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Managing Water in the West

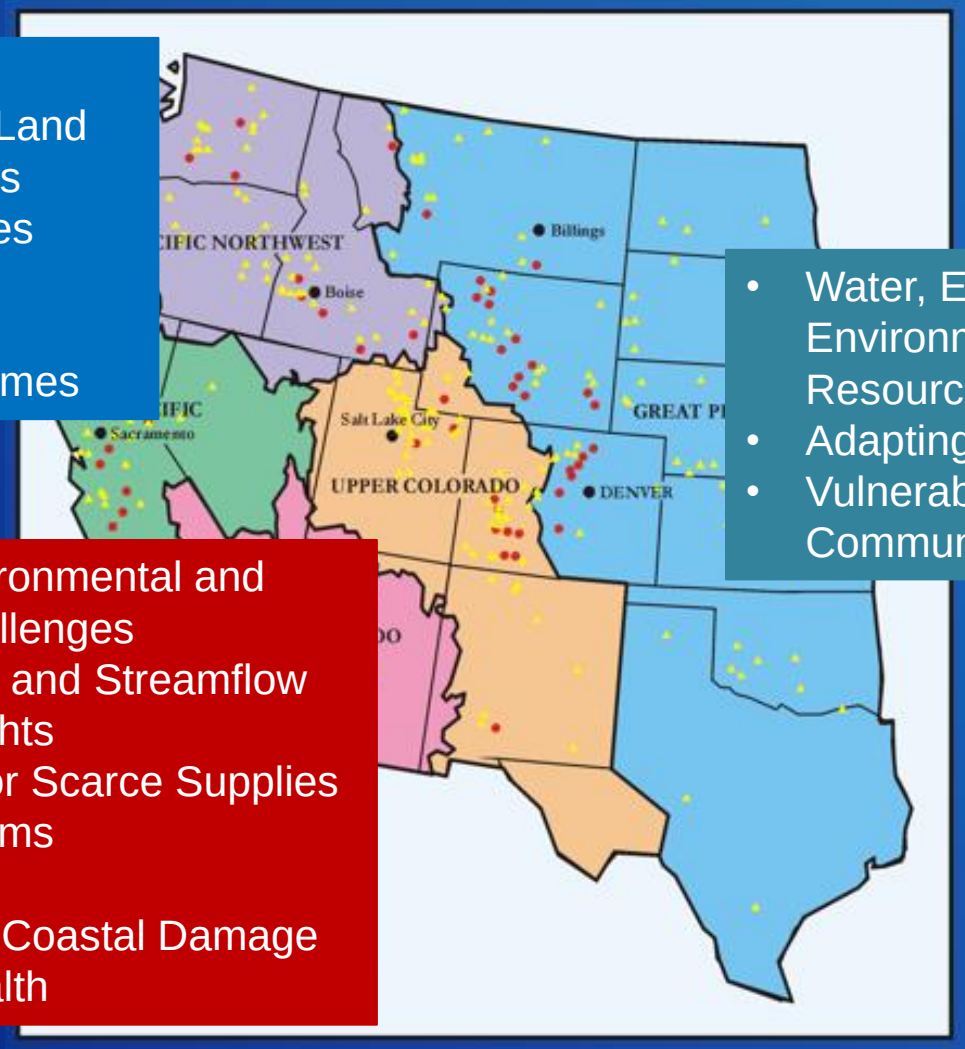
Talk 2:

How does climate change relate to Reclamation's different mission communities?

