

Local Water System Challenges



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Developed for:

Colorado State University
Grad 592 Interdisciplinary
Water Resources Seminar



Local Water System Challenges

Outline:

- I. Introduction to Greeley Water – A local municipal water provider**
 - I. Anatomy of a Local Water Provider
 - II. Background on Greeley Water and its role in the local water space
 - I. Legacy of the Union Colony in Northern Colorado Water
 - II. Strategic Focus to provide safe, reliable, affordable & environmentally responsible water services
- II. Challenges facing Greeley and other local water providers**
 - I. Strategic Planning and Water System Challenges
 - I. Increasing uncertainty and complexity - strategic tools
 - II. Risky, long and expensive water project permitting process
 - III. Role for innovation
 - IV. Wildfire and watershed recovery
 - II. Workforce Development and Leadership Challenges
 - III. Regional Opportunities
- III. Conclusions and Questions**



Greeley's Water Legacy

- **#3 Ditch Constructed in 1870 to supply Union Colony**
 - Agrarian Utopian Settlement became City of Greeley
 - Early settlers relied on infiltration wells along the Poudre
- **Quality and Quantity challenges arise early**
 - Water quality was not great on lower Poudre, and
 - Reliable supply was limited to the spring months
- **Overcoming limitations and challenges:**
 - In the early 1900s, Greeley filed a change of water rights case on Cache la Poudre rights
 - Acquired Bellvue, CO site to build a slow sand filter plant at the mouth of the Poudre Canyon
 - Built wooden stave pipes to bring water 36 miles, by gravity to Greeley
 - Coordinated formation of Grand Lake Committee to develop the vision for the Colorado – Big Thompson Project (CB-T)
 - Developed supply from four major river basins to ensure municipal reliability

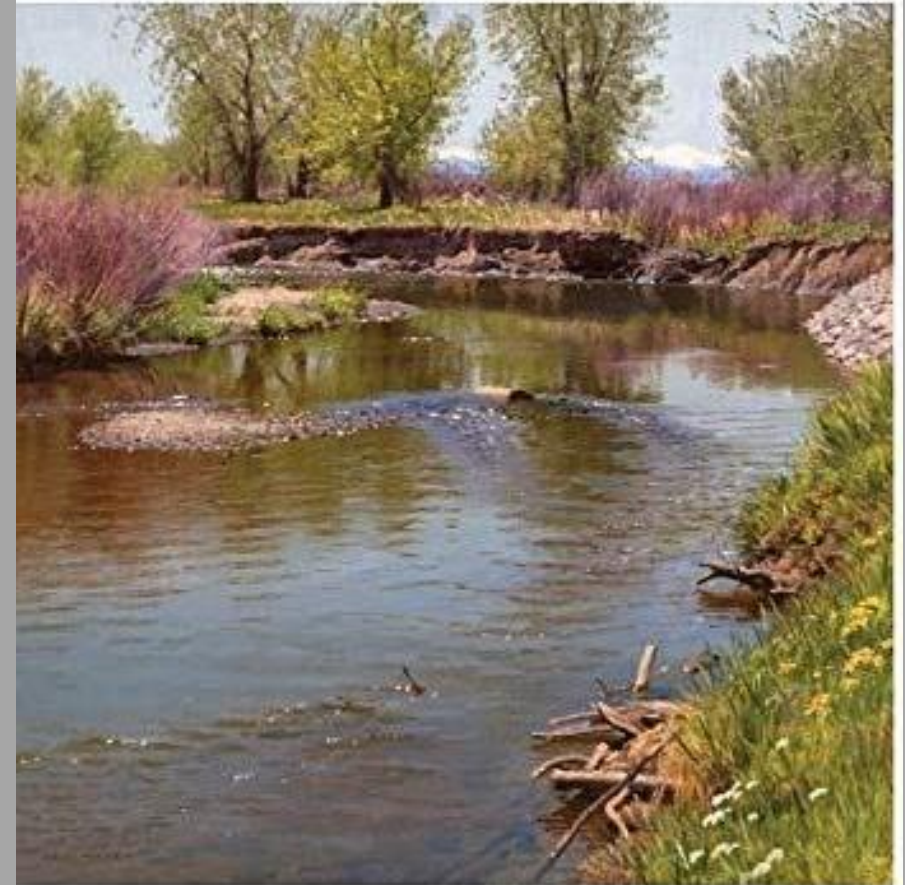
Pioneers of water had to be innovative and resilient



Municipal Utility Strategic Focus

- Provision of safe, reliable water service
- Maintain financial health and utility sustainability
- Managing risks and uncertainty
- Asset Management, Maintenance and Investment
- Contribute to environmental health and safety
- Foster water conservation and water wise behaviors
- Fostering strategic innovation
- Support equity in public health and a high quality of life
- Supporting a diverse and growing economy
- Fostering leadership development and growth

