Implementing Desired Habitat Conditions for Florida Xeric and Coastal Scrub and Recovery of Florida Scrub-Jay on National Wildlife Refuges

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Strategic Habitat Conservation
Palm Beach, FL
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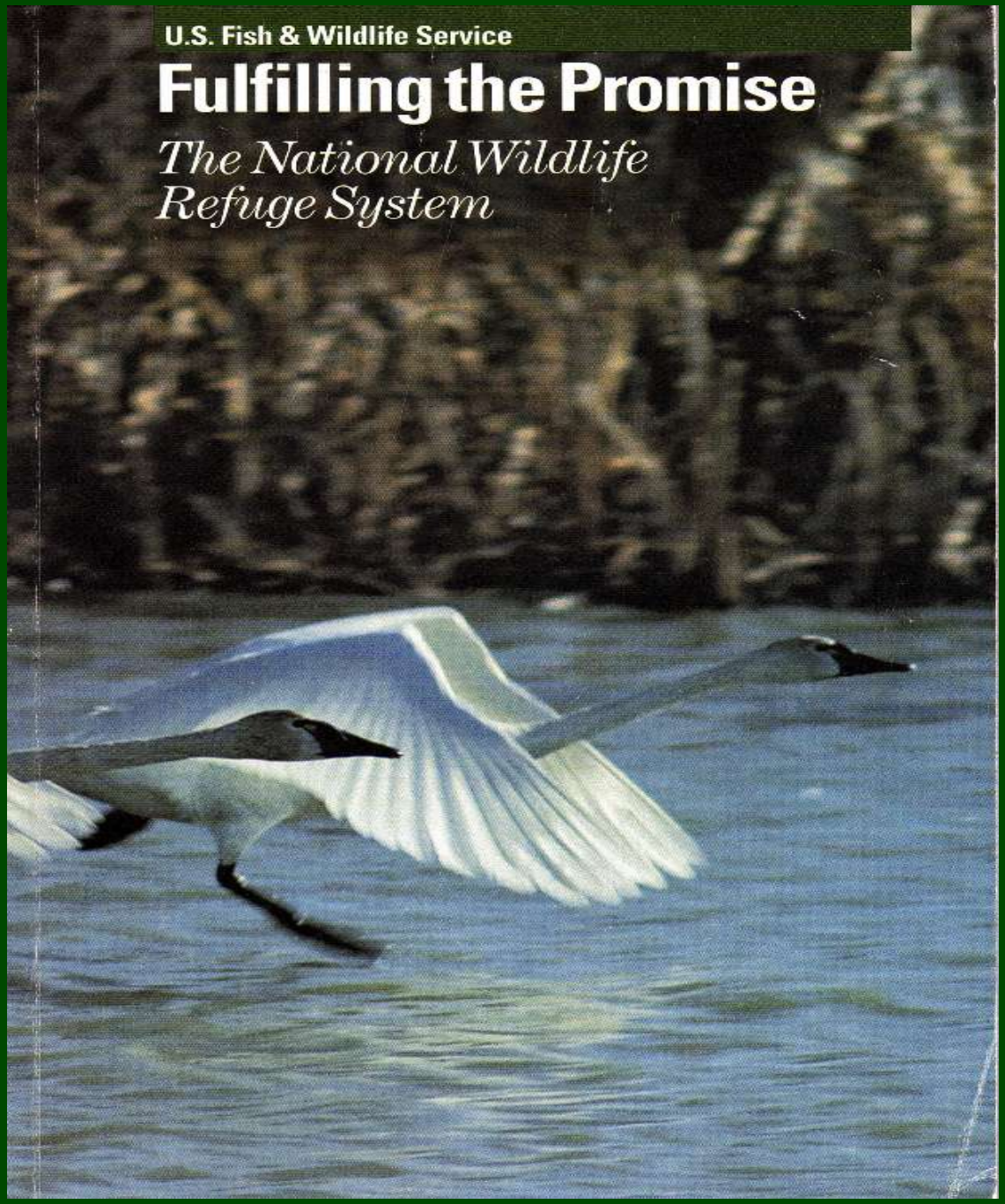
U.S. Fish & Wildlife Service

Fulfilling the Promise

The National Wildlife Refuge System



Keeping Promises Alive:

Habitat Goals and Objectives

- WH 1: Develop integrated population goals and objectives
- WH 2: Establish national, regional, and ecosystem habitat priorities
- WH 3: Define how the System and each unit can contribute to biodiversity

What are our natural resource priorities?

- System Mission and Priorities

  Are we an exceptional system or a system of exceptions?

- Regional and Ecosystem Priorities

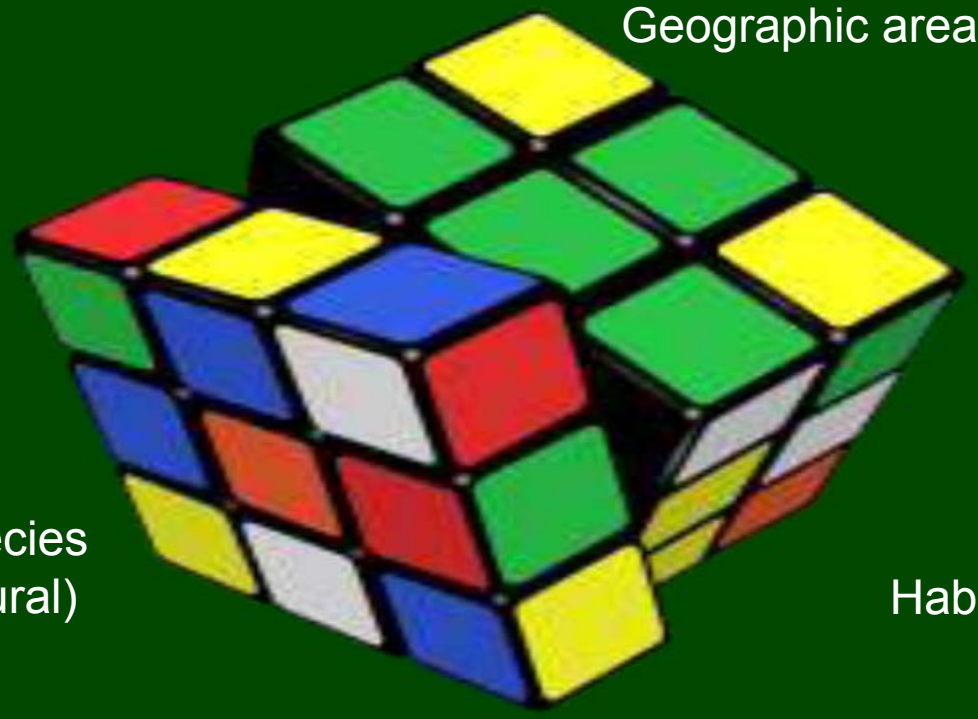
  All refuges, big and small, working with all Service programs and Service conservation partners,

- Refuge Purposes, Legislative Guidance

  Finding your place in the big picture

Now how do we think of this question in terms of building relationships among species, habitats, and geographic areas?

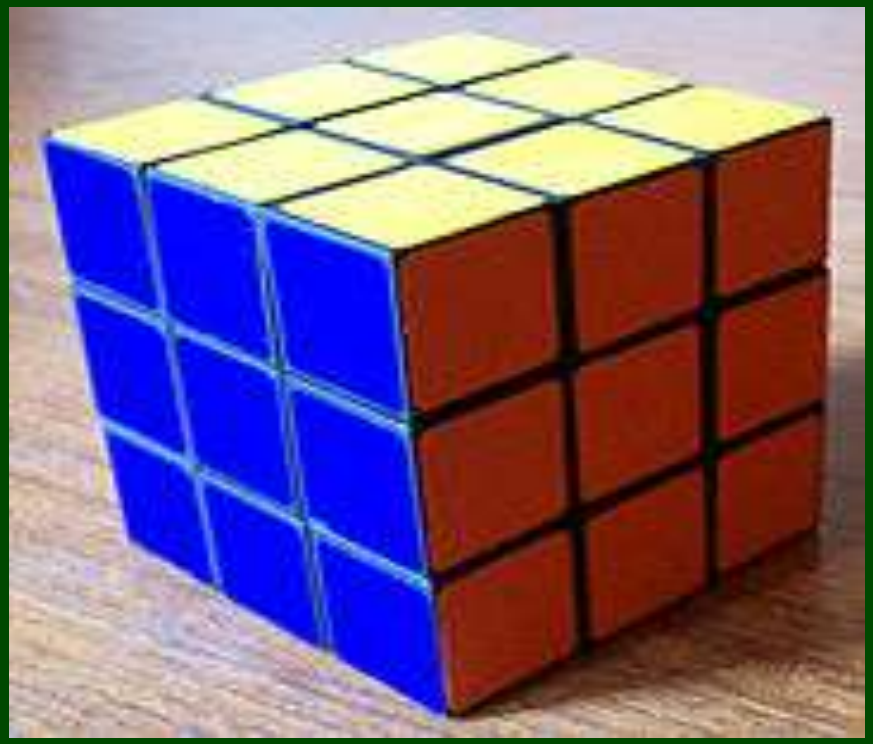
Perhaps we can bring some regional order to considering conservation of species among habitats and geographic areas



And maybe we can establish predictive relationships between these three dimensions of conservation

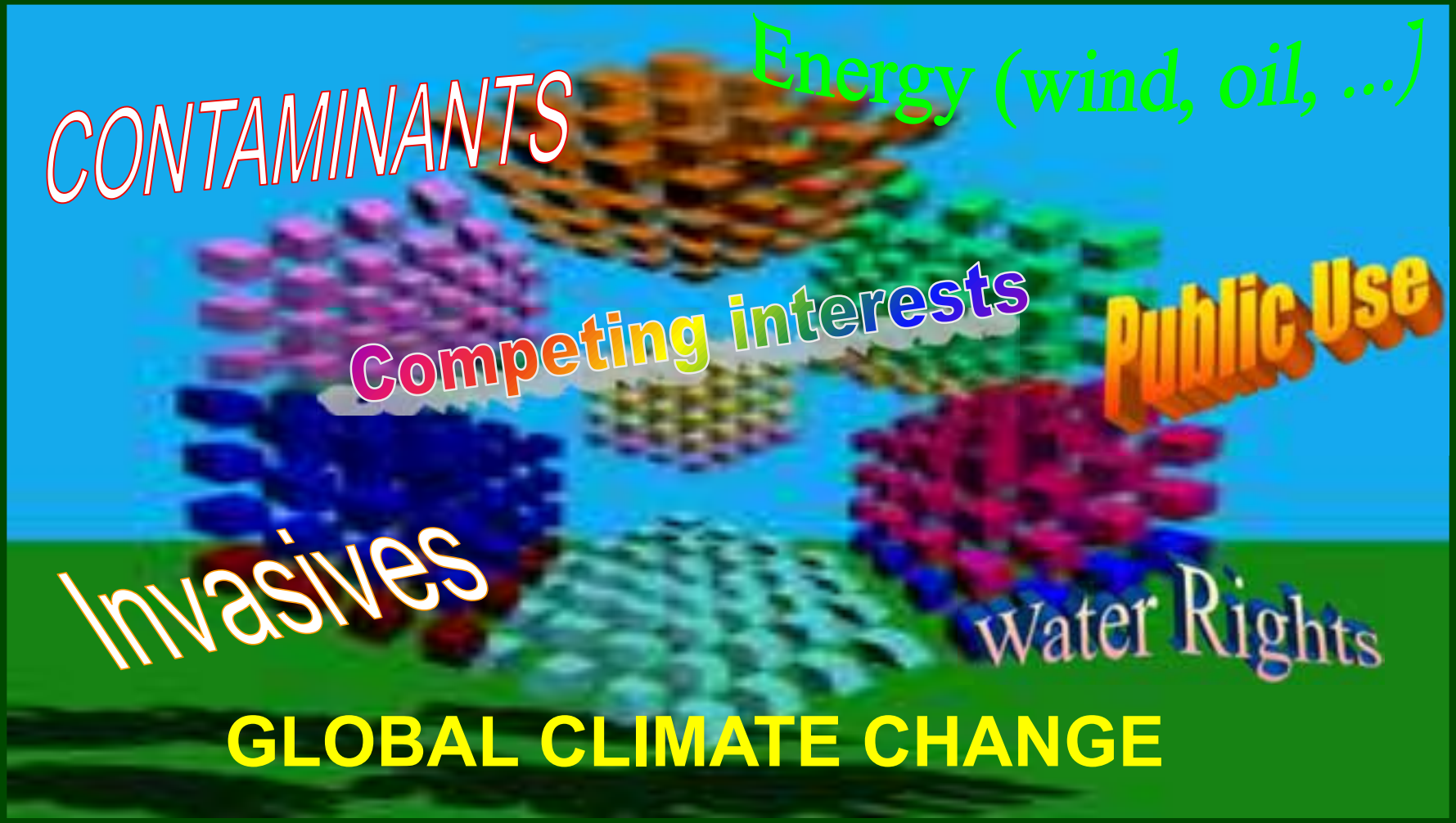
Geographic Areas

Species
(plural)



Habitats

Ultimately we need to consider more than 3 dimensions



e.g., Biological Assessment; Station Mgmt Reviews
e.g., Technical Assistance
e.g., Policy
Regional / Station Biological Program (ARM)
e.g., Planning
e.g., Continuing Education
e.g., Multi-Refuge Studies

Adaptive Management Issues

Baseline biological information on field stations is limited.

EXAMPLES :

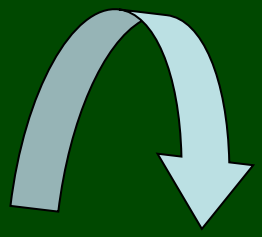
Descriptions of communities that occur on refuge and related ecological processes (involves various disciplines)

Species-habitat relationships (requirements)

Chronologies of species of concern (timing of events)

Management strategies / prescriptions
(e.g., controlling invasives & restoring natives)

Inventory, monitoring, research activities
(e.g., design, methods, protocols) ...



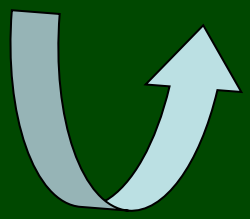
ADAPT

EVALUATE

APPLY

EVALUATE

LEARN



Maximum Biological Potential
(Effectiveness; System Sustainability)

Re-Assess & Modify

Biological Assessment and/or Review

Implementation of Plans; Continuing Education
(AHWP)

Development of Plans
(CCP; HMP; I&M; Fire; IPM; Wilderness)

Biological Assessment and/or
Wildlife and Habitat Management Review
(Identify and address additional information needs)

Baseline Biological Information / Inventory
(Species-habitat relationships, Plant community types and conditions)
(Wildlife inventories; Status of ecosystem processes)

IDEAL

Natural Resources of "Regional Importance"

- Threatened and Endangered Species
- Migratory Birds
- Interjurisdictional and Anadromous Fishes
- Jurisdictional Wetlands
- Priority ecosystems and habitats
- Resident wildlife of management interest or conservation concern

Regional Biological Potential- Vision, Goals, Objectives, and Priorities

- Where do we want to be in the future ?
- What are we trying to accomplish ?
- What, if anything, should we change ?
- What are the priorities ?

With all of these priorities and resources of regional importance how do we choose how much to do what and where?

- Recovery Plans for Threatened and Endangered Species
- Migratory Bird Conservation Plans (NAWMP, Flyway, PIF, Shorebirds, Waterbirds)
- State Wildlife Action Plans, TNC Ecoregional Plans, etc.

With all these plans, how do we sort through them to define refuge roles and responsibilities?

- Those refuges that have gone, or are going, through CCP process do their best to define their goals and objectives in light of existing plans relevant to them.

- However, there is as yet no consistent process established to define refuge roles and responsibilities in light of all resources of regional importance or in context of larger spatial scales (ecosystem, regional, flyway, continental, etc.).

Processes to assist refuges define their roles and responsibilities?

- For Migratory Birds, much progress underway through Joint Ventures
- Habitat Goals and Objectives Process
- National Ecological Assessment Process
  (Strategic Habitat Conservation)
- And using the SHC framework, maybe something else can help, like formalizing a regional or landscape perspective applied to resources of importance (i.e., Landscape Conservation Cooperatives)?

Strategic Habitat Conservation:

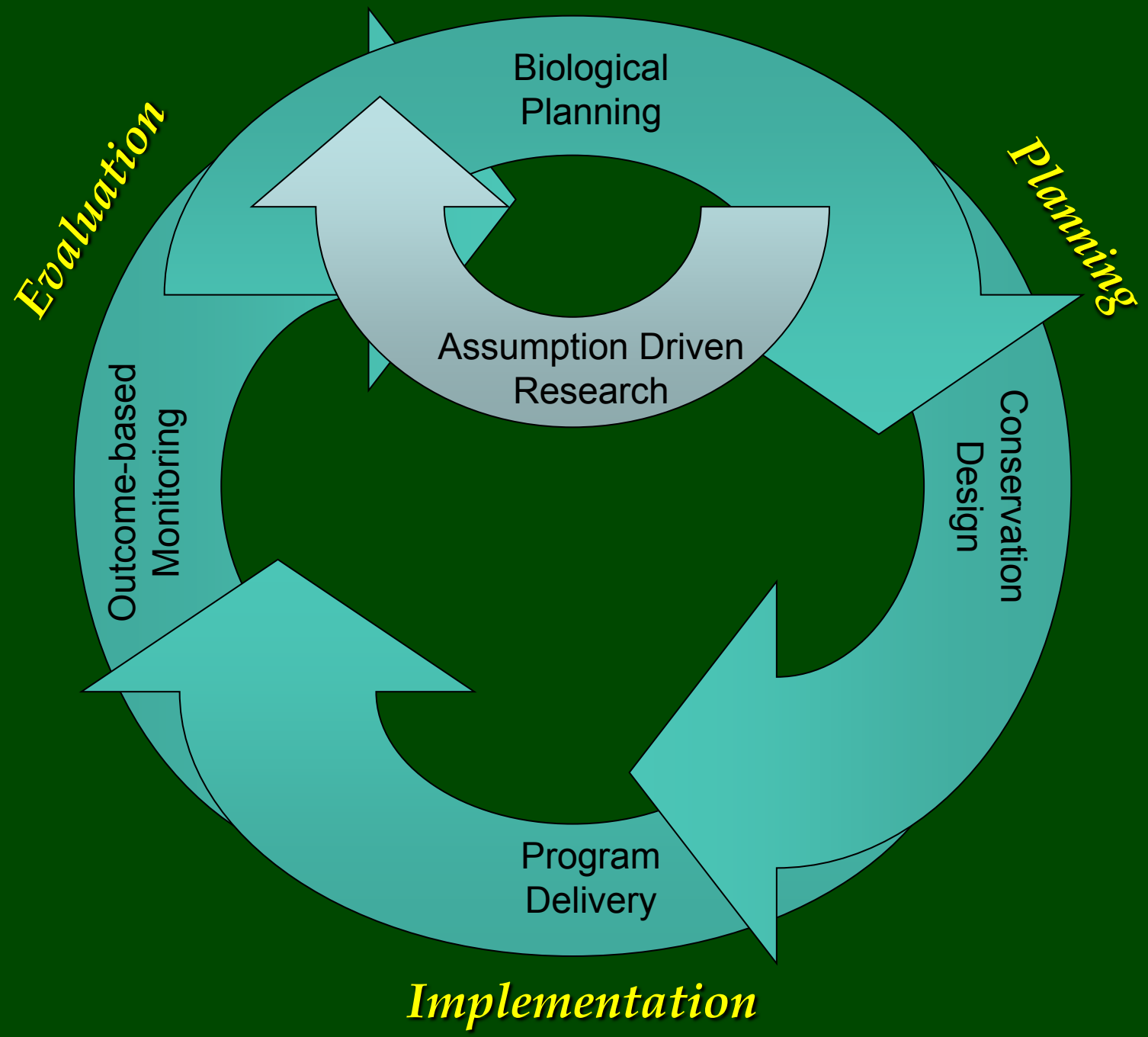
"The Right Conservation in the Right Places to Benefit America's Fish and Wildlife"

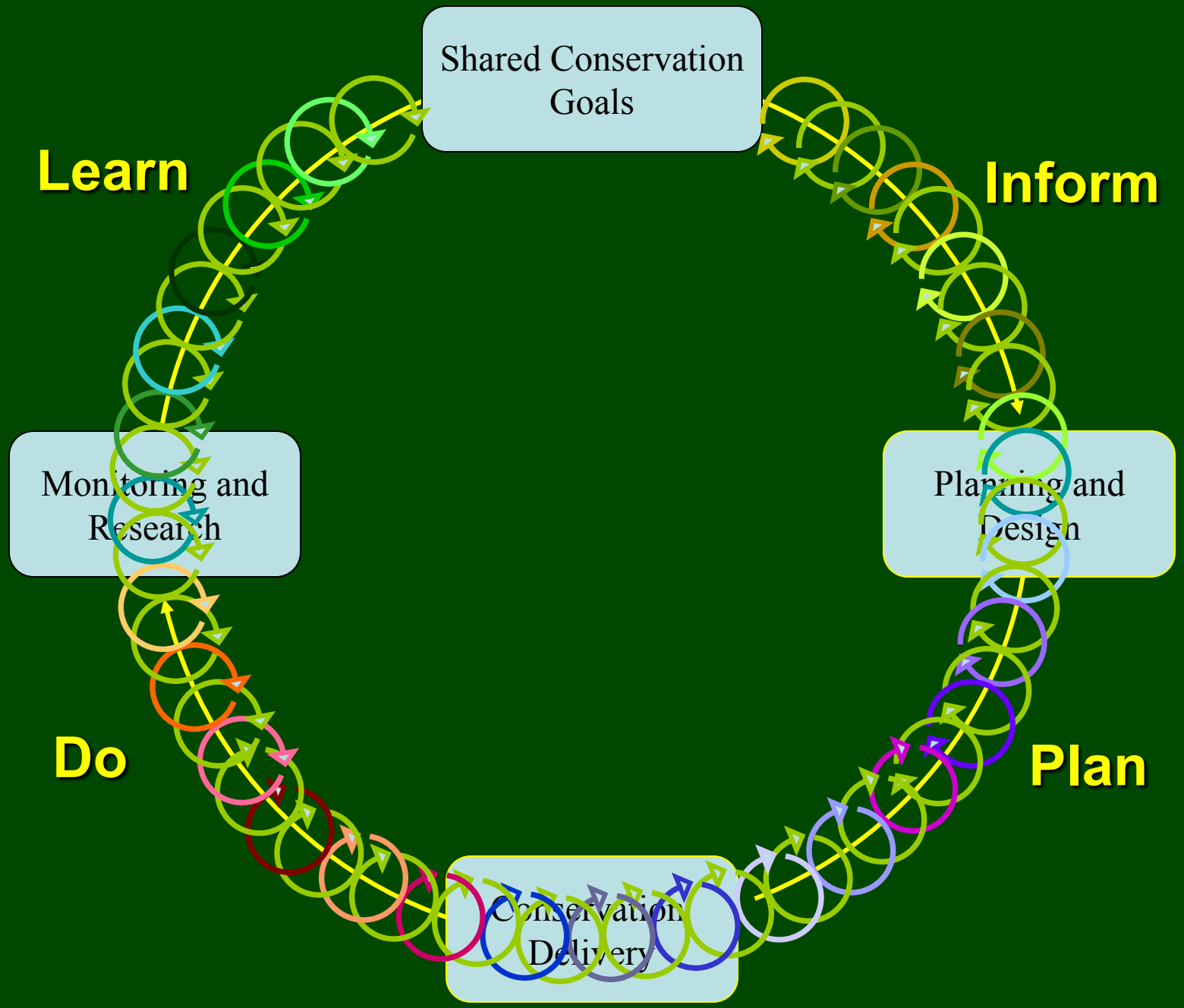
Fundamental Features of SHC:

- Establishing explicit, measurable objectives

- Using models relating populations to limiting factors to target management and assess its impacts

- Coordinating with land management partners within the landscape – to integrate planning, management, monitoring, and research activities


Biological Planning
Planning
Conservation Design
Implementation
Program Delivery
Evaluation
Outcome-based Monitoring
Assumption Driven Research


Shared Conservation Goals
Inform
Planning and Design
Plan
Conservation Delivery
Do
Monitoring and Research
Learn

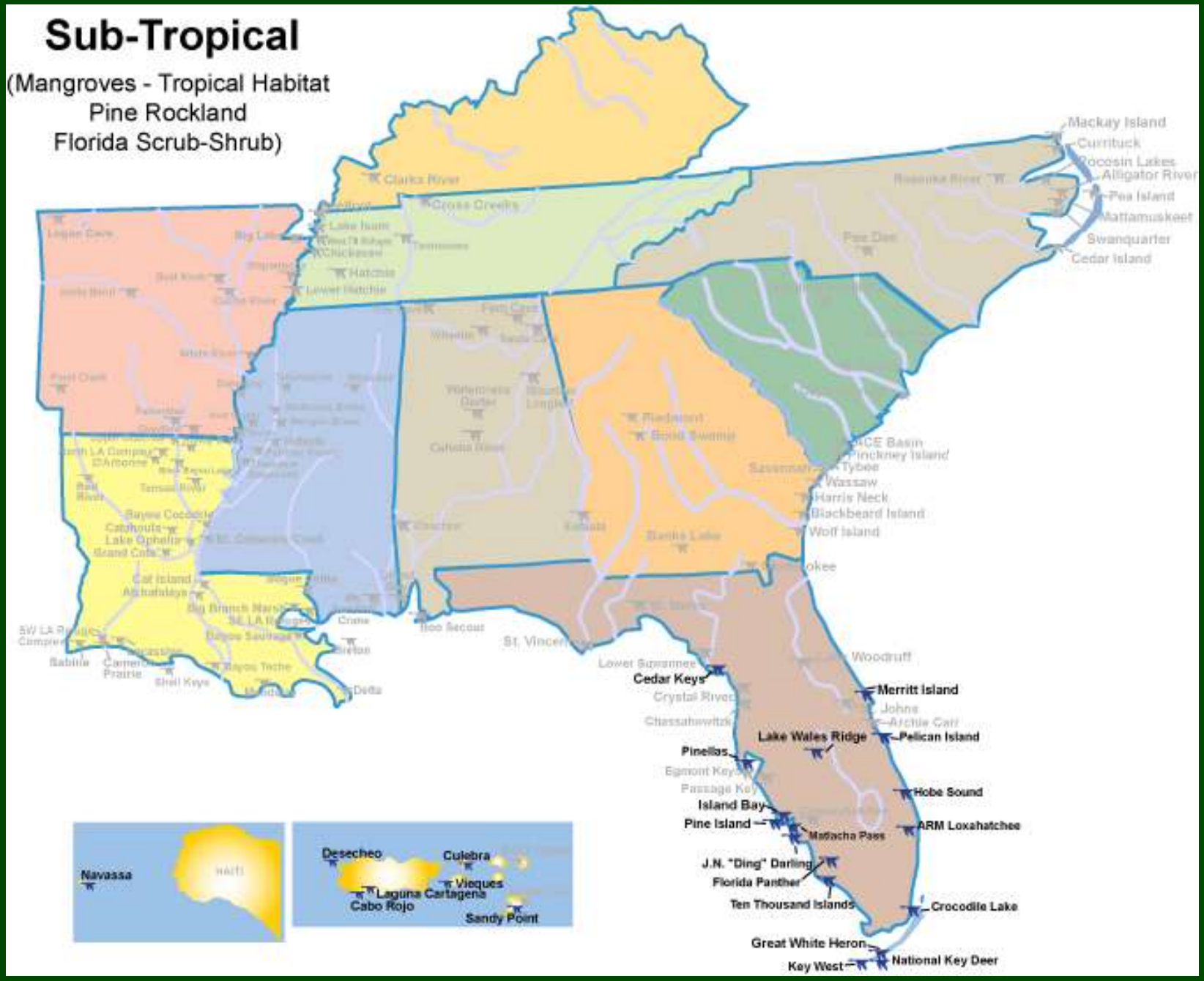
Refuge Biological Management Processes

How do we develop "Desired Habitat Conditions" under a SHC framework? The Process…

Biological Planning	**Priority Species**	
	Population Objectives	
	Limiting Factors	
	Species - Habitat Models	
Conservation Design	**Landscape/Habitat Assessment**	
	Decision Support Tools	
	Habitat Objectives	
	Integrate Multiple Species Objectives	
Conservation Delivery	**Conservation Treatments**	
	Program Objectives	
Outcome-based Monitoring	**Conservation Tracking Systems**	
	Habitat Inventory and Monitoring Program	
	Population Monitoring Program	
Assumption-driven Research	**Species/Habitat Models**	
	Management Treatments	

Sub-Tropical

(Mangroves - Tropical Habitat
Pine Rockland
Florida Scrub-Shrub)



Florida Scrub Plants

Garrett's mint

Florida golden aster

Florida ziziphus

Avon Park harebells

Scrub lupine

Florida Scrub Herps

Eastern indigo snake

Gopher tortoise

Gopher frog

Sand skink

Suite of Umbrella and Priority Species obligated to Xeric and Coastal Scrub

- Florida scrub-jay*
- Yellow sand scrub plants collectively (e.g., Garrett's mint, Florida ziziphus*)
- White sand scrub plants collectively (e.g., Avon Park harebells, scrub lupine*, Florida golden aster*)
- Sand and blue-tailed mole skinks
- Florida mouse

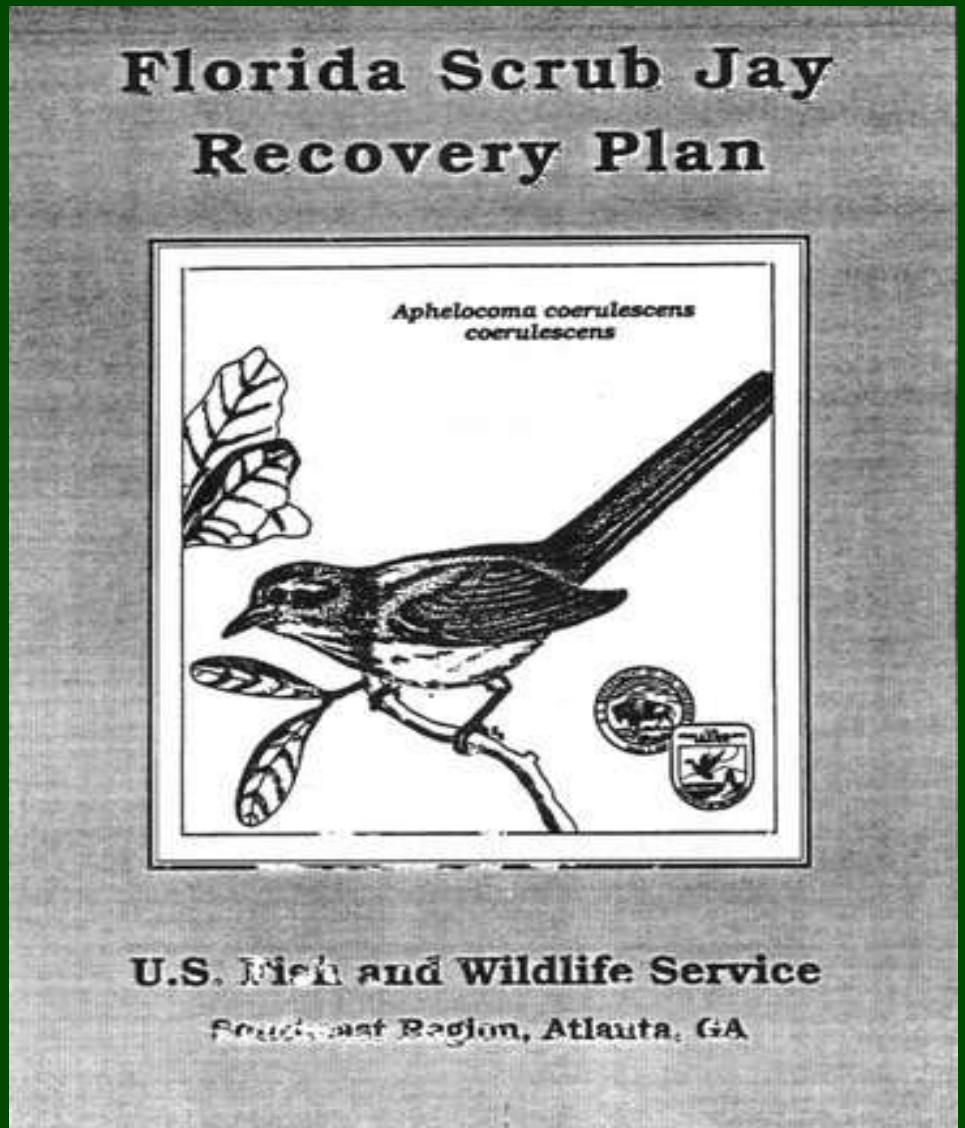
*Spotlight species

Suite of Umbrella and Priority Species associated with xeric and Coastal Scrub

- Gopher frog
- Cutthroat grass (Panicum abscissum) ephermal wetlands
- Gopher tortoise
- Eastern indigo snake*
- Beach mice (in Peninsular Florida: Anastasia and southeastern)

*Spotlight species

Listed in 1987
Recovery Plan in 1990



How do we develop "Desired Habitat Conditions" under a SHC framework? The Process for Florida xeric and coastal scrub focusing on Florida Scrub-Jay

Biological Planning	**Priority Species**	**X**
	Population Objectives	
	Limiting Factors	**X**
	Species - Habitat Models (dfc's)	
Conservation Design	**Landscape/Habitat Assessment**	
	Decision Support Tools	
	Habitat Objectives	
	Integrate Multiple Species Objectives	
Conservation Delivery	**Conservation Treatments**	
	Program Objectives	
Outcome-based Monitoring	**Conservation Tracking Systems**	
	Habitat Inventory and Monitoring Program	
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Assumption-driven Research	**Species/Habitat Models**	
	Management Treatments	

Florida Scrub-Jay (*Aphelocoma coerulescens*)

5-Year Review:
Summary and Evaluation

2007

U.S. Fish and Wildlife Service
Southeast Region
Jacksonville Ecological Services Field Office
Jacksonville, Florida

Three Major Recovery Areas for Florida Scrub-Jay

- **Ocala National Forest** potentially large population, but management consists of mostly questionable long-term sustainability tied to repeated regeneration of dense sand pine stands

- **Lake Wales Ridge** which is a collection of mostly fragmented habitats supporting moderate and small populations

- **Merritt Island** which supports a population well below habitat potential

Congruent population structure inferred from dispersal behaviour and intensive genetic surveys of the threatened Florida scrub-jay (*Aphelocoma cœrulescens*)

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Abstract

The delimitation of populations, defined as groups of individuals linked by gene flow, is possible by the analysis of genetic markers and also by spatial models based on dispersal probabilities across a landscape. We combined these two complimentary methods to define the spatial pattern of genetic structure among remaining populations of the threatened Florida scrub-jay, a species for which dispersal ability is unusually well-characterized. The range-wide population was intensively censused in the 1990s, and a metapopulation model defined population boundaries based on predicted dispersal-mediated demographic connectivity. We subjected genotypes from more than 1000 individual jays screened at 20 microsatellite loci to two Bayesian clustering methods. We describe a consensus method for identifying common features across many replicated clustering runs. Ten genetically differentiated groups exist across the present-day range of the Florida scrub-jay. These groups are largely consistent with the dispersal-defined metapopulations, which assume very limited dispersal ability. Some genetic groups comprise more than one metapopulation, likely because these genetically similar metapopulations were sundered only recently by habitat alteration. The combined reconstructions of population structure based on genetics and dispersal-mediated demographic connectivity provide a robust depiction of the current genetic and demographic organization of this species, reflecting past and present levels of dispersal among occupied habitat patches. The differentiation of populations into 10 genetic groups adds urgency to management efforts aimed at preserving what remains of genetic variation in this dwindling species, by maintaining viable populations of all genetically differentiated and geographically isolated populations.

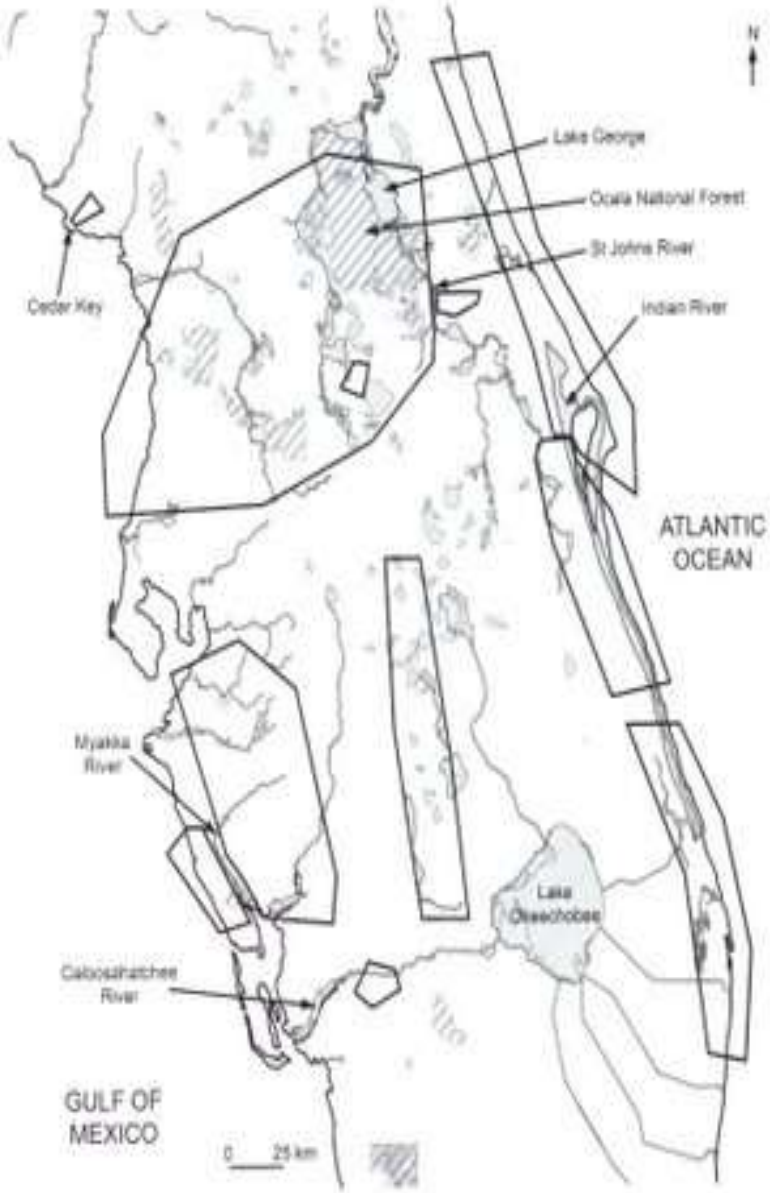


Fig. 5 Summary of relevant landscape features, including major forests (grey shading), lakes, and rivers. The genetic groups are represented by the same solid lines as in Fig. 4.

How do we develop "Desired Habitat Conditions" under a SHC approach? The Process for Florida xeric and coastal scrub focusing on Florida Scrub-Jay

Biological Planning	**Priority Species**	**X**
	Population Objectives	**X?**
	Limiting Factors	**X**
	Species - Habitat Models (dfc's)	
Conservation Design	**Landscape/Habitat Assessment**	**X**
	Decision Support Tools	
	Habitat Objectives	
	Integrate Multiple Species Objectives	
Conservation Delivery	**Conservation Treatments**	
	Program Objectives	
Outcome-based Monitoring	**Conservation Tracking Systems**	
	Habitat Inventory and Monitoring Program	
	Population Monitoring Program	
Assumption-driven Research	**Species/Habitat Models**	
	Management Treatments	

Figure 1: Optimal scrub at Savannas Preserve State Park. Note low structure, sandy openings and sparse tree cover (photo by Chris Vandello).

Optimal Florida scrub-jay habitat characteristics per territory. Adapted from Breininger (2004), Breininger et al. (1998) and, Burgman et al. (2001).

- Vegetation height: At least 10% of each potential scrub-jay territory (25 acre unit) should have shrubs that average 4 to 5.5 feet high to provide cover and produce acorns. The rest of vegetation should be shorter, with no more 1 acre of vegetation taller than 5.5 feet per unit.
- Tree (>15 foot tall) overstory: If present at all, less than 1 tree per acre.
- Distance to forest edge: Maintain a 1,000 foot non-forested (<1 tree per acre) buffer between a scrub-jay territory and forest (Burgman et al. 2001).
- Open ground: 10-50% bare sand or sparse herbaceous vegetation.

How do we develop "Desired Future Conditions" under a SHC approach? The Process for Florida xeric and coastal scrub focusing on Florida Scrub-Jay

Biological Planning	**Priority Species**	**X**
	Population Objectives	**X?**
	Limiting Factors	**X**
	Species - Habitat Models (dfc's)	**X?**
Conservation Design	**Landscape/Habitat Assessment**	**X**
	Decision Support Tools	**X?**
	Habitat Objectives	**X?**
	Integrate Multiple Species Objectives	**X?**
Conservation Delivery	**Conservation Treatments**	
	Program Objectives	
Outcome-based Monitoring	**Conservation Tracking Systems**	
	Habitat Inventory and Monitoring Program	
	Population Monitoring Program	
Assumption-driven Research	**Species/Habitat Models**	
	Management Treatments	

Management Tools (cont.)

- Forest Habitat Management (focus on restoration of desired forest composition and structure)—thinning of slash and/or sand pines

- Fire Management (balancing resource focus, fuel reduction, and WUI)—determine appropriate return cycles and seasons for burning

Management Tools (cont.)

- Invasive Management
- People Management (balancing public use with disturbance and habitat loss)
- Wildlife Disease Management (WNV, avian flu)

Support Tools

Biological (i.e., Wildlife and Habitat) Reviews

Planning Ahead (CCP's, HMP's, AHWP's)

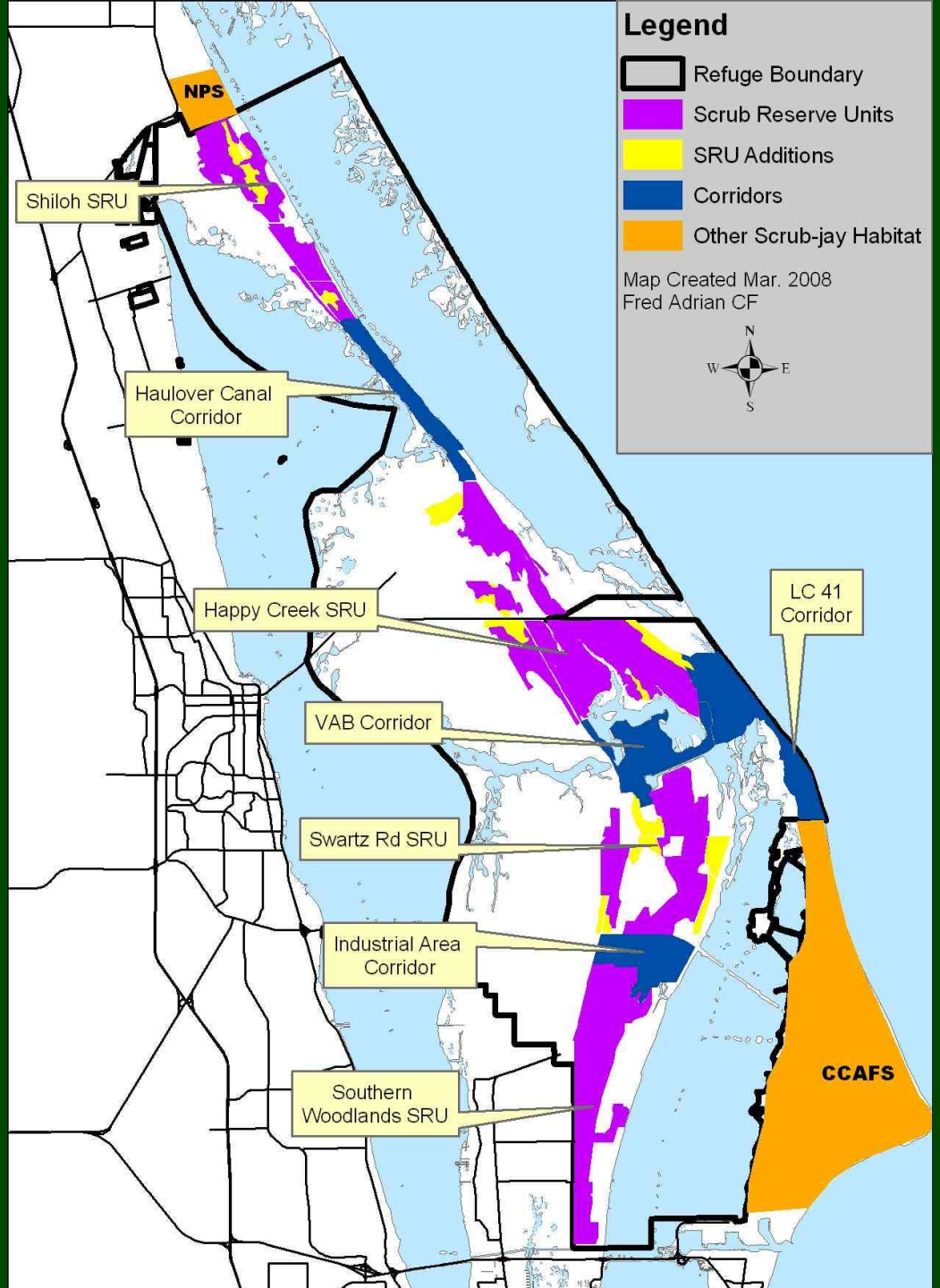
How we "doin"? (Inventory-Monitoring Plans)

Bringing Research to NWR's (Science Support, Quick Response)

What role will Landscape Conservation Cooperatives play in all of the above?

Florida Scrub Jay Habitat Management

Merritt Island


Legend
Refuge Boundary
Scrub Reserve Units
SRU Additions
Corridors
Other Scrub-jay Habitat
Map Created Mar. 2008
Fred Adrian CF
N
W
E
S
NPS
Shiloh SRU
Haulover Canal Corridor
Happy Creek SRU
LC 41 Corridor
VAB Corridor
Swartz Rd SRU
Industrial Area Corridor
Southern Woodlands SRU
CCAFS

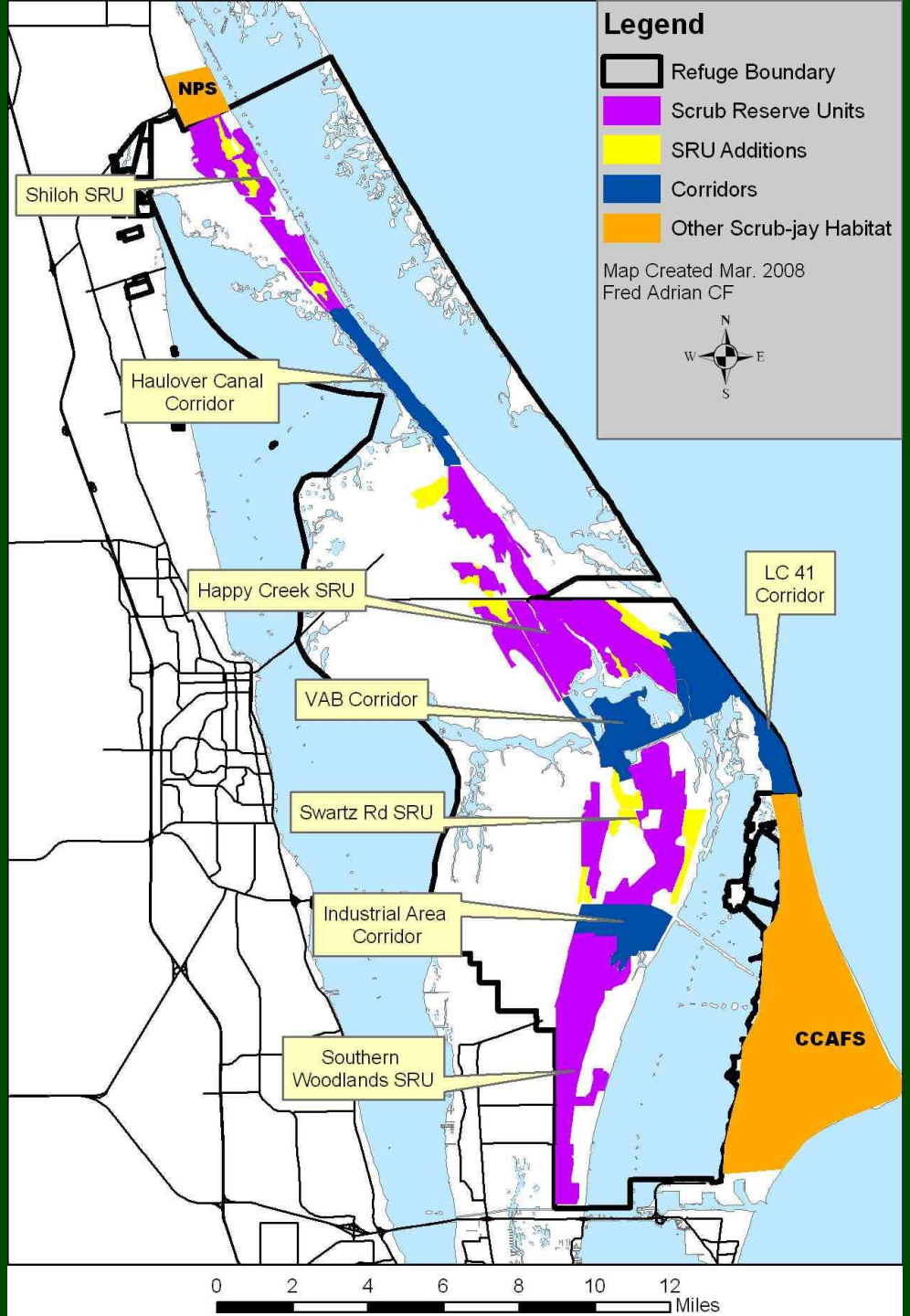
Baseline and Potential Florida Scrub-Jay Populations at Merritt Island and major issues of going from the former to the latter

- Two approaches lead to present estimates of between 320-370 family groups
- Estimated potential for supporting about 600 family groups
- Biggest challenge to meet desired habitat conditions: Increasing and maintaining sandy openings

Conservation Delivery: Treatments

Conservation Delivery: Program Objectives

It's the Habitat!



Conservation Delivery: Program Objectives

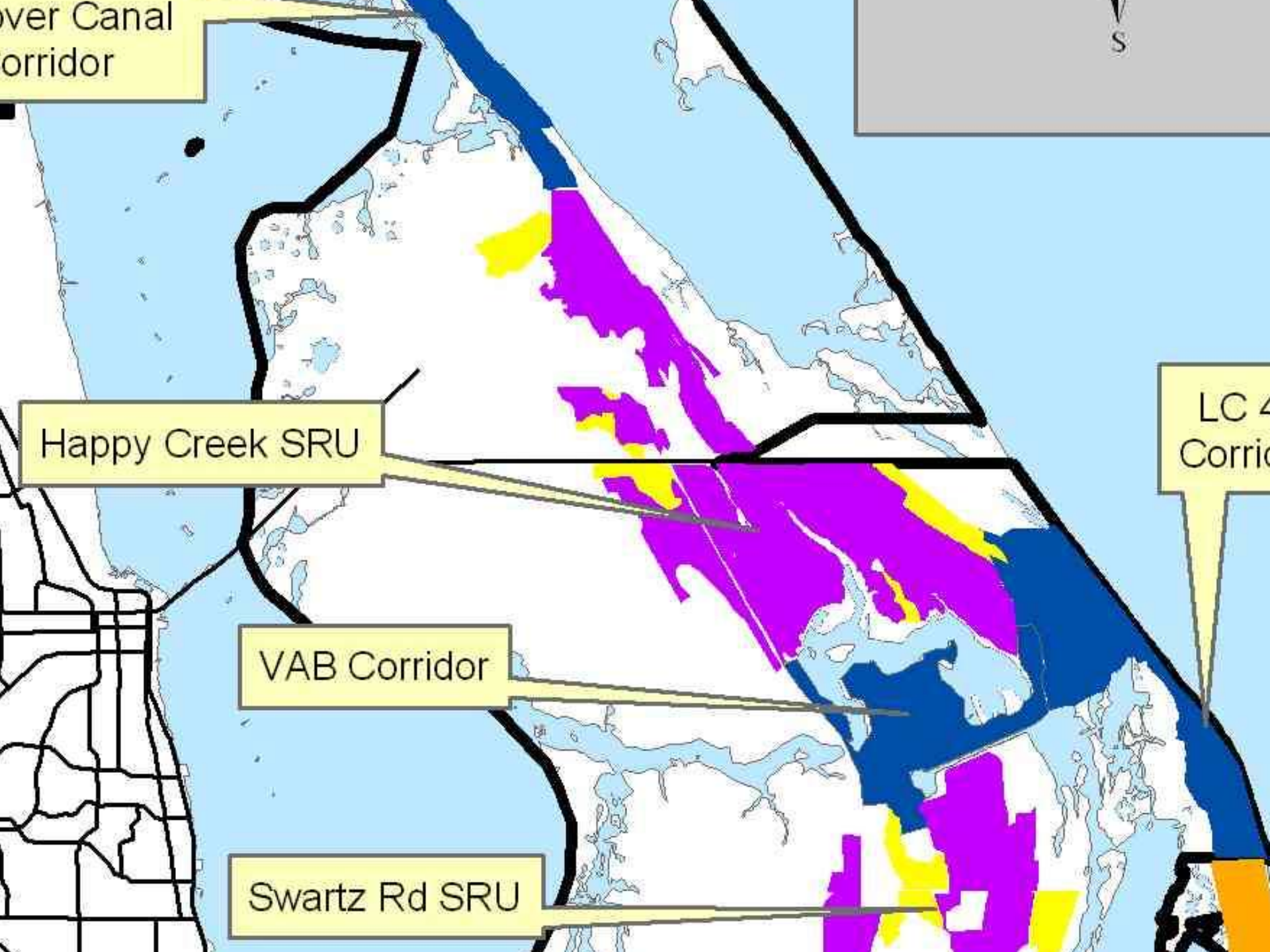
It's the Habitat?

What about those 300 families?

2007 Happy Creek Territories

Optimal Habitat (recruitment > mortality)

- Shrub lands with scrub oak patches.
- Palmetto & marsh matrix recently burned.
- Sparse trees, few or no forests, little or no tall scrub .
- Medium-height oaks & many open sandy areas.

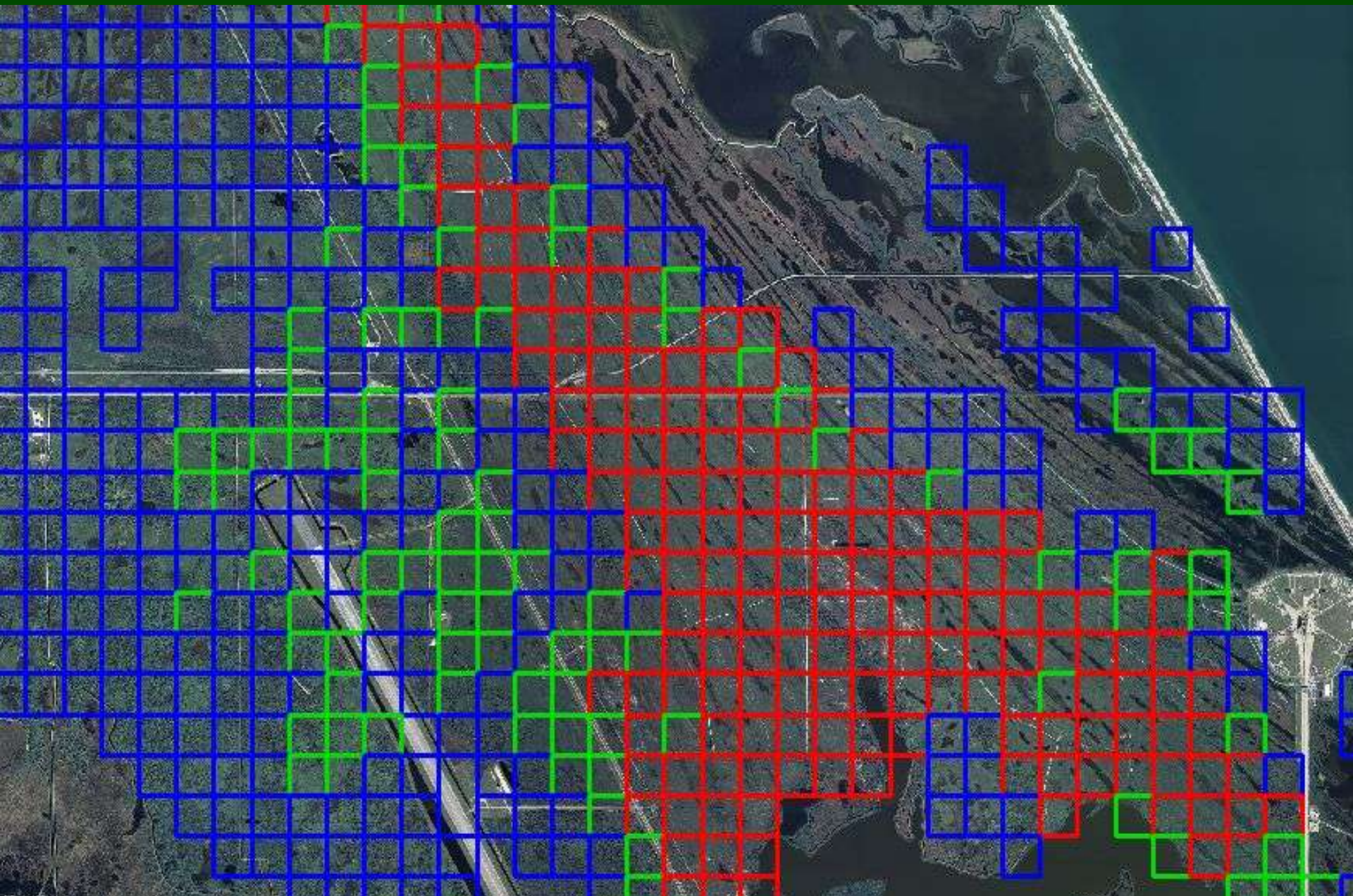

over Canal
orrido
S
Happy Creek SRU
LC 4
Corrid
VAB Corridor
Swartz Rd SRU

Program Objectives:
Habitat – Happy Creek SRU
Provide optimal habitat for 100 families (2500 ha)

Outcome-based Monitoring: Conservation Tracking Systems

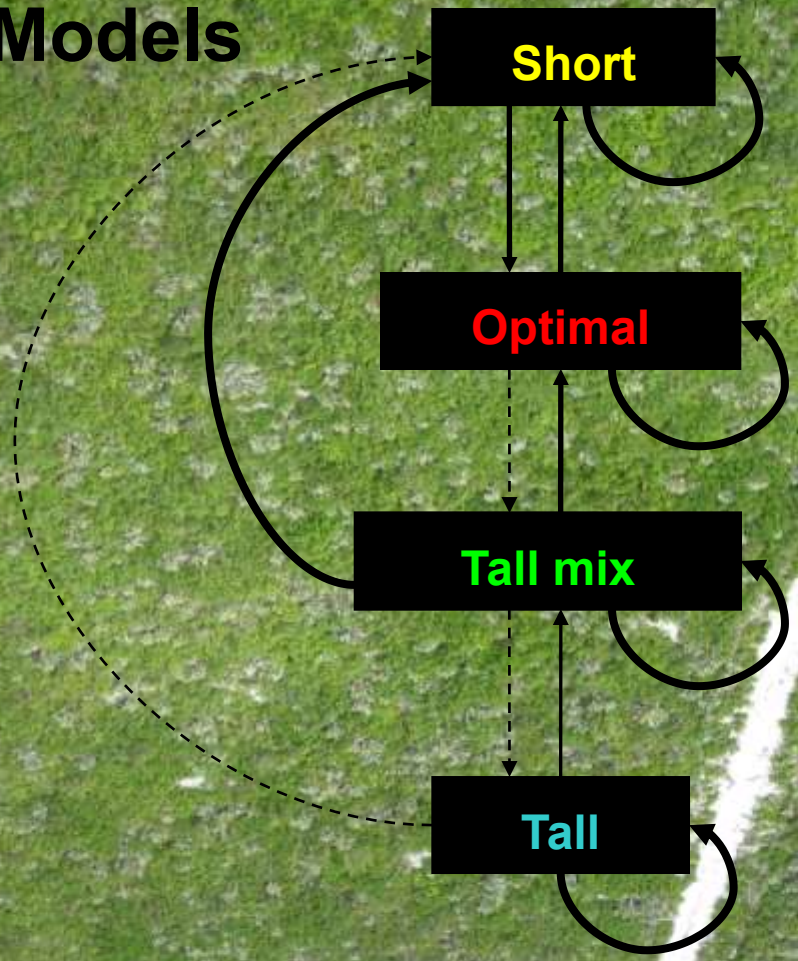
Outcome-based Monitoring: Habitat Inventory

Potential Territories
Primary, Secondary, Tertiary

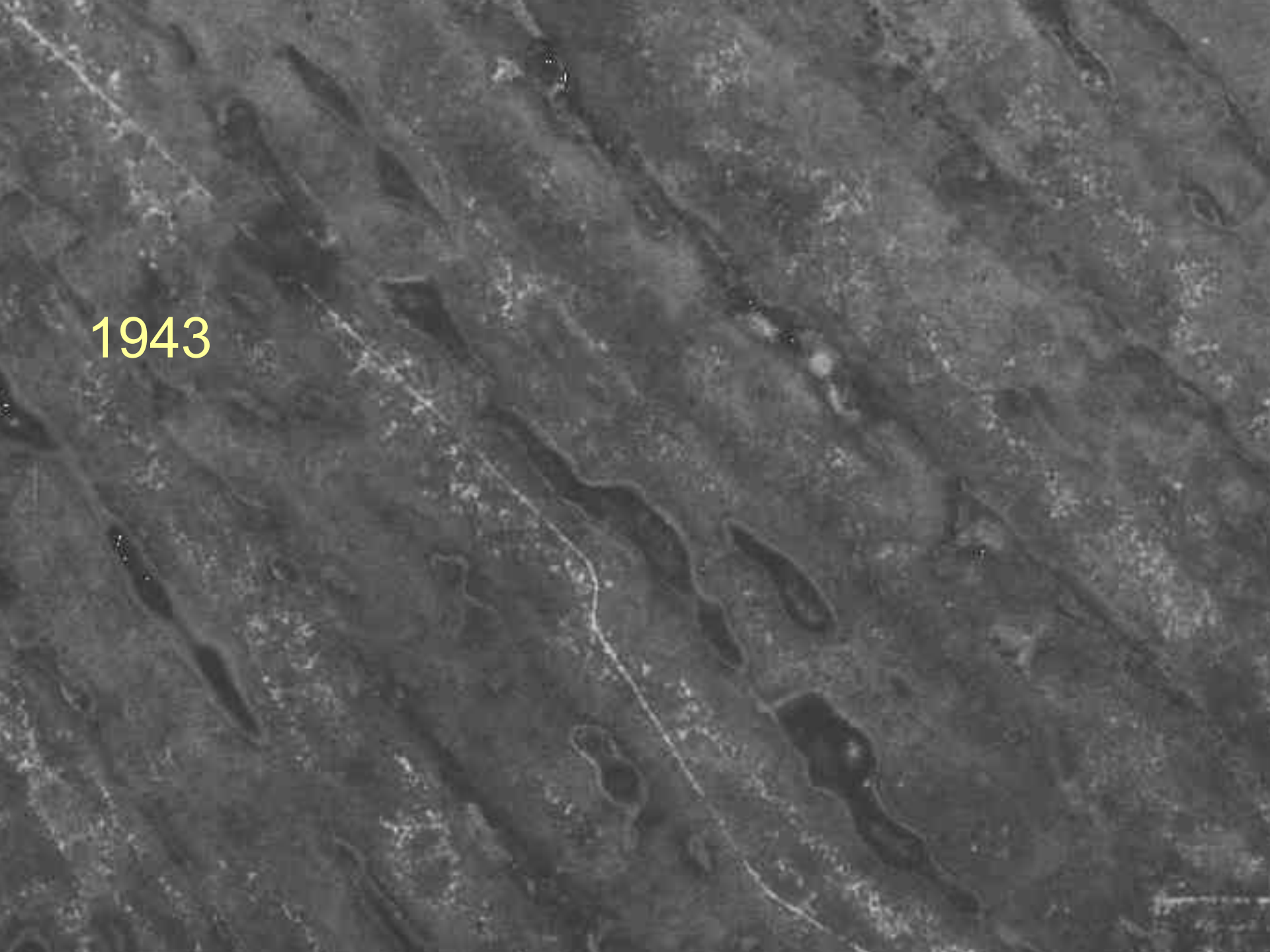


Outcome-based Monitoring: Population Monitoring Program

Assumption-Driven Research: Species/Habitat Models



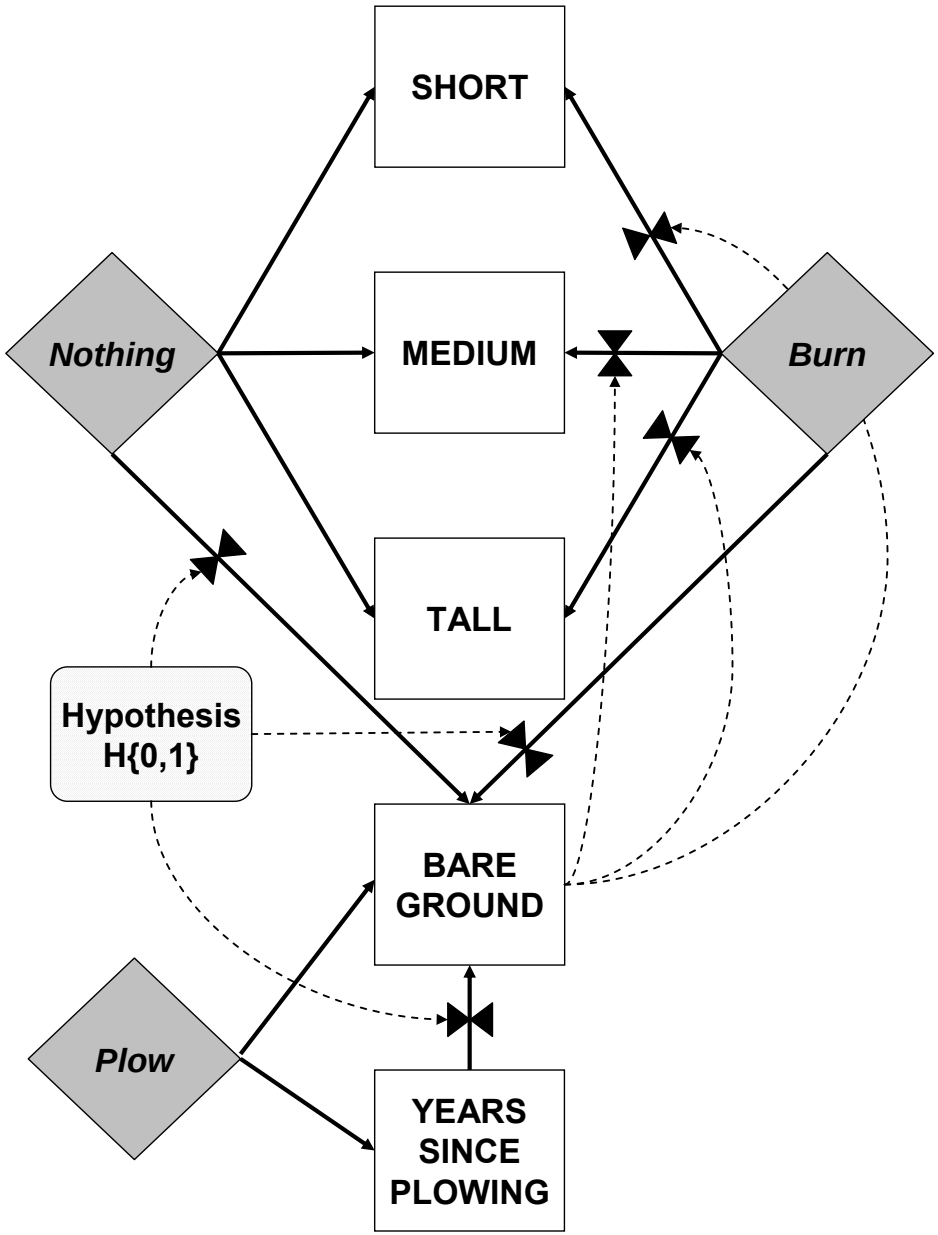
Ψ_{rs} *function of oak, edge, number fires, fire history, restoration*


1943

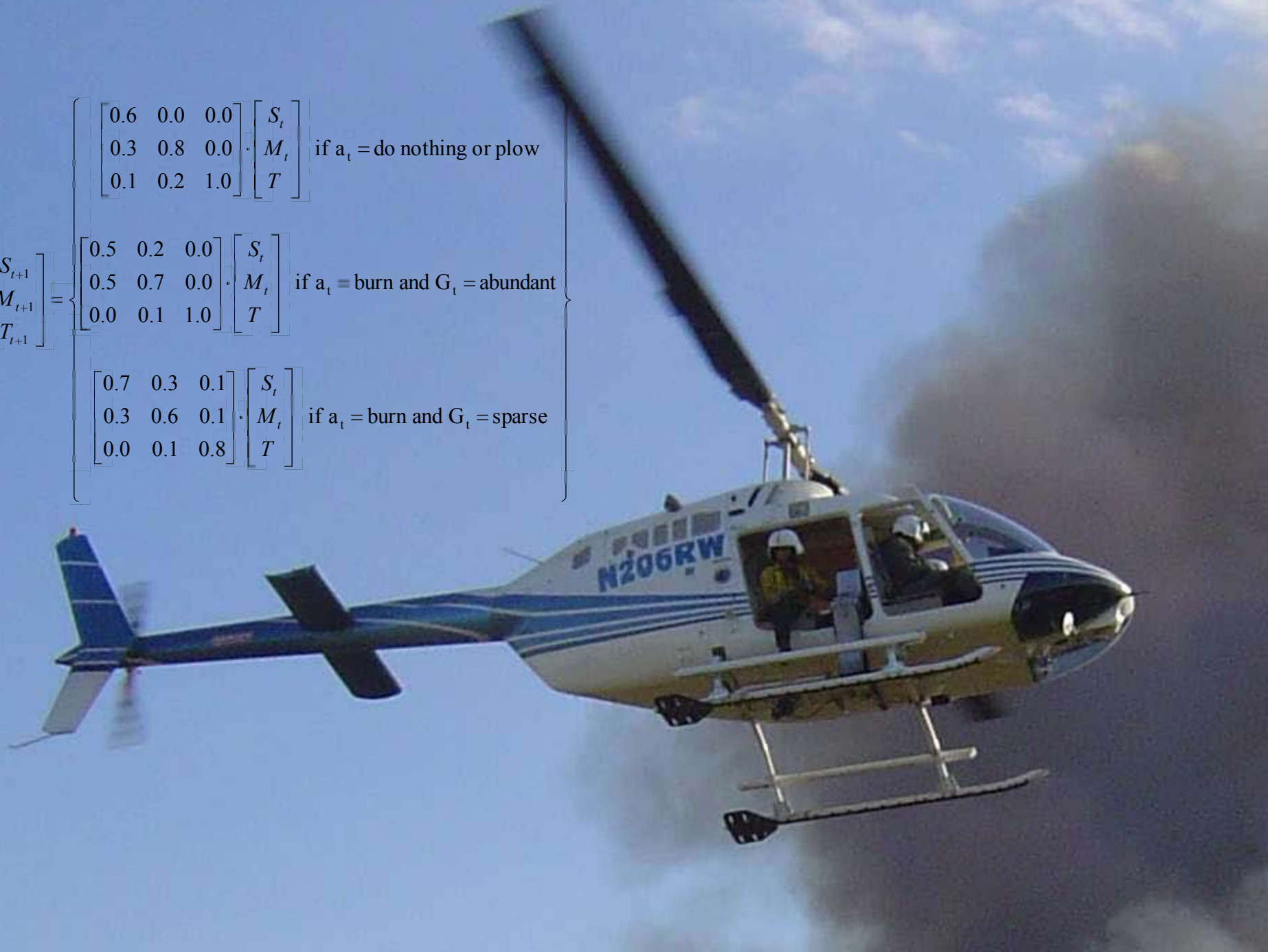
Assumption-Driven Research: Species/Habitat Models

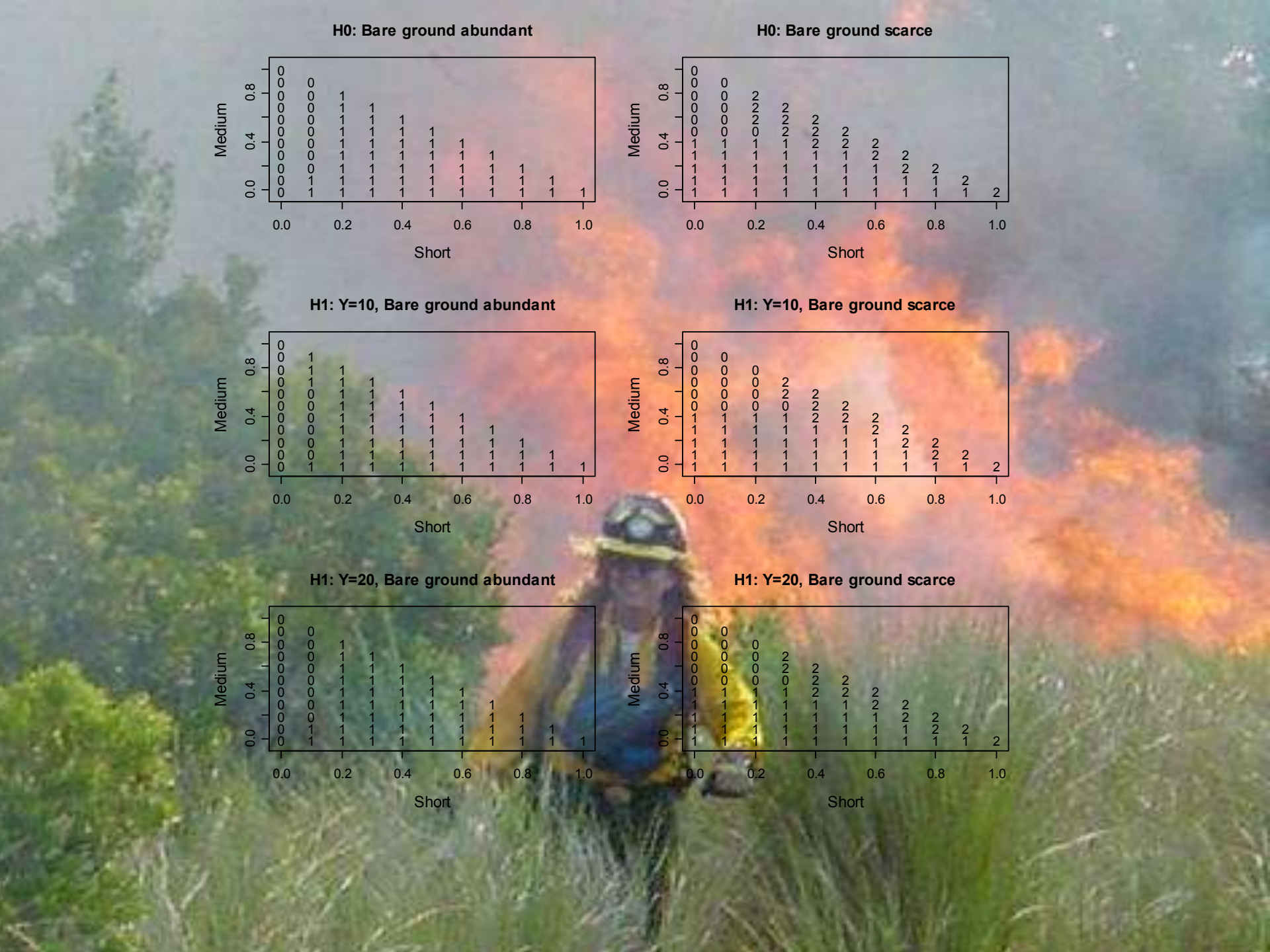
MINWR/NASA/USGS –ARM

Mike's version of the ARM process / outcome


SHORT
MEDIUM
TALL
Nothing
Burn
Hypothesis
H{0,1}
BARE
GROUND
Plow
YEARS
SINCE
PLOWING

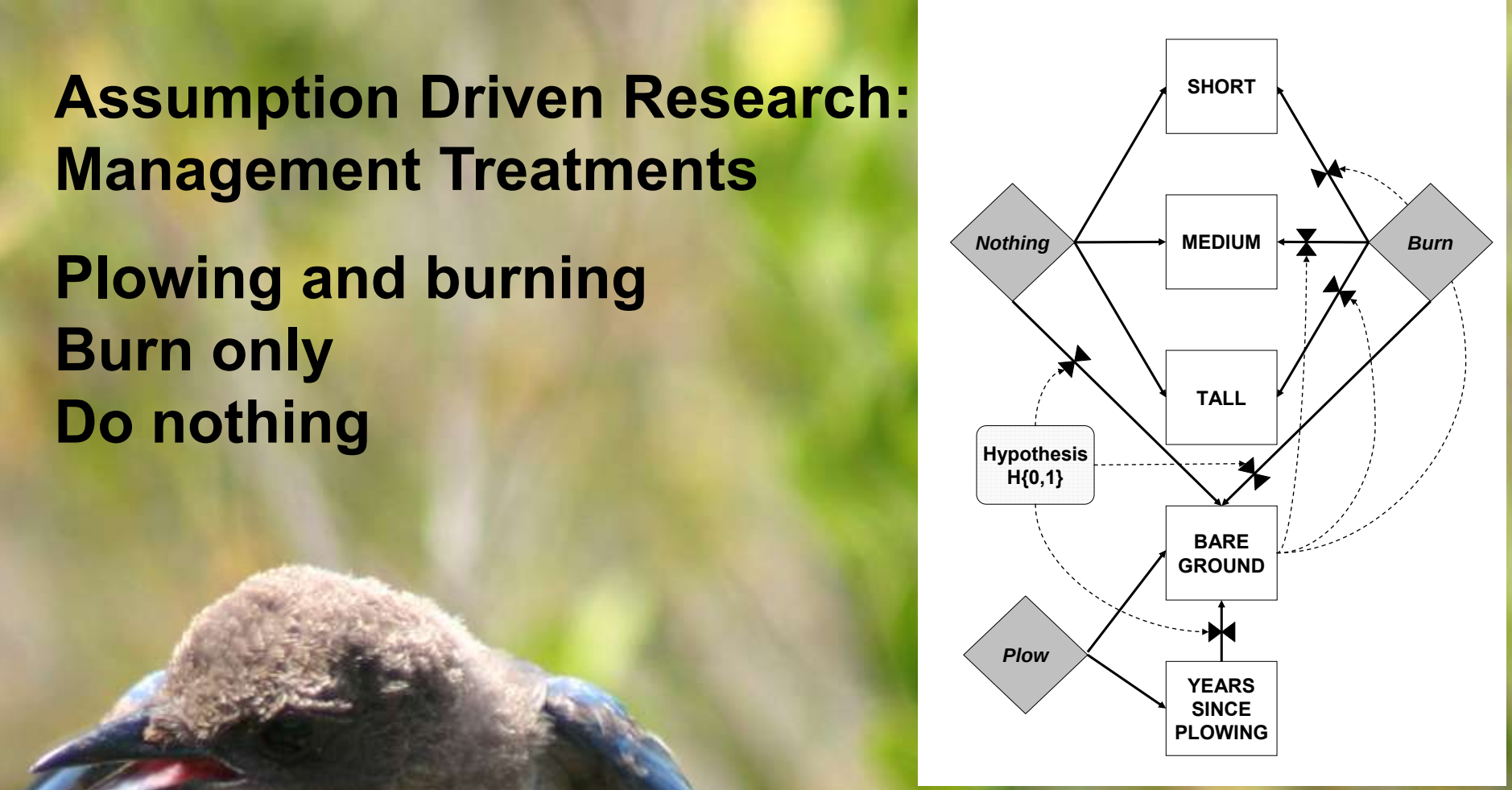
$$
\begin{bmatrix} S_{t+1} \\ M_{t+1} \\ T_{t+1} \end{bmatrix} = \begin{cases} \begin{bmatrix} 0.6 & 0.0 & 0.0 \\ 0.3 & 0.8 & 0.0 \\ 0.1 & 0.2 & 1.0 \end{bmatrix} \cdot \begin{bmatrix} S_t \\ M_t \\ T \end{bmatrix} & \text{if } a_t = \text{do nothing or plow} \\ \begin{bmatrix} 0.5 & 0.2 & 0.0 \\ 0.5 & 0.7 & 0.0 \\ 0.0 & 0.1 & 1.0 \end{bmatrix} \cdot \begin{bmatrix} S_t \\ M_t \\ T \end{bmatrix} & \text{if } a_t = \text{burn and } G_t = \text{abundant} \\ \begin{bmatrix} 0.7 & 0.3 & 0.1 \\ 0.3 & 0.6 & 0.1 \\ 0.0 & 0.1 & 0.8 \end{bmatrix} \cdot \begin{bmatrix} S_t \\ M_t \\ T \end{bmatrix} & \text{if } a_t = \text{burn and } G_t = \text{sparse} \end{cases}
$$




H0: Bare ground abundant
H0: Bare ground scarce
H1: Y=10, Bare ground abundant
H1: Y=10, Bare ground scarce
H1: Y=20, Bare ground abundant
H1: Y=20, Bare ground scarce
Medium
Short
0.0
0.4
0.8
0.2
0.6
1.0

Assumption Driven Research: Management Treatments

Plowing and burning
Burn only
Do nothing



Questions?