Grand Canyon Monitoring and Research Center (GCMRC)

Fish Monitoring Program (FMP) – Protocol Evaluation Panel (PEP)

8–17 May 2009

A Draft Summary of Recommendations

Institutional

Recommendations

1. In most cases the monitoring programs are beyond the experimental stages and considerable experience and data have been acquired. GCMRC should now be able to develop a standardized framework for archiving data and reporting of monitoring results for the key program elements. This structure would allow data and results from individual contract reports and to be synthesized and organized to report on the CMINs and management objectives. Maximum success of this approach depends on full participation by all cooperators and researchers working in the system. Currently there seem to be some impediments (both real and perceived) to timely and complete data sharing among some cooperators. These impediments should be identified and steps taken to alleviate them. For example, the USGS critical review process overly jeopardizes partnerships and cooperative relationships with other Department of Interior agencies and slows the response time of GCMRC. In some cases formal agreements such as Memoranda of Understanding may be useful mechanisms to circumvent interagency policy conflicts (e.g., among sister agencies under the DOI).
2. Any effort to recover an endangered species must by necessity take a long-term view. Numerous lines of evidence suggest that the Colorado River System will undergo substantial changes over the next 50 years and beyond, both natural and anthropogenic, that will affect key characteristics of the system, particularly water availability and temperature. Development of management strategies for system conditions that occur or can be created currently, but that will no longer exist or be feasible several decades from now, will provide little or no long-term benefit. We recommend that the AMWG and GCMRC convene a group of experts to advise them on the likely future trends in conditions that will affect the Colorado River system (e.g., changes in temperature and precipitation, water withdrawals and diversions, reservoir levels, etc.) and use that information to identify the probable bounds on management options that will be feasible in the future. Even if (perhaps especially if) those options are different than what seems optimal today, it would make sense to begin testing management scenarios now that are suited to conditions in the long-

term in order to be prepared when those changes occur, rather than managing to avoid risks now that are going to become highly likely in the future.

3. Successful adaptive management requires that the magnitude and duration of management manipulations be sufficient to generate an effect size in the variable(s) of interest that can be detected by ongoing monitoring efforts and differentiated from natural variations. Despite the size and complexity of the Grand Canyon system and the extraordinary logistical challenges to sampling, in many respects the rigor of the fish population monitoring program in the Grand Canyon is unprecedented. Coupled with this monitoring effort, the initial 16-year plan to manipulate predation pressure, temperature and flow in four-year blocks seemed likely to meet these criteria for success. Even though drought-induced temperature increases occurred simultaneously with the predator removal treatment, modifications to the long-term plan could still impose treatments of sufficient magnitude and duration to be informative in parsing the effects of these key variables on the system. It is imperative that all partners act in consultation and cooperation with each other to maintain an effective adaptive management strategy. Otherwise, even the most accurate and precise monitoring program will have little chance of identifying with confidence the ultimate, or even proximate, mechanism(s) driving observed changes. We recommend that the AMWG members participate in a Bayesian Belief Network exercise, or similar effort, to solidify their goals and reach consensus on how best to achieve them, in a way that takes into account their disparate individual needs, concerns and responsibilities.

Lee's Ferry Trout Monitoring Program

Recommendations

1. Recast management objectives as angling catch rate, rather than absolute abundance, to frame the management program more directly in relation to the current catch-and-release angling fishery. If the fishery develops into a trophy fishery (e.g. through flow regulation), management objectives can be recast to better reflect a harvest-based fishery (e.g. catch or harvest of trophy-sized trout).
2. Retain the creel survey to monitor annual fishery performance and angler satisfaction in relation to the revised management objective. Under the current catch-and-release fishery, angling catch rate is the best metric for monitoring fishery performance. If the nature of the fishery changes, alternative angler-based metrics may be required.
3. Evaluate the effect of reducing electro-fishing effort from 3–4 trips per year to 1-2 trips per year and eliminating the current fixed sites from the survey design to provide an index of trout population density based on random sites only. Effort to sample fixed sites can be redirected to surveillance for non-native fishes at likely locations (e.g., the 'carp pond', location of previous smallmouth bass catches, etc.) and increasing the number of random

sites within a trip. The power analysis suggests that reducing the sampling effort by one half would have only small impact on precision. Metrics from this part of the survey provide a frame of reference for trout in downstream reaches and a means by which to evaluate the degree to which trout migrate downstream. Growth rate can be estimated from ongoing age estimation, rather than tag-recapture data. More use of age information is recommended to develop year-class strength indicators.

4. Monitoring age-0 trout habitat use and movement is not routinely needed because the electro-fishing survey provides a direct index of pre-recruit trout density. Similarly, redd counts are not needed because the electro-fishing survey provides a direct index of adult trout density. This program's strength is in evaluating the impacts of flow manipulations on early life history, and could be reinstated to for specific flow tests.

LCR Native Fish Monitoring Program

RECOMMENDATIONS

1. There is now sufficient information and experience with the LCR HBC population to develop an assessment framework. This framework would identify the information needs and analysis required for managers to assess the state of the population relative to management objectives. The framework would then provide guidance to the various programs on the types of information needed from the annual reports, and would house all of the key information in one annual report. Typically, assessment frameworks are peer-reviewed; however the annual updates are not, unless they deviate significantly from the approved process.
2. In the context of the assessment framework evaluate the spring and fall hoop netting programs to assess the necessity of conducting both surveys. The objective of the fall survey is to provide an index of sub-adult abundance; however, it appears that spring hoop netting also provides a relative index of sub-adult abundance as the spring length frequency data mimics the length frequency data from the previous fall. The inclusion of the fixed PIT tag array may alleviate the need for fall monitoring. Assessment of the hoop netting program should consider how reducing sampling effort affects the number of newly tagged fish, particularly in smaller size classes.
3. Similarly, compare the spring random hoop net data to the fixed site 1200 meter hoop net data. Although the 1200 meter data is a valuable long-term series, it may be redundant to the ongoing spring hoop netting. These two programs should be evaluated by comparing catches in the 1200 meter program to data from the lower sections of the FWS program.

4. Expand the fixed PIT tag antenna array to span the entire channel and consider deploying antennas at two locations. Spanning the entire channel assists in estimating capture probability and having two antennas will allow determination of direction of movement. The PIT tag array may allow detection of movement pathways and the habitats used for migration or movement. The array may also inform the mark-recapture estimates of the spawning population by better describing the timing of the spawning migration.
5. Reduce the frequency of ASMR updates from annual to every 3-5 years, unless trends in field data warrant a formal reassessment. Under the aforementioned assessment framework recruitment can be monitored with empirical catch per unit effort of fish less than 150 mm TL. The LCR adult abundance can be tracked using the mark-recapture estimate.
6. ASMR estimates of recruitment do not match hoop net catch rates because of age estimation error in the ASMR. Body parts from the HBC being collected in the nearshore ecology program should be used (e.g. anal fin rays, scales, and otoliths) for *age verification.* Hopefully, verification would allow future non-lethal sampling for age estimation. Age estimates from fish tagged at small size (young "known" age) and recaptured over a wide range of years at liberty should be compared for *age validation.* It may be possible to increase the sensitivity of the ASMR recruitment index by using age information in combination with the proposed tagging of smaller fish.
7. Management objectives for Chute Falls and other translocations should be specified in measurable terms to guide monitoring and reporting. The panel could not comment on current monitoring activities with the information available.

Mainstem Colorado River Monitoring Program

Recommendations

1. Monitoring trends in relatively abundant species throughout the mainstem, and also detecting the occurrence of rare species, would be best served with a two-pronged approach. The current stratified random electrofishing survey should be continued to provide information on trends and distribution of relatively abundant native and non-native species. However, effort could likely be reduced and still provide adequate information. This extensive approach needs to be complemented by a second strategy intended to detect rare species, such as more intensive sampling using a variety of passive and active gears at a smaller number of fixed surveillance locations where potentially detrimental non-native species are most likely to be found. This sampling component can also include locations where more detailed information on native species is warranted (e.g., known HBC aggregations). Taken together, these two sampling strategies address a range of monitoring

goals, each to varying degrees (Table 1), and in combination address many of the questions posed by the TWG.

2. Evaluate the impacts of reducing river-wide electrofishing from 2 trips to 1 trip per year. The primary goal of the stratified random electro-fishing survey is to track general changes in distribution and relative abundance of the trout populations and other species that are captured by this gear. A single trip currently yields 350-450 samples along 360 km of river, which is a relatively high rate of sampling. An annual CV (for trout at least) of 10% is probably more precise than is really needed, especially for the longer-lived species that are unlikely to change in abundance significantly year to year. Existing data could be used to evaluate what would be lost by a reduction in sampling intensity.

3. Consider adding a targeted sampling program at likely locations for non-native species colonization (e.g. above Lake Mead, below Lake Powell, and stream mouths, springs, below large rapids). This program would deploy a suite of additional sampling gears, such as trammel nets, hoop nets, minnow traps, angling, set-lining, seining, and back-pack electro-fishing (these sites could also be sampled by boat electro-fishing during the stratified random electro-fishing survey trip). The primary objective is to detect colonization by non-native species and changes in their distribution in the mainstem that would not show up in the stratified random electro-fishing survey. The proposed risk assessment for invasive species could inform the locations, habitats and gear types that would be most effective. It is unclear whether this effort needs to be conducted annually.

4. Designing a monitoring program for the non-LCR HBC remains challenging. There may be value in further refining the management objectives and CMINs to help clarify the information needs. For example, if the focus is on the status of a few (2?) aggregations outside of the LCR region, a focused sampling regime to assess abundance and recruitment may be appropriate. This program could be tied (or alternated) with the targeted mainstem sampling. Given the extensive experience with trammel and hoop net sampling from the earlier surveys it should be possible to determine if the information that is generated by a proposed sampling regime will satisfy the information needs.

5. Alternative means of sampling should continue to be pursued to identify the most efficient means to detect new species and changes to the distribution and abundance of existing species.

Table 1. Relative contribution of each mainstem sampling component to primary mainstem monitoring objectives.

	System-wide trends in established species (RBT, BRT, Carp, HBC, FMS, BHS, others)	Detection of rare/new species (non-natives and natives)	HBC juvenile abundance and size at aggregations	HBC adult abundance and size at aggregations (and movement)	Size, abundance and movement of natives at the LCR confluence
Mainstem-wide stratified-random EF sampling	High	Low	Low or n/a??	Low or n/a?? (except for possible movement)	n/a
Mainstem fixed-site EF sampling (HBC aggregations)	Low	Med.	High	High	n/a
Mainstem fixed-site EF sampling (potential non-native sentinel locations/hotspots)	Low	High	n/a	n/a (except for possible movement)	n/a (except for possible movement)
Mainstem-wide multi-gear fixed-site sampling (HBC aggregations)	Low	Med.	High	High	n/a (except for possible movement)
Mainstem-wide multi-gear fixed-site sampling (potential non-native sentinel hotspots)	Low	High	n/a	n/a (except for possible movement)	n/a (except for possible movement)
LCR confluence reach predator-removal EF	n/a (low?)	Med.	n/a	n/a (except for possible movement)	n/a (except for possible movement)
LCR confluence reach hoop netting	Low	Low	n/a	n/a (except for possible movement)	High