

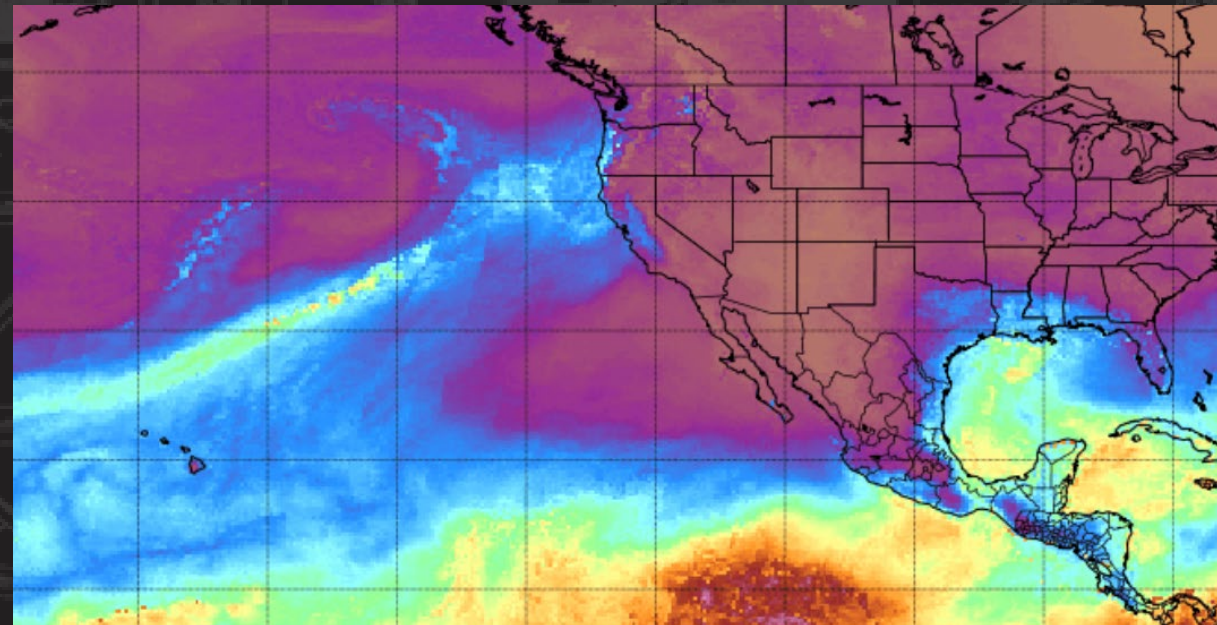
NATIONAL FIRO SCREENING PROCESS – 2026 UPDATE

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13th Annual FIRO Workshop
August 4, 2026, Scripps Institution of Oceanography



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CW3E



Where might FIRO Work?



← National Inventory of Dams

ADVANCED SEARCH ABOUT THE NID ▾ DAMS BASICS ▾ MEDIA ▾

< DAMS DAM DETAILS 🔍 Start a new search

DOWNLOAD I

- Good forecast skill
- Shorter operational lead times
- Some water management objectives are in tension
- Flexibility can help address
- Stakeholders are willing to work together

Dworsht
Emergen
Owner Na
Primary P

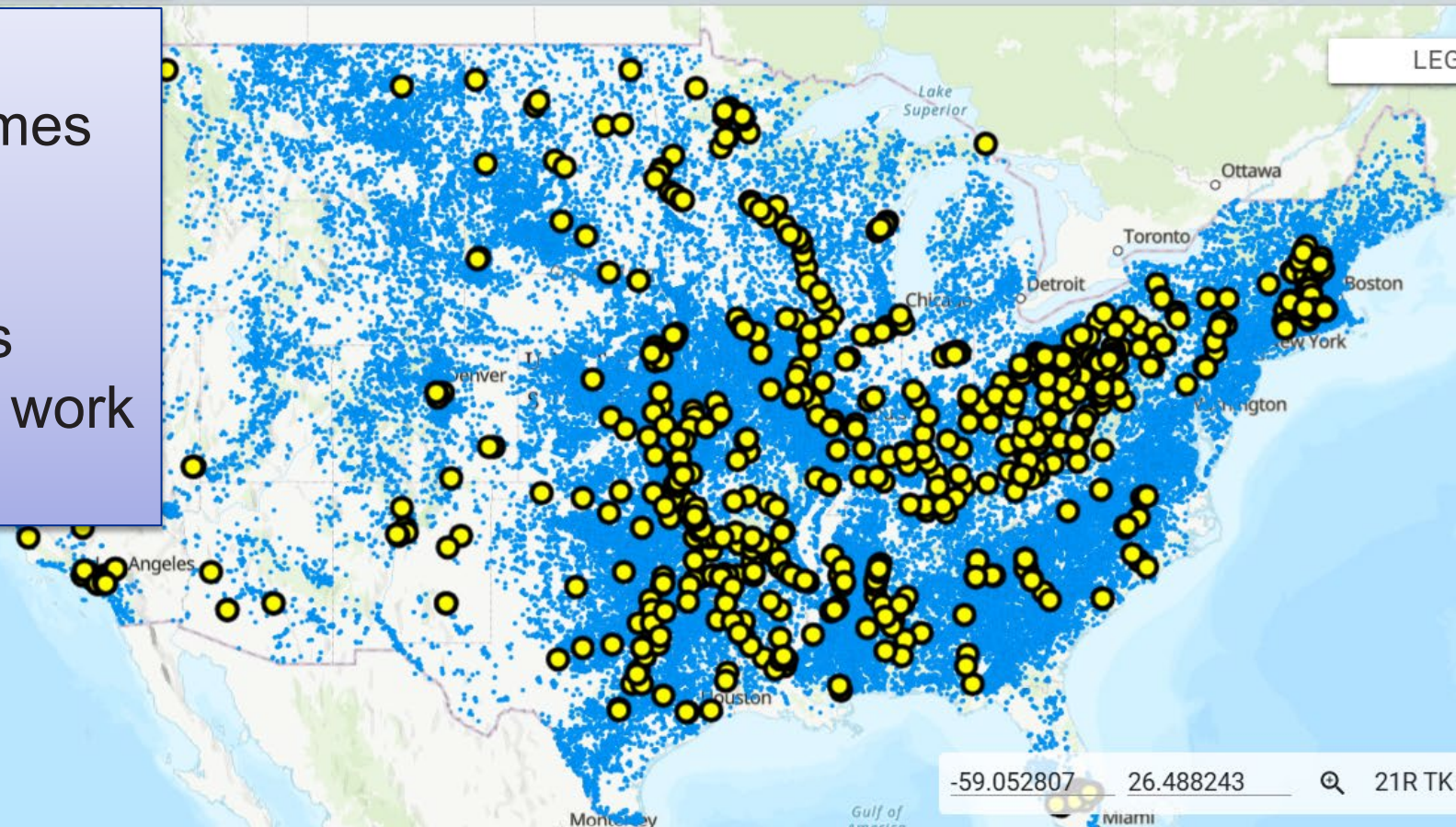
Cougar
Emergen
Owner Na
Primary P

Carters
Emergen
Owner Na
Primary P

Detroit I
Emergen
Owner Name: USACE - Portland District
Primary Purpose: Flood Risk Reduction

