

7. Bell Meadow (Keeler-Wolf 1985a, Petersen 1994a)

Location

This established RNA is on the Stanislaus National Forest about 3 miles (5 km) S. of Pinecrest. It lies within portions of sects. 25 and 26 T4N, R18E and sects. 29, 30, 31, and 32 T4N, R19 MDBM (38°10'N., 119°56'W.), USGS Pinecrest quad (fig. 14). Ecological subsections – Upper Batholith and Volcanic Flows (M261Eh).

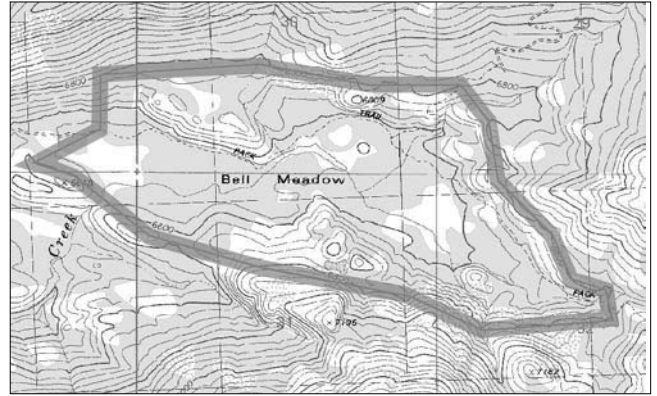


Figure 14—Bell Meadow RNA

Target Element

Aspen (*Populus tremuloides*)

Distinctive Features

Aspen Forest: The aspen stands are extensive and well developed (fig. 15). They occur on both flat, deep meadow soil and on sloping, shallower upland soil. Variation in sucker reproduction, understory density, species composition, and conifer invasion add to the research potential. Typical meadow aspens are more than 90 ft (27 m) tall, and some attain dbh of more than 40 inches (1.02 m).

Aspen vegetation of the Sierra Nevada is usually stable and not successional to coniferous vegetation. This characteristic distinguishes it from the extensive seral stands of the species in the Rocky Mountains. Local rejuvenation of stands appears to take place largely when the short-lived stems die and create light gaps, initiating renewed sucker sprouting. Conifer invasion, largely from white fir (*Abies concolor*), is not pronounced in most areas of aspen dominance.

History of Meadow Change: A combination of monitoring studies (on grazing and browsing pressure from both livestock and deer), and aerial photography in the Bell Meadow area from the early 1950s provide a useful history of the area. An important change in the upper meadow occurred over a short period in the mid-1960s when a large area of wet meadow was converted by stream downcutting to dry meadow. This event coincided with major floods in 1964, but it also may have been exacerbated by heavy grazing pressure. At present, the woody riparian vegetation has not suffered as a result of the downcutting. However, the process will continue relatively rapidly until the entire upper meadow is lowered by several feet.

Significance of Riparian Vegetation to Wildlife: Bell Meadow is an excellent summer range for Sierra mule deer (*Odocoileus hemionus californicus*) because of the interspersed wet meadow, timber, brush, and open areas. Many deer have been seen in the area. The abundant willows (*Salix* spp.) and aspens are relished by pregnant and lactating does. In addition, the riparian habitats afford forage, breeding sites, and protection for many other animals including more than 60 species of birds.

Physical Characteristics

The area covers 645 acres (261 ha) and ranges in elevation from 6540 to 6800 ft (1993-2073 m). The area occupies a part of the bottom and lower slopes of the Bell Creek drainage. Bell Meadow is divisible into upper and lower sections, which are separated by a narrow area about 300 ft (91 m) wide between granitic outcrops. The entire meadow stretches about 1.25 miles (2 km) from E. to W. and is up to 2700 ft (823 m) wide. It slopes gradually from about 6600 ft (2012 m) at the E. to about 6550 ft (1996 m) on the W.

