Updates on the PV Water – USGS Collaboration:

Pajaro Valley Hydrologic Model, Data Collection, Analysis for Sustainability

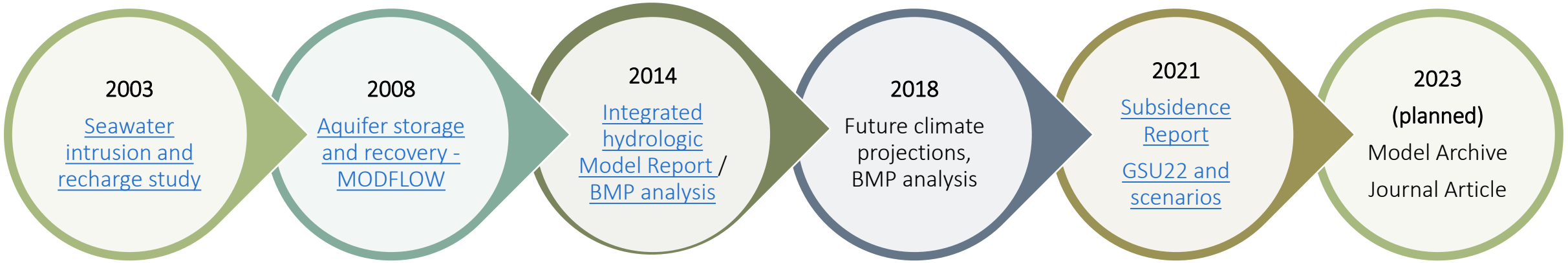
Board of Directors Meeting

February 15, 2023

Marisa Earll, U.S. Geological Survey

California Water Science Center

PV Water and USGS partnership timeline



WORK COMPLETED 2018-2022

*Deliverables

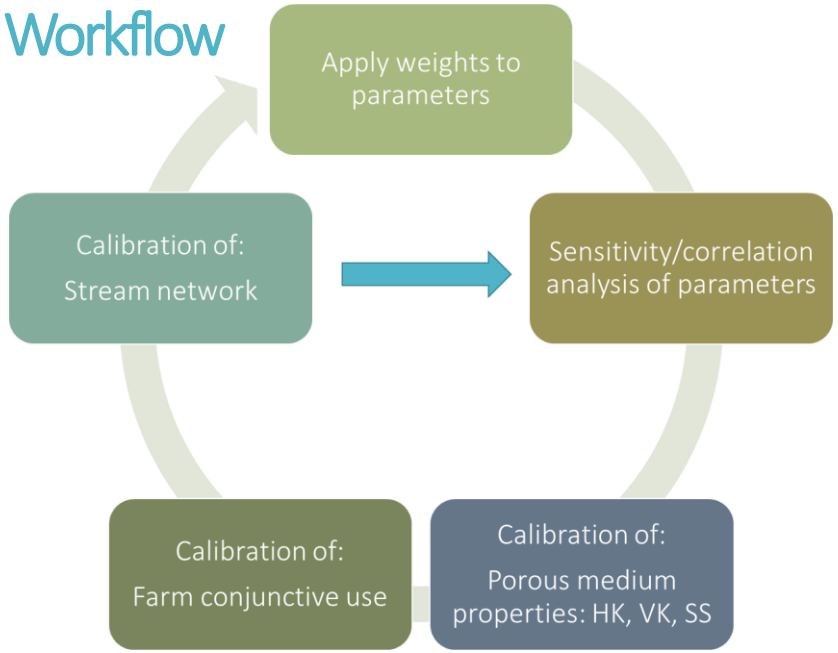
Task 1 — Pajaro Valley Hydrologic Model Updates and Extension

