

National Weather Service Red Flag Warning Program & Season Outlook

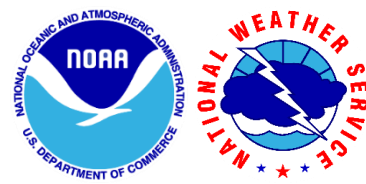


Derek Wroe

National Weather Service

derek.wroe@noaa.gov

2024-2025 Wet Season



Early wet season (Oct – Dec) dominated by mostly below normal rainfall

U.S. Drought monitor depicted drought on all islands Dec 31, 2024

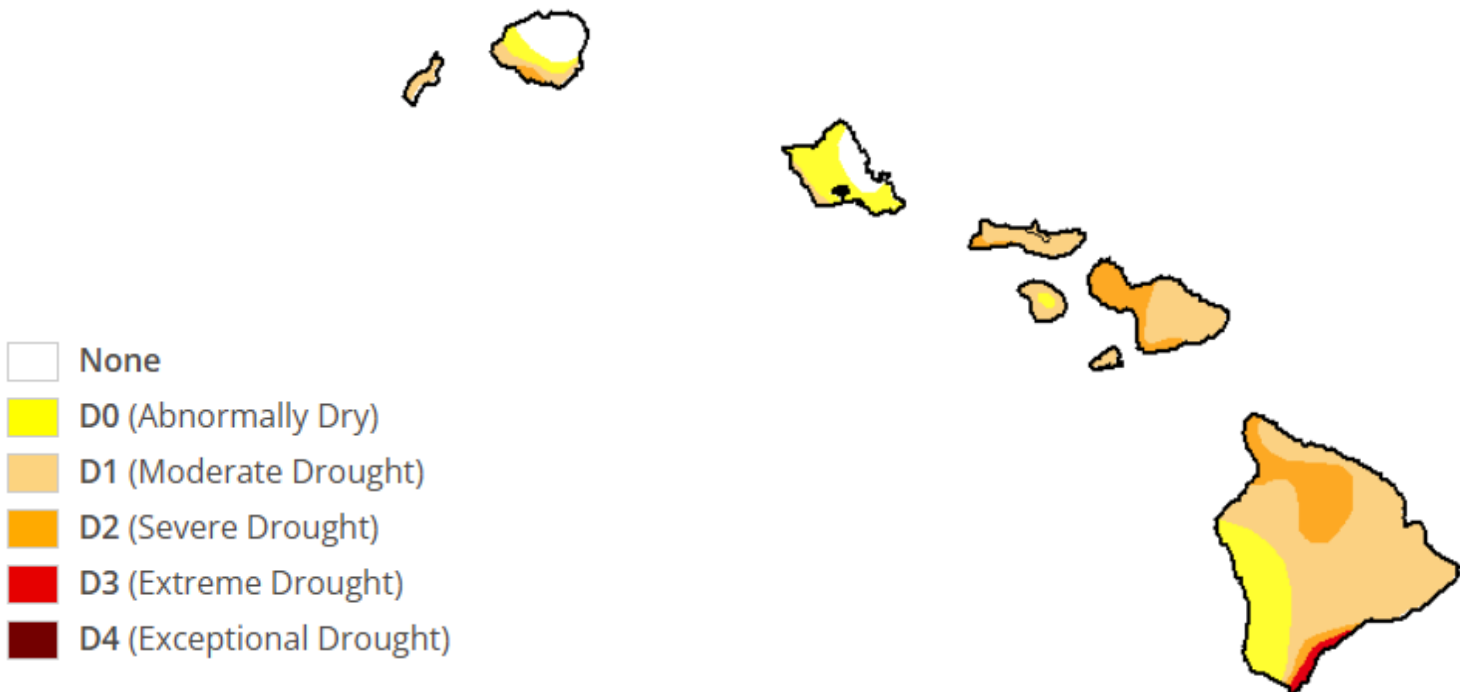


2024-2025 Wet Season

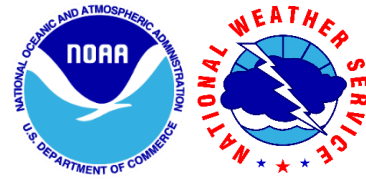


Late wet season (Jan – Apr) precipitation was mixed

U.S. Drought monitor depicted lingering drought on all islands to end wet season (Apr 29, 2025)



2024-2025 Wet Season



In last 30 years, 2nd driest wet season based rankings for 8 legacy sites

Not as dry elsewhere:

Kauai: 40 – 90 % of average

Oahu: 50 – 90 % of average

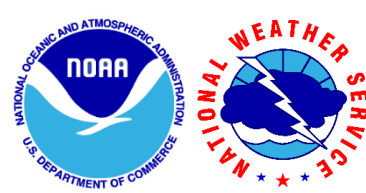
Maui County: 30 – 80 % of average

Big Island windward: 40 – 70 % of average

Big Island leeward: 60 – 100 % of average



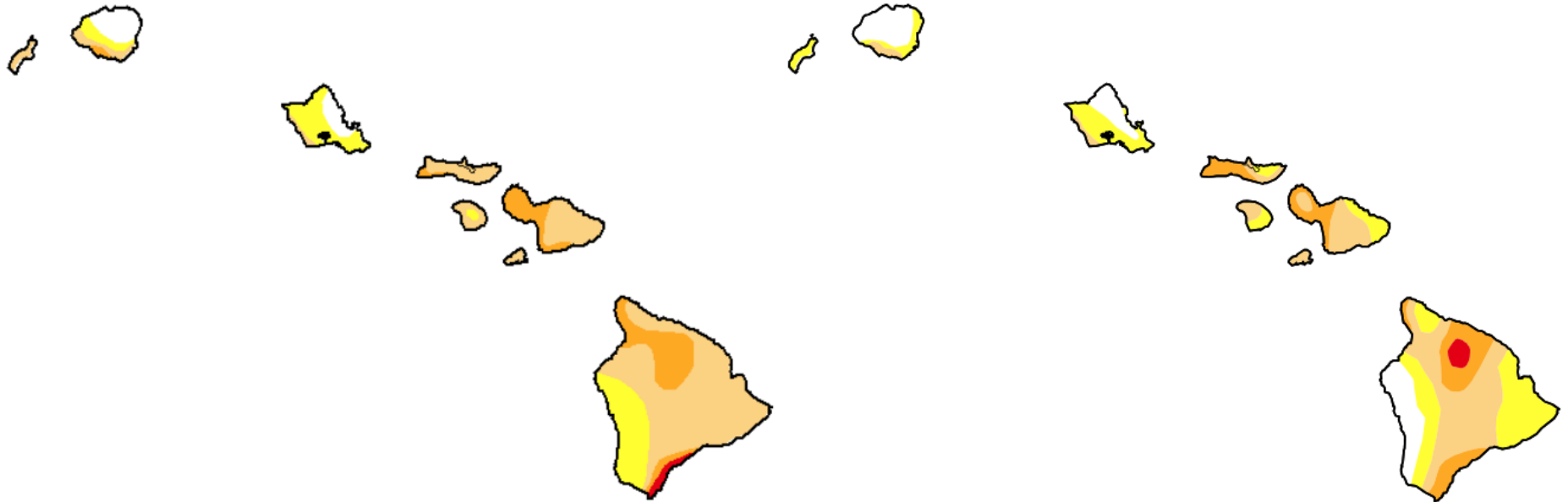
Dry Season Current State



Drought state has changed little during first half of dry season

Apr 29

Jul 24

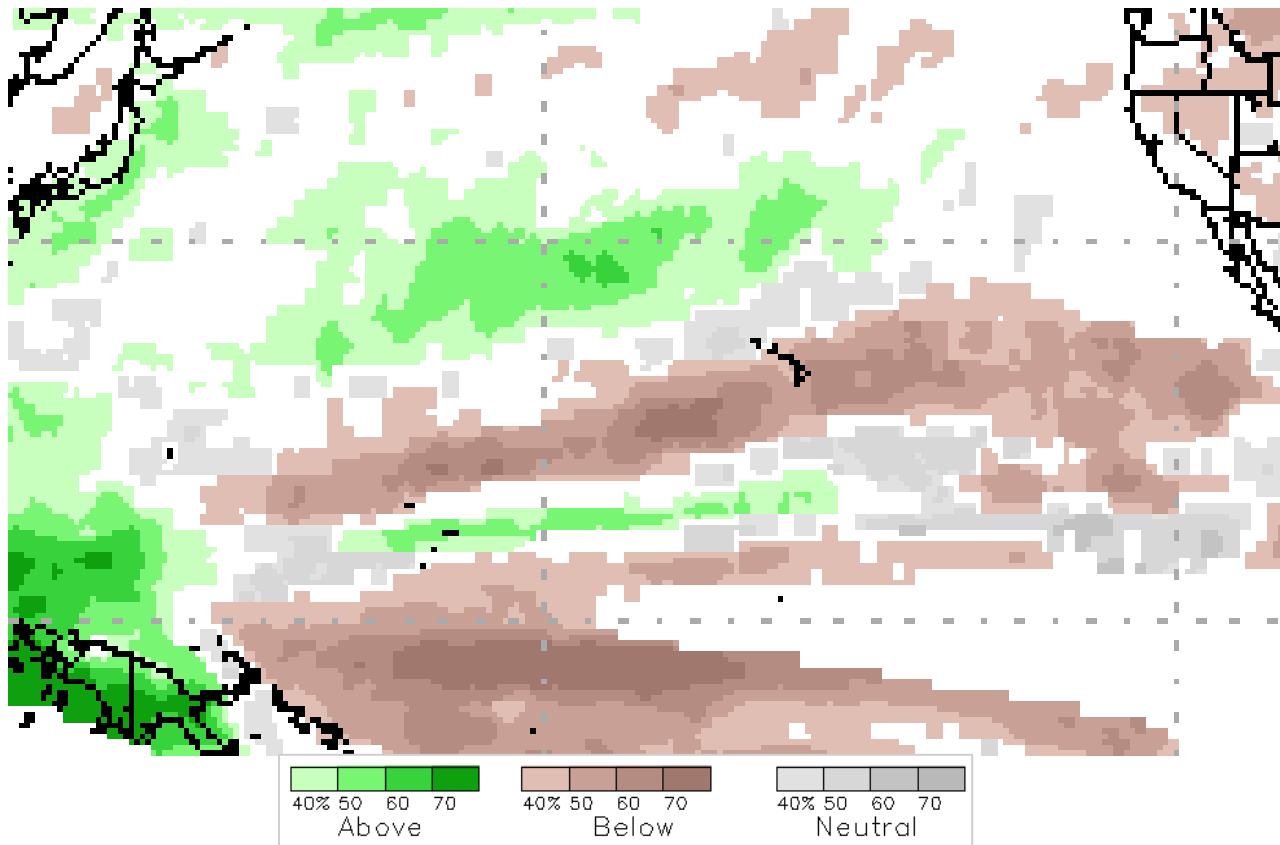


Dry Season Forecast



Below normal precipitation favored from Big Island to Oahu through the dry season and possibly into October

