

2012 Report of the Hopi Long-Term Monitoring Program for Öngtupqa (the Grand Canyon)

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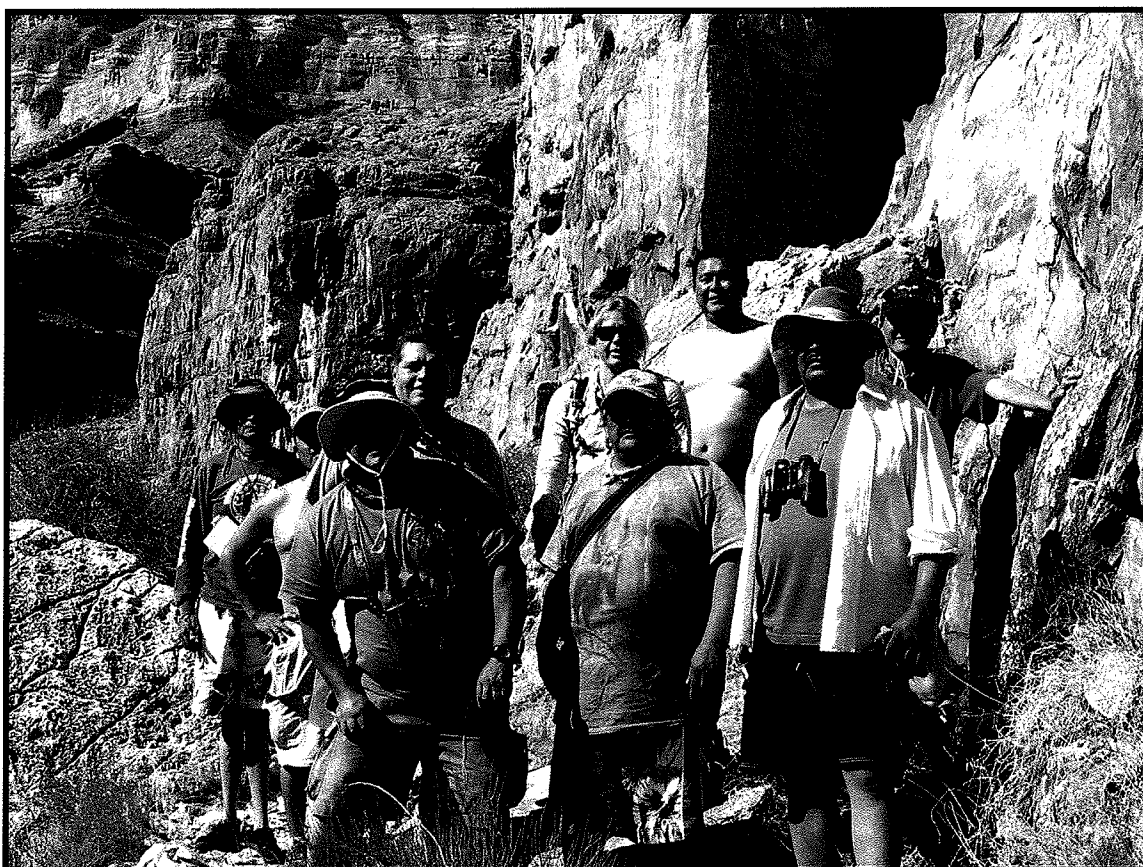
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Hopi 2012 monitoring crew.

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approach; how many fish there are, their size, the temperature of the water, its clarity, how many millions of tons of sand are in the system, the amount of vegetation coverage, etc. Whether a given resource “state” is healthy, however, is a cultural evaluation, drawing on the cultural understanding of the system and the roles the resource plays within the system and society, in this case the Hopi society. The long-term goal of the program is to measure resource health through time in a way that reflects Hopi cultural values and their understanding of the ecosystem, is scientifically defensible, and in the future, can be statistically evaluated.

Protocols

The philosophy, design, and protocols to implement the Hopi Long-term Monitoring Program are presented in detail in Yeatts and Huisinga (2007); the following summarizes some of the key methodologies. The foundation of the Hopi Long-term Monitoring Program is a survey-based approach to record Hopi impressions of resource health. Standardized survey instruments are used to record the opinions of Hopi informants about the health of culturally important resources in *Öngtupqa*. These surveys are conducted following a standardized presentation that relays the current knowledge about the states of the culturally important resources (primarily as documented through western scientific studies), the perceptions of Hopis involved in previous monitoring episodes, and any management actions that are being undertaken or proposed. These general surveys can be given to any Hopis at any time or place. In addition, more detailed surveys are completed following direct examination of the resources in *Öngtupqa* by a subset of Hopi people who can participate in the annual resource monitoring river trips. To the greatest extent possible, the Hopi Long-term Monitoring Program relies on information about the resource states obtained through the Grand Canyon Monitoring and Research Center scientific studies, Grand Canyon National Park Service monitoring, and any other relevant research. This approach seeks to minimize the impacts to the resources from multiple, overlapping field studies of the same resources and to recognize the spiritual danger of entering *Öngtupqa* for the Hopi people. In the development of this monitoring approach, the Hopi Tribe worked with other researchers conducting monitoring in order to maximize the relevance of their data to the Hopi analysis (Huisinga and Yeatts 2003).

Specifically, data about the status and trends of culturally important resources is annually summarized into a standardized presentation that is presented to various constituencies of the Hopi Tribe (the full presentation format is provided in Yeatts and Huisinga 2007; see also Appendix 1). Following the presentations, written surveys are completed which assess resource health based on the information provided during the presentation. The surveys include categories for narrative, yes/no, and demographic response data. This information provides the basis for the resource health assessment. In addition, supplemental interviews and discussions provided further detail to better understand the responses and to expand on cultural values underlying the responses. These can also provide management recommendations that don’t necessarily get coded in the surveys.

A vital aspect of the Hopi Long-term Monitoring Program is the annual resource monitoring trip undertaken by a small number of Hopi consultants who travel into *Öngtupqa*. The same surveys that are given to the larger Hopi public are conducted pre-trip and then an additional post-trip survey is administered to ascertain changes in responses that direct interaction with the resources may produce (referred to as “**general**” and “**post-trip**” surveys hereafter). During the development of the survey instrument, it became apparent that for a number of the resources, Hopi people did not feel confident in making a health assessment without actually seeing the resource. Therefore, the general survey contains a subset of the questions that are asked on the post-trip survey. Finally, the Hopi monitoring trip provides for monitoring of resource attributes that cannot be accomplished by western scientists (eg. spiritual/cultural values).

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DATA ANALYSIS

Data collected in the form of surveys or interviews is entered into the Nvivo8® database for further processing, consolidation, trend analysis, pattern searching, and ultimately statistic analysis. Since the beginning of the monitoring, a total of 195 surveys have been entered into the database and form the basis for this analysis. This includes information from 111 different Hopi individuals, and 11 non-Hopis (only the information collected from Hopi participants is included in the subsequent analyses). Table 1 summarizes this information.

