Planning for Variable (and Extreme) Weather—Grazing Management for Conservation and Sustainability in California Grasslands

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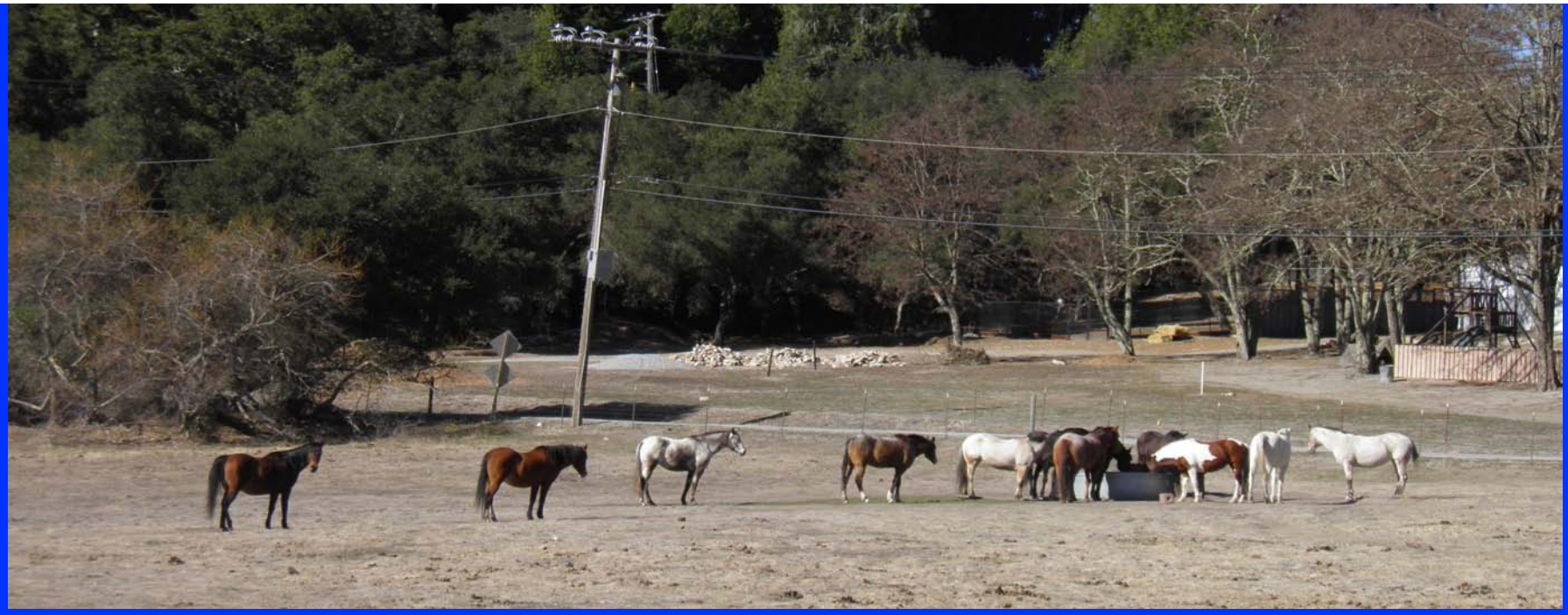
Outline:

1. Introduction
2. Risks and Challenges Due to Extreme Weather for Conservation of Working Rangelands in California
3. Planning Framework to Prepare for Extreme Weather
4. Public-Private Collaboration for Resilience to Variable (and Extreme) Weather



