

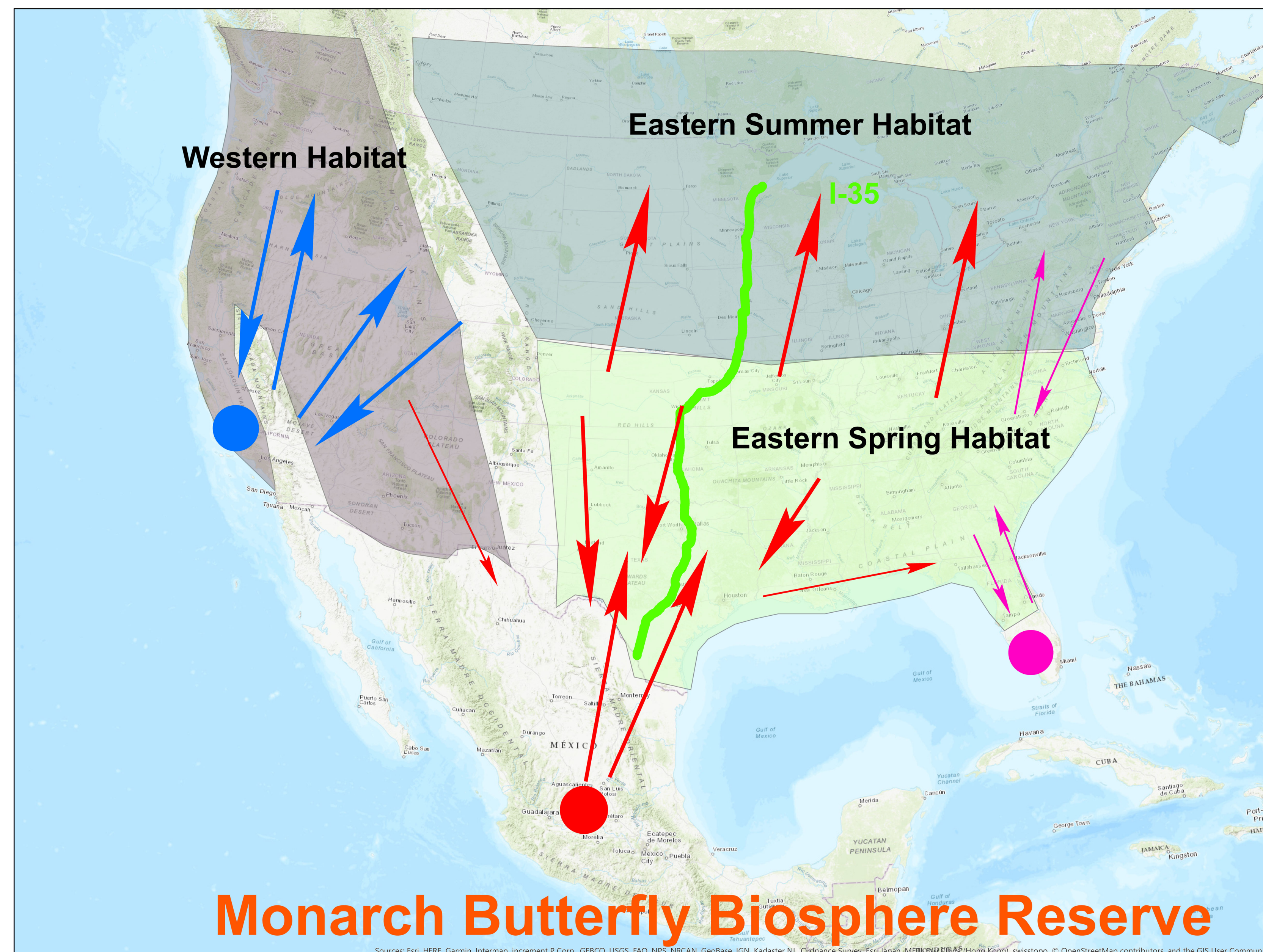
Monarch Butterfly Decline

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Introduction

The monarch butterfly in North America is unique in a sense that the species migrates over the course of multiple generations. The eastern population of Monarchs overwinter in the Monarch Butterfly Biosphere Reserve, in Michoacán, Mexico. This is an area that has been established and serves as a population indicator of the species. Population is measured by total acres of butterflies spent in the reserve each winter. As the Monarchs migrate north, they lay their eggs on the milkweed plant. With the increased use of glyphosate in agriculture, the milkweed population has decreased significantly in North America. The population of Monarchs has drastically been depleted since the late 1990's. A GIS analysis has been done to assess both the overwinter site, and the potential area of land available to reintroduce milkweed along roadsides in the heaviest areas of glyphosate use in the United States.

