Title: "Grass-Cast: what is it and why use it?"

Speaker: Dannele Peck

Coauthors: William Parton, Melannie Hartman, Justin Derner, William K. Smith, Brian Fuchs, Rafael Guerrero

Producer Abstract:

Precipitation in the Great Plains varies widely from year to year, making it challenging for ranchers to match animal demand to forage supply. Flexible stocking can help improve matching, enabling ranchers to capture more profit during wet years and experience smaller losses during drought years. Yet the benefits of flexible stocking depend on having an accurate seasonal precipitation forecast, or better yet, an accurate rangeland forecast for the upcoming grazing season. Grass-Cast was released three years ago to provide a grassland productivity forecast for the Great Plains region. Starting in mid-April, Grass-Cast provides a forward-looking estimate of peak standing biomass during the upcoming summer growing season (in pounds per acre, relative to a local area's 38-year average, where a local area is defined as a 6-mile x 6-mile grid cell). Grass-Cast can help ranchers put flexible stocking into action by translating precipitation outlooks into a rangeland outlook. Dr. Peck will demonstrate how to access and interpret the Grass-Cast maps, and combine them with local knowledge and other science-based information, to develop grazing management plans for the upcoming grazing season, depending on whether precipitation over the growing season is expected to be above, near, or below-normal.

Proceedings Paper:

Introduction

Precipitation in the Great Plains varies widely, both within and across years, making it challenging for ranchers to match animal demand to forage supply. Flexible stocking can improve matching, enabling ranchers to capture more profit during wet years and experience smaller losses during drought years (Bastian et al. 2018). Yet the benefits of flexible stocking depend on having an accurate seasonal precipitation forecast (Peck et al. 2019). Seasonal precipitation forecasts contain relevant information for ranchers and other rangeland managers, but are difficult to translate into the amount of grass expected to grow on native rangelands during the upcoming summer season. Precipitation forecasts would be more useful to the ranching community if they were translated into rangeland forecasts. With this vision, a team of researchers from USDA Agricultural Research Service (ARS), Natural Resources Conservation Service (NRCS), and Climate Hubs, in collaboration with Colorado State University, University of Arizona, and the National Drought Mitigation Center, developed a Grassland Productivity Forecast, or "Grass-Cast," for ranchers in the Great Plains region (O'Brien 2020).

What is Grass-Cast?

Developed in 2018 for the Northern Plains, and expanded in 2019 to the Southern Plains, Grass-Cast uses observed weather data from past years through the date the maps are made, in

combination with precipitation scenarios for April through August, to estimate expected productivity of rangelands at a 6-mile by 6-mile scale. The resulting productivity estimates—measured in pounds per acre of above-ground vegetation biomass at the growing season's peak—are then categorized as some percentage above or below the local area's 38-year production history (Peck et al. 2019).

Because precipitation in the Great Plains is difficult to forecast accurately, especially at a seasonal scale (3 to 4 months ahead of the grazing season), we instead produce three different Grass-Cast maps representing three potential precipitation scenarios for the growing season: above-normal, near-normal, or below-normal precipitation from the date the maps are made through the rest of the growing season, ending on August 31. The 3-map Grass-Cast outlook for the peak of the 2020 growing season is then updated every two weeks using newly observed daily weather data. As the growing season unfolds, Grass-Cast becomes more accurate, so ranchers should check the maps periodically throughout the season, not just once at the beginning of the season.

Figure 1 shows an example set of Grass-Cast maps, produced on April 14, 2020, for the summer 2020 growing season. A final Grass-Cast map of the season is produced on August 31st and provides a final estimate of peak biomass after all weather during the growing season has been observed such that precipitation scenarios are no longer needed (Peck et al. 2019).

To access the most up-to-date Grass-Cast maps, go to https://grasscast.unl.edu. When viewing the Grass-Cast maps, choose a location that interests you. Note the color of your location in each of the three Grass-Cast maps. The three colors shown for your location indicate how much higher or lower grassland production is expected to be, compared to your local area's long-term average production, depending on whether precipitation through the rest of the growing season is above normal (left map), near normal (middle map), or below normal (right map). Figure 2 demonstrates how to interpret these three Grass-Cast maps (made on May 15, 2020) for an example location of interest in Nebraska. For a clear demonstration of how to use Grass-Cast to inform stocking decisions, see Voth (2018).

Implications

The 3 Grass-Cast maps provide "sideboards" on potential forage supply, which ranchers can then try to match with animal demand. For example, if Grass-Cast indicates that an area's forage production might range from +5% (with above-normal precipitation) to -15% (with below-normal precipitation) in the upcoming grazing season, then a rancher could narrow the range of yearlings to consider retaining for the summer. Or if two of the three Grass-Cast maps indicate that an area is expected to have below-average pounds per acre, ranchers could prepare to take drought management actions, such as selling yearlings, weaning calves early, or moving cattle to areas with more abundant forage.

