

# RECLAMATION

*Managing Water in the West*

## West-Wide Climate Risk Assessments

*Landscape Conservation Cooperatives Webinar*

*Jan 10, 2012*

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**WWCRA Technical Lead**



U.S. Department of the Interior  
Bureau of Reclamation

# Presentation Overview

- **SECURE Water Act**
  - WaterSMART program (LCCs, Basin Studies, West Wide Climate Risk Assessments)
- **West Wide Climate Risk Assessments**
  - **Activities and Products**
    - Water supply assessment
    - Water demand assessment
    - Operational risk assessments

# SECURE Water Act, 2009

Coordination

Risks

Impacts

Adaptation  
/ Mitigation

Feasibility

Monitoring

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# SECURE Water Act, 2009

- **Risks**

- Change in snowpack
- Groundwater recharge and discharge
- Increases in water demand or reservoir evaporation as result of increasing temperature

- **Impacts**

- Ability to deliver water
- Hydroelectric power generation
- Recreation at Reclamation facilities
- Fish and wildlife habitat
- Endangered, threatened, candidate species
- Water quality issues
- Flow dependent ecological resiliency
- Flood control management



# WaterSMART Program

(Sustain and Manage America's Resources for Tomorrow)

- **Basin Study Program**

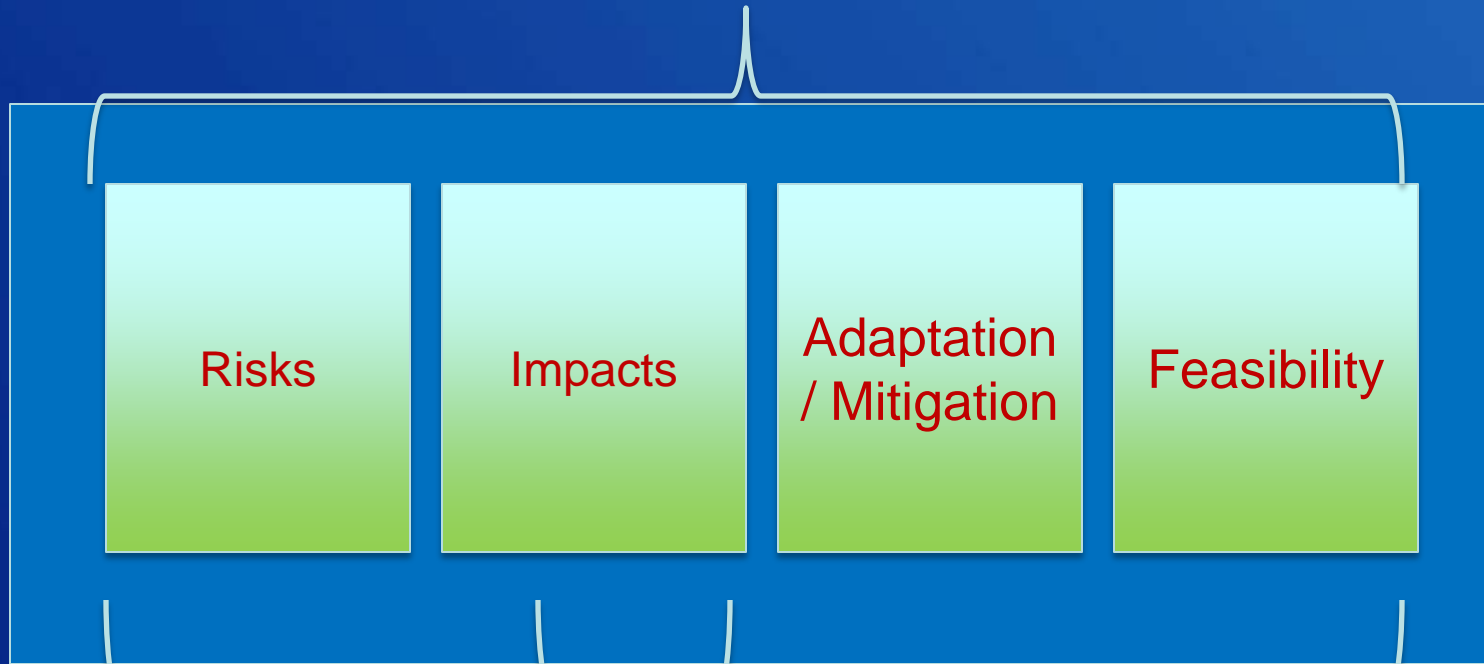
- **Basin Studies**
- **West-Wide Climate Risk Assessments**
- **Landscape Conservation Cooperatives**

