

DECEPTIVELY DANGEROUS

Low-head dams don't seem hazardous—until you're trapped underwater beneath one.

BY NICK GEVOCK

FOR YEARS, MARK BUTLER AND OTHER members of Ravalli County Search and Rescue were regularly summoned to save people in danger of drowning in the turbulent water created by the Supply Ditch Headgate Diversion Dam on the Bitterroot River. So Butler wasn't surprised in the summer of 2013 when he was alerted that several people were caught in the dangerous undertow below the concrete structure.

But that call was particularly disturbing. A six-year-old girl from Washington State was among those swept into the river when her father's boat went over the dam and capsized. When first responders arrived, everyone who had been trapped below the dam had made it to shore. But the girl was unconscious and had to be transported by rescue helicopter to St. Patrick Hospital in Missoula. She didn't survive. ▶▶



FATAL FLOW Low-head dams are built mainly to divert water into irrigation systems. The structures create powerful hydraulic forces. Even strong swimmers wearing a personal flotation device can be trapped underwater.



Because they are small, low-head dams seem innocuous. “One of the biggest problems is that, from upstream, they don't look dangerous at all,” says Chris Clancy, recently retired FWP fisheries biologist in Hamilton. “The water is calm and it looks like you can easily float right over. But you can't see what's over the drop, and you definitely can't see the danger below the surface.”

Because the dam “head”—the distance between the water surface upstream and that downstream—is so low, the water above and below the structure appears shallow. But in spring and other periods of high flow, the impounded water upstream can be 10 to 15 feet deep. When all that water volume goes over the top of the dam, it gains speed and plunges straight down with enormous force. That energy creates an underwater vortex that kayakers and canoeists call a “hydraulic.”

In rapids, people thrown from a boat are often quickly washed downstream out of danger. But below a low-head dam, the hydraulic creates a powerful back current that pushes the victim upstream against the dam. Those two forces—from above and from downstream—hold victims underwater until they become exhausted and

The tragedy was one of several accidents that year at the dam, located two miles downstream from the Woodside Bridge Fishing Access Site between Hamilton and Stevensville. Two weeks after the drowning, Mark Maier of Lolo and his two sons were sucked into the dam's turbulent waters. They spent more than half an hour trapped in the Bitterroot before being rescued. “I have never been so scared in my life,” Maier, a strong swimmer who did two infantry tours in the Middle East, told the *Missoulian*. Brent and Charise Jackson of Victor, both experienced floaters, told a reporter that they and their four girls barely escaped tragedy when their raft flipped at the dam in early June. “The [submerged] raft was rocking and the kids were scream-

ing,” Charise said. “I told the kids to stop screaming and start praying.” Finally, the raft righted itself and the parents were able to get the children back on board and continue rowing down the river.

In 2017, the conservation district that owns the dam completed a \$500,000 project to make it safer for floaters. “It's definitely safer, yes. But no diversion dam is ever completely safe,” says Randy Arnold, Montana Fish, Wildlife & Parks regional supervisor in Missoula.

These incidents highlight the deceptive dangers posed by “low-head” dams—structures that by all appearances seem no more hazardous than a small rapids. The combination of powerful hydraulics, water that looks relatively easy to run, and locations on

popular rafting rivers makes the structures especially hazardous, especially during high water runoff. Though fatalities are not common—FWP officials say fewer than a dozen people have drowned at low-head dams in Montana in the past half century—many boaters or swimmers have been trapped and narrowly escaped tragedy.

DROWNING MACHINES

Low-head, or diversion, dams are usually small structures three to ten feet high that extend across an entire stream channel. They have no gates or water-control devices; water flows constantly over the top. The dams impound water above the structure that is then pumped into sprinklers or diverted into canals to irrigate pastures and crops.

LEFT TO RIGHT: SHUTTERSTOCK/STEVE MITCHELL; CRAIG & LIZ LARCOM

drown. Even if victims rise back to the surface, the hydraulic force sucks them underwater again and again. Even powerful, experienced adult swimmers wearing life vests lack the strength to fight the water.