CONFLUENCE
The Story of Greeley Water

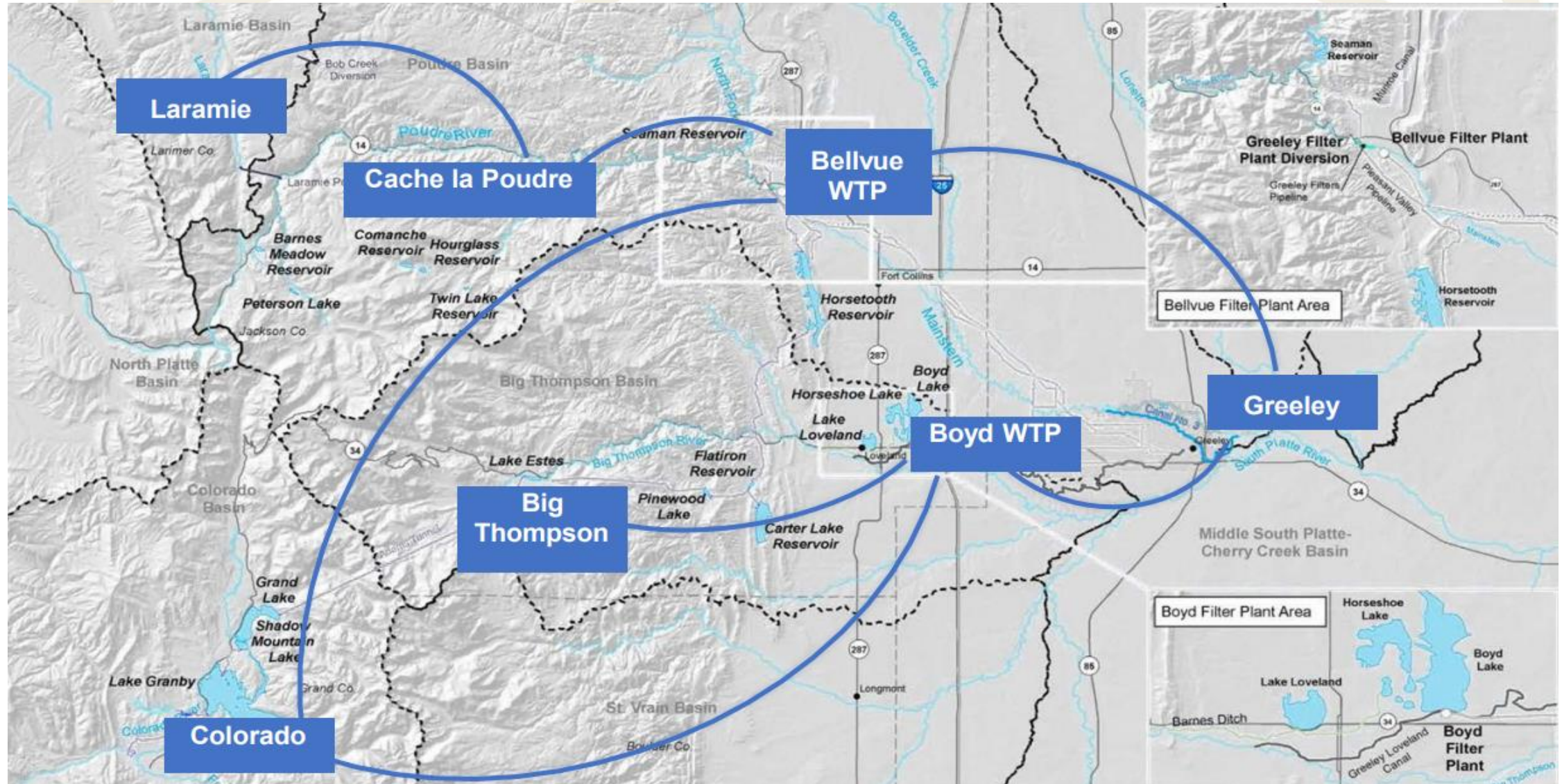


Gregory J. Hobbs, Jr.
Michael Welsh

Challenges Facing Greeley & Facing other local water providers



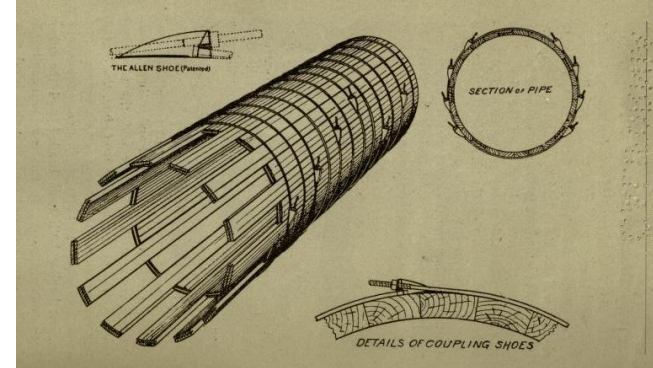
Greeley's 21st Century Water Supply System



Municipal Water System Investments

Challenge: Growth & Urbanization

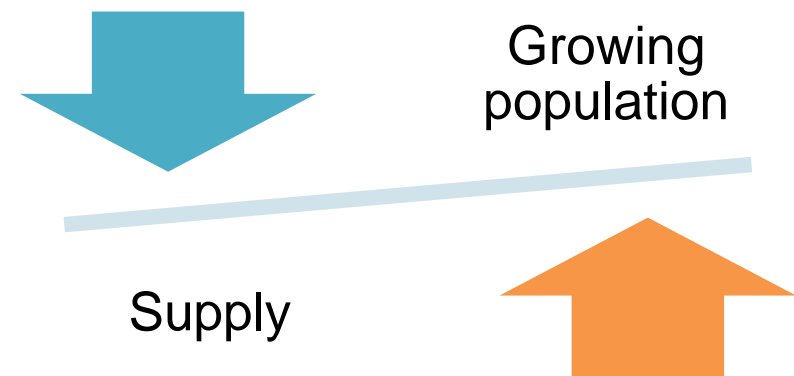
- **1905:** Greeley Population – 5,000
 - 36 miles, 20” wood stave pipe
 - First water delivery Sept. 5, 1907
- **2021** Population – 111,000 and steady growth
 - Two potable water treatment plants
 - Bellvue (Cache la Poudre)
 - Boyd Lake (Big Thompson)
 - Added focus on non-potable irrigation infrastructure
- Treat & deliver water to approx. 150K people



Population Growth and Supply Drivers

Greeley's long term community outlook:

- ✓ 260,000+ people by 2065
- ✓ Current supply not enough to meet future needs
- ✓ Must develop new water sources while maintaining affordable water rates





Challenging Conditions

- **Robust Regional Economy and Economic Growth**
 - Limited water resources available for NoCO
 - Denver area water providers buying NoCO water
 - Resource scarcity driving rapid price escalation in C-BT
- **Colorado River systemic drought and shortage**
 - 2021 Tier 1 shortage declaration (1st time)
 - NoCO region reliance on CO River; must manage risk
- **Extensive timeline to develop water supply projects**
- **Cost of resilient infrastructure**
- **Developing supply diversity**
- **Wildfire in our watersheds**
- **Workforce development**
- **Regional collaboration**
- **Empowering data analytics**



Water Master Plan ('03)

Planning to analyze and prioritize investments

- Continued water acquisition and storage
- Investments in infrastructure
- Enhanced water conservation and data driven demand management
- Public communication and engagement

Integrated Water Resource Plan – '21-'22

- Incorporating Scenario Planning and
- Tool for dynamic adaptive management

Continuous Improvement

- Aligning resources, talent and strategy to execute and adaptively manage



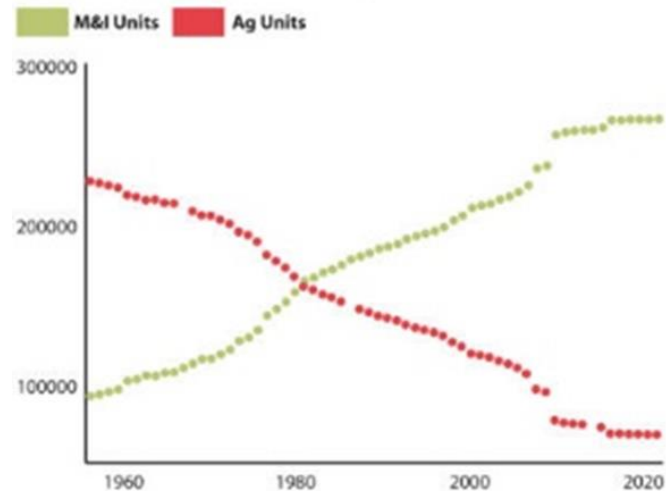
Milton Seaman Reservoir

Challenges of Escalating Water Costs

Water rights market influenced by strong economy, housing market growth, low mortgage rates and resource scarcity

- Limits affordable housing

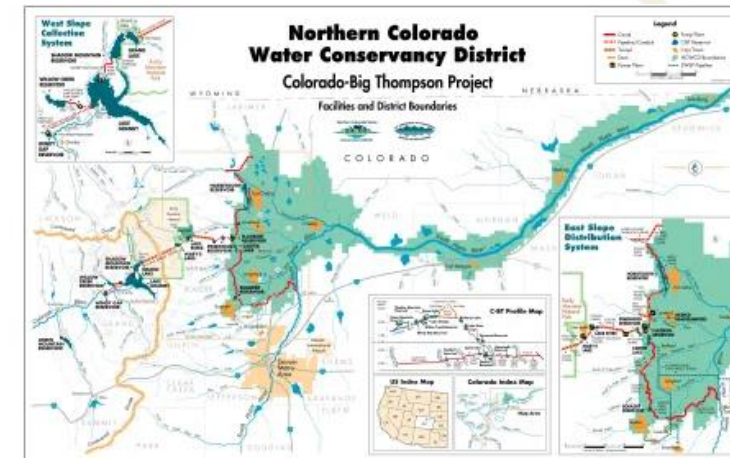
Municipal and Industrial vs. Agricultural ownership of Colorado-Big Thompson water