U.S. Department of the Interior
Bureau of Reclamation

Talk 1 – Recap of Key Challenges

- Water, Energy, Environmental, and Land Resource Challenges
- Coastal Vulnerabilities
- Forest Impacts
- Adapting Agriculture
- Increased Wet Extremes



- Water, Energy, Environmental, and Land Resource Challenges
- Adapting Agriculture
- Vulnerable Rural Communities

- Water, Energy, Environmental and Land Resource Challenges
- Reduced Snowpack and Streamflow
- More Intense Droughts
- More Competition for Scarce Supplies
- Threats to Ecosystems
- Wildfire Impacts
- Sea Level Rise and Coastal Damage
- Heat Threats to Health

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Preview of Key Messages

- **We have always dealt with climate variability. Our challenge going forward is how do we prepare for potential *drifts* in variability?**
  - **Prepare for different Floods and Droughts**
  - **Balance changing Supplies and Demands?**
  - **Factor changing climate into Environmental Stewardship?**
  - **Manage Infrastructure and Safety under changing Climate Extremes?**

- **Management of water and related-resources involves many considerations – climate change is just one additional consideration.**

- **Our response to the challenges posed by Climate Change:**
  - **is about preparing for the future, and factoring climate change into our traditional approaches for planning, conservation, operations, and science.**
  - **is about different communities within Reclamation communicating about approaches.**
  - **is not about abandoning all the good things we've always done and replacing them with reinvented ways to manage water and related resources.**

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The mission of the Bureau of Reclamation is to *manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.*

Conducting our Mission requires different Areas of activity featuring unique management approaches carried out by unique Communities of Practice.

Outline

- **Highlight implications for different Mission Areas**
- **Highlight which types of climate changes may matter most to management within a given Mission area**
  - **Narrow consideration by focusing on *relevance* and *reliability***
- **Provide Mission Area Communities insight on where they have common concerns with other Mission Areas, and where they have unique concerns**

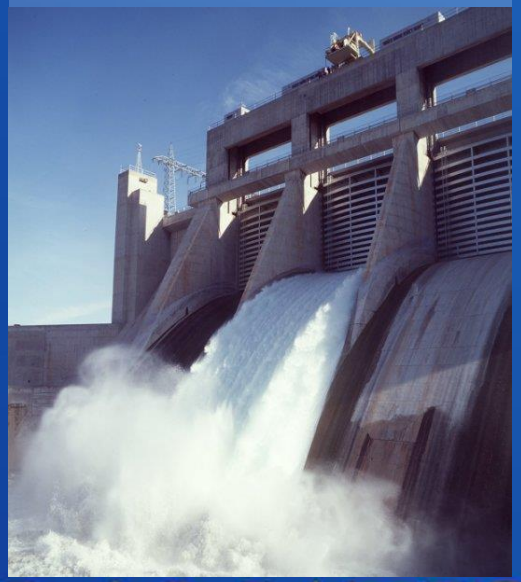
Example Mission Areas and Communities

Infrastructure Management

Species Recovery and Adaptive Management

Long-Term Planning

Reservoir Operations



Dam Safety

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Each Community must ask:
How do we prepare for potential drifts in variability? (*or deal with recent drifts?)*

What kinds of future weather and hydrology conditions should we expect, for both averages and extremes?

... for what geographic areas and conditions timeframes?

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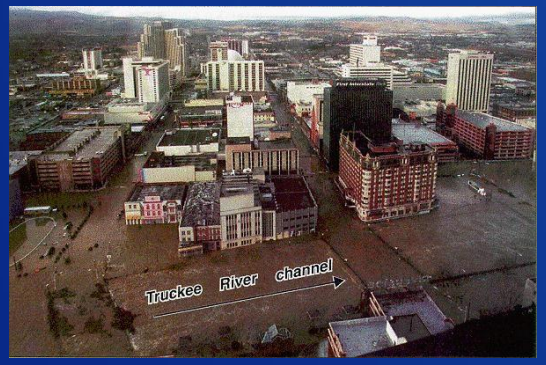
Hydro-Weather Conditions of Interest

