image-1 (00-00-04)

Investigating the Complexities of Instream Flows and Water Availability in the South Fork Eel River

April 6, 2022
CWEMF Conference
Session: The South Fork Eel River

Presented by: John Riverson, Paradigm Environmental

California Water Boards

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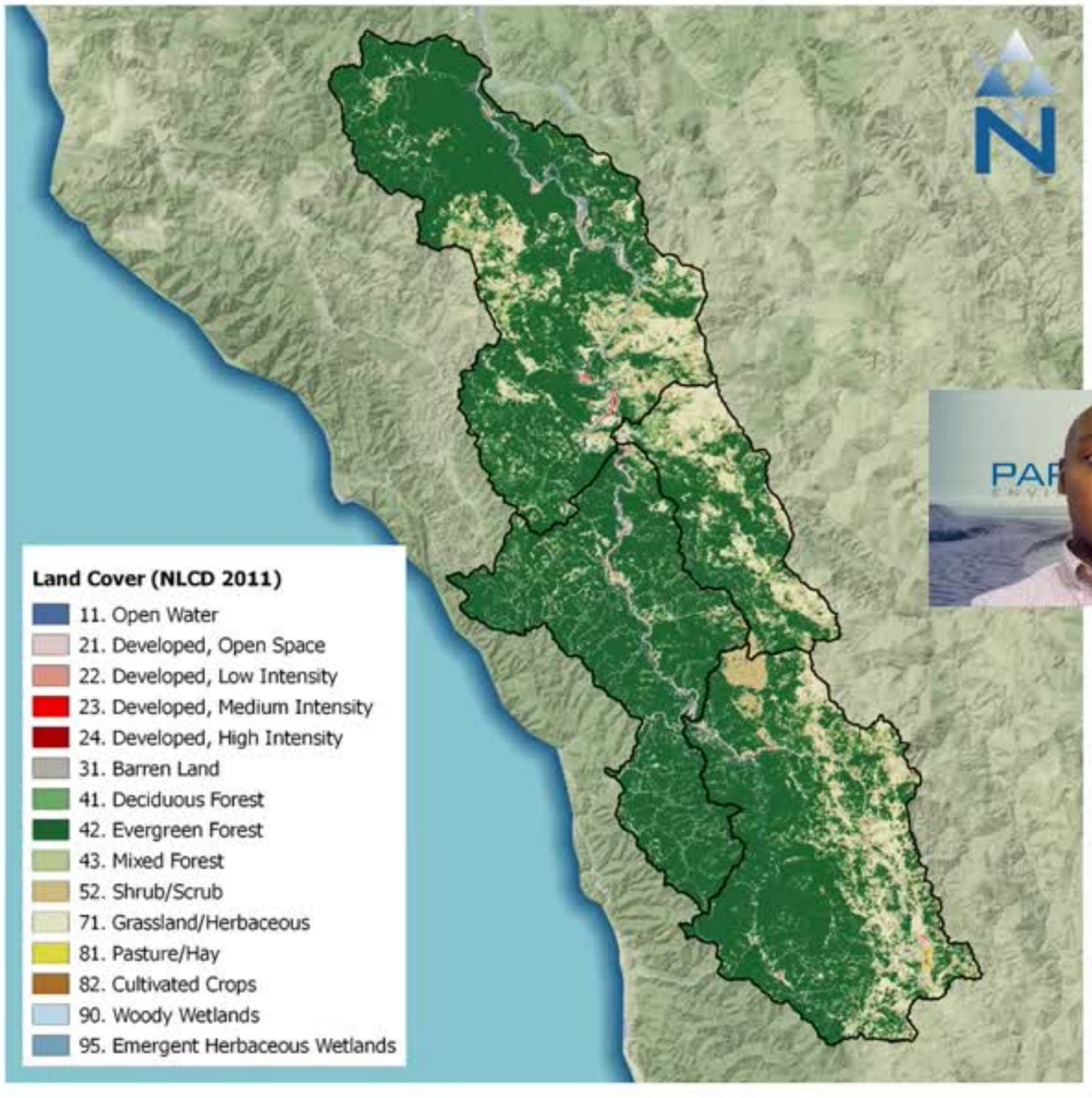
Land Use/Land Cover



