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Date: 9 June, 2008

Memo to: Jeff Cross, VCT Executive Director,
Dennis Trujillo, VCT Preserve Manager

Subject: Range Readiness Analysis for VCT livestock program for summer, 2008

I. Introduction:

The purpose of this range assessment is to determine the potential ecological outcome of the proposed Valles Caldera Trust (VCT) 2008 livestock grazing program on the Valles Caldera National Preserve (VCNP). This report is based on analyses of field data collected in May 2008 by VCT staff, volunteer citizens from the Sierra Club, 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 2008 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 summer 2008, a total of 2,000 steers and heifers are scheduled to graze 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 the Valle Grande which will be grazed at the beginning of the summer when the steers arrive, and then again at the end of the season as they are moved to the loading corrals for shipment out of the Preserve.

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 valleys, 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 at least 48 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 sustaining ecosystem function (e.g., prevention of soil erosion, promotion of nutrient cycles, maintaining soil organic matter, etc.). The 2008 results are also compared to those of previous years. In addition, grass stubble height transects (30 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 2008, 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 valleys were visited and photographed, and water levels in the tanks following snowmelt were noted. In May 2008, 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, and are comparable to the record amount observed in 2007. The results of the May, 2008, sampling are as follows:

<u>Pasture habitat type</u>	<u>Standing Crop Biomass (pounds/acre)</u>		
	<u>2006</u>	<u>2007</u>	<u>2008</u>
Grazeable Woodland	547	1,088	698
Mountain Meadow	894	1,892	1,364
Mountain Valley	1,010	1,332	833
Riparian	988	1,840	1,300

In addition to having substantial forage available this year, as in 2007, the forage quality is considerably better due to the spring rains and moist soil conditions that have allowed plants to 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 2007, 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, 2008, measured on stubble height transects at the same time forage clip plots were taken.

Species Name	<i>n</i>	Average Height (Ungrazed, cm)	<i>n</i>	Average Height (Grazed, cm)
Arizona fescue	230	15.39	0	None found
Bluegrass	575	10.95	49	7.86
Idaho fescue	112	12.83	0	None found
Mountain muhly	31	9.23	0	None found
Parry's oatgrass	215	11.44	6	8.50
Pine dropseed	5	6.50	0	None found
Prairie junegrass	118	8.23	0	None found
Sedge	439	11.45	26	7.92
Thurber fescue	26	31.92	0	None found
Timothy grass	2	14.00	0	None found
Tufted hairgrass	14	17.64	0	None found

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 (28% for bluegrass, 31% for sedges, and 26% for Parry's oatgrass).

B. Climate. Precipitation conditions in northern New Mexico during the winter of 2008 have been quite comparable to the high snow depth winter of 2005 (Fig. 1, left), although the La Niña conditions of 2008 resulted in fairly dry months in March and April (La Niñas typically have drier than normal conditions in February, March and April). 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 2007-2008 is now (early June) quite comparable to precipitation totals observed in 2004 and 2007 (both very productive years). Note that the winter-spring period of 2005 was exceptionally wet, due to a high snowpack lasting into early May. However, the precipitation in May 2008 has been the second highest amount received since meteorological data have been recorded on the VCNP (beginning in October 2003), which has contributed to maintaining spring plant growth and soil moisture.

