

OREGON



WATER RESOURCES
DEPARTMENT

Technical Info Session on analysis of Oregon wells correlated with precipitation

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Oregon Water Resources Department

January 9, 2024

The background features a stylized landscape. The top portion shows a range of mountains in shades of brown and tan, with white snow-capped peaks. A large, white, fluffy cloud is positioned in the upper right. Below the mountains is a solid blue horizontal band. At the bottom, there are rolling green hills with light tan outlines, suggesting a valley or a path.

Welcome & Agenda

Meeting Agenda

Schedule	Topic	Lead/Presenter
9:00 am	Welcome / Purpose	Justin Iverson
9:10 am	Brief Review of Methodology	Ben Scandella
	Q&A	Ben Scandella
10:15 am	Public Comments (10 minutes)	Laura Hartt
10:25 am	Wrap-up	Laura Hartt

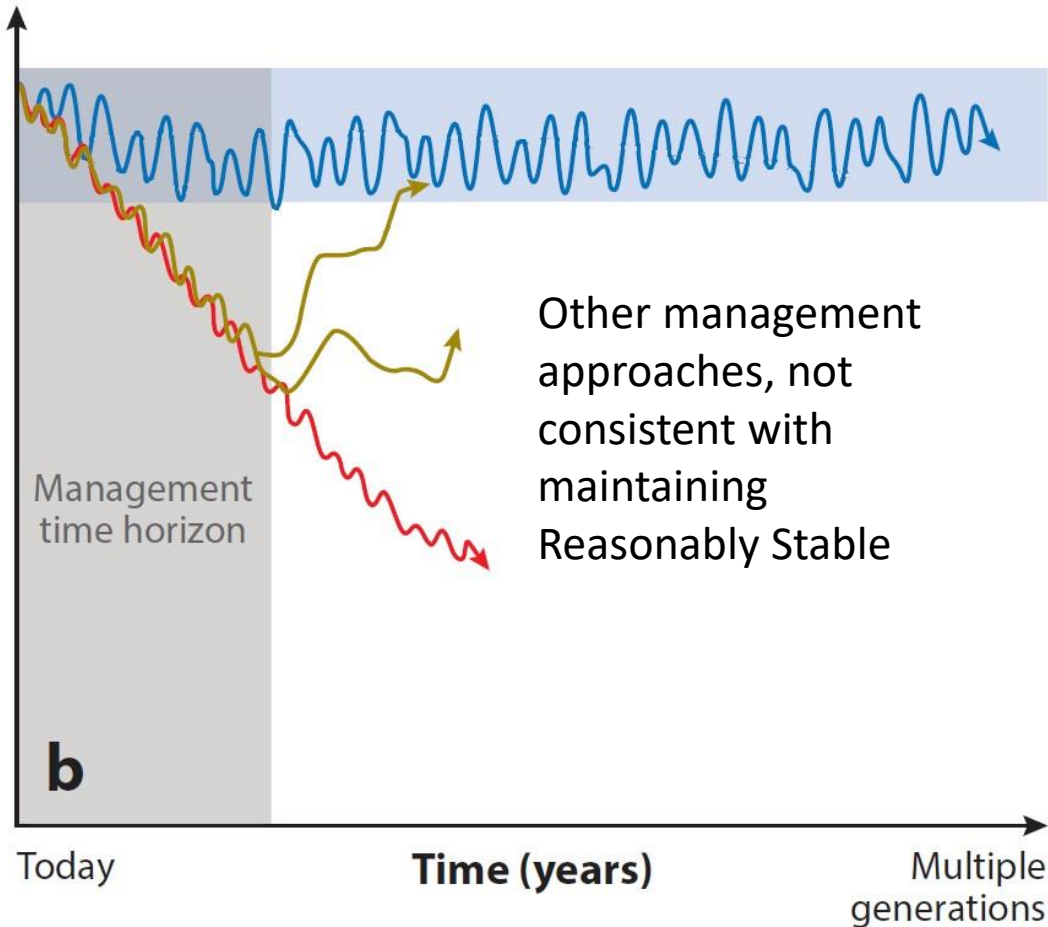
The background features a stylized landscape. The top portion shows a range of mountains in shades of brown and tan, with white snow-capped peaks. A large, white, fluffy cloud is positioned in the upper right. The middle section is a solid blue horizontal band. The bottom section consists of rolling green hills with light tan outlines, suggesting a valley or a path.

Review of Methodology

Goals for Reasonably Stable

- Consistent with hydrogeologist interpretation
- Consistent (limit switching between stable and not) within the dynamically stable range
- Sensitive to declines
- Limit (and define) the burden of collecting water levels
- Transparent and easy to implement

Dynamically Stable Range



- Range of water levels
- Fluctuate around a constant value within management time horizon

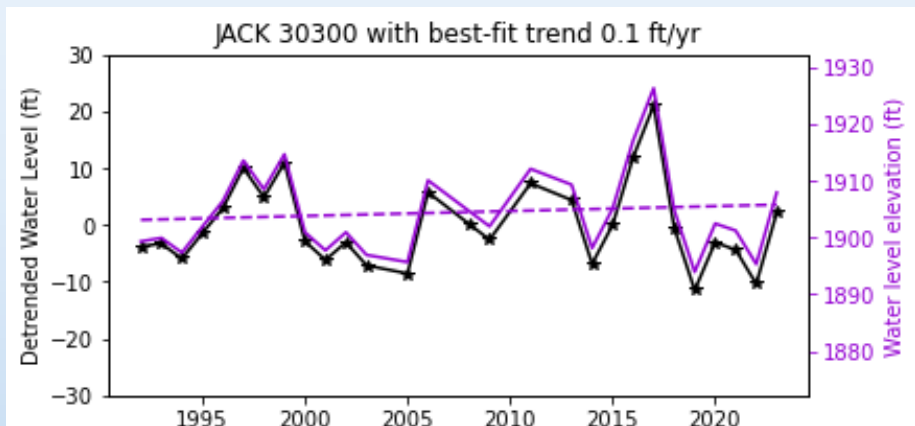
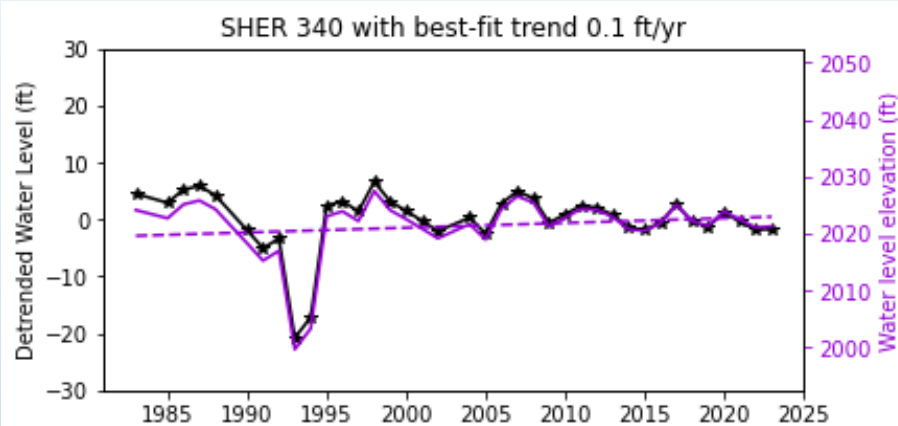
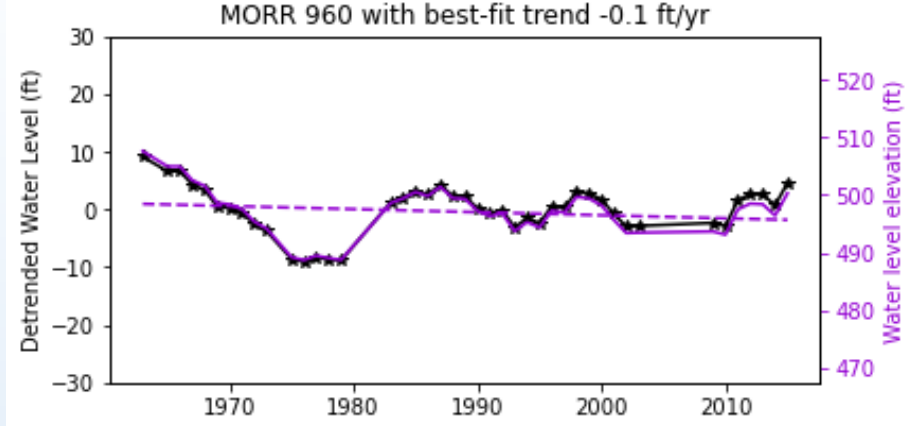
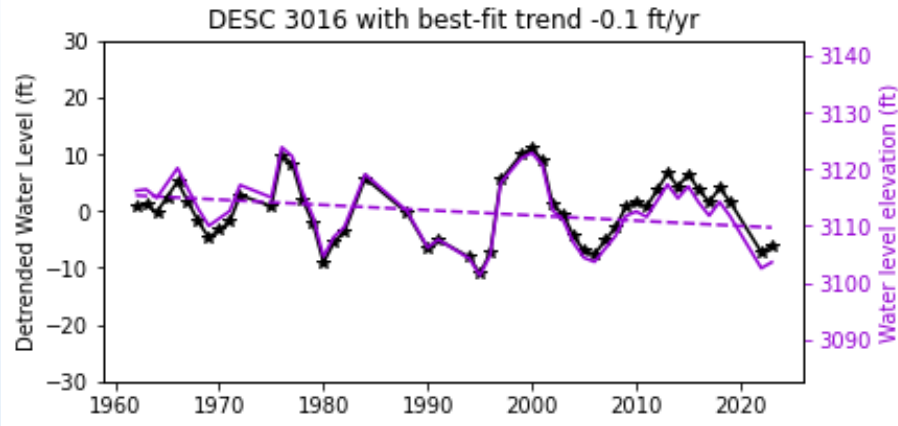
Stable, not natural

