

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring

### 2007 Range Condition and Capacity Assessment

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#### **I. Introduction:**

The purpose of this range assessment is to determine the potential ecological outcome of the proposed Valles Caldera Trust (VCT) 2007 livestock grazing program on the Valles Caldera National Preserve (VCNP). This report is based on analyses of field data collected in May 2007 by VCT staff, USDA Agricultural Research Service personnel (Dr. Kris Havstad and staff, plus nearly 30 volunteer citizens), and University of New Mexico climatology scientist Douglas Moore, and provides an evaluation of the condition of the pastures, including amounts of available forage, potential for continued forage growth in terms of soil moisture, and water availability in streams and stock tanks. In addition, a report on projected climate conditions for the summer of 2007 is provided for the purpose of anticipating possible temperature levels and precipitation amounts in regard to sustained production of forage for livestock and wildlife.

In June 2007, a total of 500 steers and heifers are expected to be delivered to the VCNP, and allowed to graze on a rapid-rotation system utilizing all the major valles. We anticipate that livestock will graze any given pasture area only once during the summer, with the exception of two areas of the Valle Toledo that will be used for 2 or 3 nights as nighttime bedding sites; this is part of an experimental procedure to determine the impacts of the herd using a pre-determined bedding site more than once during the grazing period in a pasture. Detailed monitoring data on the impacts of multiple-night use will be collected.

#### **II. Sampling Design and Methods:**

Forage availability data were derived from vegetation clip plots at 39 sites across the VCNP. These sites are part of the long-term monitoring network for forage productivity and utilization by livestock and elk, and are associated with permanent monitoring sites for plant species composition and cover. Sites are stratified by grassland type: Grazeable woodland (GW) sites are found in the sub-canopy areas of forests surrounding the VCNP valles, generally dominated by Ponderosa pines; mountain valley sites are upland slopes of the valles, dominated by Parry oatgrass and fescues; mountain meadow sites are typically in the low areas of the valles on relatively moist soils, and commonly support Kentucky bluegrass and a wide variety of other grasses and forbs; and riparian sites, found along streams in the valles, and dominated by several species of sedges. At each site, four replicated ¼ square-meter rings are clipped of all vegetation to a height of approximately 1 cm. The clipped vegetation is collected in paper bags, dried in ovens at 60° C for 72 hours, and weighed to the nearest gram. Estimates are then calculated for standing crop biomass in kilograms/hectare, and converted to pounds per acre units for report presentation. These estimates are then scaled up to the entire VCNP, and a calculation is made for the number of livestock that could be supported with the available forage, allowing for retention of forage for other herbivores (e.g., elk, rodents, grasshoppers, aphids, etc.) and

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring

sustaining ecosystem function (e.g., prevention of soil erosion, promotion of nutrient cycles, maintaining soil organic matter, etc.). The 2007 results are also compared to those of previous years. In addition, grass stubble height transects (36 paces each) were measured at each of the forage clip plot sites. At each pace location, the dominant grass species were measured (cm) for average live height of leaf blades. Each plant was inspected to determine if it had been grazed or not grazed at the time of measurement.

Meteorological data were analyzed for precipitation and soil moisture. Data from the current year were compared to conditions in previous years.

Meteorological forecast data for the summer period of 2007, including both precipitation and temperatures in northern New Mexico, were obtained from the NOAA-supported center for Climate Assessment for the Southwest (CLIMAS) web site:

(<http://www.ispe.arizona.edu/climas/forecasts/swoutlook.html>).

To ascertain overall runoff conditions in Jemez Mountain streams, stream flow data for the Jemez River watershed (based on the USGS stream gauge near Cañon in the Jemez Valley) were obtained from the USGS web site (<http://waterdata.usgs.gov/nm/nwis/current/?type=flow>).

In 2006, we determined the water source capacity of upland stock tanks for livestock from an inventory of stock tanks and their water-holding condition conducted by Mr. Leonard Atencio (former VCT Board Member and former US Forest Service Supervisor, Santa Fe National Forest). Stock tanks in upland locations surrounding the valles were visited and photographed, and water levels in the tanks following snowmelt were noted. In May 2007, several of the major stock tanks were visited to determine their water level status.