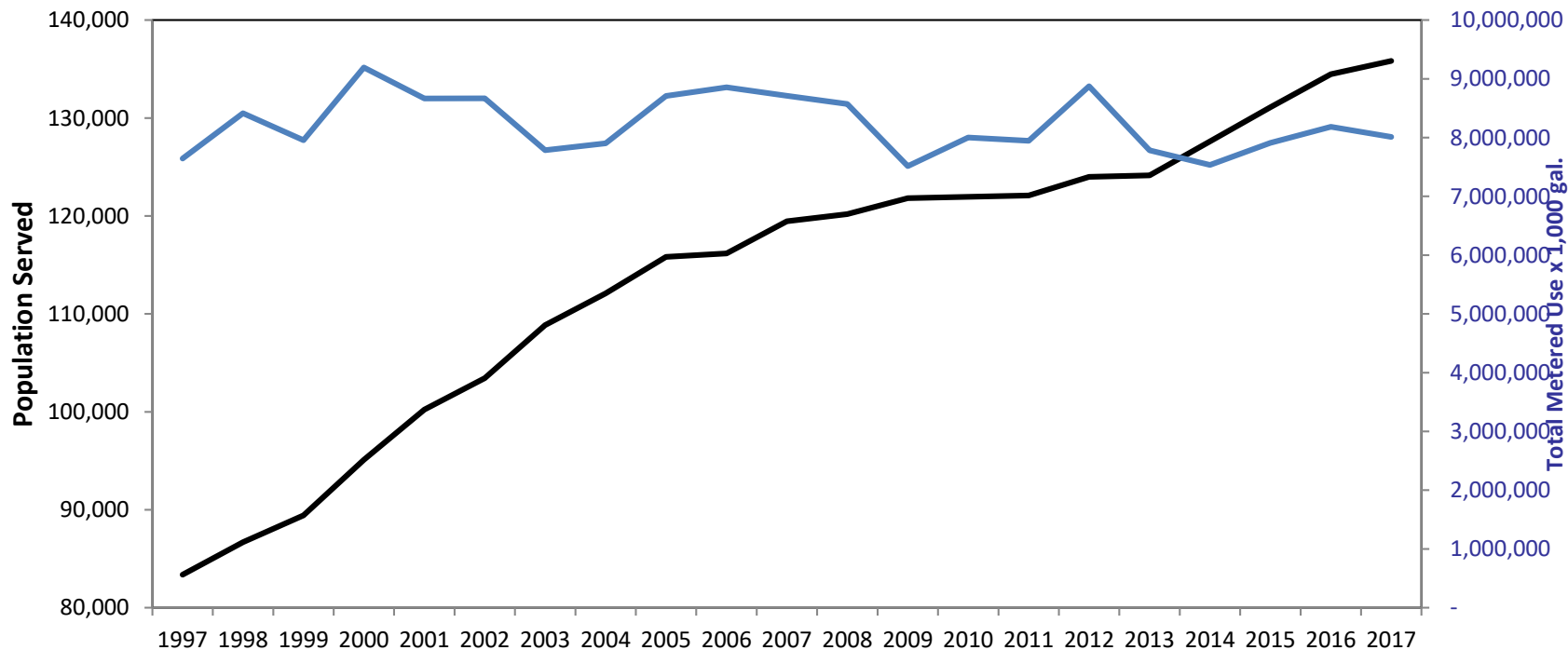
Source: Northern Water Conservancy District

A Colorado Big-Thompson (CB-T) unit delivers an average of 0.7 AF/unit

- Avg. Cost \$55K/unit = \$78,571 / AF
- Most cities or water districts require .5 – 1 CBT unit per house (SFE) for new development
- Scarcity is driving cost
- Supply diversity helps, but requires large infrastructure investments
- Inflation ripples into other supplies



Efficient Water Use & Conservation



Greeley Water City and Regional Partners (Windsor & Evans) Demands '97-'18

Big Picture:

- Water conservation is a fundamental strategy
- Since Yr. 2000, GPCPD has decrease by 25%
- Demand hardening
- Limits drought response
 - Lawn reservoir
- Drives rates & fees
- Elasticity of Demand



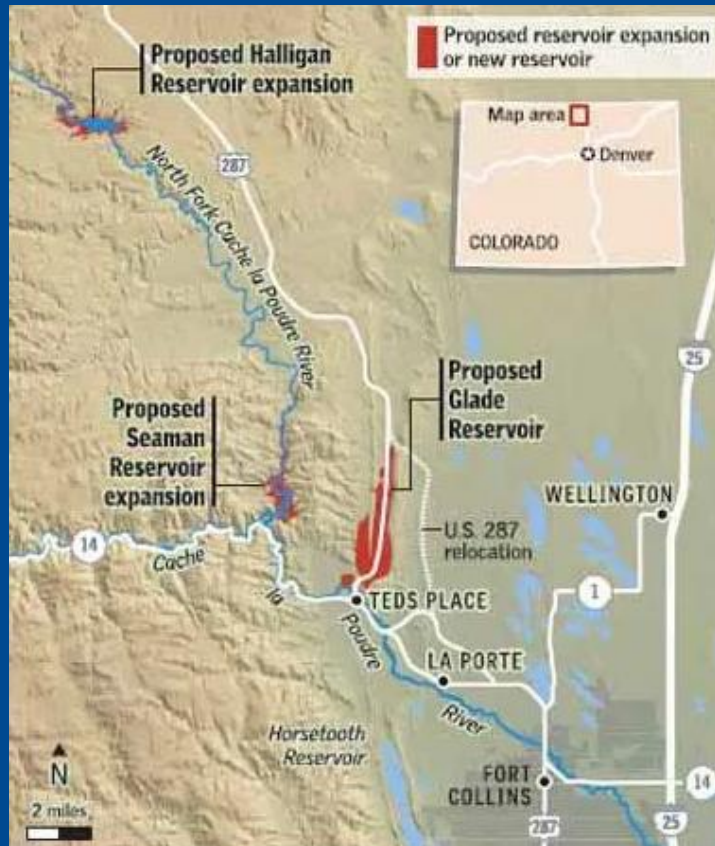
Non-potable Strategy

- Expanding the non-potable system
 - Key to meeting long range water demands
 - Key to ensuring sustainable urban forests
- Converting properties where possible
- Several new non-pot sites added in 2020
- Make improvements on existing city facilities
 - Boomerang Golf Course non-pot upgrades and irrigation water efficiencies



