

# Endangered Species Act: Economics and Implementation



# Summary of Provisions of ESA

- Sections 1 – 3 define species, acts considered “taking”, “adverse modification” of habitat, etc
- Section 4 defines procedures, e.g., for designating habitat and for evaluation of CH
- Section 6 – intergovernmental cooperation – federal/state
- Section 7 – interagency cooperation requirements (federal agency actions)
- Section 9 – private lands requirements

# Procedures in the ESA – Steps to Species Recovery

- **Listing** – requires biological assessment only
  - Listing introduces certain restrictions re “taking” of species (includes habitat modification)
- **RIP** – requires biological assessment and critical habitat designation – time limit requirement
- **Critical Habitat** – required for species recovery
  - requires economic impact analysis – time limit
- **Exclusion process** – evaluate costs of species preservation for “intolerable” standard

# Critical Habitat

- Habitat necessary for species recovery
- Designation results in regulatory restrictions on use to avoid adverse modification of habitat
- Owners required to consult with FWS on projects involving changes to habitat to ensure no adverse modification
- Nature of consultation depends on ownership – Section 7 (government) and Section 9 (private) with special provisions for DoD and Native lands
- **Not** a bar to future development but does impose restrictions

# A Case Study – Colorado River Fishes

- 4 endangered fishes: Colorado Squawfish, Humpback Chub, Bonytail, Razorback Sucker
- Historic ranges throughout Basin – **overlapping ranges**
- Manmade modifications to river flows – dams, reservoirs, irrigation channels, agricultural runoff, hydroelectric power production, cold water releases, etc
- Introduced species – e.g., trout and striped bass
- **Key factors:**
- Importance of Colorado River to economy of region
- Colorado River Compact – governing document – and river over-allocated
- Significant decline in native species populations due to **habitat modification** (these not commercial species)

# Map of Colorado River Basin



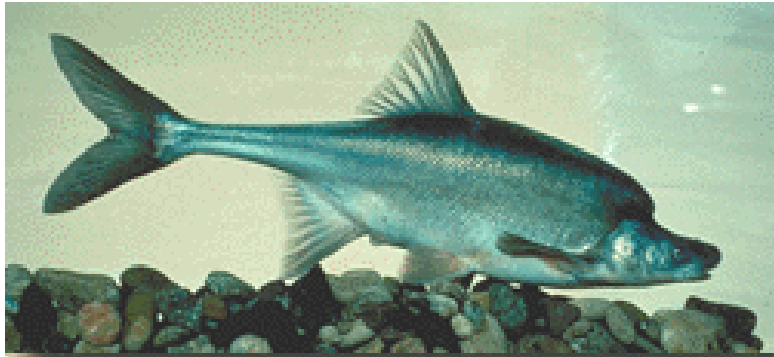


Photo by John Rinne

***Humpback chub can survive more than 30 years in the wild.***



Photo courtesy of Colorado Division of Wildlife

***Razorback suckers evolved an estimated 4 million years ago.***

# Chronology

- 4 fishes listed (by 1980) but no CH designated (no RIP in place)
- FWS sued for failure (March 1989) to implement RIP (designating CH) – some 20 years after listing of Colorado Squawfish (1967) and others
- RIP developed and CH identified – 1994
  - 2000 miles of the Colorado River System
- Key factor – multiple species considered (versus previous cases involving single species, e.g., spotted owl) – an **ecosystem** approach



# Requirement for Economic Impact Study

- Section 4(b)(2) of the ESA directs Secretary of the Interior to consider economic and “other relevant impacts” in determining whether to exclude proposed areas from final designation of critical habitat.
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- The FWS may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of inclusion, provided that exclusion will not result in extinction of a species.
  - Exceptions: “God Squad” and Sikes Act
- Economic analysis (Brookshire, McKee, and Watts, 1994) conducted to compute economic consequences of CH designation for the Colorado River fishes.

# Method of Economic Impact Study

- Regional economic models developed
  - Region (7 State) level model and 7 Individual State level models to evaluate distributional impacts
- Counterfactual – economy without CH
- Impact scenario – economy with CH
- Direct impacts due to:
  - Changes in timing of flows (gauging stations)
  - Reduction of withdrawals (water) from river system

# Method of Economic Impact Study

- **Interdisciplinary** – direct economic impacts computed based on **biological** needs (flows, temperature) and **economic principles** (least costly activities taken first)
- **Direct economic impacts** due to requirements to return flows to historic patterns: agriculture, hydroelectric power generation, some M&I uses
  - Major step: convert flow requirements (cfs) to acre feet (water quantity) to compute direct impacts

# Method of Economic Impact Study

- Direct impacts plugged into regional economic models, to capture the indirect effects, and the results measured as changes in economic output, employment, earnings, and tax revenues
- Impacts projected from 1995 through 2020
- Impacts for whole region and for each individual state – not down to county level in this study

# Impacts of CH on Economy

- Table 2.- Impacts of the Critical Habitat Designation on Employment in Each State and the Colorado River Basin. Employment Impacts Represent Jobs Foregone or Gained in the Future Through the Year 2020. (After Brookshire et al. 1994)

