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Restoration of the Lower Olentangy River: What to Expect When the 5th Avenue Dam Is Removed

With assistance from the U.S. Army Corps of Engineers Huntington District, the City of Columbus has recently made a decision to remove the 5th Avenue Dam from the Olentangy River where the river passes The Ohio State University and Battelle Memorial Institute. The decision to remove the dam was announced publicly in Columbus on December 8, 2007.

We, the undersigned, are representatives of a team of 13 scientists and engineers and 14 student researchers from six Ohio State University departments involved in a City of Columbus Capital Improvements Project No. 650706 to The Ohio State University Research Foundation entitled "Lower Olentangy River Ecosystem Restoration Project." We present both preliminary findings and professional judgments for the City of Columbus, the U.S. Army Corps of Engineers, The Ohio State University, and other interested parties, on what to expect as a result of the dam removal. Preliminary results of our City of Columbus study are reported here and will continue to be reported at the Olentangy River Wetland Research Park web site: http://swamp.osu.edu/Research/OlentangyRiver/index.html

Summary

Overall, our findings and research-based judgments can be summarized in three major points:

1. The removal of the dam will result in an improvement in water quality in the reservoir area now formed by the 5th Avenue dam (Dodridge Street to 5th Avenue). Water quality improvements and improved habitat caused by a stronger connection between the river and its riparian fringe will lead to improved aquatic diversity in fish and invertebrates in the former reservoir area.

2. Vegetation and stream channel restoration should and will be accomplished mostly through natural processes rather than by vegetation planting and channel manipulation. This "self-design" restoration will lead to a narrower, shallower stream with some meander patterns within a corridor of riparian vegetation and shifting mud and river-gravel flats.

3. Overall, while some effects of dam removal, such as improvements in water quality, will occur almost immediately, other consequences of the restoration such as development of riparian vegetation, formation of natural channels, and return of riparian animals and birds will manifest themselves over a longer time frame of several years to a decade or more.

Short-Term Changes after Dam Removal

From an ecological standpoint, the Olentangy River will improve in water quality and fish and invertebrate diversity in the pool adjacent to The Ohio State University and Battelle Memorial Institute in a relatively short time. Examples of expected short-term changes include the following:

1. Pool water quality will improve due to the dam removal. We expect dissolved oxygen and temperature to have lower amplitude swings from high to low that are now experienced due to the slow moving water, organic pollution accumulation, and high algal production during low-flow conditions.

2. Our data suggest that water quality currently changes dramatically during the "first flush" of river flooding, especially for suspended sediments, total phosphorus, and nitrate-nitrogen. This poor water quality will tend to flush downstream rather than accumulate in the river pool after the dam is removed.

3. Our biological sampling at the upstream and downstream ends of the 5th Avenue pool currently show better biological quality at those locations compared to the dam reservoir itself. This suggests that after removal of the 5th Ave Dam, the biological quality of the pool area will improve quickly due to a decrease in stream width, an increase in stream velocity, and rapid biotic fluxes from both the immediate upstream and downstream river reaches.

4. For the past 14 years, wetlands at OSU's Olentangy River Wetland Research Park have captured and cleansed a significant and continuous flow of river water before returning it back to the Olentangy River. Anecdotal information has suggested that this cleaner water has already improved portions of the 5th Avenue pool. After removal of the dam, the continual capture, cleansing, and release of river water at the OSU wetlands will have an even greater positive impact on the water quality of the river.

5. Fish species diversity will improve in the 5th Avenue pool after the removal of the dam, with less dominance of deepwater freshwater fish typical of reservoirs in Ohio and more dominance of shallow swift-stream species such as darters. In fact, *Etheostoma camurum* (Bluebreast darter), a threatened species in Ohio, was identified in October 2007 in the riffle area immediately downstream of the Dodridge Dam (the extreme upper reach of the 5th Avenue pool). With dam removal, darters and similar species will likely move downstream to the area adjacent to the Ohio State campus relatively rapidly.

6. Seeding of the restored stream area with fish or invertebrate propagules will unlikely change the recovery time for species, as natural immigration of species will occur at a relatively rapid pace.

7. Research is on-going on the effects of the dam on denitrification (a valuable process because it removes nitrogen pollution) and methane emissions (an unwanted process because methane is a greenhouse gas). Similar studies on Olentangy River wetlands suggest that there may be less methane emission from the channel after the removal of the dam because of shallower waters. Our preliminary results also indicate that denitrification in the channel may not change.

Long-Range Changes after Dam Removal

Several changes will occur over a longer period in the lower Olentangy River in the vicinity of the current pool of the 5th Avenue Dam. These changes will occur as a result of a many-mile uninterrupted riparian corridor on the lower Olentangy/Scioto River that will enhance wildlife and migratory bird populations and afford the citizens of Columbus and the Ohio State University community enriched opportunities for nature experiences and recreation in this urban area.

1. The stream will develop a predictable channel pattern within the former dam pool area over a period of a few years to a decade. Mud flats and gravel/rocky riparian zones and islands will develop and remain above normal water level for most of the time. Those areas that become stable and are flooded less than 10% of the time will begin to develop dense seedling beds of pioneer trees such as Willows (*Salix*) and Eastern Cottonwoods (*Populus deltoides*), followed by bottomland trees such as American Sycamores (*Platanus occidentalis*). These trees, if they are able to withstand high amplitude flooding, will likely develop naturally into a wider width of riparian vegetation, eventually forming a productive linear forest.

2. Based on a comparison of similar natural reaches in the river, we expect that the stream width will decrease from about 380 ft (120 m) to 330 ft (100 m) in the vicinity of the main campus of The Ohio State University (Woody Hayes Drive to the 5^{th} Avenue Dam) when the dam is removed. That lost 50 ft (20 m) of former stream width will develop as a riparian forest/wetland corridor of significant biological productivity.

3. Vegetation and stream channel restoration should be allowed to occur mostly through natural processes rather than by channel manipulation and vegetation planting. This "self-design" restoration will lead to a more natural stream with some meander patterns within a pattern of riparian vegetation and migrating mud and gravel flats. Planting and excessive structures for stream diversions will, for the most part, cause only temporary changes and could be a waste of taxpayer money.

4. Overall, the quality and abundance of riparian animals and birds will increase as the riparian vegetation expands and develops canopy cover through The Ohio State University campus river corridor. This river "ecological highway" will be uninterrupted from the Olentangy River Wetland Research Park and Tuttle Park to the north through the area formerly flooded by the dam to several miles downstream beyond the confluence of the Olentangy River with the Scioto River and downtown Columbus.

5. The restored river corridor will provide an opportunity for an ecological focus and sensitivity for campus academic programs, pedestrians, and bicyclists and a renewed interest in the river. This river corridor can serve as an outdoor laboratory for many disciplines on campus and within the Columbus educational community. Continued research and outreach education of river restoration should be explicitly recognized as part of making OSU and Columbus green and sustainable.

Signed:

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