



# (Perma)Culture and Sanity

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## Trees and the Water Cycle

### Water Is Lifeblood

Water is the lifeblood of our planet. In fact from rainforest to desert, prairie to arctic, the amount of water available is the central determinant in classifying ecotypes. No living organisms escape the need for water as the basic chemical framework for all their internal processes.

Yet fresh water accounts for only 3% of the water on our planet (and most of that 3% is frozen at the poles)... meanwhile what fresh water does exist is continually moving back to merge with the salty oceans.

To balance the return of fresh water to oceans, ocean water continually evaporates back into the atmosphere to form the clouds that return fresh water to land as rain. However, isotope studies have shown that almost all oceanic moisture falls as rain within the first 150 miles from any coast.

How, then, do life-giving rains manage to reach the vast interiors of continents?

### Plants' Moist 'Breath'

As soon as rain falls to the ground, plants begin to absorb the water into their bodies. However, plants must absorb much more water than needed strictly for metabolic use since plants also lose water through evaporation and transpiration ('evapotranspiration'). Water lost to the air through evapotranspiration by trees is the major mechanism through which air is remoistened as it moves farther inland from oceans.

If plants didn't lose so much water to evapotranspiration, the interiors of all the continents would be huge deserts (this is the situation in Australia, where severe deforestation has left the entire continent with only a narrow band of non-desert lands bordering the coast).

### Trees Humidify Air

Among plants, trees are by far the most effective evapo-transpirers. Complementing oceans, trees form the other half of the planet-wide system known as the **rain or water cycle**. A typical tree breathes out 250 to 400 or more gallons of water per day through the amazingly large surface area of its leaves (an acre of forest can contain well over 1,000 acres of leaf surface area).

It's almost impossible to overstate trees' ability to humidify air and thereby maintain the rain cycle far from oceans. While some rainfall evaporates directly from the ground and from small plants (this can amount to most of a light rain), evapotranspiration by trees accounts for the great majority of inland rain.

Even near oceans, trees are vitally important to re-humidification and rain. When European settlers removed the high forests from the island of Maui, for instance, the once heavily-forested island immediately downwind (Kahoolawe) quickly became a desert island because its source of rain had been the trees on Maui—not the ocean surrounding both islands.

*"The sky is held up by the trees.*

*If the forest disappears, the sky-roof of the world will collapse.*

*Nature and man will perish together."*

**American Indian Proverb**

### No Trees, No Rain

If trees are clearcut over large areas, therefore, rains slow or stop downwind, describing the situation existing now over most of the U.S. Southwest. This has not always been the case here, even relatively recently. Our present Southwest is drier than that of just a couple hundred years ago—remember, our popular view of the Old Southwest comes from cowboy movies, all filmed in modern degraded landscapes.



Ancient Tree at Angkor Wat, Reclaiming Slightly-More-Ancient Temple.

Tree ring, pollen and other botanical studies, as well as reports by Spanish explorers, show that the Southwest of the recent past was much greener and more productive than it is now. Just 3,000 years ago (a mere drop in the ocean of geologic time) the Southwest was more heavily forested and rainfall was 1½ or more times as plentiful. Grasslands, sprinkled with individual trees and mottes (small islands of trees), were healthy and lush and loss of rain to runoff was very low.

### Humans And Desert Formation

3,000 years ago, neither the Sonoran nor Chihuahuan deserts extended northward from Mexico into what is now Texas, New Mexico and Arizona (they both occur naturally in Mexico due to rain shadows created by the Sierra Madres).

Native American burning of prairies (to favor grasses over trees for buffalo forage) started the process of deforestation—and then [desertification](#)—which allowed the Sonoran and Chihuahuan deserts to begin creeping

northward. Even so, early Spanish explorers found most of the Southwest a healthy, productive mix of alternating meadows and woods. Soon, however, extensive logging and over-grazing began to accelerate the processes of deforestation and desertification begun by Native American burning.

Development also took its toll. Entire forests were cut across the Southwest for use as track ties in the transatlantic railroad; Albuquerque, NM, now desert, is named for the white oak trees that once covered the Rio Grande flood plain before being eradicated by European settlers. Wholesale tree cutting (aided by over-grazing) turned a land of once-great pastoral richness into a place where the weight of the grasshoppers in a given area literally far exceeds that of the cattle. As the trees went, so did the water.

### Deserts Don't 'Stay Put'

Desertification, which progresses in the direction of prevailing winds, is by nature more easily prevented than cured. This is because the very existence of a desert slows or stops rain in downwind areas. As a result, downwind forests are slowly starved of water and engulfed by the moving desert.

All deserts grow along their leeward edges unless some geographic feature—ocean, mountain range, etc.—intervenes to stop the process. In fact, according to an [article on desertification from South Africa's University of the Western Cape](#), desertification worldwide renders an area of 12 million hectares (roughly the size of England) useless for cultivation *annually*.

In semi-arid prairie regions, deserts can easily form if the few trees are removed. Our Midwestern US farming regions will probably become desert when irrigation stops because the trees once preserved as windbreak throughout the region are gone—eradicated in the 1960's by Nixon's Agriculture Secretary Earl Butz' probably well-meaning but misguided 'Fencepost to Fencepost' plowing program.



Nixon's Sec. of Ag. Earl Butz

### Stewardship vs Pillage

We must learn to think and see in terms of processes instead of static views if we want to survive. We must protect wilderness areas from human intrusion because of their intrinsic value, and more prudently manage the forests in which we do allow cutting. Remember, we haven't inherited the land from our parents, we've stolen it from our children... let's begin working to give it back. Let's begin to change our idea of 'dominion' over the Earth to one of stewardship—similar in meaning, but deeply different in results.

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## Comments

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**Agukwe@yahoo.com** October 9th, 2011; 01:32:32 PM

Being an Environmentlist is a call from God.

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**Jack** September 12th, 2011; 11:15:25 AM

Thank you, too, Anya...

For this type of subject it's hard to beat Mollison's design manual, Permaculture: A Practical Guide for a Sustainable Future. It's huge but has very good discussions of all sorts of permaculture issues. Good luck and thank you for your comment!

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**Anya** September 10th, 2011; 11:34:20 AM

Thank you for this article! There is so little about the relationship between trees and rain, although we know, generally, that the relationship is essential. I have been searching for this information! Do you have more sources?

Reprinted from [\(Perma\) Culture and Sanity Website](#)

<http://tinyorb.net/Jack/>