

# Indiana Bat Structured Decision Making Workshop December 8-12, 2008



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# 4 Decision Contexts

- A. Recovery Planning
- B. Section 10(a)(1)(A) Permitting
- C. Section 7 Consultation
- D. Section 10 Incidental Take/Habitat Conservation Plans

# Section 10(a)(1)(A) Permitting

(WNS research in Ibat hibernacula)

## Objectives

- Maximize conservation benefit (fundamental)
- Minimize take to extent practicable (fundamental)
- Avoid JAM (constraint)

## Alternatives

- Issue permit without conditions
- Issue permit with conditions
- Do not issue the permit

# Recovery Planning

(Allocation of \$ to various mgmt alternatives)

## Objectives

- Maximize conservation benefit (fundamental)
- Achieve recovery criteria (means)
- Stay true to recovery plan (means)
- Quick response (constraint)
- Sole source actions (means)
- Leverage partnership funding (means)
- Partnership relations (fundamental)
- Garner support among conservation personnel (improve efficacy of implementation)

# Recovery Planning

(Allocation of \$ to various mgmt alternatives)

## Alternatives

- Hibernacula
  - Protection - purchase & easements & gates
  - Mgmt - restoring airflow, restoring optimal microclimate conditions
- Swarming habitat
  - Protect
  - Restore, enhance suitability
- Maternity Summer (known colony)
  - Protection - purchase, easement
  - Mgmt - improve connectivity, enhance foraging and maternal areas
- Outreach
  - Landowner education - winter: minimize vandalism, effects to microclimate; summer: woodlot management
  - Recreational cave users

# Section 7 Consultation

(I-69 highway construction project from Indy to  
Evansville)

## Objectives

- Avoid JAM (constraint)
- Maximize conservation benefit (fundamental)
- Minimize adverse effects (means)
- Minimize take (fundamental)
- Monitor assumptions (means)

# Section 7 Consultation

(I-69 highway project from Indy to Evansville)

## Alternatives

- JAM with RPAs
- JAM without RPAs
- No JAM with Conservation Measures
- No JAM without Conservation Measures

**Conservation measures** -habitat mitigation (replacement & protection), seasonal cutting restrictions, hibernaculum protection, outreach, route adjustments, delineate areas of use, noise restrictions near hibernaculum

# Objectives Synthesis

Maximize Conservation Benefit = move towards recovery to the maximum extent

Recovery is...

- Ensuring extinction risk is below or at a specified level
- Maintaining a representative distribution to capture genetic and ecological diversity of Ibat (delineate Recovery Units)
  - ensure extinction risk in each recovery unit is below or at a specified level

# Consequences

	Issue Permit	Issue Permit w/cond	Do Not Issue Permit
Minimize $p(x)$			
Maintain a representative distribution			
Avoid JAM ( $\Delta p(x) < \text{appreciable}$ )			

Predictive Model(s)

# Predictive Model

## Output Variables

- $P(x)$  rangewide
- $P(x)$  by recovery unit
- JAM output (derived variables)
  - Change in  $p(x)$  (with and without alternative)
  - Change in expected time to recovery
- Existing recovery criteria (well, close)

# Predictive Model

## Input Variables

- Lethal take of individuals
- Changes in recruitment rates
- Changes in survival rates
- Changes in K
  - hibernacula
  - summer habitat

# Predictive Model

## Model Structure

- recovery unit/rangewide based
- ability to expand to finer spatial resolution in future
- capable of running parallel scenarios
- explicit expression of uncertainty (and ability to evaluate)
- state variables: population size?
  - males
  - 1st year breeding vs nonbreeding females
  - After 1st yr breeding vs nonbreeding females
- implicit spatial structure

# Where We are Going From Here?

- Influence diagram - conceptual idea of our model
- Run through with a specific decision problem
- Model Details
  - model dynamics
  - stochasticity
  - catastrophes
- Guidelines for model development
  - milestones for iterative prototypes
  - user-accessible