Pine Flat Dam
Emergency Action Plan: Yes
Owner Name: USACE - Sacramento District
Primary Purpose: Flood Risk Reduction

Mud Mountain Dam
Emergency Action Plan: Yes
Owner Name: USACE - Seattle District
Primary Purpose: Flood Risk Reduction



Stage A: Initial Screening

High-level site filtering

INPUT

- Water managers' responses to 8-item site data collection instrument
- Assessment of basin forecast skill for extreme precipitation at minimum lead time

PROHIBITIVE BARRIERS

- No controlled outlet
- No Water Control Plan
- Insufficient forecast skill

Ineligible for Stage B

SIGNIFICANT BARRIERS

- Legal or technical barriers
- Stakeholder engagement barriers
- Indefinite forecast skill

Low Priority for Stage B

STANDARD BARRIERS

No prohibitive or significant barriers identified in Stage A

High Priority for Stage B

PARKED SITES

Not assessed further unless barriers are addressed

Stage B: Suitability Assessment

*Understanding potential benefits and level of effort of FIRO;
Producing site-level recommendations*

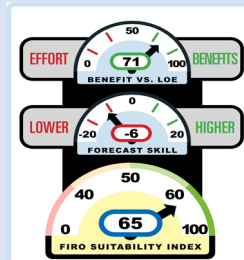
INPUT

- Water managers' responses to 22-question site questionnaire (short and long form responses)
- Assessment of basin forecast skill for extreme precipitation at range of lead times
- Assessment of dry forecast skill and site forecast error tolerance
- FIRO expert team judgment in recommendation development

Stage C: District Dialogue

Discussion of site-level results between FIRO team and USACE Water Management Offices

FIRO Screening Process Site Results



FIRO Recommendations

Strongly consider pursuing FIRO, or continue with FIRO efforts

Consider pursuing FIRO

Make improvements before pursuing FIRO

Barriers to FIRO may be prohibitive - do not pursue until significant challenges are addressed

Stage A: Rule out clearly non-suitable sites, and sort higher and lower priority sites for Stage B.

Nationally complete.

Stage B: Deeper assessment of FIRO candidates, with scoring and recommendations.

Stage C: Dialogue with stakeholders to review scoring, discuss additional context, and finalize results.

SPD complete.

NWD, SWD, SAD, LRD underway.

All to be completed by end FY28.



Forecast Skill for Extreme Precipitation

2-Part Test:

“Are inflow forecasts sufficient for operational decisions?”

(Site water manager survey)

Precipitation forecast skill at minimum lead times - CSI

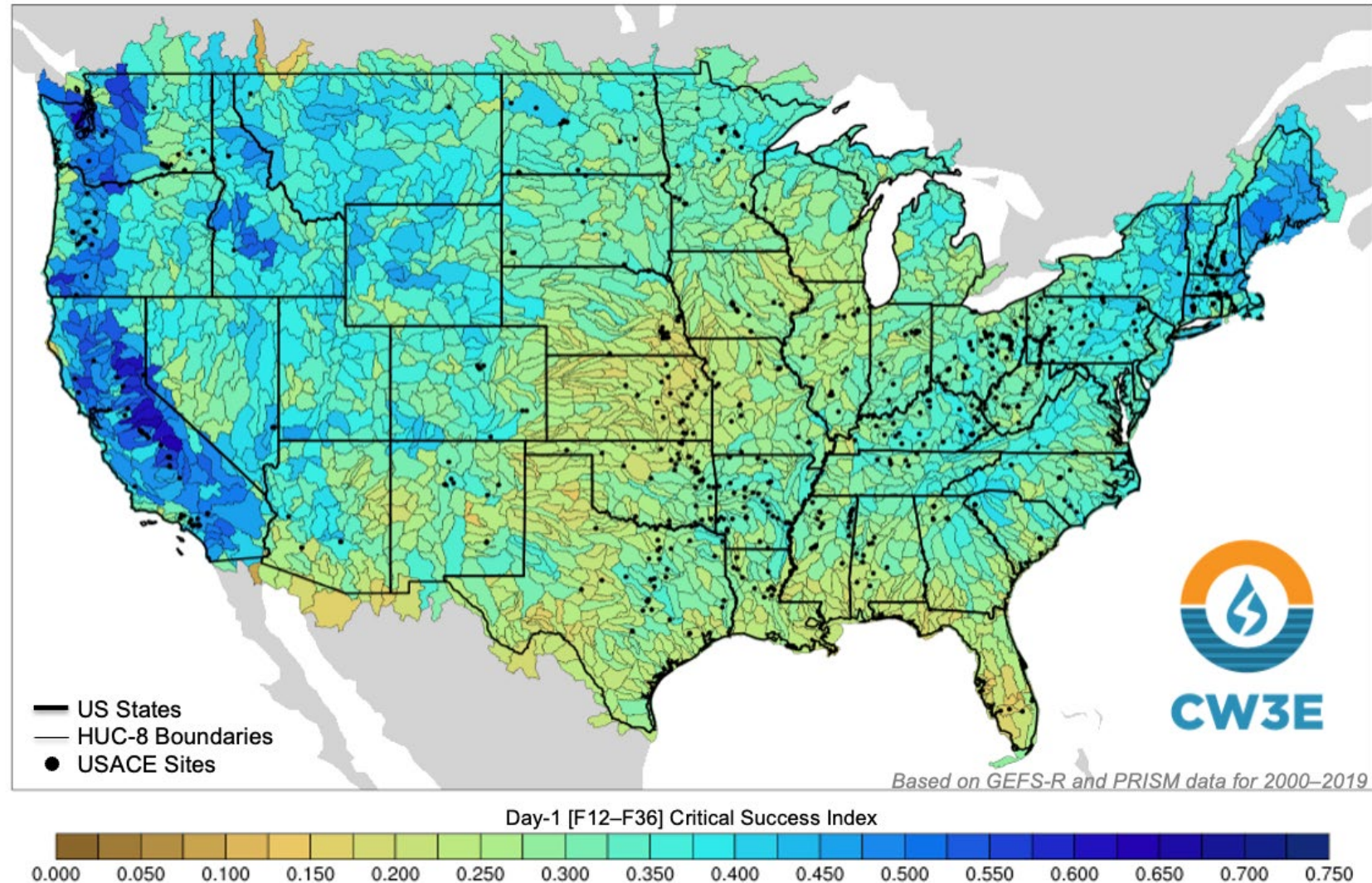
(CW3E & ERDC calculations)