Hydrologic Soils Group

Meteorological Conditions

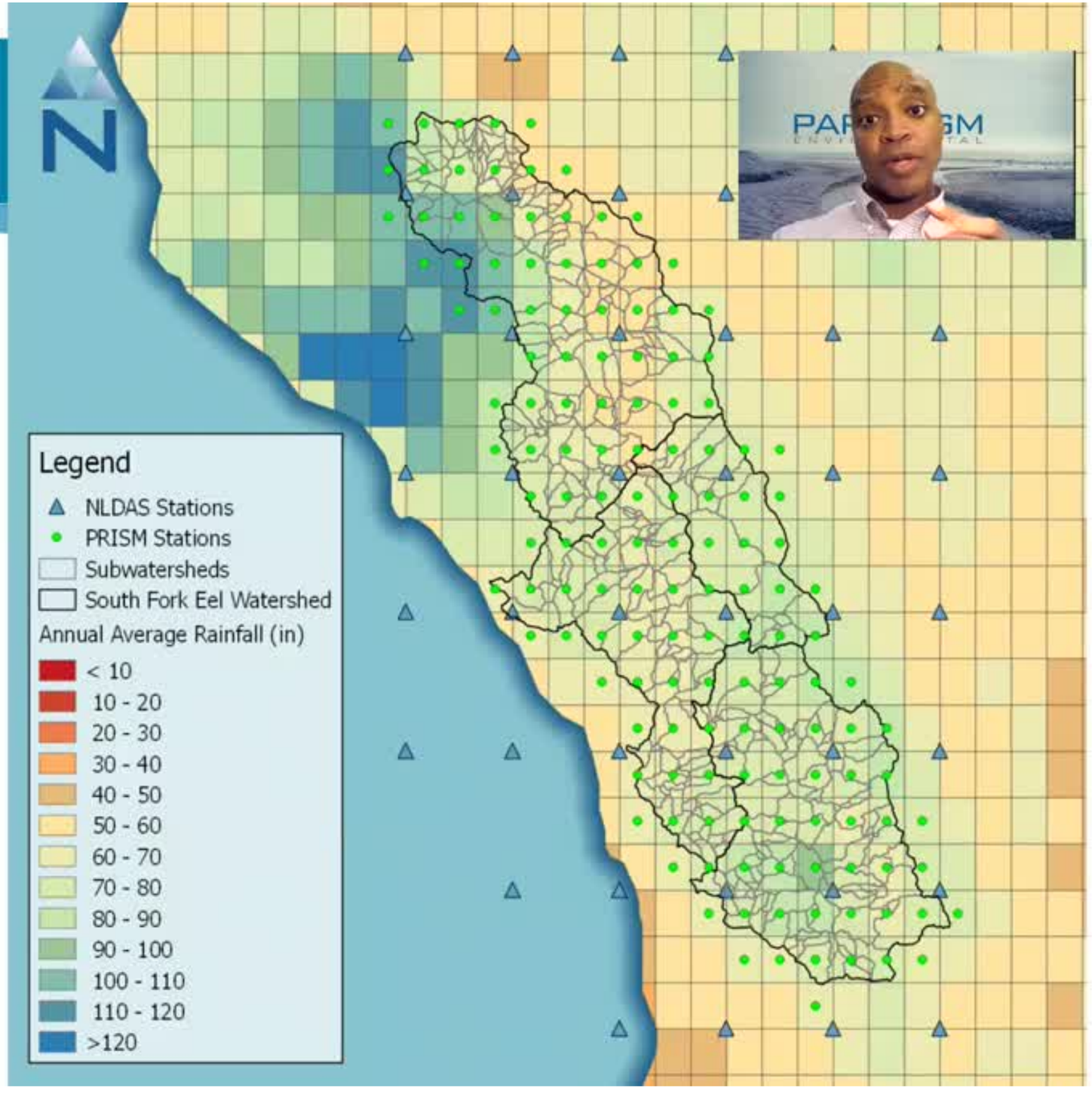
PRISM (4-km)

