2026 PRRIP Science Plan Reporting Session

February 24-25, 2026

Virtual Meeting

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

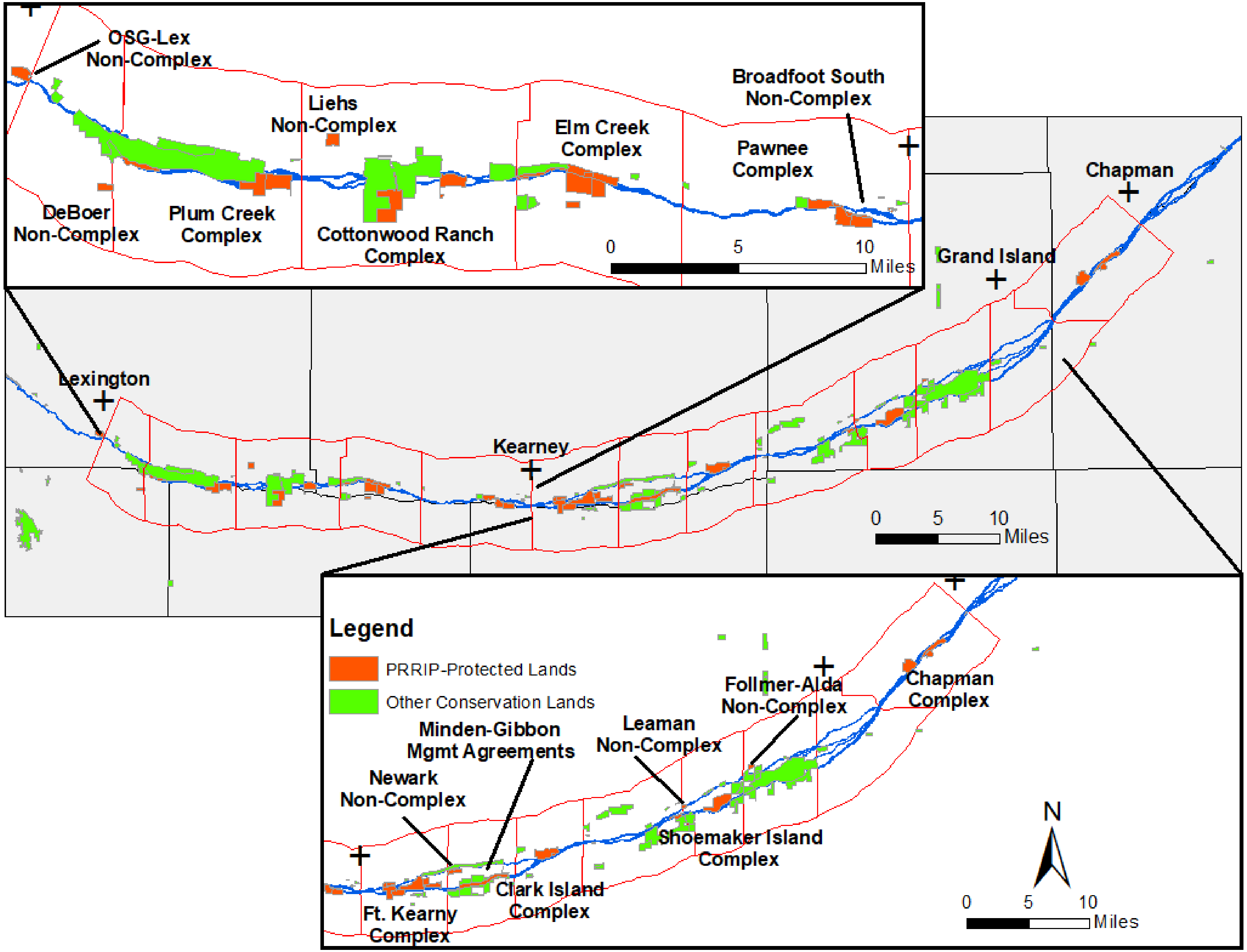
Land Plan Update

Tim R. Tunnell

Land Coordinator

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Habitat Type	Purch.& Ease.	Lease & Sponsor.	Man. Agree.	Total
Complex (9,200 ac)	9,220	2,701	1,487	13,408
Non-Complex (800 ac)	1,147	0	0	1,147
Total				**14,555**
Plus-Up (1,500 ac)	1,266	37	0	1,317



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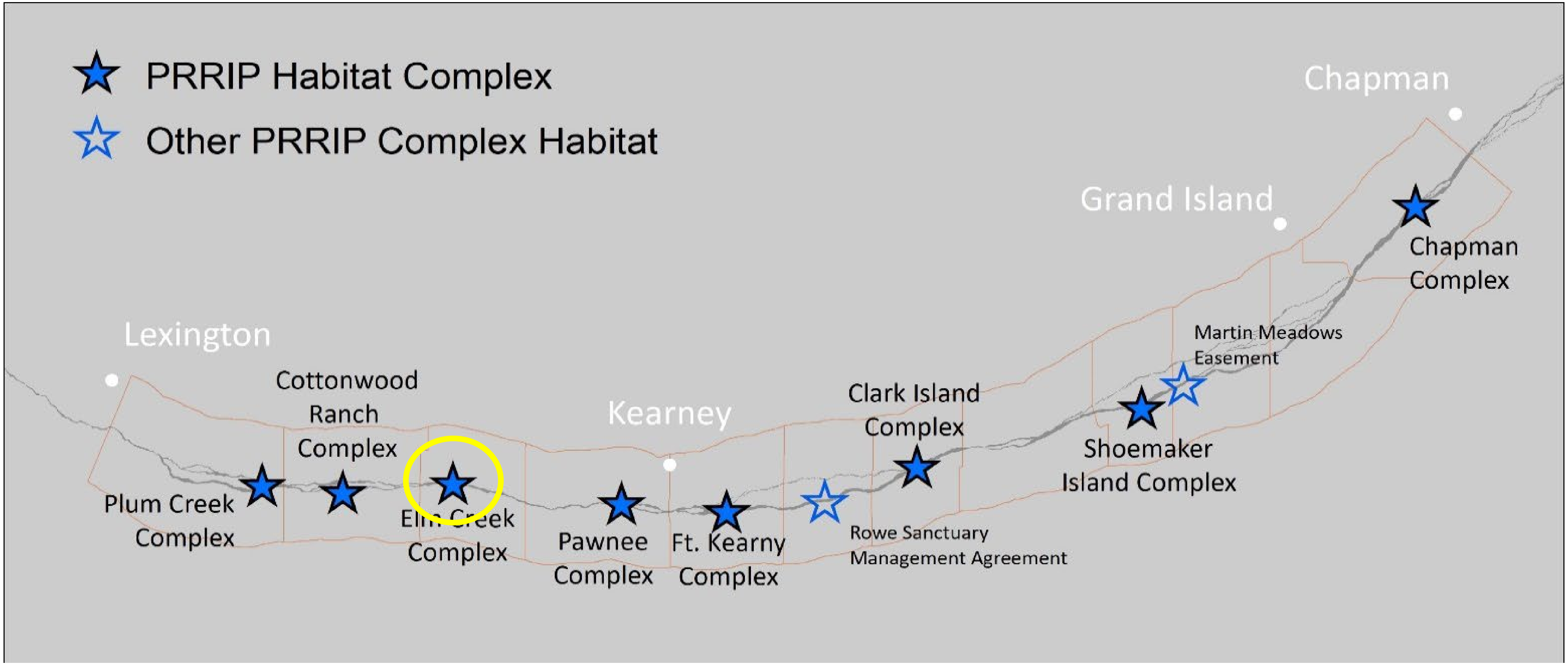
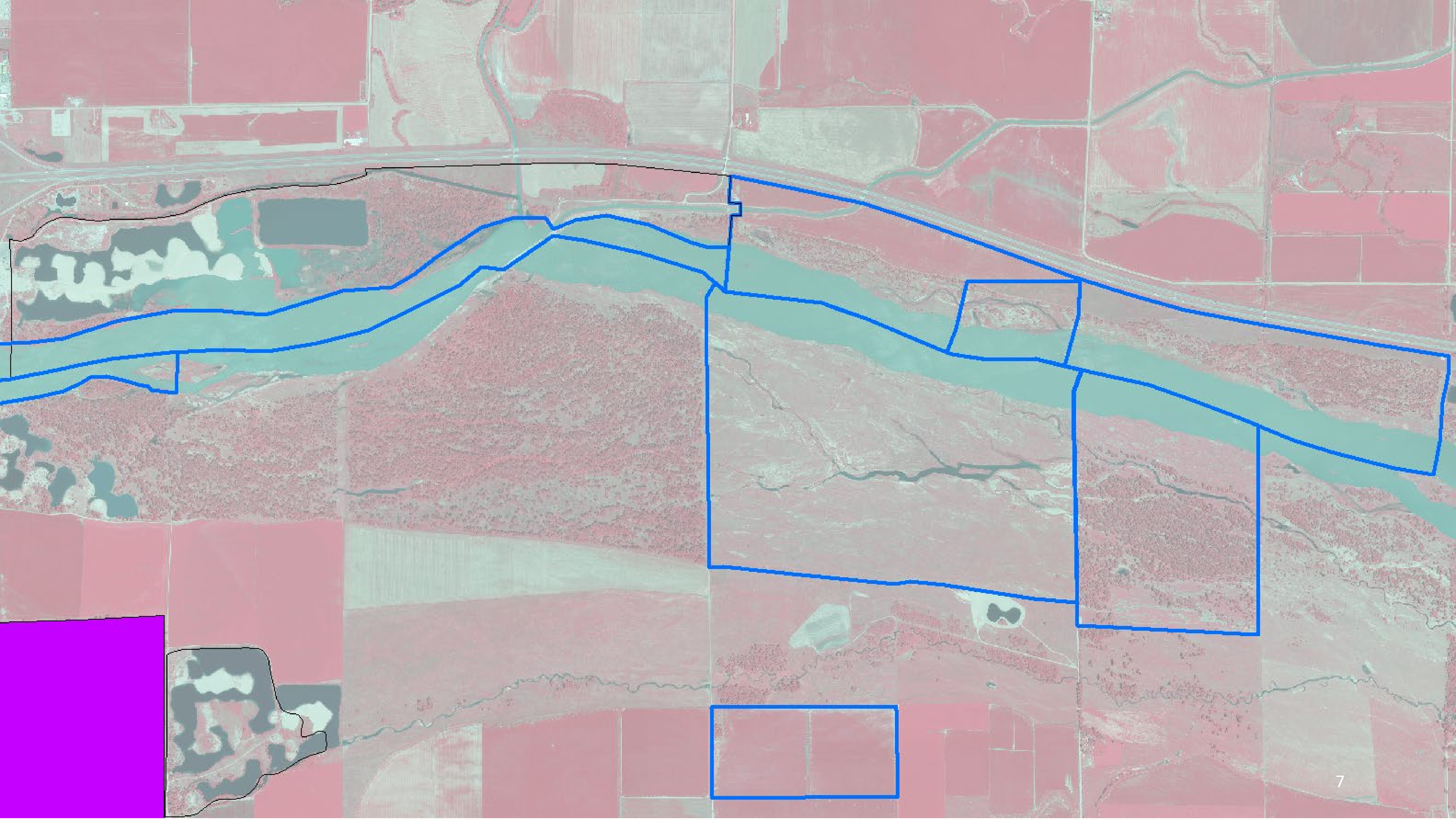
RECOVERY IMPLEMEN

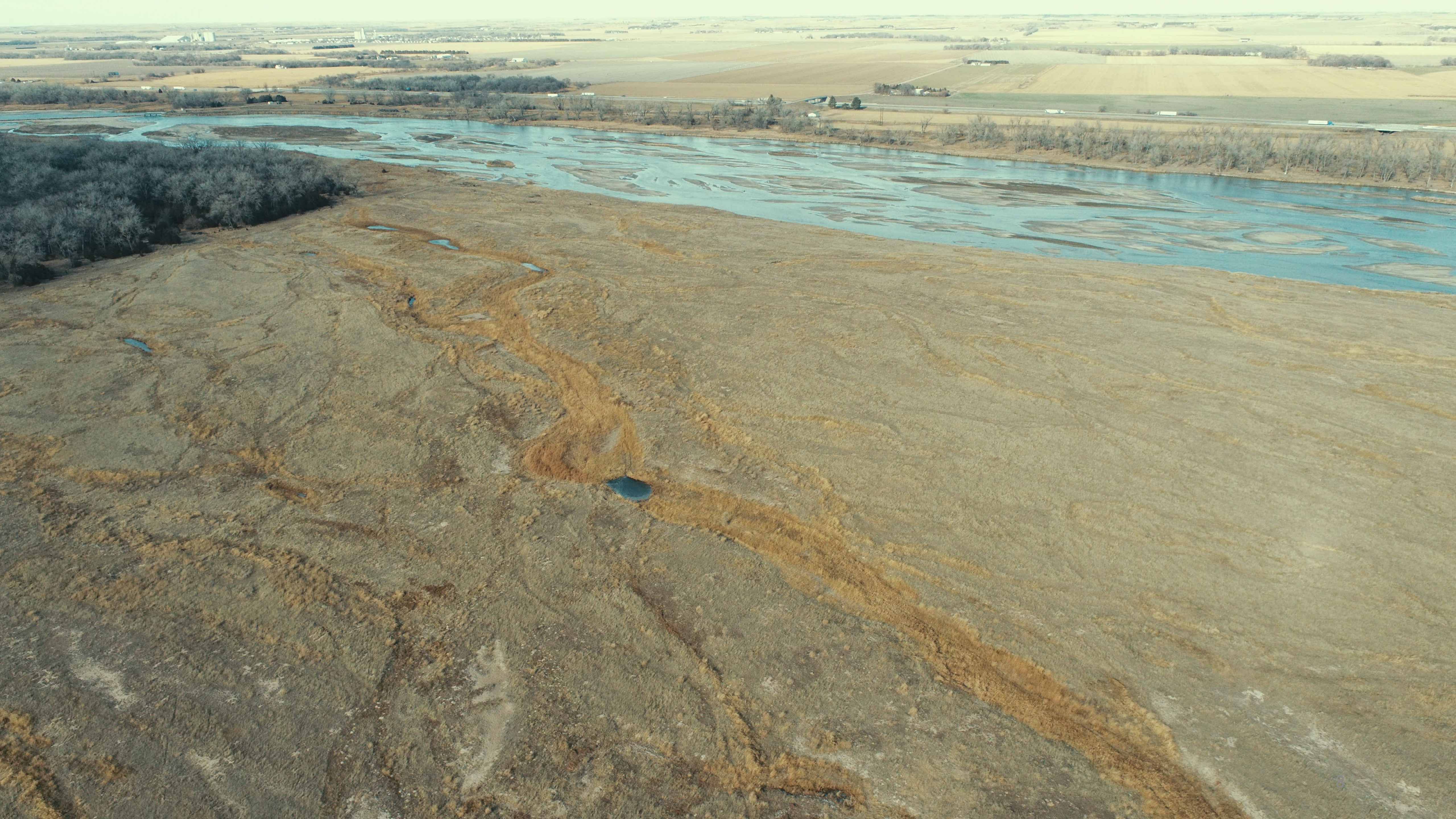
Restoration

Management

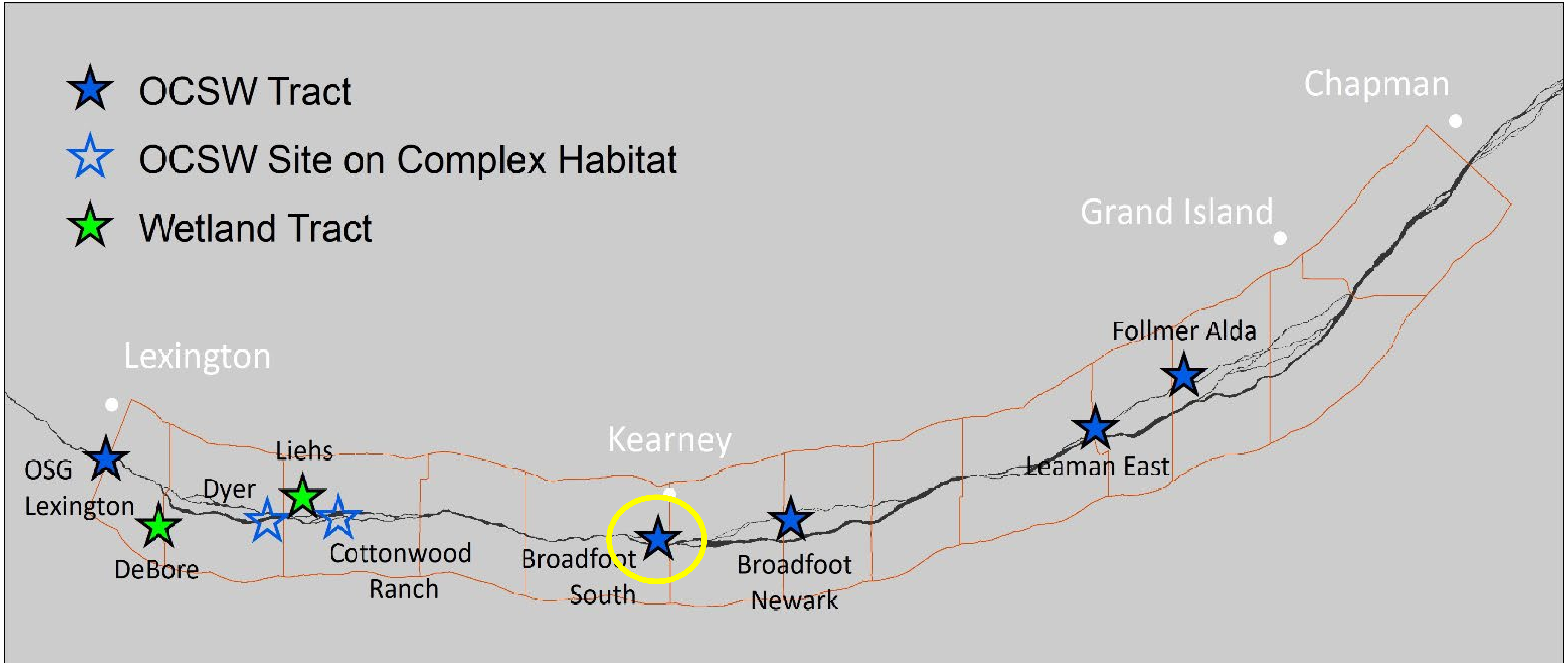
PRRIP Complex Habitat

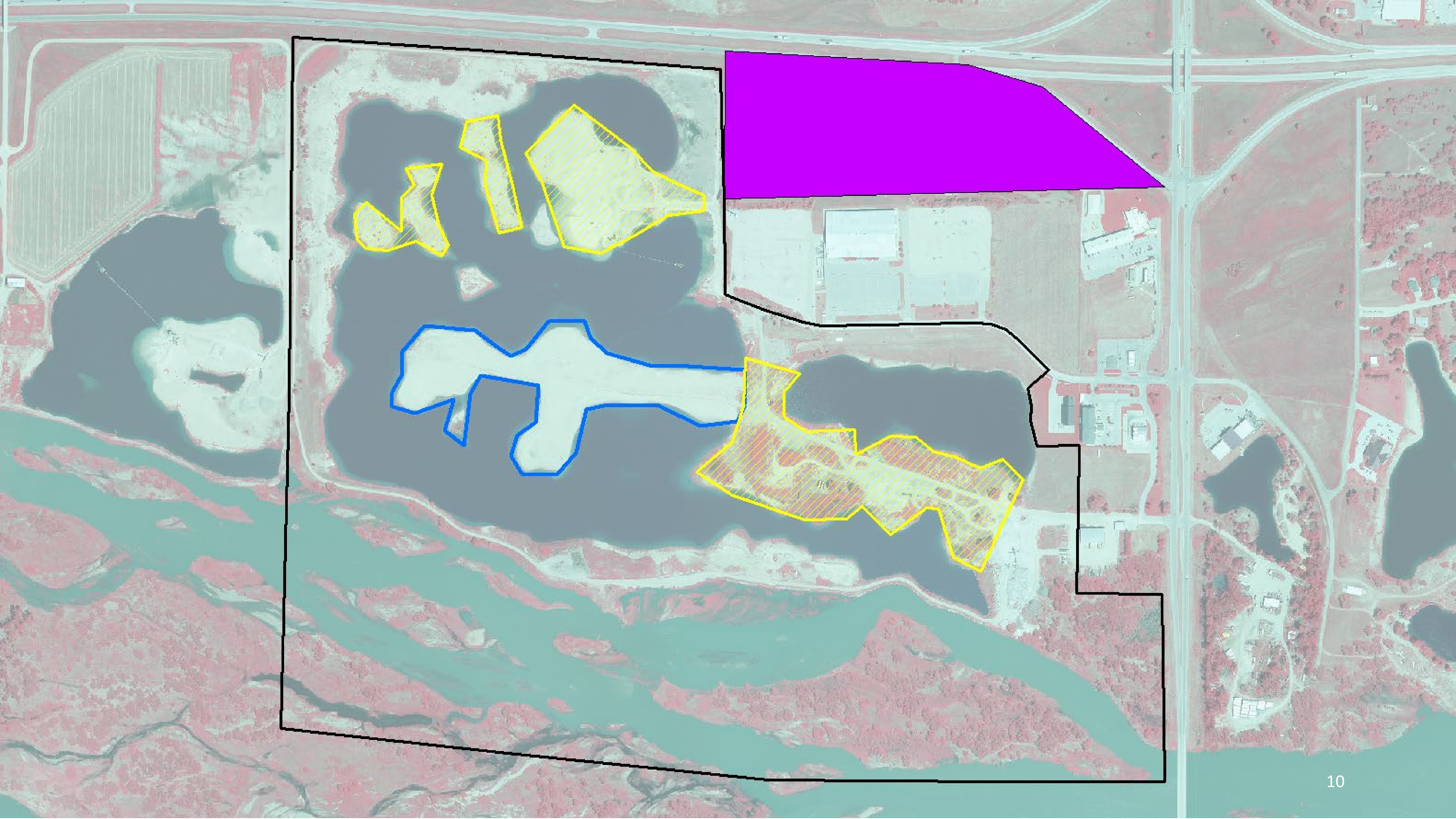






PRRIP Non-Complex Habitat





Thank you & questions!

PRRIP Water Plan Updates

Seth M Turner, PE

PRRIP Water Plan Coordinator

Science Plan Reporting Session

February 24, 2026

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

PRRIP Water Plan Updates - Overview

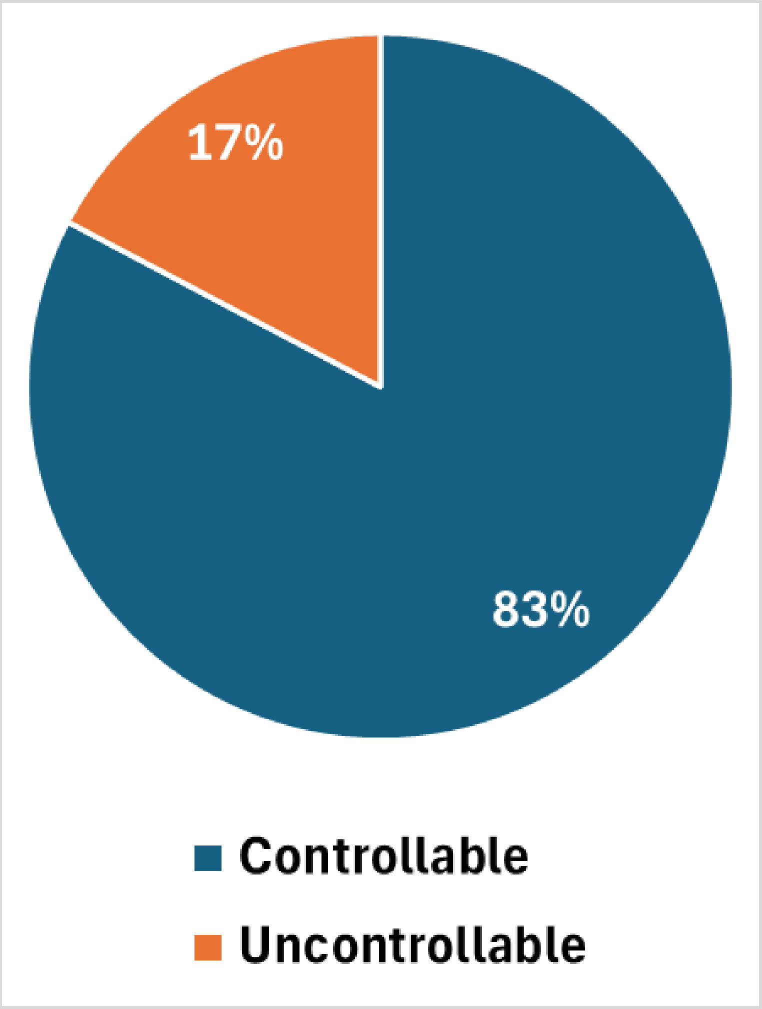
- First Increment water objective
- Water portfolio – how much water do we have?
- Water management – how much control do we have?
    - EA water (controllable) - uses and constraints
    - Groundwater recharge (uncontrollable) and recapture wells (controllable)
- Water plan – what comes next?

PRRIP First Increment Water Objective

- 2006 Program Document
  - "The Program's First Increment water objective is to provide water capable of reducing shortages to FWS target flows by an average of 130,000-150,000 acre-feet per year."
- 2017 Addendum to the Program Document – First Increment Extension
  - "The Program is committed to achieving the minimum water milestone of 130,000 acre-feet in annual reductions to target flow shortages."
    - Fiscal constraints
    - Scientific investigations need to…confirm the need for 130,000 acre-feet…
  - "The Program will invest in the resources available to achieve at least 120,000 acre-feet in annual reductions to target flow shortages as quickly as possible during the Extension and will also invest in the science necessary to determine if the additional 10,000 acre-feet is justified."
  - "The Program is committed to finding the additional resources necessary to achieve that additional 10,000 acre-feet if justified by the science."

PRRIP Water Portfolio – Active Projects

Project Name	Controllable?	Approved or Estimated Score (AF)
Storage Water Projects		
Lake McConaughy EA & Pathfinder EA	Yes	70,000
No-Cost Net Controllable Conserved Water*	Yes	260
Pathfinder Municipal Account Lease*	Yes	6,350
CPNRD Surface Water Lease*	Yes	11,000
NPPD Surface Water Lease*	Yes	2,600
Recharge and Recapture Projects		
Tamarack Recharge	No	10,000
Phelps County Canal Recharge*	No	2,700
Elwood Reservoir Recharge*	No	2,800
Cottonwood Ranch Recharge*	No	2,700
NPPD Canal Recharge*	No	900
Recapture Wells*	Yes	1,300
	TOTAL =	**110,610**
*Water Action Plan Project		



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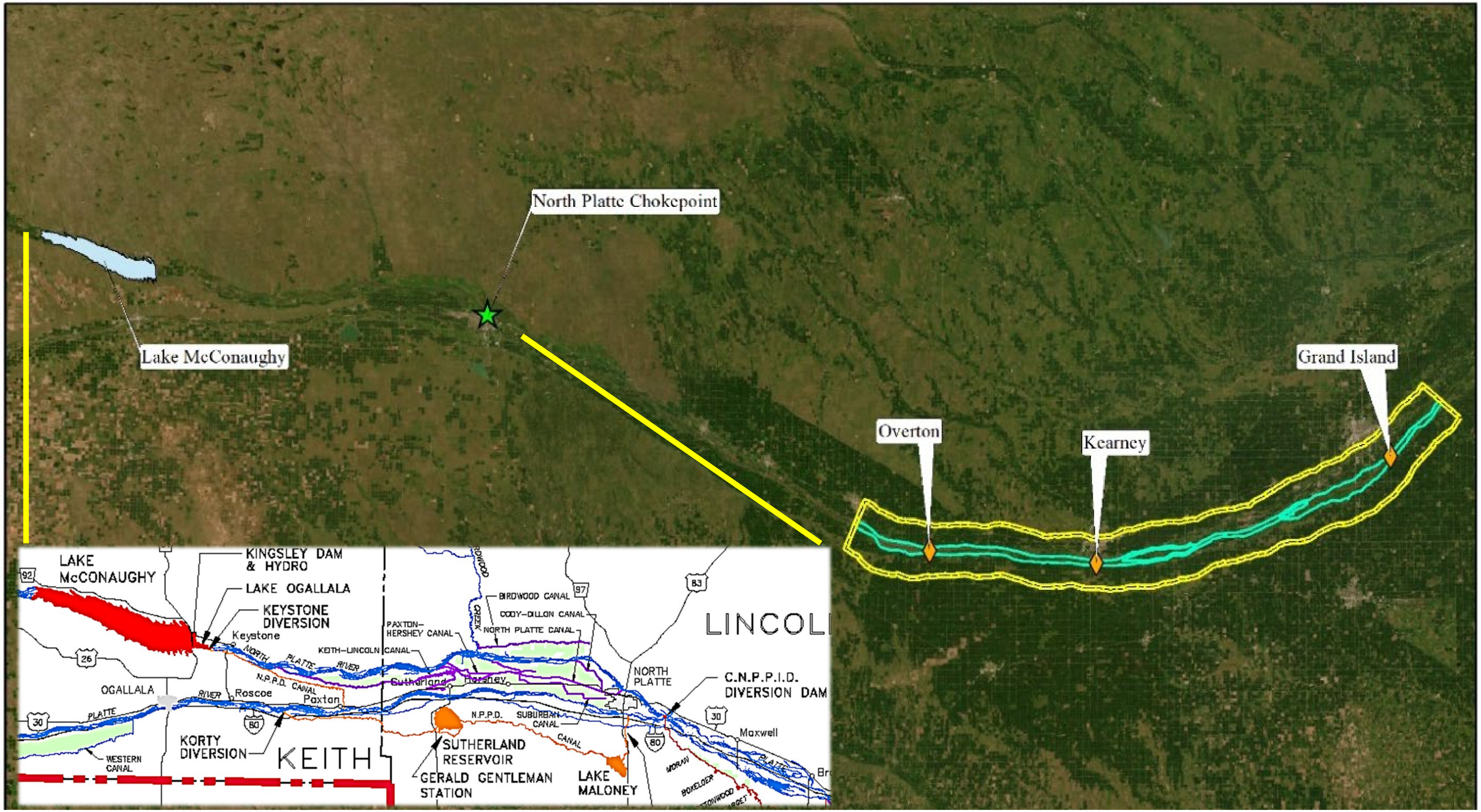
“Score” is metric for assessing progress towards First Increment Water Objective

PRRIP Water Plan - Geography



Inset map source: CNPPID

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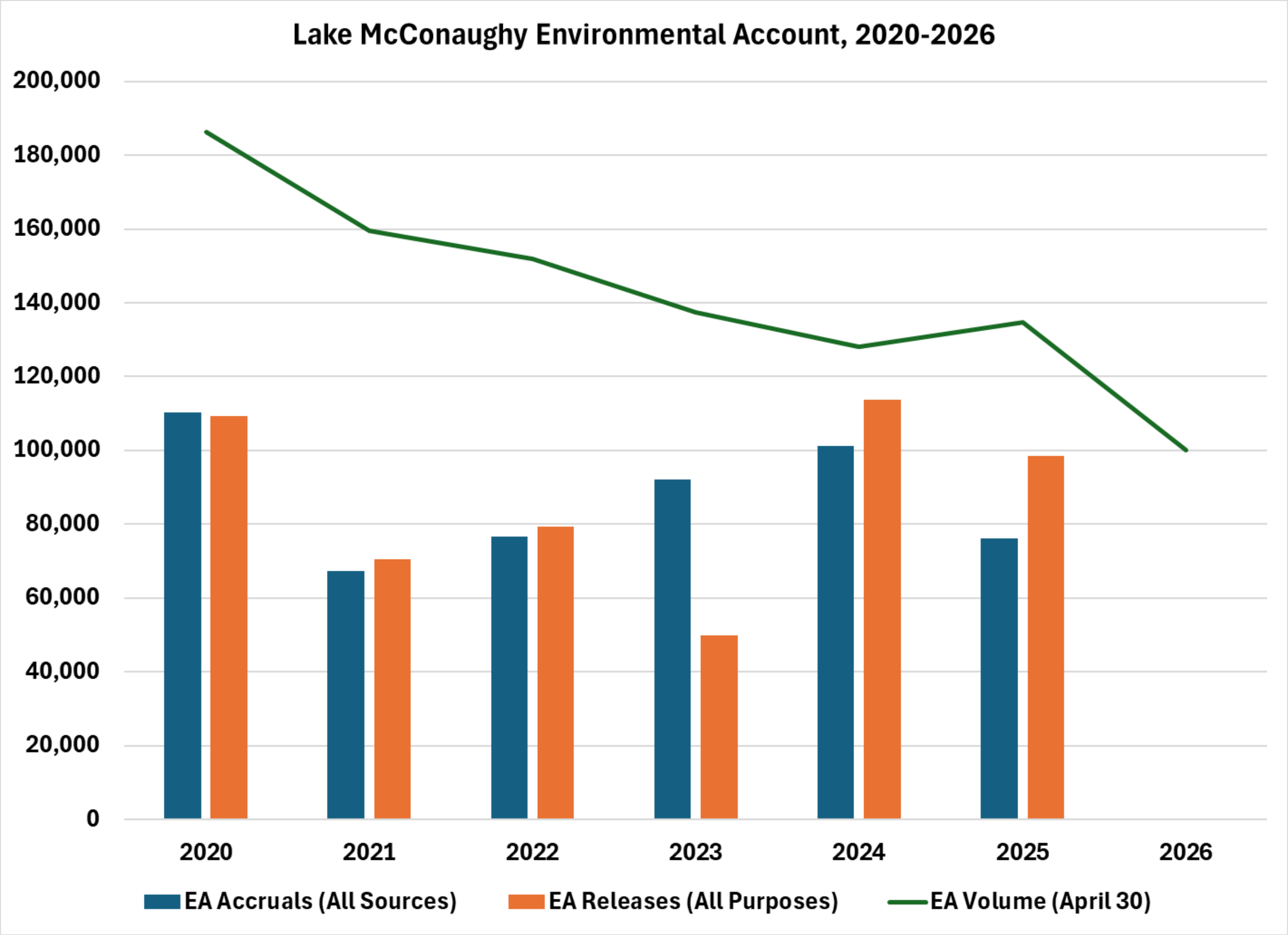
Controllable Water – Lake McConaughy EA



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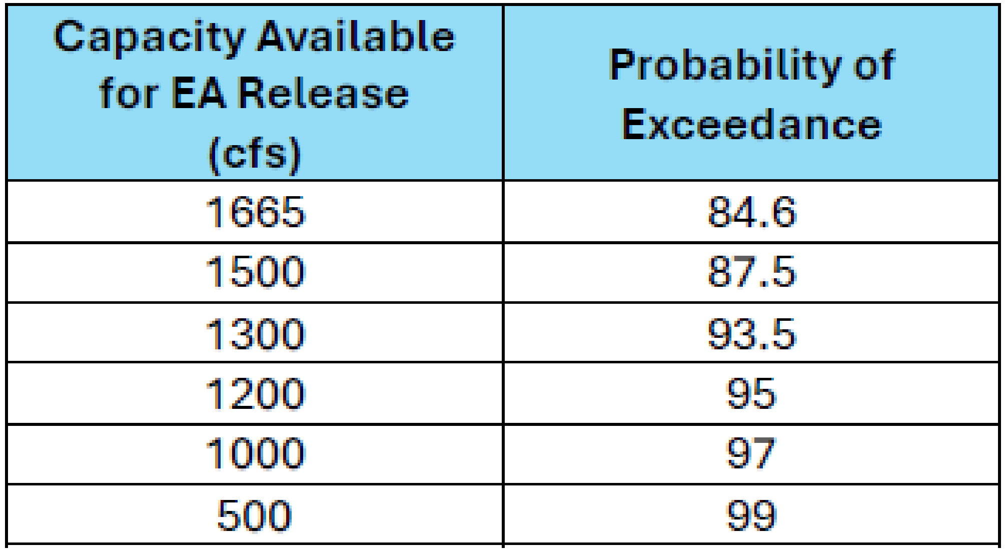
Controllable Water – EA Releases, 2020-2025

Release Dates	Purpose	Average Rate (cfs)	Volume Released (AF)
2020			
February 17-March 2	Channel maintenance, wet meadow recharge	267	7,942
April 29-May 3, May 8-June 2	Channel and habitat maintenance and rehabilitation	827	50,862
June 11-July 12	Germination suppression	457	29,036
July 13-July 24	North Platte Chokepoint flow test	881	20,961
August 13-15, September 17-18	Cottonwood Ranch recharge first fill tests	51	506
2021			
March 30-April 13	Spring whooping crane migration	420	12,496
May 24, June 2-July 2	Germination suppression	912	57,880
2022			
May 25-June 24	Germination suppression	1,291	79,359
2023			
May 24-June 14	Germination suppression	1,143	49,870
2024			
March 14-April 9	Spring whooping crane migration	667	35,702
May 22-June 23	Germination suppression	1,191	77,950
2025			
May 22-June 21	Germination suppression	1,602	98,509

Controllable Water – EA Release Constraints

- North Platte Chokepoint + NPPD Sutherland Canal
  - ~3,350 cfs combined capacity
  - Capacity for EA water diminishes 3rd week in June through August due to irrigation
- Preferential routing through Sutherland
  - 76% or higher in 4 of 5 years
  - Paths combine at NPR-SPR confluence
  - EA release benefits entire AHR downstream
- Chokepoint capacity limitation
  - June 14-24, 2022 only time EA curtailed
  - EA release still averaged 925 cfs
  - At least 300 cfs unused capacity

- Conveyance Capacity, May 24-June 24
  - Based on Dry/Normal years, 1995-2023



Capacity Available for EA Release (cfs)	Probability of Exceedance
1665	84.6
1500	87.5
1300	93.5
1200	95
1000	97
500	99

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Controllable Water – EA Release Constraints

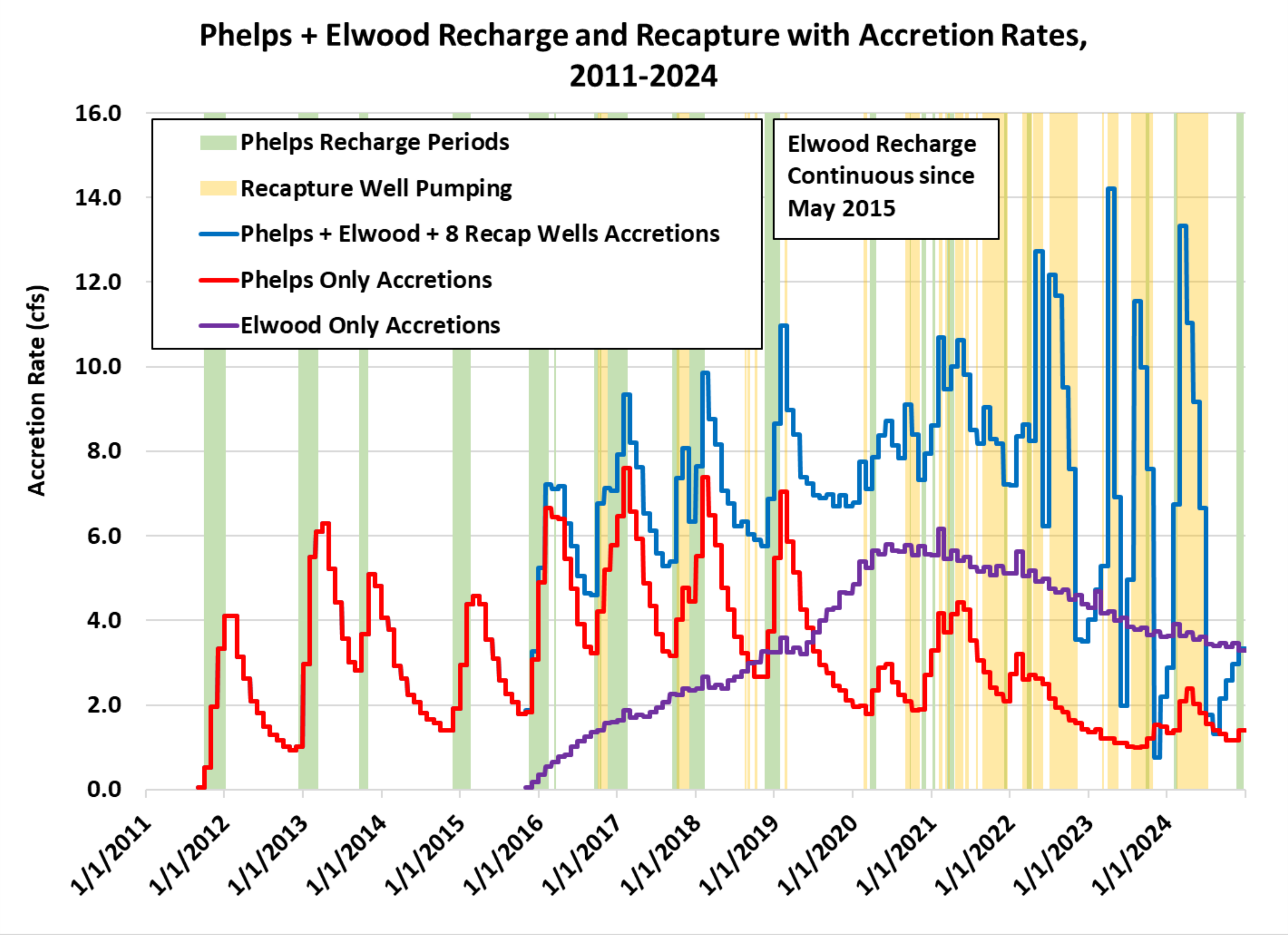
- North Platte Chokepoint
  - Minor potential constraint for current management actions
  - Perspective could change if different flow targets or timing
  - 2023-2024 engineering study identified 2 potential solutions to capacity issues
    - Sediment removal (1.2M CY) = $37M
    - Construct bypass canal = $31M
- Fall CNPPID/NPPD system outages
  - As needed for maintenance
  - Typically between mid-September and mid-November
  - 2018-2019 only EA releases during fall whooping crane migration
- EA managed by USFWS
  - EA Manager must approve all releases
  - USFWS priorities generally aligned with PRRIP

Recharge and Recapture

- Uncontrollable water projects with controllable elements
- Projects retime divertible excess flows
  - Must be declared available by Nebraska DWEE
  - Platte River flow must exceed:
    - USFWS target flow at Grand Island
    - Adjudicated instream flows held by CPNRD/NGPC at 6 locations
  - 80-85% of excess diversions for Program occurred 2011-2019
- Tamarack (Colorado project)
  - 8,074 AFY average deficit reduction credit (2007-2024)
  - Calculated at CO-NE state line, ~150 miles upstream of Overton, ~220 miles upstream of Grand Island
- CNPPID system (south of Platte River)
  - Phelps, Elwood, Cottonwood Ranch recharge
  - 8 recapture wells
- NPPD canals (north of river)
  - Gothenburg and Dawson County

Recharge and Recapture – CNPPID System

- Phelps + Elwood, 2011-2024 totals
  - Recharge = 100,200 AF
  - Accretions + pumping = 55,800 AF
  - Volume in aquifer storage = 44,400 AF
- Net river contribution ~15-30 cfs
- In 2025, pumped more (2,950 AF) than excess diversions (2,678 AF)
  - Caution to not create river depletions



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Water Plan – What comes next?

- Water objective and water portfolio
  - Current score estimate ~110,600 AF
  - Two potential projects get to 120,000 AF
    - Elwood outlet
    - CNPPID storage lease
  - Outcome highly uncertain
- Water management actions – how effective?
  - Evaluation of germination suppression in progress (EBQ #1 and #2)
    - Directly related to EA releases
  - Evaluation of whooping crane use vs flow (EBQ #4, #5, #6)
    - Analysis primarily involving natural flow conditions
    - Infrequent migration season EA releases included in dataset

Whooping Crane Monitoring

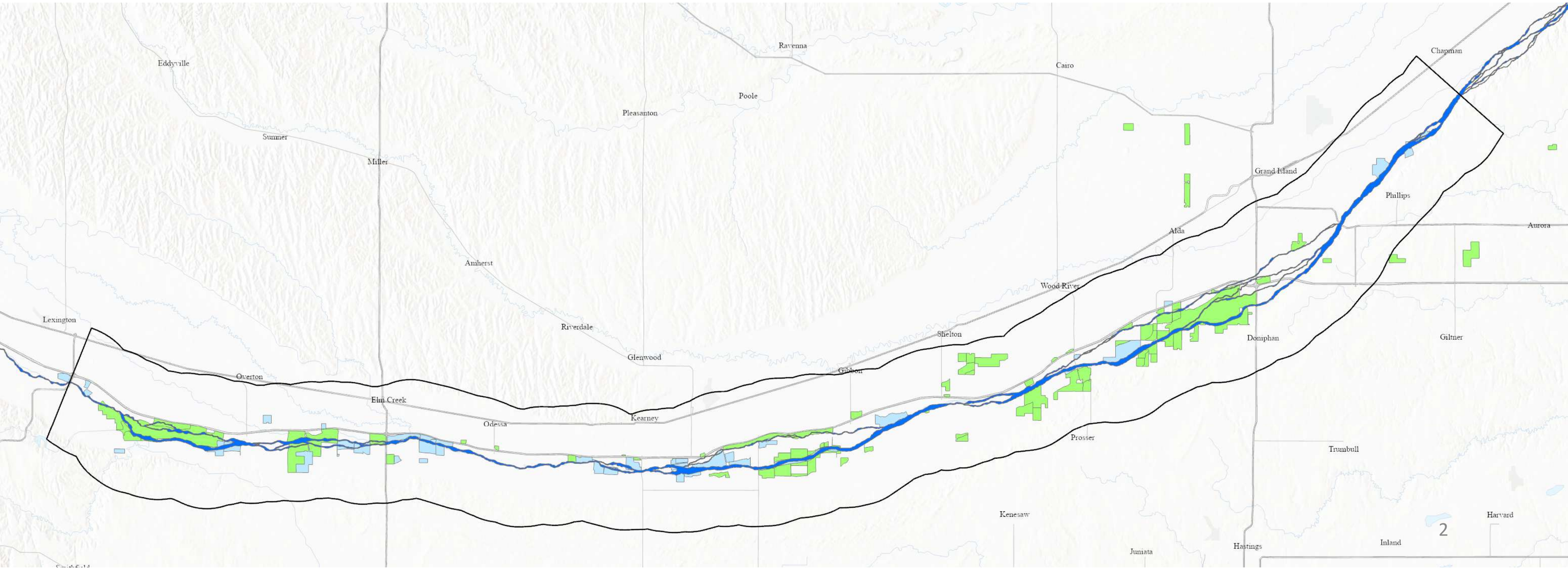
Ethan Ideus, PRRIP EDO

2026 Science Plan Reporting Session, February 24, 2026

Colleen Childers

Program Management Objective

- Improve & maintain stopover habitat



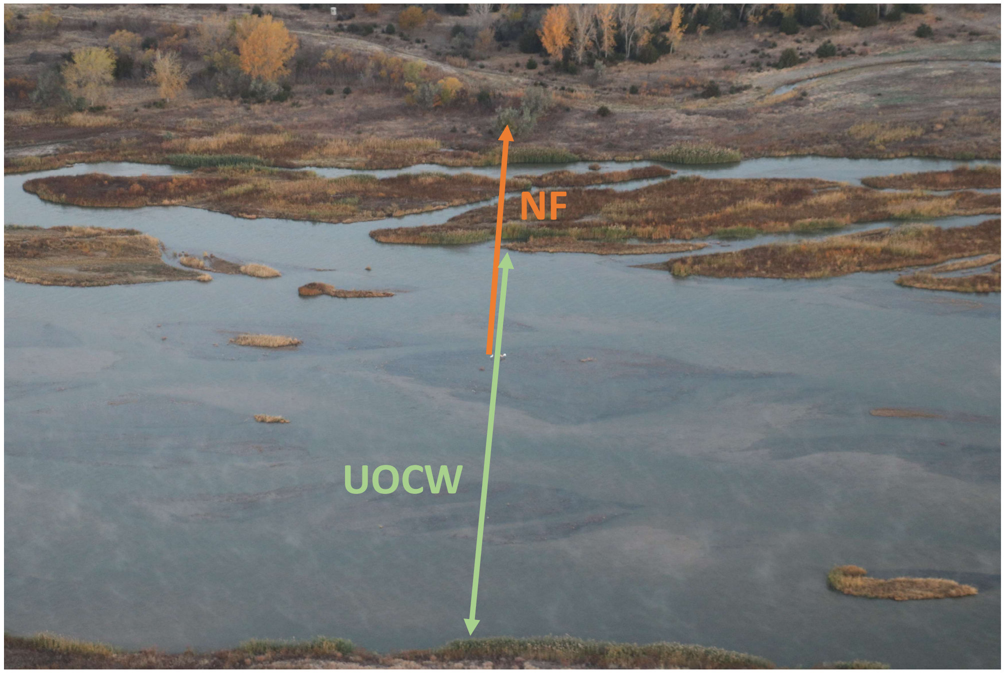
Methods

- Aerial monitoring
    - Two flights per morning
    - Systematic transects
- Ground monitoring

Monitoring Data

- Whooping crane use locations
- Habitat metrics
  - Discharge
  - Unobstructed channel width & nearest forest
- Stopover metrics
  - Proportion
  - Crane use days

Monitoring Data

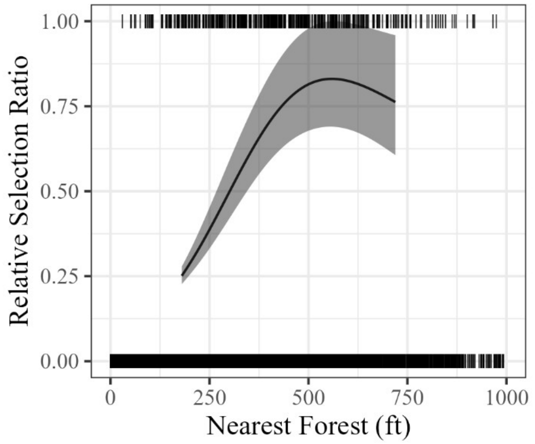


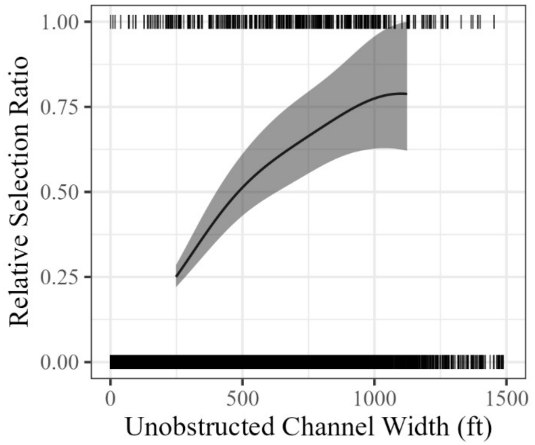
- Whooping crane use locations
- Habitat metrics
  - Discharge
  - Unobstructed channel width (UOCW) & nearest forest (NF)
- Stopover metrics
  - Proportion
  - Crane use days

Program Management & Policy Decisions

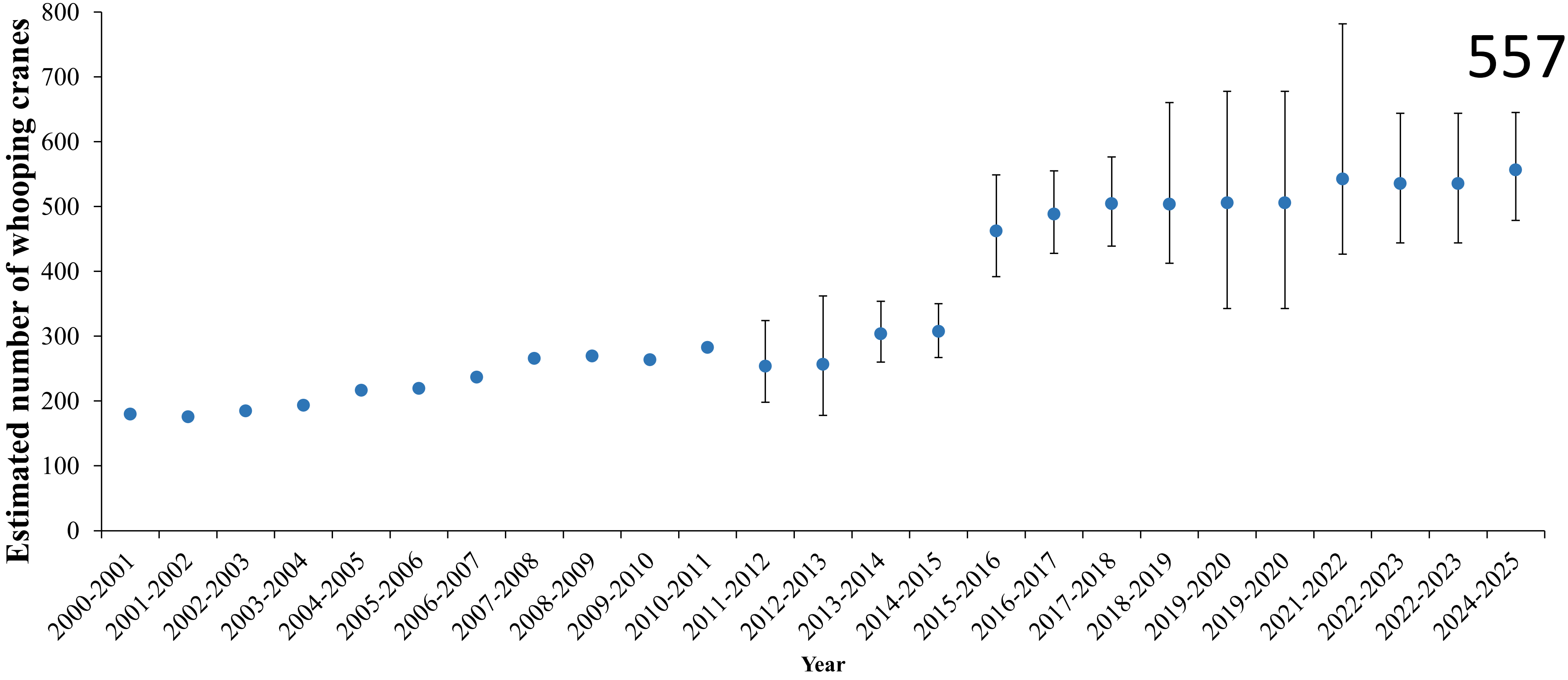
- Roost Site Selection & Diurnal Use Site Selection Analyses

- Habitat management goals



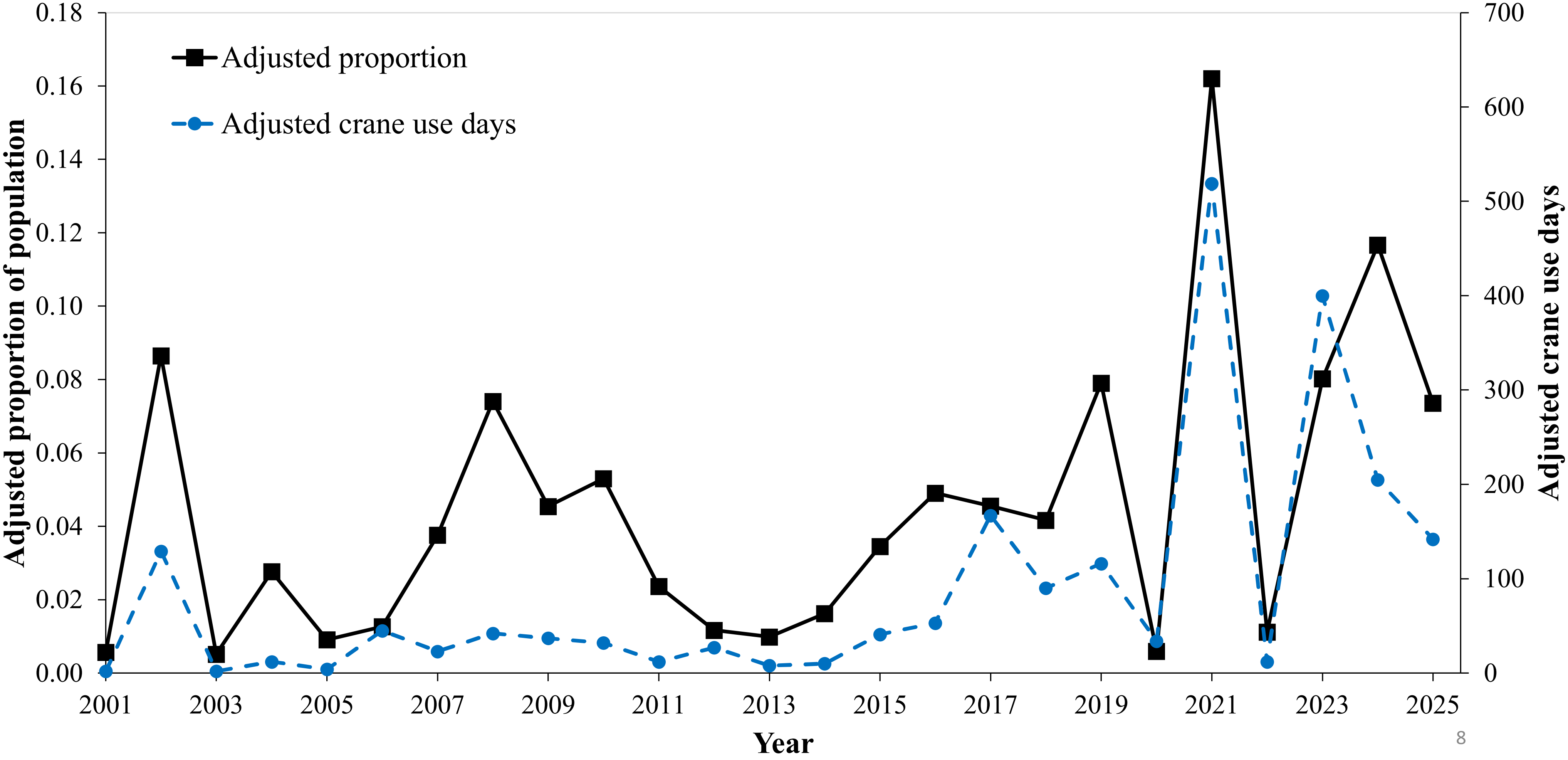


USFWS Population Census

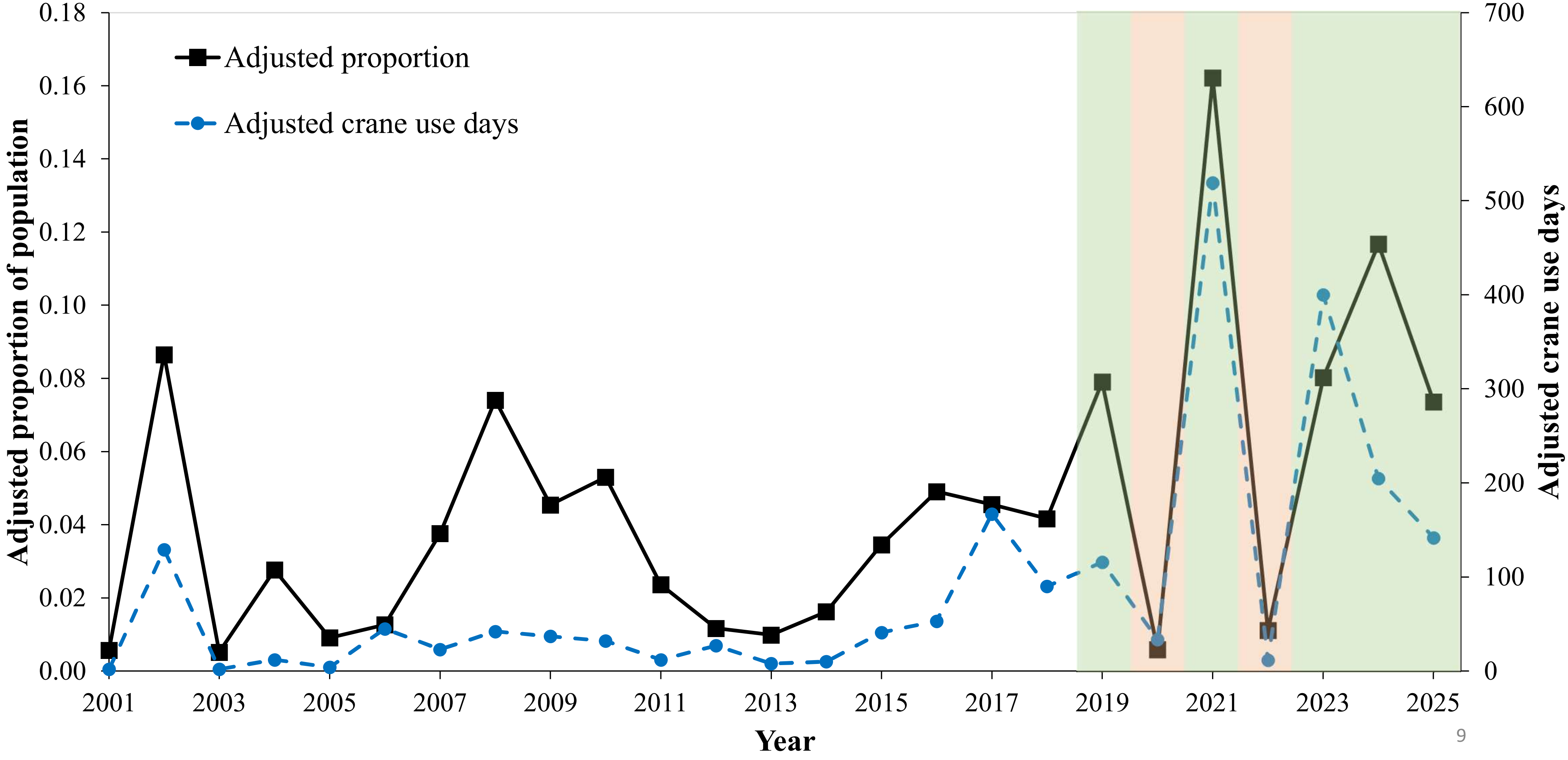


557

Stopover Metrics - Fall



Stopover Metrics - Fall



Stopover Patterns

What have we seen?