- Do we expect water levels to recover?
- Previously focused on “natural” variability
- Inferring causes of declines is hard
- Instead, look at data in wells that *do* recover
 - May include anthropogenic influence

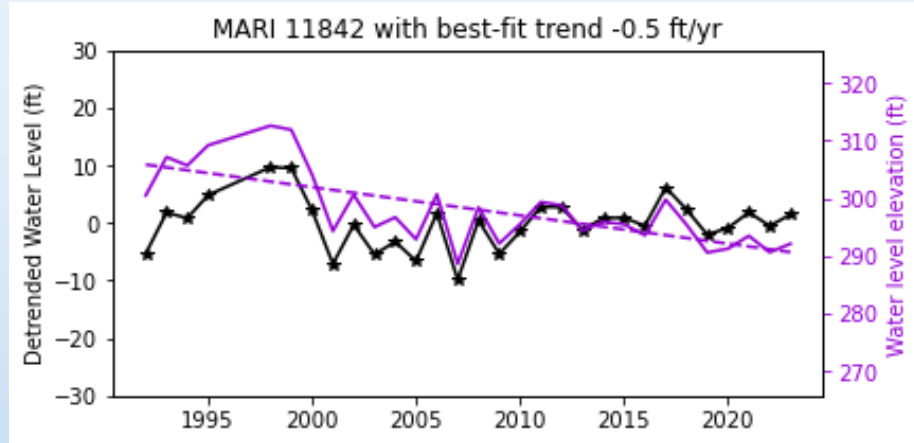
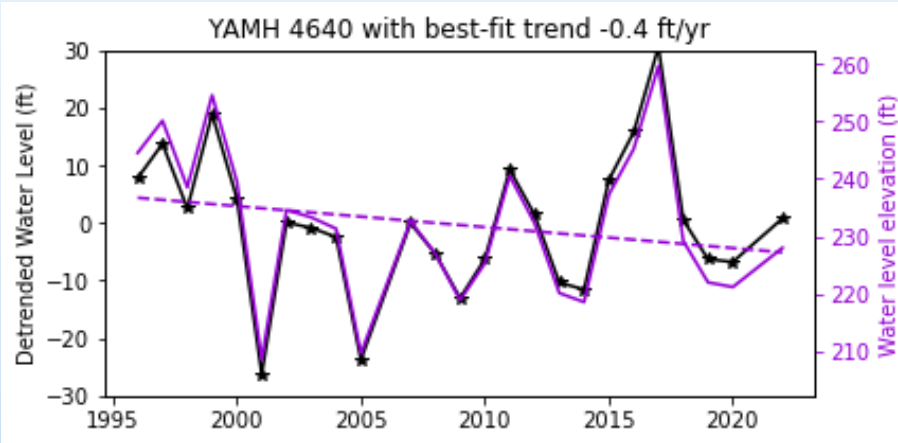
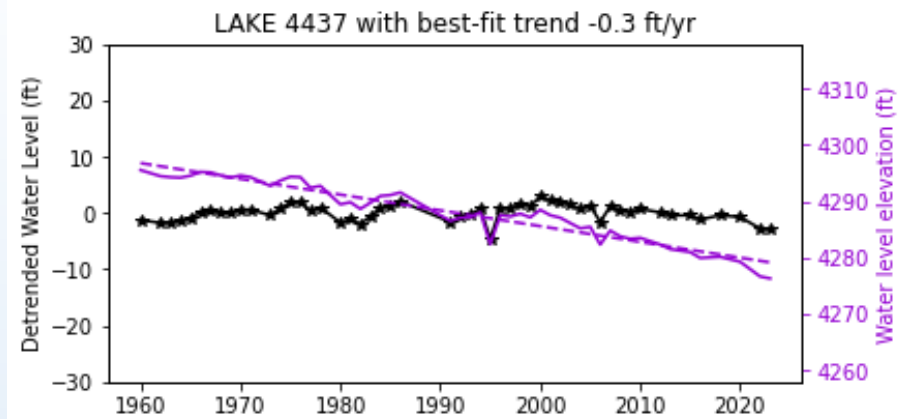
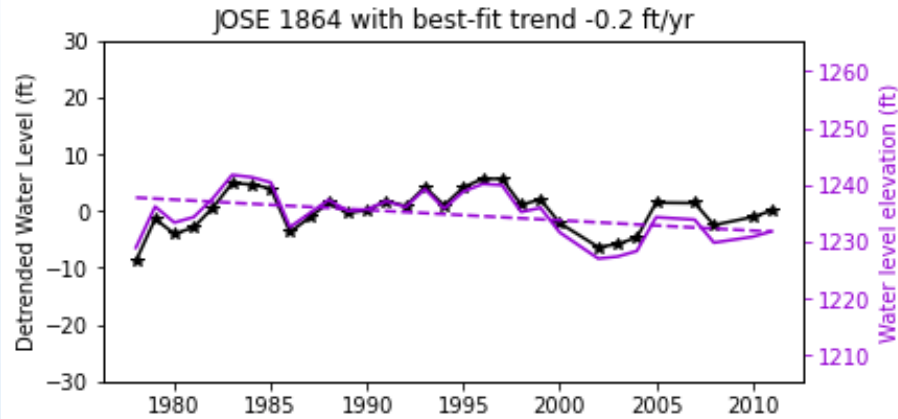
Evaluation of Dynamically Stable Range

- Select wells to represent “stable”:
 - Correlated with precipitation averaged 2 to 10 years*
 - With long-term rate of decline < 0.5 ft/yr
- Process data:
 - Remove the best-fit linear trend
 - Cluster similar wells to reduce spatial bias*
- Evaluate:
 - Total decline and rate of decline*
 - Maximum values in each well
 - Percent of time passing test