- Monthly Rainfall

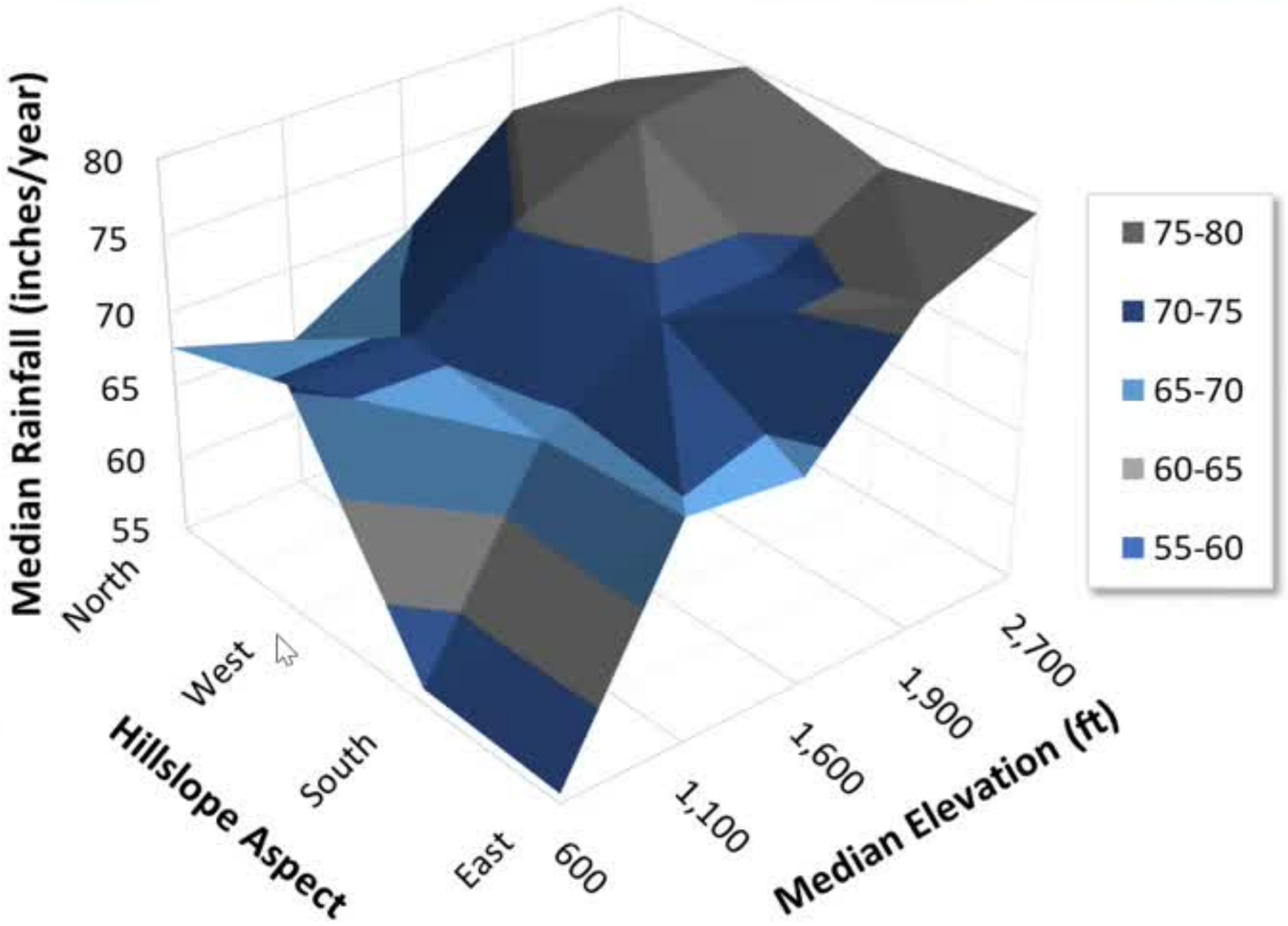
NLDAS-2 (8-mile):

