



Home on the Range: Exploring and Assessing Climate Science Needs for Range Management in Arizona

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Presentation Overview

- Arizona Rangelands
- Connections to Climate
- Assessing Climate Science Needs for Range Managers
- Lessons learned, preliminary projects, and next steps



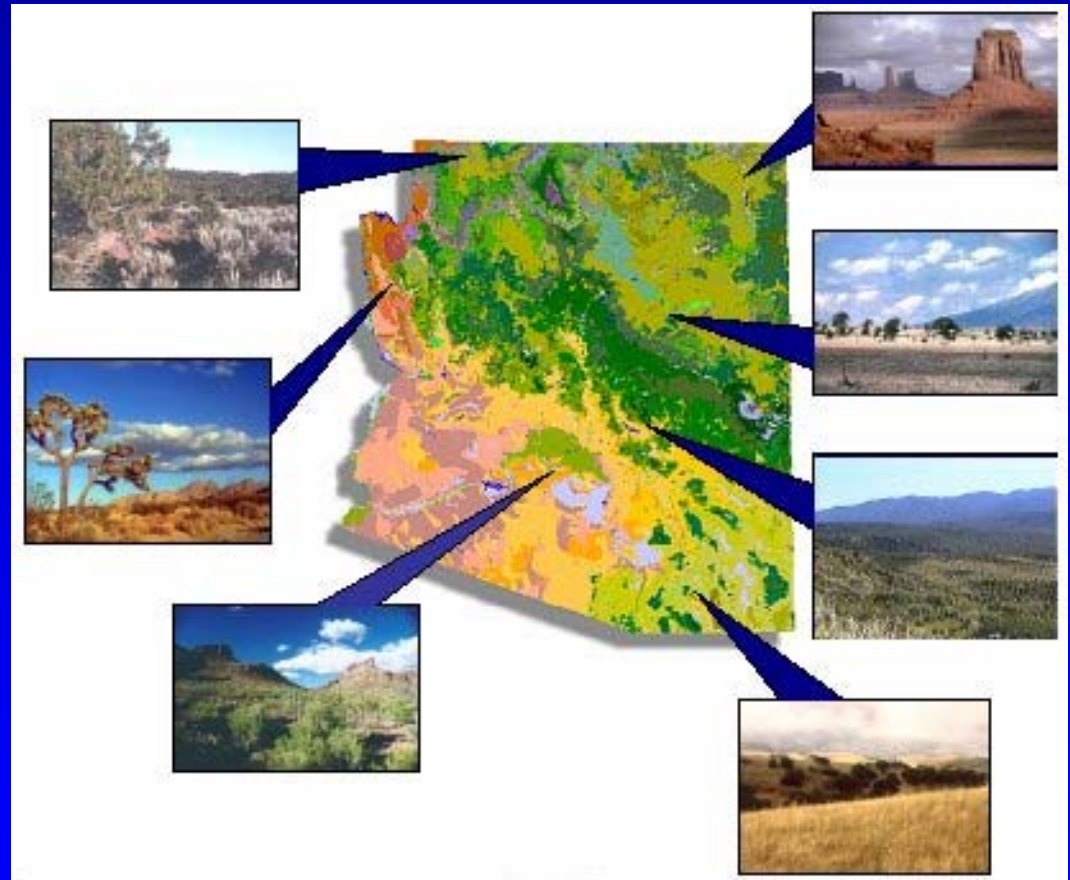
What are Rangelands?

Rangelands are a type of land on which the natural vegetation is dominated by grasses, forbs and shrubs and the land is managed as a natural ecosystem. (Society for Range Management 2006)



Arizona Rangelands

- ~80% of Arizona are rangelands
- Broad diversity of types
- Annual rainfall: 8-14 inches
- Managed for both livestock production and ecosystem function (private and public lands)



<http://rangelandswest.org>



Arizona Climate and Range Management

“Arizona ranchers are the canaries in the coal mine with respect to climate variability and change...we feel everything first.”