Table 1. Summary of all Survey Data.

	Number of people	Total # of surveys
GC River Trip 2003	8	16
GC River Trip 2004	6	9
GC River Trip 2006	8	16
GC River Trip 2007	9	18
GC River Trip 2008	9	16
GC River Trip 2009	8	14
GC River Trip 2010	9	17
GC River Trip 2011	11	22
GC River Trip 2012	7	14
SJ River Trip Women 2009	9	13
CRATT	12	12
Hopi Natural Resources	3	3
Hopi Tribal Council	9	9
Misc Hopi participants	3	3
Non-Hopi participants	11	13
Total Hopi	111	182
Total people including non-Hopi	122	195

Table 2 presents a summation of all the responses to the questions asked on the survey. This information provides snapshot of the overall distribution of responses and provides an introduction to the response categories that are used in this document. In general, a “Yes” response indicates that a resource is considered healthy, a “No” response that it isn’t, and the remaining responses indicate that the respondent was uncertain about the resource health or had a more nuanced assessment. It should be noted that in the analyses of the individual resource questions in later portions of the report, responses including “Don’t Know,” “Yes and No” to a single question, and where there was no response to a question (**Blank**) are grouped together into a single “Other” category for graphical presentation. This was done because all of these types of responses indicate a hesitancy to evaluate the resource as good or bad, and so was reflecting a similar category of response.

in fact be trending towards decreasing health and this is important to know in order to effect a management change before the situation becomes irreversible. Therefore, the next two sections of the report look specifically at the resource trends in the monitoring data. The first section looks at the results for each individual resource or resource class that has been identified as culturally important to the Hopi people. The second section addresses the Hopi perception of activities that could be classified as “management” in nature. These include things such as recreation, data recovery at archaeological sites and non-native removal activities.

All figures displaying trend information for the remainder of the report portray two temporal spans. The thin lines represent the best-fit line over the entire period for which data has been collected and the thick lines are the trend over the last four monitoring episodes. This display format was done to explore any differences in short and long term perspectives. As the temporal span of the data collection gets long enough, it is anticipated that the slopes of the long-term trend lines will tend to center around zero and their relative positions (y-intercept) will stabilize. These will then represent something of a “baseline” condition. On the other hand, the trend line over the previous four monitoring episodes will reflect a more timely assessment of the system and highlight deviations from the long-term trend. The selection of four years for the duration of the short-term trend is somewhat arbitrary, but is felt to be short enough to capture the recent views as to system health, but at the same time to be long enough to even out stochastic variability. A consistent deviation in the direction of the short-term trend from the long-term trend may indicate that an issue is arising that may need to be addressed and changes in the relative positions of the lines with respect to each other could indicate a fundamental change in how the health of the resource is viewed.

The y-axis in all the following trend figures portray the normalized response rates for each question ($[\text{number of responses in category}]/[\text{total responses to question}]$). This was done to make inter-annual comparisons equivalent given that different numbers of people responded to the survey in differing years.

Overall Health

Survey Question:

-Do you think *Öngtupqa* (Grand Canyon) is better cared for now than in the past?

Yes No Don't Know

Table 3. Is *Öngtupqa* Better Cared for Now than in the Past

	Yes	No	Yes and No	Don't know	Blank
2003 surveys	5	2	1	8	2
2004 surveys	13	3	1	5	1
2006 surveys	9	0	0	7	0
2007 surveys	13	1	1	3	0
2008 surveys	8	3	2	2	1
2009 surveys	11	1	0	6	1
2010 surveys	12	1	0	4	0
2011 surveys	23	0	0	9	0
2012 surveys	11	0	1	2	0
Total	105	11	6	46	5
Percent	60.69%	6.36%	3.47%	26.59%	2.89%

values for what is considered healthy by the Hopis rather than being attributable to physical changes occurring in the resources.

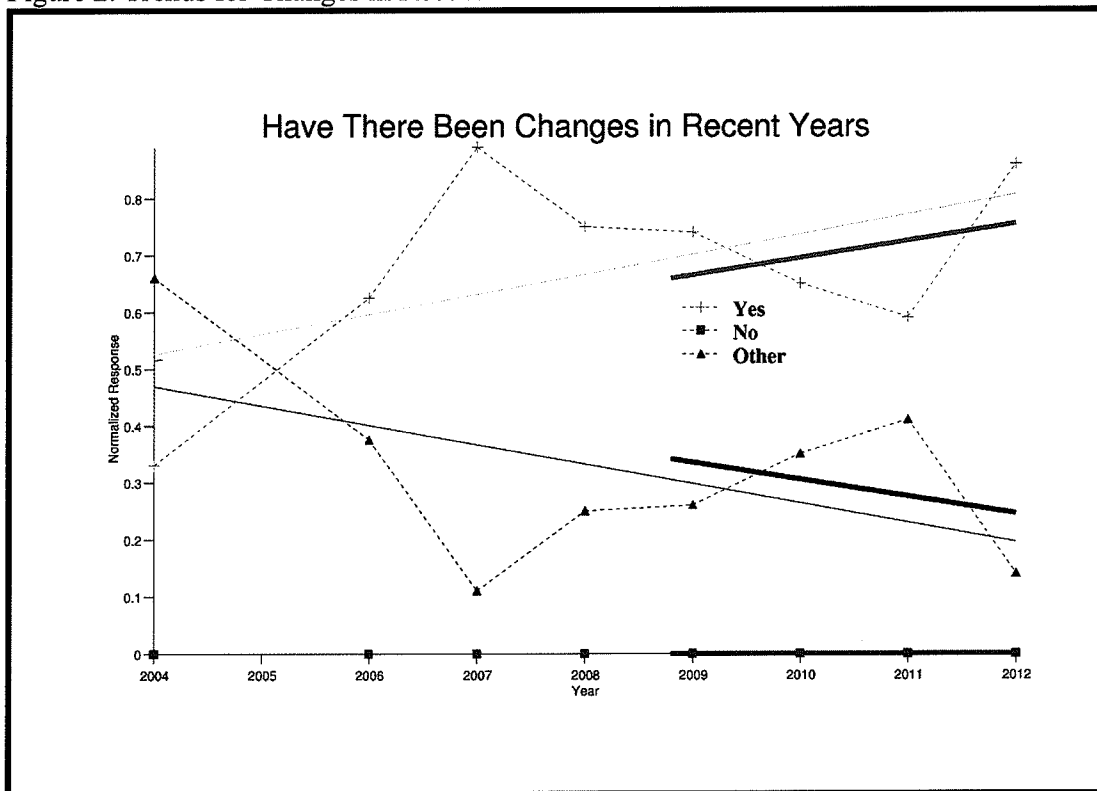
Question:

- Do you think there have been changes in *Öngtupqa* in recent years?
Yes or No or Don't Know

Table 4. Have There Been Changes in Recent Years

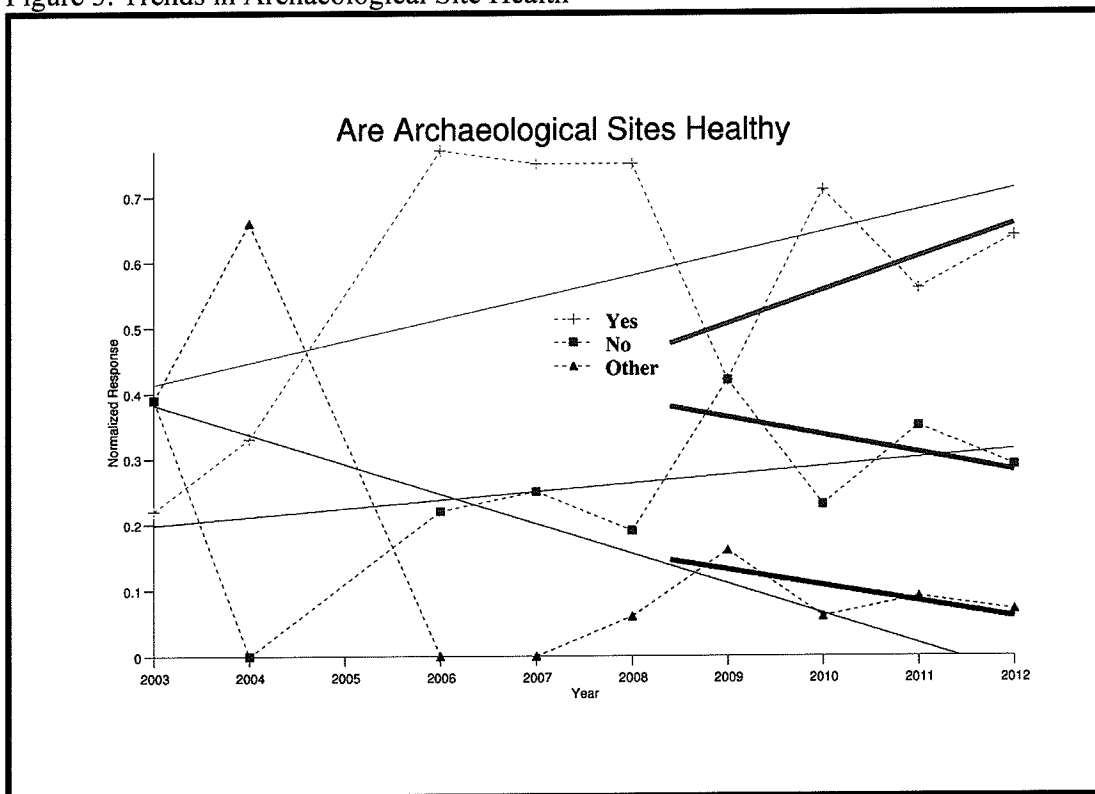
	Yes	No	Yes and No	Don't Know	Blank
2004	2	0	0	4	0
2006	5	0	0	3	0
2007	8	0	0	1	0
2008	12	0	0	4	0
2009	14	0	0	5	0
2010	11	0	0	6	0
2011	19	0	0	13	0
2012	12	0	0	1	1
Total	83	0	0	37	1

Figure 2. Trends for Changes in Recent Years



As in past years, none of the survey respondents felt that change did not occur in *Öngtupqa* (Table 4, Figure 2). The direction of the short-term trend line for “change is occurring” (Yes) has reversed direction from last year to once again mirror the long term trend, that is, increasing certainty that changes are in fact occurring in the system. Discussions with river trip participants and narrative responses on the surveys indicate that the **Other** category is selected by respondents not

Figure 3. Trends in Archaeological Site Health



Both the short-term and long-term trends show that archaeological sites are still viewed as generally healthy (Table 5, Figure 3). Last year, the short-term trend data showed that there was decreasing confidence that sites were healthy; this trend has reversed in the current data. Given that no new information concerning the status of sites was available this year, some of this response may be due to the understanding that the protocol for High Flow Experiments (HFEs) has recently been developed and that as part of this experimentation, effects on archaeological sites will be studied. Since a general lack of sediment in the system is one of the factors postulates as contributing to site erosion, knowledge that HFEs will become part of the standard operations may be viewed as a positive management action. In addition, the plan to integrate traditional knowledge and tribal values into any treatment that occurs at sites in the future is similarly a positive development. One of the river trip participants noted that being able to pray at some of the sites was good.

Marshes

The health of two proxy species is used to gage the health of marsh habitats: cattails (*Typha* spp.) and reeds (*Phalaris* spp.). Because monitoring of this component of the ecosystem has not been undertaken recently by the AMP, assessment is being made primarily on the basis of field observation by the Hopis and an understanding of possible succession scenarios of marsh habitats under current flow regimes. The question asked is:

- From what you have heard, *Wipho'qölö* (patches of *wipho* or cattail) and *paaqap'qölö* (patches of *paaqavi* or reed) in Grand Canyon exist in a healthy state?
Yes or No or Don't Know

National Park (GRCA) is apparently conducting some avian monitoring activities but the Hopi Tribe has not yet been able to incorporate this information into its monitoring program.

