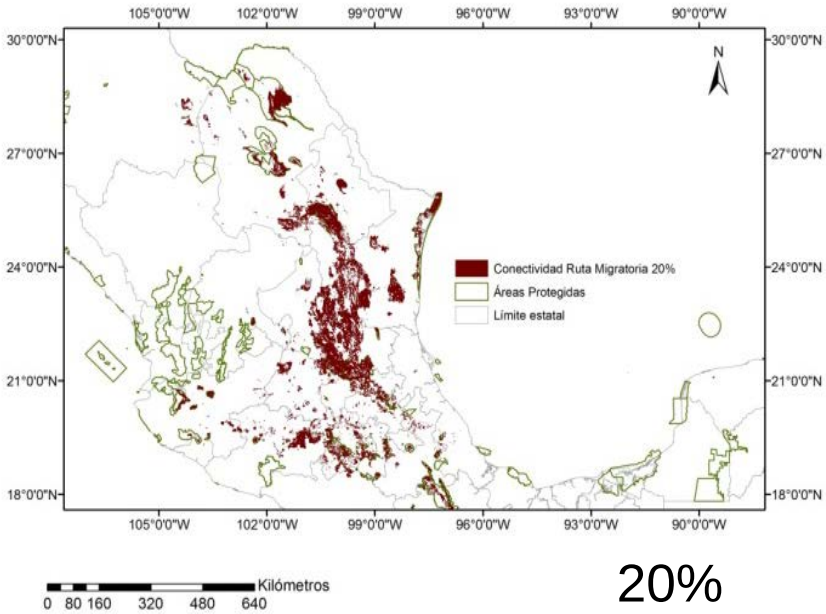
Our conservation exercise follows the precautory principle

Connectivity in the monarch butterfly migratory route.

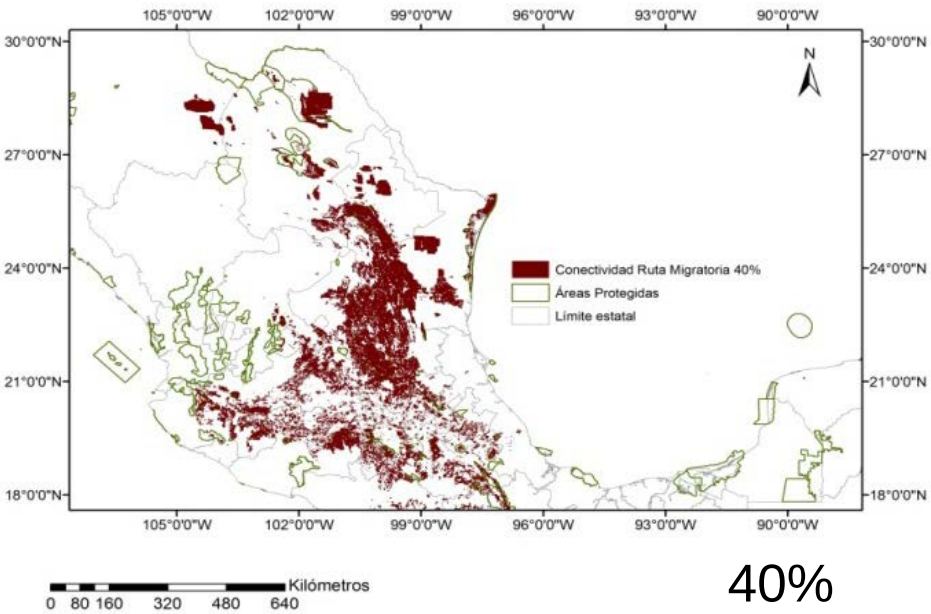


- Using ConsNet, we search optimal solutions for connectivity and biological representation (20, 40 and 60% of the potential species distributions) in the monarch migration route.