- *Rancher from southeast Arizona, March 2006*



Arizona Climate and Range Management

- Diverse types of rangelands (grasslands \leftrightarrow forested areas) with different connections to climate
- Quick response to changing conditions (species specific adaptations and strategies)
- Complex interactions between native/invasive species, disturbances, soil types, current and past management actions AND climate.



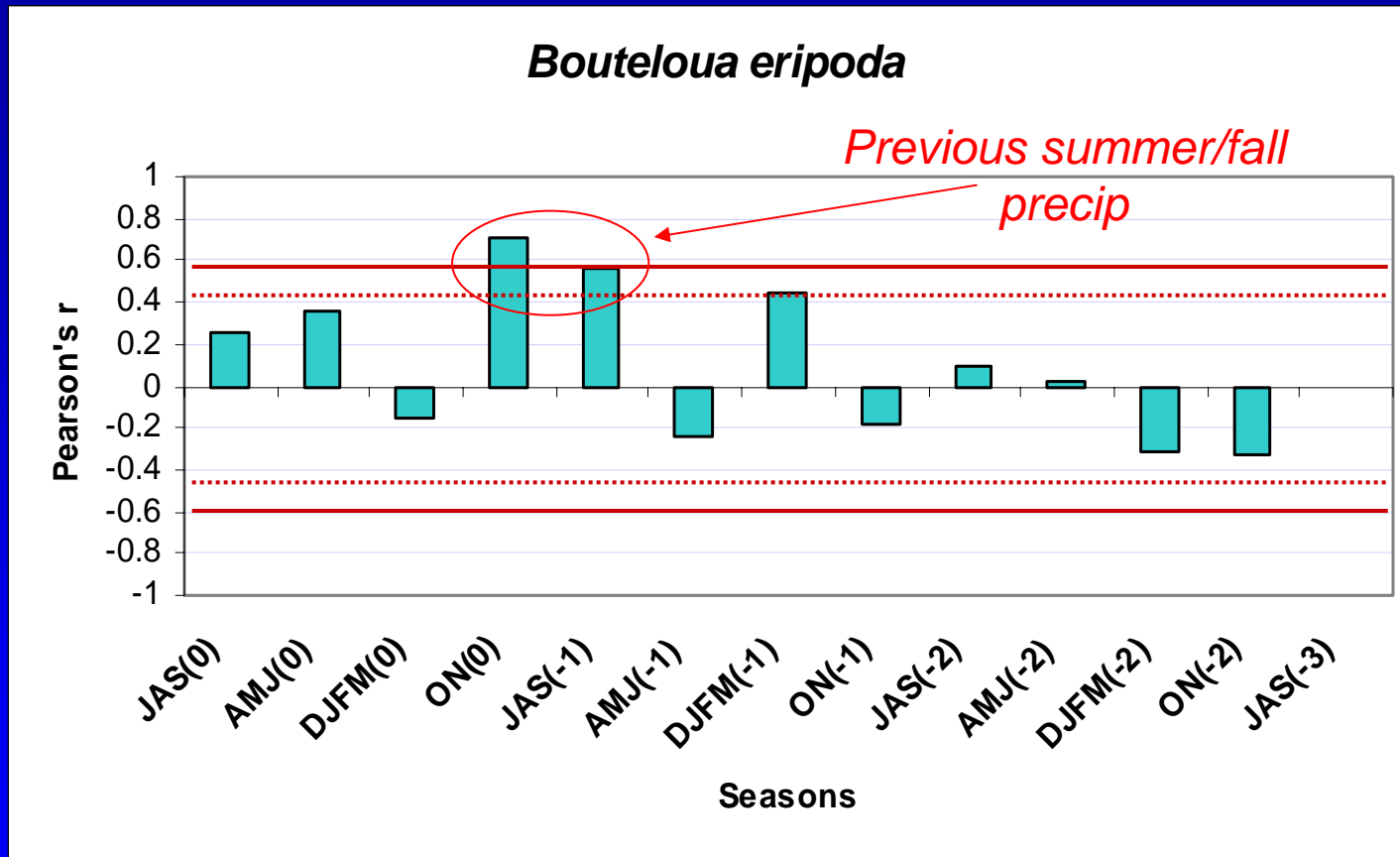
Arizona Climate and Range Management

Climate variability is important at many different scales

- Interannual variability, timing, duration, intensity of precipitation events
- Spatial coverage of precipitation
- Interactions between temperature and precipitation
- Climate-related disturbances (e.g. wildfire, insects, drought stress)



