

NASA Western Water Applications Office annual meeting:

*Perspectives from the Rio Grande Basin and the Upper Colorado Basin Region of the Bureau of Reclamation*

*Dagmar Llewellyn: Supervisor, Resource Programs / Planning Group; Bureau of Reclamation, Upper Colorado Basin Region*





# Bureau of Reclamation

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 people.





How much water can we give them?

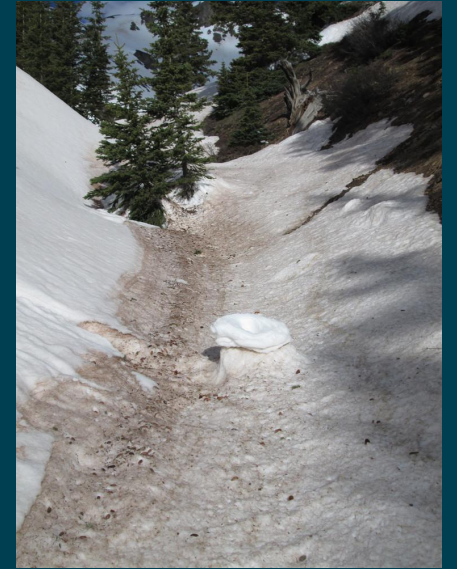
- Snow covered area
- Snow depth
- Snow water equivalent
- Vegetation density
- Vegetation moisture stress
- Soil moisture
- Reservoir evaporation
- Crop evapotranspiration (ET)
- Forest ET
- Riparian ET
- Groundwater storage



How much Power can we generate?



# Needs: Integration



Navajo Nation Drought Assessment (Amber McCullum)

Dust-on-Snow area, snow albedo (Karl Rittger)

Amount of sublimation from affected snowpack

Soil moisture (panel)

Hydrologic losses

Remaining streamflow

How much water can we give them?

"The Bureau that Changed the West"