Rainfall

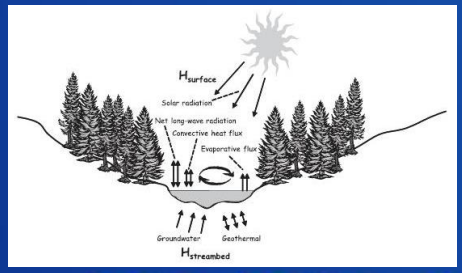
Air Temperature

Snowfall



Floods

Streamflow, Water Supply, Drought



Water Quality

Water Temperature

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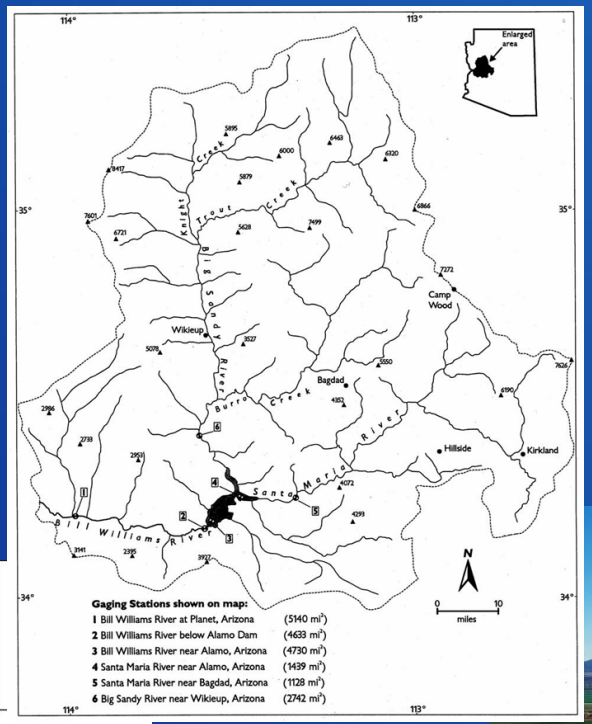
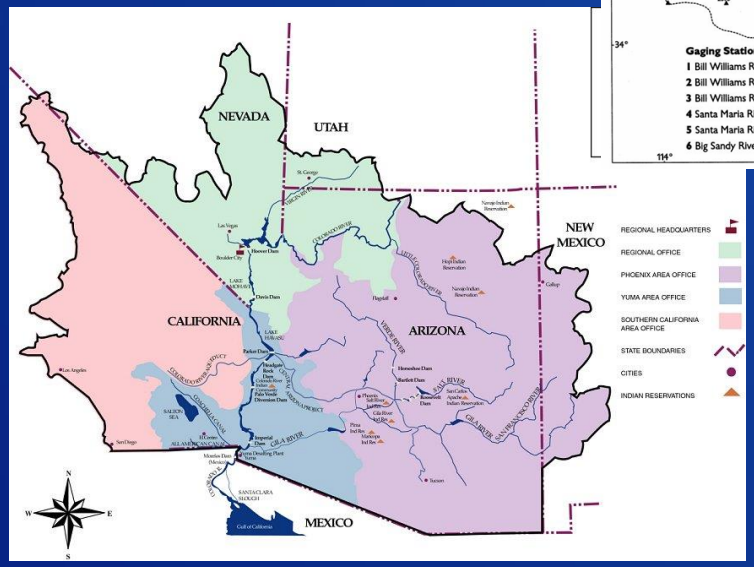
Geographic Areas of Interest

Reservoir Basin



Regional Watershed



Local Catchment

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Condition Timeframes of Interest

Multiple Years (Drought)

Season

Hours to Days

Year

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Climate change involves many types of changes (hydro-weather conditions, regions, condition timeframe).

Mission Area Communities must decide which types are most *relevant* to their interests…

… and what information is *reliable* enough to warrant action.

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Long-Term Planning

- **Evaluate proposed actions**
  - **infrastructure, operating criteria… broad set of activities that could affect our project systems or management**
- **Study types**
  - **appraisal and feasibility studies**
  - **environmental compliance (NEPA)**

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Example: Colorado River Basin Water Supply and Demand Study

