



Stream Team Academy Fact Sheet Series

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Collect this entire educational series for future reference! Contact us at 1-800-781-1989 if you'd like copies of previous Fact Sheets and a binder for storing them.

HEADS UP ON LOW HEAD DAMS

An Educational Series For Stream Teams To Learn and Collect

By Ange Corson, MDC Streams Program Coordinator

A quaint mill dam on a flowing stream is reminiscent of a bygone era, back when mills were the community gathering place to get the latest local news and gossip while your grain was being milled. Not to mention swimming in the ponded backwaters of the dam or fishing in the waters below it on a hot summer day. What's not to like?

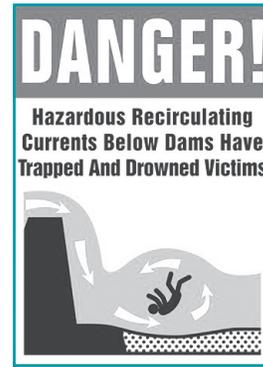
While mill and other types of low head dams are alluring and seem wistful and benign, they can have a more sinister side that is all too often overlooked. They are responsible for hundreds of drownings across the U.S., with numbers increasing since the last decade. Dams are not the only perpetrators though; there are many places in MO where low water crossings behave like dams and cause drownings, too. All told, they pose a threat to humans and aquatic resources. To understand why, we need to know how stream hydraulics interact with these structures.

Dam Dynamics:

Low head dams typically span the width of the stream channel and pool water upstream for a certain distance depending on their height from the bed of the stream. They are called run-of-the-river dams because the river can flow over them. They range from just a few feet high to ~25 ft. from the bed. Even though they allow water to pass over and/or through them, they do not allow for much sediment movement. This sediment stacks up, shallowing and widening the upstream pooled stream channel. Below the dam, the plunging effect of the water spilling over the top erodes the streambed, forming a scour pool directly below and just downstream of the dam.

Dam Dangerous!

The hydraulics below these structures are often referred to as backwash, rollers, boilers, or drowning machines. The water coming over them has an increased velocity from the drop and when it hits the downstream bed, it recirculates upstream towards the structure creating a



current that rolls continuously in an upstream direction. Imagine the current as being like a clothes dryer barrel, continuously spinning clothes down, up, over, and back down.

These currents can be strong enough to pin boats, trees, and people (with or without life jackets) underwater.

Dam Fish!

People are not the only things harmed by low head dams. Dams and some low water crossings can be significant barriers for aquatic organisms such as fish, amphibians, mussels, and other invertebrates. They inhibit their ability to access habitat, reproduce successfully, find food, or seek refuge when flow or water quality conditions change. This disturbs the stream's trophic energy flow, reducing the quantity and diversity of biota within.

Dam Removal?

It is essential to consult with appropriate agencies and professionals if considering dam removals. While dam



Niangua darter, a federally endangered species in Missouri affected by low head dams and some low water crossings.

removal seems like a simple solution, careful considerations need to be taken. Some considerations include:

- Many dams are privately owned, so locating owners and getting them to agree to removal can be a challenge;

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- Acquiring enough funding to remove them properly can be arduous;
- Some may have historical significance and need to follow State Historic Preservation Office rules before they can be altered or removed;
- Since many of these dams have been in place for decades, they may have accumulated large sediment slugs upstream of the dam.

Additionally, releasing the sediment downstream could cause issues for the stream and landowners as it pulses through the system over time. Conversely, when that slug of sediment above the dam is gone, the streambed is deeper, potentially making nearby streambanks more unstable. Measures may need to be taken to account for these possible concerns ahead of dam removals.

For low water crossings that function as a dam, they can be replaced with better low crossing designs that do not pose a human hazard and allow more conveyance under and over the crossing to pass water, sediment, and aquatic organisms. Although all of these removal projects can be expensive, the cost is usually outweighed by preventing drownings and potentially expensive liability.



Want to know more?

iowadnr.gov/portals/idnr/uploads/riverprograms/dmachine.pdf

iowarivers.org/wp-content/uploads/2016/04/iowa-low-head-dam-modification-success-stories.pdf

alleghenyfront.org/pennsylvania-is-leading-the-nation-in-dam-removals/

wfyi.org/programs/over-under-gone/television/over-under-gone-the-killer-in-our-rivers

americanrivers.org/threats-solutions/restoring-damaged-rivers/

Don't forget to send your questions to streamteam@mdc.mo.gov or call 1-800-781-1989.

Dam Retrofitting?

When dam removal is not an option, there are alternatives for retrofitting that are safer and more aquatic organism-friendly. Several states like Iowa and Pennsylvania are taking the lead in raising awareness and retrofitting dams. One popular alternative is creating rock rapids, which allows for a more gradual drop in slope over a longer distance of stream. These rapids are sometimes designed to provide recreational opportunities for kayakers and canoers as well.



Klondike Mill Dam on the Big Sioux River, retrofitted to create rock arch rapids; photo by the Iowa Department of Natural Resources.