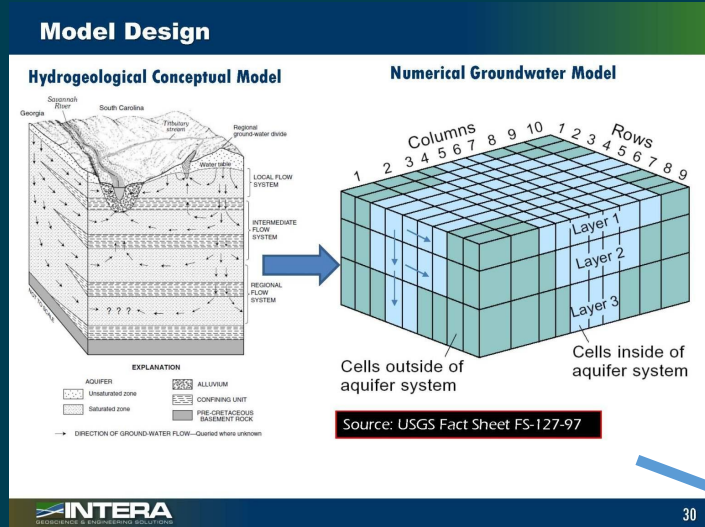




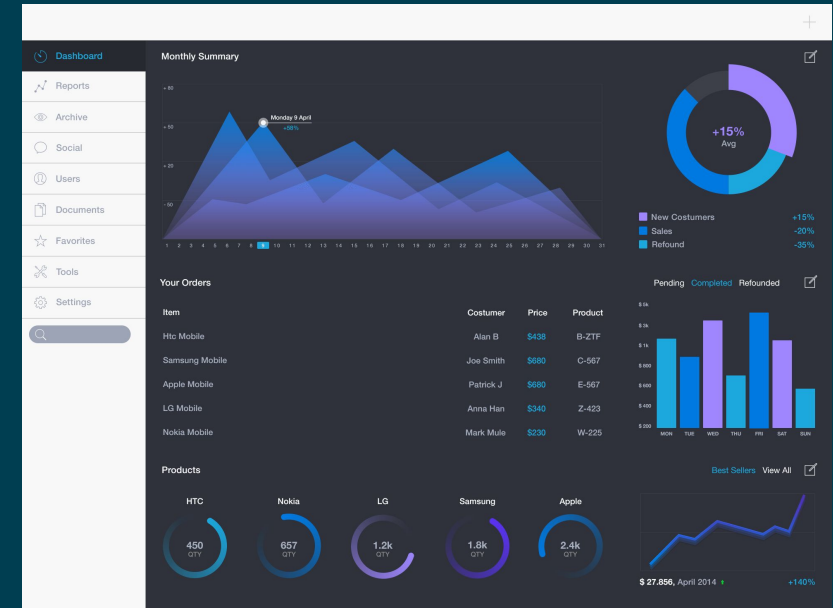
# Needs: Tools and Models

Data dashboards and decision support tools

## Groundwater models



## Water Operations Models

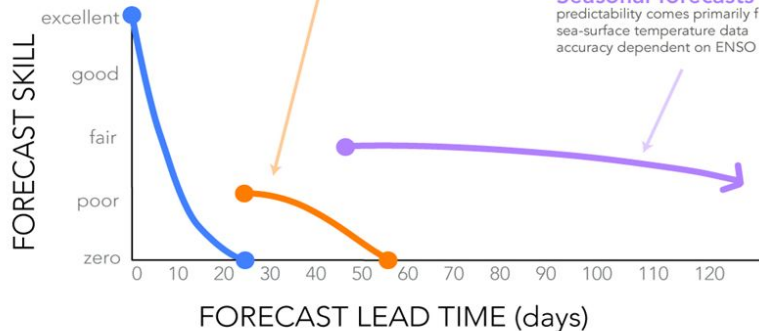


## Weather forecasts

predictability comes from initial atmospheric conditions

**Sub-seasonal forecasts**  
predictability comes from monitoring the Madden-Julian Oscillation, land surface data, and other sources

**Seasonal forecasts**  
predictability comes primarily from sea-surface temperature data accuracy dependent on ENSO state

