

Uses and needs for climate information by municipal water providers on the Front Range of Colorado

Climate Prediction Assessment Workshop
March 21-24, 2006
Tucson, AZ

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Study purpose

- To identify water user needs for climate products (information and forecasts)
- Match these needs to WWA and NOAA climate research or identify new research areas
- Complement other WWA work on the South Platte basin
 - South Platte Regional Assessment Tool (SPRAT), e.g. decision rules
 - Drought Management
 - Climate Affairs
- Continue dialogue between these managers and WWA researchers
- Complement similar studies on climate and municipal water management at CLIMAS, Penn State

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Study Design

- Previous interactions with all providers
 - Participants in past workshops since 1998
 - Reservoir management studies
 - Other water management meetings
- Analysis of secondary sources: operations and planning documents, EIS documents, system information, etc
- Focus on both annual operations and longer-term planning
- Interviews
- WWA Workshop with Colorado water managers in December 2005

Study participants

- Six municipal water providers
 - Denver
 - Westminster
 - Boulder
 - Aurora
 - Colorado Springs
 - Northern Colorado Water Conservancy District (NCWCD)
- Provide water to about 63% of Colorado's population of about 4.3 million people, either directly or through contracts or shares

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NCWCD

Boulder

Westminster

Denver

Aurora

Colorado
Springs



Characteristics

- Old cities with senior water rights and more slowly growing demand, cities near “build-out”
 - Denver, Westminster, Boulder
 - Newer suburbs with junior water rights and expanding population and demand
 - Aurora, Colorado Springs Utilities
 - Shift from agricultural ownership and use to municipal ownership and use
 - Northern Colorado Water Conservancy District, Westminster, Boulder
 - Transmountain diversions
 - Denver, Boulder, Colorado Springs, Northern
 - Professional capacity of staffs varies considerably
 - Some have larger and more highly trained staff, more time to devote to exploring new technologies or management strategies
- **Vulnerabilities to climate vary; interest in climate varies**

Context for Municipal Water Management

- Water management and development has evolved in response to growth
 - 1860's: Early surface water development and groundwater use
 - Early 1900s: Development of smaller reservoirs
 - 1950s: Transmountain diversions
 - Conservation: Denver example
 - Cities acquire agricultural rights and often major ownership in ditch companies for municipal use; renting water back to ag is common
 - Drought planning; reuse facilities and distribution
 - Exchange agreements, and collaboration among cities
- **Strategies to increase efficiency show continual innovation & adoption of new technologies, practices**

Current uses of climate information in water management

- Use of the instrumental record of hydro-climate variables in planning and operations models
- The use of climate influenced hydro-climate parameters to generate projections of streamflow, reservoir contents, or water supply
 - SWE, historic records of streamflow, water year precipitation
- Use of paleoclimate data, e.g. reconstructions of SWE or streamflow
- Use of forecasts of climate variables, e.g., precipitation or temperature, such as the NOAA/CPC Monthly and Seasonal Climate Forecasts, or medium-range weather forecasts
- **Climate variability reflected in annual and longer term operations in ways other than use of forecasts**

Annual Operations

Current uses of climate related information:

- NRCS/NWS April-July volume forecasts
 - MBRFC not as active in this part of their region as CBRFC, most perceive these as solely an NRCS product
- Arbitrary use of 10%-50%-90% exceedances to represent risk of extreme conditions
- Drought/ supply shortage assessment
- Several municipalities consult CPC monthly and seasonal products, but say these only influence them when they're "on the fence"
- Interest in improved monthly and seasonal CPC forecasts, but:
 - Forecasts winter and spring only available for these climate divisions about 20% of possible lead times
 - Need better spatial resolution, eg Wolter experimental product



Annual Operations: Needs

- Interest in streamflow volume forecasts that are conditioned on climate forecasts
- Spring runoff hydrograph is important for many operations
 - Potential use for hydrograph forecasts (not provided by NRCS or MBRFC) or within season temperature forecasts
- Demand: most agencies do some sort of demand estimate -> potential use for summer T and P forecasts
 - Little attention to seasonal temperature forecasts or trend
 - Shorter lead T-forecasts: zero-lead monthly forecast; 6-10 and 8-14 day
- Do not prefer 2-category forecast; “around average” isn’t a management problem -> extremes are
 - Not aware that the monthly forecast is updated to zero-lead
 - Verification and skill

Longer term planning

- Assess the potential for future systems to cope with drought: streamflows from the historic record
- Planning for projects to “firm-up” yield
 - Windy Gap surpluses from early 90’s, but none since
 - Other supply options
- Demand projections: primarily population based
 - Temperature trend not considered
- Several agencies now using paleoclimate reconstructions to expand the types of drought they evaluate
- Interest in assessments: range of potential climate change scenarios, droughts that have occurred outside the instrumental record

Findings I

- Seasonal climate forecasts not widely used, but climate-related data used in annual and longer-term planning
 - Suggests potential to incorporate the right climate products
 - Overall history of adopting innovations suggests that there will be a next generation in water management
- Other needs revealed:
 - Potential uses include information that **exists**, but not well utilized
 - Trend, shorter term temperature forecasts
 - Other requirements don't exist
 - Streamflow hydrographs (CBRFC, not MBRFC or NRCS); flow forecasts conditioned on forecast
 - Needs for information across-time scales or “seamless suite” needs

Findings II

- Keystone organizations are one good target for climate services
 - Manage large fraction of the water
 - Trained staff, play a regional role in testing and proving innovations
 - Professional networks extend knowledge and practices
- “Perceived” user needs are not a stable indicator: as participants have learned about climate in general and specific products, they are interested in more complex information
- Diversity of capacity, resources
- Diversity of vulnerability
- **More interest in climate information from those with higher capacity or vulnerability**

Thank you!



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