

Big Muddy Metrics: Adaptive Management on the Missouri River

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Topics

- Missouri River Recovery Program & Adaptive Management
- Overview of Draft ESH Adaptive Management Strategy
- Data and trends from 2004-2010
- Recommendations for adjustments to ESH Program
- 2011 and beyond?

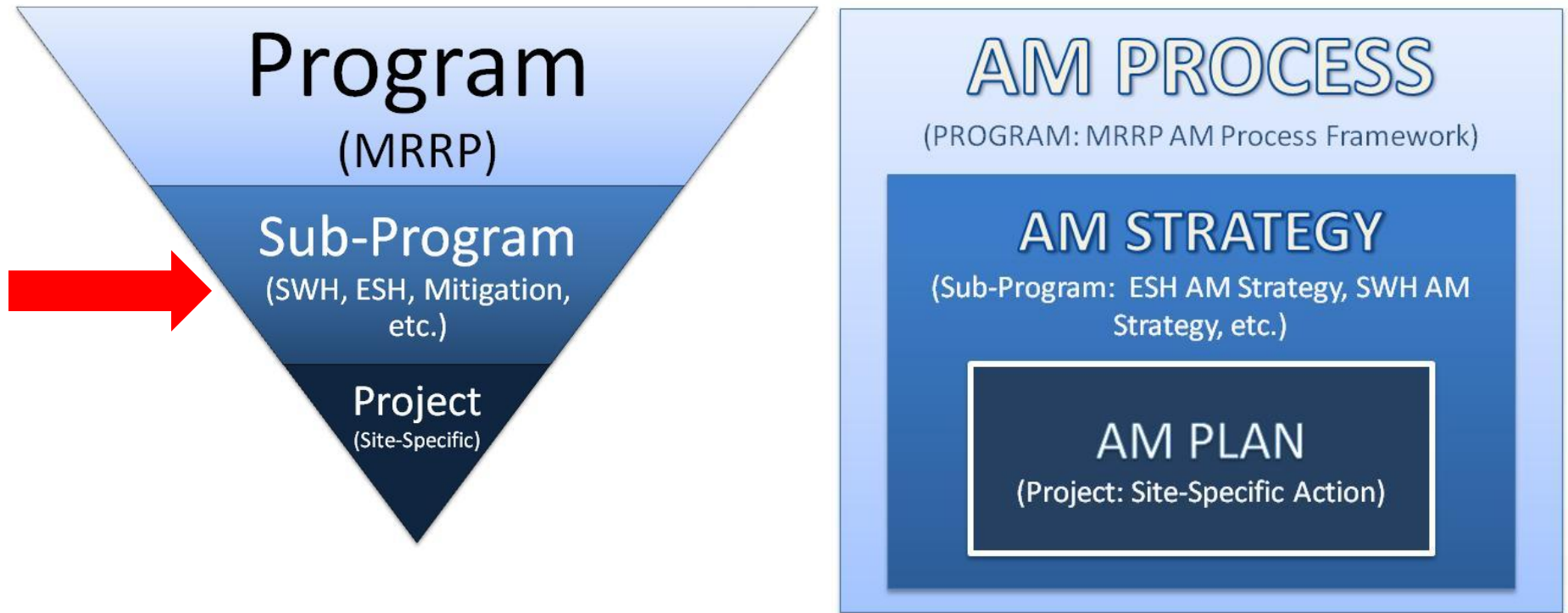


Missouri River Recovery Program (MRRP)

- Actions stem from a 2003 Amended Biological Opinion on Missouri River Operations
- Four listed species
 - ▶ Pallid Sturgeon
 - ▶ **Least Tern**
 - ▶ **Piping Plover**
 - ▶ Bald Eagle (now delisted)



MRRP AM Structure

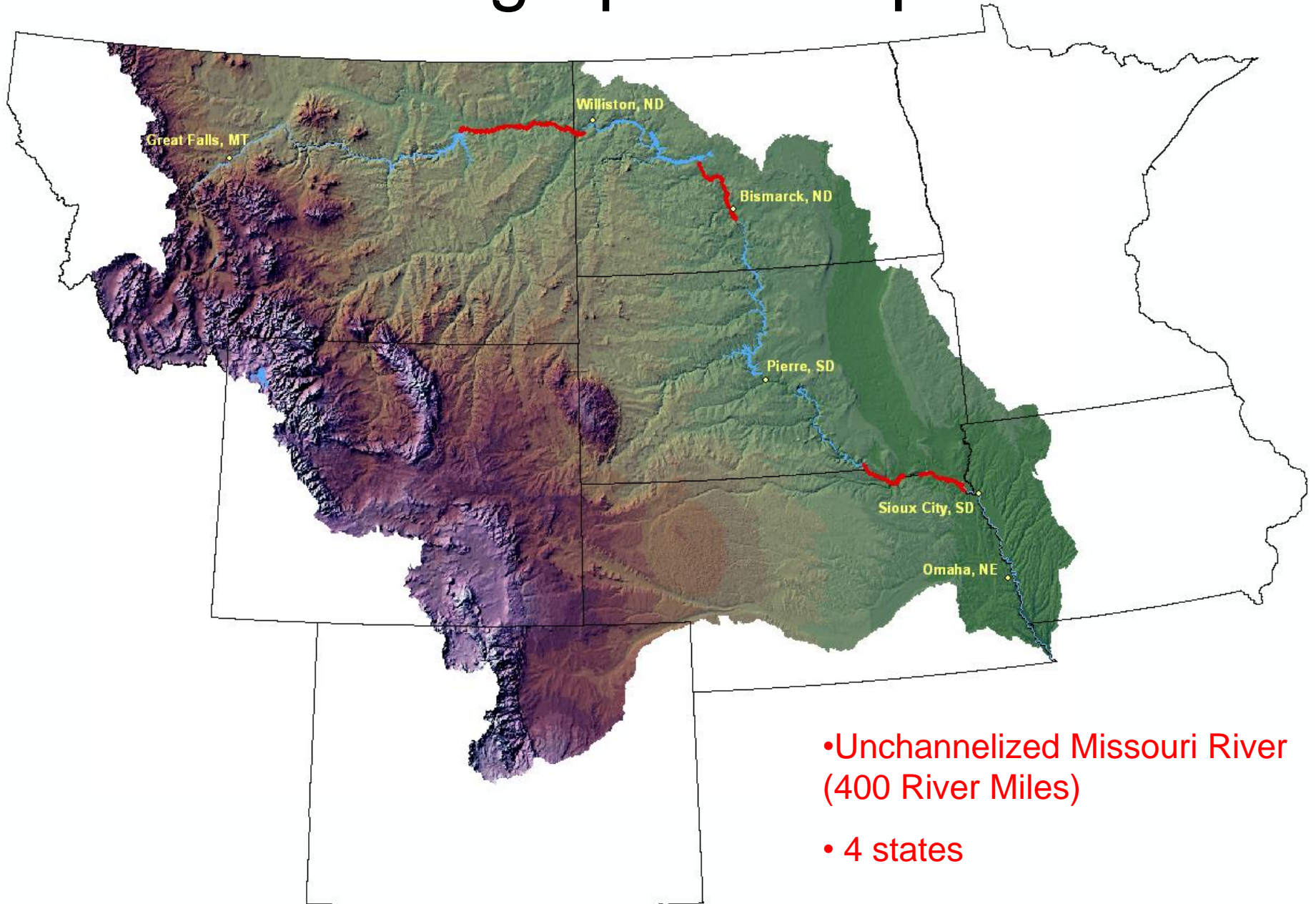


Emergent Sandbar Habitat AM Strategy

- Developed concurrently with a Programmatic EIS
- Covers a large geographic area
- Covers actions to supplement and maintain natural habitat on the system



Geographic Scope

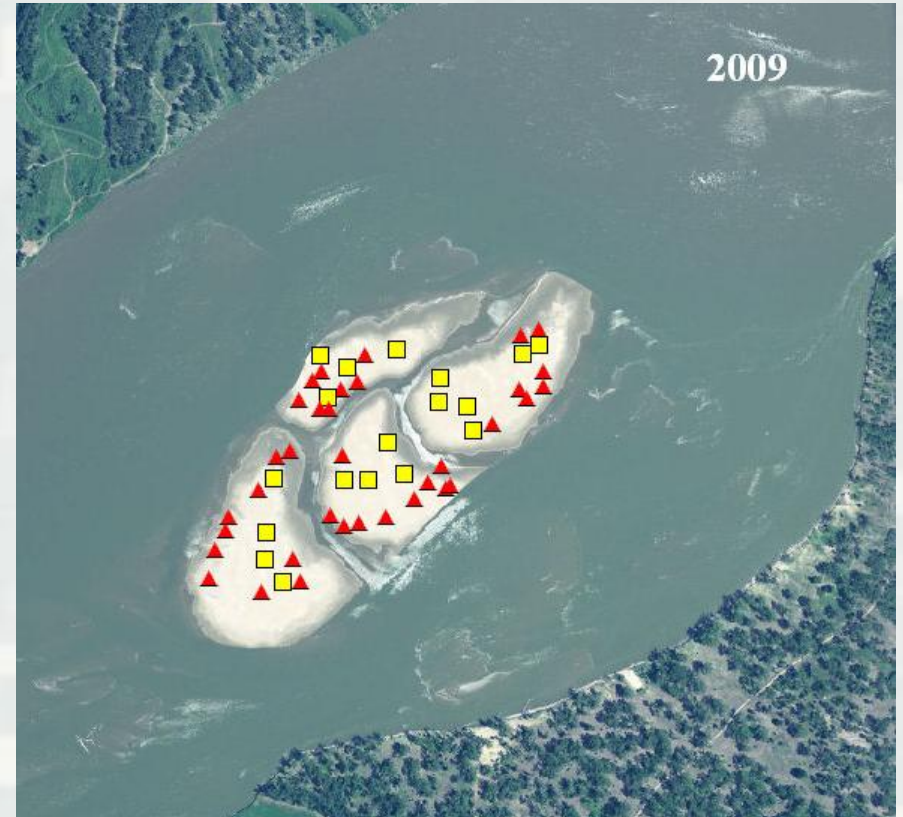
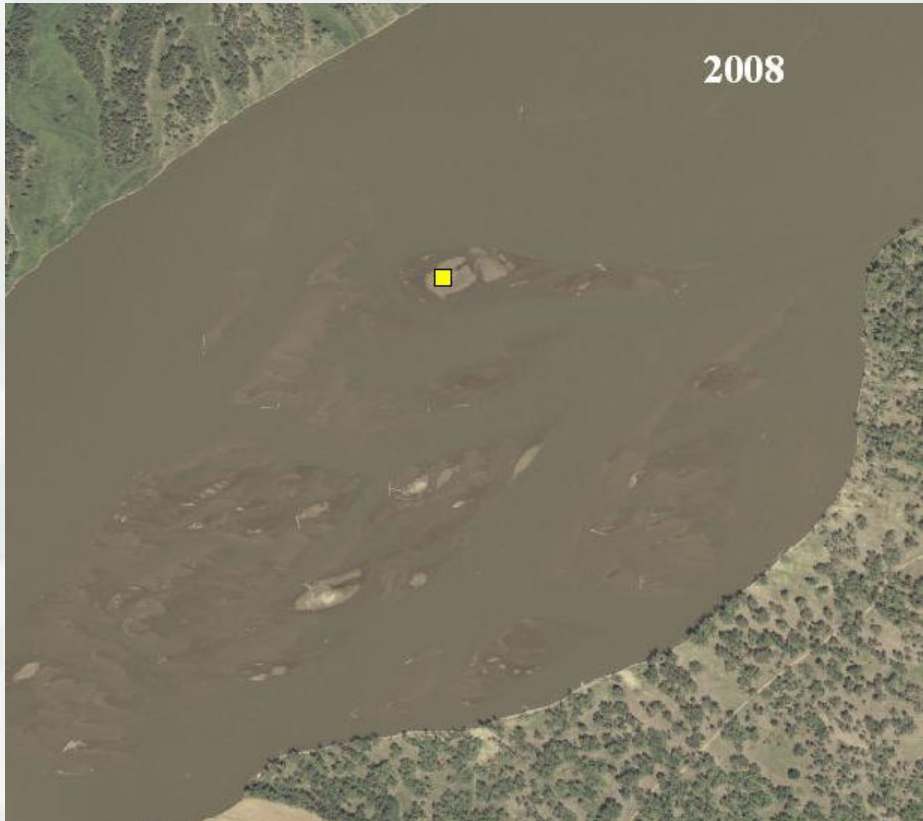


Emergent Sandbar Habitat

- Bare sand with gradual shoreline
- Nesting area for terns and plovers
- Typically constructed in 30-60 acre complexes



Bird Usage Before and After ESH Construction



1997 Flood

- Highest runoff year on record (since 1898, prior to 2011)
- Created roughly 6,700 acres of ESH available in 1998
- Immediately followed by a drought
- Resulted in record productivity and populations of terns and plovers through 2004
- Large scale efforts to supplement habitat began in 2004 (after receipt of 2003 BiOp)
- Initiated PEIS in 2004 as well



Objectives and Performance Metrics

- **Objective 1: Meet or exceed tern and plover productivity targets**
 - ▶ Metric: Fledge Ratios
- **Objective 2: Increase and subsequently stabilize tern and plover populations**
 - ▶ Metric: Population Size and Population Growth Rate
- **Objective 3: Meet ESH acreage targets**
 - ▶ Metric: Area of ESH
- Objective 4: Minimize negative impacts due to ESH construction activities
 - ▶ Metric: Cubic yards of dredged material
- Objective 5: Reduce uncertainty to improve projections and reduce risk
 - ▶ Coefficient of Variation

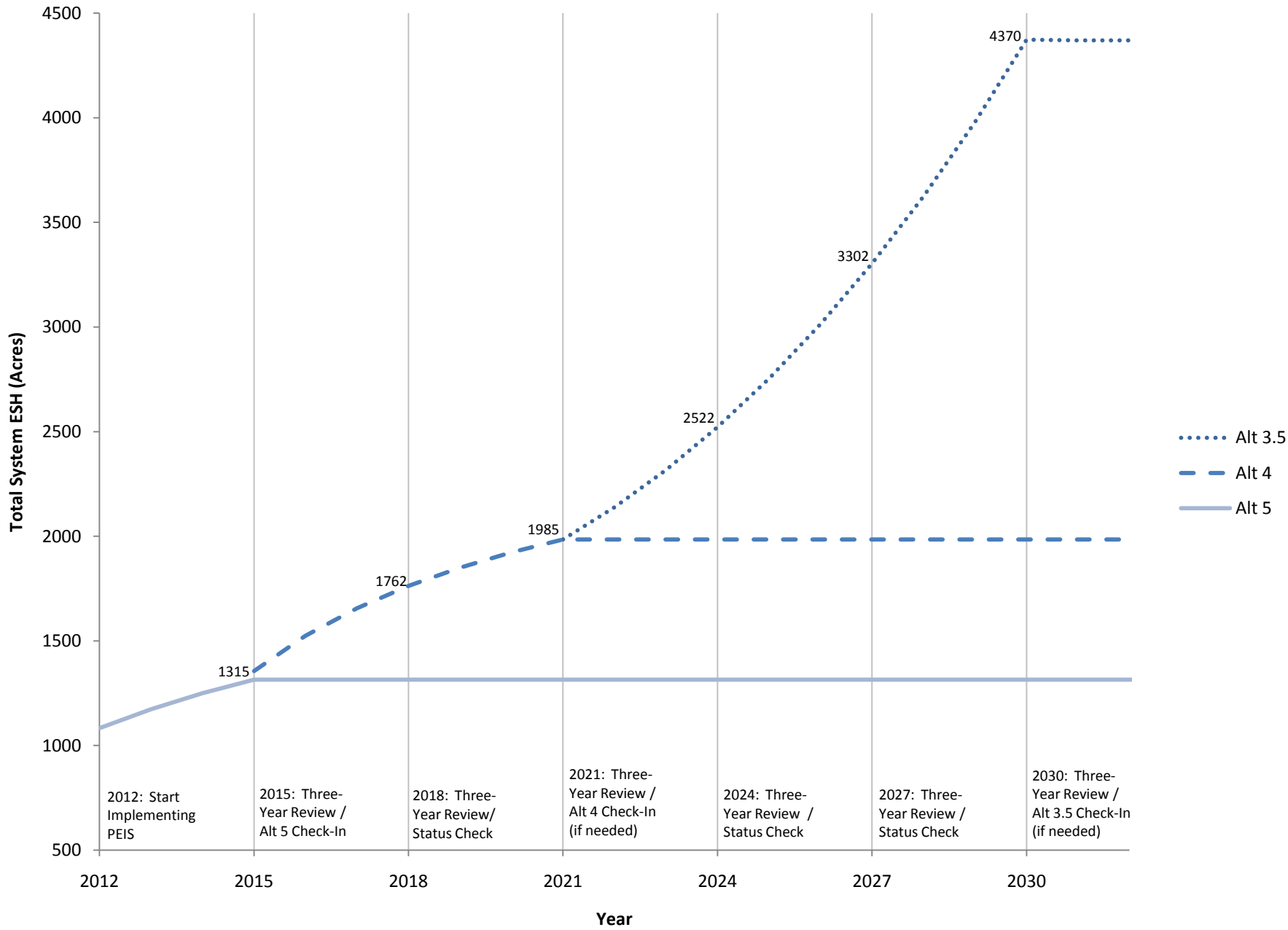


Objective 3

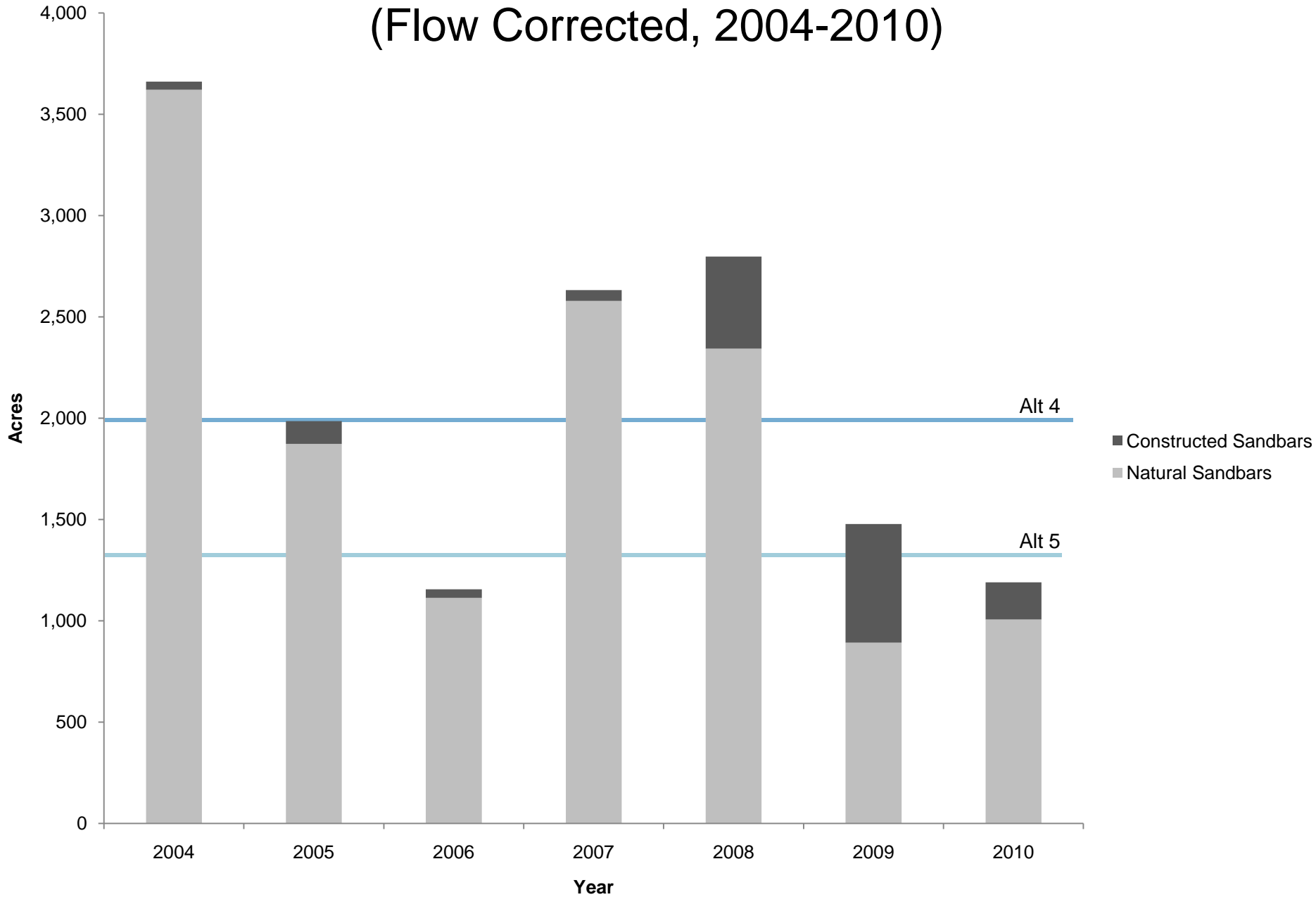
Meet ESH acreage targets

- Metric: Area of ESH
- Initial Target: 1,315 Acres
- Upper Construction Limit: 4,370 Acres
- Addresses annual creation needed to meet acreage target (Annual Work) and adjustment of acreage target to meet biological objectives

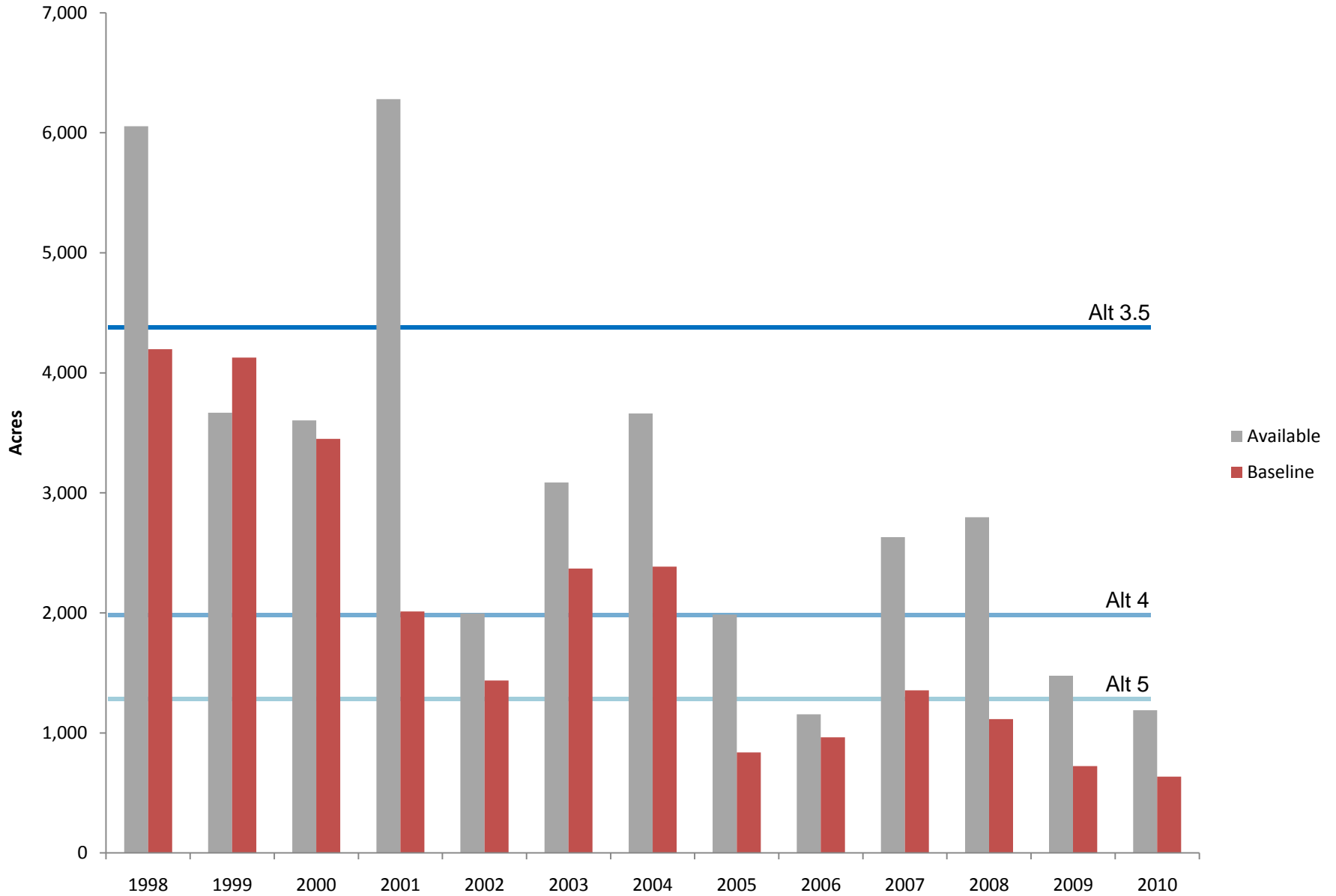




Estimated Riverine ESH Acreage (Flow Corrected, 2004-2010)



Available and Baseline Acres of ESH 1998-2010

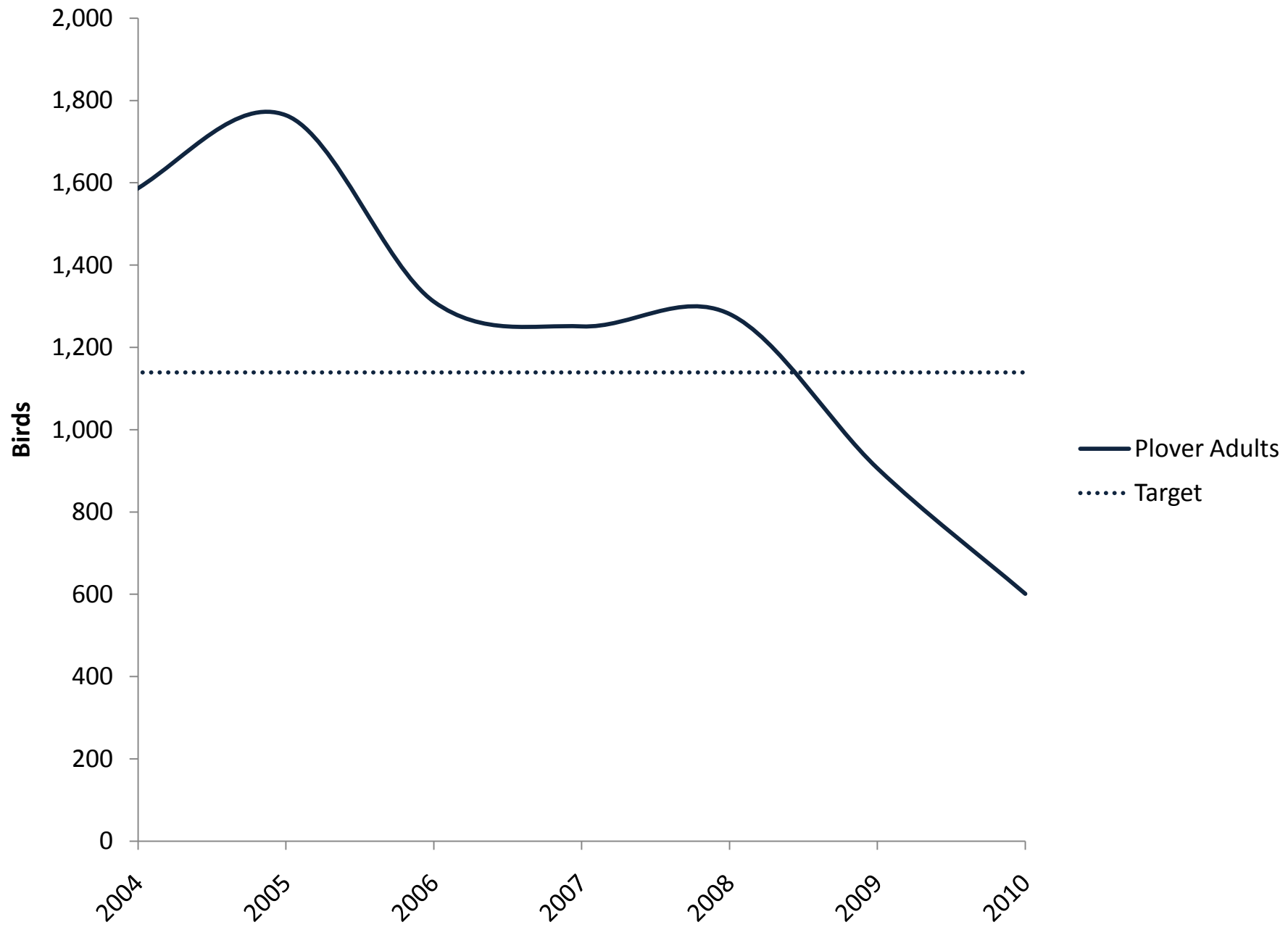


Objective 2

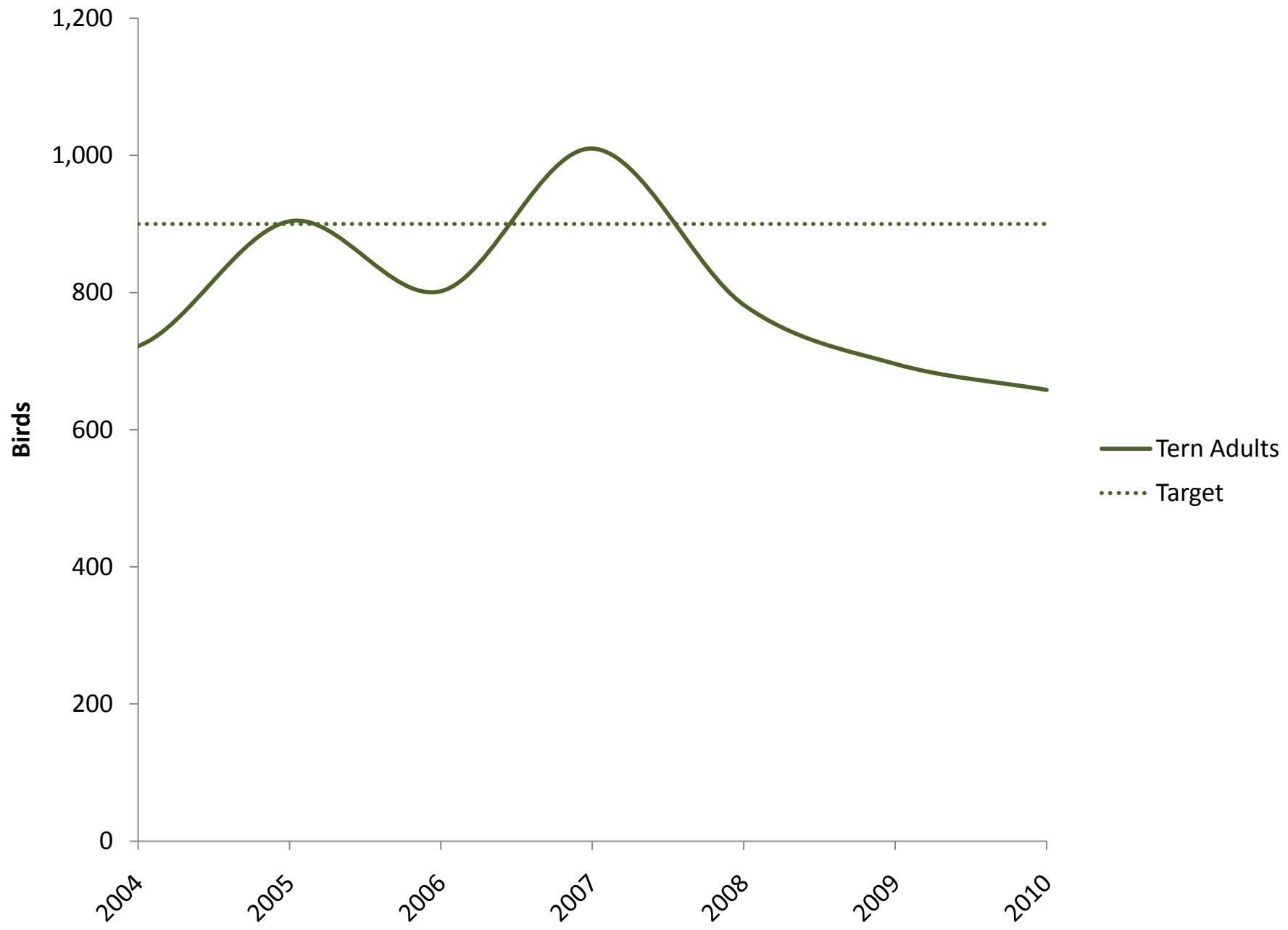
- Increase and subsequently stabilize tern and plover populations
- Metrics: Adult Population Size; Population Growth Rate
- Targets: Tern – 900; Plover – 1,139; Growth Rate > 1



Plover Population Size (2004-2010)



Terns Population Size (2004-2010)

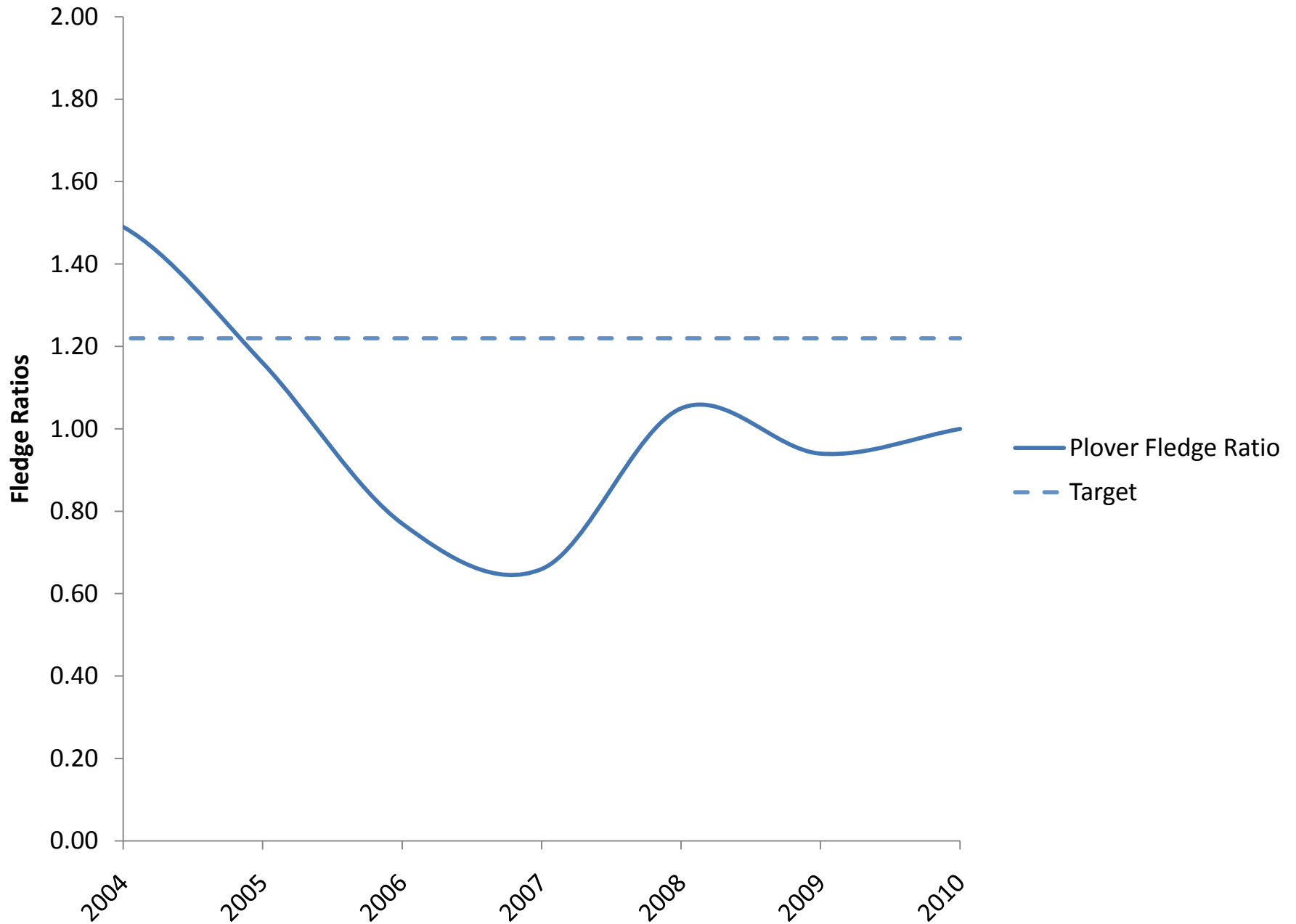


Objective 1

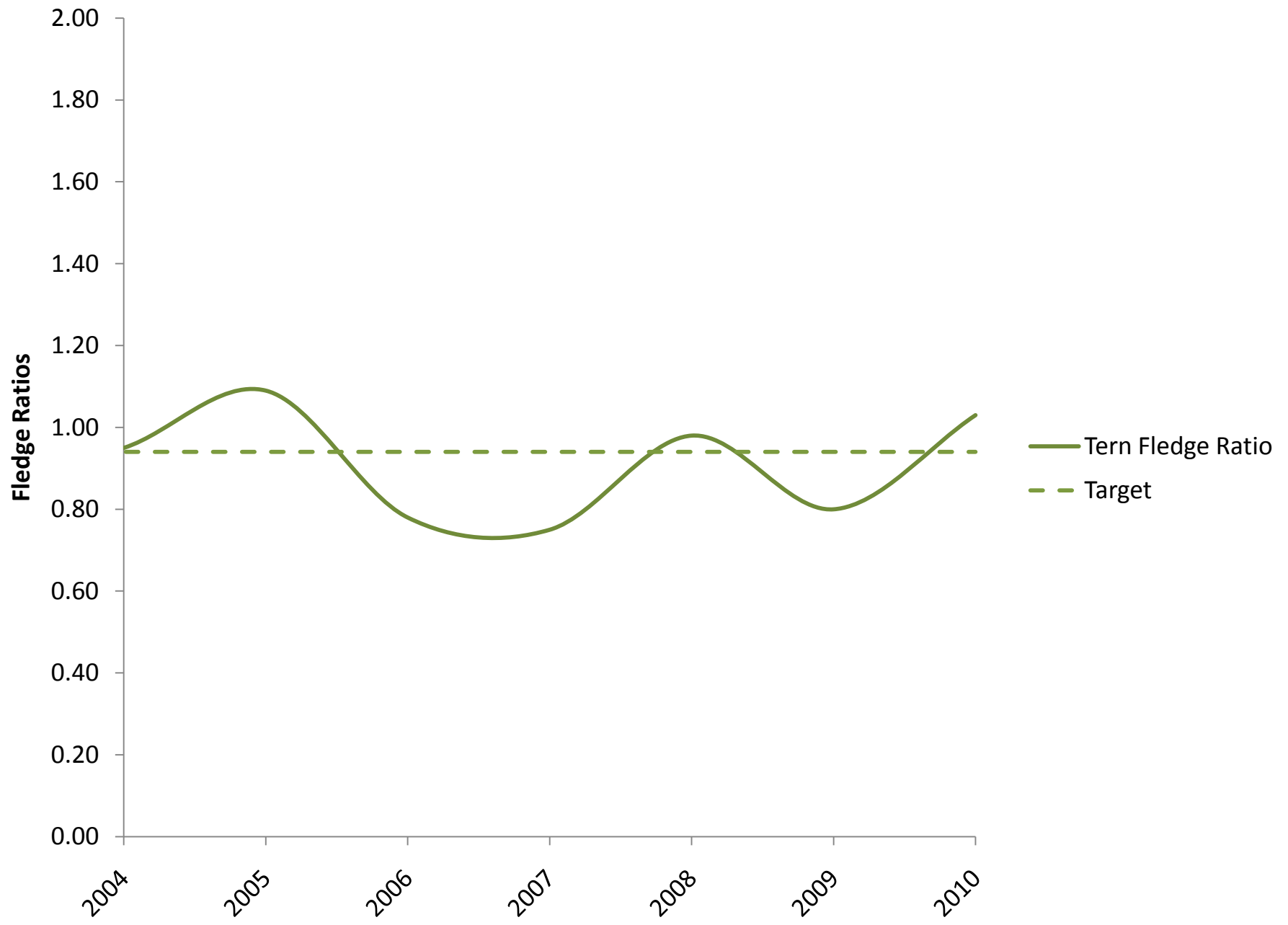
- Meet or exceed tern and plover productivity Targets
- Metric: Fledge Ratios
- Targets: Tern – 0.94, Plover – 1.22



Plover Fledge Ratios (2004-2010)



Tern Fledge Ratios (2004-2010)



2010 Adaptive Management Report Card

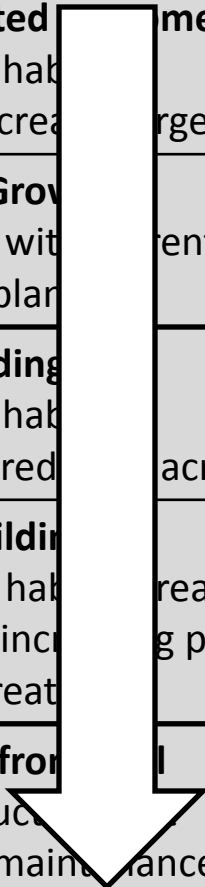
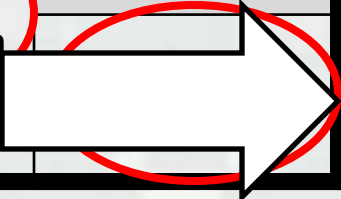
Objective	Performance Metric	Target	2010 Value	Change from Previous Year ^b	3-Year Average
1	Plover Fledge Ratio	1.22	1.01	7%	1.01
1	Tern Fledge Ratio	0.94	1.03	29%	0.94
2	Plover Population Growth Rate	$\lambda > 1$	0.67^a	-17%	0.80
2	Tern Population Growth Rate	$\lambda > 1$	0.95^a	-26%	0.87
2	Plover Population Size	1,139	604	-33%	930
2	Tern Population Size	900	658	-5%	692
3	Amount of ESH (acres)	1,315	1,189^c	-19%	1,821
4	Area affected by construction (annual yd ³)	<960,712	290,000	-74%	1,140,290
5	Reduce uncertainty	Minimize CV ^d	Plover: 17.71 Tern: 6.60	Plover: -0.1% Tern: -1.5%	-

EXAMPLE: Decision Matrix

		Acreage < target	Acreage = target
Growing Population	Population ≥ target	Unexpected outcome Maintain habitat Reduce acreage target	Overbuilding Maintain habitat Consider reducing acreage target
	Population < target	Desired Growth Continue with current habitat creation plan	Overbuilding Maintain habitat
Stable Population	Population ≥ target	Overbuilding Maintain habitat Consider reducing acreage target	Desired Stability Maintain habitat
	Population < target	Underbuilding Continue habitat creation Consider increasing pace of habitat creation	Underbuilding Increase acreage target Improve habitat quality
Declining Population	Population ≥ target	Reversal from goal Reconstruct habitat Improve maintenance	Reversal from goal Improve habitat quality Increase acreage target
	Population < target	Underbuilding Increase pace of habitat creation	Unexpected outcome Increase acreage target Improve habitat quality

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		Underbuilding Increase pace of habitat creation	Unexpected outcome Increase acreage target Improve habitat quality



Summary of Recommendations

- Create more ESH annually
- Expand efforts to other river segments
- Test the efficacy of other methodologies
 - ▶ Vegetation Removal
 - ▶ Geotubes and other deposition-inducing structures
 - ▶ Off-channel habitat
 - ▶ Several small sites



Summary of Recommendations

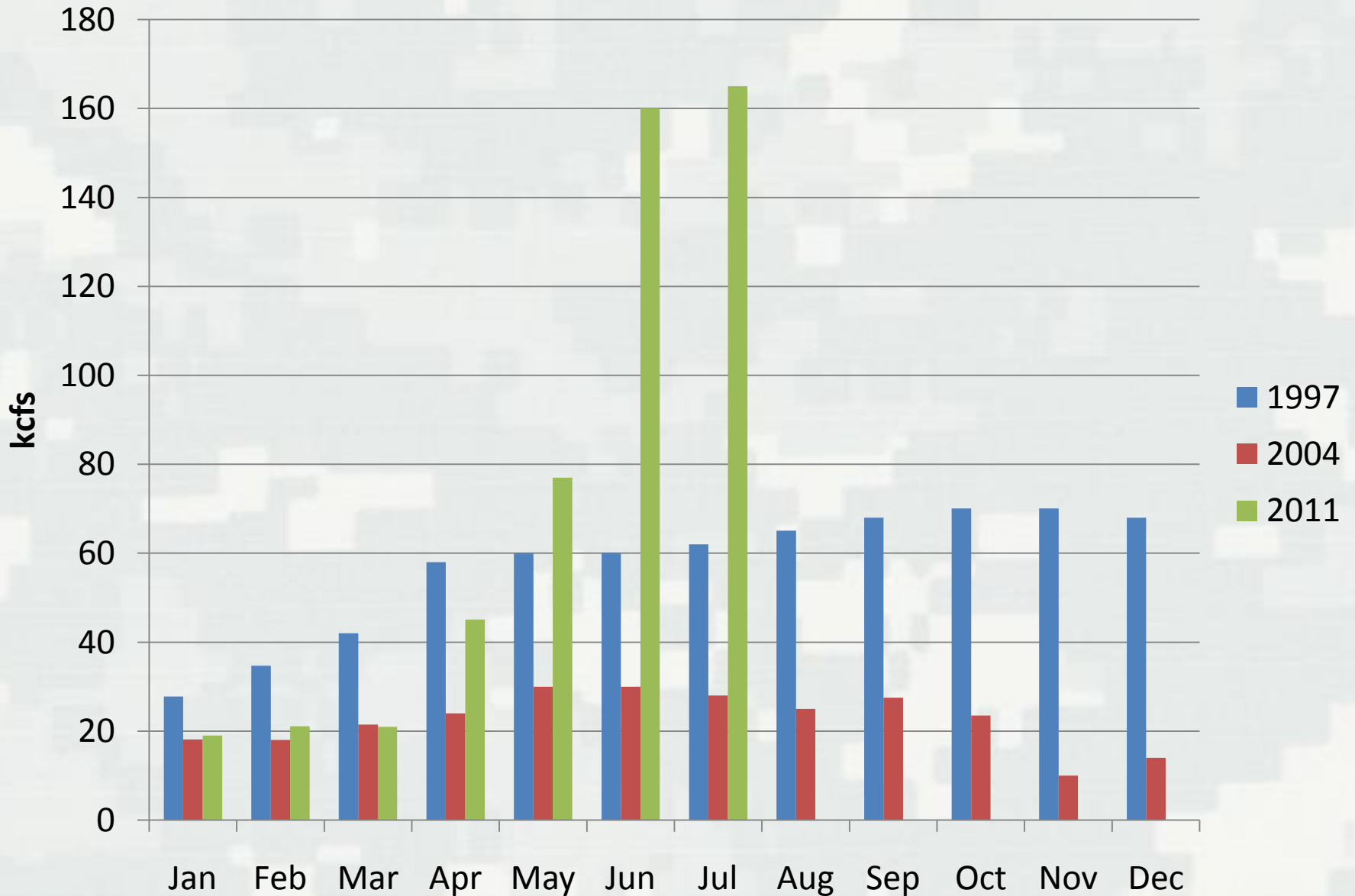
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- Undertake investigations to reduce uncertainties
 - ▶ Erosion and vegetation rates
 - ▶ Changes in acreage due to flows (update flow curves)
 - ▶ Metapopulation studies
 - ▶ Non-target impacts
- Analyze existing data
 - ▶ Density dependence
 - ▶ Differences in population use and productivity



Looking forward – 2011 & Beyond

Gavins Point Max Monthly Outflow





Looking Forward

- 1997 high flows => 6,700 acres of ESH
- By 2005 - 1,900 acres remained
- How much will be created in the 2011 event?
- How can we better maintain habitat?
- What is the right amount to achieve the metrics?



For more information...

<http://www.moriverrecovery.org/>



BiOp Efforts

Adaptive Management

Adaptive Management (AM) is a decision-making process that promotes collaboration, flexible decision-making, and learning from the outcomes of management actions. This decision-making process ultimately leads to more effective decisions and enhanced benefits from projects.

More information on Adaptive Management is available in the Department of Interior *Adaptive Management Technical Guide*.



- **Science**
 - Science Process
 - Project Information
 - Protected Species
 - Important Links
- **Adaptive Management**
 - Process & Guidance
 - AM Strategies
 - Models & Monitoring
 - Documents
- **Emergent Sandbar Habitat**
- **Shallow Water**



Questions?