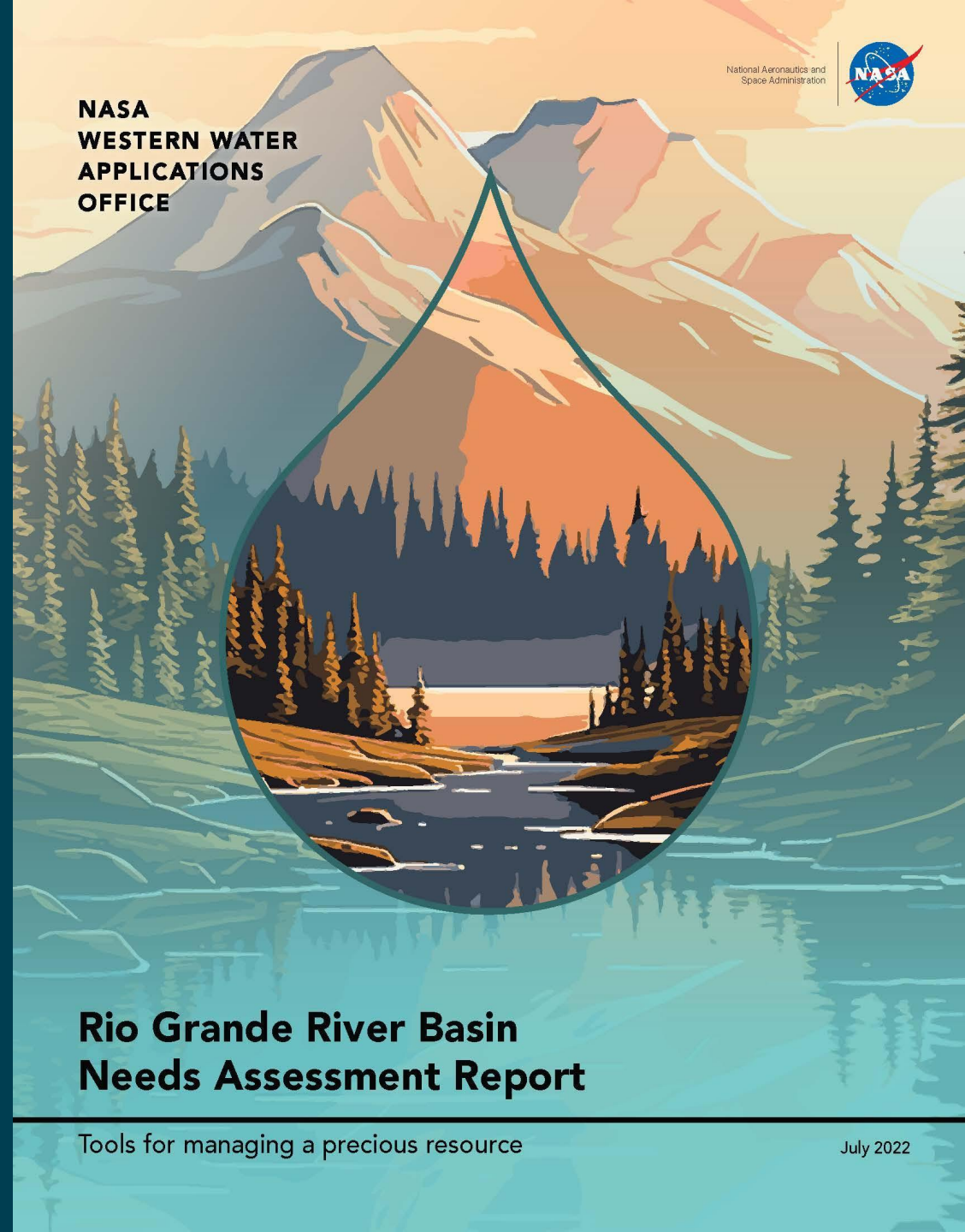


## Forecasting models



# WWAO Rio Grande Needs Assessment

- Two Projects on assessment of **snowpack** conditions in headwater forests.
- Two **hydrology dashboards** – one on hydrologic data and modeling, and one on future hydroclimate conditions.
- An integrated **modeling framework**
- An analysis of **surface-water / groundwater interaction**
- A **water supply forecasting** tool.





# Needs: Tools that support assessment of risk

## Examples for Wildfire:

- Fuel Loads
- Presence of fire-spreading or hot-burning invasives
- Soil Moisture
- Forest Moisture Stress
- Debris-flow potential
- Human infrastructure at risk (esp. Reclamation dams and diversions)
- Burned area, for assessment of seed sources to support recovery
- Erosion rates, sedimentation rates into reservoirs

*Shout out the Jackie Schuman,  
NASA Firesense*



**Nambe Reservation, Nambe Dam/Reservoir**

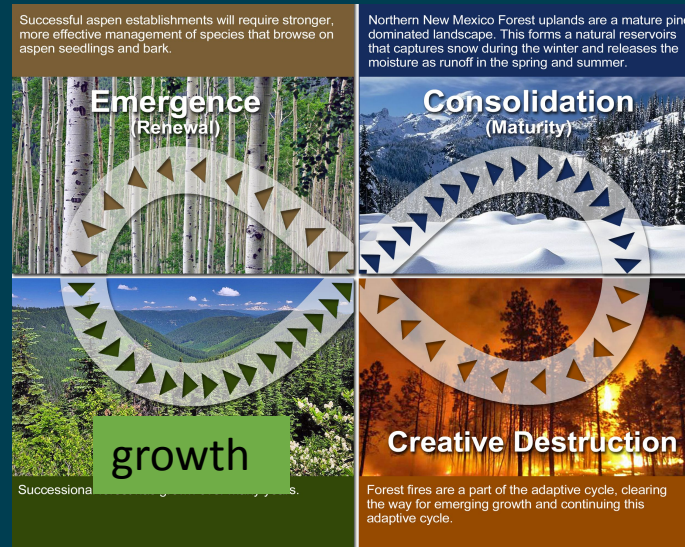
Courtesy of Ralph Manzanares , PVID District manager

# Needs: Tools that support resilience

## Assess or protect Resilience

Soil carbon / soil carbon loss

Invasive species



## Manage Transformation

Remaining soil carbon

Available seed sources

## Other Systems and Ideas

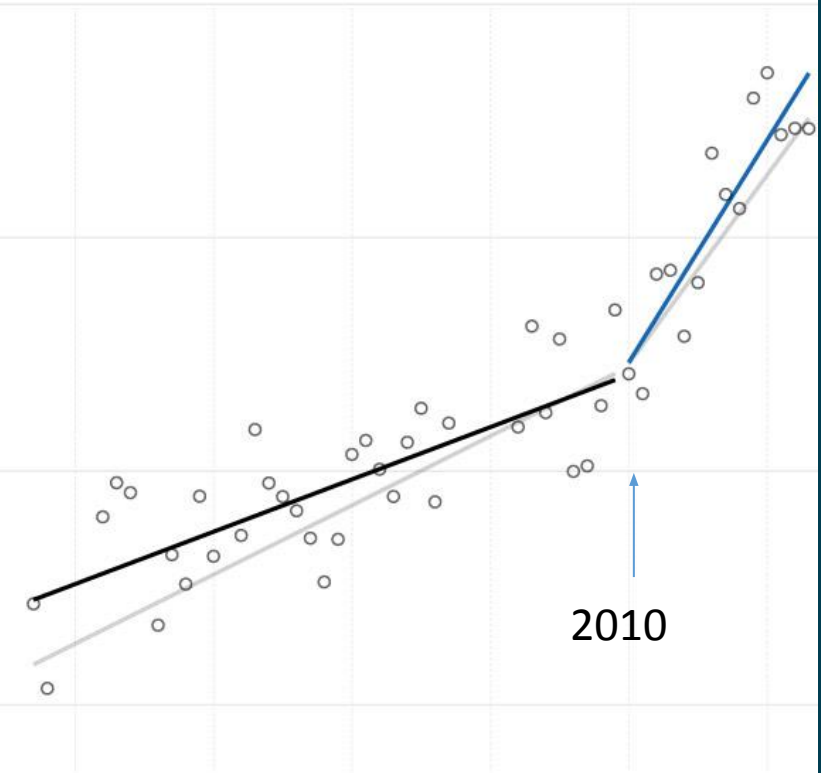
- Real-time information in emergencies
- Alternative water sources for emergencies
- Impending crop failure
- Water quality
- Endangered species populations and biodiversity (shout out to Kimberly Miner)



# Challenges: Agency Inertia

- Government agencies are tasked with providing stability, designed to have inertia.
- Need to better understand the speed and scale of changes on the landscape, and resulting changes needed in how agencies meet their mission.
- 
- Need to figure out tools needed to evaluate what is needed *as systems change* – what kinds of tools will be needed to assess the flooding on the Gulf Coast? How are people changing how they live on the landscape?

Sea level rise along the Gulf of Mexico (Washington Post)



# Challenges: Security!

How do we collaborate and make information public and transparent without imposing risk?