### **III. Results:**

**A. Forage Availability.** The results of the forage assessments indicated that standing crop biomass had improved considerably since the spring of 2006. The results of the May, 2007, sampling are as follows:

<u>Pasture habitat type</u>	<u>Standing Crop Biomass (pounds/acre)</u>	
	<u>2006</u>	<u>2007</u>
Grazeable Woodland	547	1,088
Mountain Meadow	894	1,892
Mountain Valley	1,010	1,332
Riparian	988	1,840

In addition to having significantly more forage available this year, the forage quality is considerably better due to the spring rains and moist soil conditions that have allowed plants to

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring

add substantial growth already this season. Previous nutritional analyses of plants during this stage of growth have shown very good protein, energy and nutrient levels. While some of the forage materials are certainly the cured, nutritionally poor leaves and grass blades from the summer of 2006, much of the material is new spring growth. The following list shows the average leaf blade heights (new growth only) of the dominant grass species in late May, 2007, measured on stubble height transects at the same time forage clip plots were taken.

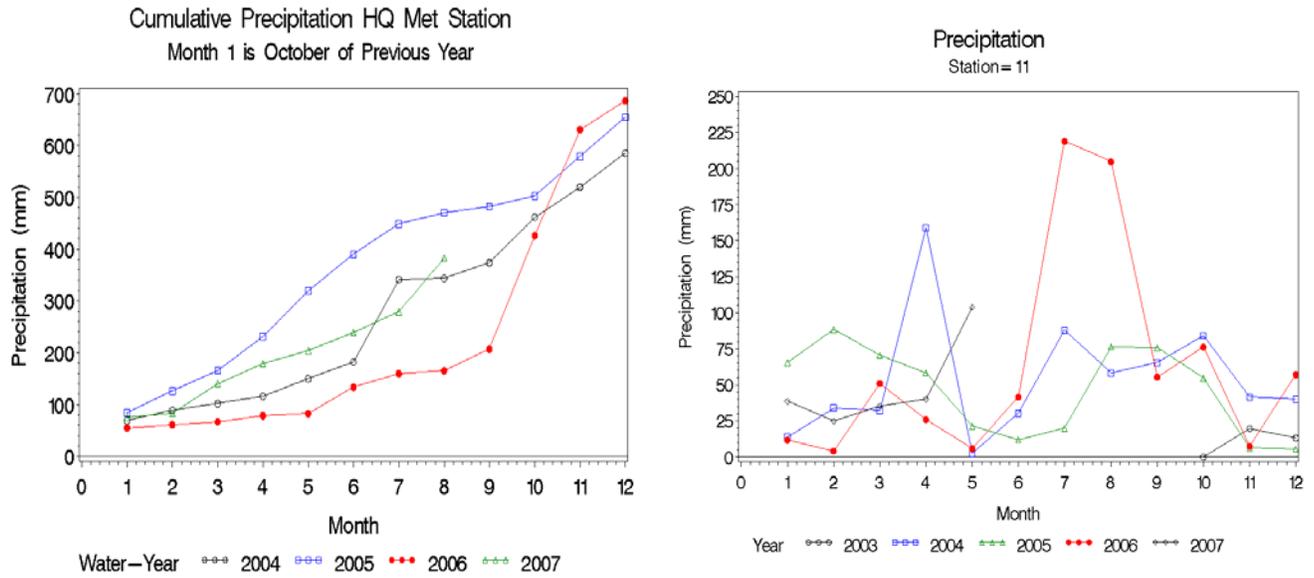
Species Name	#	Average Height (Ungrazed, cm)	#	Average Height (Grazed, cm)
Arizona fescue	365	21.87	0	None found
Blue grama	86	3.95	0	None found
Bluegrass	1,103	11.80	16	7.94
Idaho fescue	326	12.20	0	None found
Mountain muhly	175	10.17	0	None found
Parry's Oatgrass	396	14.40	0	None found
Prairie junegrass	163	10.01	0	None found
Sedge	881	12.38	29	8.76
Thurber fescue	59	42.61	0	None found
Timothy grass	18	20.78	0	None found
Tufted hairgrass	67	15.37	8	7.88

In the above list, note that many of the grass species had not been grazed by elk or other herbivores, and that even for those species that showed some grazing, the number of plants that had been grazed was small relative to the number found. For those individual plants that were grazed, the amount of height reduction from the grazing appeared to be modest (33% for bluegrass, 31% for sedges, and 49% for tufted hairgrass).