*comprehensive approach to incorporate the best available science into planning activities for climate change adaptation planning*

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# Reclamation WaterSMART Program

LCCs  
Science / Coordination / Communication



Risks

Impacts

Adaptation  
/ Mitigation

Feasibility

WWCRA

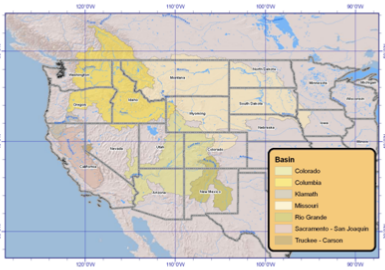
Basin Studies

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*Managing Water in the West*

**SECURE Water Act Section  
9503(c) - Reclamation  
Climate Change and Water  
March 30, 2011**



U.S. Department of the Interior  
Policy and Administration  
Bureau of Reclamation  
Denver, Colorado

January 2011

LCCs

Basin Studies

SECURE Reporting on  
Risks / Impacts / Strategies /  
Feasibility

(Coordinated through WWCRA)

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# West Wide Climate Risk Assessments

## *Baseline Assessments of Risks and Impacts*

- Transforming General Circulation Model information into a spatial and temporal scale relevant to a planning context
- Projections of Future Water Supply
- Projections of Future Water Demand
- Simulating future operations of Reclamation facilities
- Determining Aquatic Ecosystem Responses