1) *Assessed long-term supply and demand imbalances and potential options to mitigate impacts*
2) *Study considered uncertainty with scenario planning approach*
   I. *4 Supply scenarios derived from combinations of observed data, paleo reconstructed record, and climate model projections*
   II. *6 Demand scenarios developed from storylines; when coupled with climate model hydrology, demands were modified to reflect warming associated increases in evapotranspiration*

http://www.usbr.gov/lc/region/programs/crbstudy.html

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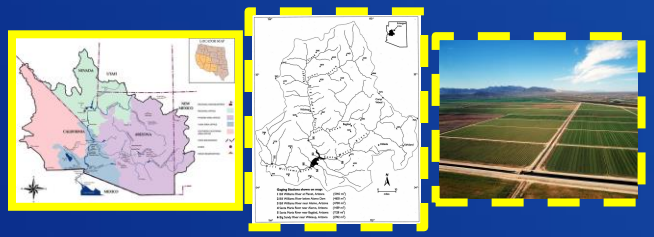
Long-Term Planning

Solid: likely relevant
Dashed: maybe less relevant or not relevant

Hydro-Weather Conditions

Regions



Conditions Timeframe

- **Evaluate proposed actions**
  - infrastructure, operating criteria… broad set of activities that could affect our project systems or management
- **Study types**
  - appraisal and feasibility studies
  - environmental compliance (NEPA)
- **Climate-related Assumptions**
  - supplies, demands, constraints
- **Considering Climate Change**
  - Is future climate change motivating the proposed action?
  - Performance and effects of proposed action under future climate? Effects on future climate?
  - Focus on risk-based planning ==> consider range of future climates

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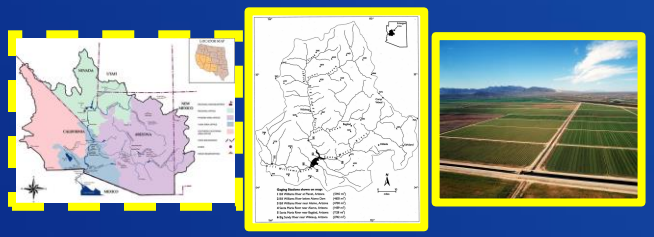
Infrastructure Management

- **Major Repair & Replacement**
  - project development (1+ years)
  - pre-design, design
- **Annual Prioritization**
  - Region needs, cost-share, other factors; FY15 goal is to develop and add climate change criterion

Infrastructure Management

Hydro-Weather Conditions

Regions



Conditions Timeframe

- **Major Repair & Replacement**
  - project development (1+ years)
  - pre-design, design
- **Annual Prioritization**
  - Region needs, cost-share, other factors; FY15 goal is to develop and add climate change criterion
- **Climate-related Assumptions**
  - varies with facility
  - wet and dry extremes, water quality related to corrosion, hydrology
- **Considering Climate Change**
  - Both historical trends and projected future trends should be evaluated; they may differ
  - Focus on risk-based planning ==> consider a range of future climates

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Species Recovery and Adaptive Management

- **Several Region Programs**
  - **unique species, goals, and threats**
  - **unique coalitions and stakeholders**
- **Scientific Uncertainties**
  - **program-specific science plans**
  - **adaptive management (AM) is a tool**

Example:
Multi-Species Conservation Program

1) *Riparian areas are a small portion of the Southwest*
2) *These areas are critical habitat for a range of species, particularly migratory birds*
3) *Climate change, land use, and other practices threaten this habitat*
4) *MSCP is engaged in large-scale restoration and monitoring for adaptive management*

Lower Colorado River
Multi-Species Conservation Program

www.lcrmscp.gov

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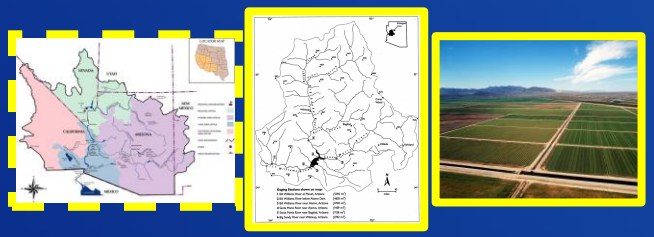
Species Recovery and Adaptive Management

