SOUTHEAST FISH AND AQUATIC SPECIES BARRIER ASSESSMENT WORKSHOP

November 15 and 16, 2006
North Carolina Arboretum, Asheville

Thursday, November 16, 2006

"Working Session: Roundtable Discussion"

GROUP DISCUSSION QUESTIONS and ANSWERS

9:00 – 10:30 AM **Identifying Data Gaps/Research Needs Related to Fish and Other Aquatics in SE Streams**

1. Name priority target aquatic species or groups (fish or other) you recommend be considered in design. Why did you select these species or groups?
    a. Group 1 agreed that there is a need to address nongame coldwater species---something beyond trout-perhaps focusing on host species of freshwater mussels. In coastal areas diadromous fish (eel, shad, for example) are also very important when designing for passage.
    b. Group 3 thought it inadvisable to design for a particular species, favoring instead the idea of designing for the stream community. However, because of the ESA sec. 7 process, when a federally listed species is involved, design may focus on that species because of the regulatory requirements.
    c. Choosing a lowest-common-denominator species could essentially be designing for the community if in making certain the target species has passage, the needs of the other species are met as well.
    d. Group 3 also recognized that while designing for the community may be the most ideal option, there are a limited amount of resources for up-front costs, therefore not every site would be able to be designed for the community. Indeed, you would want more pristine sites getting more resources to help ensure they remain high-quality or even improve in quality. With that in mind, group 3 thought it best to develop a prioritization system that would help define when resources are allocated. Developing some sort of prioritization process could be done in such a way that the needs of T&E species are taken into consideration, since they are generally found in areas you would want to take better care of.

2. One approach to design is to identify a "LCD", lowest common denominator (or species that we target for crossing design standards to ensure we meet the minimum needs for all species). For example, juvenile coho (silver) salmon swim/jump ability is used as a baseline for designing crossings in the Pacific NW. Would you recommend the development of a baseline target species on which design standards are based for your physiographic area or state?
    a. Group 1 discussed at some length the need to take a community approach using functional groups of species that would consider grouping species by similar body size, shape, movement in the water column and home range in design. Other factors to consider include understanding the typical distance traveled and the timing of movement (day or night, seasonal variation). The group felt it was important to design for the context of the situation rather than individual species since focusing on a target species may result in designs that leave out other important species requirements for passage. The group also agreed that one could base designs on an LCD on a case-by-case basis if it is warranted.
    b. Group 2: Be sure to break out into physiographic region for fish/aquatics.
    c. Group 2: Stream simulation should be part of the package. Start with stream simulation (cost savings, etc.) and then move towards an LCD based on situation. Or use stream simulation but test the success of the design using an LCD.
    d. Group 2: Start the effort by choosing an LCD that is the weakest swimmer in the ecoregion and would have the most difficulty passing, assuming that if this LCD can pass then most everything else can pass. The darter or sculpin family may be a good candidate for the LCD, but there has been little research on these species so we need to find funding for research.
    e. Group 2: Should also consider other aquatic organisms as the LCD given that fish are not the least mobile aquatic organisms.
    f. Group 2: Should also consider other wildlife passage issues when designing crossings.
    g. Group 2: Should incorporate the results of research on stream simulation and LCD in manuals such as the Federal Highway Administration design manual.
    h. Group 2: Summary of Group 2's discussion—Start with stream simulation→ Context of situation→ LCD, based on the situation → Statewide assessment of LCDs
    i. Group 4: The type of passage structure is important and should be established before LCD. Stream simulation is the most important factor to use during stream crossing construction. If a LCD is chosen, other species may be left out and behavioral factors of other species may not be included. If the natural

stream conditions are mimicked then all species would be included. Recommend establishing a protocol/assessment for the movement of species up and downstream of the specific crossing and use that information in crossing design.

