Selecting Species as Drivers for Landscape-scale Conservation: Key Concepts

U.S. Fish & Wildlife Service

Conserving the Nature of America

SHC

Session Objectives

Encourage FEEDBACK and INVOLVEMENT in exploring and understanding:

- CONCEPTS associated with "species selection"
- CHALLENGES associated with "species selection"
- APPLICATIONS of "species selection"
- SURROGATE SPECIES as a form of "species selection"

Conservation Objectives

- *Working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people*
- *SHC is driving us to take a broader, landscape approach to conservation*
- *An adaptive management framework that informs our conservation decisions about how much, how much more, where, and when habitat is needed to achieve desired biological outcomes*
- *Objective - Characterize and maintain functional landscapes capable of supporting self-sustaining fish, wildlife, and plant populations.*

A Daunting Responsibility

Responsibility for

myriad species/resources

Unrealistic to:

set population objectives,

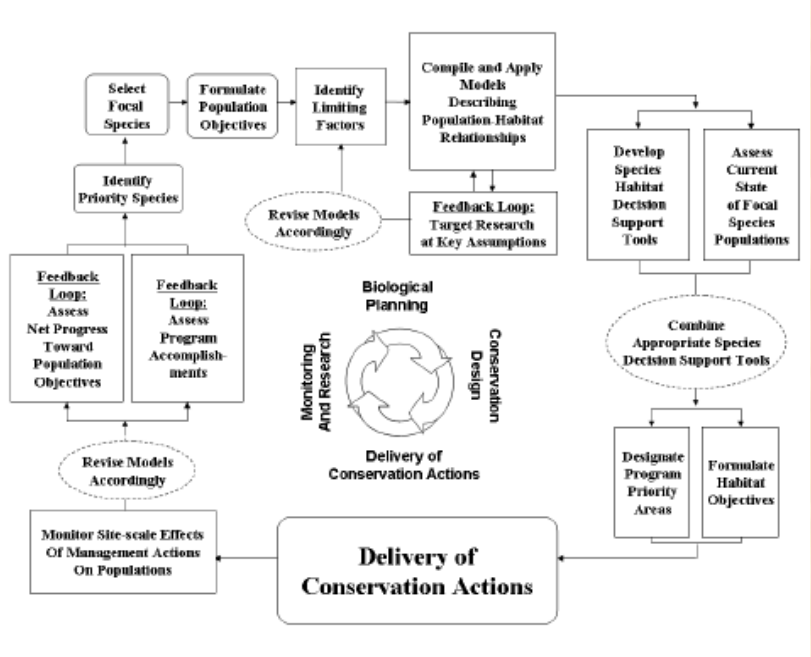
translate these to habitat objectives,

and evaluate and monitor

every aspect of a functional landscape

Conservation of landscapes capable of sustaining all species is impractical

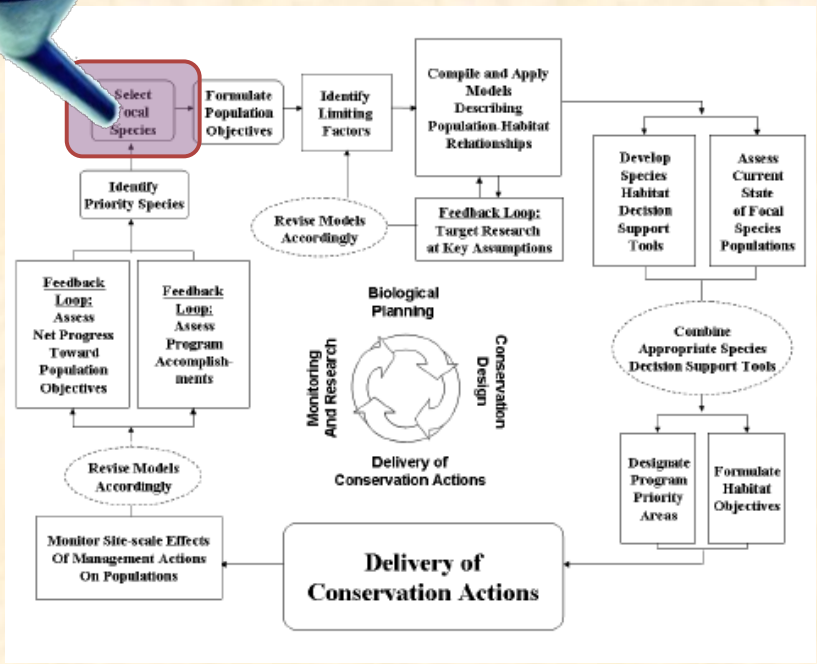
deliver habitat conservation specifically for, on a species-by-species basis



How Can We Begin to Focus?

. . . in ways that best preserve our broad responsibilities to many species?

We all focus to some degree already!



Selecting Species
- Inherent Challenges -

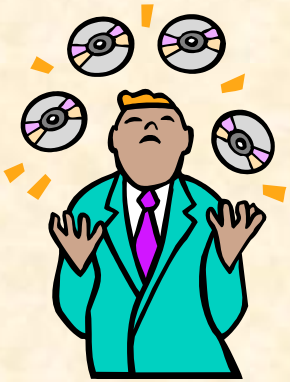
Requires Consideration of:

- Objective(s)
- Scope & Scale
- Selection Criteria
- Assumptions, Uncertainties, Limitations, Risks
- Implications to Decision Making

Priority vs. Surrogate Species
- Concepts -

Priority Species

- Implies relative rank/ importance
- 1:1 species benefits
  - Broader benefits implied/assumed
- Emphasize a subset of species based on any number of criteria
  - Exclusionary approach



Surrogate Species

- Not intended to imply relative rank/importance
- 1:many species benefits
  - Broader species benefits explicitly stated, evaluated
- Emphasize as many species as possible
  - Inclusionary approach

Priority vs Surrogate Species
- Basis & examples -

Priority Species

- Conservation status & vulnerability
  - T&E, Candidate species
- Economically important
  - Sportfish
- Culturally important
  - Bald Eagle
- Organization specific
  - Ducks Unlimited

Surrogate Species

- Ability to represent other species or aspects of the environment
  - Umbrella
  - Keystone
  - Ecosystem Engineer
  - Indicator
  - Foundation
  - Flagship

The Power (& Pain) of Terminology

Surrogate Species

Surrogate Species Approaches

Variety of Specific Approaches:

Umbrella, Indicator, Keystone, Foundation, Flagship, Engineer. . .

- Suitability of any particular surrogate species concept depends on specific conservation objectives of the application, geographic scale, uncertainties and assumptions, and implications to decisions

Surrogate Species as Priorities?

<u>Efforts</u> to apply and identify surrogate species can be PRIORITIES, but surrogate <u>species per se</u> should not be confused with the traditional context of "priority species."

Should Surrogates Drive Resource Investments?

Like "priority species", Yes!

Should they drive all investments? No!

If concept is sound and application successful: investments in surrogates should equate with investments in other species.

Key Surrogate Assumption

Undertaking actions that support conservation objectives for surrogate species in a given area will contribute to supporting the needs of larger sets of species characteristic of the area





Surrogate Species

Provide a LENS through which to consider and approach broad responsibilities for ecosystem

Surrogate Species
A Case Study from WGCP Open Pine

- A vision for bird conservation in WGCP open pine
  - Desired state for pine forests
  - What is specifically needed and why
  - How much is needed

West Gulf Coastal Plains/Ouachitas Open Pine Landbird Plan

A report to the Lower Mississippi Valley Joint Venture Management Board prepared by the Lower Mississippi Valley Joint Venture WGCPO Landbird Working Group comprised of:

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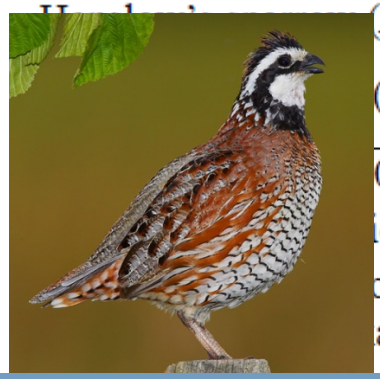
interconnected blocks

Table 2. Key limiting habitat characteristics of 4 umbrella species, northern bobwhite (NOBO), red-cockaded woodpecker (RCWO), brown-headed nuthatch (BHNU), and Bachman's sparrow (BACS) in open pine habitats in the West Gulf Coastal Plain/Ouachitas Bird Conservation Region.

Habitat Factor	NOBO	RCWO	BHNU	BACS
Large patch size (>230 ha [>585 ac])	X	X		
Low pine basal area (<20 m^2/ha [<90 ft^2/ac])	X	X		
Low hardwood basal area (<5 m^2/ha [<20 ft^2/ac])	X	X		X
Low canopy cover (<60%)	X	X		X
Dense herbaceous ground cover	X			X
Short distance (<3 km [<1.9 mi]) to nearest patch (connectivity)	X		X	X
High snag density (>40 snags/ha [16.2 snags/acre))			X	
Large diameter (>35 cm [>14 inch] dbh) pines		X	X	



West Gulf Coastal Plain Open Pine
Targets to Objectives

- Setting population objectives for species limited by desired habitat conditions provides habitat objectives as well

Table 6. Estimated 1990s populations (adjusted for sub-regional habitat suitability index [HSI] scores) and medium- and long-term population objectives for open pine umbrella species in the West Gulf Coastal Plain/Ouachitas Bird Conservation Region. Partners in Flight (PIF) estimated landbird populations from the North American Landbird Conservation Plan (Rich et al. 2004), which were based on Breeding Bird Survey data from the 1990s.

Variable	Northern bobwhite	Brown-headed nuthatch	Bachman's sparrow
PIF population estimate (*No. of pair*)	110,000	120,000	10,000
Percent of population in 'Open Pine'[a]	40%	100%	~100%
HSI adjusted 1992 population (*C=No. of pair*)	44,000[b]	120,379	9,913
Average BBS abundance 1999-2003 (*BBS2001*)	8.59	1.176	0.14
Minimum viable population (*N*; pairs)	60	28	46
Breeding density (*D*; ha/pair)	6.8	3.55	3
Area for *N* pair (*A;* ha)	408	99	138
Current habitat (ha)[c]	299,200	125,354	29,739
Average BBS abundance 1978-1982 (*BBS1980*)	38.86	1.542	0.524
Medium-term population objective ($P_{medium\text{-}term}$)	199,050	157,844	37,103
Population deficit for medium-term objective	(155,050)	(37,465)	(27,190)
Medium-term habitat objective ($H_{med\text{-}term}$ ha)	1,353,540	164,369	111,309
Medium-term habitat deficit (ha)	(1,054,340)	(39,015)	(81,570)
Average BBS abundance 1967-1970 (*BBS1969*)	51.18	1.866	1.068
Long-term population objective ($P_{long\text{-}term}$)	262,156	56,029	75,622
Population deficit for medium-term objective	(218,156)	(70,631)	(65,709)
Long-term habitat objective ($H_{long\text{-}term}$; ha)	1,782,661	198,903	226,866
Long-term habitat deficit (ha)	(1,483,461)	(73,549)	(197,127)

[a] 36% of birds in the WGCPO (calculated from data in the National Bobwhite Conservation Initiative, Table 20, page 97).

[b] 40% of PIF population estimate.

[c] Calculated as the product of HSI adjusted 1992 population estimate and assumed breeding density.

Use of Surrogate Species
West Gulf Coastal Plain

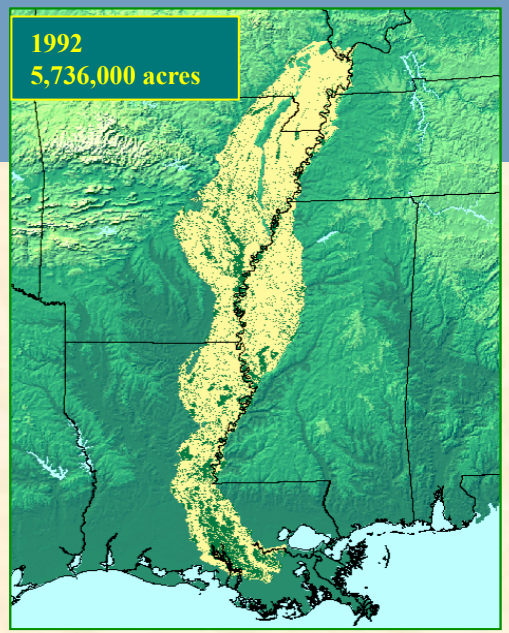
- Develop tools that enable more strategic conservation of open pine habitats
- Guide decisions – where and why to undertake conservation actions
- Comprehensive landscape analysis; application of conservation biology principles (patch size, viability, juxtaposition) reflective of species needs
- Maximize conservation benefits for birds

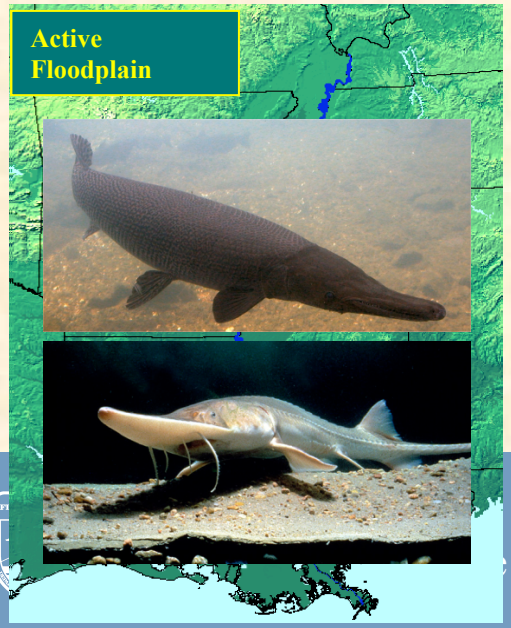
LONGLEAF PINE FOREST

FOURTH IN A SERIES

NATURE OF AMERICA

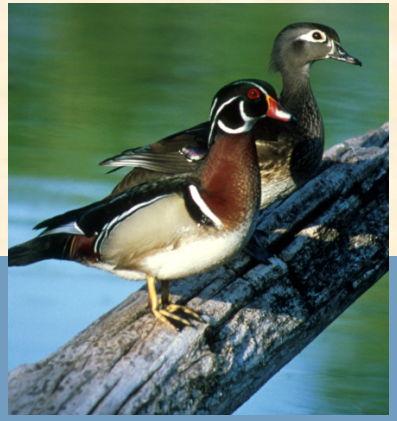
Mississippi Alluvial Valley





Primary Resource Management Concern of the Past 50 Years...

Agricultural encroachment into the poorly drained, frequently flooded areas of the LMV



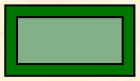
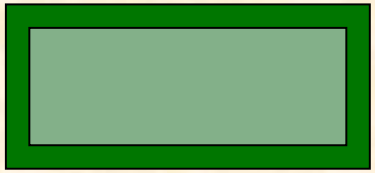
Mississippi Alluvial Valley

European Settlement **1950's** **1992**

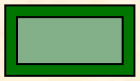
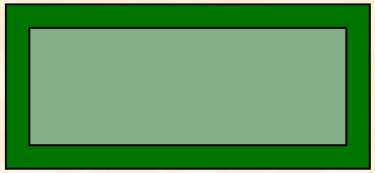
Predation & Parasitism

99% of Forest Fragments Unable to Sustain Source Populations

Use of Surrogate Species Mississippi Alluvial Valley

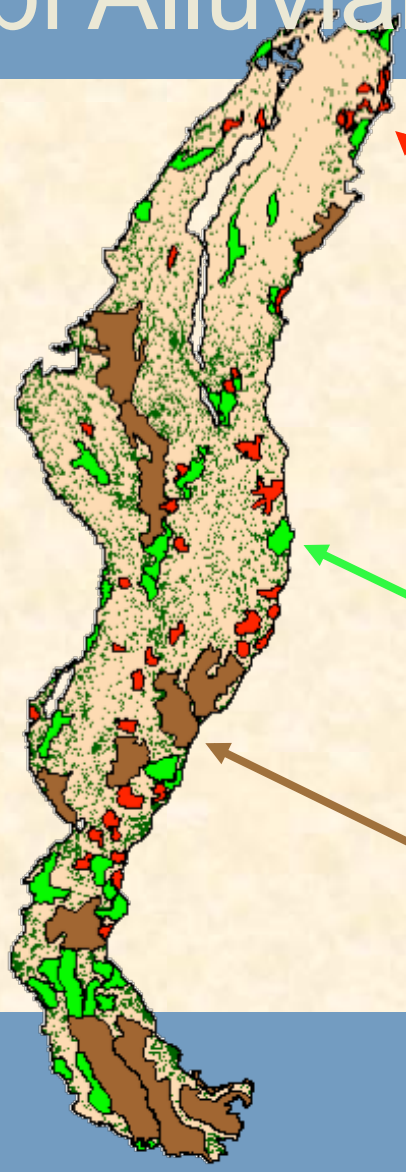
Ecological Suites	Habitat Needs
Swainson's Warbler	Forest Blocks ≥ 4,000ha  500 Pairs
Cerulean Warbler	Forest Blocks ≥ 8,000ha  500 Pairs
Swallow-tailed Kite	Forest Blocks ≥ 40,000ha*  ~80 Pairs

Use of Surrogate Species
Mississippi Alluvial Valley

Ecological Suites	Habitat Needs
Swainson's Warbler Prothonotary Warbler Hooded Warbler Wood Thrush Acadian Flycatcher	Forest Blocks ≥ 4,000ha  500 Pairs
Cerulean Warbler Kentucky Warbler Summer Tanager Yellow-billed Cuckoo Eastern Wood-Pewee	Forest Blocks ≥ 8,000ha  500 Pairs
Swallow-tailed Kite Red-shouldered Hawk Broad-winged Hawk Pileated Woodpecker Cooper's Hawk	Forest Blocks ≥ 40,000ha*  ~80 Pairs

Use of Surrogate Species
Mississippi Alluvial Valley

State	10K	20K	100K
Arkansas	9	11	3
Illinois	0	1	0
Kentucky	2	1	0
Louisiana	19	15	7
Mississippi	14	6	2
Missouri	6	1	0
Tennessee	1	1	1
Totals	51	36	13



Swainson's Warbler
Prothonotary Warbler
Northern Parula
Hooded Warbler
Wood Thrush
Acadian Flycatcher

Cerulean Warbler
Kentucky Warbler
Summer Tanager
Yellow-billed Cuckoo
Louisiana Waterthrust
Eastern Wood-Pewee

Swallow-tailed Kite
Red-shouldered Hawk
Broad-winged Hawk
Pileated Woodpecker
Cooper's Hawk

U.S. Fish & Wildlife Service
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A DECISION SUPPORT TOOL FOR LOUISIANA PEARLSHELL MUSSEL CONSERVATION: PRIORITIZING SEARCH AND RESTORATION SITES

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[1]Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative; [2]Natchitoches National Fish Hatchery, U.S. Fish and Wildlife Service; [3]Kisatchie National Forest, USDA Forest Service; [4]The Nature Conservancy

INTRODUCTION

- Louisiana Pearlshell (*Margaratifera hembeli*)
  - Freshwater Unionid mussel (Figure 1)
  - Federally-threatened
  - State-endangered (Louisiana)
- Range (Figure 2)
  - Potential: Red River tributaries in Louisiana
  - Current: Grant and Rapides Parishes
- Habitat associations (Figure 3)
  - Low-order streams
  - Gravel substrates
  - Forested landscapes
  - Host fish species currently unknown

Figure 2. Potential range (shaded parishes) and current known locations (red dots) of Louisiana Pearlshell mussel beds, 2011.

QUESTIONS

- Downlisted from endangered after discovery of additional populations in Grant Parish

Are there other unknown populations in the potential historic range?

- Full recovery (i.e., delisting) likely requires active restoration to extirpated areas

Are there unoccupied sites with suitable habitat in current range? Beyond?

Figure 1. An adult Louisiana Pearlshell mussel.

OBJECTIVES

- Develop a spatial habitat model to:
  1) Estimate suitable habitat in known range
  2) Prioritize "new" areas to search in potential historic range
  3) Identify potential areas for stocking
  4) Serve as a model for other mussel species

Figure 3. Typical Louisiana Pearlshell habitat: a low-order stream with a gravel substrate in a forested landscape, Grant Parish, LA, 2011.

METHODS AND RESULTS

- Identified key features of mussel habitat and proxies to characterize them from available geospatial datasets (Table 1)

Table 1. Habitat parameters, proxies, data sources, and thresholds for Louisiana Pearlshell mussel.

Habitat Parameter	Proxy	Data source	Threshold
Stream	Stream	NHDPlus	Perennial
Flow	Order	NHDPlus	1st to 3rd
	Slope along streambed	DEM	0.0025-0.01%
Gravel substrate	Maximum slope perpendicular to streambed	DEM	5-10%
Water temperature	% canopy	NLCD	>85%
	% non-forest	NLCD	<3%

- Divided all streams in Grant and Rapides Parishes into 100-m reaches
- Determined value of each habitat parameter within each stream reach and sub-watershed
- Identified threshold values for habitat parameters in reaches with mussels
- Graphically compared habitat parameters in reaches with mussels to all reaches (Figure 4)
- Identified in a GIS reaches that within each habitat parameter's threshold (Figure 5a-e)

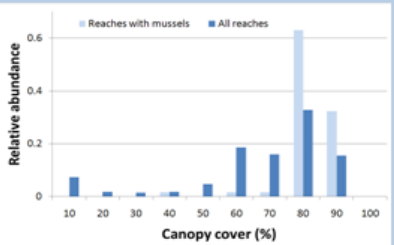

Figure 4. Relative abundance of all stream reaches and reaches with Louisiana Pearlshell mussels, by 10% canopy cover class, 2001.

DISCUSSION AND NEXT STEPS

- Most suitable habitat in the current range is occupied (Figure 5f)

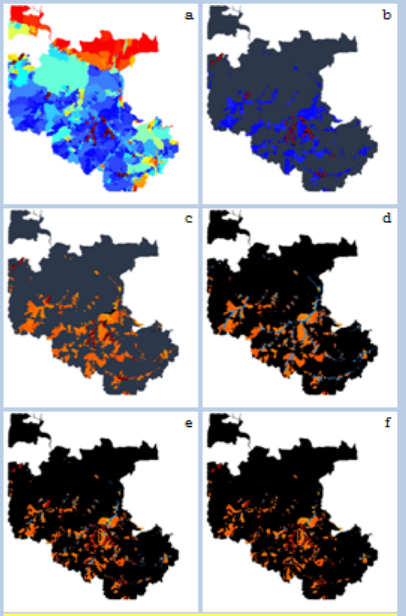

Figure 5a-f. Potentially suitable mussel habitat is identified by removing from consideration those locations that exceed threshold values. From a) the base layer of % non-forest in each sub-watershed, b) all sub-watersheds with >3% non-forest are removed. A similar process was done for c) canopy cover, d) perennial 1st to 3rd-order streams, e) stream slopes, and f) bank slopes.

- Proxies proved useful discriminatory variables
- Spatial modeling approach offers promise for other freshwater mussels

Surrogate Species
- Final Thoughts -

- Decision process best conducted within a community of stakeholders
- Going it alone or in independent directions won't be effective

GCPO

Questions?