Adding to the danger are logs and other debris trapped in the vortex, and the frothy, aerated water that survivors say make it impossible, when submerged, to tell which way is up. “It’s like being trapped in a giant washing machine,” says Phil Kilbreath, boating law administrator with FWP’s Enforcement Division. “You can’t see the powerful hydraulics below that can suck a person under and hold them there.”

Water safety officials call low-head dams “drowning machines.”

According to the Association of State Dam Safety Officials, drownings at low-head dams nationwide have drastically increased in the past two decades as more and more people use rivers for recreation. Most people who drown at low-head dams are males ages 11 to 20.

Many diversion dams have been in place for decades. Veteran floaters are accustomed to the structures on their favorite river stretches and most portage around them. Some highly experienced (or reckless) floaters determinedly run low-head dams, but at significant risk.

Of the 11 boating-related fatalities in Montana in 2018, many of the causes are unknown, Kilbreath says. “One thing we do know is that wearing a life jacket, or personal flotation device, is the best way to increase your odds of surviving any type of boating-related accident.”

RIVER CHANGES COURSE

The lower Yellowstone River holds several large low-head diversion dams, including those at Intake, Huntley, and Cartersville. All are dangerous to floaters, especially in high water. Potentially dangerous diversion dams are also on the Sun, Musselshell, and Milk Rivers.

The Bitterroot has several low-head dams. What’s more, the river carves out new channels each year after high water, sending bankside trees toppling into the

water. Submerged trees, known as sweepers or strainers, can capsize rafts, canoes, and kayaks and trap occupants underwater (see “Strainers’ can be deadly,” page 35.)”

Supply Ditch Headgate Diversion Dam, where the 2013 drowning occurred, spans an eastern channel of the Bitterroot. Experienced floaters have long known it was there, says Clancy, the retired biologist. But for years the main river flowed through a western channel, away from the dam. In 2011, high water caused that stretch of the Bitterroot to shift, sending the main river through the eastern channel. That sent floaters and anglers over the dam.

After several boats swamped, FWP posted warning signs at the three fishing access sites upstream. “We also posted a sign on the river about 200 yards upstream of the dam informing floaters to portage around it,” Clancy says. Though the signs were in place when the accidents occurred in 2013, some boaters said they did

not see them or were unable to get their craft to the bank in time.

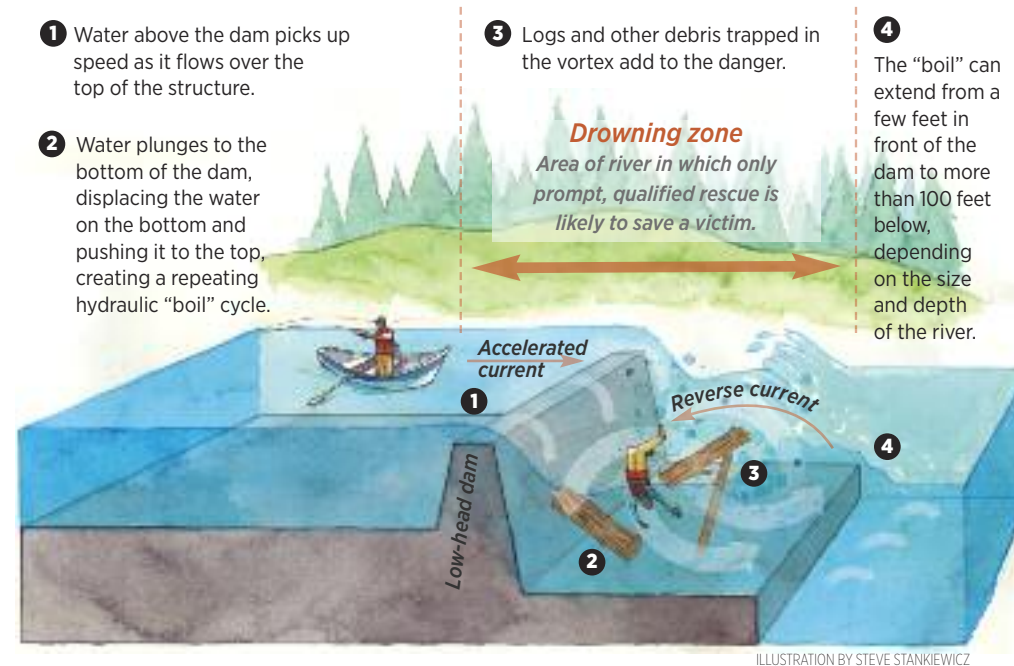
Clancy says floaters should consider stopping at a local fly shop or sporting goods store before floating any river to learn about new hazards.