Weaker signal for Kauai



Dry Season Forecast



Official Seasonal Drought Outlook favors drought persistence

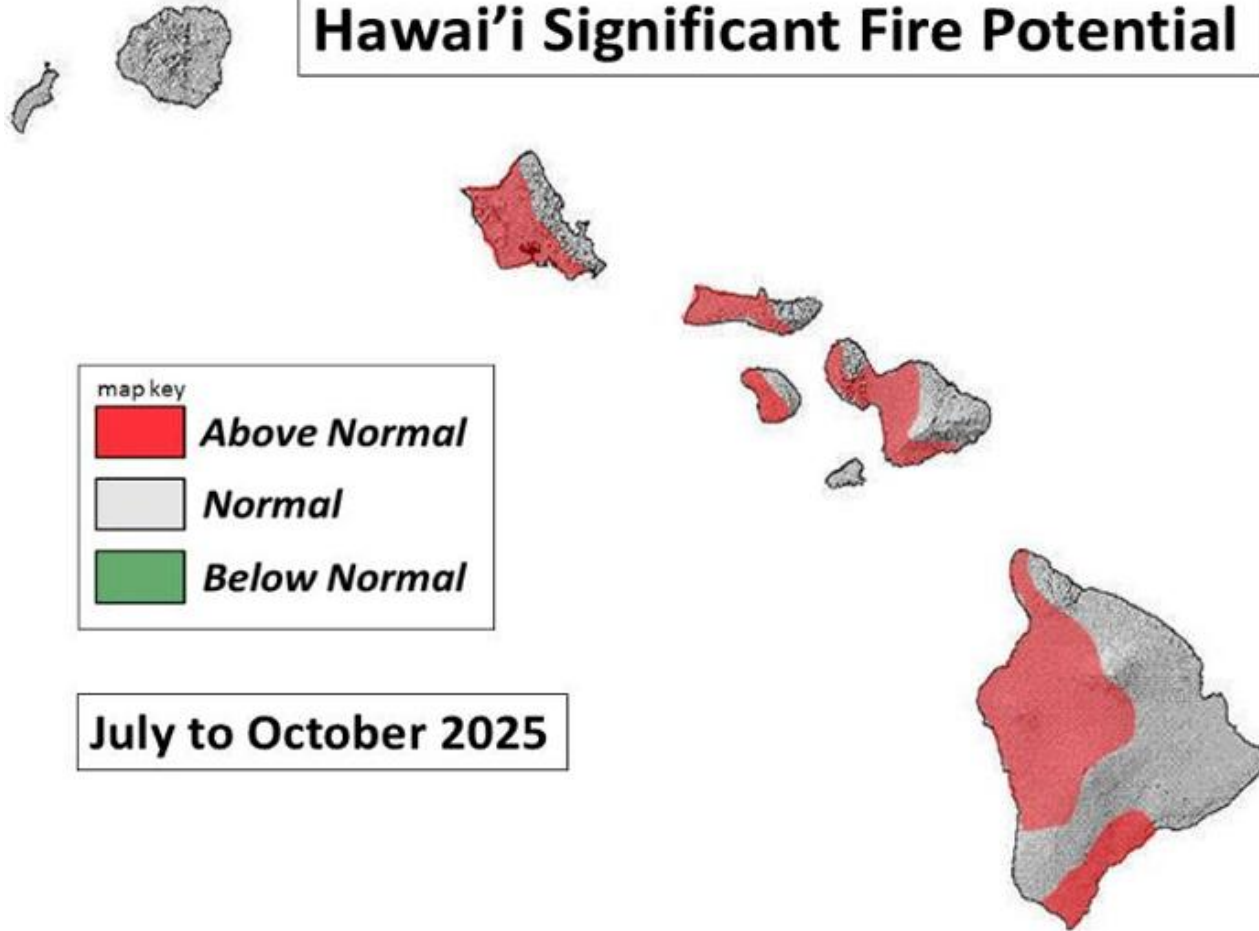
Lack of widespread drought on Oahu and Kauai questionable



Predictive Services Forecast



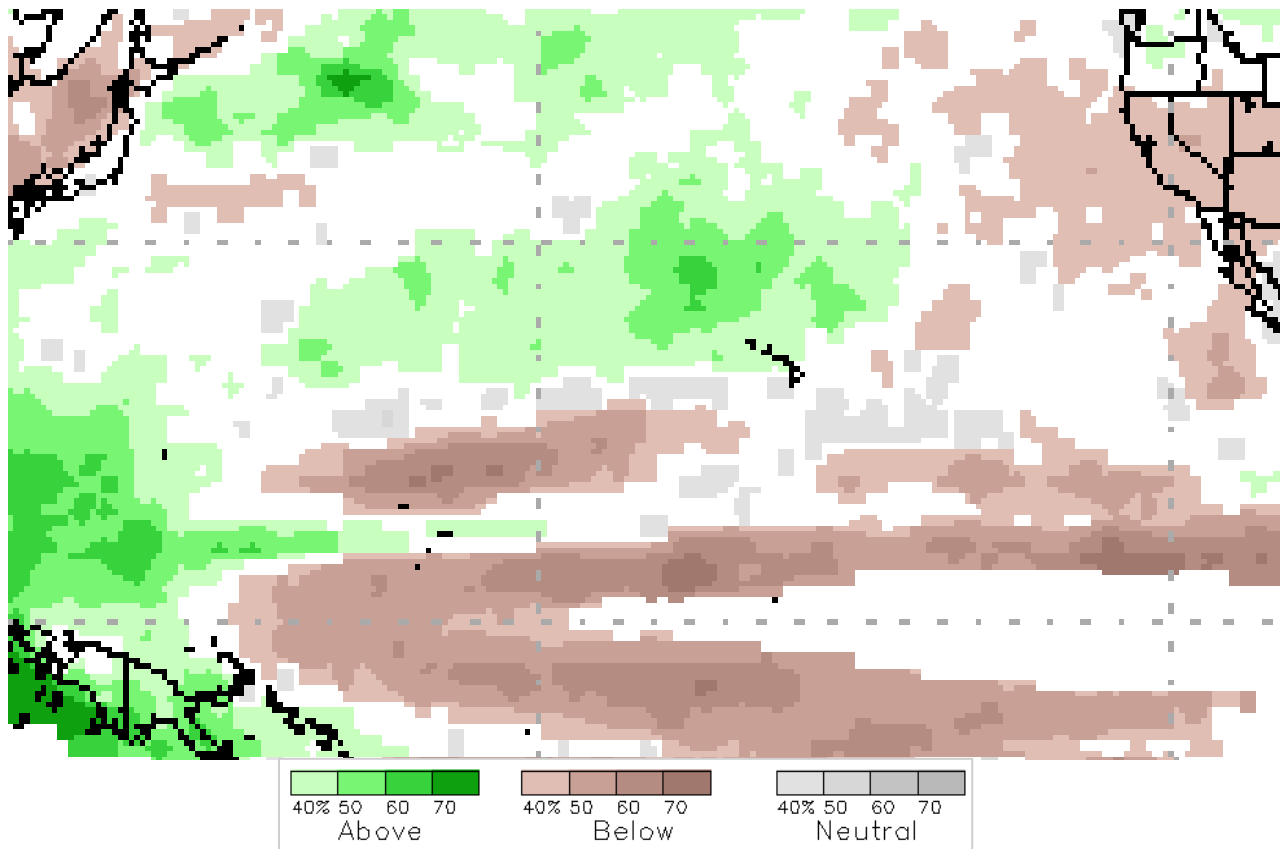
Hawai'i Significant Fire Potential



Early Wet Season Forecast



Transition to higher chances for wetter conditions favored by the U.S. ensemble model early (Oct – Dec) in the wet season



Red Flag Criteria



At Honolulu International Airport (HNL) for 2 or more hours:

Keetch-Byram Drought Index (KBDI) ≥ 600

Minimum RH $\leq 45\%$

Wind ≥ 20 mph

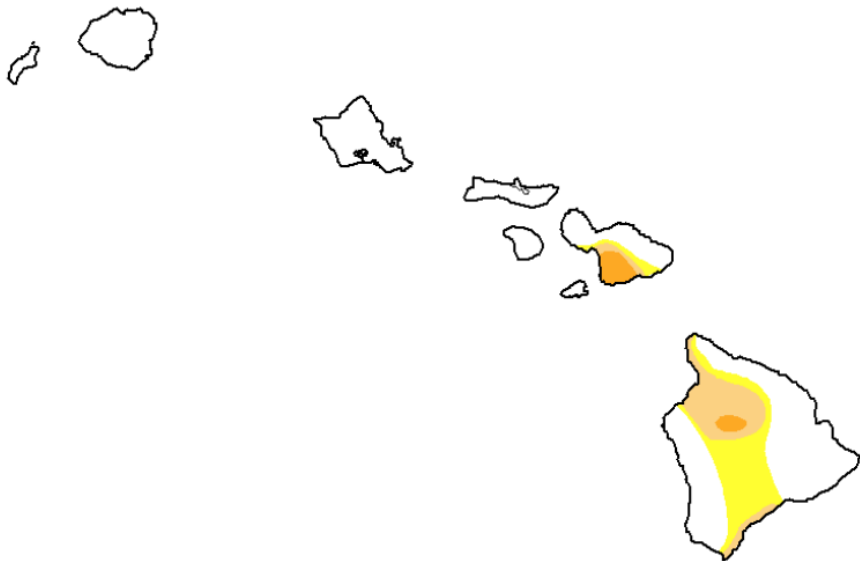


Red Flag Criteria Weaknesses

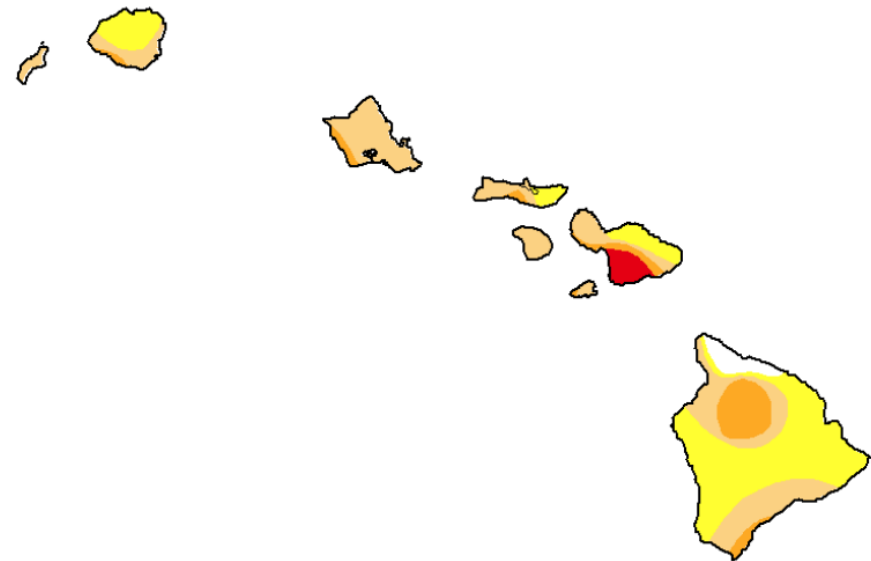


Reliance on HNL as sole reference point for fuels is a major weakness

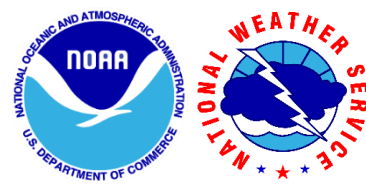
May 14, 2024



Aug 6, 2024



Red Flag Criteria Weaknesses



Reliance on HNL as sole reference point for fuels is a major weakness

Lahaina Fire Incident Analysis Report, Sep 13, 2024:

12. FINDING: There is no adequate system for monitoring fuel loads, fuel moisture, and other relevant characteristics.

RECOMMENDATION: Improve monitoring of fuels and utilize drones, satellite imagery, and ground-based monitoring systems to detect and assess vegetative fuel loads, fuel moisture, and high fire risk conditions.

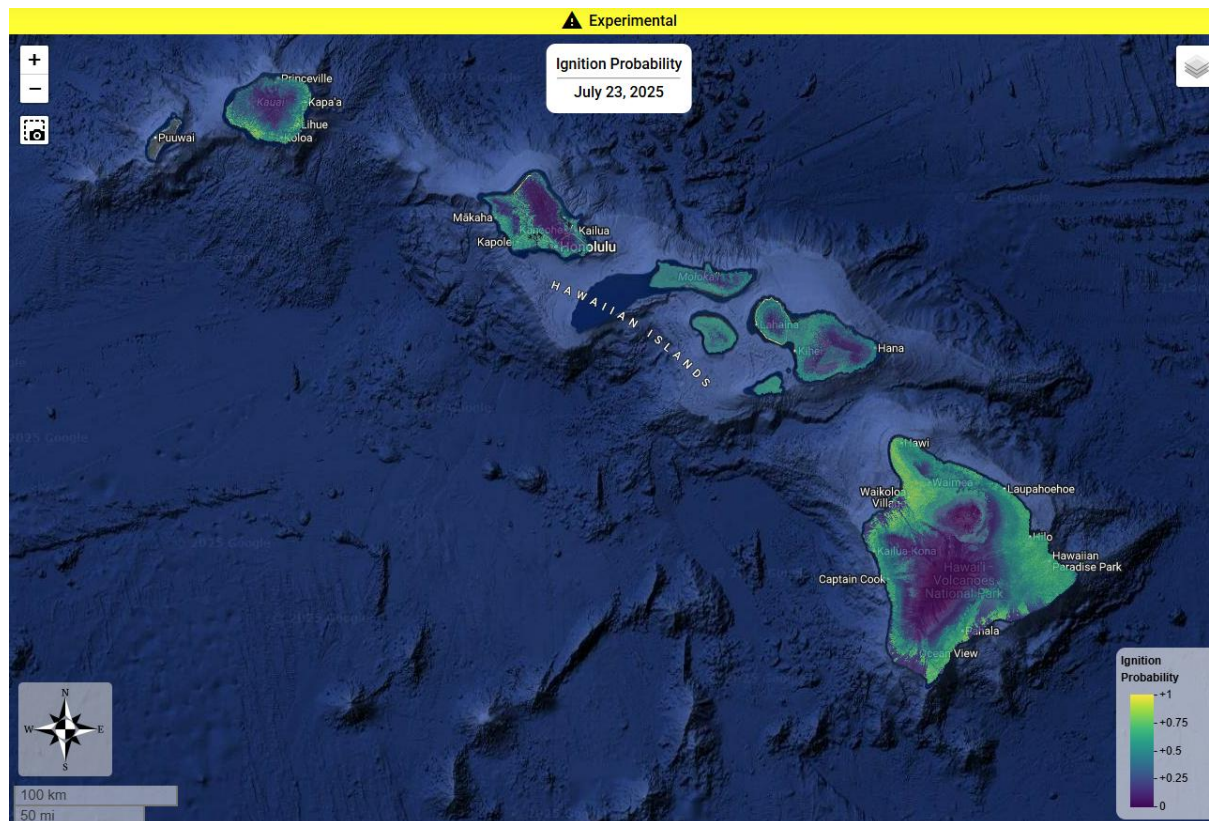
RECOMMENDATION: Establish an information dissemination system to fire and emergency managers to communicate high-risk locations and periods.