Detecting and removing the best-fit trend over period of record

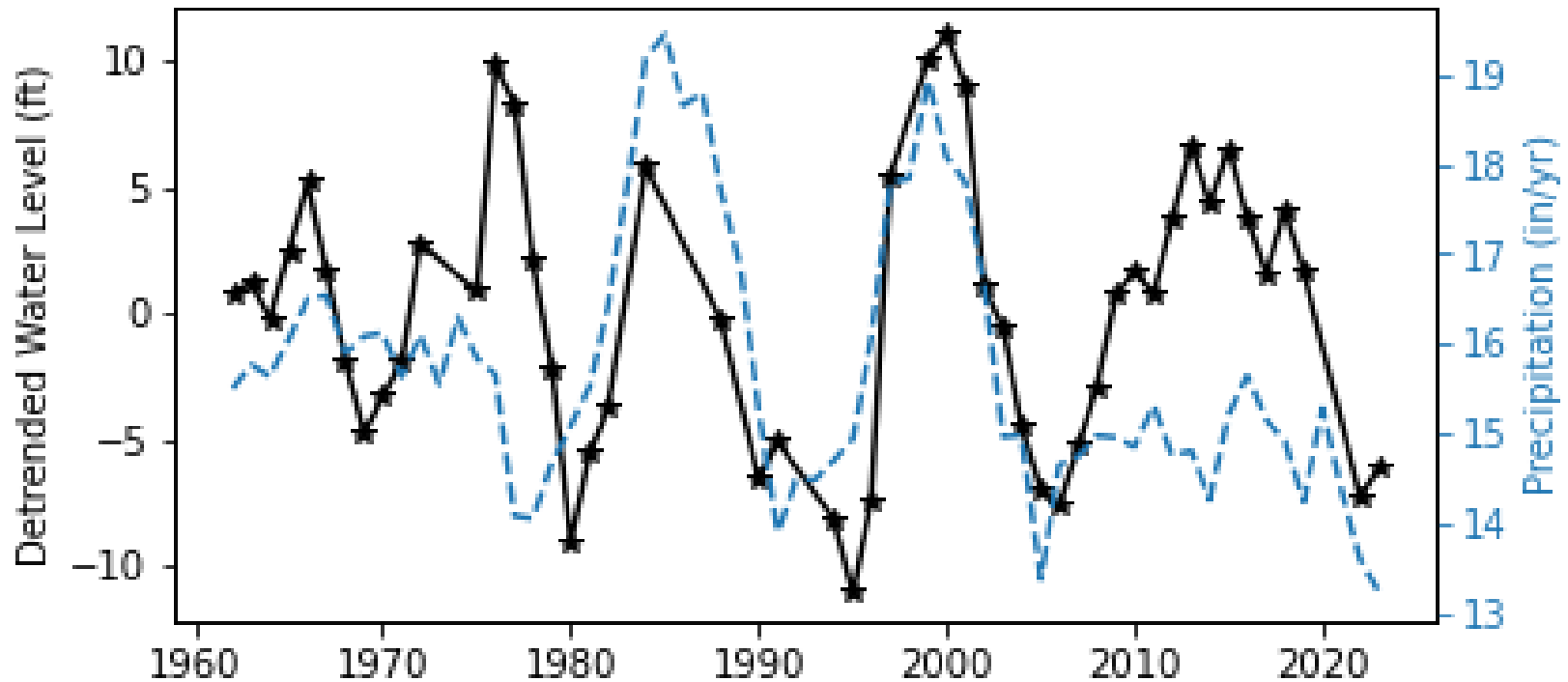


Detecting and removing the best-fit trend over period of record



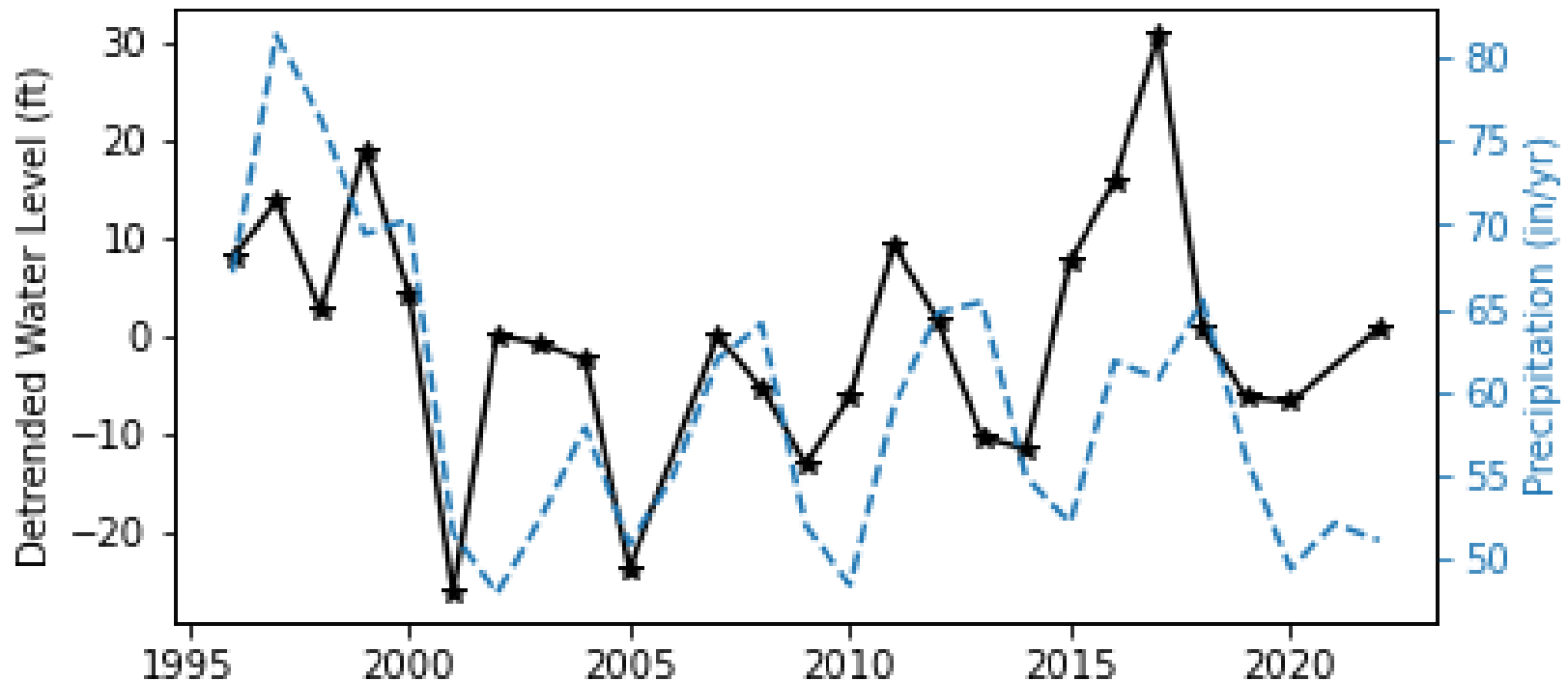
Wells Correlated w/Precipitation

DESC 3016: $R^2=0.22$ with 6-yr avg. precipitation,
characteristic magnitude=20.8 ft and rate=0.3 ft/yr in 1995



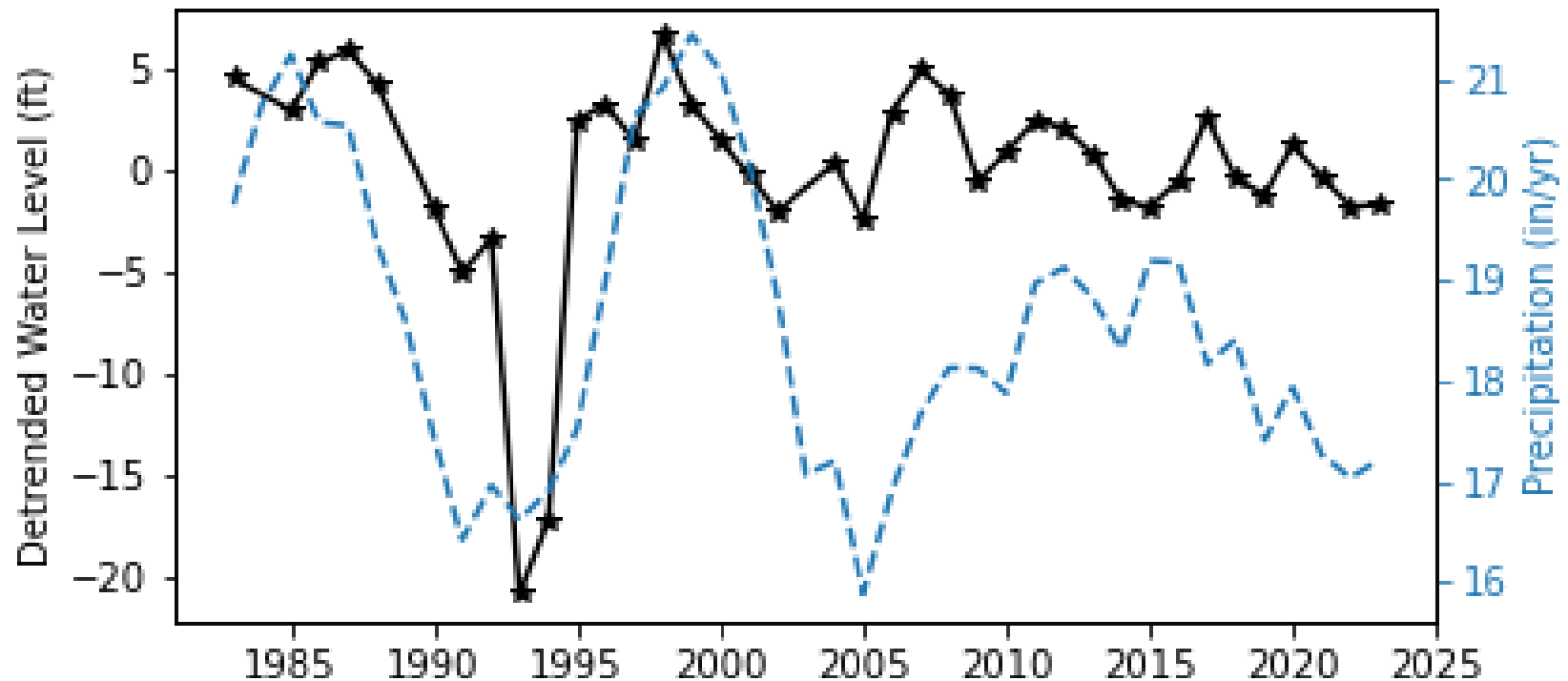
Wells Correlated w/Precipitation

YAMH 4640: $R^2=0.23$ with 2-yr avg. precipitation,
characteristic magnitude=45.2 ft and rate=0.8 ft/yr in 2009