- Annual variability
- Larger groups
- Later fall arrivals & earlier spring arrivals

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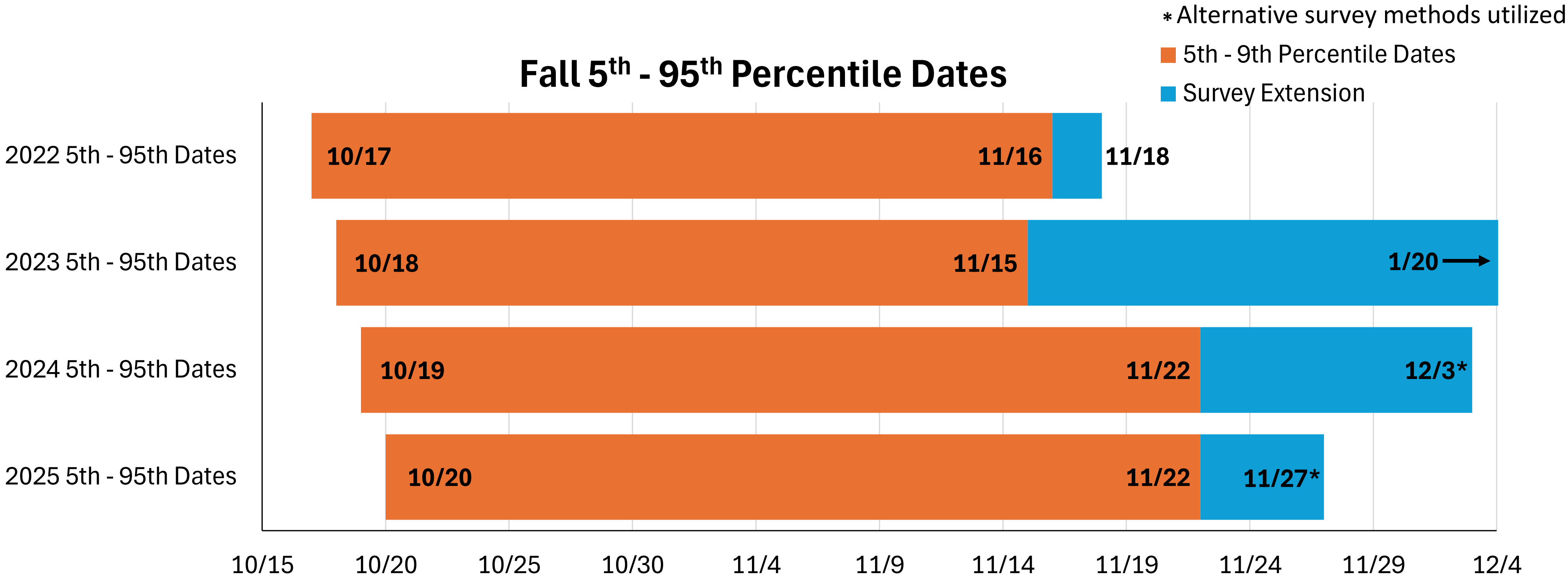
Adjustments



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Questions & Feedback

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Target Species – Piping Plover and Least Tern

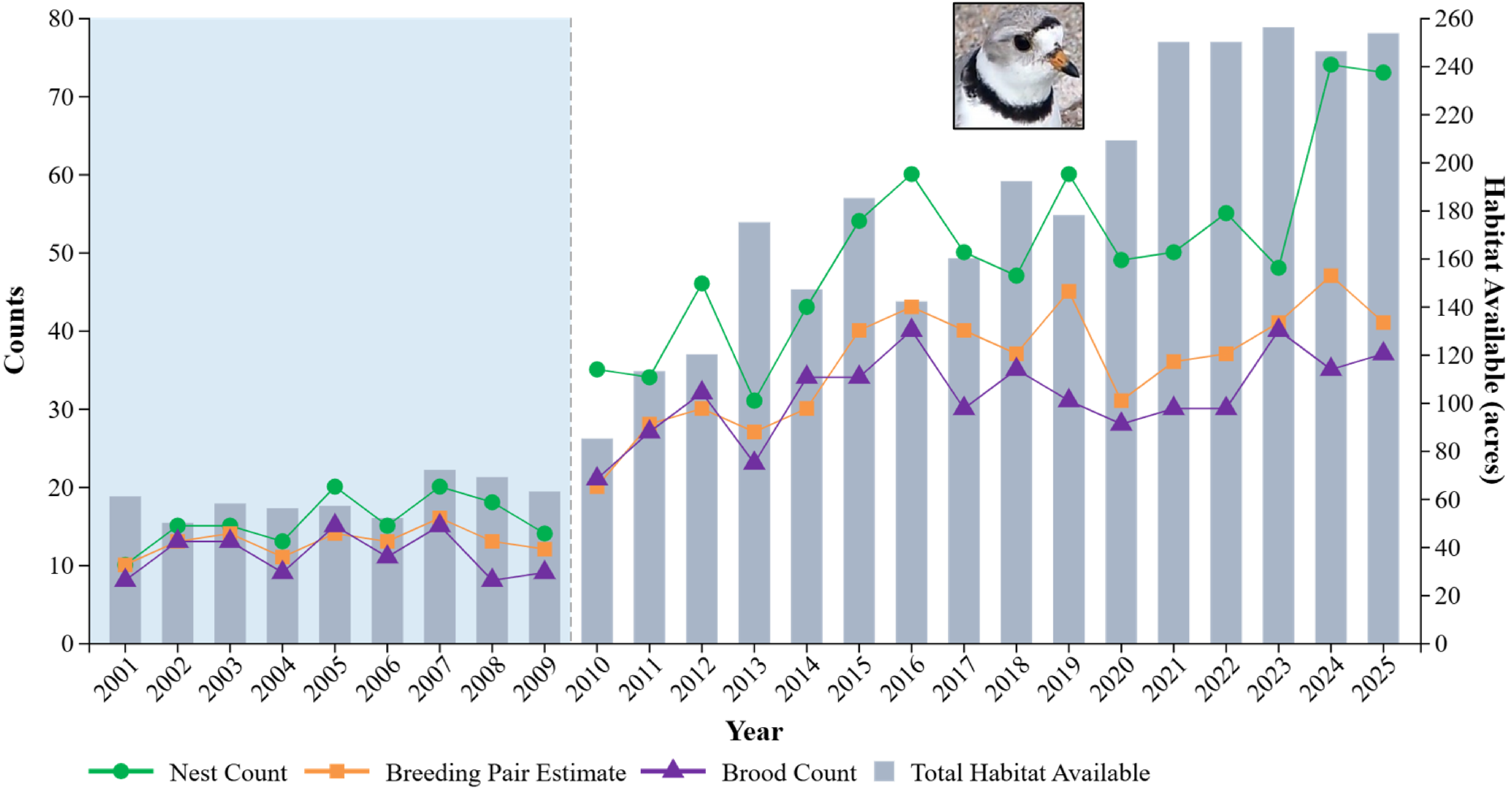
Alyx Vogel, PRRIP EDO

Long-term monitoring

- Document numbers of adults, nests, chicks, and fledglings
- On- and off-channel
- Collect nest habitat metrics
    - Design habitat based on metrics

Methods

- River Surveys
- OCSW Site Surveys


Counts
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10
20
30
40
50
60
70
80
Habitat Available (acres)
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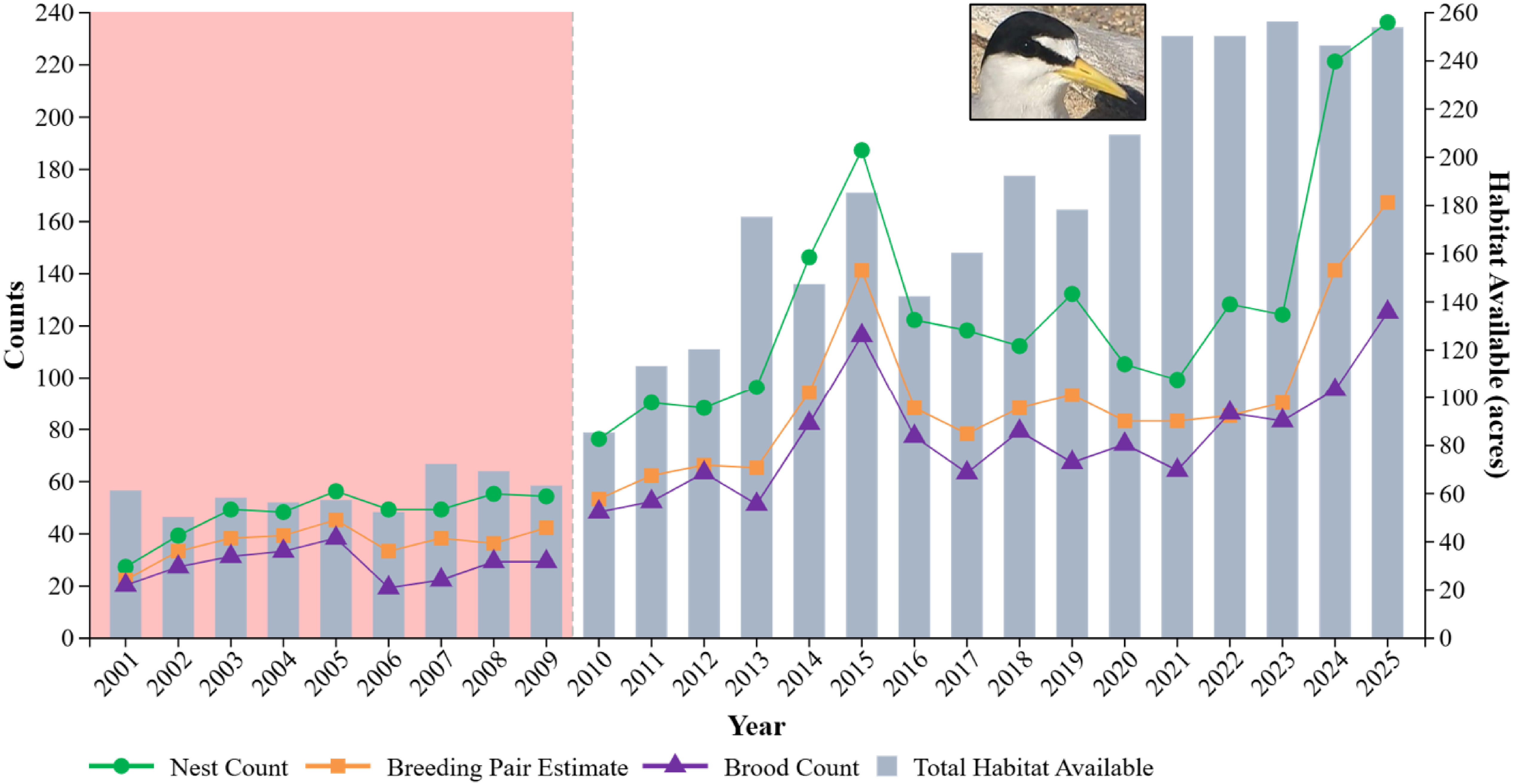
Year
Nest Count
Breeding Pair Estimate
Brood Count
Total Habitat Available


Counts
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Habitat Available (acres)
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Year
Nest Count
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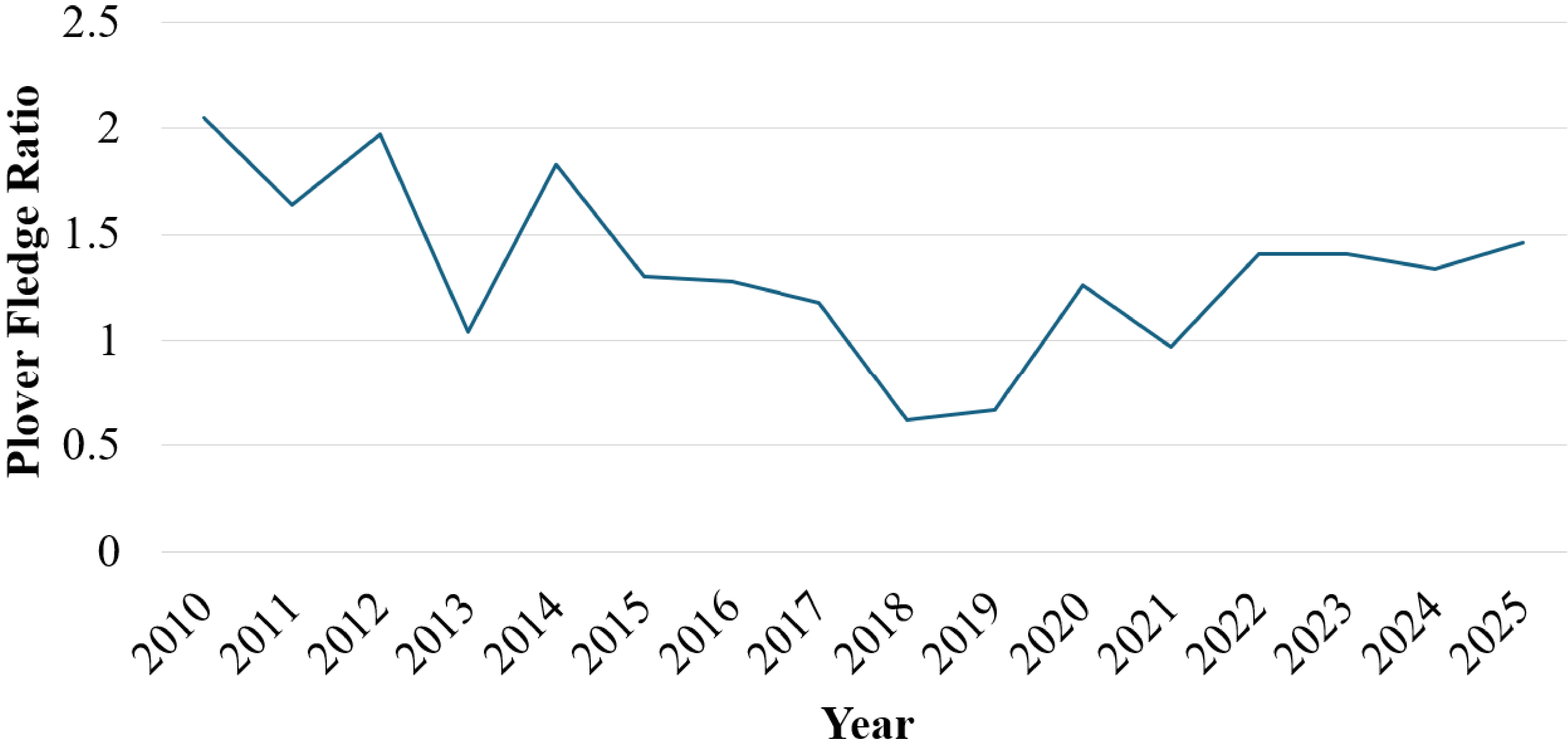
Brood Count
Total Habitat Available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Plover Fledge Ratio
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2011
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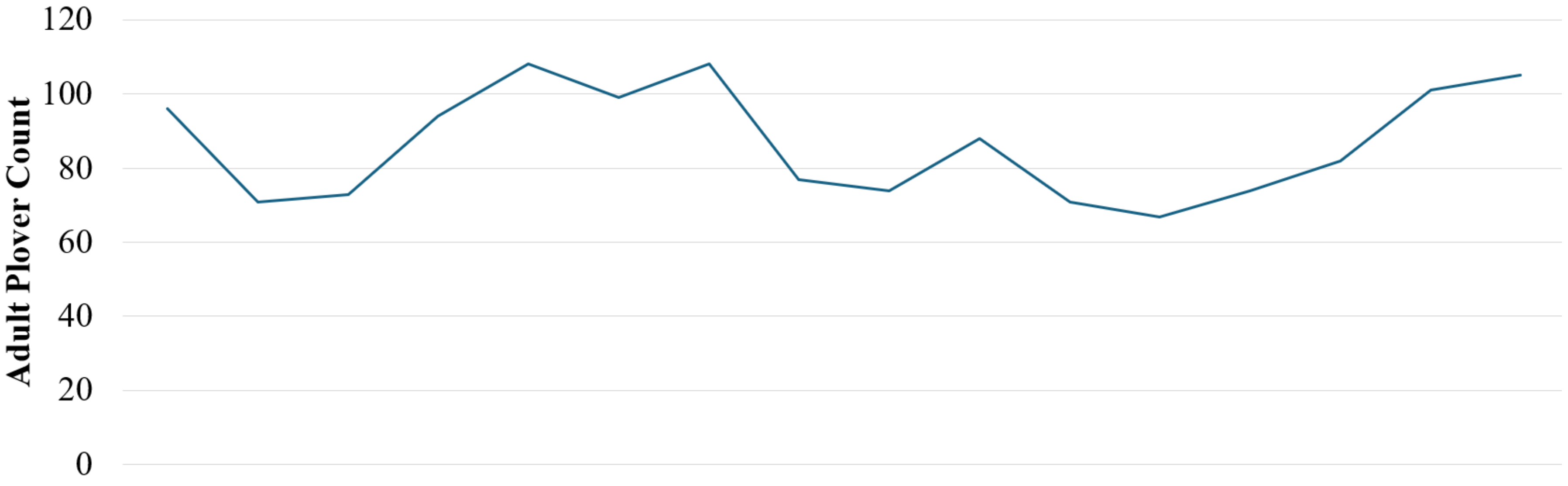
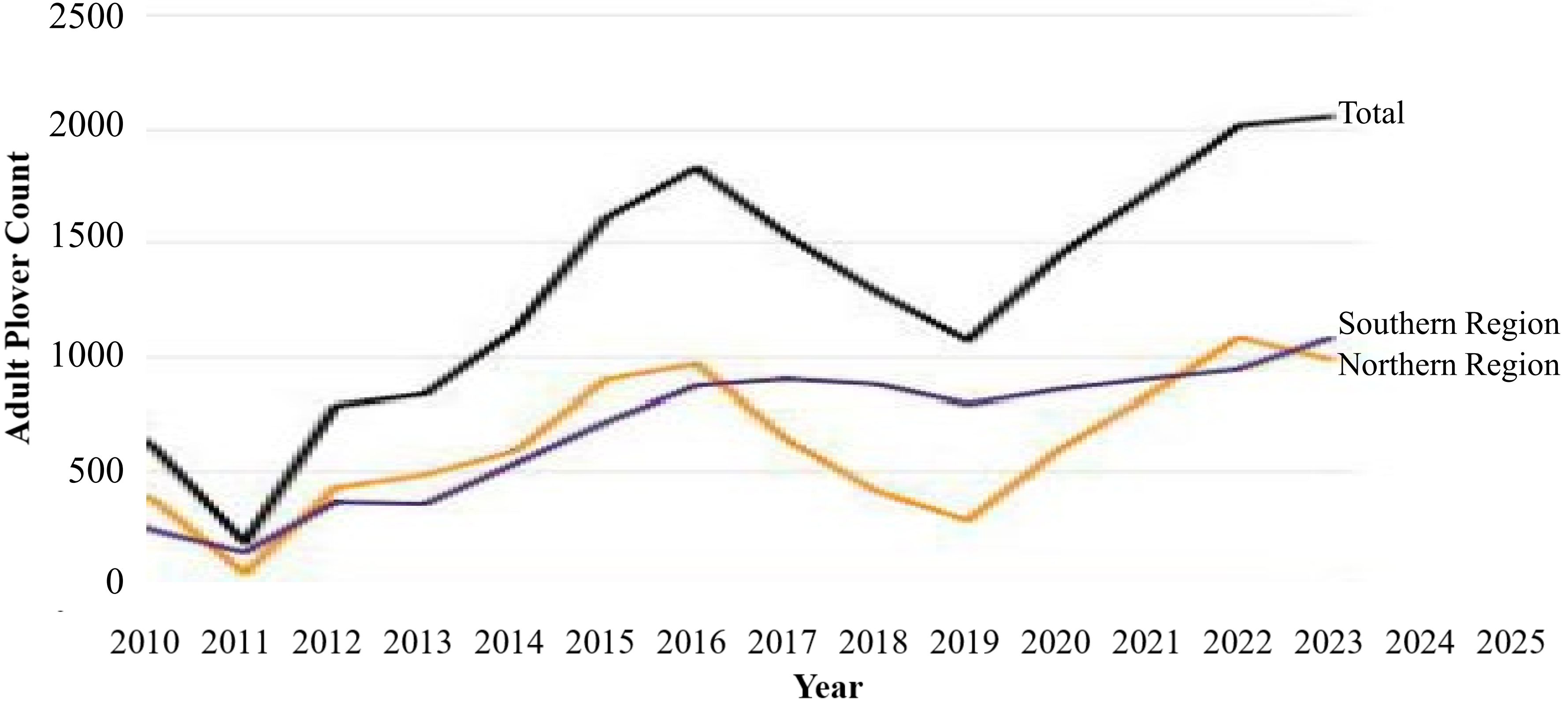
2024
2025
Year

PRRIP – central Platte River

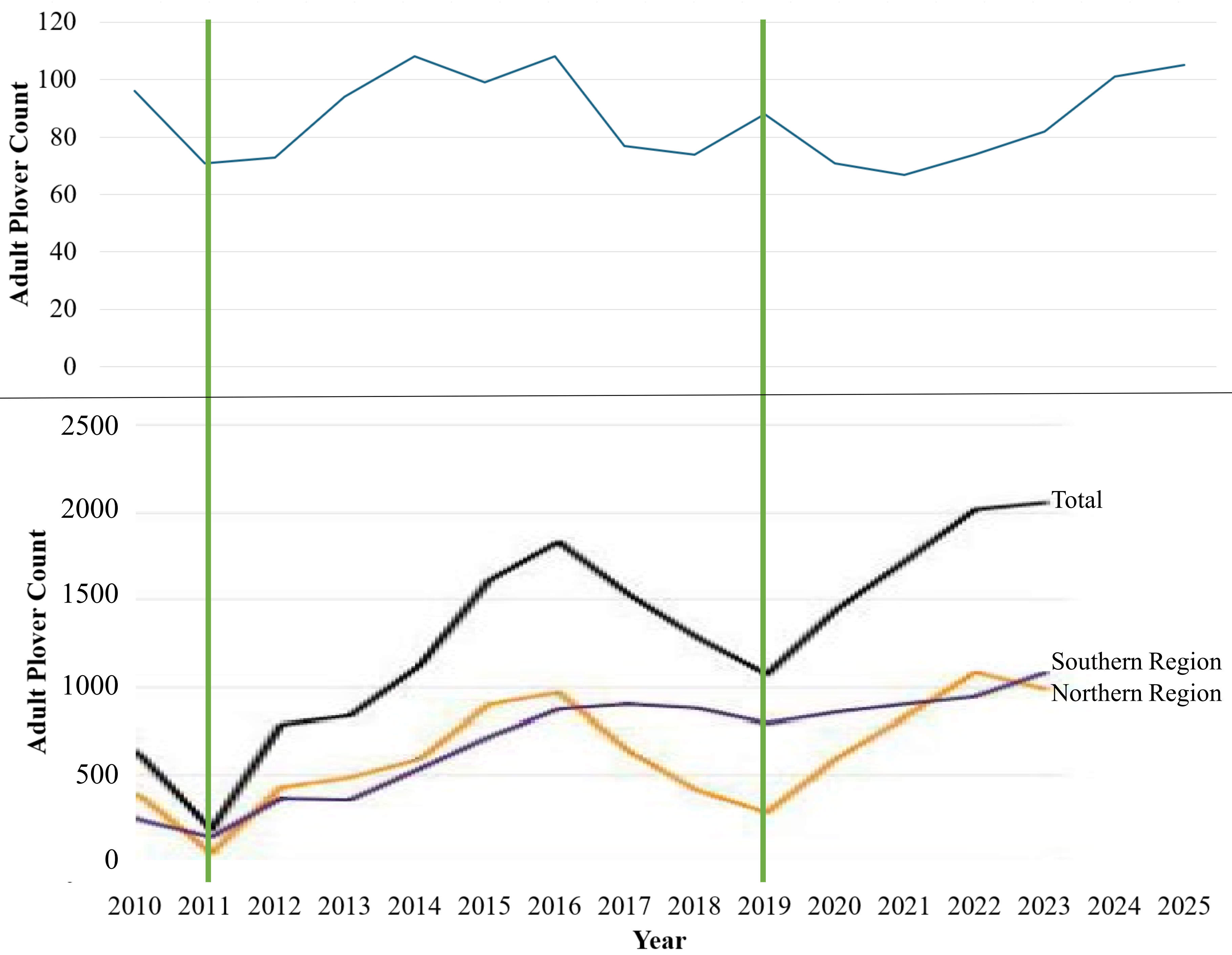


MRRP – Missouri River

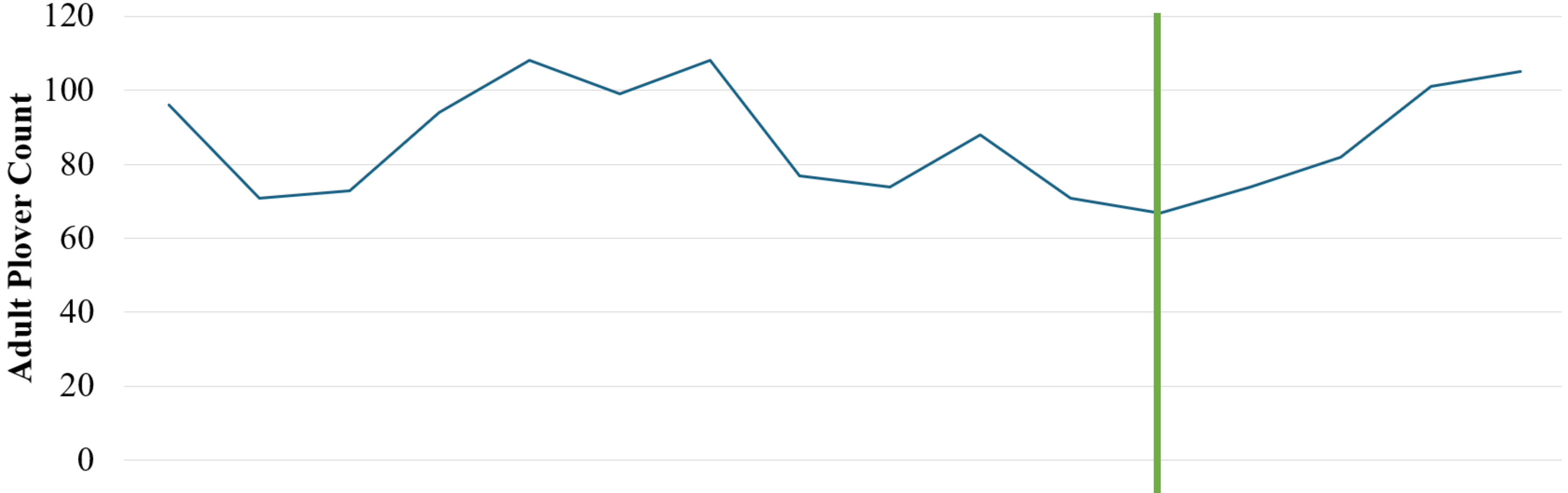


PRRIP – central Platte River

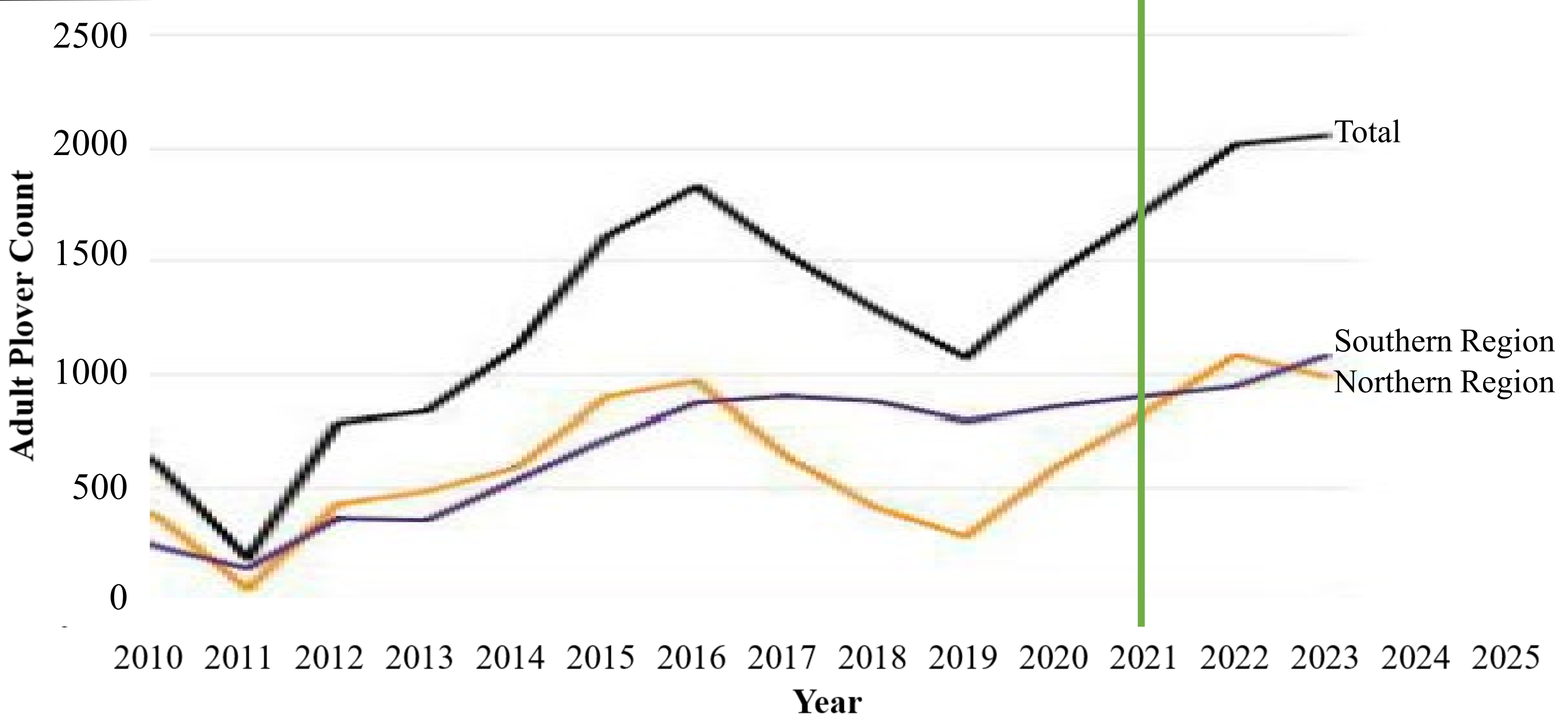
MRRP – Missouri River



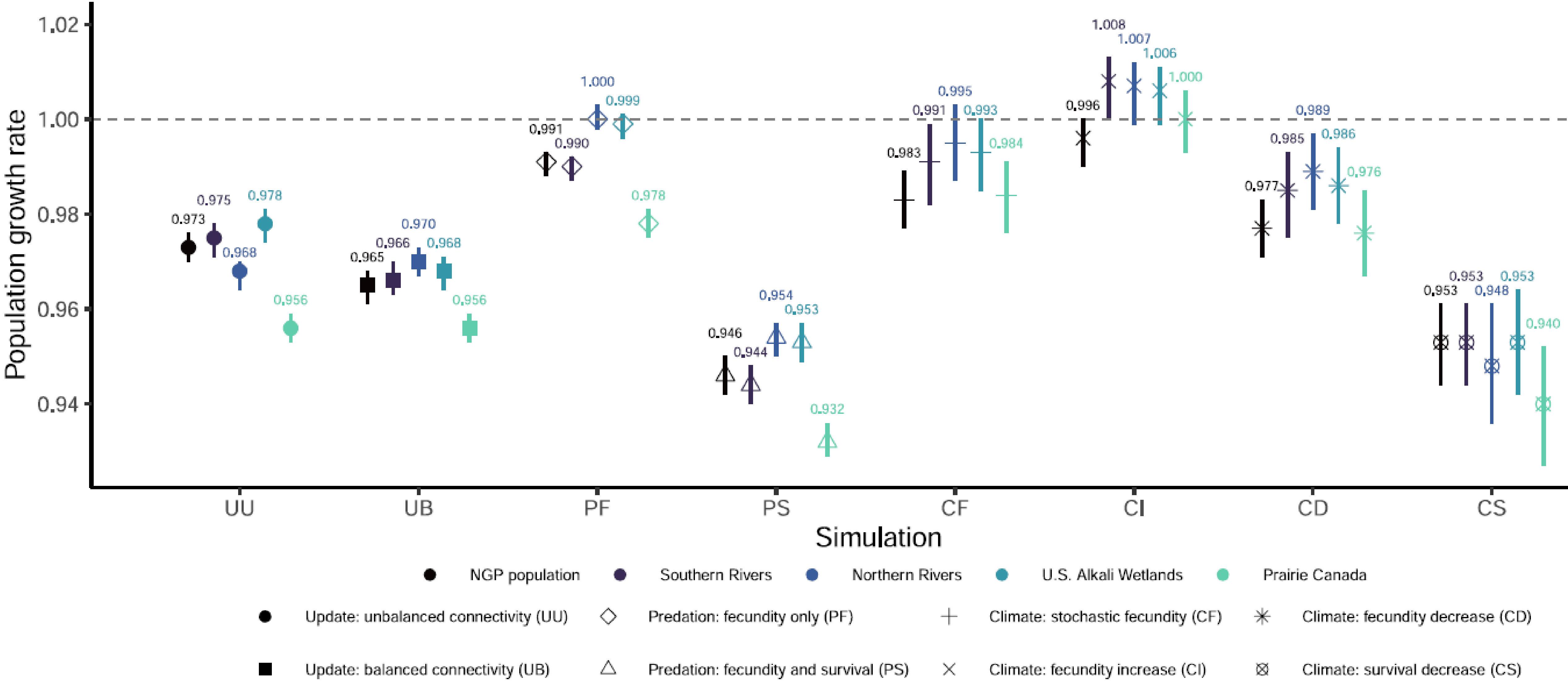
PRRIP – central Platte River



MRRP – Missouri River



USFWS Status Update with Swift et al. 2023 Modeling



Questions?

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RECOVERY IMPLEMENTATION PROGRAM

UNL Pallid Sturgeon Research 2022-2025

Mark Pegg, Jonathan Spurgeon, Jenna Ruoss, Chris Pullano

2026 Science Plan Reporting Session

Malinda Henry – Science Plan Coordinator

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Pallid Sturgeon Monitoring within the Lower Platte River - 2022-2025

Monitoring Methods

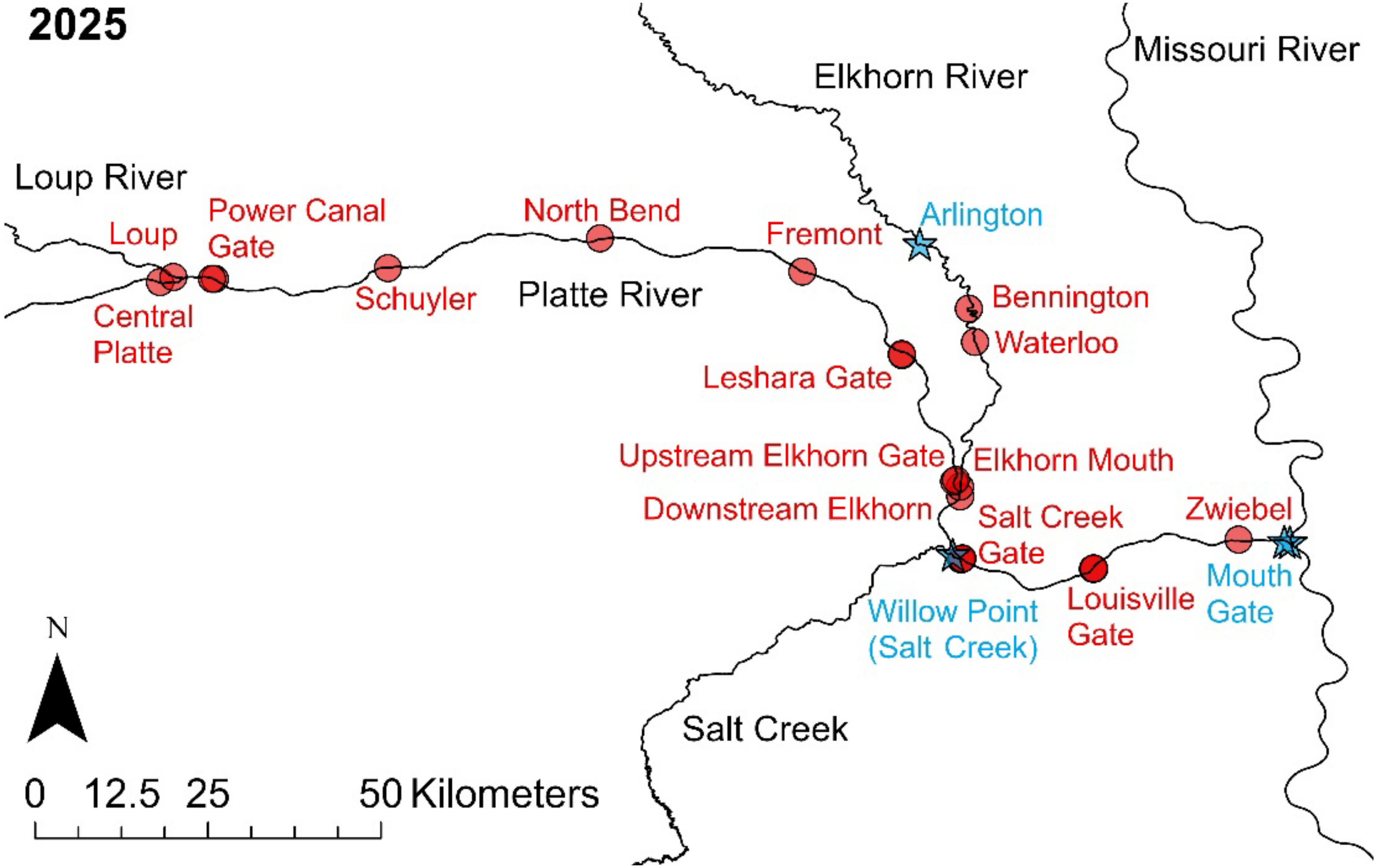
- Capture/Tagging
  - 41 new trackable PS

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM

Pallid Sturgeon 2022-2025

Monitoring Methods

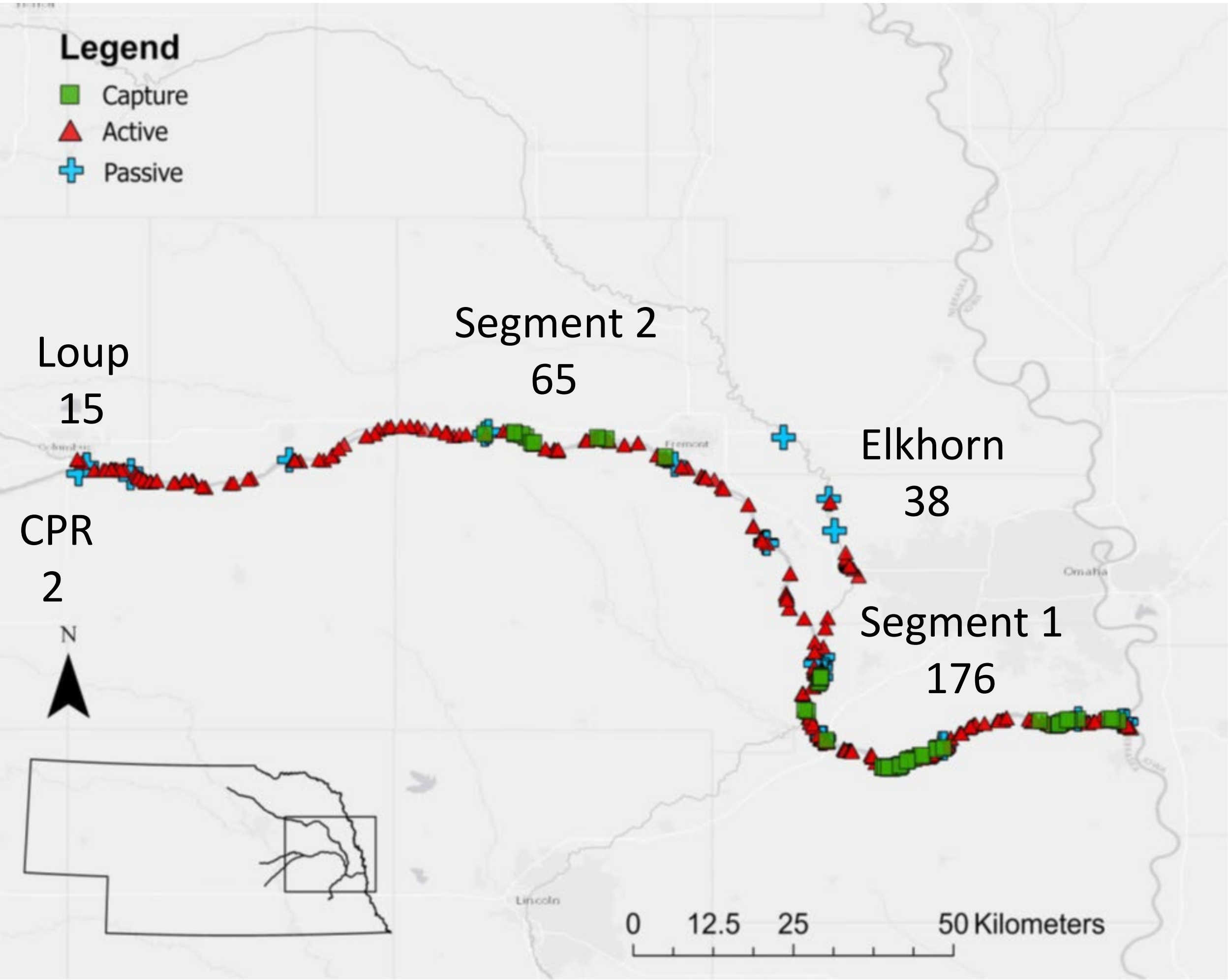
- Capture/Tagging
- Passive receivers
- Active tracking



Pallid Sturgeon 2022-2025

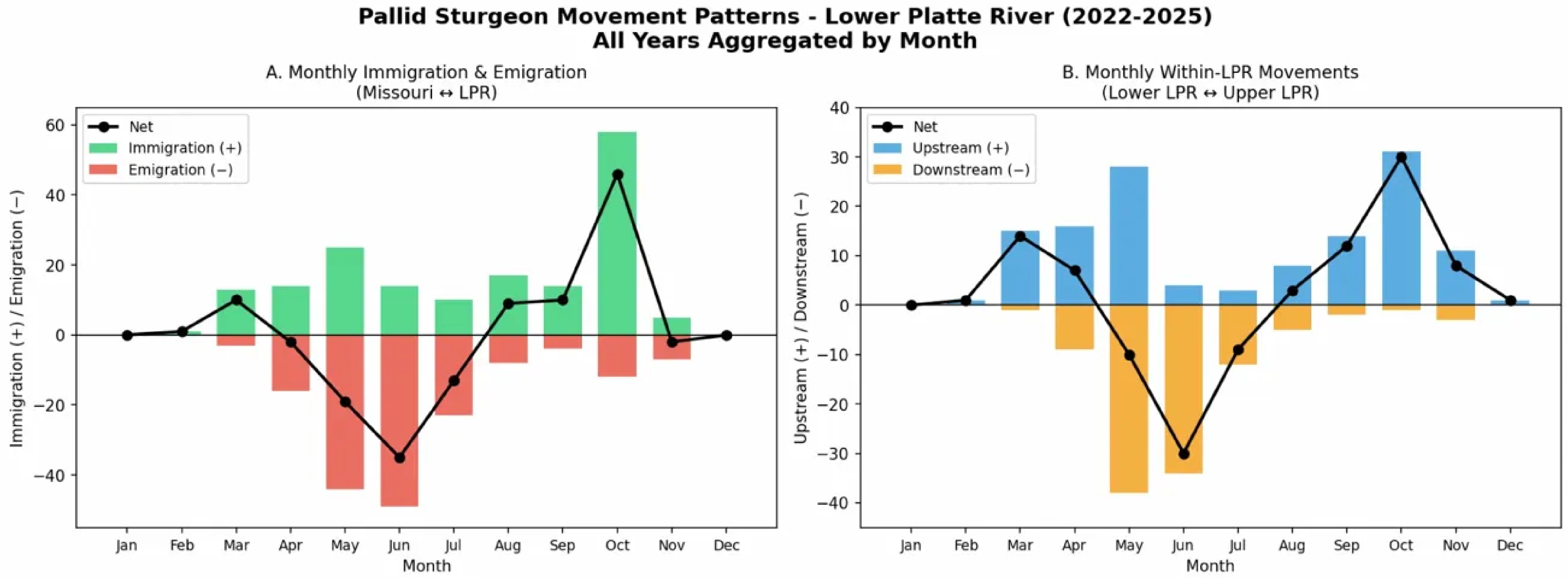
- 179 individuals in lower Platte system
  - ~30% of total tagged in Lower Missouri
  - 68% hatchery
  - 13% wild
  - 19% of unknown origin

Pallid Sturgeon 2022-2025



Segment	Unique PS
Platte (Elkhorn to Missouri) Segment 1	176
Platte (Loup to Elkhorn) Segment 2	65
Elkhorn	38
Loup	15
Central Platte	2

