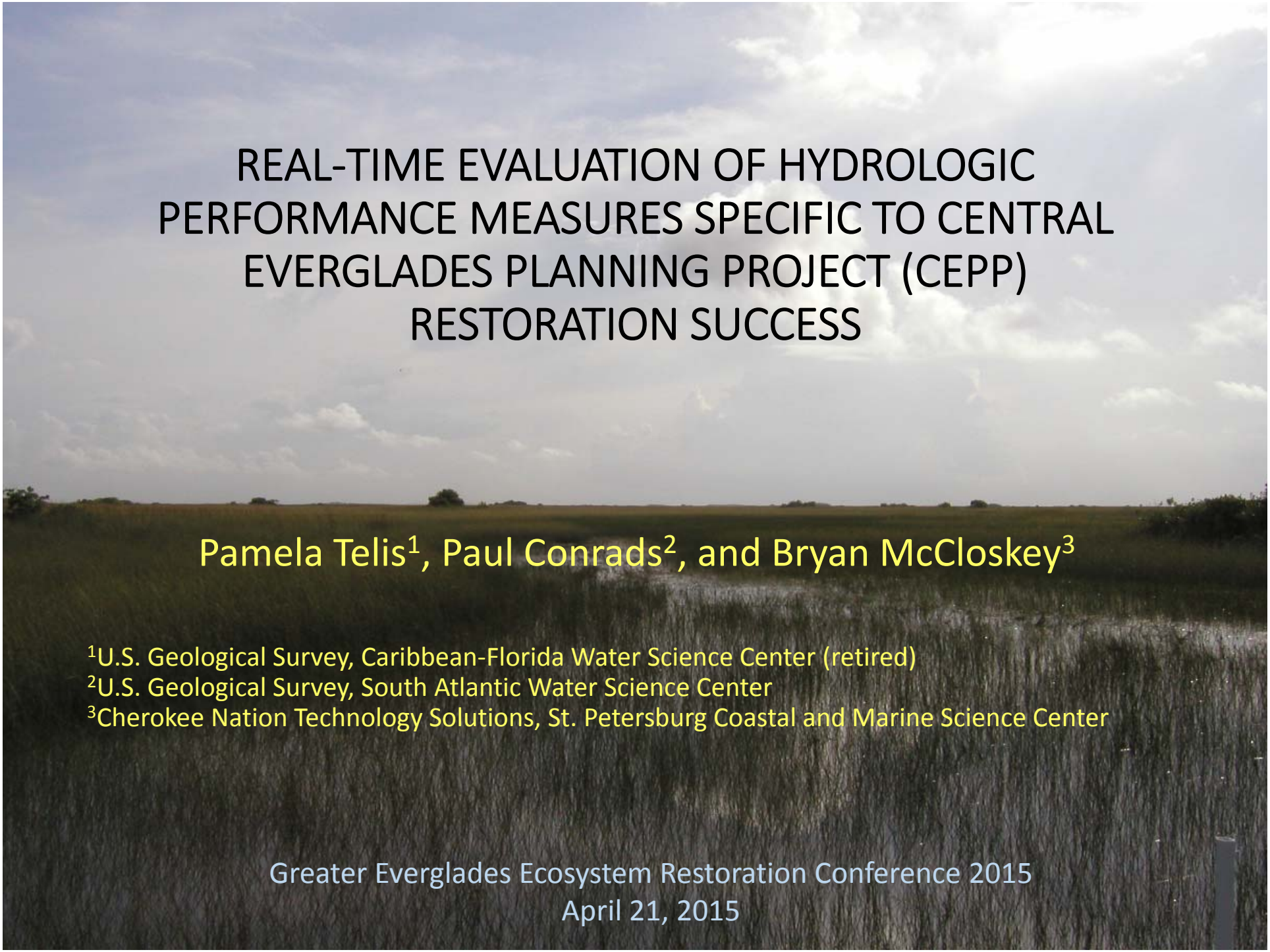

REAL-TIME EVALUATION OF HYDROLOGIC PERFORMANCE MEASURES SPECIFIC TO CENTRAL EVERGLADES PLANNING PROJECT (CEPP) RESTORATION SUCCESS

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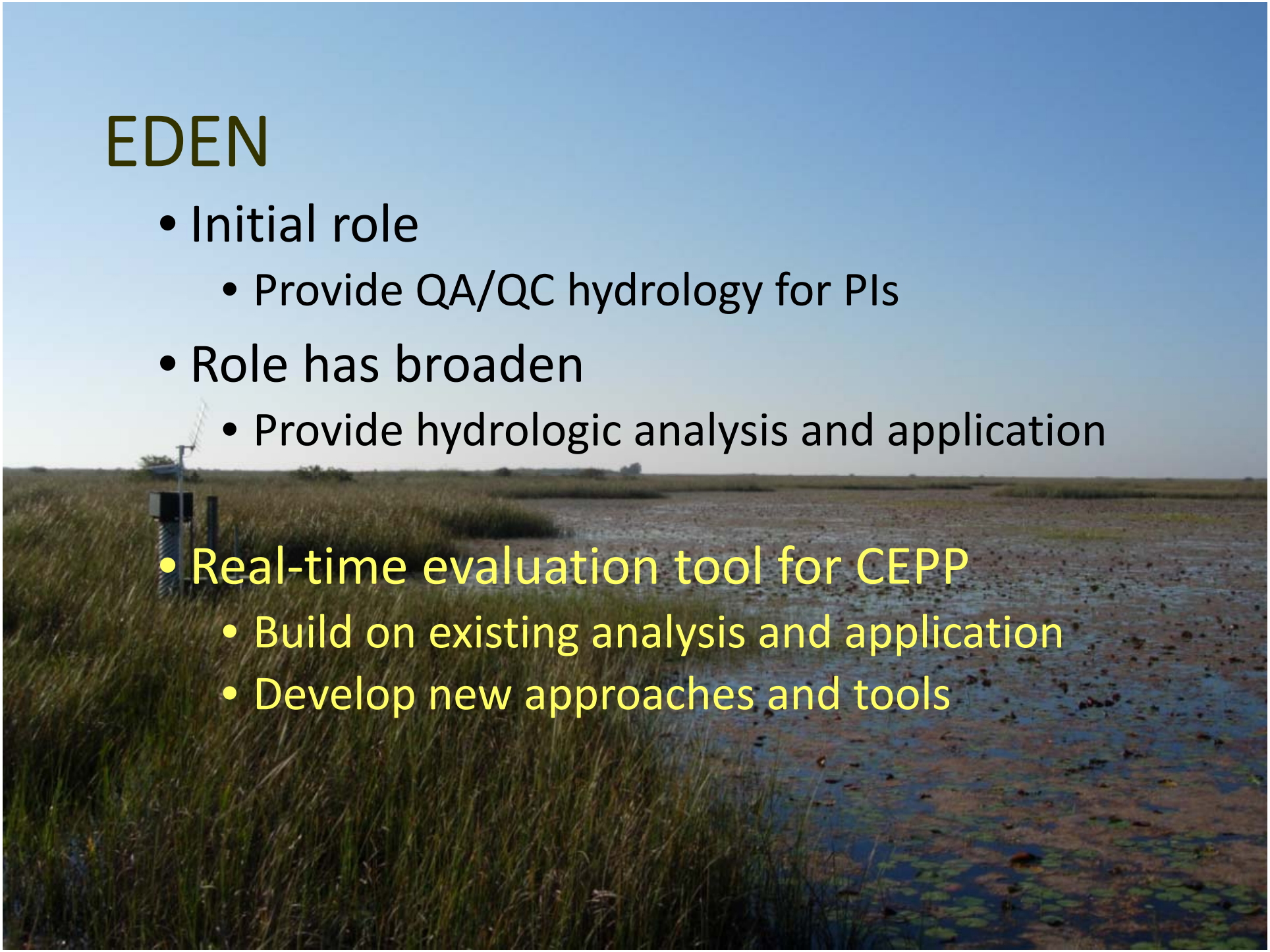
Greater Everglades Ecosystem Restoration Conference 2015
April 21, 2015