3. What information do we need to know about small-bodied fish and other aquatic organisms to ensure our crossing designs are meeting their passage requirements? What data gaps are in design methods for these species and how should they be researched?
    a. There are data gaps for non-fish species
    b. What are the fish hosts for mussels
    c. Need more data on basic life history including where species are moving, when, swimming speed, behavior
    d. Using stream simulation model in design, although this may not be practical in all cases.
    e. Lack of light/cover may also effect passage of organisms
    f. What are cumulative effects of barriers?
    g. Group 5: We need to understand more about the behavior of these organisms, what is the motivation for movement(s), whether darkness affects movement through culverts, whether openness affects movements.
    h. Group 5: We need more data on home ranges of species, dispersal modes, life stages and seasonal movements.
    i. Group 5: Should we target a species? We could focus on the maintenance of the stream community, by designing for a target species which may be the weakest swimmer, a threatened or endangered species, a popular gamefish, a species with a unique life history (such as an aggr. spawner), or a host fish for freshwater mussels.
    j. Group 5: We should look at how the fish responds to natural barriers or existing barriers.
    k. Group 5: In terms of data gaps, we do not need to know much more about aquatic species if we design crossings to pass the broadest range of fishes.
    l. Group 5: We need to look at the economics of using stream simulation in design, and how we can shift focus to crossing structures with the least impacts. We need to know how to "sell" the stream simulation model. We need to do a cost comparison of long term maintenance costs for hydraulically-designed culverts vs. stream simulation design at crossings.

4. Could you get internal support to design crossings based on the passage requirements of these species? Why or why not? How would you approach this issue?

a. Group 2: Before individuals are going to change the protocol for installing culverts there must be requirements developed by their agency, the state, or U.S. Army Corps of Engineers.
b. The U.S. Army Corps of Engineers nationwide permit conditions or regional permit conditions would be a good place to start implementing design crossings based on passage requirements. If these federal permits would require these design standards then all of the nationwide permits issued would have to implement these standards and the occurrence of culvert barriers would be greatly reduced.
c. Group 2: FHWA has a design manual for culverts which may not include stream simulation model in design.
d. Group 2: Incorporate culvert retrofitting into design options and develop an incentives program for these retrofits.

5. Name aquatic invasive, exotic species of concern and discuss research needs associated with the prevention of their spread into new areas. What are the potential impacts to designing for aquatic species passage and at the same time preventing the further spread of invasive, exotic species.
    a. Policy and social issues with exotic species that have to be addressed – need to address the implications of providing passage for exotic species
    b. While group 3 did name a handful of species of concern (rainbow trout, rusty crayfish, zebra mussels, carp) and a single specie threatened by an invasive species (brook trout), with the question of selecting invasive species to focus on excluding, group 3 struggled with the question of how you would exclude a specific invasive species, without harming the native community's ability to pass?
    c. In general, the group concluded that invasive species management would be done best on a case by case basis in regards to fish passage, and in general is an issue outside of the scope of fish passage design.
    d. If you were going to pursue invasive species exclusion as part of fish passage design, then some research points we raised are: the effects of isolation on communities, life histories of the invasive species, and alternative management approaches for the invasive species. *However, our thought was about designing to keep an invasive species from passing; it was not about what to do when a current culvert issue is preventing the spread of an invasive.*

6. Would you support passage design for non-fish taxa? Why or why not?
    a. Yes.
    b. Group 1: Policy/social issues with exotic, invasive species need to be addressed.

c. Other aquatic organisms include crayfish, salamanders, turtles, snakes.
d. Include consideration of the needs of water shrews, other riparian area dependent species which may be impacted more by crossings than instream aquatic species.
e. Should consider also wildlife passage in road crossing design/stream simulation may provide passage for terrestrial wildlife too.
f. Fish are not necessarily the least mobile of aquatic organisms, so we need to consider those organisms that may be less mobile (freshwater mussels, for example).
g. Group 4: Overall the group decided that it was important to design for non-fish taxa. It was important to include non-fish taxa in order to maintain ecological integrity throughout the stream. However, there was a consensus that data was inadequate to design for non-fish taxa. Non-fish taxa sometimes includes listed species and crossings should especially be designed for the mobility of these species (ESA).
h. Animal and human safety was also a discussed as a reason for designing for non-fish taxa. In these instances crossings should be designed to aid the movement of large animals.
i. One person in the group did question the importance of designing crossings for non-fish taxa because many species move during their terrestrial stage and the stream crossings may not be a barrier. In these cases it may not be cost effective to design for this taxa.

7. Are there other resources that weren't presented during this workshop that may be useful in addressing the passage needs of aquatic fauna?

10:30 – 10: 45 AM Break

10:45 – 12:30 PM **Developing Protocol for Barrier Inventory and Assessments: Research Needs and Recommendations**

1. What are the regulatory definitions of barriers in your state? Would you recommend these be modified? How and why?
   a. Group 5: Corps Permits state in regulation stream crossings cannot preclude passage of aquatic life.
   b. Group 5: There needs to be consideration of farm ponds as barriers to movement, and there is a lack of good mechanism or adequate use of existing regulation.
   c. There are dam safety regulations
   d. There are DOT BMP's for anadromous fish passage.

e. Group 5: In general, there is a lack of regulatory definitions, but there may be some risk of establishing regulations (for example, passage standards in US have been based on adult salmonids).
f. Group 5: Resource agencies should make permitting agencies aware of concerns.
g. Group 5: There are some old laws on the books for shad (absolute barriers).

2. Based on yesterday's presentations, can you surmise what constitutes a barrier to these species?
    a. Group 4 felt that the presentations did describe barriers, however it was still difficult to completely define a barrier. Barriers can be partial or complete and in some studies, structures that appeared to be barriers weren't **complete** barriers after surveys were completed up and downstream of the structure. Many different types of barriers were listed by the group (velocity, behavioral, performance levels of species, seasonal, thermal, chemical, etc.) but the question was raised as to what percentage of blockage constituted a barrier. The group concluded that barriers existed and designs should be incorporated to minimize any impediments to aquatic movement. However, to fully design crossings and structures to maintain complete ecological integrity of the system, more information and studies are needed as to aquatic organism movement and baseline data should be established by conducting more pre- and post-construction studies.

3. What more do we need to know in order to assess barriers to small bodied fish and other aquatic fauna? What are the data gaps?
    a. Group 1 related that in order to assure passage for aquatic species, stream simulation may be the best alternative for design, but it may not be practical in all cases. Lack of light/amount of cover may also affect passage. We need more data on basic life history, including where species are moving and when, swimming speed, behavior and what the zone of passage is for different types of organisms.
    b. Group 1 stated that we often don't know what the historic/reference condition was in most streams and for most fishes. Some states need to convene a panel of experts and develop a manual of fishes to recreate reference data.
    c. Group 1 added that where culverts exist, streams and structures need to be monitored to determine if newly replaced culverts are providing passage---are the species that occur instream moving upstream/downstream of existing culverts?
    d. Group 1 thought we need to take advantage of existing data on aquatic organisms. There are untapped sources such as museum

collections and Wildlife Resource Commission Collection Permits. These data need to be made available to practitioners. Another potential source is long term IBI data. IBI data combined with data about the length of time culverts have been installed in certain areas could be used to determine whether passage is occurring in streams with existing culverts. An acknowledged data gap is the amount of genetic exchange—both what is occurring and what is needed. Data exists in WRC Collection Permits (museum collections) and this should be made available to practitioners.

e. Group 1 said it is important to know culvert position on the landscape and the stream/valley type and stratify our sampling accordingly. We need to know if the existing culvert changed the stream type, created "perchedness", or created scour pools. We need to know if substrate stays in the culvert or is washed out during high flows.
f. Group 1 recognized the need to understand the cumulative effects of barriers within a watershed. One critical barrier or a series of barriers in a stream may isolate populations and prevent access to important habitat.
g. Group 1: We need to assess the implications of providing passage for exotic species.
h. Group 5: We need to challenge the premise of natural stream simulation (financially?).
i. Group 5: We need to know more about other aquatic organisms, such as crayfish, salamanders.
j. Group 5: Follow-up implementation, including as-builts, monitoring, determining effectiveness (did it work to pass species?), validation.
k. Group 5: In order to assess, we need topographic information, location, jurisdiction (who is responsible to fix barrier), cumulative effects, what is upstream/downstream, prioritization scheme, PVA??, baseline information on effects of existing barriers, seasonal variations in flow and species response to flow changes, changes in the watershed (increase in impervious surface), is it a functional barrier, other stressors in the watershed/stream, whether the stream is channelized.

4. What do you recommend we measure to assess barriers to these focal species?
    a. Group 1: Physical parameters that could be measured include sediment transport, pebble counts,
    b. Group 1: Need to understand individual species life history and swimming ability, movement through dark passages, movement dynamics within the catchment, etc., and then define suitable passage conditions in order to assess barriers.

c. Group 3 acknowledged that group member Seth Coffman had already developed some metrics for assessment. Other things to look at when assessing – the physical characteristics of barrier and surrounding stream; biological aspects such as the species assemblages and whether or not the passage issue is an important genetic barrier; and a hydrologic assessment including how the flow changes seasonally.

5. Should we standardize how barriers are assessed in SE streams? How could we coordinate this effort in our individual states.
    a. Group 2: Yes, and this should include a coordinated effort where a multi-state task force could be developed with a Regional Coordinator at the helm of the task force. There should be a regulatory sector as well as private sector to target.
    b. Group 2: Should make sure all BMP Manuals are improved and standardized.
    c. Group 2: May start with San Dimas method but need to validate through out the country.
    d. Group 2: Should also consider barriers from dams, farm ponds, and natural barriers.
    e. Group 2: Create a database for people to access that will label whether there is a barrier, no barrier, or possibly a barrier.
    f. Group 2: Should also consider high and low flow barriers.
    g. Group 2: Consider not only upstream but also downstream movement.
    h. Group 2: Consider other barriers such as water quality, thermo, and chemical.

6. Would you support a comprehensive inventory of barriers in your state to identify sites in need of restoration. What sources might fund such a project? Which agencies might be involved in barrier assessment?

7. Would you support the creation of a database which contains information on barriers to aquatic species and offers a prioritization of passage restoration projects in your state or area of responsibility? (Objectives may be to (1) create an accessible database format, (2) compile existing culvert data into database, (3) identify data gaps and work with partners to collect missing data, (4) prioritize fish passage barriers, (5) create GIS maps that illustrate the barriers and their priority rankings, and (6) provide educational opportunities for community members.) Please offer suggestions as to how to fund/and who might oversee and contribute to a project of this magnitude? How should this effort be coordinated?
    a. Yes. Group 3 thought a database would be a good idea as it would enable prioritization and help bring in money and guide when that money would go. In fact, apparently the Forest Service and SC

DOT are already doing this. That agencies are independently doing it raises the issue of having a standardized format for the data. There was also discussion about who could coordinate the various databases, or who could lead an effort to create a central database that everyone could tie into. What would/could be the roles of NGOs, agencies, and academia?

b. As for funding, all of the organizations mentioned above were mentioned as possible sources, and it was noted that gains to listed species or game species might help steer money to such a project.
c. Group 4 supported the establishment of a database and felt that prioritization of passage restoration projects was important. Discussion for funding led in the direction of USFWS, Corps, EPA, Federal Highways, etc. Also, it was brought up that mitigation from project impacts could include payments for funding a database project. Universities and NGOs were also mentioned as important contributors of both manpower and database establishment.

8. How would you prioritize passage needs in your area? What criteria would you use?
    a. Recommended using the USFS National Inventory and Assessment Procedure – To Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings (San Dimas, CA). However, more research may be needed to validate these procedures, even though it is being used from AK to FL.
    b. Through the creation of an extensive database of barriers, a prioritized list of sites for restoration could be generated.
    c. An incentives program for retrofit credit could be initiated to encourage DOT's or local public works departments to remove barriers.
    d. Criteria to consider includes looking beyond permanent structures, determining high and low flow barriers, considering downstream movement also, water quality, temperature and chemical barriers in assessment.
    e. T/E species and their habitats should be a priority for barrier removal.
    f. Group 2: Threatened and Endangered species and their habitats should be a priority for barrier removal.
    g. Other state species of interest should be considered.
    h. Group 2: Need to know barrier status and type.
    i. Group 2: High quality resource waters should be prioritized.
    j. Group 2: Development pressure and existing development should be considered.
    k. Group 2: New vs. existing crossings should be prioritized.

l. Group 2: Risk assessment/benefit of fixing and the degree to which the functions of the stream can be improved.
m. Group 2: Public interest and the probability of success should be considered.
n. Group 2: A watershed/landscape approach should be considered during prioritization.

12:30 – 1:30 PM Lunch

1:30 – 3:30 PM **Developing Design Standards for Small-bodied Fish and Other Aquatics: Research Needs and Recommendations**

1. a)What design standards should we adopt to ensure passage of weak swimming aquatic organisms?

a. Group 3 quickly came up with a laundry list of characteristics, including: flow through culvert match, more or less, flow through a representative natural reach; bury culverts where applicable; include a substrate that mimics natural substrate as much as possible; have bottomless culverts where applicable; use properly sized culverts. After looking at our list, we acknowledged that we were talking about stream simulation.

1. b)Can you get support internally to design to ensure the passage of these species?

b. If it's part of a permit requirement, then it will get incorporated. If mitigation credit can be offered, then that would encourage use of these techniques. There was some question about how it could be incorporated into the nationwide permit process.

2. Which resource agencies and/or regulatory agencies would need to endorse alternative crossing standards for them to be implemented in your state and how would you initiate these changes?

a. Group 2: Federal and state resource agencies including, U.S. Forest Service, National Park Service, National Marine Fisheries Service, U.S. Fish and Wildlife Service, State Fish and Wildlife Agencies
b. Group 2: Federal and state regulatory agencies and others including U.S. Army Corps of Engineers, Division of Water Quality (401 Permits), State Division of Environmental Protection, Environmental Protection Agency, Tennessee Valley Authority, Department of Transportation, Federal Highways Administration, CAMA
c. Group 2: Developers, local governments and private landowners also need to be brought on board to endorse changes. This will require target outreach to these groups.

d. Group 2: It was recommended a task force be developed to discuss issues/initiate changes.
e. Group 2: Consensus would be needed to bring changes to Corps Nationwide Permits. Or at least comment on the nationwide permits (which are reissued every 5 years).

3. Should we consider abiotic factors (such as the passage of large woody debris) in design standards? What other factors should be considered during design that may not have been mentioned or emphasized in this workshop?
    a. Group 3 thought design should allow passage of woody debris and allow sediment transport; crossings should be designed to maintain floodplain flow; daylighting streams should be factored in; practitioners can piggyback these efforts with greenway designs; and we should also look at threat of increased predation at mouth of passage as fish wait to enter or get washed back down

4. Describe your concerns for designing for small-bodied or non-traditional aquatics species and using the stream simulation model in design. What are potential institutional barriers?
    a. Group 2: Differences in perspectives, most people are just concerned with game fish crossings or getting water through for hydrological issues, such as flooding private land. You would have to show that all goals could be met, including the goal of passing all forms of aquatic life.
    b. Group 2: Need to design for a range of flows.
    c. Group 2: Need to evaluate current designs before running with new method
    d. Group 2: Mimic function not just form.
    e. Group 2: Should develop pilot programs
    f. Group 2: Standard specifications.

5. What BMP's should be followed during passage construction in SE streams?
    a. Group 4: The NCDOT along with partners established a BMP manual for Construction and Maintenance Activities. This manual is a good starting point for BMPs during construction of passage construction. It provides details on erosion control measures, for controlling sediment from entering streams, minimizing area disturbance, diversion of streams during construction, and for crossing maintenance.

6. How might we demonstrate the economic feasibility of moving towards stream simulation model in design of road crossings?

a. Group 5: In order to demonstrate an economic benefit, we need to demonstrate this model reduces stream erosion, reduces maintenance costs long term, reduces the costs of water treatment and intake maintenance as compared to existing designs/crossings.
b. Group 5: We should compare and contrast construction/maintenance cost/benefits.
c. Group 5: Avoid regulatory restrictions associated with poor planning.
d. Demonstrate cost of habitat loss.
e. Compare types of structures and costs/availability of alternative structures/cost of individual design.
f. Overall, this method may help avoid regulatory restrictions and project delays; reduce mitigation costs.
g. Group 5: Holistic concept???

7. How should monitoring occur to ensure design standards are meeting passage requirements of target species? Who should monitor and how will this effort be coordinated and funded?
    a. Group 4: As previously stated, pre- and post-construction monitoring and surveys are essential in ensuring that design standards are meeting passage requirements. It was discussed that a representative sample could be taken from all crossings and detailed surveys be conducted. Also, the DOT could conduct visual assessments during routine inspections. NGOs and Universities could be included in conducting surveys and establishing priority crossings for surveys.

8. Should this workshop be brought to other states? How might this workshop be improved?
    a. Group 5: An engineering design workshop would be useful.
    b. A workshop presenting case studies and with field trips would be useful
    c. Try to bring in more engineering staff, hydrologists, decision makers, geomorphologists, culvert suppliers/manufacturers, contractor/construction engineers, permit decision makers and local planners.