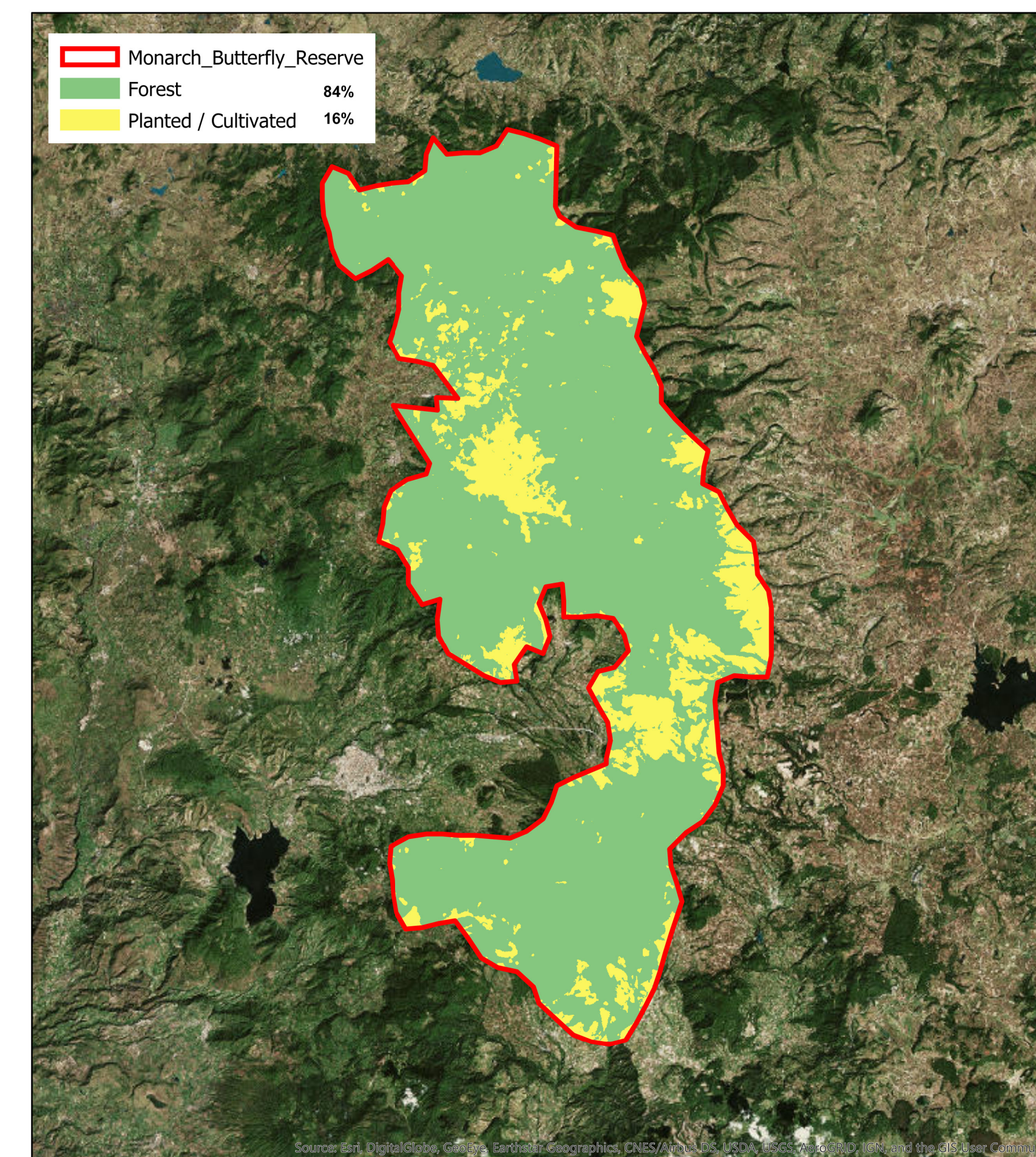
Monarch Migration



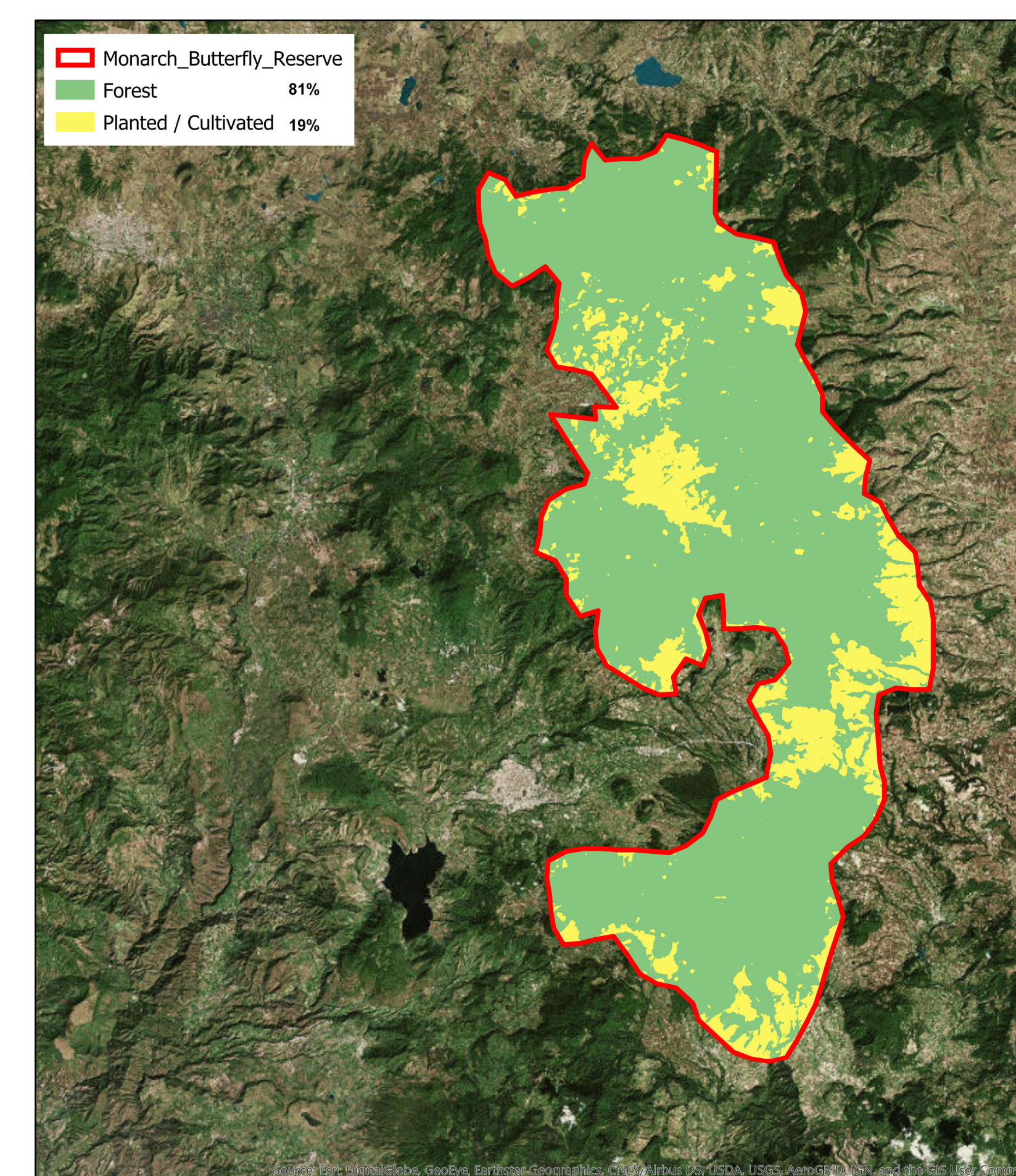
<https://journeynorth.org/tm/monarch/PopulationMexicoAnalyzeGraph.html>

