Big Valley GSP
Ad-Hoc Modeling Workgroup

BVIHM Model Discussion

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December 2, 2021
Outline

September – Model Development

November – Water Budgets

Today – Additional Topics & Discussion
  • Frost Protection
  • Stream Depletion
  • Demand Uncertainty
  • Discussion
Frost Protection - Background

- Significant demand for groundwater pumping prior to irrigation season for frost protection
- Irrigation applied in vineyards and pear orchards to avoid damage to buds
- Applied during the spring following bud-break
- Applied when temperatures approach freezing

Vineyards and Pear Orchards (2018)

THE LOSS OF GRAVEL IN KELSEY CREEK ESSENTIAL FOR HITCH SPawning

Peter Windrem
September 2021
Frost Protection - Methodology

- Frost Protection Period assumed late-March through May
  - Vineyards: 4,300 ac
  - Pear Orchards: 1,500 ac
- Frost protection occurs when the minimum daily temperature is less than 32°F
  - Ranges from 0 to 25 days per year
- Weather Data
  - Western Weather Kelseyville (2010-2019)
  - PRISM Climate Group (1984-2009)
- Duration 4 hours per night
- Application 0.11 acre-in per hour
Frost Protection – Estimated Use

• Temperature data suggests that applied water for frost protection can vary significantly between years

• Simulated values range from 0 AFY in “hot” years to 6,400 AFY in “cold” years (1,600 AFY average)

• Can exceed 30% of the total applied water for crop irrigation (12% average)
Stream Depletion – Background

**Stream Leakage**
net flow between surface water and groundwater in either direction

- **Gaining Stream**
  flow of groundwater into surface water

- **Losing Stream**
  flow of surface water into groundwater

- **Disconnected Stream (A)**
  Stream is not hydraulically connected to the water table

- **Disconnected Stream (B)**
  Stream is not hydraulically connected to the water table, no flow in stream

Stream Depletion - Background

**No Pumping**
natural discharge to stream

**Early-Stage Pumping**
water pumped largely from groundwater storage

**Later-Stage Pumping**
well begins to capture groundwater discharge to stream

**Extreme Case**
Pumping induces infiltration from previously gaining stream
Stream Depletion - Methodology

GSP Regulations
“Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions in those systems...”

Approach
Comparison between calibrated model and a synthetic run with no groundwater pumping for irrigation to quantify stream depletion from groundwater pumping (1984-2019)

Synthetic Run Assumptions
• Groundwater pumping removed for agricultural irrigation and landscape watering
• Agricultural and landscape water demand met only by precipitation and surface water
• Land use and surface water diversions do not change
Stream Depletion - Results

Kelsey Creek

Adobe Creek

Mean Monthly Streamflow (cfs)

Mean Monthly Streamflow (cfs)
Stream Depletion – Hitch Spawning

Kesley Creek (April)

Adobe Creek (April)
Demand Increase Scenario - Background

Evaluate Future Demand Uncertainty
• Model Addresses Climate Uncertainty
  • Wet-Moderate Warming
  • Dry Extreme Warming
• Land Use
  • Difficult to predict
  • Vineyards & Orchards anticipated to be stable or decline
• Emerging markets for commercial cannabis
• Could be other unknown future markets

Approved and Pending Cannabis Cultivation Permits (2021)
Demand Increase Scenario - Methodology

Demand Increase
- Specified in Scenario C (Dry and Extreme Warming)
- Specified as a percent increase to Scenario C agricultural pumping through additional wells:
  - 10% Increase
  - 20% Increase
  - 45% Increase
  - 90% Increase
- Assumed no deep percolation (pumped water removed from Basin)
Demand Increase Scenario - Methodology

Water Supply

Ag Pumping Future Scenarios

- Based on calculations within BVIHM based on current land use (2018).

Artificial Demand Increase

- New pumping is added to the model.
- This water disappears after being pumping.

Run the model and assess RMS locations
We will look at the difference, i.e., the Pumping Scenario minus Base Climate Scenario.
Demand Increase Scenario - Results

Groundwater Level Changes
Big Valley North RMS

Groundwater Change from Additional Pumping (ft)

Pumping Scenario
- 10% Increase
- 20% Increase
- 45% Increase
- 90% Increase

Projected Date

2020 2040 2060

10% Increase
20% Increase
45% Increase
90% Increase
Demand Increase Scenario - Results

Groundwater Level Changes
Big Valley Central-East RMS

![Groundwater Level Changes Map]

- **10% Increase**
- **20% Increase**
- **45% Increase**
- **90% Increase**

**Pumping Scenario**
- 10% Increase
- 20% Increase
- 45% Increase
- 90% Increase

**Projected Date**
- 2020
- 2040
- 2060
Demand Increase Scenario - Results

Groundwater Level Changes
Big Valley Central-West RMS

Pumping Scenario
- 10% Increase
- 20% Increase
- 45% Increase
- 90% Increase

Projected Date

Groundwater Change from Additional Pumping (ft)
Questions & Discussion
Demand Increase Scenario - Results

Groundwater Level Changes
Big Valley Northeast RMS

Groundwater Change from Additional Pumping (ft)

Pumping Scenario
- 10% Increase
- 20% Increase
- 45% Increase
- 90% Increase

Projected Date

2020 2040 2060

County of Los Angeles
State of California
Demand Increase Scenario - Results

Groundwater Level Changes
Big Valley Northwest RMS

*Pumping Scenario*
- 10% Increase
- 20% Increase
- 45% Increase
- 90% Increase

*Groundwater Change from Additional Pumping (ft)*

*Projected Date*
- 2020
- 2040
- 2060
Demand Increase Scenario - Results

Groundwater Level Changes
Big Valley Southwest RMS

Groundwater Change from Additional Pumping (ft)

Projected Date

Pumping Scenario
- 10% Increase
- 20% Increase
- 45% Increase
- 90% Increase

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