Outline

- Role of EDEN
- Real-time Restoration Evaluation
- Examples:
  - ERTP affects on tree island water level
  - Hydroperiods in CSSS subpopulation areas
  - Water level gradient vector maps
  - Tribute to Florence Nightingale
    - Flow direction rose direction diagrams



EDEN

- Initial role
  - Provide QA/QC hydrology for PIs
- Role has broaden
  - Provide hydrologic analysis and application
- Real-time evaluation tool for CEPP
  - Build on existing analysis and application
  - Develop new approaches and tools

Everglades Restoration Transition Plan (ERTP)

- **Issue: The water-control plans for the Everglades caused unnatural inundation of sacred burial sites on Tree Islands**

l: Online application for real-time evaluation

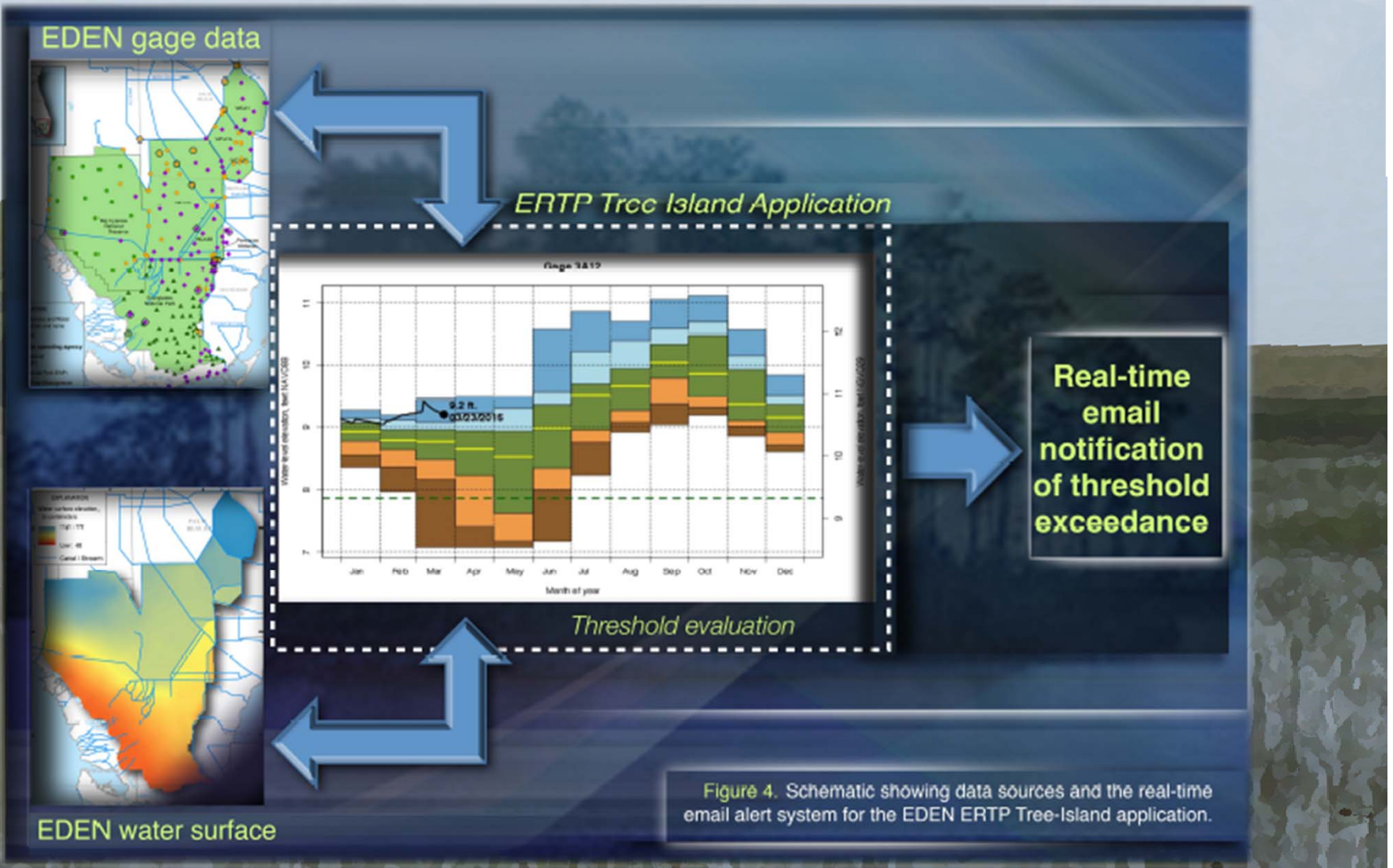
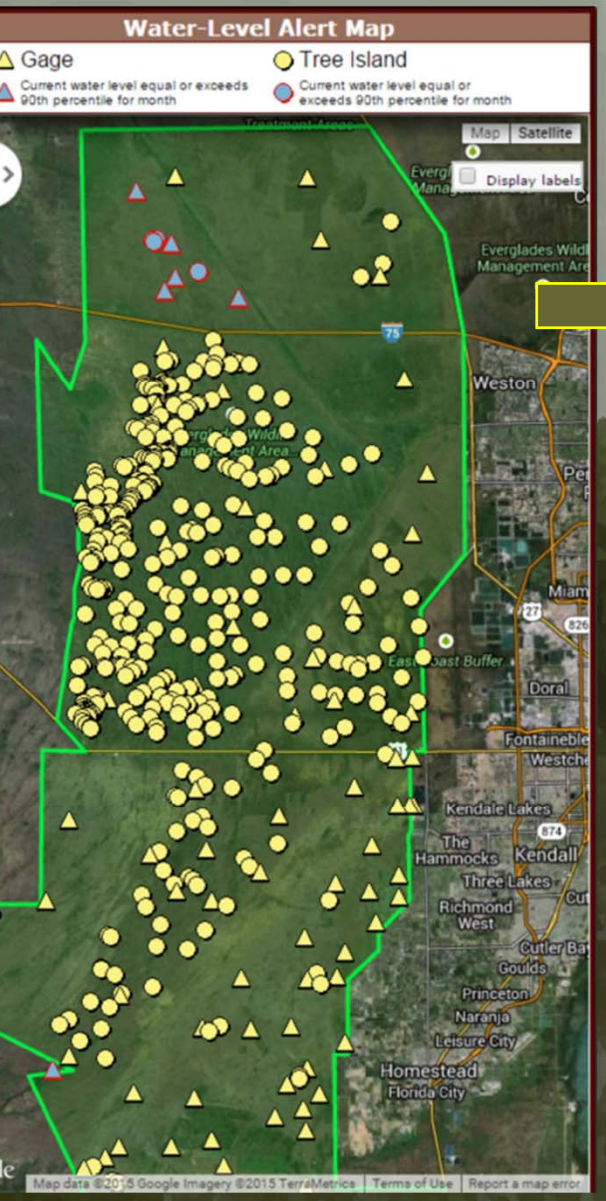


