NOV 16, 2022

Fire Risk and Forecast Alerts

Public Utility District No. 1 of Chelan County

Carl Brandenburg and Peter Vanney

Agenda

- A Bit About US
- Chelan County Public Utility District
- PI Usage at the Chelan PUD
- Wildfire Risk
- Mitigation and Alert Motivation
- Solution Architecture
- Display and Alert Details
- Recap

A Bit About Us

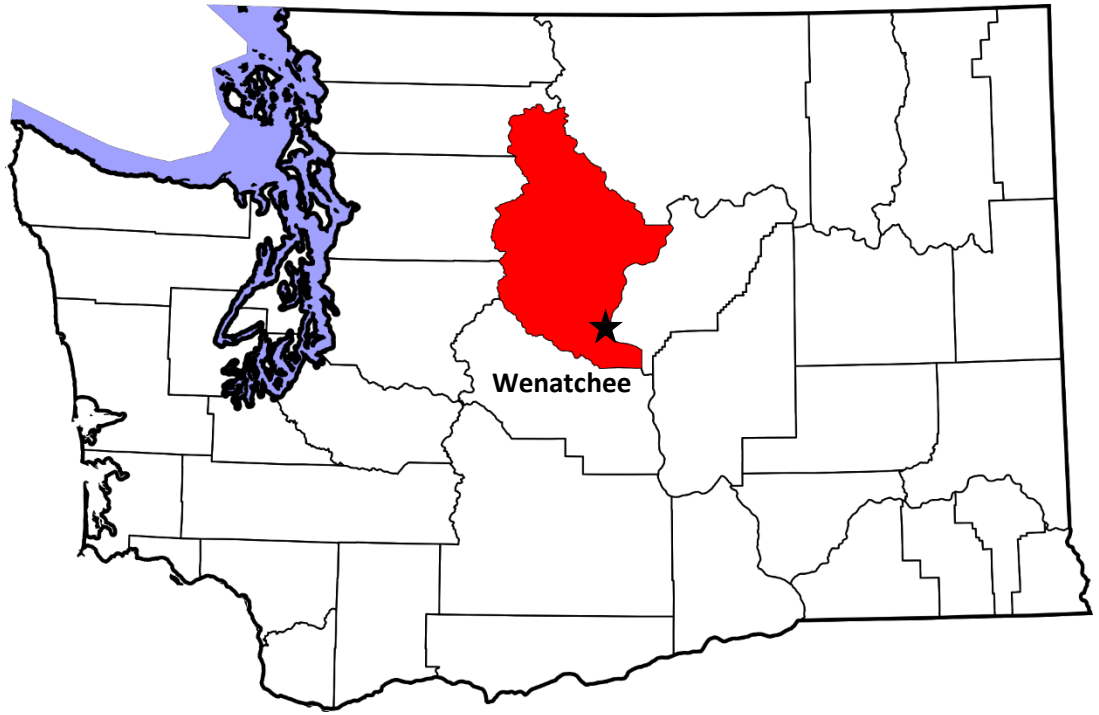
Carl

- Started at Chelan County PUD in 2015
- Software developer and DBA for 23 years.
- Originally from Spokane, WA

Peter

- Started at the PUD in 2018. Formerly:
  - Statistician for Texas Highway Patrol
  - Grad student math/stats instructor
  - Peace Corps Volunteer teacher in Ghana
- Originally from Decorah, IA.

Chelan County Public Utility District (Chelan County PUD)



https://en.wikipedia.org/wiki/Chelan_County,_Washington

- Nonprofit and customer-owned
- Electric, water, wastewater, and telecommunications
- 3 hydroelectric dams ~2,000MW nameplate capacity
  - 2 on the Columbia River (mix of Kaplan and Bulb turbines)
  - 1 at the base of Lake Chelan (Francis turbines)
- Meet local load and export ~80+%
- Average residential rate just over $0.03 per KWH
- Serve about 50,000 retail electric customers

PI at Chelan County PUD

- PI System installed in 2002
- Originally:
  - Data Archive on both SCADA and Corporate networks
  - PI Historian used primarily as a database for after-the-fact root cause analysis
  - Some reporting and dashboarding using DataLink and ProcessBooks
  - Use required active engagement and some knowledge silos were formed
- 2018 – now: invest in PI Visualization and Development tools
  - Initial Asset Framework based on Maximo Asset Location Hierarchy
  - Started with Generation Assets, but have enterprise-wide goals
  - PI Vision & PI Web API development
  - AMI pilot with AVEVA and PowerRunner