Role of Antecedent Moisture



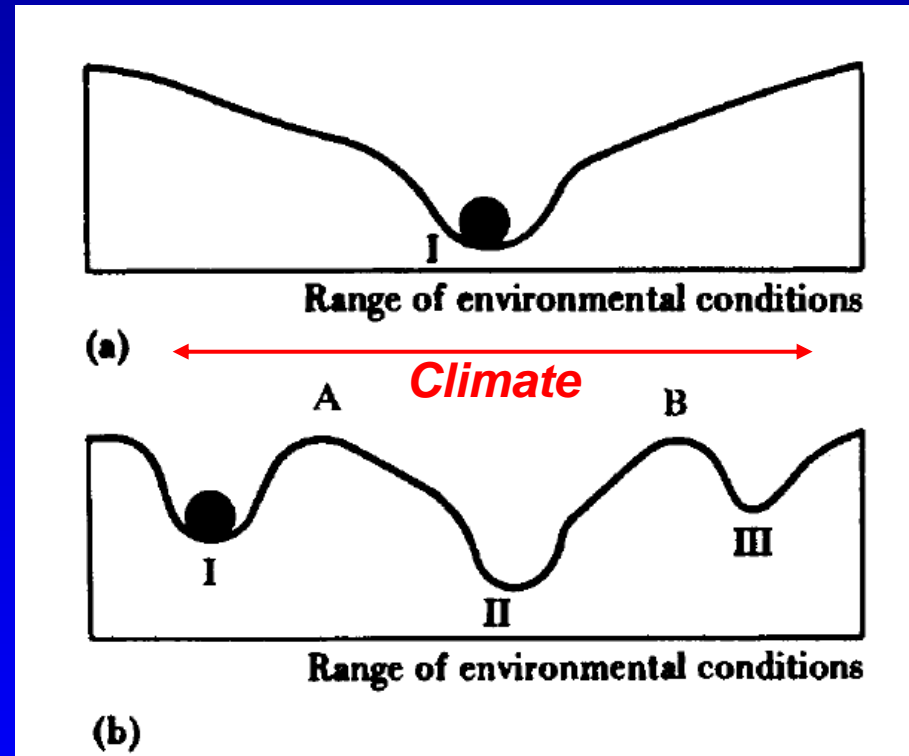
Black Grama

Correlation between vegetation cover and seasonal precipitation (Crimmins and Mau-Crimmins 2003)



Non-linear Interactions

- Semi-arid rangeland ecosystems are especially sensitive to climate variability
- Multiple stable ecosystem states with thresholds
- Complex and non-linear interactions with management actions and climate