\* Consistent approach across 8 major Reclamation riverbasins

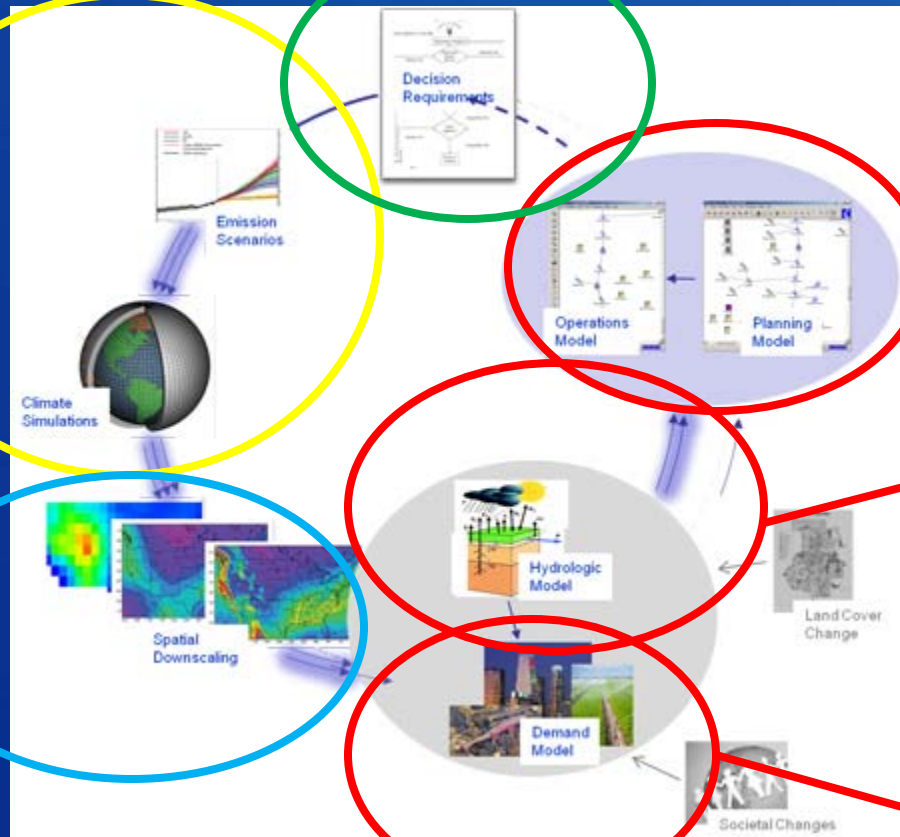


# WWCRA Activities

With Stakeholders  
e.g. CO Basin Study

CMIP3 &  
Updates

BCSD 2008 &  
Updates

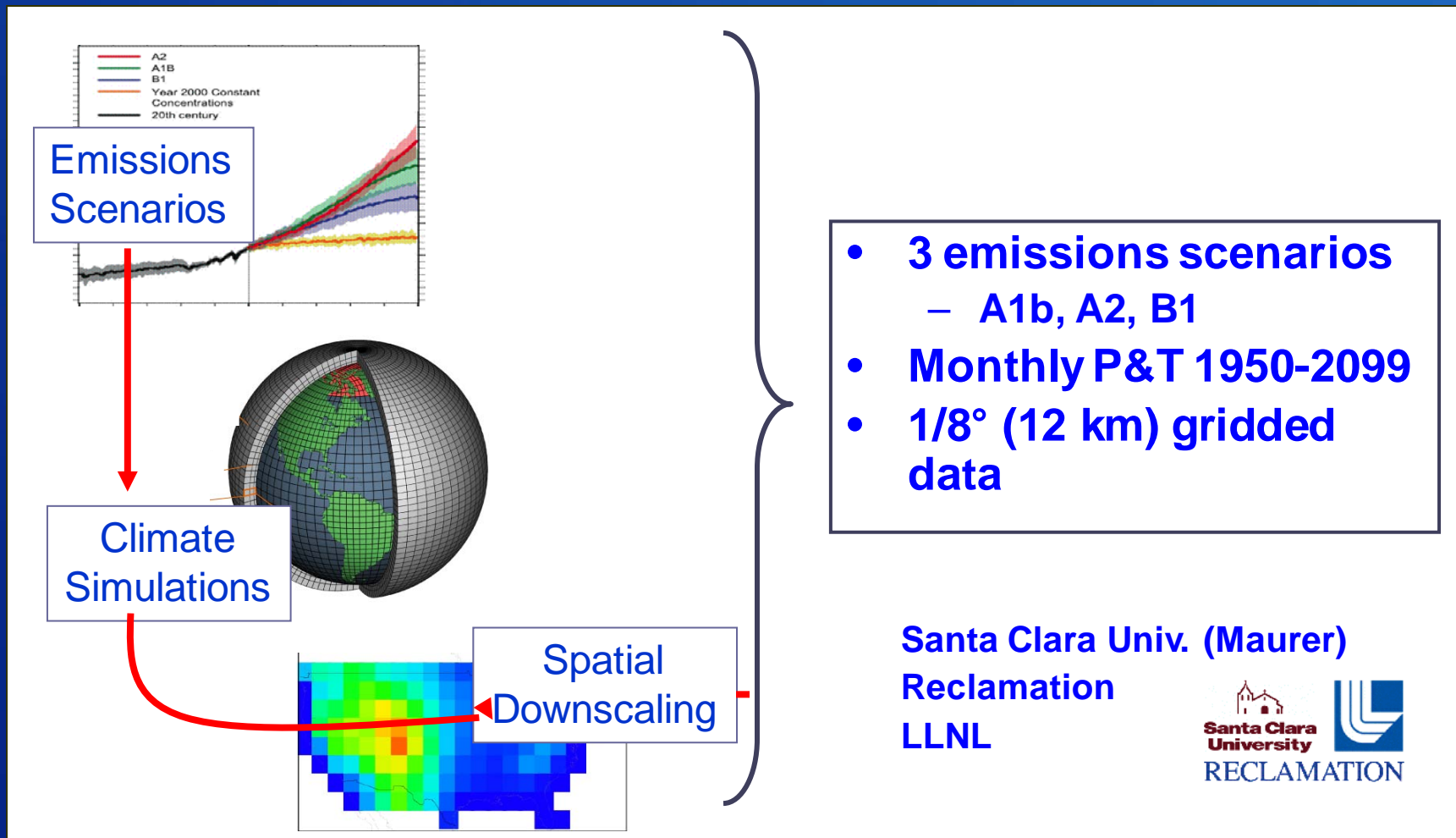


FY 2011 Rio Grande

FY 2010 - 2011

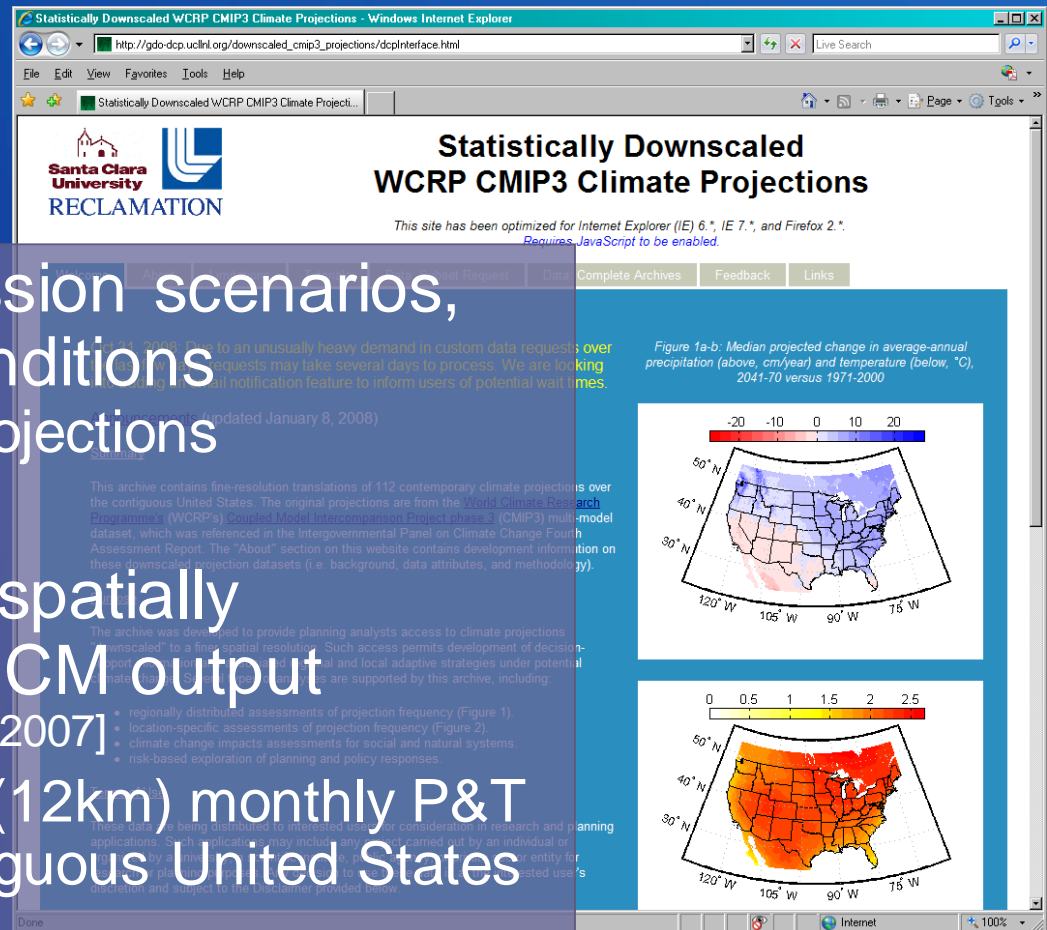
FY 2011 - 2012