Pallid Sturgeon 2022-2025



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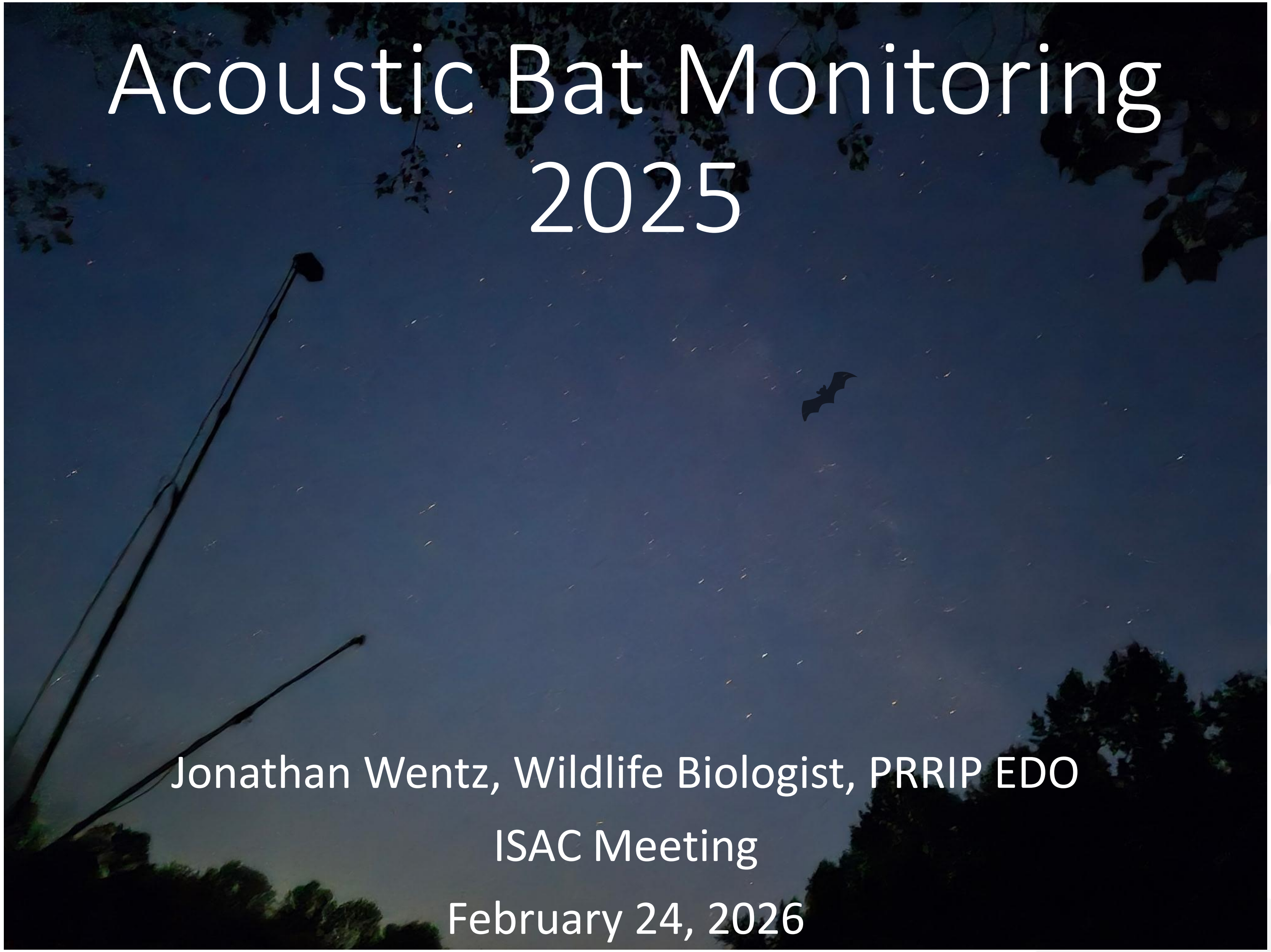

Acoustic Bat Monitoring 2025

Jonathan Wentz, Wildlife Biologist, PRRIP EDO

ISAC Meeting

February 24, 2026

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Purposes

- Consultation required prior to tree removal or bridge/culvert work
- Benefits to other species without taking away from target species
- Proactive baseline across the AHR

Northern long-eared bat

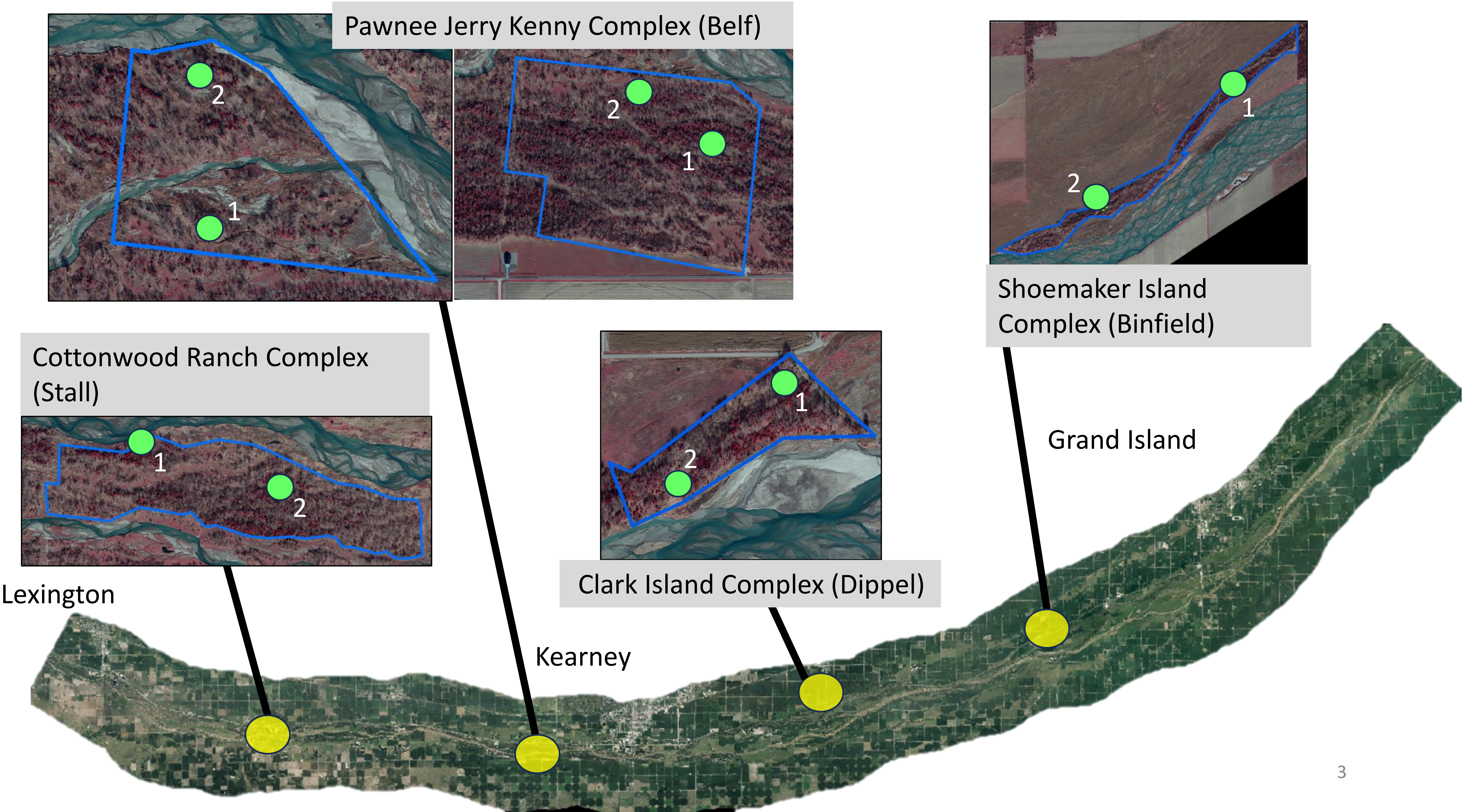
Listed
Endangered 2022

Tricolored bat

Proposed
Endangered 2022

Photos from: Joe Szewczak and John Chenger

2025 Survey Sections



Pawnee Jerry Kenny Complex (Belf)

Shoemaker Island Complex (Binfield)

Cottonwood Ranch Complex (Stall)

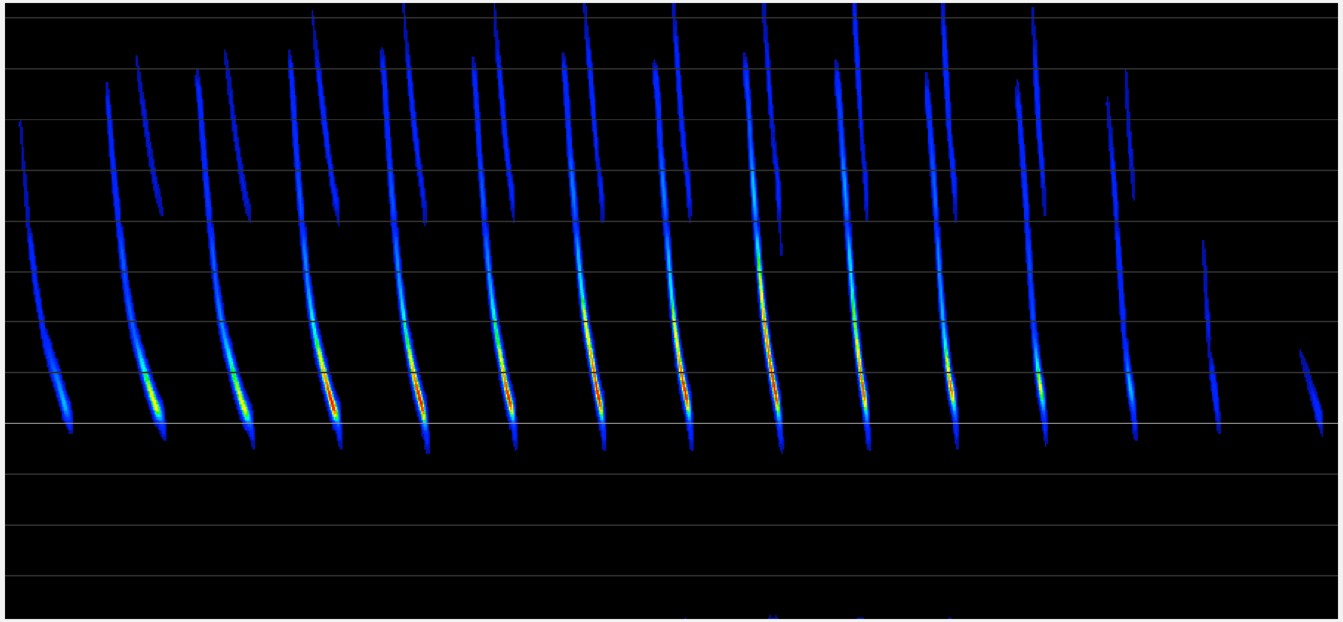
Clark Island Complex (Dippel)

Effort

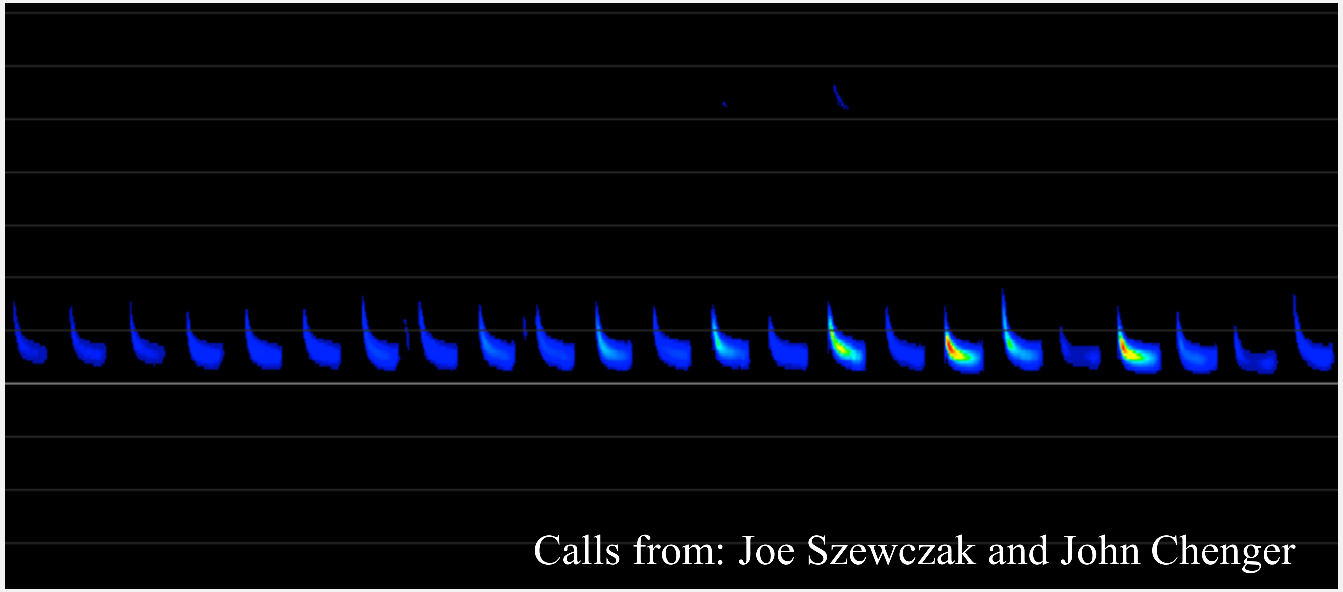
Section	Location	Start date	End date	Valid detector nights
Stall	1	10-Jun	22-Jul	11
	2	10-Jun	22-Jul	14
Dippel	1	23-May	20-Jun	8
	2	23-May	20-Jun	11
Pawnee SW	1	15-May	6-Jun	7
	2	6-Jun	3-Jul	9
Pawnee NW	1	3-Jul	21-Jul	5
	2	21-Jul	15-Aug	12
Binfield	1	1-Jul	6-Aug	16
	2	1-Jul	6-Aug	13

Species identification process

- Auto identified with SonoBat and Kaleidoscope Pro
- Manual vetting requirements
  - Vet calls of target species regardless of P-values



Northern long-eared bat

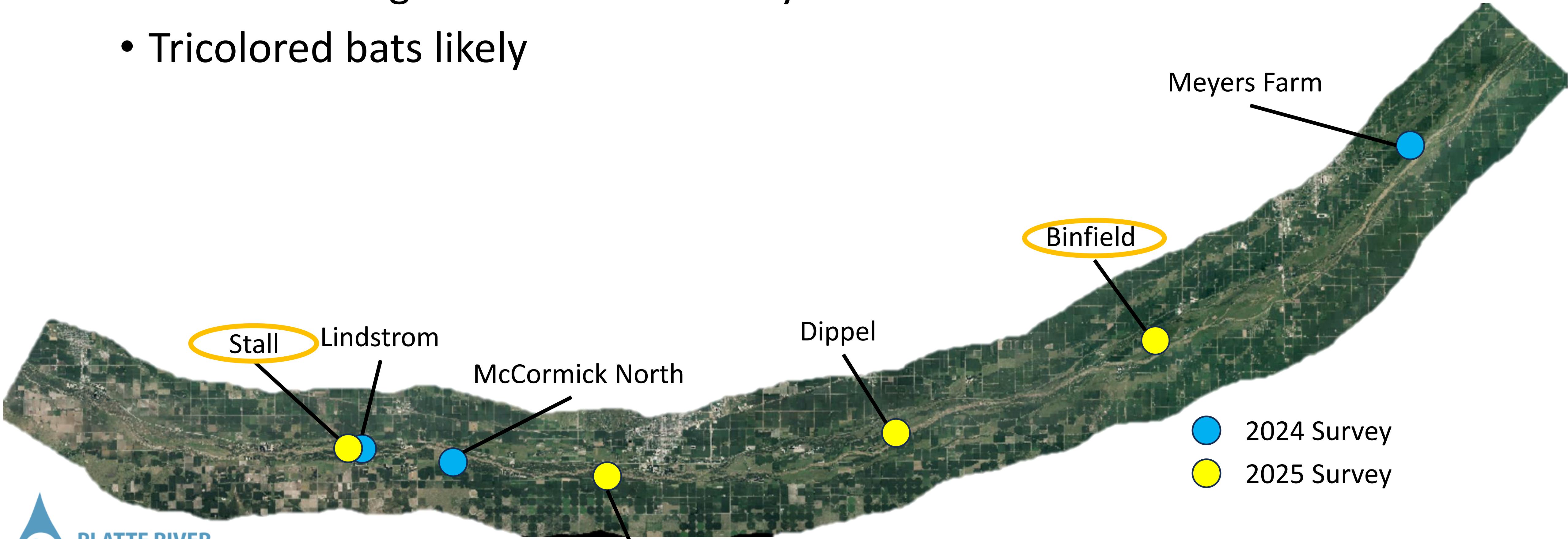


Tricolored bat

Calls from: Joe Szewczak and John Chenger

Tentative results

- Northern long-eared bats not likely
- Tricolored bats likely



Program moving forward

- Finish 2025 report for FWS
- No surveys unless needed for management
- Gap in data for species present in central Nebraska

PRRIP Extension Science Plan

2026 Science Plan Reporting Session

Malinda Henry – Science Plan Coordinator

Jason Farnsworth – Executive Director

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PRRIP Science Plan

- Focus – Evaluate effectiveness of using water to provide target species benefits
  - How much, how, when?
  - Potential benefits and tradeoffs
  - 10 Extension Big Questions

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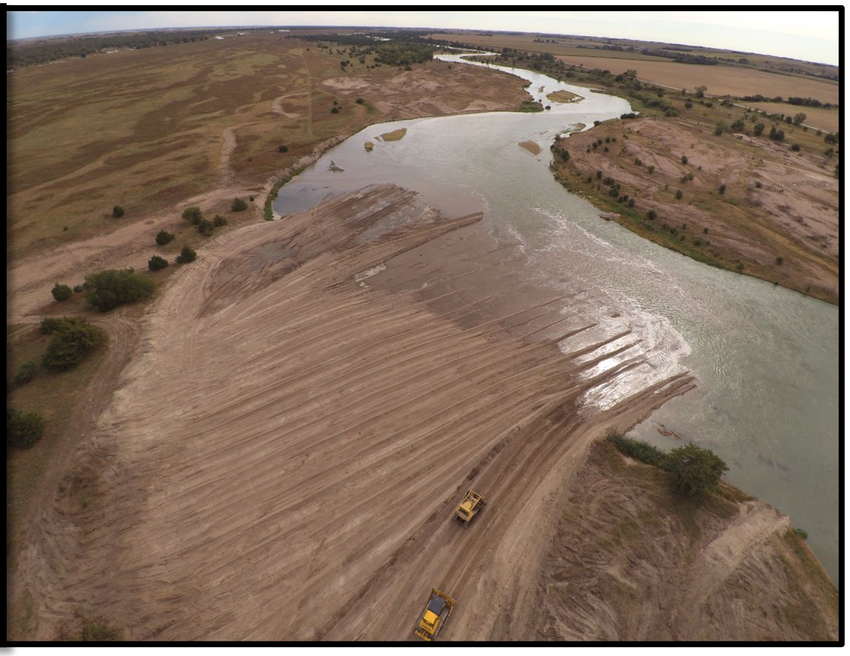
Extension Big Questions 1-3: Maintenance of channel widths

1. Germination suppression flow release
2. *Phragmites* management
3. Sediment augmentation



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Extension Big Questions 1-3: Maintenance of channel widths

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
EBQ	**Objective**	**Performance Metric**	**Information Provided**	**Mar/Apr Spring WC Release**	**June GS Release**	**July Summer Release**	**October Fall WC Release**
1,2,3	WC Habitat: Channel Maintenance - Geomorphology and Vegetation Control	MUCW, TUCW, wetted width WC Response	Estimate of when, where, and under what conditions flow releases provide channel maintenance benefits. Estimate volume and periodicity of sediment augmentation necessary.		X		

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Extension Big Questions 4-6: Importance of flow for WC stopovers

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Extension Big Questions 4-6: Importance of flow for WC stopovers

EBQ	Objective	Performance Metric	Information Provided	Alternative 1 Mar/Apr Spring WC Release	Alternative 2 June GS Release	Alternative 3 July Summer Release	Alternative 4 October Fall WC Release
1,2,3	WC Habitat: Channel Maintenance - Geomorphology and Vegetation Control	MUCW, TUCW, wetted width WC Response	Estimate of when, where, and under what conditions flow releases provide channel maintenance benefits. Estimate volume and periodicity of sediment augmentation necessary.		X		
4,5,6	WC On-Channel Habitat	WC Stopovers	Relative importance of on-channel metrics (flow, wetted width, MUCW, etc) for WC stopover decisions	X			X
4,5,6,10	WC Off-Channel Habitat	WC Stopovers	Relative importance of off-channel landcover incl. wet meadows for WC stopover decisions	X			x

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Extension Big Question 10: Wet Meadow Hydrology

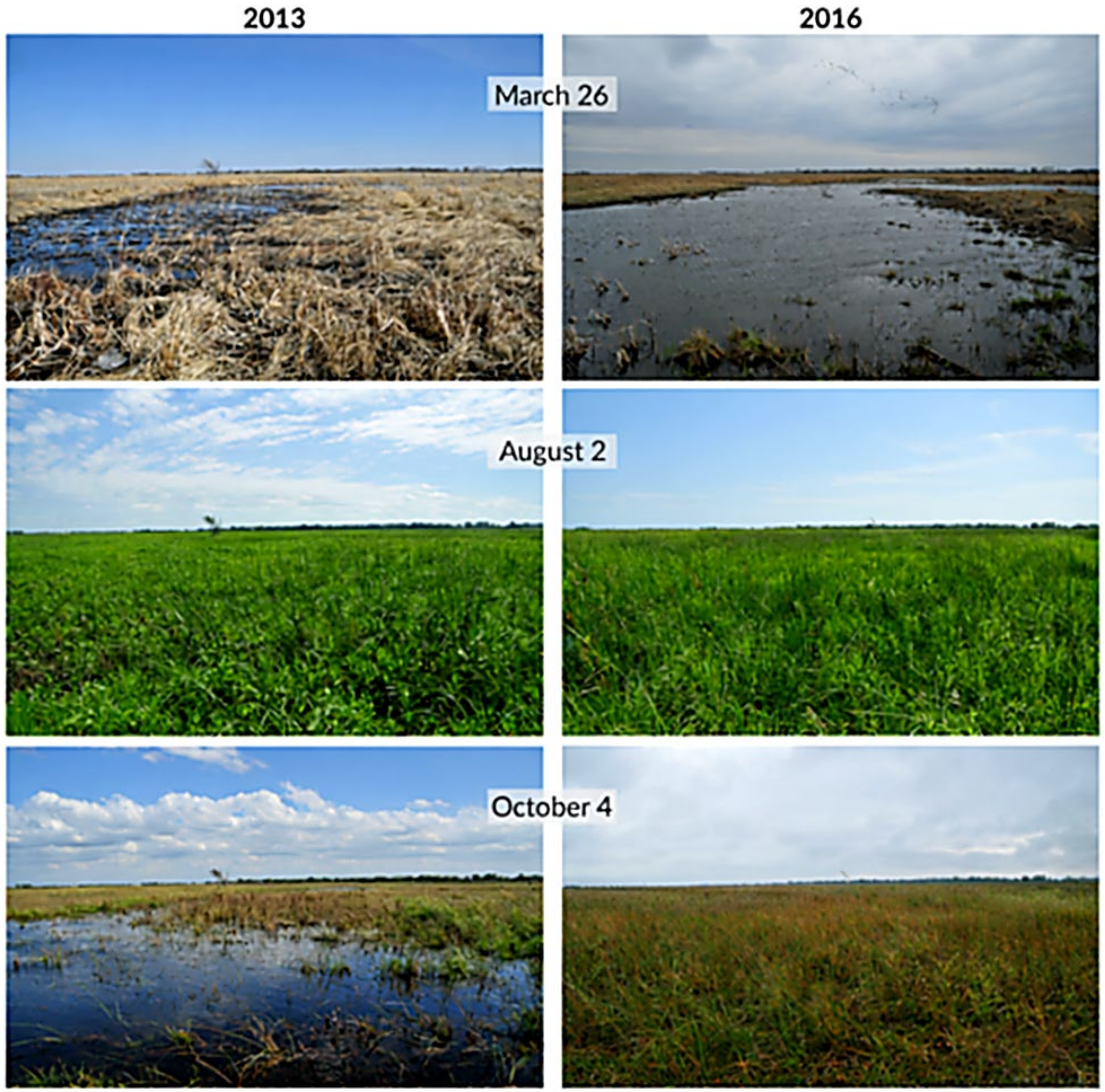

Figure from Brinley Buckley et al. 2021 Ecosphere

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Extension Big Questions 4-6: Importance of flow for WC stopovers

				Alternative 1	Alternative 2	Alternative 3	Alternative 4
EBQ	**Objective**	**Performance Metric**	**Information Provided**	**Mar/Apr Spring WC Release**	**June GS Release**	**July Summer Release**	**October Fall WC Release**
1,2,3	WC Habitat: Channel Maintenance - Geomorphology and Vegetation Control	MUCW, TUCW, wetted width WC Response	Estimate of when, where, and under what conditions flow releases provide channel maintenance benefits. Estimate volume and periodicity of sediment augmentation necessary.		X		
4,5,6	WC On-Channel Habitat	WC Stopovers	Relative importance of on-channel metrics (flow, wetted width, MUCW, etc) for WC stopover decisions	X			X
4,5,6,10	WC Off-Channel Habitat	WC Stopovers	Relative importance of off-channel landcover incl. wet meadows for WC stopover decisions	X			x

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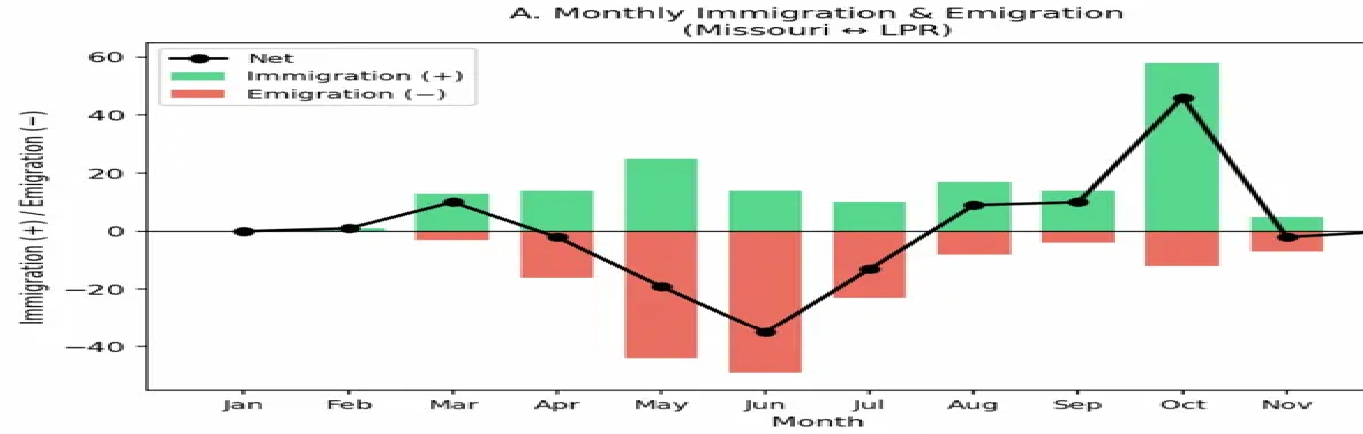
Extension Big Question 7: Impacts of PRRIP water management on PS

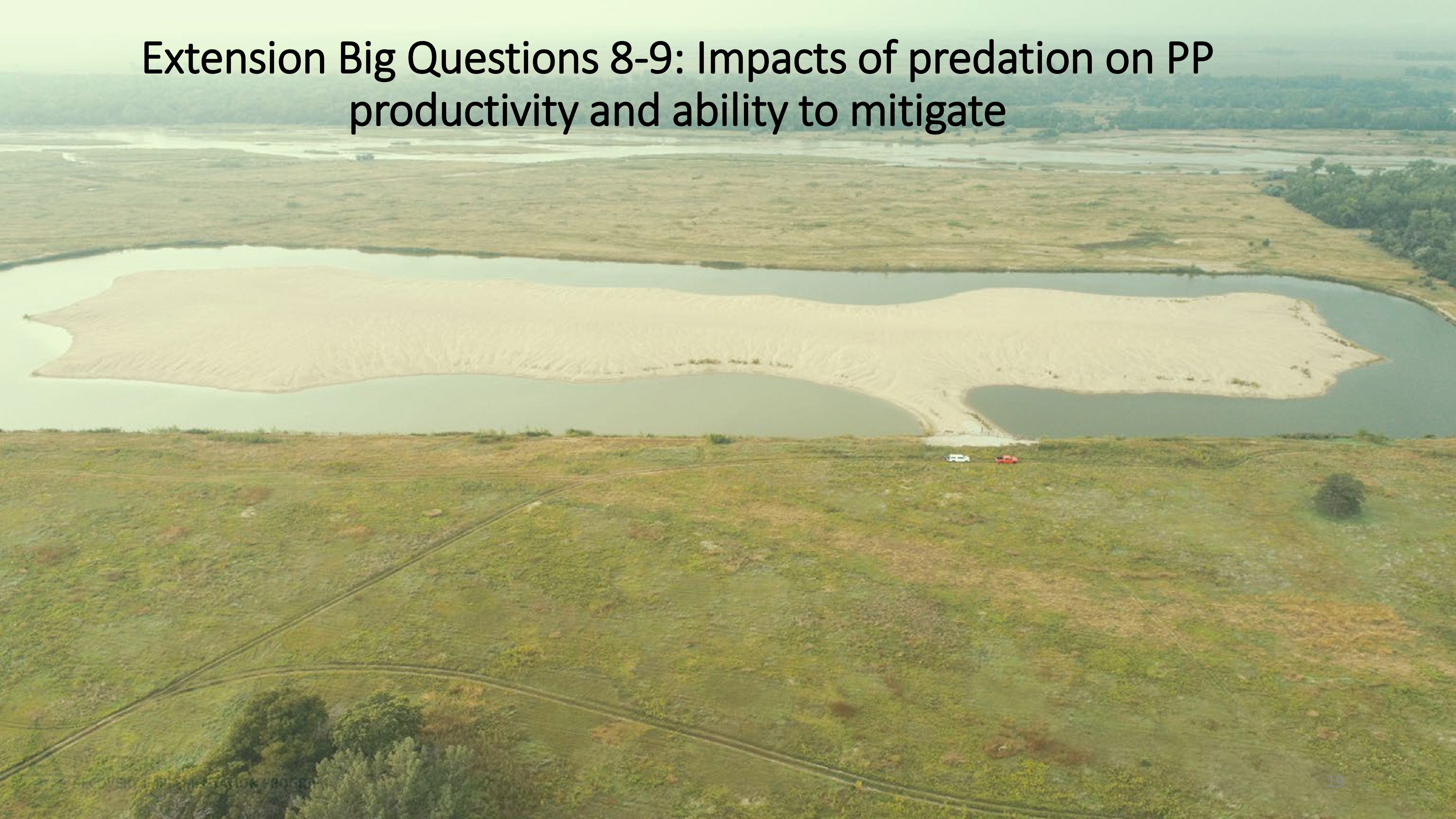
EBQ	Objective	Performance Metric	Information Provided	Alternative 1 Mar/Apr Spring WC Release	Alternative 2 June GS Release	Alternative 3 July Summer Release	Alternative 4 October Fall WC Release
1,2,3	WC Habitat: Channel Maintenance - Geomorphology and Vegetation Control	MUCW, TUCW, wetted width WC Response	Estimate of when, where, and under what conditions flow releases provide channel maintenance benefits. Estimate volume and periodicity of sediment augmentation necessary.		X		
4,5,6	WC On-Channel Habitat	WC Stopovers	Relative importance of on-channel metrics (flow, wetted width, MUCW, etc) for WC stopover decisions	X			X
4,5,6,10	WC Off-Channel Habitat	WC Stopovers	Relative importance of off-channel landcover incl. wet meadows for WC stopover decisions	X			X
7	Quantify impacts and benefits of PRRIP water mgmt on PS - PS Spawning - Immigration into Platte - Movement through Platte - PS Habitat	Numbers of PS immigrating into the Platte River	Environmental conditions under which PS enter and move upstream through the Platte River				
7	Quantify impacts and benefits of PRRIP water mgmt on PS - PS Emigration from Platte	Numbers of PS emigrating from the Platte River	Environmental conditions under which PS move downstream and leave the Platte River				

Extension Big Question 7: Impacts of PRRIP water management on PS

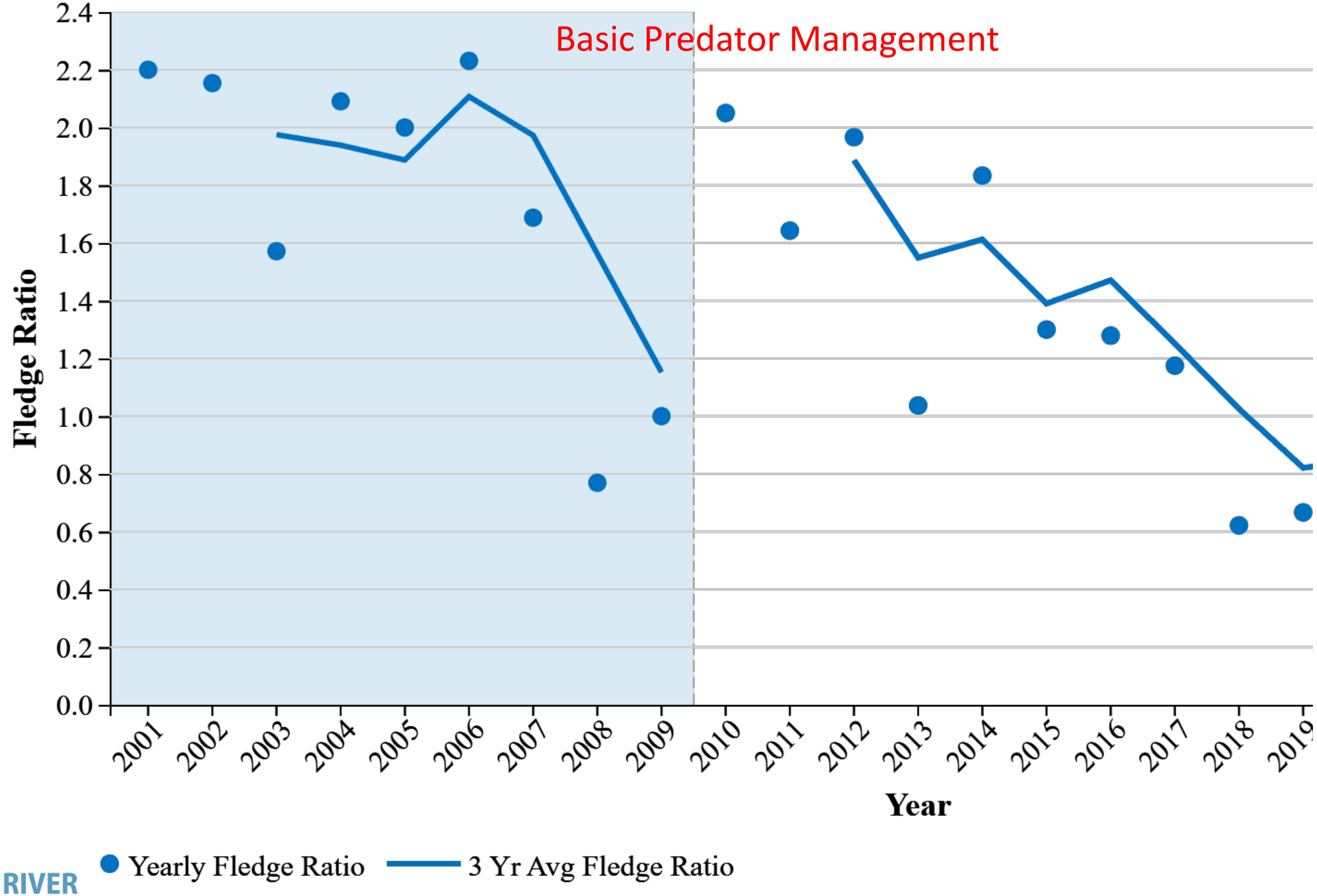
EBQ	Objective	Performance Metric	Information Provided	Alternative 1 Mar/Apr Spring WC Release	Alternative 2 June GS Release	Alternative 3 July Summer Release	Alternative 4 October Fall WC Release
1,2,3	WC Habitat: Channel Maintenance - Geomorphology and Vegetation Control	MUCW, TUCW, wetted width WC Response	Estimate of when, where, and under what conditions flow releases provide channel maintenance benefits. Estimate volume and periodicity of sediment augmentation necessary.		X		
4,5,6	WC On-Channel Habitat	WC Stopovers	Relative importance of on-channel metrics (flow, wetted width, MUCW, etc) for WC stopover decisions	X			X
4,5,6,10	WC Off-Channel Habitat	WC Stopovers	Relative importance of off-channel landcover incl. wet meadows for	X			x
7	Quantify impacts and benefits of PRRIP water mgmt on PS - PS Spawning - Immigration into Platte - Movement through Platte - PS Habitat	Numbers of PS immigrating into the Platte River					
7	Quantify impacts and benefits of PRRIP water mgmt on PS - PS Emigration from Platte	Numbers of PS emigrating from the Platte River	a				



Extension Big Questions 8-9: Impacts of predation on PP productivity and ability to mitigate



Extension Big Questions 8-9: Impacts of predation on PP productivity and ability to mitigate



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Extension Big Questions 8-9: Impacts of predation on PP productivity and ability to mitigate

Additional Management

EBQ	Objective	Performance Metric	Information Provided	Baseline Predator Mgmt	Lighting	Exterior Fencing	Interior Fencing
8,9	Predator management to improve LTPP productivity	Adults, BPE, nests, fledges, losses to predation	Estimate of losses to predation and future productivity under alternative management practices	X	X	X	X

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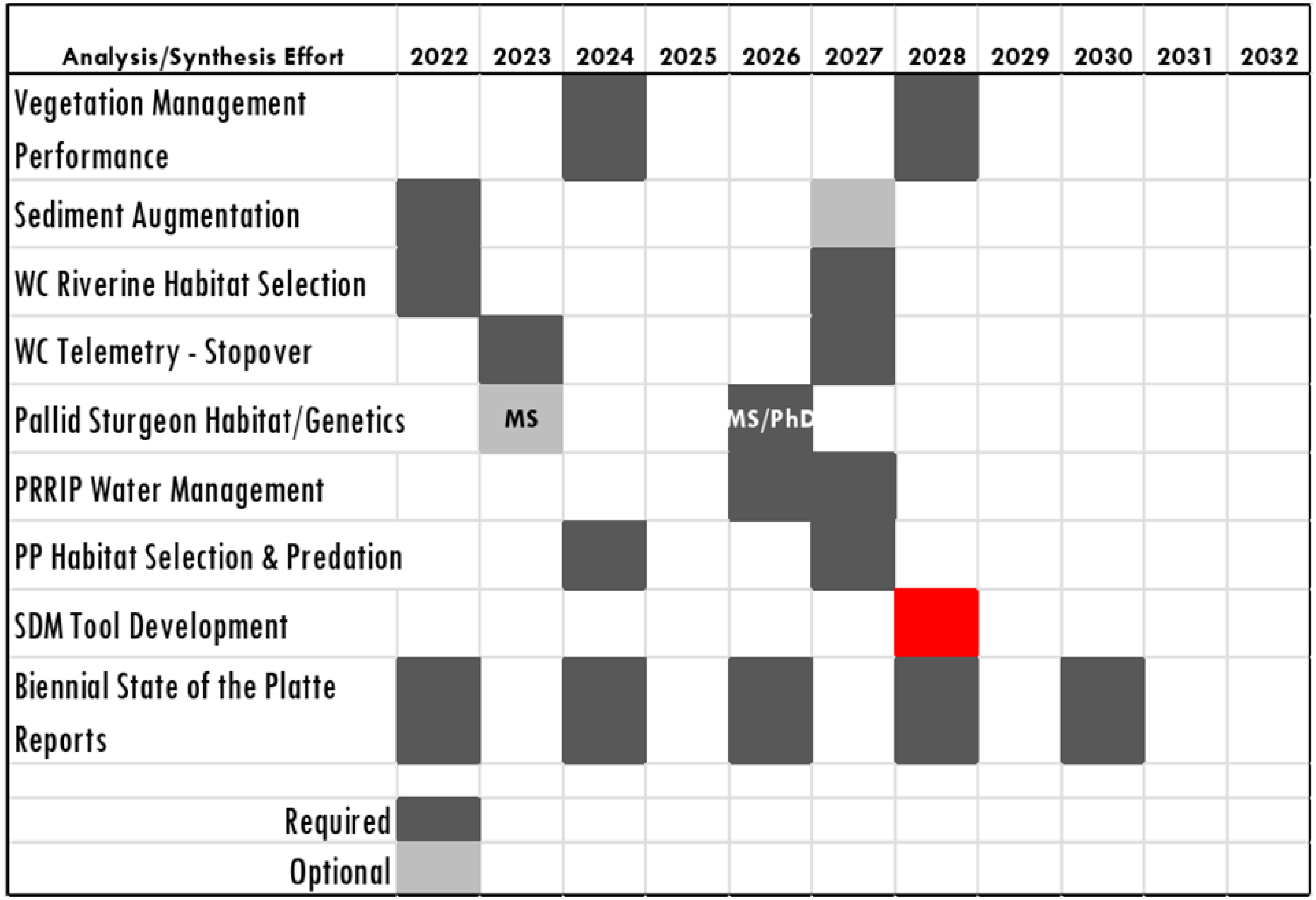
PRRIP Science Plan

- Each question (2022-2028)
  - 2 multi-year evaluations
  - Continue, adjust, or stop
- Results into SDM (2028)
  - Compare and weigh outcomes
  - Consider costs and benefits
- Second Increment negotiations (2029-2030)



Analysis/Synthesis Effort	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Vegetation Management Performance			■				■				
Sediment Augmentation	■					▨					
WC Riverine Habitat Selection	■					■					
WC Telemetry - Stopover		■				■					
Pallid Sturgeon Habitat/Genetics		▨ MS			■ MS/PhD						
PRRIP Water Management					■	■					
PP Habitat Selection & Predation			■			■					
SDM Tool Development							🟥				
Biennial State of the Platte Reports	■		■		■		■		■		
Required	■										
Optional	▨										

PRRIP Water & Land Management Whooping Crane Response

2026 Science Plan Reporting Session

Malinda Henry – Science Plan Coordinator

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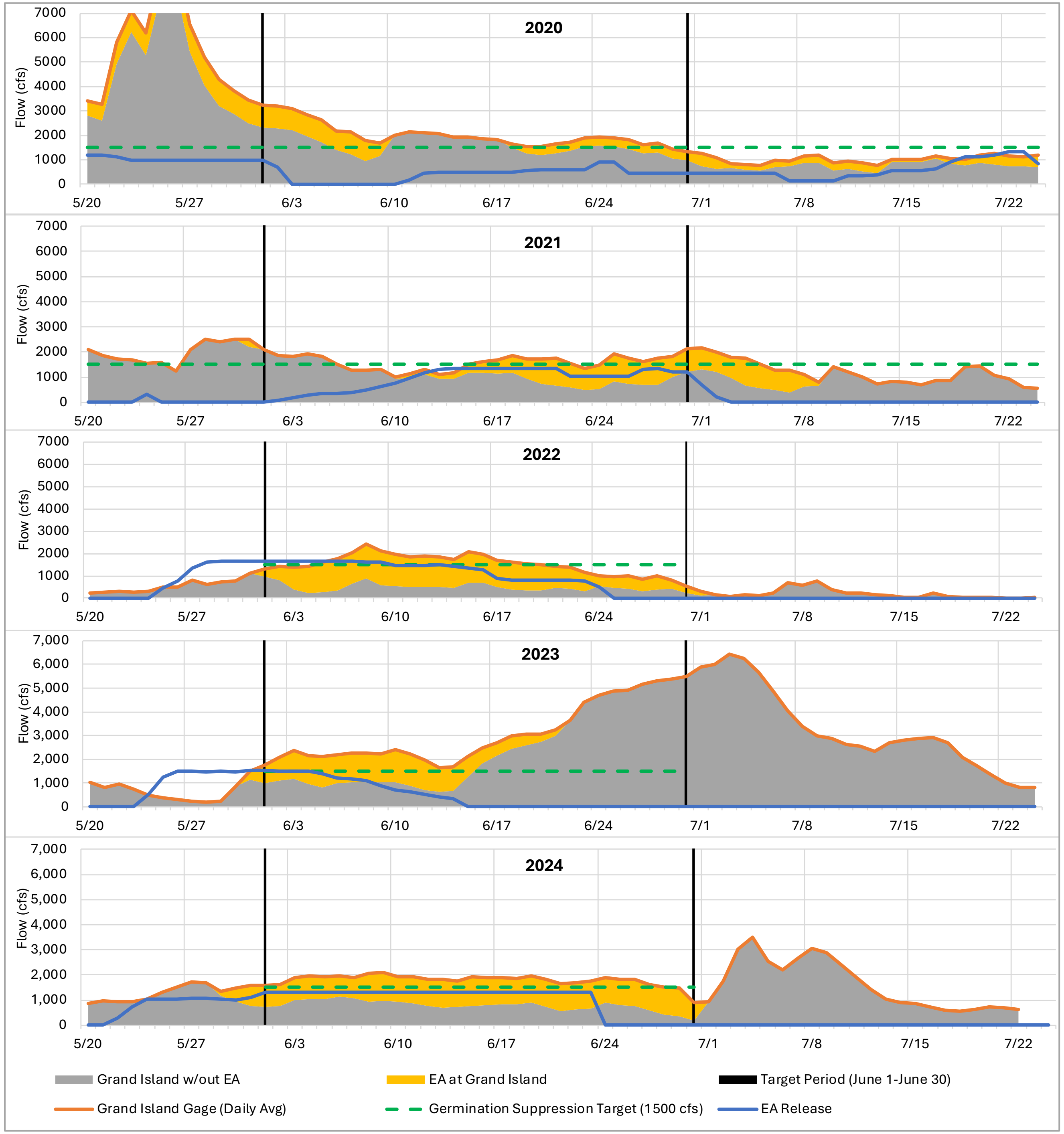
In-channel Management Actions

- Germination Suppression Releases 2020-2025
  - Inundation of 85-90% of the channel
  - Timing coincides with cottonwood seed dispersal peak
  - In-channel vegetation control
  - Maintain unvegetated channel width



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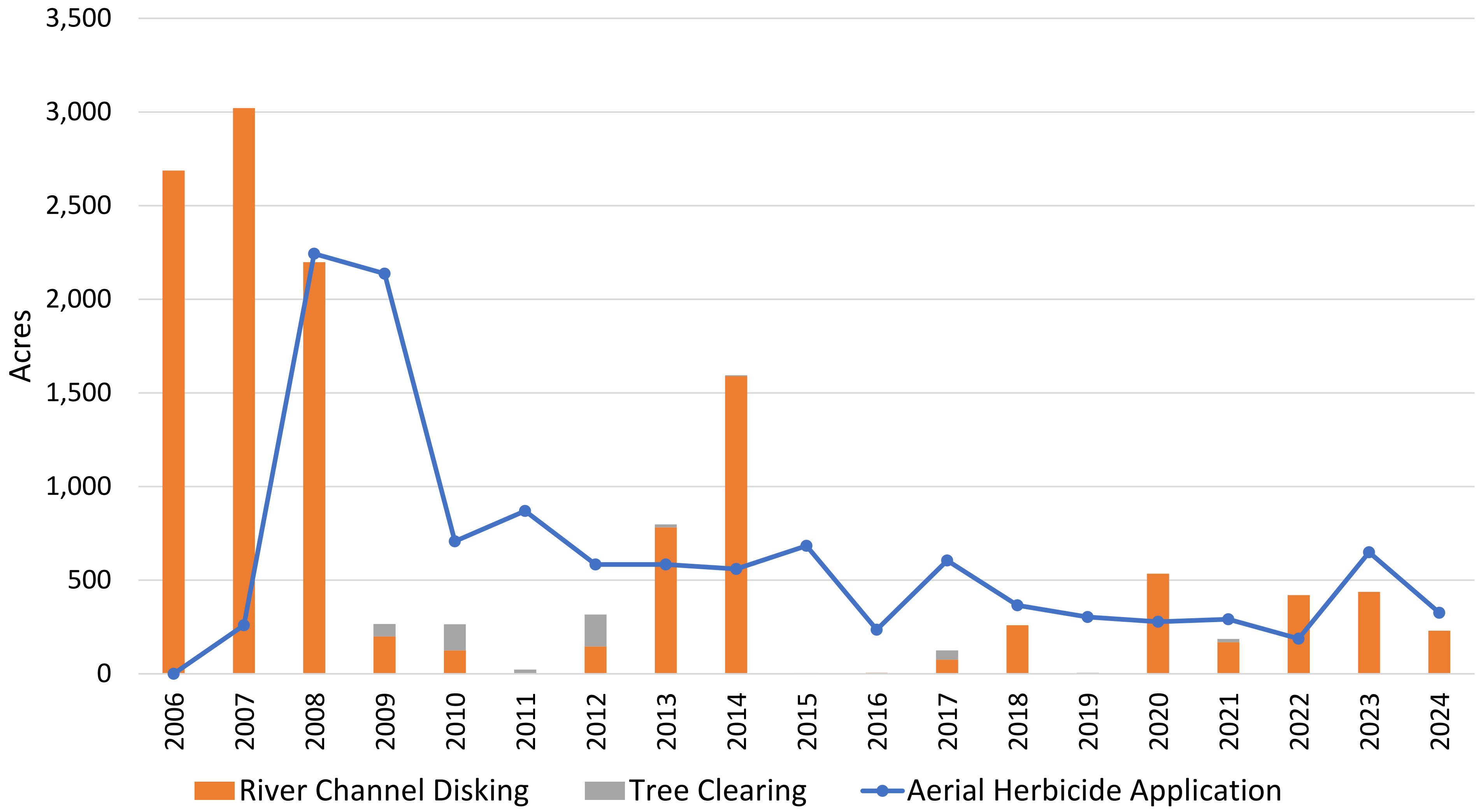
In-channel Management Actions



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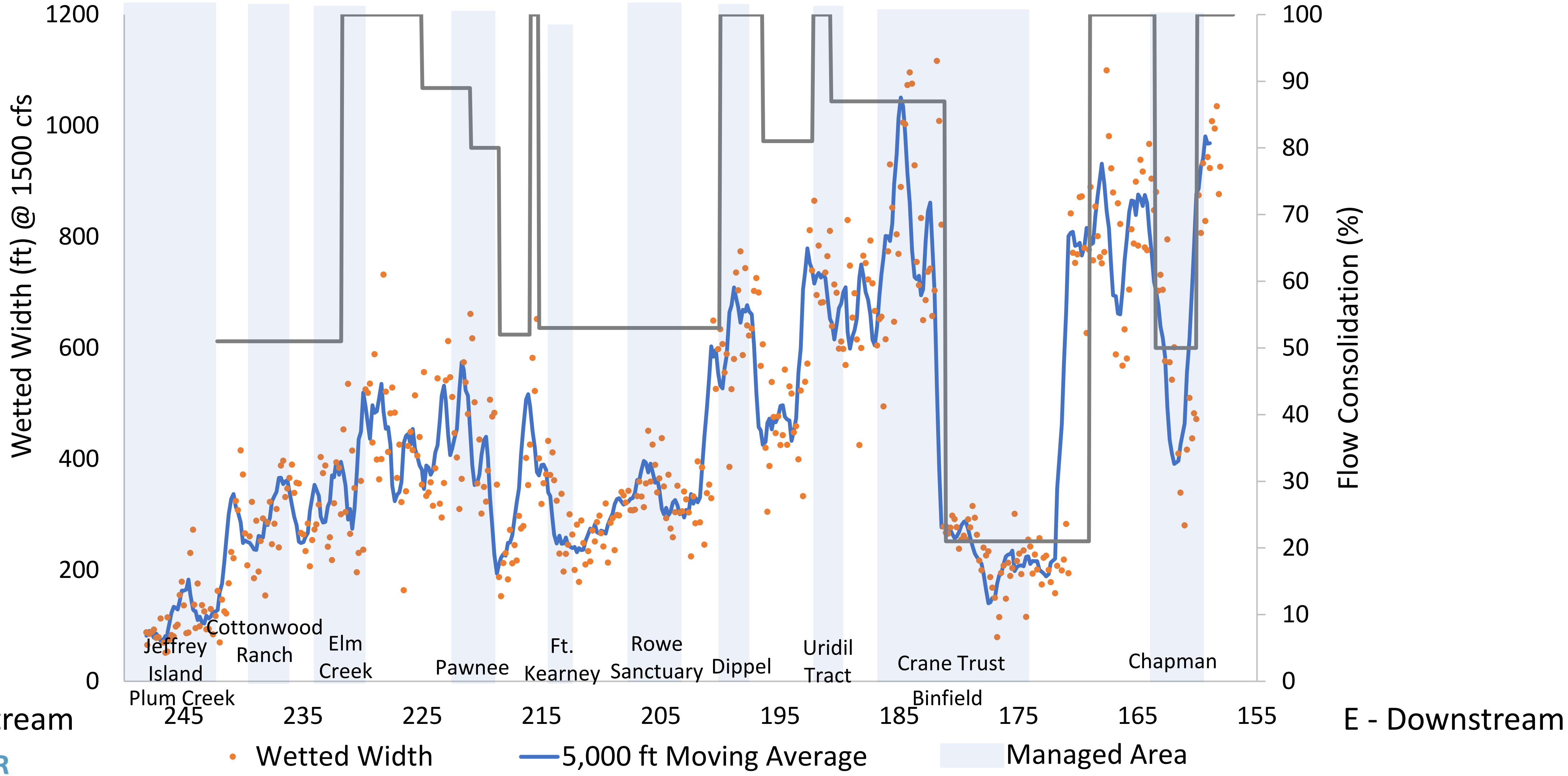
In-channel Management Actions

Table 1. Sediment augmentation volume and location 2017 to 2024.