Surrounding slopes are both granitic (quartz monzonite and granodiorite) and volcanic (Miocene latites of the Stanislaus formation), with the granitics prevailing. The meadow is underlain by up to 14 ft (4.3 m) of fine sandy-to-

gravelly alluvium. Soils have been differentiated into seven mapping units. The meadow is underlain by deep Entic Cryumbrepts. The other units principally comprise combinations of Gerle family and rock outcrop. Climate is typical Sierran montane, with annual precipitation averaging 50-55 inches (1270-1397 mm). Mean annual temperature is 44-46 °F (6.7-7.8 °C).



Figure 15—Bell Meadow, upper meadow aspen forest with *Elymus glaucus* and *Mertensia ciliata* dominant in understory. (1984)

Association Types

Twenty-one 100-m² plots were sampled from three forest associations. The remaining associations are qualitatively described.

Jeffrey Pine (*Pinus jeffreyi*) Woodland (85100): 262 acres (106 ha). This open-to-very-open woodland occupies the shallow soils of the slopes surrounding the meadow. A variant, with western juniper (*Juniperus*

occidentalis ssp. *australis*) as a subdominant, occurs on the Miocene volcanics at the E. edge of the area. The shrub understory is dominated by mountain chaparral species and forms a mosaic with tree-dominated vegetation and sparse herbaceous cover on rock outcrops.

A fine-grained view of this association would differentiate Jeffrey pine woodland from mixed montane chaparral (Holland 37510), huckleberry oak (*Quercus vaccinifolia*) scrub (Holland 37542), and rock outcrop (Holland 91200). Overall shrub dominants include *Quercus vaccinifolia*, *Arctostaphylos nevadensis*, and *A. patula*. *Holodiscus boursieri* and *Acer glabrum* var. *torreyi* occur on N.-facing slopes. Herbs include many species typical of mid-elevation rock outcrops, such as *Raillardella scaposa*, *Stipa occidentalis*, *Eriogonum umbellatum*, *E. marifolium*, *Cryptogramma acrostichoides*, *Arenaria kingii* var. *glabrescens*, *Sedum lanceolatum*, *Lomatium tracyi*, *Penstemon laetus*, *P. newberryi*, and *Hieracium horridum*.

Aspen Riparian (81B00, 61520): 90 acres (36 ha). Of the three deciduous plant associations, this is the driest with little or no surface water and a water table in mid-summer from 2 to 14 ft (0.6-4.3 m). The largest aspen groves occur on the E. end of the meadow with smaller fringing stands surrounding most of the remainder and a broad band covering the central portion of the lower meadow (together making up the meadow flat subtype). Typically, aspen forms an even monospecific canopy from 60 to 90 ft (18-27 m) tall with few young small stems. However, in the central lower meadow, stands are multi-layered resulting from numerous young- to middle-aged suckers growing among a sparse canopy of large, senescent stems. On 11 plots, total tree density averages 910 trees/ha with a cover of 69 m²/ha. On these plots aspen averages an importance value of 240 with both a relative density and relative cover of 89 percent. In addition to the aspen, only a few small white fir, Jeffrey pine, and lodgepole pine (*Pinus contorta* ssp. *murrayana*) occur in the tree strata.

Shrub cover is light, but the herbaceous understory is dense (typically nearly 100 percent) and diverse (63 taxa in the sample). Only seven herbaceous species have a frequency of 50 percent or greater. These are *Elymus glaucus*, *Lupinus andersonii*, *Veratrum californicum*, *Hackelia jessicae*, *Descurania richardsonii*, *Thalictrum fendleri*, and *Osmorhiza chilensis*. *Elymus* may reach 6 ft (2 m) tall in wet years. *Rudbeckia californica* may dominate in certain areas of heavy grazing.

An upland subtype occurs in several small stands at the edge of the main meadow or on benches above it. These stands are similar to the meadow flat

subtype, but more white fir and Jeffrey pine are present here than in the meadow flat. Herbaceous understory is less dense compared to the main meadow stands, primarily because of higher grazing pressure on these areas.