Grass-Cast does have some limitations, so ranchers should use Grass-Cast in combination with their local knowledge of soils, plant communities, topography, and management to help with decision-making. One limitation is that Grass-Cast cannot tell the difference between desirable forage species and undesirable species. So, it is important for ranchers to know what proportion

of a pasture is occupied by weeds, and to monitor different vegetation types to see if one is responding to the weather better than the other. Grass-Cast also does not directly account for local management practices, such as grazing intensity in previous years. Grid-level productivity estimates should therefore be adjusted to reflect if a specific pasture has been managed in a way that makes it more (or less) vulnerable to drought compared to other pastures in the area.

Given the limitations of Grass-Cast, ranchers should not rely on it as a sole source for making management decisions. Similarly, public land managers should not use Grass-Cast as a sole source of information for setting stocking rates, determining turnout dates, or other aspects of lease agreements, allotments or permits. Grass-Cast should be used in combination with local knowledge and other data-driven sources of information, such as the U.S. Drought Monitor (https://droughtmonitor.unl.edu) and the near-real-time "Vegetation Drought Response Index" (https://vegdri.unl.edu). Grass-Cast complements these tools by providing a unique, forward-looking view, which helps ranchers anticipate sooner if grazing resources are more likely to be abundant or scarce, and thus if animal demand should be adjusted to better match forage supply.

Acknowledgements

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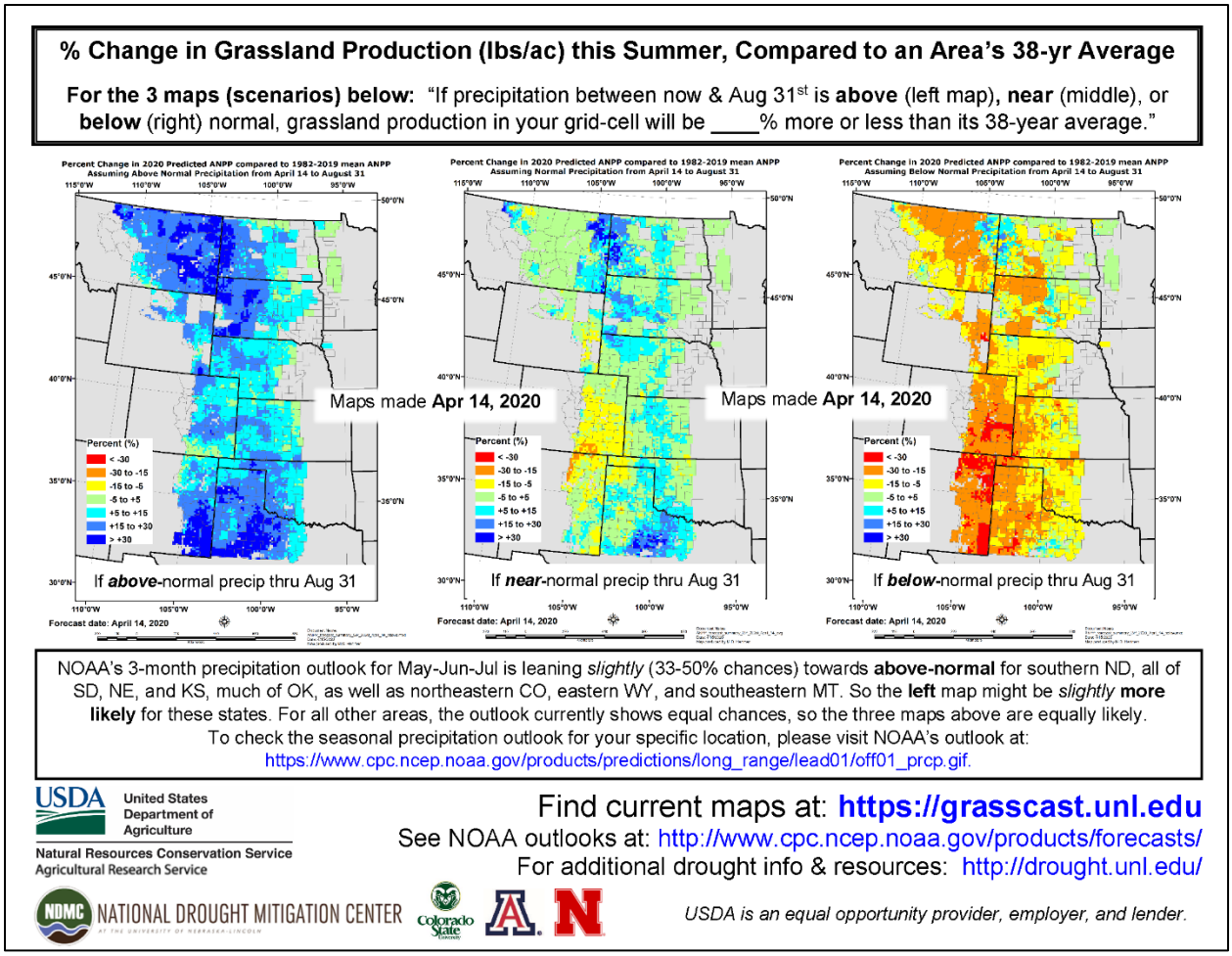