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NO GUARANTEE

Low-head dams also present a dilemma for FWP. Department officials have long insisted that people are responsible for their own safety when taking to the outdoors—and that includes floating rivers, which are inherently

Deceptive Drowning Machine



TRAPPED Low-head dams don’t appear dangerous. Because the structure is hidden underwater, boaters, kayakers, and other floaters can’t judge how deep the water is above and below the dam—or how fast it moves over the top. Also hidden is the deadly hydraulic, caused by the large volume of water flowing over the structure. Victims are usually trapped between the two current forces.

Nick Gevock is conservation director for the Montana Wildlife Federation.

dangerous. In addition to the hazards of low-head dams and submerged trees, runoff from mountain snow and heavy rain in late spring and early summer causes river flows to double or triple in a few hours, turning a gentle float into a harrowing experience. “It’s not possible for FWP—any government agency—to warn people about every hazard on a river,” says Arnold, the FWP regional supervisor. “If you don’t know what you’re doing, the results can be tragic.” It’s also worth noting that low-head dams are private property managed by local irrigation districts and licensed by the Department of Natural Resources and Conservation (DNRC).

However, Arnold says, unlike runoff and sweepers, low-head dams are permanent, man-made structures that have been on rivers for decades. Many are notorious for causing boating accidents. FWP has begun to work with dam owners and the DNRC to identify the most dangerous structures and post warnings to prevent future tragedies.

Just because a diversion dam has no signage doesn’t mean there is no danger. “A lack of warning is no guarantee of safety,” says Sara Smith, FWP boating education coordinator. “People still need to learn where low-head dams are and how best to get around them.”

According to FWP officials, the best approach for people considering a float down any river is to learn as much as possible about potential hazards well ahead of time. Floaters can buy river maps that show the location of many low-head dams. Online stream flow reports maintained by the U.S. Geological Service show if river levels are dangerously high. “Consider any dam to be dangerous and heed warning signs wherever they are posted,” Smith says.

Smith adds that anyone who plans to float a river should buy or borrow a waterproof cell phone or case that attaches to the body. “That way, if you capsize you have your life line on your person and can get help as soon as possible—if there’s cell coverage,” she says.

Perhaps the safest approach is to always portage around every dam—no matter the size and how safe it might look. As anyone who has survived being held underwater below a low-head dam can attest, appearances can be deceiving. 🐾



The dangers posed by big dams

Large hydroelectric dams are hazardous both above and below the structures. Above dams, boats can be swept into intake areas and spillways. Below, a sudden discharge of water from spillways and turbines can rapidly increase river flows. Protect yourself when recreating on or along a river near a hydroelectric facility by following these safety tips:

- ▶ Always obey warning signs near dams.
- ▶ Never cross boater safety cables. These devices designate areas where boats should not operate, such as near intake areas, dams, and spillways.
- ▶ Never anchor your boat directly below a dam. Sudden discharges of water can rapidly increase river flows.
- ▶ Be alert for debris, river obstructions, and partially submerged objects.
- ▶ If caught in rising water, get out on the nearest bank and move to high ground.

“Strainers” can be deadly

Though they produce great hiding habitat for fish, log jams and submerged timber, known as strainers or sweepers, are some of the most dangerous threats to Montana boaters and floaters.

Because water flows through logjams and downed trees, boats can be sucked into the woody debris, and the boaters are then tossed overboard and can become trapped underwater amid the tangle of branches and trunks.

“Almost all of the 16 people who have drowned in the Bitterroot during the past 20 years I’ve been with Ravalli County Search and Rescue were killed directly or indirectly due to strainers,” says Mark Butler, of Corvallis.

