**Grand Canyon Monitoring and Research Center (GCMRC)**

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

**8–17 May 2009**

**A 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 reporting of monitoring results for the key program elements. This structure would take results from individual contract reports and synthesize and reorganize them into them to report on the CMINs and management objectives.

**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 fishery changes to a trophy fishery, angling harvest and effort may be the best metric for monitoring fishery performance.
3. Evaluate the effect of reducing electro-fishing effort from 3–4 trips per year to 1-2 trips per year and eliminating fixed sites from the survey design to provide an index of trout population density. Effort to sample fixed sites can be directed to 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. The increased coverage by having more random sites provides surveillance for invasive species. 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 needed because the electro-fishing survey provides a direct index of age-0 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.

**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 type of information needed from the annual reports, and would house all of the key information in one 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 fall length frequency data mimics the spring length frequency one year later. 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 2 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 the antenna 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 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 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, 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 e/f 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 over 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 suite of additional sampling gears, such as trammel nets, hoop nets, minnow traps, angling, set-lining, seining, and back-pack electro-fishing, but not boat electro-fishing. 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 e/f surveys. 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.