UA Sense of Place Trip #1: Santa Cruz River Basin

Trip #1 traverses the Santa Cruz River Basin near Tucson. Geology starts on “A” Mountain, a suite of volcanic and sedimentary rocks that formed during explosive volcanism 20-25 million years ago (McGarvin, 2001). Physical properties of rocks and how they illuminate mountain formation are emphasized. Adjacent to “A” Mountain is Tumamoc Hill, where unobstructed views promote discussion of Basin and Range concepts (McPhee, 1981). South of Tucson, an entrenched tributary of the Santa Cruz River called Brickyard Arroyo shows Holocene wetlands (buried organic soils) and agricultural settlements (prehistoric artifacts).

Ecology starts with buffelgrass (Pennisetum ciliare) growing on rocky slopes of "A" Mountain. Buffelgrass is native to Africa, but it was introduced into the Southwest in the 1940s and has since expanded throughout the Sonoran Desert (Búrquez-Montijo et al., 2002). Buffelgrass "invasion" of the Sonoran Desert is a serious ecological concern (Yetman and Búrquez, 1994). Additionally, Tumamoc Hill is home to the Desert Laboratory, a premier center of desert ecology and paleoenvironmental science for more than 100 years (Bowers 1990). Principal features of the Lab are its enclosed area of pristine desert and the permanent recording of saguaro cacti in 1908 in order to observe them throughout many decades (Pierson and Turner 1998).

Cultural history starts on the summit of Tumamoc Hill, where bedrock mortars, rock art, and rock roomblocks speak of people who lived there from AD 500 to AD 700 (Fish et al., 2007). Why would people live on a hilltop, far removed from water and agricultural fields of the Santa Cruz River floodplain? Later on this trip, Mission San Xavier del Bac is a modern, active church as well as a glimpse of the Spanish and Mexican periods of the American Southwest. The building is a blend of Spanish, Mexican, and Native American architecture and design (Frontain, 1968). The arrival of Padre Francisco Eusebio Kino in 1687 started a grand change of cultures and environments of southern Arizona (Fontana, 1994).


UA Sense of Place Trip #2: Tucson Mountains

Trip #2 circumnavigates the Tucson Mountains, which were formed by explosive, caldera-style volcanism 70 million years ago, when Arizona was located on the western edge of the continent and colliding with subducting oceanic crust (Bezy, 2005; Kring, 2002). Geology emphasizes describing rocks and deciphering what they tell about landscape history, all for the purpose of visualizing plate tectonics and geologic time.

At each stop of Trip #2, iconic plants of the Sonoran Desert are featured. In particular, Prospect Wash allows easy entry into a lush, diverse tract of Sonoran Desert, where multiple leguminous tree species as well as many cactus species are common (Phillips and Comus, 2000). Shreve's (1936) concepts of multiple layers and varied life forms in the Sonoran Desert become obvious, as does the fact that the Sonoran is a highly productive desert (McGinnies et al., 1968). Various food and drink items derived from desert plants are sampled on this trip, including prickly pear pads and saguaro lemonade, thereby challenging conventional opinion that deserts are desolate places with limited food resources.

A rock art site known as Signal Hill emphatically connects geology and ecology with cultural history. At Signal Hill, prehistoric Hohokam and historic O’Odham left marks on basaltic rocks overlooking the desert. Both groups integrated floodwater farming with foraging as part of an annual cycle to adapt to desert areas far removed from perennial streamflow (Castetter and Bell, 1942; Crosswhite, 1980; Doolittle, 2000:309–346).


UA Sense of Place Trip #3: Desert Washes and Urban Flooding

Trip #3 explores desert washes and how humans live next to them. Hydrological measurements are made along Rillito Creek, a major tributary to the Santa Cruz River. The amount of water that the Rillito can carry, i.e., maximum instantaneous discharge, is calculated from channel gradient, flow width and depth, and hydraulic roughness using a simple open-channel hydraulic equation like the Manning formula (Chow, 1959; Barnes, 1967). In addition to improving quantitative skills, “back-of-the-envelope” calculations reveal patterns and interactions between elements of the landscape (Manduca et al., 2008). Ultimately, flooding is viewed as neither bad nor good, but rather as a natural process that does the job of moving water and sediment.

The Rillito also offers a chance to practice dendrochronology, the study of tree rings (Fritts, 1976). Cottonwood (Populus sp.) grows in the dry wash bed itself, but only at the mercy of flooding. An increment borer is brought along for students to try nondestructive sampling (Grissino-Mayer, 2003). Ring growth of trees growing in washes can indicate past flooding, thereby establishing frequency and discharge values (McCord, 1996). Realizing how easy it can be to collect data in the field is empowering.

Prehistoric farming is addressed. Fort Lowell Park is the site of a Hohokam community located along the edge of the Rillito and its tributaries (Gregonis and Reinhardt, 1979). The importance of flooding and deposition of nutrient-rich silt for sustainable agriculture is evident. This theme is repeated at Catalina State Park, where another Hohokam village was located near seasonally flooding watercourses (Swartz and Doelle, 1996). These Hohokam sites were located above floodplains, so flooding was restricted to agricultural fields and away from residences, showing how flood hazard is influenced by where people place themselves on the landscape.

Fort Lowell Park also has a grove of pecan trees. Southern Arizona is home to large tracts of pecans, making the region important for pecan production. However, growing pecans in the desert poses a dilemma: How to reconcile water use of thirsty, broadleaf trees in this arid eco-region? Catalina State Park also has trees, native mesquite (Prosopis sp.) in this case. Mesquite is one of many legume species of the Sonoran Desert (Daniels and Meixner, 1999) and is truly a magnificent species (Rogers, 2000).

UA Sense of Place Trip #4: Santa Catalina Mountains

Trip #4 treks up the Santa Catalina Mountains, all the way to the top of Mt. Lemmon. Geologically, the Catalinas are a mountain range quite unlike others visited during previous field trips. Metamorphic core complexes are formed by regional crustal extension, thermal intrusion, and uplift, all resulting in mountain ranges with granite cores surrounded by deformed and metamorphosed igneous and sedimentary rocks (Crittenden et al., 1980; Davis and Coney, 1979). These rocks were once deep within the crust and consequently pulled and stretched under conditions of high temperature and pressure, but horizontal movement along low-angle detachment faulting brought these deep rocks to the surface, where they are now visible at road cuts along the lower part of the Catalina Highway (Bezy, 2004).

Ecologically, southern Arizona is internationally known for its sky islands, i.e., high mountains (the “islands”) sticking up from low deserts (the “ocean”) (Crowley and Link, 1989). Flora and fauna influences from the Sierra Madre to the south and the Rocky Mountains to the north as well as from the Sonoran and Chihuahuan Deserts combine to make southern Arizona sky islands highly diverse. The Catalinas peak out almost 2000 m (6500 ft) higher than Tucson, and the Catalina Highway makes for easy passage across this large elevational gradient. Along the way, multiple ecosystems are traversed (Lowe, 1967).

The Catalina Mountains are also a textbook of wild land fire. Most of the mountain burned recently in two large fires, much to the grief of Tucson (Barnes, 2005). Fire used to burn on the Catalinas frequently but with low intensity such that mature trees typically were not killed (Swetnam and Baisan, 1996). The question for Tucson, as well as for similar settings worldwide, is how to manage forests to accommodate the inevitability of fire without suffering devastating, big, intense wildfires.

Driving the Catalina Highway is not just educational. It is an honor to experience so conveniently such diversity and richness in geology, ecology, and cultural history.