Figure 1. An example set of Grass-Cast maps, similar to those available on the Grass-Cast website, http://grasscast.unl.edu/. This example was produced on April 14, 2020, and provided an early forecast for the 2020 growing season. Grass-Cast's estimate of total production at the peak of the growing season is updated every two weeks, through August 31, 2020. See the text box above the maps to learn how to interpret the 3 panels (left, middle, right). Next, see the color-scale inside each panel, which explains for each local area whether it is forecasted to have X% more or less pounds per acre of rangeland vegetation than the average of its 38-year production history. Finally, see the text box below the maps to learn whether one panel is more likely to occur than others, or if they are equally likely.

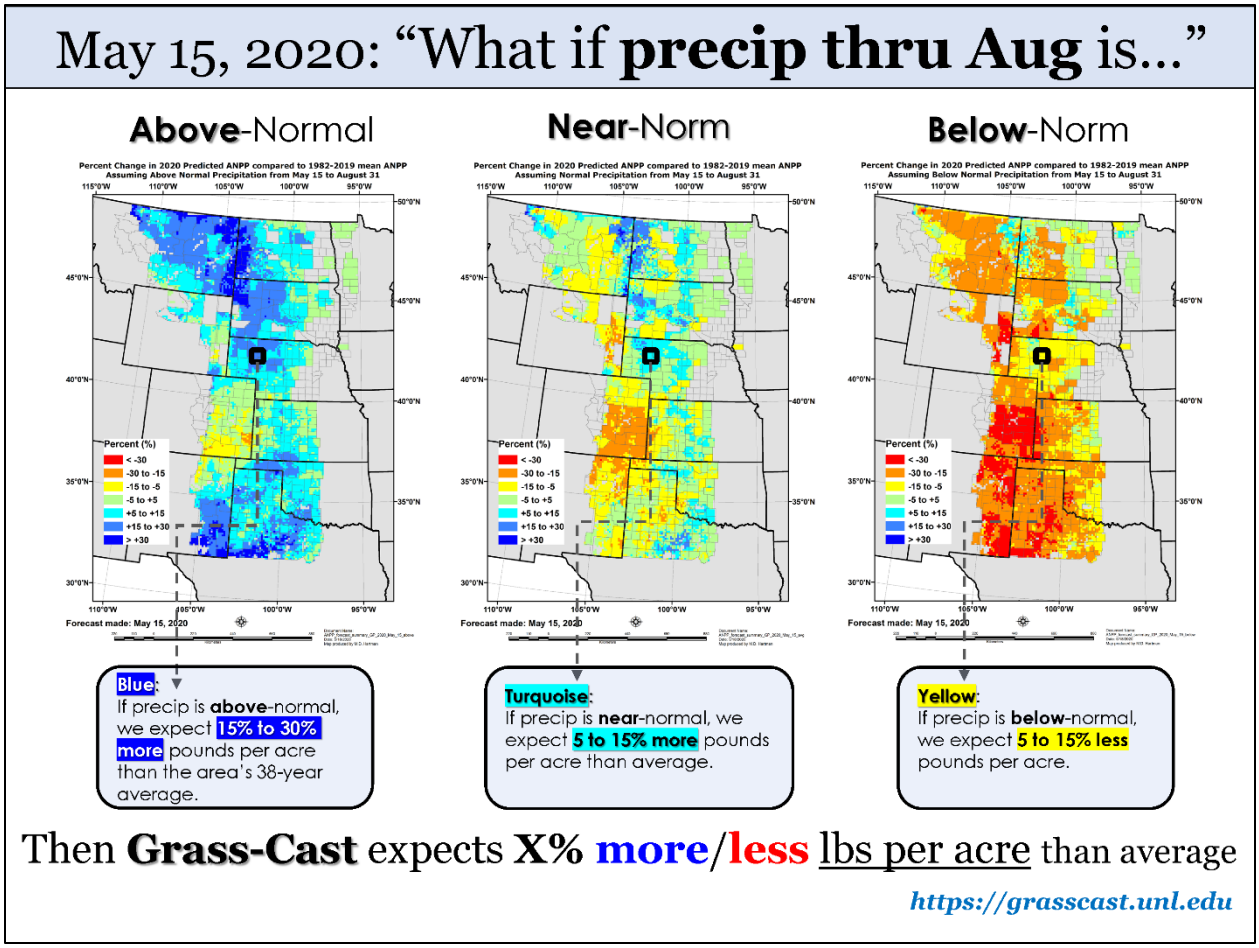

Figure 2. A demonstration of how to interpret the Grass-Cast maps for a location of interest, using example maps made on May 15, 2020. This 3-map set, at the time it was made, provided a forecast for the 2020 growing season of peak pounds per acre expected to grow on native rangelands compared to the area's 38-year average.