Hydro-Weather Conditions

Regions



Conditions Timeframe

- Several Region Programs
  - unique species, goals, and threats
  - unique coalitions and stakeholders
- Scientific Uncertainties
  - program-specific science plans
  - adaptive management (AM) is a tool
- Climate Relevance
  - thresholds related to habitat quality and species health
  - general hydrology, hydrologic extremes, water quality
- Considering Climate Change
  - Activities may be reach-scale; relevant climate likely larger-scale
  - AM may take long time, difficult to intrepret under climate change

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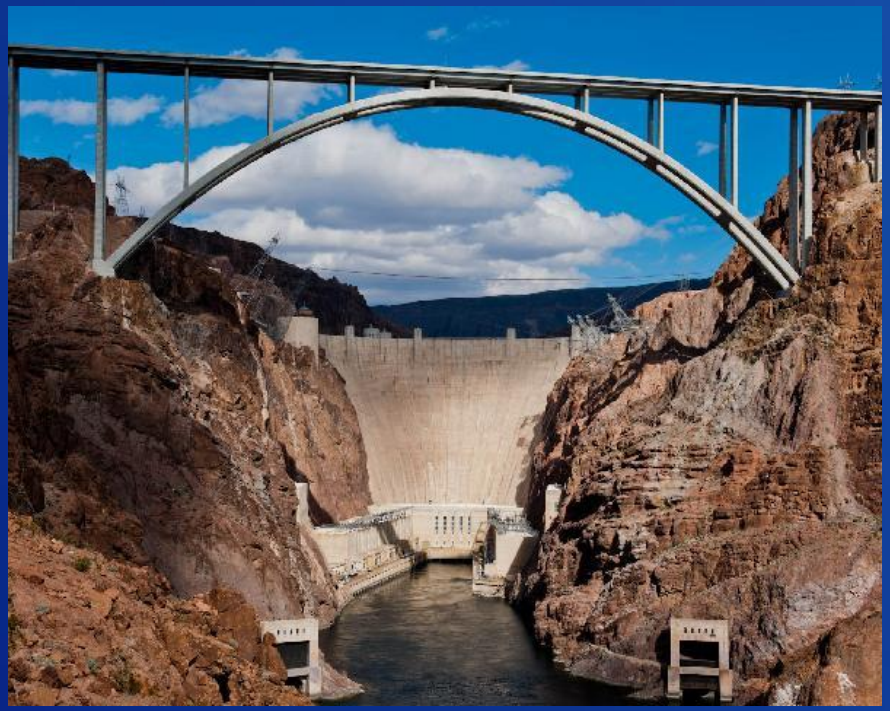
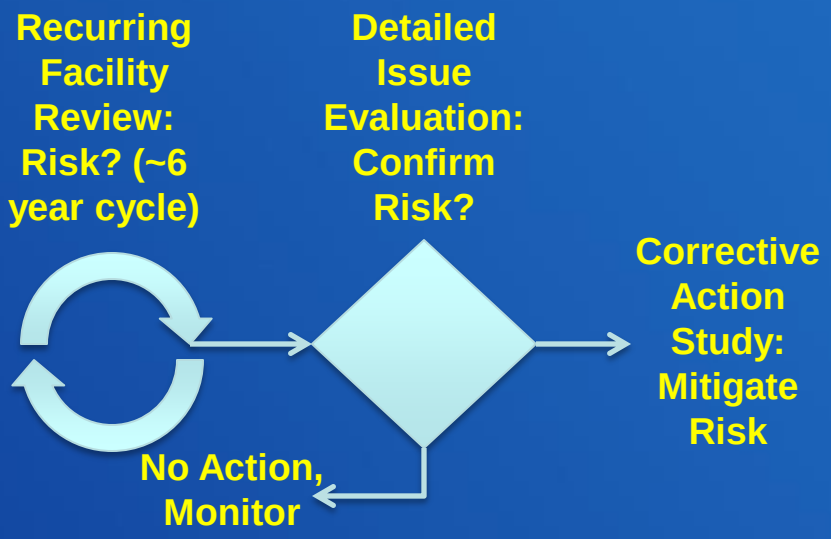
Dam Safety