NBCE Conversion Project

Supply and Storage Strategic Innovation



The Denver Post, Thomas McKay - Source: USGS

Challenge of Permitting Expanded Storage

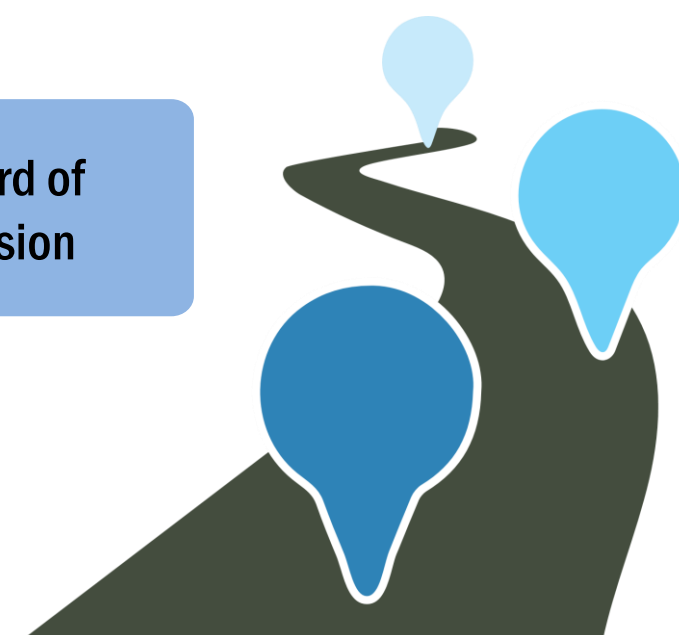
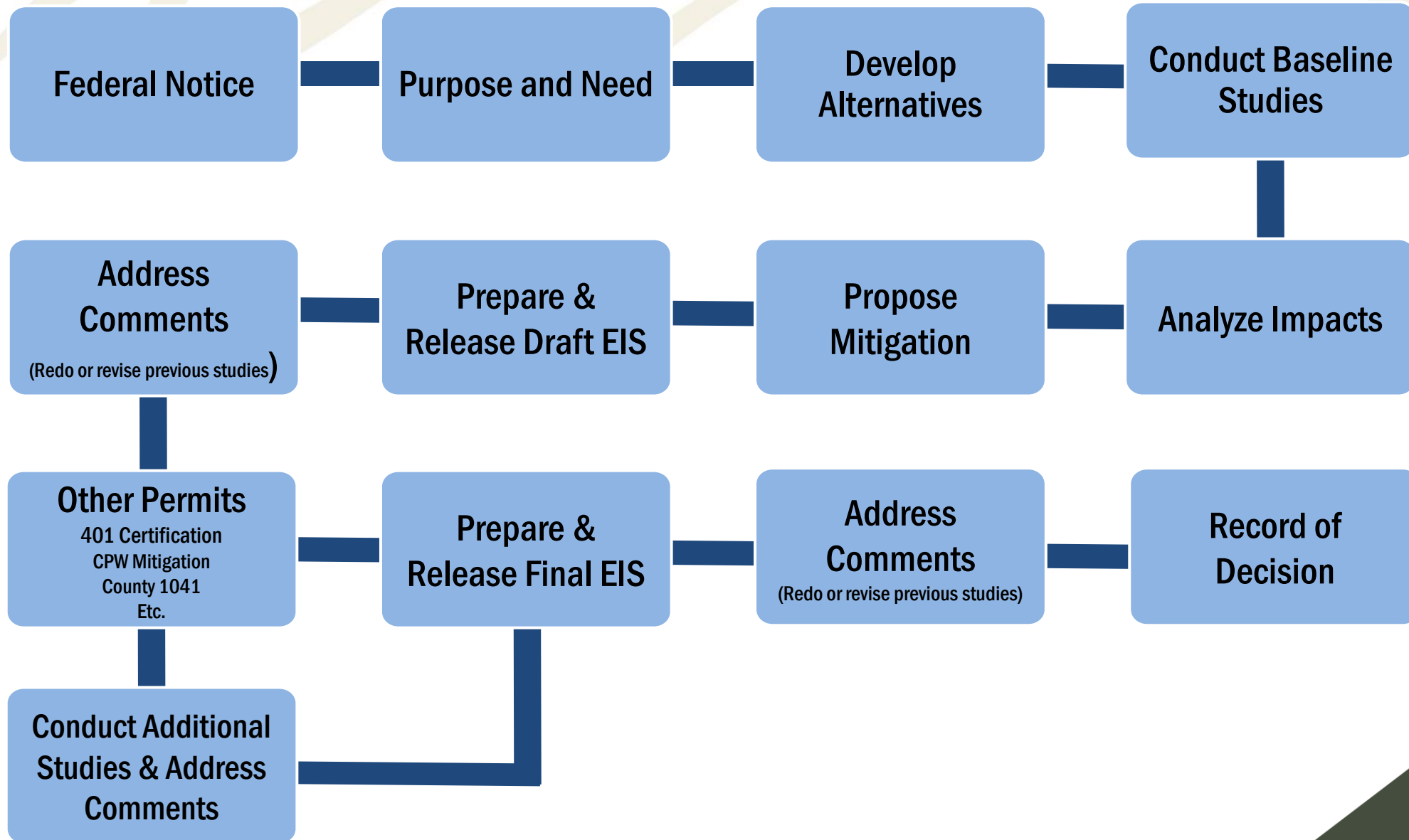
Greeley Example: North Fork Expansion of Milton Seaman Reservoir (current = 5,000 AF)

- Very costly - \$0.5 – 1.0 Billion
- Very challenging to permit – local, state and federal
- LEDPA difficult to obtain given on-channel nature, topography and site conditions
- Challenging geologic conditions and difficult construction
Limitations on site access and complex property ownership
- requires a large and uncertain water portfolio
- Junior rights require large storage volumes to firm yield