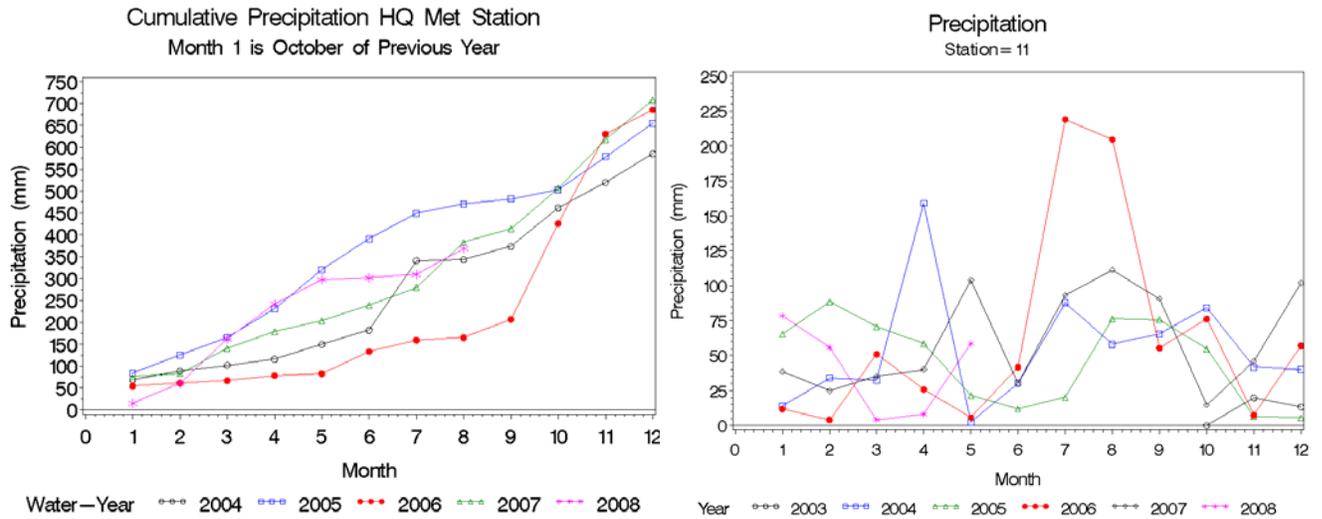


Figure 1. Left: Cumulative precipitation at the VCNP HQ station in Valle Grande. Monthly data are for annual “water year” running from October through September. Right: Monthly precipitation at the HQ station, showing January – December patterns. Note that cumulative precipitation in 2008 is nearly equal to last year (2007) which led to record accumulation of forage productivity during the spring-summer period.

As in 2007, soil moisture conditions (Fig. 2) as of early June 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 wet month of May.

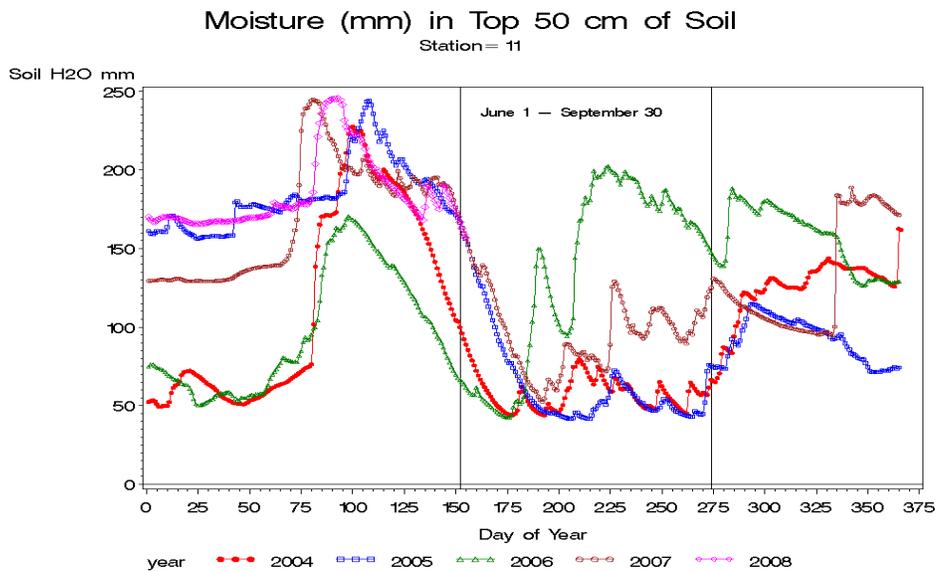


Figure 2. Soil moisture at HQ station, top 50 cm. Dates based on Julian Days (Jan. 1 = Day 1, Dec. 31 = Day 365). The livestock grazing season is shown as June 1 – Sept. 30). Note that soil moisture is essentially equal to values observed in 2007.

D. Climate forecast for summer, 2008. 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, 2008. 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 potentially 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 2008.

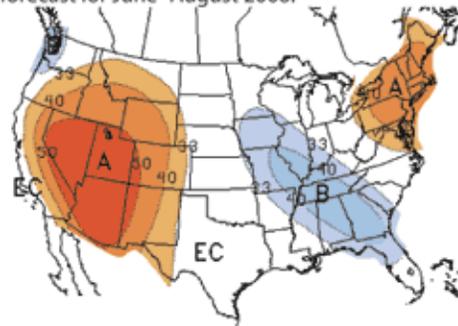


Figure 10b. Long-lead national temperature forecast for July–September 2008.