Introduction

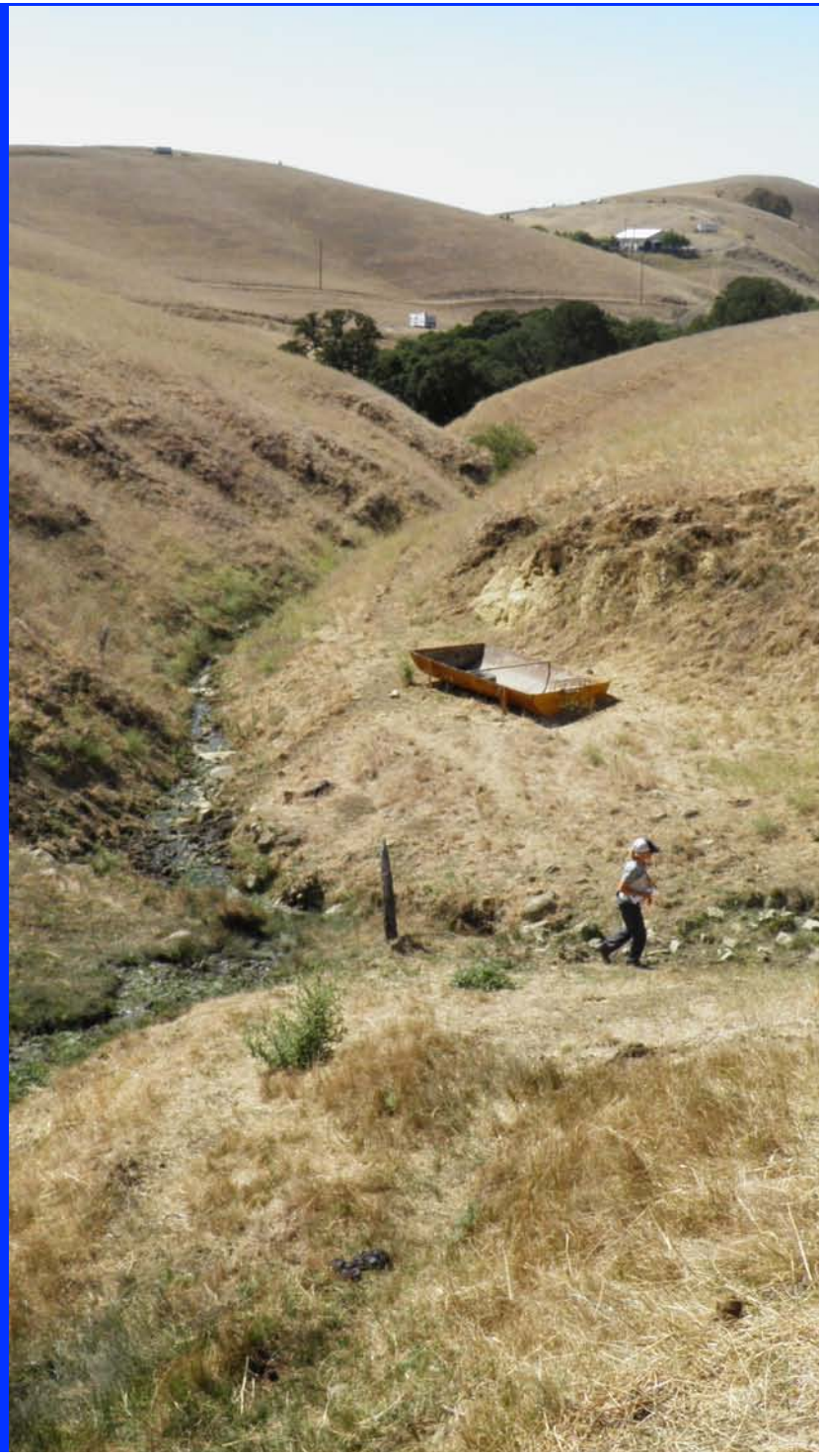
1. When extreme weather occurs, what alternatives to excluding livestock are available?
2. How can we achieve both conservation and a sustainable livestock community?
3. How can we provide flexibility to minimize impacts on special resources and the livestock operator?

Risks and Challenges (*Refer to Handout #1*)

1. Soil Integrity (erosion and compaction)
2. Grassland Condition and Grazing Capacity
3. Special Habitat Areas
4. Pest Plants

Risks and Challenges (*Refer to Handout #1*)

5. Woody Plants
6. Surface and Ground Water
7. Grazing Operations Costs
8. Livestock Availability to Perform Conservation Services