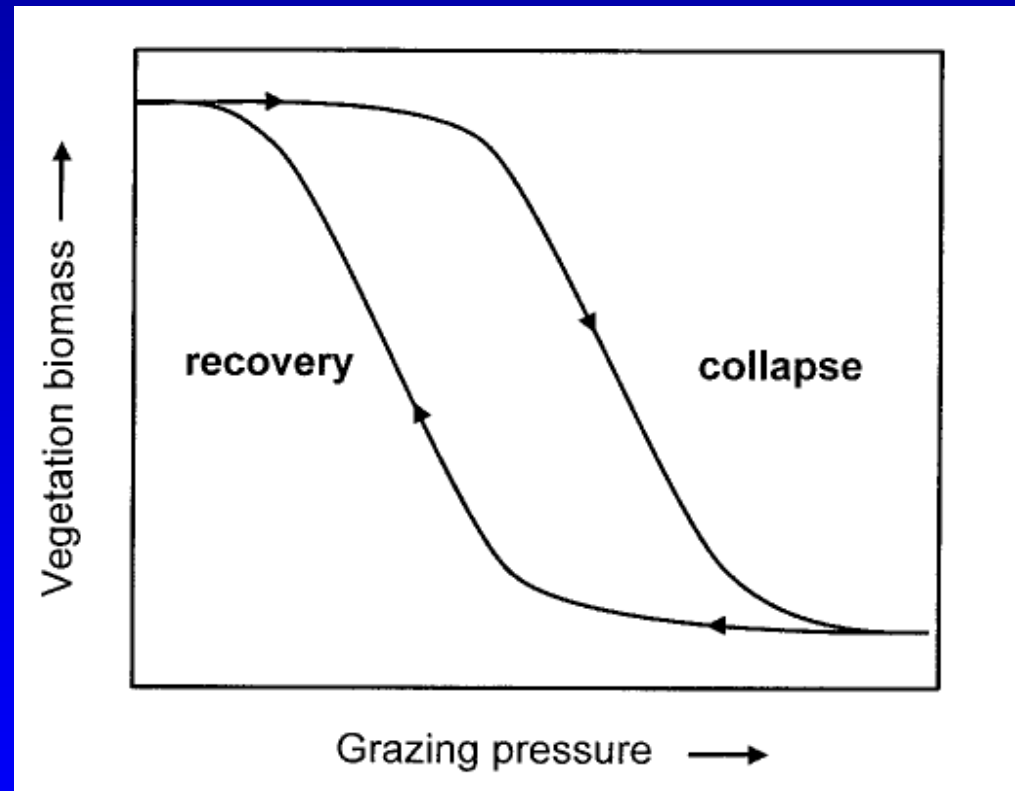


Laycock 1975



Hysteresis

- Challenge of managing for maximum productivity or planning restoration efforts under variable climate
- Different return path when threshold is exceeded
- High stakes in using forecast tools



Holmgren & Scheffer 2001



Everybody talks about the weather...

Tools/methods/strategies to reduce climate sensitivities

- Management options(?)
- Historical introduction of non-native species to increase cover (impacts on biodiversity, changing fire regimes)
- Other options??



Assessing Climate Science Needs for Range Management

- Assessment Approach
 - Group meetings, presentations, & panel discussions
 - Workshops
 - Targeted surveys
 - Informal site visits
 - Follow-up communications



Assessing Climate Science Needs for Range Management

- Partnerships
 - Society for Range Management – Arizona Section
 - Arizona Cattlegrowers Association
 - USDA-Natural Resources Conservation Service, U.S. Forest Service, Bureau of Land Management, National Park Service
 - Arizona Cooperative Extension Working Groups and County Offices



What have we learned so far?

- Summer vs. winter precipitation (stock pond water, warm/cool season grass production)
- Importance of monitoring (need for better precipitation monitoring; drought impacts, crop insurance payouts, grazing restrictions)
- Variables beyond precipitation and temperature (e.g. relative humidity)
- Need for guidance in implementation of seasonal forecasts
- Need for research into interpreting range monitoring data in conjunction with climate information

