Risk Analyses

Answering the Jeopardy Question
Jeopardy

• **Jeopardize the continued existence of** – 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 by reducing the numbers, reproduction, or distribution of that species.
Destruction and Adverse Modification

- Our existing definition of “destruction or adverse modification of critical habitat”:
  - “direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical”

- Was first invalidated by the court in a case the Sierra Club brought against NMFS and FWS

- We are currently preparing to propose a new definition
Risk analysis is based on the species and critical habitat’s:

- Viability or Conservation Value
- Sensitivity to change.
- Resilience to change.
- Recovery rate
- Limiting factors
- Threat regime

You should find this information in the Status and Baseline sections of our Biological Opinions.
During Consultation

- **Exposure** will tell you which individuals, populations, or critical habitat are likely to be exposed, over what area and time, and with what intensity.
- **Response** will tell you what will happen to those individuals or critical habitat upon exposure.
- **Risk** analyses integrate exposure and response profiles to estimate the risk the Actions pose to listed resources.

*In the context of the Status of the species and critical habitat*
Steps of Risk

Step 1
Individual Responses

Step 2
Risks to Populations

Environmental Baseline
(or the “base condition” of the species in an Action Area)

Step 3
Risks to Species

Status of Species
The viability of “Species” integrates the viability of the “populations” that comprise them.

The viability of “Populations” integrates the fitness of the individuals that comprise them.

The fitness of Listed Individuals” integrates their physical, physiological, and behavioral responses to their environment.
Population “Growth”

\[ N_t = N_0 + \text{Birth} + \text{Immigration} - \text{Death} - \text{Emigration} \]

Populations grow only through these processes

Populations decline only through these processes

If a population is declining, what can you assume about (BI) relative to (DE)?
How Do We Answer The Question?

- By applying
  - Empirical information
  - Accepted ecological theory
  - And quantitative analyses, when we can do them

- But we generally begin with the empirical information
What Empirical Information?

- Many species have become extinct
- Even more populations have become extinct
- Our job is to prevent others from following them into oblivion...
  - We study the populations or species that have died
  - There are patterns in the mechanisms and circumstances behind those deaths
  - We compare the current situation to those patterns and processes for empirical support
Jeopardy Analyses...

- Our jeopardy analyses would follow the sequence:
  - Identify the individuals or populations at risk (Exposure analyses)
  - Determine if the exposure is sufficient to reduce reproduction, numbers, or distribution (Response analyses)
  - Determine if any responses would be sufficient to
    - Reduce population growth rates or mean, median, modal times to extinction
    - Reduce the species’ probability of persistence over 25, 50, 100, or some other time intervals
    - Increase the species probability of extinction in some time interval or
    - Increase the species’ ultimate risk of extinction
Support from Ecological Theory

Species’ Likelihood of Surviving And Recovering in the Wild

Reductions In

Reproduction

- Reduced birth rates or fecundity schedules
- Reduced reproductive lifespan
- Reduced recruitment into the adult, breeding ages or stages
- Increased age at sexual maturity
- Increased iteroparity interval
- Increased variance in fecundity schedules, birth rates, iteroparity interval, or reproductive lifespan
- Altered sex ratios
- Allee effects

Numbers

- Dead animals
- Reduced survival rates (mean or median survival rates)
- Altered age- or stage-structure
- Increased emigration rates
- Reduced immigration rates
- Increased variance in survival, emigration, or immigration rates

Distribution

- Reductions in the number of populations or sub-populations
- Shift in the species’ biogeography to areas with reduced resource quality, availability, or both
- Reduced connectivity between population segments
- Collapse of metapopulation structure
Destruction and Adverse Modification

- Determine if effects can be expected to reduce the quality or quantity of the PCEs

- Determine if any reductions identified above can be expected to reduce the habitat’s conservation value for listed species (Response Analysis)