

**THE STATUS, ECOLOGICAL ROLE, AND POTENTIAL FOR
REINTRODUCTION OF SPECIES EXTIRPATED FROM THE COLORADO RIVER
ECOSYSTEM, GLEN AND GRAND CANYONS, ARIZONA:
DRAFT EXECUTIVE SUMMARY 15 March 2009**

Grand Canyon Wildlands Council, Inc.

The loss of native species is one of the three largest human impacts on natural ecosystems. The removal of ecologically important foundation taxa (e.g., dominant trees, abundant prey taxa), keystone species (e.g., those that influence trophic structure and composition), or previously abundant species, as well as the substitution of non-native taxa in those roles, affects the structure, composition, function, resilience, and goods and services of the ecosystem. Understanding the distribution and ecological roles of native species no longer present in altered ecosystems, such as the Colorado River ecosystem (CRE) in Glen and Grand Canyons is limited by uncertainties about the pristine condition of populations and ecosystem structure; nonetheless, ecosystem management and rehabilitation requires accounting for missing species and functions that characterized the natural ecosystem. Decisions about which native species and functions should be and can be restored, and which non-native species can be tolerated, remains the purview of well-informed ecosystem stewards.

Like other great landscape parks, Grand Canyon National Park has lost native species despite its highly protected status (Newmark 1995; Stevens et al. 2001). Much ecological attention has been paid to dwindling populations of endangered CRE big river fish (i.e., Humpback Chub – HBC, *Gila cypha*; Minckley 1991; Valdez and Ryel 1997; Stone and Gorman 1999) and birds (e.g., Southwestern Willow Flycatcher – WIFL, *Empidonax trailii extimus*; summarized in Paxton et al. 2007), but the fate of the other declining or extirpated species has been largely ignored. Federally endangered species do not necessarily serve as adequate ecological “umbrellas”, protecting other species or ecosystems (Angelstam and Roberge 2004), particularly in complex landscapes like the canyons of the Colorado River (Stevens et al. 2001). Extirpated species that are not federally listed may have important ecological roles, and their loss may greatly compromise ecosystem function. Also, little scientific attention has been paid to the distribution and status of rare and endemic taxa in Grand Canyon, particularly invertebrates, for which few status or life history data exist, and which can be jeopardized by insensitive resource management practices (Stevens and Polhemus 2008).

Goal 3 of the Glen Canyon Dam Adaptive Management Program is to “Restore populations of extirpated species, as feasible and advisable.” To move forward on that goal, Grand Canyon Wildlands Council, Inc. (GCWC) has incorporated data from Grand Canyon National Park (GRCA), and Glen Canyon National Recreation Area (GLCA) on extirpated or at risk species. Preliminary analysis of those data suggest that at least 34 species of plants and animals may have been extirpated from the CRE or may have seriously declined there since the closure of Glen Canyon Dam in 1963, and the fate of at least 6 other species in the CRE is uncertain. This list includes at least: 2 plants, 5 invertebrates, 5 fish, 2 amphibians, 1 reptile, 8 birds, and 11 mammal species. GCWC looks forward to further discussion with the NPS to complete these preliminary analyses in the near future.

A more complete review of information on the distribution, status, ecological role(s), and potential for reintroduction of extirpated species and other taxa of management concern is warranted to better understand and manage the CRE as an ecosystem. In the white paper GCWC is completing on Goal 3, we will present a list of the CRE species known to have been extirpated, those apparently nearing extirpation, and those for which insufficient data exist to determine status. We will describe distribution, ecological role(s), status, potential for reintroduction, and the quality of information available on those CRE species. We will introduce a motion to the Adaptive Management Work Group at the spring 2009 meeting to improve the information base on extirpated or declining taxa, the potential for reintroduction of extirpated species, and the compliance requirements of agencies participating in reintroduction efforts to be undertaken.

REVISITING AMP GOAL 3:
ISSUES AND A PRELIMINARY ANALYSIS OF
EXTIRPATED OR AT-RISK SPECIES
IN THE COLORADO RIVER ECOSYSTEM
DOWNSTREAM FROM GLEN CANYON DAM

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- Legal issues, guidance
- Species lists
- Case studies
- How to address Goal 3

AMWG VISION AND MISSION
Adopted by the Glen Canyon Dam Adaptive
Management Work Group
July 21, 1999

The Grand Canyon is a homeland for some, sacred to many, and a national treasure for all. In honor of past generations, and on behalf of those of the present and future, we envision an ecosystem where the resources and natural processes are in harmony under a stewardship worthy of the Grand Canyon.

We advise the Secretary of the Interior on how best to protect, mitigate adverse impacts to, and improve the integrity of the Colorado River ecosystem affected by Glen Canyon Dam, including natural biological diversity (emphasizing native biodiversity), traditional cultural properties, spiritual values, and cultural, physical, and recreational resources through the operation of Glen Canyon Dam and other means.