Red Flag Criteria Weaknesses

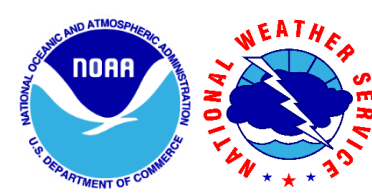


NWS now engaged in a weekly fuels discussion with State of Hawaii Forestry and U.S. Fish and Wildlife Service

Univ of Hawaii producing experimental ignition probability



Red Flag Criteria Weaknesses



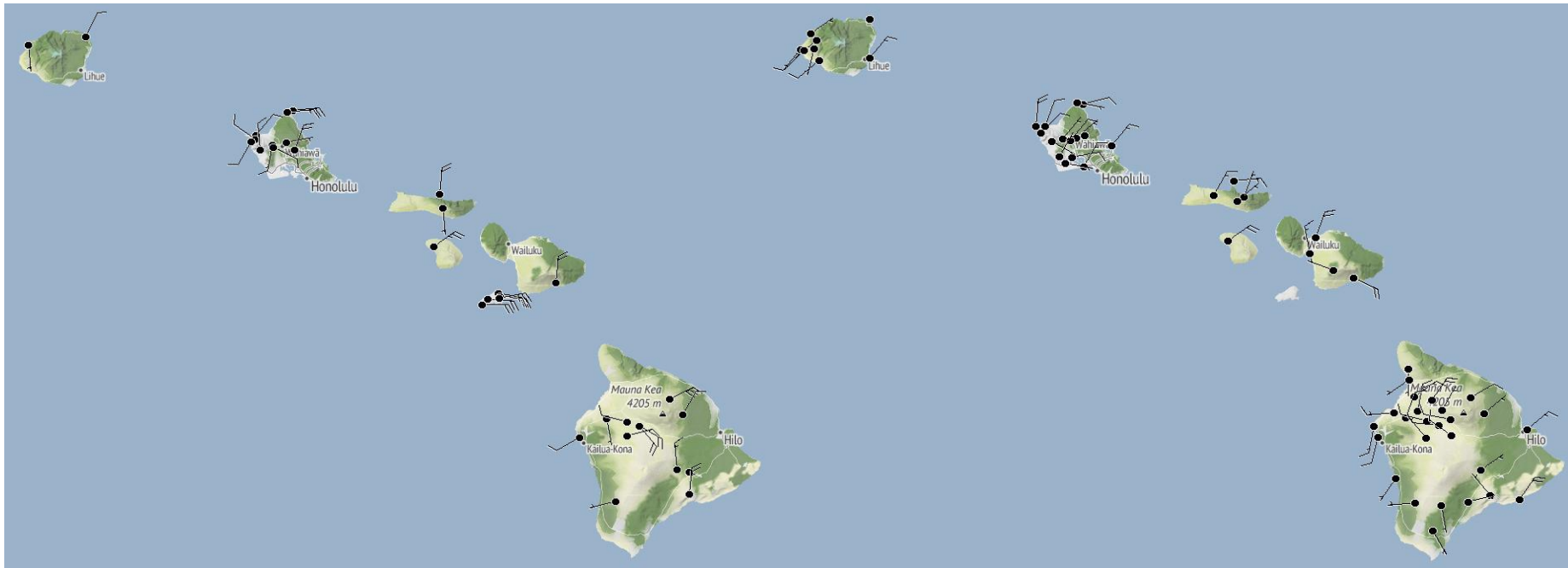
Reliance on HNL as sole reference point for weather is a weakness

HNL assumed to be representative of typical leeward conditions

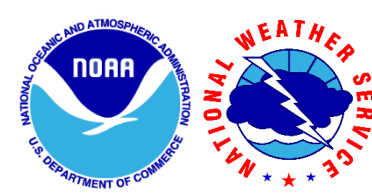
Expanded observation network requires 10 year history

