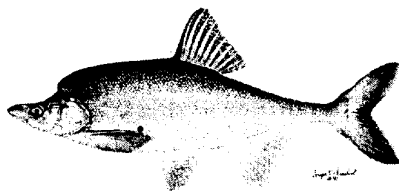


DRAFT RECOVERY GOALS Colorado River Endangered Fishes

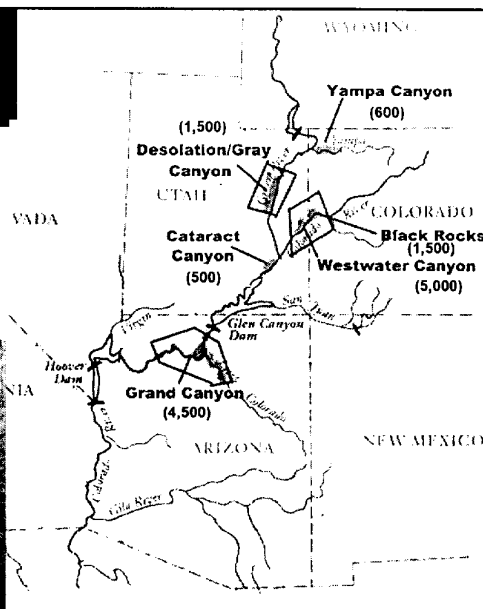
SPECIES	LISTED	RECOVERY PLAN
Humpback chub	1967	1990
Colorado pikeminnow	1967	1991
Razorback sucker	1991	1998
Bonytail	1980	1990

*Critical habitat designated in 1994

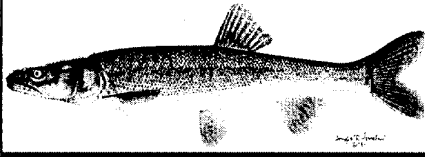
Humpback Chub



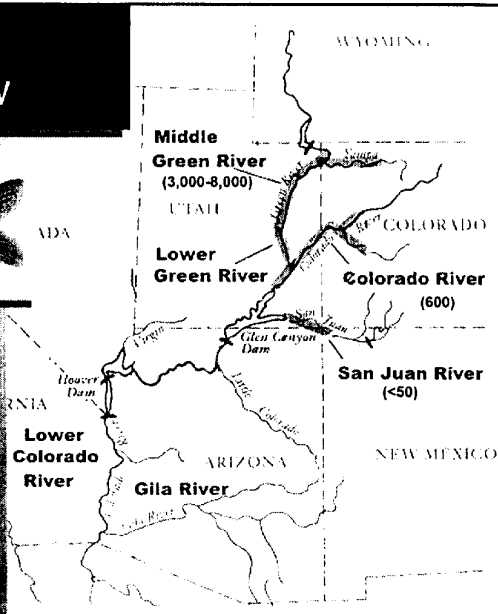
- Restricted to canyon reaches
- Deep water, swift currents, rocky substrates
- Limited movement



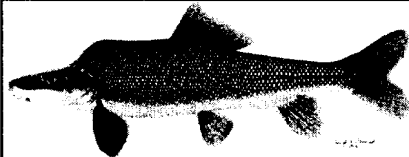
Colorado Pikeminnow



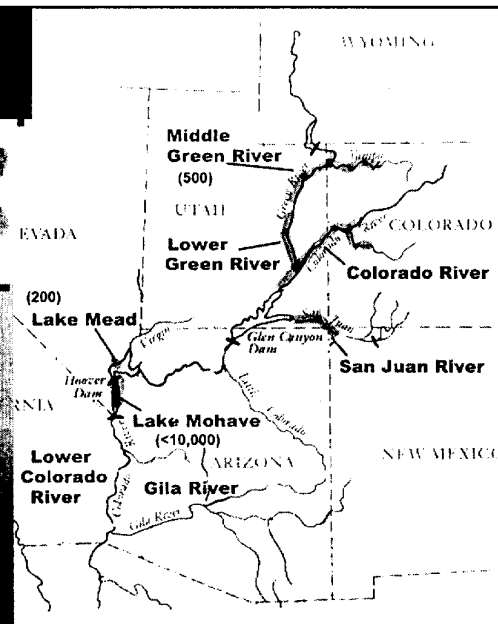
- Widely distributed
- Low-gradient, flat-water reaches
- Backwaters important for young
- Long-distance movements



