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Why low-head dams are called 'drowning machines' and how many are in Virginia

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RICHMOND, Va. (WRIC) — Nearly 150 people died in the United States from 2018 to 2021 due to incidents caused by low-head dams, submerged dams that are sometimes referred to as "drowning machines."

Low-head dams extend fully across the banks of a river or stream channel to allow water to continuously flow over the crest from bank to bank. They have been built for various reasons, including to generate power, irrigation and recreational purposes.

They have been connected to hundreds of drowning deaths across the country, as they produce hydraulic forces and recirculating currents that can drag swimmers, boaters and others into churning waters that cause "continuous and forcible dunking," **according to a 2020 presentation** by the American Society of Civil Engineers (ASCE).

According to the National Weather Service (NWS), there were 111 reported low-head dam-related deaths between 2018 and 2020 and another 38 at or near low-lying dams **in the U.S. in 2021**.

Despite the dangers they present, the total number of low-head dams in the country is unclear. A database called the "National Inventory of Low Head Dams" shows the ones across the country, but most states have not reported to the database.

"Virginia has several of these killers on rivers throughout the state," **the state's Department of Wildlife Resources' (DWR) website states**. "Over the years, houseboats, fishing vessels, powerboats, sailboats, PWC, and canoes have all fallen victim to lowhead dams."

The state's Department of Conservation and Recreation (DCR) "has inventoried 59 low-head dams in Virginia," Rebecca Jones, a DCR spokesperson, told 8News on June 1.

A low-head dam in the Richmond area, Bosher's Dam, is the site of a recent incident involving such structures. A group of 12 people in rafts and on paddleboards went over Bosher's Dam, a low-head dam on the James River, on Memorial Day.

The body of one of the women in the group, Lauren Winstead, was found about five miles downriver from the dam after three days of searching. As of June 1, first responders are still searching for another woman who was part of the group.

Low-head dams can be seen as an "**enticing challenge**" for kayakers and other recreationalists, but they pose risks to many people who may not recognize them or are "aware of the turbulent currents they can cause, which are extremely difficult to escape," **according to the NWS**.

They vary across the country, with some having a 25-foot drop-off to others with just a six-inch drop, according to DWR. The dangers of a low-head dam are the same no matter the drop and flow of water.

Objects moving over the drop can be trapped in a hole or hydraulic formed at the base by water flowing over the drop, causing the recirculating current below the dam.

"Once swept over the dam, a victim becomes trapped and is forced underwater, pushed away from the dam, then circulated to the top," the DWR's website states. "The circulating motion then repeats the cycle over and over again as the individual is drawn back against the base of the dam."

Low-head dams are difficult to often not marked and can be difficult to spot from upstream, the hydraulics are unpredictable and can deceive experienced boaters, according to DWR. The walls at the side of the dam face also block the exit route for people trying to escape.

The 2020 presentation from ASCE states that more than 1,400 fatalities have been classified as low-head dam-related incidents but reports don't accurately reflect the number of deaths.

According to DWR, it's "nearly impossible to escape the strength of the hydraulic when trapped," but there are a few safety tips to follow:

Virginia DWR's Safety Tips:

- *Scout the river and know the location of hazards. Talk with boaters who are familiar with the river to gain additional knowledge.*
- *Boat with experienced, responsible boaters and learn from them.*
- *Watch for a smooth horizon line where the stream meets the sky. This potentially indicates the presence of a dam.*

- *Look out for concrete retaining walls which are part of the dam structure and easier to spot.*
- *Portage around all dams.*
- *When portaging, re-enter the river at a point well downstream of the boil.*