We do so in keeping with the federal trust responsibilities to Indian tribes, in compliance with applicable federal, state, and tribal laws, including the water delivery obligations of the Law of the River, and with due consideration to the economic value of power resources.

This will be accomplished through our long-term partnership utilizing the best available scientific and other information through an adaptive ecosystem management process.

AMP GOAL 3

*Restore populations of extirpated species,
as feasible and advisable.*

The only IN for Goal 3 is RIN 3.1.1:

What information (including technical, legal, economic, and policy issues) should be considered in determining the feasibility and advisability of restoring pikeminnow, bonytail, roundtail chub, river otter, or other extirpated species?

Restoration Perspectives:
What can be restored in the CRE?

- "Past Nature" – stewardship of the pristine condition
- "Present Nature" – management of a naturalized ecosystem (*sensu* Schmidt et al. 1998)
- "Future Nature" – ecosystem develops in the absence of future human intervention

Management for "Future Nature" may yield a "Silent Forest" – high quality habitat with low faunal biodiversity

BIODIVERSITY CONSERVATION IN THE CRE

- ~ 800 plant species
- ~ 10,000 invertebrate species
- ~ 350 vertebrate species

EXTIRPATED OR DECLINING SPECIES

- Which species have been lost in post-dam time and why ?
- Which are declining and why ?
- Is there potential for restoring missing populations ?

Grand Canyon MIA or Declining Plant Species

NPS Rare or Extirpated Species List	FWS Endangered Species List	GCWC Focal Species
	7 plant species of special concern (formerly category 2 species) 26 vascular plants are of management concern due to their limited distribution	7 plant species of special concern (formerly category 2 species) 26 vascular plants are of management concern due to their limited distribution
Bear Valley sandwort		Bear Valley sandwort
MacDougall's Flaveria		MacDougall's Flaveria
25 other rare or endemic vascular plants		Numerous cacti and other plants
		Salix gooddingii
	Sentry Milkvetch	Sentry Milkvetch
		Yerba-mansa

(Text in bold are extirpated or declining species in the CRE; other species are species of concern elsewhere in GRCA)

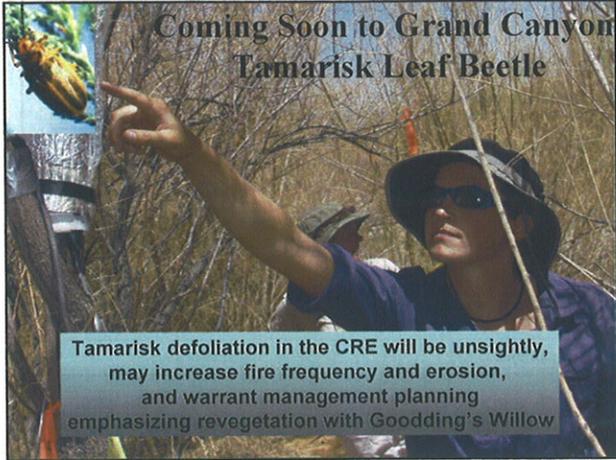
McDougall's Flaveria: a rare springs plant



Goodding's Willow (*Salix gooddingii*)



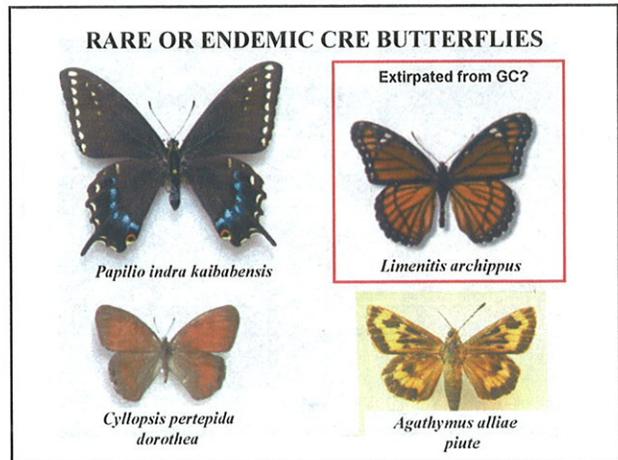
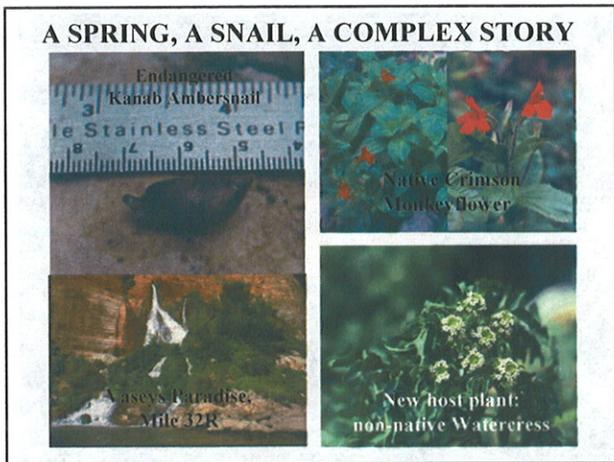
Once relatively common along wide reaches of the Colorado River in Grand Canyon, now gone from 7 of 18 post-dam sites, with most plants in dire health and no recruitment; losses due to increased beaver attack and possibly flow alteration.