Monarch Butterfly Biosphere Reserve Michoacán, Mexico

2014 Land Cover

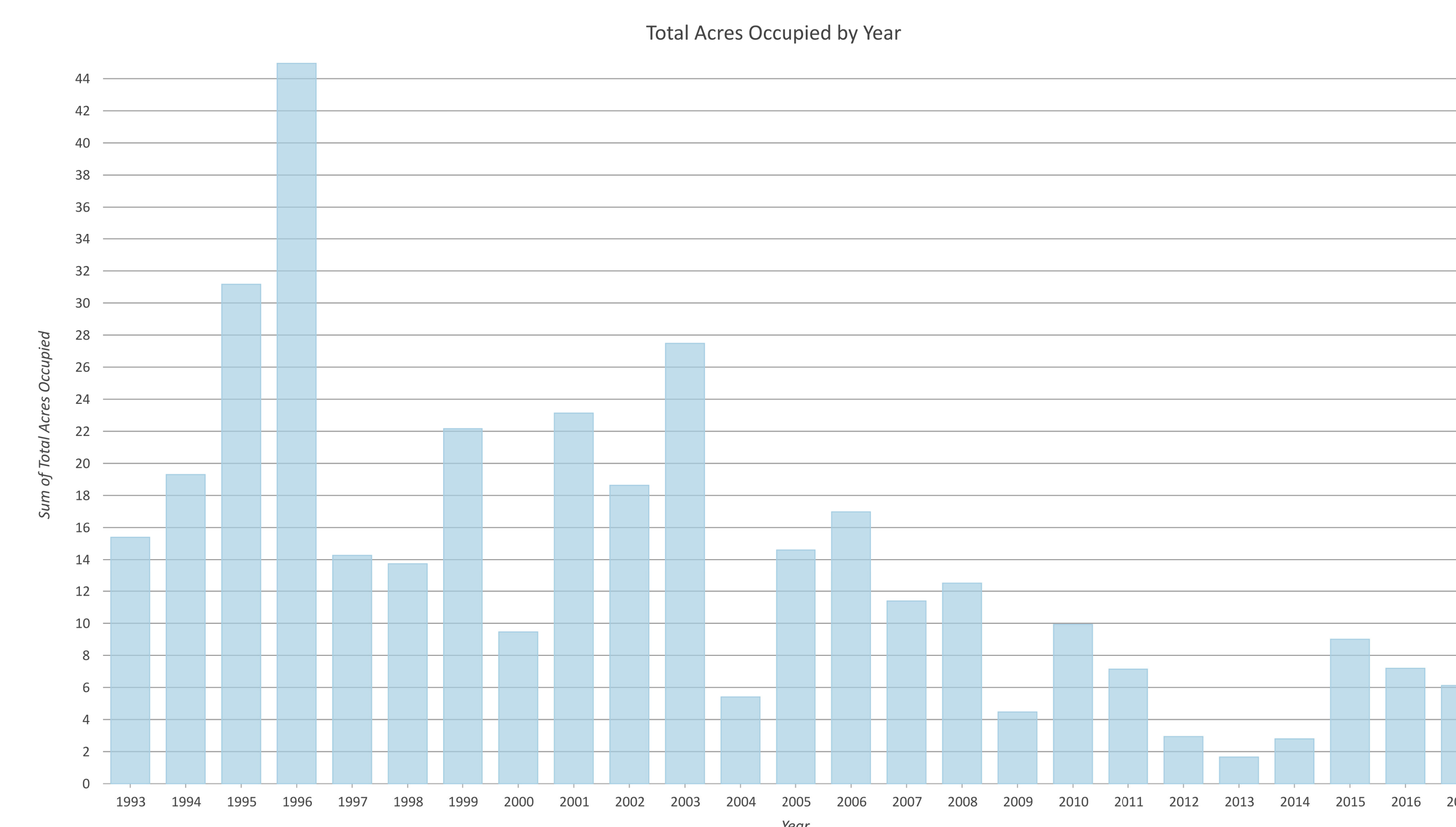


2019 Land Cover



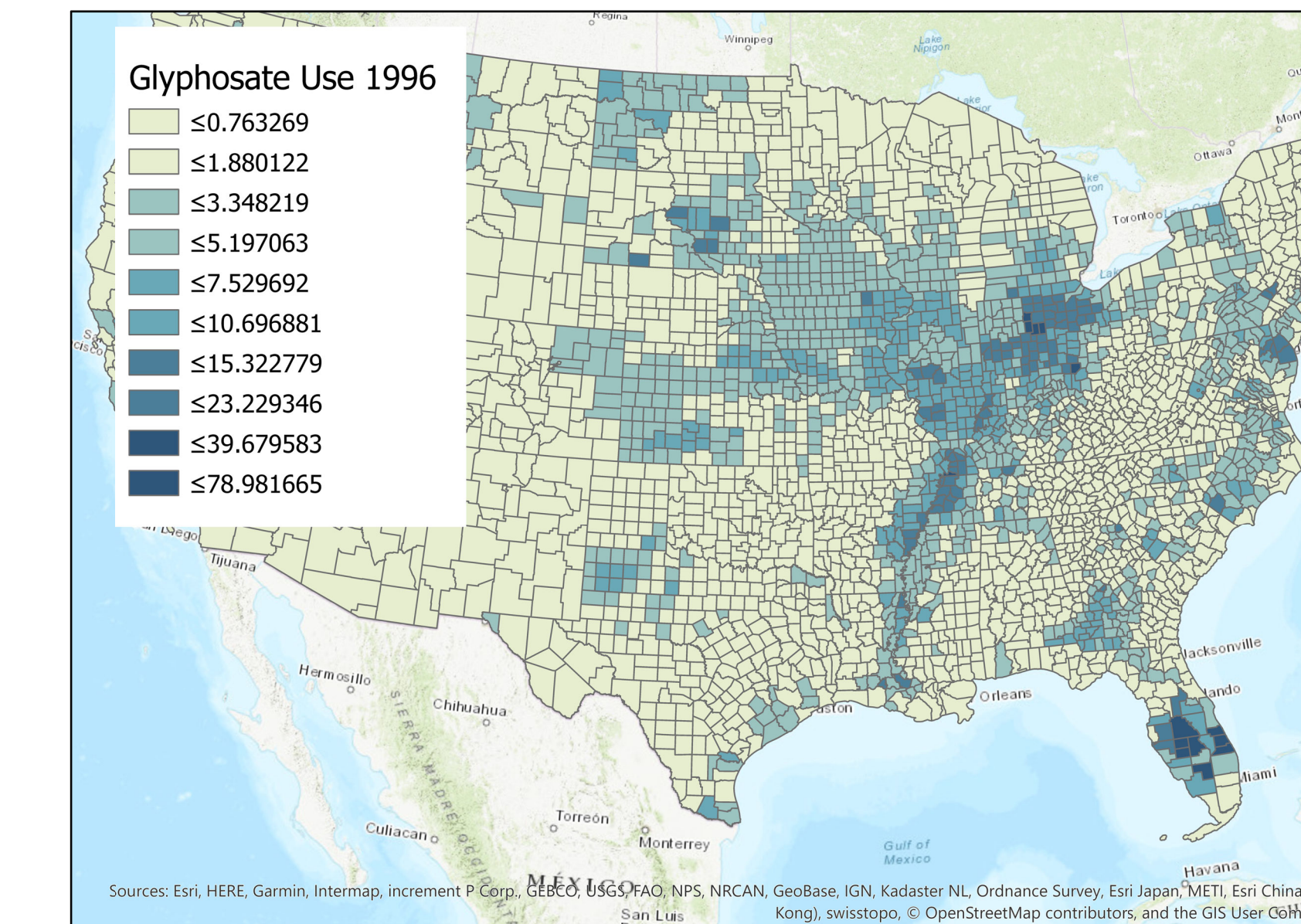
The Monarch Butterfly Biosphere Reserve was established in the 1980's, and consists of approximately 137,610 acres. Although it was designated a reserve, the area is still predominately privately owned. The reserve covers the majority of the monarch butterflies overwintering sites. Farming and illegal logging remain a concern. Looking at Landsat 7 images from 2014, and 2019, show that there is little to no forest change. Management practices in the area appear to be effective in preventing habitat loss.

