

# Salvation in the Air

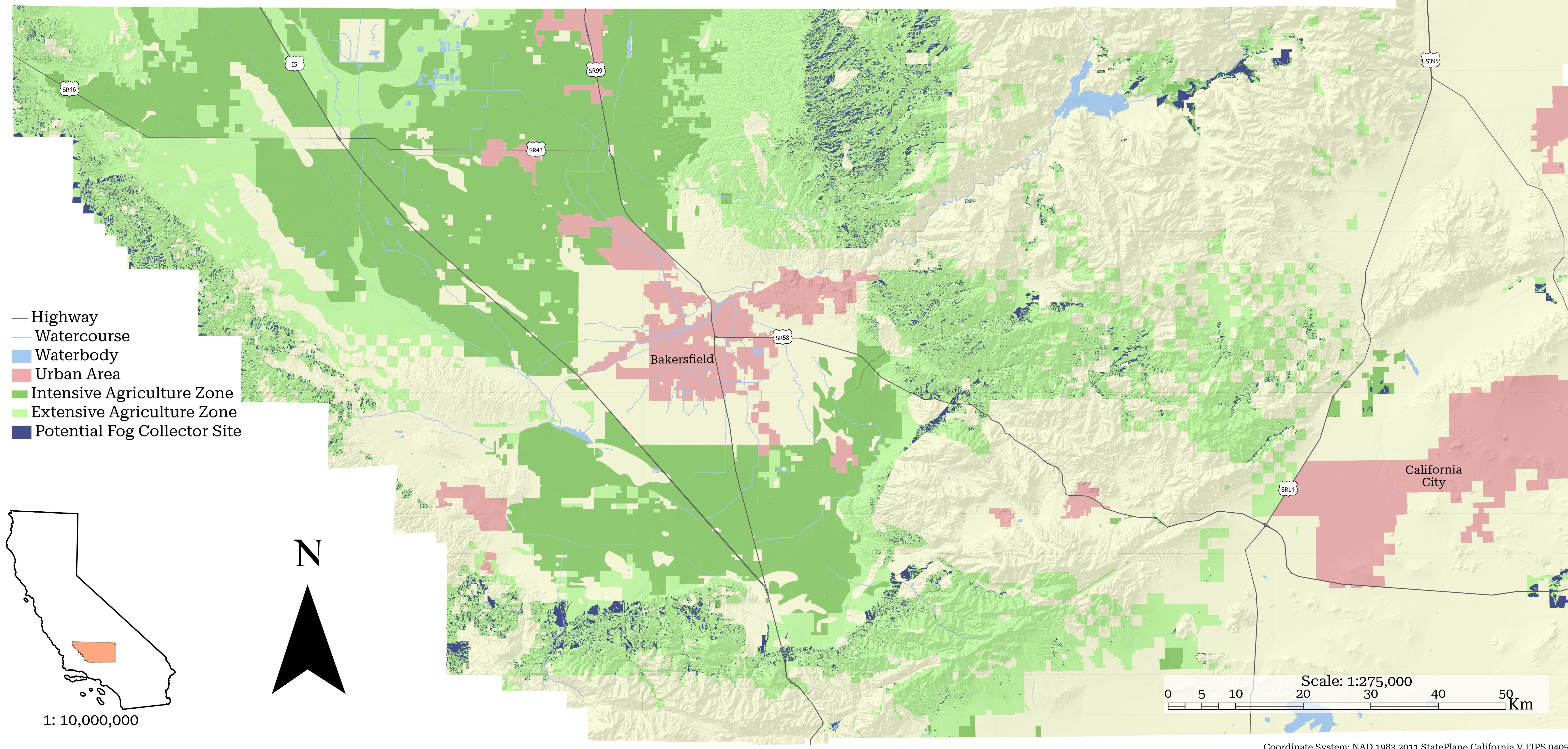
## Exploring Fog Harvesting to Fight Drought in Kern County, California