Salix Riparian (63500): 59 acres (24 ha). This association is extensive on the upper and lower meadow flats. It is dominated by the willow *Salix ligulifolia*, which forms thickets 10-13 ft (3-4 m) tall. These thickets are interspersed with small openings dominated by wet meadow vegetation. Other shrubs include *Salix melanopsis*, *S. lasiandra*, *S. drummondiana* var. *subcaerulea*, *S. scouleriana*, *Sambucus microbotrys*, and *Sambucus caerulea*. A number of herbaceous species are typical of the shady thickets and include *Delphinium glaucum*, *Heracleum lanatum*, *Epilobium adenocaulon*, *Castilleja miniata*, *Senecio triangularis*, *Habenaria sparsiflora*, *Circaea alpina* var. *pacifica*, *Smilacina stellata*, *Lilium kelleyanum*, and *Aquilegia formosa*.

White Fir-Red Fir Forest (85310): 55 acres (22 ha). This dense forest occurs in the valley of the S. branch of Bell Creek upstream from the meadow. Dominant red fir (*Abies magnifica*) attains heights of 200 ft (61 m) and dbh of 5 ft (1.5 m). Red fir dominates the basal area (157 m²/ha, relative cover 46 percent), but white fir may occur in higher density (460 trees/ha, relative density 59 percent). Both species have near equal importance values on the five sample plots (white 141, red 127). The understory is typically sparse, and duff cover is heavy. Density of saplings and seedlings is higher for red fir than white fir.

White Fir-Jeffrey Pine Forest (84240, 85210): 52 acres (21 ha). This forest typically occurs as a narrow fringe surrounding the meadow flat. The soil is rockier than the meadow, but deep. The dominants are white fir and Jeffrey pine, with lodgepole pine and red fir as subdominants (total density on five plots averages 920/ha, total basal cover averages 108 m²/ha). White fir has the highest importance value (150) followed by Jeffrey pine (77), lodgepole pine (59), and red fir (14). White fir has the highest importance values for seedlings and saplings, as well. The most frequent shrubs are *Quercus vaccinifolia* and *Symphoricarpos acutus*. Both account for 20-40 percent cover in many areas. The most conspicuous herbs are *Pteridium aquilinum* and *Kelloggia galioides*.

Wet Meadow (45100, 52430): 49 acres (20 ha). Since the recent erosion cycle in the upper meadow, the reduction in this association has been drastic. However, extensive areas of wet meadow still exist, particularly in the lower meadow. This association is divided into three types:

The saturated subtype (Holland 52430) occurs in slough-like channels of Bell Creek and around an ephemeral pond in the S. of the area. *Carex rostrata* dominates as a ring around open water (which remains through mid-summer). Additional species include *Sparganium multipedunculatum*, *Elatine gracilis*, *Potamogeton nutans*, *Puccinellia pauciflora*, *Scirpus microcarpus*, *Juncus orthophyllus*, *Carex aquatalis*, *C. athrostachya*, and *C. fracta*.

A wet subtype is dominated by sedges and grasses, often forming a well-consolidated sod. This type has standing water in the spring and remains moist throughout the summer. Other species shared with the *Salix riparian* association typically include *Carex fracta*, *C. nebrascensis*, *C. stramineiformis*, *C. paucicaustata*, *C. festivala*, *C. hoodii*, *C. jonesii*, *Trifolium cyathiferum*, *T. montanum*, *Ranunculus orthorhynchus*, *Epilobium brevistylum*, *Polygonum bistortoides*, *Juncus howellii*, *Glyceria elata*, *Allium validum*, *Deschampsia caespitosa*, *Agrostis exarata*, and *Dodecatheon alpinum*.

A moist subtype is the most extensive and diverse. It commonly is interspersed with *Salix riparian* vegetation. Ground cover ranges from 50 to 100 percent. The drier fringe sections are dominated by *Danthonia californica* var. *americana*, *Perideridia parishii*, *Trifolium longipes*, *Deschampsia elongata*, *Calamagrostis inexpansa*, *Penstemon rydbergii*, *Achillea millefolium*, *Solidago californica*, *Horkelia fusca*, and *Gilia capillaris*. Slightly moister areas are dominated by *Hordeum*

brachyantherum, *Erigeron peregrinus* ssp. *calliantherus*, *Aster occidentalis*, *Agrostis scabra*, *A. oregonensis*, *Poa pratensis*, *Ranunculus occidentalis*, *Juncus confusus*, *J. balticus*, *Luzula comosa*, *Helenium hoopesii*, and *Veratrum californicum*.

Dry Meadow (45120): 47 acres (19 ha). This association is dominated by grasses and herbs with cover from 10 to 90 percent. The largest dry meadows are in upper Bell Meadow on deep, well-drained soil that supported wet meadow before stream downcutting. Three subtypes occur.

The most extensive subtype is dominated by *Stipa columbiana*. Additional species include *Agropyron trachycaulum*, *Elymus macounii*, *Madia glomerata*, *Perideridia parishii*, *Polygonum douglasii*, *Navarretia divaricata*, *Cryptantha torreyana*, *Cordylanthus tenuis*, *Bromus orcuttianus*, *Lotus purshianus*, and *Gayophytum diffusum* ssp. *parviflorum*.

The second subtype occurs in peripheral areas of the upper meadow. It is characterized by a coarse, sandy substrate with low vegetation cover (<25 percent) dominated by *Madia glomerata*.

The third subtype is dominated by the annuals *Lotus argophyllus* and *Euphorbia spathulata*. It occurs on more pebbly or rocky soils than the previous type, typically bordering on Jeffrey pine and lodgepole pine forests.

Lodgepole Pine-Fir Forest (86100): 30 acres (12 ha). This association borders meadow and riparian vegetation. The forest is dominated by lodgepole pine, but Jeffrey pine, white fir, and red fir also occur. Stem density is high, but because of the moist substrate and deep soil, the understory is well developed. Many herbs are shared with aspen and meadow associations, but several are characteristic. These include *Botrychium multifidum* ssp. *silaeifolium*, *Antennaria rosea*, *Prunella vulgaris*, and *Hypericum anagalloides*. Other common species include *Aster occidentalis*, *A. integrifolius*, *Deschampsia elongata*, *Calamagrostis inexpansa*, *Perideridia parishii*, *Muhlenbergia filiformis*, *Pyrola secunda*, and *Juncus confusus*.

Rocky Stream Riparian (61530): 1 acre (0.4 ha). This association occurs sporadically along the main branch of Bell Creek, largely on rocky stretches with steeper gradients than in the main meadow area. Black cottonwood (*Populus-trichocarpa*) is the most conspicuous tree. Cottonwoods are typically scattered in small clumps and attain heights of 100 ft (30 m) and dbh of 49 inches (1.25 m). Shrubby species include *Cornus stolonifera*, *Rhamnus purshiana*, *Spiraea densiflora*, *Ribes nevadense*, *Rosa gymnocarpa*, and, occasionally, *Alnus tenuifolia*.

Plant Diversity

Two hundred forty-seven taxa are listed in the establishment record, which updates the list in the ecological survey.

Conflicting Impacts

The area has been used for grazing for more than 100 years. The downcutting of the upper meadow stream may have begun because of reduced vegetation cover caused by overgrazing. After establishment, most of the area will be excluded from grazing. At present the core area of the meadow is fenced, and herbaceous cover is generally high, indicating good potential for recovery of the entire area. Various options for dealing with the downcutting problem in the upper meadow are discussed in the ecological survey and the establishment record. Downcutting in the meadows will be allowed to continue unimpeded. So far, no detrimental impact to the aspen or the *Salix* riparian zones has occurred. Recreational use of the area has been high. After establishment, a major trail to the adjacent Emigrant Wilderness will be re-routed around the RNA.