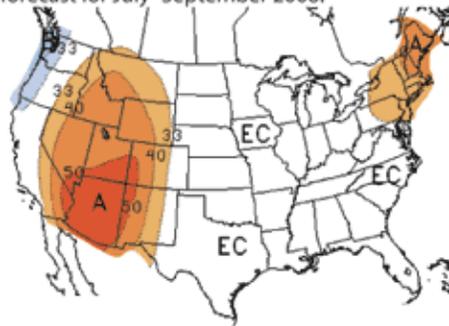


Figure 10c. Long-lead national temperature forecast for August–October 2008.

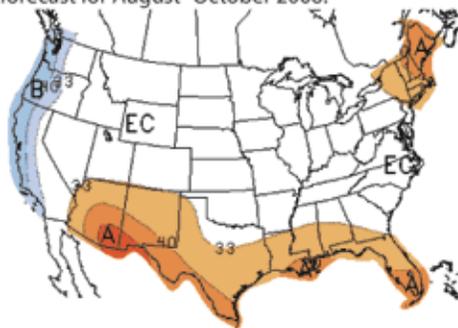
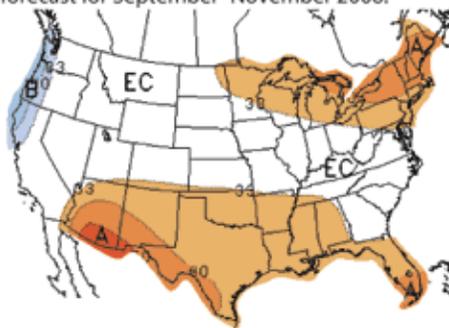


Figure 10d. Long-lead national temperature forecast for September–November 2008.



■ 50.0–59.9%
■ 40.0–49.9%
■ 33.3–39.9%
■ 40.0–49.9%
■ 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

Figure 3. Temperature forecasts for summer, 2008. These outlooks predict the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps are % probabilities and do not refer to degrees.

Figure 11a. Long-lead national precipitation forecast for June–August 2008.

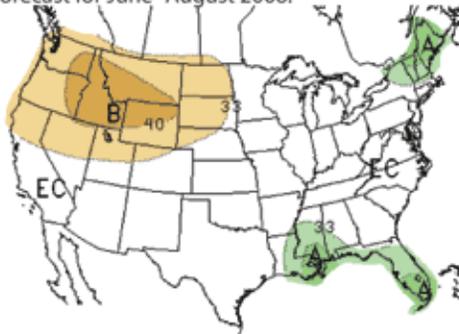


Figure 11b. Long-lead national precipitation forecast for July–September 2008.

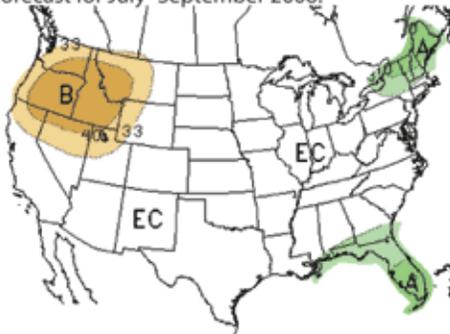


Figure 11c. Long-lead national precipitation forecast for August–October 2008.

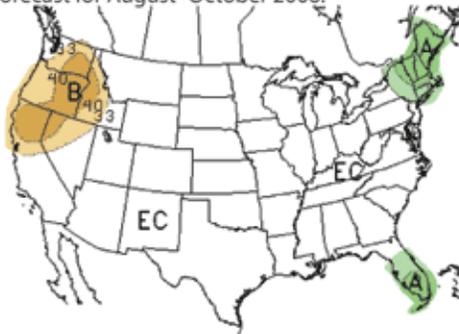
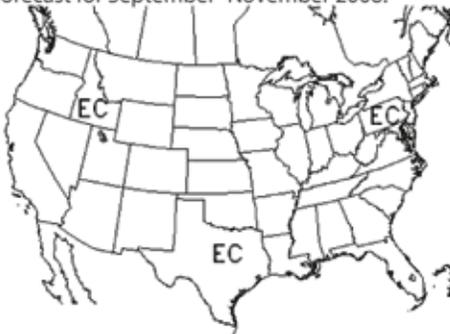


Figure 11d. Long-lead national precipitation forecast for September–November 2008.