Two successive years of drought in California has had dire effects on the state's agriculture. The resultant widespread economic hardship has forced many small-scale farms out of business, and is indirectly causing increasing environmental damage, as large-scale agribusinesses respond by drilling new wells into shrinking aquifers. The ongoing trend of global warming suggests that droughts will only increase in frequency and severity, as formerly fertile agricultural regions face

reduced rainfall and longer, more intense heat waves. A major agricultural region in California, Kern County has found itself suddenly contending with this new reality. However, while losses in recent years have been significant, there may be some hope for the county's agriculture through the implementation of 'fog harvesting.' The significant mountain and hill cover within the county suggests it may be well suited to the implementation of low-tech, environmentally

responsible 'fog collectors'. This map shows the results of a site suitability analysis for fog harvesting within the region. While the most heavily cultivated "Intensive Agriculture" land use zones within the valley surrounding Bakersfield lack the elevation necessary to make fog harvesting feasible, there is possibility for its employment in the "Extensive Agriculture" zones that make up the higher elevation regions surrounding the valley. In total, roughly 4.1% of the County's total

agricultural area meets the criteria necessary for fog collector construction. Given the extreme drought that the region has faced in recent years, further investigation into fog harvesting in the areas highlighted here is highly recommended.



## Methodology

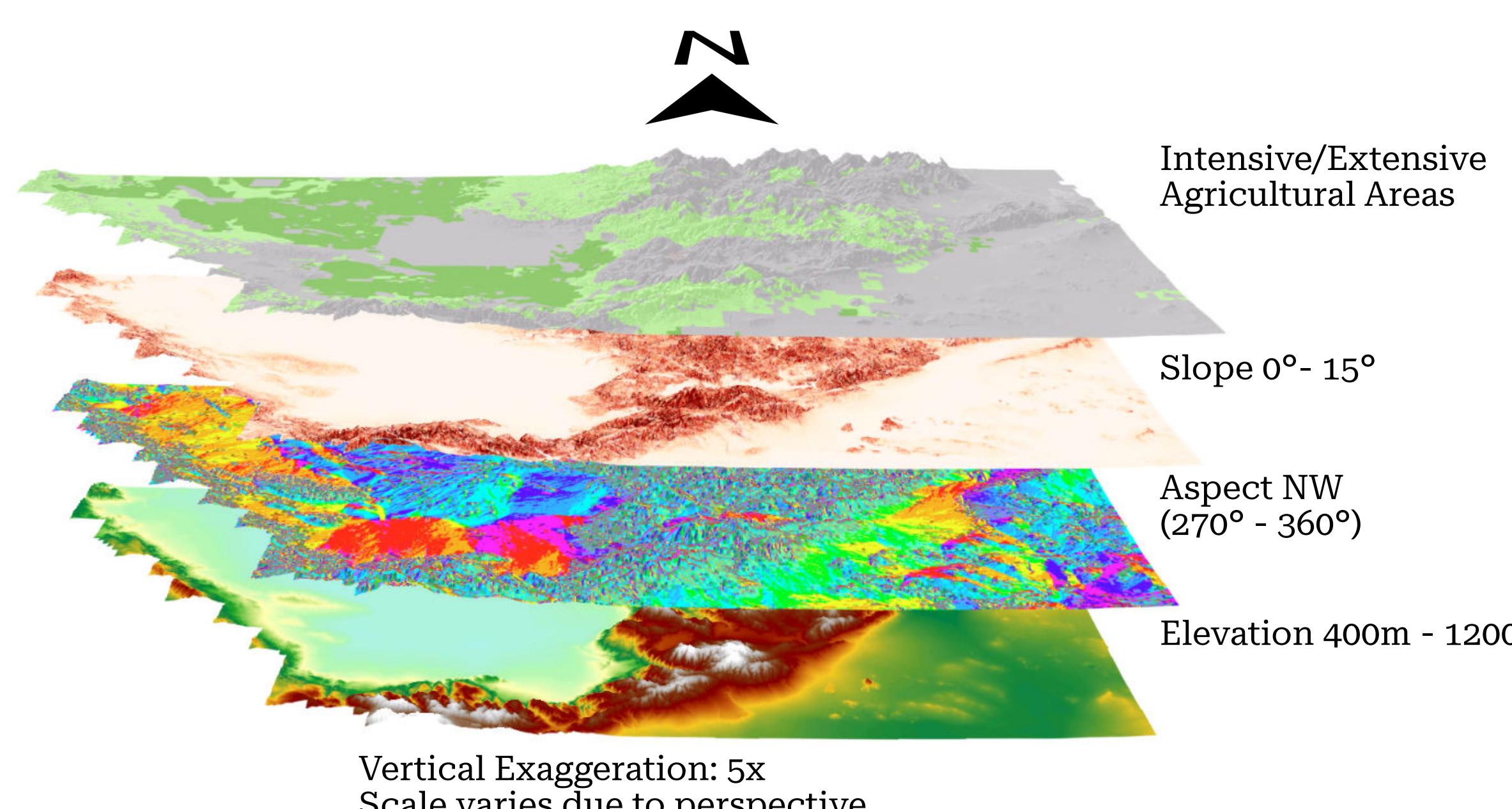
Drawing on research performed by the Organization of American States in conjunction with the United Nations Climate Technology Centre and Network, four key criteria were identified for fog collector site selection:

- Elevation from 400-1200 metres to access stratocumulus clouds
- North-Northwest aspect for sites to face into prevailing winds
- Slope between 0 and 15 degrees to emphasize site accessibility
- Sites that fall within County-designated agricultural regions

To facilitate this analysis, both land use and elevation data were required. Shapefiles containing data on the County's General Plan and detailing contours within the county were both sourced from

the Kern County Open Data Portal. The contour data was then processed to create a digital elevation model (DEM) of the county, via use of Topo to Raster interpolation with a cell resolution of 20mx20m, a Tolerance 1 of 10, and a Tolerance 2 of 100. This interpolation method was chosen based on previous analysis of multiple interpolation methods for accuracy. Once created, the DEM was used to generate an 'Aspect' and a 'Slope' raster, required to analyze direction and hillslope.

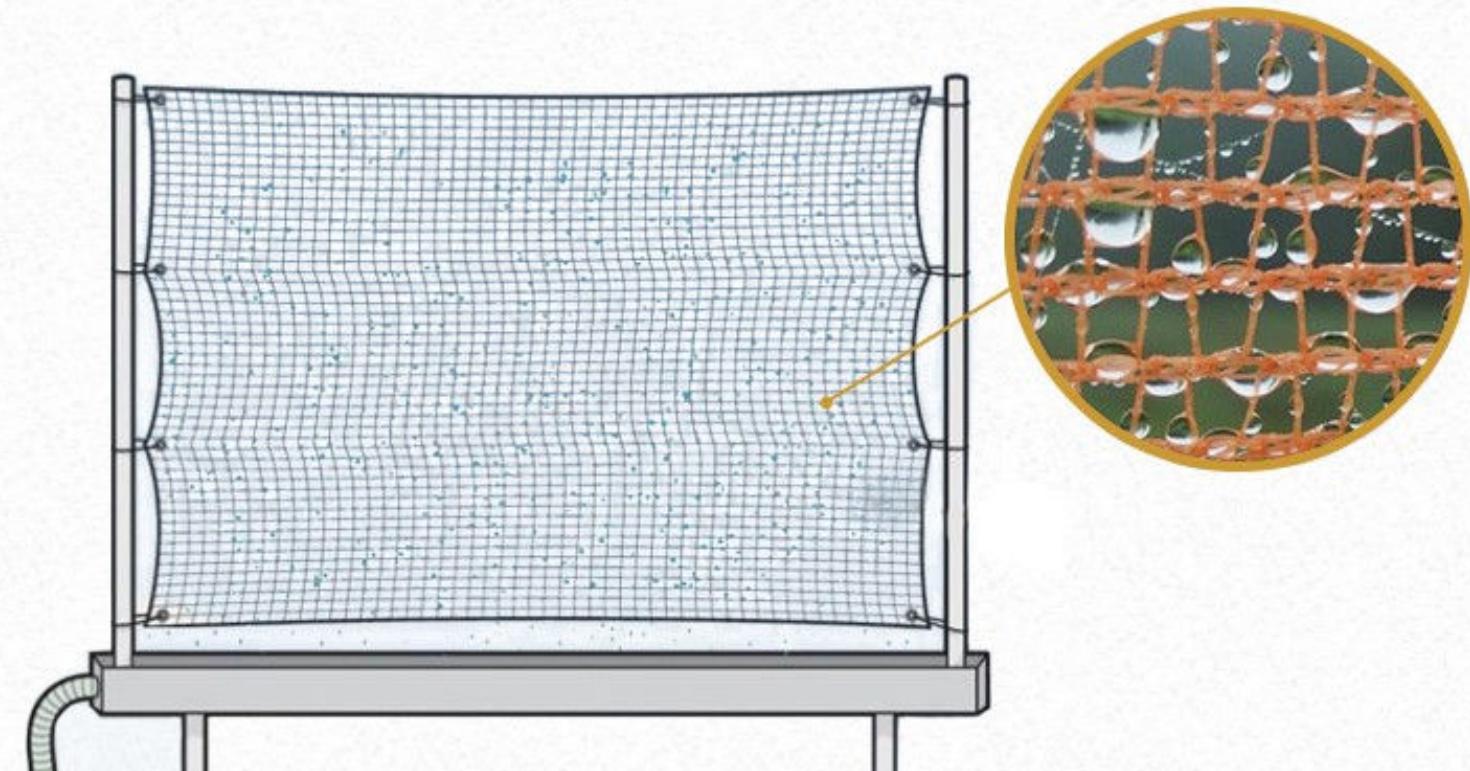
To facilitate analysis, the polygons representing the agricultural regions within the County's General Plan shapefile were extracted and converted to an 'Agricultural Area' raster. Then, the DEM, Aspect, Slope, and Agricultural Area rasters were all reclassified into Boolean rasters to highlight the areas within each matching the established criteria. Finally, a Boolean overlay analysis was performed to highlight areas that matched all criteria, and were promising locations for fog harvesting.



