Corydon Dam Removal

Corydon, Indiana Removes Two Dams to Restore Ecosystem Health and Water Quality

Project Summary

With a growing push to remove low-head dams due to safety concerns and the potential for ecosystem improvement, Corydon, Indiana was approached by The Nature Conservancy to remove two dams owned by the Town. The dams blocked potential habitat for the endangered hellbender salamander, so funding was available from a variety of sources, allowing Corydon to remove their dams at no cost to the Town. Now that the dams have been removed, Corydon has less liability and the health of the river ecosystem can begin to improve.

Corydon, Indiana removed two dams in the fall of 2019. Jerry Sweeten, Ecosystems Connections Institute

How did they do it?

Action	Applicable Resources
Conduct a sediment analysis • Take 3-5 samples to determine what is in the sediment and if that will create any issues with removal.	• US Geological Survey Regional Stream Quality Assessment (RSQA) <https://webapps.usgs.gov/rsqa/#!/> characterizes multiple water-quality factors that are stressors to aquatic life and provides information to better understand the relationship between stressors and ecological conditions in streams.

Action	Applicable Resources
	• The Environmental Markets and Stream Barrier Removal <https://www.nature.org/en-us/what-we-do/our-insights/reports/> report highlights opportunities in the United States to improve stream health by removing barriers to aquatic connectivity.
Hold meetings • Meet with all applicable parties to determine goals and what steps need to be made. • Have follow-up meetings with experts to obtain all the information you need.	• Protecting Inland Lakes: A Toolkit for Local Governments <https://www.mymlsa.org/protecting-michigans-inland-lakes-a-toolkit-for-local-governments/> provides resources, information, and ordinances that help local governments improve the health of their aquatic ecosystems. • US Geological Survey Regional Stream Quality Assessment (RSQA) <https://webapps.usgs.gov/rsqa/#!/> characterizes multiple water-quality factors that are stressors to aquatic life and provides information to better understand the relationship between stressors and ecological conditions in streams. • Great Lakes Coastal Resilience Planning Guide <http://greatlakesresilience.org/> offer case studies to illustrate how local planners and practitioners are helping to make their communities more resilient.
Engineering conceptual design • Asses the dams and how best to remove them. • Lay out the sequence of deconstruction. • Determine the concept level costs and establish unit costs.	

Action	Applicable Resources
Apply for grant funds • Seek funds using the established costs determined from the conceptual design.	Potential funding sources • USFWS Fish Passage Program <https://www.fws.gov/fisheries/fish-passage.html> • Indiana Dept. of Natural Resources (IDNR) Lake and River Enhancement Funds <https://www.in.gov/dnr/fishwild/2364.htm> • IDNR Stream and Wetland In-Lieu-Fee Mitigation Program <https://www.in.gov/dnr/heritage/8340.htm> • Local community foundations
Permits • Work to obtain permits from relevant agencies while funds are being sought. • Engineering drawings and deconstruction designs are useful to the permitting process. • Conduct pre-removal monitoring of stream conditions.	• General dam regulations and guidelines <https://www.in.gov/dnr/water/2458.htm> from the Indiana Department of Natural Resources
Demolition • Backhoe with a pneumatic hammer to remove the dam. • Concrete from the dam may be left in place or used as fill material. • Hydraulic crane(s) used to remove the dam. • All concrete and/or fill must be removed from the stream channel and disposed of in an appropriate and acceptable manner.	

Action	Applicable Resources
Post-removal monitoring • Monitor the waterway after removal to determine the ecosystem health and water quality. • Use the data in decision making for species habitat and to satisfy permitting requirements.	• US Geological Survey regional Stream Quality Assessment (RSQA) <https://webapps.usgs.gov/rsqa/#!/> characterizes multiple water-quality factors that are stressors to aquatic life and provides information to better understand the relationship between stressors and ecological conditions in streams.

Background

Two low-head dams in the 1960s were built by Corydon in Big Indian Creek for water storage purposes. The Town's water supply is no longer Big Indian Creek and the dams were not used for flood control purposes. Low-head dams are notoriously dangerous to people using the waterways for recreation <https://www.in.gov/dnr/outdoor/9419.htm> . Several drownings have occurred at one of the dams in recent years. The Town of Corydon owned these dams, and liability was a concern.