2007

2023



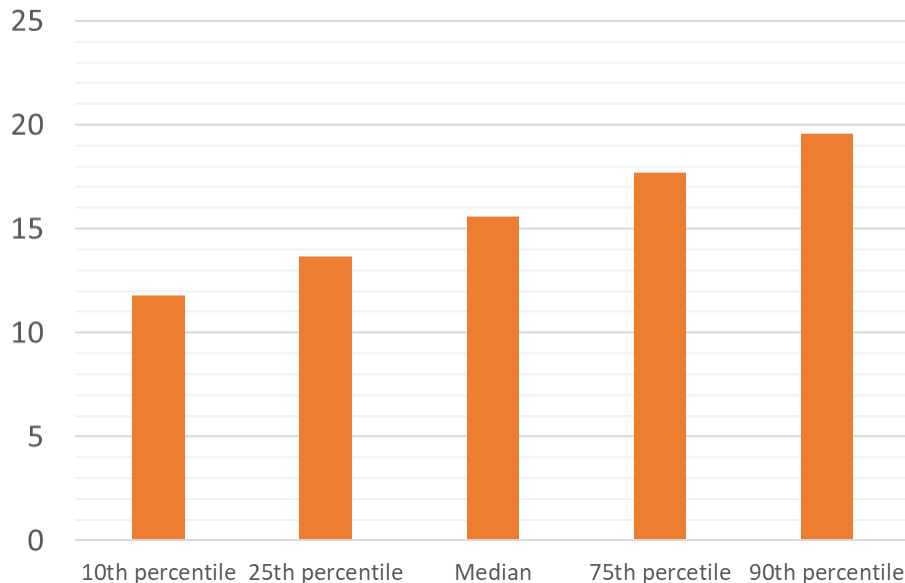
Red Flag Criteria Weaknesses



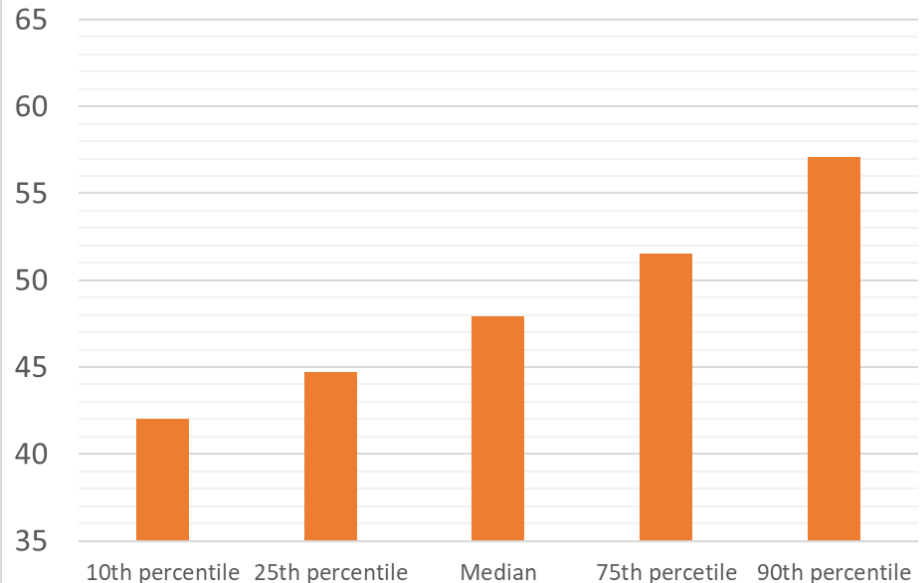
Reliance on HNL as sole reference point for weather is a weakness

Small deviations from typical summer wind and relative humidity can result in Red Flag Warning conditions

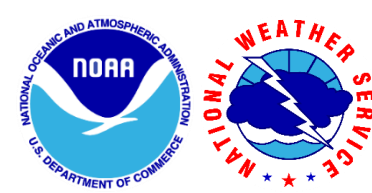
Jun-Sep Daily Maximum Wind (kt) Percentiles 2001-2020



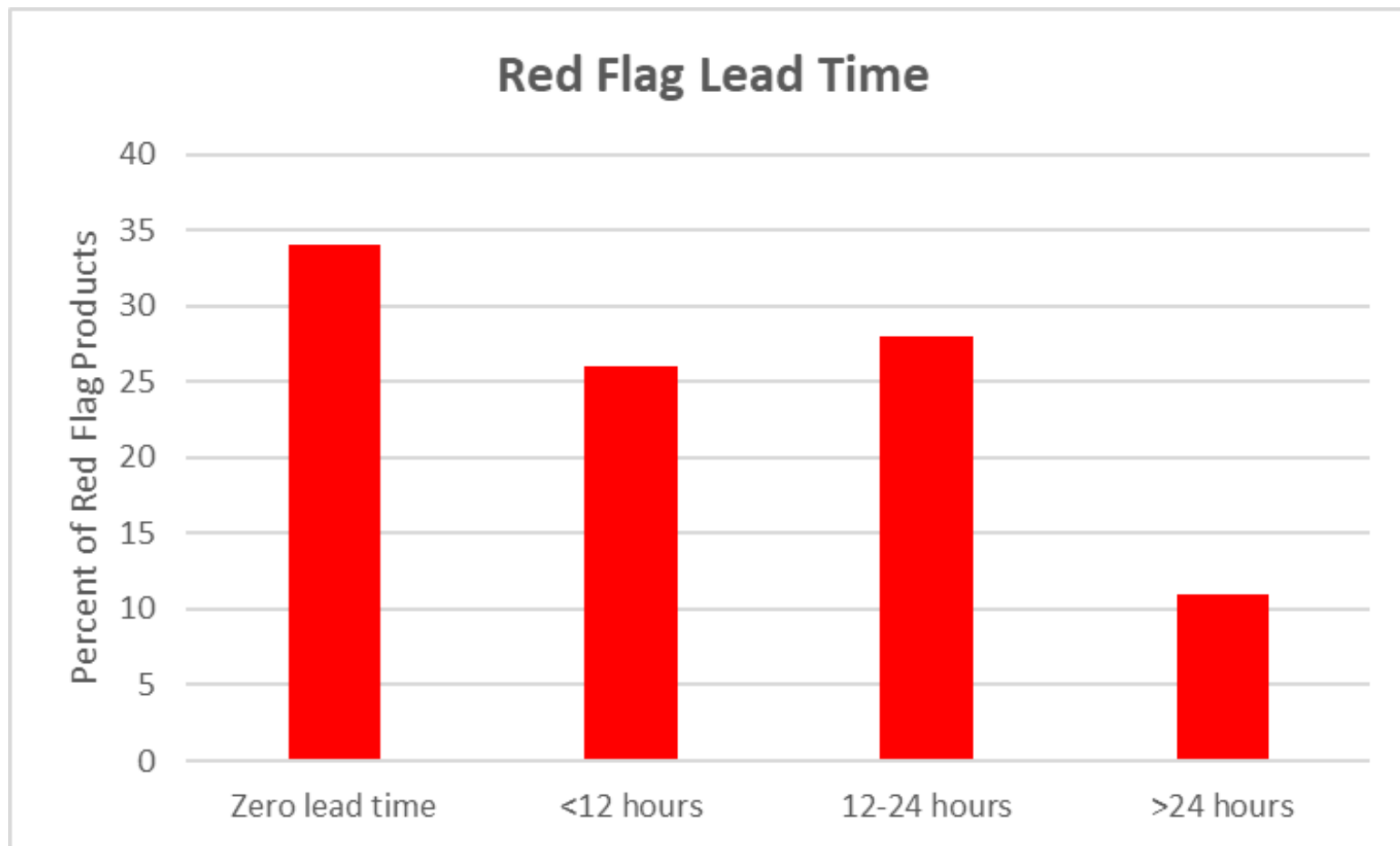
Jun-Sep Daily Minimum RH Percentiles 2001-2020



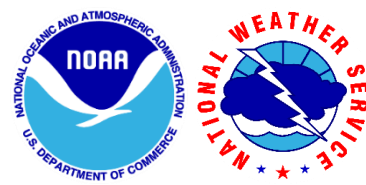
Red Flag Criteria Weaknesses



Small deviations from typical summer wind and relative humidity can result in Red Flag Warning conditions



Red Flag Criteria Weaknesses



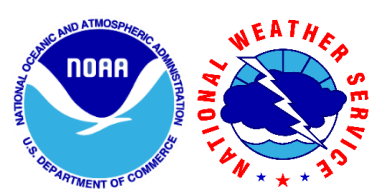
Reliance on HNL as sole reference point for weather is a weakness

Lahaina Fire Incident Analysis Report, Sep 13, 2024:

7. FINDING: There is little perceptible difference between Hawai'i Red Flag criteria and a typical summer day, which may have contributed to the emergency manager's response to the forecast.

RECOMMENDATION: Engage federal partners to assist in refining Red Flag criteria to be commensurate with appropriate fire danger that is actionable by policymakers, emergency managers and responders, and the public.

Red Flag Criteria Changes?



Informal NWS research on airport data shows:

Wind is dominant factor

RH of median or lower is sufficient (higher threshold?)

Fire behavior expert's informal research shows:

Wind is dominant factor

RH of less significance

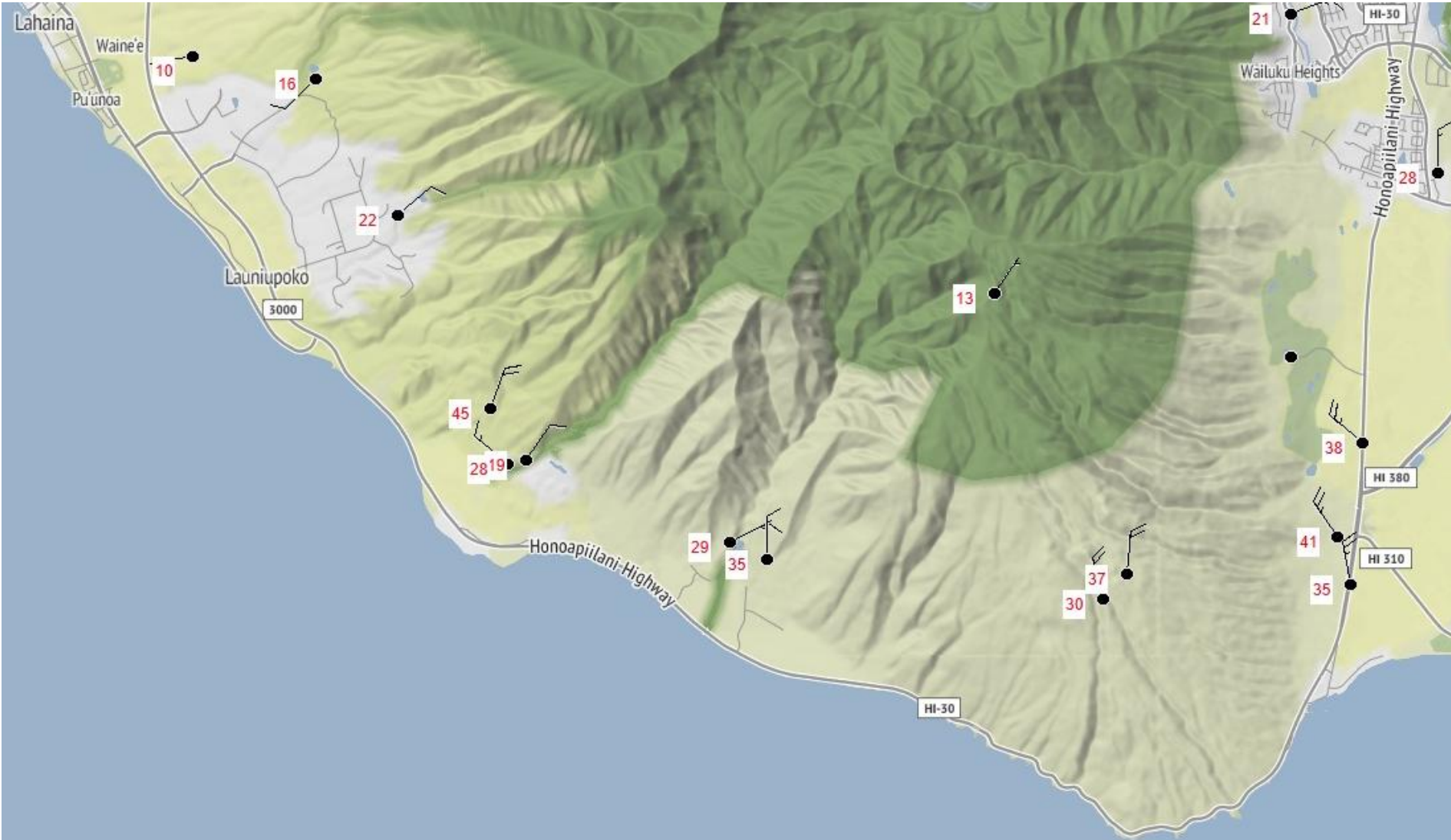
Suggests using 90th percentile wind (~23-25 mph)

Possible 3 hour duration of conditions

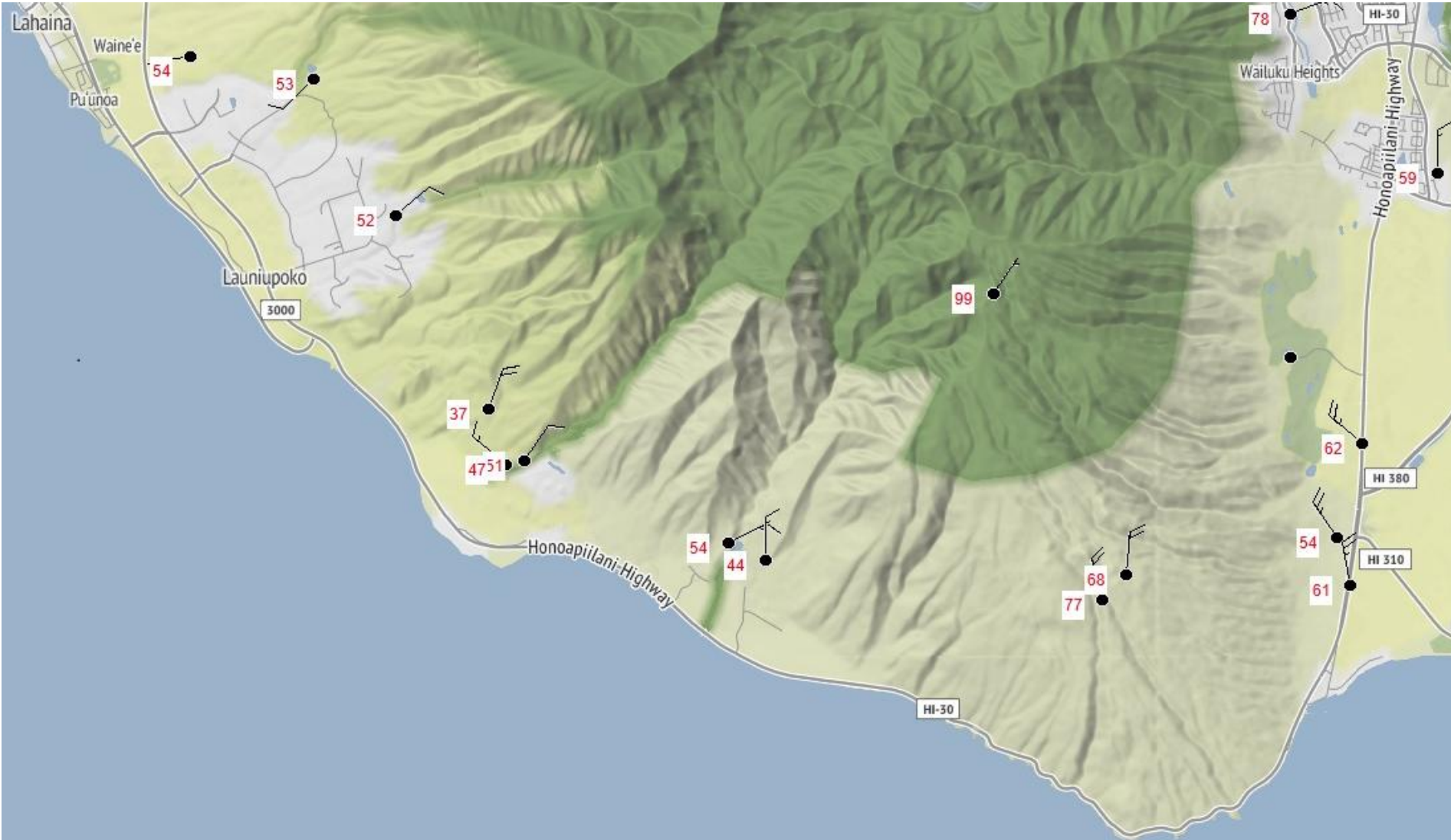
No change to criteria this season

Predictive Services goal to provide guidance for next dry season

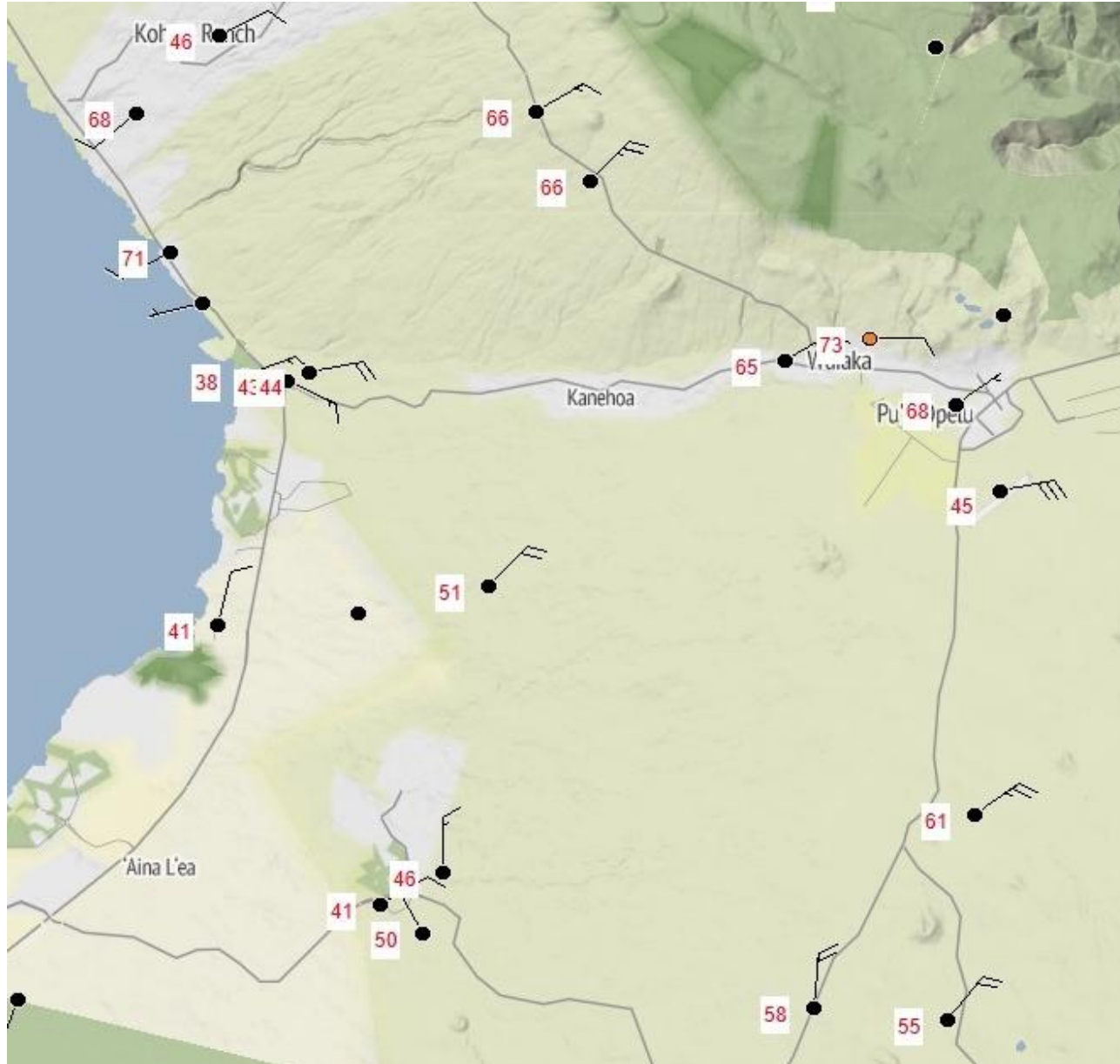
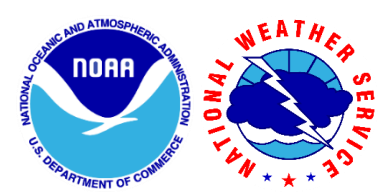
Weather complexity in Hawaii



Weather complexity in Hawaii



Weather complexity in Hawaii



Questions?