**B. Climate.** Precipitation conditions in northern New Mexico during the winter and spring of 2006-2007 have been considerably wetter than in the previous year (Fig. 1). Data from the VCNP Headquarters meteorological station show that total precipitation during the “water year” (that starts in October and runs through the following September) of 2006-2007 is considerably above the levels observed in 2005-2006. Note that the winter-spring period of 2004-2005 was exceptionally wet, due to a high snowpack lasting into early May. However, the precipitation in May 2007 has been the highest amount received since meteorological data have been recorded on the VCNP (beginning in October 2003).

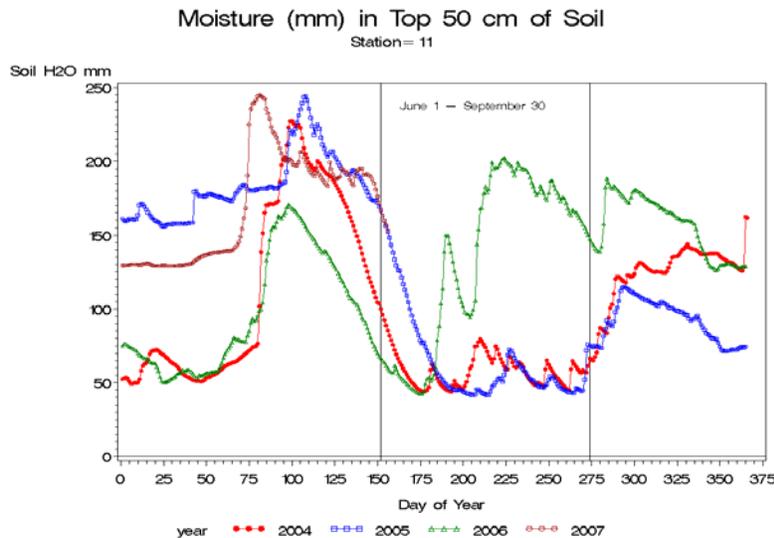
# VALLES CALDERA NATIONAL PRESERVE

## Research, Inventory, and Monitoring



**Figure 1.** Left: Cumulative precipitation at the VCNP HQ station in Valle Grande. Monthly data are for annual “water year” running from October through September. Right: Monthly precipitation at the HQ station, showing January – December patterns. Note that May 2007 has been the wettest May on record since measurements began in October 2003.

Soil moisture conditions (Fig. 2) as of late May were also excellent for supporting continued plant growth into the early summer. Soil moisture at the HQ station has benefited from both the large amount of snowpack and subsequent snow melt, as well as the record wet month of May.



# VALLES CALDERA NATIONAL PRESERVE

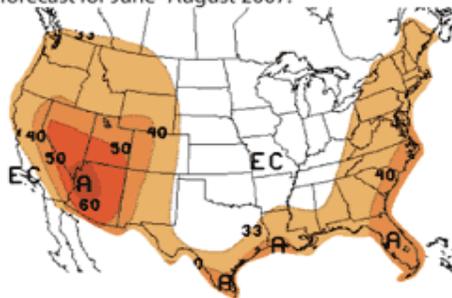


## Research, Inventory, and Monitoring

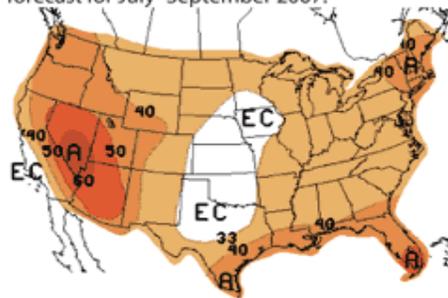
**Figure 2.** Soil moisture at HQ station, top 50 cm. Dates based on Julian Days (Jan. 1 = Day 1, Dec. 31 = Day 365). The livestock grazing season is shown as June 1 – Sept. 30).

