Climate Change, Climate Variability, and Ecosystem Response in the Great Basin

Great Basin Science Delivery Project
Webinar, October 26, 2011

Faith Ann Heinsch,
U.S. Forest Service, RMRS, Missoula, MT
faheinsch@fs.fed.us

Climate change and its resulting impacts are the foci of much scientific study. The Fourth Assessment Report of the Intergovernmental Panel of Climate Change (IPCC, 2007) reports that

> *"warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."*

Global precipitation patterns have also changed, and drought has increased in many places, particularly since 1980. Ecosystems have responded to these changes in various ways.

Current ecosystem responses to increased temperatures and drought in the Western U.S.:

- In the western U.S., winter precipitation is more often falling as rain than as snow, with the percentage of snow decreasing by 12-40%. This is exacerbated by warmer winter and spring temperatures, leading to earlier snowmelt and less spring snowpack (Mote 2003; Stewart et al. 2005; Barnett et al. 2008).
- There has been a documented increase in the length of the growing season across the United States. This has led to increased vegetation growth across much of the country, where adequate precipitation is available.
- Wildfire intensity has increased, particularly in the western U.S., a result, in part of longer, drier summers.

Predicted future climate change for the western U.S.:

- Both summer and winter temperatures are predicted to increase in the western US by about 3°C (5.4°F) during the next 30-50 years.
- During this same period, the amount of summertime precipitation is expected to decrease as is the amount of precipitation falling as snow. The northwestern U.S. will continue to experience earlier snowmelt and lower average spring snowpack, while droughts are expected to increase in length and severity in the southwest U.S. (Julius and West 2008).

Projections for increased fire:

- These changes could have significant impacts on water availability in western U.S. ecosystems, leading to:
    - Increased wildfire,
    - Decreases in fire-sensitive species and specialists,
    - Increases in annuals and weedy species (McKenzie et al., 2004), and
    - Possible large-scale vegetation shifts, with a loss of alpine and subalpine forests and an increase in woodlands/savannas (Lenihan et al. 2008).
- The response of vegetation to such changes will be driven by a *combination* of temperature and precipitation changes as well as management actions.

Impacts on public management:

- Managing ecosystems in a changing climate brings additional challenges. The past may no longer be a good predictor of the future. The focus should be on healthy resilient ecosystems, rather than specific species assemblages.
- No single management solution will fit all areas or regions. Managers should seek to incorporate a range of options for both the short- and the long-term, and look for solutions that best fit their area, while managing for realistic outcomes.
- There are several options that managers can consider, including:
    - Applying surface fuel treatments in areas of high resource, economic, and political values (such as the wildland-urban interface),
    - Maintaining biological diversity and planning for post-disturbance management
    - Implementing early detection and rapid response,
    - Incorporating climate change into restoration planning,
    - Anticipating that there will be big surprises (e.g., mega droughts, larger fires, system collapses, species extirpations), and
    - Planning for the unexpected.