## What is Fog Harvesting?

First widely implemented in regions of Chile and Peru, fog harvesting offers a promising if geographically limited avenue to help mitigate the impacts of drought on agriculture. The fog collector mechanism is simple and relatively inexpensive - a screen of specialized mesh is stretched between two posts, and as fog or cloud passes through the mesh, condensation forms. The condensation is then collected for use in irrigation and beyond.

While initially employed only in fog-heavy regions, the Organization of American States recognizes the potential of this technology in other areas where topography includes mountains, hills, or tall dunes which grant access to low-hanging stratocumulus clouds.



## Sources

**Map Data:**  
Kern County General Plan: Kern County Planning and National Resources Department. "kc general plan" [shapefile]. Scale not given. NAD83 / California Zone 5, Lambert Conformal Conic. "Kern County Open Data Portal." April 2019. [https://geodat-kernco.opendata.arcgis.com/datasets/575bd48fb01c44899334301c8e6eda015\\_0](https://geodat-kernco.opendata.arcgis.com/datasets/575bd48fb01c44899334301c8e6eda015_0)

**Contour Data:** USGS, "Kern County Contours USGS" [file geodatabase] 1:24,000 scale. NAD83. "Kern County Open Data Portal." January 2022. <https://geodat-kernco.opendata.arcgis.com/datasets/d8396beb7f4f48a0a3911c9545fb5c70/>

**Road, Water, Urban Area Data:** Navteq, "NAV\_NA\_highways", "NAV\_NA\_water", "NAV\_NA\_waterseg", "NAV\_NA\_citylim" [shapefile]. Scale not given. WGS 1984. Fleming College Internal Database. 2015.

**State and County Polygons:** US Census Bureau, "CA County Boundaries" [shapefile]. Scale not given. WGS 1984 Web Mercator. California Open Data Portal. January 2016. <https://data.ca.gov/dataset/ca-geographic-boundaries>

**Supplemental Information:**  
Fog Collector Diagram: Bold Business. "Fog Harvesting System For Clean, Drinkable Water." May 2017. <https://www.boldbusiness.org/human-achievement/fog-harvesting-system-clean-drinkable-water/>

**Drought Information:** Cal Matters. "Drought has big impacts on California agriculture." November 2021. <https://calmatters.org/commentary/2021/11/drought-information-drought-california-agriculture/>

**Suitability Criteria:** Organization of American States & United Nations Environment Program. "Fog Harvesting". 1997. <https://www.oas.org/dsd/publications/unit/oas59e/ch12.htm>