Required Forecast Lead Time

$$= \frac{\text{FIRO Space}}{\text{Water Released per Day}}$$

+ *Travel Time*

Nationwide QPF Skill (CSI) | Top-5% | Day-1





SCAN ME

FIRO Screening – Stage A Results

184 prohibitive barrier sites

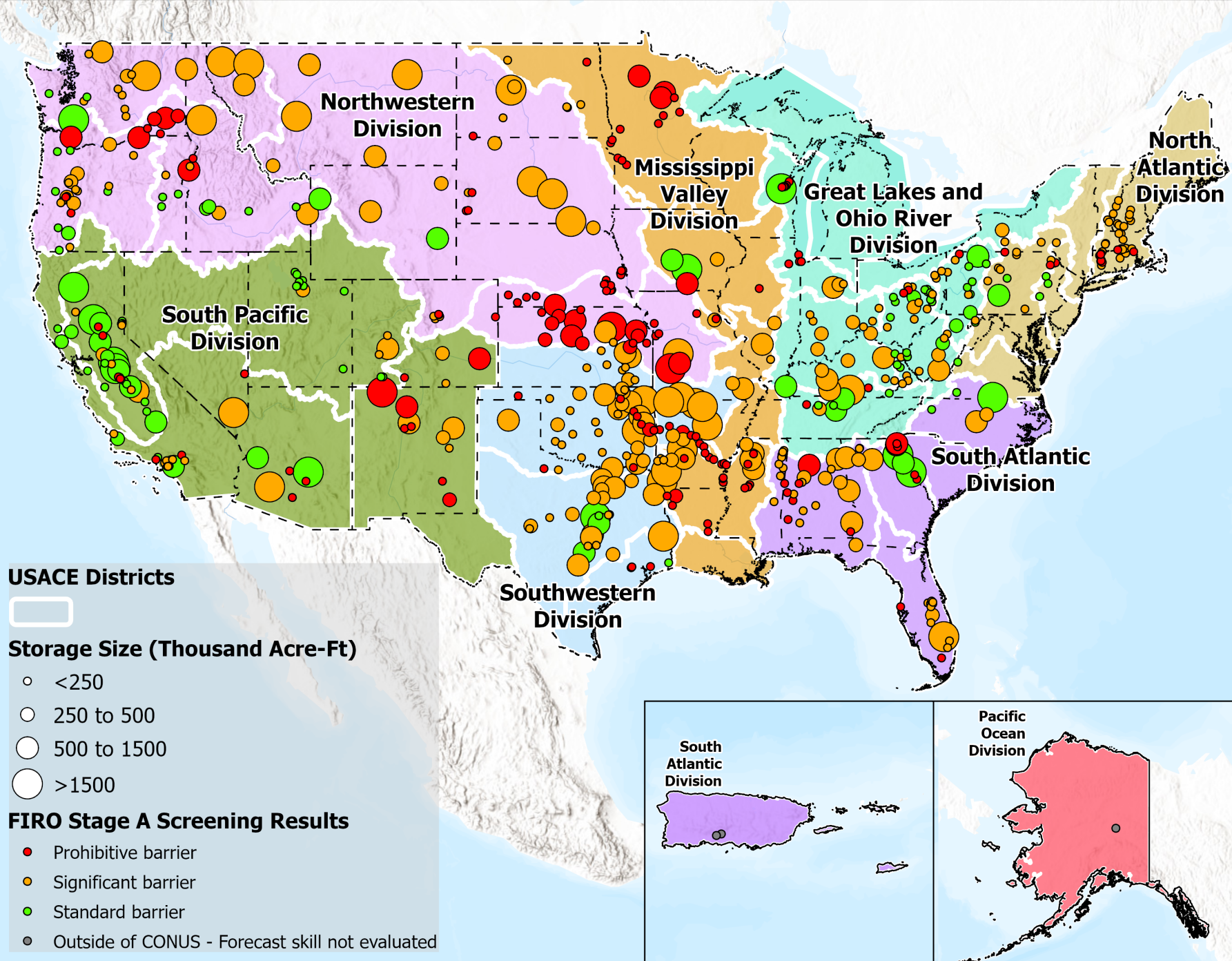
- Eliminated from FIRO
- No controlled outlet
- Insufficient forecast skill

299 Significant barrier sites

- Legal or technical barriers to change
- Stakeholder issues
- Indefinite forecast skill