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CHELAN COUNTY

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Fire Weather Monitoring and Alerts

Business Challenge

- Need a fire mitigation plan with risk analysis, analytics, and regular monitoring
- Data and condition monitoring sources are dispersed online and in-house
- Lack of automated email and text notifications
- Manual condition monitoring and weather forecasts

Plan

- Study our fire risk
- Centralize data in PI Archive using Asset Framework
  - Gov’t web data
  - Sensor data (PI Tags)
  - Forecast data (External)
- Develop PI Vision displays for enterprise-wide monitoring
- Create PI Analyses, Event Frames, and Notifications to automate alerts and track alert history

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Fire Risk & Suppression Cost Modeling

https://www.doi.gov/wildlandfire/suppression

- Chelan County is geographically diverse (sagebrush, mountains, forests, lakes, rivers, and wilderness areas)
- In the US, the party responsible for ignition may be held responsible for wildfire suppression costs.
- Federal data: $350 per acre average suppression cost estimate (rough estimate due to widely varying factors)
- Reax Engineering modeled ignition risk in the Chelan PUD service area focusing on fire intensity, fire size, and potential damage to structures

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Fire mitigation plan

- Vegetation management: More frequent inspections, pruning
- Operational changes during fire season (auto-reclosers)
- Undergrounding where feasible
- Fire hardening: Steel structures & fire-retardant paint
- Coordination with other agencies
- Fire safety outage management (FSOM) group
- Public Safety Power Shutoffs
- PI Vision displays and forecast notifications