Year	Augmented (CY)	Augmented (tons)	Location
2012-2013	125,000	182,000	Dyer Tract and Cottonwood Ranch
2017	23,000	34,500	J-2 Return (South Channel)
2018	42,900	64,305	J-2 Return (South Channel)
2019	42,300	63,500	J-2 Return (South Channel)
2020	57,700	86,475	J-2 Return (South Channel)
2021	51,300	76,982	J-2 Return (South Channel)
2022	43,900	65,789	J-2 Return (South Channel)
2023	No Aug	No Aug	N/A
2024	No Aug	No Aug	N/A

Channel Response

2024



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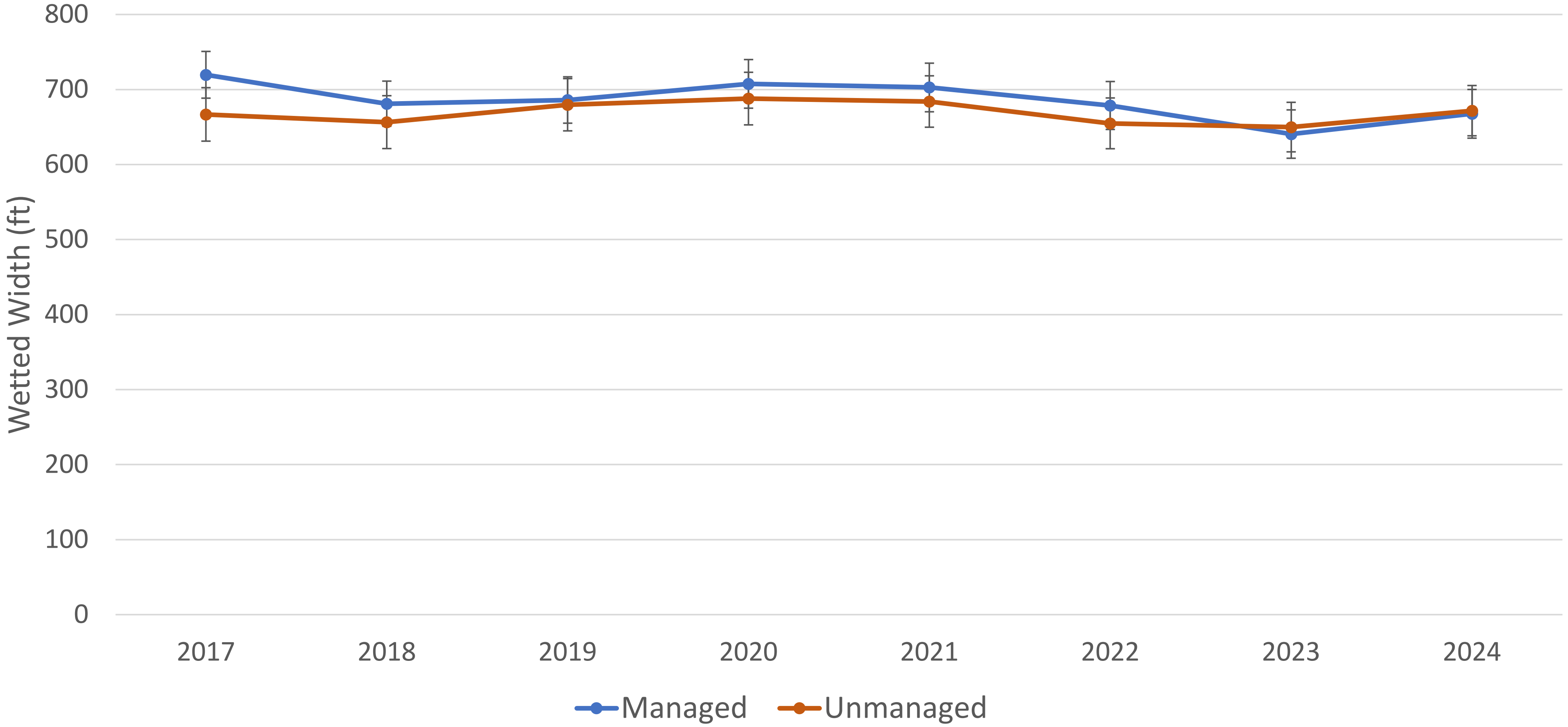
Channel Response



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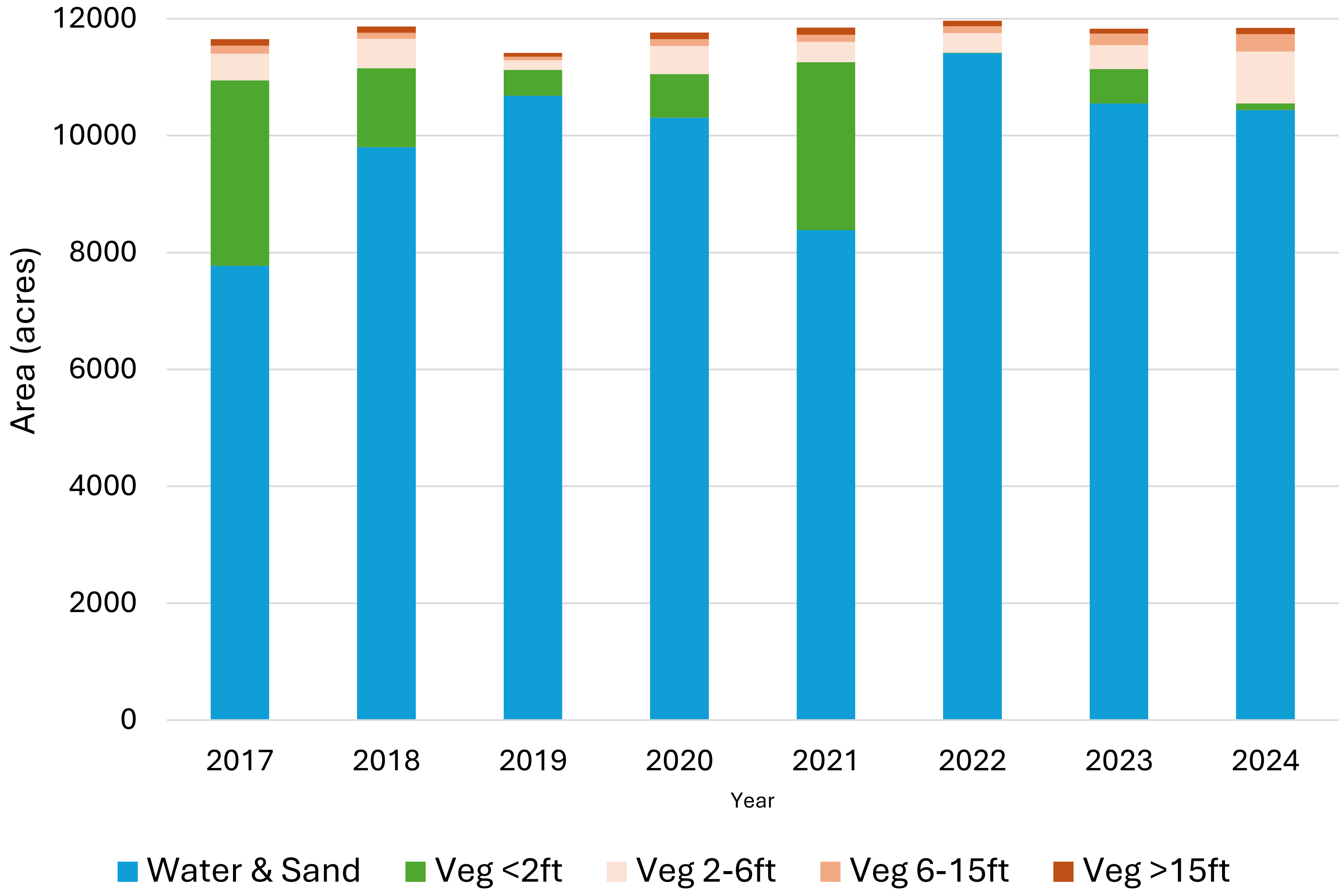
Channel Response



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Channel Response

Total Unobstructed Channel Width (TUCW)

- Geormorphic metric

Maximum Unobstructed Channel Width (MUCW)

- WC habitat metric

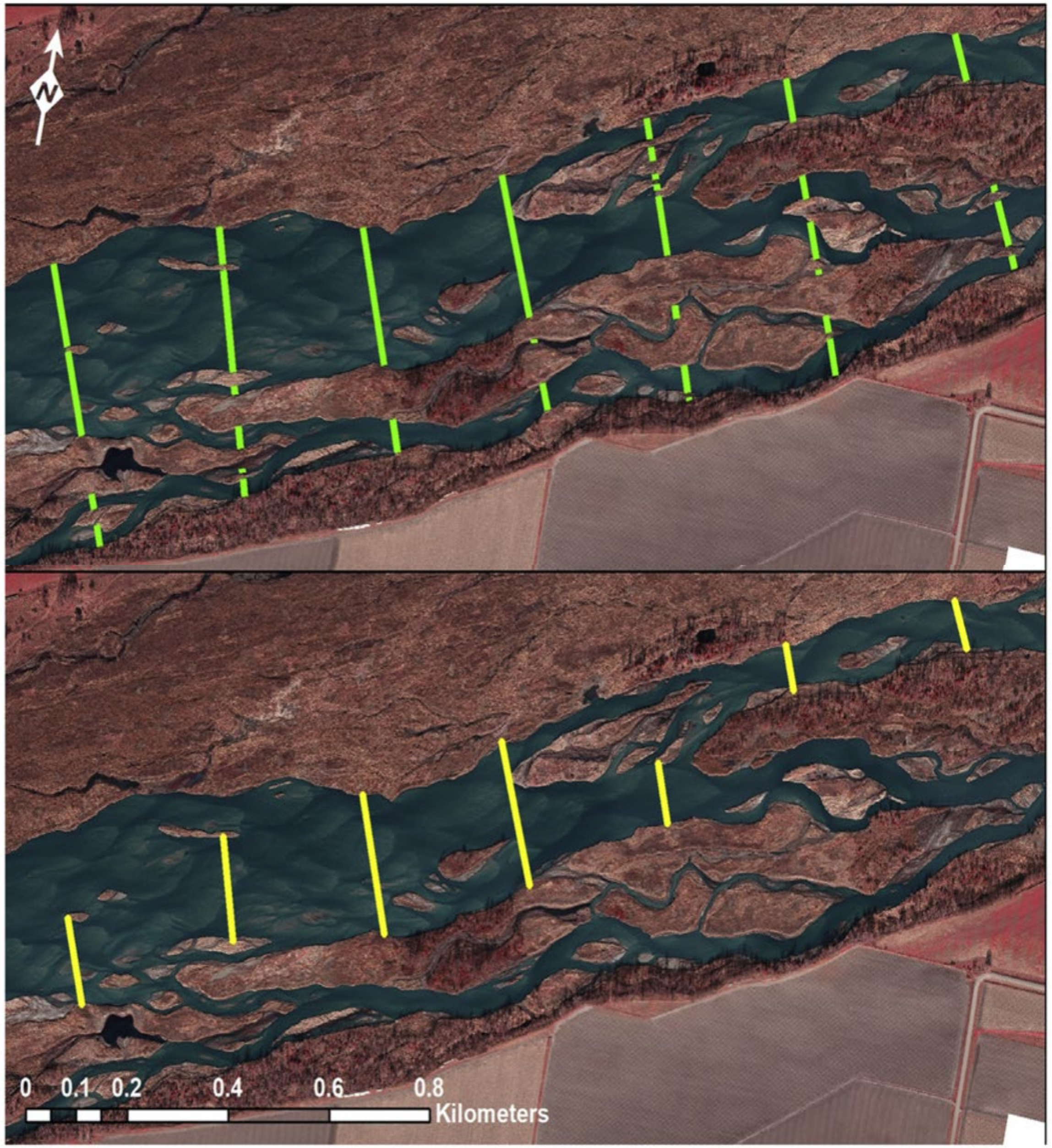

Figure from Farnsworth et al. 2018 Heliyon

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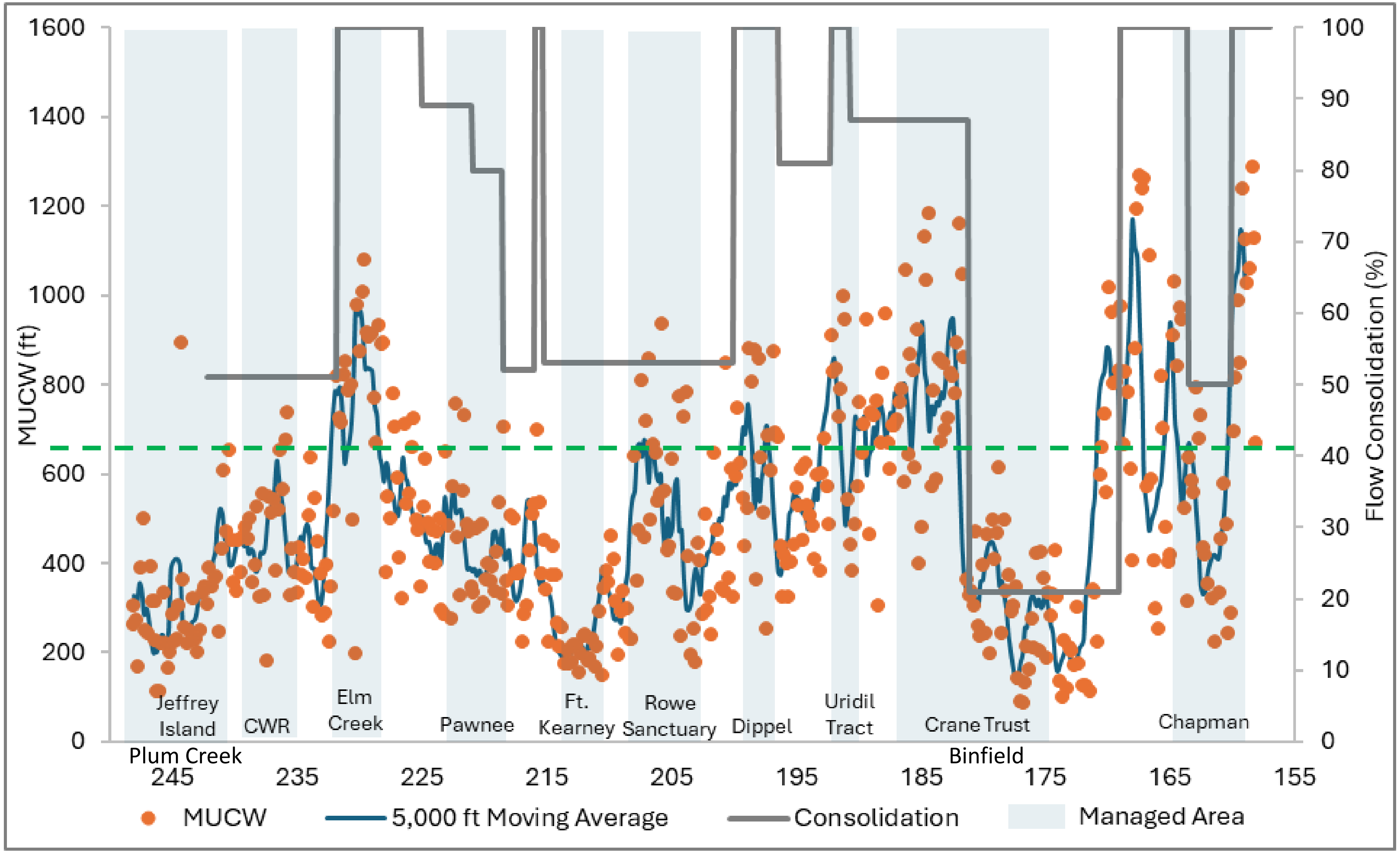
Channel Response

2024

MUCW≥650 ft
Highly suitable
WC habitat

W - Upstream



E - Downstream

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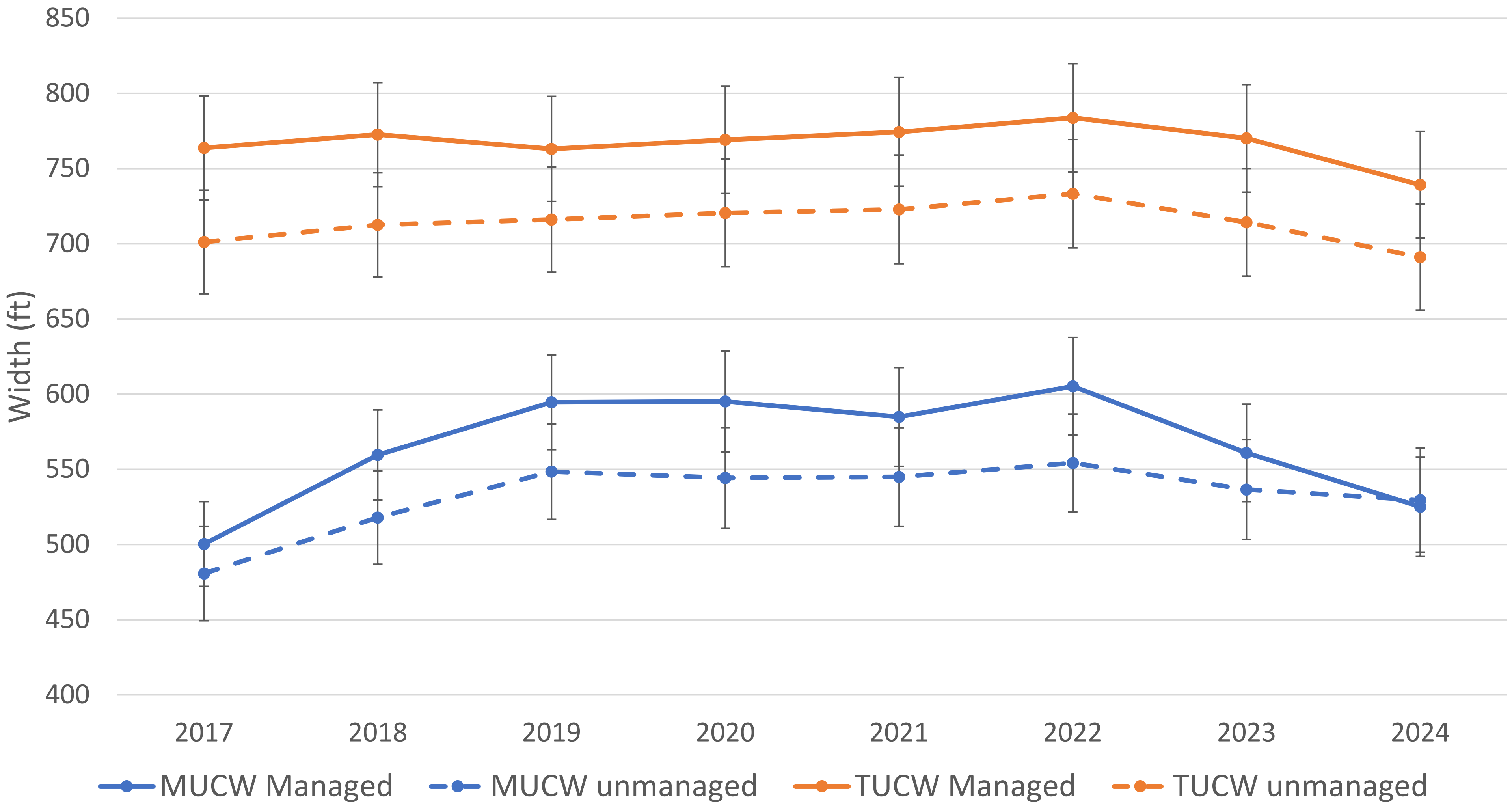
Channel Response



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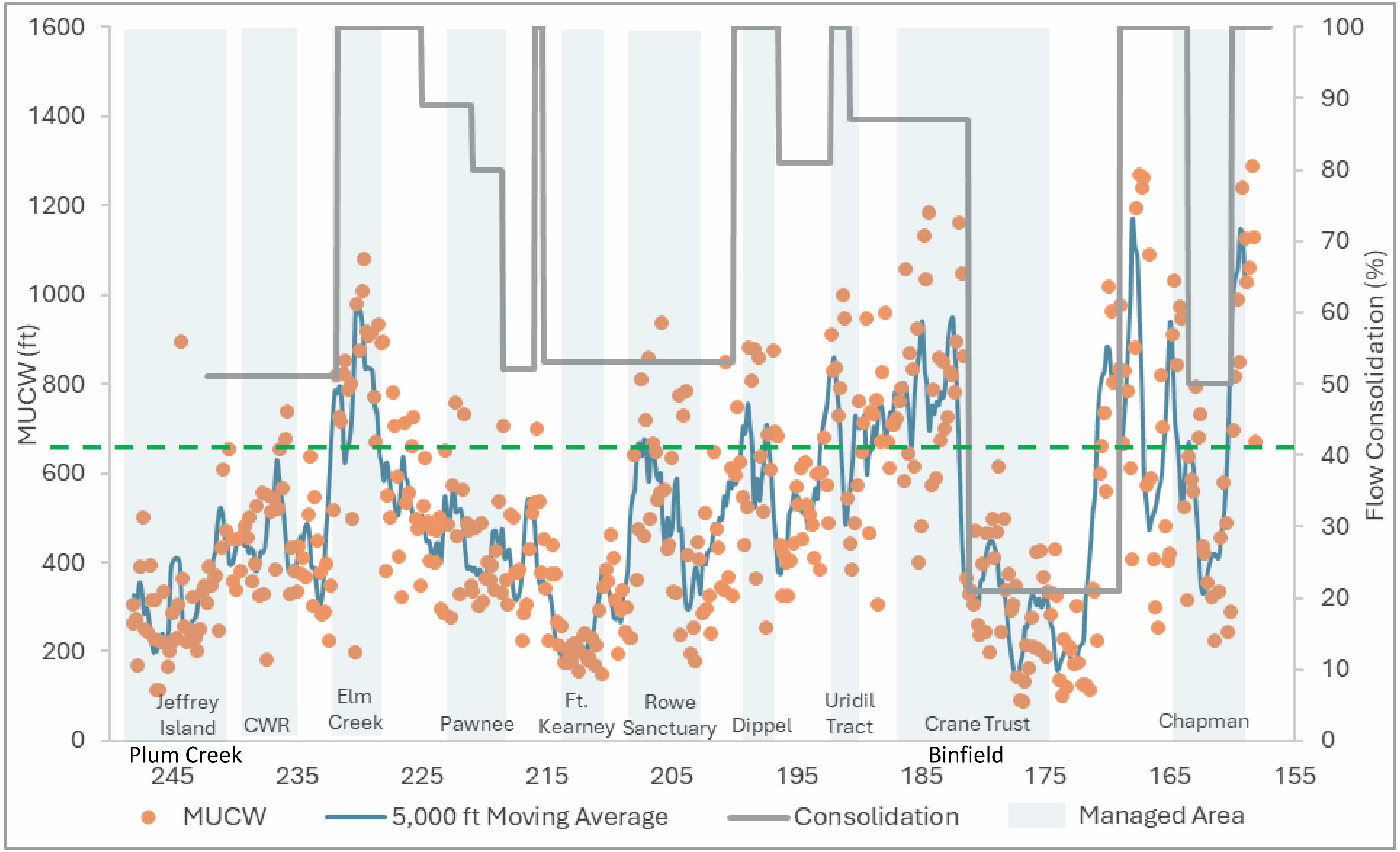
WC Response

2024 SP WC #s	2 grps	0	2	0	1	2	0	0	1	0	1	1	3	1	4	6	9	0	0	1
	9 indivs	0	6	0	4	5	0	0	6	0	1	2	12	7	27	38	20	0	0	3

MUCW≥650 ft
Highly suitable
WC habitat



W - Upstream

E - Downstream

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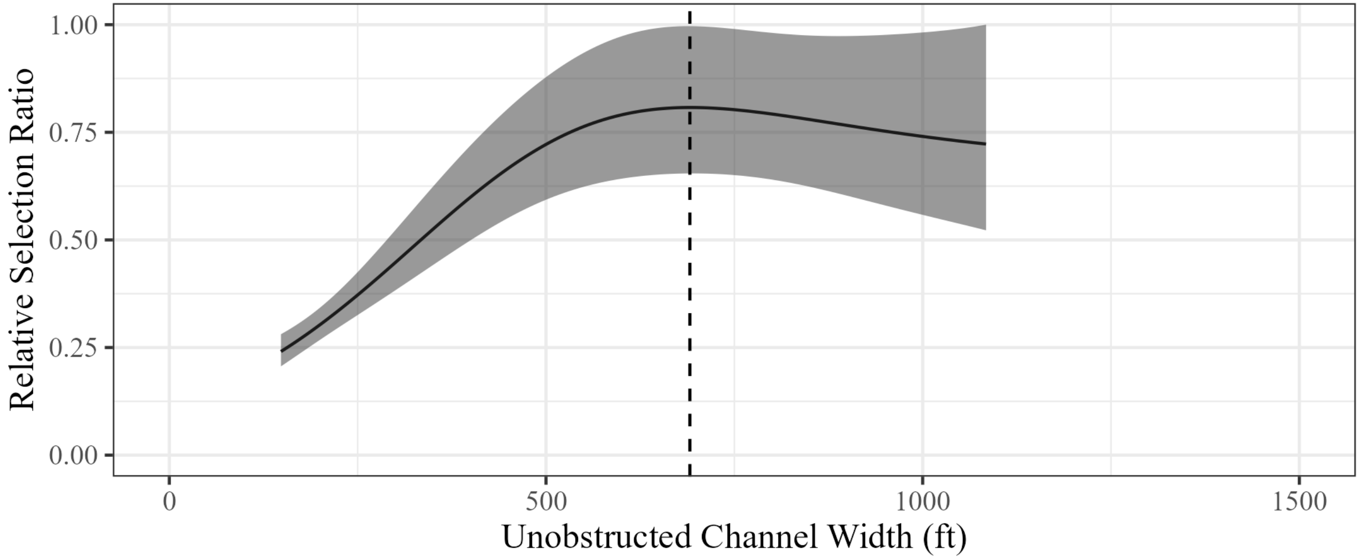
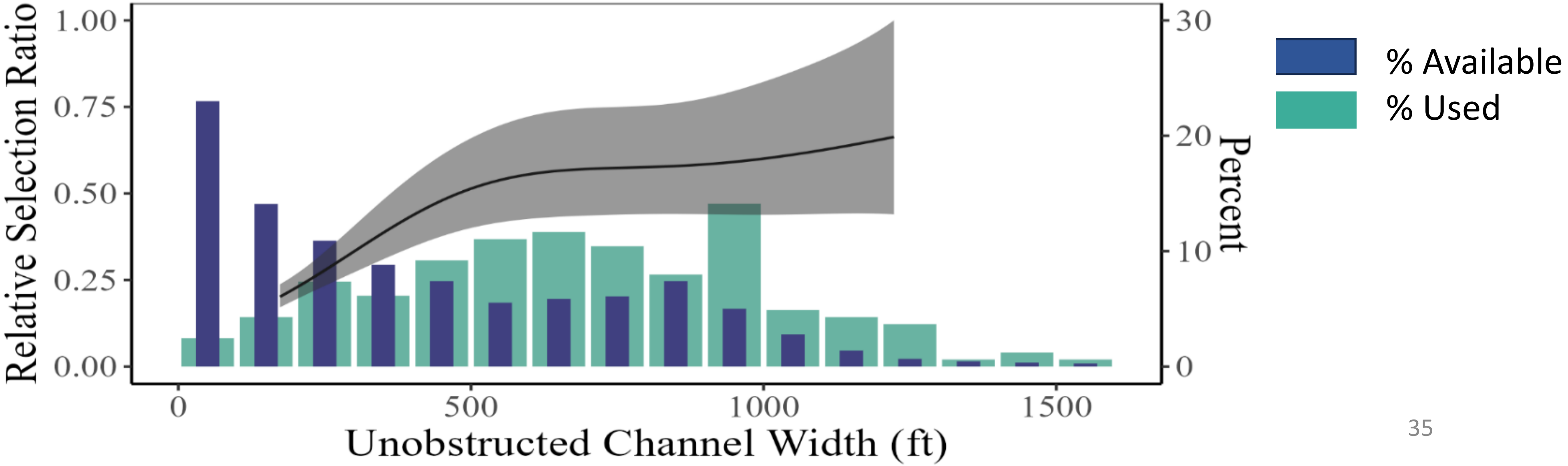
WC Response – Roost site selection

Spring 2001-Spring 2017

Figure from Baasch et al. 2019



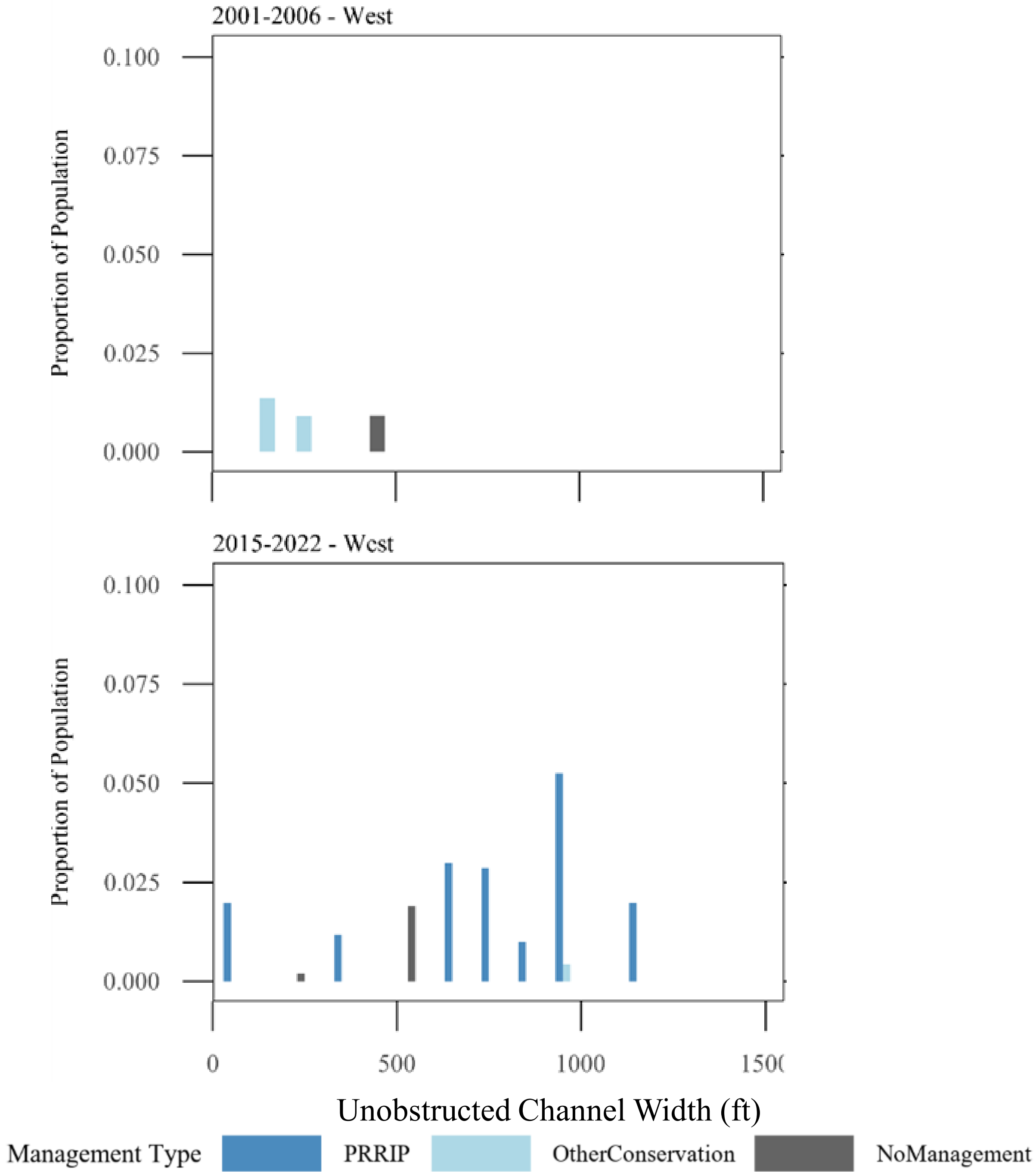
Spring 2001-Spring 2022



PRRIP contribution to WC use of the AHR

Proportion of population using the AHR increased by 148% in areas after PRRIP management

- 13 of 23 areas
- Associated with wider UOCW
- Biggest contribution in western AHR



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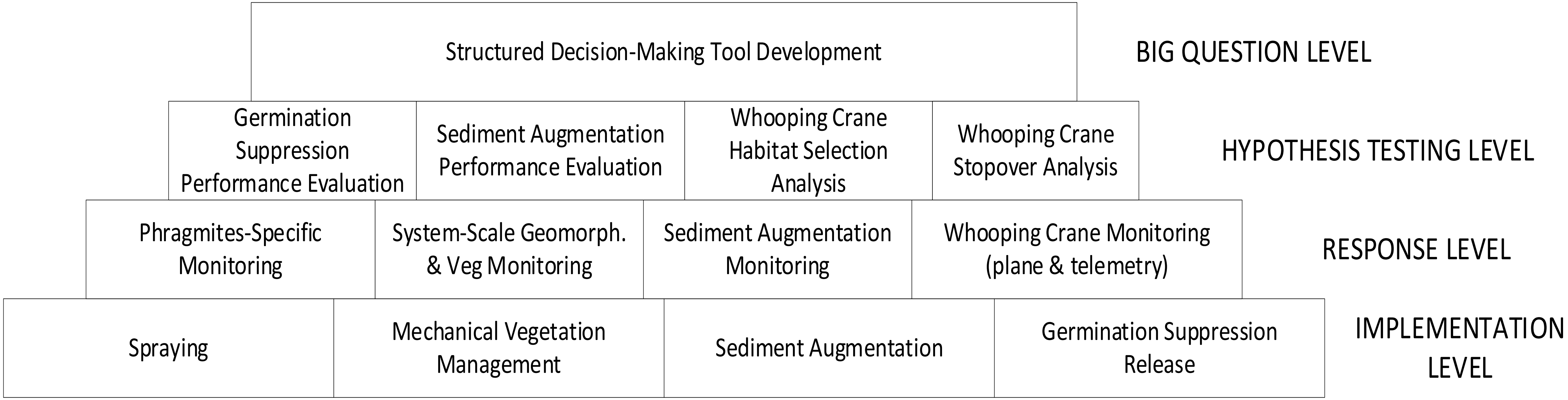
Active Learning Pyramid



Structured Decision-Making Tool Development

BIG QUESTION LEVEL

Germination Suppression Performance Evaluation

Sediment Augmentation Performance Evaluation

Whooping Crane Habitat Selection Analysis

Whooping Crane Stopover Analysis

HYPOTHESIS TESTING LEVEL

Phragmites-Specific Monitoring

System-Scale Geomorph. & Veg Monitoring

Sediment Augmentation Monitoring

Whooping Crane Monitoring (plane & telemetry)

RESPONSE LEVEL

Spraying

Mechanical Vegetation Management

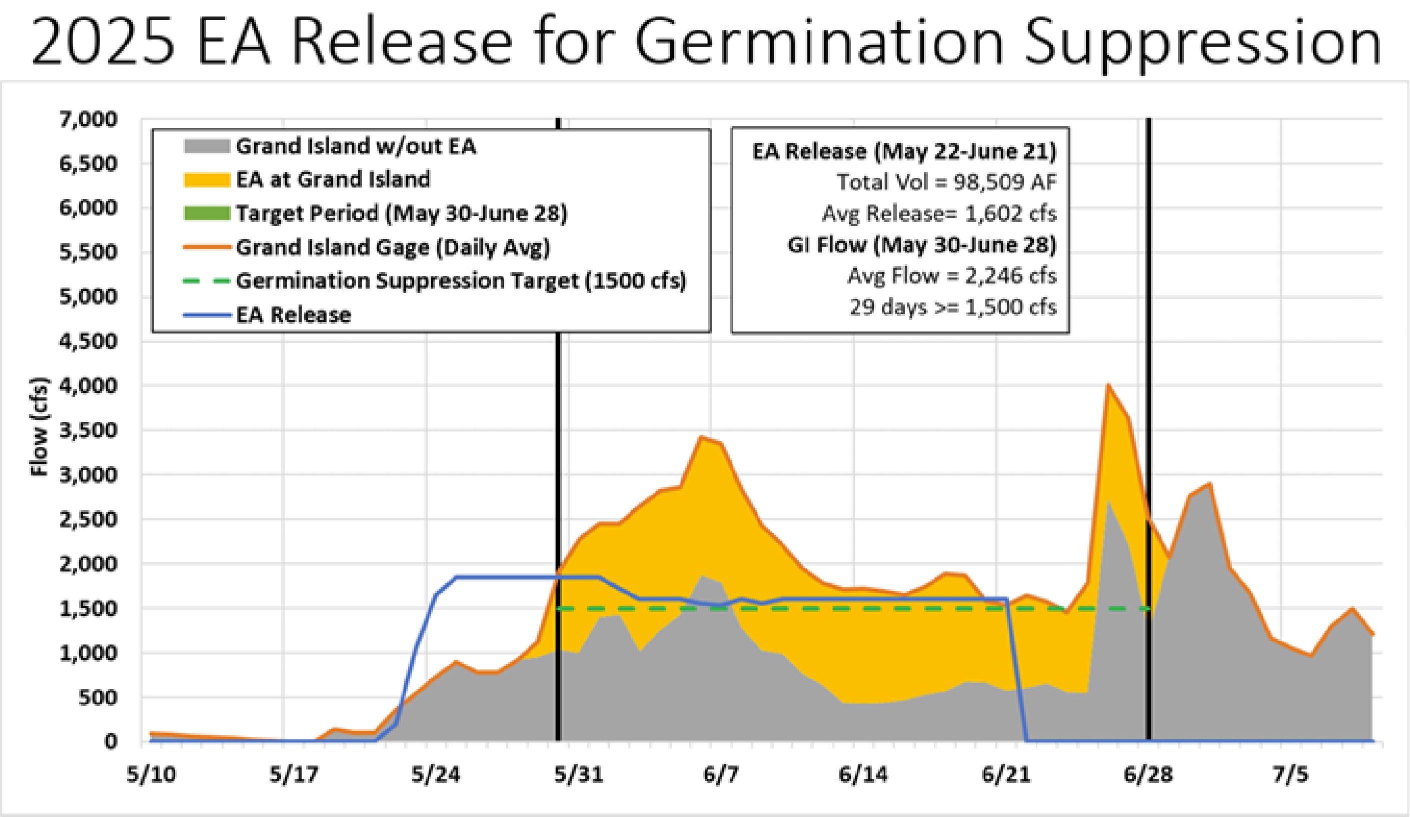
Sediment Augmentation

Germination Suppression Release

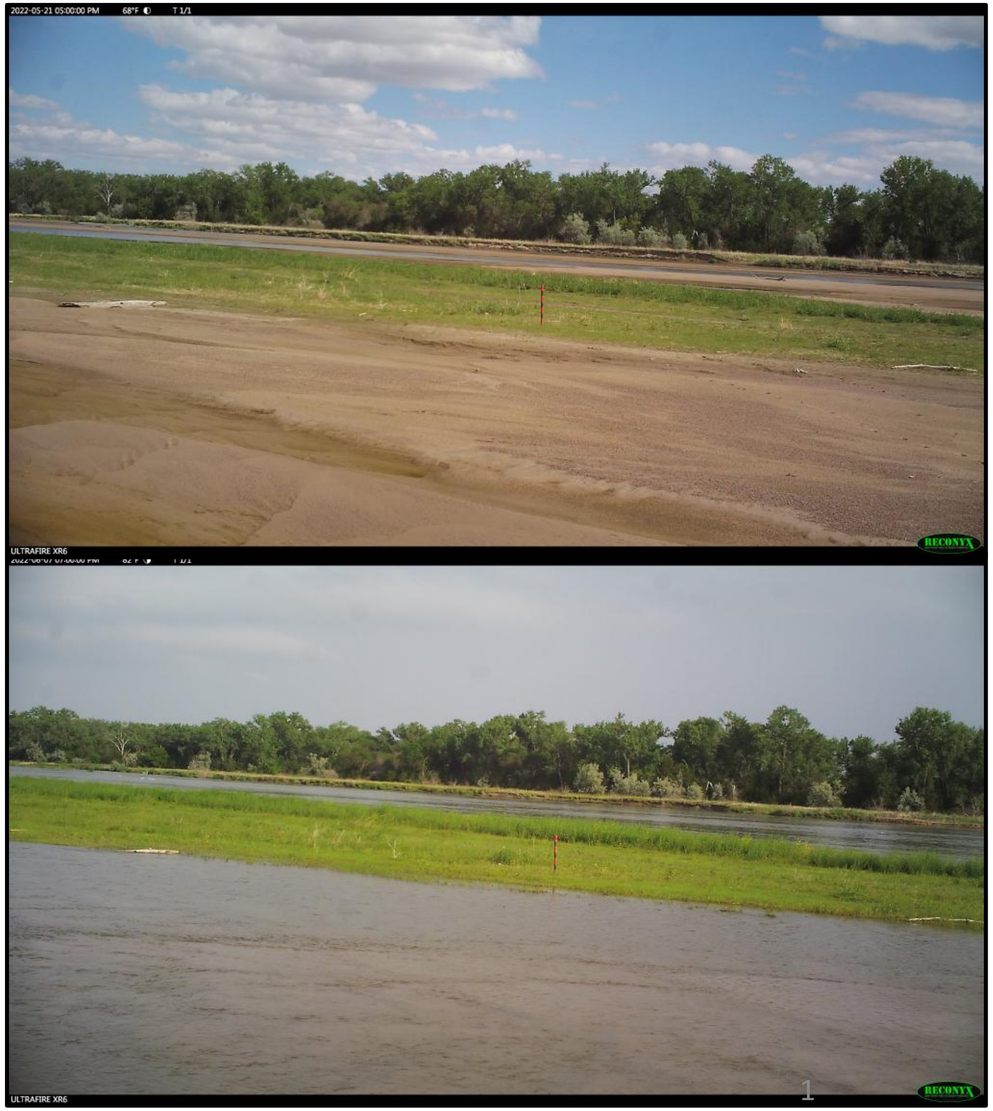
IMPLEMENTATION LEVEL

EBQs #1 and #2: How effective is Program water and Phragmites management in maintaining suitable whooping crane roosting habitat?

2025 EA Release for Germination Suppression



EA Release (May 22-June 21)
Total Vol = 98,509 AF
Avg Release= 1,602 cfs
GI Flow (May 30-June 28)
Avg Flow = 2,246 cfs
29 days >= 1,500 cfs



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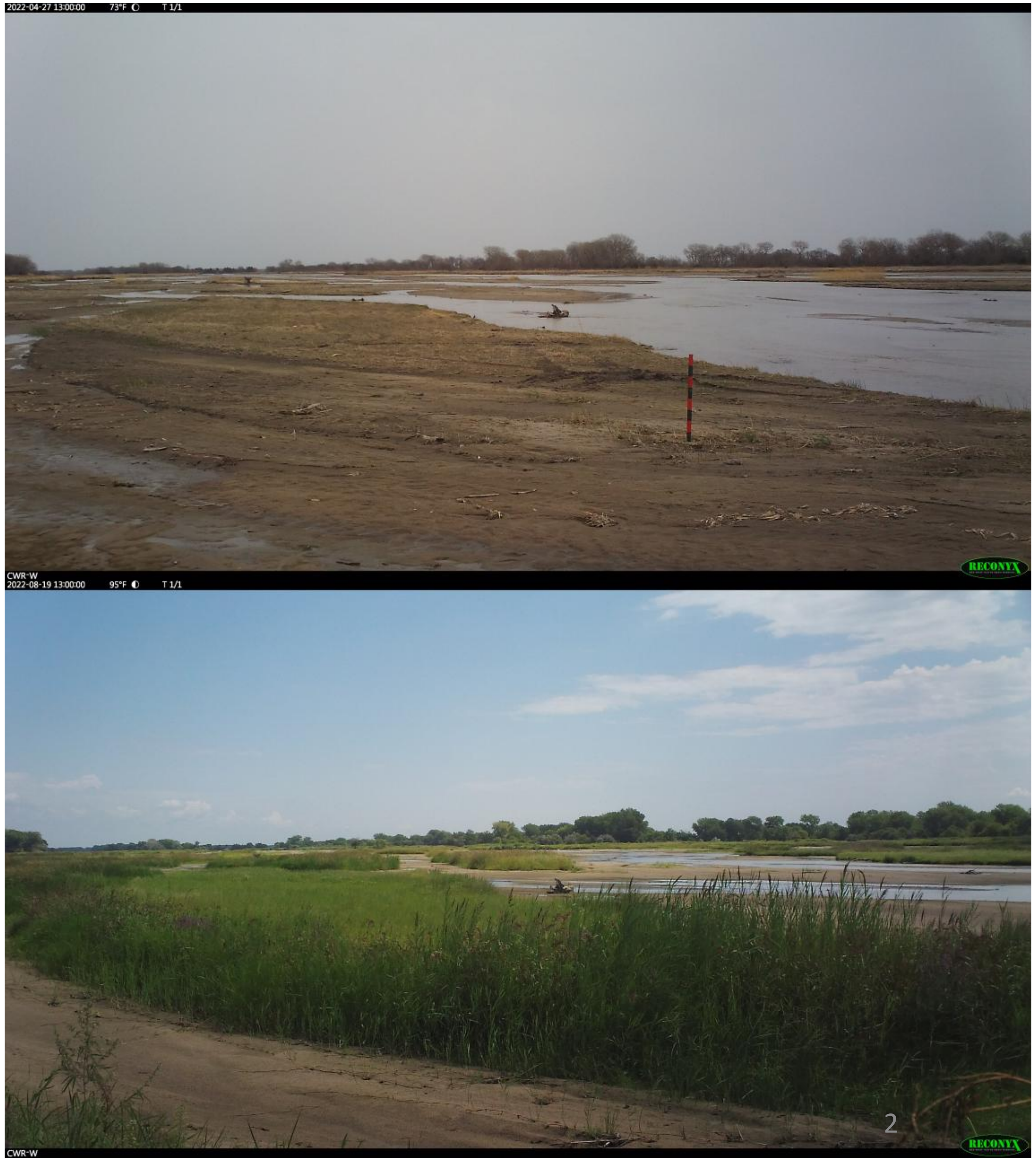
Decision-making context

- Any new permanent veg is a threat to habitat (UOCWidth)

- Phrag: **biggest** threat to habitat
- During early 2000s, >50% of channel transitioned to Phrag in <5 years
  - another 5+ years of spraying, mechanical removal, peak flows to restore habitat

- PVWMA spends $600K/year spraying to manage Phrag


2022-04-27 13:00:00 73°F T 1/1
RECONYX
CWR-W
2022-08-19 13:00:00 95°F T 1/1
RECONYX
CWR-W

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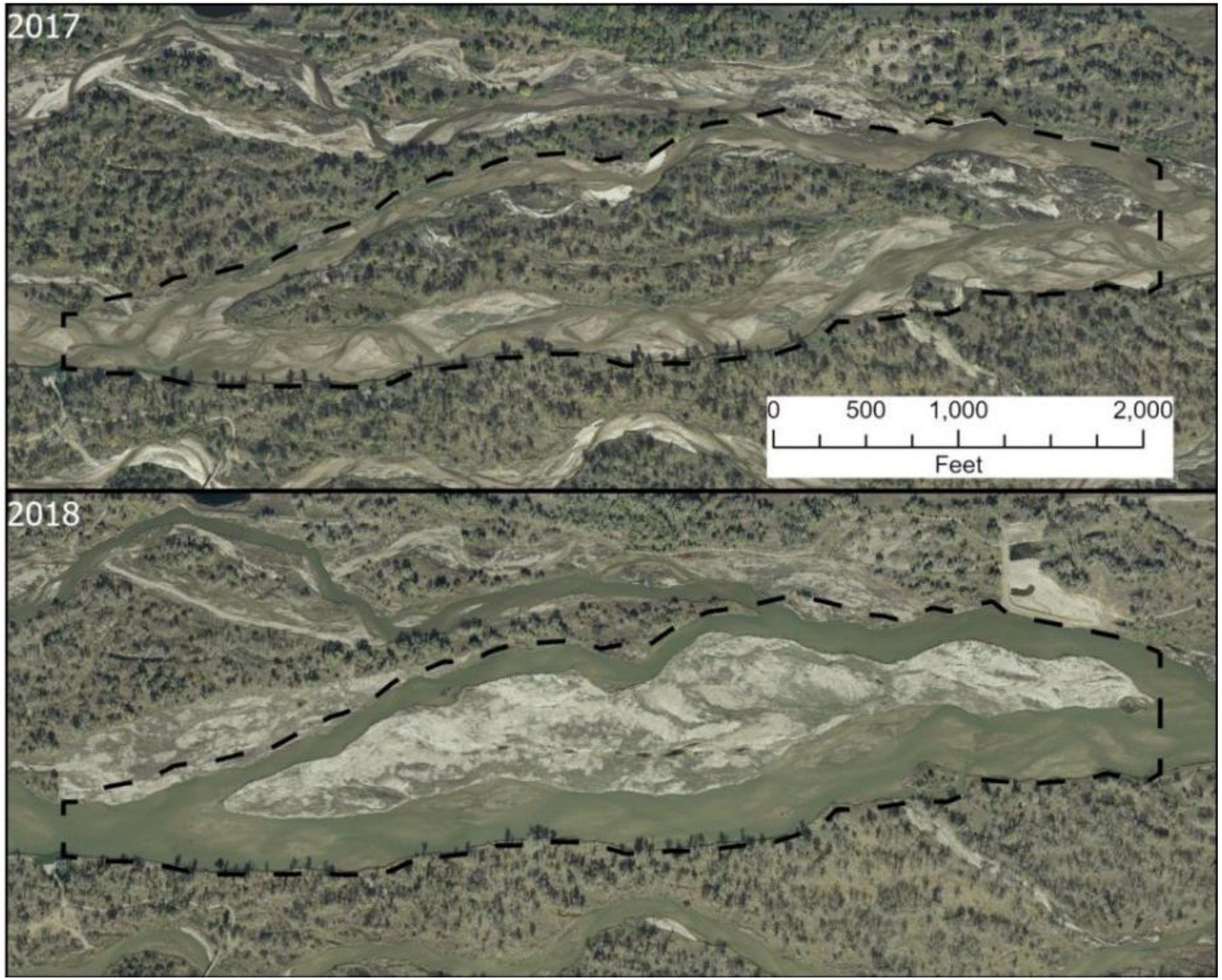
Decision-making context

- Research shows flows to scour veg far exceed Program capacity
- New habitat created by natural peak flows or mechanically
- Focus instead on *maintenance* through veg growth *prevention*



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Management hypothesis

How effective is Program water and Phragmites management in maintaining suitable whooping crane roosting habitat?

30-days of min. 1,500 cfs between June 1 – July 15 (germination suppression release) will:

- suppress germination
- slow vegetation expansion into the channel

in combination with continued herbicide spraying

- slow Phrag expansion into the active channel

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Questions expected to address:

- Tradeoff of using water for germination suppression *vs* WC roosting?
  - How does rate of veg expansion (including Phrag) vary with June flow?
  - How much habitat is lost and how much $ needed to fix with and without suppression and/or spraying/clearing?

- Does Phrag respond differently than other vegetation to magnitude, timing of flows? How does timing/seasonality, length of release alter effectiveness?

- Capacity limitations at the NP Chokepoint?

