California Wildlife Habitat Relationships System
California Department of Fish and Game
California Interagency Wildlife Task Group

Alkali Desert Scrub

Peter G. Rowlands

Vegetation

Structure-- Alkali Scrub plant assemblages (primarily chenopods) are generally subdivided into two phases: xerophytic and halophytic (Hunt, 1966, Twisselman, 1967, Vasek and Barbour, 1977, Turner, 1982a, b). The xerophytic phase (here, including Shadscale Scrub) consists of open stands of very low to moderately high (0.25-2.0 m; 0.8-6.6 ft) grayish, spinescent, leptophyllous to microphyllous subshrubs and shrubs, which are physiognomically uniform, widely spaced, occur on relatively dry soils, and exhibit low to moderate osmotic tolerance (Billings 1949, 1951, Küchler 1964, Knapp 1965, Johnson 1976, Thorne 1976, Vasek and Barbour 1977, Crosswhite and Crosswhite 1982, Fowler and Koch 1982). The halophytic phase consists of suffrutescent species which exhibit varying degrees of succulence, are generally more closely spaced than the xerophytic phase, tolerate periodic flooding, and generally exhibit a high degree of osmotic tolerance (Flowers 1934, Hunt 1966, Twisselman 1967, Johnson 1976, Vasek and Barbour 1977).

Composition-- Some primary perennial plant species of the xerophytic phase include various species of shrubby saltbushes, especially allscale, desert holly, fourwing saltbush, Nuttall saltbush, big saltbush, Parry saltbush, shadscale, Torrey salt bush, and western Mojave saltbush (Cheatham and Haller 1975, Thorne 1976, Vasek and Barbour 1977). Other important shrubs include bud sagebrush, white bursage, cresotebush, Fremont dalea, Nevada ephedra, black greasewood, spiny hopsage, spiny menodora, rabbit-thorn, Thurber sandpaper-plant, winterfat, and Anderson wolfberry. Subshrubs common in the xerophytic phase include cheesebush, desert alyssum, desert prince's plume, alkali goldenbush, Cooper goldenbush, Shockley goldenhead, honeysweet, and common snakeweed. The diversity of cactuses and other succulents in the Alkali Scrub is relatively low; however, cottontop cactus, hedgehog cactus, beavertail pricklypear, grizzlybear pricklypear, staghorn cholla, and redspined sclerocactus may be common in certain areas. Forbs and grasses that characterize the xerophytic phase of the Alkali Scrub or are known only from this type of vegetation include Torrey blazingstar, kidney-leaved buckwheat, obtuse-leaved cleomella, desert sunbonnet, Booth evening-primrose, browneyed evening-primrose, desert globe-mallow, Nevada goosefoot, oligameris, oxystylis, desert pepperweed, annual psathyrotes, leaf-cover saltweed, Lemmon scurfpea, white-margined spurge, Nevada sumpweed, hairy wildcabbage, sand dropseed, galletagrass, Indian ricegrass, and King eyelashgrass (Beatley, 1976) (Bureau of Land Management, unpublished data on file; P. G. Rowlands, unpublished data). Trees are generally not present in the xerophytic phase of Alkali Scrub.

Some of the primary perennial shrub and subshrub species of the halophytic phase of Alkali Scrub include arrow-weed, black greasewood, alkali goldenbush; species of kochia, iodinebush, alkali rubber rabbitbrush; species of seablite, in particular, alkali blite, and Mojave seablite; and species of saltbush and saltcedar. Forbs and grasses are important constituents of the halophytic phase. Among the more notable are alkaliheath, alkaliweed, weak arrowgrass, canaigre, common glasswort, salt heliotrope, western miterwort, various species of annual saltbushes, Cooper wirerush, yerba mansa, aparejograss, alkali muhly, alkali sacaton, and saltgrass. Cactuses are noticeably absent from this phase. Screwbean, western honey-mesquite, and saltcedar may occasionally form a sparse overstory. Munz and Keck (1959), Ornduff (1974), Cheatham and Haller (1975), Thorne (1976), and Vasek and Barbour (1977) list these and many other secondary associates.

Other Classifications-- Other names for the Alkali Scrub habitat include Shadscale Series, Arrow-weed Series (in part), Pickleweed Series, and Saltgrass Meadow (in part) (Parker and Matyas 1981), Shadscale Zone (Billings 1949), Valley Saltbush Scrub, Great Basin Saltbush Scrub (habitat types 3.611-3.613), Intermittently Moist Alkali Sink, Permanently Moist Alkali Sink (in part, habitat types 3.621-3.622), and Alkali Seep (habitat type 3.63, in part) (Cheatham and Haller, 1975), Arrow-weed Series (in part) (Cheatham and Haller, 1975), Greasewood Series, Saltbush Series, Pickleweed Series (in part) (Payson et al. 1980), Saltbush-Greasewood Vegetation (No. 40, Küchler 1964), Shadscale Series, Saltbush Series (152.12, 152.17, Brown et al. 1980), Desert Saltbush (No. 45), San Joaquin Saltbush (No. 47), and Alkali Scrub Woodland (No. 48) (Küchler, 1977), Saline-Alkali Scrub and Desert Alkali Grassland (in part) (Rowlands et al. 1982), Shadscale Community, Gray Molly Community, Saltdesert Shrub Zone (Fowler and Koch 1982).

Habitat Stages

Vegetation Changes-- 1.24:S-M. There are few, if any, undisputed examples of plant succession (as described by Odum 1971) occurring in deserts (Lathrop and Rowlands, 1982). The alkali scrub is a heterogeneous habitat whose component plant assemblages vary considerably in composition along gradients of moisture, salinity, and microtopography (Cannon 1908, Flowers 1934, Billings 1949, Marks 1950, Hunt 1966, Mitchell et al. 1966, Twisselman 1967, West and Ibrahim 1968, Vasek and Barbour 1977, Vasek and Lund 1980). However, a succession, of sorts, was observed by Vasek and Lund (1980) on the edge of Rabbit Dry Lake. Kochia was succeeded successively by Torrey saltbush, alkali goldenbush, and shadscale, with a concomitant accumulation and coalescence of earth mounds. Hunt (1966) described a plant zonation in Death Valley along a salinity gradient starting with iodinebush (tolerant to 6% salt) and continuing through Cooper wirerush, saltgrass, Mojave seablite, saltcedar, alkali sacaton, fourwing saltbush, arrow-weed, and western honey mesquite (tolerant to 2% salt). At soil salinities below 2 percent, a xerophytic alkali scrub of desert holly and allscale predominates and grades into creosotebush. Similar observations were made by Bradley (1970) around Saratoga Springs.These habitat stages may exist as any of structural classes 1.2-4:S-M.

In addressing long-term changes in shadscale communities, Holmgren and Hutchings (1972) (Was written as Hutchins in draft. I changed to Hutchings to match Hab Lit Cite.)stated that shadscale has become a much more important constituent of many cold desert communities than before exploitation of western rangelands. Shadscale increases as more desirable forage species are weakened. However, compositional change under protection or under grazing treatments favorable to range improvement is not linear over time and may require either man caused natural catastrophic events to be set in motion.

Duration of Stages-- Fourwing saltbush appears to have a life span of around 20 years (Wallace and Romney 1972). Other species of shrubby saltbushes probably live about as long or within an order of magnitude. Spiny hopsage, often an associate species, was also found to have a similar life span (Wallace and Romney 1972). Two subshrubs, common snakeweed (West et al. 1979) and desert alyssum (Rowlands unpublished) live about 8-10 years. Indian ricegrass has an observed longevity of about 19 years (West et al. 1979). In cold desert communities, plants seem to be highly plastic with no reliable size-age relationship (West et al. 1979). However, general patterns may be inferred. Dominant shrub species of the Alkali Scrub may live for decades; overstory species, such as Joshua trees or mesquite, live for centuries; and pioneer subshrubs, except under continuous grazing pressure, do not persist for more than a decade. Recovery following severe disturbance in the Alkali Scrub, like other desert scrub types, requires decades and perhaps centuries, (Webb et al. 1982).

Biological Setting

Habitat-- Alkali Scrub vegetation generally occurs at lower to middle elevations and interdigitates with a number of other arid and semiarid wildlife habitats. At lower elevations, Alkali Scrub may intermingle with Barren (BAR) salt flats and Desert Scrub (DSC); and in the southern part of its range, Palm Oasis (POS). At lower-middle elevation Alkali Scrub may interface with Joshua Tree (JST); and at upper middle elevations, with Juniper (JUN), Pinyon-Juniper (PJN), Sagebrush (SGB), Low Sagebrush (bSB), and Bitterbrush (BBR). Throughout its range, Desert Wash (DSW) and Desert Riparian (DRI) may occur within the Alkali Scrub. In the San Joaquin Valley, Alkali Scrub borders on Annual Grassland (AGS) habitat. In many locations, Alkali Scrub overlaps with Perennial Grassland (PGS).

Wildlife Considerations-- Characteristic species of the shadscale aspect of the xerophytic phase of Alkali Scrub include the pallid kangaroo mouse, chisel-toothed kangaroo rat, zebra-tailed lizard, and the San Emigdio blue butterfly, whose host plant is fourwing saltbush (Jaeger and Smith 1966, Pyle 1981). Characteristic species of other aspects of Alkali Scrub habitat are the Mojave ground squirrel, zebra-tailed lizard, and long-nosed leopard lizard.

Physical Setting

Alkali Scrub types can generally be found surrounding the receding shores of large prehistoric lakes or alkali playas that mark the locations of dry lake beds (Fowler and Koch 1982). At sites where the halopytic phase predominates, the available groundwater is usually at or very close to the surface and is heavily mineralized (Turner 1982b). Hunt (1966) reported that soils in allscale stands (i.e., xerophytic phase) contained few salts, though the water table was as shallow as 5 m (16.4 ft), but permanent water was mostly much deeper. The soils under allscale communities are often very deep, tend to have high proportions of silt and clay, and have a much greater moisture holding capacity than soils of creosotebush communities (Schantz and Piemeisel 1924, Marks 1950, Vasek and Barbour 1977, Turner 1982b). Conversely, soils supporting desert holly are often very coarse and gravelly (Hunt 1966).

Climatic conditions associated with Alkali Scrub include generally low precipitation and relative humidity, high summer temperatures (mean July maxima, 30 to 47 C; or 86 to 117 F), rather cool winter temperatures (mean January minima, 8 to 5 C or 18 to 41 F), and very high levels of solar radiation all year round, especially during the summer. Precipitation ranges from around 42 to 230 mm (1.7 to 9.1 in) per year; depending upon location (Rowlands et al. 1982).

Distribution

Alkali Scrub vegetation occurs in California throughout the Mojave Desert, parts of the Colorado Desert, parts of northeastern California within the Great Basin, and in the southern San Joaquin Valley. Examples of the halophytic phase of alkali scrub are common in California deserts, but are scattered and usually associated with dry lakes and flood plains of rivers such as the Mojave, Colorado, and Amargosa. Alkali Scrub phases occur from below sea level in Death Valley to over 1800 m (5900 ft) in some Great Basin locations (Rowlands et al. 1982).

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