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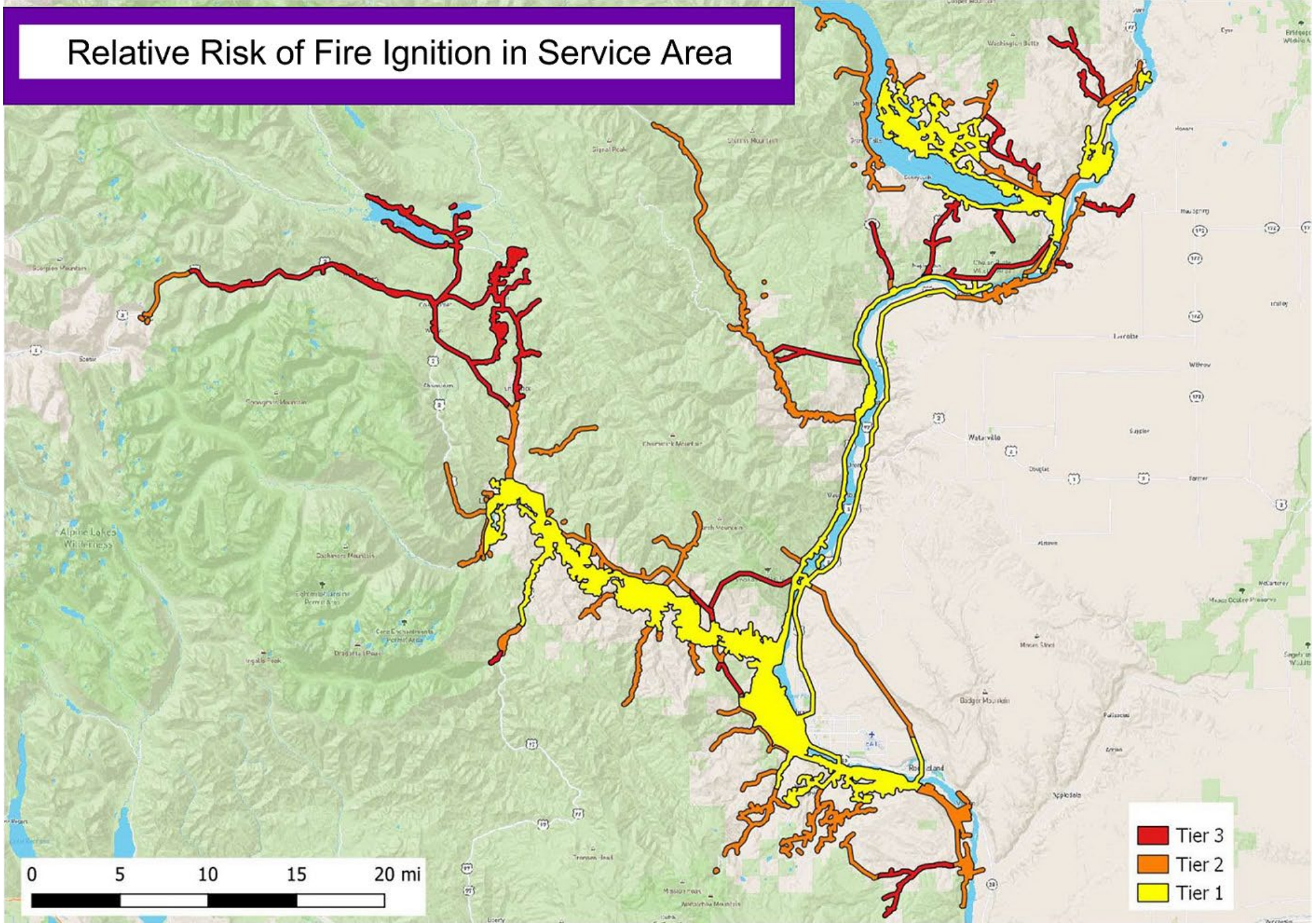
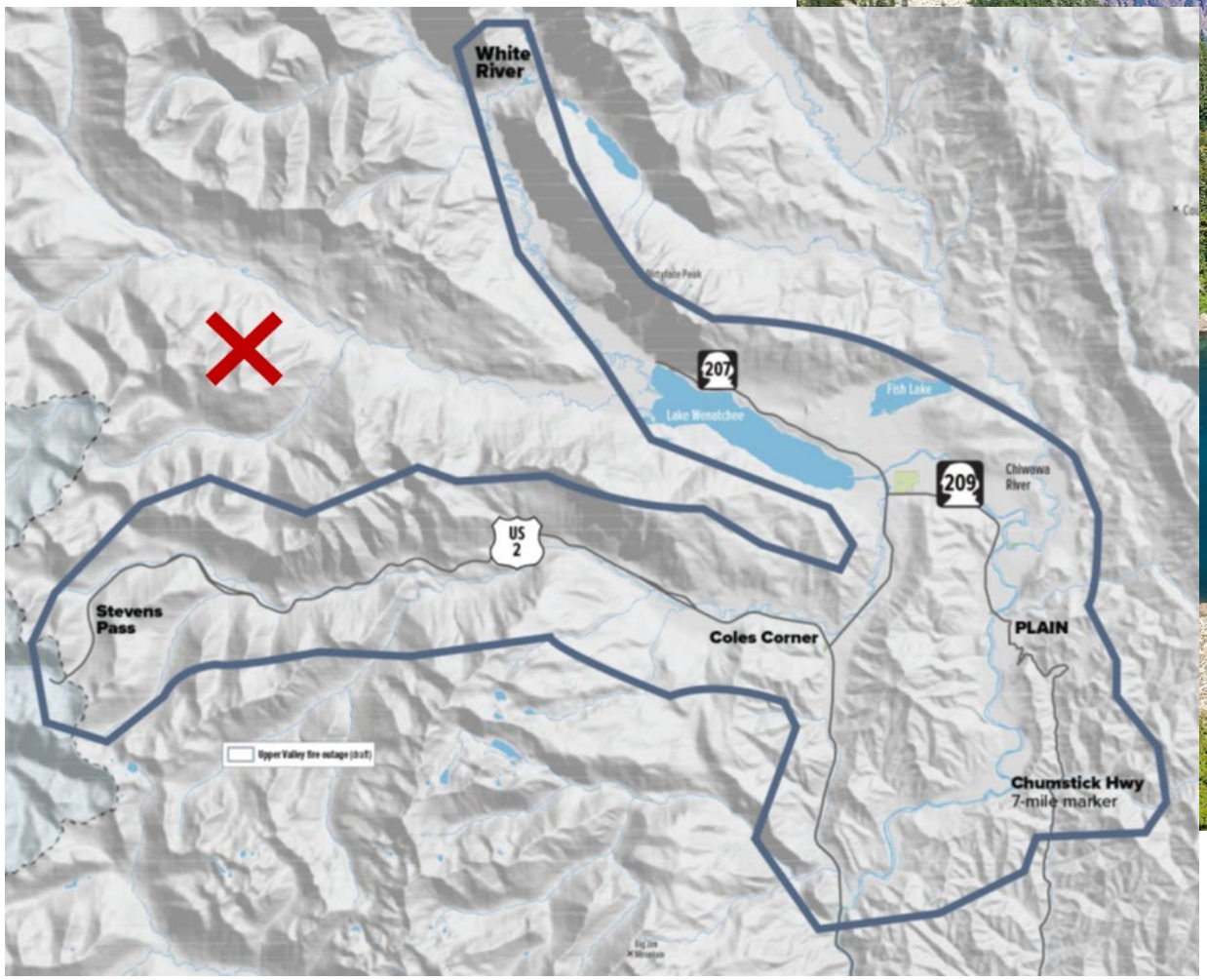
Relative Risk of Fire Ignition in Service Area