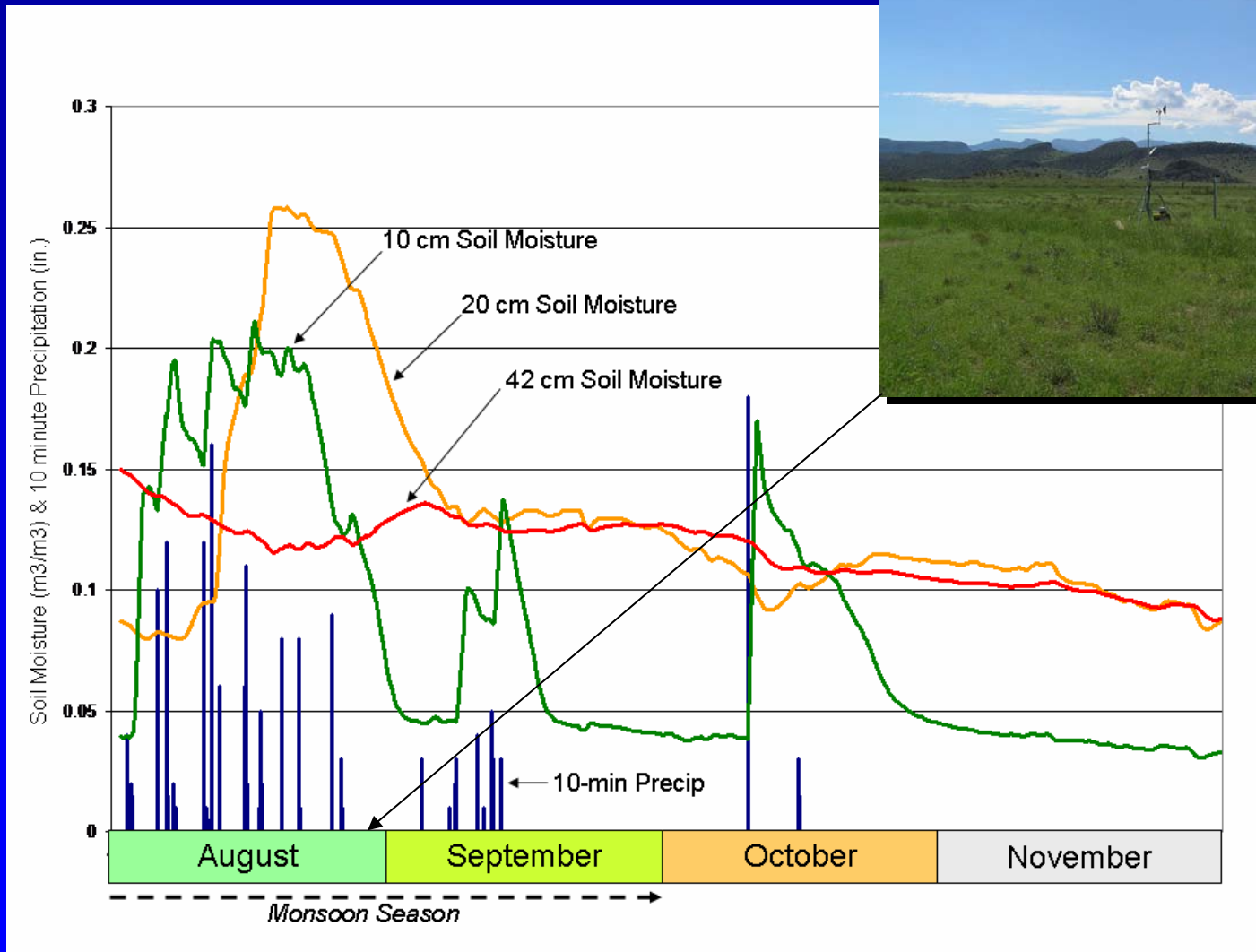


Applied Research

- Assessing the utility of non-traditional monitoring variables (e.g. soil moisture)
- Analyzing historical range monitoring data with multi-scale climate data (grazing vs. climate effects on range condition)
- Addressing soil-climate interactions on grazing land areas




Local Soil-Climate-Vegetation Interactions




Extension and Outreach: Communications

- Monthly to quarterly publications
- Sustained interaction with user groups
- Opportunity to gauge impact and solicit feedback




Southeast Arizona Climate Summary

Winter 2006




February 2, 2006 – The early winter period has been exceptionally dry and warm for southeast Arizona. December 2005 was the 7th driest since 1948 with a climate division average of 0.07 inches of precipitation for the southeast corner of the state. Precipitation for the entire winter season has been 1.10 inches below average at 40 stations. Tucson received 0.10 inches of precipitation, a record and 1.00 inches below average for the period of December-February with departures close to 2.2° F above normal.



Northwest Arizona Climate Summary

Early Spring 2006



March 6, 2006 – The 2005-2006 winter season has been exceptionally dry and warm for northwest Arizona. Temperatures were 1.5° F above normal for the period of December-February with departures close to 2.2° F above normal. The big story is the lack of snowpack in most of the river basins in Arizona and southern New Mexico. Drought or abnormally dry conditions have expanded to include nearly all of the Southwest, except for extreme northwestern Arizona.