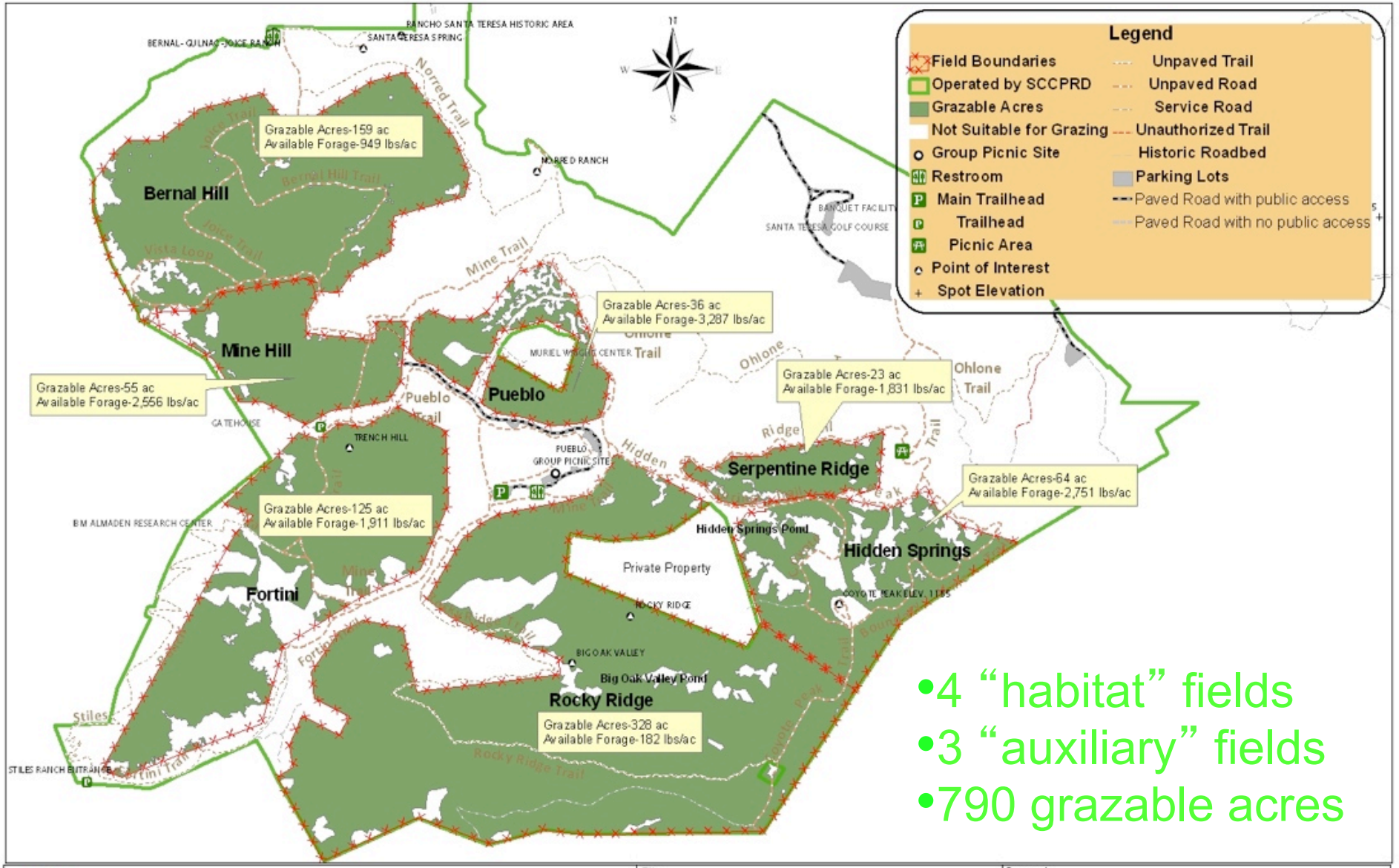
Planning Framework (*Refer to Handout #2*)

1. Grazing Management Plan
   - a. Resource conditions and vulnerabilities
   - c. Predicted effects
   - d. Guidance for flexibility
   - e. Sustainability of the livestock operation
2. Monitoring Reports
3. Adaptation of Management Actions

Public-Private Collaboration for Resilience

Informal and semi-formal mechanisms for flexibility:

1. Private Networks Off-Site
2. Non-Habitat Flexible Use Fields On-Site
3. Regional Grass-Banks
4. Program for Temporary Emergency Grazing Access



- 4 “habitat” fields
- 3 “auxiliary” fields
- 790 grazable acres

SANTA CLARA COUNTY PARKS

This map generated by the County of Santa Clara Department of Parks and Recreation. The GIS files were compiled from various sources. While deemed reliable, the Department assumes no liability.

Title: Grazing Capacity Map-Santa Teresa County Park		Comments:	
Date: March 7, 2011		Created By: DRocha	Scale: 0 265 530 1,060 1,590 2,120 Feet

Grass-Banking

1. Uses and values
   a) Replacement grazing land when forage is lost
   b) Temporary alternative forage for displaced livestock
   c) Supports sustainability of rancher-partners
   d) Expedite exchange of forage when needed for conservation practices
2. Membership and access
   a) Members make long-term agreement
   b) Members get access when needed or as planned