FSOM Focus Area



Technology Challenges

- Short deadline for implementation
- Incorporate myriad of data sources:
  - Web APIs
    - Weather.gov
    - Synoptic.com
  - Screen Scraping
    - Preparedness Levels
  - Zip files provided by Reax Engineering
  - Leverage remote monitoring devices
- Update hourly data

Solution

- PI System – best enterprise solution for time series storage and analysis and more
  - Supports many data sources
  - Easy visualizations
  - Built-in notification engine
  - Web API for reads and writes to Data Archive
- Widows Service - Primarily for web scraping/API's
- Oracle OSB Platform
- RStudio Server & Connect

Business Benefit/Strategy

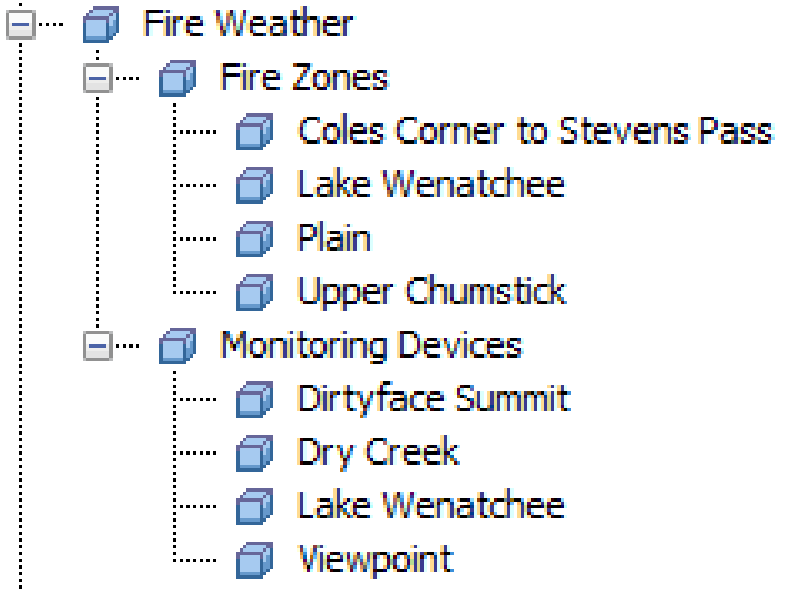
- Able to leverage a single ecosystem instead of piecing it together.
- Centralize data in PI Archive and Asset Framework
- PI Vision displays for enterprise-wide monitoring
- PI Analyses, Event Frames, and Notification System

Putting it all together

Team members with many hats

- Laryn Brinkman (Trans. Sys. Engr.)
  primary business contact, PI Vision developer
- Carl Brandenburg (IT Dev)
  project manager, PI architect
- Justin Blaufuss (IT Dev)
  data engineering, integrations
- Peter Vanney (Data Analytics)
  PI System analytics, R developer

AF Structure



- PI Vision displays
- Email notification on events forecasted 4-7 days in the future
- Text notification on events forecasted 0-3 days in the future
- Use R to analyze multiple forecasts simultaneously