Eastern Butterfly Population

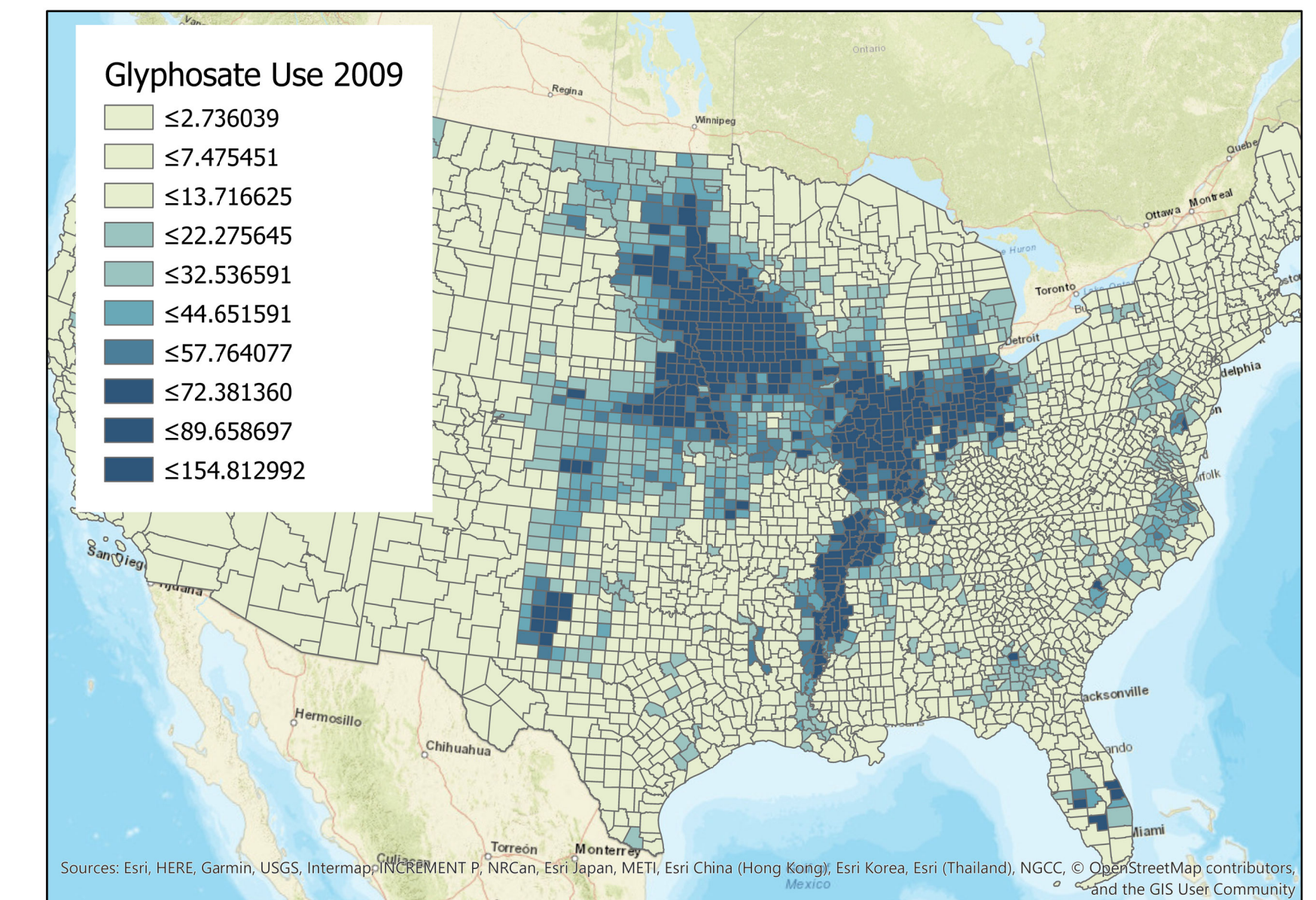


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1996 Glyphosate Use
 (lbs/sqmile)