**D. Climate forecast for summer, 2007.** Projected long-term forecasts of temperature by the NOAA CLIMAS Center for northern New Mexico indicate a statistically higher probability of somewhat higher than average temperatures (Fig. 3 below). These estimated projections were generated in May, 2007. This may lead to realized higher evapo-transpiration rates, and potentially drier soils if the monsoon rains do not materialize. Fortunately, the forecast for precipitation is for essentially normal moisture amounts (Fig. 4), which means a typical summer monsoon. However, given that monsoons periodically fail, continued monitoring of precipitation and forage condition will be undertaken throughout the summer.

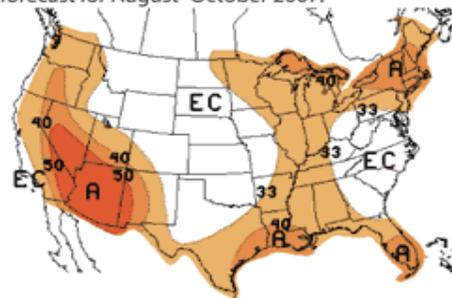
**Figure 10a.** Long-lead national temperature forecast for June–August 2007.



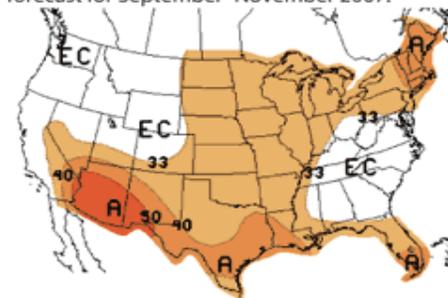
**Figure 10b.** Long-lead national temperature forecast for July–September 2007.



**Figure 10c.** Long-lead national temperature forecast for August–October 2007.



**Figure 10d.** Long-lead national temperature forecast for September–November 2007.



60.0–69.9%  
50.0–59.9%  
40.0–49.9%  
33.3–39.9%

A= Above

EC= Equal chances. No forecasted anomalies.

**Figure 3.** Temperature forecasts for summer, 2007. These outlooks predict the likelihood (chance) of above-average, average, and below-average precipitation, but not the

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring

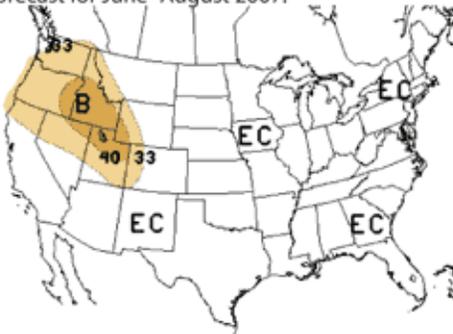
**magnitude of such variation. The numbers on the maps do not refer to inches of precipitation.**

# VALLES CALDERA NATIONAL PRESERVE

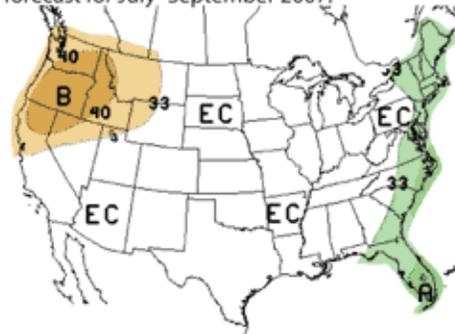


## Research, Inventory, and Monitoring

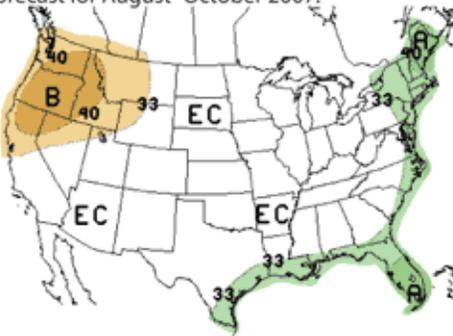
**Figure 11a.** Long-lead national precipitation forecast for June–August 2007.



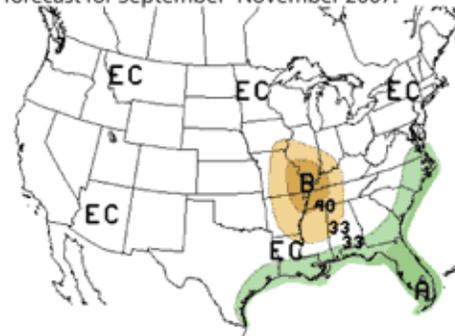
**Figure 11b.** Long-lead national precipitation forecast for July–September 2007.



**Figure 11c.** Long-lead national precipitation forecast for August–October 2007.



**Figure 11d.** Long-lead national precipitation forecast for September–November 2007.



A= Above 40.0–49.9%  
33.3–39.9%  
B= Below 33.3–39.9%  
40.0–49.9%  
EC= Equal chances. No forecasted anomalies.

**Figure 4. Precipitation forecasts for summer, 2007.** These outlooks predict the likelihood (chance) of above-average, average, and below-average temperature, but not the magnitude of such variation. The numbers on the maps do not refer to degrees of temperature.

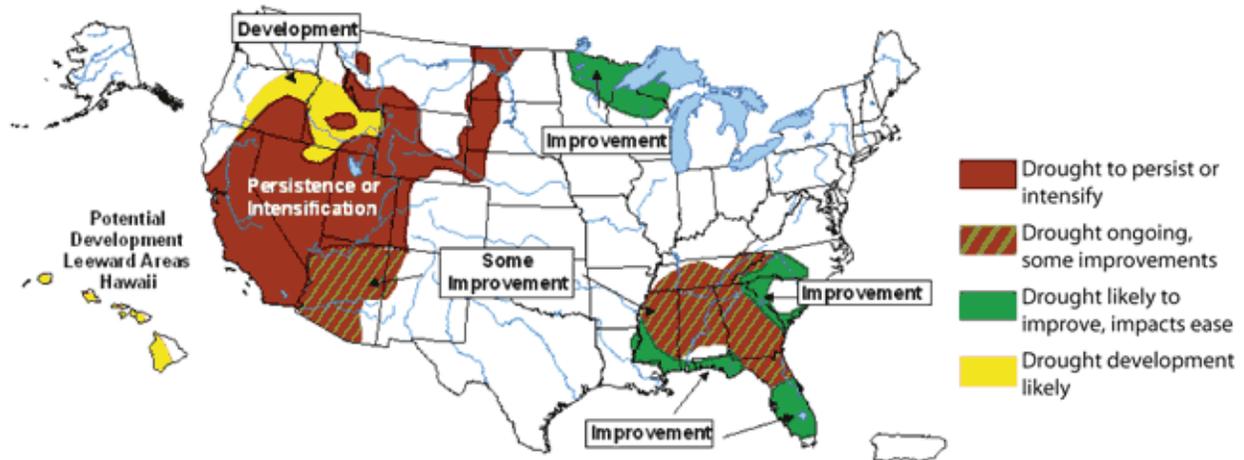
Drought conditions have alleviated somewhat in northern New Mexico since 2006, as a result of record monsoons in 2006.

**Figure 5. Drought status in the United States as of May, 2007.**

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring



**E. Stream flow and runoff.** Data from the USGS stream gauge on the Jemez River show dramatic improvement in stream water discharge in 2007 compared to 2006 (Fig. 6). In late May, 2007, discharge was ~50 cfs, compared to only ~15 cfs in May 2006. This 2007 flow rate resulted from the higher snowpack during the winter of 2006-2007, and the spring rains in May 2007. The improved discharge rate is indicative of good water availability in the upper watershed and the VCNP.