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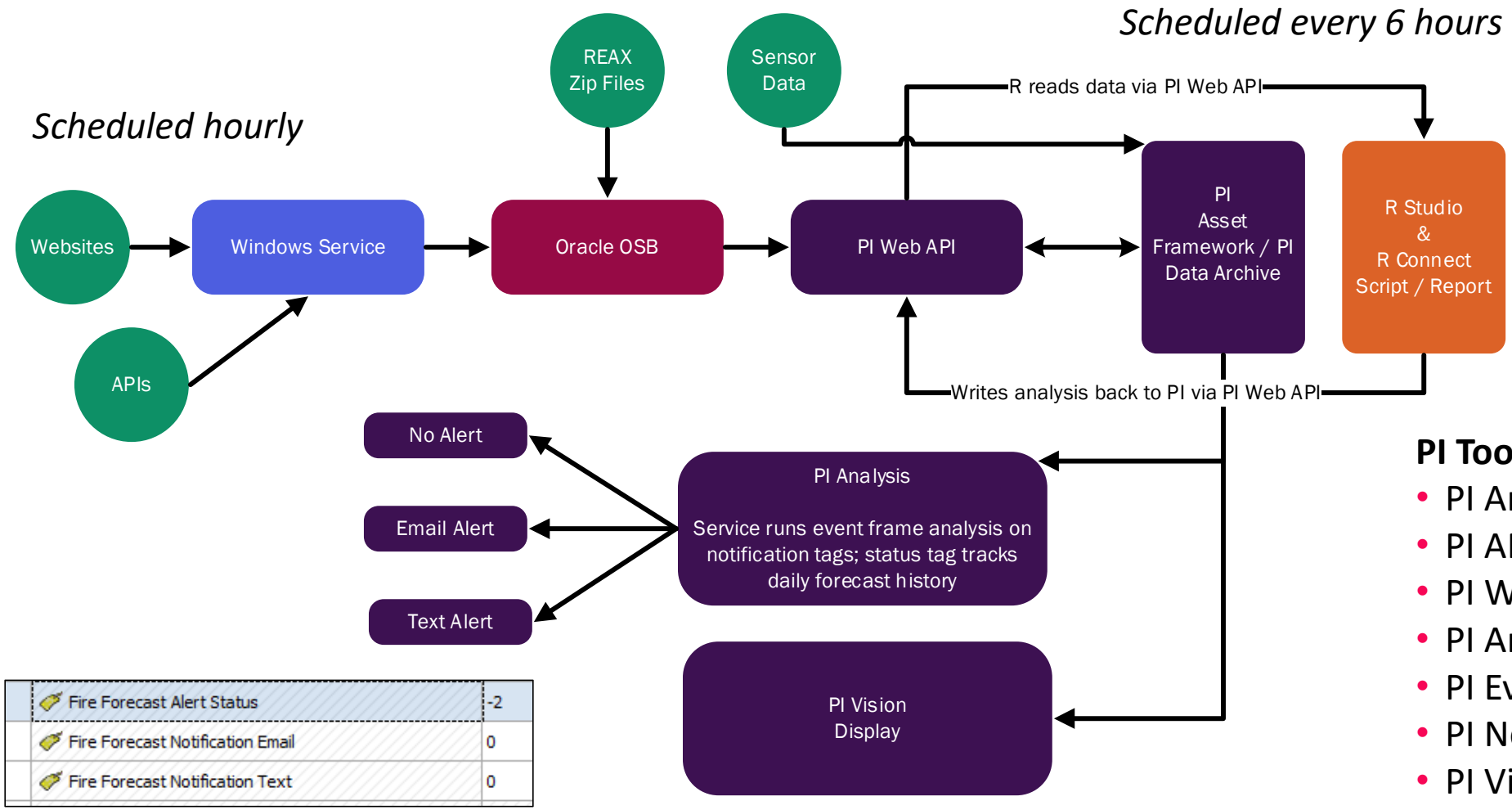
Fire Weather Solution Architecture



