Progress and Prospects for Connecting the Climate Research and Water Management Communities: Predictions, Applications, and Decision-Making

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Russian River Basin

Environmental Management Challenges

• Native salmonid impacted by:
  - changes in stream flow (Eel River imports)
  - water temperature
  - flood control/water supply dams
  - channel incision/geomorphology
  - ocean productivity
  - hatchery (genetic diversity & disease)
  - invasive species competition
  - land use practices

• Minimum stream flows support both river recreation and fish habitat/passage for Endangered Species Act listed populations.
Russian River Environmental Management Challenge: Lake Mendocino

- Lake Mendocino is one of two major reservoir projects used to manage water supply for the Russian River watershed.
- Provides flood control
- Provides water supply for
  - minimum stream flows
  - agriculture
  - municipal and industrial use
Lake Mendocino
Environmental Intelligence Challenge

Lake Mendocino Water Years 2012 - 2014

- Storage
- Storage Curve
- Cumulative Rainfall

Flood Control Rule Curve

Can we save some of this water?

Reservoir Storage

Cumulative Precipitation
Lake Mendocino

Water Supply Challenge Persists

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Can we save some of this water?

Reservoir Storage

Cumulative Precipitation

July 8, 2014

Water Supply Challenge Persists
To “save some of this water” from improved early warning

Need to know large scale dynamics of extremes to predict the timing of the next extreme precipitation event

- Reliable and skillful hazard outlooks at 0 to 14 days
  (do not immediately evacuate water from flood pool by implementing “forecast based operations”)

- Reliable and skillful subseasonal outlooks at 15 to 45 days
  of risk for extreme precipitation events before the end of the winter/spring rain season
    (able to hold additional water in flood pool space until seasonal rule curve changes)
Lake Mendocino
Environmental Intelligence Needs - 2

To “save some of this water” by informed preparedness

Need to know the large scale climate dynamics of extremes to predict changes in extreme precipitation event risk

✓ reliable and skillful seasonal outlooks at 3 to 6 months of conditional risk of more or less extreme precipitation events over the winter/spring rain season (hedging strategies in managing flood pool space decisions to implement forecast-based operations)

✓ reliable and skillful multiseason to multi-decadal outlooks of risk for more/less extreme precipitation and drought (hedging strategies in managing water supplies, minimum flow releases, and consumptive uses)
To “make better use of saved water”

✓ reliable and skillful site-specific short term frost forecasts and subseasonal-to-seasonal cold outbreak outlooks (*guide and reduce the use of water from the Russian River to spray their vineyards to protect the grape blossoms*)

✓ reliable and skillful 0 to 14 days precipitation forecasts and subseasonal-to-seasonal streamflow outlooks (*guide hatchery releases to maximize vitality of native populations*)

✓ reliable and skillful subseasonal-to-seasonal coastal upwelling outlooks (*guide management of native and hatchery fisheries*)
Lake Mendocino
Environmental Intelligence Needs - 4

To “make better use of saved water”

✓ reliable and skillful seasonal to decadal outlooks of the nutrient content of upwelled water (*guide management of native and hatchery fisheries*)

✓ reliable and skillful annual to multi-decadal outlooks of local sea level rise (*inform water supply requirements to manage salt water intrusion in estuaries*)

✓ reliable and skillful projections of changes in West Coast’s Mediterranean climate (*inform the sustainability of current reservoir systems and water management practices to meet the full spectrum of water supply requirements*)