Figure 4. Schematic showing data sources and the real-time email alert system for the EDEN ERTP Tree-Island application.



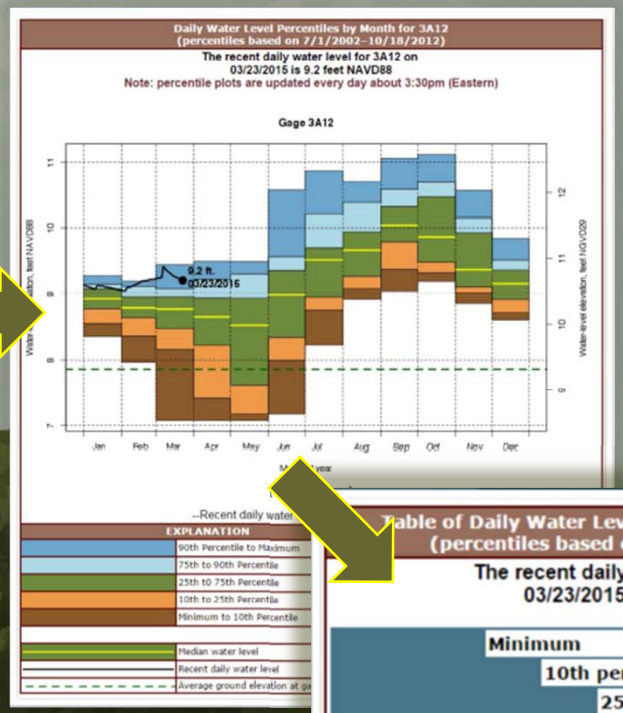


Table of Daily Water Level Percentiles by Month for 3A12
(percentiles based on 7/1/2002–10/18/2012)

The recent daily water level for 3A12 on
03/23/2015 is 9.2 feet NAVD88

	Minimum	10th percentile	25th percentile	Median	75th percentile	90th percentile	Maximum
January	8.36	8.55	8.78	8.93	9.07	9.15	9.27
February	7.96	8.36	8.64	8.79	8.96	9.12	9.19
March	7.07	8.16	8.48	8.77	8.96	9.08	9.44
April	7.07	7.41	8.23	8.65	8.94	9.22	9.49
May	7.07	7.17	7.62	8.53	8.94	9.3	9.49
June	7.17	8	8.34	8.99	9.36	9.57	10.58
July	8.23	8.76	8.96	9.52	9.7	10.21	10.86
August	8.92	9.08	9.27	9.66	9.94	10.39	10.7
September	9.04	9.38	9.79	10.04	10.33	10.59	11.06
October	9.19	9.32	9.40	9.86	10.47	10.7	11.12
November	8.86	9.01	9.11	9.37	9.93	10.15	10.58
December	8.61	8.72	8.91	9.16	9.36	9.51	9.84

--Recent daily water levels subject to revision--

ee Islands and gages

Hydroperiods and Cape Sable Seaside Sparrow (CSSS) Habitat

sue: Limited success in increasing populations of
ne CSSS. Need to evaluate water depth during
esting season.

Tool: An animated viewer shows water depths and statistics of percentages of flooded areas

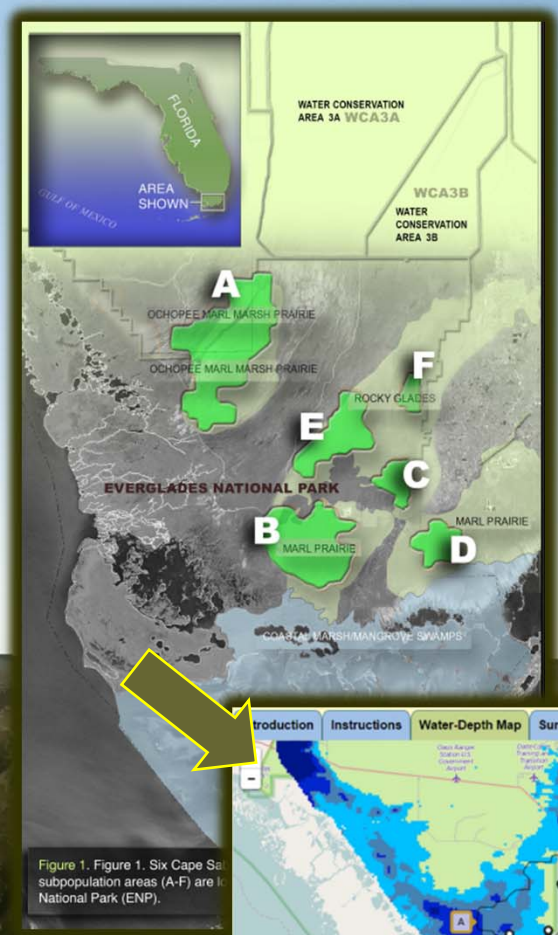
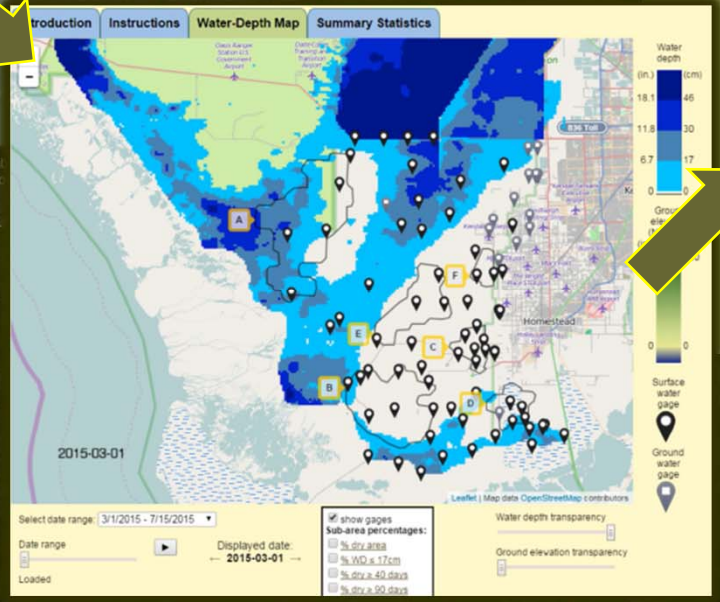