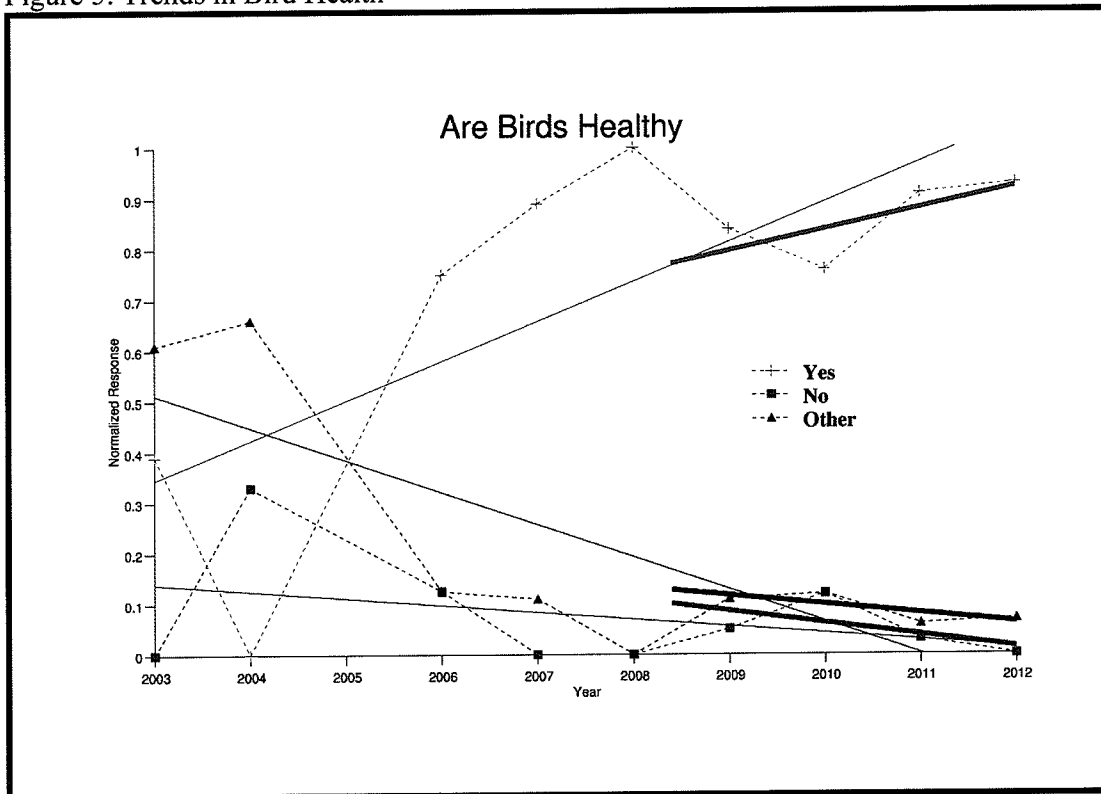
Question:

- *Tsirot* (birds) in Grand Canyon exist in a healthy state?
Yes or No or Don't Know

Table 7. Are Birds Healthy

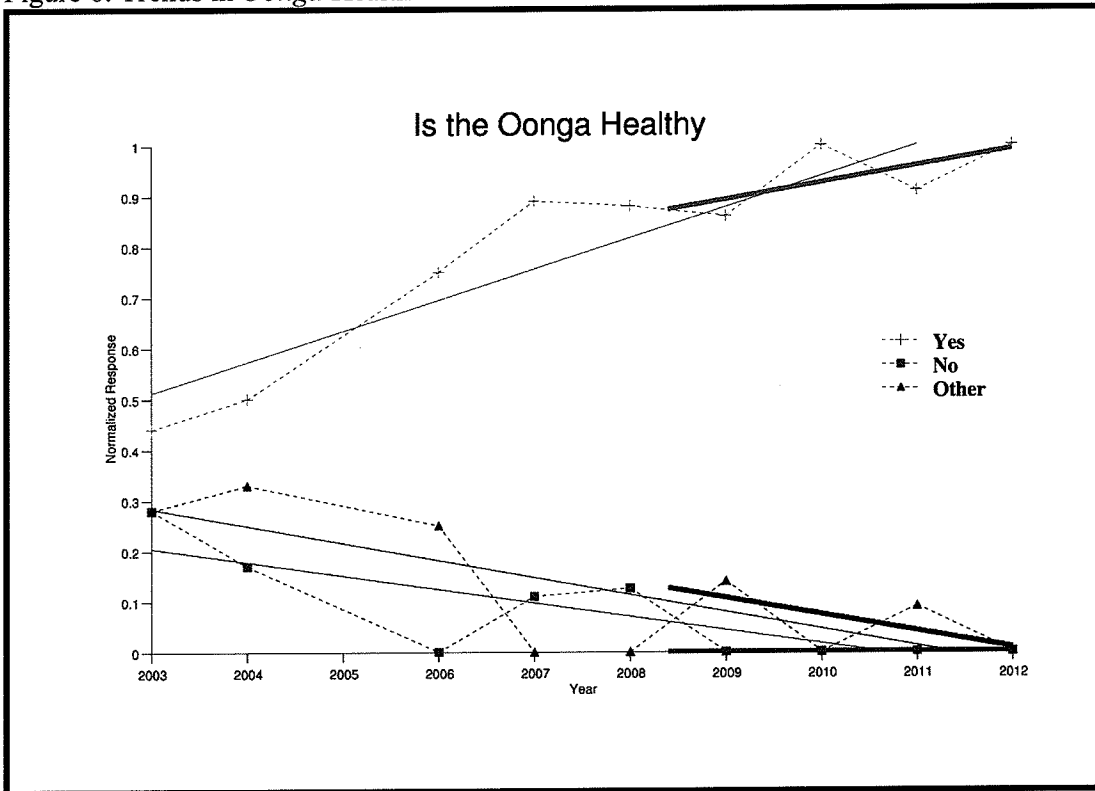
	Yes	No	Yes and No	Don't know	Blank
2003	7	0	0	11	0
2004	0	2	1	3	0
2006	6	1	0	1	0
2007	8	0	0	1	0
2008	16	0	0	0	0
2009	16	1	0	1	1
2010	13	2	0	1	1
2011	29	1	0	2	0
2012	13	0	0	0	1
Total	108	7	1	20	3

Figure 5. Trends in Bird Health



Like the marsh health, the perspective of the Hopis is that the health of the birds is very good and the responses appear to be stabilizing at baseline levels compared to the first couple of monitoring cycles. (Table 7, Figure 5). Because of the lack of monitoring data from the AMP program, this result is driven primarily by what the Hopis are actually observing in *Öngtupqa* on the

Figure 6. Trends in Öönga Health



Willows

Willows are a culturally important species in their own right and they serve as an indicator species for the post-dam riparian zone. As noted above for the Marshes, monitoring of this component of the ecosystem has not been undertaken recently by the AMP. Therefore, assessment is being made primarily on the basis of field observation and an understanding of the general trend in riparian plant succession scenarios. The following question has been asked consistently:

-*Qahavi* (willow plants) in Grand Canyon exist in a healthy state?
Yes or No or Don't Know.

