Vernal Pool Vegetation Profile

Brief Community Description	Alliances	Current Distribution Range Wide	Distribution in the MSPA	Habitat Affinities
Vernal pools are seasonal depressional wetlands that collect precipitation creating a perched water table with water ponding from a few weeks to a few months [1]. Vernal pools are often completely dry for most of the summer and fall months. They typically occur on clay and loamy clay soils [2]. A collection of vernal pools that occur in close proximity, on the same soil series and are connected hydrologically are defined as a vernal pool complex and are often part of an undulating landscape frequently called mima mound topography [1,3]. Vernal pools are closely tied to the upland vegetation communities that surround them which include needlegrass grassland, annual grasslands, coastal sage scrub, maritime succulent scrub, chaparral, and montane wet meadow [4, 5].	There are no vernal pool alliances currently classified and mapped in the MSPA.	Vernal pool ecosytems are found in the western United States extending from southern Oregon south through California and into northern Baja California, Mexico [1]. “Vernal” or ephemeral pools can also be found in Chile, South Africa, Australia, and in the Mediterranean Basin where they are influenced by a similar Mediterranean climate [5]. In California vernal pools can be found from Modoc County south to Otay Mesa, San Diego County. In Baja, California, Mexico vernal pool habitat is found adjacent to the international Border and south along the coast to the vicinity of San Quintin [2,3,6].	Within the MSPA vernal pool habitat is found in MU2 (Kearny Mesa, Mira Mesa, Montongermy Field, Tierrasanta), MU3 (Otay lakes, Procotor Valley, Otay Mesa, Marron Valley), MU5 (Ramona), MU6 (Del Mar Mesa, Lopez Ridge, Carlsbad, Carmel Mountain), and MU8 (San Marcos) [7]. Although military bases are not included in the MSPA, vernal pools are found on MCB Camp Pendleton and MCAS Miramar and are under the protection of the Integrated Resource Managemnt Plans [7,8].	After sufficient rainfall, pools form in depressions above an impervious soil layer or layers associated with poorly drained soils [5]. Vernal pools cannot form without these nearly impermeable surface or subsurface (the claypan or the hardpan) soil layers which create the perched water table that is necessary for the presence of ponding in a flat to gently sloping topography (<10% slope) [1, 9]. They can be found on mesa tops above primary drainages or in valleys at the low end of the watershed [3]. Functioning vernal pool ecosystems are affected by subtle differences in the duration and pattern of ponding, water and soil chemistry, temperature regimes in winter, and the chance of summer rain [10]. Within the MSPA, vernal pools are associated with Huerhuero, Stockpen, Redding, Olivenhain, Las Flores, and Placentia soil series [3, 5]. Vernal pools provide habitat that is used by a wide variety of animals throughout their life cycle [4, 11].

Vernal Pool Vegetation Profile

Ecosystem Processes	Threats	Special Considerations
Soils, topography, and a Mediterranean climate (most precipitation falls from November to March) create the necessary conditions for vernal pool formation [3,12]. The duration of ponding and subsequent rainfall trigger germination in plants and cyst hatching in crustaceans; these species complete their lifecycle as the pools begin to dry [11,13]. Vernal pools can be described as a few basins or as a complex of hydrologically connected pools with a shared watershed and includes all the areas needed to collect rainfall and surface flows needed to adequately fill the pools within the complex [9]. Hydrology is directly related to the pool's capacity to maintain functionality and support endemic vernal pool species [10,12]. Some complexes have substantial watersheds, while other pools fill almost entirely from direct rainfall [1, 8]. Watersheds can be localized or part of a larger more complex landscape [5]. Vernal pool basins are also dependent on the adjacent geomorphology for maintenance of their unique hydrological conditions and the connection between pools, which is important for gene flow and dispersal [1]. Surface and subsurface lateral flows between vernal pools and the surrounding uplands within a watershed influence the onset and level of inundation, and the seasonal drying of vernal pools; subsurface inflows from surrounding soils may be an important factor in filling some vernal pools [9,14].	Threatened by the loss, degradation and modification of habitat; habitat fragmentation and isolation; OHV use; military activities; altered hydrology and watersheds; soil compaction; erosion; International Border security; invasion by nonnative species (plant and animal); and human access and disturbance [6,15]. Destruction of watersheds and disruption of hydrological systems can create further impacts by creating barriers to dispersal, such that pollination and reproductive output may be inhibited [16]. Indirect threats cumulatively damage vernal pools and include exposure to pesticides, water and air pollution, and fire and wildfire suppression activities [5]. Drought may also indirectly result in a reduction in native plant populations which increases weed invasion in native habitats, including the surrounding watersheds, as well as prolonged dry periods [12]. Future climate is projected to have more frequent, intensive and prolonged droughts, which could affect vernal pool species [17, 18]	Vernal pool preserves should provide adequate upland habitat and/or habitat linkages adjacent to vernal pools to support pollinators, herbivores and their predators, and avian species [4,11]. Preserving small, isolated, fragmented preserves may not sustain the multiscale ecological processes associated with vernal pools [1, 5].

