RMA

RESOURCE MANAGEMENT ASSOCIATES

WATER RESOURCES ENGINEERING

Wetland Assessment and Drainage Modeling with HEC-RAS

Steve Andrews, Scott Burdick - RMA
John Takekawa, Steve Chappell - SRCD
Robert Eddings – CWA
Cliff Feldheim – DWR

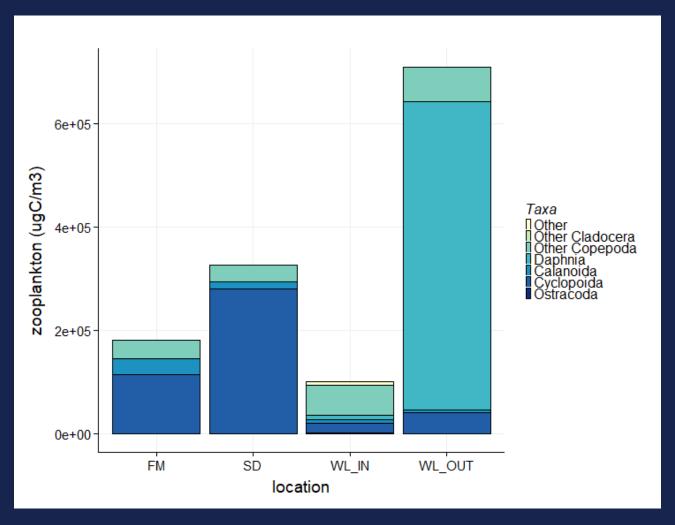5 September 2018

Resource Management Associates, Inc.

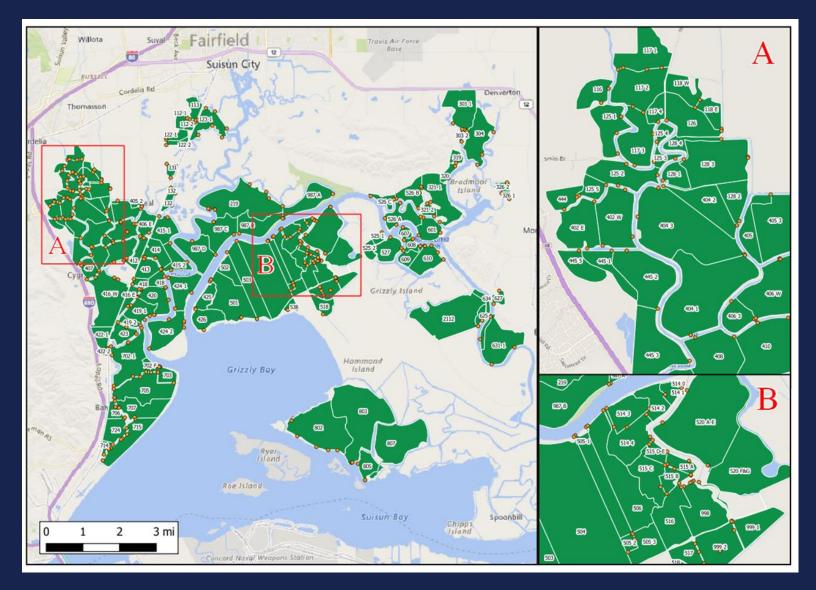# Project Motivation and Objectives

- Increase drainage capacity of managed wetlands
  - More control over circulation, salt flushing
- Benefits to local ecosystems: increased potential for phytoplankton and zooplankton production

1. Inventory current state of drainage infrastructure
2. Model drainage rates with predictive model (HEC-RAS)
3. See where most cost-effective improvements can be made
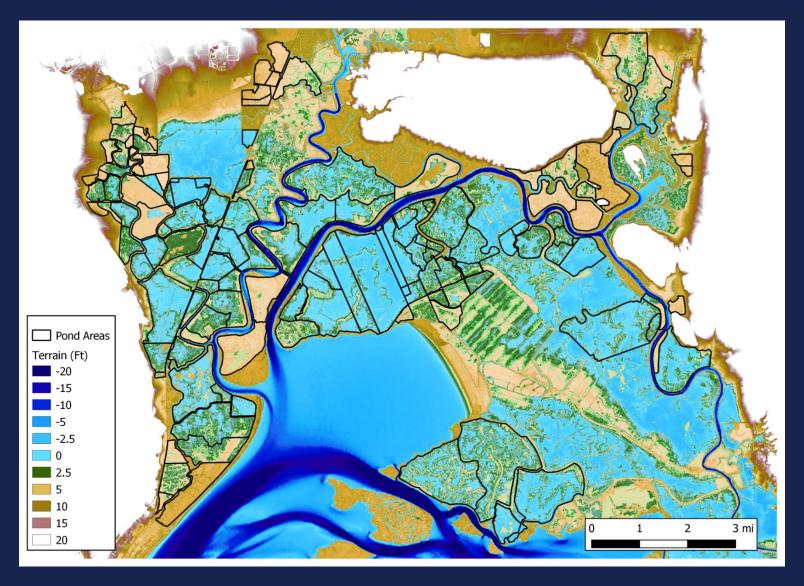
Zooplankton Levels High in Pond Drain Water
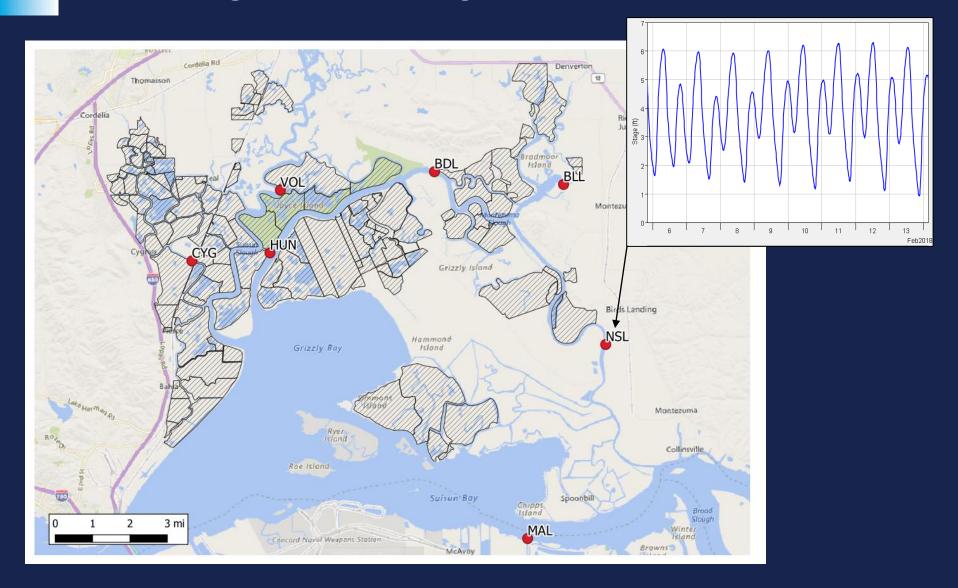

Source: Nicole Aha, UC Davis

Drainage Infrastructure Inventory
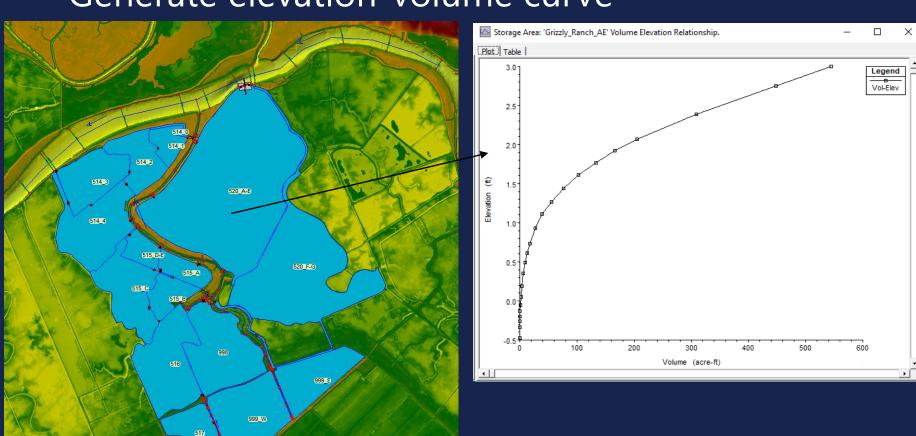
Wetland Topography
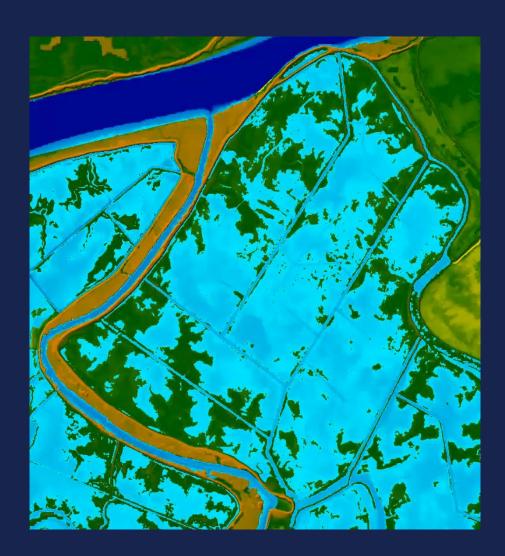
DWR Stage Monitoring Locations

HEC-RAS
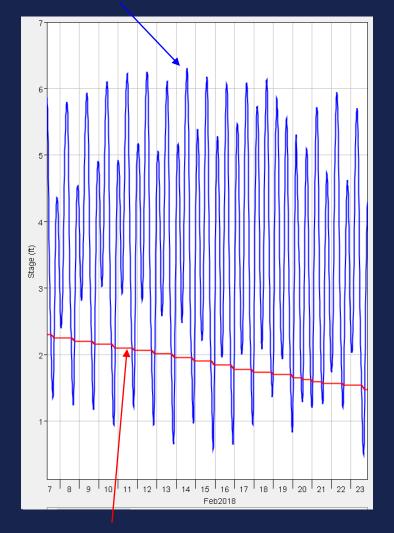
- Model each pond as a "storage area"
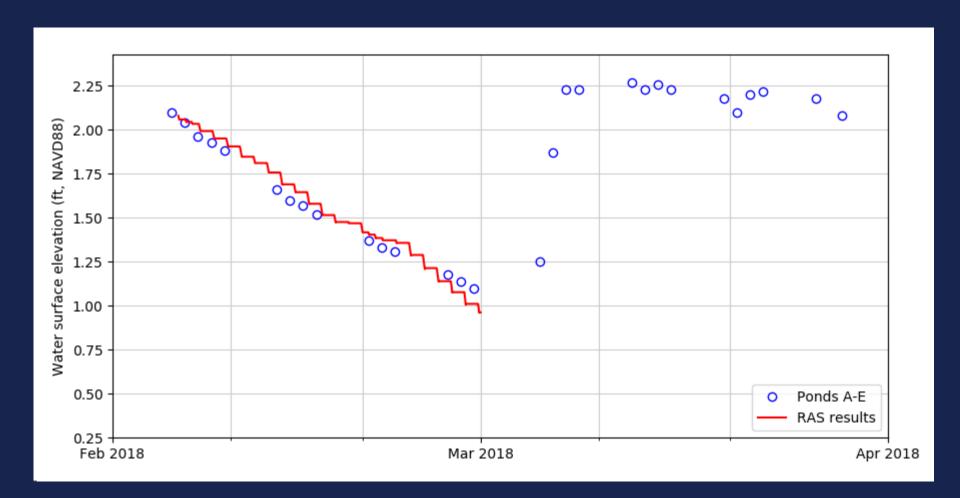- Generate elevation-volume curve

Example Simulation Result – Grizzly Ranch

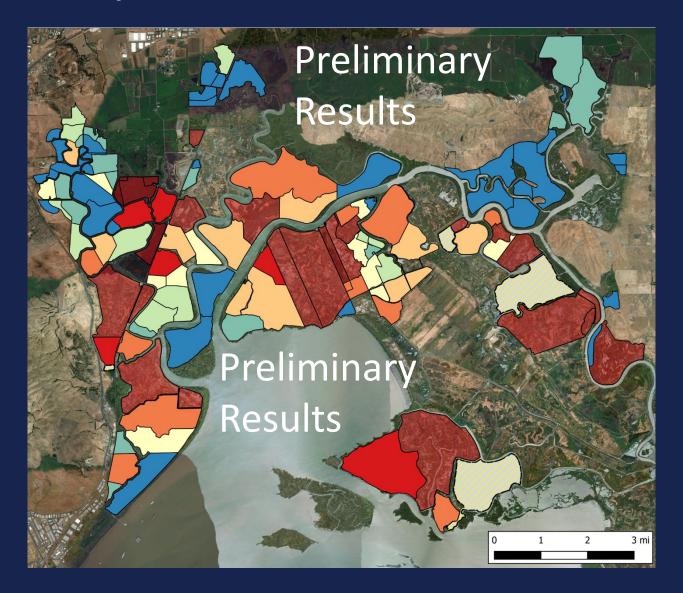Montezuma Slough Elevation

Pond Elevation

Calibration – Grizzly Ranch

Preliminary Assessment Results
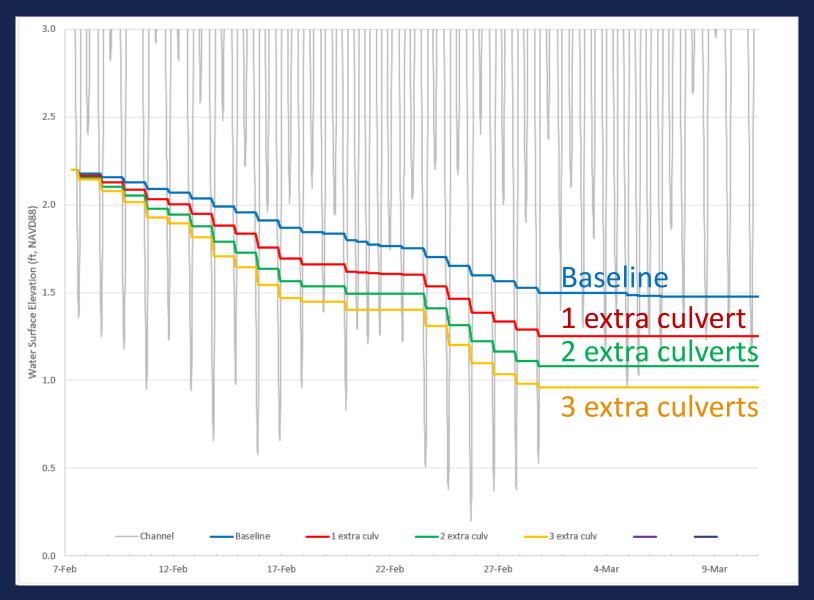
Rapid Assessment Tool

- Simplified model in Excel to calculate improvements for infrastructure additions
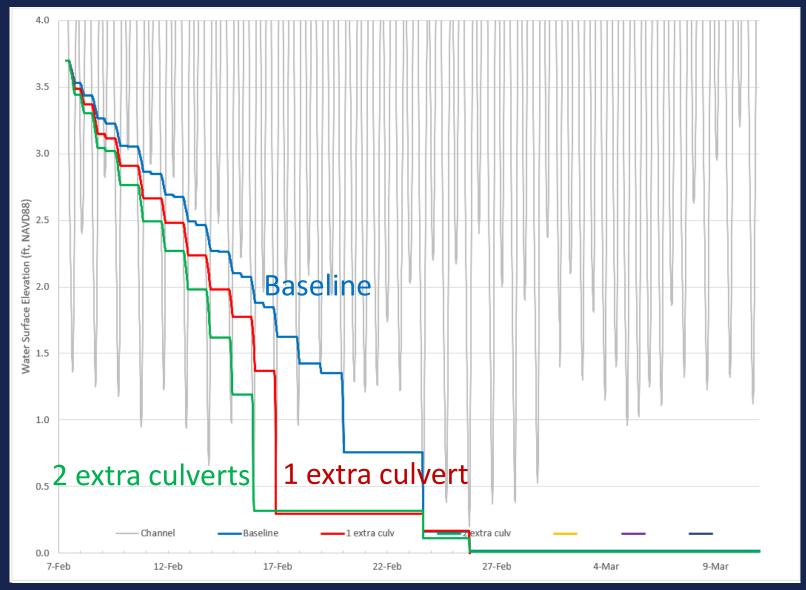 - Drainage times
  - Circulation rates

Input and Output Information

					Culvert 1	Culvert 2	Culvert 3	Culvert 4	Culvert 5	Culvert 6	Culvert 7	Culvert 8	Culvert 9	Culvert 10
Club number	520_A-E		Fill Club Information			Clear Club Information								
Club Input Information														
Shoot Elevation (ft, NAVD88)	2.3													
Nearest Stage Monitoring Station Code	BDL													
Culvert Information					Culvert 1	Culvert 2	Culvert 3	Culvert 4	Culvert 5	Culvert 6	Culvert 7	Culvert 8	Culvert 9	Culvert 10
Number	5		Diameter (inches)		36	36	24	24	36					
			Interior Invert Elevation (ft, NAVD88)		-0.98	-0.44	-1.13	-0.52	-1.35					
			Exterior Invert Elevation (ft, NAVD88)		-0.30	0.19	-0.12	0.00	0.00					
			Drainage Restriction Factor (range 0-1)		0.0	0.0	0.0	0.0	0.0					
			Intake Water During Circulation? (Y/N)		Y	N	N	N	N					

Drainage Simulation Name	Baseline	Run Drainage Simulation	Clear All Drainage Results

Time to Drain to 1 ft below Shoot Elevation		days
Time to Drain to 1.5 ft below Shoot Elevation		days
Time to Drain to 2 ft below Shoot Elevation		days
Volume of Water Remaining after 2 weeks		acre-feet
Volume of Water Remaining after 30 days		acre-feet

Circulation Simulation Name	Baseline	Run Circulation Simulation	Clear All Circulation Results

Average Volume of Water Exchanged Daily		acre-feet
		% of Shoot Level Volume

Example – Pond on lower Joice Island

Example – Denverton

Outcomes

- Modeling such as this provides justification for federal and state grand money to install drainage improvement structures

- Benefits for:
  - Landowners
  - Water quality
  - Local and regional ecosystems

Thanks!

Stephen Andrews, Ph.D.
Senior Water Resources Specialist

Resource Management Associates
1756 Picasso Ave, Suite G
Davis, CA 95618
(530) 564-7043

steve@rmanet.com
www.rmanet.com