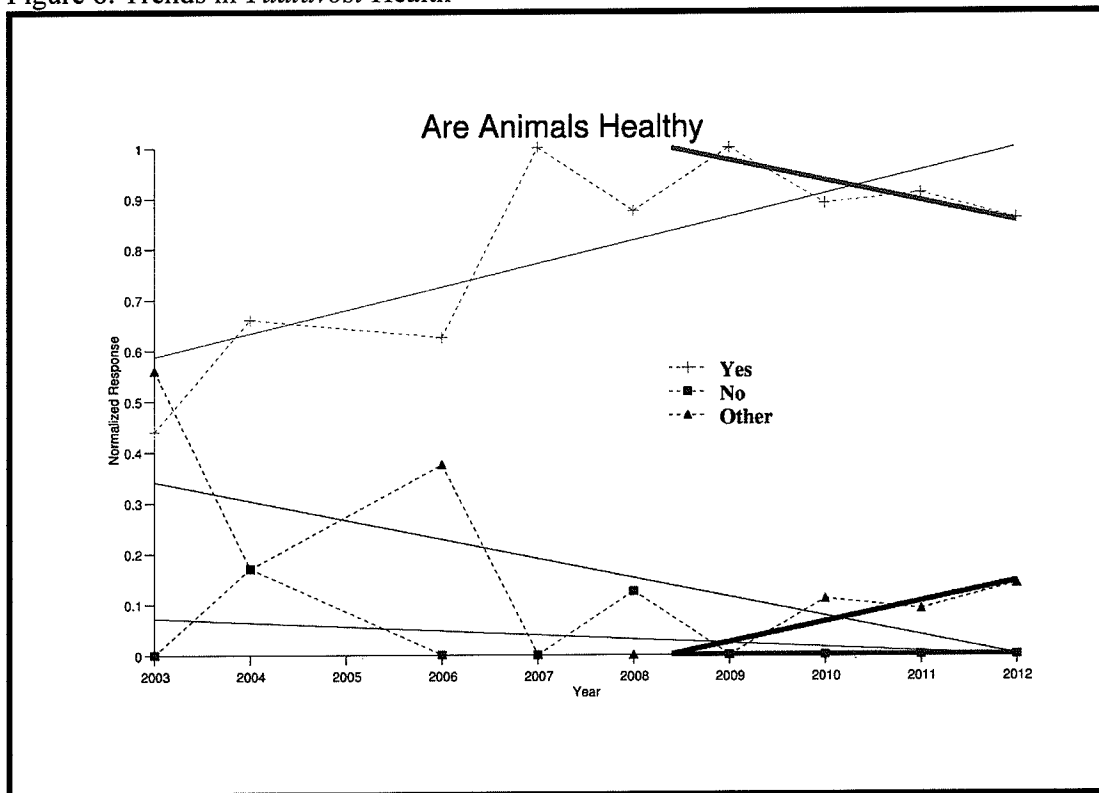
Table 9. Is *Qahavi* Healthy

	Yes	No	Yes and No	Don't know	Blank
2003	9	0	1	8	0
2004	4	0	1	1	0
2006	6	0	0	2	0
2007	8	1	0	0	0
2008	3	4	1	0	0
2009	7	0	0	0	0
2010	7	0	0	1	1
2012	6	0	0	0	1
Total	50	5	3	12	2

Table 10. Is *Tuutuvost* Healthy

	Yes	No	Yes and No	Don't know	Blank
2003	8	0	0	9	1
2004	4	1	0	1	0
2006	5	0	0	3	0
2007	9	0	0	0	0
2008	7	1	0	0	0
2009	7	0	0	0	0
2010	8	0	0	1	0
2011	10	0	0	0	1
2012	6	0	0	0	1
Total	64	2	0	14	3

Figure 8. Trends in *Tuutuvost* Health



From the responses, it appears the Hopi consider the animal population in *Öngtupqa* to be relatively healthy; for the past four years, no people thought that animals were unhealthy (Table 10, Figure 8). Because there is no population data being presented regarding animal populations during the standardized presentation, perceptions are largely driven by what is actually seen during monitoring trips, particularly for bighorn sheep and deer. Given that trips alternate between spring and fall in successive monitoring episodes, there may be a slightly alternating trend showing up in the data reflecting the seasonal variation of habitat usage. One Hopi noted that at this time of year (fall) the deer have migrated to the rims. As with the results for birds, it was noted that the protection afforded by being inside a Park was beneficial to the animals.

There seems to be more variability in responses about the health of the humpack chub than any of the other resources in the survey (Table 11, Figure 9). While there has been a consistent decline in the **Other** responses, meaning that people are making up their mind about whether the chub are healthy, there is a fairly even split about their health. Last year because the Hopis on the monitoring trip had the opportunity to conduct some backwater seining and got to see numerous native fish including humpback chubs, there was a strong feeling that they were doing well. Looking at the comments provided this year, the strong **No** response (“not healthy”) seems to be reflecting the fact that the fish are still endangered, even though their population has been increasing. Several comments expanded on this concept suggesting that “...with further management [the chub] could come to a healthier state.” Another noted that “...Game and Fish is on the right track by introducing these species upriver in smaller streams..,” referring to the translocation efforts. This year is the first time since the initiation of the Hopi Long-term Monitoring Program that more people said the native fish were not in a healthy state than those saying that they were healthy. Given the fact that the long-term trend is still strongly positive (it doesn’t seem to be reaching a “baseline” equilibrium yet), the swing in the short-term trend line may just be reflecting the large variability in the data set. It will be interesting to see if there is a reversal again after the next monitoring episode.

Snakes

Snakes play an important, ongoing role in Hopi culture and society. As with a number of the other terrestrial resources, observations by Hopis during the monitoring trips and old monitoring data forms the sole data set for this resource as the AMP no longer monitors this culturally important group.

Question:

-Snakes in Grand Canyon exist in a healthy state?