Permitting Challenges Drove Innovation

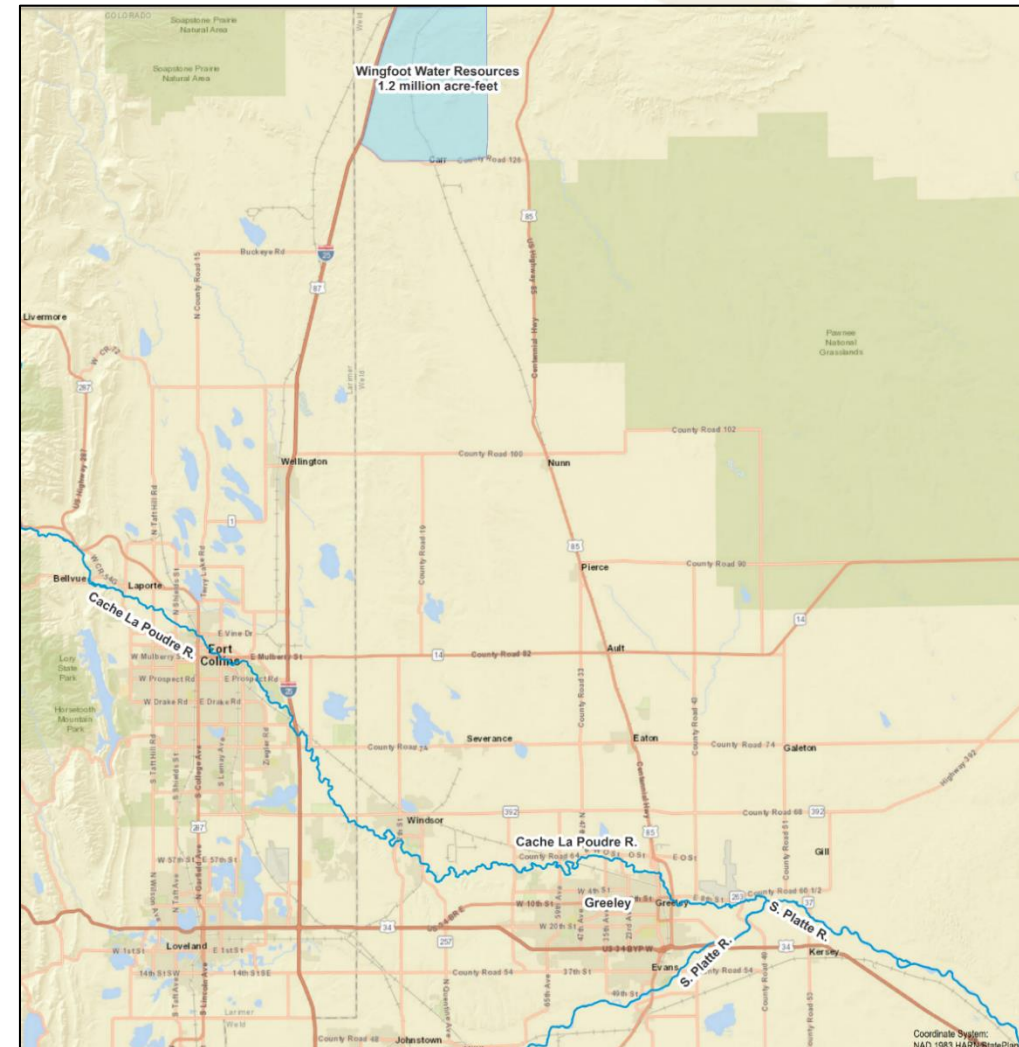


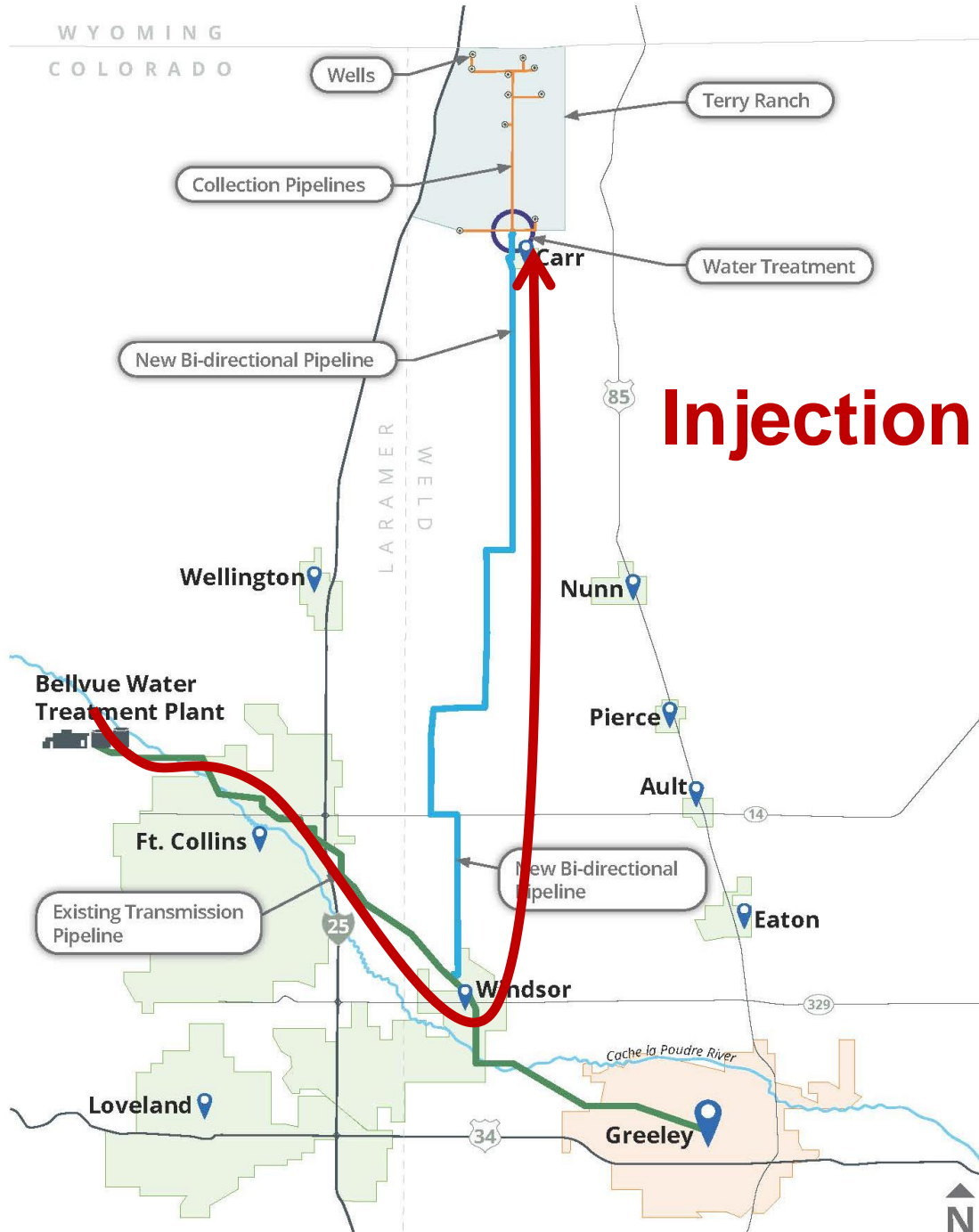
Water Project Permitting: Complex & Challenging



Terry Ranch ASR Project Overview

- ✓ Non-tributary Aquifer:
 - ✓ 1,200,000+ acre-feet, reusable
 - ✓ Private property right – decreed in 2017
 - ✓ Production wells drilled in 2019 to verify
 - ✓ Not previously available
- ✓ Suitable for underground water storage (“ASR”)
- ✓ Meets Greeley’s water needs for decades to come

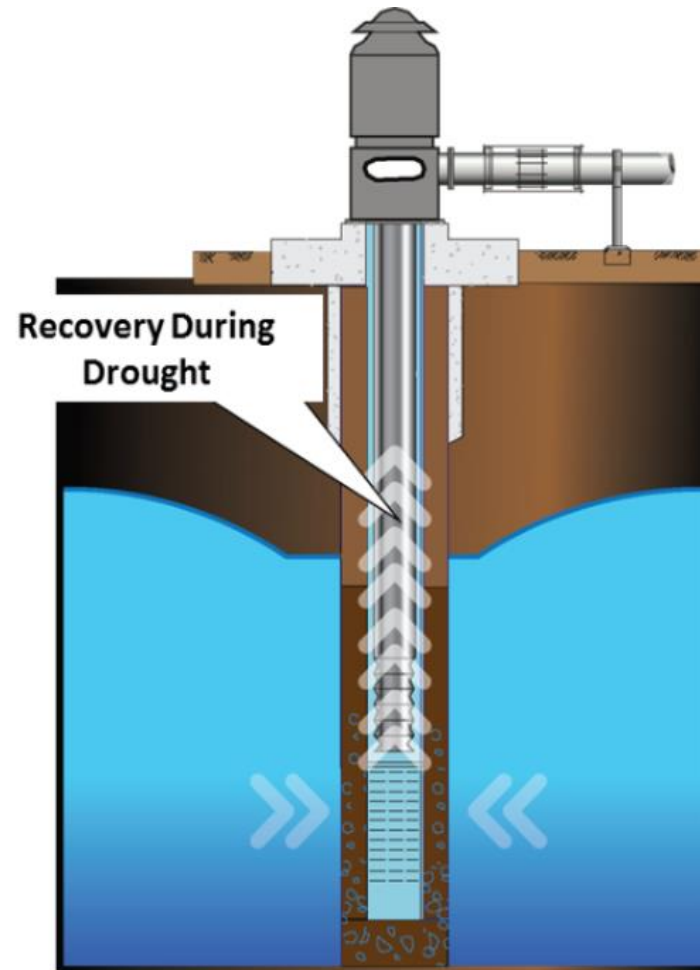
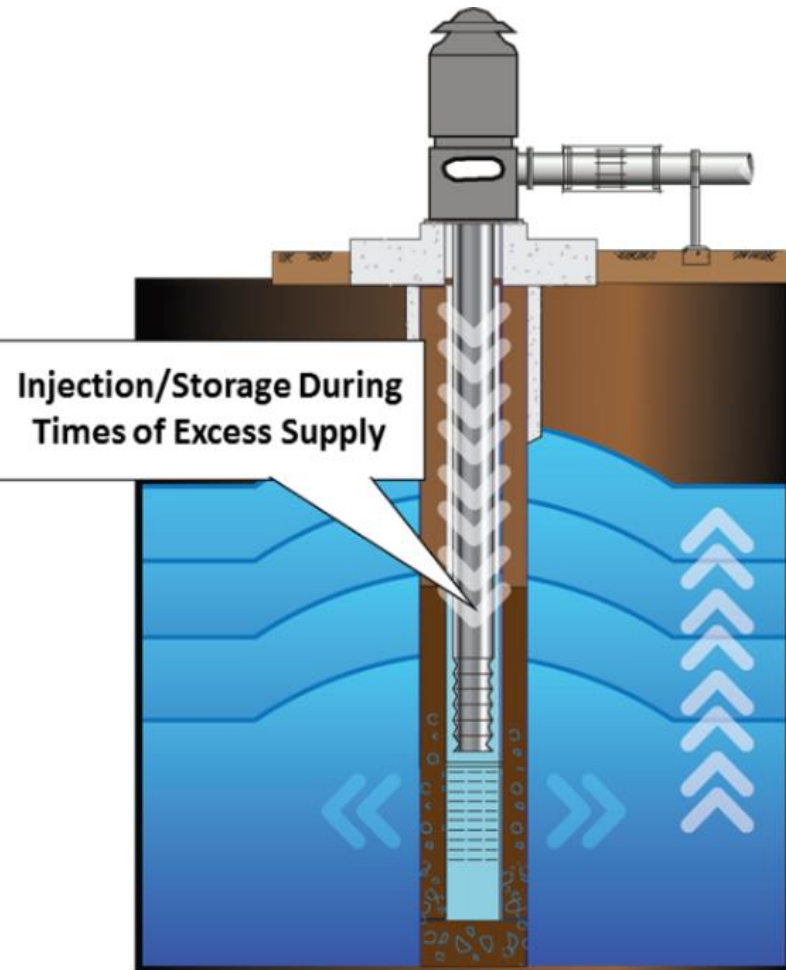




How It Works

- ✓ Use existing and yet-to-be acquired surface water rights
- ✓ Treat at Bellvue Water Treatment Plant
- ✓ Use existing 60" pipeline
- ✓ Pump treated recharge from Windsor north to the ranch
- ✓ Wellfield injection – aquifer storage

Aquifer Storage and Recovery



- ✓ New to Greeley & NoCO, but common throughout Colorado and U.S.
- ✓ PRO: few environmental impacts, no evaporation
- ✓ CON: requires treatment & pumping

Why Terry Ranch?

- ✓ Compared to all other options: more certain, lower cost, minimal environmental impacts, fewer permits – can begin immediately
- ✓ Innovative purchase structure reduces risk and secures third-party funding – lower water rates – City paid with credits redeemable for raw water
- ✓ Diversifies Greeley's water sources and provides redundancy
- ✓ Underground storage protects against drought and watershed disruptions like wildfire



The Challenges of Watershed Wildfires

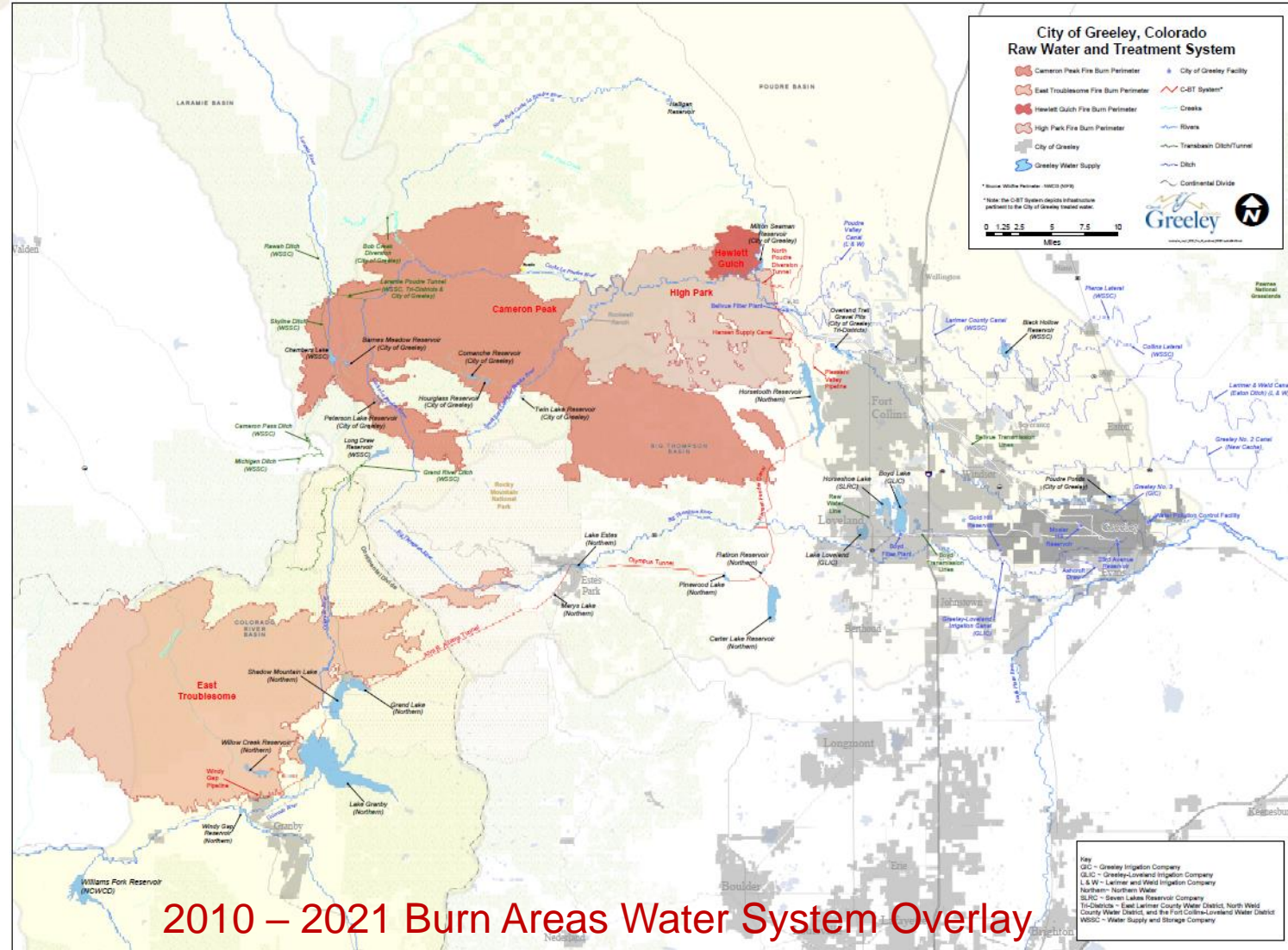


Wildfire Watershed Impacts

- Sediment, nutrients and debris washed into reservoirs, diversions and ditches
- Flood hazard and infrastructure risk
- Water quality degradation beyond treatment
- Uncertain long-term impacts...
 - Snowpack, Water Quality, Algae Blooms?



Black Hallow Flash Flood 7-21-2021



2010 – 2021 Burn Areas Water System Overlay

Increased Sedimentation Limits Storage



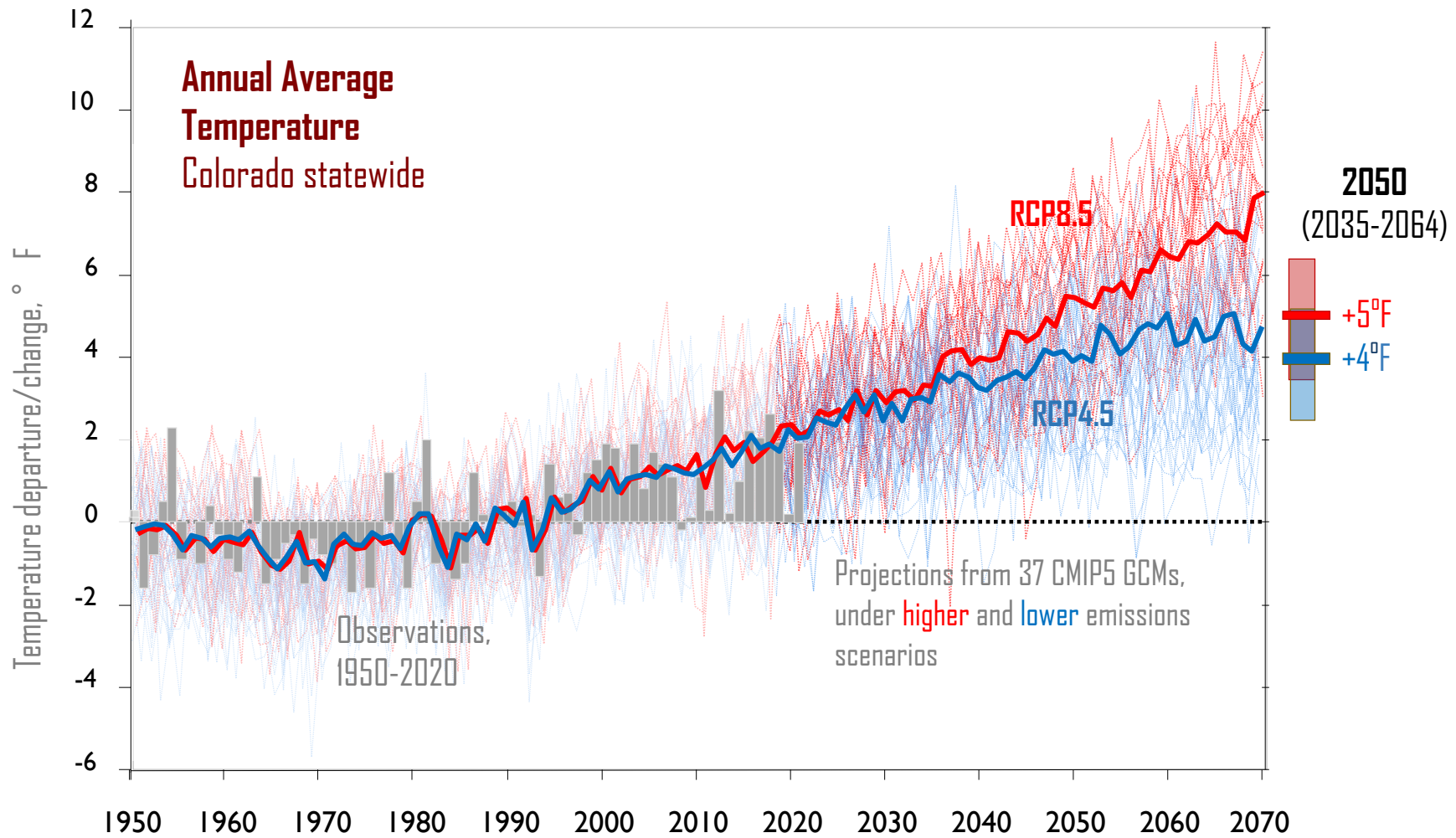
Greeley's Comanche Reservoir Burn Area Runoff – May 2021

Landscape Scale Erosion Issues

- Severely burned soils are hydrophobic and may take decades to achieve basic recovery
 - Denver Water still working to recover from 2002 Hayman Fire above Cheesman Reservoir
 - Colorado Springs Unities still working to recover from 2012 Waldo Canyon Fire around Rampart system



Colorado: All climate models project more warming



Source: Updated and adapted from Lukas et al. (2014), Climate Change in Colorado

Workforce Development and Leadership



Resource Alignment Challenge:

Aligning strategy, budget, talent & training

Investing in People, Culture, Leadership and Process

➤ This takes a lot of time, intentionality and resources

Water Providers have limited budgets, bandwidth and compensation resources

- Invest in talent attraction, development, retention and succession
- Invest in internal and external communication
- Invest in strategic master planning - regularly
 - Setting strategic priorities based upon analysis
 - Process for budgeting and prioritized investment
 - Consideration of talent needs to execute on priorities
 - Process for evaluation updates and adaptive management

Make a game plan and stick to it. Unless it's not working.

- Yogi Berra (1925 – 2015)



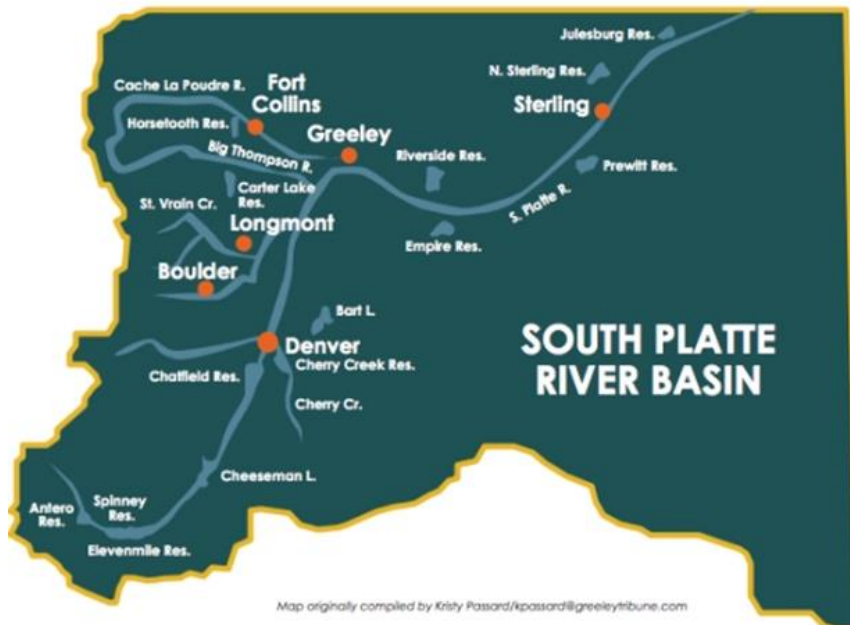
Regional Collaboration

Challenges:

- Commitment of resources with no certain outcome
- Slow collaborative process
- Requires some fundamental alignment of values

Opportunities:

- Economies of scale
- Undertaking projects too large for a single agency
- Sharing of risks and rewards
- Resiliency - regional interconnects & mutual aid
- Opportunity to work across water user types – multi benefit

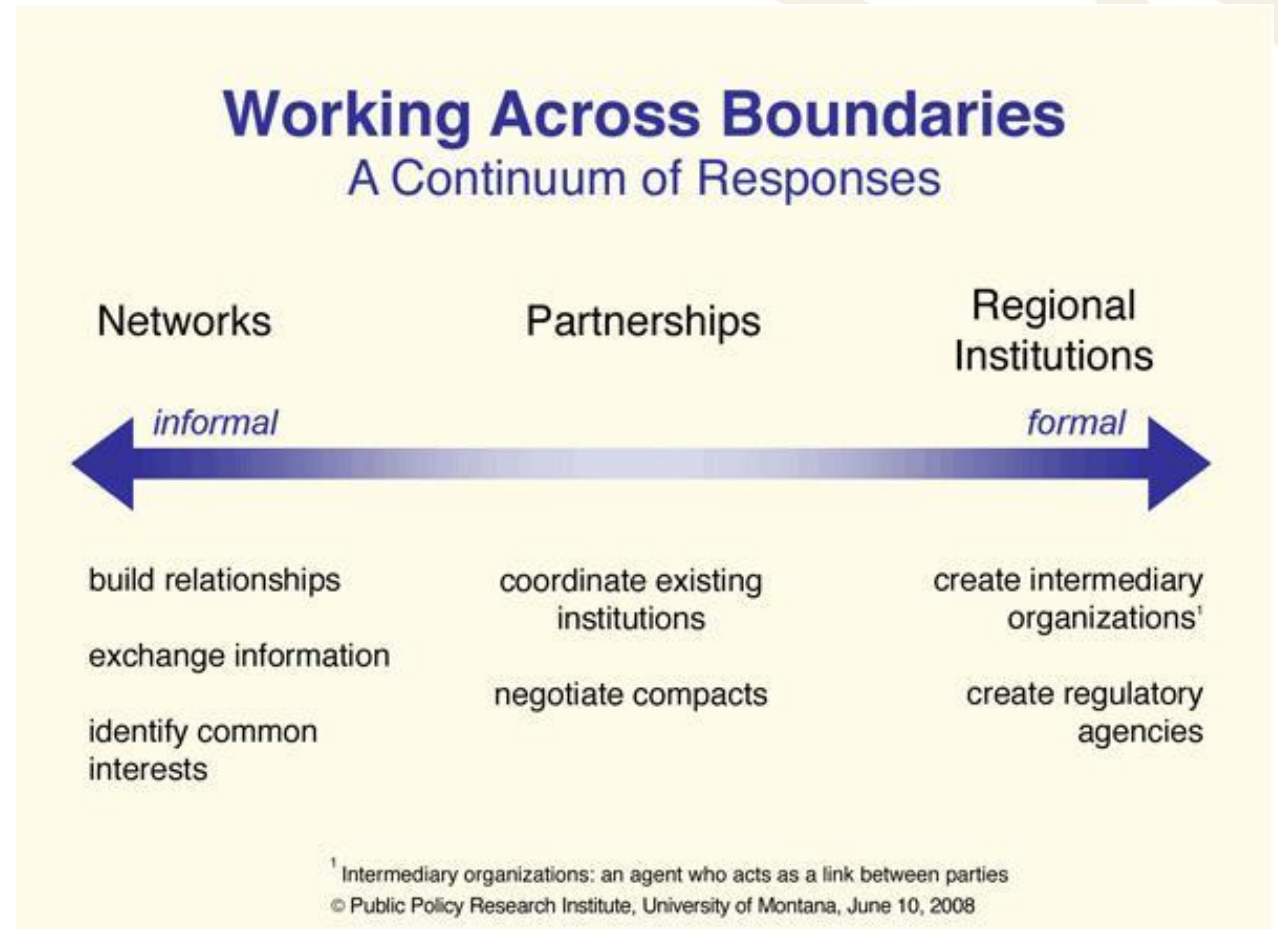


Regional Water Insight

Regional collaboration is... slow, difficult and expensive, but the potential rewards in term of sustainable water strategies and policy can be significant.

Whatever the governance form, resources and capacity are highly correlated to their ability to achieve impact.

Leveraging shared knowledge and experiences will be key to success



University of Montana, Public Policy Research Institute

Continuum of Water NoCO Regional Water Programs or Scope for Committee Consideration

Regional Messaging on Value of NoCO Water

Regional Water Conservation Program

Regional Legislative Advocacy on Water Matters

Regional Watershed Monitoring, Mgmt. and Restoration

Regional Infrastructure, or Water Right Resiliency Project

Regional Integrated land use and water supply planning

Regional CO River DM and Contingency Planning

Regional Funding and Protection of NoCO Water



Moderate Resource Requirements, Low Risk (Builds on existing programs), and Participation not Required from all members

Higher Resource Requirements, New Scope Work with Larger Commitment – Moderate Risk

Large Resource Requirement, Long-term Scope, May Require Voter Approval, High Risk – High Reward



“Look ahead and
plan for others as
others have planned
for you”



Greeley Tribune - 1941

Conclusions and Questions

Local Municipal Water Providers and our citizen owners face increasing uncertainty

- Uncertainty must be acknowledged and explored
- Data driven analyses and scenario planning are key tools
- Strategic Master Planning is fundamental to navigating uncertainty
- The magnitude of impacts from climate change remain uncertain, but must be a priority

Utility organizations must aligning strategy, budget, talent, training and best practices

- Building effective teams is essential to meeting the challenges that any water utility faces
- Building, developing, engaging and empowering people

Regional Collaboration is difficult, but proven effective

- Resiliency is enhanced when we're all connected – literal & figurative
- More efficient systems can be achieved with intentional collaboration
- Some issues, like wildfire recovery too big for any single agency



Questions