Grass-Banking

3. Pros & Cons for California (mostly cons…)
   a) Too small size of properties to support enough livestock
   b) Unexpected high costs to operate (taxes, insurance, fences, monitoring, and operation, administration)
   c) Un-grazed or under-grazed grasslands can suffer reduced quality of forage, pest plant invasions, increased conditions for disease (pink-eye), and thus lower livestock performance, when grazed
   d) Degraded infrastructure, requiring expensive rebuilding
   e) Reluctance to mix herds

***Handout #1*. Notes on Risks and Challenges Due to Extreme Weather for Conservation of Working Rangelands in California**

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Risks and Challenges (direct and indirect)	Affected by:		Effects on:	
	Drought	Heavy Rain and Flooding	Conservation	Livestock Production
1. *Soil Integrity* *Erosion—* • Increased sheet erosion, rills, and gullies, and increased deposits of sediments in streams due to high-volume rainfall, rainfall on dry soils, and at livestock concentration areas and vulnerable soils or slopes • Increased bank erosion due to high-flow in stream channels and flooding over the channel banks • Sediment pollution of lakes and streams; reduced productivity of the field; damage to ponds, roads, trails, and gullied and sedimented sites • If there was a flood, the excess water would flow in predictable places within the drainages; and thus could be managed within a flood zone (over-bank relief, vegetated buffers, monitoring for logjams, removal of hazardous materials, etc.) *Compaction—* • Increased compaction of vulnerable high-clay soils of low slopes and valley bottoms due to grazing traffic while those soils are saturated • Feedback to increased erosion, sedimentation, reduced productivity, and damage to lands	x	x	x	x
2. *Grassland Condition and Grazing Capacity* *Composition Change; Reduced Forage Quality, Quantity, and Availability; and Reduced Access to Fields—* • Too light and too severe defoliation (or variation in weather) can result can result in temporary annual plant composition changes and different amounts of residual mass (mulch versus thatch); thatch accumulation can require multi-year grazing to reduce it unless decomposed by favorable weather • If natural unplowed rangelands, severe grazing for up to 3 years usually doesn't deplete soil seed bank; no need for seeding (Bartolome 1976) • Excessive impacts of grazing (trampling, herbivory) in grazing fields due to shortages (failure to regenerate as normal in winter and spring) of forage during drought and flooding • Excess grazing during the spring and summer can lead to inadequate dry forage available the next fall at the start of the grazing period • Reduced area of lands available for grazing due to exceeding RDM minimum standards and exclosure of special habitat areas • Replacement/supplementation feed required, which is expensive and can't	x	x	x	x

Risks and Challenges (direct and indirect)	Affected by:		Effects on:	
	Drought	Heavy Rain and Flooding	Conservation	Livestock Production
sustain livestock health				
3. *Special Habitat Areas—* • Prolonged or extra impacts of grazing (trampling, herbivory) in areas designated as high-value for special-status species or natural communities due to shortages of forage during drought • Shifting habitat conditions might move boundaries of special management areas • Performance standards might be exceeded before that is recognized or before alternative grazing fields or replacement forage are found • Water-dependent habitats, such as riparian woodlands, wetlands, and salmonid streams, would be affected by persistent drought (and reduced or eliminated flow), and by flooding; these habitats could be more vulnerable to grazing impacts	x	x	x	
4. *Pest Plants—* • Trends of increased temperatures and changes in precipitation patterns may induce new conditions affecting populations and distributions of insect pests, disease pathogens, and pest plants • Increased soil disturbance due to erosion and landslides as well as reduced cover and more bare ground in grasslands may provide habitat for increasing or new infestations of pest plants	x	x	x	x
5. *Woody Plants—* • Encroachment of woody plants into grassland (seedling then sapling establishment) would be reduced by more frequent drought, and increased by both extended rainfall periods and reduced summer grazing (Ford and Hayes 2007) • Stress and increased mortality due to drought-caused drops in ground water or flooding • Increased grazing utilization of browse when herbaceous forage availability reduced	x		x	
6. *Surface and Ground Water—* • Reduced surface water flows can lead to dry wetlands, springs, creeks, and ponds during seasons they'd normally be wet • Reduced ground water can lead to wells not functioning, and thus not supplying water for livestock and people; well improvement or drilling new wells can be very expensive and risky • Reduced water supply for livestock; trucking water can be expensive and is not sustainable • Increased suitability for livestock access to normally wet wetlands, meadows, and wet grasslands	x		x	x