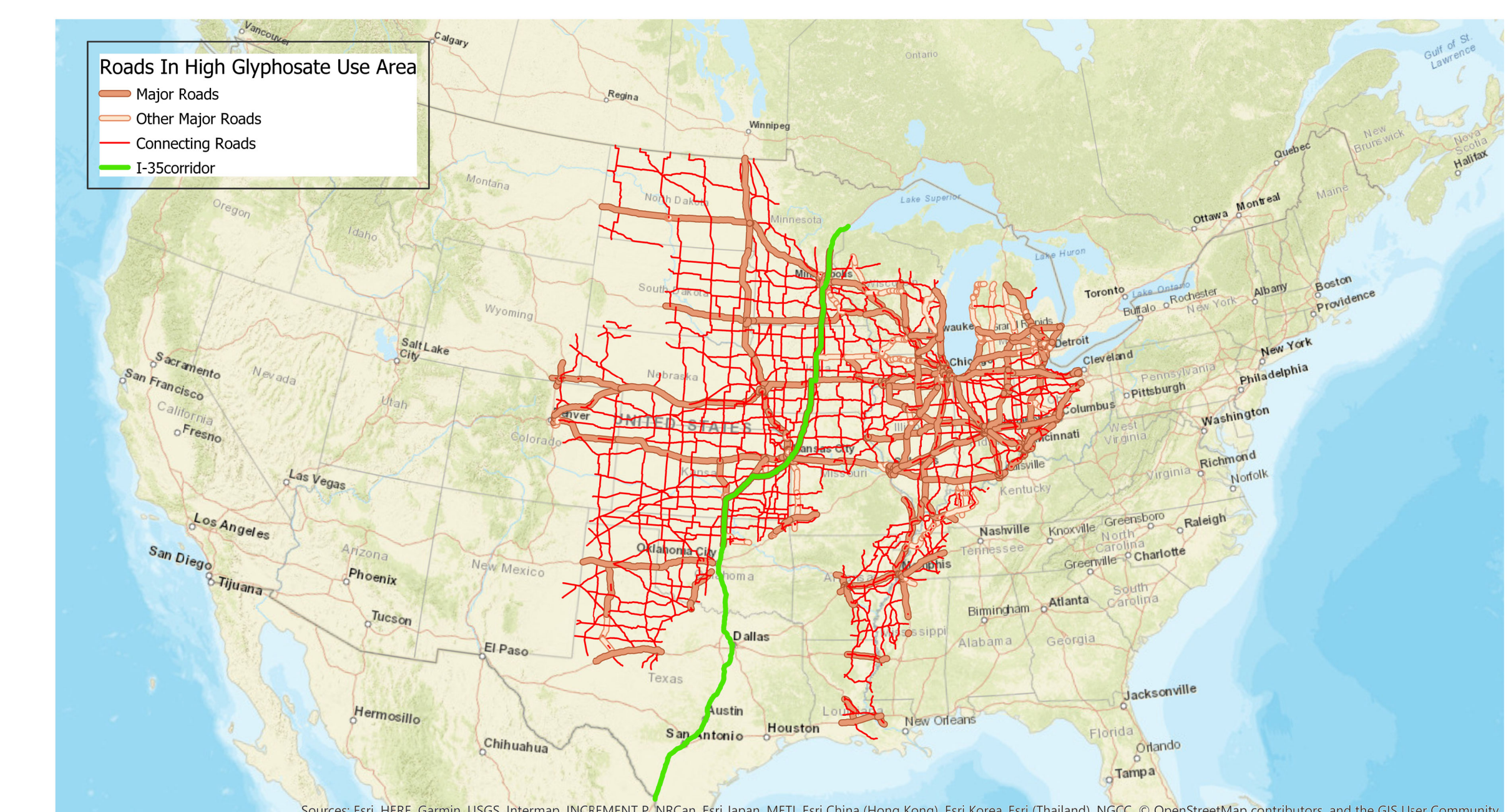


2009 Glyphosate Use
 (lbs/sqmile)



https://services3.arcgis.com/vQ3OYhPynK3Zqb/arcgis/rest/services/Pesticide_Use/FeatureServer

Roads Through Area of High Glyphosate Use Potential Milkweed Habitat



Area	Length (Mi)	Buffer (ft)	Acers Along Roadside
Major Roads	26,828	50	325,187
Other Major Roads	5,649	50	68,475
Connecting Roads	53,466	50	648,067
Total	85,943	50	1,041,729
Planned I-35 Corridor	1,558	50	18,885

Land along the roadside is ideal habitat for milkweed reintroduction. The land available is plentiful and distributed fairly evenly. In 2015 it was proposed that highway I-35 be used as a monarch butterfly corridor. If completed it will provide approximately 18,885 acres of new habitat from South Texas to Minnesota. If all major roads running through the areas of highest glyphosate use, were protected, we could add over a million acres of milkweed habitat.