Southwest Climate Outlook

Published by the Climate Assessment for the Southwest project and the University of Arizona Cooperative Extension

Issued: January 24, 2006

January Climate Summary

Drought – Severe drought conditions now exist in southeast Arizona and southwest New Mexico. Drought or abnormally dry conditions have expanded to include nearly all of the Southwest, except for extreme northwestern Arizona.

- Drought conditions are expected to intensify throughout most of the Southwest, due to recent warmer and much drier-than-average conditions.
- The lack of snowpack in most of the river basins in Arizona and southern New Mexico has led to a streamflow forecast of well below average.
- Drought conditions are improved from last year, but many important reservoirs in New Mexico remain below average.

Temperature – Since the start of the water year on October 1, 2005, temperatures over most of the Southwest have been above average.

Precipitation – Almost all of the Southwest has been drier than average since the start of the water year, especially during the last two months.

Climate Forecasts – Experts predict increased chances of warmer-than-average temperatures through July, and below-average precipitation through May.

El Niño – La Niña or ENSO-neutral conditions are expected to prevail over the next three to six months.

The Bottom Line – Drought is likely to persist or intensify over most of the Southwest except for far western Arizona.

The climate products in this packet are available on the web: <http://www.ispe.arizona.edu/climas/forecasts/swoutlook.html>

Disclaimer – This packet contains official and non-official forecasts, as well as other information. While we make every effort to verify this information, please understand that we do not warrant the accuracy of any of these materials. The user assumes the entire risk related to the use of this data. CLIMAS disclaims any and all warranties, whether expressed or implied, including (without limitation) any implied warranty of merchantability or fitness for a particular purpose. In no event will CLIMAS or the University of Arizona be liable to you or to any third party for any direct, indirect, incidental, consequential, special or exemplary damages or lost profits resulting from any use or misuse of this data.

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Lack of snow in the Southwest

Snow is important for more than just skiing or snowboarding—it is also a crucial part of the Southwest's water supply. Spring runoff from melting winter snow is essential for maintaining river volumes and reservoir levels throughout the Southwest. So far this winter, snowfall in the region has been far below average. In Flagstaff, less than an inch of snow has fallen since September 1, 2005—more than 41 inches below average. In New Mexico, snow water content at sites throughout the state ranges from 4 to 35 percent of average. Projections for spring runoff range from 30 to 48 percent of average for many rivers in Arizona. Fortunately, many reservoirs, including those which supply the Phoenix area, still have adequate water from above-average precipitation last winter.

See page 11 for more info on Southwest Snowpack...

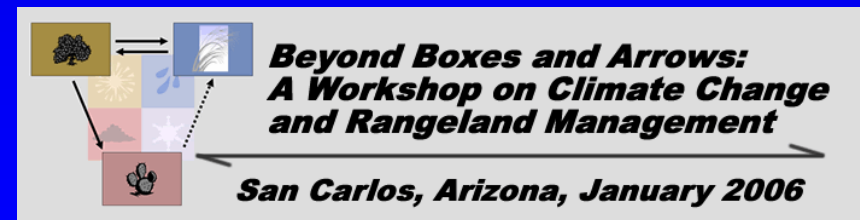


Climate Science Applications Program - Arizona Cooperative Extension



Extension and Outreach: Workshops

- Workshop on climate change and range management organized in conjunction with CLIMAS, Arizona Society for Range Management, & Cooperative Extension
- Presentations and panel discussion were followed by hands-on climate-range management exercise
- Pre & Post-workshop surveys conducted



Next Steps...

- Additional opportunities for conversations with range management community at upcoming drought planning workshops
- Climate-range management working group being developed with AZ-SRM and AZ-NRCS
- Development of new and refinement of existing climate extension and outreach tools (SWCO, county bulletins and newsletters)
- Ongoing interdisciplinary research with soil scientists & range ecologists



A photograph of a sunset over a mountain range. The sun is low on the horizon, partially obscured by a mountain ridge, creating a bright glow and casting long shadows. The sky is filled with wispy clouds, some of which are illuminated by the setting sun. The foreground is in deep shadow, showing the silhouette of the mountain range.

Happy Trails!

<http://cals.arizona.edu/climate>