Figure 1. Figure 1. Six Cape Sa
subpopulation areas (A-F) are l
National Park (ENP).



Introduction | Instructions | Water-Depth Map | Summary Statistics

Nesting Season/Annual Statistics for Critical Habitats

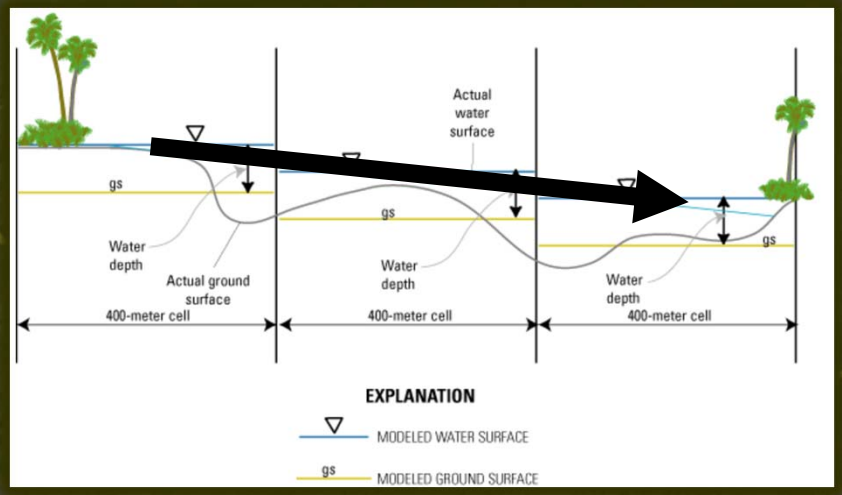
Summary statistics for the Cape Sable seaside sparrow critical habitats, showing percent of subpopulation areas dry during nesting season (March 1 through July 15) for at least 40 and 90 consecutive days; and percent of subpopulation areas with discontinuous hydroperiods during the calendar year of 0 to 89, 90 to 210, and > 210 days. A CSV file of these statistics used in this application can be downloaded here.

