

Fisheries Long-Term Monitoring Components

Brook Trout Distribution and Monitoring

- 1) Accomplishments since inception in the 1990's
 - a) The Fisheries staff has surveyed approximately 80% of the streams in the Park. The results indicate that six streams have suffered headwater loss. Water quality monitoring data indicate that these streams are too acidic to support trout.
 - b) Annually 16 – 32 sites have been monitored to evaluate natural annual variation in allopatric and sympatric brook trout populations. These data have shown that droughts and floods control population density and biomass.
- 2) As a result of the information gathered as “outputs”, how has that changed “outcomes” in: a) park management decisions, b) our agency policies or procedures, c) other agency policies or procedures?
 - a) The distribution data has resulted in increased awareness of environmental issues affecting brook trout and has resulted in increased urgency of restoring brook trout to segments of historic range at lower elevations in GRSM.
 - b) Annual monitoring results have increased our understanding of natural variation in allopatric and sympatric brook trout populations.

The results have not affected agency policies or the policies of other agencies.

- 3) Has the component been modified from the original set up? How?

There have been no modifications to the original program design.
- 4) Were the original monitoring questions in the 1993 plan answered?
 - a) Yes, the upstream and downstream limits of brook trout and mixed rainbow/brook trout populations were accurately assessed in the watersheds surveyed. No, selected streams in each watershed have not been resurveyed on a 10 year rotation to determine if there have been changes due to acidification or encroachment of non-native salmonids.
 - b) Yes, annual variation has been described, but the appropriate sampling interval has not been determined.
- 5) Do they still need to be answered?
 - a) Yes, the distribution in the remaining watersheds needs to be mapped to completely document the current distribution of brook trout in GRSM. Sampling of one or two streams in each watershed on a 10 year rotation to determine what if any changes have occurred needs to be implemented once the distribution in all watersheds has been completed.

- b) Questions related to annual variation have been answered.
- 6) As a result of the information gathered, have new pertinent questions arisen?
No, the questions related to changes in distribution and annual monitoring has not changed. However, the urgency of completing the distribution surveys and implementing sampling on a 10 year rotation has increased based on continued declines in stream pH and documented headwater range loss.

The program was initially designed to incorporate distribution and annual monitoring as one component. If the program were to be re-designed, distribution surveys and annual monitoring should be separated and objectives developed for each component.

Large Stream Monitoring

- 1) Accomplishments since inception in the 1990's
 - a) From 1993 – 2001, fish communities in two to three large streams were sampled annually.
 - b) Threatened and Endangered fish monitoring was terminated in 1996 due to the lack of funds.
 - c) Resource Protection and Fisheries staff have collected angler creel data annually.
- 2) As a result of the information gathered as “outputs”, how has that changed “outcomes” in: a) park management decisions, b) our agencies policies or procedures, c) other agencies policies or procedures?
The data collected has not changed management decisions or policies nor has it affected the policies of other agencies.
- 3) Has the component been modified from the original set up? How?
The procedures for stream surveys and the collection of angler creel data have not changed. Large stream surveys are no longer conducted due to the loss of funding for this component.
- 4) Were the original monitoring questions in the 1993 plan answered?
 - a) Natural annual variation in game and non-game fish populations has been described for the streams sampled. But streams recommended for rotational sampling were not sampled due to time and loss of staff in the fall.
 - b) No the success of threatened and endangered fish reintroductions was not evaluated. Additionally, species of concern or in need of management were not monitored.
 - c) Annual creel surveys have provided information on angler catch rates and use patterns.

- 5) Do they still need to be answered?
 - a) Yes, streams need to be sampled periodically to determine if populations are within the range of natural variation observed and to determine if all species are still present.
 - b) Yes, species of concern and in need of management need to be identified and appropriate monitoring protocols developed.
 - c) Yes, angler use patterns have changed and are declining. Annual monitoring will assist with determining the rate of change.

- 6) As a result of the information gathered, have new pertinent questions arisen?
 - a) Yes, how will increasing acidification affect fish community structure, density and biomass along elevational gradients?
 - b) Will increasing acidification affect species of concern and species in need of management?
 - c) What is the effect of stream channelization and dam building on fish communities?
 - d) Have threatened and endangered fish populations recovered in Abrams Creek?

Water Quality Monitoring

- 1) Accomplishments since inception in the 1990's
 Water samples have been collected park wide annually since the program was initiated. There has been a lot of variation in the number of samples taken through time.

- 2) As a result of the information gathered as “outputs”, how has that changed “outcomes” in: a) park management decisions, b) our agencies policies or procedures, c) other agencies policies or procedures?
 Yes, the data collected from park wide samples has resulted in streams listed on the 303d list. Park staff is working with staff from TN Department of Environment and Conservation and EPA to develop a TMDL based on pH for these streams. This work will be coordinated with work that is addressing critical loads for GRSM.

- 3) Has the component been modified from the original set up? How?
 Yes, the number of samples has been downsized considerably. The last change occurred in 2006 when based on an analysis of the data the number of samples collected was reduced to 32 bi-monthly and 11 from Hazel Creek semi-annually.

- 4) Were the original monitoring questions in the 1993 plan answered?
 Yes, park wide trends have been documented and are being used to direct future research.

- 5) Do they still need to be answered?
Monitoring needs to continue to address continued declines in pH and to assess changes related to improvements in air quality.
- 6) As a result of the information gathered, have new pertinent questions arisen?
Yes, questions related to small watershed sensitivity to future acidification and the effects this could have on brook trout and aquatic macroinvertebrates. How will soil chemistry be affected by continued acidification and what are the critical loads for park streams and ecosystems. Additional questions arise almost monthly.