WRRC 2025 Annual Conference

Shared Boarders
Shared Waters

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Building Trust Through Data and Collaborative Modeling in the Verde River Watershed

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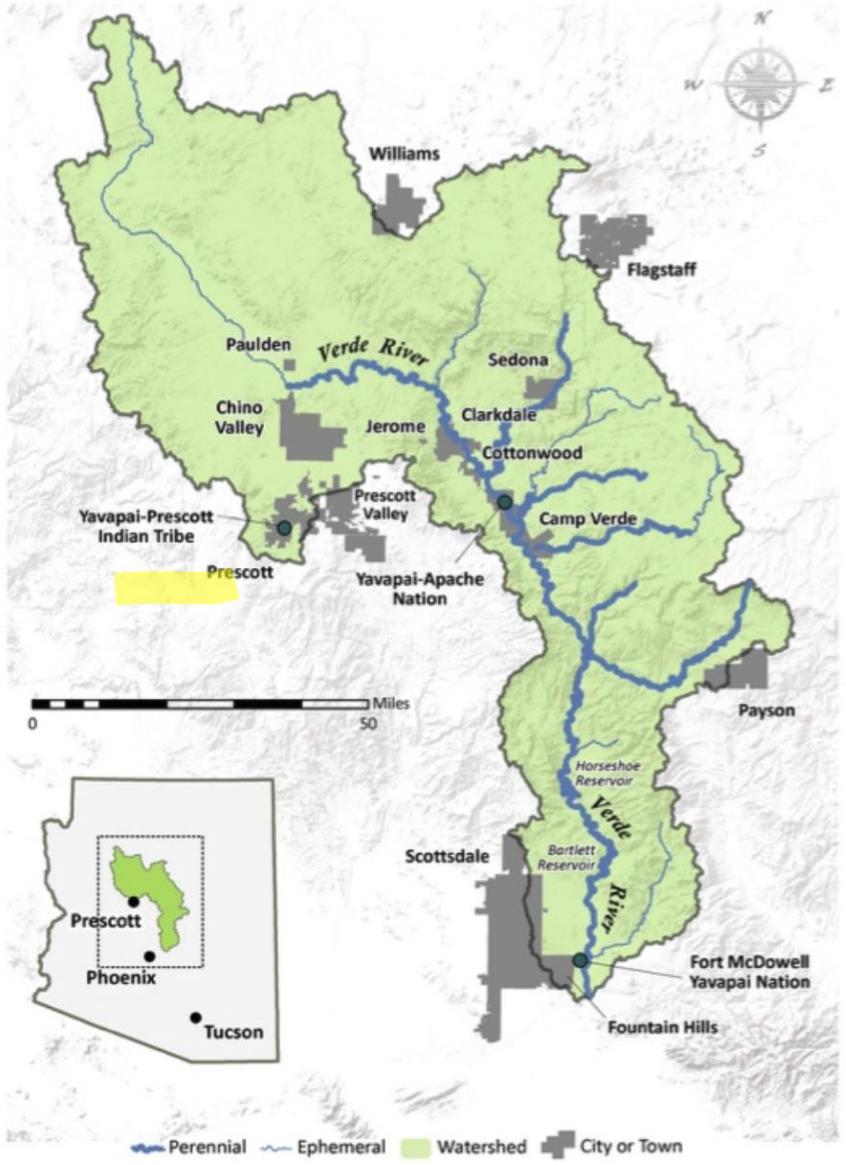
ATTORNEYS AT LAW

- 2018 the Yavapai-Apache Nation recognized the need in the Verde River Watershed to gather data and develop modeling tools on the Verde River, its groundwater interactions, and how human actions, drought, and climate change could affect the River – positively or negatively

- 2020 the Nation and The Nature Conservancy (TNC) co-funded the modeling work of:
  - Dr. Laurel Lacher of Lacher Hydrological Consulting
  - Dr. Bob Prucha of Integrated Hydro Systems

- GOAL – gather data and develop the Verde Basin Regional MIKE SHE Model and the Verde Valley-Oak Creek MIKE SHE model

The Nature Conservancy



Groundwater model goes public amid controversy

Steve Ayers Jun 14, 2011

USGS working on response to concerns about its Big Chino computer model

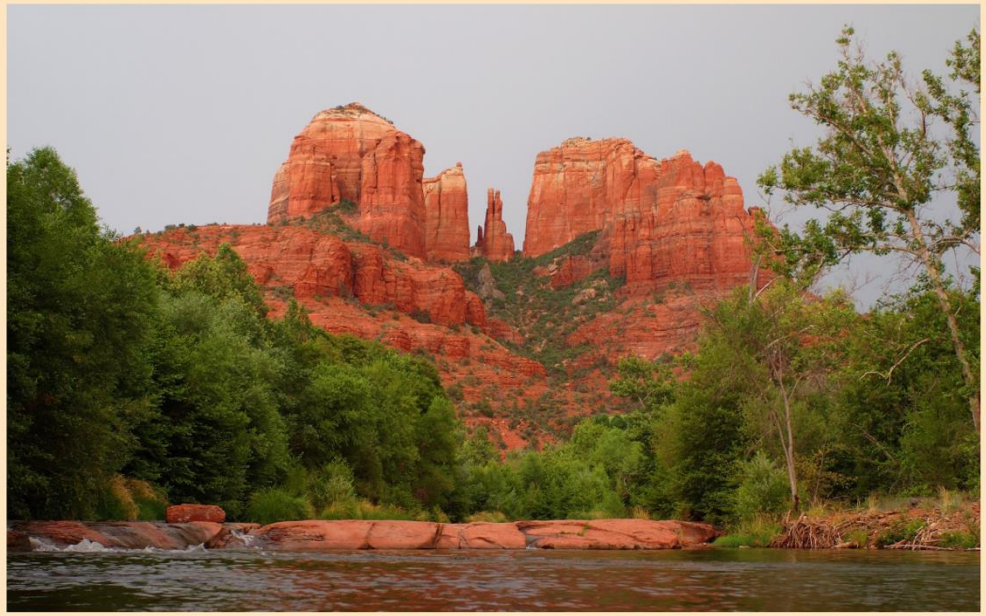
By Joanna Dodder Nellans Jan 17, 2012

USGS responds to Prescott-area concerns over groundwater model

By Joanna Dodder Nellans Feb 4, 2012

Prepared in cooperation with the Arizona Department of Water Resources and Yavapai County

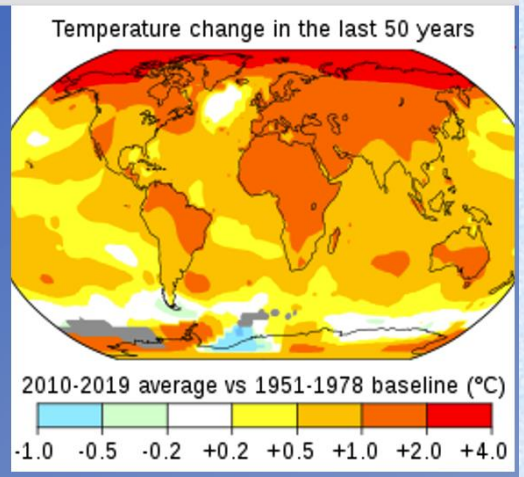
Regional Groundwater-Flow Model of the Redwall-Muav, Coconino, and Alluvial Basin Aquifer Systems of Northern and Central Arizona



Scientific Investigations Report 2010-5180, v. 1.1

U.S. Department of the Interior
U.S. Geological Survey

Why Did the Yavapai-Apache Nation Want the Integrated Model(s)?



To test the outcome of actions that <u>can't easily be tested</u> in real life, like:

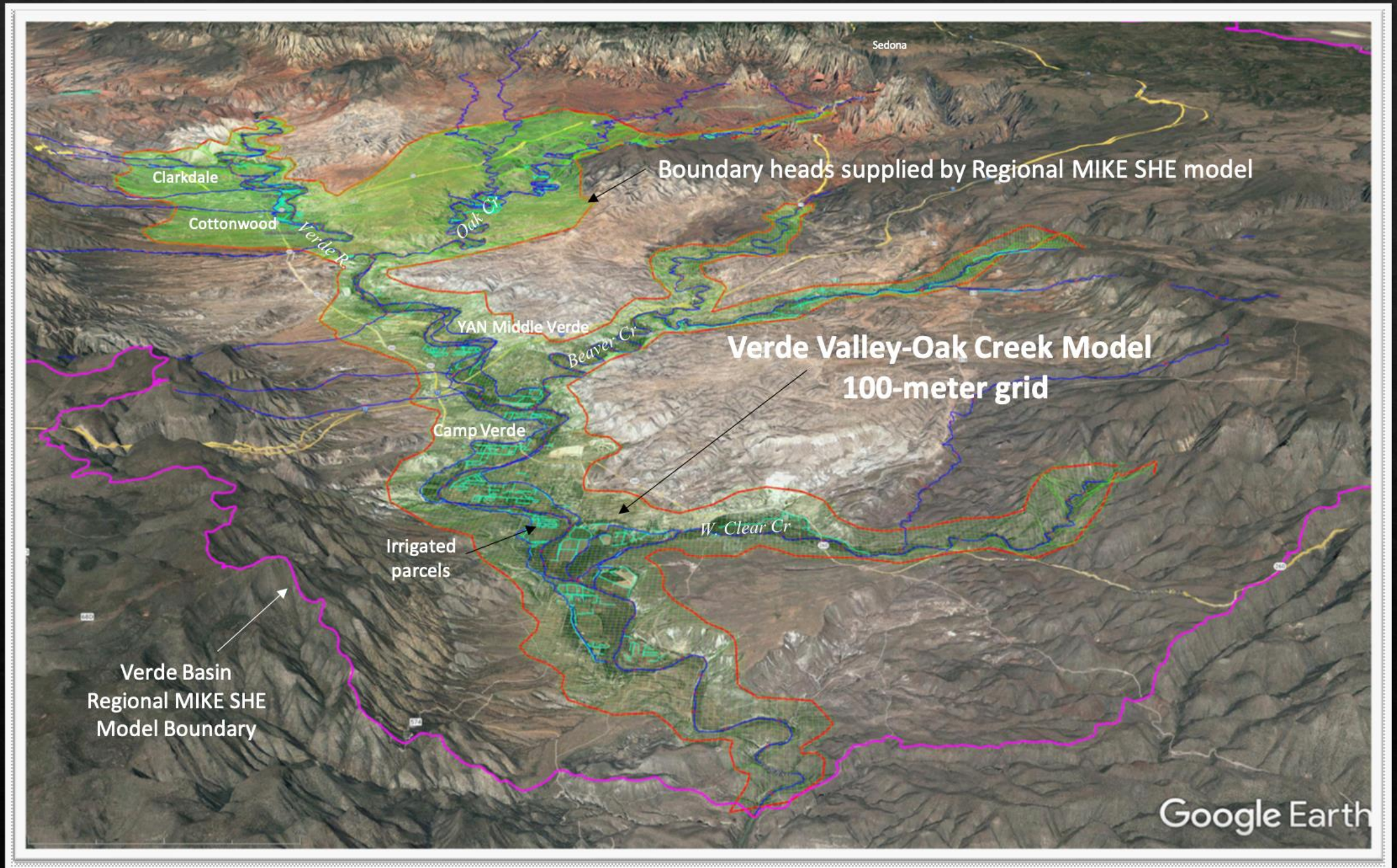
- **Future changes in pumping**
  Impacts to streams and groundwater levels
- **New water added to stream**
  Changes in evapotranspiration, seepage to aquifer, water quality
- **Changing climate**
  Changes to natural runoff and recharge
- **New recharge projects**
  Changes to groundwater levels and water quality

The Verde Basin Multi-Scale MIKE SHE Integrated Model

- **Verde Basin Multi-Scale MIKE SHE Integrated Model** – uses MIKE SHE - integrated modeling tools developed over 40 years ago by DHI Group

- Unlike a typical "groundwater model", MIKE SHE simulates the entire hydrologic cycle and is "driven" by weather including precipitation, temperature, evapotranspiration (ET)

  - Over time, Prucha/Lacher also developed a more refined **Verde Valley-Oak Creek MIKE SHE Integrated Model** that is "nested" within the Multi-Scale Model
    - High resolution – 100 x100 meter (2.5 acre grid)
    - Updated to include geologic and lithologic information and modeling
    - Uses hourly satellite-based weather inputs to simulate runoff, ponding, ET
    - Incorporates Verde Valley irrigation ditches and agricultural uses


Sedona
Clarkdale
Cottonwood
Verde R.
Oak Cr.
Boundary heads supplied by Regional MIKE SHE model
YAN Middle Verde
Beaver Cr.
Verde Valley-Oak Creek Model
100-meter grid
Camp Verde
W. Clear Cr
Irrigated
parcels
Verde Basin
Regional MIKE SHE
Model Boundary
Google Earth

How have these Models Been Used So Far?

- Yavapai-Apache Nation Indian Water Rights Settlement
- BOR Applied Science Grant - Community Engagement in Water Resource Management in the Verde Valley
- 2023-24 – stakeholder meetings held with communities in the Verde Valley to identify integrated modeling scenarios that might be of interest in the Verde Valley

Key Takeaways to Building Trust in Modeling Process

- Develop modeling objectives as early as possible with key stakeholders
- It's all about the science and data – not an agenda!
- Provide information about the modeling goals to interested stakeholders at the earliest opportunity and keep talking about the model with trusted partners in public forums whenever possible
- Ask for input in the model, its objectives, and goals early on to create shared objectives/buy in
- Make clear that the model is a shared tool – it is not to be used to litigate water rights or prove anyone wrong
- Don't just "bake the cake" and say, "here you go"!
- Stand by your goals – here, how can the model be helpful for local communities and stakeholders to manage water and protect the Verde River?


Thank You!