

**QUESTIONS FOR THE KAS REVIEW PANEL
(REVISED SEPTEMBER 2, 1999)**

1) STATEMENT: There currently appears to be no evidence of genetic exchange between ambersnail populations in the Colorado River drainage, although there may have been some exchange in past millennia in order for several geographically separate populations to have become established. Genetic dissimilarity with other *Oxyloma haydeni* populations in the Colorado River drainage further supports this contention (Miller et al. in press). Kanab ambersnail (KAS) taxonomy has been based on internal and shell morphology, and is being revisited through molecular genetic techniques.

QUESTIONS:

- (1A) Is it appropriate to identify ambersnails exclusively, or primarily, based on morphological characteristics?
- (1B) What is the current understanding of KAS distribution in northern Arizona and southern Utah based on genetic analyses?
- (1C) Is the Vaseys Paradise (VP) population unique?
- (1D) How do recent discoveries, experimental results, and observed findings alter the current understanding of ambersnail taxonomy for populations in the Grand Canyon region?
- (1E) In seeking to establish additional populations of KAS at new sites in Grand Canyon, would it contribute to genetic exchange and population viability to translocate snails from more than just the VP site?
- (1F) Is inbreeding a significant risk factor for the translocated VP KAS?

2) STATEMENT: In reference to the VP KAS, the 1994 biological opinion states:

The KAS population also has wide seasonal and annual fluctuations. This is the only known population of the KAS in a wilderness setting and the survival of this population is critical to the species (U.S. Fish and Wildlife Service 1994b). Because the lower areas of KAS habitat can be quantified, incidental take will assume to be exceeded if more than 10% of the occupied habitat in Grand Canyon will be inundated by high flows or a controlled flood.

QUESTIONS:

- (2A) What is the natural mechanism of dispersal for KAS or similar snail species to expand their range?
- (2B) Is this dispersal enhanced or depressed by dam operations?
- (2C) How was the VP population able to recover and reinhabit VP after extreme high flow events before the dam was built?

3) STATEMENT: Annually variable amounts of the habitat at VP, lying below the 45,000 cfs stage, consists of mixed vegetation patches dominated by horsetail (*Equisetum* spp.), common reed (*Phragmites australis*) and other species that could be considered secondary habitat for KAS. These

patches are little used by KAS, and are somewhat resistant to scour, having persisted through the 1996 Beach/Habitat-Building Flow (BHBF) and the high flows (up to 33,000 cfs) of 1997 and 1998.

QUESTIONS:

- (3A) Is it appropriate to distinguish primary and secondary habitats, and extent of use, or is it enough to know that the snails use it, therefore it's of critical value?
- (3B) What are the critical biotic and abiotic characteristics of the VP site that create unique habitat for KAS only at this location in the Canyon?

4) STATEMENT: In Arizona, KAS has apparently been restricted to VP in the Grand Canyon National Park. No other wild KAS populations have been detected at more than 100 other springs/seeps in the Grand Canyon region, surveyed from 1992-1998. This may suggest that the VP KAS population, like many southwestern spring species, is a Pleistocene relict which has become restricted in distribution as the Holocene climate dried out. KAS habitat at VP has expanded post-dam as a result of human intervention (river management). Current ecosystem management efforts call for re-establishment of a more natural flooding regime (magnitude and frequency). VP KAS evolved under conditions of frequent high magnitude flooding. Floods of 200,000 - 300,000 cfs have occurred within the last 150 years, and floods of 90,000-100,000 cfs occurred almost annually pre-dam, and also happened in 1983. KAS typically experience large annual reductions in population size. Three years of population data indicate that the KAS population undergoes a substantial reduction through over-wintering mortality. Natural winter mortality may reduce the KAS population by 25%-90% (Kanab Ambersnail Interagency Work Group 1998).

QUESTIONS:

- (4A) What percentage of snails can be lost in one year, or consecutive years, without adverse long-term consequences to the population (given the high inter-annual variability in population size)?
- (4B) Given the recent information on KAS population status and ecology, should the 10% take limit of VP habitat still apply to current management of Glen Canyon Dam operations?
- (4C) What percentage of habitat protection is appropriate to ensure long-term survival of the VP KAS population?

5) STATEMENT: VP habitat area is likely to be reduced by floods over 32,000 cfs, with floods of up to 60,000-90,000 cfs being considered. Even with flows of those magnitudes, the total area of habitat that would remain would still equal or exceed the total area present as recently as 1984. Rematched historical photographs of VP (e.g. Turner and Karpiscak 1980) reveal that vegetative cover has increased greatly at lower stage elevations since completion of Glen Canyon Dam, and that flow regulation by the dam has increased primary KAS habitat area at VP, below the pre-dam 10-year flood stage of 125,000 cfs, by more than 40%. Furthermore, all vegetation below the approximate 90,000 cfs stage was scoured by annual pre-dam floods in normal years. Assuming KAS had always existed at VP historically, the VP population has survived numerous larger floods both before and after dam construction. KAS habitat has recovered within six months following the 1996 flood, down

to the 32,000 cfs stage, although the composition of primary and secondary vegetation had changed. In the following year and a half, flood zone habitat was dominated by secondary vegetation that was used less frequently (seasonally) by KAS.

QUESTIONS:

- (5A) Can we establish or predict what level of habitat destruction would most likely have long-term adverse consequences to a local KAS population or to the species throughout its range?
- (5B) What information is necessary to establish a population viability index for KAS, with a reasonable degree of confidence?
- (5C) Is the time it takes for habitat to recover critical to the viability of the KAS population?
- (5D) If the VP habitat (KAS host plants) are somehow protected from flood scour, can KAS in the affected habitat withstand 2-4 days of inundation and displacement from river currents?

6) **STATEMENT:** The Endangered Species Act requires that any action funded, authorized by, or carried out by a federal agency should not jeopardize an endangered or threatened species. During the 1996 experimental BHBF, and as currently drafted in the KAS Contingency Plan, impacts to KAS are mitigated by physically moving them out of harms way. During 1996, that meant moving them up above the peak flow stage, but still within VP. For future actions, that could involve moving KAS to higher ground at VP, to other locations within Grand Canyon where establishment is being pursued, and/or moving KAS to zoological or academic refugiums.

QUESTIONS:

- (6A) Is moving an endangered species an appropriate, ongoing method to protect the species?
- (6B) Are there other options?

7) **STATEMENT:** KAS at VP and Three Lakes are parasitized by the trematode flatworm, *Leucochloridium cyanocittae*, with 1% to 9.5% of the mature snails expressing sporocysts in mid-summer from 1995 through 1997 (Stevens et al. 1997b, Kanab Ambersnail Interagency Work Group 1997 a,b; V. Meretsky personal communication). Parasitized KAS are apparently able to continue to reproduce. It appears that this parasite has evolved naturally with KAS, and is self-regulating in its infestation rate and impact on KAS populations. We have evidence that it occurs at both VP and Three Lakes, and believe the determinate hosts are migratory birds that range across the region.

QUESTIONS:

- (7A) What measures should be undertaken when introducing KAS to new locations to reduce parasite infection?
- (7B) Should the parasite also be intentionally (or incidentally) moved, or should efforts be taken to use only parasite-free specimens?
- (7C) Are there risks of adverse effects on snail species already inhabiting sites for KAS introduction?

8) STATEMENT: In the biological opinion for the 1996 experimental beach/habitat-building flow, the Fish and Wildlife Service included the following reasonable and prudent measure:

Before another habitat-building flow, Reclamation will enter into informal consultation with the Service to evaluate test flow studies, the establishment or discovery of a second population of Kanab ambersnail in Arizona, and reinstate formal consultation with the Service if incidental take will exceed the 10 percent as established in the 1995 biological opinion.

The following was subsequently proposed as a definition of establishment of a second population of Kanab ambersnail proposed by FWS on July 2, 1998:

The establishment of a new wild population of the Kanab ambersnail can be considered successful when:

- (1) the population densities, fecundity, and recruitment are similar to those of the parent population at VP;
- (2) habitat remains suitable while accommodating environmental uncertainties including changes in weather, food supply, predators, and other factors; and
- (3) the trend of population growth must be positive or at equilibrium with the available habitat for a certain period of time, perhaps three (3) years.

The Service requires 10 populations of KAS throughout its range before downlisting can occur. Whether a species is listed as endangered or threatened, it is still afforded the same amount of protection under the Endangered Species Act. Currently, there is no criteria for delisting KAS from T&E status.

QUESTIONS:

- (8A) In attempting to establish new populations, what period of time (persistence) or number of successful generations is reasonable to consider the population a success?
- (8B) How close geographically can ambersnail populations be to each other and still be considered distinct?
- (8C) Could genetic variances in newly discovered KAS congregations be considered significant enough to change our assessment of the number of known KAS "populations"?
- (8D) What should be the boundaries for establishment efforts--historic ranges versus state/political boundaries?
- (8E) Should establishment efforts concentrate within the known geographic range or extend outside this range?

Contributors:

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Kanab Ambersnail (KAS) Workshop

When: December 1-2, 1999 (8am-3pm) (Dec 3 is a closed session for the review panel only)

Where: The Phoenix Zoo Stone House Group Pavilion in Phoenix, Arizona

Where to stay: La Quinta Inn (1-800-687-6667 or 602-967-4465)--block of rooms reserved
911 South 48th St., Tempe, AZ (free airport shuttle available)

How to get there: Bowers Travel (1-800-229-8755) is contracted to make air travel reservations

* Please identify yourself with the KAS workshop when making travel & hotel reservations, so we can take advantage of special rates & reserved rooms--deadline is September 30!

The following individuals have been selected to participate on the KAS expert review panel:
Dr. Mark Gordon, Dr. Elaine Hoagland, Dr. Charles Lydeard, Dr. Patricia Mehlhop, Dr. Reed Noss, and Dr. Barry Roth.

Invited speakers on recent KAS research may include: Dr. Paul Keim, Dr. Vicky Meretsky, Dr. Lawrence Stevens, and Dr. Shi-Kuei Wu. (This list is not final)

The workshop will be co-facilitated, and videotape will be used to record the proceedings. Dave Wegner has agreed to be one of the two facilitators. Both USBR & WAPA have offered to provide the second facilitator.

The deadline to submit questions, comments, related documents & information for distribution is October 25. Jeff Sorensen is compiling reading material for the review panel.

If you do not plan to attend, please let us know soon...someone else may want your reserved room. Thank you.

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