Nesting Season Statistics: Consecutive dry days

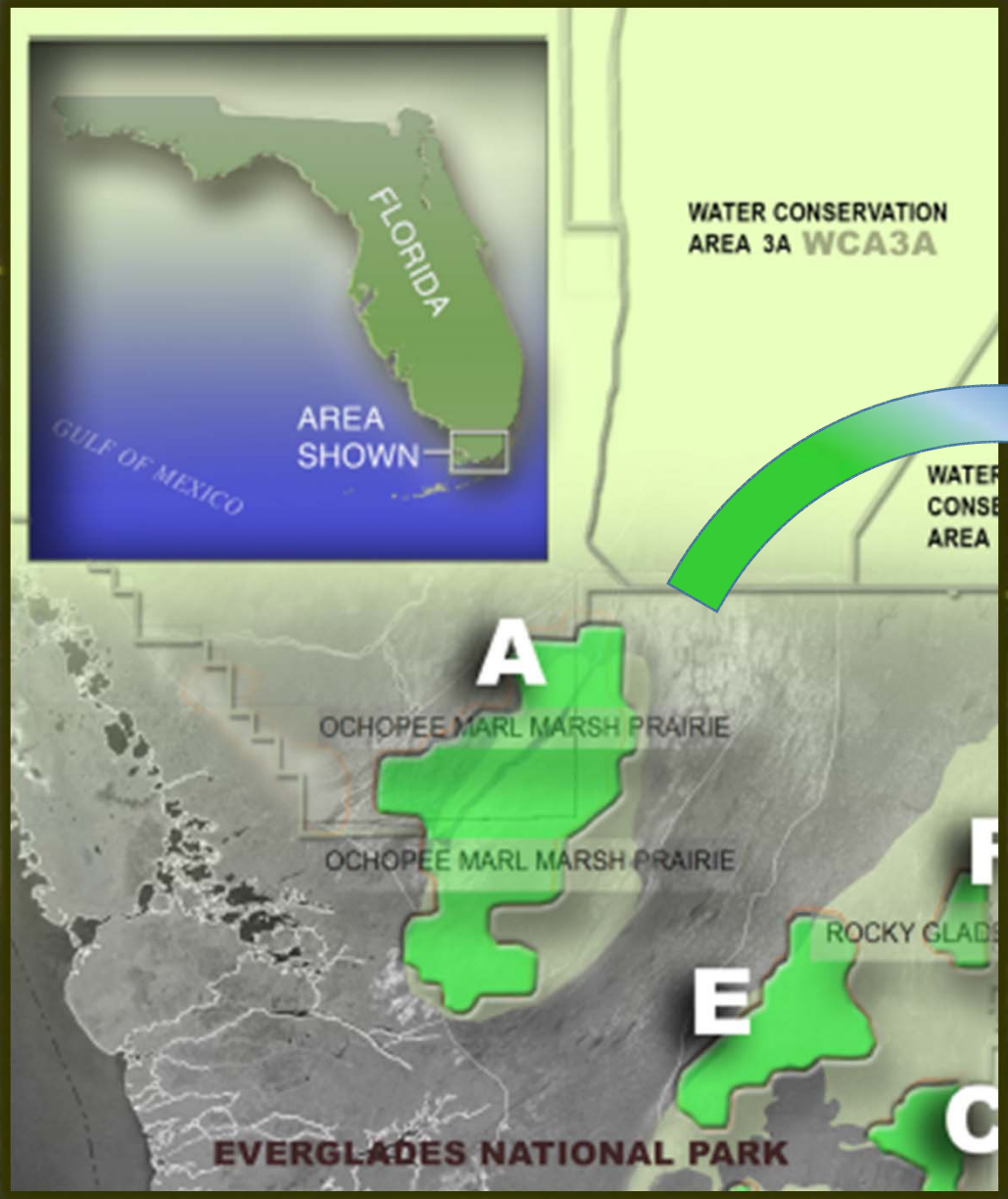
	A Nesting		B Nesting		C Nesting		D Nesting		E Nesting		F Nesting	
Year	≥ 40	≥ 90	≥ 40	≥ 90	≥ 40	≥ 90	≥ 40	≥ 90	≥ 40	≥ 90	≥ 40	≥ 90
1992	56.2%	25.8%	95.2%	90.7%	100%	100%	97.6%	80.9%	100%	99.1%	100%	100%
1993	2.9%	0.2%	78.1%	60.1%	98.7%	97.4%	72.8%	58.5%	91.9%	62.4%	100%	100%
1994	22.9%	3.1%	94.6%	73%	96.2%	82.1%	56.5%	22.8%	99.7%	70.3%	100%	100%
1995	0%	0%	70.4%	44.7%	98.7%	89.7%	58.1%	20.3%	46.3%	19.2%	100%	99.3%
1996	21.4%	2.3%	79.1%	42%	100%	43.2%	88.2%	34.1%	82%	48.8%	100%	86.3%
1997	22.4%	10.5%	86.5%	55.1%	100%	81.2%	94.3%	70.7%	98.6%	35.5%	100%	100%
1998	27.1%	5.6%	87.5%	47.5%	98.3%	95.3%	58.1%	17.5%	95.8%	44.8%	100%	100%
1999	37.3%	8%	100%	71%	100%	100%	100%	72%	100%	79.7%	100%	100%
2000	30%	13.4%	90.9%	73.8%	100%	95.7%	79.3%	40.2%	97.5%	65.3%	100%	100%
2001	84.1%	39.5%	100%	100%	100%	100%	100%	89%	100%	99.5%	100%	100%
2002	73.5%	25%	99.6%	62.3%	100%	100%	100%	68.7%	98.9%	59.8%	100%	100%
2003	36.5%	2.8%	41.2%	25.5%	96.6%	58.5%	21.5%	18.3%	66%	23.8%	100%	8.9%
2004	51.3%	29.3%	100%	93.3%	100%	100%	98.4%	84.1%	100%	90%	100%	100%
2005	55.9%	24.7%	99.7%	83%	100%	100%	76.4%	55.7%	100%	93.4%	100%	100%
2006	56.7%	33.4%	98.5%	43.7%	100%	100%	84.6%	57.3%	100%	64.8%	100%	100%
2007	28.5%	6.2%	91.5%	35.6%	100%	97.4%	69.5%	18.7%	98.3%	36.3%	100%	100%
2008	64%	22.6%	100%	69.6%	100%	99.1%	95.1%	20.3%	100%	74.8%	100%	100%
2009	72.9%	16.3%	100%	67%	100%	86.8%	100%	20.3%	100%	15.8%	100%	100%
2010	29.8%	10.8%	77.3%	58.6%	100%	94.4%	48.4%	22.8%	85.1%	66.4%	100%	58.9%
2011	74.4%	62.3%	100%	99.6%	100%	100%	100%	93.5%	100%	100%	100%	100%
2012	56.7%	11.3%	98.8%	23%	100%	8.1%	82.5%	0.8%	99.7%	8%	100%	37%
2013	37.4%	0.6%	74.4%	12.9%	100%	8.5%	64.2%	2%	94.8%	0%	100%	100%
2014	67.4%	23%	95.3%	69.2%	100%	100%	91.9%	45.9%	99.5%	75%	100%	100%

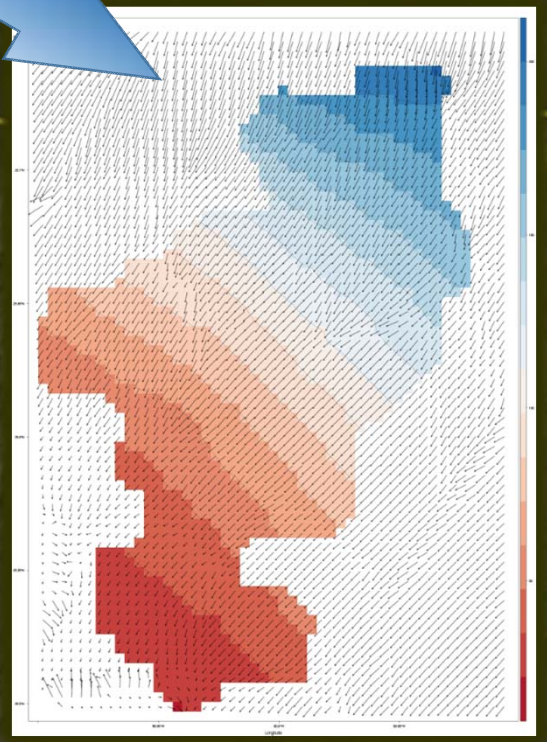
Flow Direction Vectors

- **Issue: Restore North-South orientation of flow directions**
- **Need: After modification to canal system, detect changes in flow directions**
- **Use EDEN surface to compute water level gradient vectors**

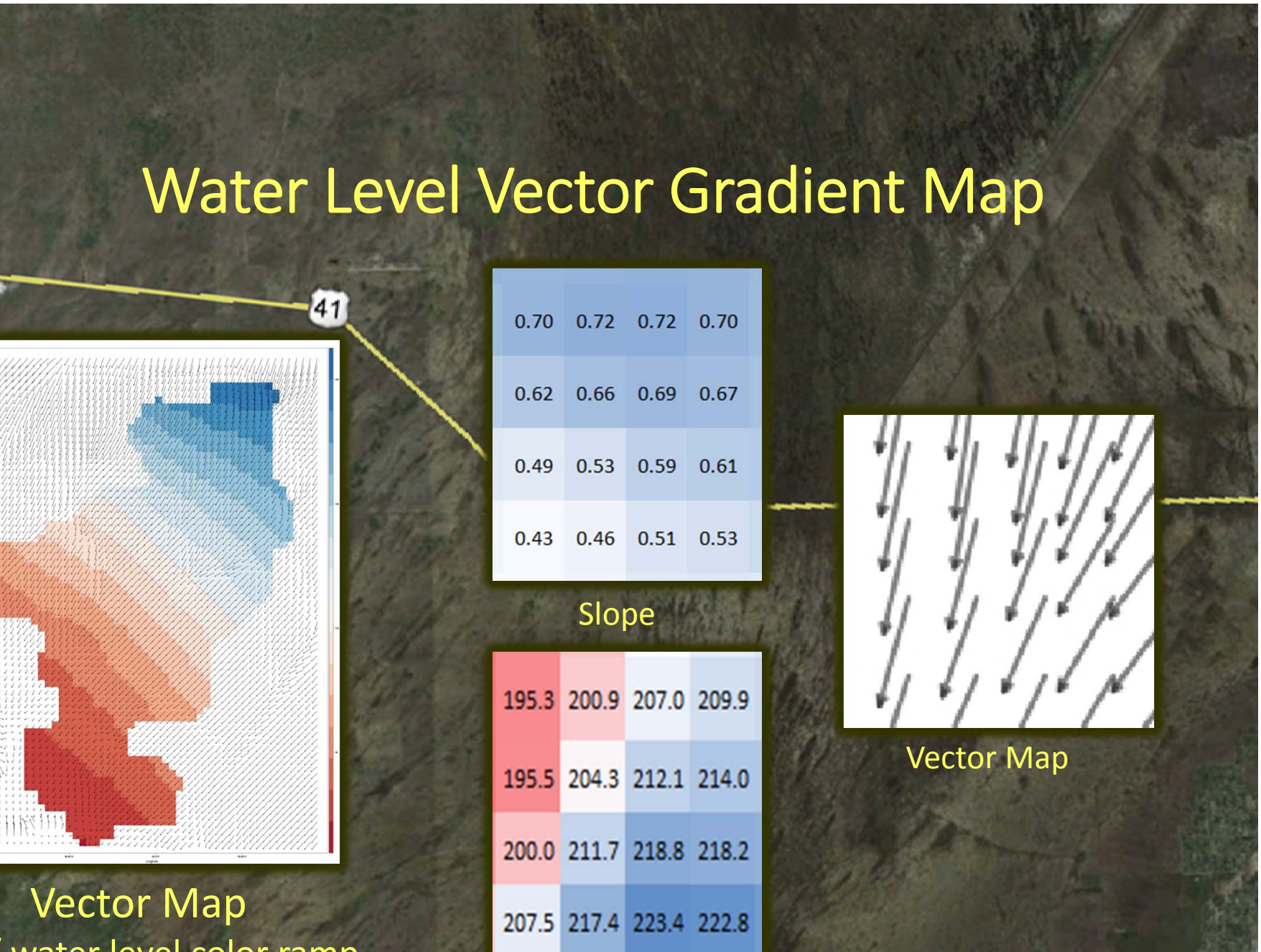


Water Level Vector Gradient Map



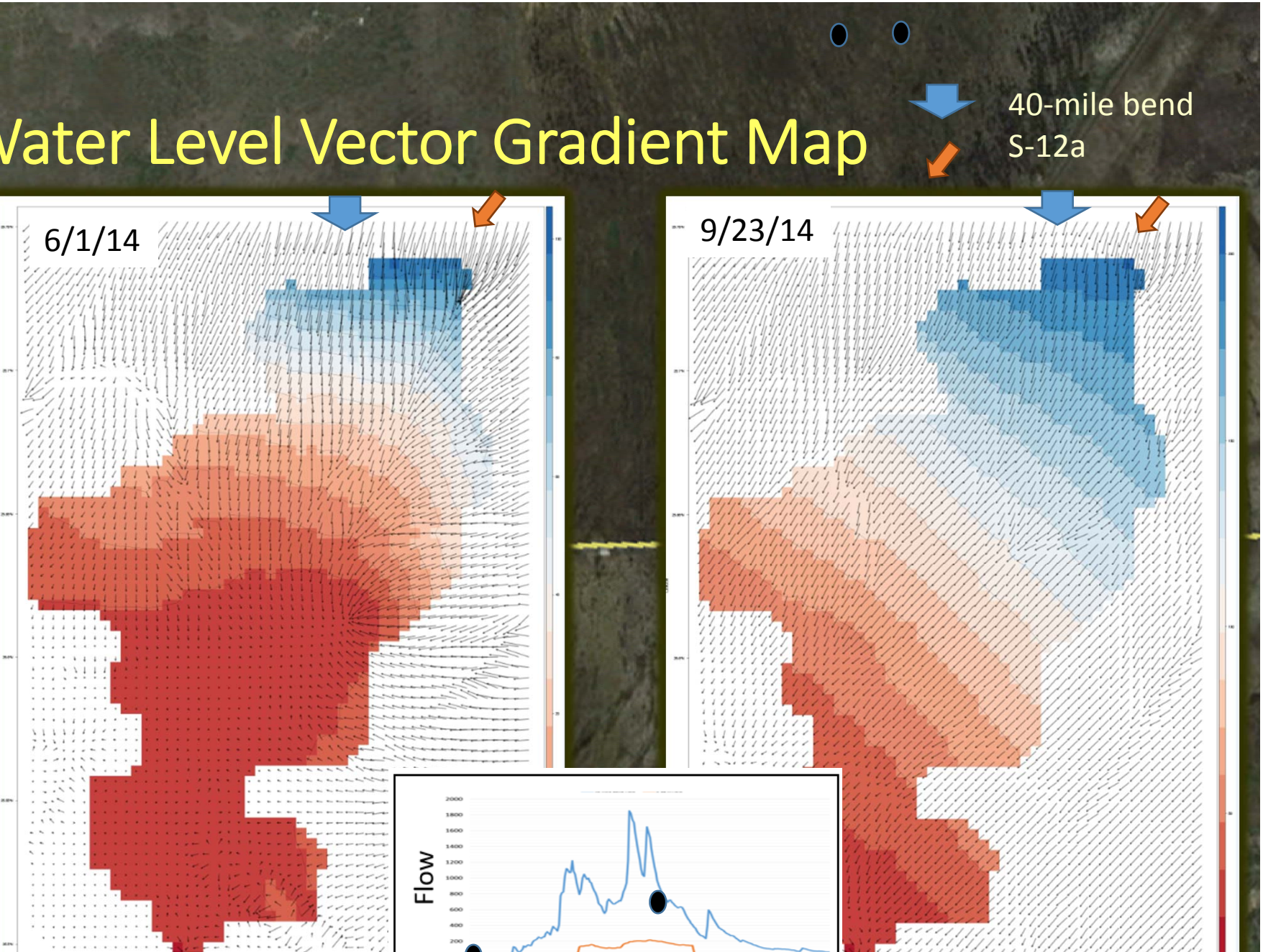


Water Level Vector Gradient Map

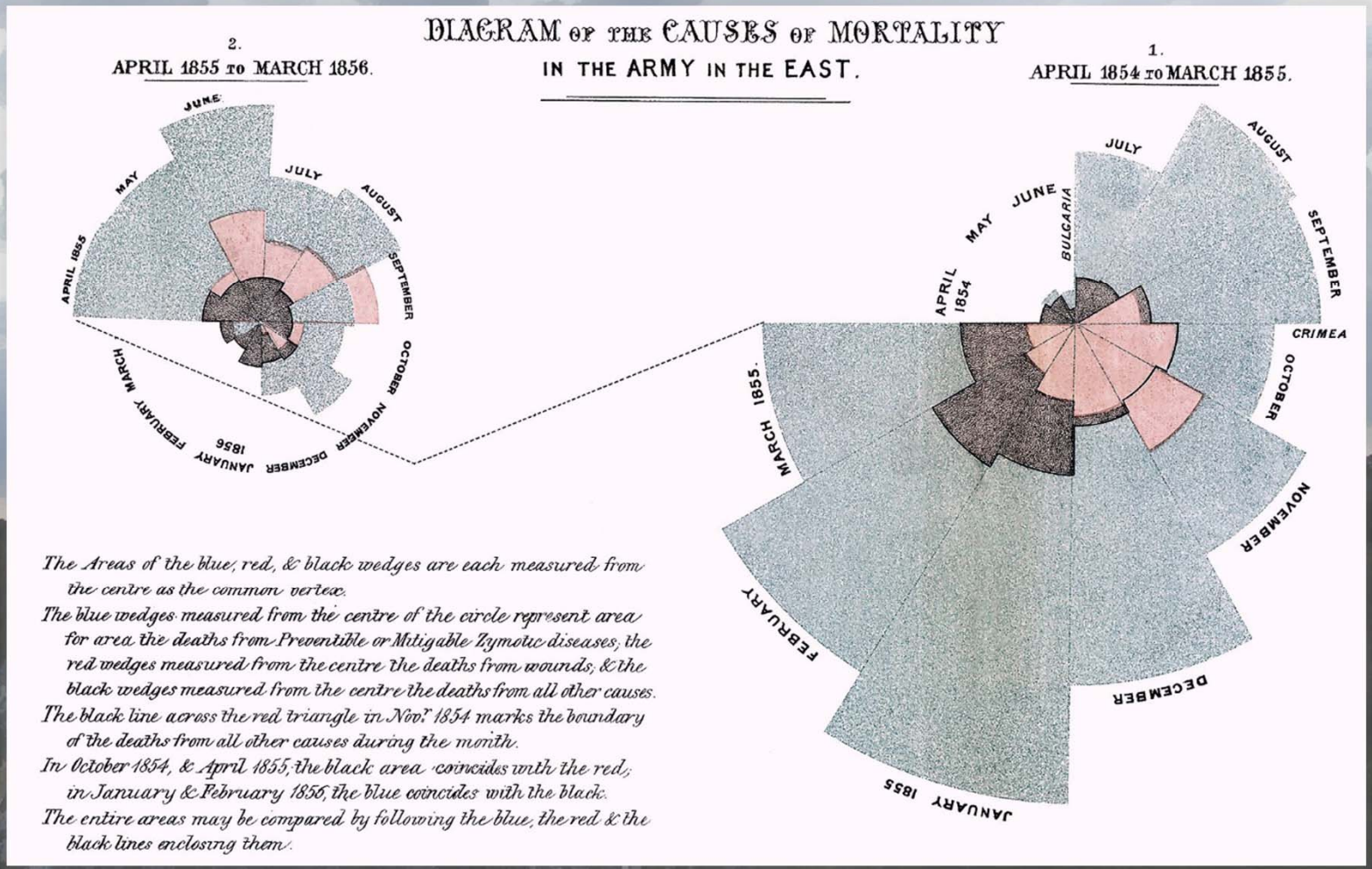


Water Level Vector Gradient Map

40-mile bend
S-12a



Florence Nightingale's Approach

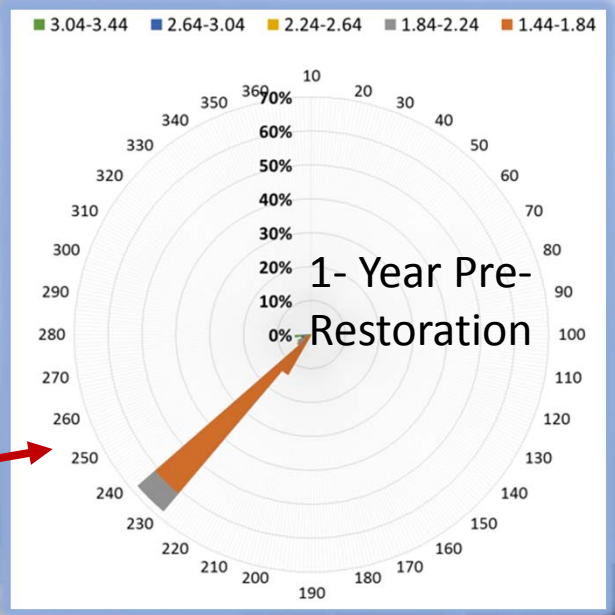


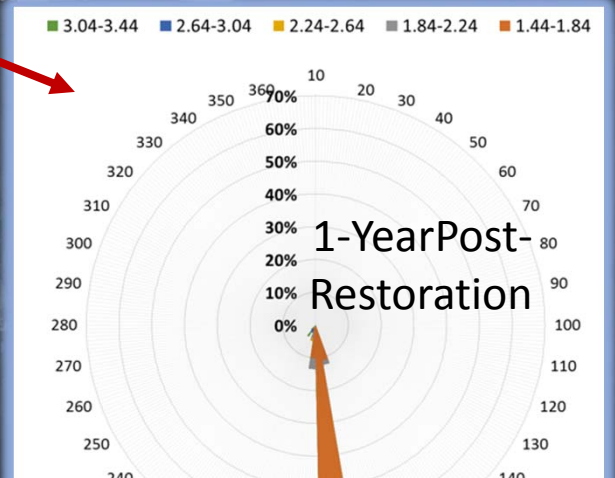
Army in the East - Crimean War

Detecting Changes in Flow Direction

- Generate time series of water-level gradient vectors
- Generate rose diagrams to compare “pre-” and “post-” restoration flow directions

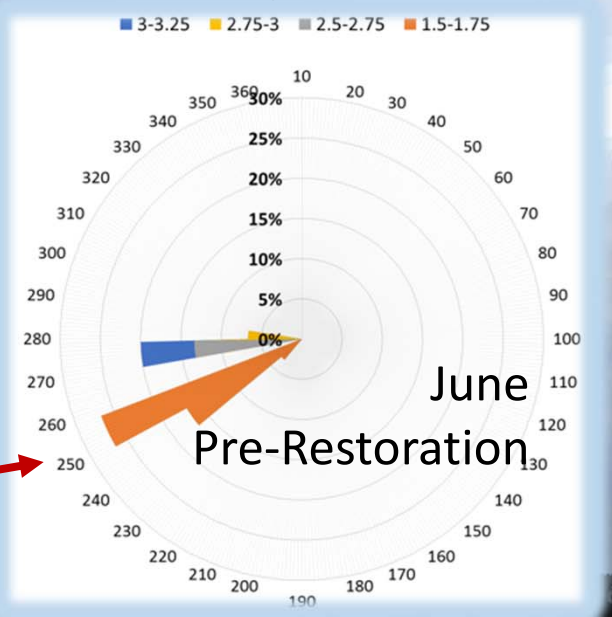
Florence would be proud

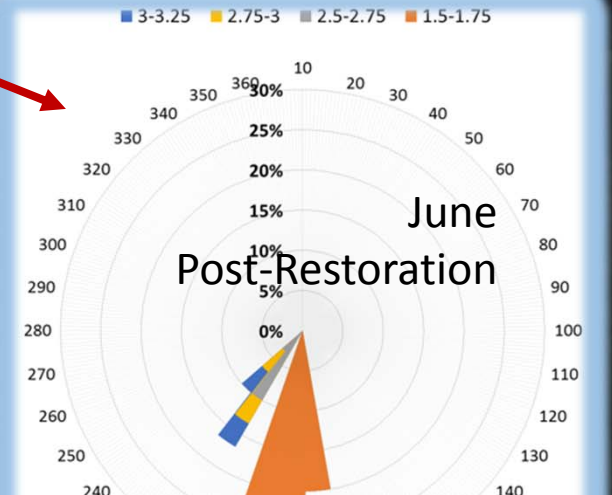




Warning: Hypothetical data set

Florence would be proud



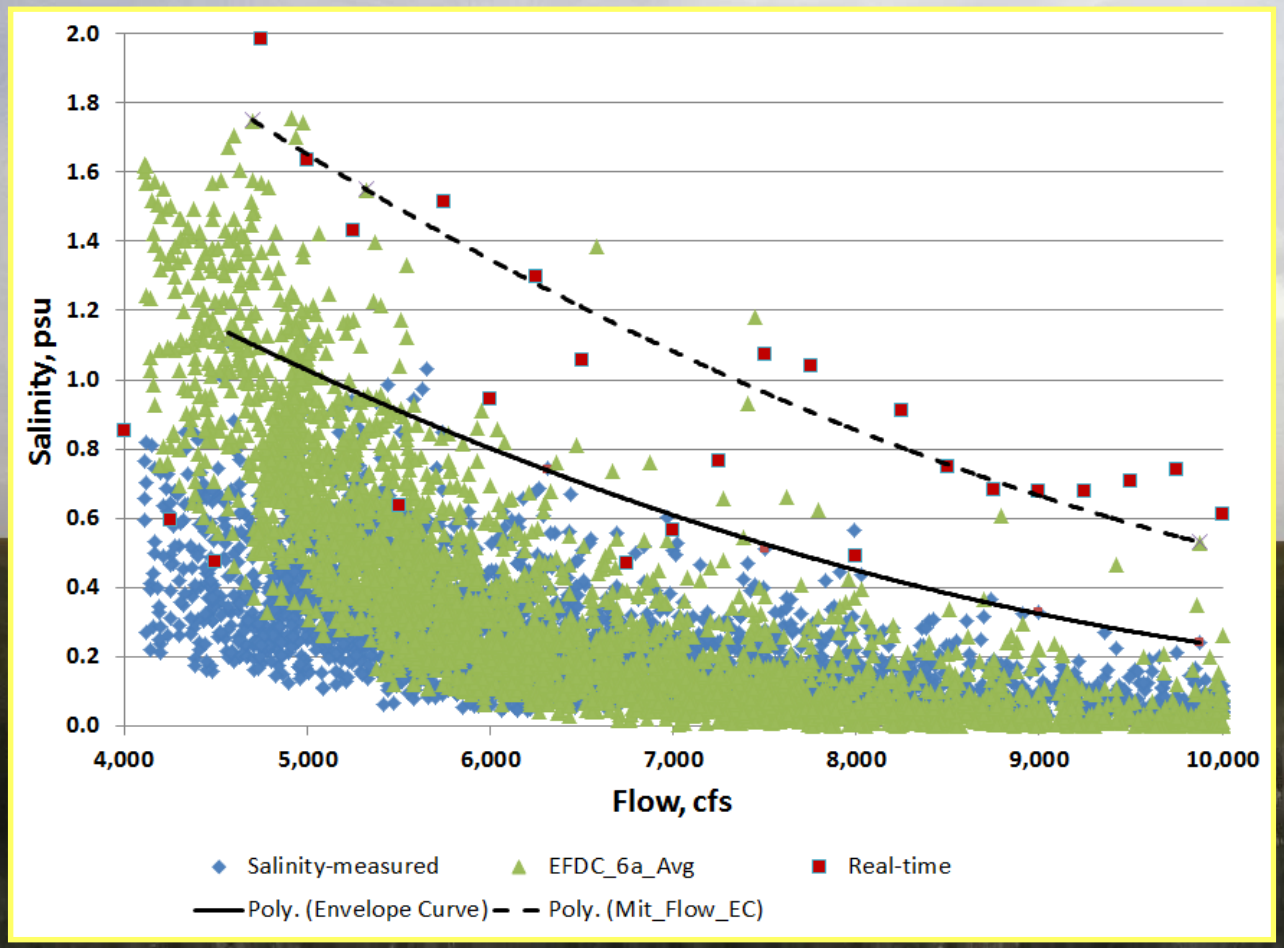


Warning:

Summary

- Previous EDEN application can be used for real-time evaluation of CEPP implementation
- EDEN and others (JEM lab, NPS) have the frameworks to leverage resources for real-time evaluation

alinity Envelope Curves



mbination of measured data, restoration simulation, and envelope