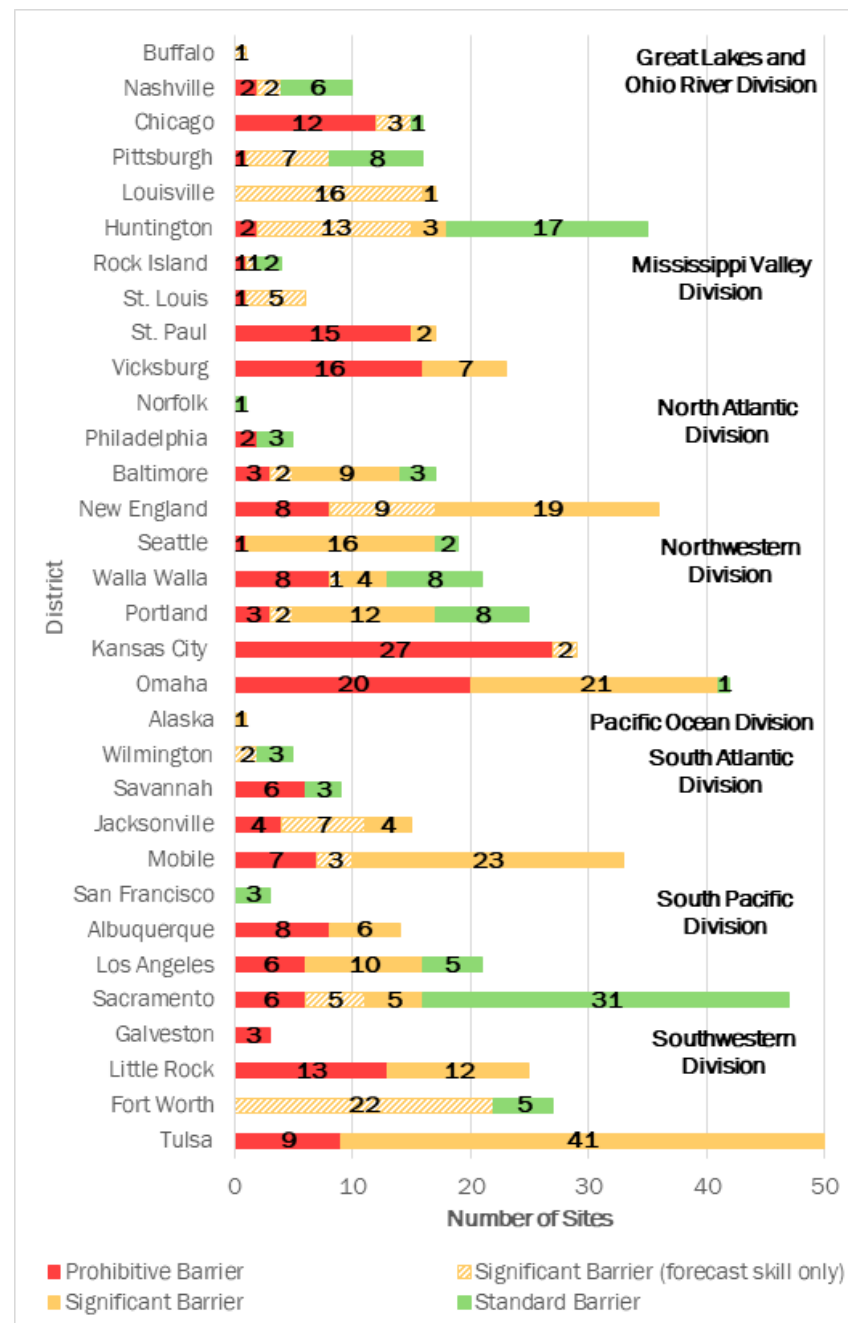
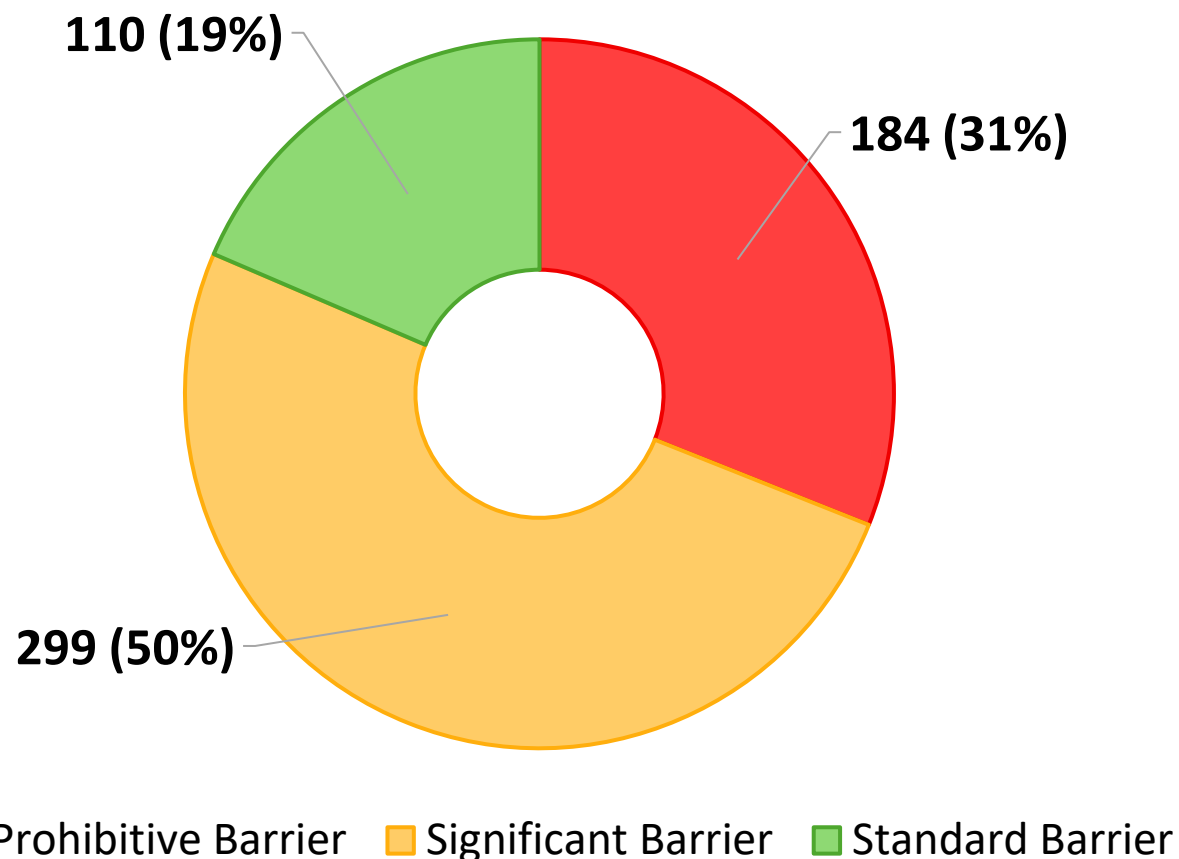
110 Standard barrier sites

- Prioritized for Stage B





FIRO Screening Stage A – National Results





Forecast-Informed Reservoir Operations

The Forecast-Informed Reservoir Operations (FIRO) Screening Process

Stage A Development and National Results

Elissa M. Yeates, Caitline A. Barber, Natalie B. Rodman,
Eric Shearer, Rachel Weihs, Joe Forbis, and Cary Talbot