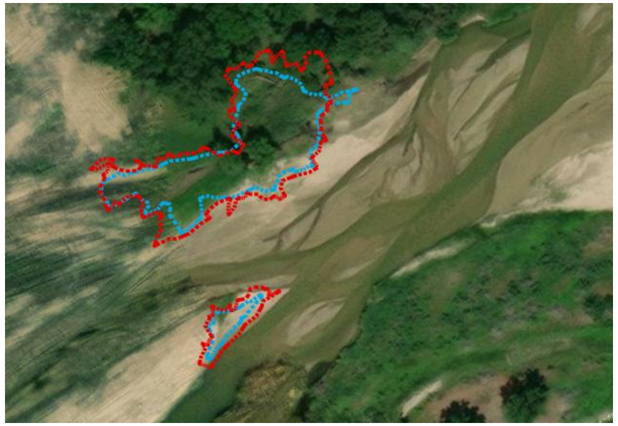
Ongoing research

- Understand natural flows and variability
- Germination suppression release flows (2020 – 2025)
- Herbicide application, disking

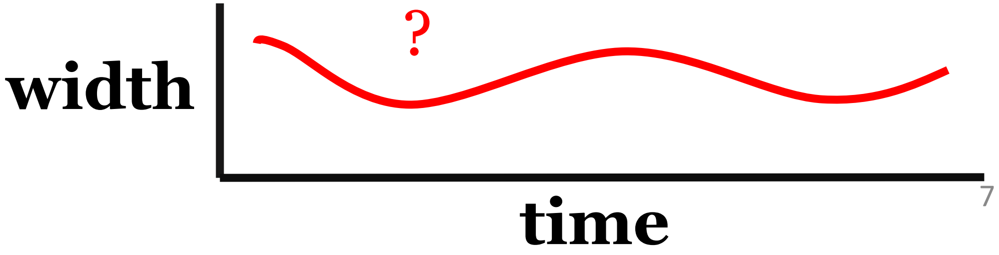
Ongoing research

Linking inundation to vegetation response

- *Point scale:* veg cameras – physical process
- *Patch scale:* Phrag growth patterns
  - field-work, process-oriented



- *Broad scale:* veg, morphology state change
  - remote sensing, form-oriented
- *Scale and process/form integration:* channel width model



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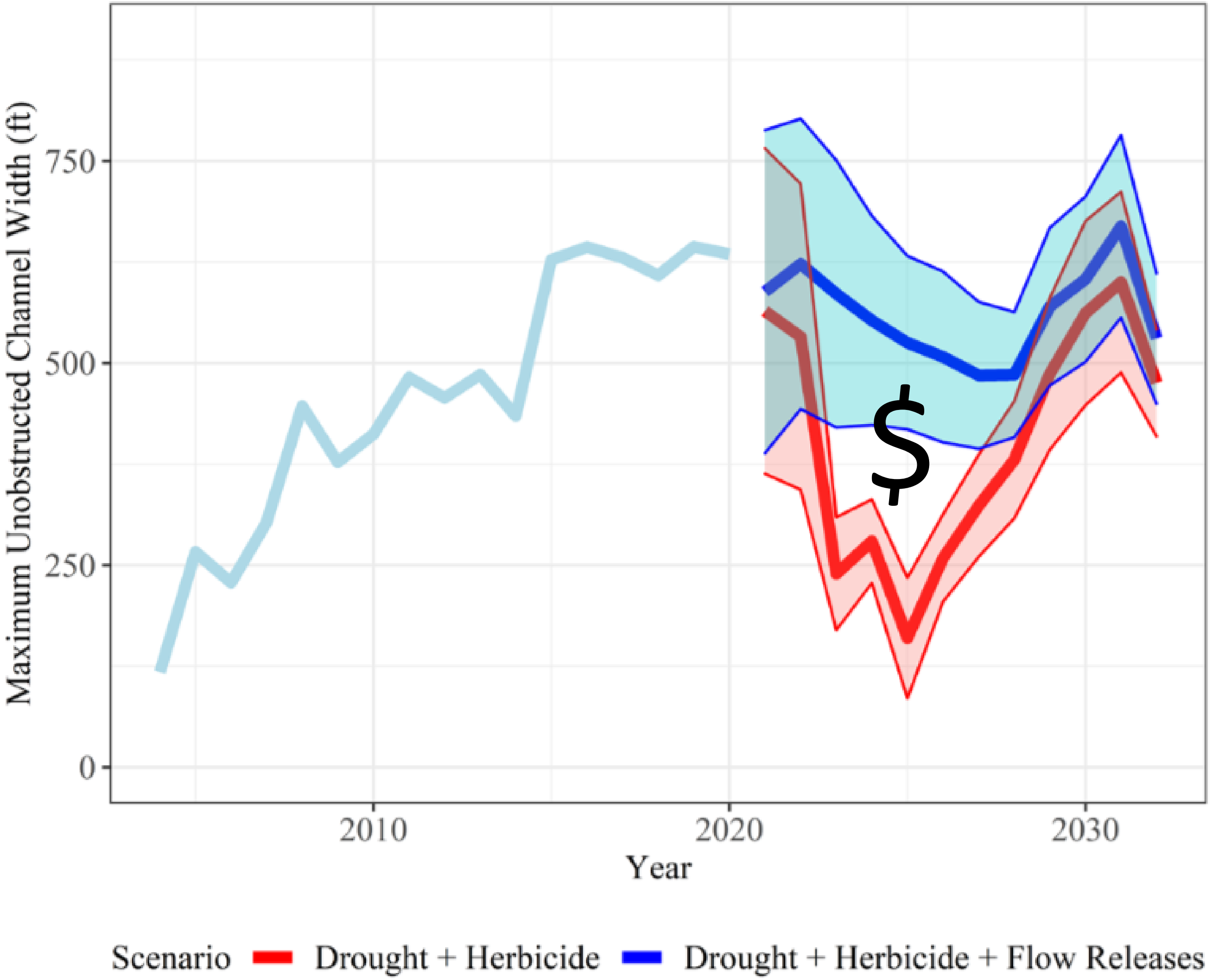
Addressing Uncertainties: broad scale

Develop estimates of the effectiveness of germination suppression flow



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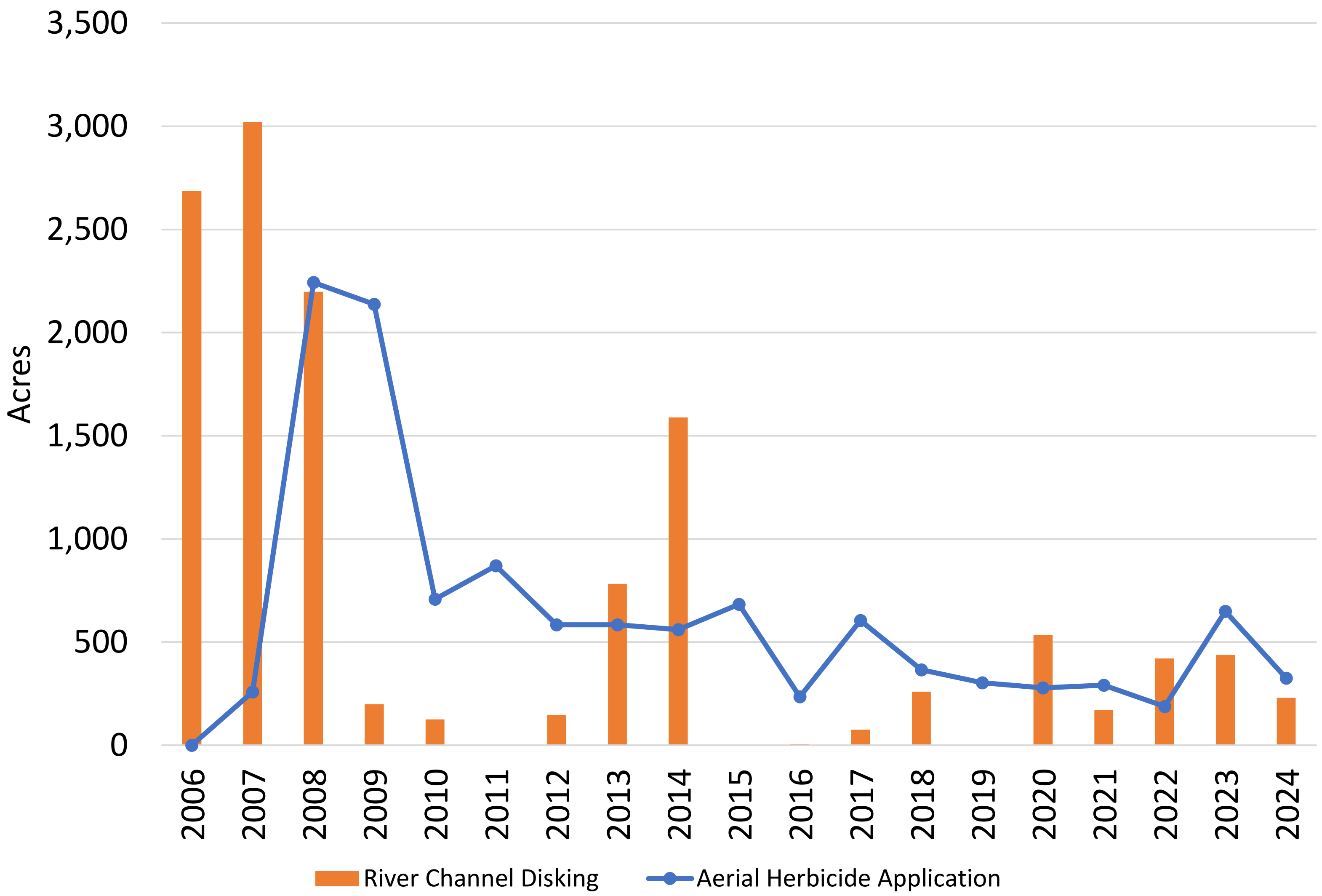
Addressing Uncertainties: Broad Scale

- Develop estimates of vegetation establishment in **without** natural peak flows or germination suppression releases.



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Do We Know Enough?

- Not Yet
- Promising observations under crucial flow scenarios
- Full scale analyses are in process

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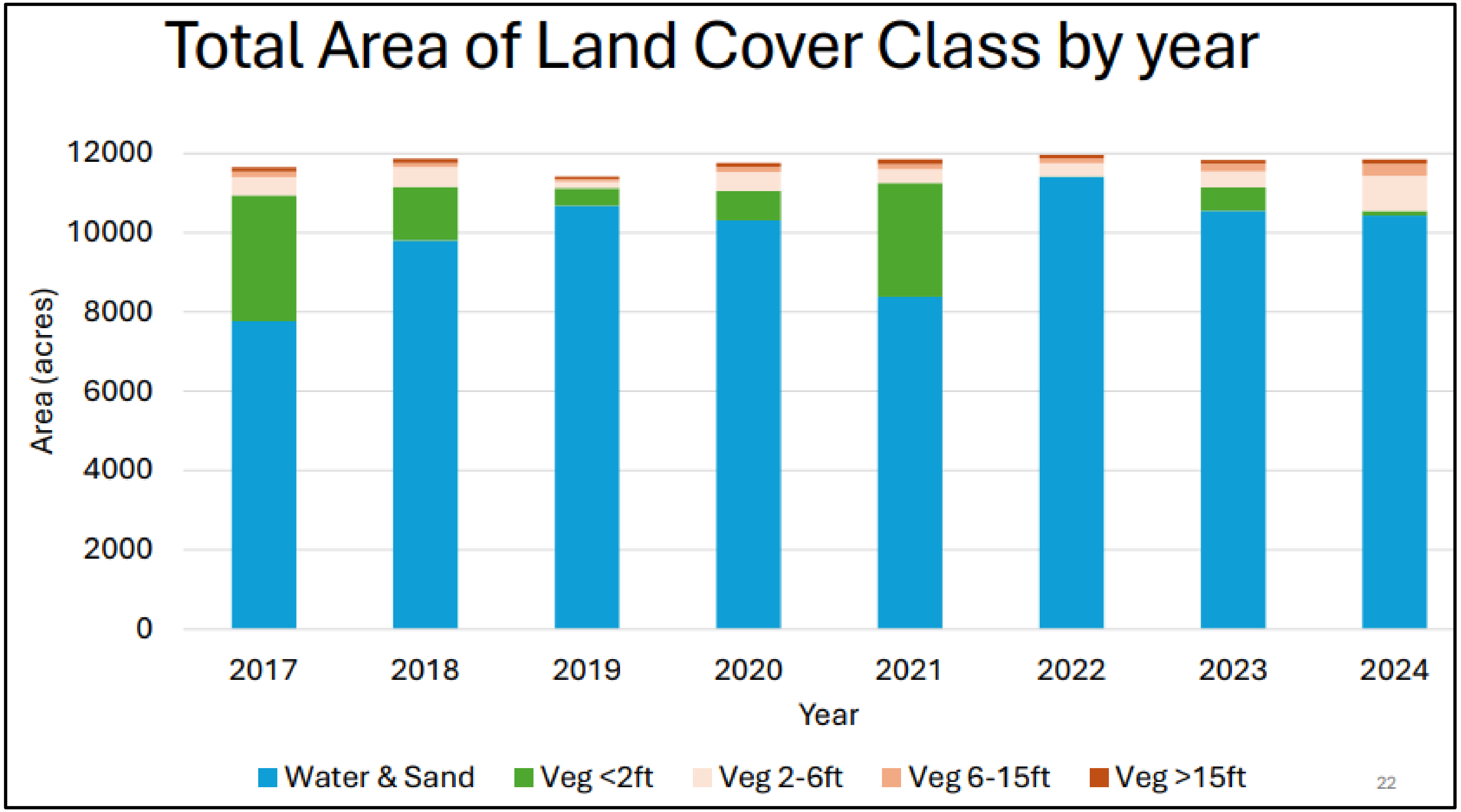
What we do know: suppression flows are positive



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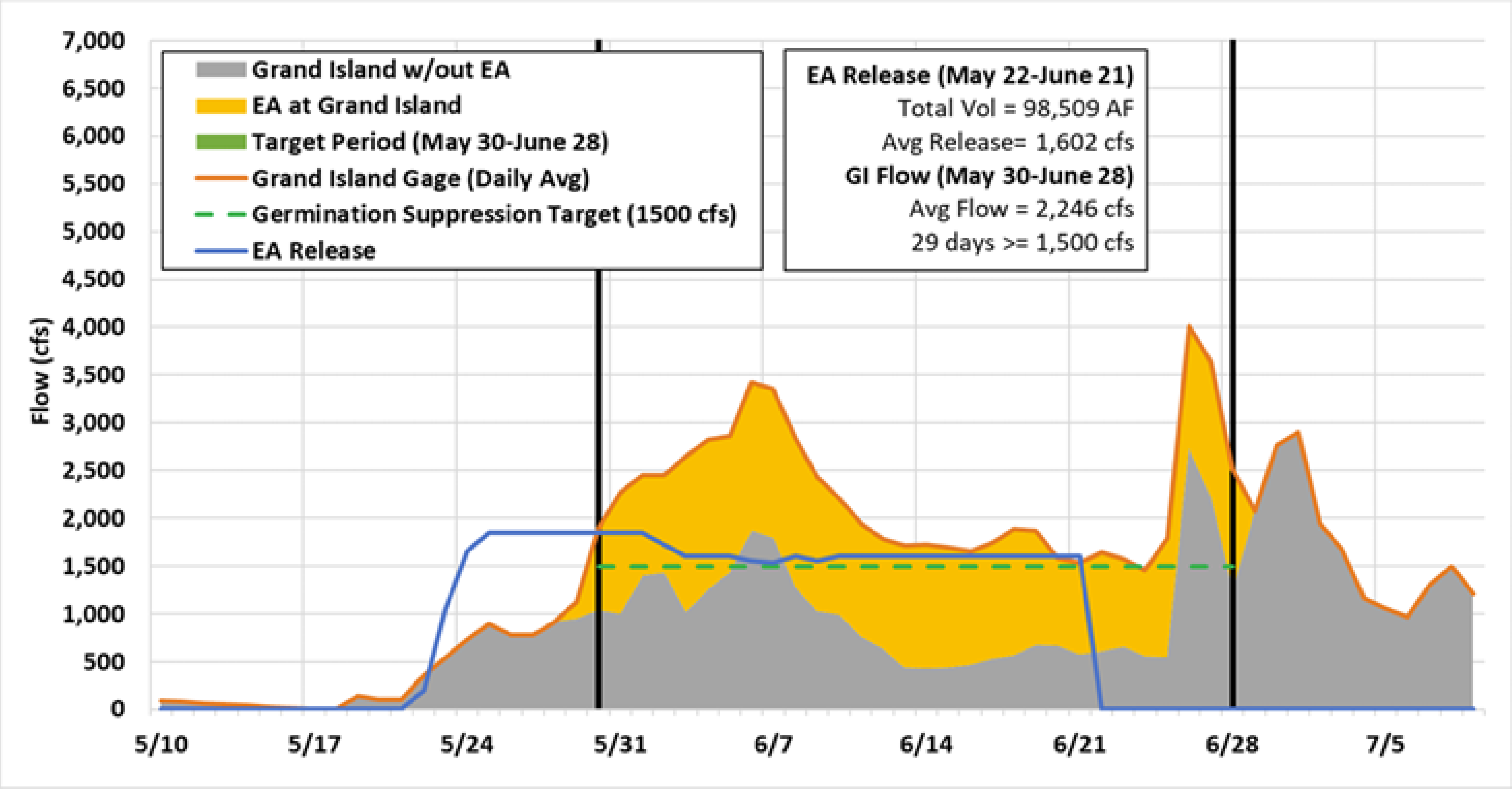
What we do know: suppression flow are *quantifiable*

2025 EA Release for Germination Suppression



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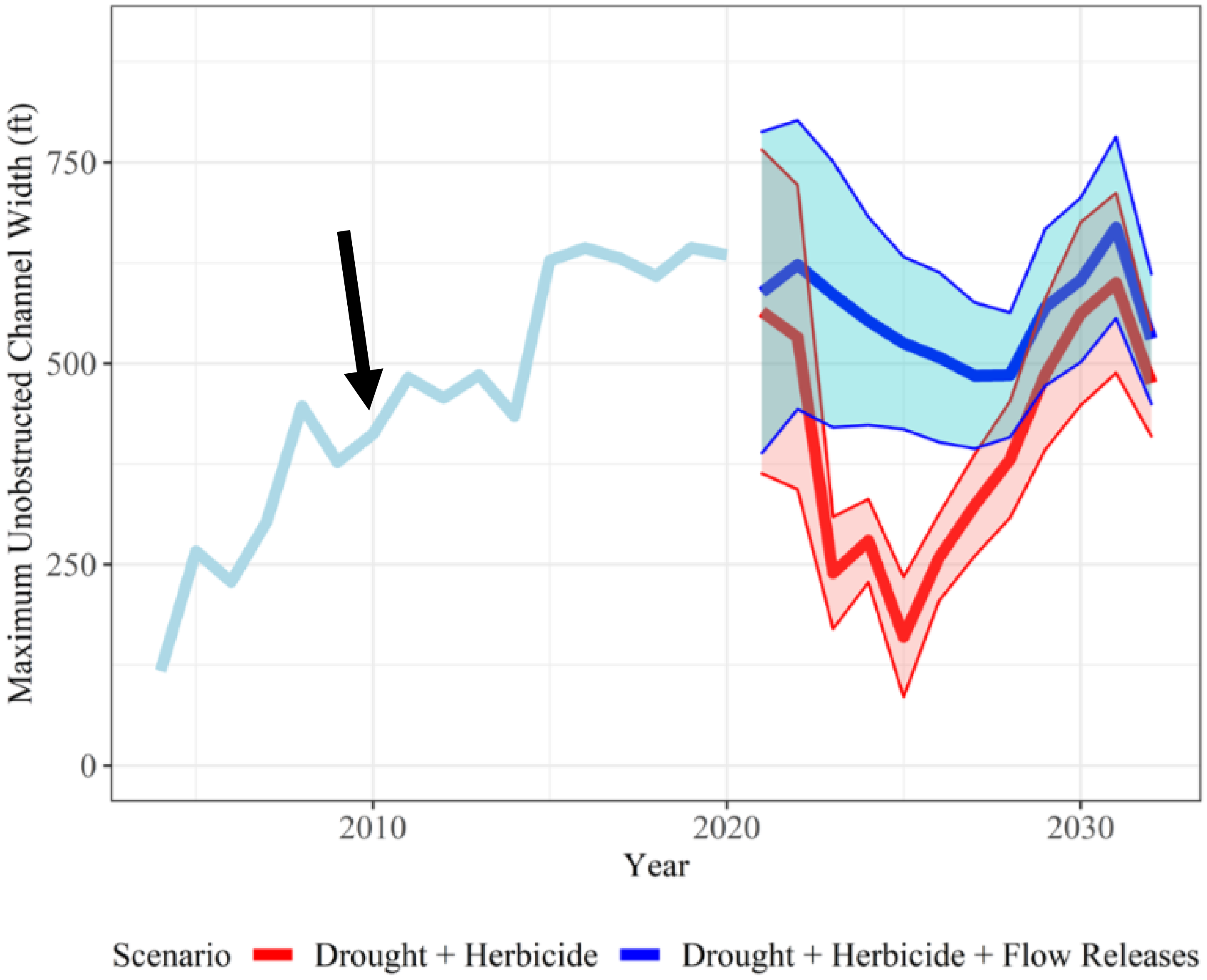
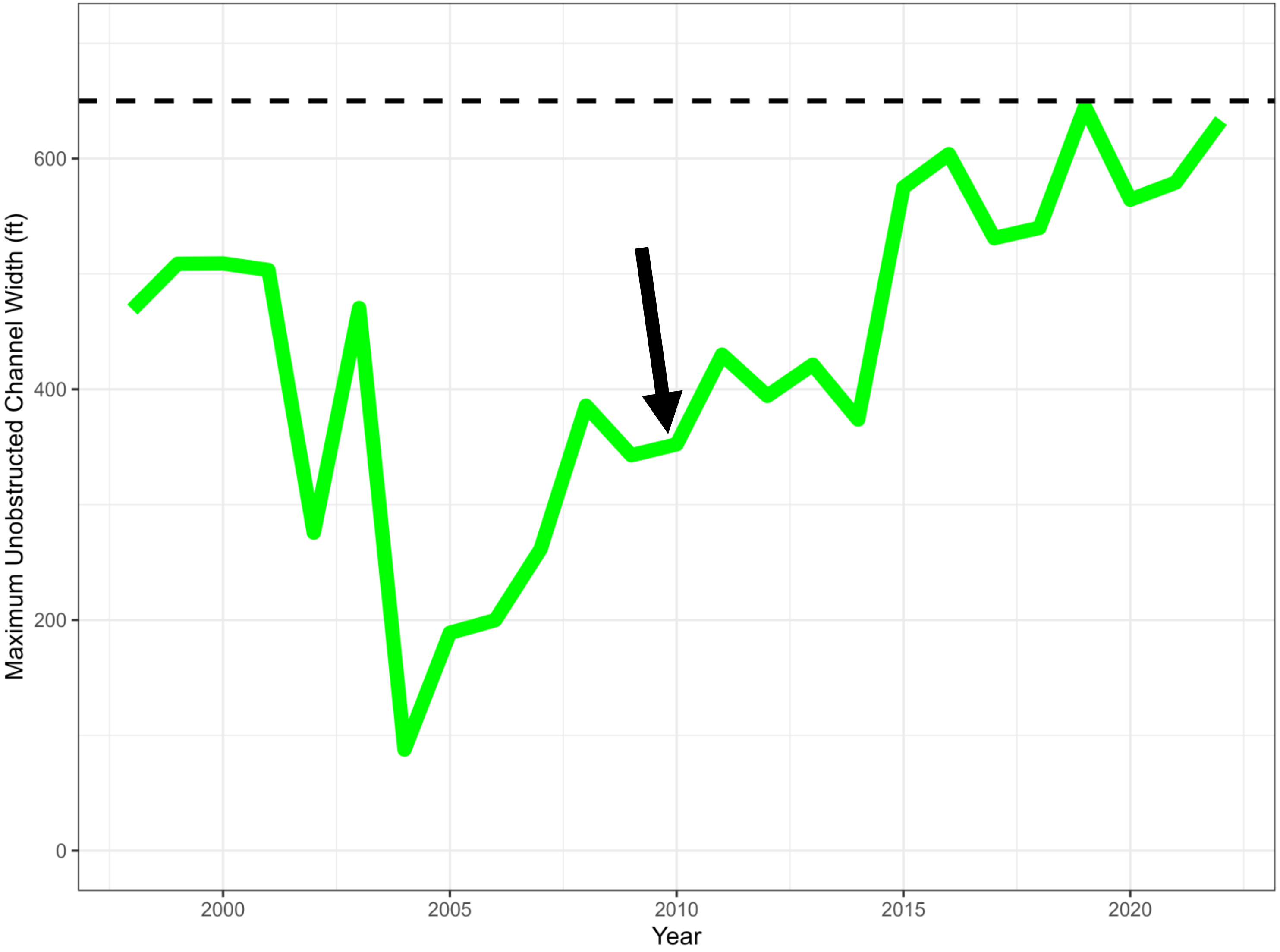
What we know: suppression flows are intertwined with *Phragmites* Control



High certainty of effectiveness in dry to normal years.

Information Prior to Suppression Flow Years



Some certainty with no germination suppression release and/or Phrag spraying.

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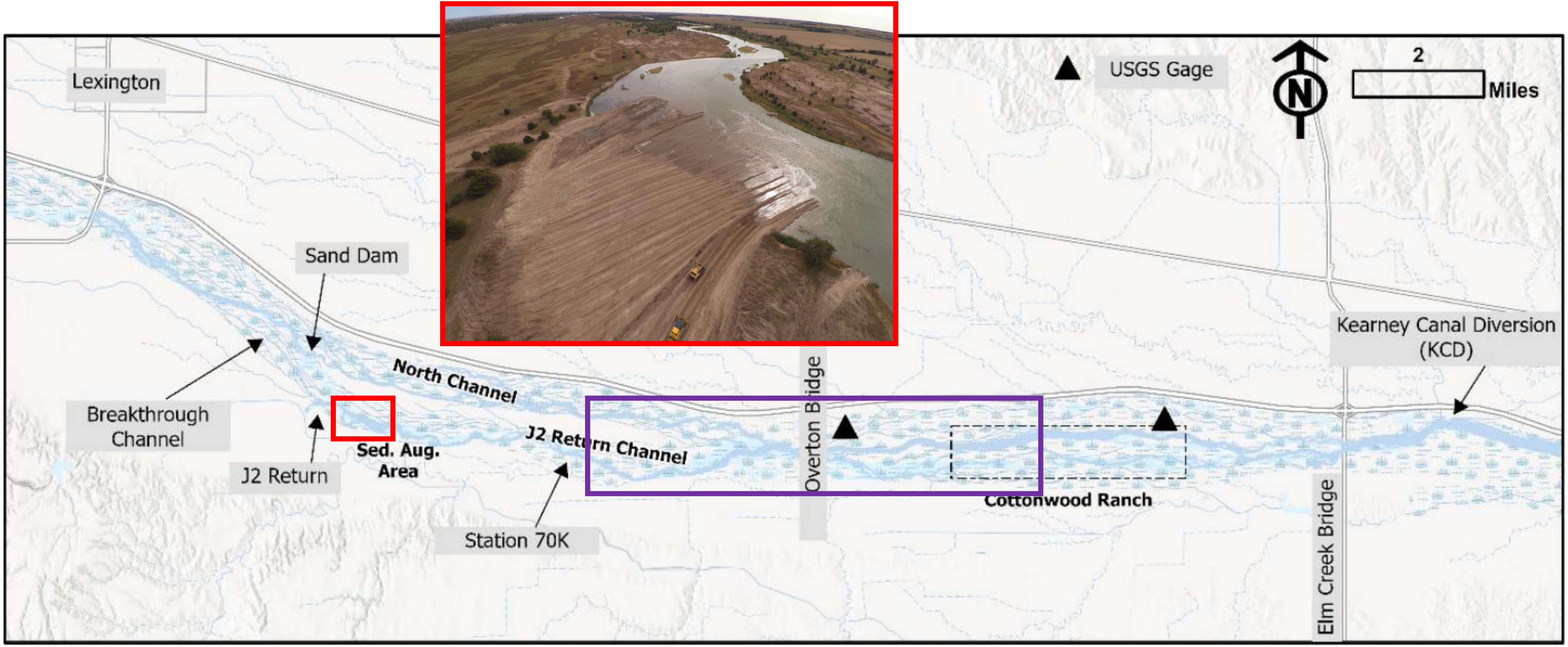
Potential Surprises

- Herbicide Treatment
    - Lack of implementation or effectiveness
- Only have additive benefits on continued annual flow releases

EBQ3: Is sediment augmentation necessary to create and/or maintain suitable whooping crane habitat?



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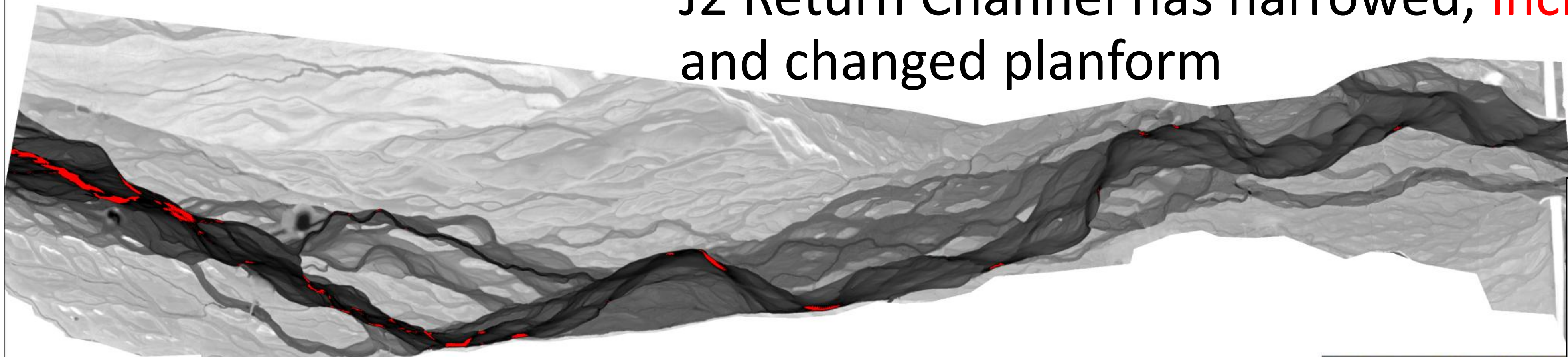
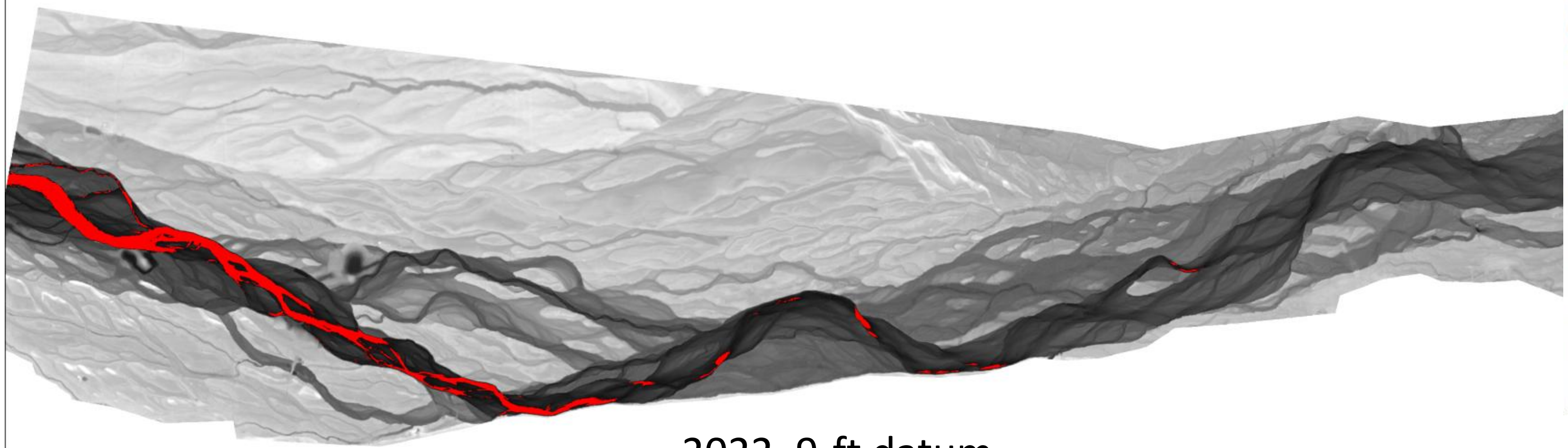
Decision-making context – J2

J2 Return Channel has narrowed, incised, and changed planform



2016, 9-ft datum

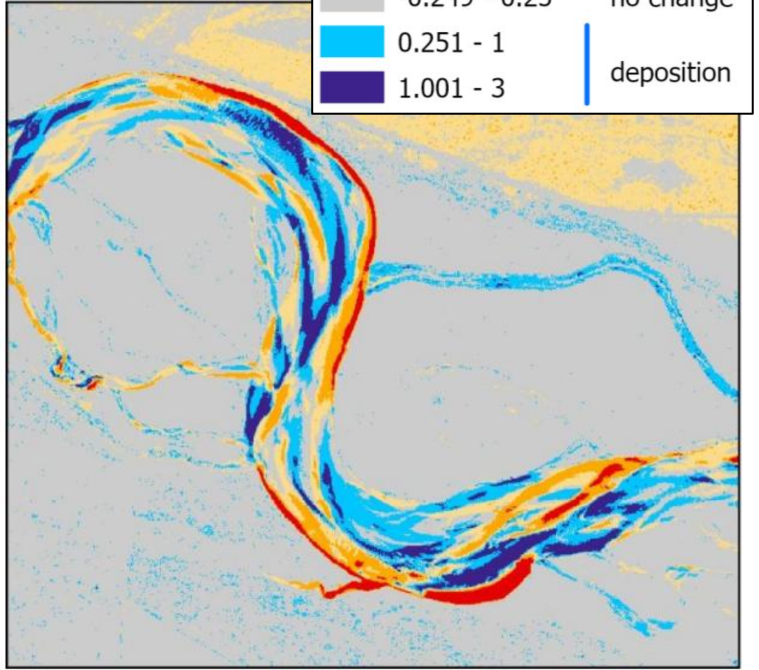
Station 70K to Overton Bridge



2022, 9-ft datum

2023 - 2024 DEM (ft)

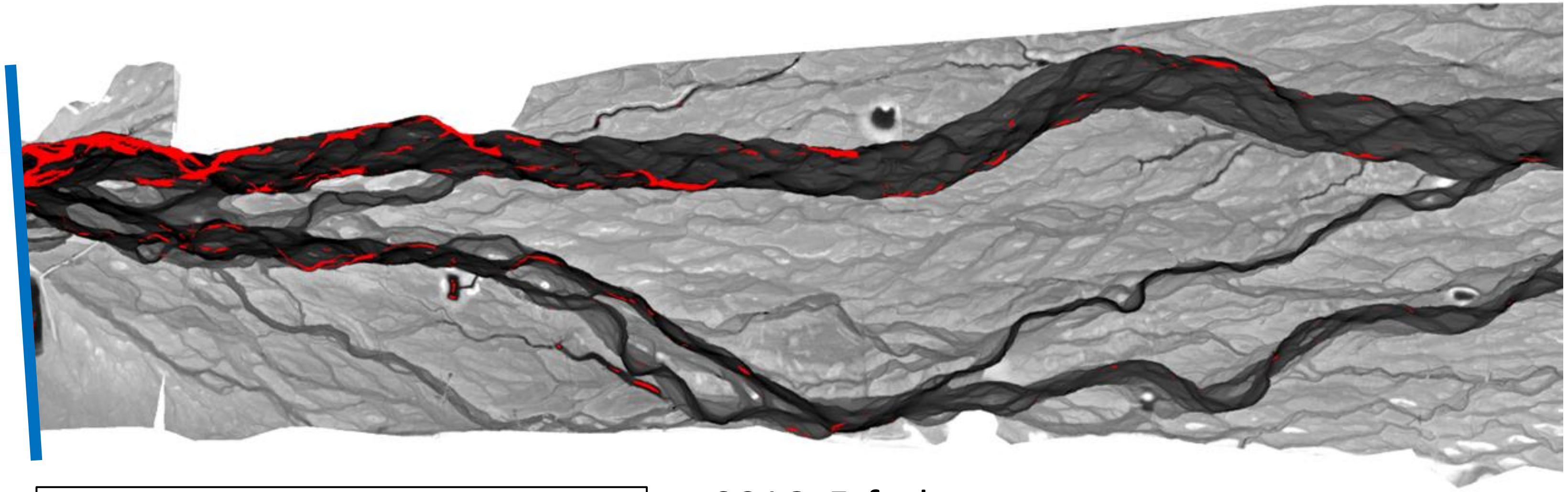
🟥	-3 or greater	erosion
🟧	-2.999 - -1	erosion
🟨	-0.999 - -0.25	erosion
⬜	-0.249 - 0.25	no change
🟦	0.251 - 1	deposition
🟪	1.001 - 3	deposition



Decision-making context – DS of Overton Bridge

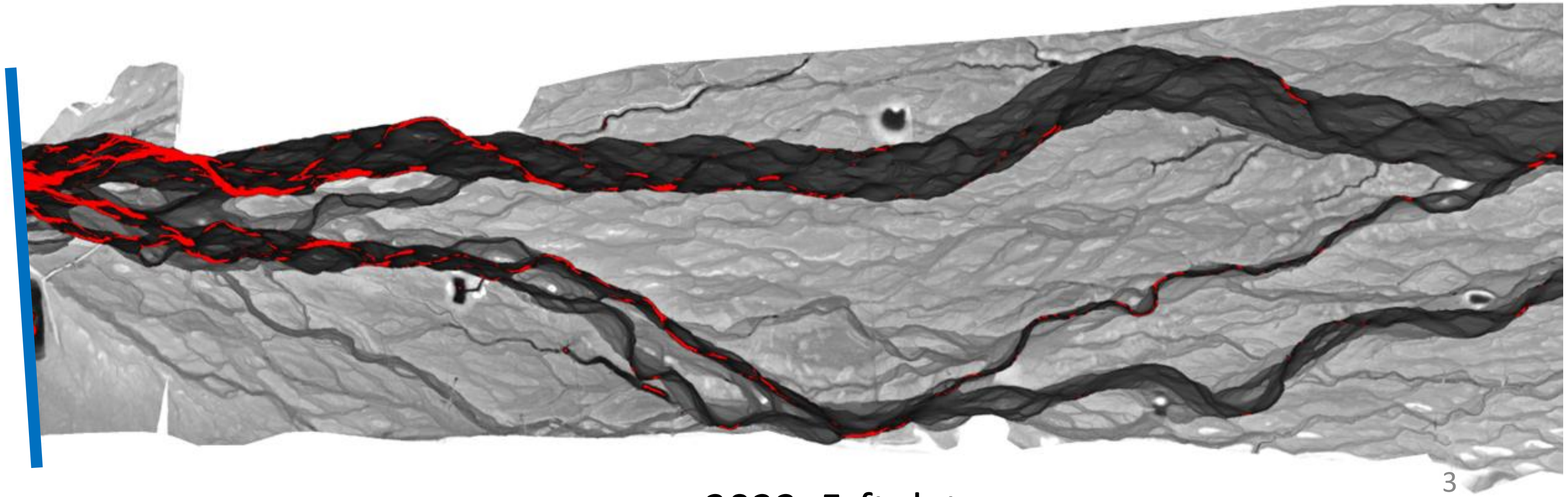
Change has progressed downstream, but *slower than expected*

Rate of downstream movement towards high-quality habitat is critical



DS of Overton Bridge

2016, 5-ft datum



2022, 5-ft datum

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Management Hypothesis

Direct, mechanical sediment augmentation is necessary to halt narrowing and incision in the J-2 Return Channel.

Alternative hypotheses?

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Questions expected to address:

Rate and pattern of incision, narrowing, planform change with *vs* without augmentation?

If rate is unacceptable, how much augmentation is needed?

Viable alternatives for equivalent effectiveness?

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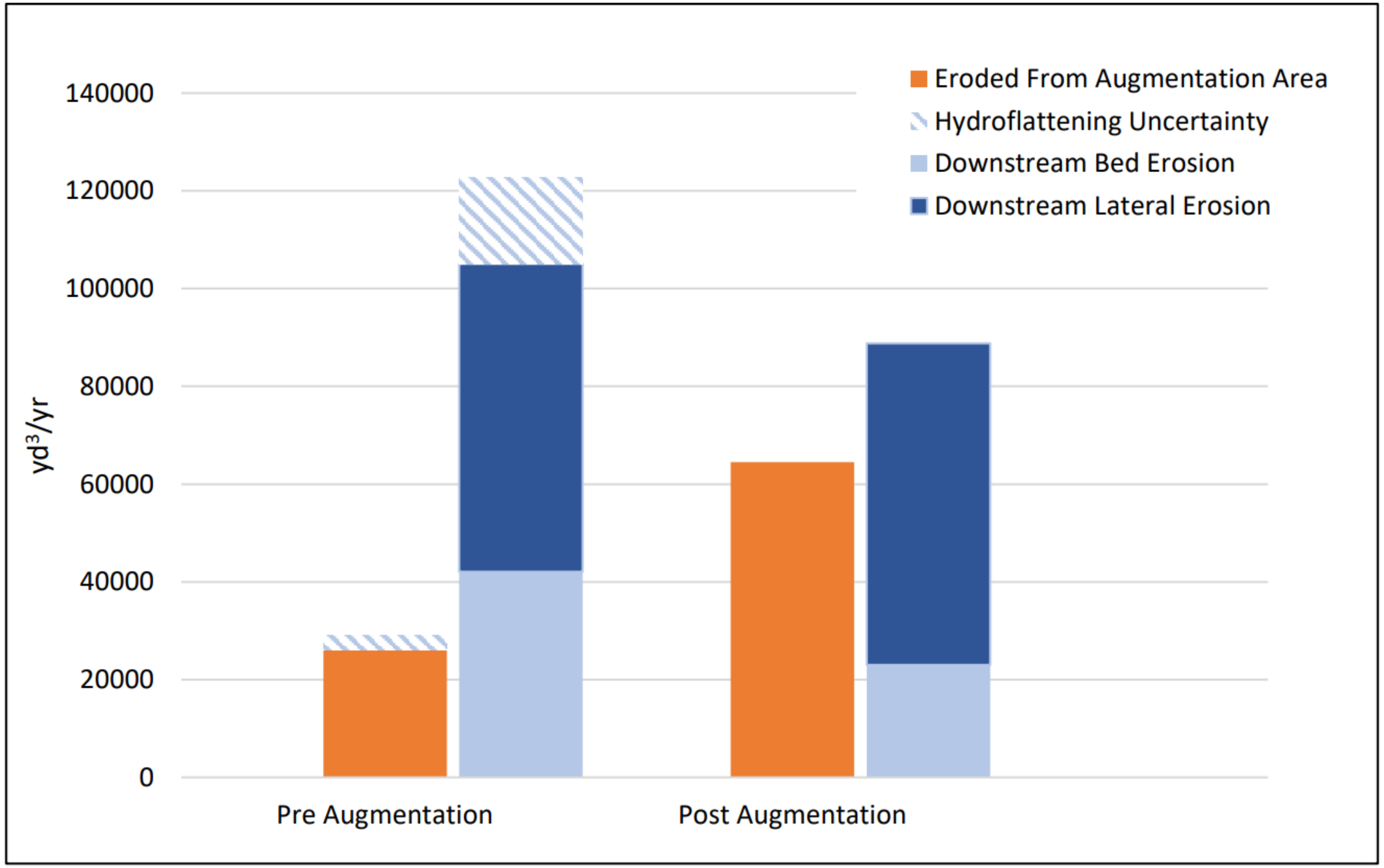
Direct Augmentation

2017 – 2022, peer-reviewed

Continued slow progression of incision – lateral erosion high

~ ½ the bed erosion in J2 offset by augmentation



Key result: benefits difficult to quantify mechanical *vs* lateral erosion…→ no augmentation experiment

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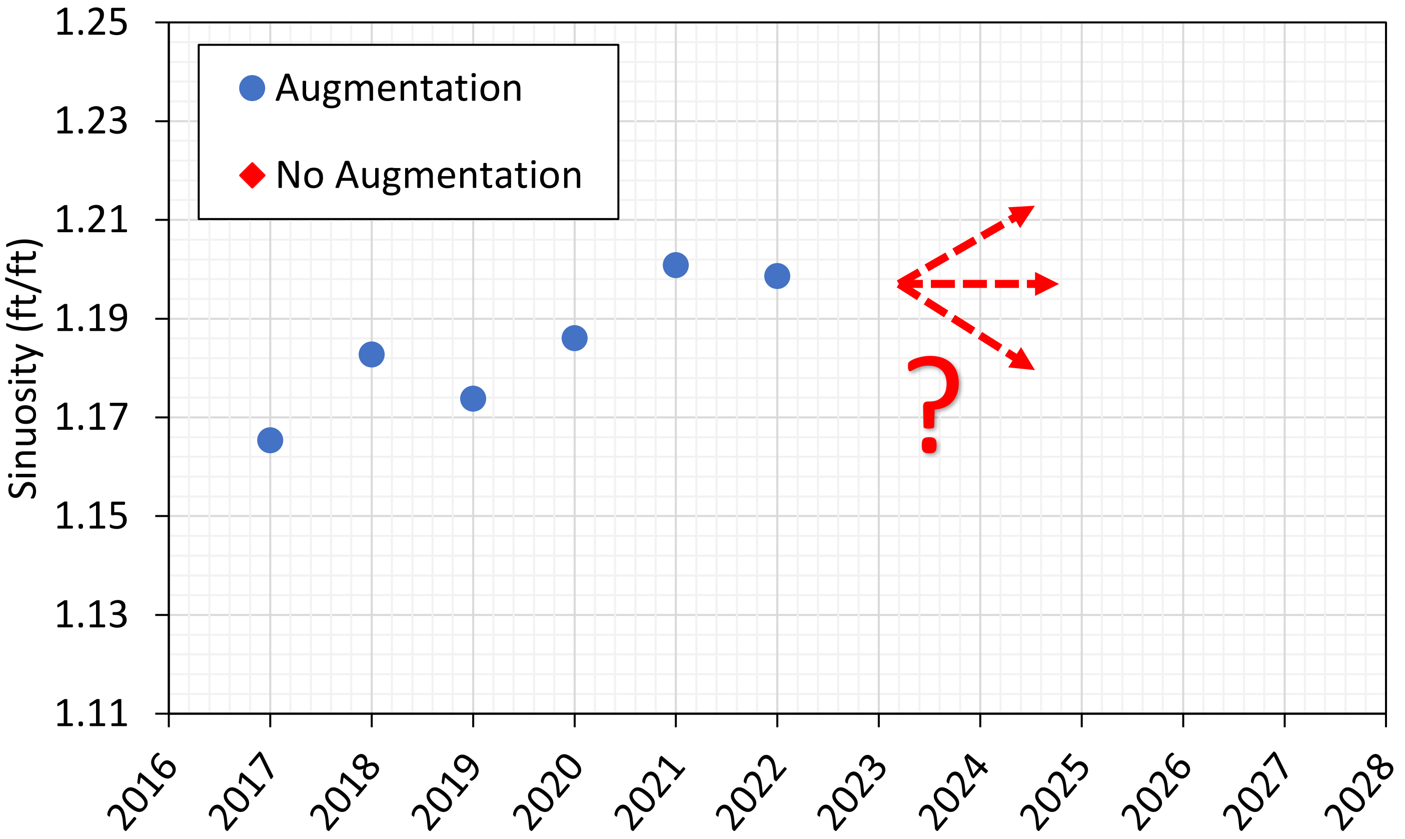
No Augmentation

No Augmentation Experiment

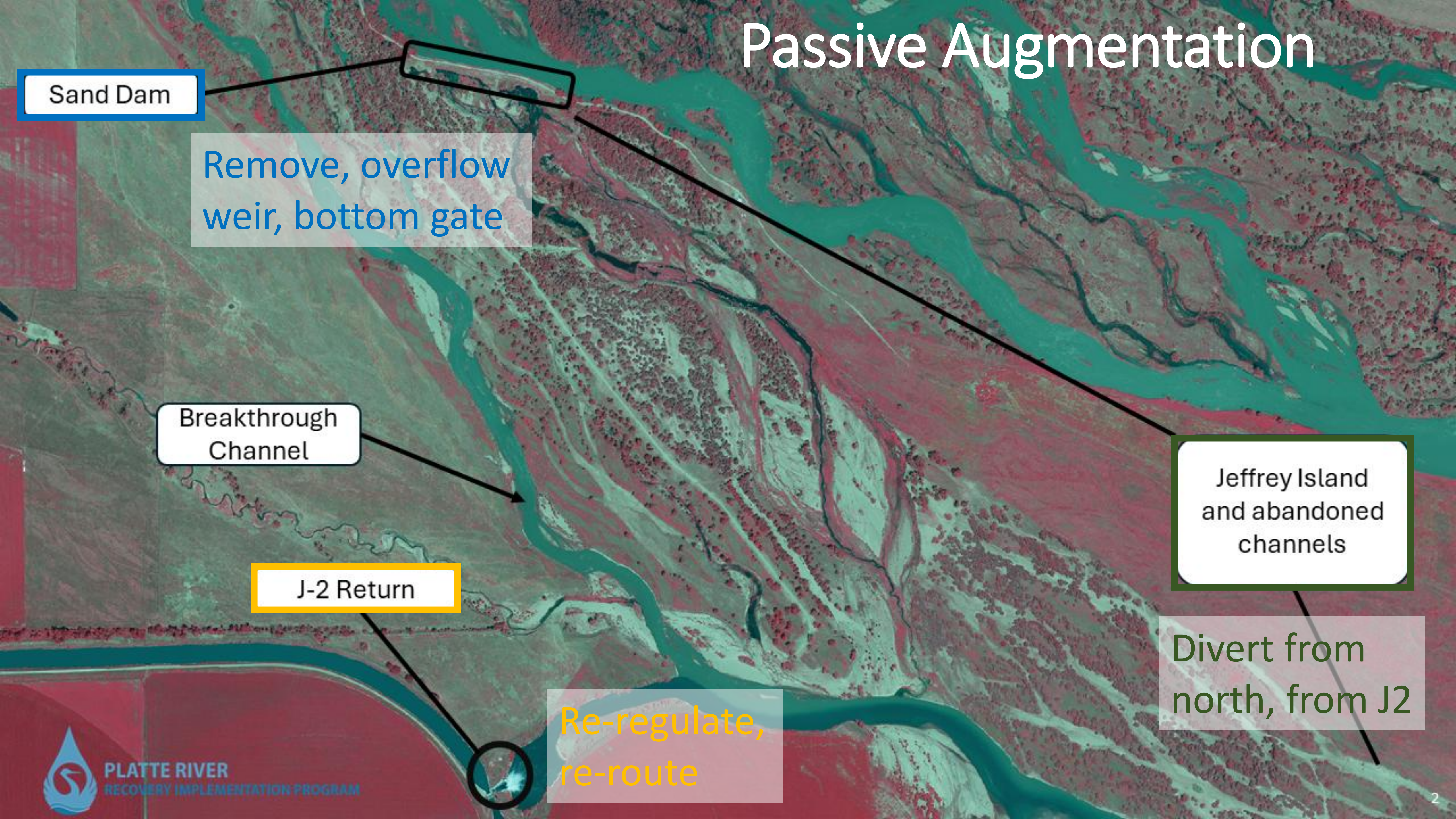
- Estimate rates of incision, narrowing, planform change
- Determine augmented volume required to offset changes

- Annual evaluation and reporting is critical, and so far has shown **no new major concerns**



Example – sinuosity during augmentation, and no-augmentation

Passive Augmentation



Sand Dam

Remove, overflow weir, bottom gate

Breakthrough Channel

J-2 Return

Re-regulate, re-route

Jeffrey Island and abandoned channels

Divert from north, from J2

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Passive Augmentation Study Results

- *Reconnaissance-level* study of alternatives to direct sed aug
- All alternatives are more expensive and complicated than direct aug

	Average Annual Deposition (+) or Erosion (-)			
Alternative	North Channel (tons/yr)	J2 Channel (tons/yr)	DS Channel (tons/yr)	Capital Cost ($)
Nothing	-53,000	-169,000	-24,000	0
Re-regulate J2	-50,000	-130,000	-33,000	Unknown
Re-route J2	-53,000	-139,000	-16,000	**25,686,475**
Sand dam weir	41,000	-179,000	-85,000	**10,404,422**
Sand dam gate	55,000	-176,000	-88,000	**10,404,422**
J2 erodes Jeffrey Island	-44,000	-122,000	30,000	**29,230,172**

What do we know?

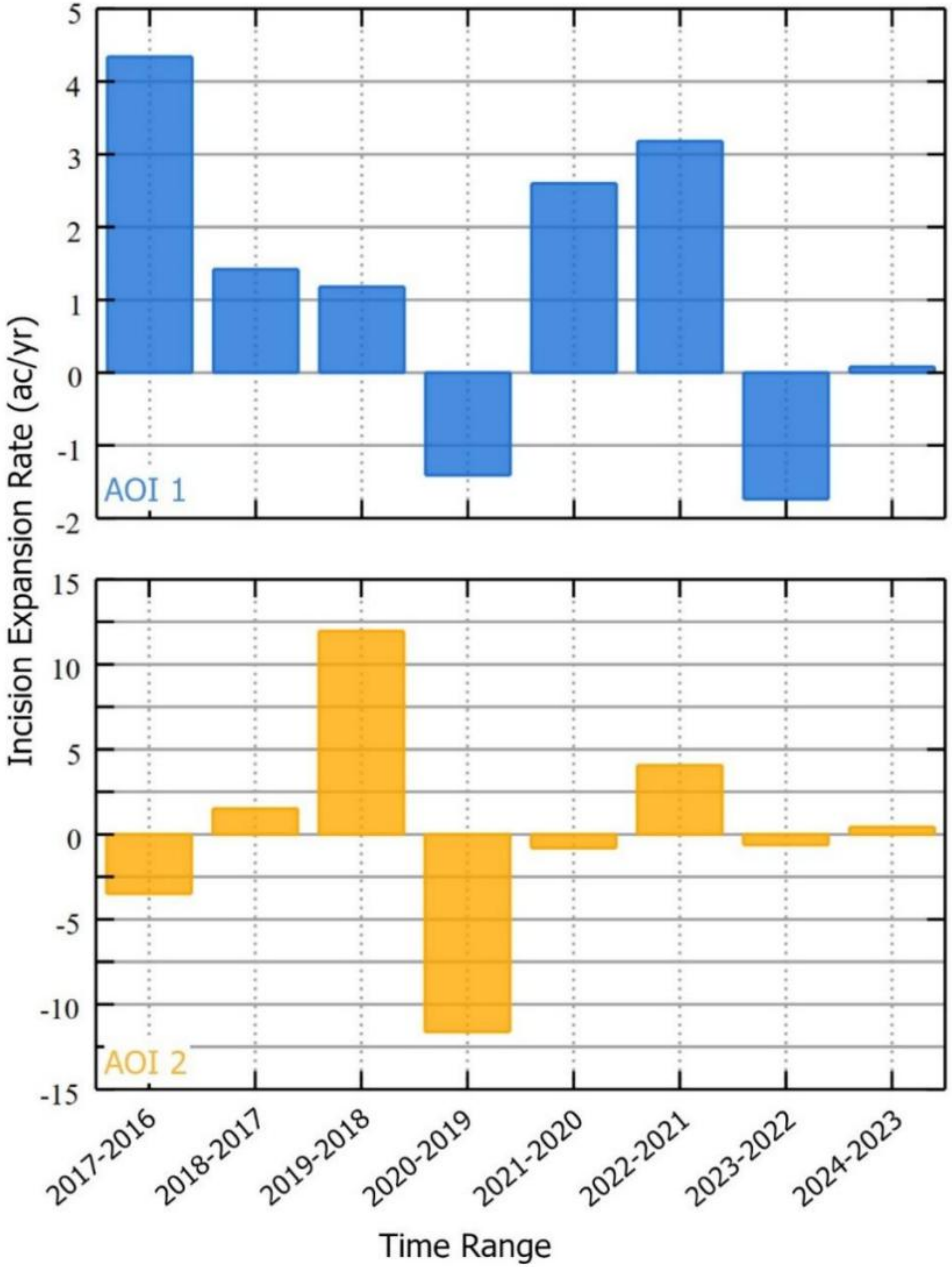
No augmentation monitoring

- Ongoing (began 2023)
- Natural experiment limitations

Initially *cautiously optimistic* that incision/narrowing remains slow

Rates and patterns within recent historic values

So far low stream power conditions



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Potential surprises

Hydrology – downstream of Overton, a wet year could recruit more sediment to bed, increase narrowing/incision, or something else

Rates and patterns of **lateral erosion** have large impacts on risk of narrowing/incision

Water Year	Mean Annual Discharge (ft^3/s)
1958-2024	1,715
2009	916
2010	2,069
2011	3,972
2012	1,032
2013	1,068
2014	1,177
2015	3,304
2016	2,904
2017	1,499
2018	1,408
2019	2,550
2020	1,823
2021	1,001
2022	570
2023	1,075
2024	967

Emerging issues

Could mitigation of incision/narrowing be mandated regardless of results?

J2 return channel as WC habitat *vs* sacrificial reach?

How does channel incision and floodplain processes and form impact wet meadow hydrology?