Risks and Challenges (direct and indirect)	Affected by:		Effects on:	
	Drought	Heavy Rain and Flooding	Conservation	Livestock Production
• Reduced surface water can lead to increased reliance on pumping from wells, which are often shallow and unreliable in drought • Reduced winds with fewer storms can lead to windmills not working, and thus the requirement to use other power sources to pump well water • Accentuates need for improved watershed retention and efficiency of water use and re-use				
7. *Grazing Operations Costs—* • Increased stress on livestock due to extreme heat, increased frequency of moving/shipping, and reduced forage quality and quantity that can reduce weight gains and disrupt reproduction • Increased frequency of demands from land owner to respond to changing conditions or management strategies, maintain infrastructure, move or concentrate livestock, repair eroded sites, control pest plants, attend meetings and communicate, and perform other extra conservation services • Added costs are disincentives to livestock operator to cooperate for conservation; and might require compensation • Excessive costs might lead to reduction or elimination of livestock herds; and to delayed re-building of herds • Reduced grazing due to reduced herd size could mean inadequate livestock numbers for fire hazard control if spring rains produce a lot of herbaceous mass; ranchers going out of business could mean increased conversion of rangelands from ranching to ranchettes	x	x	x	x
8. *Livestock Availability to Perform Conservation Services—* • Combinations of reduced forage, water, and grazing land access can lead to economic and operational stress (on both the livestock operators and eventually their supporting services), and thus reduction of livestock industry in region • Increased amplitude of the cycling of extreme weather adds to stress • Reduced availability of livestock in sufficient numbers to perform conservation services	x	x	x	x

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Bartolome, J.W. 1976. Early rains alter range forage. *California Agriculture*. 30(12):14-15.

Ford, L.D. and G.F. Hayes. 2007. Northern coastal scrub and coastal prairie. Chp. 7 in: M.G. Barbour, T. Keeler-Wolf, and A. Schoenherr (Eds.). *Terrestrial vegetation of California*, Third Ed. Berkeley: University of California Press.

Melillo, J.M., T.C. Richmond, and G.W. Yohe (Eds.). 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841p.

Handout #2. Planning Framework to Prepare for Extreme Weather in California Grasslands

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Planning Supplement:	
1) Grazing Management Plan	
a. Resource conditions and vulnerabilities to variable and extreme weather	i. Climate and weather history ii. Soils and sites vulnerable to erosion during storms and flooding iii. Special resources and elements of livestock operation vulnerable to temporary weather extremes
b. Goals, Objectives, and Performance Standards, including to sustain the special resources, productive capacity, and livestock operations	
c. Predicted effects of typically variable as well as extreme weather on the rangelands and the livestock operation, and their resiliency	i. Numerous reports about drought effects on livestock operations and assistance ii. Native grass populations fluctuate more in association with weather year cycles than management, and occur at sites of relatively low fertility (Spiegal et al. 2014; Hayes and Holl 2011) iii. Non-native forage grasses and their seed bank persist during droughts and over-use, but composition can change (Bartolome 1976 and 1979)
d. Guidance for flexibility of grazing management and provision of livestock needs	i. Grass-banks within properties or in regional networks ii. Core habitat versus flexible-use fields distinguished iii. Alternative watering sources and delivery means prepared in advance iv. Removal to home ranch or sacrifice fields
e. Sustainability of the livestock operation to provide conservation services and other stewardship	i. Integration with regional socio-economic systems ii. Guidelines, incentives, and contingencies for operations (for flexibility to adapt to extreme events and changing conditions)
f. Monitoring to efficiently provide accurate information for short-term management decisions and long-term adaptations of plans	i. Defined variables (related to weather effects), methods, standards, and schedule
2) Monitoring Reports	
a. Sections on observed weather trends, weather effects, grazing effects that exceeded standards, adaptive responses to extreme weather, and recommended next actions	
3) *Adaptation of Management Actions*	
a. Specified responses to results that exceed standards	

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Bartolome, J.W. 1976. Early rains alter range forage. *California Agriculture*. 30(12):14-15.

Bartolome, J.W. 1979. Germination and seedling establishment in California annual grassland. *J. Ecology* 67:273-281.

Hayes, G.F. and K.D. Holl. 2011. Manipulating disturbance regimes and seeding to restore mesic Mediterranean grasslands. *Applied Vegetation Science* 14:304-315.

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Spiegal, S., L. Larios, J.W. Bartolome, and K.N. Suding. 2014. Restoration management for spatially and temporally complex Californian grassland. Chapter 4 in: P. Mariotte and P. Kardol (Eds.). *Grasslands: habitat management, impacts of plant diversity and restoration strategies*. Nova Science.