State	1995	2000	2005	2010	2015	2020
Arizona.....	-1.85	-4.68	-7.77	-12.08	-18.86	-25.83
California.....	+19.99	+92.57	+258.48	+475.86	+781.18	+1161.93
Colorado.....	+8.91	+5.16	-6.93	-19.69	-36.86	-55.60
Nevada.....	+34.86	+71.52	+108.03	+143.22	+177.25	+208.69
New Mexico...	-2.17	-27.98	-110.71	-239.60	-415.21	-612.64
Utah.....	-10.91	-22.30	-34.56	-47.71	-61.06	-74.13
Wyoming.....	-0.40	-1.40	-2.41	-3.45	-4.35	-5.22
Colo. R. Basin	+59.94	+116.15	+178.70	+230.02	+294.76	+392.67

- Reference: 50 CFR Part 17, “Endangered and Threatened Wildlife and Plants: Determination of Critical Habitat for Four Colorado River Endangered Fishes, Final Rule” Federal Register, Vol 59 No. 54.

## Impacts of CH on Economy – 2

- Table 3.--Results of Computable General Equilibrium Model for the Colorado River Basin. (After Brookshire et al. 1994)

Variable	Economic impact	% Change
Regional Product.....	+\$7.92 million.....	0.0013
Employment.....	+710 jobs.....	0.0047
Earnings.....	+\$6.62 million.....	0.0017
Govt Revenue.....	+\$3.20 million.....	0.0016

# Exclusion Process of the ESA

- Step 1—Identify areas that meet the definition of critical habitat in section 3(5) of the ESA and that are considered essential to the conservation of the species.
- Step 2—Conduct an economic analysis to determine the anticipated economic consequences of designating areas as critical habitat.
- Step 3—Develop economic criteria or thresholds to help identify those areas that would be significantly affected by the critical habitat designation.
- Step 4—Compile the biological information that should be considered to determine whether excluding an area would result in extinction.
- Step 5—Conduct exclusion process (includes public comments).

# Exclusion Process for Fishes

- FWS evaluated which areas, if any, should be excluded due to economic or other relevant impacts (includes social and cultural).
- Prior to this evaluation, economic criteria in the form of thresholds (Step 3) were developed to provide a method by which the severity of economic impacts could be assessed.
- **No** exclusions were made – impacts did not exceed the threshold



## Exclusion Process – Economic Thresholds

- How to calculate the threshold for significant economic impact? Our approach:
- Computed impacts were evaluated in context of normal fluctuations of economy
- 1959-1991: growth rate of the national economy (measured as percentage change in Gross Domestic Product) varied from -2.2 percent to 6.2 percent – mean growth rate 2.85 percent (SD of 2.26 percent). Average unemployment rate was 5.95 percent (SD=1.52 percent)
- Impacts within this range are judged to be normal fluctuations of economy and able to be absorbed by economy
- Conservative threshold for significant impacts would be a 1 percent deviation from projected baseline – if changes in employment or output due to CH habitat at a State level exceed threshold, then that area of critical habitat should be *considered* for economic exclusion

# Safe Minimum Standard – An Evaluation Tool

- SMS defined (for species protection or other renewable case) – a preservation principle argues for maintaining population above replacement level
- SMS applied – a decision rule based on principle of erring on the side of caution when the results are irreversible and potentially catastrophic UNLESS the costs are intolerable (i.e., there is an “out”) – origin is Ciriacy-Wantrup
- Differs from Benefit Cost Analysis

# Safe Minimum Standard

- BCA approach – compute Net Benefits (Benefits – Cost)
  - Evaluate benefits of species preservation
- SMS conceived of as burden-of-proof device
- Under SMS, preservation is *a priori* beneficial and only to be abandoned (possible extinction) when the economic costs are “intolerable”

# SMS and the ESA?

- ESA provision as implementing the SMS
- Listing – no economic analysis permitted – implied benefits are infinite
- Critical Habitat – economic analysis of impacts required (Section 4)
- Exclusion process – balance preservation against economic losses
  - May incorporate distributional issues\*\*
- “God Squad” exemption process rules
- Sikes Act provisions may be invoked

# Conclusion and Discussion

- Not sufficient to study the legislation only
- Budget allocation determines whether legislation is effective
  - Implementing ESA requires funding for listing activity and also for CH economic impact studies
- Ecosystem protection versus Species preservation – how should the ESA be implemented?

# Conclusion and Discussion

- DoD Military facilities (bases, posts, camps) and endangered species
  - E.g., Fort Bragg, Camp Pendleton, Fort Irwin, US Air Force Academy
  - Response: Sikes Act (amended 1997)
- Native Lands and Endangered Species
- Broader environmental impacts
  - E.g., polar bear versus mountain pika?
- What factors characterize most of the endangered species? What are the implications?

# Some Websites

- <http://www.fws.gov/endangered/bulletin.html>
- <http://www.fws.gov/endangered/wildlife.html>
- <http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=E020> (bonytail)