# Downscaled GCM Output



# Downscaled GMC Archive

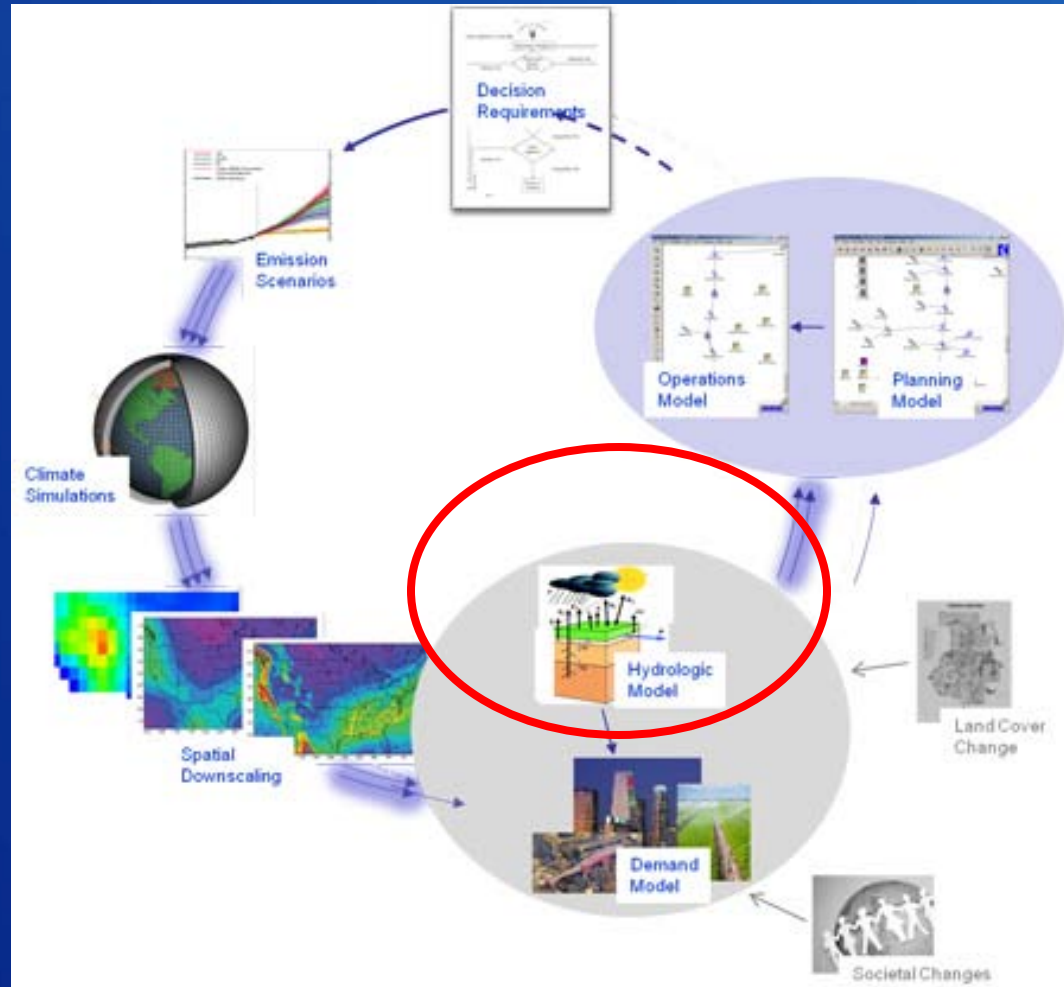
- 16 GCMs, 3 emission scenarios, multiple initial conditions  
- Resulted in 112 projections
- Bias-correct and spatially downscale raw GCM output [Wood et al. 2004, Maurer 2007]
  - Resulted in 1/8° (12km) monthly P&T 1950-2099, contiguous United States