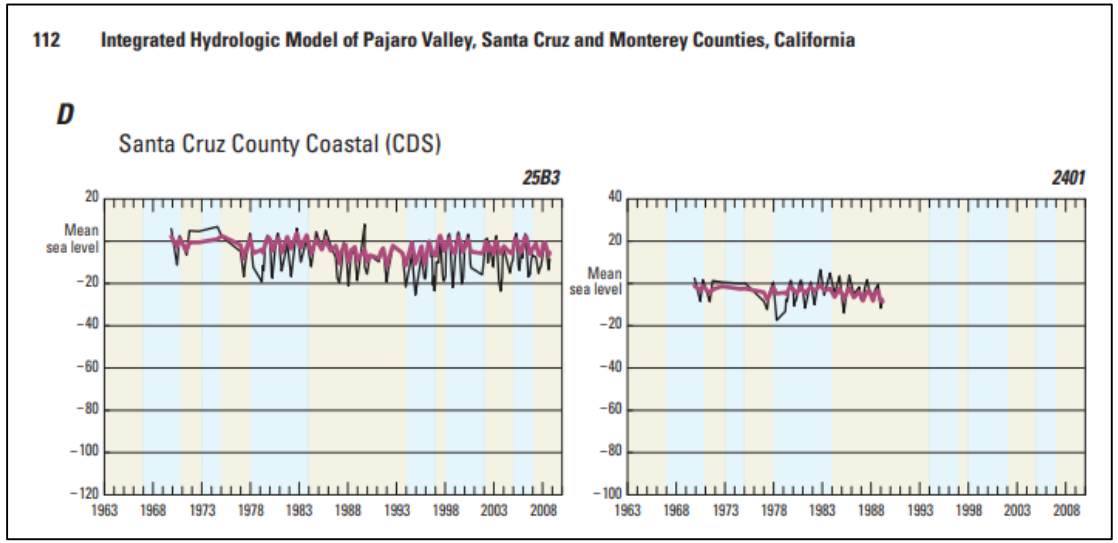
- Updates to code and improvements in BMP representation, simulation of coastal boundary and sea level rise
- Historical model was extended through 2021 with observation data

Task 2—Historical Model Calibration

- The historical PVHM was re-calibrated for years 1963-2018 to match historical observations of pumping, streamflow, and groundwater levels

Calibration Workflow





Extended 1963-2021

Hanson and others, 2014

WORK COMPLETED 2018-2022 (cont.)

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*Deliverables

Task 3— Assist with Development of SGMA Metrics and Milestones

- Modeling and Technical Support for SGMA Reporting and the GSU22
- Model documentation, updates, validation, and quality control for the PVHM (inputs/outputs)

Task 4—Develop Budget and SGMA Metric Reporting Tools

- Worked with PV Water to develop hydrologic budget tools to generate water budgets for GSU22 reporting
- Three future scenarios were updated and improved to forecast BMPs, groundwater budgets, chronic lowering of groundwater levels and seawater intrusion with climate change projections.

GSU22

Pajaro Valley Basin Management Plan

Groundwater Sustainability Update 2022

Model Scenarios
Historical
Average climate
Dry climate
High sea level Rise

Pajaro Valley Water Management Agency, 2022

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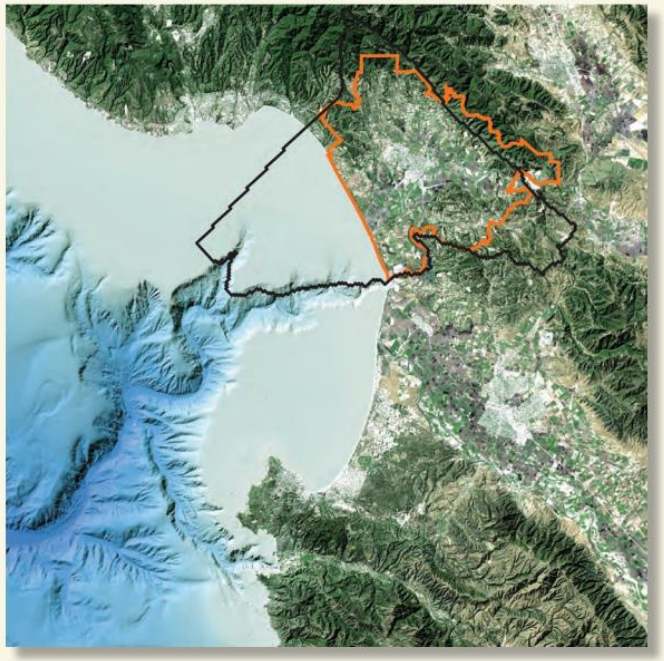
Prepared in cooperation with the Pajaro Valley Water Management Agency

Integrated Hydrologic Model of Pajaro Valley, Santa Cruz and Monterey Counties, California



Scientific Investigations Report 2014–5111 Hanson and others, 2014

WORK COMPLETED 2018-2022 (cont.)