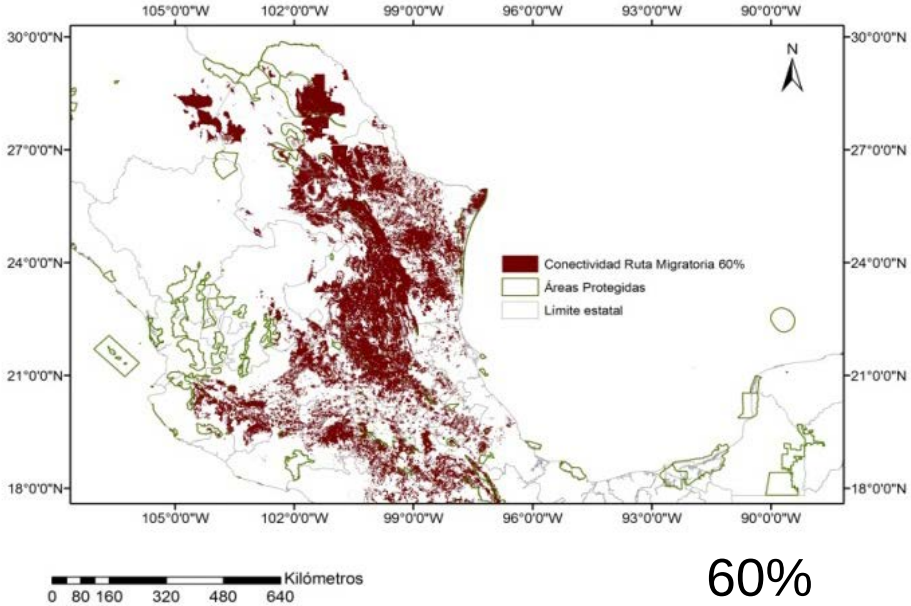
Results



20%

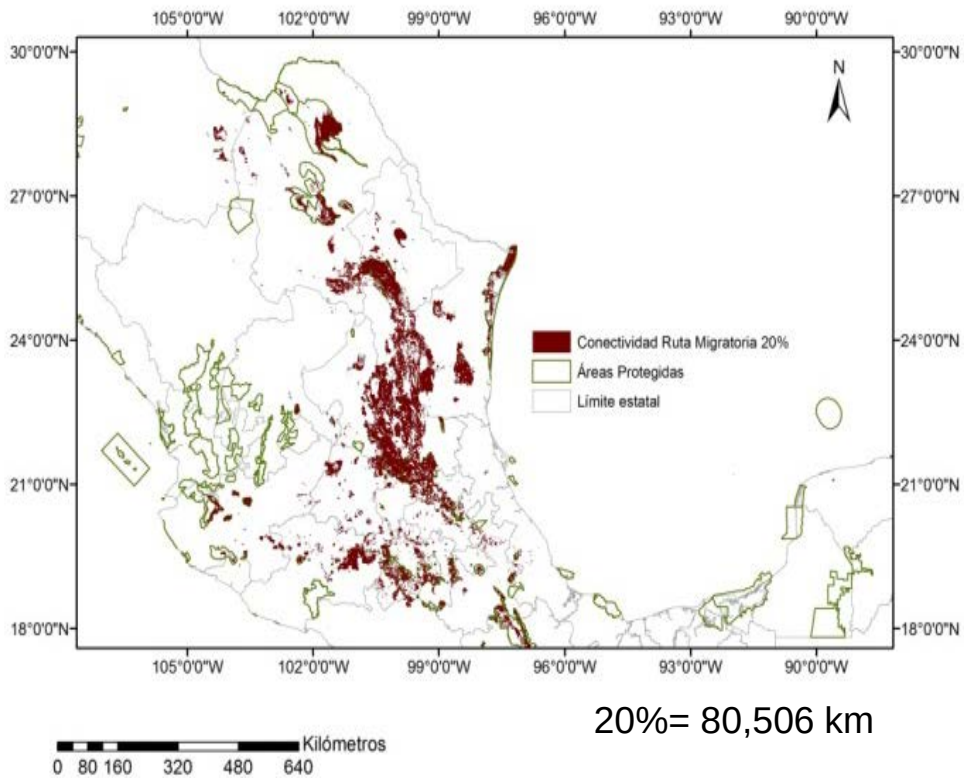


40%



60%

Quo vadis?



20%= 80,506 km

- Field work validation of the identified priority sites with academic and citizen science.
- Set different conservation targets on key plant species, based on their relative importance to monarch butterfly migratory route.
- Include wind currents into the SDM of monarchs in the migratory route.
- Produce a multi-criteria analysis, including ecological, demographic, economic and governance level, to refine our conservation area network.
- Launch short and long-term conservation actons in identified conservation areas.

Thanks!

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(By the way, let's go for the Mexican Presidential Memorandum to promote the health of honey and native bees and other invertebrate and vertebrate pollinators)!