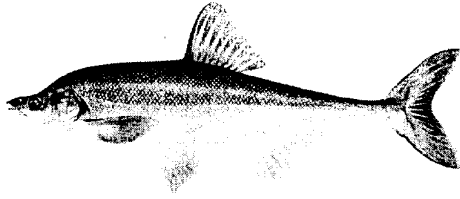
Razorback Sucker



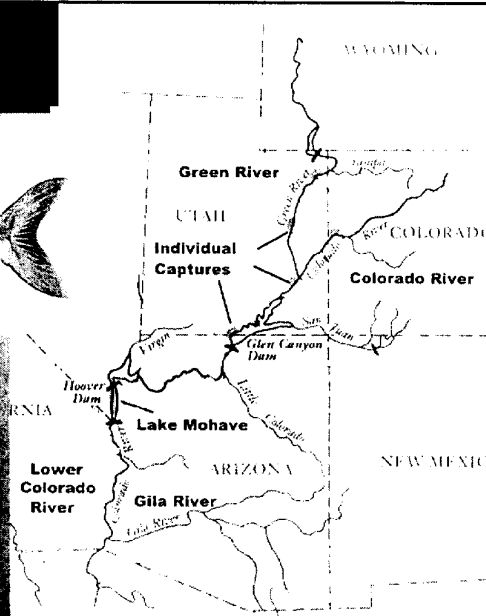
- Widely distributed
- Low-gradient, flat-water reaches
- Floodplains important for all life stages
- Long-distance movements



Bonytail



- Limited information
- Once widely distributed in large rivers
- Observed in pools and eddies



APPROACH Overview

- **The Recovery Process**
 - Defining "Recovery"
 - Recovery Units
 - Development of Recovery Goals
- **Population Viability and Self-Sustainability**
 - Demographic Viability
 - Carrying Capacity
 - Genetic Viability
- **Threats**
- **Recovery Goals**
 - Demographic Criteria
 - Recovery Factor Criteria

The Recovery Process

Defining "Recovery"

- (1) "Recovery is the point at which wild populations are secure and self-sustaining and no longer need ESA protection." (2) "Recovery does not mandate returning a species to all or a significant portion of its historic range nor establishing populations in all possible habitats..."
- ESA Guidelines (e.g., address five listing factors) and Service Policy (e.g., definitions of recovery and conservation)
- recovery approaches for other vertebrate species (i.e., bald eagle, peregrine falcon, desert tortoise, Pacific salmon, and southern sea otter)

The Recovery Process (Continued)

Listing Factors: ESA Section 4(a)(1)

- (A) The present or threatened destruction, modification, or curtailment of its habitat or range
- (B) Overutilization for commercial, recreational, scientific, or educational purposes
- (C) Disease or predation
- (D) The inadequacy of existing regulatory mechanisms
- (E) Other natural or manmade factors affecting its continued existence

The Recovery Process (Continued)

“ Recovery is achieved when management actions and associated tasks (to minimize or remove threats associated with the five listing factors) have been implemented and/or completed to allow genetically and demographically viable, self-sustaining populations to thrive under minimal ongoing management and investment of resources.”

The Recovery Process (Continued)

Classification Categories for Downlisting and Delisting

Endangered – ESA “...any species which is in danger of extinction throughout all or a significant portion of its range...”

- Genetics: numbers too low to maintain genetic viability
- Demographics: populations small; deaths exceed births/recruitment
- Population Redundancy: populations are too few, scattered, or concentrated
- Threats: persistent threats are significant

Threatened – ESA “...any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range...”

- Genetics: numbers sufficient to maintain genetic viability
- Demographics: self-sustaining populations small; lack sufficient recruitment
- Population Redundancy: populations are too few, scattered, or concentrated
- Threats: threats exist over a significant portion of the species' range

The Recovery Process (Continued)

Recovery Units

- Recovery addressed in the Colorado River Basin as a whole
- Recovery criteria presented for each of two “recovery units”
 - Upper Colorado River Basin (above Glen Canyon Dam), including San Juan River subbasin, for Colorado pikeminnow and razorback sucker
 - Lower Colorado River Basin for humpback chub, razorback sucker, and bonytail
 - Unique threats, and separate conservation and recovery programs

The Recovery Process (Continued)

Conservation and Recovery Programs

- Upper Colorado Endangered Fish Recovery Program
- San Juan River Basin Recovery Implementation Program
- Glen Canyon Dam Adaptive Management Program
- Native Fish Work Group
- Lower Colorado River Multi-Species Conservation Program

The Recovery Process (Continued)

Development of Recovery Goals

- Assimilated current data on life history and existing population estimates
- Defined self-sustaining populations
- Identified past and existing threats
- Identified management actions to minimize/remove threats and develop objective, measurable recovery criteria

The Recovery Process (Continued)

Recovery Plan Requirements

ESA Section 4(f)(1)(B)

- Describe necessary site-specific management actions to achieve species' conservation and survival
- Develop objective, measurable criteria that, when met, would result in delisting
- Estimate time and costs to achieve recovery
- *"The Secretary shall...conduct, at least every five years, a review of all species..."*

Population Viability and Self-Sustainability

Cornerstones to Defining a Recovered Species

Demographic Viability

- Characteristics, environmental uncertainty, and catastrophes
- Existing populations
- Populations as redundant units
- Metapopulation

Carrying Capacity

Genetic Viability

Population Viability and Self-Sustainability (Continued)

Genetic Viability

- Contemporary thinking in conservation genetics
 - "*Genetic Effective Population Size*" = number of individuals contributing genes to next generation. Way to judge genetic viability (are populations at risk genetically?)
 - Sex ratio (1:1 humpback chub and bonytail; 3:1 Colorado pikeminnow and razorback sucker)
 - Portion of breeding individuals in population. Ratio for fish from literature = range, 0.013 to 0.90; mean, 0.30
 - Compensated for annual adult mortality
 - "*Minimum Viable Population*" (MVP)

