"*The Most Sweeping Water Law Change in a Century*" (EDF)

Significant change in groundwater management = Significant change in management tools
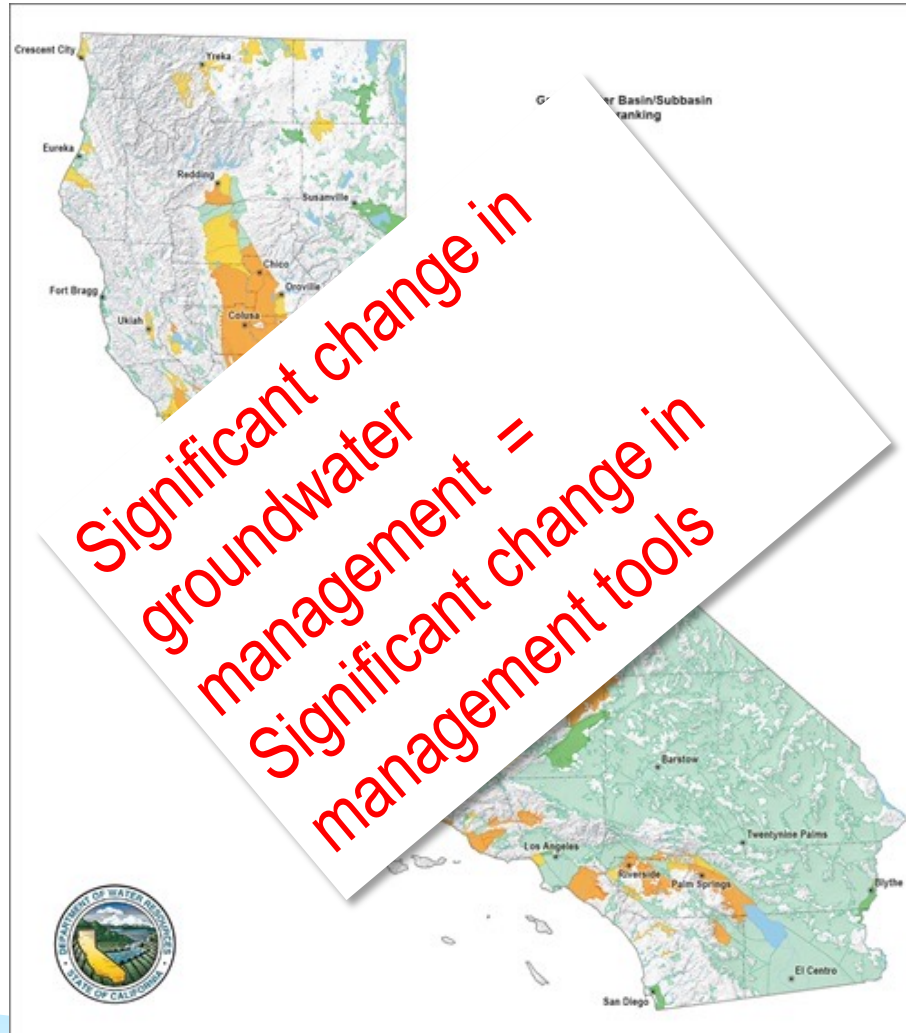
- Did our models and our process keep up with the change?
  - Existing Models 😊
  - Model Purpose 🤨
  - Communication 🙁

MONTGOMERY & ASSOCIATES

Leverage Existing Models 😊

Existing Model Utility - Success

- Existing models shone when they had their day in the sun

  - Ample time for model development

  - Sufficient data assessment and model review

We know what we're doing when we develop groundwater models for a clear purpose (levels and budgets)!

Modeling with Purpose 🤨

Model Purposes Have Not Kept Up with SGMA

"The purpose of a hydrologic model is to support resource management decisions. All other truths on this subject are merely derivative."

CWEMF 2005 Annual Meeting

"*Eliminating overdraft … is not the only requirement … [groundwater management] must avoid [all six] undesirable results*." (DWR, June 9, 2021)

Can One Model Address Six Purposes?

