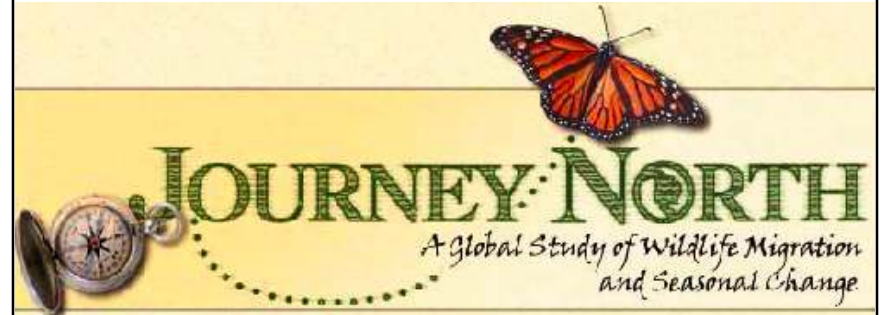




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Layout by Margaret Black



## Monarchs, Mountains and Moisture



by Dr. Lincoln Brower,  
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Moisture is crucial for the butterflies' overwintering success in Mexico. I hypothesize that one of the reasons the butterflies choose to overwinter where they do is because the high altitude mountains capture moisture. These pictures tell the story...

I took this picture early in the morning, as the clouds were forming and blowing through the butterfly colony. (The colony is just outside of the image, to the left.)



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1

Early in the morning, the mist is engulfing the butterflies and condensing on the Oyamel fir trees.



Inside the colony, clusters of monarchs on the Oyamel firs are enshrouded in mist.



2

Taken early in the morning on 11 December 2006, this picture shows how the condensed mist freezes on the magnificent open area on Cerro Pelon, known as the Llanos de los Tres Goberonores. In this picture, you cannot see the colony, but it is all the way down at the end, to the right, in a grove of cedar trees.



*The mist freezes into frost.*

Later in the morning, in the same area, we found several thousand monarchs drinking dew.

The sun's rays had fallen on the frosted ground vegetation and the frost had melted into dew. The monarchs flew out of the overwintering colony to drink the dew drops.



*Thirsty monarchs drinking dew (melted frost).*

Here is a monarch with his proboscis in the grass, imbibing the dew.



This monarch failed to fly back into the clusters before nightfall. Water droplets condensed on its wings. This is a very precarious situation. The dew can freeze when the overnight temperature drop below freezing. This often happens in open areas that are exposed to the cold, clear sky.

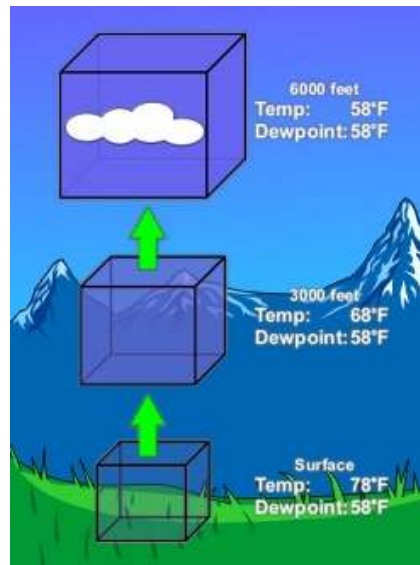


This butterfly is a victim of one of these freezing events and will not survive. The frost crystals mortally wounded the butterfly. They penetrated through the cuticle and disrupted the cells.

Although millions of monarchs may fly out of the colony on sunny days to find water to drink, almost all of them manage to fly back into their colonies. Only a few get stranded in open areas where they may freeze to death.



The high altitude mountains capture moisture through the process of *adiabatic condensation*. This process occurs when moisture-laden winds blow up and over the mountains.



## Adiabatic Condensation

As air rises, it expands and cools. Then clouds form.

Graphic by NOAA  
Jetstream: Online  
School for Weather

At the high altitudes, the moisture condenses as water droplets on the needles of the Oyamel and pines

You can see droplets of condensed mist on both the pine needles and on the butterflies.