B=Below
 33.3–39.9%
 40.0–49.9%

A=Above
 40.0–49.9%
 33.3–39.9%

EC= Equal chances. No forecasted anomalies.

Figure 4. Precipitation forecasts for summer, 2008. These outlooks predict the likelihood (chance) of above-average, average, and below-average precipitation, but not the magnitude of such variation. The numbers on the maps do not refer to inches of precipitation.

Drought conditions have alleviated somewhat in northern New Mexico since 2006, as a result of record monsoons in 2006, good rains in 2007, and a deep winter snowpack in early 2008.

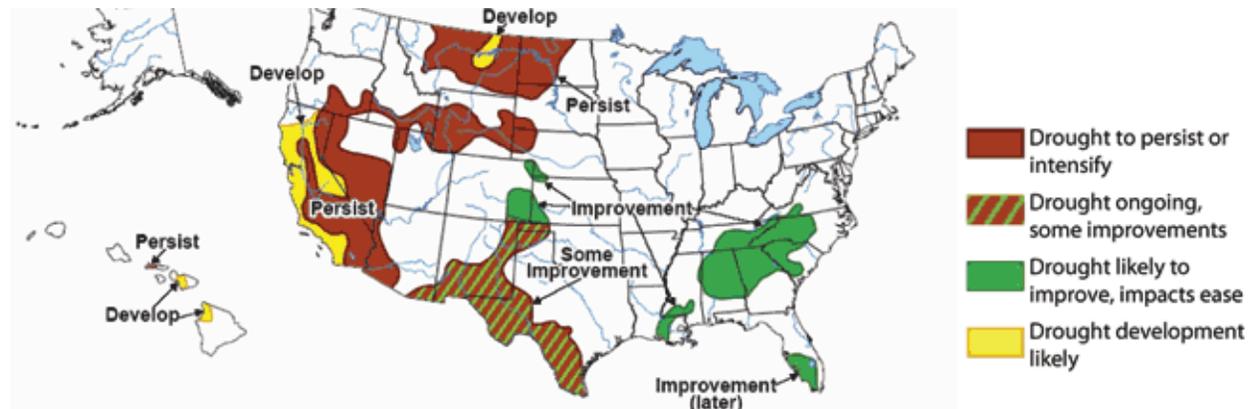


Figure 5. Drought outlook through August, 2008, in the United States as of May, 2008.

E. Stream flow and runoff. Data from the USGS stream gauge on the Jemez River show dramatic improvement in stream water discharge in 2008 compared to 2007 (Fig. 6). In late May, 2007, discharge was ~50 cfs (cubic feet per second), compared to ~69 cfs on June 7, 2008 (note that in late May, 2006, the flow was only 15 cfs). This 2008 flow rate resulted from the higher snowpack during the winter of 2007-2008, and the spring rains in May 2008. The improved discharge rate is indicative of good water availability in the upper watershed and the VCNP.