Traditional Viewpoint: One Model to Rule Them All (We're Not There Yet)

| Lowering GW Levels | Reduction of Storage | Seawater Intrusion | Degraded Quality | Land Subsidence | Surface Water Depletion |

California Department of Water Resources, 2016

Six Model "Purposes"

"…it is impossible to develop a model that will fulfill all purposes"
T.E. Reilly and A.W. Harbaugh

Every Modeler Knows This

Two Ways to Address "All Purposes"

Everything is Subservient to Groundwater Levels

Lowering GW Levels

Reduction of Storage | Seawater Intrusion | Degraded Quality | Land Subsidence | Surface Water Depletion

Independent Models/Calculations

Examples

- Subsidence: 1-D Models

- Seawater Intrusion: 2-D cross-sectional models

- Surface Water: analytical capture

- Quality… uh …

SGMA Requires Our Models Do More

- Every SGMA Criterion Should Have A Model
- Limit Models to Their Intended Purposes

Model Communication 😟

Communication: Possibly SGMA's Biggest Impact on Modeling

- **SGMA put citizen-scientists in charge of groundwater management**

- We do not model for other trained scientists or DWR. We model for average citizens

- Average citizens must be able to draw sharp conclusions from our work

"Words can be meaningless. If they are used in such a way that no sharp conclusions can be drawn."

-Richard Feynman
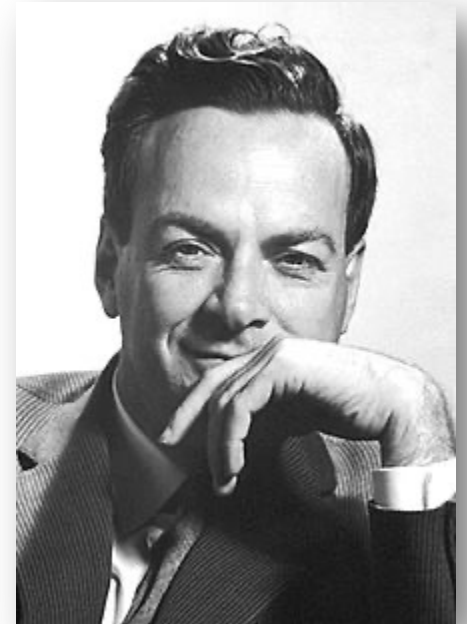
Clear Communication **Might** Clash with Ever-More Complicated Models

- Current directions in added complexity are not done in the service of transparency

- Simple tools tell simple stories. Complexity should be added when citizens are comfortable with the simpler stories.

MONTGOMERY
& ASSOCIATES

Why are Weather Forecasters Trusted More than Hydrogeologists?

How do they communicate better than we do?

MONTGOMERY
& ASSOCIATES

SGMA Lessons and SGMA's Modeling Opportunities

MONTGOMERY
& ASSOCIATES

- SMGA's timeline was too short for using best modeling practices
  - But, we have 20+ years to improve on the modeling we have done
- SGMA requires analysis of six criteria. Many of our models are good at handling two or three.
  - But, we have independent tools to address all six criteria. Use multiple tools, we can integrate them later

SGMA's Opportunity for Long-Term Model Success

- Take a long-term view.

    o We will not be judged by whether our initial model was perfect.

    o We will be judged (harshly) if we avoided best practices

- Integrate the best practices that we know into a 20-year plan

- Use multiple models to address sustainability criteria not in your current model.

- Move towards integrated models – but we may not get there for all six criteria

You Are Here

Every Modeler Knows This

MONTGOMERY
& ASSOCIATES

SGMA's Opportunity for Long-Term Model Success

- Communicate, communicate, communicate
    - Know your audience
    - Maybe ... talk like a weather forecaster – communicate daily and in simple terms

SGMA Remains Our Opportunity to Implement <u>What We All Know</u>

- We have time, step back and assess existing models

- Take a stepwise approach (SGMA is a multi-decade process. Develop a multi-decade modeling program)

- Develop models with purpose, and for a specific purpose(s)

- Know our audience and work with them. All the modeling we do is useless if the citizen-scientists managing groundwater cannot understand our results.

We have heard this before
- Haitjema and Hunt, 2018
- Anderson and Woessner, 1992
- DWR BMP, 2016
- Etc., etc., etc.

MONTGOMERY
& ASSOCIATES

Questions

?

Derrik Williams, P.G., C.Hg.

DWilliams@ELMontgomery.com

MONTGOMERY & ASSOCIATES
Water Resource Consultants