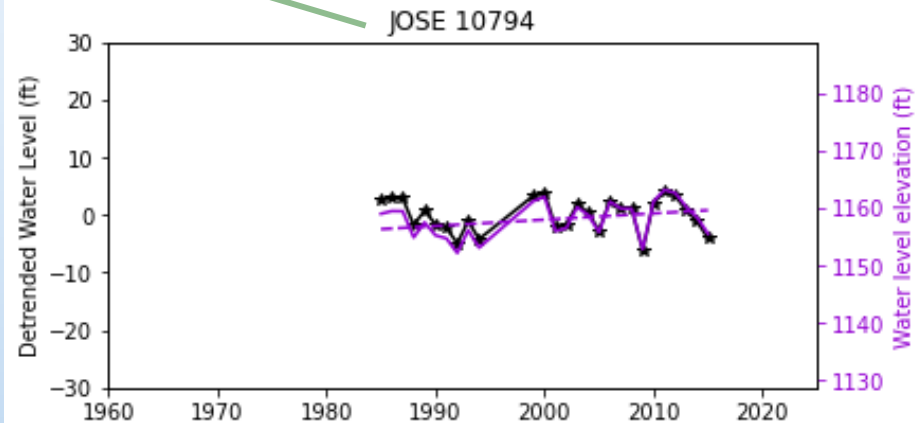
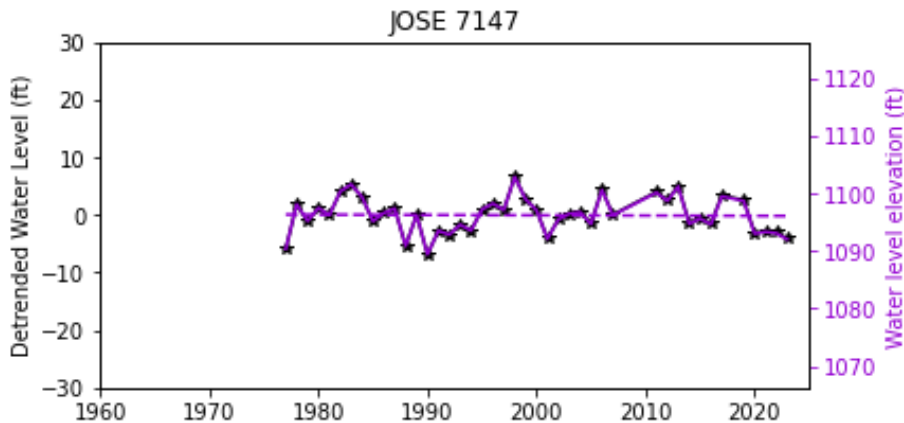
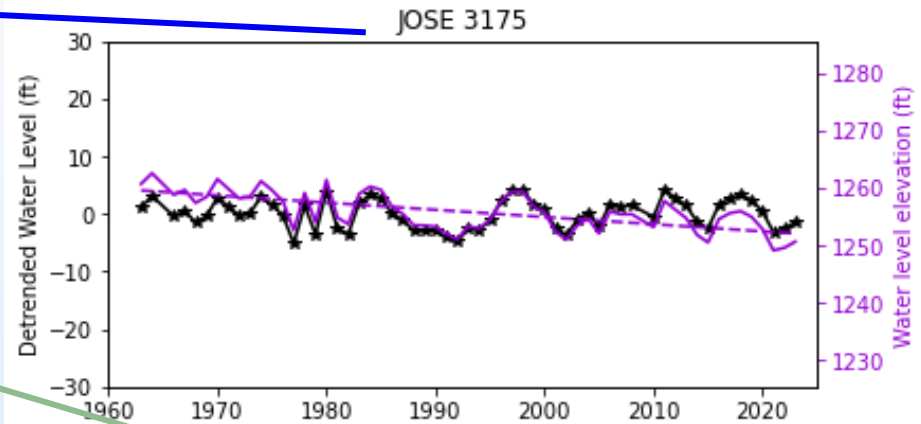
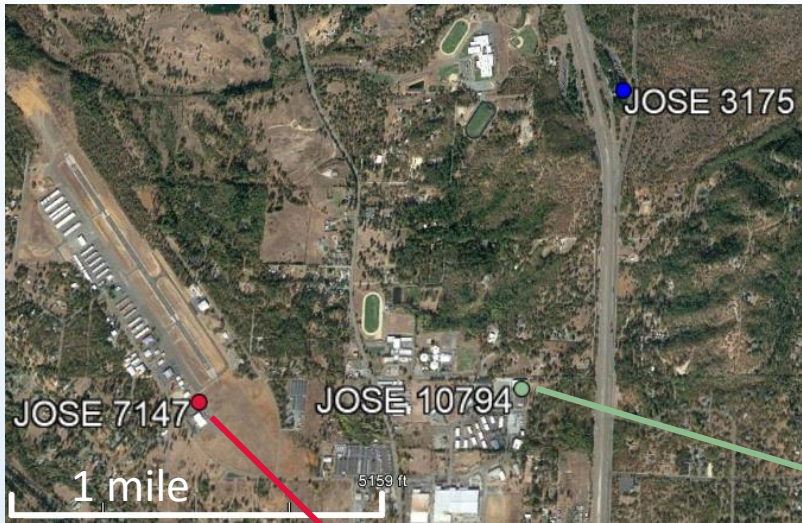


Wells Correlated w/Precipitation

SHER 340: $R^2=0.29$ with 6-yr avg. precipitation,
largest decline=26.6 ft, fastest rate=1.9 ft/yr in 1994