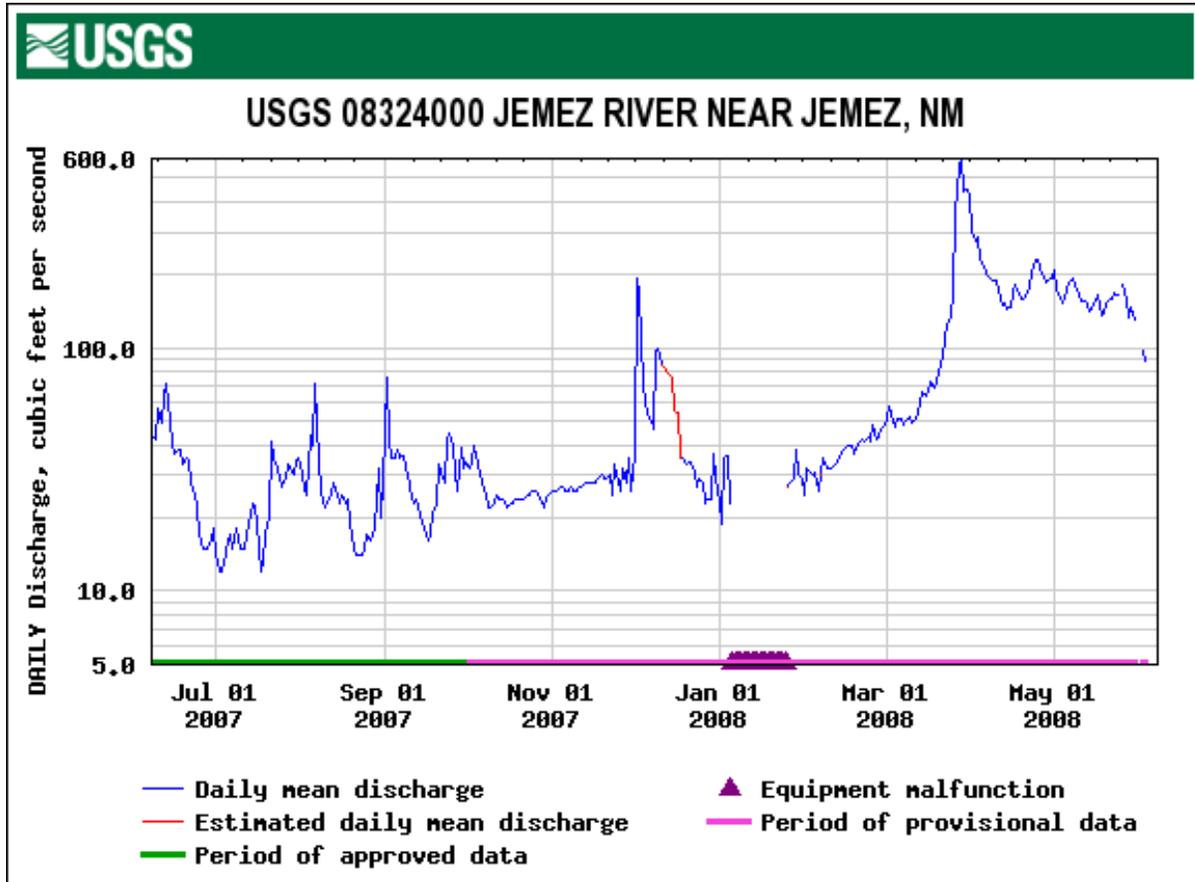


Figure 6. Discharge (cubic feet per second, or cfs) of the Jemez River (USGS stream gauge near Cañon, NM).

F. Stock tank water-holding conditions. In May, 2008, 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 2008 are derived as follows (*ref.* 2003 E.A. Amendment, pp. 3-4):

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 valleys (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, 2008, in the Mountain Valley habitat was computed as:

$$14,227 \text{ acres} \times 0.61 \text{ (proportion of MV habitat type)} \times 833 \text{ pounds/acre} = 7,229,165 \text{ pounds.}$$

In the Mountain Meadow habitat, the available forage was:

$$14,227 \text{ acres} \times 0.39 \text{ (proportion of MM habitat type)} \times 1,364 \text{ pounds/acre} = 7,568,195 \text{ pounds.}$$

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:	$7,229,165 \text{ pounds} \times 0.35 = 2,530,208 \text{ pounds forage}$
Mt. Meadow/Riparian:	$7,568,195 \text{ pounds} \times 0.15 = \underline{1,135,229 \text{ pounds forage}}$
	Total = 3,665,437 pounds forage available

The total forage available (3,665,437 pounds) divided by 900 pounds/AUM yields a total of 4,073 AUMs.

The VCNP livestock grazing program is set for 4 months (1 June through 30 September; *ref.* 2002 E.A., p. 33), and therefore the total number of Animal Units (AU) is 4,073 AUMs divided by 4 months, or 1,018 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 2008 is:

1,018 Animal Units / 0.7 = **1,455 steers/heifers.**

This is the herd size that could be supported if there were no new production of grass/forb forage in the Valles Caldera for the rest of the summer. However, given that soil moisture is excellent, we can anticipate that several more weeks of new forage growth will continue.

Given that the 2008 livestock grazing contract specifies that up to 2,000 steers/heifers will be brought on to the VCNP pastures during June through late September, the available forage for this herd size is sufficient to last for 88 days, or until August 27th, assuming no new net growth. The long-term forecast for summer precipitation is for “equal chance” of normal precipitation amounts during the monsoon (Fig. 4 above). An average monsoon will result in considerable growth of forage plants. However, the Trust will need to monitor the range condition and available forage amounts in July and August to ensure that the utilization rates do not exceed prescribed limits.