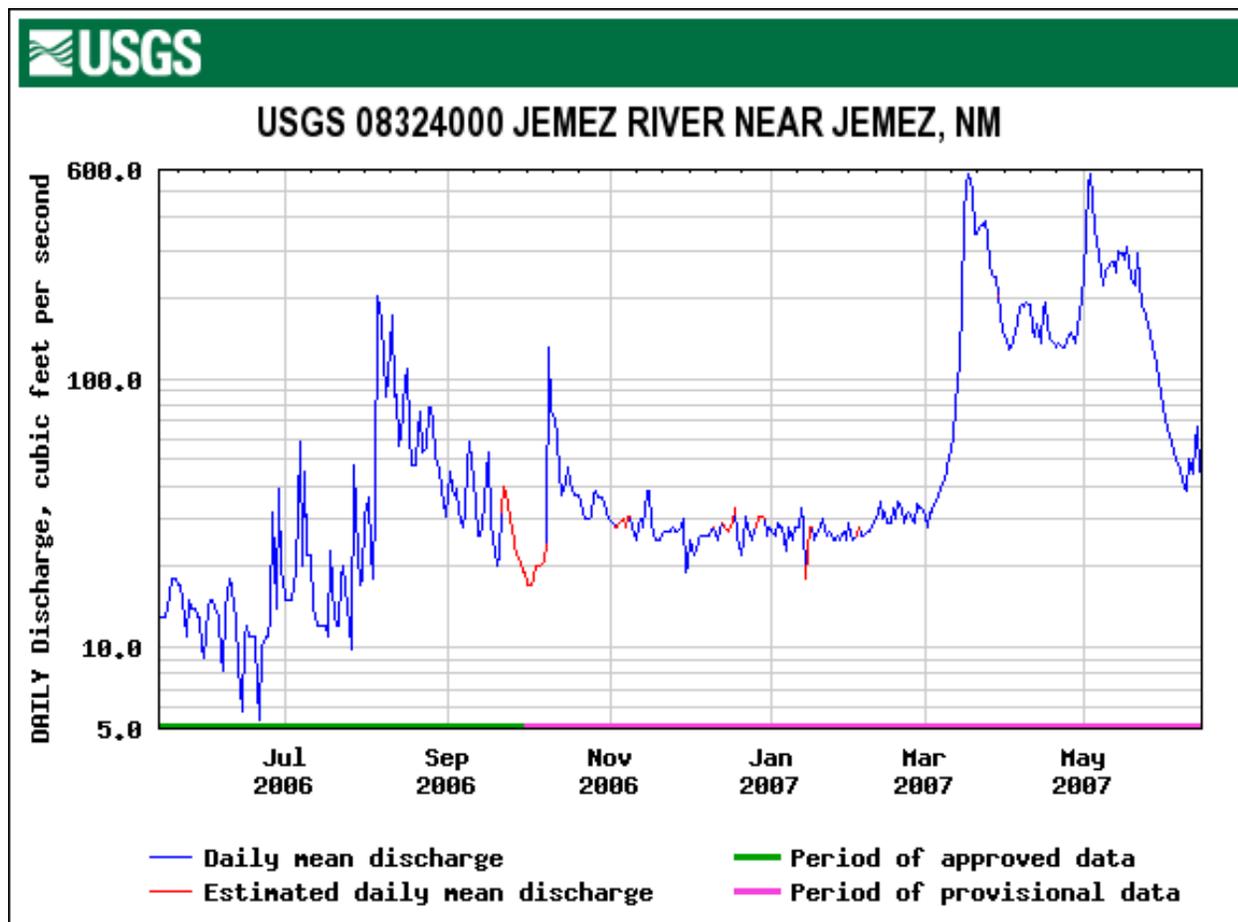


Figure 6. Discharge (cfs) of the Jemez River (USGS stream gauge near Cañon, NM).

**F. Stock tank water-holding conditions.** In May, 2007, the major stock tanks in the Valle Grande, Valle de Los Posos, and the Valle Seco, were full to capacity and water was flowing through the spillways to the streams below. Upland water tanks that were visible from back-country roads also appeared to be full to capacity. While many of the VCNP stock tanks are in need of repair and maintenance, and some are not functional, the remaining tanks appear to have sufficient water levels to support livestock and elk through the pre-monsoon periods.

**IV. Steer/heifer Stocking Quantity Calculations:**

Based on the original Environmental Assessment (E.A.) for the Interim Grazing Strategy (13 August 2002), under which VCNP livestock grazing activities have been conducted since 2002, and incorporating the Amendment to the E.A. (March 2003), the calculations for estimating the maximum number of steers to be supported on the VCNP in 2006 are derived as follows (*ref.* 2003 E.A. Amendment, pp. 3-4):

