

Low-Head Dams

by Virgil Chambers

Virgil Chambers prepared this information paper several years ago when he served as chief of the Boating Education Section for the Fish and Boat Commission. The paper has been updated with more current information.

Recreation on rivers and streams is a safe, wholesome outdoor activity. However, low-head dams can be a threat to an unwary boater, swimmer or wader. Of all the things you may encounter on a river or stream, the low-head dam is one of the most dangerous. In fact, if an engineer designed an efficient, unattended, self-operated drowning machine, it would be hard to come up with anything more effective than a low-head dam under certain flow conditions.

There are about 250 dams in the Commonwealth that meet the statutory definition of run-of-the-river dams. These dams are supposed to be marked under the law. However, as many as 2,000 Pennsylvania dams can show the dangerous hydraulic characteristics of low-head dams under certain flows. What's more, a dam that may look safe can suddenly become very dangerous if flows change suddenly, such as during periods of high water or after storms. The dam can become a monstrous death trap when river levels are up. If river travel is something you plan for this year's recreation, whether canoeing, kayaking, swimming or cruising, be familiar with the river's dangers.



From upstream low-head dams may be virtually undetectable.

Note: *This particular dam is now well marked both on the bridge and above and below the dam.*



The same low-head dam from an across-the-river view.

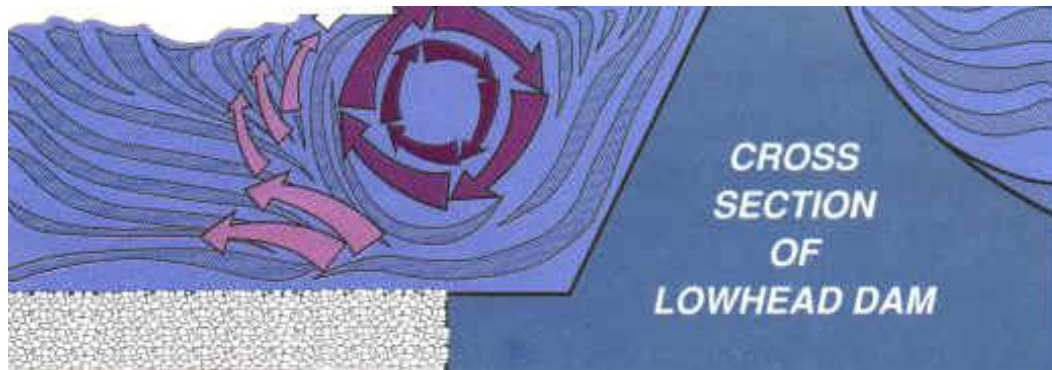
Hazards exist not only from going over the dam, an obvious source of danger, but also from being caught in the backwash below the dam, where the power of the water is sometimes overlooked. Anything caught in this backwash below the dam is trapped and recirculated round

and round, making escape or rescue difficult. A person caught in the backwash of a low-head dam in certain flows will be carried to the face of the dam, where water pouring over it will wash him down under and back beneath the boil. When the victim struggles to the surface, the backwash again carries him to the face of the dam, thus continuing the cycle.

To complicate matters, these dams are sometimes loaded with debris, such as tires and logs on the surface and rocks and steel bars on the bottom, posing another serious problem for the recirculating victim. If rescue is not immediate and the victim is to survive and escape this water trap, he must go down with the current coming over the face of the dam, stay as close to the bottom as possible, and try to get past the crest of the boil before resurfacing. This maneuver is very difficult, and few have done it.

Another method of escape, with rescuers available, is for the victim to attempt lateral movement across the dam after each cycle. This involves proper breathing control and great endurance. If the victim is able to work his way to the side of the dam, rescuers may then be able to assist him out of the powerful backwash. In either case, the chances of survival are much greater if the victim is wearing a PFD.

Dams do not have to have a deep drop to create a dangerous backwash. During periods of high water and heavy rains, the backwash current problems get worse, and the reach of the backwash current is extended downstream.



Illustrated is the hydraulic backwash current action characteristic of low-head dams. Boaters, swimmers, waders and anglers can get too close to the downstream side of the dam. They can then become drawn or sucked into the backwash current that takes them to the base of the dam and are forced underwater. Victims are then pushed away from the dam underwater. When the victim surfaces, he can get drawn back in toward the base of the dam, starting the cycle all over again.