Yes or No or Don't Know

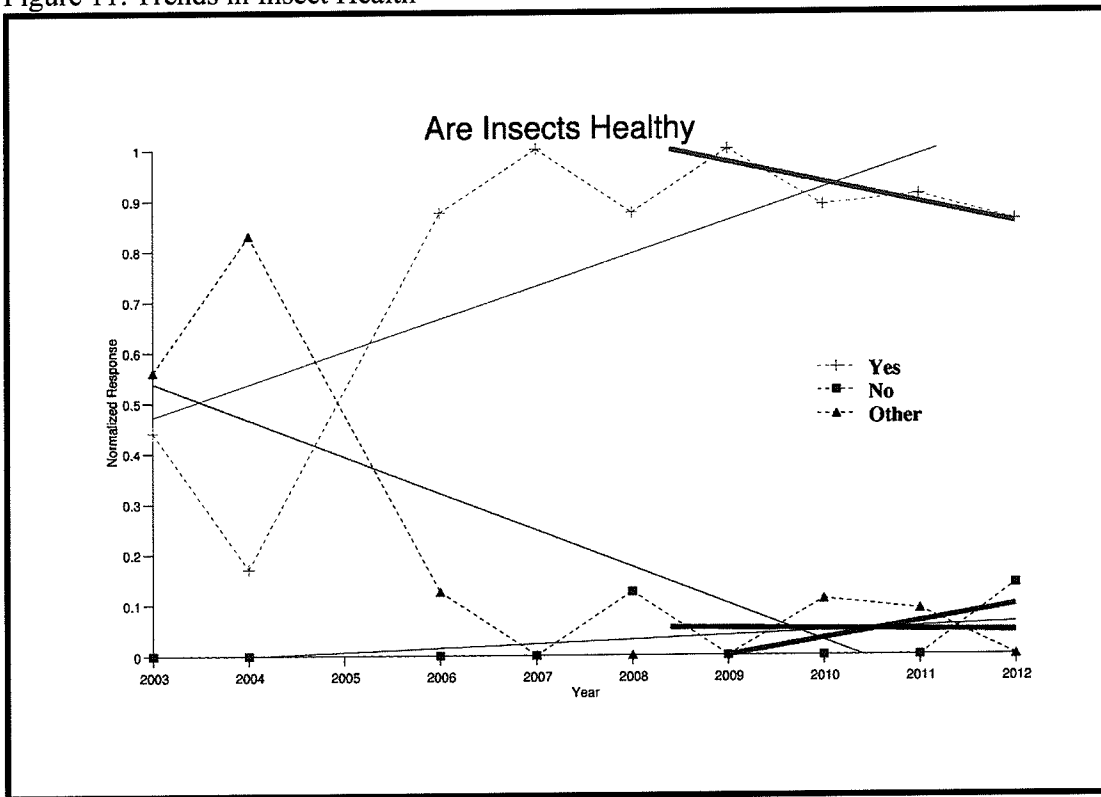
Table 12. Are Snakes Healthy

	Yes	No	Yes and No	Don't know	Blank
2003	5	0	0	12	1
2004	1	0	0	5	0
2006	6	0	0	2	0
2007	9	0	0	0	0
2008	6	1	0	1	0
2009	7	0	0	0	0
2010	8	0	0	1	0
2011	6	1	0	0	4
2012	3	1	0	2	1
Total	51	3	0	23	6

Table 13. Are Insects Healthy

	Yes	No	Yes and No	Don't know	Blank
2003	8	0	0	9	1
2004	1	0	0	4	1
2006	7	0	0	1	0
2007	9	0	0	0	0
2008	7	1	0	0	0
2009	7	0	0	0	0
2010	8	0	0	1	0
2011	10	0	0	0	1
2012	6	1	0	0	0
Total	63	2	0	15	3

Figure 11. Trends in Insect Health



Insect health has consistently viewed as positive even though there has been a slight decline in the short-term trend (Table 13, Figure 11). Many respondents noted how many ants, bugs, and flying insects they saw, noting that there may be too many biting flies!

Springs and seeps

Springs and seeps are extremely important within the Hopi culture. Because they are essentially unaffected by most current operations of Glen Canyon Dam, they can somewhat serve as a control within the survey methodology.

Trends for Management Activities

The next set of questions deal with activities associated with the management of resources in *Öngtupqa* rather than the resources themselves. These are used to track whether management activities that are occurring or are proposed are viewed as appropriate from the Hopi perspective.

Hopi Involvement in the AMP

Three questions are asked that assess the relevance of Hopi participation in the AMP and monitoring of resources in *Öngtupqa*. They are:

Question 1:

Should Hopi be involved in stewardship and Management of *Öngtupqa* (Grand Canyon)?
Yes or No or Don't Know

Question 2:

Is this information about *Öngtupqa* important to you?
Yes or No or Don't Know

Question 3:

Does this information about *Öngtupqa* relate to your cultural teachings?
Yes or No or Don't Know

These questions are used to track a couple of issues, foremost of which is whether the Hopi consider it appropriate that they remain involved in the AMP. Because there are very real cultural and political implications for working in *Öngtupqa* for the Hopi people, it is appropriate to identify whether participation is still considered important enough to outweigh the potential negative aspects of involvement. Additionally, responses are used to gauge whether the monitoring program is continuing to collect the "right" information. That is, is the Hopi Long-term Monitoring Program addressing the correct Hopi concerns or are there other resource issues that need to be examined? These questions are more for internal evaluation of the Hopi Long-term Monitoring program rather than to track the health of any given resource.

Since these questions have been asked, we have received a total of 501 responses, for these three questions combined (see Table 2). A total of 3 have been negative (1 for each questions) and another 19 total either did not know or simply did not respond; all respondents from 2012 responded "Yes." This shows that there continues to be overwhelming support for Hopi participation in the AMP and that the work being conducted is culturally relevant and important to the Hopi people. One Hopi summed up the need for Hopi participation by noting: "Hopi have a long history with the Canyon, so who better to gather information from?"

Recreation

Recreational use of *Öngtupqa* is a contentious issue from the perspective of the Hopi Tribe. It has two principle impacts. First, there are the actual physical impacts that can occur to resources from trailing, vegetation damage, introduction of exotic species, damage to archaeological resources, littering, etc. Second, from the Hopi perspective, it is inappropriate and even dangerous for non-initiated people to venture into *Öngtupqa*. The correct spiritual preparations must be made before such a journey is undertaken and appropriate behavior must be followed. A consistent concern

at the same time. The mixed feeling about recreation is expressed in a number of the comments. Some who supported recreation clarified that it was appropriate “To an extent. I think that while it may be a hard decision to make, limits must be in place. We were never alone so it somewhat taints the experience.” And, “As long as they just look and not touch or take anything. Just leave everything as is and Respect the place.” The need to respect *Öngtupqa* was a common theme. Even those who felt that recreational use was wrong seemed resigned to the fact that it was going to happen.

Treatment of Eroding Archaeological Sites

Because archaeological sites are the “footprints” left by the Hopi ancestors, site preservation has been a concern of the Hopi Tribe ever since it became involved in the operations and management of Glen Canyon Dam. The overwhelming consensus is that archeological sites should be preserved in place, if possible. In situations where this is not possible, there is more divergence of opinion on what should be done. Because interview work identified that there is sometimes a distinction made between human caused impacts to archaeological sites and those that are due to “natural” processes, two separate questions are used provide feedback.

Question 1:

Should eroding archaeological sites be: a). **left to erode** b) **be reburied** c) **be excavated**

Question 2:

If an archaeological site is impacted because of human actions, it should be: a). **left to erode** b) **be reburied** c) **be excavated**

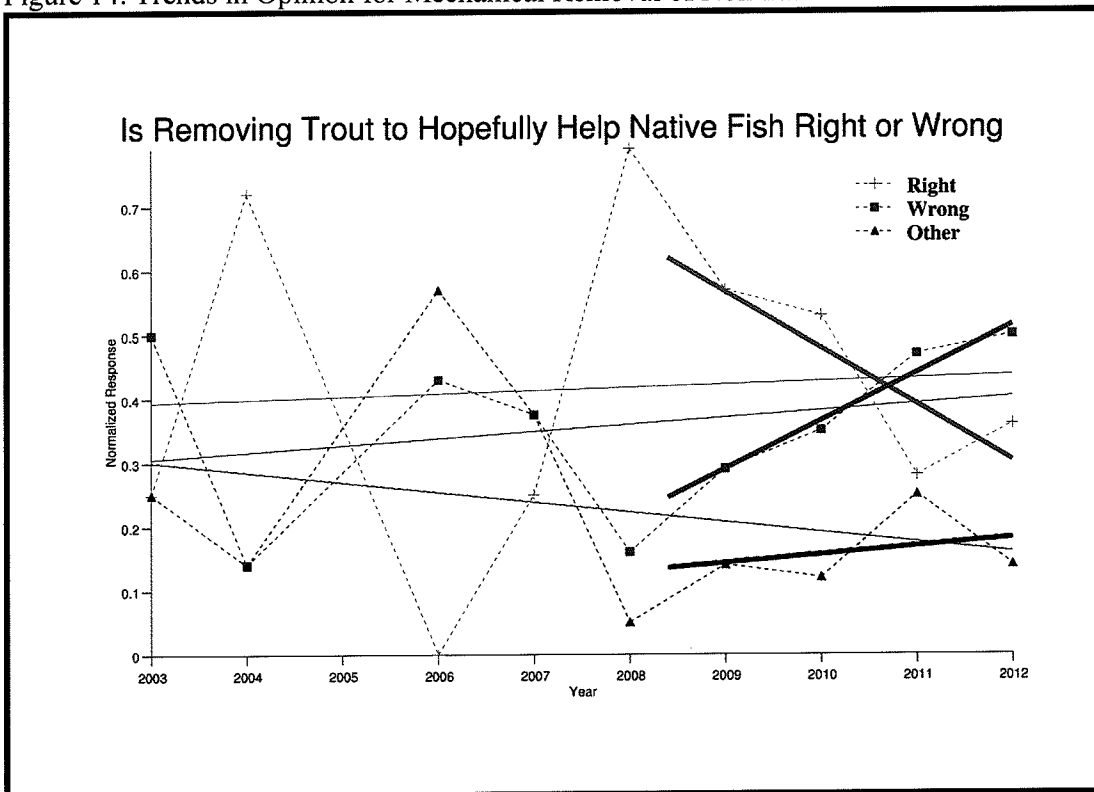
Table 16. Treatment of Archaeological Sites

	Excavate	Let erode	Rebury	Excavate & let erode	Excavate & rebury	Excavate, rebury & let erode	Preserve	Blank	Don't know
Q12 Eroding arch sites	30	37	29	7	5	4	2	4	3
Q13 Human caused erosion	32	19	44	0	9	3	2	8	3

It should be noted that respondents often selected more than one of the three responses to each question, suggesting a more nuanced, possibly stepwise approach to management of archaeological sites. Table 16 shows the various combinations of responses received for all of the monitoring that has occurred. As an example of a composite response, one commenter suggested that for a site being impacted by human actions: “Rebury it, if not in harms way, But have it excavated if there is no other options to save it.” Others commented that in essence, “humans should not impact burial spaces.”

In Table 17, the data from above is grouped into the three options from the original questions: **Excavate**, **Let erode**, or **Rebury**. For grouping, the assumption is made that a recommendation combining excavation with some subsequent action is still a recommendation for excavation. Similarly, “**Preserve**” was combined with “**Rebury**.” A forth, “**Other**” column was added for the “Blank” and “Don’t know” responses.

Figure 14. Trends in Opinion for Mechanical Removal of Non-native Fish



This is the only question asked where the “No” responses currently outnumber the “Yes” responses (Table 18, Figure 14). The falloff of support for mechanical removal has been a consistent trend since about 2008. This is likely a response to the fact that the chub populations have been increasing in spite of increasing trout numbers and the uncertainty in the effectiveness in trout removal to benefit the chub. As one Hopi noted, trout removal is both “Right and wrong. ...I am a fisherman, but how do you keep all the trout at Lees Ferry? Being that water flows downstream the trout end up downstream. Still with the increase in natives, I think what is being done today is as good as we can do.” Support for trout removal was phrased by another Hopi as follows: “...they [chub] were here first and it is good to see something being done to keep them alive and well.” While most respondents who did not support mechanical removal simply said it was wrong, one elaborated by stating that the trout “...shouldn’t have been introduced to begin with and to resort to killing them is a ethical wrong thing to do. Two wrongs do not make a right, as white people would say.”

Non-native species

While the previous question targeted management primarily for an individual species, this question seeks to understand the broader perspective with respect to the values for native and non-native species in general.

Question:

-Non-native species (such as tamarisk) and native species (such as cottonwood) have an equal role in the balance of the natural world?

Yes or No or Don’t Know

natives be removed). There is a balance that needs to be struck between ensuring the survival of the native species and unnecessary taking of life. If coexistence is possible, then this is the appropriate course of action as it maximizes “life.”

Some of the support for coexistence is more pragmatic. One person noted the possible role that vegetation (both native and non-native) may play in beach stabilization. Another provided the example of both tamarisk (non-native) and cottonwood (native) being used in traditional crafts. In basketry, tamarisk and yucca are sometimes combined in the same item.

Demographic Analyses

Since the Hopi Long-term Monitoring program is drawing conclusions from a sample of Hopi individuals that are not necessarily randomized across the entire population, it is important to understand some of the biases that may be occurring in the data. Because the data set is still relatively small, the analytic focus is initially on a couple potential biases with the greatest implications for the overall monitoring methodology: 1.) whether responses are systematically different before and after taking a river trip; 2.) whether there is systematic change in response when multiple river trips are taken by an individual.

The first hypothesis is particularly important given the key assumption for implementing the Hopi survey methodology is that visitation is not required by Hopis to make a valid assessment of the health of *Öngtupqa*. Because river trip participants complete surveys following the standardized presentation (as is the protocol for surveys carried out at Hopi), but prior to the monitoring trip, an assessment can be made of changes in responses due to direct interaction with the resource versus only having heard about in the presentation. Finally, it is anticipated that as more surveys are completed, issues of age, clan, society, village, or other demographic variables will be analyzed. The use of Cultural Consensus Theory analysis may be applicable for addressing the data set and identifying underlying commonalities for better data interpretation (eg. see Romney et. al. 1986).

General versus Post-trip comparison

Because only a limited subset of Hopis are able to enter *Öngtupqa* and directly examine the resources, it is important to understand whether their view is fundamentally different from those who complete the questionnaire but have not been in *Öngtupqa*. Therefore, this sections looks at the responses supplied by people who completed the questionnaire both before and after a monitoring trip. As with previous sections, “blank and “don’t know” were grouped together under “other.” Differently however, in those cases where both “yes” and “no” were checked, the numbers were added to both the “yes” and “no” categories. While this doesn’t affect the yes-to-no ratio, it does incorporate the fact that the respondent did have an opinion (as opposed to stating “don’t know”) – they just did not make a value judgment. The raw data from all trips is presented in Table 20.