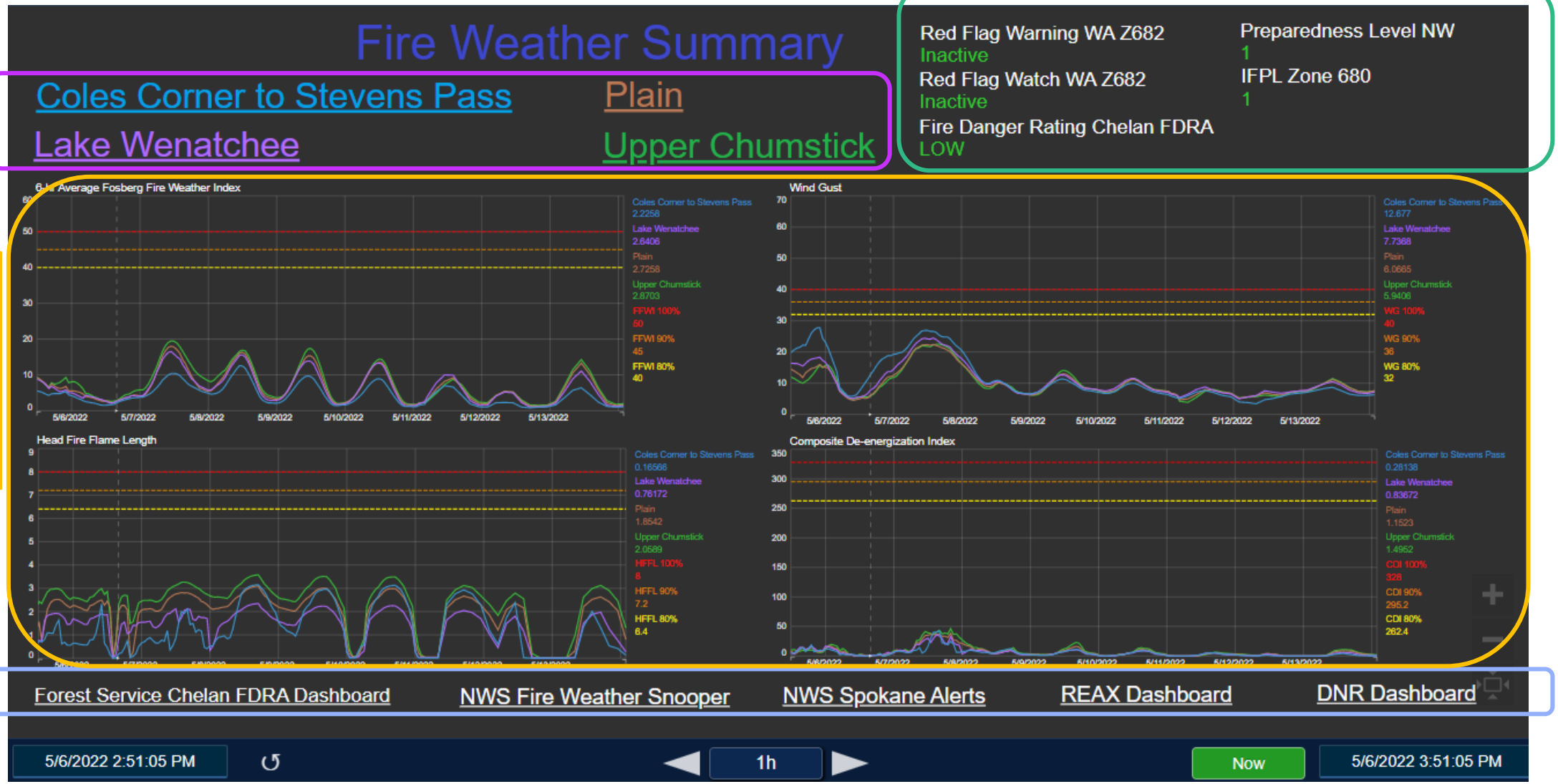
PI Tools

- PI Archive
- PI AF
- PI Web API
- PI Analysis Service
- PI Event Frames
- PI Notifications
- PI Vision