Population Viability and Self-Sustainability (Continued)

Minimum Viable Population (MVP) is defined as
*“a population that is sufficiently abundant and
 well adapted to its environment for long-term
 persistence without significant artificial
 demographic or genetic manipulations”.*

Humpback chub	MVP = 2,100 adults
Colorado pikeminnow	MVP = 2,600 adults
Razorback sucker	MVP = 5,800 adults
Bonytail	MVP = 4,400 adults

THREATS

PRIMARY THREATS	Humpback chub	Colorado pikeminnow	Razorback sucker	Bonytail
Streamflow regulation	X	X	X	X
Habitat modification	X	X	X	X
Nonnative fish negative interactions	X	X	X	X
Parasitism	X			
Hybridization with other <i>Gila</i> species	X			X
Pesticides and pollutants	X	X	X	X

RECOVERY GOALS

Objective, Measurable Criteria

- **Demographic Criteria**
 - MVP
 - Redundancy
 - Metapopulation
- **Recovery Factor Criteria (linked with site-specific management actions and tasks to minimize or remove threats)**
- **Recovery Goals reevaluated at 5-year review of species' status**

Humpback Chub

Demographic Criteria

Downlisting (5 years; monitoring)

- Each population maintained ("no net loss"); and
- One core population in upper basin >2,100 adults*; and
- One core population in lower basin >2,100 adults*

*Currently exceeding number

Delisting (3 years beyond downlisting)

- Each population maintained ("no net loss"); and
- Two core populations in upper basin, each >2,100 adults; and
- One core population in lower basin >2,100 adults

(8 years generation time)

Colorado Pikeminnow Demographic Criteria

Downlisting (5 years; monitoring)

- Green River and upper Colorado River populations maintained ("no net loss"); and
- Green River core population >2,600 adults*; and
- Upper Colorado River population >700 adults; and
- San Juan River establish/maintain 800 adults

*Currently exceeding number

-
- *Lower Colorado River Basin establish/maintain two populations, each >2,600 adults*

Delisting (7 years beyond downlisting)

- Green River and upper Colorado River populations maintained ("no net loss"); and
- Green River core population >2,600 adults; and
- Upper Colorado River population >1,000 adults **OR** upper Colorado River population >700 adults and San Juan River population >800 adults

(12 years generation time)

-
- *Lower Colorado River Basin two populations, each >2,600 adults*

Razorback Sucker Demographic Criteria

Downlisting (5 years; monitoring)

- Establish/maintain populations in Green River and **EITHER** in upper Colorado River or San Juan River, each >5,800 adults; and
- Maintain genetic refuge of 50,000 adults in Lake Mohave; and
- Lower Colorado River Basin establish/maintain two populations, each >5,800 adults

Delisting (3 years beyond downlisting)

- Maintain populations in Green River and **EITHER** in upper Colorado River or San Juan River, each >5,800 adults, and
- Maintain genetic refuge in Lake Mohave, and
- Lower Colorado River Basin maintain two populations, each >5,800 adults

(8 years generation time)

Bonytail Demographic Criteria

Downlisting (5 years; monitoring)

- Establish/maintain populations in Green River and upper Colorado River, each >4,400 adults; and
- Identify genetic variability and establish/maintain genetic refuge in suitable locations in Lower Colorado River Basin; and
- Lower Colorado River Basin establish/maintain two populations, each >4,400 adults

Delisting (3 years beyond downlisting)

- Maintain populations in Green River and upper Colorado River, each >4,400 adults; and
- Maintain genetic refuge in suitable locations in Lower Colorado River Basin; and
- Lower Colorado River Basin maintain two populations, each >4,400 adults

(8 years generation time)

Recovery Factor Criteria

Downlisting Keywords: developed, identified, implemented, evaluated, revised

Delisting Keywords: provided, attained, completed, executed, legally protected

Factor (A): Adequate habitat and range for recovered populations provided

- Flow regimes or environmental conditions
- Passage over barriers (e.g., water diversions)
- Thermal enhancement
- Minimize entrainment (e.g., water diversions)

Recovery Factor Criteria (Continued)

Factor (B): Protection from overutilization for commercial, recreational, scientific, or educational purposes

- Ensure adequate protection

Factor (C): Adequate protection from diseases and predation

- Ensure adequate protection and/or control problematic parasites (e.g., Asian tapeworm in Little Colorado River)
- Control problematic nonnative fishes (e.g., stocking/fishing regulations, escapement from chronic sources, removal)

Recovery Factor Criteria (Continued)

Factor (D): Adequate existing regulatory mechanisms

- Ensure legal protection of flows and/or environmental conditions
- Long-term management/protection through conservation plans

Factor (E): Other natural or manmade factors which no longer affect its continued existence

- Reduce risk of increased hybridization among *Gila* species
- Ensure adequate protection from hazardous-materials spills and/or other water contaminants (shut-off valves on pipelines)