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring

1. An Animal Unit Month (AUM) is equivalent to 900 pounds air-dry forage consumed per month.
2. Harvest of forage should remain below 40% of annual forage production so as not to inhibit forage plant root growth.
3. As stated in the 2002 E.A., the analysis allocates 35% of available forage towards livestock in Mountain Valley (upland) habitat, and 15% in Mountain Meadow habitats (in or near wetlands and riparian zones).
4. Grazing capacities (AUMs) for Mountain Valley are obtained by multiplying acres assigned for livestock capacity times forage production (pounds/acre) estimates, and multiplying this total by 0.35 (35% livestock utilization allowed), and dividing by 900 pounds/month for an AUM. Grazing capacities for Mountain Meadow sites are obtained by multiplying assigned acres times forage production (pounds/acre) estimates, and multiplying this total by 0.15 (15% livestock utilization allowed), and dividing by 900 pounds/month for an AUM. The two capacity estimates are then added together to yield the total VCNP stocking AUM number.

The total acres assigned for livestock were 14,227 acres of open grasslands in the three major valles (Valle Grande, Valle San Antonio, and Valle Toledo; *ref.* E.A. Amendment, March 2003, Table 1-2, p. 5).

Based on the VCNP vegetation map, Mountain Valley habitat constitutes 61% of the grassland habitat on the VCNP, while Mountain Meadow/Riparian habitat (wet meadows, wetlands and riparian zones) constitutes 39% (VCNP Vegetation Map, 2006).

Therefore, the total pounds of forage available in spring, 2007, in the Mountain Valley habitat was computed as:

$14,227 \text{ acres} \times 0.61 \text{ (proportion of MV habitat type)} \times 1,332 \text{ pounds/acre} = 11,559,722 \text{ pounds.}$

In the Mountain Meadow habitat, the available forage was:

$14,227 \text{ acres} \times 0.39 \text{ (proportion of MM habitat type)} \times 1,892 \text{ pounds/acre} = 10,497,818 \text{ pounds.}$

A utilization rate of 35% was assigned to livestock in the Mountain Valley habitat, and 15% in the Mountain Meadow habitat, giving the following for available forage assignable to livestock:

Mountain Valley:  $11,559,722 \text{ pounds} \times 0.35 = 4,045,903 \text{ pounds forage}$   
Mt. Meadow/Riparian:  $10,497,818 \text{ pounds} \times 0.15 = \underline{1,574,673 \text{ pounds forage}}$   
Total =  $5,620,576 \text{ pounds forage available}$



## Research, Inventory, and Monitoring

The total forage available (5,620,576 pounds) divided by 900 pounds/AUM yields a total of 6,245 AUMs.

The VCNP livestock grazing program is set for 4 months (1 June through 30 September 2006; *ref.* 2002 E.A., p. 33), and therefore the total number of Animal Units (AU) is 6,245 AUMs divided by 4 months, or 1,561 Animal Units.

As defined in the 2002 E.A. (*ref.* p. 30), 1-year old steers/heifers are equivalent to 0.7 Animal Unit (due to their smaller body weights and forage consumption amounts relative to a full-grown cow or bull) and therefore the total steer/heifer capacity estimated for 2007 is:

$$1,561 \text{ Animal Units} / 0.7 = \underline{\underline{2,230 \text{ steers/heifers}}}$$

Given that the 2007 livestock grazing contract specifies that 500 steers/heifers will be brought on to the VCNP pastures in mid-June through late September, the available forage for this herd size is more than sufficient to support the herd while preserving adequate plant biomass for other herbivores and ecosystem functions.

### **V. Supplement. VCNP resource impacts of the 2006 decision to cancel livestock grazing:**

In spring, 2006, Executive Director Dr. Jeff Cross canceled the 2006 summer livestock grazing program due to (1) insufficient forages amount to support a planned steer herd of 1,500 animals, (2) insufficient forage nutritional quality to ensure adequate weight gain, (3) poor soil moisture conditions for sustaining continued pre-monsoon forage production, (4) extreme below-average stream flows, (5) dry or nearly dry stock tanks, and (6) the potential for negative impacts on the Jemez Mountain elk herd through forage competition with livestock and negative impacts on the VCNP trout fishery through livestock disturbances in stream channels and riparian areas (the only viable source of water for livestock). The winter spring period of 2006-2007 proved to be one of the driest periods in the history of meteorological record-keeping in New Mexico (112 years), and forecasts for extremely hot and dry conditions in May and June proved accurate until the last week of June. The summer monsoons of 2006 provided record precipitation, and forage production increased significantly, achieving near-record amounts by the autumn of 2006.

In the 2006 Range Readiness Report, five potential benefits of canceling the 2006 livestock program were listed, and it is a useful exercise to evaluate the consequences of the canceling action on those predictions.

The text from the 2006 report is as follows:

“The potential benefits to the VCNP of postponing the livestock program until 2007 include: (1) improved forage availability for the Jemez Mountain elk herd and preservation of rangeland vegetation; (2) better stream water quality; (3) potentially favorable streambank geomorphology changes, with streams becoming deeper and narrower due to plant colonization and

# VALLES CALDERA NATIONAL PRESERVE



## Research, Inventory, and Monitoring

establishment on exposed stream edges; (4) reducing potential damage to fisheries; and (5) the opportunity to learn from a large-scale “experiment” the natural resource response to lack of livestock (i.e., changes in natural resource characteristics from large herbivore activities would be attributed solely to elk)” (R. R. Parmenter, VCT 2006 Range Readiness Report, p. 18).

Outcomes as assessed in 2006-2007:

1. **Elk herd forage availability and vegetation condition.** Elk body condition, based on analyses from the 2006 elk hunt, indicated excellent condition of the cow elk in the fall following the 2006 spring and summer. Calf:cow ratios during the summer of 2006 improved over 2005, increasing from 18.6% to 26.5%. Range vegetation in 2006 showed improvements in aboveground standing crop biomass (see table below).

### Valles Caldera National Preserve

#### 2002- 2006 Fall standing crop of herbaceous biomass (lbs/acre)

Average by site type - Standing Crop					
Site type id:	2002	2003	2004	2005	2006
GW	560	919	565	1074	1125
MM	1233	1481	843	1431	2211
MV	765	912	904	1639	1574
RR	1103	1091	944	1584	2268
All	915	1101	814	1432	1795

GW = Grazeable woodland (subcanopy grassland under Ponderosa pines)

MM = Mountain Meadow (wet meadows near streams)

MV = Mountain Valley (drier grasslands on valley slopes)

RR = Riparian grasslands (along streambanks)



## Research, Inventory, and Monitoring

2. **Stream water quality.** Water temperatures declined in the major streams during 2006 from the 2001 survey data, due at least in part to continued development of riparian sedge cover and plant heights (increased shading). There were 20% fewer days in which water temperatures exceeded standards set by the New Mexico Environment Department (East Fork Jemez River: 76 days in 2001, 61 days in 2006).
3. **Stream channel geomorphology.** Stream channels and riparian areas were resampled in 2006 by members of the New Mexico Cadre of the Creeks and Community Strategy, using the same protocols that were used in 2000 (immediately after purchase of the VCNP by the Federal Government). Results of the 2006 survey indicated substantial improvements in proper functioning condition.
4. **Fisheries.** Data from the 2006 fisheries monitoring indicated no statistically significant changes in trout abundances or body condition. Several creeks went dry in the drought, including Jaramillo and Redondo creeks.
5. **Large-scale experiment for livestock impact.** In 2006, forage estimates and utilization percentages were computed from vegetation clip plots, and in the absence of livestock (except for an experimental herd of 200 head from NM State University), forage utilization averaged 19% (see table below). When compared to previous years when livestock were present on the VCNP, it is clear that elk account for a majority of the forage utilization, given the cattle stocking rates undertaken in 2002-2006. The 2006 “experiment” shows clearly that the elk, along with other resident herbivores, are the major consumer groups of forage on the VCNP.



Valles Caldera National Preserve

**Summer Percentage Forage Utilization (2002-2006)**

Average by site type - Utilization					
Site type id:	2002	2003	2004	2005	2006
GW	47	33	30	29	24
MM	19	30	41	20	14
MV	27	23	25	18	16
RR	29	42	45	33	23
All	31	32	35	25	19

GW = Grazeable woodland (subcanopy grassland under Ponderosa pines)

MM = Mountain Meadow (wet meadows near streams)

MV = Mountain Valley (drier grasslands on valley slopes)

RR = Riparian grasslands (along streambanks)