Links to field device display

Current government fire conditions

7 days of future forecast conditions



Links to external data sources and dashboards

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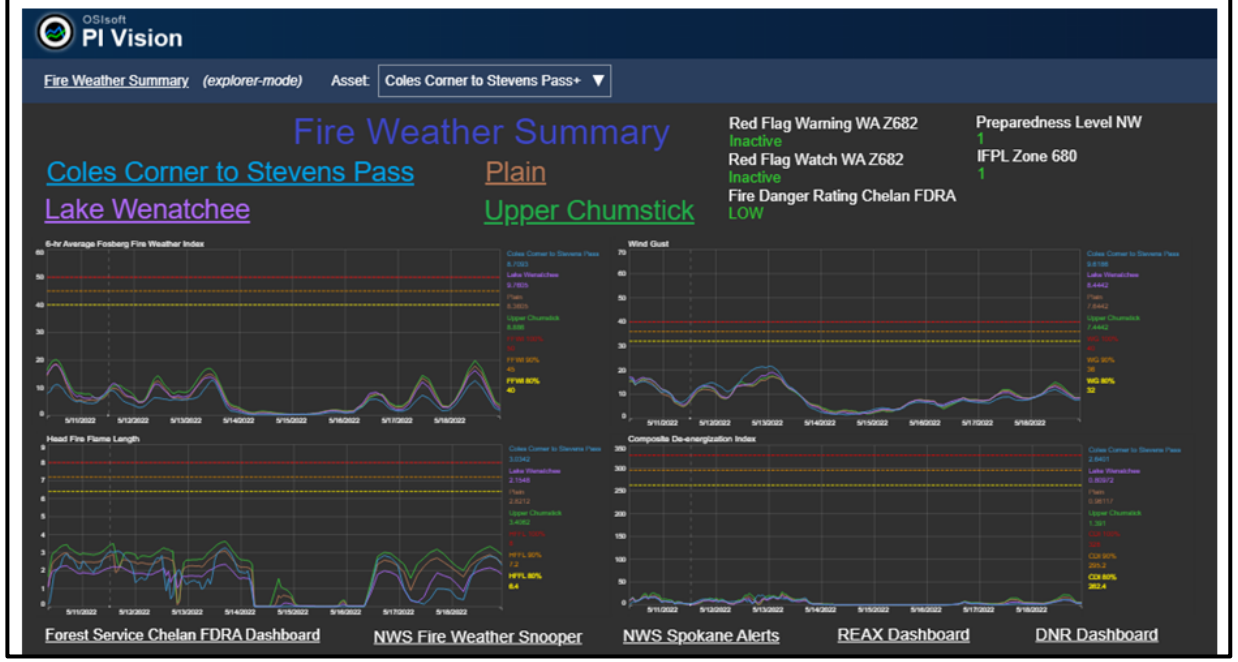
Fire Weather Forecast Alerts

Fire Weather Forecast Alert 4-7 days -

PINotifications@chelanpud.org
To Peter Vanney

Fire Weather Forecast Alert 4 - 7 days

Dates of Alert	Which Metrics	Metric/Threshold/Max Value		
0	0	Metric	80% Threshold	Maximum Value during event
		6Hr Avg Wind Gust	0	0
		CDI	0	0
		HFFL	0	0



Fire Forecast Alert Status

General | Table | Define Table | Version

Fire Forecast Alert Status

Filter

	Value	Interpretation
▶	0	No Alert
	1	Email alert sent - Event identified between 3 and 7 days in the future - alert is active
	-1	Email alert sent – Event identified between 3 and 7 days in the future – alert is inactive
	2	Text alert sent - Event identified between 0 and 3 days in the future - alert is active
	-2	Text alert sent - Event identified between 0 and 3 days in the future - alert is inactive
	3	Email alert and text alert sent - Event first identified between 3 and 7 days in the future, then became inactive, then was reidentified between 0 and 3 days in the future - alert is active
	-3	Email alert and text alert sent - Event first identified between 3 and 7 days in the future, then became inactive, then was reidentified between 0 and 3 days in the future - alert is inactive

Notification history tracking

Email notifications with link & display snapshot

Text notification

pinotifications@chelanpud.org

0-3 days at Coles Corner to Stevens Pass
Fire Weather Forecast Alert / 0 - 3 days

Coles Corner to Stevens Pass

Dates of Alert: -, -, 10/10, -
Which Metrics: Wind Gust, -, -

Metric *** 80% Threshold *** Max Val of event

6Hr Avg Wind Gust *** 32 *** 32.7
CDI *** 262.4 *** 0
HFFL *** 6.4 *** 0

Send Time: 2021-10-08T06:17:10
Server: ARMADILLO
Database: CCPUD

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PI Value Analytics at Chelan PUD

Challenge

- Lacked centralized fire condition monitoring data
- No single view into the data necessary for fire weather decision making
- Lacked automated notifications

Solution

- Leverage investment in the PI System
  PI Archive, PI AF, PI Web API, PI Analysis Service, PI Event Frames, PI Notifications, PI Vision
- Incorporate other technology solutions
  - Custom Windows Service
  - Oracle OSB
  - R Server and RStudio Connect

Benefits

- Defined time-series data strategy
- Templatized data modeling
- Centralized display
- Automated Alerts
- Historical record for continuous improvement
- Data-driven decision making

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Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

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