EBQs 4-6: Water Needed During WC Spring and Fall Migration

2026 Science Reporting Session

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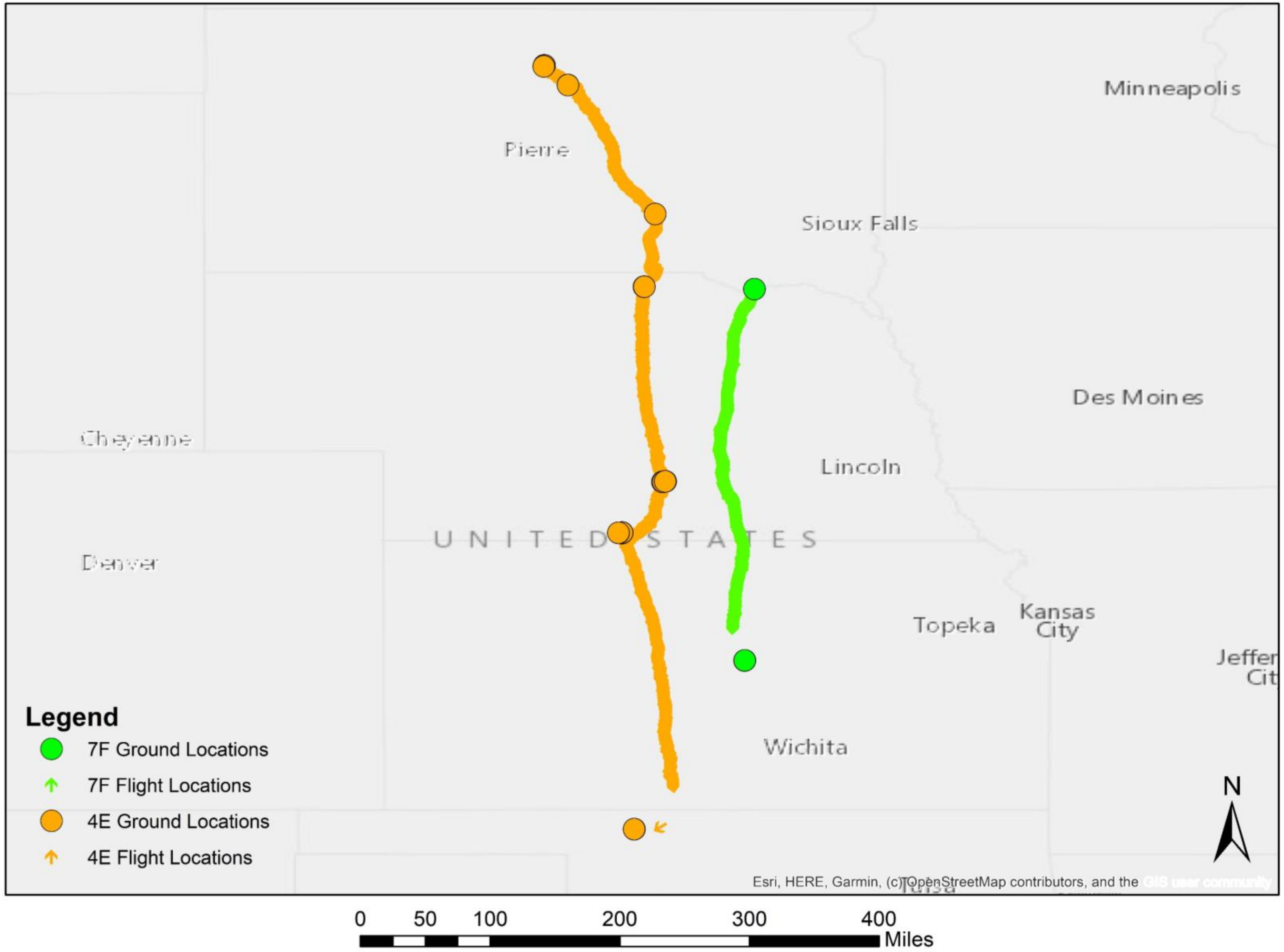
Extension Big Question #4-6: What factors influence WC decision to stop or fly over the AHR, how long they stay, and why use differs by season.

BQ4 Management Hypothesis: Probability of WC stopping within the AHR is a function of discharge.

BQ5 Management Hypothesis: Length of WC stopover within the AHR is a function of discharge.

BQ6 Management Hypothesis: WC use of the AHR in the Spring is greater than during the Fall due to higher flows during the Spring.

Decision making context



Data

- Cellular telemetry data (2017-2024)

Analyses

- Stopover/flyover
- Stay length
- Seasonal differences

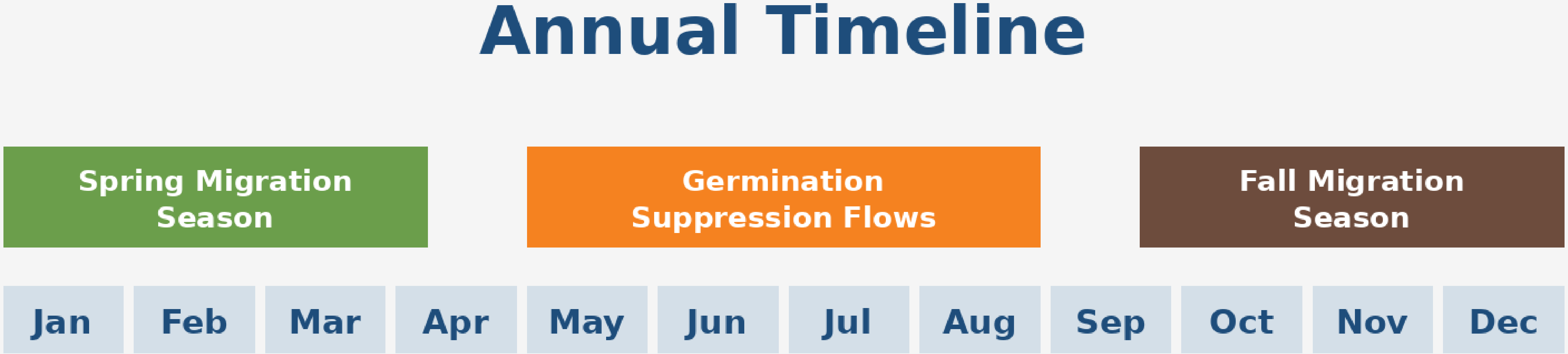
Decision making context

Key Uncertainties

- Whether flow **directly** or **indirectly** influences stopover initiation and stay length

- Relative importance of manageable variables

Decision making context



Annual Timeline

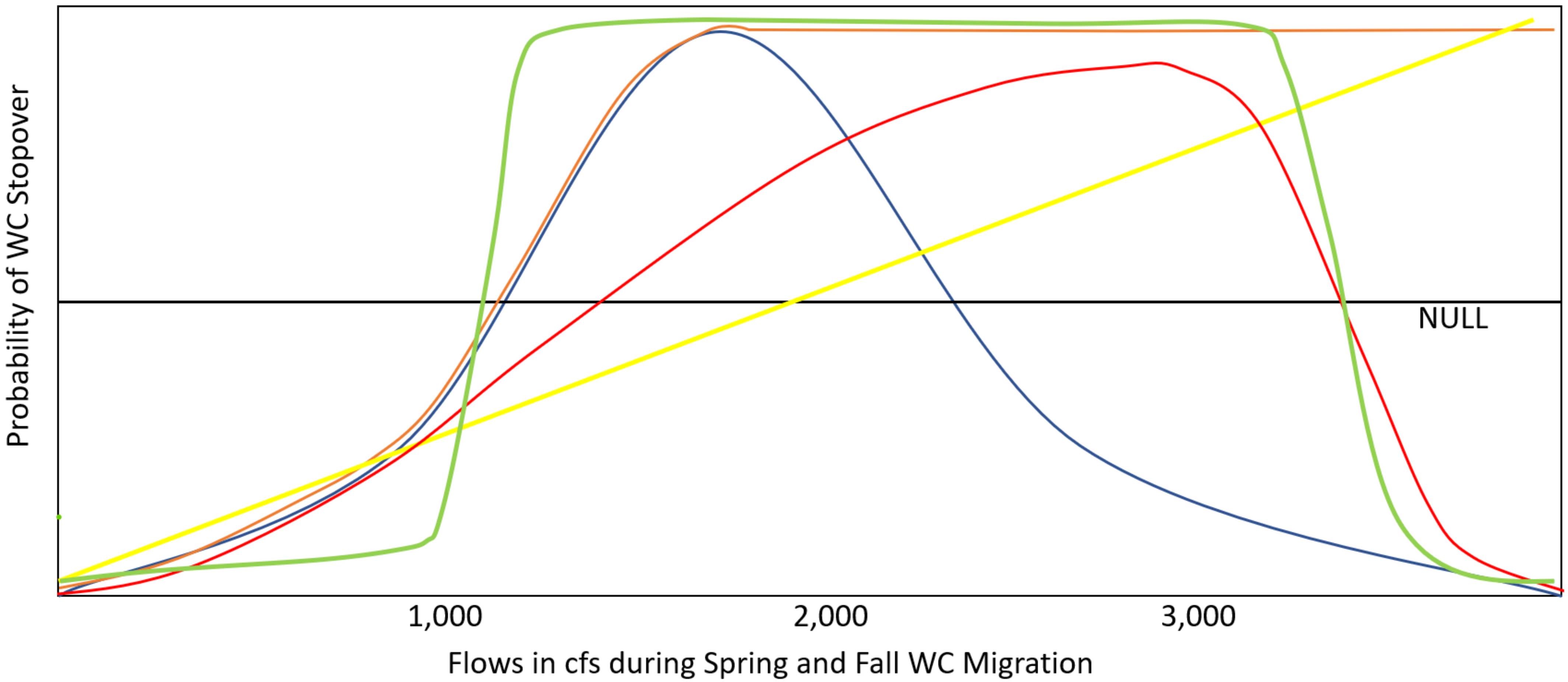
Spring Migration Season

Germination Suppression Flows

Fall Migration Season

Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec

Negotiation related questions – flow relationship



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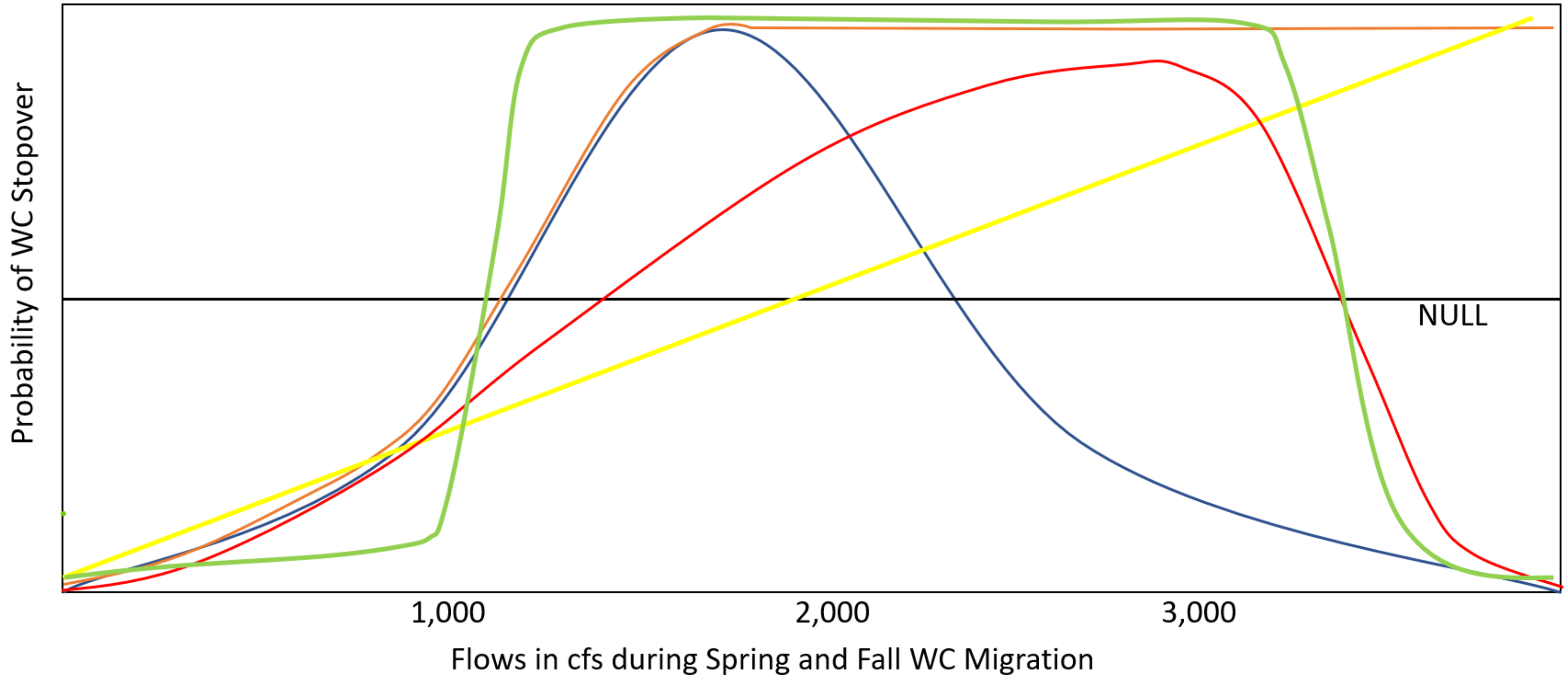
Negotiation related questions – flow relationship



If resources are invested, what is the expected improvement to WC use?

Under what conditions would flow have a greatest benefit?

Addressing uncertainties: analysis objectives

- Identify what factors are important to predict when a crane will stop during migration
- Develop the form of those relationships
- Translate probability to expected number of birds under various scenarios

Addressing uncertainties: analysis objectives

If **discharge** is important:

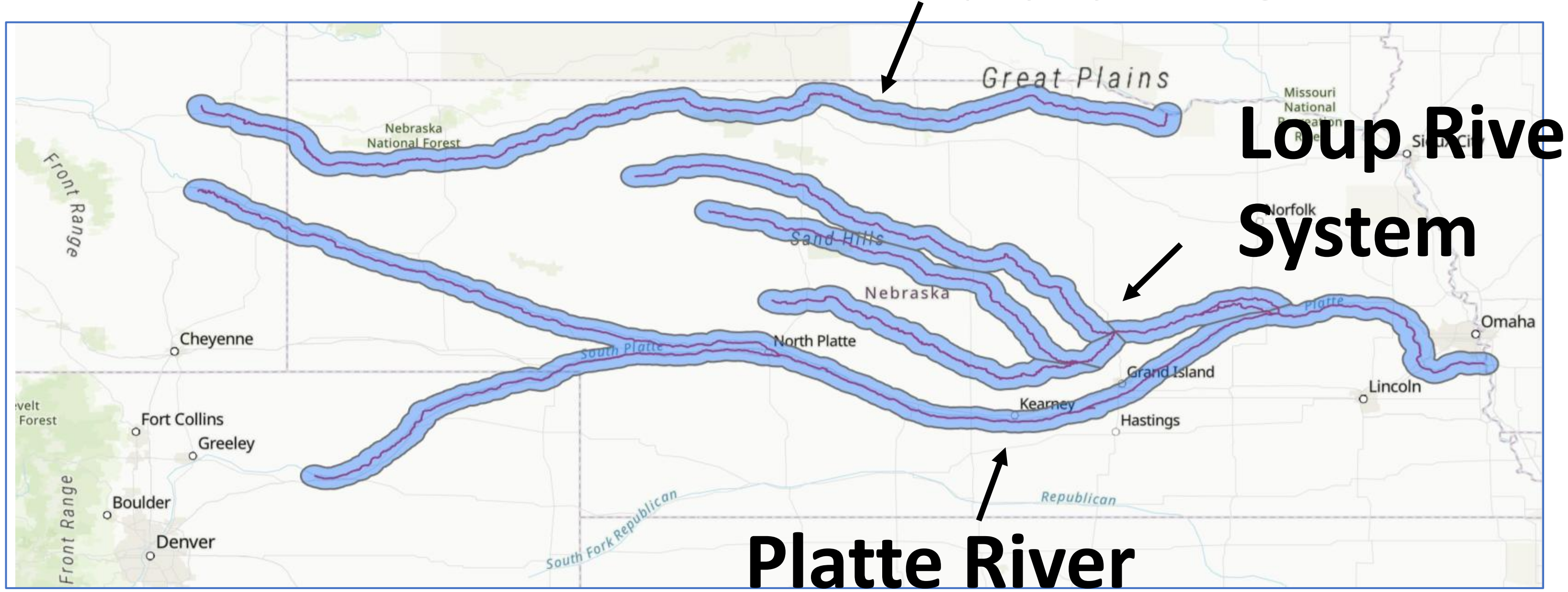
- Identify discharge ranges associated with highest marginal benefit.
- Estimate cost of incremental flow increases.
- Compare cost per additional expected crane stopover.

Addressing uncertainties: seasonal differences

- Evaluate whether drivers differ between spring and fall migration
- Identify variables with seasonal effects
- Evaluate implications for seasonal management decisions

Addressing uncertainties: across systems

- Is stopover frequency higher in the AHR relative to other systems?
- Are discharge–response relationships unique to the AHR?
- Do channel characteristics differ systematically across systems?



Niobrara River

Loup River System

Platte River System

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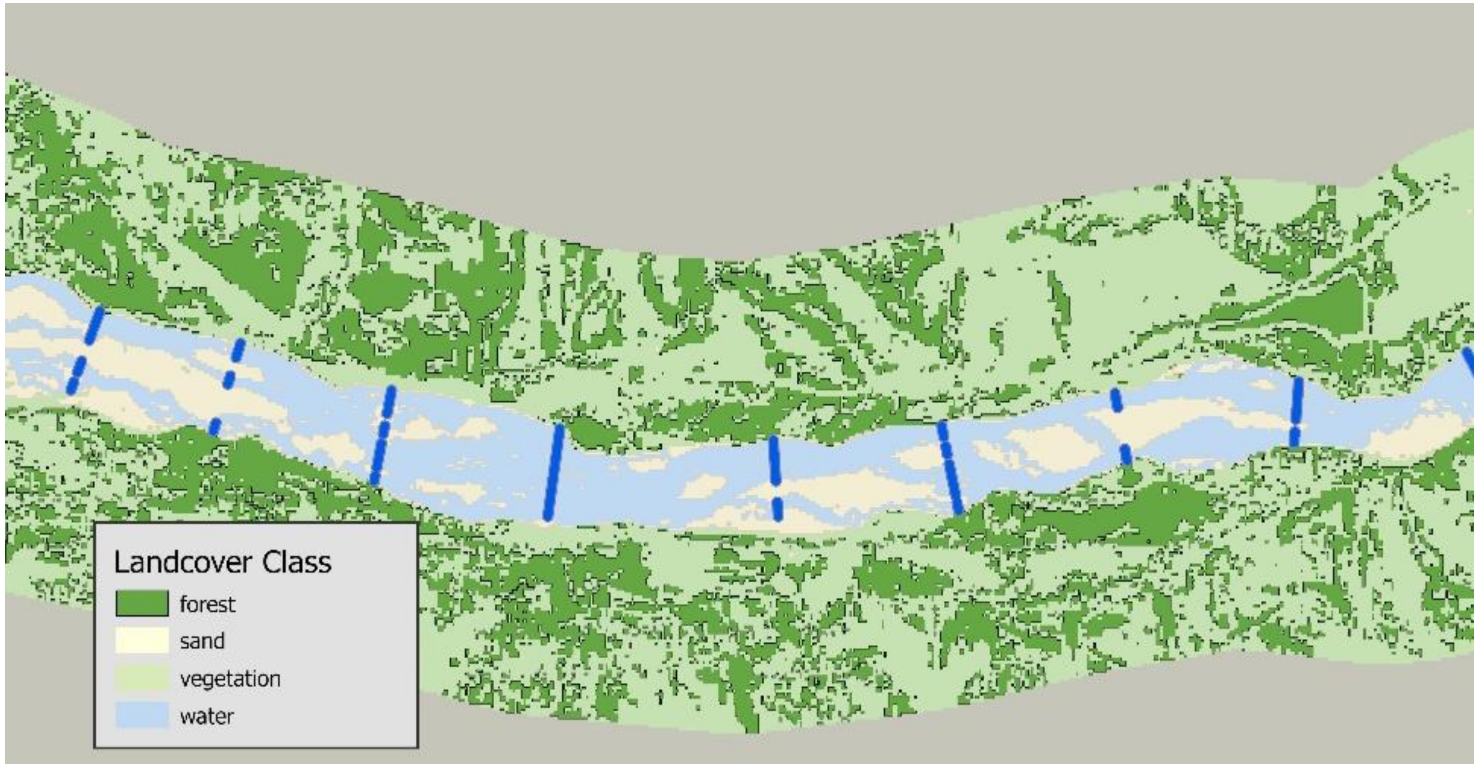
Do we know enough to address uncertainties?

- Not Yet; but close

- Large effort to process telemetry data and extract relevant variables



Wetted width at stopover/flyover decision point

Do we know enough to address uncertainties?

- Not yet — but close.
- Telemetry processing and variable extraction largely complete.
- Stopover frequency higher than previously Likely sufficient sample size for broad-scale inference.

Potential surprises: fall water operations

- If discharge strongly influences **fall stopover probability**, current water operational constraints may limit the Program’s ability to respond.

- This could necessitate broader evaluation of fall water operations.

Extension Big Question #10: Wet meadow research

2026 Science Plan Reporting Session

Malinda Henry – Science Plan Coordinator

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Extension Big Question #10: Wet meadow research

Decision-making context:

- Acquire/restore 640 acres
- Lack of agreement on definition
- Lack of agreement on WC selection for CPR wet meadows
- What is the management objective for a Second Increment?

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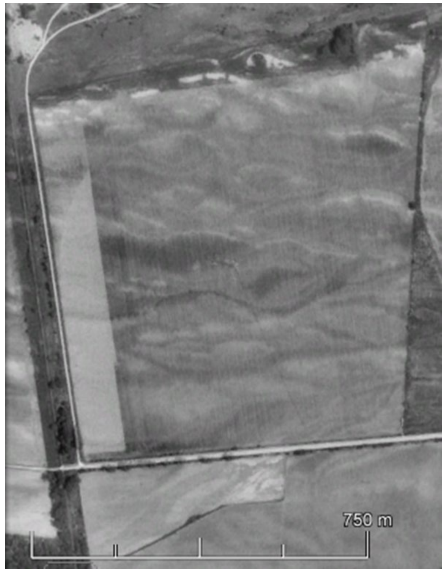
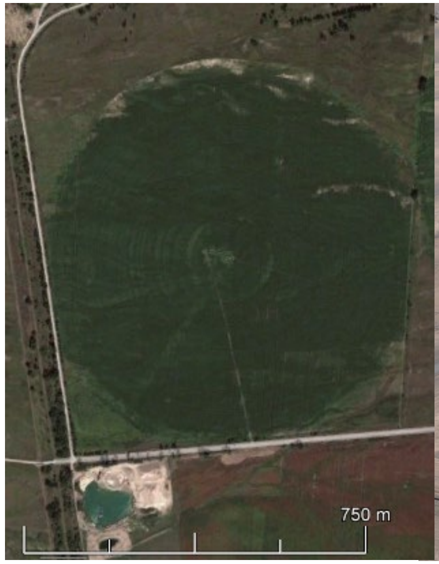
Extension Big Question #10: Wet meadow research

Negotiation-related questions:

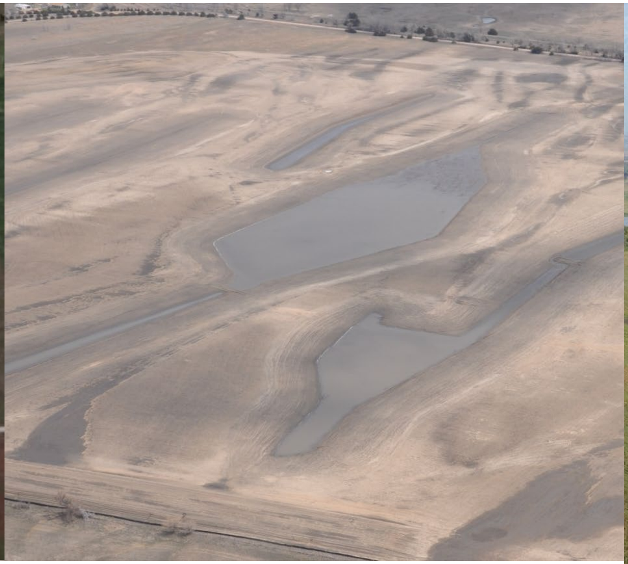
- Can the Program create/restore wet meadows at additional locations?
- If feasible, will benefits extend to whooping crane use?



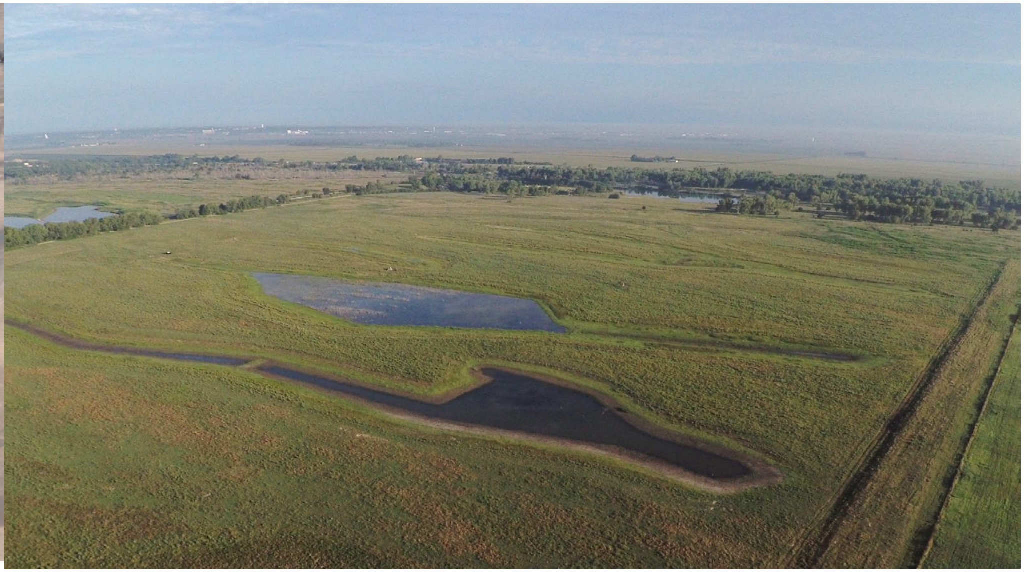
Fox, 1985



2009



2012

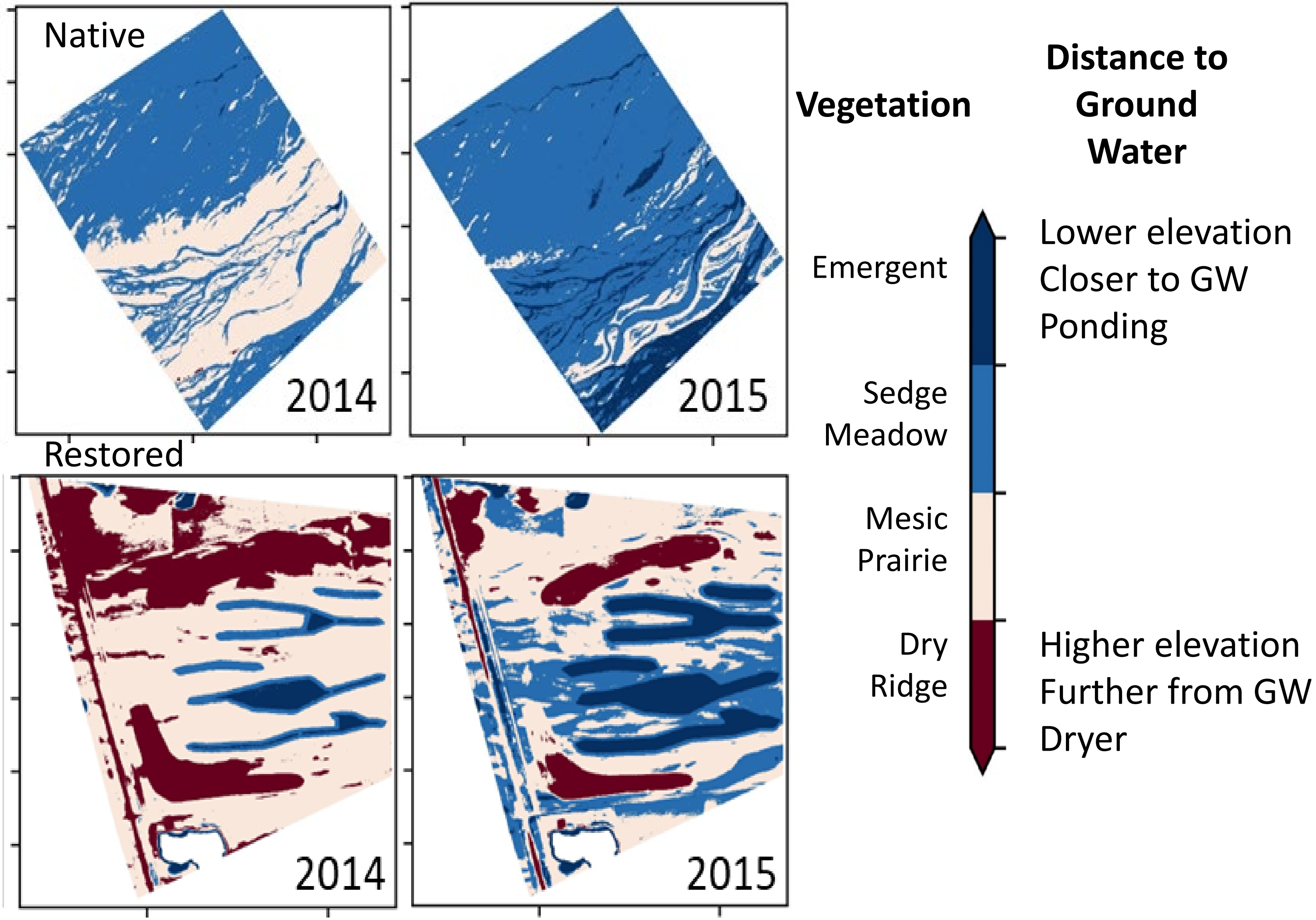


Fox, 2017

EBQ10 What do we know?

Functional wet meadow hydrology

- Spatial and temporal variability in depth to groundwater
- Linked to vegetation community



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Extension Big Question #10: Wet meadow research

Can we build it?

- Develop a modeling tool for land managers to inform management decisions
- Estimate water needed for flow releases or surface application

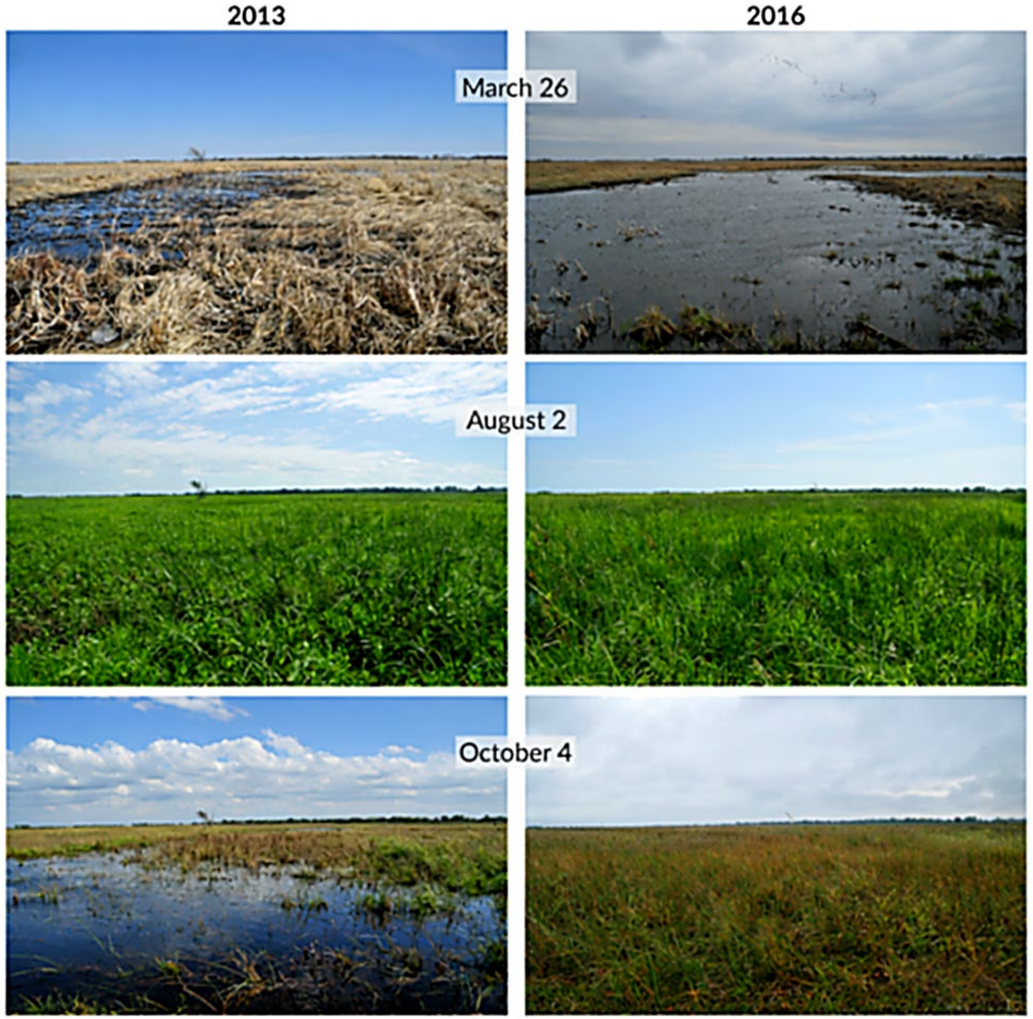

Figure from Brinley Buckley et al. 2021 Ecosphere

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EBQ10 What do we know?

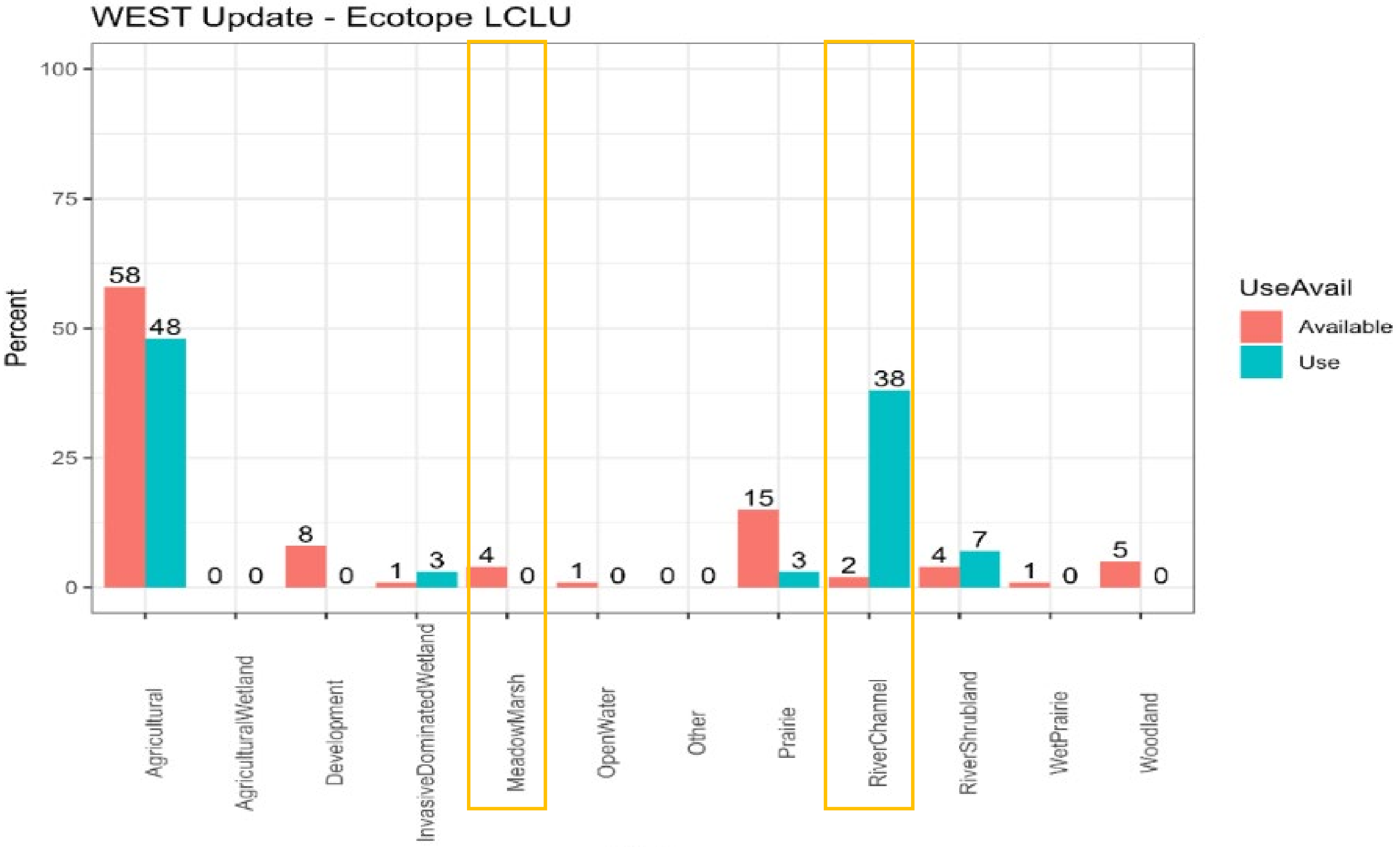
Will benefits extend to WC use?

Diurnal use site selection

- No positive selection for wet meadows

Roost Site Selection

- Amount of nearby wet meadow not important for roost site selection



EBQ10 Do we know enough already? YES

Wet Meadow Policy

Approved at December 2024 GC

- Retain current definition of wet meadows
- Retain current wet meadow/grassland holdings
- Improve Program's management of wet meadow/grasslands
  - Benefit other species of concern
- Prioritize riverine habitats over creating additional wet meadows mechanically

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Extension Big Question #7: What effect do Program flow management actions to benefit WC, PP, and LT in the central Platte River have on pallid sturgeon (PS) use of the lower Platte River (LPR)?

Mark Pegg, Jonathan Spurgeon, Jenna Ruoss, Chris Pullano

2026 Science Plan Reporting Session

Malinda Henry – Science Plan Coordinator

PLATTE RIVER
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Extension Big Question #7: What effect do Program flow management actions to benefit WC, PP, and LT in the central Platte River have on pallid sturgeon (PS) use of the lower Platte River (LPR)?

Decision-making context:

Program obligation to minimize/avoid impacts and quantify benefits for PS

Negotiation-related questions:

- Are there impacts or benefits?
  - Under what conditions?
  - Where, when, to what extent?
- If impacts, how do we minimize or mitigate?

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EBQ7: What are we doing?

Pallid sturgeon habitat and spawning research

- UNL tagging and tracking PS use and movement

Addressing uncertainties:

- Extent and timing of PS use of LPR
- Environmental variables and habitat metrics

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EBQ7: What are we doing?

2D Hydrodynamic Model and Flow Management Study

Addressing uncertainties:

- Identify expected changes in LPR flow-related metrics (PS habitat metrics) due to PRRIP flow management

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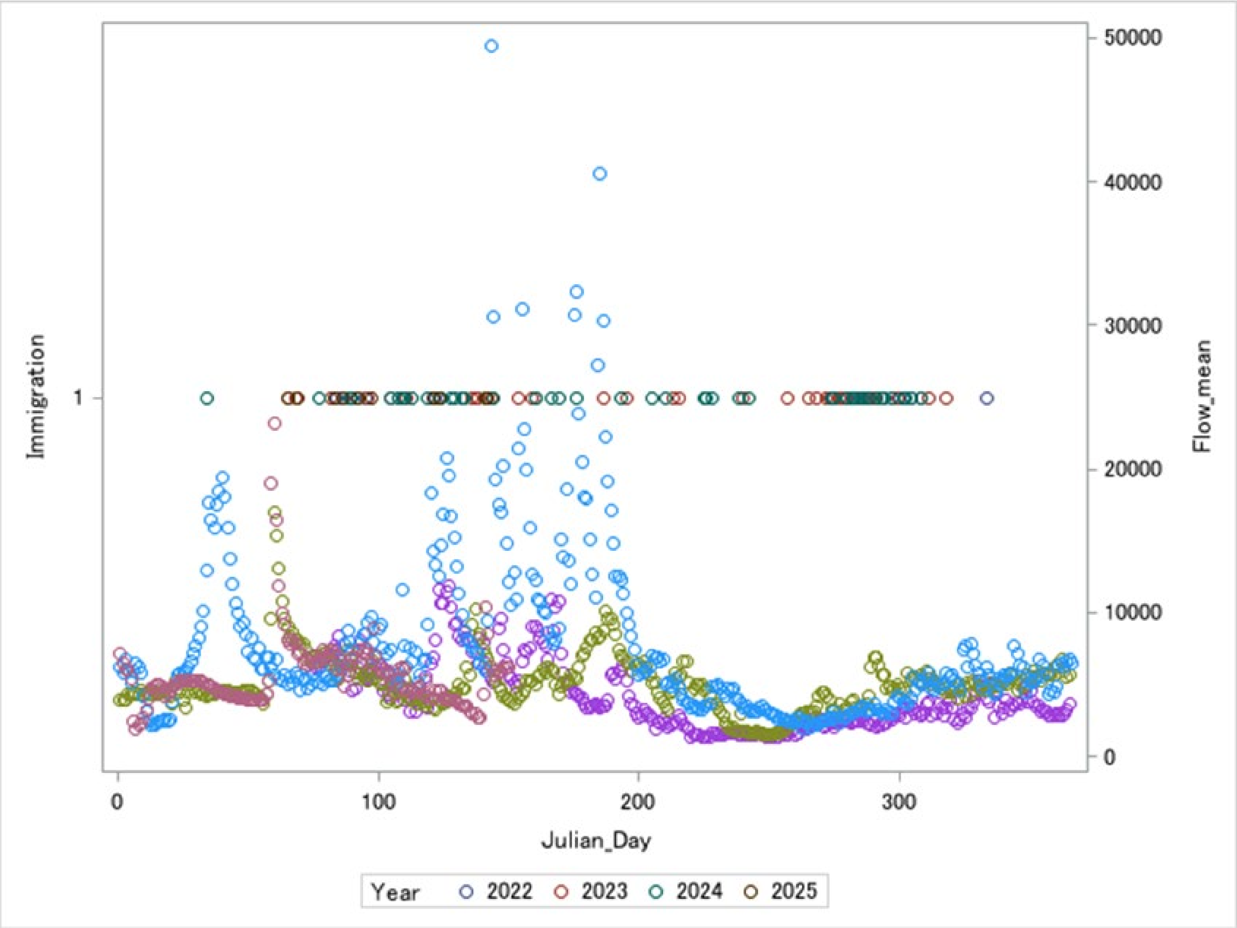
EBQ7: Do we know enough already? No

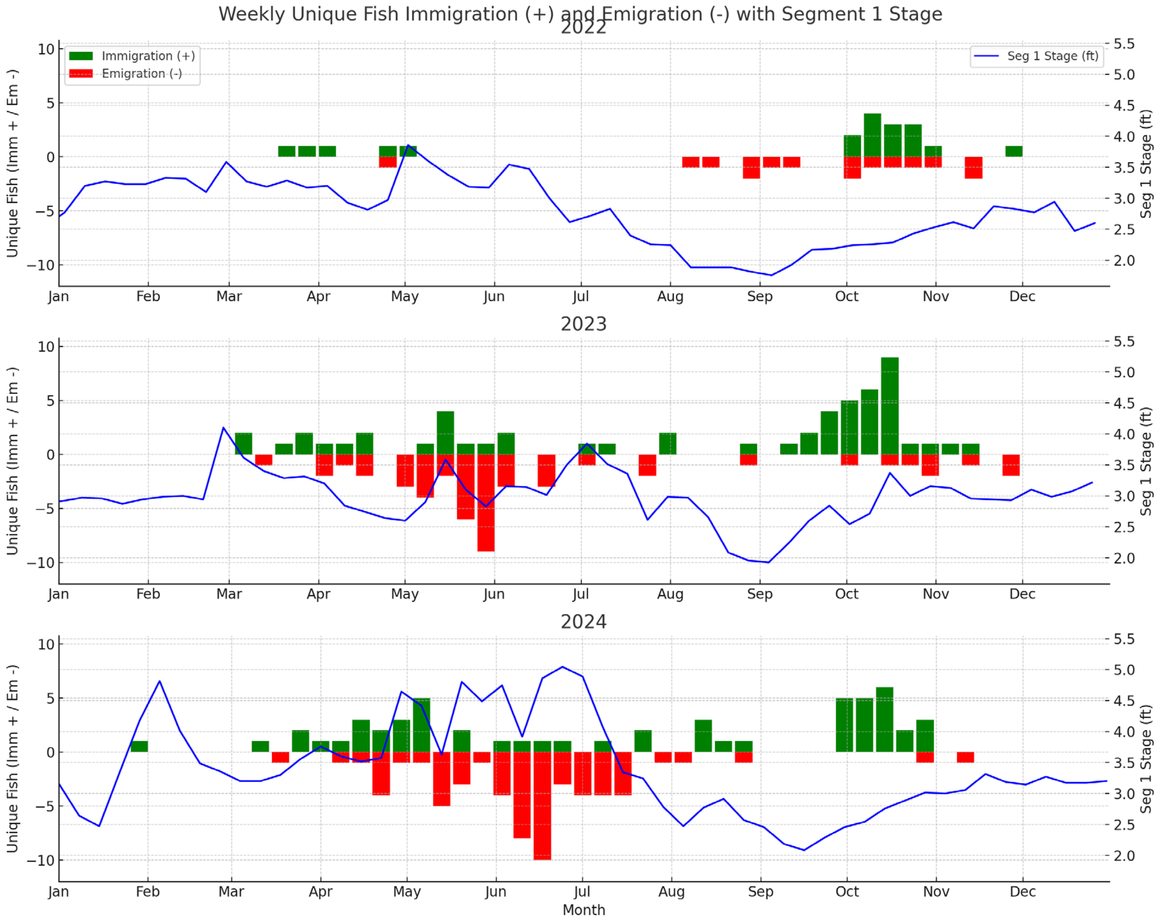
- 2026 Data Analysis
  - in prep, 2025 Fall ISAC Meeting
- ISAC feedback on analyses to address
- Factors associated with:
  - Immigration/Emigration
  - Movement through system
  - Pallid habitat

Photo credit: Platte River, September 24, 2025, Jennifer Hoeting.

UNL Response to feedback

- Longer timescale for evaluation of factors associated with movement





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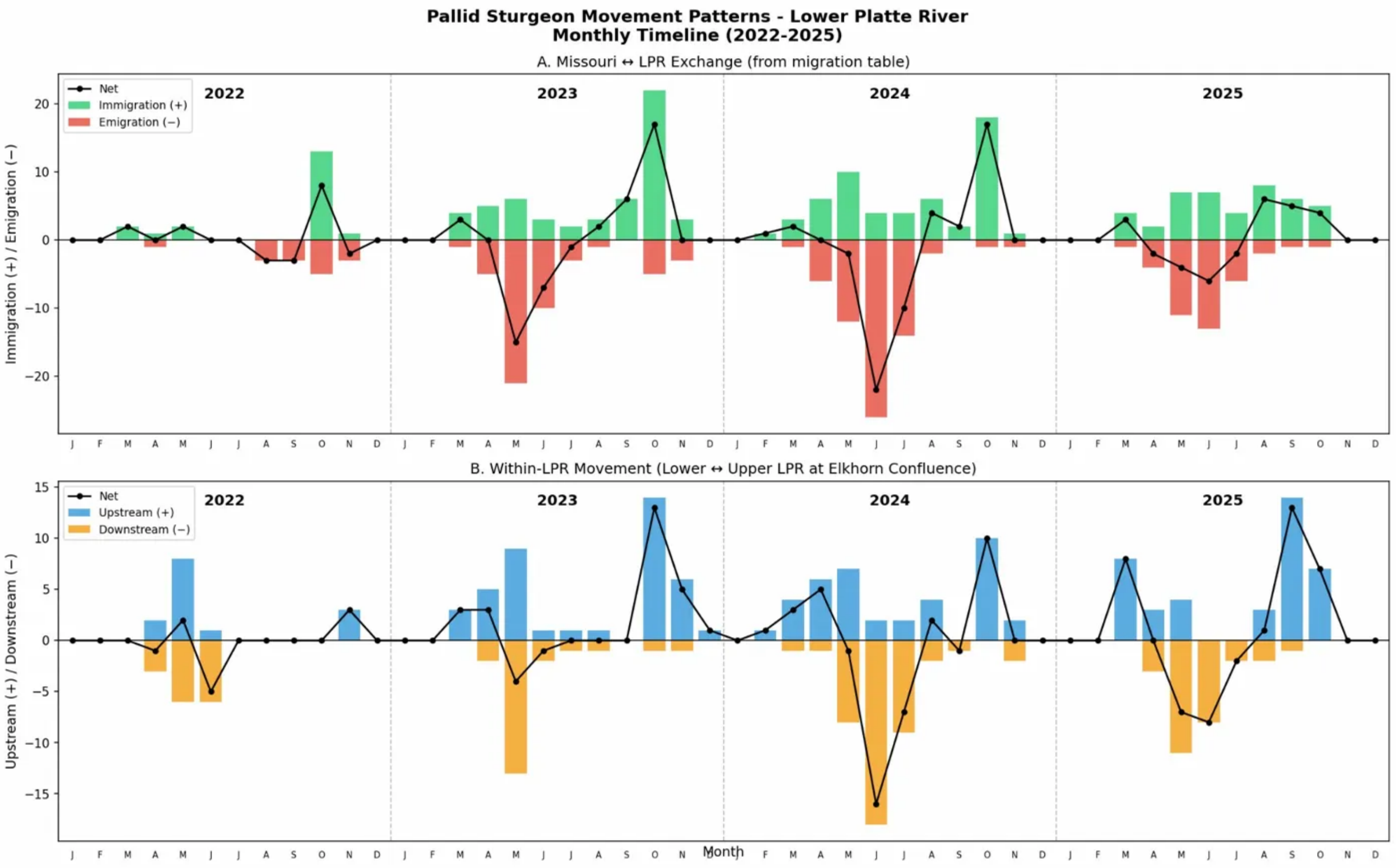
UNL Response to feedback

- Adjust analyses for effort and number of marked fish
  - Focus on 2023-2025 dataset – similar effort
  - Use “offset”
    - convert #fish/day to (#fish/effort)/day



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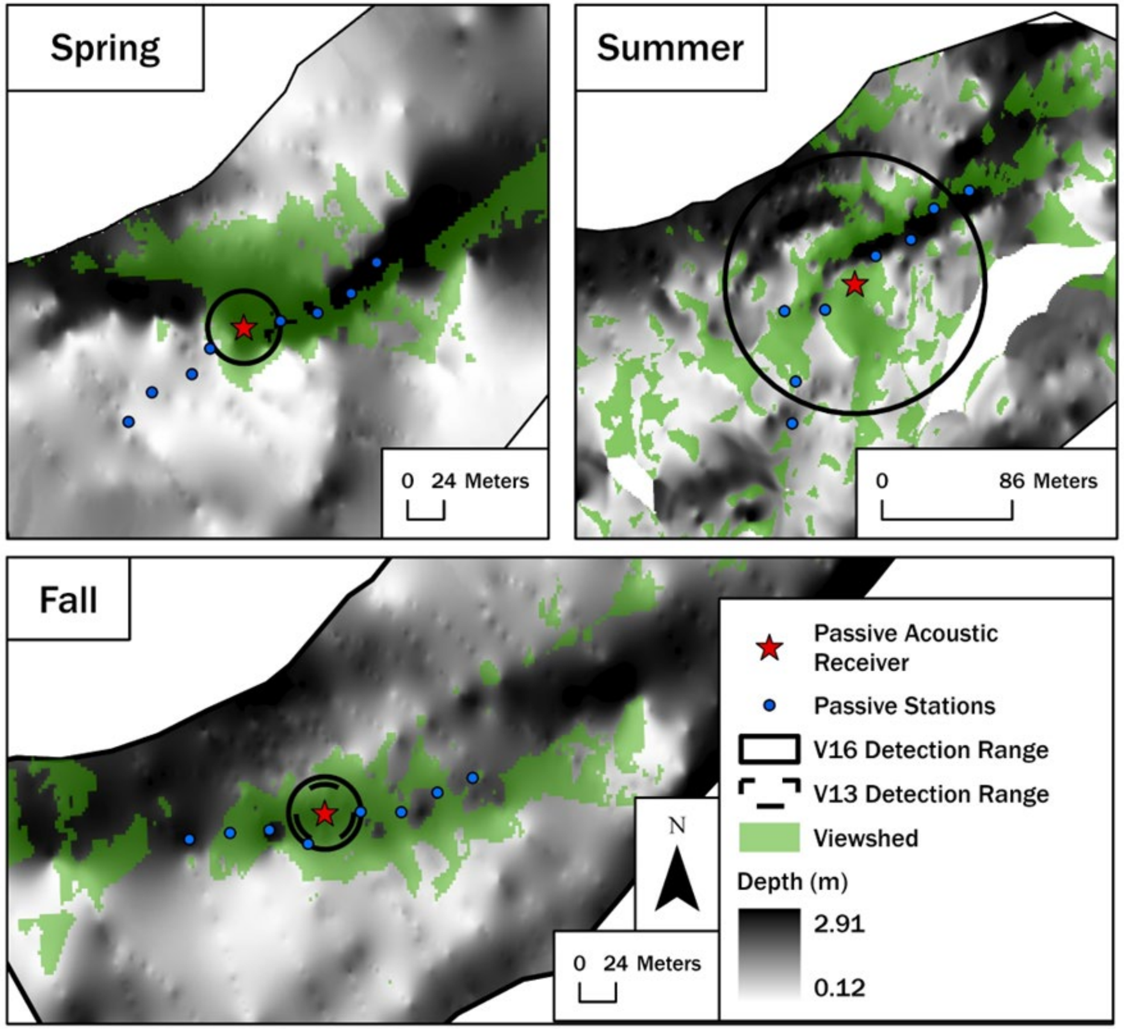
UNL Response to feedback

- Note study limitations
  - Sampling underrepresents shallow, multi-thread conditions
    - Limits to spatial inference?
  - Gaps between detections increase uncertainty about directionality and timing of movement
    - Habitat metrics derived from time/location of detections
    - More certainty around immigration/emigration
    - Less certainty upstream with coarser detection history



Depth, viewshed, and detection range at Louisville receiver.