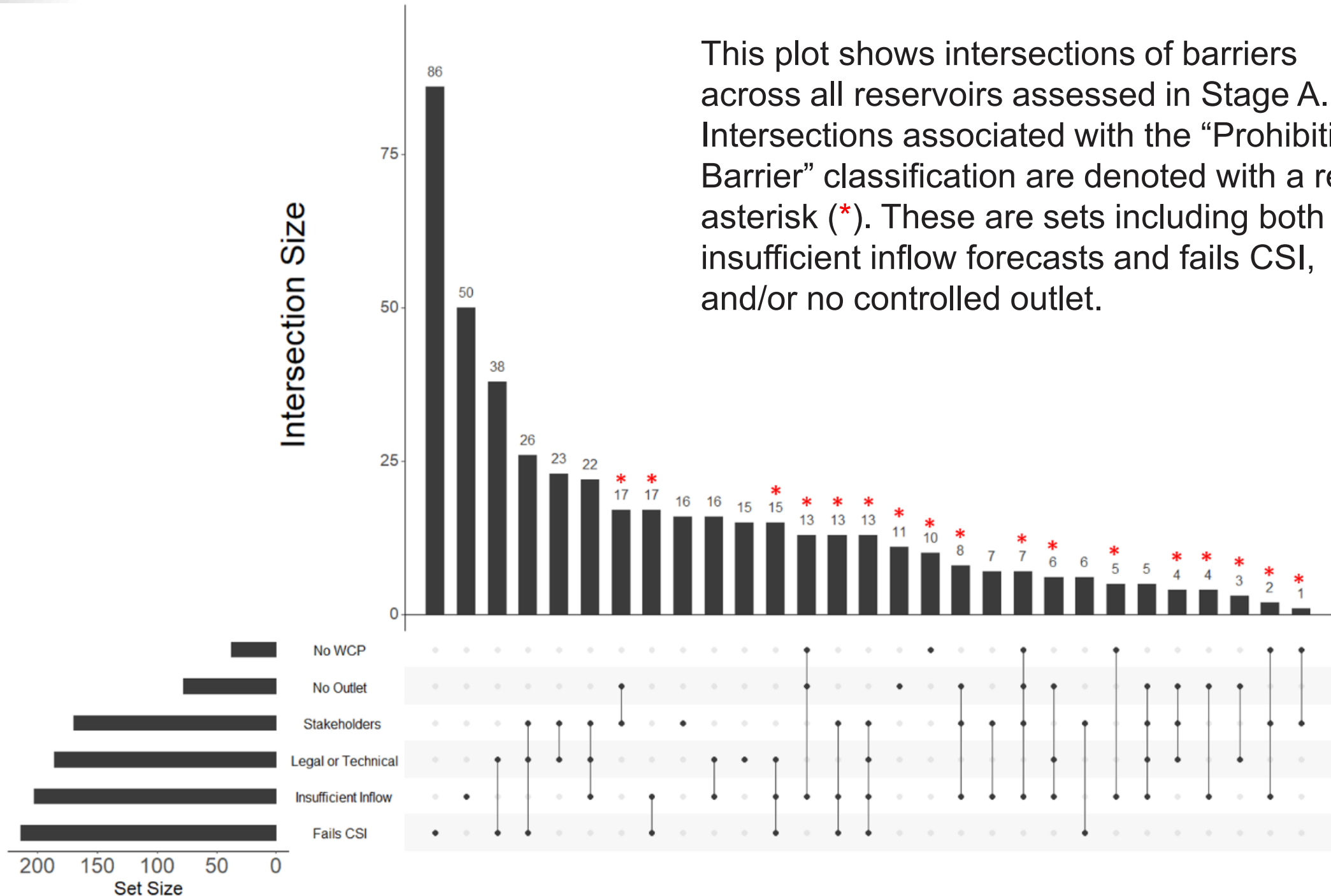
July 2026



Newly published Stage A Technical Report:
<https://dx.doi.org/10.21079/11681/50314>



This plot shows intersections of barriers across all reservoirs assessed in Stage A. Intersections associated with the “Prohibitive Barrier” classification are denoted with a red asterisk (*). These are sets including both insufficient inflow forecasts and fails CSI, and/or no controlled outlet.





Screening Process Stage B



Scored Questions

Is there a perceived need that FIRO could help address?

Perceived Need

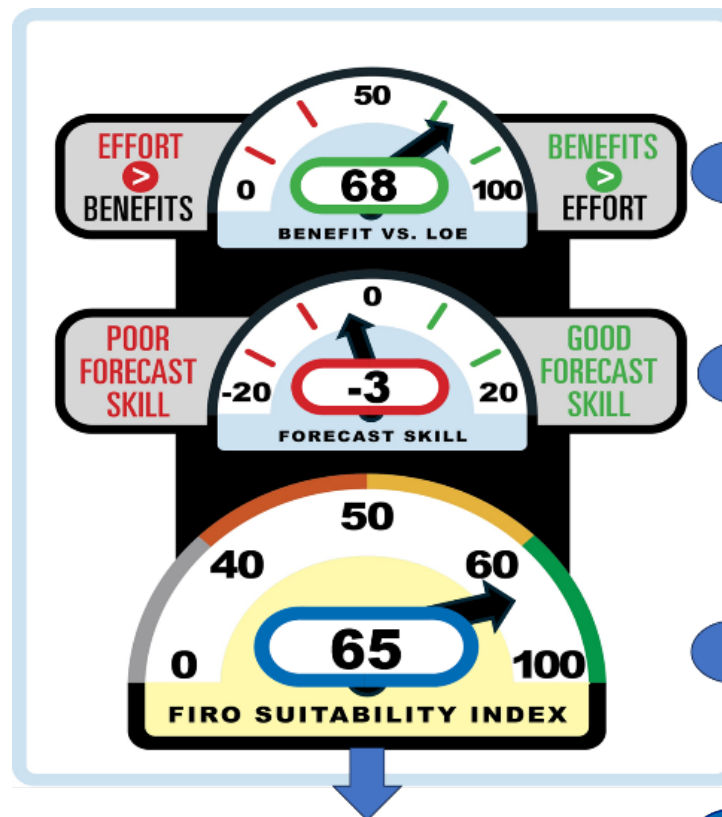
1. **[BENEFIT]** How interested are stakeholders in improving operations to address a water availability, flood risk management, environmental, or other issue? *Select from the response options provided. In the “examples” section, provide concrete examples of interest, such as any upcoming or ongoing efforts to explore how additional water availability could be achieved. Please note if there are no examples of such interest.*

Score	Response Options
1	Not at all interested
2	Slightly interested
3	Moderately interested
4	Very Interested
5	Extremely interested

Examples

2. **[BENEFIT]** Is there an interest among stakeholders to improve operations for any of the benefits below? Select all that apply. *In the “response description” section, provide any comments that can further describe benefits of interest to stakeholders. If “other” benefit is selected, please provide a description of the benefit in the “response description” section.*

- Water availability (e.g., municipal & industrial, agriculture, groundwater recharge)
- Flood risk management
- Environmental flows (including habitat)
- Water quality
- Navigation
- Recreation
- Hydropower production
- Other