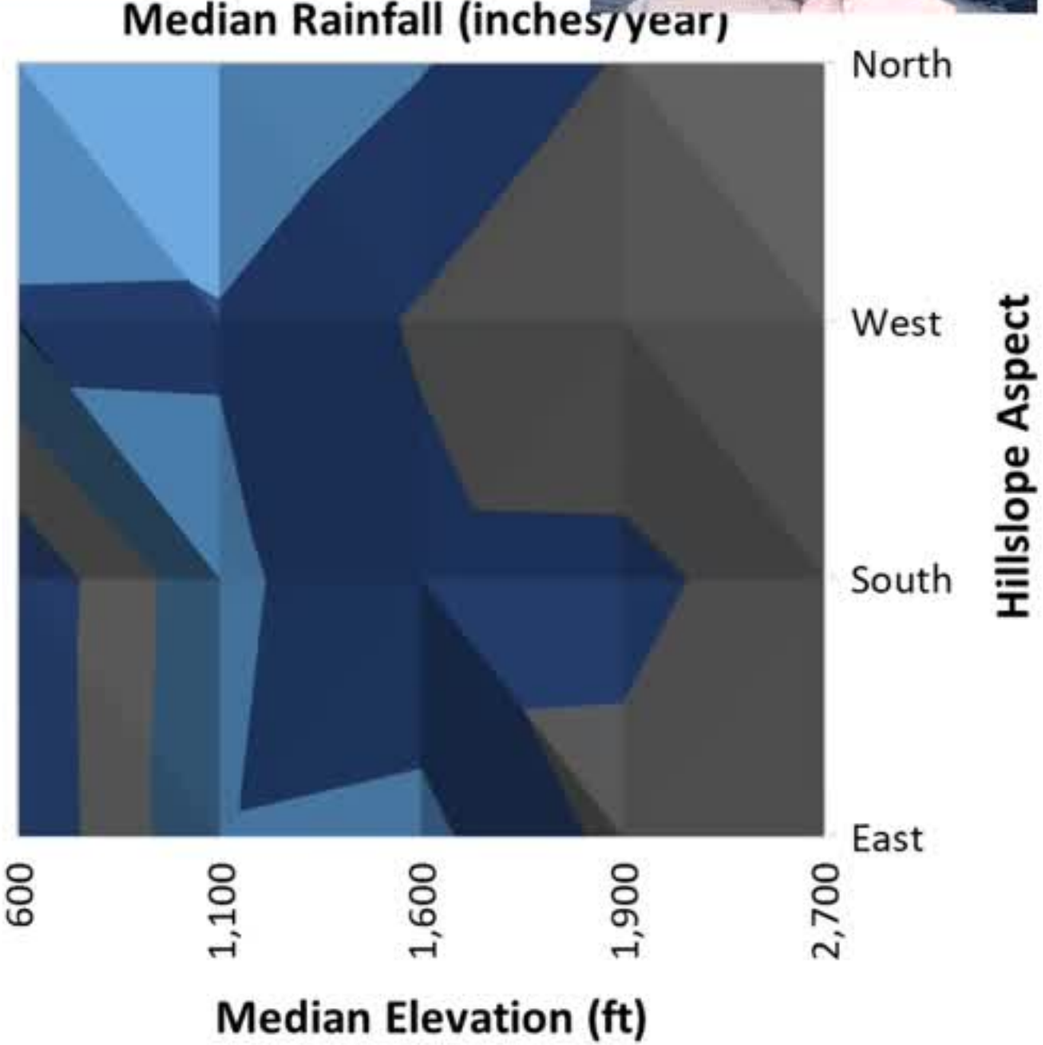
- Hourly Precipitation
- Potential Evapotranspiration
- Air temperature
- Wind Speed
- Solar Radiation
- Dewpoint temperature