Invertebrates

NPS Extirpated Species List	FWS Endangered Species List	GCWC Focal Species
	Kanab ambersnail E	Kanab ambersnail E
		Arizona Wetsalts Tiger Beetle (endemic)
		Grand Canyon Ringlet Butterfly
		Kaibab Indra Swallowtail
		Masked Club-skimmer (endemic)
		Viceroy Butterfly
		Vulcans Well Waterbug (endemic?)
		Many rare species

(Text in bold are extirpated or declining species in the CRE; other species are species of concern elsewhere in GRCA)



**ENDEMIC, SMALL POPULATIONS, NO MONITORING,
STATUS UNCERTAIN**



"Masked Clubskimmer
(LIBELLULIDAE: *Brechmorhoga pertinax*)"
Stone Creek to Nankoweap Creek.



Wetsalts Tiger Beetle
(CICINDELIDAE:
Cicindela haemorrhagica arizonae)
Stone Creek to Nankoweap Creek.



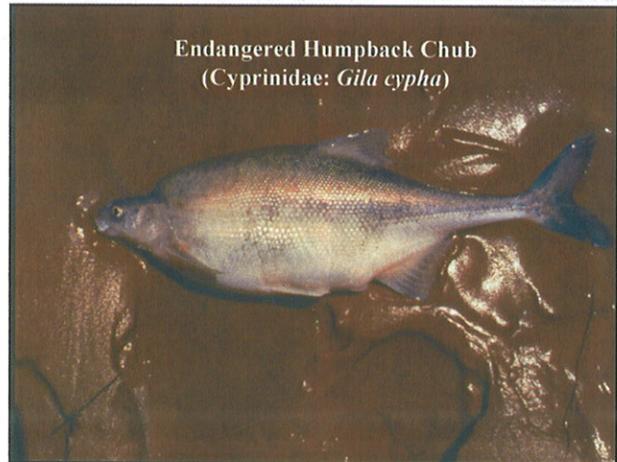
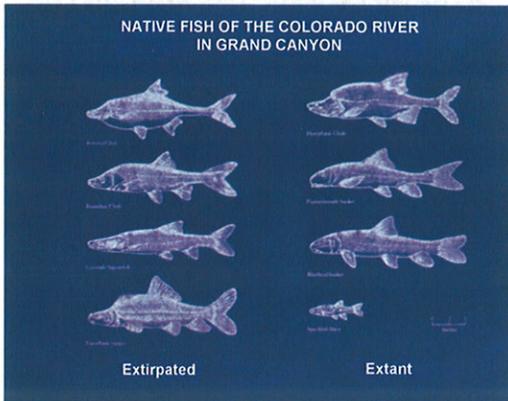
Vulcans Well Giant Waterbug
(BELOSTOMATIDAE:
Belostoma flumineum new ssp?)
One spring along river, taxonomy?

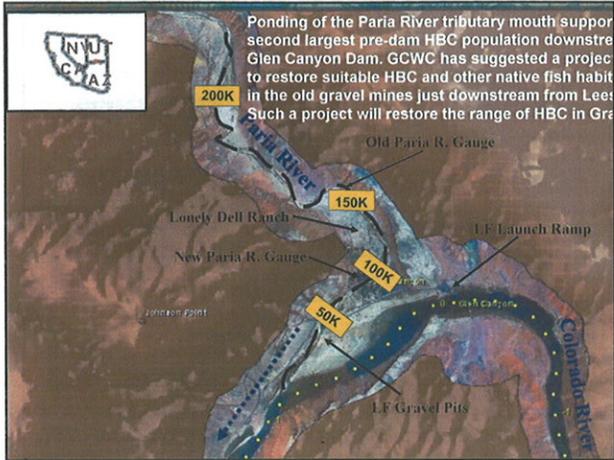
FISH

NPS Extirpated Species List	FWS Endangered Species List	GCWC Focal Species
Bonytail chub E		Bonytail chub E
Colorado pikeminnow E		Colorado pikeminnow E
	Humpback Chub	Humpback Chub
	Little Colorado River Spinedace	Little Colorado River Spinedace
Razorback sucker E	Razorback sucker E	Razorback sucker E
Roundtail chub		Roundtail chub

(Text in bold are extirpated or declining species in the CRE;
other species are species of concern elsewhere in the GC region)

**NATIVE FISH OF THE COLORADO RIVER
IN GRAND CANYON**





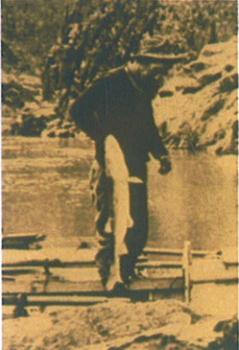
OTHER FISH SPECIES MISSING FROM GRAND CANYON



Bonytail Chub



Razorback Sucker



Colorado Pikeminnow

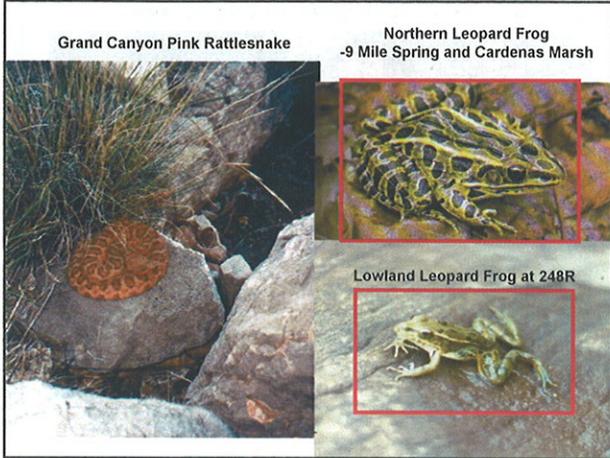
Other Species of Management Concern



HERPETOFAUNA

NPS Extirpated Species List	FWS Endangered Species List	GCWC Focal Species
Northern Leopard Frog		Northern leopard frog
		Lowland Leopard Frog
	Desert Tortoise	Desert Tortoise
		Zebra-tailed lizard
		Western Blind Snake

(Text in bold are extirpated or declining species in the CRE; other species are species of concern elsewhere in GRCA)



BIRDS

NPS Extirpated Species List	FWS Endangered Species List	GCWC Focal Species
	Yuma Clapper Rail	
	Bald Eagle	Bald Eagle
		Brown Pelican E
		Burrowing owl
	California condor E*	California condor E*
	Mexican Spotted Owl	Mexican Spotted Owl
		Peregrine Falcon
		Pileated woodpecker
		Sage grouse
	Southwestern willow flycatcher E	Southwestern willow flycatcher E & Extptd
		Yellow-billed cuckoo

(Text in bold are extirpated or declining species in the CRE; other species are species of concern elsewhere in GRCA)

Southwestern Willow Flycatcher

- One of ~ 30 nesting neotropical migrant bird spp. in GC
- Extirpated from historic range
- BH Cowbird brood parasitism
- Commonly nest in non-native tamarisk

CALIFORNIA CONDOR

Reintroduced into the Grand Canyon region, now common along the Colorado River

Bald Eagle

- Winter along CR in GC upstream from LCR and at several tribs downstream
- Feed on trout
- Feeding aided by fluctuating flows
- Easily disturbed by passing boats
- Present status in GC?



Peregrine Falcon

- Largest breeding population on any land management unit in the 48 states
- 90 % of prey biomass is waterbirds, mostly related to post-dam clearwater flow



MAMMALS

NPS Extirpated Species List	FWS Endangered Species List	GCWC Focal Species
		Black Bear
Black-footed Ferret	Black-footed Ferret	Black-footed Ferret
Grizzly Bear	Grizzly Bear	Grizzly Bear
Jaguar	Jaguar	Jaguar
		Miriam Elk
		Muskrat
Gray Wolf	Gray Wolf	Plains Gray Wolf
		Prairie Dog
		River otter
		Badger

(Text in bold are extirpated or declining species in the CRE; other species are species of concern elsewhere in GRCA)

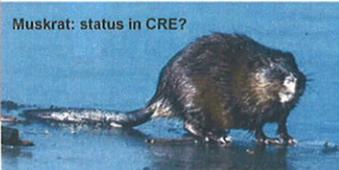
MISSING MAMMALS



Colorado River Otter
Extinct? Role as mammalian
fish predator



Badger



Muskrat: status in CRE?

A PROPOSED PLAN TO ADDRESS GOAL 3: Employing an ecosystem approach requires understanding the changing distribution and status of ecologically important species

- Evaluate extent of knowledge (overview) – add task to GCMRC 5-yr MRP, with work to be conducted in 2010
- TWG review report; assess potential for reintroduction of extirpated species--TWG Ad Hoc and AMWG-GCMRC-SA discussions
- Address information gaps, reintroduction strategies, responsibilities: TWG Ad Hoc and AMWG-GCMRC-SA discussions
- Acquire funding and implement restoration activities
 - From AMP if relevant and advisable
 - And/or from other agencies and other sources