1 The difference between the **benefit** and **effort** scores highlights whether “the juice is worth the squeeze”.

2 The **forecast skill evaluation score** is added and can increase or decrease the total score.

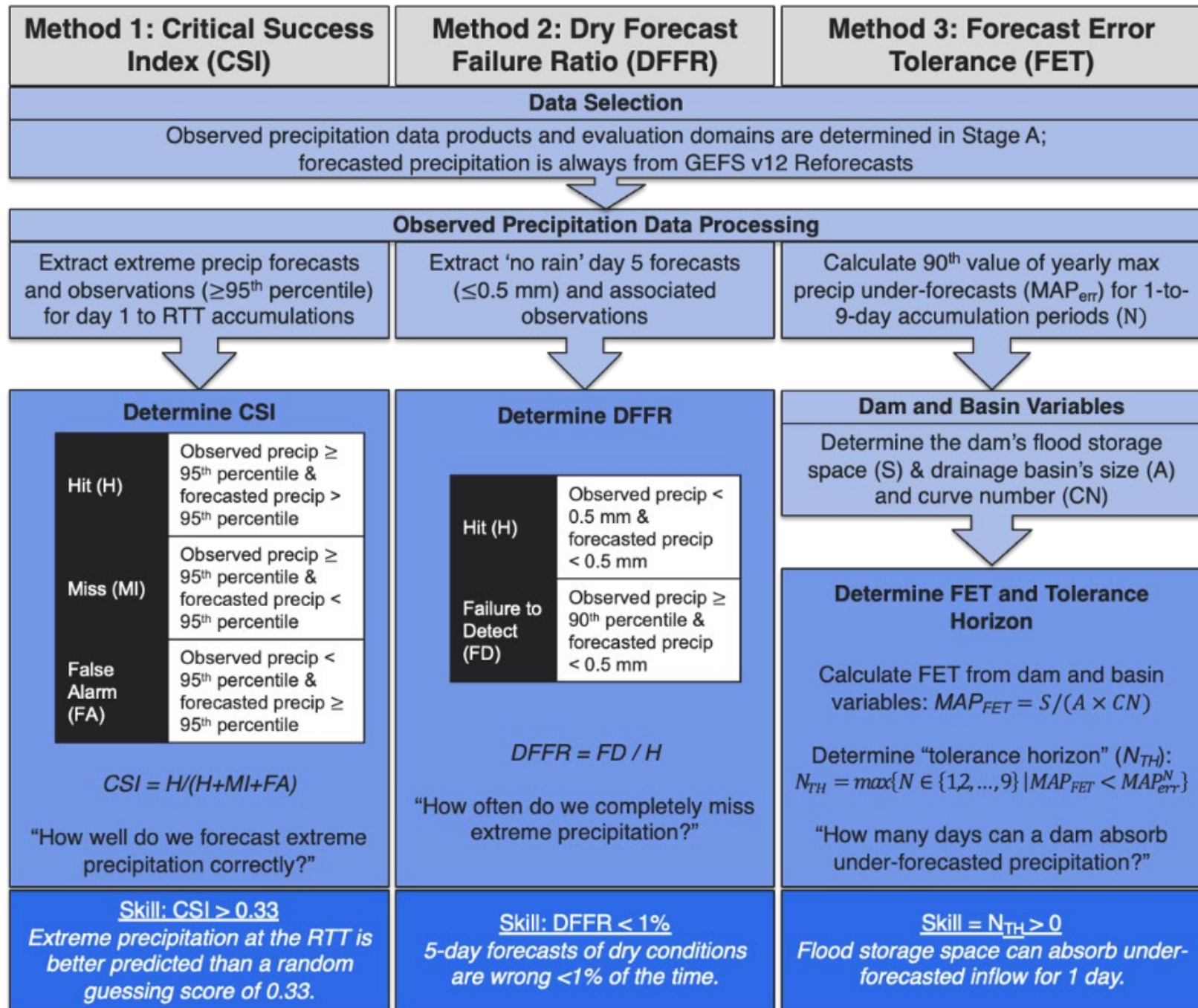
3 The total score is referred to as the **FIRO Suitability Index (FSI)**.

FSI	Recommendation
60-100	Strongly consider pursuing FIRO or continue with FIRO efforts
50-59	Consider pursuing FIRO
40-49	Make improvements before pursuing FIRO
0-39	Barriers to FIRO may be prohibitive – do not pursue until challenges are addressed

4 The **FSI value** corresponds to a **recommendation** category indicating **next steps**- the outcome of Stage B.



Stage B Forecast Evaluation Methods





CURRENT ASSUMPTIONS IN CSI APPROACH



- "FIRO volume" is assumed to be 5% of gross pool
 - This is half of the FIRO volume achieved at Lake Mendocino (10% of gross pool)
 - Too high for SWD, too low for NWD...
 - USACE approach to gross pool management varies widely
 - CW3E advised against working backward using CSI early in SP development
- Forecast lead time assumptions
 - Ignores other timing factors (administrative lead times, gate changes etc.); these can be added on a site-by-site basis
 - Uses nearest flood control point unless otherwise specified
 - Ignores downstream inflows
 - Systems use best component forecast skill values for scoring
- Forecast skill metrics are year-averaged and event-averaged
- "How wrong is too wrong" framing – sensitivity; screening-level; best case scenario approach



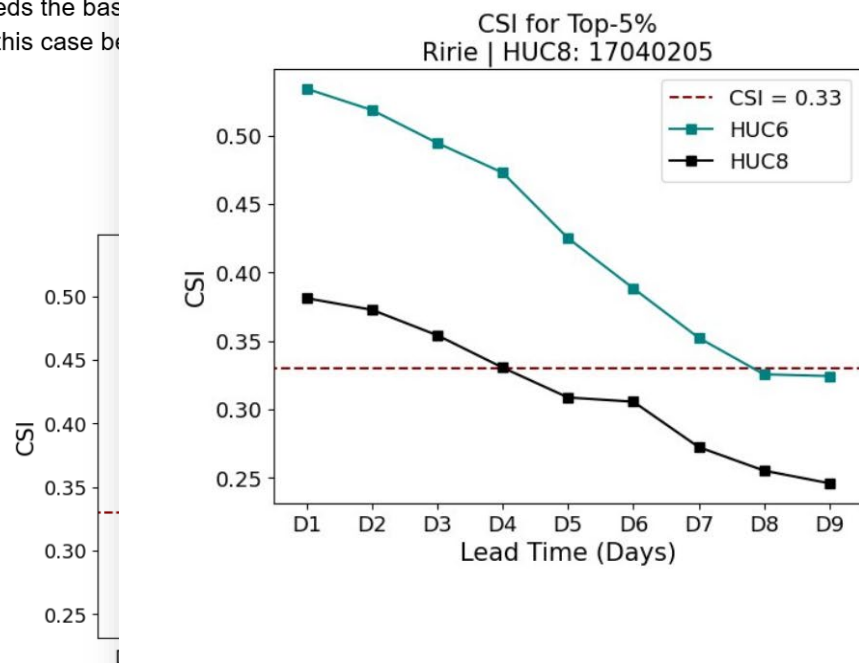
COMMUNICATING FORECAST ASSESSMENTS



Forecast Skill Results

Precipitation forecast skill in the watershed

Precipitation forecast skill for various lead times, as measured by CSI, for the top 5% of extreme events at Ririe Dam. The values in the figure reflect the forecast skill as described elsewhere. The skill is relatively high for the larger HUC6, with a baseline score of 0.33 for the HUC8. The forecast skill exceeds the baseline for the HUC6.



Leverageable forecast skill at Ririe

The required forecast lead time for Ririe Dam was calculated to be 1.3 days based on a FIRO of 29 hours and a 29-hour release rate. The required lead time is shown below in Table 3.

Ririe Dam: Forecast skill in the region

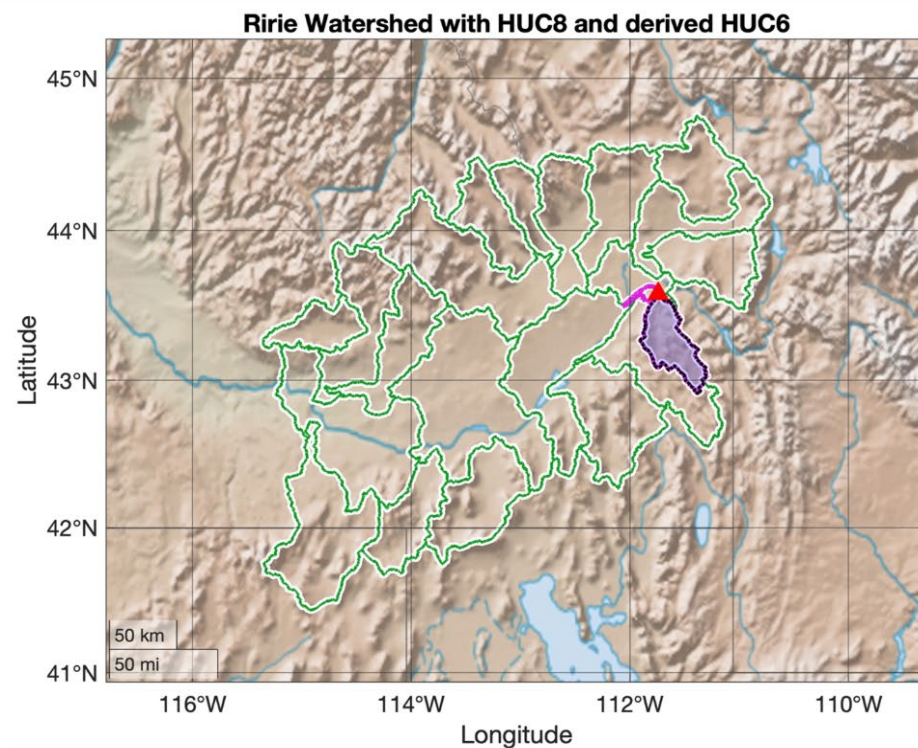


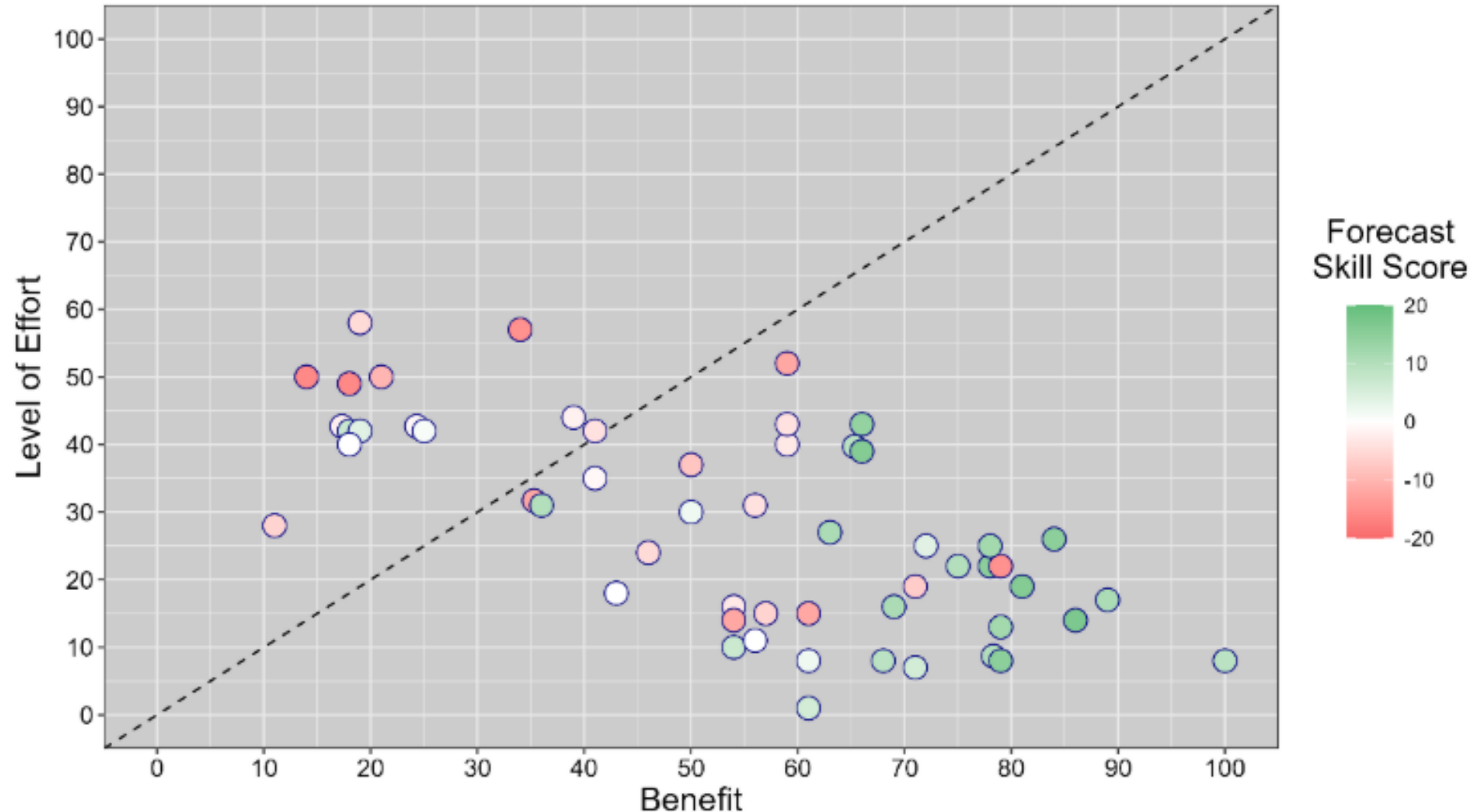
Figure 7. Precipitation forecast skill, reported as CSI, for the top 5% of extreme events at various forecast lead times over the Ririe region (HUC6 ID 170402)

The raw values for the three metrics that compose leverageable forecast skill, their normalized values, and their contribution to the overall forecast skill score are summarized in Table 4.



Stage B/C Application in SPD

Recommendation	#
Strongly consider pursuing FIRO	30
Consider pursuing FIRO	6
Make improvements before pursuing FIRO	7
Barriers to FIRO may be prohibitive; do not pursue until significant challenges are addressed	10



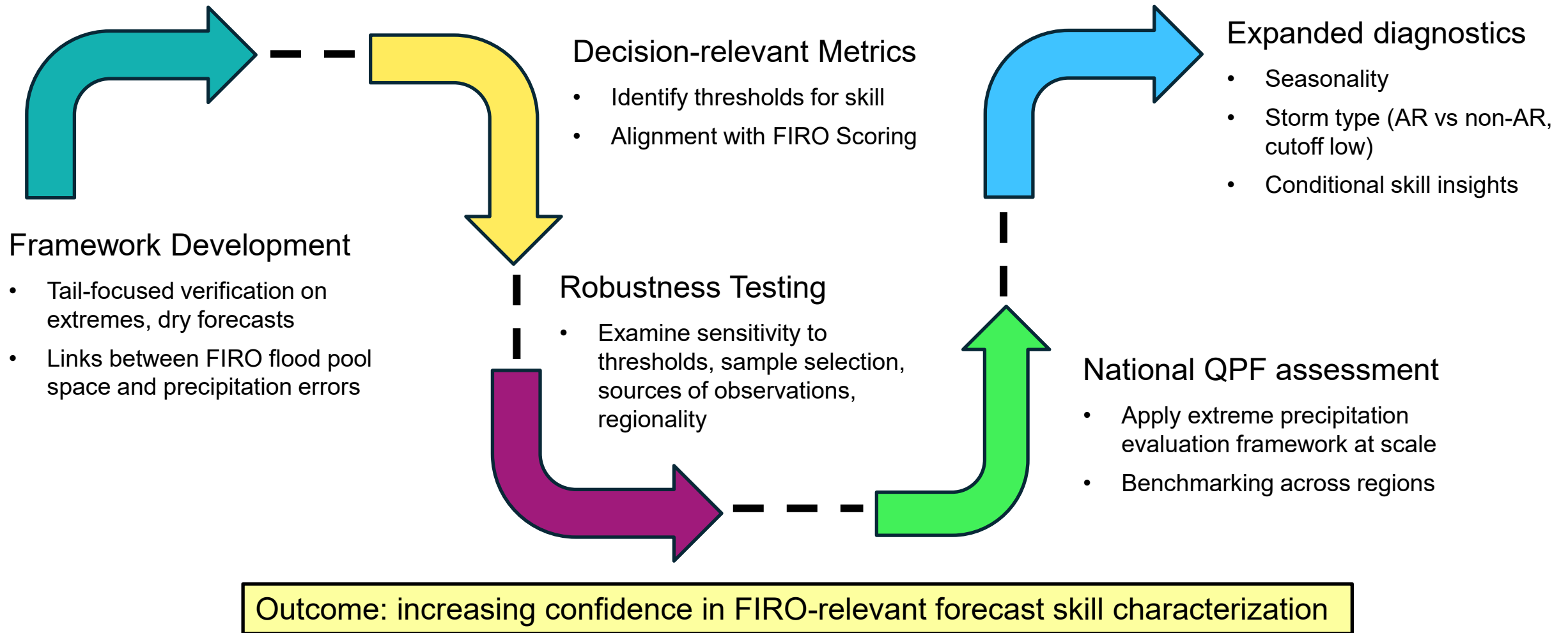


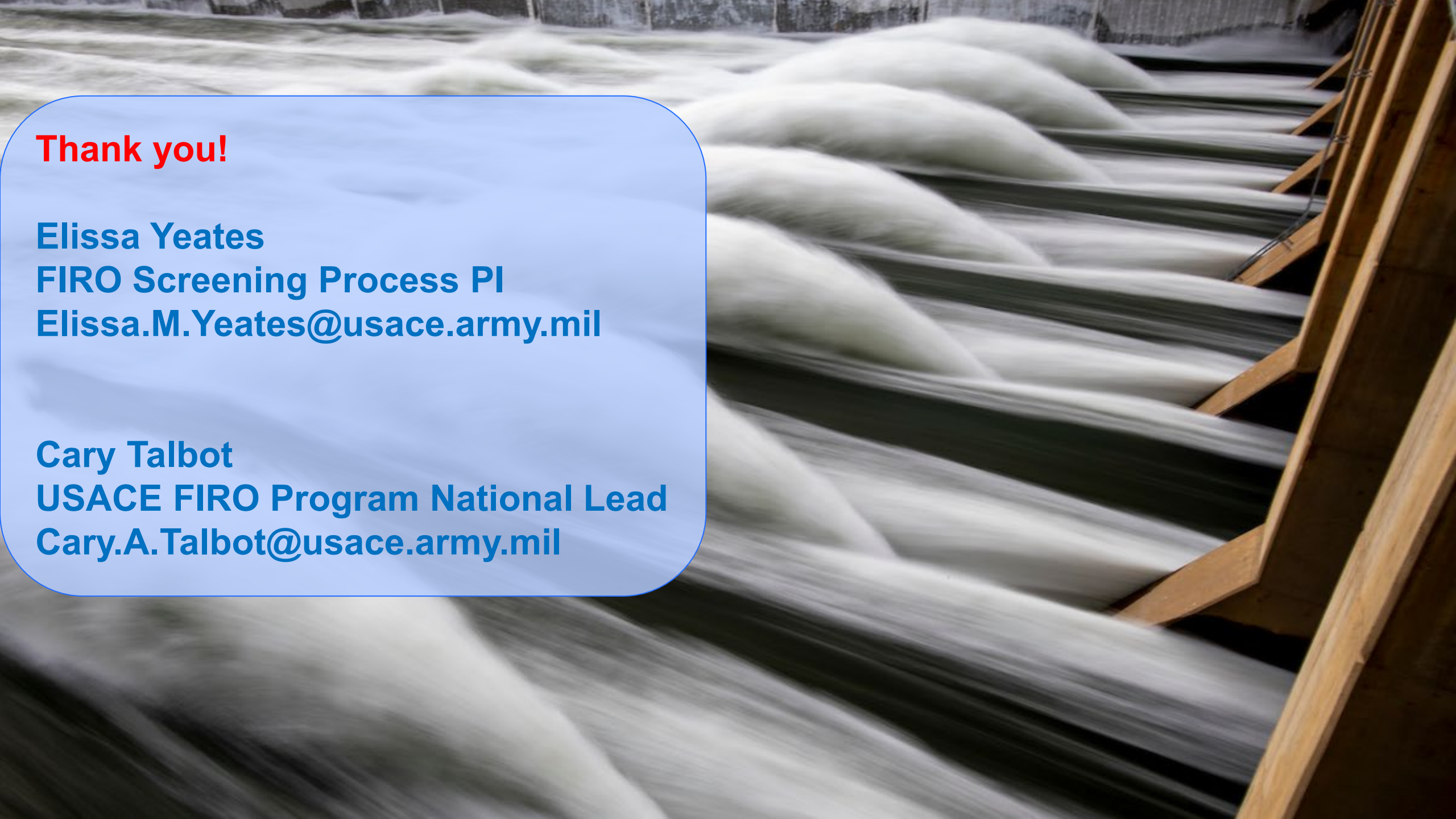
CURRENT COMPLETED SITE RESULTS



Division	District	Strongly consider pursuing FIRO or continue with FIRO efforts	Consider pursuing FIRO	Make improvements before pursuing FIRO	Barriers to FIRO may be prohibitive — do not pursue until significant challenges are addressed	Total
SPD	Albuquerque	1	1	2	4	8
SPD	Los Angeles	3	1	7	3	14
SPD	Sacramento	27	3	1	1	32
SPD	San Francisco	3	0	0	0	3
NWD	Walla Walla	4	2	1	0	7
SAD	Mobile	0	0	1	0	1
Total	Total	38	7	12	8	65

Roadmap: Evolution of FIRO Screening Verification Framework





Thank you!

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