Results in 111 unique sets of meteorological timeseries



Rainfall Volume vs. Elevation and Asp





South Fork Eel Watershed

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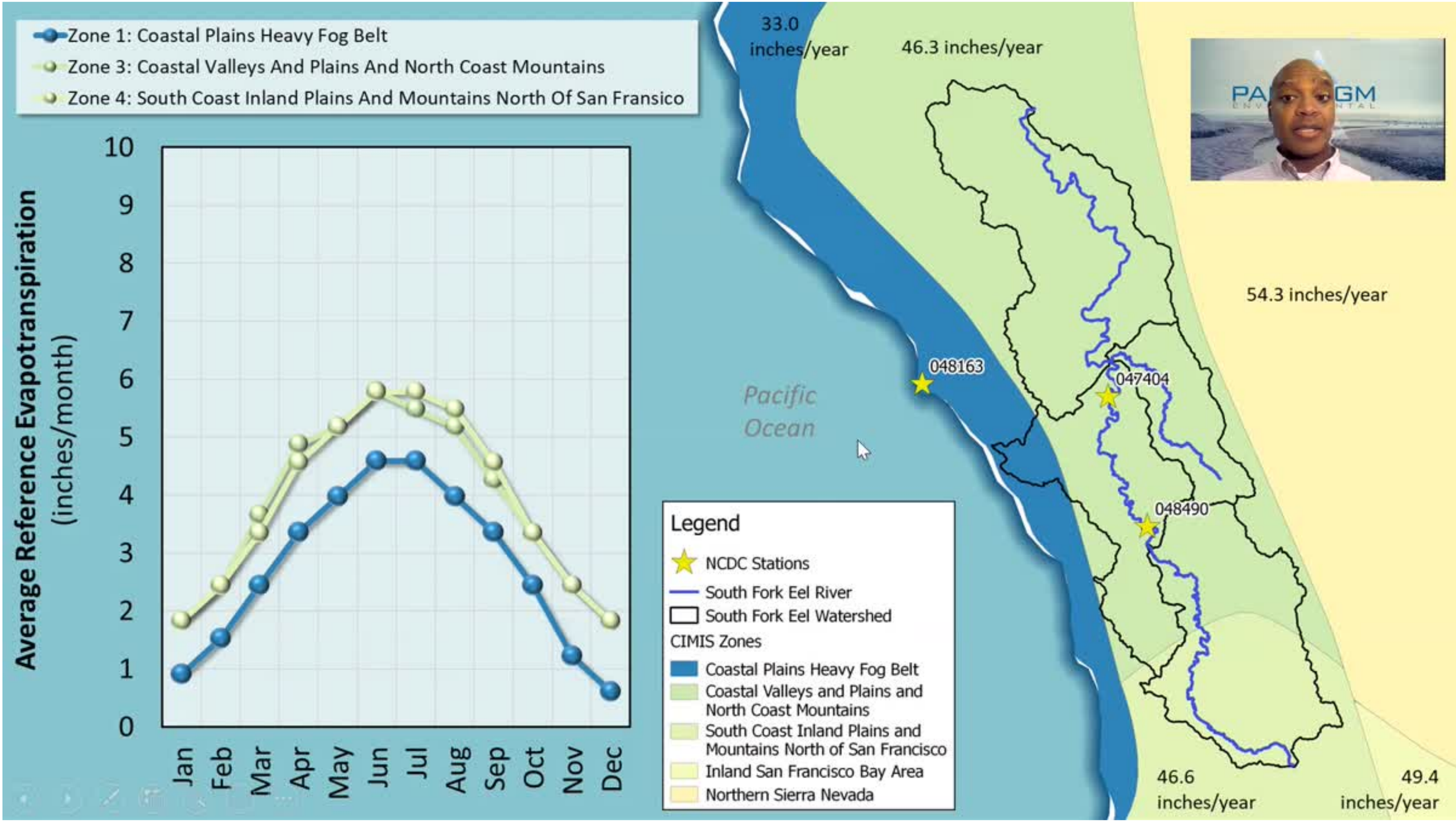

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Model Calibration Sequence

Weather Data

Ensure quantity + quality of spatial/temporal coverage of forcing data to drive watershed hydrology.

Land Hydrology

Represent evaporation losses, runoff, interflow, and groundwater inflow from land—simulated on an *hourly* basis.

Stream Routing

Route land-based flows, net groundwater flows. Represent surface withdrawals, diversions and hydromodifications.

Compare: Instream Flow Gages

Compare: Weather Patterns

Groundwater Model

Receives groundwater inflows (aggregated to *monthly*). Incorporates consumptive groundwater pumping and transpiration losses. Outputs downscaled to *hourly*.

Compare: Groundwater Levels

Calibration Objective: *Minimize Residual*

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MODFLOW Packages

- RCH: uses deep percolation data from LSPC HRUs
- GHB: represents lateral boundaries as needed
- WEL: represents flux boundaries where latera
  available
- CLN: (from MODFLOW-USG) simulates wells
- RIV: represents streams and provides baseflow that replaces LSPC groundwater inflow/outflow timeseries

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Domestic

Domestic Pumping Volume (ft3/year)
- 0 - 5942
- 5942 - 24531
- 24531 - 58728
- 58728 - 157418
- 157418 - 298337
- 298337 - 465202
- 465202 - 1666588

Domestic Pumping Intensity (in/year)
- 0 - 0.1
- 0.1 - 0.29
- 0.29 - 0.53
- 0.53 - 0.97
- 0.97 - 1.75
- 1.75 - 3.2
- 3.2 - 11.53