Clustering

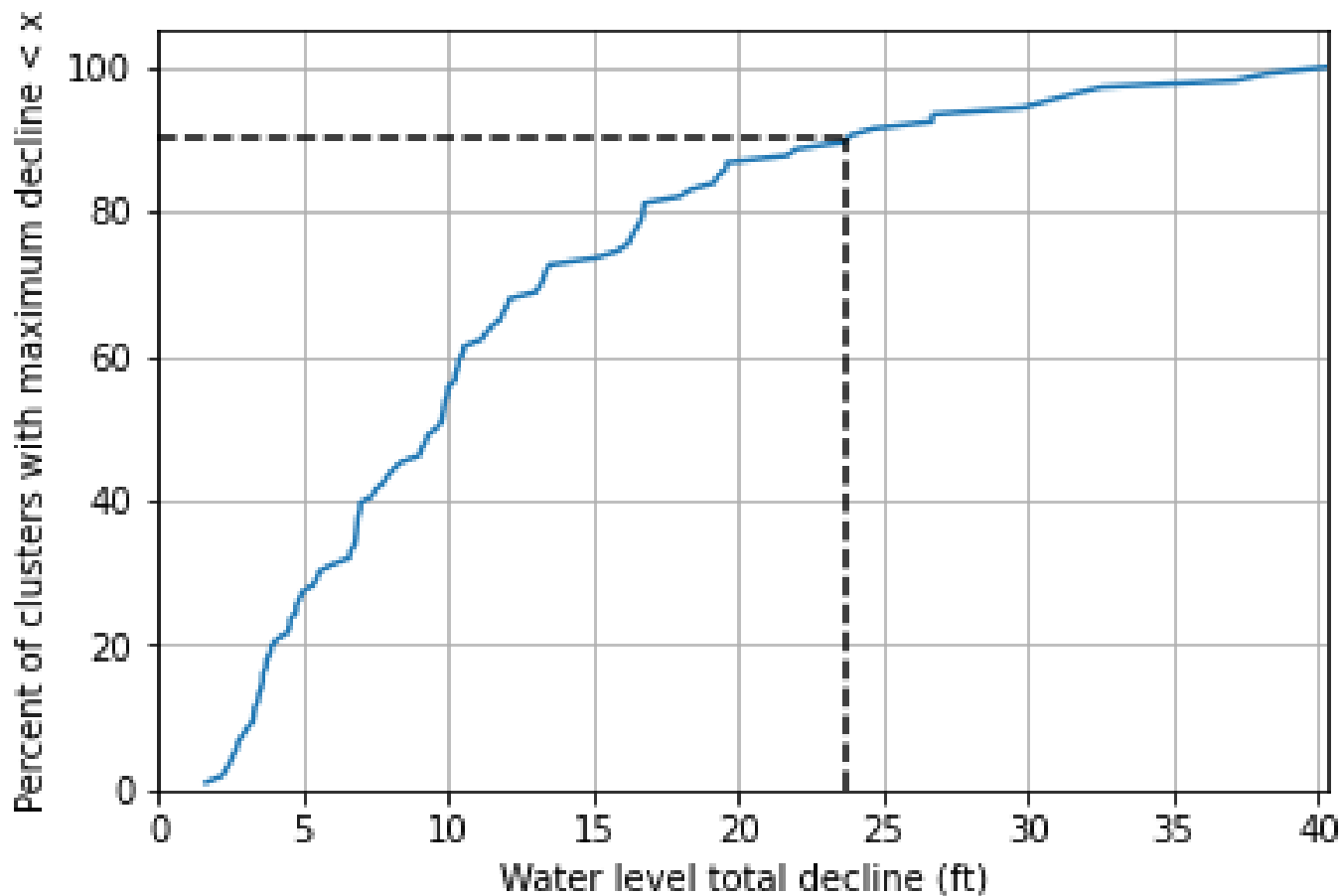


Total Decline Test

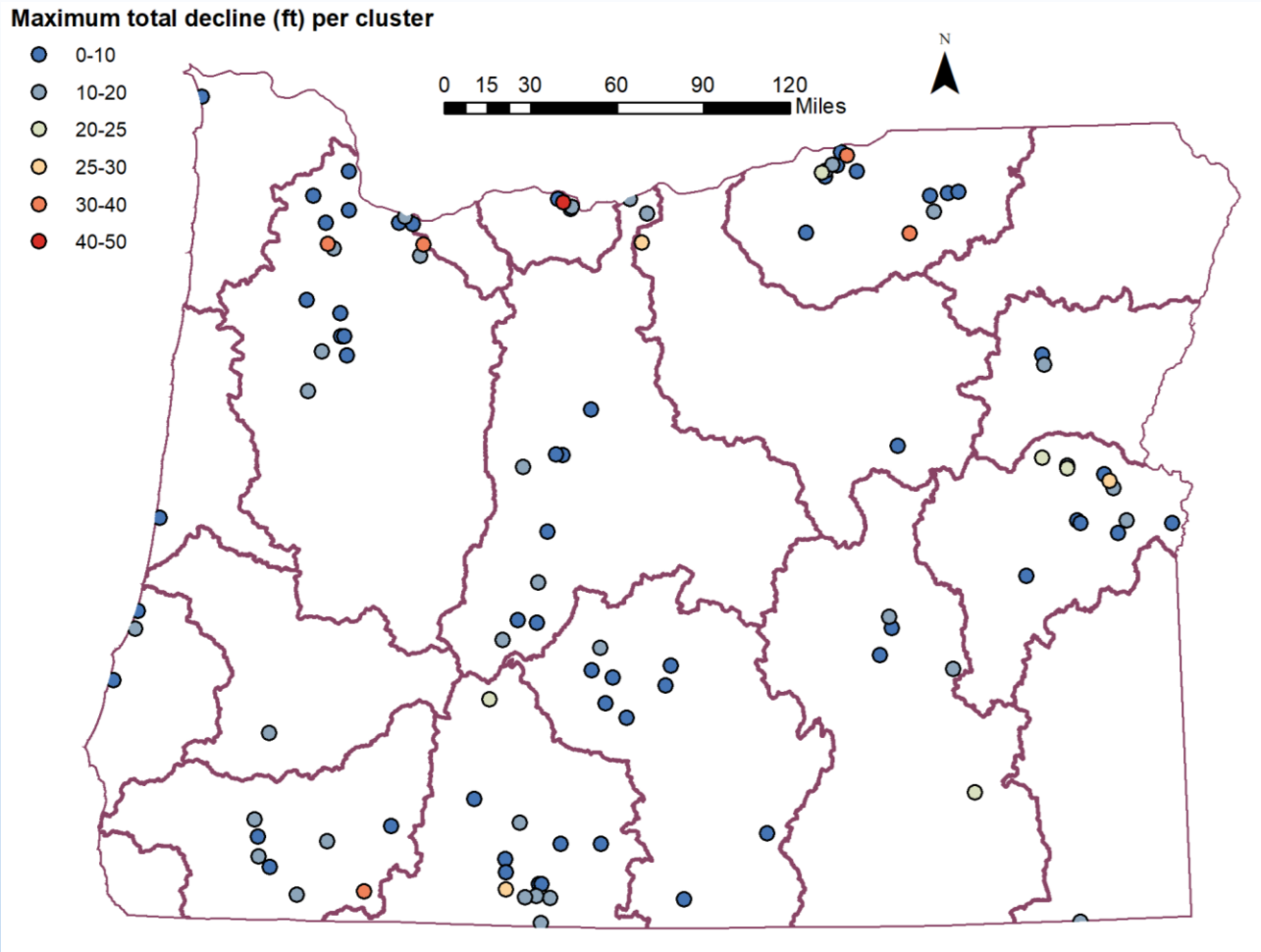
Total decline test explanation

- Decline from ~~highest known pre-~~ development limited to ~~25~~ YY feet

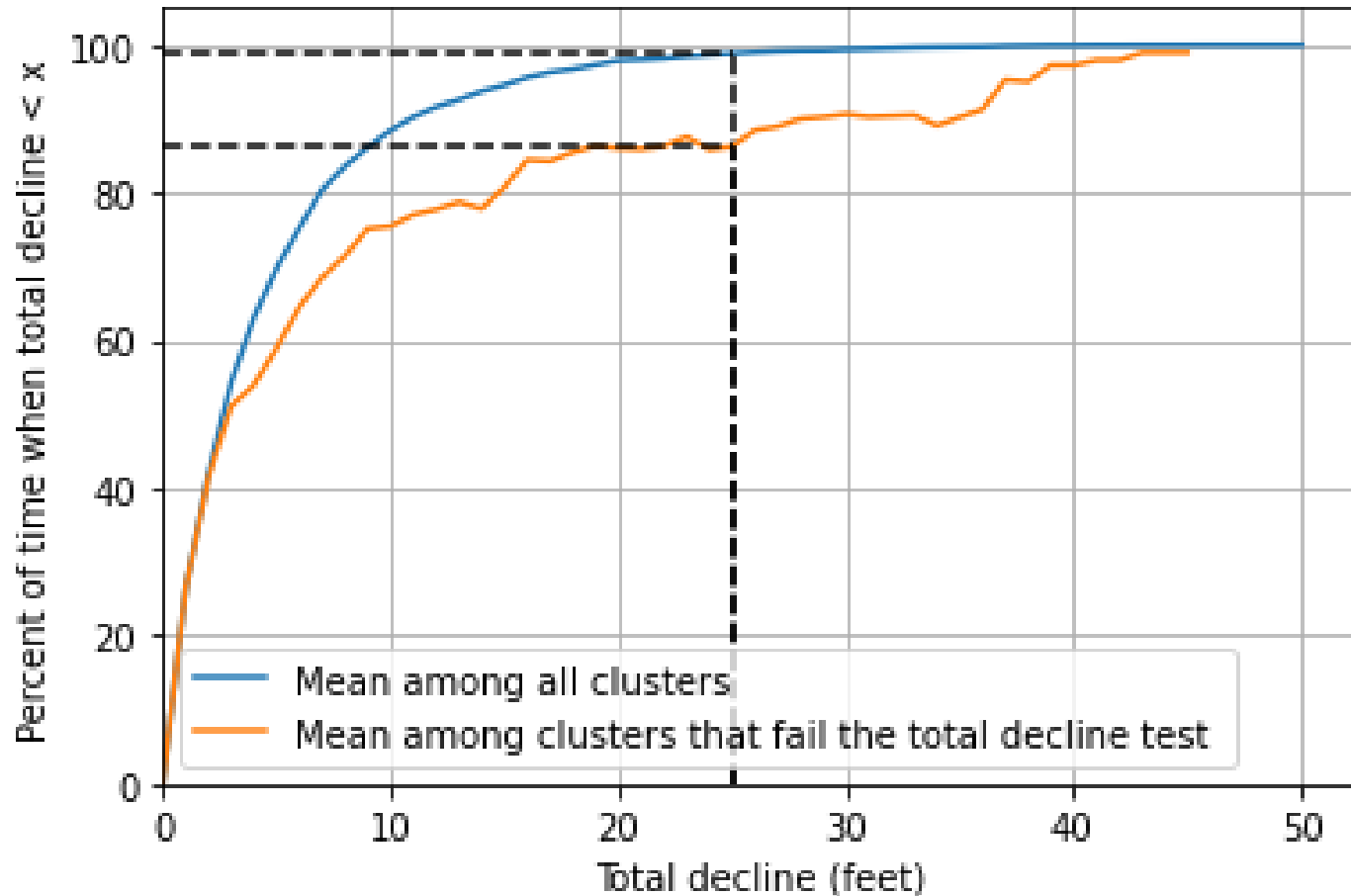
Total Decline: Percent of Well Clusters



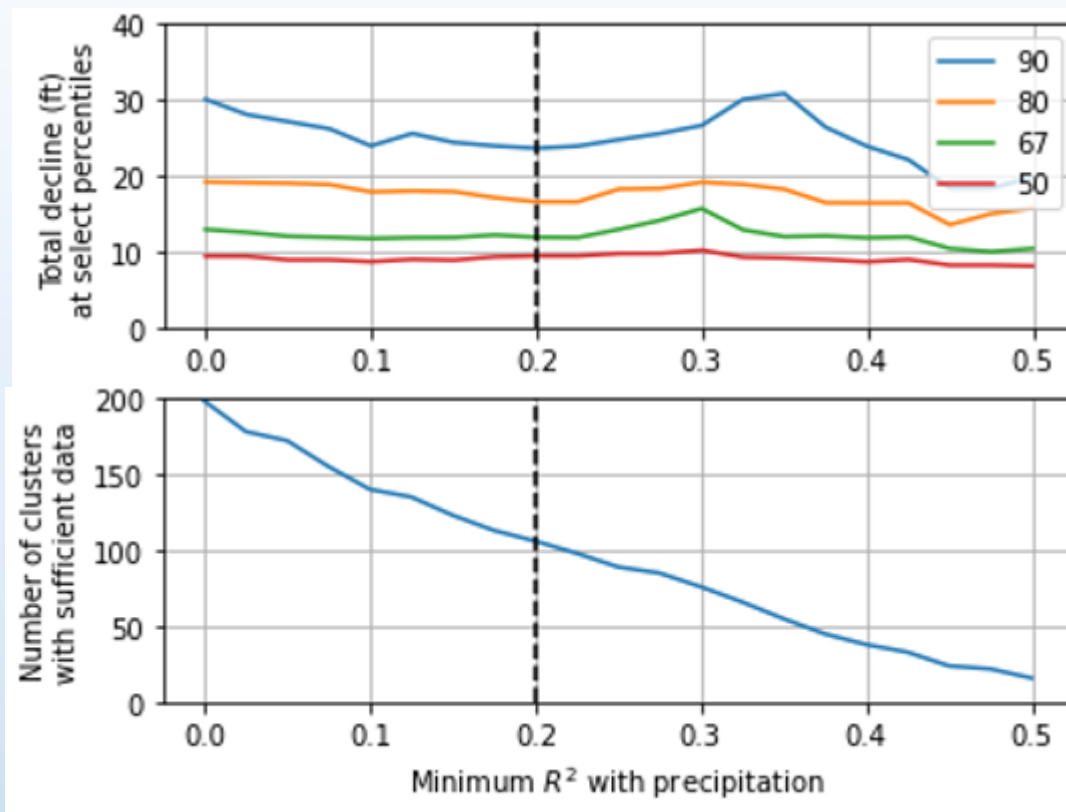
Total Declines Spatial Distribution



Total Decline: Percent of Time

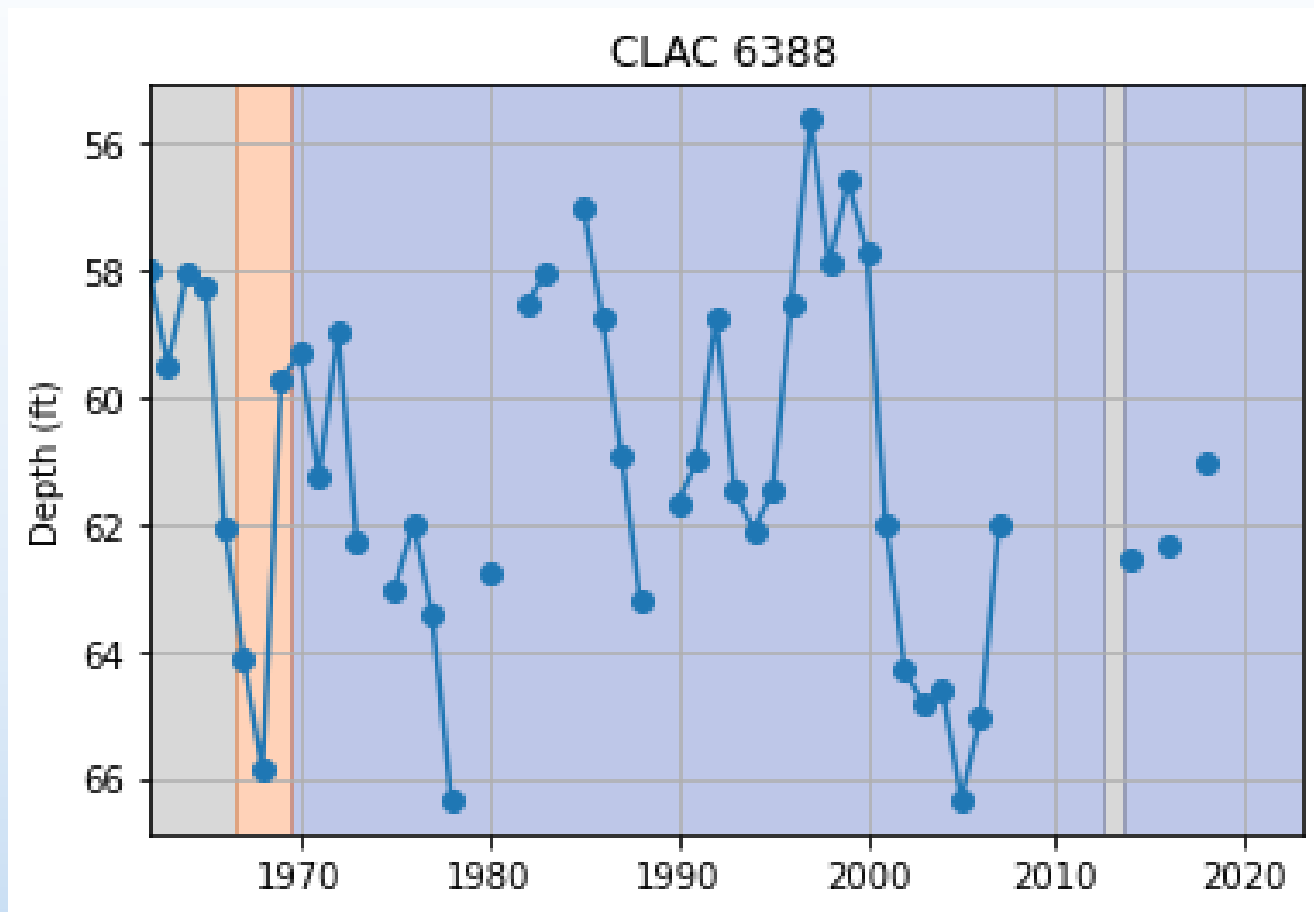


Sensitivity of total declines to correlation

