13.5: The Great Basin and the Basin and Range

The Great Basin is the largest area of interior drainage in North America, meaning there is no outlet to the ocean and all precipitation remains in the basin or is evaporated. It covers western Utah, most of Nevada, and extends into eastern
California, southern Oregon, and southern Idaho. Streams in the Great Basin gather runoff and groundwater discharge and deliver it to lakes and playas within the basin. A subregion within the Great Basin is the **Basin and Range** which extends from the Wasatch Front in Utah west across Nevada to the Sierra Nevada Mountains of California. The basins and ranges referred to in the name are horsts and grabens, formed by normal fault blocks from the crustal extension, as discussed in chapter 2 and chapter 9. The lithosphere of the entire area has stretched by a factor of about 2, meaning from end to end, the distance has doubled over the past 30 million years or so. This has created the bowl-like shape of the region, which creates an overall internal drainage, and countless sub-drainages in individual basins. Each of these is lined by alluvial sediments leading into playa or lacustrine depositional environments. Even without the arid conditions, there would be these types of deposits, with lacustrine becoming more common in place of playa. This most recently occurred with pluvial lakes that formed during the last glacial maximum (see chapter 14.4.3).

![Figure 1: Typical Basin and Range scene. Ridgecrest, CA sits just east of the southern Sierra Nevada Mountains.](Image)

The desert of the Basin and Range extends from about 35° to near 40° and has a rain shadow effect created by westerly winds from the Pacific rising and cooling over the Sierras, depleted of moisture by precipitation on the western side. The result is relatively dry air descending across Nevada and western Utah. A journey from the Wasatch Front southwest to the Pacific Ocean will show stages of desert landscape evolution from the young fault blocks of Utah with sharp peaks and alluvial fans at the mouths of canyons, through older landscapes in Southern Nevada with bajadas along the mountain fronts, to the oldest landscapes in the Mojave Desert of California with subdued inselbergs sticking up through a sea of old bajadas. These landscapes illustrate the evolutionary stages of desert landscape development.
Desertification

Previously arable and usable land may be turned into desert by climate change and the activities of humans, such as poor farming practices, livestock overgrazing, and overuse of available water. This is a process called desertification and it is a serious problem worldwide [22]. Plants and soil types that are non-arid specifically help groundwater infiltration and water retention. Adding aridity to an area converts these soils and plants to be less effective in retaining water, and via a positive feedback loop (meaning that the processes feed on themselves promoting an increasing spiral). This only increases the aridity and spreads the desert further. The figure shows areas of the world and their vulnerability to desertification. Note the red and orange areas in the western and midwestern United States. The Dust Bowl of the 1930s is a classic example of human-caused desertification. Sometimes there is a conflict between what is known to prevent desertification and what an individual farmer feels he needs to do to make a living. Mitigating the desertification process includes both societal steps and individual education on alternatives.

Reference