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

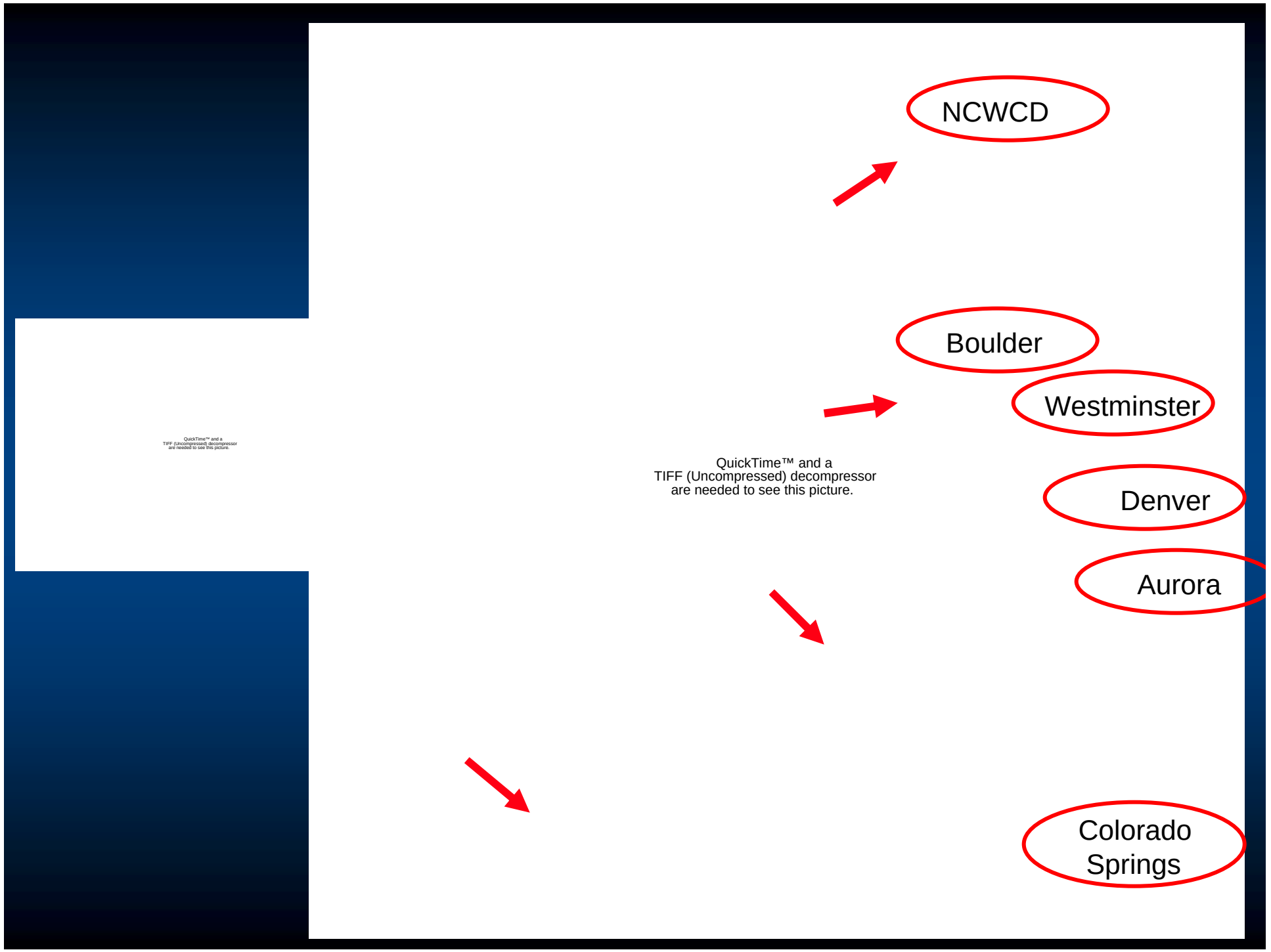
- To identify water user needs for climate products (information and forecasts)
- Match these needs to WWA and NOAA climate research or identify new research areas
- Complement other WWA work on the South Platte basin
  - South Platte Regional Assessment Tool (SPRAT), e.g. decision rules
  - Drought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

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


NCWCD
Boulder
Westminster
Denver
Aurora
Colorado Springs
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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 relate 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

Western Water Assessment

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Thank you!

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