Source: Wall Street Journal

Data Transfer between branches of government



## Storage

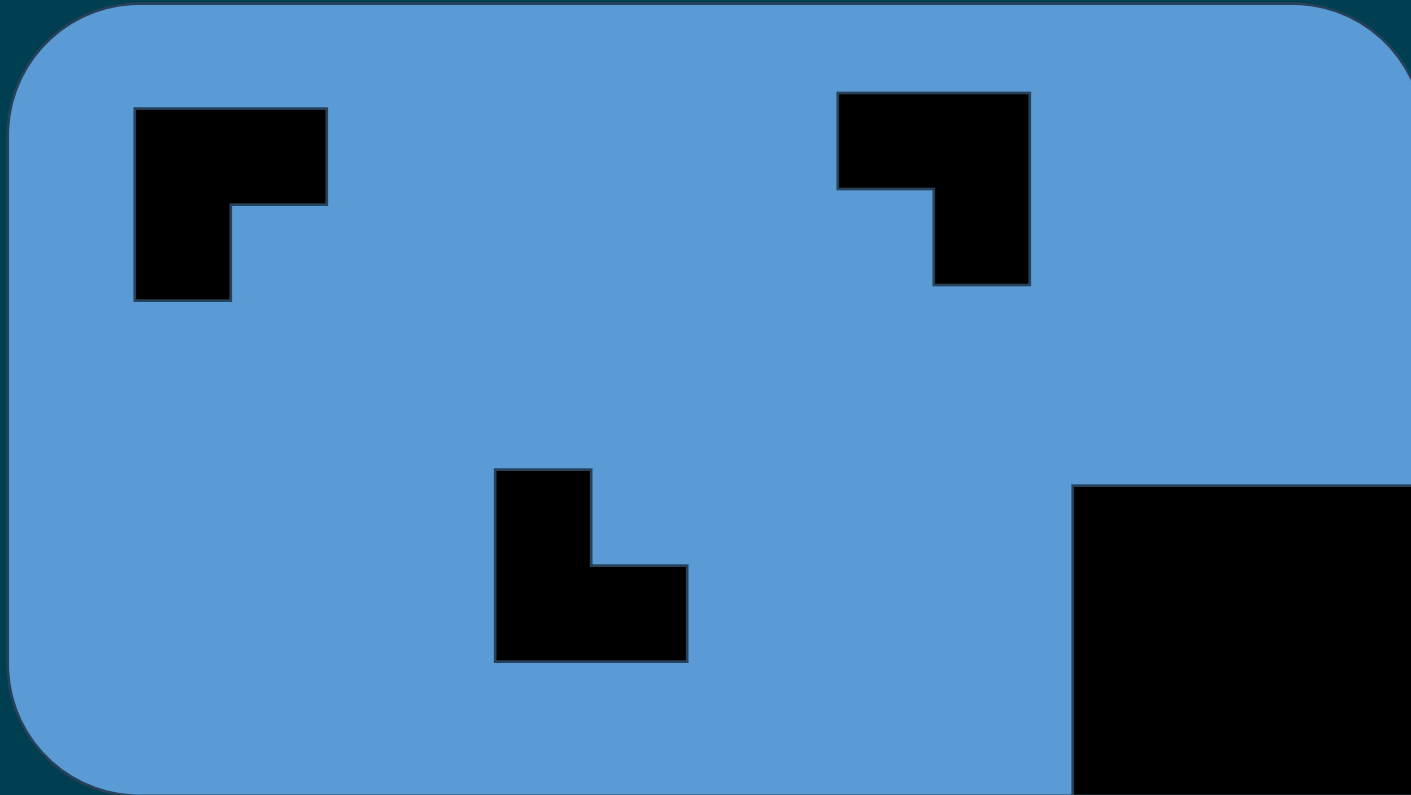
How do we take the important information out of our remotely sensed data to allow long-term storage?



Source: Environmental Protection Agency



# Challenges: Private property, Proprietary information, Data Sovereignty



*Talk this morning by Alyssa Whitcraft, addressing data privacy concerns.*

*Need for co-management of data with State and local partners.*

*Federal Trust responsibility to Native American tribes, and respect of their data sovereignty (shout out to Amber McCullum).*



Your thoughts and suggestions.....?



— BUREAU OF —  
RECLAMATION

Dagmar Llewellyn [dllewellyn@usbr.gov](mailto:dllewellyn@usbr.gov)