A warning sign near one of the dams. Jerry Sweeten, Ecosystems Connections Institute

The dangers of low-head dams

Low-head dams can be dangerous to water recreationists. These dams are relatively small (under 25 feet but usually much smaller), causing people to under-estimate the danger. When there are moderate to high flows over a low-head dam, an occurrence that will become more frequent with increasing extreme precipitation events <https://hri.eri.iu.edu/climate-vulnerability/index.html?

placeid=Corydon> , turbulence and recirculating currents become stronger at the bottom of the dam. With increased precipitation expected in Indiana, moderate to high flow events will become more common and increase the risk of drowning at low-head dams. Even experienced water recreationists with flotation devices can easily be swept over a dam and be unable to escape the recirculating currents at the bottom of the dam. In Indiana, there are around 150 identified low-head dams (see a map of low-head dams in Indiana <https://indnr.maps.arcgis.com/apps/webappviewer/index.html?id=729f94f7963a42d9ab0d38c639590fea>). Indiana ranks 10th in the nation for people who have died at low-head dams and of all drownings in Indiana, 10 percent are dam-related. For more information on the dangers of dams, visit the Indiana Department of Natural Resources page on low-head dams <https://www.in.gov/dnr/outdoor/9419.htm> or view a documentary from WFYI <https://www.wfyi.org/programs/over-under-gone/television/over-under-gone-the-killer-in-our-rivers> .

Dams also alter fish migration, fragment important ecological functions of stream, and may negatively affect water quality. Big Indian Creek has been evaluated as habitat potentially suitable for hellbender salamanders, an endangered species in Indiana. Currently, in Indiana, hellbenders are only found in the Blue River. Big Indian Creek has been identified as a historical habitat of the hellbender with similar natural qualities as the Blue River. However, the presence of dams has altered the habitat in a way that prevented hellbender migration within the stream. Dams are a barrier that isolates hellbenders and present other negative changes in a river such as lower dissolved oxygen in the artificial pools created behind dams.
<https://www.federalregister.gov/documents/2019/04/04/2019-06536/endangered-and-threatened-wildlife-and-plants-12-month-petition-finding-and-endangered-species>

An eastern hellbender. Photo by Brian Gratwicke, Smithsonian Conservation Biology Institute

Implementation

In June 2017, the Town of Corydon was approached by The Nature Conservancy. The Corydon Town Council was apprehensive about removing the dams at first due to cost and concerns over increased flooding, so representatives from the Town of Corydon and The Nature Conservancy met with the Indiana Department of Natural Resources and the US Fish and Wildlife Service. Their discussion

focused on how dam removal would work and the potential costs and benefits for the Town. This in-person meeting was important as it established a level of trust and allowed for a better flow of information from the researchers to the Town Council.

The Corydon Town Council wanted to know if removing the dams would lead to flooding, so a US Fish and Wildlife Service hydrologist ran a model based on flood insurance maps. The model showed that the dams were not actually controlling flooding, so their removal would not create future flooding issues. If anything, the removal might actually reduce flooding upstream of the dams by a small amount. The removal would also allow for more water flow downstream to Corydon where the streambed often gets low in the summer and has little flow. As more sediment flows in with the additional water, algae on the gravel will be reduced and aquatic plants will be more likely to root, which can reduce erosion and stabilize banks.

The Nature Conservancy presented these findings to the Town Council. The Council then gave approval to begin seeking funds to remove the dams and said they would approve the project once sufficient funding was identified.

The Town of Corydon and The Nature Conservancy began to look into the specifications of the dam and what options were available for removal. They found Ecosystems Connections Institute who had done work on dam removals in the Eel River in northcentral Indiana. Ecosystems Connections Institute navigated the logistics of dam removal and handled the permitting process through the Indiana Departments of Environmental Management, Natural Resources, and State Historic Preservation as well as the US Army Corps of Engineers.

Images of the dams in Corydon courtesy of Cassie Hauswald and Jerry Sweeten.

The Nature Conservancy identified grant opportunities. They found the Indiana Department of Natural Resources' Lake and River Enhancement Program <https://www.in.gov/dnr/fishwild/2364.htm> and the National Fish Passage Program <https://www.fws.gov/fisheries/fish-passage.html> through the US Fish and Wildlife Service. The Nature Conservancy and Ecosystems Connections worked with Corydon to write the grants, which were submitted in December 2017. They received notice in January 2018 of the awards for the removal. Some of this funding was available to Corydon because of the potential hellbender habitat.

