
Climate Change, Precipitation, and Native Vegetation

by: Patsy M. Miller, Ph.D.

THE IMPORTANCE OF THOSE NOT-SO-PRETTY SHRUBS FOR EROSION CONTROL

photos: Dave Mills



*Examples of native shrubs useful for erosion control:
(l to r) Triangle-leaf Bursage, Canyon Ragweed, Snakeweed*

Even if some folks try to ignore them, there are some laws of physics that just will not go away. Certain gases in the earth's atmosphere, including carbon dioxide and methane, are greenhouse gases. These gases function like a huge sheet of greenhouse glass covering the surface of our planet. The function of a greenhouse is to let the high energy short-wave irradiance from the sun in through the glass and then to trap lower energy long-wave reflected radiation from the surfaces inside the greenhouse. This process is a low-cost way to warm the interior of the greenhouse in order to lengthen the season of plant growth or to allow plants to be grown in locations otherwise unfavorable to commercial species. Greenhouse gases allow the sun's short-wave irradiance in, but trap long-wave reflected energy as it tries to escape out of the lower atmosphere. The result is a warmer earth.

It is the consensus of climate experts (*Science* 289: 2068-2074) that alterations in climate patterns because of increasing global temperatures will increase the frequency of extreme events. In the future, extreme high and low temperatures and intense precipitation events will become more common. Since the 1930s the



frequency of one-day precipitation events that exceed the historical one per year and one per five-year rain totals have become more frequent in the southwestern part of the United States. Extreme events often account for a larger percentage of the measured precipitation even though the total amount of rain in a given location may not be altered.

To bring this a little closer to home, on August 28, 2000, the areas around Carefree Rolling Hills received over two inches of rain in a couple of hours. Pima and Scottsdale Roads were both closed because of flooding. The Town of Carefree spent considerable time, effort, and money repairing the damage by scooping the gravel off our roads and rip-rapping the sides of a small wash that was undercutting Wildflower Road. In the future, such high intensity convectional storms are likely to become more common and the potential for water related damage will increase.

At this point, one might be tempted to ask, “What does this have to do with the native vegetation of the Upper Sonoran Desert?” As it turns out, native plants have a role to play in mitigating the effects of anticipated climate change.

A rather thorough but non-quantitative survey of erosion patterns in Carefree Rolling Hills indicated that most of the soil movement associated with the two-inch downpour on August 28 was the result of human activities. Erosion was greatest where roads had altered drainage patterns and where yards had been denuded of their natural vegetation.

All those little shrubs, the ones that aren’t very pretty, have prickly seeds, and sometimes grow where we do not want them – the bursage (*Ambrosia deltoidea* and *A. ambrosioides*), desert broom (*Baccharis sarothroides*), snakeweed (*Gutierrezia sarothrae*), turpentine bush (*Ericameria laricifolia*), and white ratany (*Krameria grayi*), to name just a few – play a crucial role in erosion prevention. Their spreading growth form and dense covering of small leaves reduce the impact of the pounding rain. The impact of rain dislodges soil particles that can then be entrained in surface runoff. Dead leaf litter under and around shrubs absorbs rainwater and helps slow runoff, both of which increase infiltration. Shrub roots help hold the soil in place.



When these small native shrubs are removed, all of the protection for the soil surface goes with them. Often in a “grubbed” yard only the cholla (*Opuntia acanthocarpa*) or prickly pear (*Opuntia engelmannii*) are left. The growth forms of these branched cacti do little to protect the soil surface from erosion.

The landscape section of the Town of Carefree Design Guidelines have prohibited the use of pre-emergence spraying, grubbing, thinning, or trimming outside of approved building envelopes or a 30-foot fire buffer area. All native shrubs are to be left in place. Besides reducing erosion, these shrubs are nurse plants for saguaros (*Carnegiea gigantea*), hedgehog cacti (*Echinocereus engelmannii*), palo verdes (*Parkinsonia* sp.), and many other native species that define the Upper Sonoran Desert.

One often wonders what one individual can do to mitigate the effects of climate change. Even if we all bought fuel efficient cars, set our thermostats at least two degrees higher during the summer, and used a drying rack instead of an electric clothes dryer, the effects of elevated atmospheric carbon dioxide and methane would be with us for many years. High intensity precipitation events like the one in August 2000 are very likely to become more frequent in the desert foothills. In the face of these realities, each of us can make a small but significant contribution to reducing the erosion potential of our yards by retaining or even replanting the native shrubs that perform so many vital functions in our beautiful Upper Sonoran Desert.

[Editors’ Note: since the writing of this article in 2000, the causes of global warming or climate change have become increasingly politicized as critics have called attention to the questionable science of the advocates of human-caused climate change. This editor takes no position on the merits (or lack thereof) of the arguments, but instead, encourages readers to grasp and act upon the main thrust of Dr. Miller’s position: that uncontrolled “blading” of desert lands is harmful for the ecology, particularly soil control during monsoon storm events.]