- **Risk Management Process**



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Hydro-Weather Conditions

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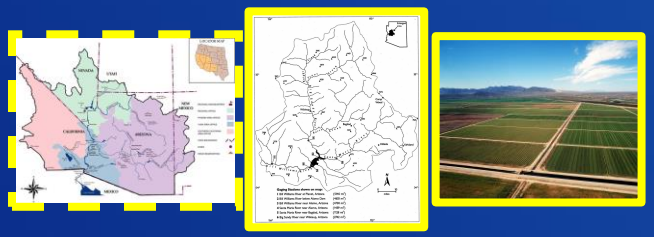

Conditions Timeframe

- **Risk Management Process**

Recurring Facility Review: Risk? (~6 year cycle)

Detailed Issue Evaluation: Confirm Risk?

Corrective Action Study: Mitigate Risk

No Action, Monitor

- **Climate Relevance**
  - hydrologic extremes, general hydrology
- **Considering Climate Change**
  - Focus on what is relevant, reliable, and can practicably be addressed
  - As climate changes, how is flood risk changing?

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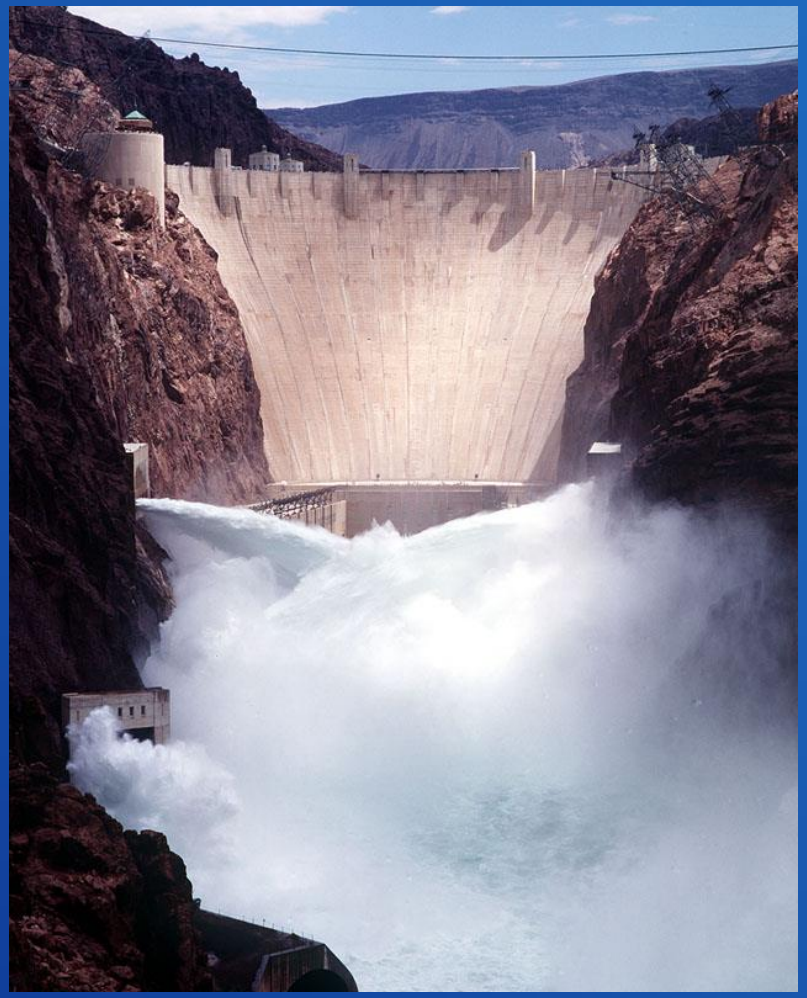
Dam Safety

- **Hydrologic Hazard Analysis (HHA)**
  - **Conducted on ~8 year cycle**
  - **15 Dams in Lower Colorado Region**
  - **Climate model derived flows to be used in future HHA**



