Edwards Aquifer Recovery Implementation Program

Species Needs

Upstream Users - San Antonio

Downstream Users - Recreation - Urban Areas

FWS is here!

SB 3
Decision Problem

Avoid jeopardy and contribute to the recovery of the Texas wild rice and Comal Springs dryopid beetle through a Habitat Conservation Plan with a 20 year permit.

Species

Texas wild-rice
(Zizania texana)

Comal Springs dryopid beetle (Stygoparnus comalensis)
FWS Objectives

• Avoid jeopardy of two species
  – Texas Wild Rice
  – Comal Springs Dryopid Beetle

• Contribute to their recovery

What is Jeopardy?

“Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild…
Baseline of Species

Likelihood of Survival vs. Time

Baseline

Jeopardy

Likelihood of Survival vs. Time

Baseline

Appreciable Reduction in Survival and Recovery

Project Description / Action

Extinction
**Recovery** is the point at which a species no longer warrants listing under the ESA

This means, the species is no longer “likely to become in danger of extinction in all or a significant portion of its range in the foreseeable future.” (e.g. no longer a threatened or endangered species)

So, recovery is when the likelihood (or probability) of extinction over some future (time) is low enough again to no longer be a danger

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**Baseline of Species**

![Baseline of Species Diagram](image_url)
Recovery

Likelihood of Survival

Time

Project Description / Action

Increase Likelihood of Survival and Recovery

Baseline

San Marcos River: Segment B

Legend
- 2005 TVR pts.
Hypothetical Belief Net Model

Texas Wild-rice

Factors most influencing extinction risk

Areas with high and middle Springer Flow (depth & velocity)

Invasive Plant Cover
- High: 20.0
- Med: 70.0
- Low: 10.0

Floating Veg Amount
- High: 22.0
- Med: 61.0
- Low: 17.0

Recreation Use
- High: 69.0
- Med: 21.0
- Low: 10.0

Flood Damage
- High: 10.0
- Med: 46.0
- Low: 44.0

% of Potential Habitat Occupied
- <25: 34.5
- 25-50: 16.1
- 55-75: 15.2
- 75-100: 34.2

Area Occupancy 20 yr (m²)
- <100: 50.1
- 100-200: 26.7
- 200-300: 14.2
- 300-500: 5.03

Hypothetical Belief Net Model

Flow

Restoration

Pumping

Area Occupied ‘N’

Change in Area Occupied

Threats
- Invasive Plants
- Recreation
- Flood Damage
### OUTCOMES

(Area of TWR in m²)

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### Example Simulation Result

Probability of Low Plant Area Under Hypothetical "Red Alternative"

Area of Plant Cover after 20 years

- Probability (%)
  - 0-100
  - 101-200
  - 201-300
  - 301-400
  - 401-500
  - 501-600
  - 601-700
  - 701-800
  - 801-900
  - 901-1000
Finding Factor Combinations
Delineating JEOPARDY

All points on the line (combinations of these two factors) produce the same outcome for extinction risk:

JEOPARDY THRESHOLD

All points in Red Zone = JEOPARDY

Finding Factor Combinations
Delineating RECOVERY

Blue, Red, Green Management Alternatives
equivalent reduction in extinction risk
Jeopardy Analysis Structuring

Data
Expert Knowledge

Biological-System Models

Decision Criteria

1
2
3

Edwards Aquifer RIP Structuring?

Research & Monitoring

Data
Biological-System Models

Decision-Aiding Models

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Stakeholder engagement in all steps

PrOACT

Objectives
Next Steps

Go Back to the RIP – PrOACT
- Determine decision problem
  - Stakeholder objectives
  - Multi-objective alternatives
  - Consequences
  - Tradeoffs