Beginning in August 2018, Ecosystems Connections Institute began sampling the health of the river and the fish present. They discovered that the area furthest upstream, the pool with the largest area, had the lowest levels of fish. They also determined that wildlife was the healthiest after a third dam further down the river, so removing the two upstream dams would provide the best impact to the ecosystem.

Ecosystems Connections Institute managed the permitting process throughout the project. Permitting can be an impediment to dam removal as the process is cumbersome and not clear-cut as it deals with multiple agencies and people. Working with partners who have gone through the process simplified the project for Corydon. All permits were acquired by July 2019.

In partnership with Ecosystems Connections Institute and The Nature Conservancy, the Town hosted a public meeting in May 2019 to inform residents of the plans for and purpose of dam removal, and to gather feedback from the community. During the meeting, there was little dissent from residents. Likely factors in the low amount of dissent were Corydon not having to pay out-of-pocket because of the grants, habitat restoration, public safety improvement, and the dams not being prominent features people saw on a day-to-day basis.

All relevant parties had approved the dam removal project by the summer of 2019. The project was scheduled for the fall when the creek would be in a lower water stage. The dam removals took place in October 2019 and took around two weeks to complete removal. A contractor was hired to do the actual removal with supervision from Ecosystems Connections Institute.

Funding

The total cost of the removals was $304,000. $95,000 was provided by the Indiana Department of Natural Resources Lake and River Enhancement program. The remainder came from the US Fish and Wildlife's Fish Passageway Program with matching funds from The Nature Conservancy. There was no financial cost to Corydon.

Timeline

Corydon was approached in June of 2017 by The Nature Conservancy and the dams were removed in October 2019.

Outcomes and Conclusions

With the dams removed, the river biodiversity and ecosystem can improve. Sediment and water flow trapped by the dams can begin to establish new habitat for aquatic plants and wildlife while also improving the overall water quality. It will likely take a year or two before it can be determined if hellbenders can be reintroduced. In the meantime, Ecosystems Connections Institute will conduct post-removal tests in Big Indian Creek to quantify the physical, chemical, and biological responses. This information will be used to determine the overall health of the creek and for future hellbender reintroduction plans.

Now that the dams owned by Corydon have been removed, the recreational danger is reduced. The removals eliminate potential liability for Corydon while also allowing them to promote water recreation.

Challenges

Dams are regulated by multiple agencies and have multiple moving parts that do not always communicate with each other. This complexity can make it difficult for local governments to remove dams on their own. Partnering with an outside organization or person who has experience going through the permitting process can help. State and federal agencies are working to streamline the process and people in charge of creating removal permits are becoming more familiar with what needs to be included, which should expedite the process going forward.

Another challenge was convincing some members of the Town Council the dam removal project was in the Town's best interest. When combining the liability aspect and the fact the Town would not spend any money on the removal, the Council approved the project.

Takeaway Message

Jerry Sweeten of Ecosystems Connections Institute said, "Removal of low head dams reduces liability to the owner of the dam, improves safety for people who use the stream for recreation, and creates better habitat for aquatic species." All parties agreed that partnering is a beneficial step as it helps better navigate the process.

Project Resources

- Learn about funding opportunities for dam removal from the Indiana Department of Natural Resources' Lake and River Enhancement Program <https://www.in.gov/dnr/fishwild/2364.htm> and the National Fish Passage Program <https://www.fws.gov/fisheries/fish-passage.html> from the US Fish and Wildlife Service.

- Read about the dangers of low-head dams from the Indiana Department of Natural Resources page on low-head dams <https://www.in.gov/dnr/state-parks/recreation/water-trails/water-trail-safety/low-head-dams/> , the Indiana Department of Homeland Security's guide on low-head dam safety <https://www.in.gov/dhs/files/Low-Head-Dam-Safety-Tips.pdf> , and a WFYI documentary. <https://www.wfyi.org/programs/over-under-gone/television/over-under-gone-the-killer-in-our-rivers>

For more information on the dam removal process, contact:

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