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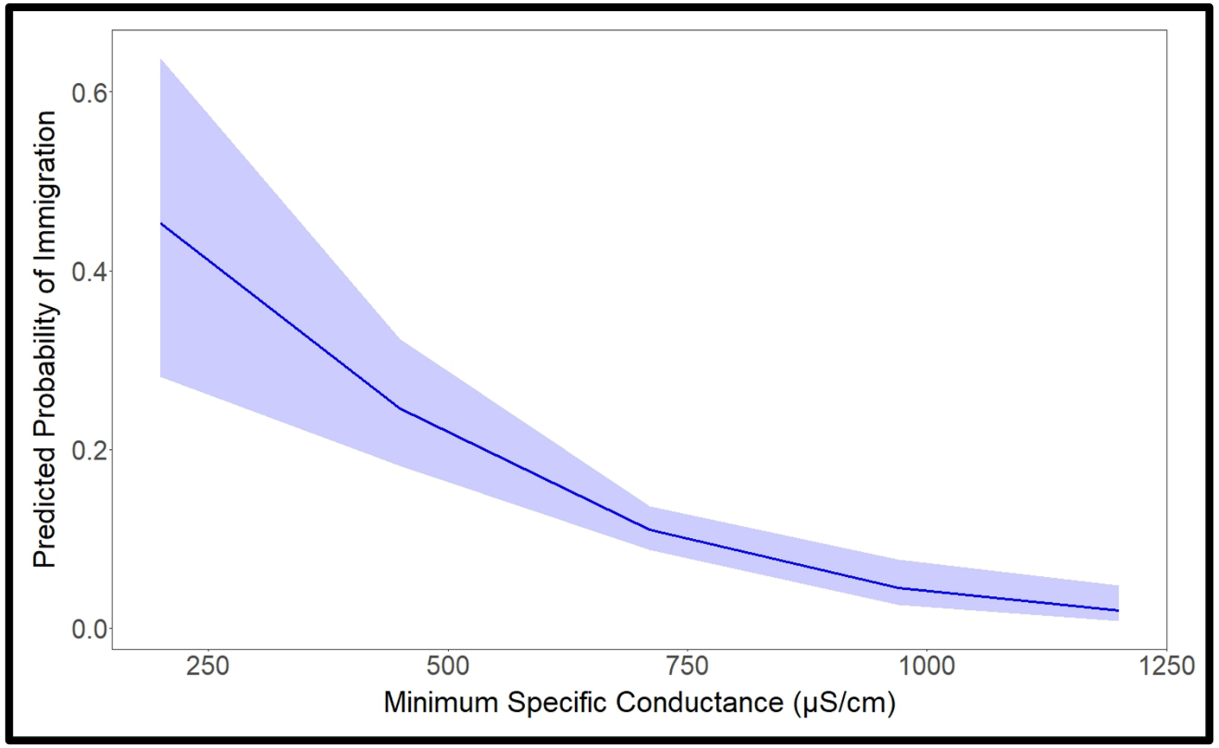
UNL Response to feedback

- Missing data – turbidity
  - Impute missing values or drop variable
- Improve set of predictor variables
  - Biologically relevant, directly interpretable
  - Central tendencies
- Goal-based approach to variable selection
  - LASSO - exploration
  - GLM - inference



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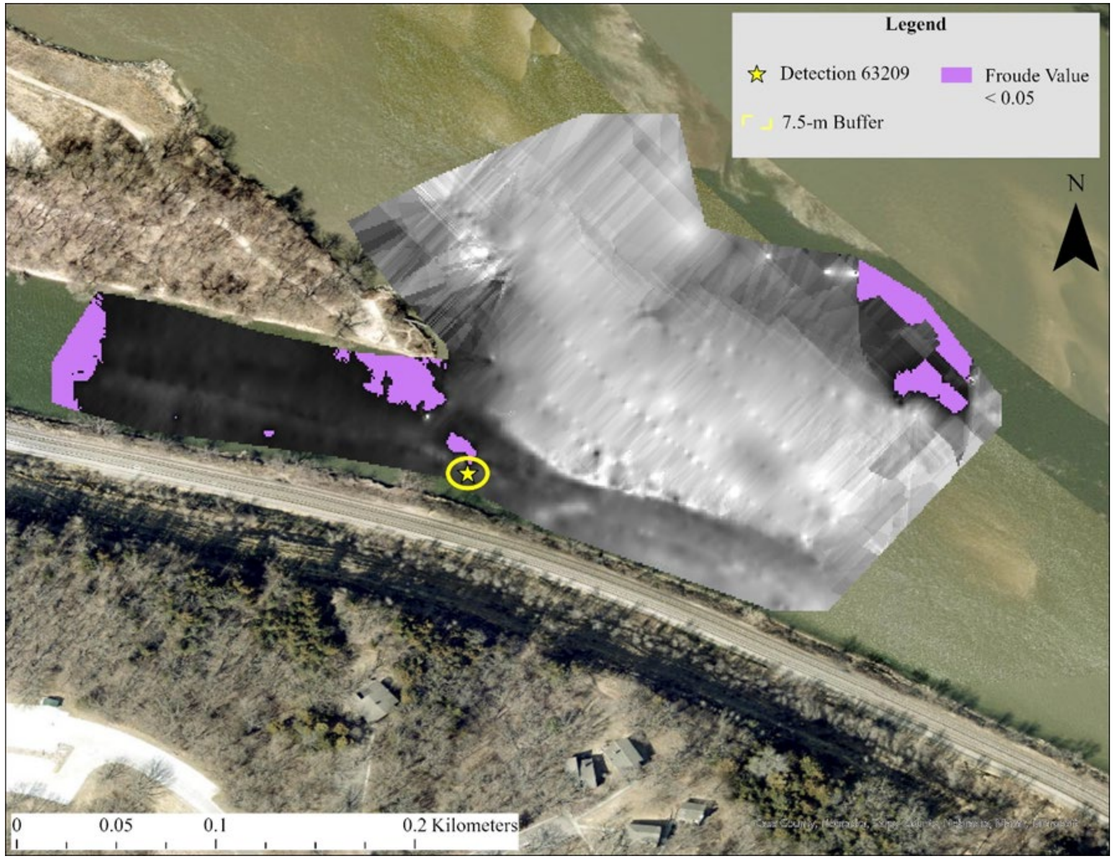
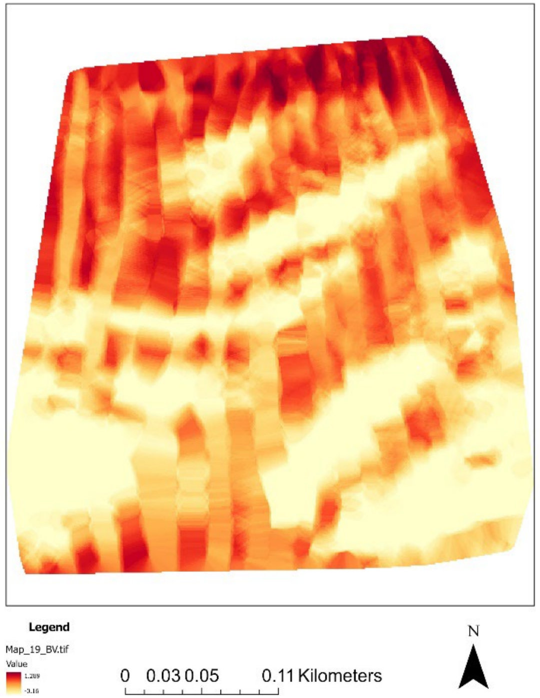
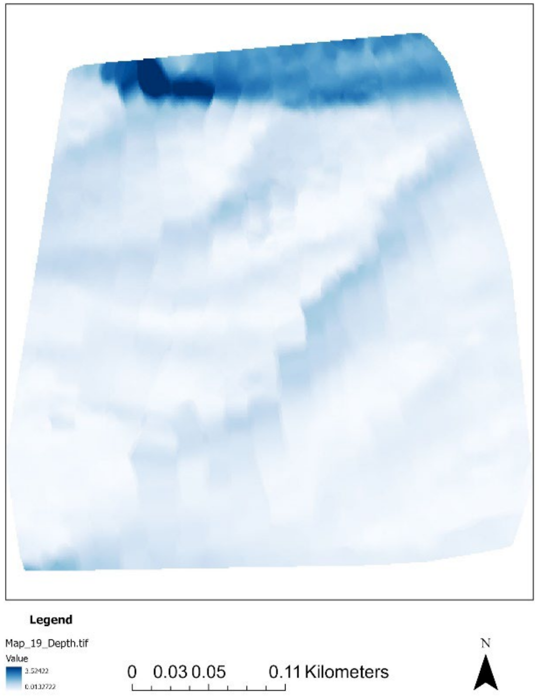
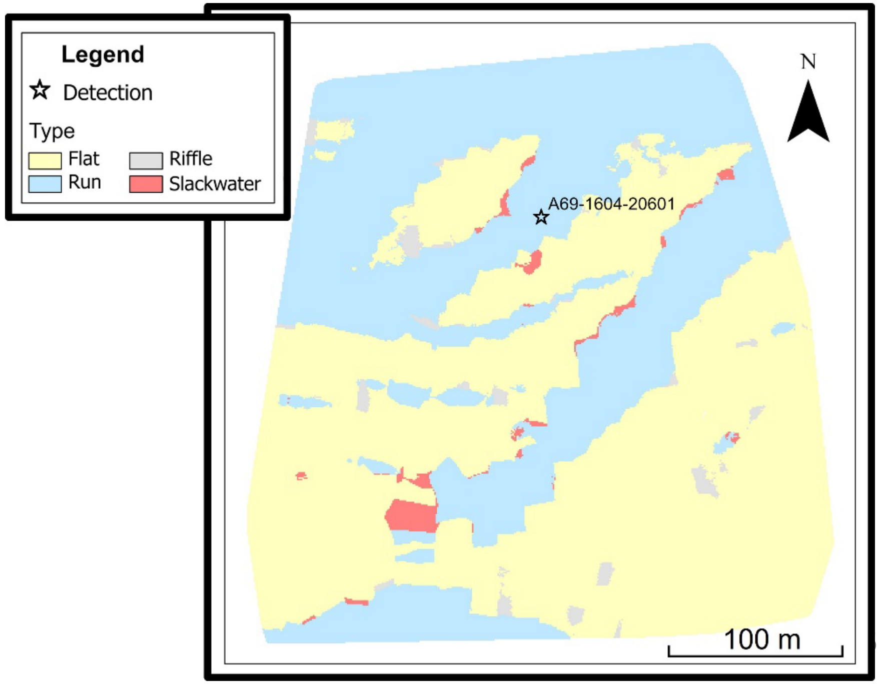
UNL Response to feedback

- Dimensionless variables that integrate depth, velocity, slope









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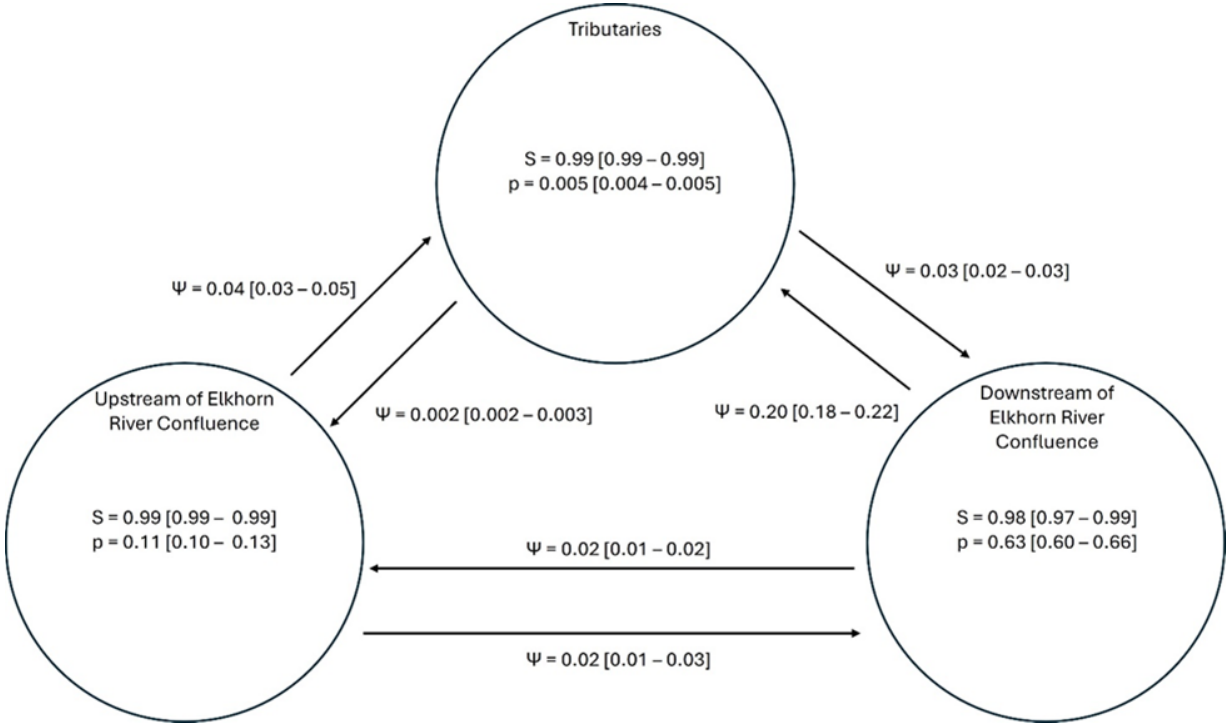
UNL Response to feedback

- Multi-state models without environmental drivers
  - Baseline to assess change
  - Together with overall use distributions, informs occupancy and movement patterns
- Separate tributaries
  - Segment 1 (Salt Creek, Platte below Elkhorn, mouth of Platte – Missouri)
  - Segment 2 (Platte above Elkhorn, Loup)
  - Elkhorn



Tributaries

S = 0.99 [0.99 – 0.99]
p = 0.005 [0.004 – 0.005]

Upstream of Elkhorn River Confluence

S = 0.99 [0.99 – 0.99]
p = 0.11 [0.10 – 0.13]

Downstream of Elkhorn River Confluence

S = 0.98 [0.97 – 0.99]
p = 0.63 [0.60 – 0.66]

Ψ = 0.04 [0.03 – 0.05]

Ψ = 0.002 [0.002 – 0.003]

Ψ = 0.03 [0.02 – 0.03]

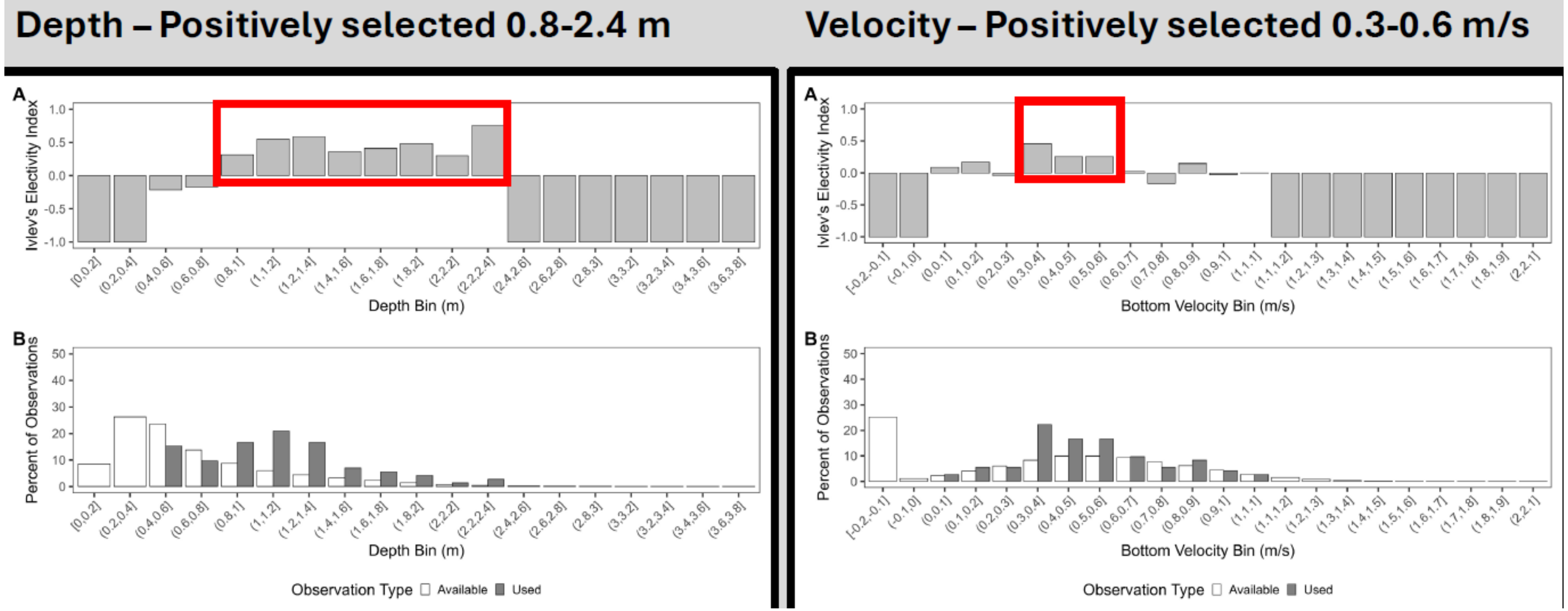
Ψ = 0.20 [0.18 – 0.22]

Ψ = 0.02 [0.01 – 0.02]

Ψ = 0.02 [0.01 – 0.03]

UNL Response to feedback

- Discrete choice habitat selection analyses
  - Paired availability
- Student products – PRRIP Final Report


Depth – Positively selected 0.8-2.4 m

Velocity – Positively selected 0.3-0.6 m/s

Potential Surprises

- PRRIP water management alternatives are small in scale
  - Will PRRIP water management move the dial in relation to LPR hydrology?
  - Hard to quantify impacts or benefits
- Temperature may be a better predictor of PS use of LPR than stage
  - Effects of Program water on temperature are highly uncertain and likely irrelevant in comparison to other factors

Extension Big Questions 8-9

Improvement of LTPP Productivity Through Predator Management

Alyx Vogel and Josh Carrell, EDO

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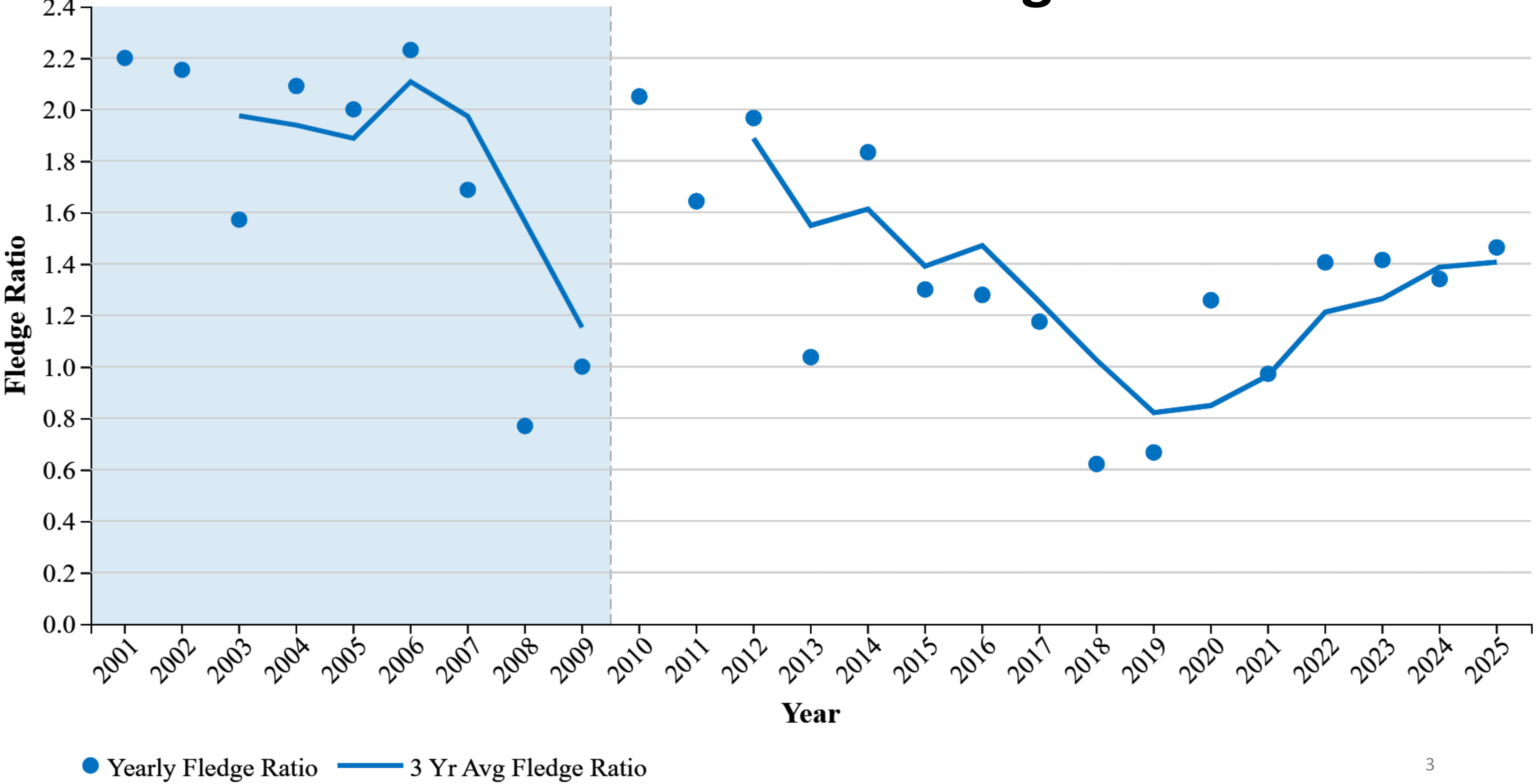
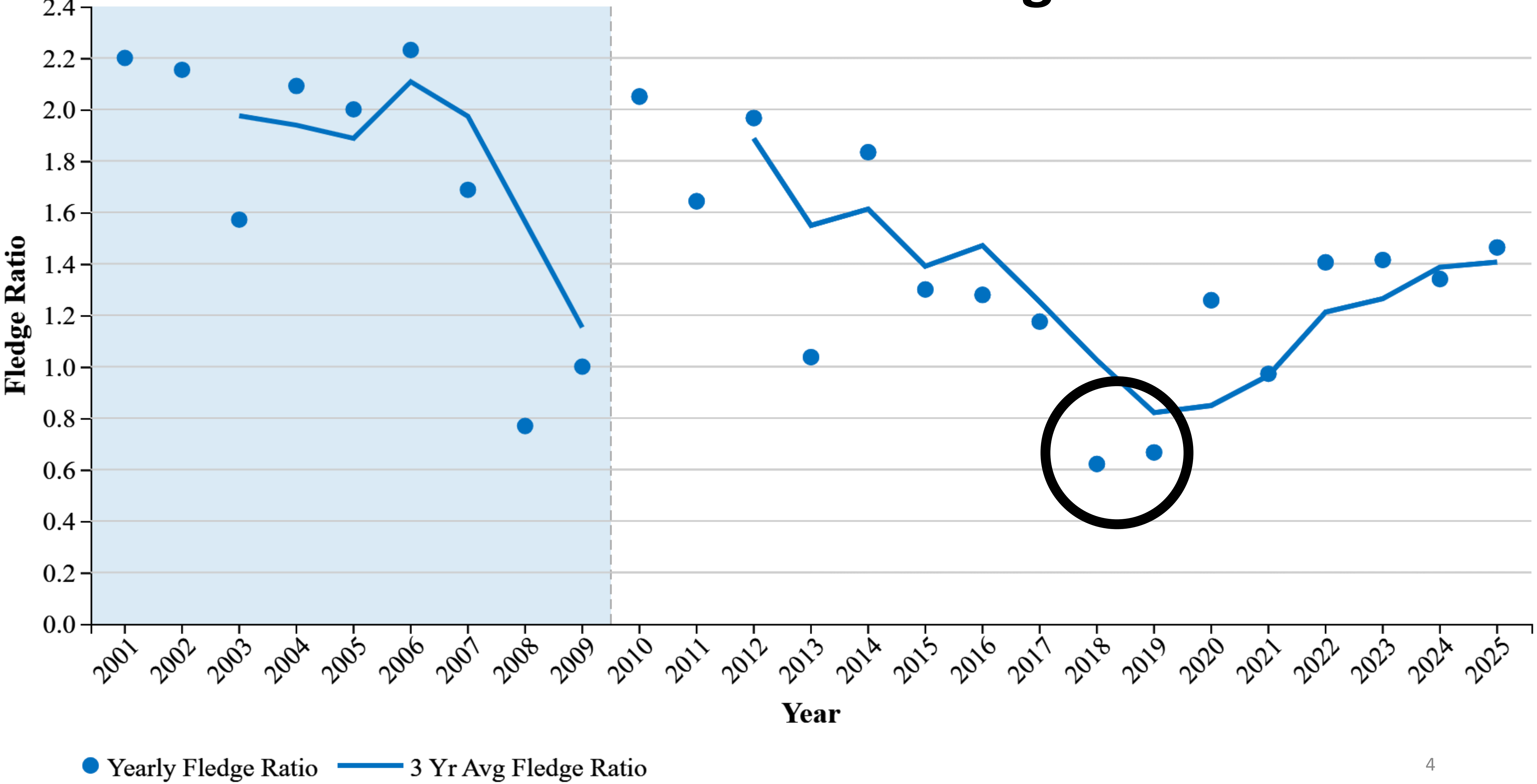
Decision-Making Context

- Existing OCSW and MCA habitats are sufficient
  - Unless use and/or productivity drops below an acceptable level

Plover Fledge Ratios



Plover Fledge Ratios



EBQ 8: How much of an effect does predation have on plover productivity?

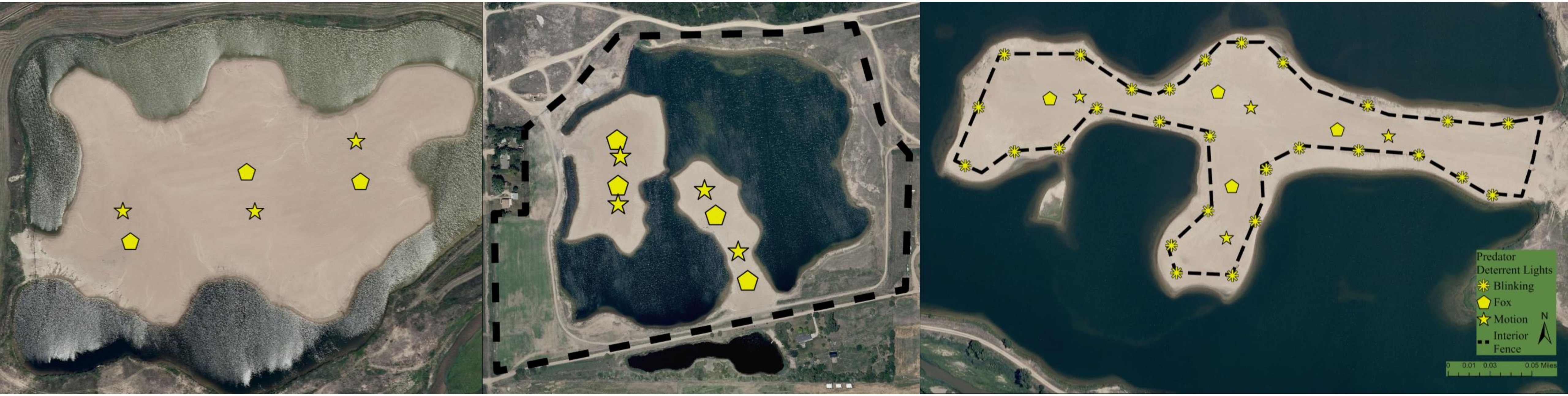
EBQ 9: How effective is PRRIP management at mitigating losses of plover productivity due to predation?

Negotiation-related Questions

- What patterns of use and productivity are unacceptable?
- Can predation be reduced?
- How much does it cost?

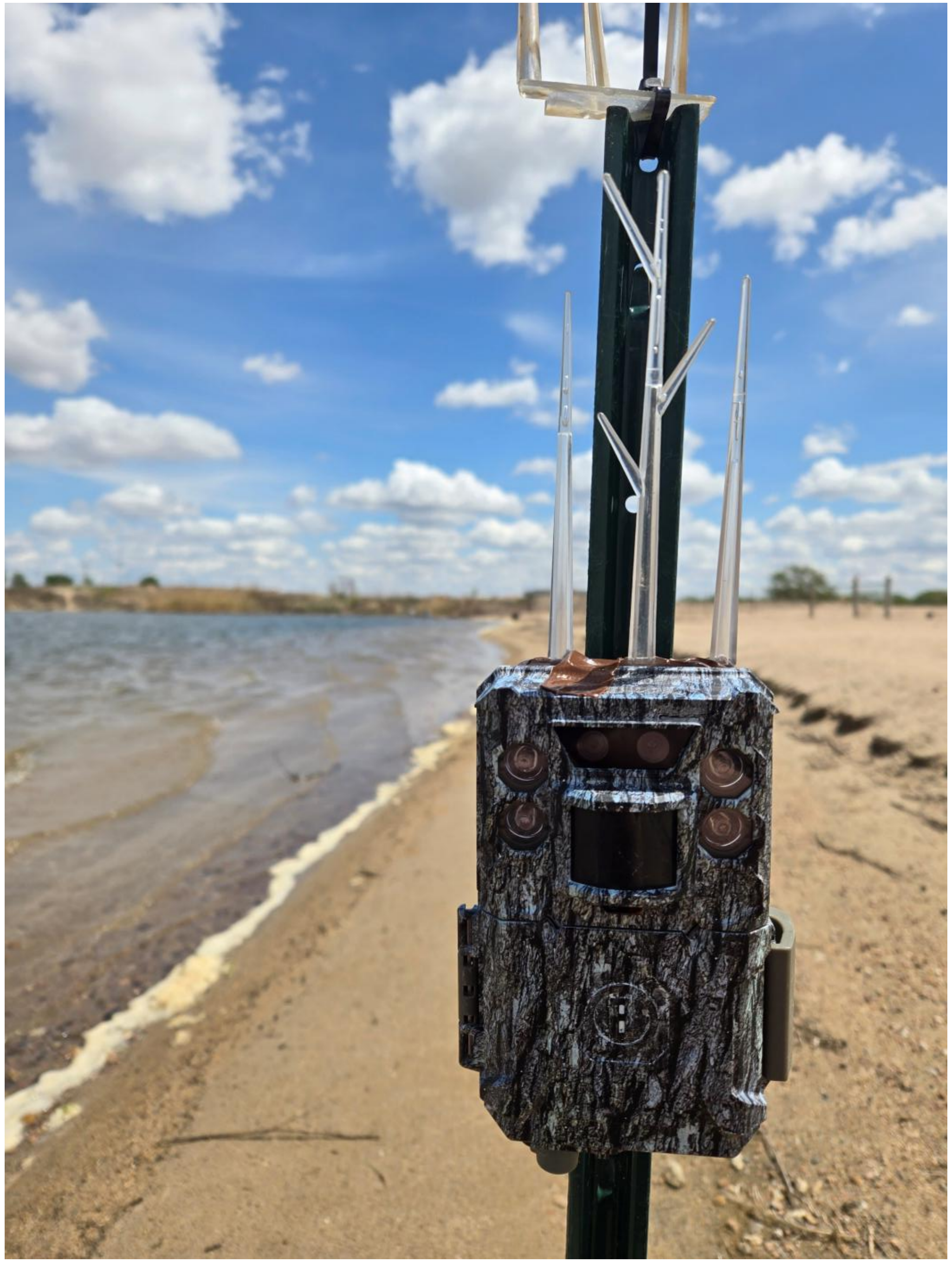
Extension Research

- Additional Predator Management (lights, fencing)



Monitoring

- Shoreline cameras
- Quantify predator presence around the perimeter of each site



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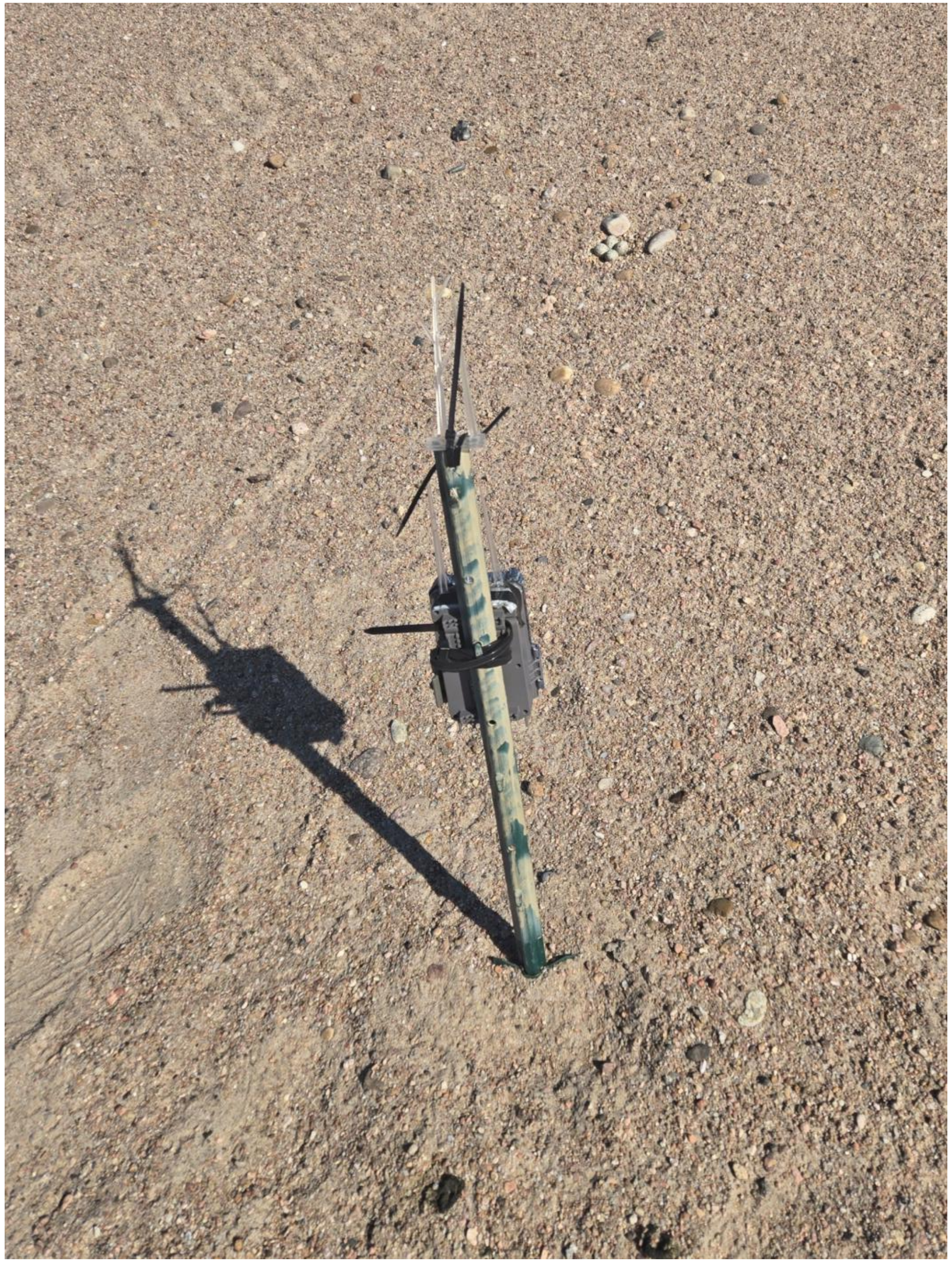
Monitoring

- Site-level cameras
- Quantify predator presence on the nesting site

Monitoring

- Nest-level cameras
- Quantify predator presence at the nest and document predation events



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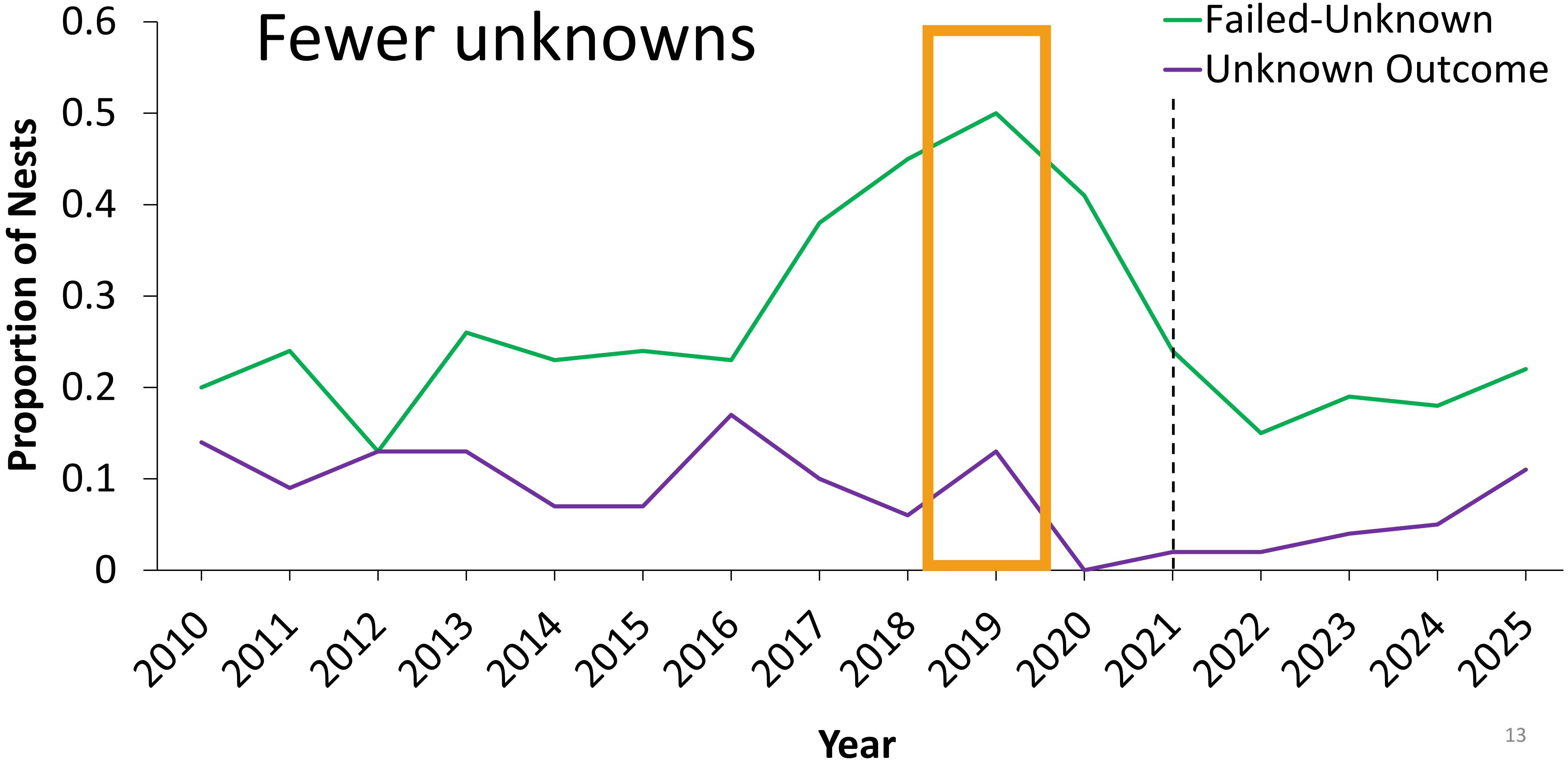
Addressing Uncertainties

- Quantify productivity lost due to predation
- Evaluate cost and effectiveness of additional management
- Predict what effect decreases in fledge ratios due to predation may mean for future breeding population

Do we know enough? Unclear

- 5 years of additional predator management and monitoring research
- Just begun analyzing the data

Learning while doing: Improved fating Fewer unknowns



Predator Impacts

- Variable
- Unpredictable

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Fencing

- Less nesting by other species which attracts predators

Lights

- Not effective

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Camera Data

- Fating
- Adjust trapping
- Maintenance needs

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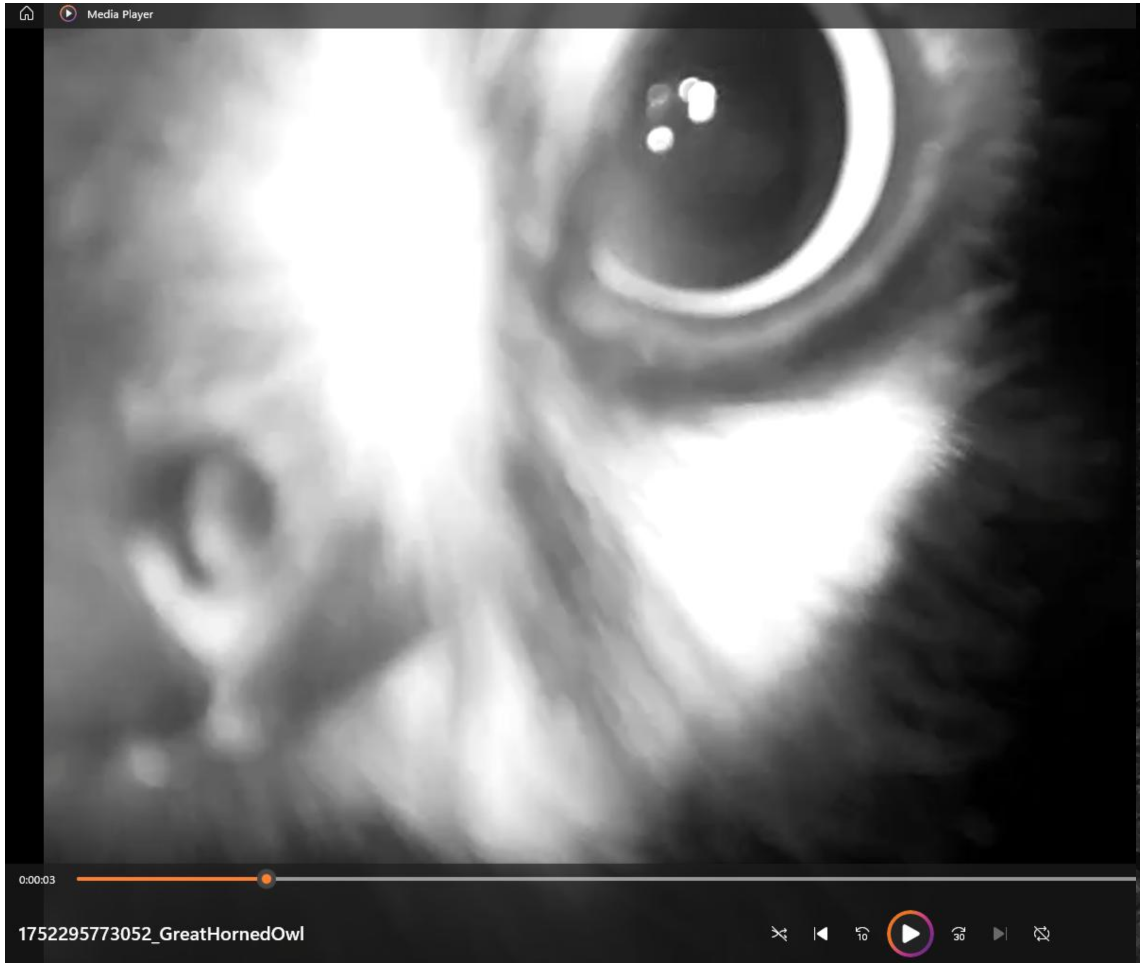
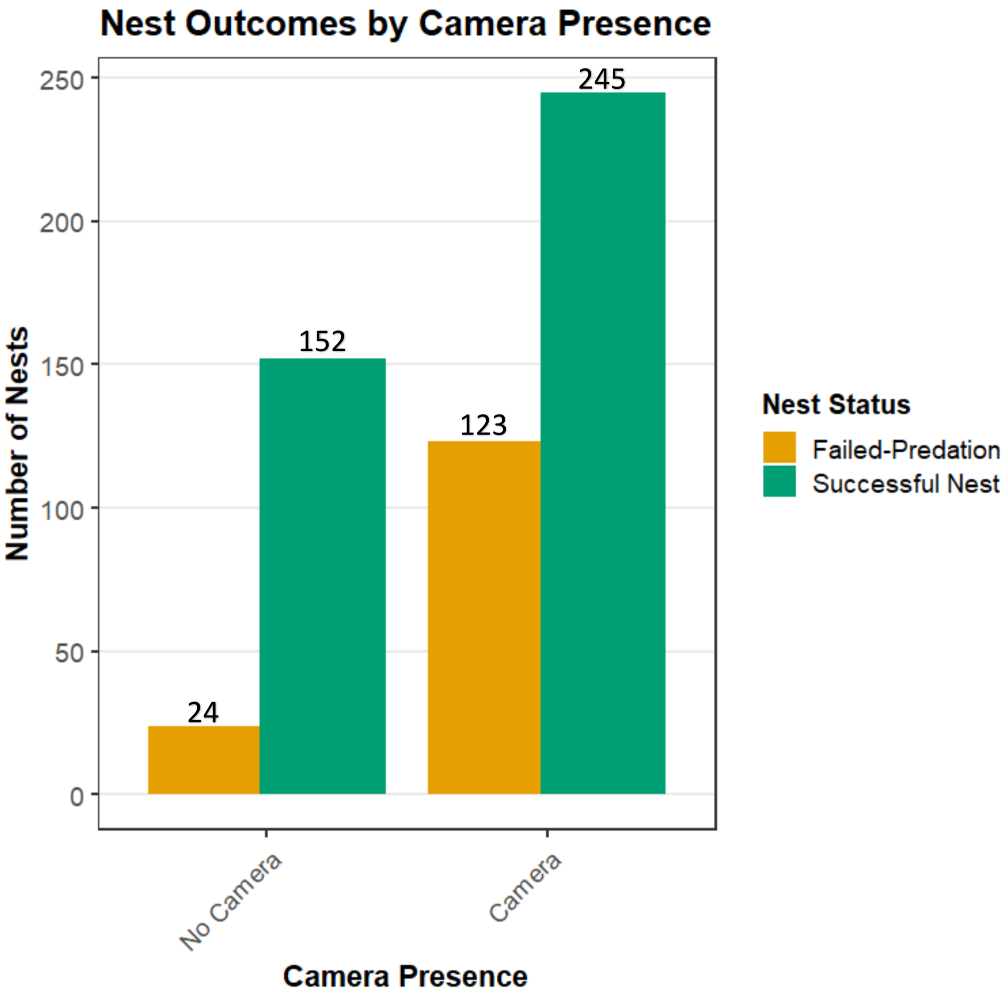
Camera Risk –
Predators interacting with cameras



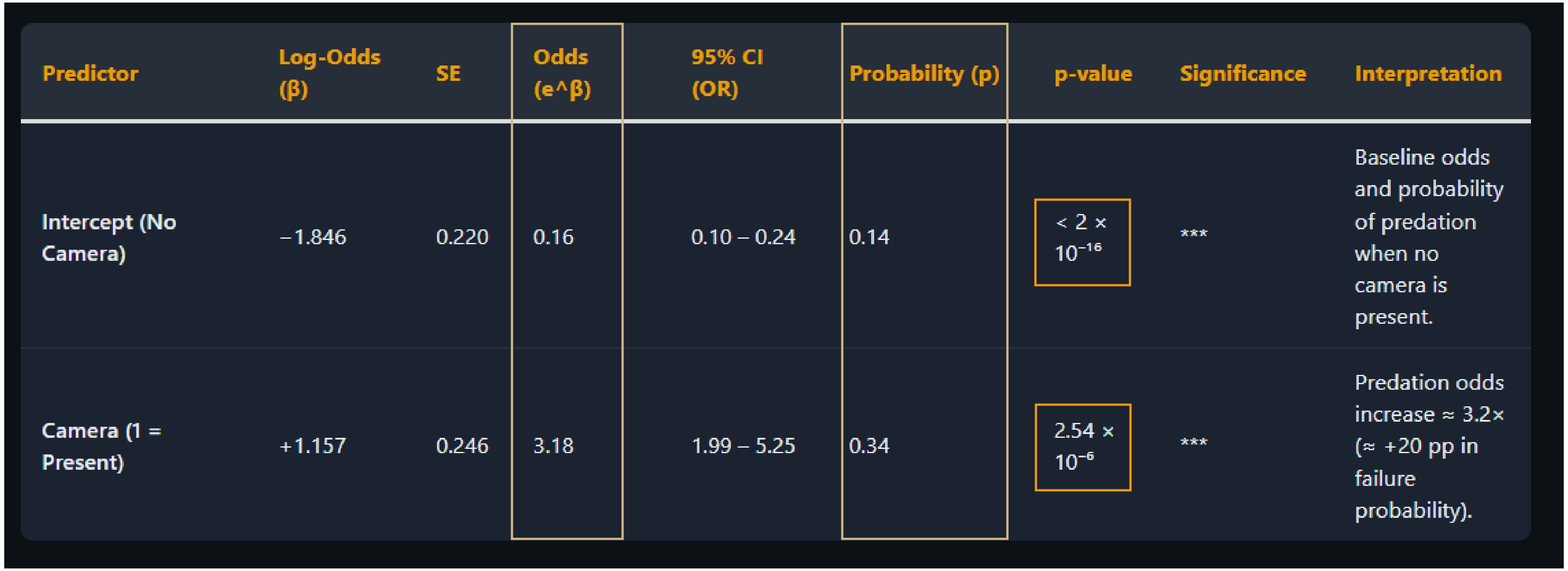


Proportion of Outcomes: *Success vs. Failed Predation*

$$Nests\ without\ Cameras: \quad \frac{24}{24+152} = \ \sim.14$$

$$Nests\ with\ Cameras: \quad \frac{123}{123+245} = \ \sim.33$$

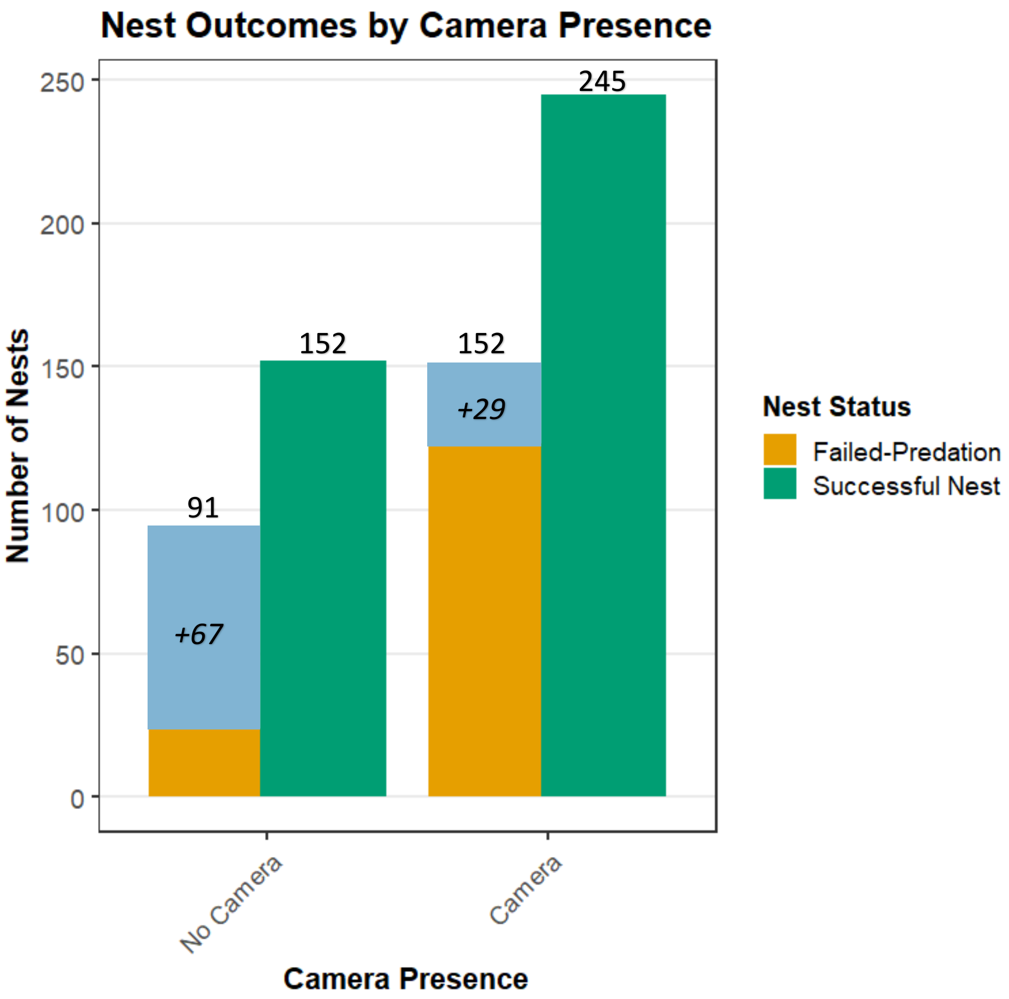
Generalized Linear Model



Predictor	Log-Odds (β)	SE	Odds (e^β)	95% CI (OR)	Probability (p)	p-value	Significance	Interpretation
Intercept (No Camera)	−1.846	0.220	0.16	0.10 – 0.24	0.14	$< 2 \times 10^{-16}$	***	Baseline odds and probability of predation when no camera is present.
Camera (1 = Present)	+1.157	0.246	3.18	1.99 – 5.25	0.34	2.54×10^{-6}	***	Predation odds increase ≈ 3.2× (≈ +20 pp in failure probability).

Odds: Nests with cameras have about 3.2× higher odds of predation compared to nests without cameras (OR = 3.18, 95% CI: 1.99–5.25).

Probability: The predation probability increases from ~14% to ~34% when a camera is present, roughly a +20 percentage-point increase in failure risk.



Proportion of Outcomes: *Success vs. Failed Predation*

$$\textit{Nests without Cameras}: \quad \frac{24}{24+152} = \quad \sim.14$$

$$\textit{Nests with Cameras}: \quad \frac{123}{123+245} = \quad \sim.33$$

Proportion of Outcomes: *Success vs. Failed Predation + Failed Unknowns*

$$\textit{Nests without Cameras}: \quad \frac{91}{91+152} = \quad \sim.37$$

$$\textit{Nests with Cameras}: \quad \frac{152}{152+245} = \quad \sim.38$$

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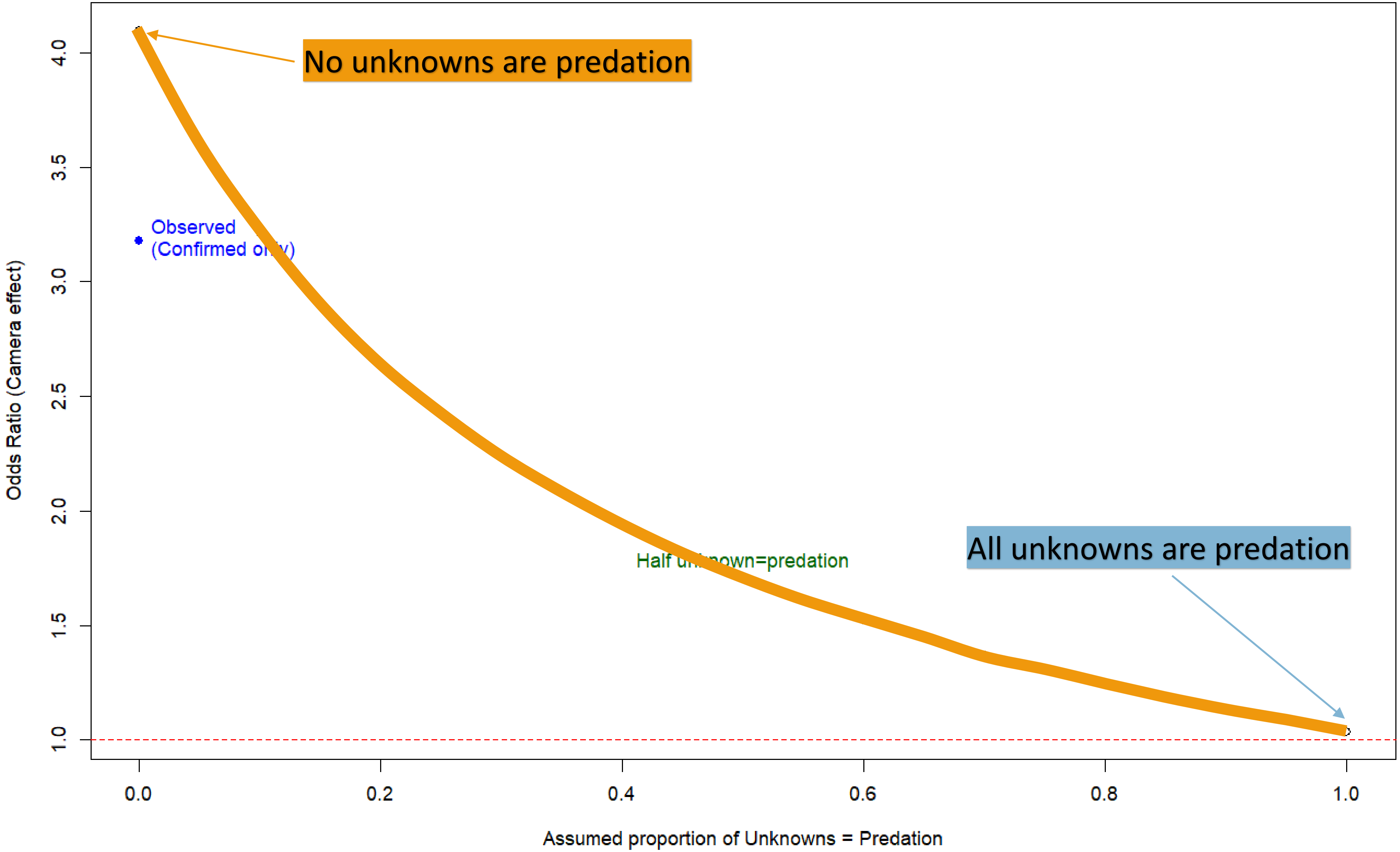
What if Unknowns were Predations?