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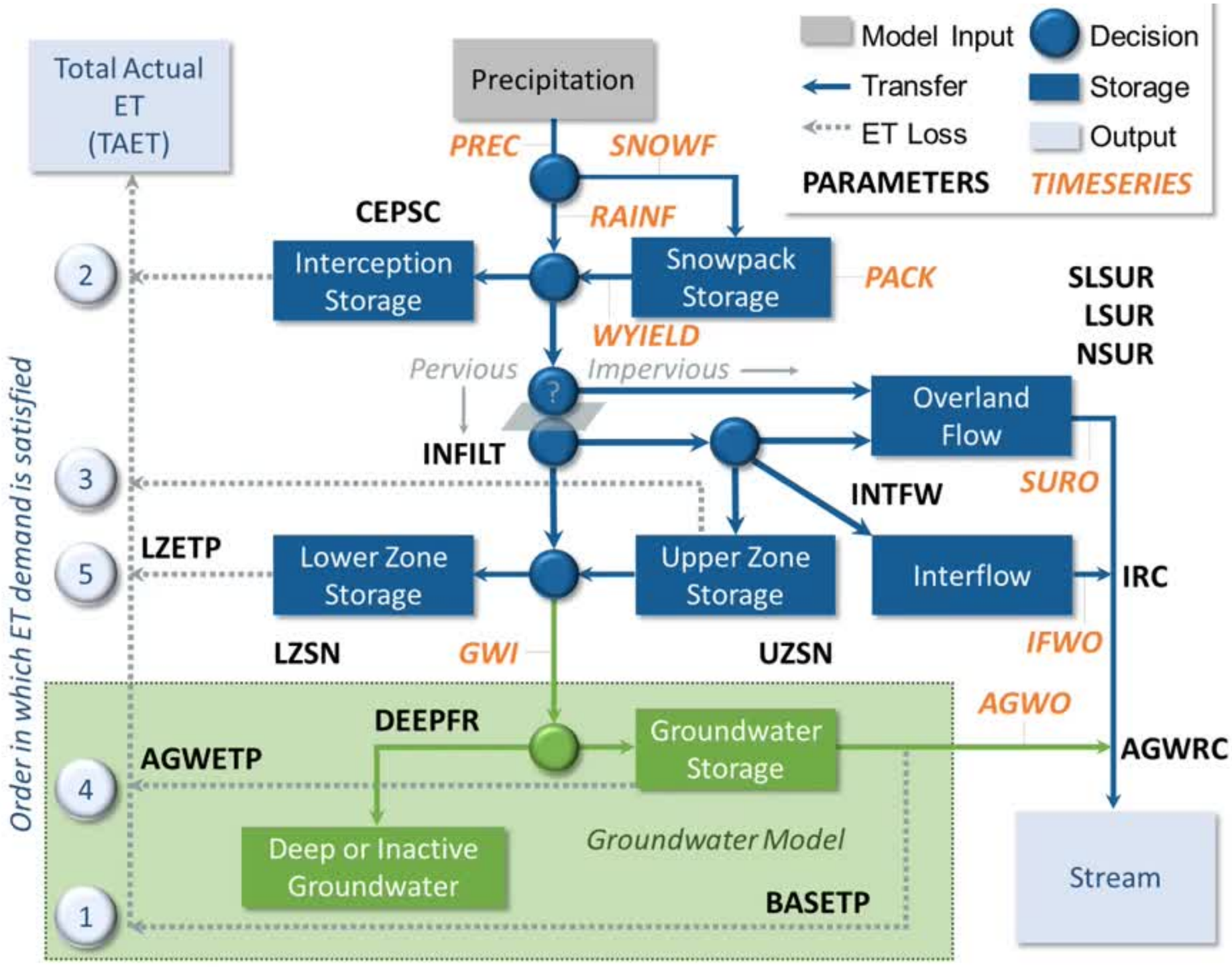

(Based on Stanford Watershed Model)

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Water Budget Components

Outflow Pathways

Intermediate

PREC (Inflow) SURO IFWO AGWO TAET GWI

% Total Annual Precipitation (Outflows)

% Total Annual Precipitation (Inflow)

8% 7% 6% 5% 4% 3% 2% 1% 0%

24% 21% 18% 15% 12% 9% 6% 3% 0%

Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep