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Mr Dorney:

I am writing to comment on the document "Determining appropriate compensatory mitigation credit for dam removal projects in North Carolina" dated February 13, 2008, which is currently open for public comment. I am writing as someone who has participated and led stream restoration and dam removal projects in the private sector, public regulatory/research agencies, and now as a research scientist. As such, I believe that my comments are informed based on rigorous research as well as balanced with real-world experience.

On Page 2: The contributing agencies state that "Dam removal projects should be used cautiously and on a limited basis as compensatory mitigation until a better understanding of the benefits and consequences of dam removal projects is gained." I strongly disagree with this approach taken by the agencies. The balance of evidence increasingly supports dam removal as a practical and effective took in river restoration, whereas traditional (i.e., "natural channel design") approaches have been increasingly if not consistently shown to be ineffective in producing real, ecological functional change. This is particularly true for a large number of studies conducted here in North Carolina. Moreover, given the documented success dam removal, and the failure of traditional restoration for generating real ecological restoration, the impetus should actually be the other way around. That is, traditional restoration should be used on a limited basis until traditional restoration in North Carolina has been proven more effective than dam removal has already been proven to be. At a minimum, both dam removal and traditional restoration via natural channel design should both be considered forms of stream restoration, and both should be evaluated on a case-by-case basis where the proposals are evaluated based on merits of likely restoration potential, not based on the methods of restoration. I suggest that in such an even-handed evaluation approach, it is likely that dam removal will be a highly competitive approach, resulting in the greatest restoration at the least cost. Moreover, based on my reading of the research that has been conducted to date in North Carolina of stream restoration for compensatory mitigation, I find that these projects do not provide sufficient ecological restoration to mitigate the impacts of development activities.

A few examples of relevant findings which must be considered by the agencies as they formulate this policy (references provided at end of comments):

Dam removal:

"When the impoundment was converted to a free flowing reach, the composition of the benthic macroinvertebrates and fish assemblages in this portion of Manatawny Creek shifted dramatically from lentic to lotic taxa." (Bushaw-Newton et al., 2002, page 1581)

"Physical habitat at the former impoundment became comparable to free-flowing sites within 1 year of the breach." ; "Overall macroinvertebrate assemblage structure at the former impoundment shifted to a characteristically free-flowing site 2 yrs following the breach."; "**Collectively, our results support the effectiveness of dam removal as a restoration practice for impaired streams and rivers**." (Maloney et al., 2008, page 1055).

"**Within 1 year of dam removal, macroinvertebrate assemblages in formerly impounded reaches did not significantly differ from those in either the upstream reference site or in other unimpounded reaches below the dam site**." (Stanley et al., 2002, page 172).

"Our study suggests that dam removal is a viable option for restoring lotic fish communities, but further study is needed on recovery patterns as they relate to channel morphology…" (Catalano et al., 2007, page 519).

"Evidence of spawning activity was detected upstream of the former dam site for three anadromous species: American shad, hickory shad, and striped bas."; "**These results demonstrate that anadromous fishes will take advantage of upper basin spawning habitat restored through dam removal as long as instream flows are adequate to facilitate upstream migration**." (Burdick and Hightower, 2006, pg 1290).

Stream Restoration

"There were few significant relationships between the fish fauna and physical variables, indicating that increasing habitat does not necessarily lead to higher biological diversity." ; "**From this substantial sample of lowland rivers, there is little evidence of any general benefit to fish of small-scale instream structures in river rehabilitation**." (Prett et al., 2003, pg 251).

"Neither artificial riffles nor flow deflectors had any significant impact on the taxon richness of the benthos or of the rehabilitated stretch of the river as a whole. Invertebrate diversity of rehabilitated stretches related closely to that of reference stretches, indicating that larger scale factors constrained any impact of rehabilitation. Local rehabilitation structures appeared to have minor biological effects in lowland rivers." (Harrison et al., 2004, pg 1140).

"The project improved mesohabitat structure and fish abundance, and biomass and diversity were greater for 2 years following construction. However, the improved fish metrics were in the low range when compared to rural streams in the same ecoregion, and the fish community consisted primarily of tolerant, slow-water species. Absent were intolerant and riffle dwelling species, such as insectivorous cyprinids and darters." (Schwartz and Herricks, 2007, p 451).

"My statistical results show that the traditional use of in-stream structures for channel restoration design does not ensure demonstrable benefits for fish communities, and their ability to increase fish populations should not be presumed." (Thompson, 2006, pg 784).

Stream Restoration in North Carolina

"Even after four years, dominant fauna do not recolonize to the levels of pre-construction conditions and in no case to dominant in common values meet the proposed 75% criterion." ; "**To date, proposed success criteria have not been met during post-construction monitoring at any of these [16] restoration projects**." (Penrose, 2006, pg 5-6).

These preceding findings are not meant to suggest that all dam removals are perfect successes and that traditional restorations never work. But rather, that there is as much evidence for the efficacy of dam removal as there is for restoration failure. To suggest, as the current guidance for dam removal does, that traditional restoration is in some way a more proven approach to restoring ecological function, is to ignore the available research to date, and particularly to ignore the available research in North Carolina. The current guidelines for use of dam removal for compensatory mitigation is not based on best available science.

Page 2, "Furthermore, compensatory mitigation credits generated through dam removal will constitute no more than half of the required mitigation credit for any particular impact, with the exception of those projects involving the discharge of fill material and subsequent impoundment of upstream waters. Any remaining credits will be generated from other stream projects following the Stream Mitigation Guidelines in North Carolina."

The requirement that at most half of mitigation credits be generated by dam removal is unsubstantiated and not based sound science. To date, the results of ecological restoration via dam removal are substantial while the results from traditional stream restoration are lacking, particularly in North Carolina. Moreover, the few studies that have examined the actual ecological change at traditional stream restoration sites in North Carolina have shown that restored streams are ecologically indistinguishable from urban, degraded streams (studies by Dave Penrose, NCSU; Christy Violin,

UNC-Biology, presented at annual meeting of the North American Benthological Society; water quality study by Elizabeth Sudduth, Duke University). The agencies should not require that an unproven method (traditional restoration) be used in preference of an increasingly proven method (dam removal).

Page 2, "This guidance relates to dam removal projects only and is not intended to address other types of potential compensatory stream mitigation projects."
It is unreasonable for the agencies to separate dam removal from other forms of mitigation if the credits generated from both types of mitigation are going to be used interchangeably to compensate for unavoidable impacts. Most importantly, if dam removal is being held to a more strict standard that other forms of mitigation (as outlined in page 3 of guidelines), then dam removal should be given preference over other forms that are held to lower standards (and arguably are held to NO standards for ecological restoration).

Page 3: "If dam removal does not meet at least two of the four criteria, then it is unlikely that the Federal and State agencies will support removal of the dam as compensatory mitigation."
If credits from dam removal are considered equal to credits from traditional restoration, then both forms of restoration should be held to the same evaluative criteria. I strongly recommend that the agencies hold both forms of mitigation to the same criteria articulated in this dam removal guidance, rather than the insufficient criteria laid out in the stream mitigation guidance that is currently used for traditional restoration. I find the proposed evaluation criteria laid out in this guidance to be an appropriate first step, but that both forms of restoration (traditional and dam removal) held to these criteria.

Page 11: Requirement for wooded buffers:
While wooded buffers are important to the restoration of streams, the agencies should not require buffers for dam removal to create mitigation credits. Previous research has shown rapid and unequivocal ecological restoration following dam removal with no requirements for wooded buffers; there is no evidence that wooded buffers enhance or diminish the changes of ecological recovery following dam removal. Stanley et al. (2001) showed rapid recovery of invertebrate communities following dam removal, despite the dam that was removed was the middle of a small city (Baraboo, Wisconsin) which contained impervious areas up to the edge of the river channel, and agricultural areas up to the channel edge in the upstream reaches. Breaching of the South Batavia dam in Illinois was followed by rapid recovery of habitat, invertebrates, and fish, in less than 2 yrs, yet the South Batavia Dam was located within the city of Batavia Illinois, amidst Railroad infrastructure, neighborhoods, etc. Fisheries studies following several dam removals in North Carolina, as documented by Joe Hightower, NC State University, have all shown substantial movement of fish past dam removal sites despite no requirements for wooded buffers along the river corridor at the dam site as part of the dam removal

project. In sum, wooded buffers are helpful and advantageous, but have not been shown in any way to be imperative to the success of a dam removal project for ecological recovery. Without justification, the agencies should not make such a requirement. Moreover, if the agencies retain this requirement, dams that pose the greatest public safety hazards will not be amenable to removal because they lie in urban or sub-urban areas, and thus would not have the potential for wooded buffers. Yet these are exactly the kinds of dam removal projects that would benefit the environment as well as the general public.

I hope that these comments are seriously considered as you move toward a final policy for the use of dam removal in compensatory mitigation. I would be happy to answer any questions that may arise as part of these comments.

Best regards

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