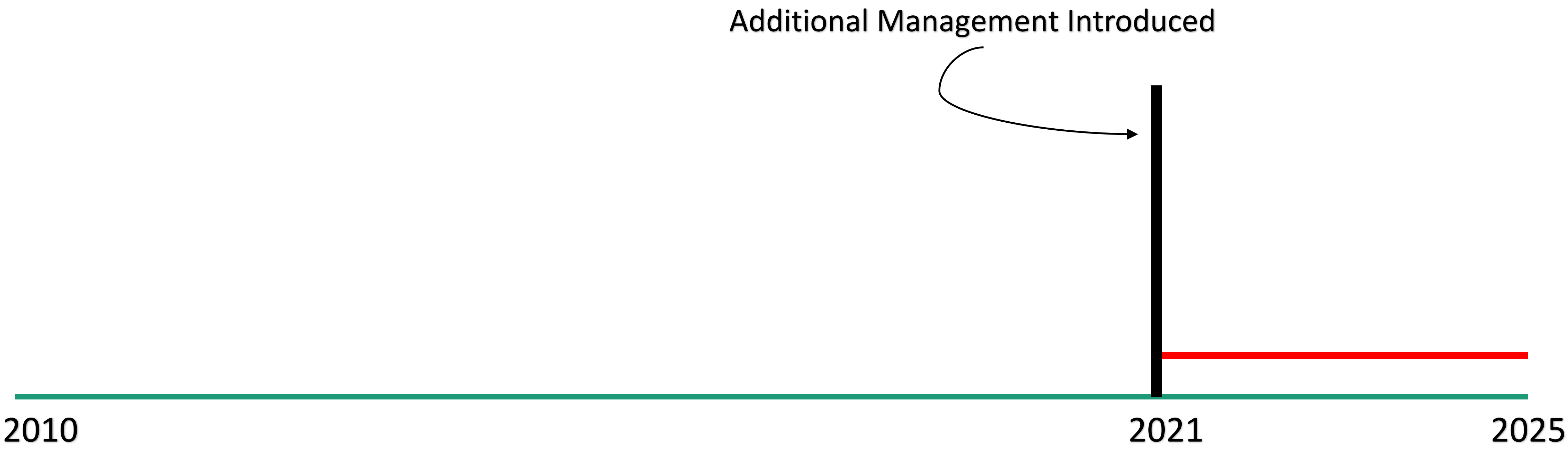


No unknowns are predation

All unknowns are predation

2026 Monitoring

- Cameras at gates/shorelines
- Utilize nest-level cameras on tern nests as needed
- Keep additional management

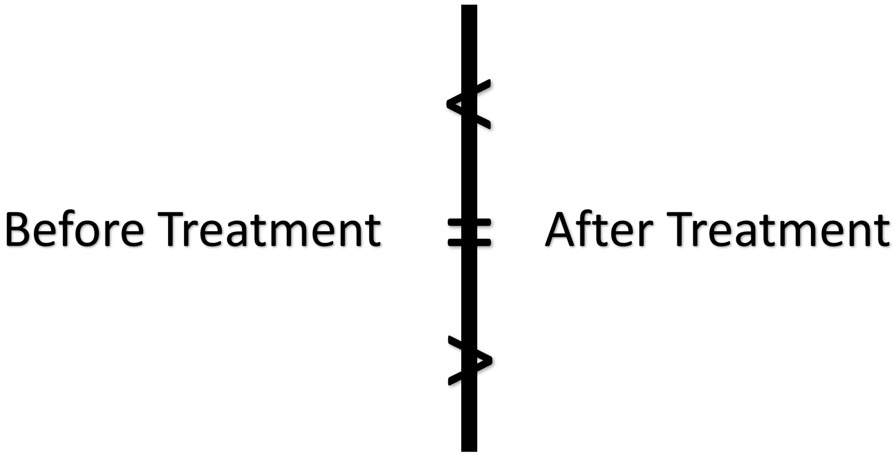


Additional Management Introduced

2010

2021

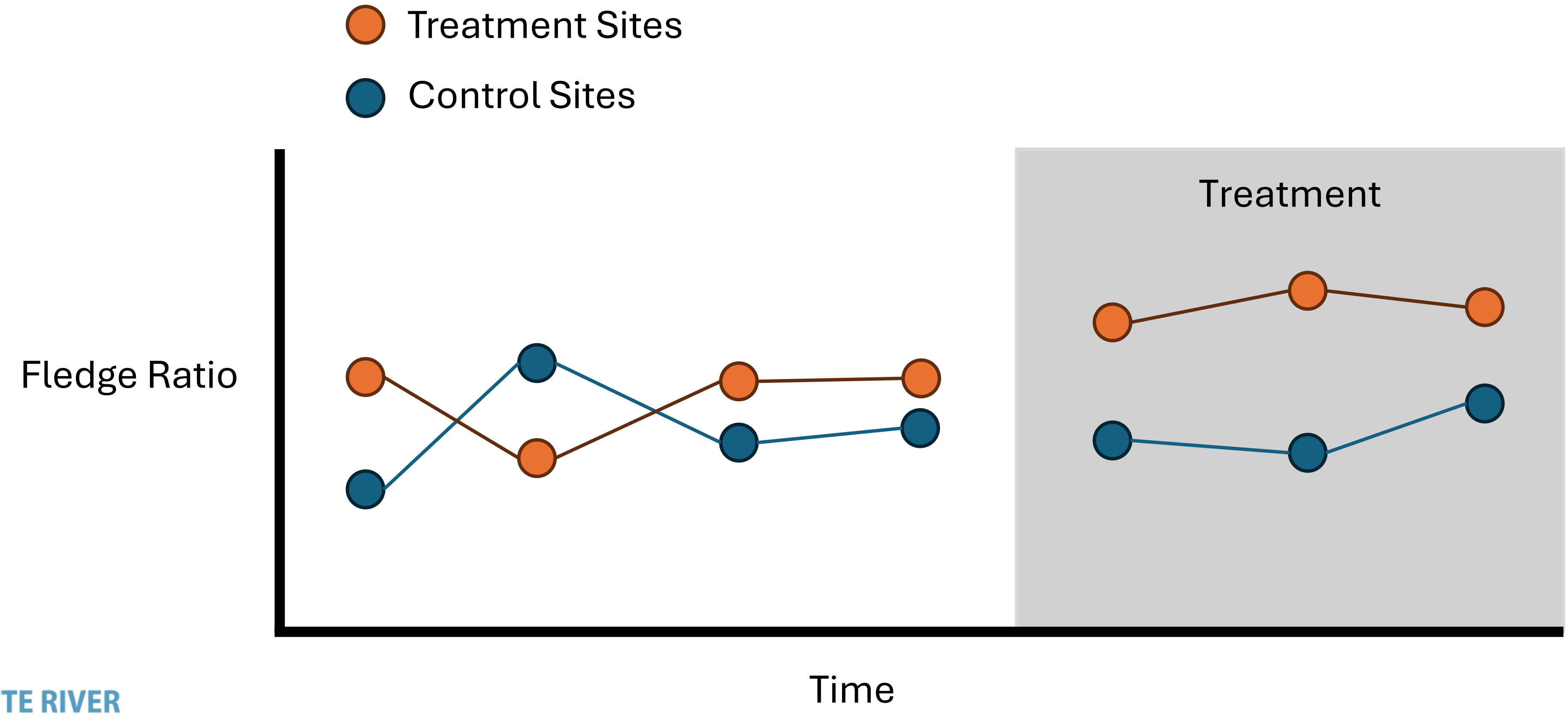
2025



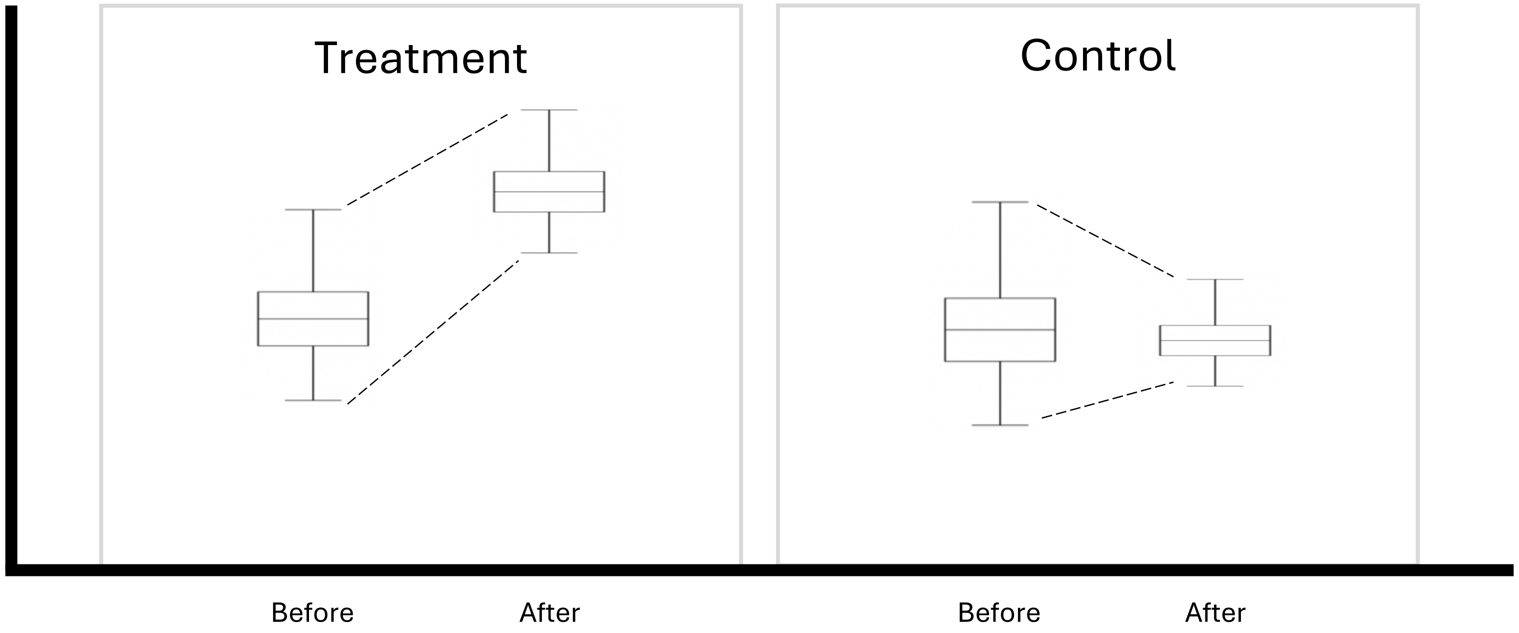
<
Before Treatment
=
After Treatment
>

Analysis Approach

- Before-After-Control-Impact (BACI) Design
- Compares treatment vs. control sites | before vs. after treatment

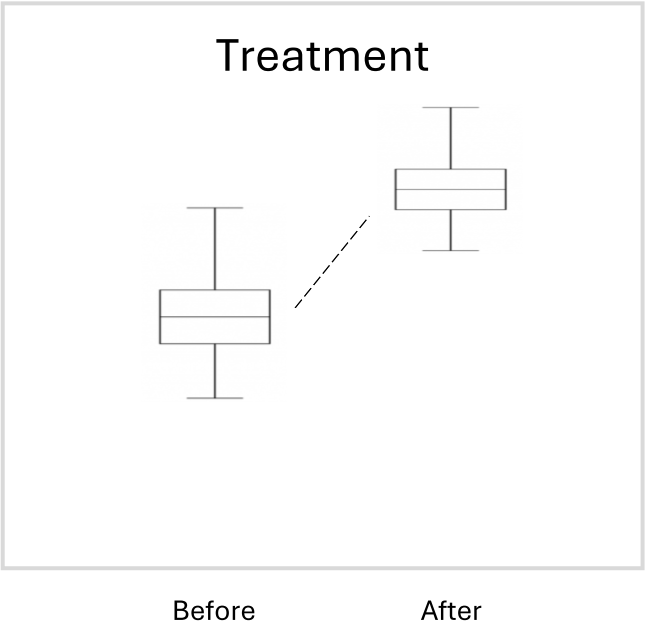


We are comparing
changes at **treatment** sites
to *changes* at **control** sites.

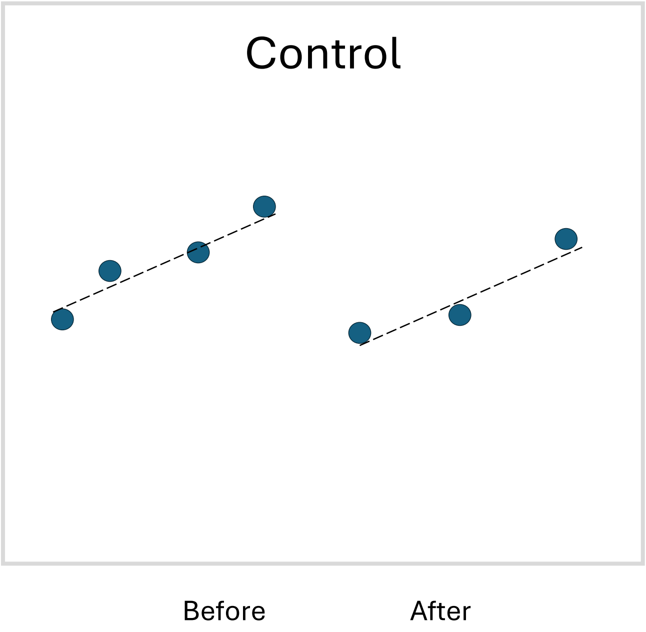


BACI vs. BACIPS

- BACI
  - Comparison of means
  - T-test

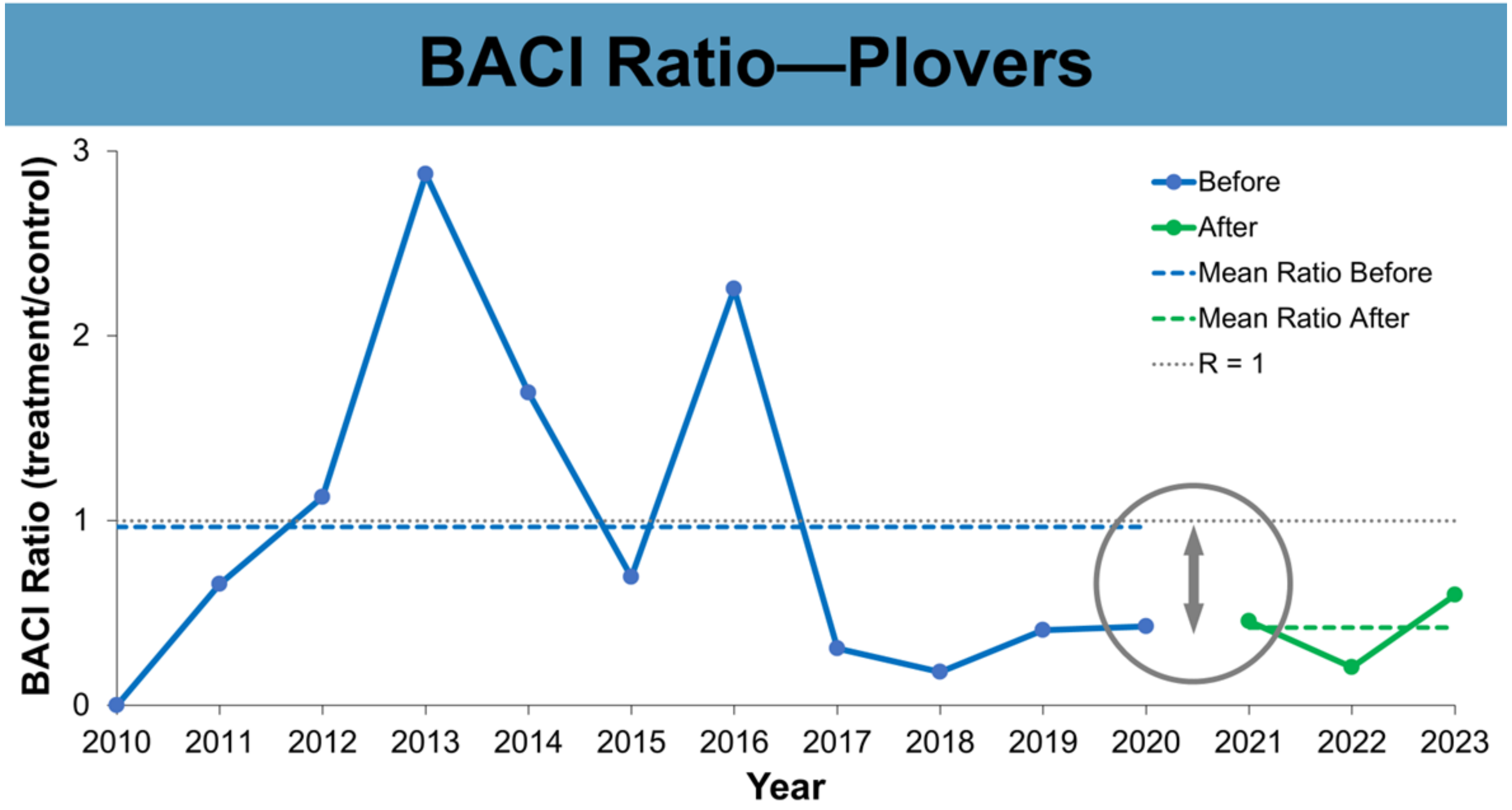


- BACIPS
  - Comparison of trends
  - Regression



Analysis 1

- To determine whether there was a signal for the effect of predator management on fledge ratios.
  - Comparing Trends.
  - Comparing Means.
  - Comparing Ratios.



Analysis 1

- To determine whether there was a signal for the effect of predator management on fledge ratios.
  - Comparing Trends.
  - Comparing Means.
  - Comparing Ratios.

Results: *Inconclusive*

- BACIPS (Trends):
  - No significant difference.
- BACI (Means):
  - No significant difference.

- BACI (Ratio):

Fledge Ratio-Treatment Sites / Fledge Ratio-Control Sites

- No significant difference.
- 95% CI (-1.20, 0.113)
- Could not rule out positive effect, no effect, or negative effect (centered negative).

Analysis 2

Competing Fates

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Overview

Analysis 1:

- Composite fledge ratios to detect overall productivity differences.

Analysis 2:

- Groups productivity into nest and brood stages and models
- Incorporates Exposure
- isolates predator-management effects from other variables.

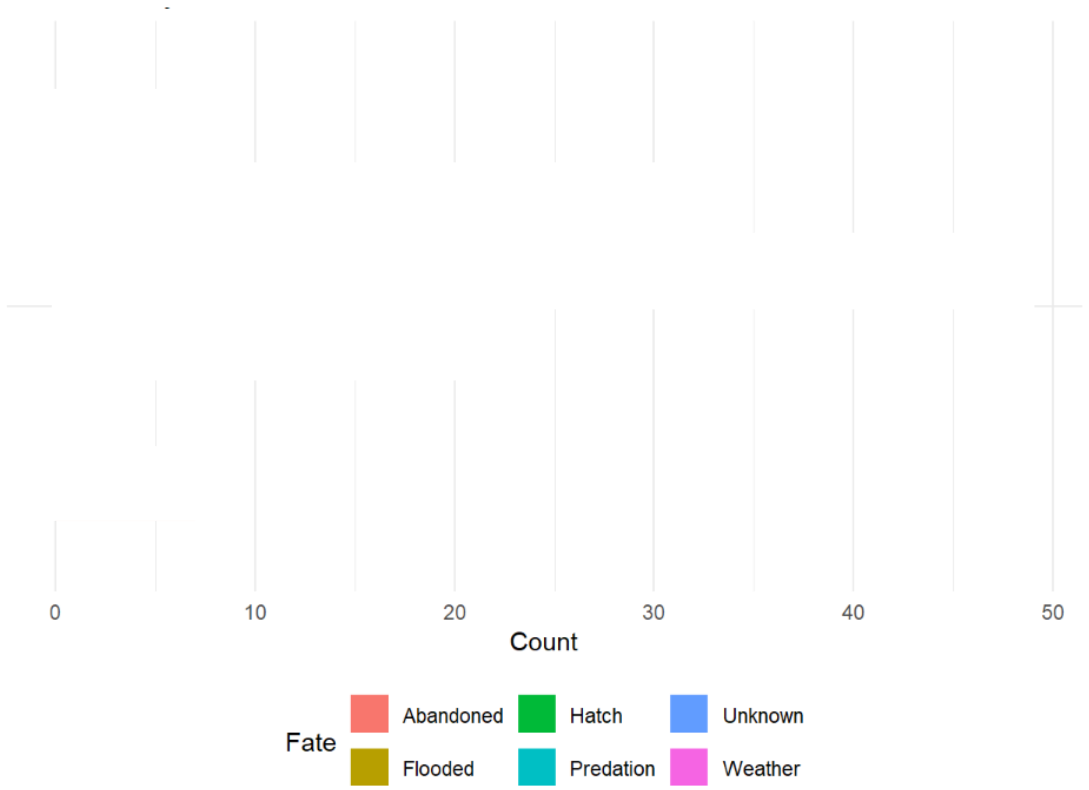
Overview

- This analysis uses R/JAGS to fit Bayesian exposure models for cause-specific daily nest survival.
- BACI/BACIPS framework
  - to quantify whether predator management reduces daily predation risk and translates into increased plover productivity.

Multiple Outcomes & Modeling

Success & Predation are not the only outcomes:

- Failed-Predation
- Failed-Weather
- Failed-Abandonment
- Failed-Flooding
- Failed-Unknown
- Success
  - How much success?



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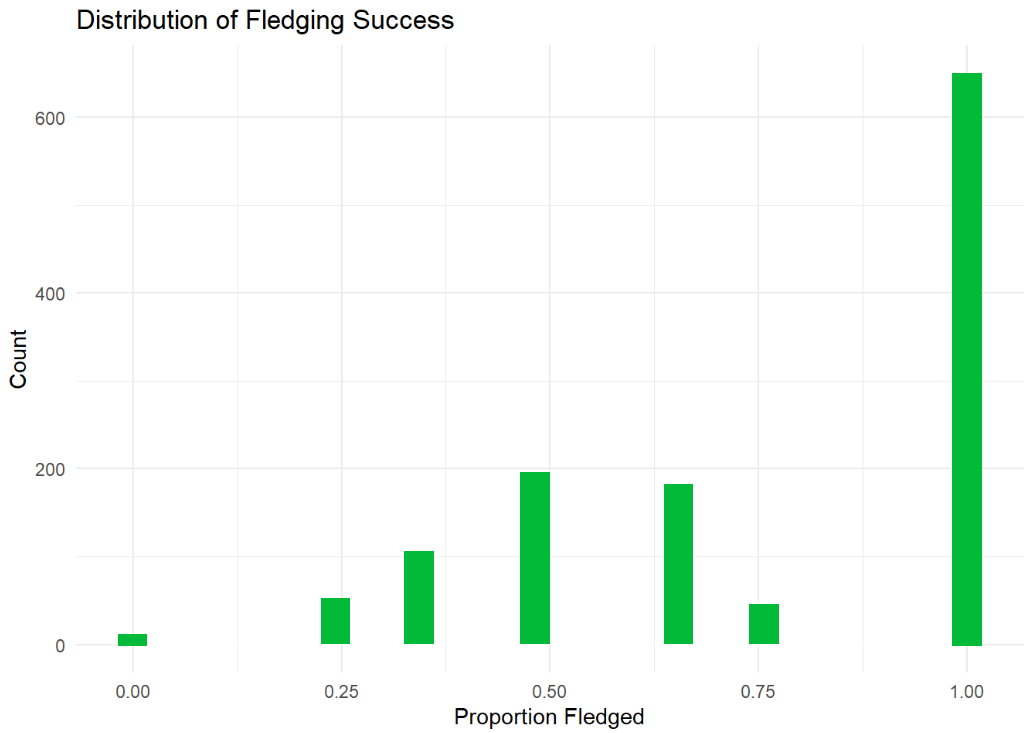

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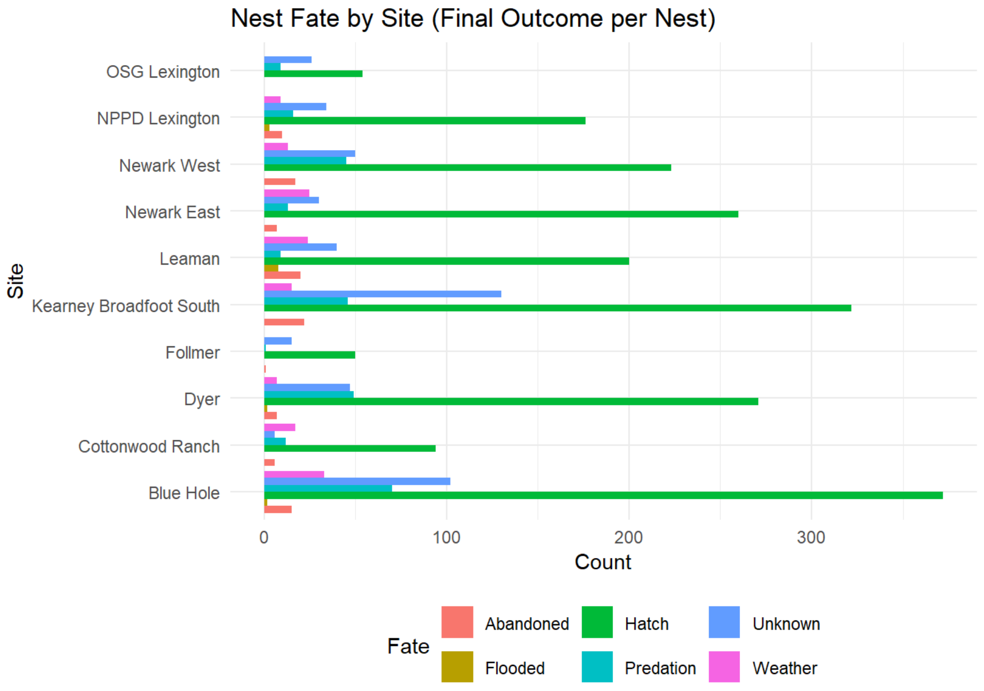
Modeling Framework

Multinomial Logistic Model

- Multinomial response (*s, p, w, a, f, u)*



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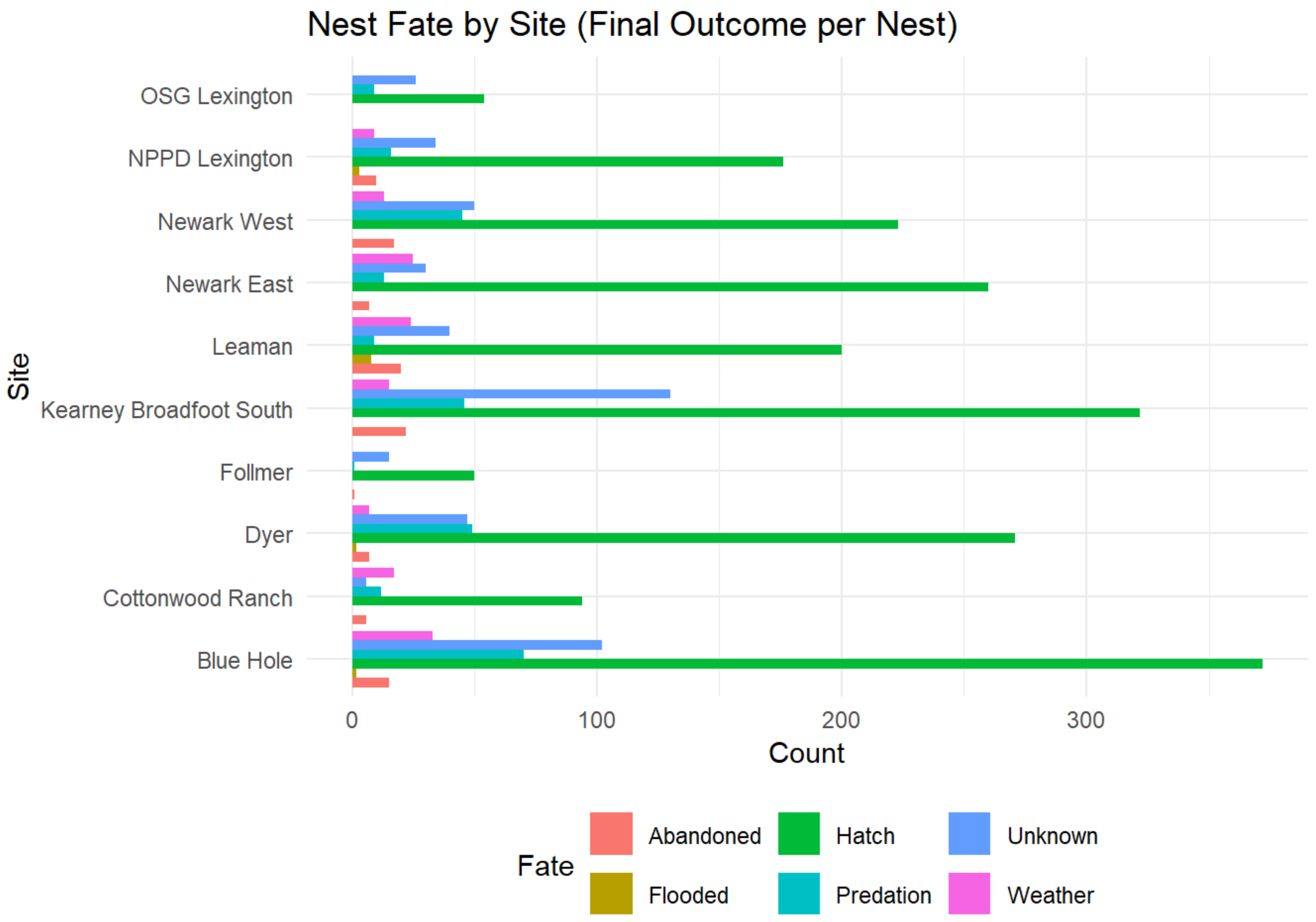
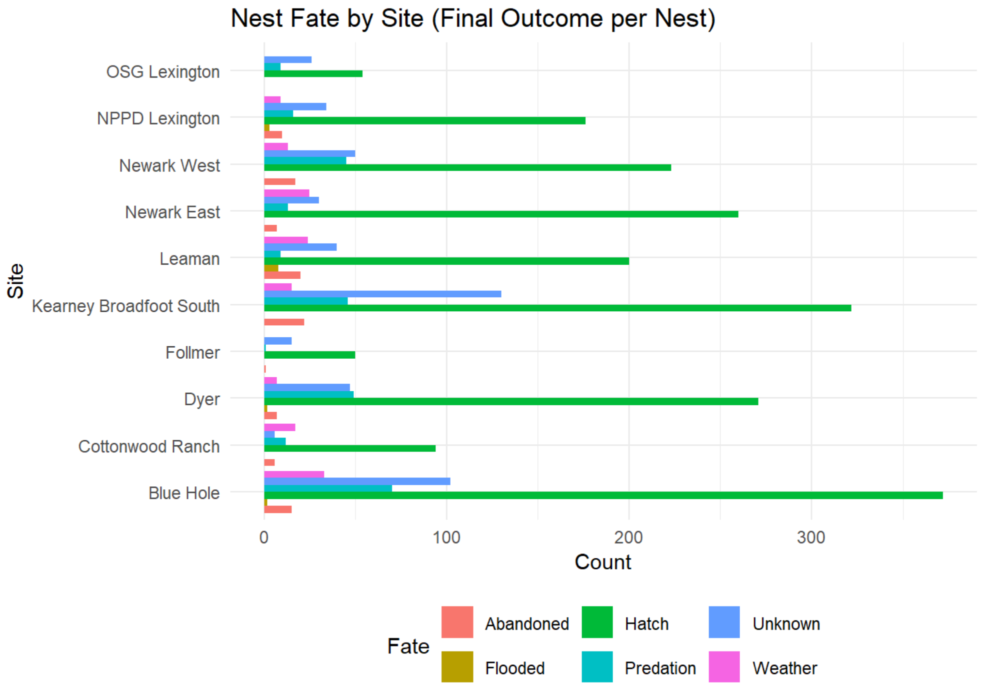

Nest Fate by Site (Final Outcome per Nest)

Modeling Framework

Multinomial Logistic Model

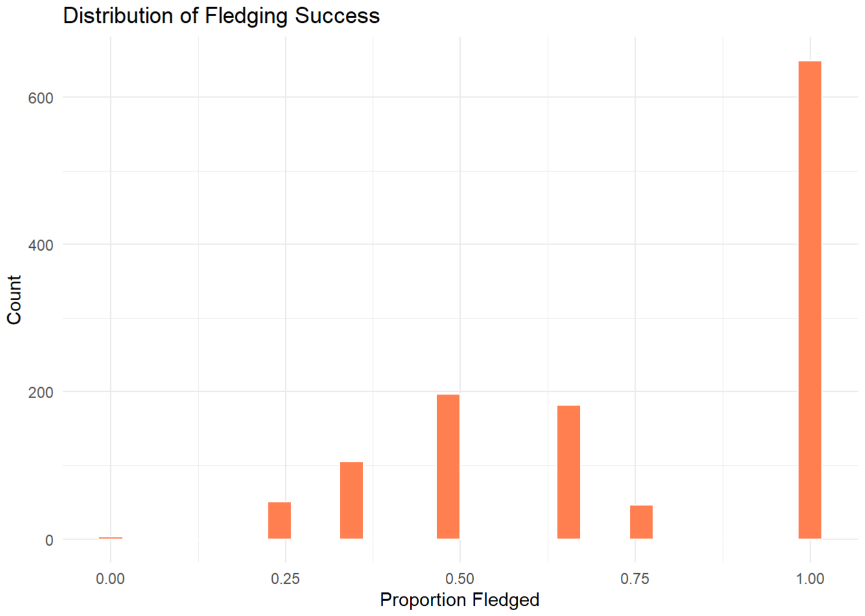
- Multinomial response (*s, p, w, a, f, u)*



Nest Fate by Site (Final Outcome per Nest)

Zero-One Inflated Beta Regression

- Proportional response, capped by 0 and 1.



Distribution of Fledging Success

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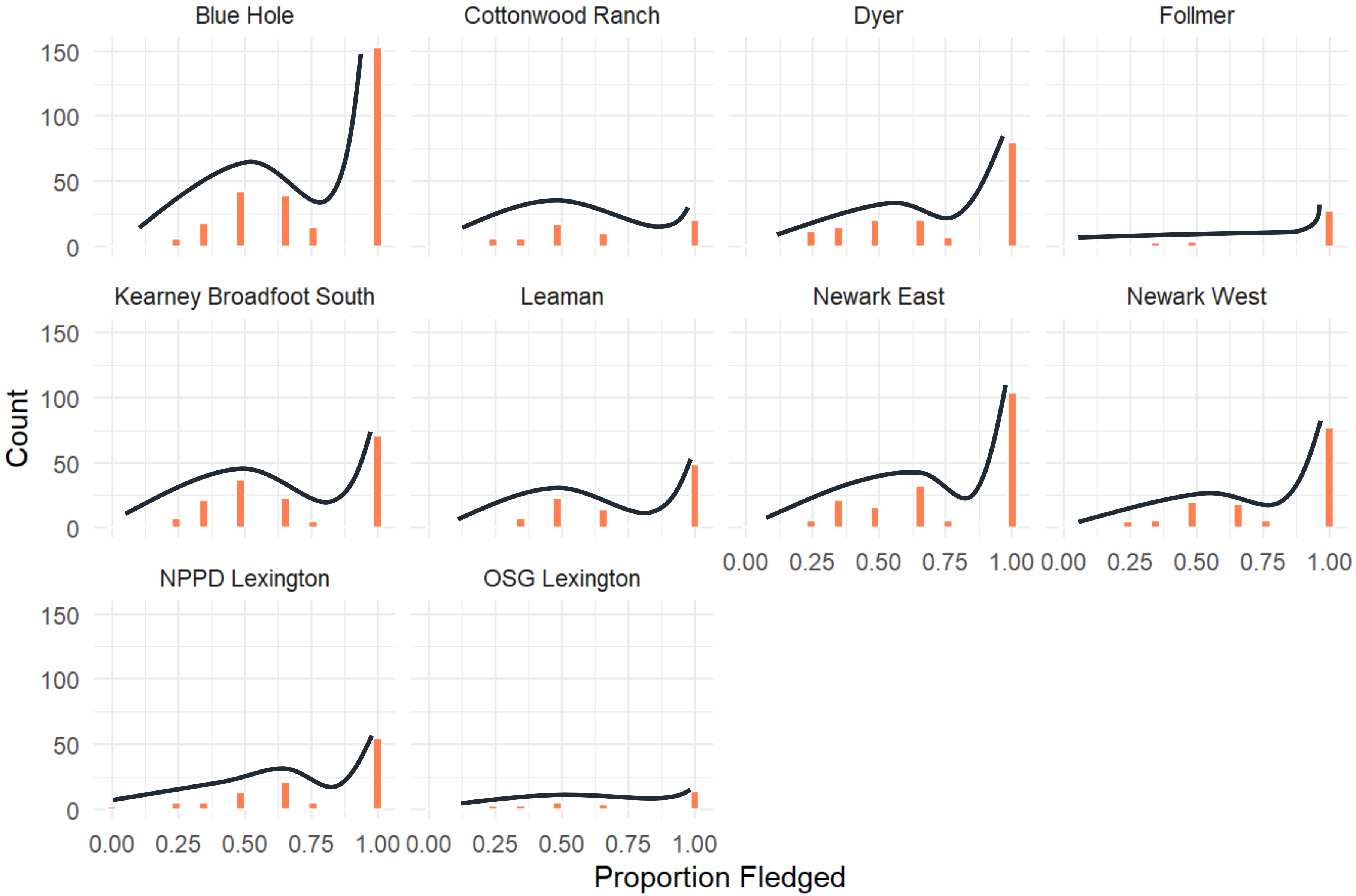
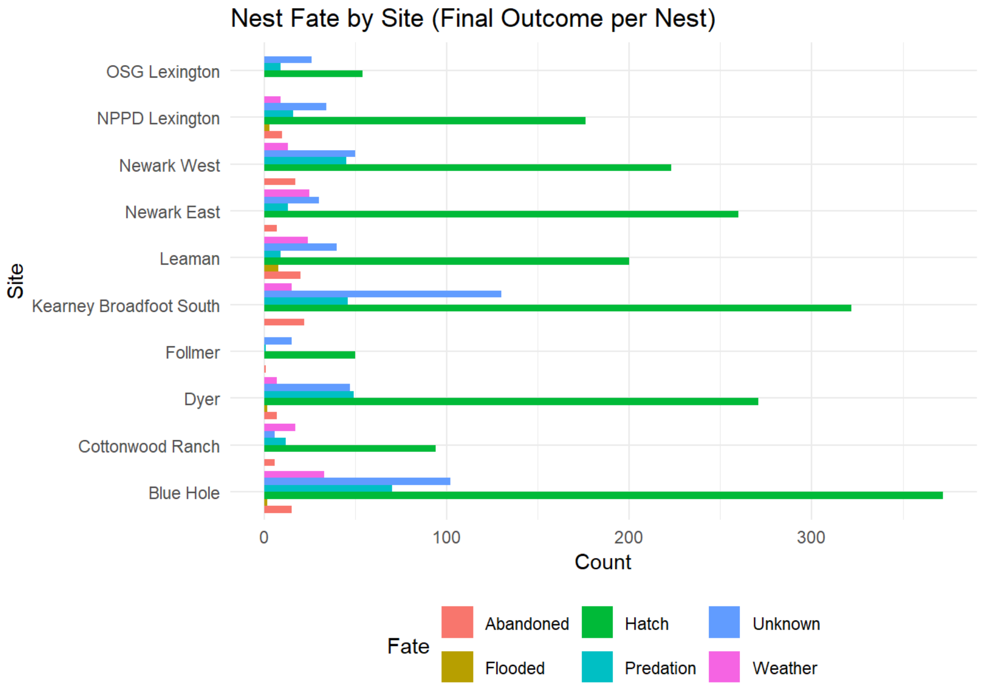
Distribution of Fledging Success by Site



Modeling Framework

Multinomial Logistic Model

- Multinomial response (*s, p, w, a, f, u)*



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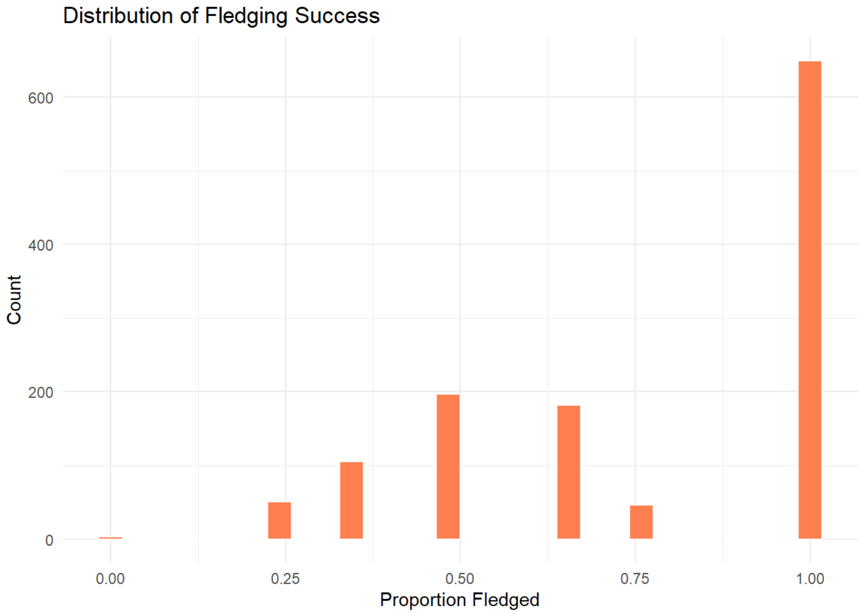
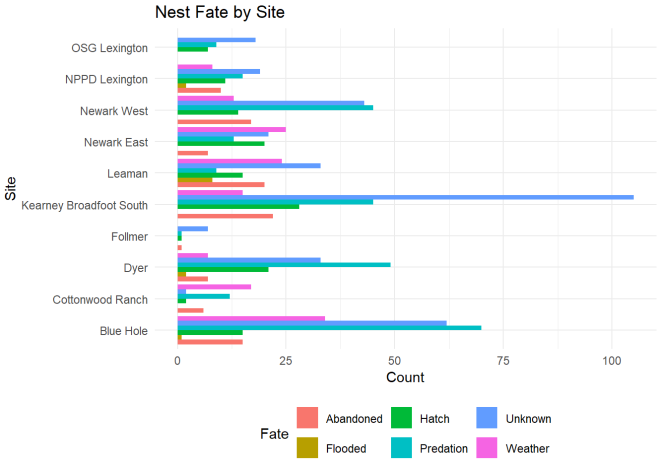


Modeling Framework

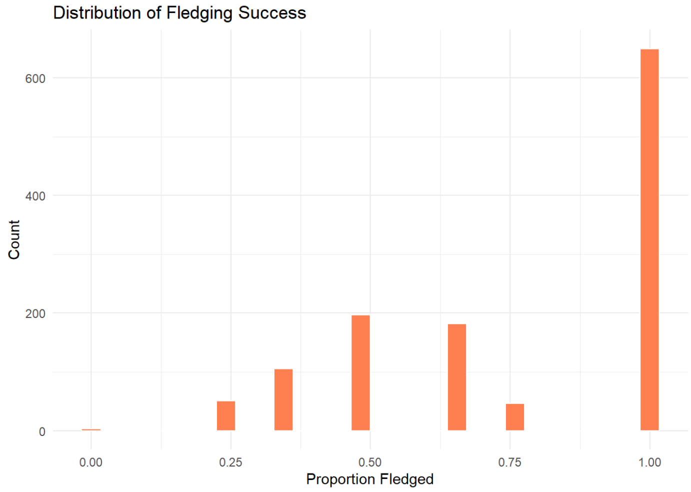
What is the probability of fate?

- Multinomial response (*s, p, w, a, f, u)*



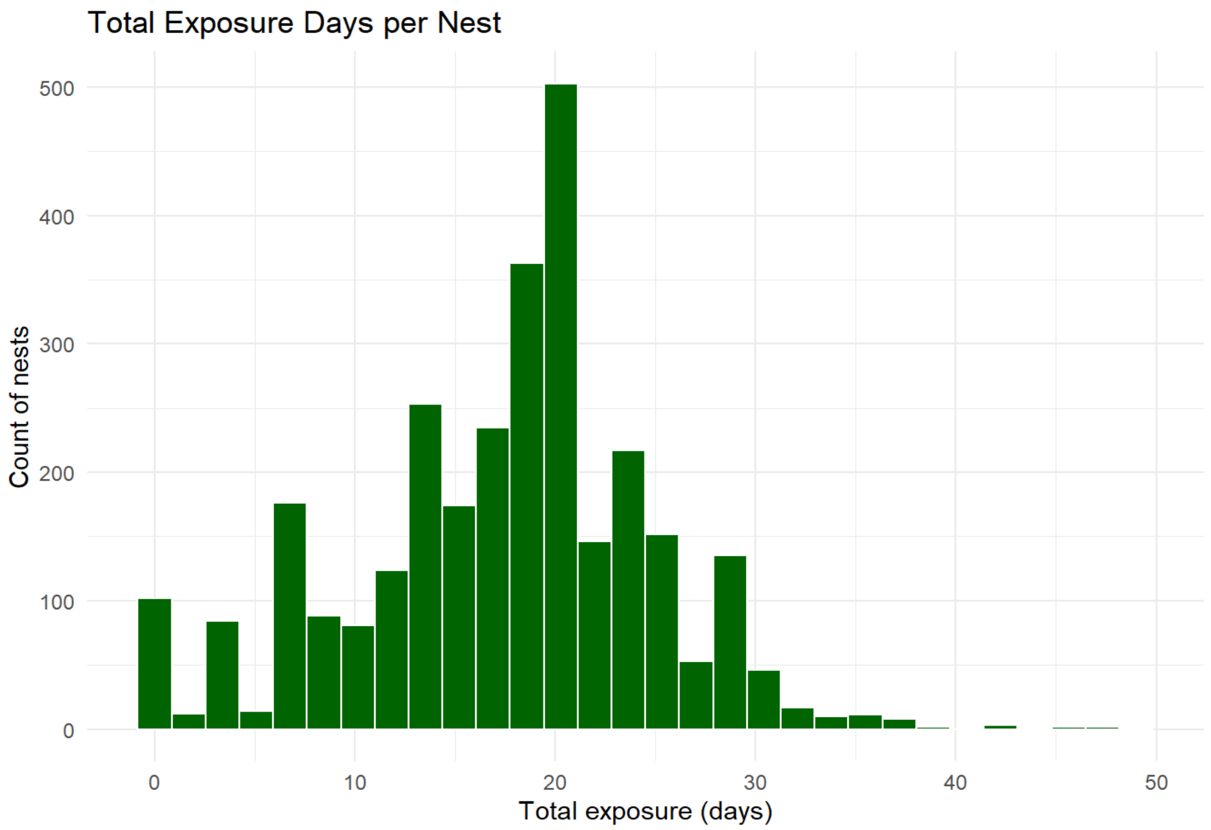
If Successful, by how much?

- Proportional response, capped by 0 and 1.



Key Predictor: Exposure

- Both models incorporate **exposure** by converting interval length (number of days observed) into a daily probability of fate, so longer monitoring intervals appropriately scale the estimated daily hazard rate.
- Accumulates Risk.



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Covariates

- Explain variation in survival and productivity beyond simple treatment effects.
- Allow us to separate true management impacts from natural site, seasonal, and environmental drivers.

Predator management

- Interior fence (yes/no)
- Exterior fence (yes/no)
- Deterrent lighting (yes/no)

Site characteristics

- Site area (continuous)
- Site age since construction
- Surrounding Habitat (% categorical)

Temporal variables

- Julian day

Nest-level variables

- Camera Presence

Climatic variables

- Temperature
- Precipitation

Grouping structure

- Site (random effect)
- Year (random effect)

Information Generated

1. Identifies where loss risk is highest, indicating sites or conditions where predation pressures remain limiting.
2. Identifies where success is most likely, revealing conditions associated with survival environments.
3. Quantifies productivity when broods partly survive, showing whether management improves survival after early losses.

Addressing Uncertainty

Impacts on Productivity

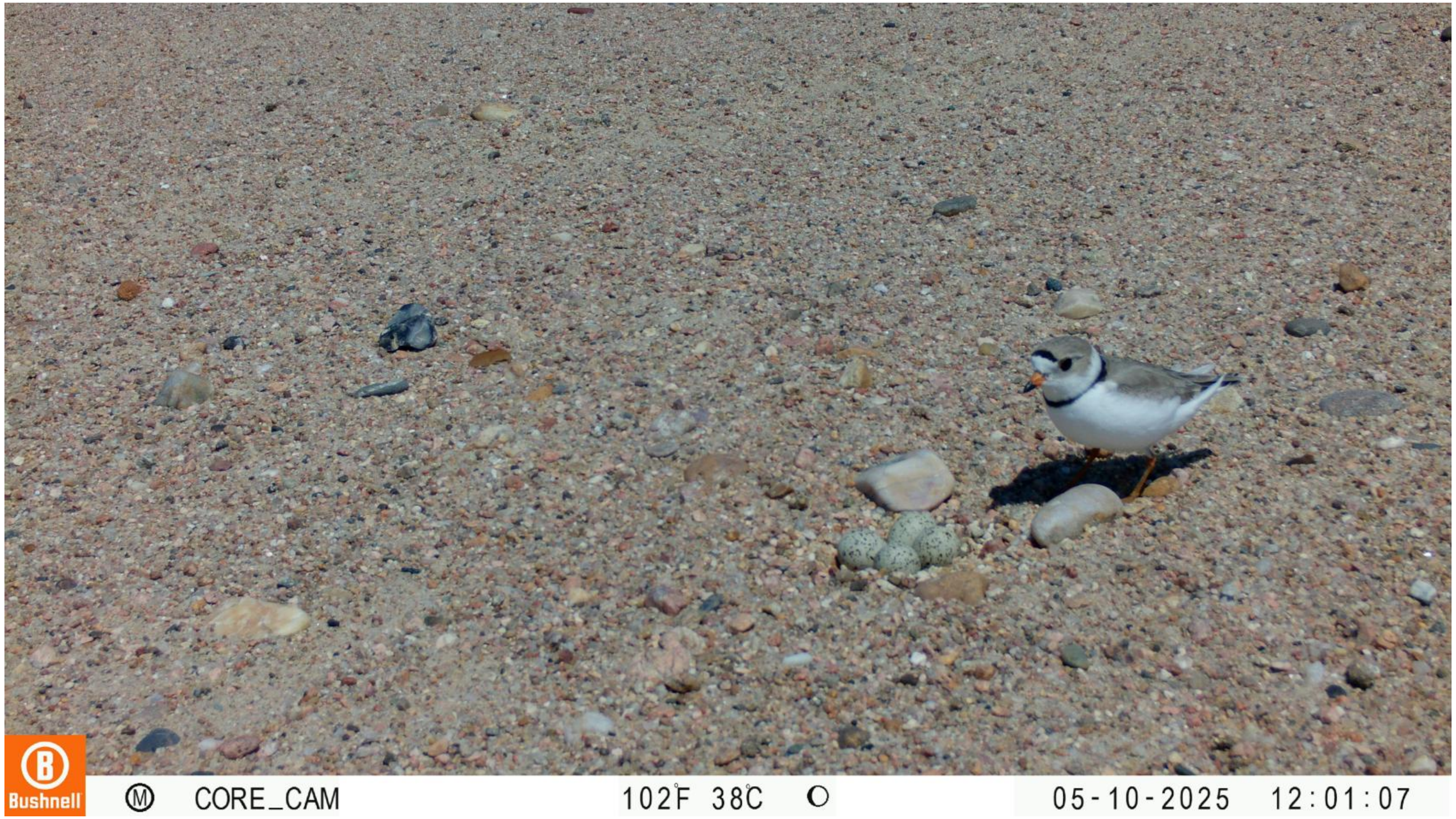
- What level of productivity loss is attributable to predation pressure?
- How much does predator management reduce brood loss and improve productivity?
- How do outcomes under management compare to a no-action scenario?
- How much monitoring information will be lost under the 2026 camera protocol change?

Given known costs, effort, and expected benefits of each management option, can we project likely future productivity outcomes to support decision-making?

Potential Surprises

- Habitat availability in other systems
- Unmanageable environmental factors – weather
- Factors out of our control which may drive use and productivity

Questions?



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