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Alkali Playa Vegetation Profile

Brief Community Description	Alliances	Current Distribution Range Wide	Distribution in the MSPA	Habitat Affinities
The alkali playas found in the Ramona Grasslands differ in species composition from most alkali playas, sinks, or meadows described in the literature [1, 2]. Alkali playas often undergo periods of inundation, frequent and rapid evaporation, and subsequent excretion and accumulation of salts and minerals in the underlying poorly drained soil strata [3]. A unique flora develops in association with the moisture gradient, when water moves toward the center of the depression during evaporation [4]. The Ramona Grasslands support alkali playas/vernal swales that are associated with the Santa Maria Creek floodplain.	There are no alkali playa alliances currrently classified and mapped in the MSPA.	In cismontane San Diego, alkali playas are found in dry lakes at Lake Henshaw, Clark Dry Lake, and the Borrego Sink [2]. A group of alkali playas/meadows exist within cismontane areas of San Diego County [5].	Alkali playas/vernal swales are found in MU5: Ramona in the Ramona Grasslands and along Santa Maria Creek [6]. Twenty-three alkali playas are found in Ramona [5].	They are associated with poorly drained Visalia sandy loam soils that have a high salinity and/or alkalinity (pH values ranging between 7.5 and 10) [5]. Alkali playas are found on 0 to 2 percent slopes in an undulating landscape which creates the swales and basins [7]. Ramona grassland alkali playas/vernal swales typically support Parish's brittlescale (Atriplex parishii), Coulter's saltbush (Atriplex cf. coulteri;), dwarf peppergrass (Lepidium latipes), vernal pool plantain (Plantago bigelovii), alkali barley (Hordeum depressum), and southern tarplant (Centromadia parryi ssp. australis) [5; 8]

Alkali Playa Vegetation Profile

Ecosystem Processes	Threats	Special Considerations
Ramona grassland alkali playas/vernal swales become inundated in the winter months but for a shorter duration than vernal pools in the same area [1]. Multiple wet-dry cycles during one growing season are common and appear to be necessary factors in supporting the unique flora [9]. Alkali playas/vernal swales are hydrologically connected and share the watershed including all the areas needed to collect rainfall and the surface flows needed to adequately saturate the soils [5]. Alkali playas are dependent on the adjacent geomorphology for maintenance of their unique hydrological conditions and the connection between areas, which is important for gene flow and dispersal of seeds [10].	Threatened by habitat destruction and fragmentation from urban and agricultural development, alteration of hydrology and floodplain dynamics, off-road vehicle activity, trampling by cattle and sheep, weed abatement and fire suppression practices (including disking and plowing), and competition from invasive plant species [4,11]. Continued growth and development in the town of Ramona threatens to degrade the water quality downstream of Santa Maria Creek thereby affecting the associated ephemeral aquatic habitats [5]. Nonnative annual grasses, including filaree, wild oat, rip-gut grass, vinegar weed, Bermuda grass, and ragweed, continue to threaten the Santa Maria Creek watershed and native species diversity [12]. Destruction of watersheds and disruption of hydrological systems can create further impacts by creating barriers to dispersal, such that pollination and reproductive output may be inhibited [13]. Drought may also indirectly result in a reduction in native plant populations which increases weed invasion in native habitats, including the surrounding watersheds, as well as prolonged dry periods [9].	Protecting land within the Ramona Grasslands Preserve from future development would minimize Santa Maria Creek watershed stressors, future fragmentation, water pollution from grazing and agricultural practices, and invasivion of nonative plants [5]. The Nature Conservancy has protected nearly 4000 acres within the Ramona Grasslands Preserve which is currently under the management of San Diego County Parks and Recreation [7]. A Resource Management Plan has been developed that incorporates protection and management of Santa Maria Creek and its associated wetlands to maintain existing natural drainages and watersheds and to restore or minimize changes to natural hydrological processes [7].

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