



US Army Corps of Engineers



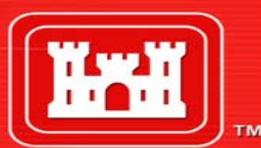
Chatfield, Cherry Creek and Bear Creek Reservoirs, CO

Chatfield Storage Reallocation Study

***U.S. Army Corps of Engineers
Omaha District***

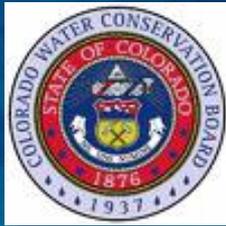
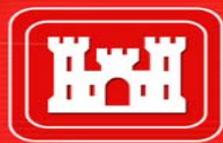
Sponsor: Colorado Water Conservation Board

***USACE Water Supply Workshop
June 2-4, 2009***



Purpose and Need

“Increase availability of water, sustainable over the 50 year period of analysis, in the greater Denver area so that a larger proportion of existing and future (increasing) water needs can be met.”



Sponsor Colorado Water Conservation Board

Downstream Users

- City of Aurora
- City of Brighton
- Central Colorado Water Conservancy District
- Colorado Parks and Outdoor Recreation
- Denver Botanic Gardens
- Western Mutual Ditch Company

Upstream Users

- Castle Pines Metro District
- Castle Pines North Metro District
- Centennial Water and Sanitation District
- Center of Colorado Water Conservancy District
- Mount Carbon Metro District
- Perry Park Country Club
- Roxborough Water and Sanitation
- South Metro Water Supply
- Town of Castle Rock



Problems and Opportunities

Problems:

- Population Growth Resulting in Increased M&I Water Demand
- Reliance of Some Municipal Water Providers on Non-Renewable Denver Basin Non Tributary Groundwater (NTGW)
- Agricultural Water Users Need Augmentation Water for Alluvial Wells

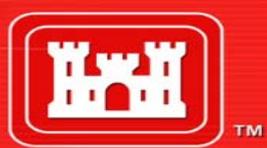
Opportunities:

- Expanding Use of Existing Storage Facility
- Chatfield Reservoir's On-Channel Location
- Chatfield Reservoir's Relatively High Location Within Basin



Chatfield Reservoir

- **Authorized by Section 204 of the Flood Control Act of 1950**
 - Original purposes of silt control, recreation, fish and wildlife, and water supply storage
 - Based mainly on *Survey Report on Flood Control of the South Platte River and Its Tributaries, Colorado, Wyoming, and Nebraska* (USACE 1945).
 - Constructed Completed in 1975
- **Chatfield Reservoir, in conjunction with the Cherry Creek and Bear Creek reservoirs (i.e., Tri-Lakes) are managed to protect the Denver Metro area from catastrophic floods**

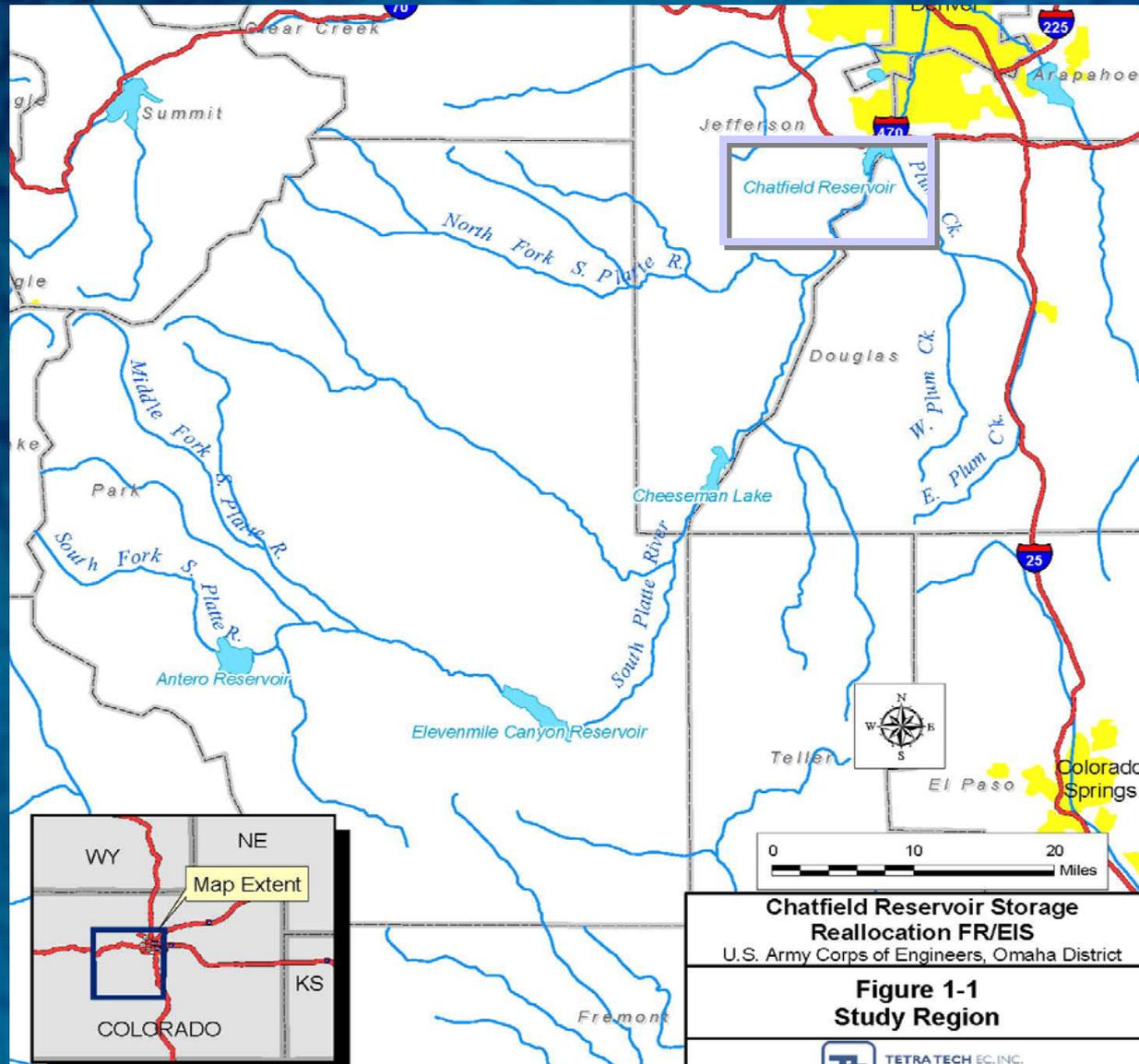


Reallocation Authority

- Section 808 of WRDA 1986 , as amended
 - Authorization Pertinent to Bear Creek, Cherry Creek, and Chatfield Reservoirs
 - Authorize the Secretary, upon request of State, and upon the Chief of Engineers' Finding of Feasibility and Economic Justification, to Reallocate to Joint Flood Control-Conservation Purposes
 - Conservation Purposes May Include M&I, agriculture, and recreation and fishery habitat protection and enhancement.
 - Non-federal interests shall agree to repay the costs allocated to M&I
 - Amended in WRDA 2007 to add “Ecosystem Restoration” as purpose
- River and Harbor Act of 1958 “The Water Supply Act of 1958”
 - Water Supply is State/Local Responsibility
 - Includes M&I Storage in New Reservoirs
 - Allows Storage in Existing Projects To Be Allocated To M&I
 - All Costs to be Repaid by Local Sponsor in Reallocation
 - If Reallocation to M&I affect other Authorized Purposes, Congressional Authorization Required



Regional Context

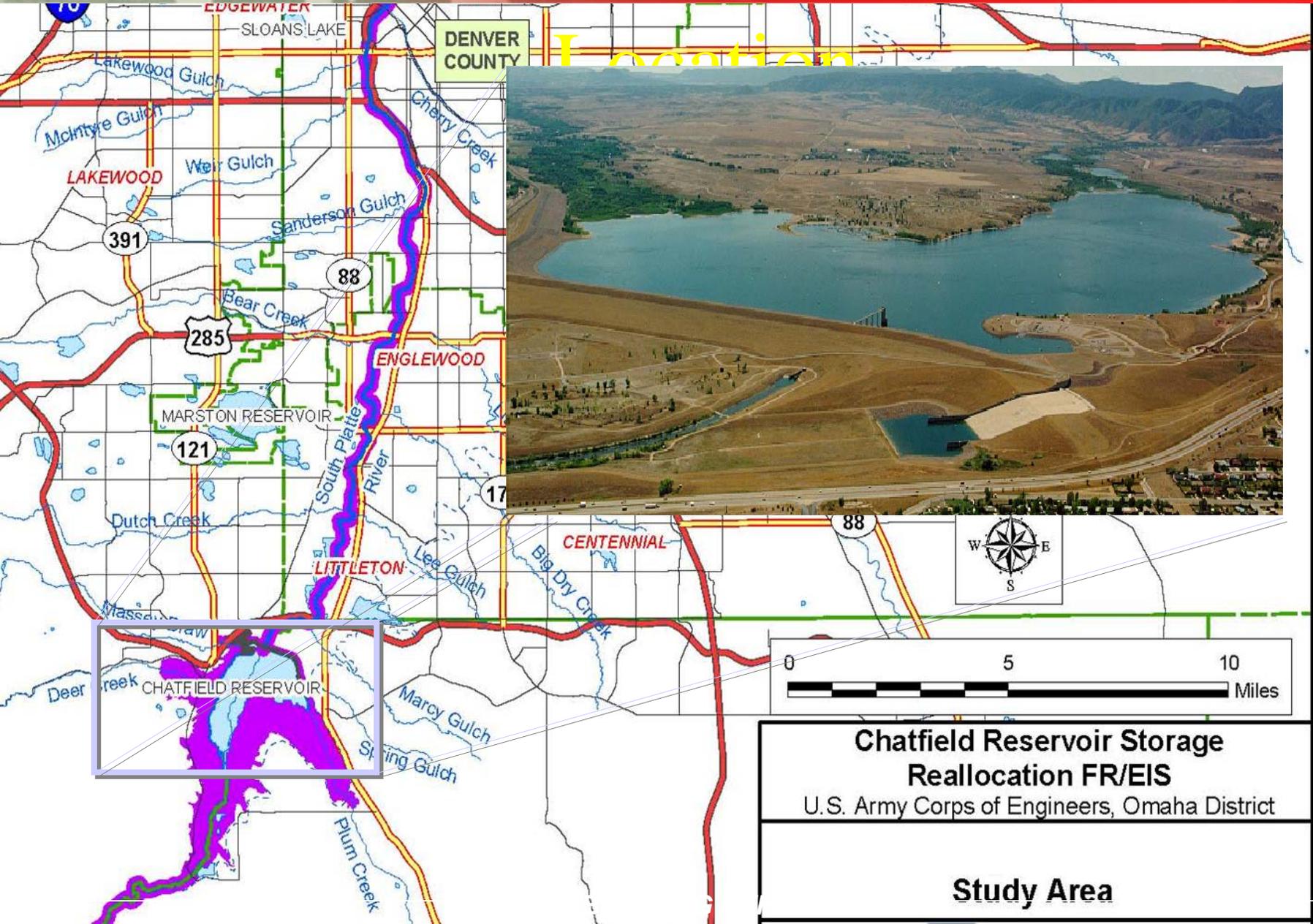




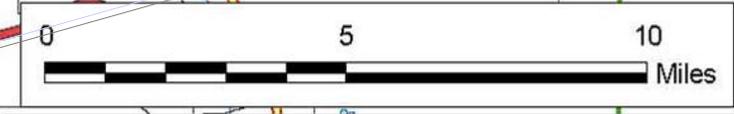
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TM



Location

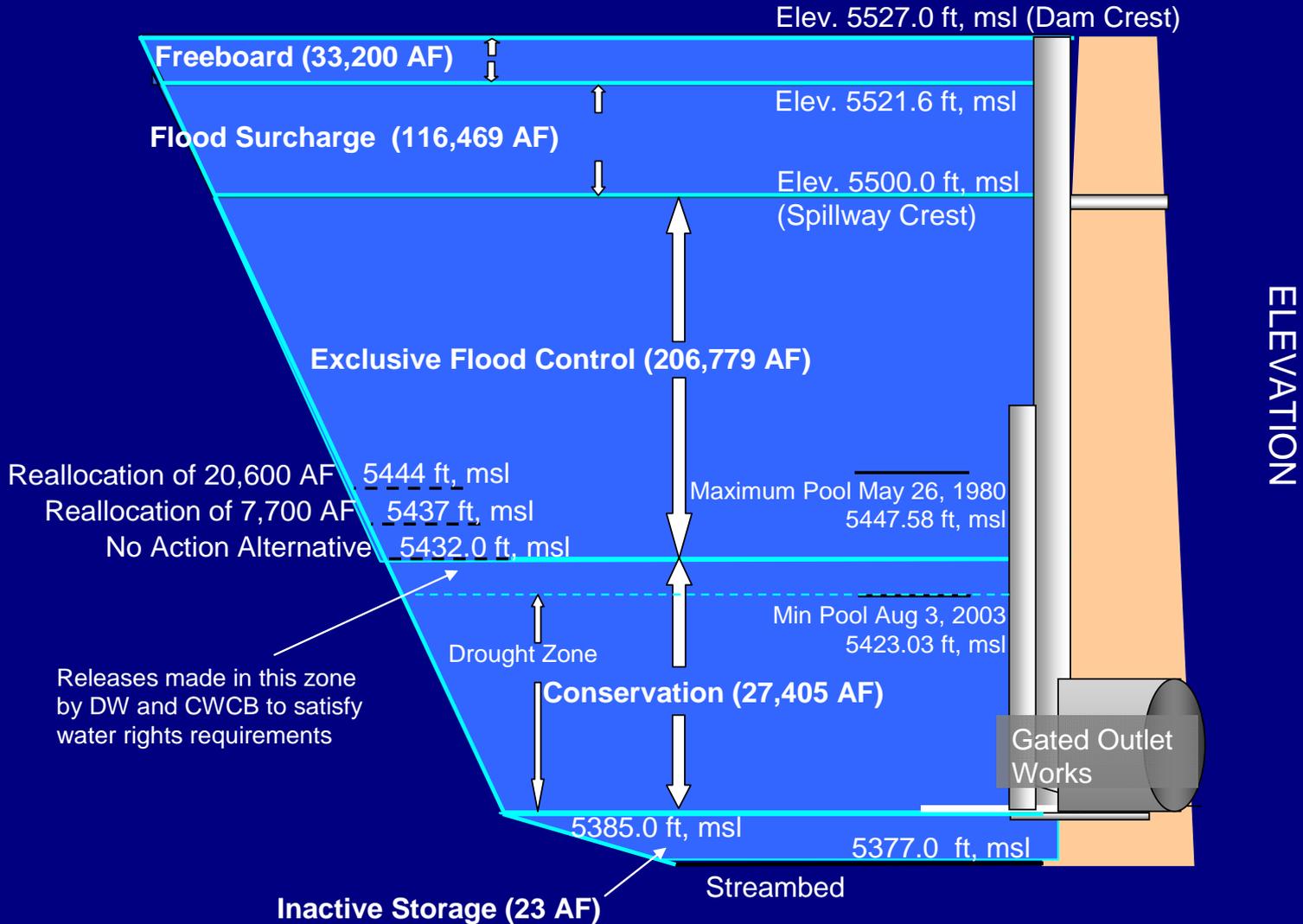


**Chatfield Reservoir Storage
Reallocation FR/EIS**
U.S. Army Corps of Engineers, Omaha District

Study Area



US Army Corps of Engineers





Current Condition - Recreation and Environment

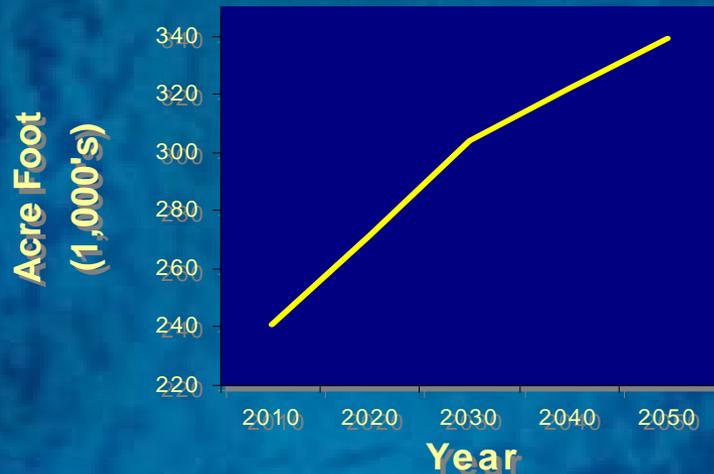
- Chatfield Park's Total Revenue Generated Exceeded \$1.9 Million, In Top Three of Colorado State Parks
- Provides Many Recreational Opportunities, from Ballooning to Scuba Diving
- Chatfield has a Diverse Array of Federally Significant Ecological Resources, Including:
 - Populations of Breeding Migratory Birds and Waterfowl
 - Riparian Forest and Scrub Shrub Habitat
 - Federally Threatened Preble's Mouse and Designated Critical Habitat
 - Wetland Habitats



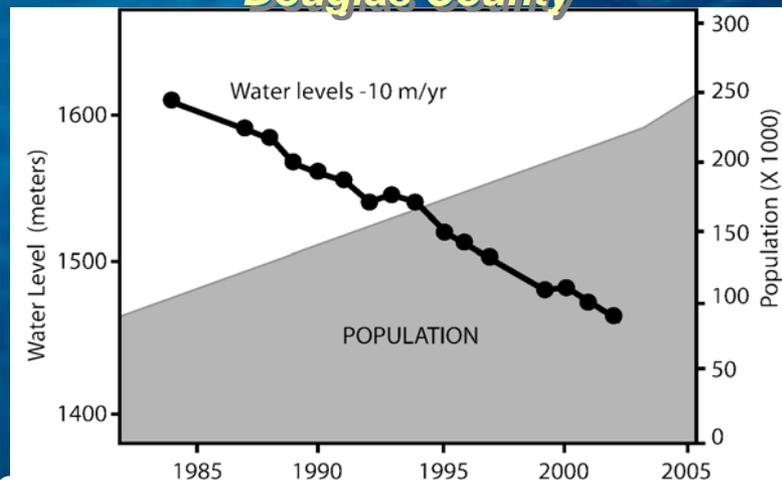


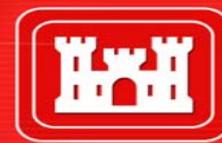
Current Condition - Regional Water Demand Demand

- South Metro Population is Projected to More than Double by 2040
- Water Users Project Needs will Increase from 250,000 AF in 2010 to 366,000 AF in 2050
- NTGW Is Non-Renewable Yet Greatly Depended On
- Ag Water Alluvial Well Shutdown Having Socio-Economic Impacts
- Hydrologic Events are Highly Variable in Semi-Arid Climate



Population vs. NTGW level changes in Douglas County





Alternatives Considered

- **Water Conservation**
 - Major tool for reducing demands, but not adequate in developing supply
- **Alternative Reallocation Volumes**
 - Nothing above 20,600 – Effect to Authorized Purpose
 - 4500 Acre Feet – Impacts Similar to 7,700 AF Alternative
 - 2,900 AF – Not Enough Water for Cost
- **Non-Tributary Ground Water**
 - Collectively 57% of Upstream User's Supply is NTGW, With 7 Entities Using >85% NTGW.
- **Surface Storage**
 - Gravel Pits and Reservoirs are Common in Denver Metro for Developing Surface Water Supply
- **Existing Conservation Pool**
 - Denver Water & Storage Rights vs. Relatively Jr. Water Right



Alternatives Considered in Detail

Alternative 1 — No Action, Penley Reservoir combined with Gravel Pit Storage

Alternative 2 — No Action, NTGW combined with Gravel Pit Storage (Least Cost Alternative to Chatfield Reservoir Storage Reallocation)

Alternative 3 — Reallocation of 20,600 acre-feet to Storage (20,600 Acre-Foot Reallocation)

Alternative 4 — Reallocation of 7,700 acre-feet to Storage (7,700 Acre-Foot Reallocation) and use of NTGW and Gravel Pit Storage

No Action Alternatives

- Two No Action Alternatives Provide the Opposite Ends of the “Future Scenario” Scale
 - Penley No Action Provides Most Expensive, But Preferred Action to Develop Surface Supply
 - NTGW No Action Provides the Non-Preferred Action, but Least Cost Alternative to Chatfield.
 - Because NTGW is Currently Being Heavily Used by Many of the Upstream Water Users, it Cannot be Ignored

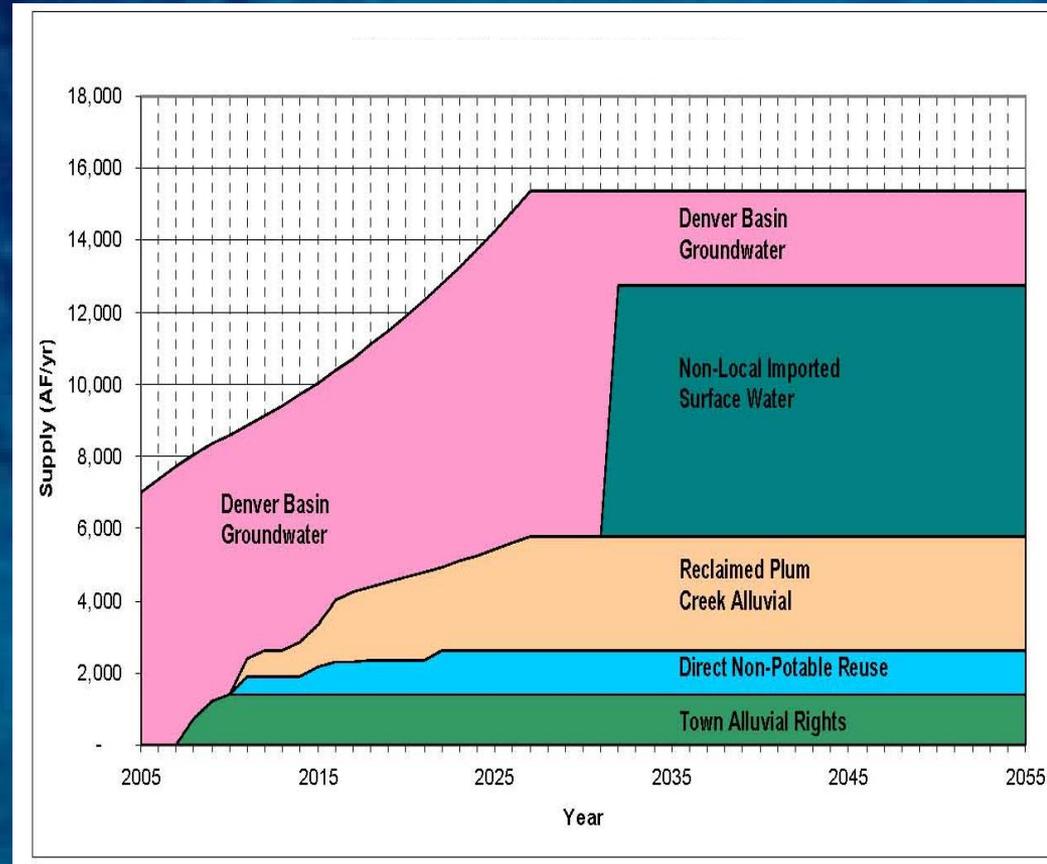
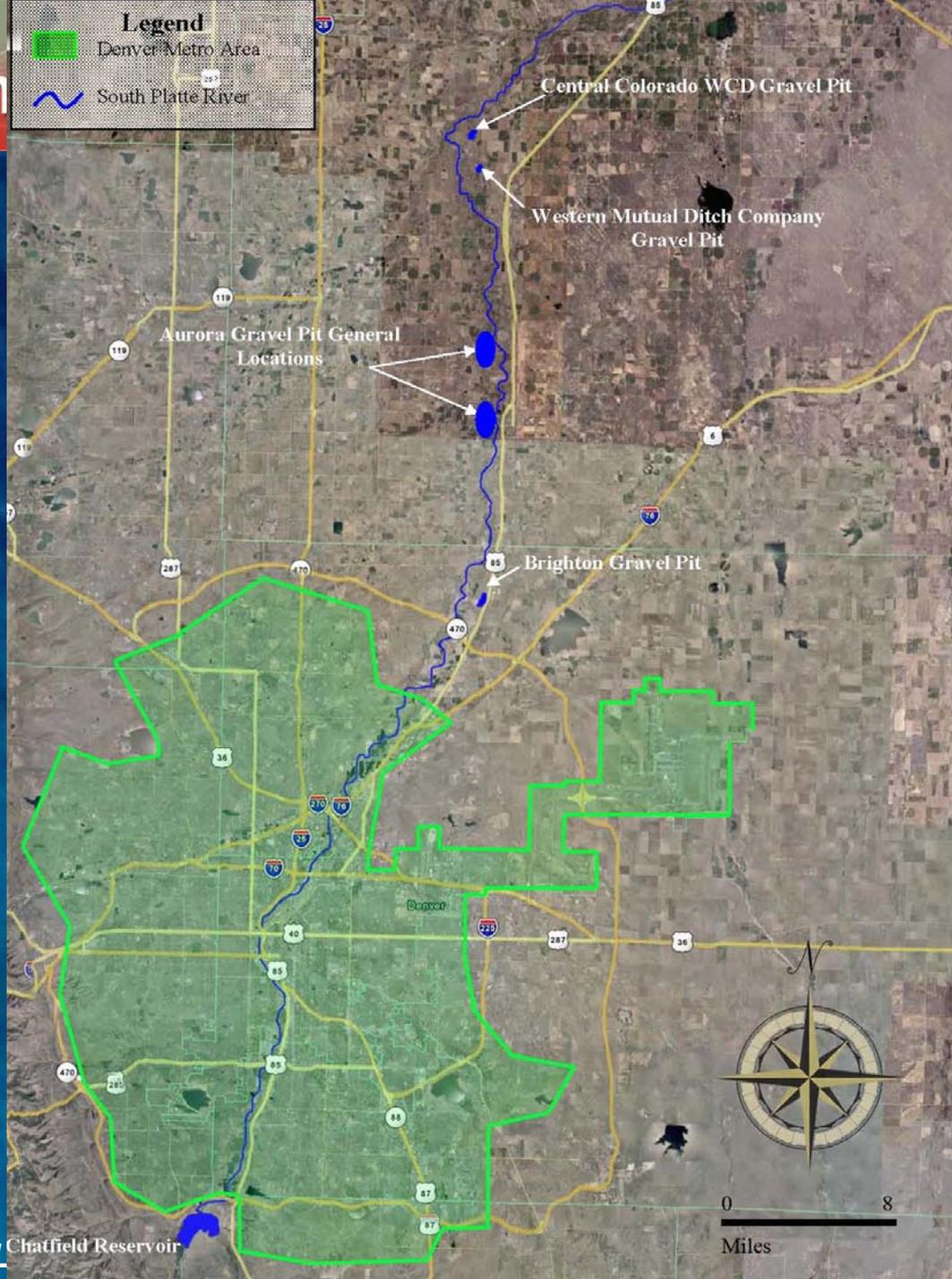


Figure is Representative of Local Desire to Reduce Dependency on NTGW and Develop Alternative Sources of Water to Meet Growing Future Demand



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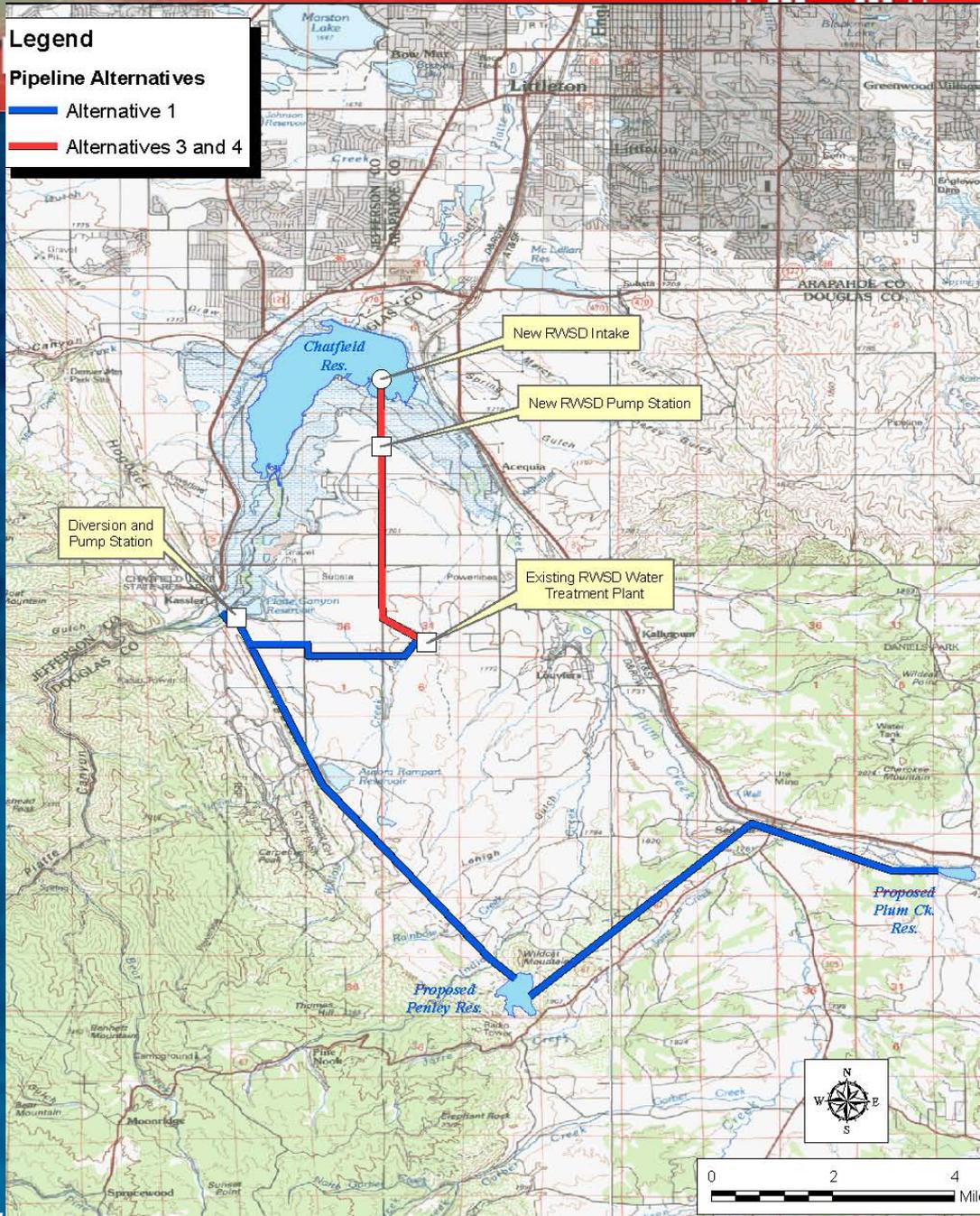


- Alternative 1 - No Action: Gravel Pits and Penley Reservoir

- Approximate Gravel Pit Locations Shown in Figure
- Gravel Pit Locations Are Same for No Action Alternatives 1 and 2



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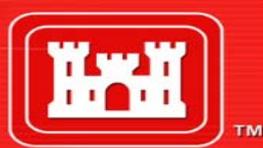


Legend

Pipeline Alternatives

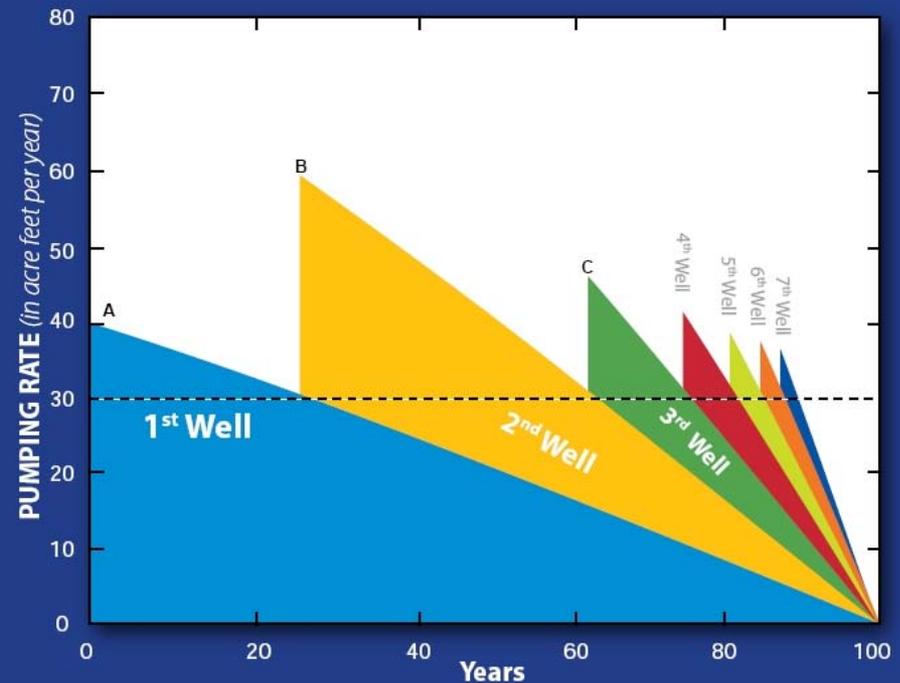
- Alternative 1
- Alternatives 3 and 4

- **Alternative 1 - No Action: Gravel Pits and Penley Reservoir**
 - Blue Shows Approximate Location of Penley and Infrastructure
 - Water Captured and Distributed From River
 - Red shows Pipeline Required for Reallocation
 - Water Captured and Distributed from Reservoir



- Alternative 2 - No Action: Gravel Pits and Non-Tributary Groundwater (NTGW)
 - This Alternative is Used as Least Cost Alternative
 - Upstream Users Prefer to Not Utilize NTGW to Fill Needs
 - While NTGW is Unsustainable, Chatfield Can Only Provide A Portion of Total Need
 - Sustainable Through 50 Year Period of Analysis, But Not Sustainable for Long Term Water Supply into Future

CASCADING REDUCTION IN WELL YIELD





- **Alternatives 3 and 4**

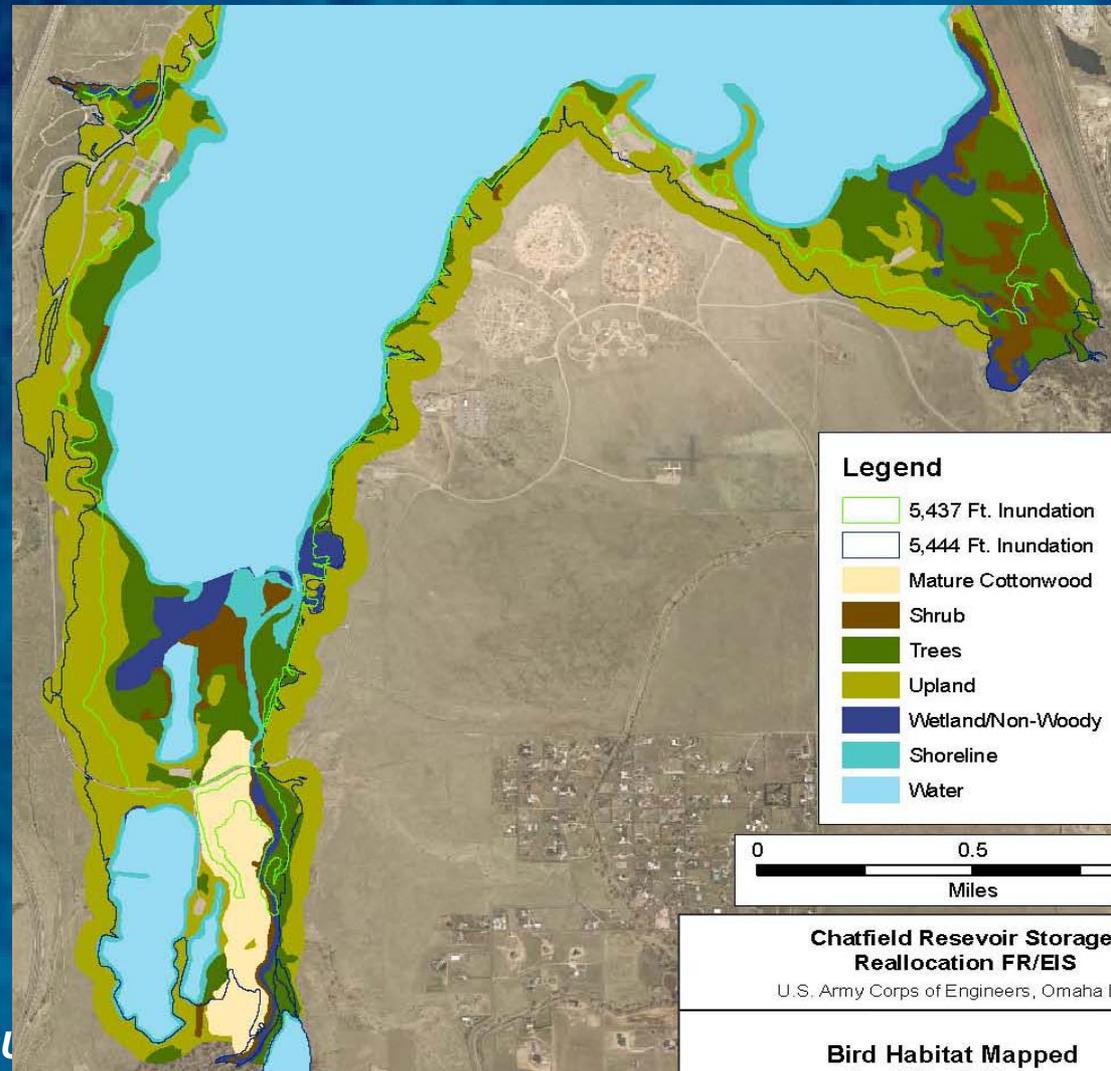
- Alt 3) Reallocation of 20,600 AF storage: (12 Foot Raise of Conservation Pool)
- Alt 4) Reallocation of 7,700 AF storage: (5 Foot Raise of Conservation Pool)





Environmental Considerations Vegetation/Bird Habitat (Alternative 3)

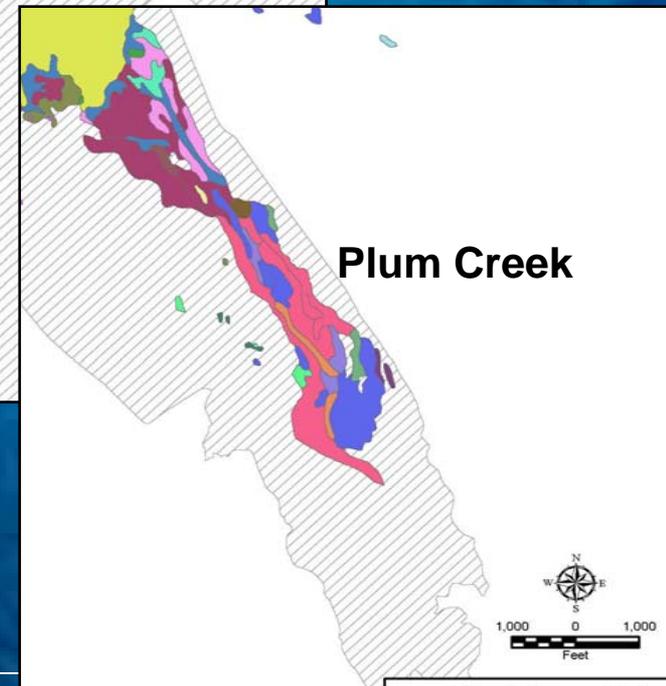
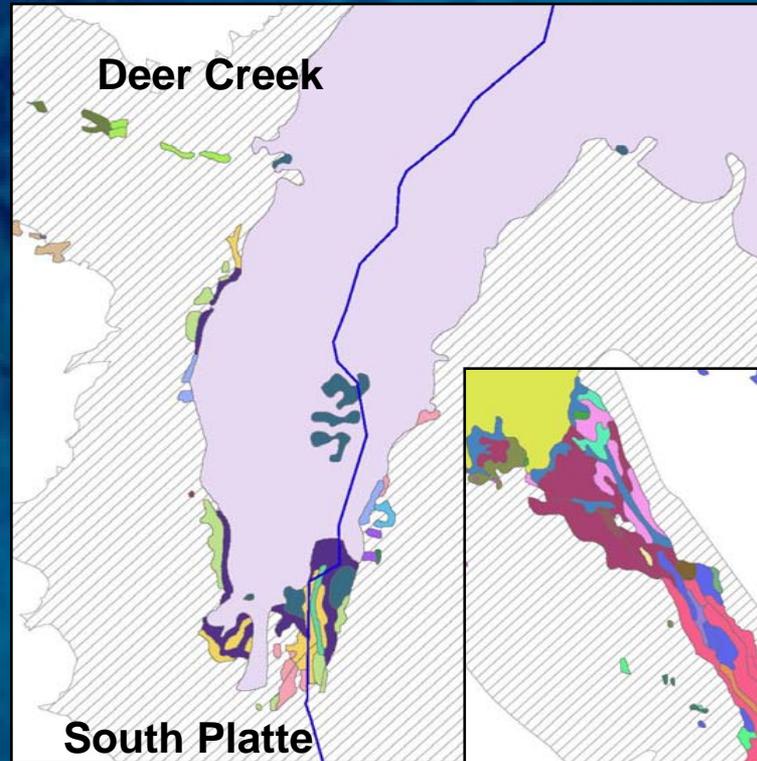
- Riparian Wetland, Scrub & Woodland
 - 204 Ac Max Elev.
- Upland Introduced Grass/Forbs
 - 258 Ac Max Elev.
- Native Grassland
 - 16 Ac Max Elev.





Environmental Considerations Wetland (Alternative 3)

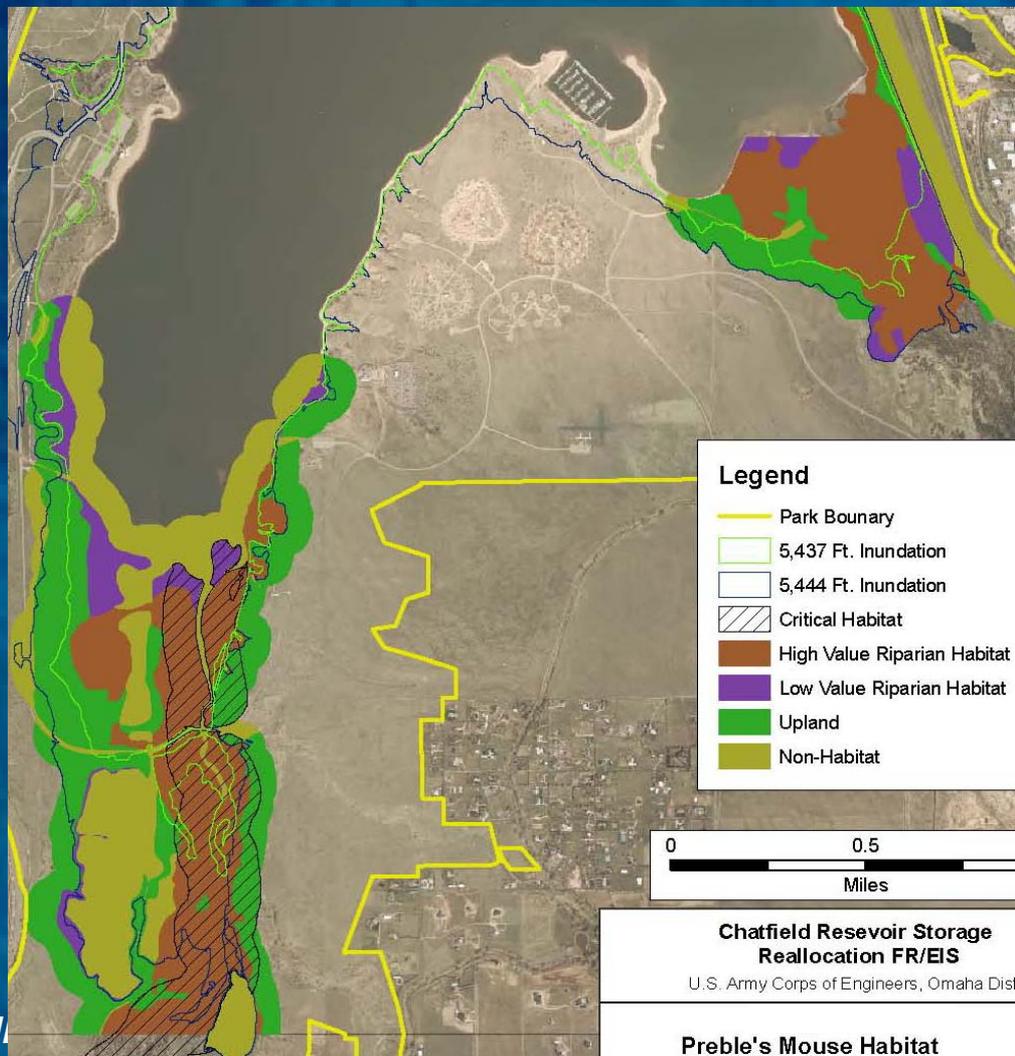
- **76 Total Wetland Acres**
 - **Palustrine Aquatic Bed**
 - 4.4 Acres
 - **Palustrine Emergent**
 - 11.9 Acres
 - **Lacustrine Emergent**
 - <.2 Acres
 - **Palustrine Scrub/Shrub**
 - 40.6 Acres
 - **Palustrine Forested**
 - 19.2 Acres





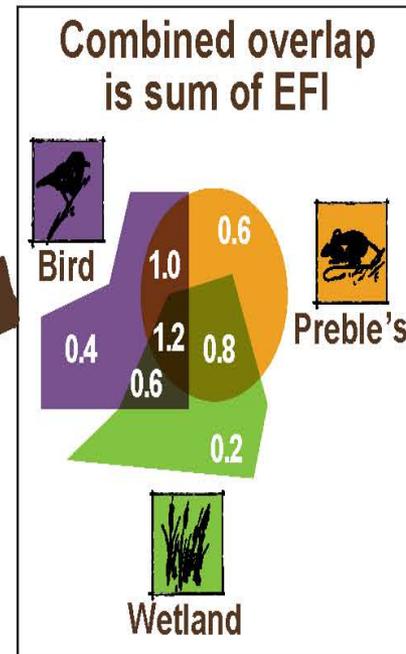
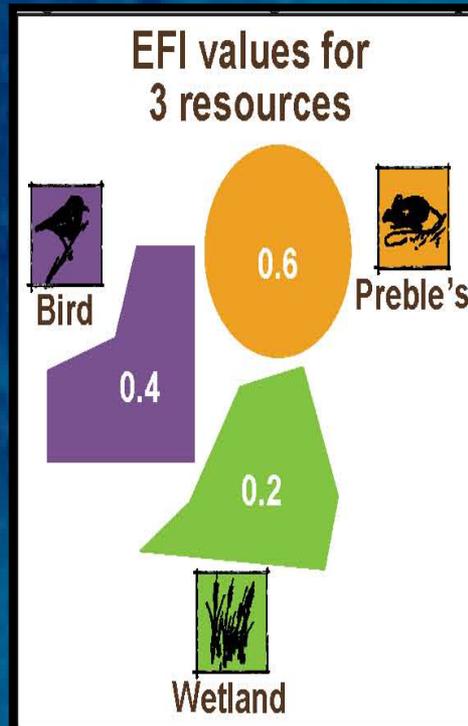
Environmental Considerations Preble's Mouse Habitat (Alternative 3)

- **High Value Riparian**
 - 98.7 Ac South Platte
 - 65.8 Critical Habitat
 - 53.3 Ac Plum Creek
- **Low Value Riparian**
 - 16.7 Ac South Platte
 - 0 Ac Critical Habitat
 - 30.4 Ac Plum Creek
- **Upland**
 - 93.7 Ac South Platte
 - 1.5 Ac Critical Habitat
 - 38.3 Ac Plum Creek



Environmental Considerations - Mitigation Planning

- **Model Significant Habitat**
 - “Ecological Functional Index” models for each main resource
- **Mitigate Based on CE/ICA**
 - Onsite First
 - Offsite Public Lands
 - Offsite Purchased Lands
- **Guiding Principles Include:**
 - Monitoring & Adaptive Management
 - Local Involvement & Cooperative Management
 - Corps Lead Coordination Committee
 - Manage Debit/Credit
 - Incorporation of Local Conservation Planning Efforts
 - Incentive Based
 - Reallocation Allowed Based on Mitigation



$$EFU = EFI \times \text{acres}$$

1.2 at 2 acres = 2.4 EFU



Environmental Considerations – Mitigation Cost (Alternative 3)

	Low	High
<i>Onsite Mitigation Within Chatfield</i>		
Enhancement/Creation	\$1,161,350	\$14,200,000
Mitigation Workgroup Costs	\$390,000	\$390,000
Lands/Management	\$9,161,250	\$10,736,250
<i>Subtotal</i>	<i>\$10,712,600</i>	<i>\$25,326,250</i>

Offsite Mitigation (South Platte and Plum Creek)

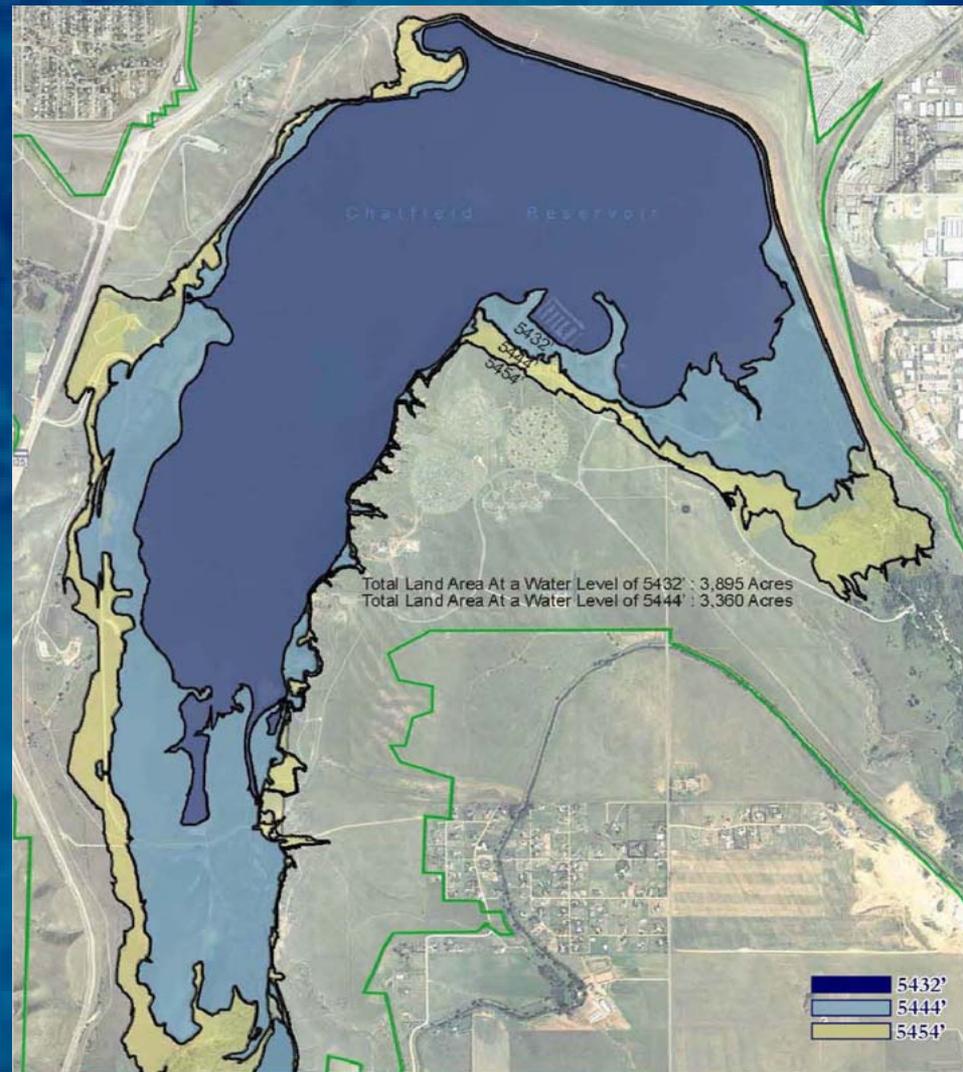
Enhancement/Creation	\$1,831,000	\$14,000,000
Mitigation Workgroup Costs	\$780,000	\$780,000
Lands/Management	\$11,490,000	\$25,165,000
<i>Subtotal</i>	<i>\$14,101,000</i>	<i>\$39,945,000</i>

Total (On-site and Off-site) **\$24,813,600** **\$65,271,250**



Recreation Facility Modifications

- **Goals**
 - Maintain in-kind Recreation Experience
 - Minimize Cost for Replacement Facilities





Recreation Facility - Swim Beach (Alternative 3)





Recreation Facility Gravel Pond / River Crossing (Alternative 3)





Recreation Facility Marina (Alternative 3)





Recreation Facility Cost (Alternative 3)

North Ramp	\$630,228
Massey Draw	\$357,851
Eagle Cove	\$183,492
Deer Creek Day Use & Balloon Launch Area	\$799,623
Swim Beach	\$5,019,200
Jamison	\$990,890
Catfish Flats	\$847,309
Fox Run	\$97,574
Kingfisher Area	\$134,830
Gravel Ponds Area	\$113,640
Platte River	\$58,575
Marina Point	\$1,321,896
South Ramp Including Marina	\$4,608,257
Roxborough Cove	\$213,949
Plum Creek	\$249,943
Roads and Bridges	\$6,570,963
Reallocation Subtotal	\$22,198,220
Cost Estimate Allowances/Contingencies	\$10,299,974
Design Services Allowances/Contingencies	\$10,074,440

Reallocation Grand Total

\$42,572,634



Sponsor Cost

User Costs in \$Millions

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cost of Storage	\$0.0	\$0.0	\$34.5	\$12.9
Specific Costs	\$270.4	\$179.5	\$16.9	\$144.0
O,M,&R	\$33.3	\$21.4	\$33.5	\$27.4
Environmental Mitigation	\$0.4	\$0.4	\$44.0	\$16.4
Recreation Modifications	\$0.0	\$0.0	\$45.0	\$16.8
Total	\$304.1	\$201.4	\$174.0	\$217.6



Seismic Issue

- The Results of a 2005 Seismic Safety Review (SSR) Indicated a More In-Depth Evaluation of Seismic Issues was Warranted
- O&M Funds Unavailable
 - Omaha District has Utilized Project Funds to Move Ahead.
- Study Will Identify:
 - If There is a Seismic Deficiency at Chatfield,
 - If it is a Pre-Existing Condition or Caused by Reallocation
- The Seismic Study is a Parallel Effort, Not Integrated With Reallocation Study.
 - The Completion of a Seismic Study is Part of Ongoing O&M
 - Will Provide Assurances that the Dam is Safe
 - Reallocation Does Not Worsen Condition
- Reallocation Should Be Allowed to Occur If Pre-Existing Condition Exists, but Not Caused By Reallocation
 - Currently Ranked DSAC4 & Seismic Event is Extremely Rare Event
 - USACE Policy Unclear



Questions And Discussion