Table 20. Response Frequencies from Before and After a Monitoring Trip

	Yes (PRE)	No (PRE)	Other (PRE)	Yes (POST)	No (POST)	Other (POST)
Q01 Overall health	59	9	31	52	8	20
Q02 Hopi Involvement	94	0	4	68	2	6
Q03 Importance of Information	96	1	1	73	0	2
Q04 Relates to Cultural Teachings	86	2	1	64	0	3
Q05 Recent changes	32	0	22	51	0	16

with the “Yes” and “No” and “Other” analyses being combined in the same manner as the previous analysis.

Table 21. Raw Data for Single and Multiple Trip Responses

	Yes (0-1 trips)	No (0-1 trips)	Other (0-1 trips)	Yes (2+ trips)	No (2+ trips)	Other (2+ trips)
Q01 Overall health	64	8	39	41	3	17
Q02 Hopi Involvement	106	0	5	54	1	6
Q03 Importance of Information	109	1	1	59	0	2
Q04 Relates to Cultural Teachings	97	1	1	51	0	4
Q05 Recent changes	53	0	25	30	0	12
Q06 Marshes	55	18	17	32	6	10
Q07 Birds	67	6	17	40	1	7
Q08 Recreation	46	32	33	24	11	26
Q09 Trout removal	42	29	12	15	17	13
Q10 Non-natives	55	26	9	25	18	5
Q11 Archaeological Sites	47	25	18	30	16	2
Q14 Öönga	39	5	7	25	3	4
Q15 Willow	34	3	14	25	3	4
Q16 Animals	38	2	11	26	0	6
Q17 Native fish	17	11	23	14	5	13
Q18 Snakes	30	2	19	21	1	10
Q19 Insects	35	2	14	28	0	4
Q20 Springs	34	6	11	23	2	7

Figure 17 shows the Non-metric MDS plot of the standardized data provided in Table 21 based on Euclidian similarity measures. In this case, responses to all of the questions were considered in the analysis as the data is pooled and whether a question was asked only after a trip, or both before and after is irrelevant. Further, data from people who never took a trip and those that took a single trip were also grouped as the analysis of responses from before and after a trip showed that there is no modified response pattern.

Once again, it is clear that people who never go on the river monitoring trip or who conduct only a single trip are responding in the same manner as those who have had multiple exposures to the resources along the river. Because respondents who have been on multiple trips have also heard multiple standardized presentations and have been involved in discussions that vary from one year to the next during the course of multiple river trips, the consistency in response lends confidence that responses are not being fundamentally altered by variations in how the data is being presented.

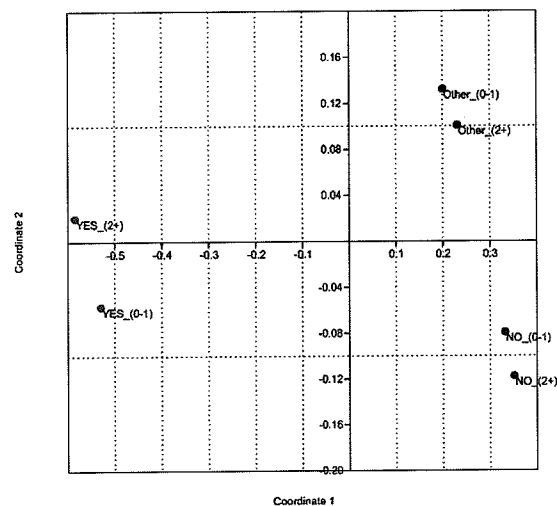


Figure 17. Single/Multiple Trip MDS Plot

seem to be increasing in tandem with the humpback chub and they are more directly associated with the mainstem Colorado River throughout its length, it makes sense that more emphasis should be focused on them by the AMP. Separating the management/conservation activities related to the humpback chub into a separately authorized and funded Recovery Program (that does not have the issues of whether a given action it is "in or out" of AMP purview) might make sense. This could free up funding for a broader ecosystem approach by the AMP.

Finally, as was recommended last year, the Hopi Tribe recommends that a much more formal, cooperative relationship be established between GCMRC and the two National Park units for sharing of monitoring data.

APPENDICES

General and post-trip survey instruments from 2012

***** General Survey *****
General Questions

1. Do you think *Öngtupqa* (Grand Canyon) is better cared for now than in the past?

Yes No Don't Know (Circle one)

Comment:

2. Should Hopi be involved in stewardship and management of *Öngtupqa* (Grand Canyon)?

Yes No Don't Know (Circle one)

Comment:

3. Is this information about *Öngtupqa* important for you?

Yes No Don't Know (Circle one)

Comment:

4. Does this information about *Öngtupqa* relate to your cultural teachings?

Yes No Don't Know (Circle one)

Comment:

5. Do you think there have been changes in *Öngtupqa* in recent years?

Yes No Don't Know (Circle one)

Comment:

5a. What changes do you like?

5b. What changes do you dislike?

5c. If you could change something, what would it be?

5d. If you wanted to make sure something stayed the same, what would it be?

Background Information

Village _____ Clan _____

Hopi/Tewa Religious or Cultural Societies _____

Name _____ Age _____

Gender **Male** **Female** (Circle one)

Are you a tribal Employee? Yes No (Circle one)

If yes, what Tribal department _____

Are you a CRATT member? Yes No (Circle one)

Number of visits to *Öngtupqa* (Grand Canyon) on a river trip _____

Other visits to *Öngtupqa*: Canyon Rim _____
Hiking into Canyon _____

***** POST-trip Survey *****
General Questions

1. Do you think *Öngtupqa* (Grand Canyon) is better cared for now than in the past?

Yes No Don't Know (Circle one)

Comment:

2. Should Hopi be involved in stewardship and management of *Öngtupqa*?

Yes No Don't Know (Circle one)

Comment:

3. Is this information about *Öngtupqa* important for you?

Yes No Don't Know (Circle one)

Comment:

4. Does this information about *Öngtupqa* relate to your cultural teachings?

Yes No Don't Know (Circle one)

Comment:

5. Do you think there have been changes in *Öngtupqa* in recent years?

Yes No Don't Know (Circle one)

Comment:

5a. What changes do you like?

5b. What changes do you dislike?

5c. If you could change something, what would it be?

5d. If you wanted to make sure something stayed the same, what would it be.

14. *Öönga* (Hopi Salt Mines) is healthy.

Yes No (Circle one)

Comment:

15. *Qahavi* (willow plants) in *Öngtupqa* exist in a healthy state.

Yes No (Circle one)

Comment:

16. *Tuutuvost* (animals) in *Öngtupqa* exist in a healthy state.

Yes No (Circle one)

Comment:

17. Native fish called the Humpback chub exist in a healthy state in *Öngtupqa*.

Yes No (Circle one)

Comment:

18. Snakes in *Öngtupqa* exist in a healthy state.

Yes No (Circle one)

Comment:

19. Insects in *Öngtupqa* exist in a healthy state.

Yes No (Circle one)

Comment:

20. Springs and seeps in *Öngtupqa* are healthy.

Yes No (Circle one)

Comment: