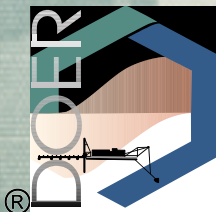


# Monitoring, Modeling, and Conservation Planning: USACE Contributions to Recovery of an Endangered Species

How USACE R&D is providing science support and using interagency cooperation to delist the Interior Population of Least Tern

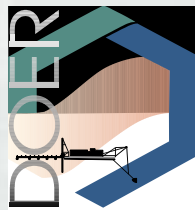
Dredging Operation and Environmental Research Program  
Dredging Operations Technical Support Program

Richard A. Fischer, Ph.D.  
ERDC Environmental Laboratory



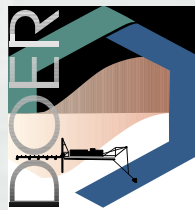
# Overview

- Describe the history of collaborative work by ERDC, American Bird Conservancy, and USFWS to recover endangered least terns
- Provide an overview of Section 7(a)(1) of the Endangered Species Act and how we used the power of the Act to achieve recovery



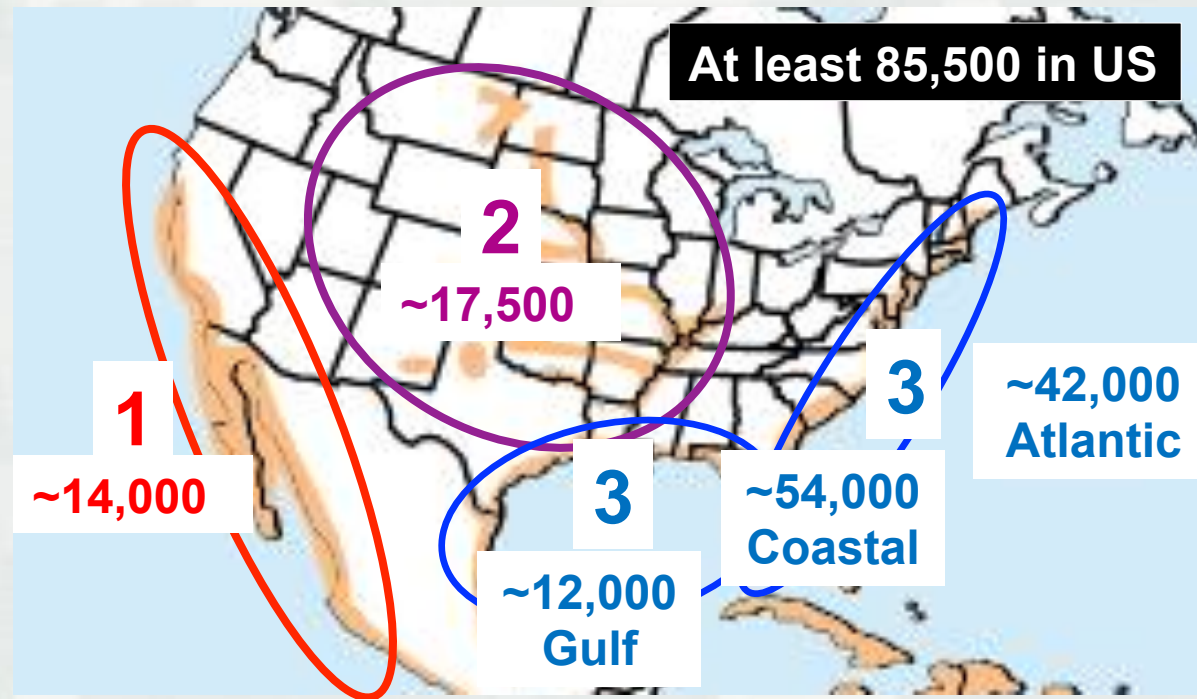
# Least Terns (*Sternula antillarum*)

- Least terns are colonial, fish-eating birds that nest on bare ground in a variety of open habitats on rivers and along coasts



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# Least Terns in North America



Three populations, two with USFWS listed status

1. “California” - includes Western Mexico
2. “Interior” = all LETE > 50 mi. from Gulf Coast
3. “Atlantic Coast” – includes Gulf Coast, Caribbean



# What is an “Interior” Least Tern?



Courtesy: C. Lott,  
ABC, 2012

- Any Least Tern nesting  $> 50$  mi. from the Gulf of Mexico (USFWS 1985)
- Long lived ( $>20$  years)
- Highly mobile
- Highly adaptable



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# “Interior” Least Terns

- ILT nest on or adjacent to large rivers of the Great Plains and in the Lower Mississippi Valley
- Eight rivers with ILT populations >500 adults: Mississippi, Red, Arkansas, Missouri, Platte, Cimarron, Canadian, Rio Grande/Pecos\*
- Lower Mississippi has order of magnitude more birds/habitat than all other populations



# Problem

- ESA concerns affect many USACE mission areas
- Must evaluate via modeling the population consequences of multiple chronic impacts under alternative management strategies
- USACE costs to monitor ILT populations and manage habitat (including BiOp compliance) often exceed \$10 million/year
- Population size far exceeds Recovery Plan goals, but “Recovery” cannot be secured without evaluating the population consequences of multiple chronic threats under alternative management strategies



# HISTORY

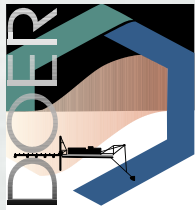
- Start with the end result – nearing a petition to delist the Interior Least Tern
  - ▶ If successful, removes ESA protection
  - ▶ Eliminates Section 7(a)(2) responsibilities and associated costs of compliance
  - ▶ Safeguards in place through Section 7(a)(1) and post-listing monitoring plan
  - ▶ Protection remains through MBTA





# HISTORY

- Start with the end result – nearing a petition to delist the Interior Least Tern
- 2004: Coastal engineering and shoreline-dependent birds (DOER)





**AMERICAN BIRD  
CONSERVANCY**



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# HISTORY

- Start with the end result – nearing a petition to delist the Interior Least Tern from ESA protection
- 2004: Coastal engineering and shoreline-dependent birds (DOER)
- 2005: Interior Least Tern “Information Gathering Era” – coordinating monitoring efforts, rangewide workshops, rangewide survey



# RECOVERY STATUS

## Recovery Criteria (1990)

- When listed (1985), only 1970 birds throughout distribution
- Protect habitat, establish management plans, increase ILT population to 7,000 birds range-wide and maintain for 10 years.
- Requires active management/monitoring

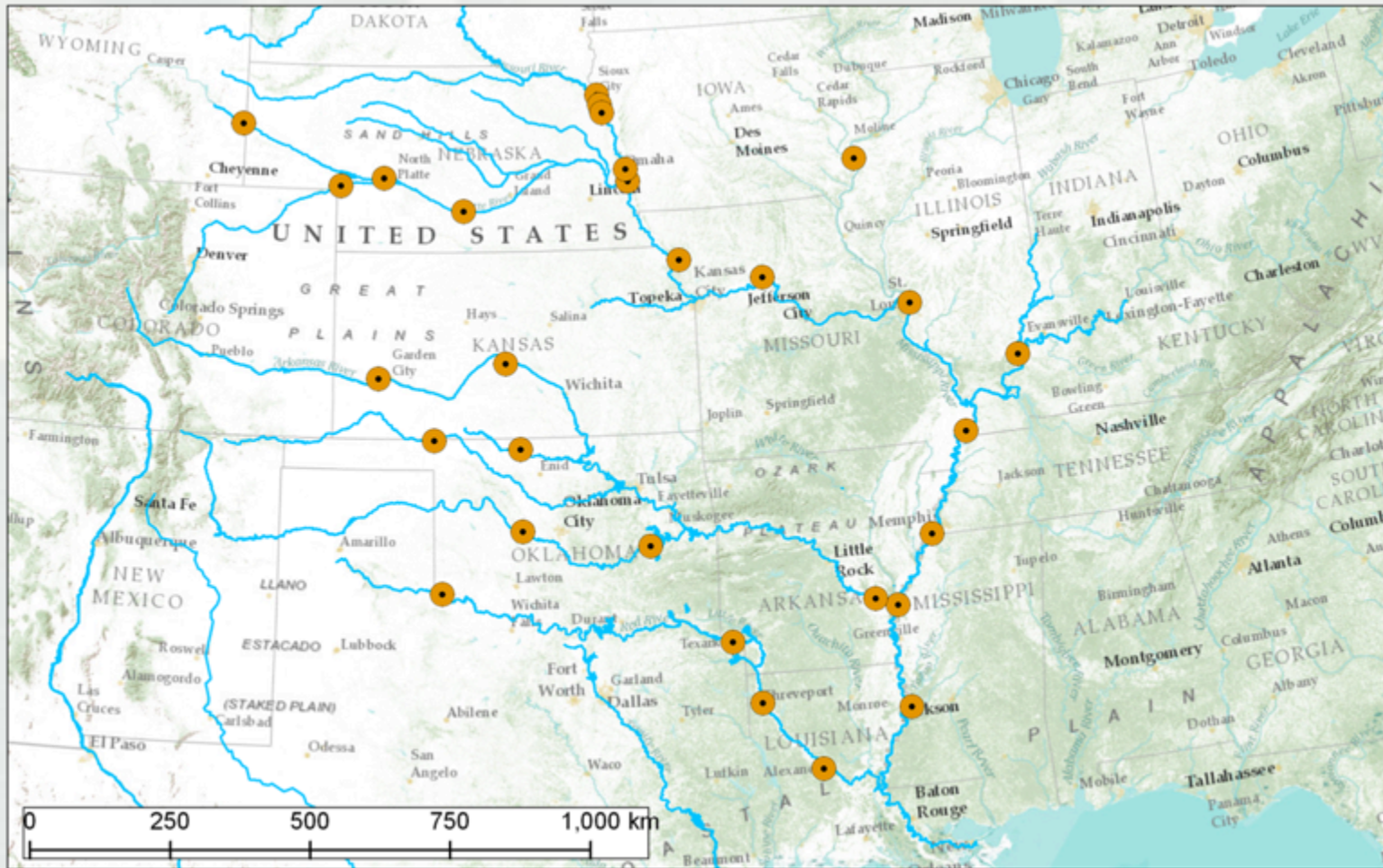


Missouri River > 2,100  
Lower Mississippi River = 2,500  
Arkansas River > 1,600  
Red River > 300  
Rio Grande River = 500



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# Historical Distribution (Hardy 1957)

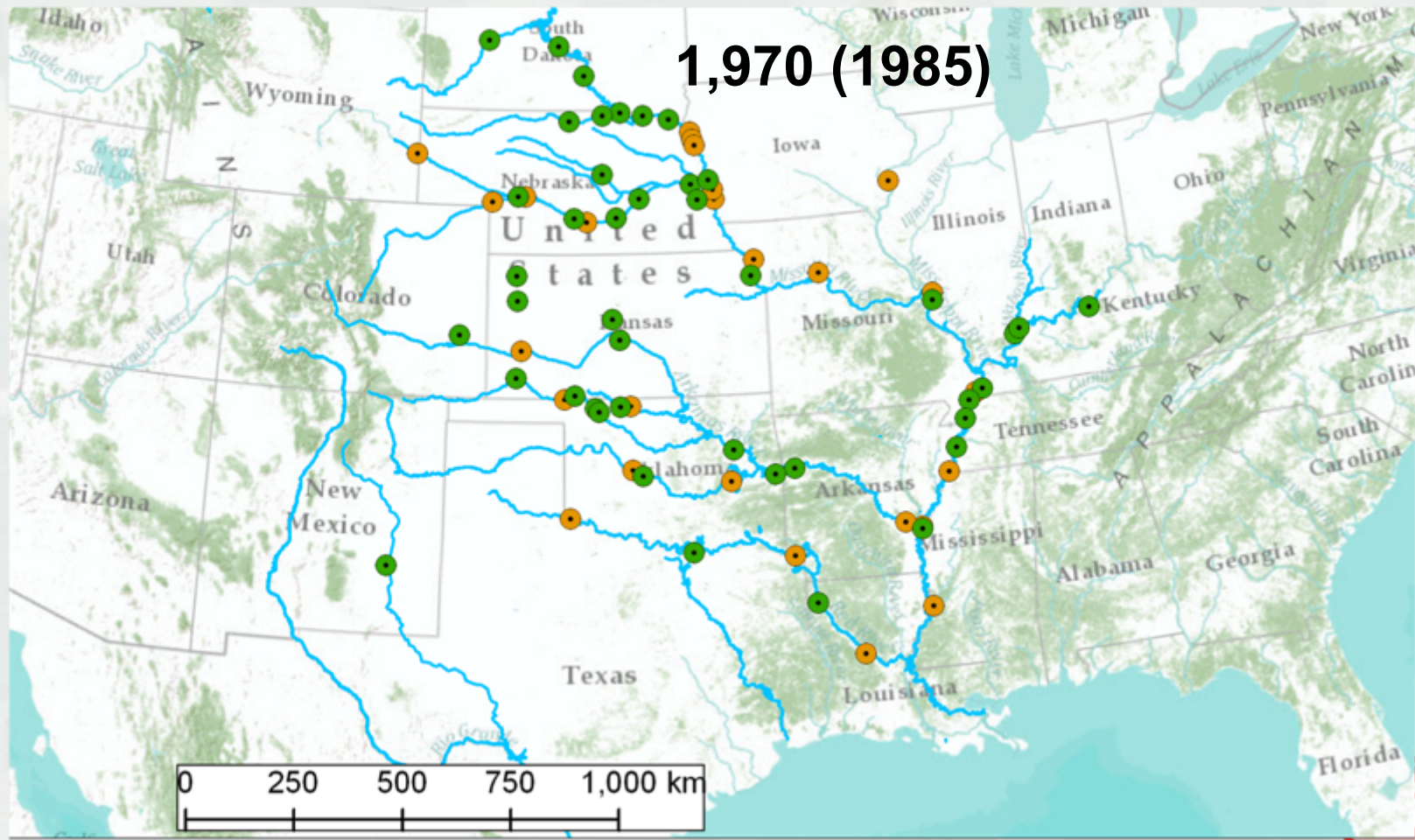


Courtesy: C. Lott,  
ABC, 2012



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# Abundance and Distribution When Listed (Ducey 1981)



Courtesy: C. Lott,  
ABC, 2012

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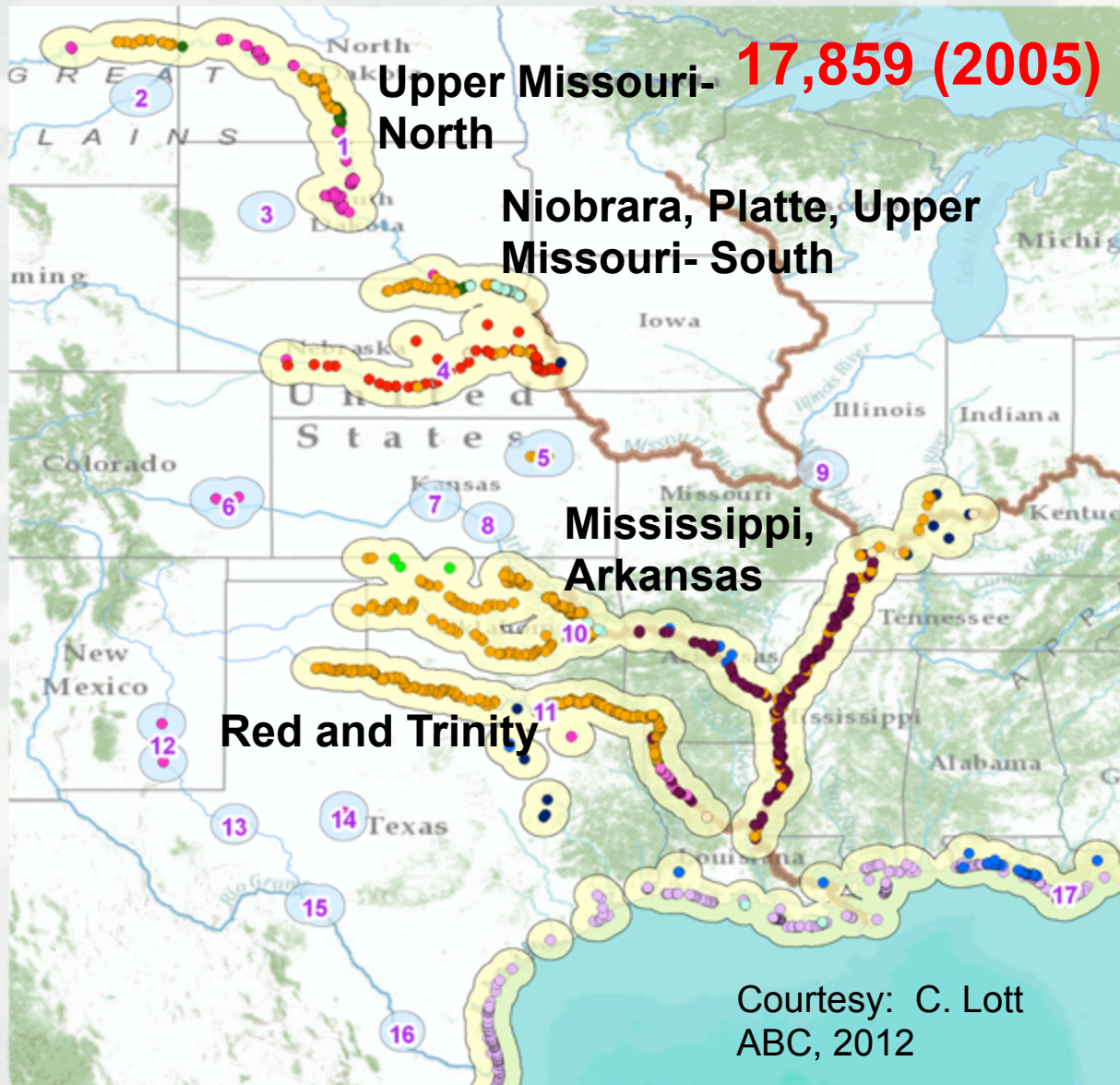
# Range-wide Survey Results (Lott 2006)

## Recovery Criteria (1990)

- Protect habitat, establish management plans, increase ILT population to 7,000 birds range-wide and maintain for 10 years.
- 2005 Range-Wide Total: **17,859** (Lott 2006)
  - ▶ Missouri River > 2,100 (**2,044**)
  - ▶ Lower Mississippi River = 2,500 (**10,960**)
  - ▶ Arkansas River > 1,600 (**2,119**)
  - ▶ Red River > 300 (**1,821**)
  - ▶ Rio Grande River = 500 (**366**)



# Current Abundance and Distribution



- 16 discrete ILT populations (96 km)
- 47 subpopulations (26 km)
- 4 main populations account for **97.8%** adults, **95.4%** sites
- 34 subpopulations within 4 main pops.



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## Objectives

- Provide science support to USFWS that promotes *ILT Recovery*
- Assist Districts with ESA Conservation Planning along major inland rivers with *ILT*
- Leverage expert assistance from American Bird Conservancy and USFWS *ILT Recovery Lead*
- Help reduce ESA expenditures, and ESA conflicts with USACE Missions
- Support Delisting (i.e., remove from ESA protection)



# HISTORY

- 2007-2009: Development of an Individual-based Model of Least Tern Reproduction



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## *an individual-based model of Least Tern reproduction*

The TernCOLONY model simulates breeding seasons for virtual populations of Least Terns nesting on river sandbars.

Users design their own simulation experiments to understand which factors may limit tern reproductive success (e.g., predators, floods) or to compare different management approaches for increasing reproductive output.

-  [Getting Started](#)
-  [Tutorials](#)



**Explore**

previous experiments



**Observe**

a single breeding season



**Create**

your own experiment



**Learn**

how to use the model

TernCOLONY model  
<http://www.leasttern.org>

Adult terns

Colony site selection

Re-nesting

Flows

Sandbars

ORVs  
Predators

Nest site selection

Nests

Chicks

Abandonment

Fledglings

Model input

Mortality agents

Tern object

Tern behavior submodel



# HISTORY

A photograph of a man with a white beard and mustache, wearing a yellow hooded rain jacket and an orange life vest. He is sitting on a boat, looking directly at the camera. The background shows a river or stream with trees and a cloudy sky. The word "HISTORY" is overlaid in large white letters at the top of the image.

- 2011: The Paul Hartfield Era. In 2011, the Recovery Lead for the Interior least tern, and responsibility for finalizing the 5-year Status Review, was transferred to USFWS Region 4.

# 2012 Alton, IL ILT Workshop



Goal: Review current issues and options available to meet recovery goals and to promote the conservation of ILT populations.

Objective: to assemble an interdisciplinary group of ILT experts that could:

- a) review the conservation status of ILT;
- b) identify knowledge gaps for understanding factors that limit long-term population persistence, and
- c) identify key research and monitoring needs that provide the science to support persistence.



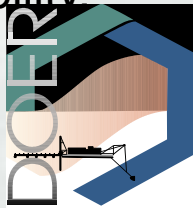
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# 2012 Alton, IL ILT Workshop

## Outcomes:

Future research needed to promote ILT conservation included 1) application of a metapopulation model to examine roles of main and subpopulations on the range-wide sustainability of the ILT population, 2) determination of the role of dispersal (natal and adult) on breeding population dynamics (including the movements between coastal and interior populations), 3) examination of ecological needs and threats occurring to ILT during migration (e.g., key stopover areas) and over-wintering sites, 4) need to compile and summarize existing monitoring data to develop better insights into the range-wide status of the species (including the creation of a centralized repository for ILT data), and 5) a range-wide assessment to understand abiotic factors impacting ILT populations and management actions, including the roles of river geomorphology, hydrology, and habitat variability



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# 2013 Status Review

2013 5-Year ILT Status Review recommended delisting but this action requires a metapopulation model, 7(a)(1) Conservation Plans, and post-listing monitoring plan



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# Interior Least Tern

## 5-Year Review Strategy

FWS Intra-Agency Review Draft focusing on metapopulation dynamics (Regions 2, 3, 4, 6): 2013 (1-year, minimum for the review)

Primary criticism will focus on lack of a Metapopulation Model (2014: FWS, USGS, ERDC, ABC)

Additional criticisms will include need and lack of:

- **Monitoring strategy** (2013-14: FWS, ABC, ERDC)
- **Management strategy** (LMR 2012-13: FWS, MVD; Southern Plains 2013: MVD, FWS, SWD)

Final Review and Recommendation  
2014

ILT 5-year Review is bringing attention to LMR strategy.  
Need to complete the consultations ASAP.



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# Then What??

Develop a range-wide metapopulation model (TernPop) for ILT to evaluate population persistence across a range of scenarios

Develop Division-wide ESA Sect. 7(a)(1) Conservation Plans to cover majority of ILT breeding range.

Develop and finalize an effective and cost-efficient post-listing monitoring plan



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# ILT Recovery through ESA Section 7(a)(1)

## Approach

- Assemble Interagency Collaborative Modeling Team
  - USACE-ERDC, USFWS, American Bird Conservancy, USGS-Columbia, USGS-Mississippi State
- Work collaboratively with USGS, USFWS, and American Bird Conservancy to develop a spatially-explicit, range-wide metapopulation model for ILT.
- Contribute science support through DOER and DOTS to USFWS 5-year Status Review for ILT
- Assist USFWS ILT Recovery Lead in establishing a formal, cost-effective conservation management program with MVD and SWD that would encompass >75% of the current ILT population.
- Work directly with MSC's on Regional Conservation Planning for T&E Species Recovery through ESA Section 7(a)(1)
- Complete efficient, low-cost Range-wide Post-listing Monitoring Plan



A photograph of a beach scene. In the foreground, a light-colored bird with a black cap and a yellow beak sits on the sand. The middle ground shows a calm body of water. The background is a dense line of green trees under a blue sky with light clouds.

# Endangered Species Act A New Approach

Species Recovery through ESA  
Section 7(a)(1)

# SECTION 7 of ESA

## INTERAGENCY COOPERATION

(a) *FEDERAL AGENCY ACTIONS AND CONSULTATIONS.-*

(1) *...All...Federal agencies **shall**, in consultation with and with the assistance of the Secretary, **utilize their authorities** in furtherance of the purposes of this Act **by carrying out programs for the conservation** of endangered species and threatened species...*

(b) **Section 7(a)(2)** states each Federal agency shall ... insure that any action ... is not likely to jeopardize the continued existence of any endangered species or threatened species...or result in destruction...of (critical) habitat...

- Minimize and permit “take” incidental to Federal agency actions
- Maintain status quo, at best

(c) **Section 7(a)(1)** addresses the conservation (recovery) needs of listed species relative to Federal Program impacts. These conservation programs are to improve listed species baselines within the scope of Federal action agency authorities.



An aerial photograph of a river delta, showing a wide river branching into smaller channels. The land is a mix of green fields and brownish soil. The text is overlaid on the image.

# History

Forty years of using ESA Formal Consultation through Section 7(a)(2)

- *Adversarial*
- *Confrontational*
- *Dictatorial*
- *Costly*
- *Little Flexibility*
- *Unpredictable*
- *Little or no control*
- *Losing process for the species*

Paul Hartfield, USFWS



# New Approach

## Section 7(a)(1)

- Allows USACE to be proactive in consultation and conservation processes rather than reactionary
- Reduces surprises and conflicts
- We commit to actions we would be predisposed to undertake anyway under 7(a)(2)
- Reduce future 7(a)(2) consultations
- Actions contingent upon availability of funds providing budget predictability
- Improves likelihood of species recovery

# 7(a)(1) for ILT Recovery

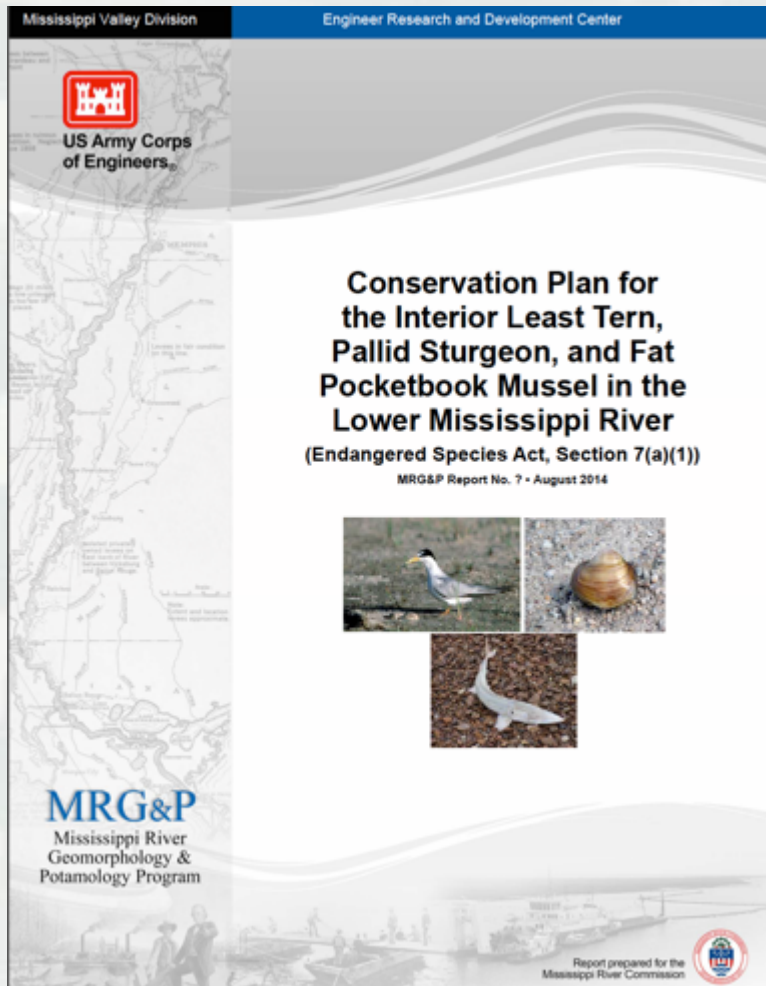
- In 2001, USACE Mississippi Valley Division initiated consultation with FWS Southeast Region under section 7(a)(1) of the ESA.
- This consultation culminated in a USACE conservation program which transformed the primary threats (channel engineering) to three endangered species, into the primary conservation tools for their recovery.

# Collaborative conservation under ESA?

- Section 2(c)(1) requires agencies to “conserve” listed species (move towards recovery)
- Section 7 (a)(1) requires agencies to use their “authorities” to carry out actions for recovery
- 7 (a)(1) provides mechanism to systematically compensate for **past, present, and future** impacts
- ESA planning becomes part of routine action planning
- Considering listed species early in planning and budgetary process reduces surprises and conflicts



# MS River Habitat Conservation Plan



- Proactive and innovative
- Creates “buy-in” from multiple agencies and organizations
- Addresses multiple species
- Conserves habitat in perpetuity for listed species
- Provides template for others to follow
- Long-term cost-savings to USACE
- Supports USFWS 5-Year Status Reviews for listed species



# Lower Mississippi River Dike Notch Construction

**\$167,000 to maintain island integrity in 11.25 mile reach  
(Reduced predator/human access)**

Pre-Construction



After Construction (Post Flood)



# RECOVERY STATUS SUMMARY

- Range-wide numerical criteria have been exceeded for 20 years.
- Range has >doubled since Recovery Criteria were identified (1990); however,
- Until 2013, no viable management strategy or plan has been successfully developed and implemented on a regional or range-wide scale.
- Management and monitoring strategies, efforts, and success vary greatly among drainage populations.



# Summary

- Range and population size of ILT significantly exceeds recovery criteria.
- Recovery requires management programs that ensure habitat quantity and quality to support ILT [7(a)(1)]!!
- MVD has demonstrated ability to utilize authorities to maintain and manage ILT habitats in the LMR through Conservation Planning
- Successful development and implementation of this metapopulation strategy in the Mississippi, Arkansas, and Red rivers will fulfill recovery management criteria for 90% of the listed ILT population.
- Working toward completion of metapopulation model and post-delisting monitoring plan



# HISTORY

- 2007-2009: Development of an Individual-based Model of Least Tern Reproduction
- 2011: The Paul Hartfield Era
- 2012: Addressing requirements from the 5-Year Status Review
  - ▶ Range-wide metapopulation model
  - ▶ Conservation Plans
  - ▶ Post-listing Monitoring Plan





# Interior Least Tern (ILT) Recovery

## Approach

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# ILT Metapopulation Modeling

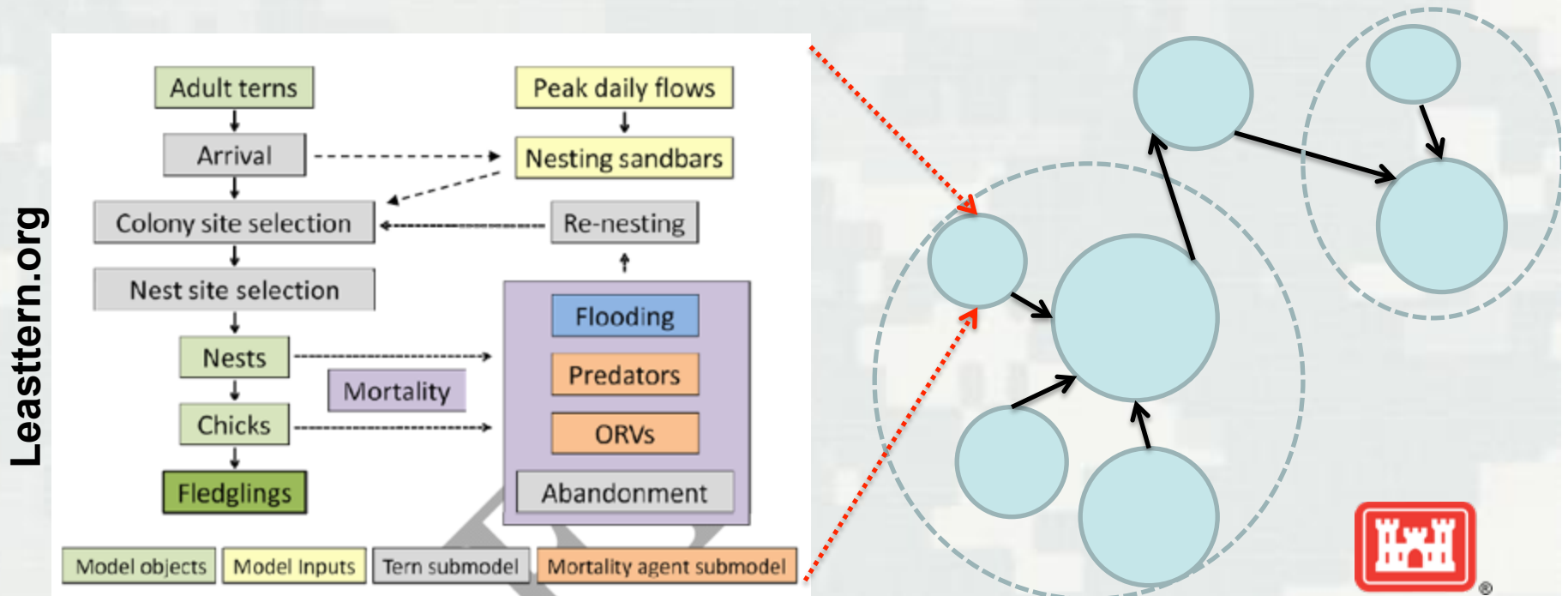
*Based on the state-of-the-science, and the collective opinions of an independent science panel from the recent ERDC ILT workshop, a metapopulation model has high likelihood of providing the remaining information necessary to complete the ILT 5-yr status review and put USACE in the best possible position for a delisting petition.*

- Objective - provide sufficient science to warrant a petition for delisting the Interior Least Tern
- Goal – Develop a model that will facilitate understanding of underlying ecological processes for ILT so managers can evaluate consequences of management actions and how they affect long-term conservation of the ILT



# ILT Metapopulation Modeling

- Objective - provide sufficient science to warrant a petition for delisting the Interior Least Tern
- Goal – Develop a model that will facilitate understanding of underlying ecological processes for ILT so managers can evaluate **long-term** consequences of management actions and how they affect dynamics and conservation of the ILT



## Metapopulation model components

- Demography study provides survival and movement rate estimates (5 year study)
- Nest counts provide estimates of initial population size (1 time survey)
- Individual-based models estimate reproductive success (linked to habitat models)



# USACE Science Support for ILT Recovery

## Benefits of R&D to USACE

- ✓ *Return on Investment* – USACE and USFWS funding provides critical science support with future ROI in the millions of \$\$
- ✓ *Potential Delisting and Mission Support* - reduced costs of ESA compliance enhance USACE ability to meet mission requirements
- ✓ *Modeling* - allows USACE and others to understand the population consequences of alternative management strategies on rivers
- ✓ *Improved Management* – R&D promotes adaptive management strategies that are measurable; also promotes ILT metapopulation persistence
- ✓ *Conservation Planning* - 7(a)(1) approach allows USACE to be proactive in consultation and conservation processes rather than reactionary (similar approach for other spp. may reduce likelihood of a non-jeopardy BiOp).

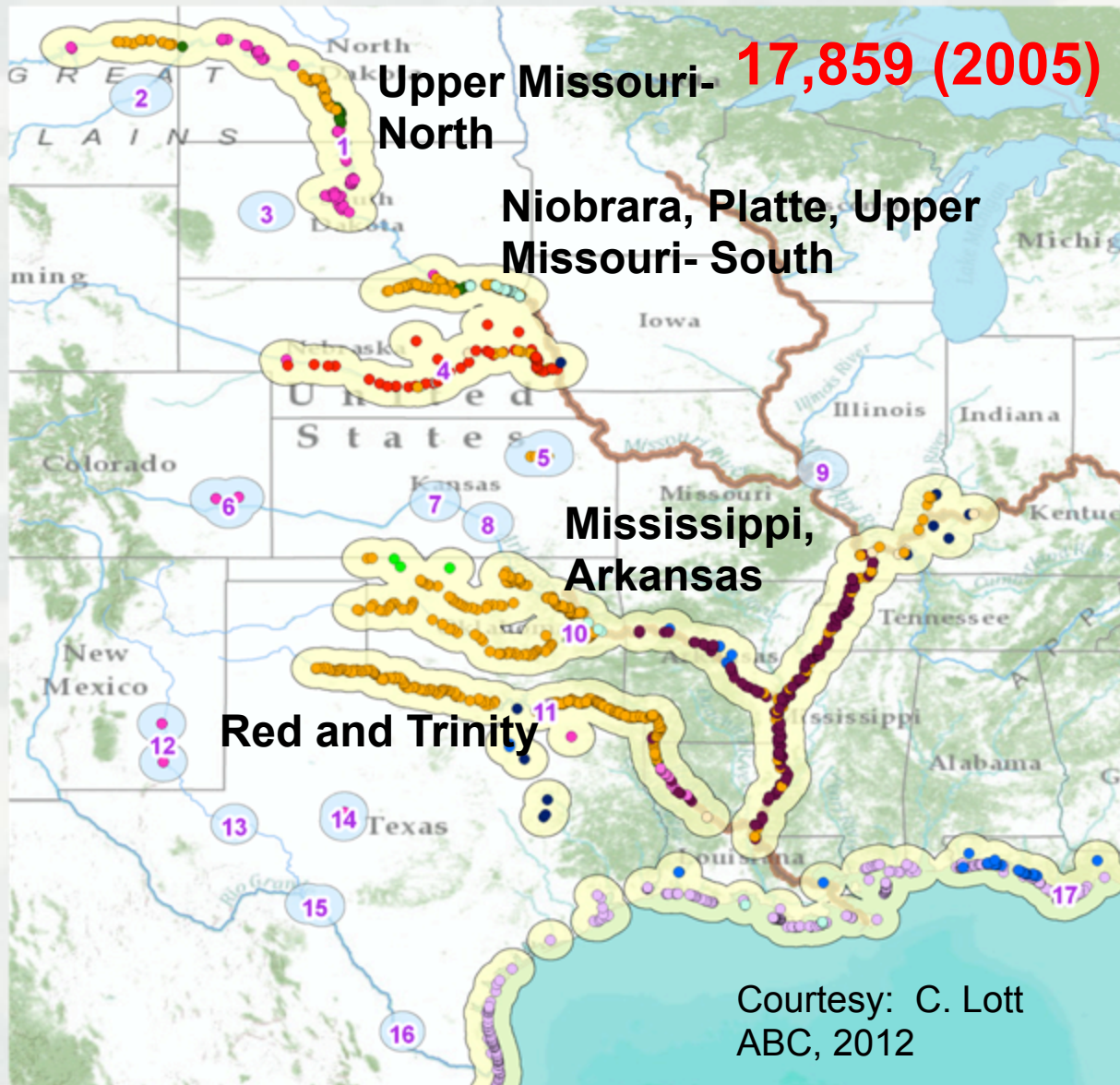


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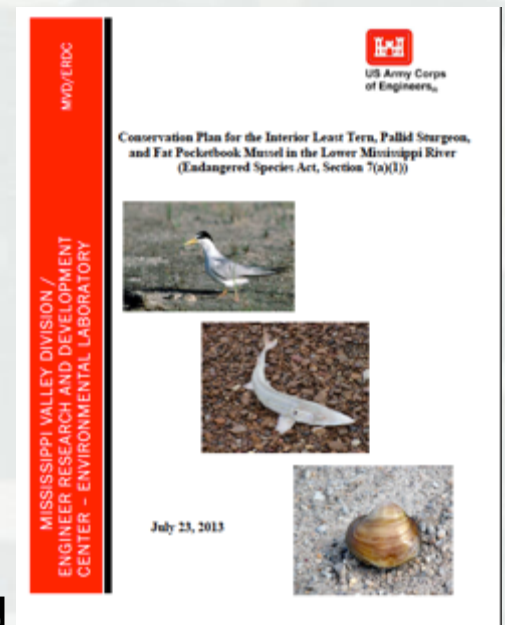


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# USACE Science Support for ILT Recovery

## Accomplishments

- ✓ Successful interagency collaboration and funding
- ✓ DOTS funding to American Bird Conservancy (ABC)
  - ✓ Completion of critical range-wide survey in 2005
  - ✓ Assistance with 5-Year Review input
  - ✓ Significant expertise for metapopulation model
- ✓ USFWS 5-Year Status Review recommends *Delisting* (2013)
- ✓ Final Lower Mississippi River Conservation Plan – ESA Sect. 7(a)(1) – signed by Gen. Peabody (2013)
- ✓ Initiation of similar Conservation Planning in SWD and GLORD (2013-14)
- ✓ Initiation of Range-wide metapopulation model (slated for 2015 completion)
- ✓ USFWS, USACE/DOER, and ABC jointly funding and developing a rangewide post-listing Monitoring Plan (2014-15)



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# Summary

- Active EWN actions created habitat to increase bird abundance
- Modeling can help understand long term management actions
- Range and population size of ILT significantly exceeds recovery criteria.
- Recovery requires management programs that ensure habitat quantity and quality to support ILT [7(a)(1)]!!
- MVD has demonstrated ability to utilize authorities to maintain and manage ILT habitats in the LMR through Conservation Planning
- Successful development and implementation of this metapopulation strategy in the Mississippi, Arkansas, and Red rivers will fulfill recovery management criteria for 90% of the listed ILT population.
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# Interior Least Tern – An Action Plan for Delisting

- Delisting the Interior Least Tern
  - Complete testing of TernPOP model and provide to USFWS
  - Complete 7(a)(1) Plans for SWD, LRD
  - Publish monitoring plan in PR literature
  - USFWS proposes delisting rule in Federal Register
  - USFWS receives comments from federal agencies, species experts, etc.
  - Final Rule



# Questions/Comments?



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