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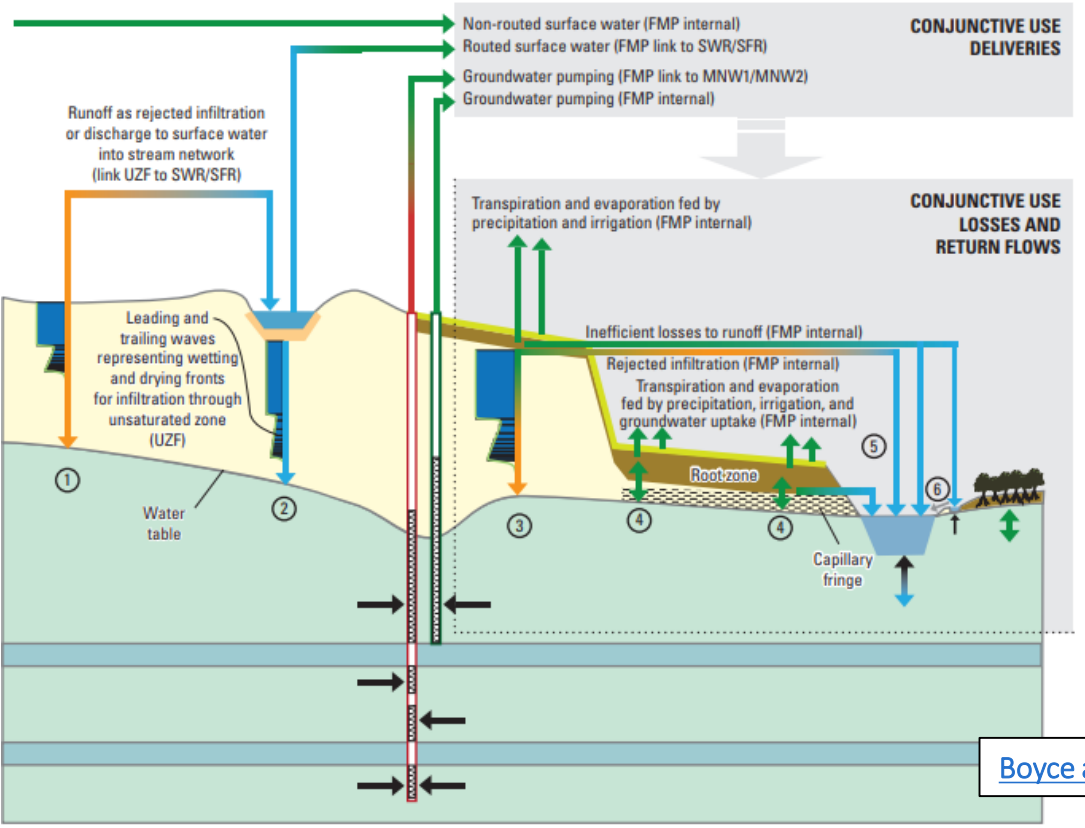
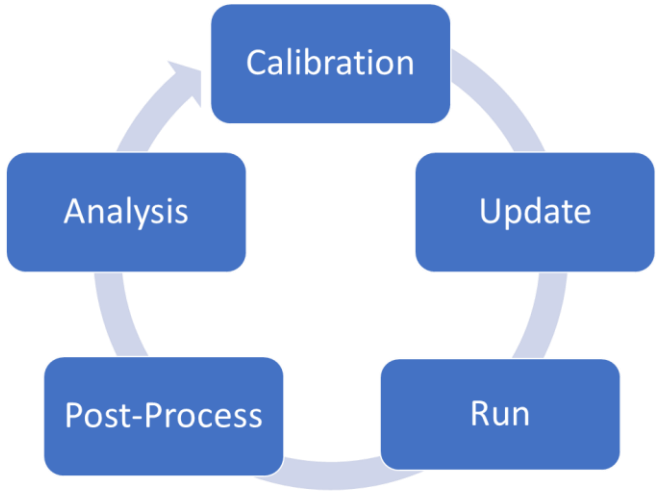
*Deliverables

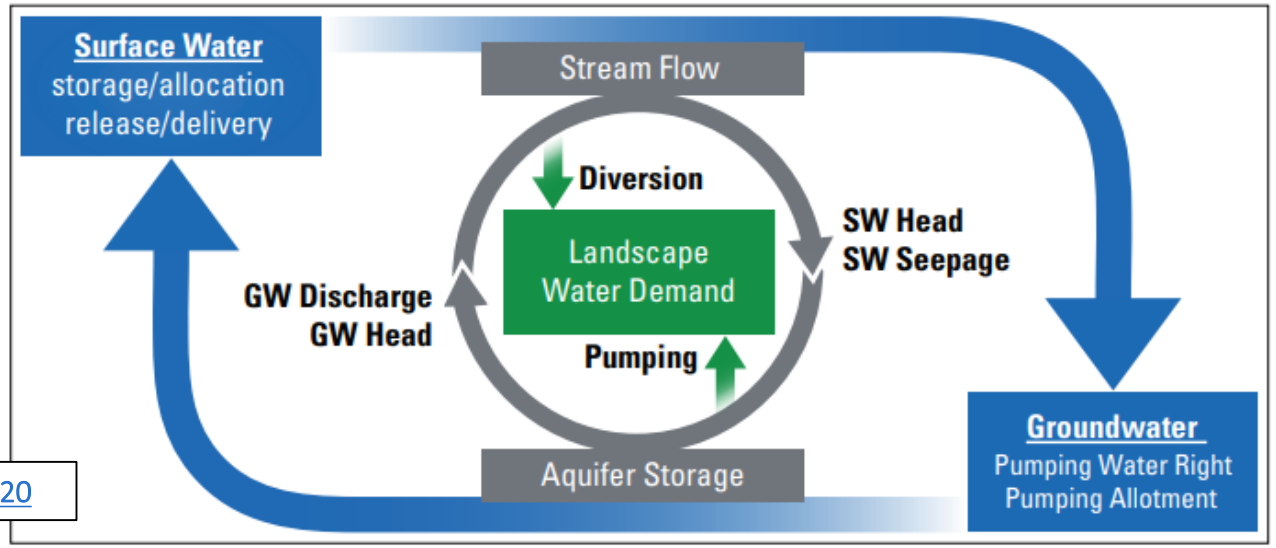
Task 5 – Model Documentation

- Preliminary model, documentation, data, and analysis tools were provided to work on collaboratively.



Boyce and others, 2020





WORK COMPLETED 2018-2022 (cont.)

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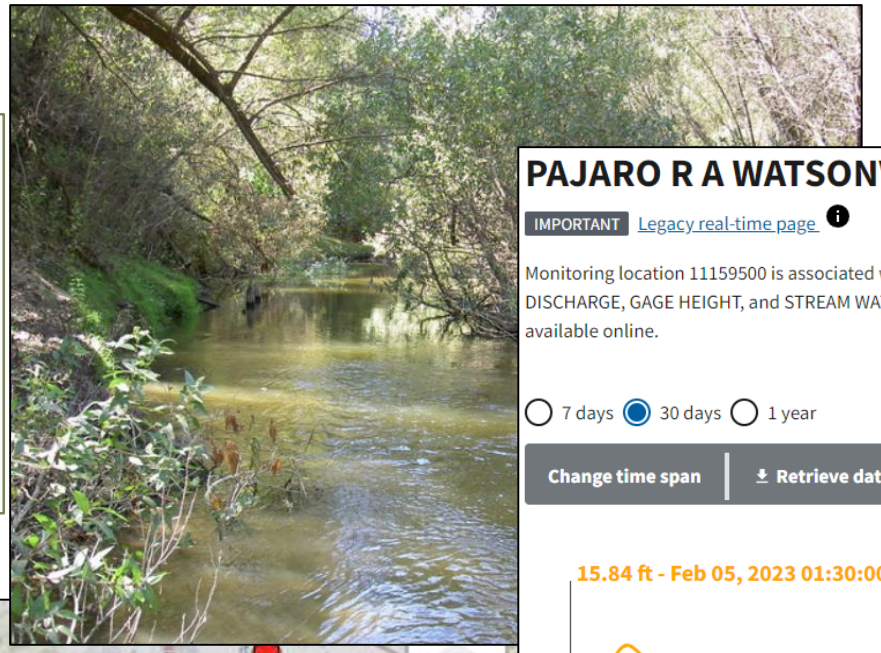
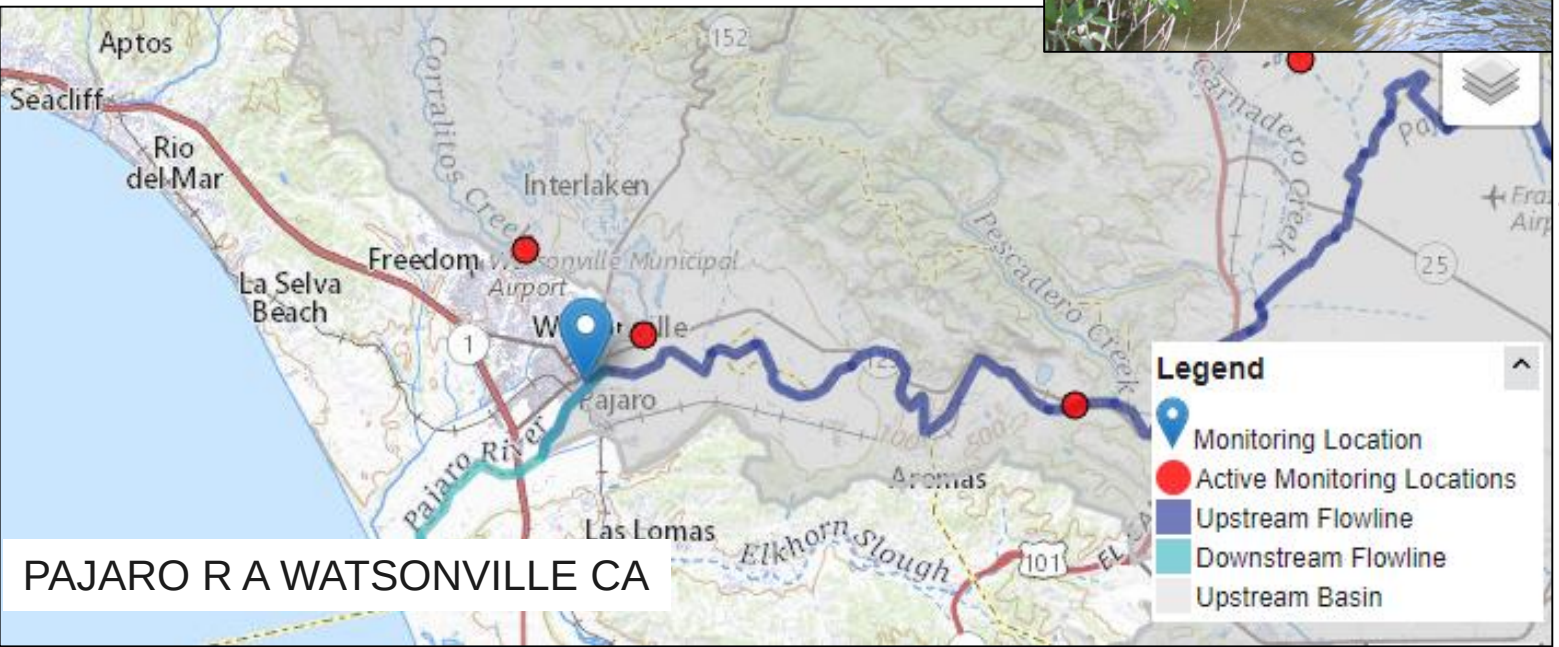
*Deliverables

Task 6 -- Install new streamgage and yearly operation

- Streamgage installed at PAJARO R A WATSONVILLE CA (U.S. Geological Survey, 2023)
- Extra stream measurements at USGS streamgage Pajaro River at Murphy Crossing
- Streamgage installed at SALSIPUEDES C NR WATSONVILLE CA (U.S. Army Corp of Engineers, 2023)





PAJARO R A WATSONVILLE CA

WORK COMPLETED 2018-2022 (cont.)

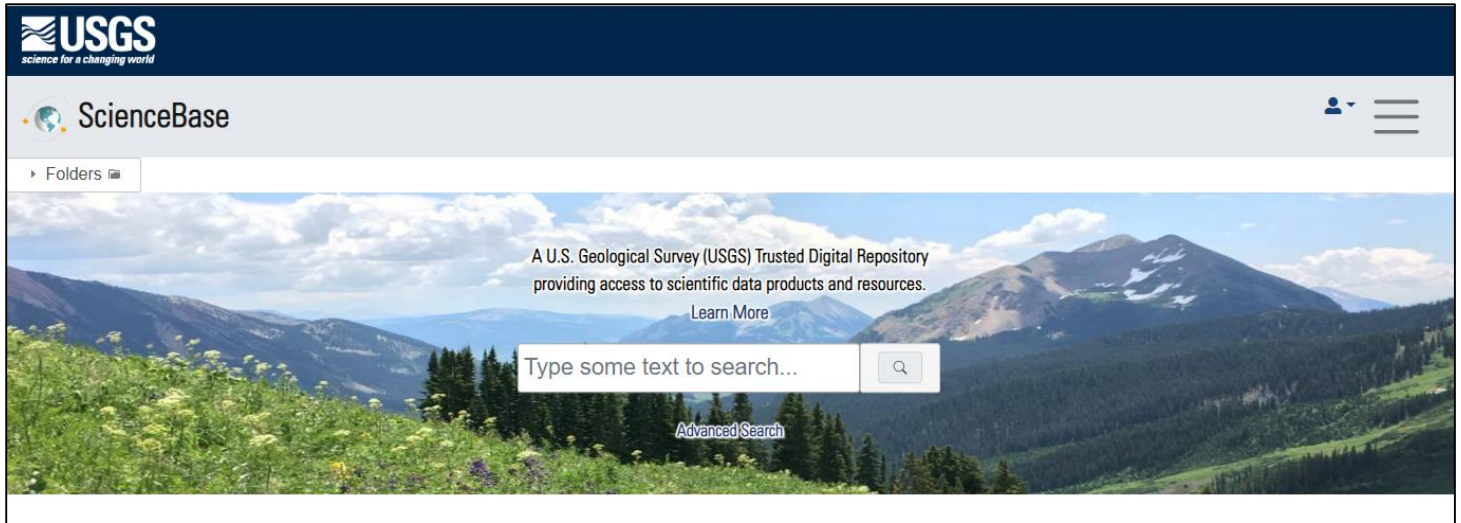
*Deliverables

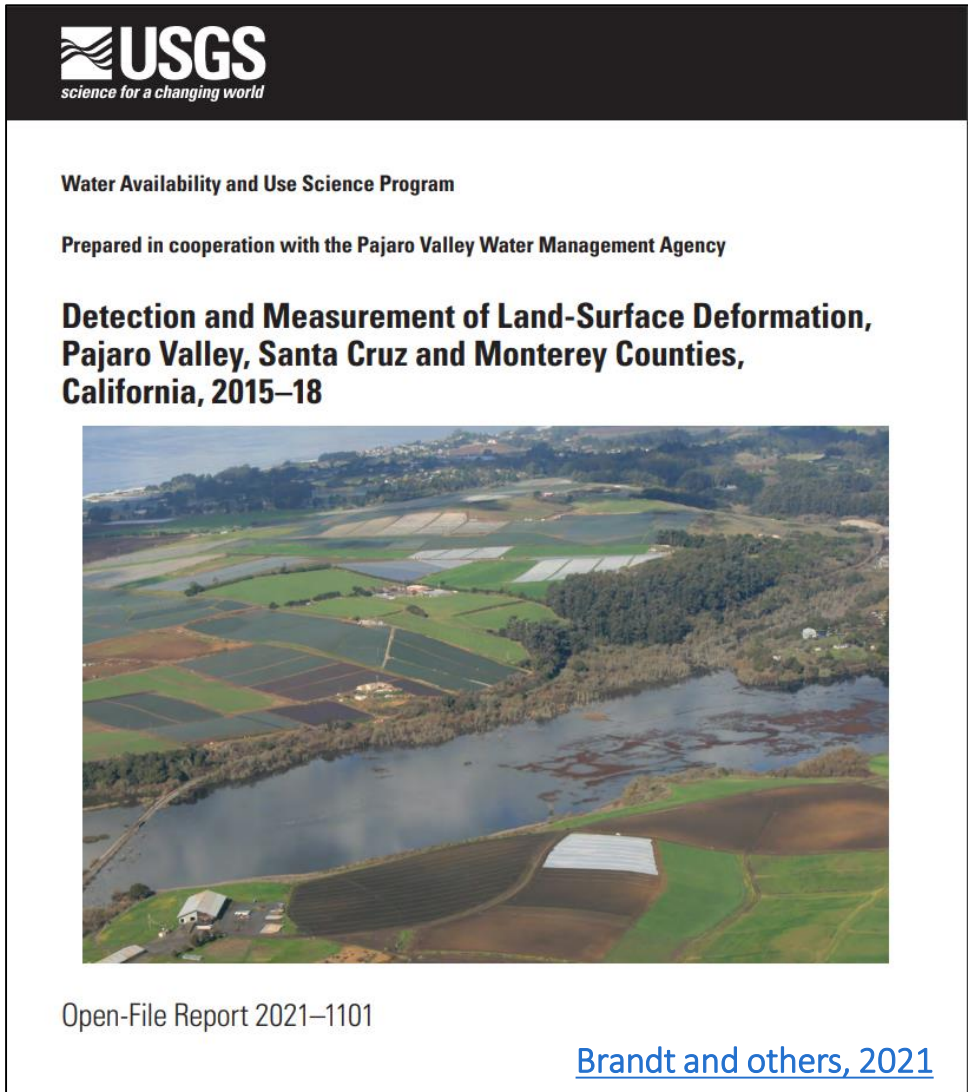
Task 7 — Evaluation of Subsidence

- *Detection and Measurement of Land-Surface Deformation, Pajaro Valley, Santa Cruz and Monterey Counties, California, 2015–18 (Brandt and others, 2021)*

Task 8 — Reporting

- Model archive of updated and extended historical model and future climate scenarios in ScienceBase (planned 2023).
- Journal article on future seawater intrusion and climate change projections (planned 2023)




USGS
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Water Availability and Use Science Program

Prepared in cooperation with the Pajaro Valley Water Management Agency

Detection and Measurement of Land-Surface Deformation, Pajaro Valley, Santa Cruz and Monterey Counties, California, 2015–18

Open-File Report 2021–1101

Brandt and others, 2021

NEW PROJECT WORK 2023-2025

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Task 1 – Pajaro Valley Hydrologic Model Updates (2022-2024)

- Historical model will be extended through 2024 with observation data

Task 2: Model Validation (1963-2023)

- Examination of Groundwater level, pumping, streamflow, and 22,680 observations and simulated results

Task 3: Streamgage Measurements: Pajaro River at Murphy Crossing

- 9 annual streamgage measurements at USGS streamgage Pajaro River at Murphy Crossing

Task 4: Model Scenarios and Data Release

- Release of updated model and scenarios

Task 5: Technical Support for GSP Alternative Updates and Recommendations (As Needed)

- Work collaboratively on model (scenarios, output, dissemination, documentation, and technical support)

Task 6: Project Management, Training and Presentations

- Board presentation, training on model

References

Boyce, S. E., Hanson, R. T., Ferguson, I., Schmid, W., Henson, W. R., Reimann, T., Mehl, S. W., & Earll, M. M. (2020a). One-Water Hydrologic Flow Model: A MODFLOW based conjunctive-use simulation software. In *Techniques and Methods*. https://doi.org/10.3133/tm6A60

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