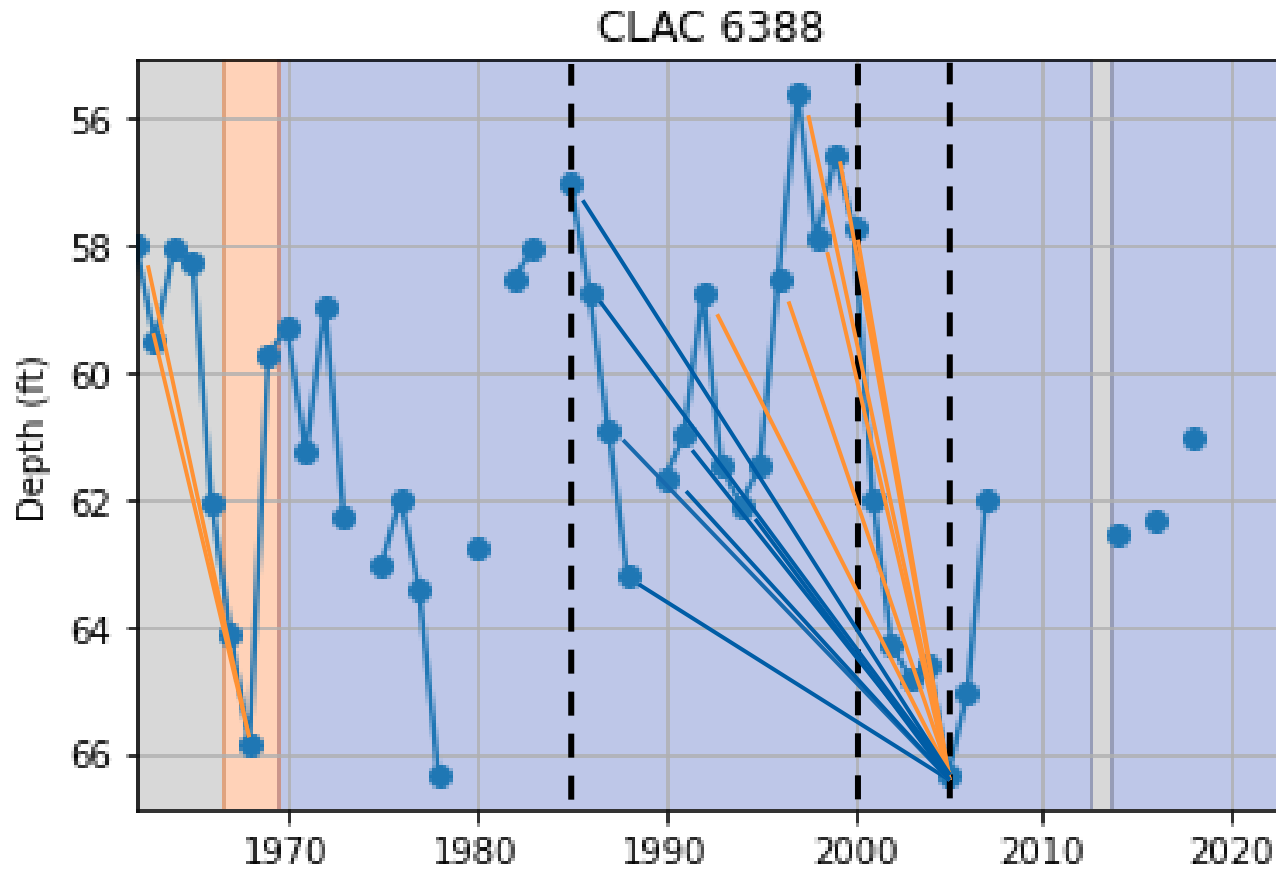


Rate Test

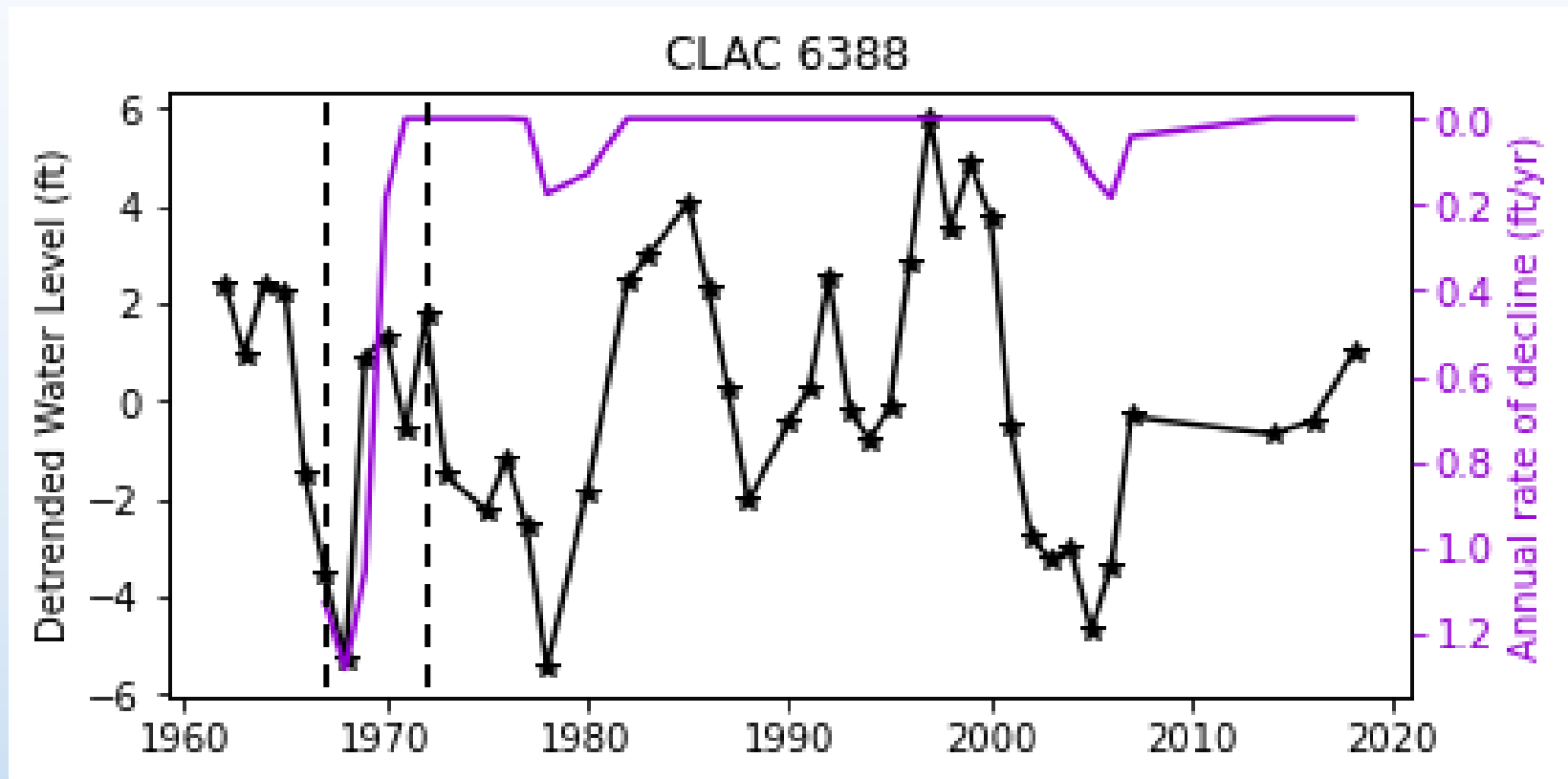
Rate test



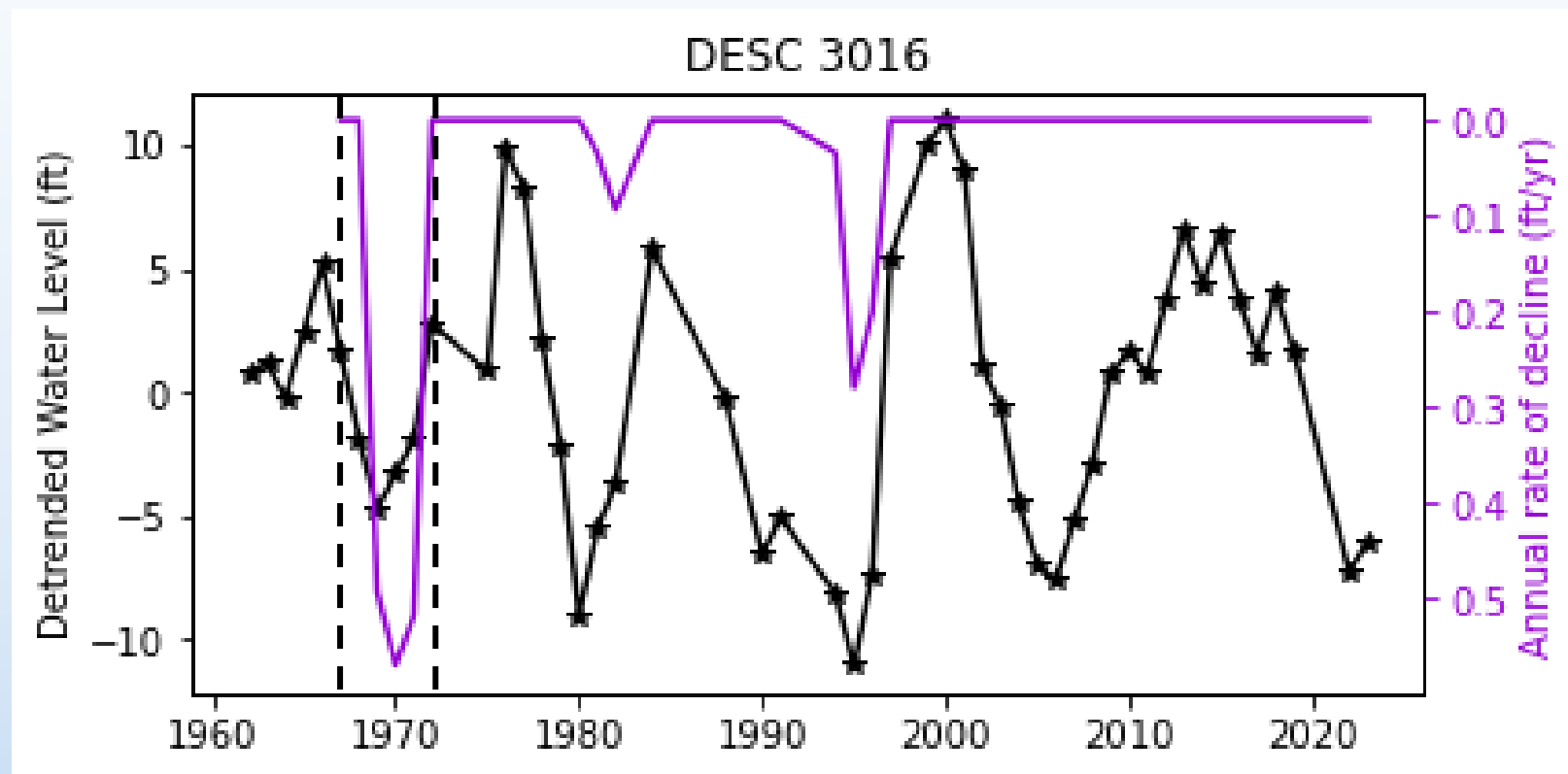
Rate test



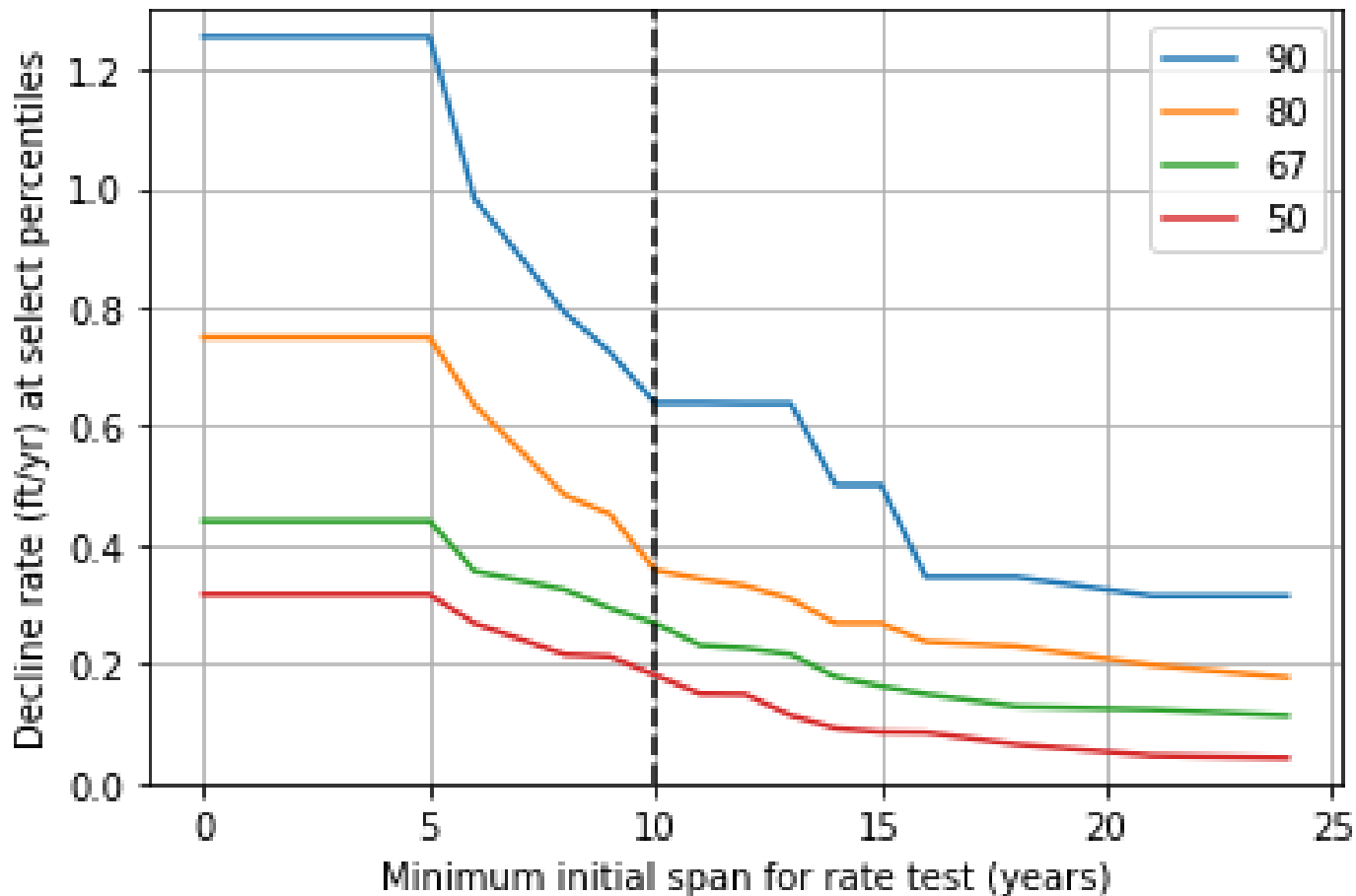
Rate analysis



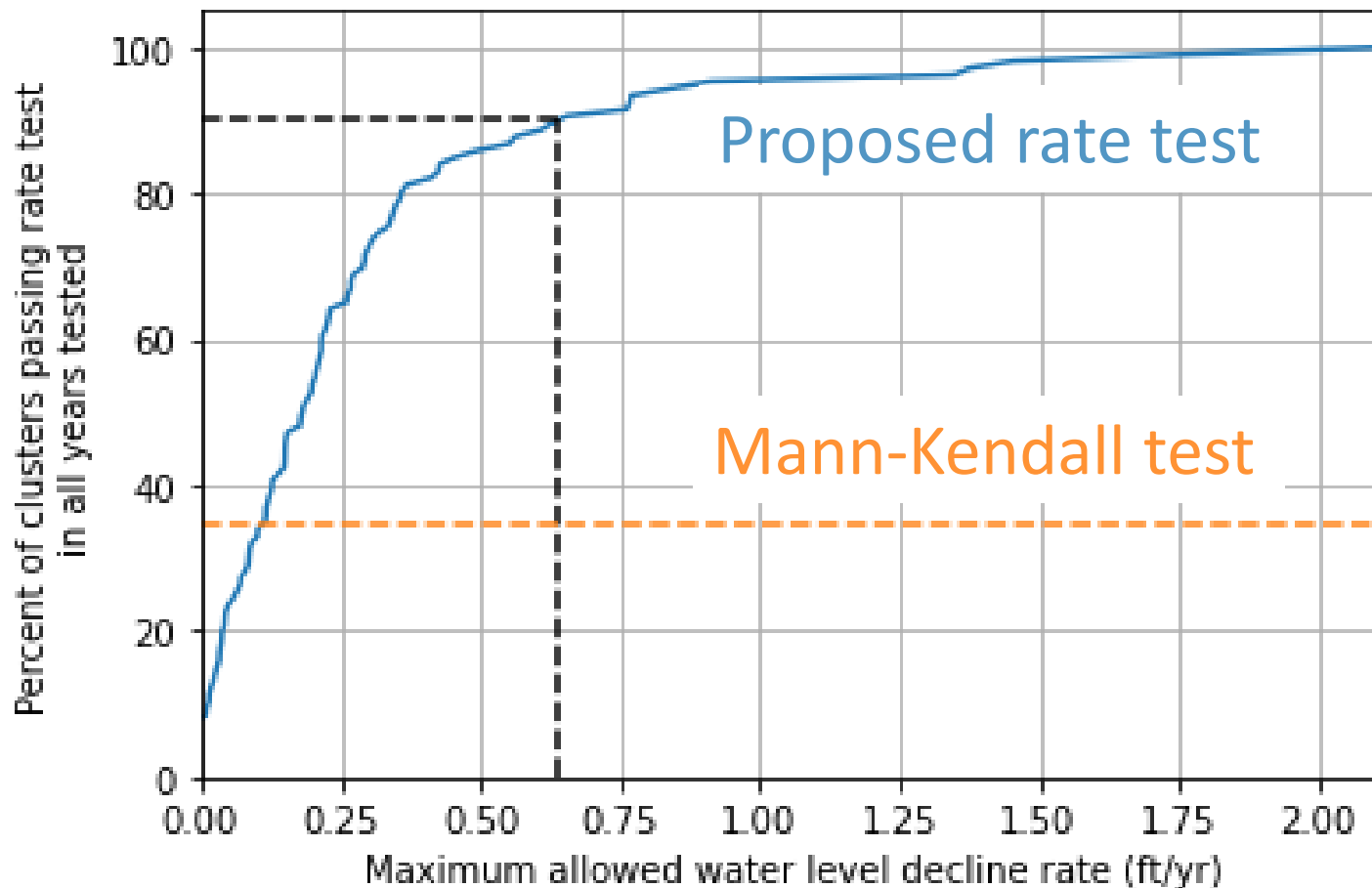
Rate analysis



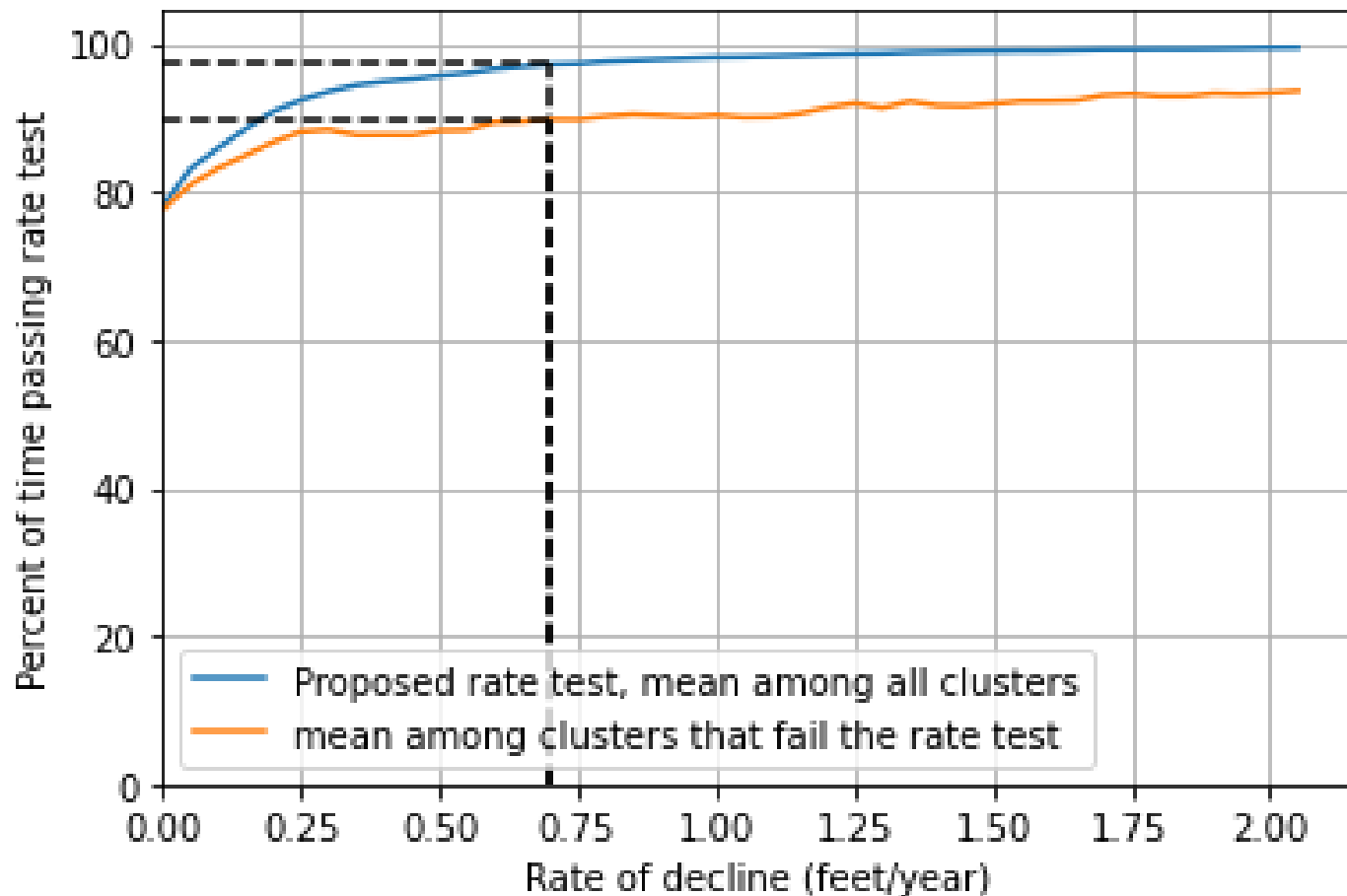
Sensitivity of Rate to Minimum Initial Span



Rate of Decline: Percent of Well Clusters



Rate of Decline: Percent of Time Passing Rate Test



Analysis Summary


- Filtered for wells expected to represent the dynamically stable range, found 234
 - Flexible correlation with precipitation allows for local variability in hydrogeology
- Tested total declines and rates of decline
- Total declines did not vary consistently by basin
- Thresholds can include 90% of clusters
 - Water levels remain stable over 97-99% of time
 - Proposed rate test remains stable more than a standard statistical test
- Seeking technical peer-review and RAC feedback



Q&A

The background features a stylized landscape. The top portion shows brown mountains with white snow-capped peaks and white, fluffy clouds against a light blue sky. Below the mountains is a solid blue horizontal band. At the bottom, there are rolling green hills with light beige outlines.

Public Comment



Schedule/ Wrap Up/Next Steps

Wrap Up/Next Steps

Email Rules Coordinator (laura.a.hartt@water.oregon.gov)

- Any additional input regarding this analysis by **January 9, 2024**

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