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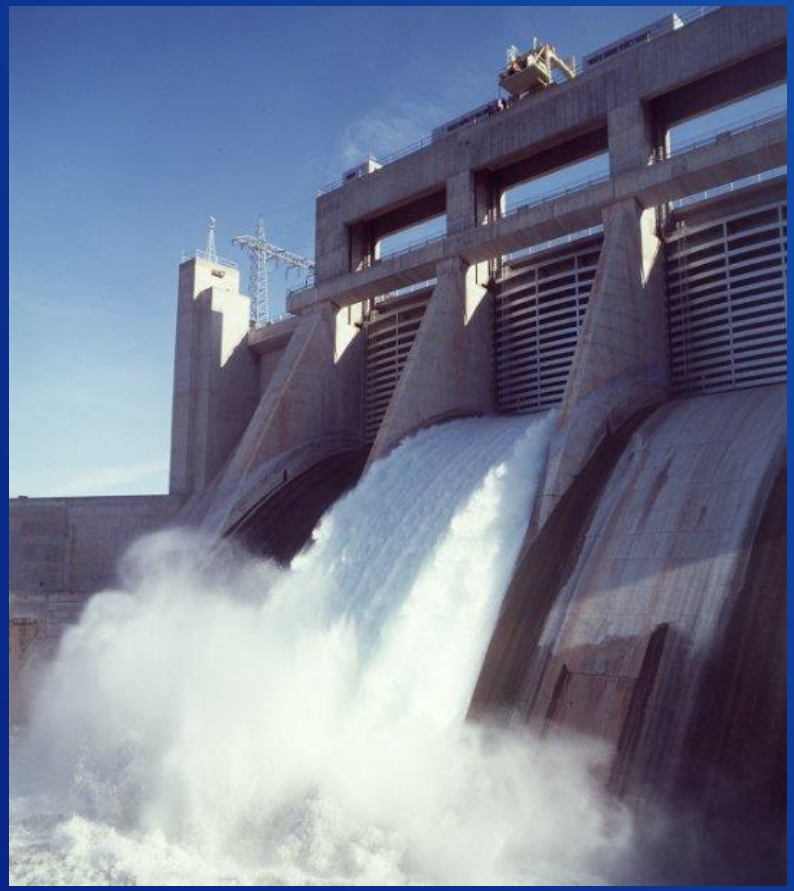
Reservoir Operations

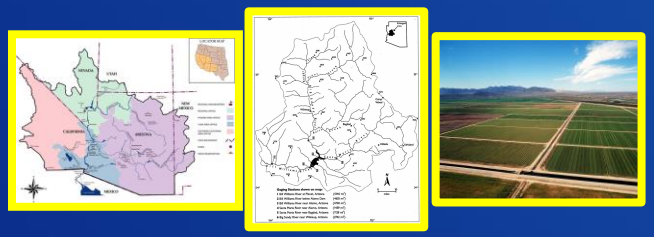


- Decide on storage and releases
- Balance multiple objectives
  - flood control, environment, water quality, water supply, hydropower, recreation, navigation
- Adhere to constraints
  - Constraints for each objective (e.g., flood control ==> storage reservation diagram)
  - Constraints vary by reservoir

Reservoir Operations

Hydro-Weather Conditions

Regions



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- Adhere to constraints
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  - Constraints vary by reservoir
- Climate Relevance
  - each criterion is based on expectations for unique types of hydrology and weather (conditions, region, time period)
  - leads to a large set of relevant types of hydro-weather
- Considering Climate Change
  - As climate changes, when is it time to update criteria?
  - Reconcile historical trends w/ projected future trends

Looking across the Communities…

- **Changes of common interest, motivating sharing of approaches between Communities**
  - **Conditions: flood, air temperature**
  - **Regions: reservoir basin, local catchment**
  - **Conditions Timeframe: seasons to days.**

- **Changes where interest varies by Community motivates more Community-specific approaches**
  - **Hydro-Weather Conditions: snowpack, drought, water quality…**
  - **Regions: regional watershed**
  - **Condition Timeframes: year, multi-year**

- **Communities may be able to share methods for addressing uncertainty.**

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Summary

- **We have always dealt with climate variability. Our challenge going forward is how do we prepare for potential *drifts* in variability?**
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