[http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/dcpInterface.html#Welcome](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html#Welcome)

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# WWCRA Activities

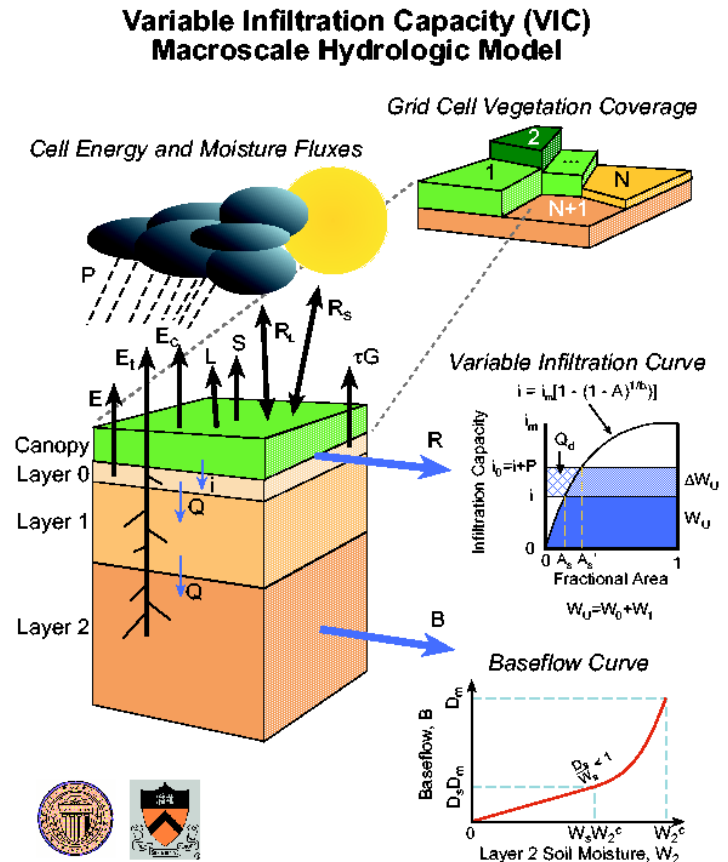


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# Hydrologic Model

Move 112 climate projections through VIC to simulate runoff

- Disaggregate monthly to daily precipitation and temperature
- Run hydrologic model (1950-2099)
- Simulate runoff, ET, snowpack
- Entire western US, 1/8 °(12km) grid





# Future Climate and Hydrology Projections

- **Precipitation, Temperature, Runoff, Snowpack, Evapotranspiration**

- 1950-2099
- Monthly and daily data
- Western US 1/8 (12km) grid
- 112 simulations

- **Website downloads and tutorials**

[http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/dcpInterface.html](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html)

The screenshot shows a web browser window with the URL [http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/). The page title is "Bias Corrected and Downscaled WCRP CMIP3 Climate and Hydrology Projections". The page content includes a navigation menu with "Welcome", "About", "Tutorials", "Projections: Subset Request", "Projections: Complete Archives", "Feedback", and "Links". Below the menu, there is a form for selecting projection parameters. The form has three tabs: "BCSD-CMIP3-Climate-monthly", "BCCA-CMIP3-Climate-daily", and "BCSD-CMIP3-Hydro". The "BCSD-CMIP3-Climate-monthly" tab is selected. The form has a "Submit" button and a "Cancel" button. Below the form, there is a section titled "Step 1.1: Products & Variables -- monthly proje". Under "Products", there are checkboxes for "1/8 degree BCSD projections" and "1/8 degree Observed data (1950-1999)". Under "Variables", there are checkboxes for "Precipitation Rate" and "Temperature". To the right of the form, there is a map of the Western US with various regions labeled: PNW, M, GB, CK, C, AR, RG, and WG. The map shows a grid of 1/8 degree cells. The bottom of the browser window shows "(1 item remaining)" and "Internet |".

# Routed Streamflow Projections

Routed Monthly and  
Daily Streamflow

1950-2099

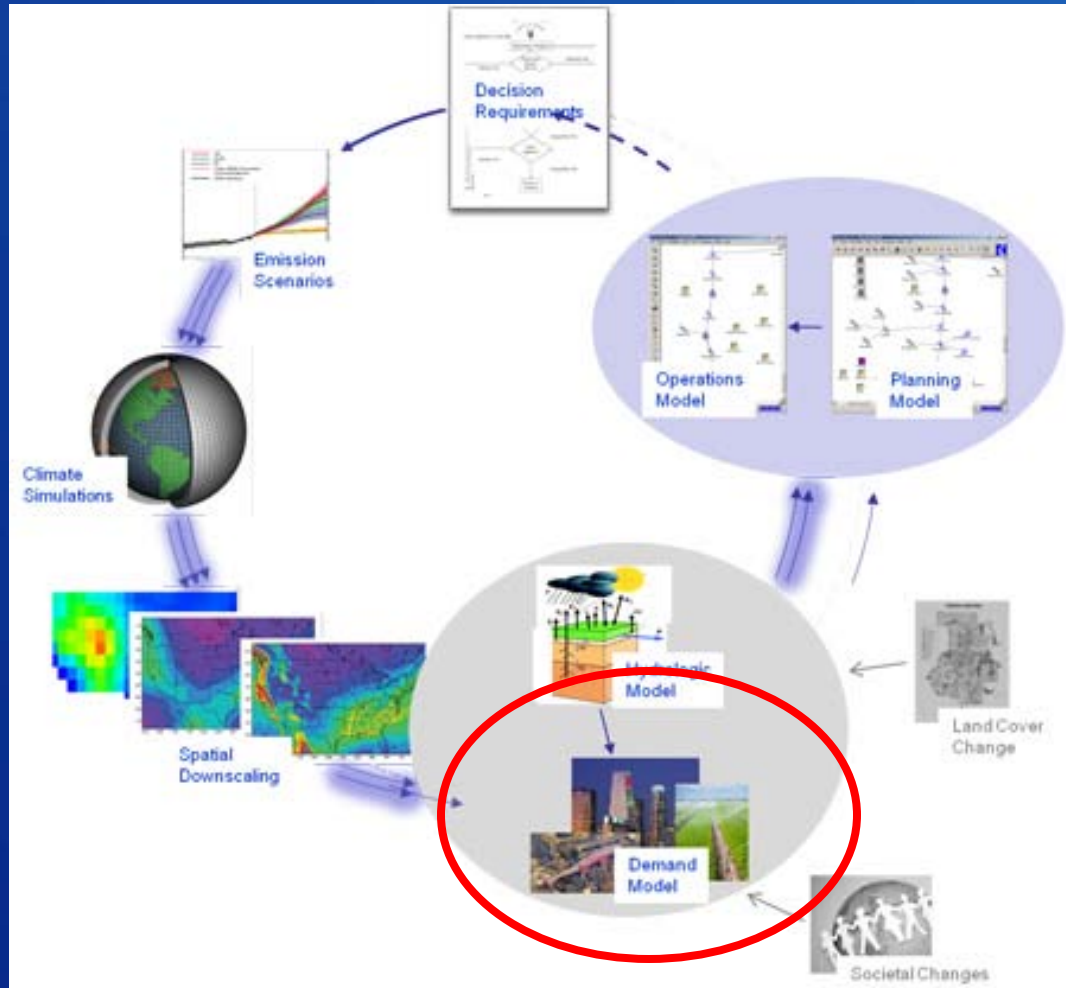
195 locations across  
Western United  
States

Working on website  
now...



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# WWCRA Activities



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# WWCRA – Agricultural Demands

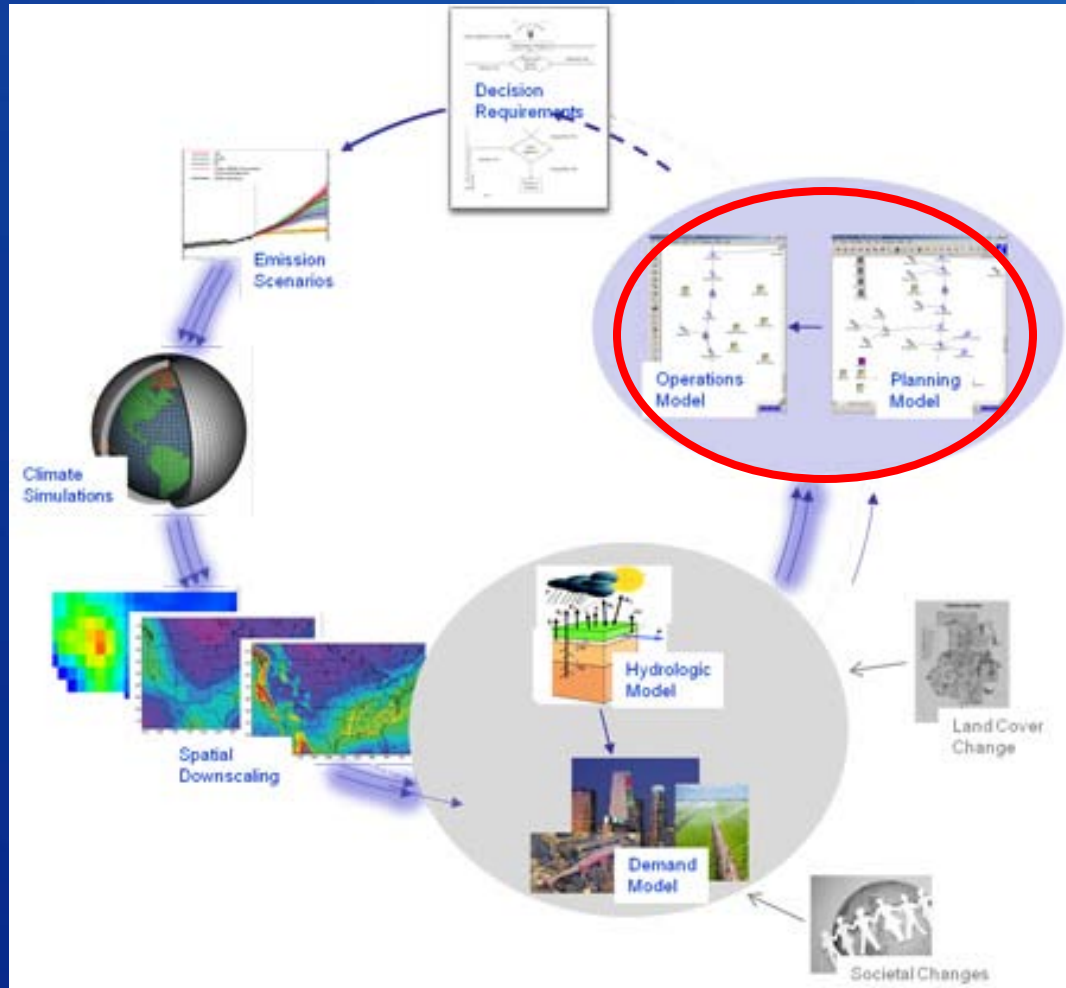
Climate Forcings

Current use Ag  
demand data

Ag demand analysis  
tool

- 1) 5 future climate scenarios
  - 2020's 2050's 2080's, period-composite method (HDe)
- 2) Current use ag use is as a "baseline"
- 3) Each basin choose which ag demand tool to use (Blaney-Criddle, ET toolbox, Penman-Monteith, Hargreaves-Semani,)

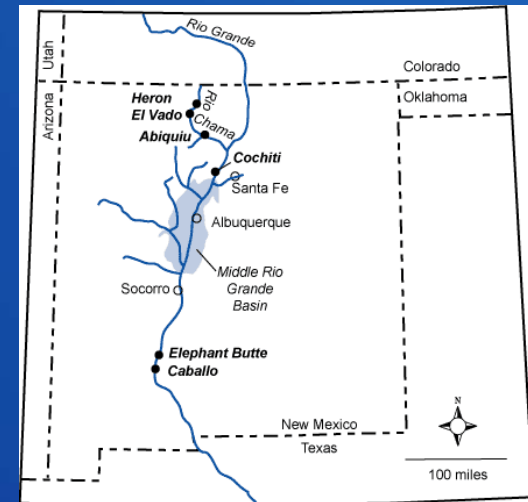
# WWCRA Activities



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# WWCRA - Rio Grande Risk Assessment

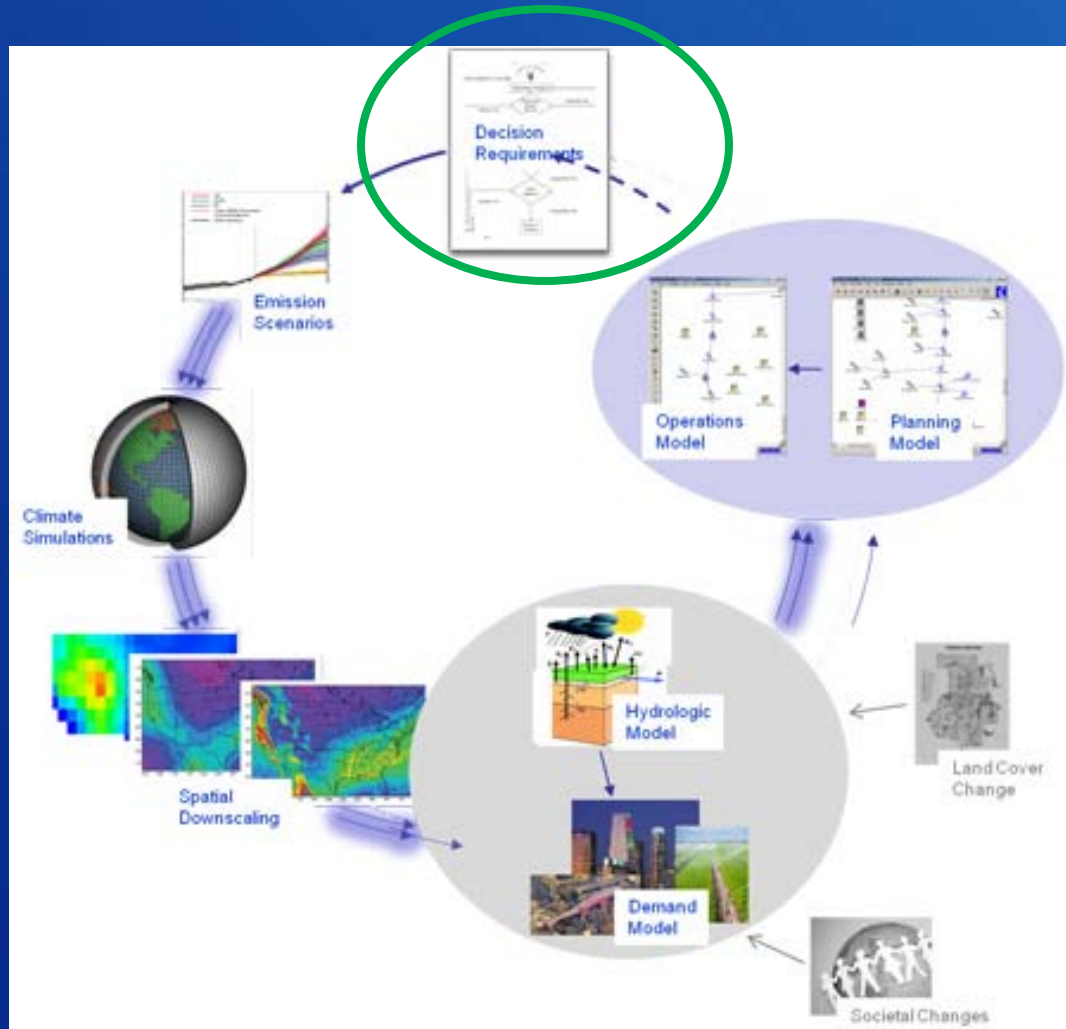
- **Assessing Risks and Impacts from Climate Change**
  - Evaluating water supply, crop irrigation requirement, reservoir operations, water delivery, hydropower, recreation, fish and wildlife habitat, and flood control management
- **Evaluated in reservoir operations model**
- **3 future periods: 2020's, 2050's, 2090's**
- **Rio Grande headwaters down to Elephant Butte Reservoir delivery area**
- **Utilizing WWCRA runoff projections**
- **Completed by June 2012**



# Ecosystem Response

- **FY2012: Developing metrics to consistently evaluate ecosystem response to changing climate across 8 major river basins**
  - Ecological resiliency
  - Water Quality
  - Fish and Willife Habitat
  - Endangered, threatened, or candidate species
- **White paper describes current methods and metrics used in each basin**

# WWCRA Activities



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# West Wide Climate Risk Assessments

<http://www.usbr.gov/WaterSMART/wcra/index.html>

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Climate and hydrology projections archive:

[http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/)

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