



Low-head Dams: Status and Legal Issues

Rollin H. Hotchkiss, Ph.D., P.E. | Forrest R. Hansen

This article is a summary and extract of the legal article entitled: “Low-head Dams (aka Drowning Machines) Are Deadly: An Analysis of Liability for Landowners and States, and Recommendations for Legislation and Warnings” which will be published in Volume 15 of *The Kentucky Journal of Equine, Agriculture, and Natural Resources Law*, which provides an in-depth legal analysis of claims in low-head dam litigation. Published with permission.

ABSTRACT

Low-head dams are built across rivers to raise upstream water levels enough for diversions for beneficial use or to reduce stream channel incision. There are untold thousands of these structures in the United States; many are well over a hundred years old. Although the structures are not high (3 – 20-ft), a condition known as a submerged hydraulic jump or ‘hydraulic’ can develop downstream that produces a reverse current. Any person who passes over the dam during such a condition will very likely drown. More than 1,000 fatalities have occurred at low-head dams in the United States.

These dams are often “nonjurisdictional,” meaning that they are not part of any state or federal dam safety and inspection program. Any low-head dams that are part of dam safety programs are typically considered “low hazard” and are therefore not a focus of these programs. Often the ownership cannot be easily determined, and in many cases the low-head dam is either abandoned or no longer serving its purpose. State Dam Safety Regulatory programs in the United States, which have traditionally focused on preventing loss of life and property damage resulting from dam failures, are increasingly concerned about public safety and the risk of fatalities at low-head dams.

We recommend that states enact legislation specifically addressing low-head dams and suggest considering the approach taken by the state of Indiana that (1) defines low-head dams, (2) requires a statewide inventory of low-head dams and owners, (3) sets warning standards, (4) publishes information on low-head dam safety, (5) furnishes information to owners on low-head dam removal and modification, (6) requires notification to the state of changes in ownership, (7) restricts persons from accessing low-head dams, and (8) declares state immunity for those dams not owned by the state. Other elements may also be useful, such as increasing the penalties for noncompliance or deeming landowners to have met the duty of care for warning the public of the hazards posed by the dam.

For all low-head dam owners we recommend posting and maintaining adequate warning signs to help reduce the number of recreationists passing over low-head dams.

Acknowledgments: We wish to acknowledge the work and contributions of the ASDSO Public Safety Around Dams Committee (Manuela Johnson, chair), and the members of the Task Force to Create a National Inventory of Low-head Dams.

BACKGROUND

A low-head dam is defined as “a dam built across a stream to pass flows from upstream over all, or nearly all, of the width of the dam crest on a continual and uncontrolled basis” (Federal Register, 2017). The Indiana legislature defined a low-head dam as “a manmade in-channel structure in a watercourse that is capable of generating hazardous recirculating currents that pose a risk to public health and safety and causes the watercourse to have a vertical drop of twenty-five (25) feet or less” (Ind. Code Ann. § 14-27-7.3-2). Virginia defines a low-head dam as “a dam that is built across a river or stream for the purpose of impounding water where the impoundment, at normal flow levels, is completely within the banks, and all flow passes directly over the entire dam structure within the banks, excluding abutments, to a natural channel downstream” (Va. Code Ann. § 29.1-509A). The states of South Dakota and Georgia state that low-head dams are not dams at all because they do not conform to requirements for the National Inventory of Dams (Brewitt and Colwyn, 2020). Low-head dams are also called low overflow structures, run-of-the-river dams, weirs, diversion dams, and grade control structures (Figure 1).

There is no nationwide inventory of low-head dams because (1) most do not meet the water storage and dam height criteria in the National Dam Inspection Act (1992); (2) there are no inspection requirements for low-head dams under that act; (3) many low-head dams are “nonjurisdictional,” meaning that they are not regulated by any public agency (Brewitt and Colwyn, 2020); and (4) ownership in many cases is unknown (Tschantz, 2014). The number of low-head dams is unknown; Walter and Merritts (2008), for example, found more than 65,000 low-head dams in 872 eastern counties in the United States and 1,025 low-head

dams (“mill dams”) in three Pennsylvania counties, using historic maps from the mid-1800s. The same three counties now exhibit only about 1% as many low-head dams (personal communication, Simon Shenk, Franklin and Marshall College, July 2022). While the number of low-head dams is unknown, numbers are being tallied by the Task Force to Create a National Inventory of Low-head Dams (Dietrich, 2021).



Figure 1 Low-head dam on the Jordan River in Taylorsville, Utah. A site with a single fatality. Note the warning sign on the left, well out of view of any recreationist, placed after the out-of-court settlement. The dam is now being replaced with recreational rock weirs.

Water falling over a low-head dam produces a phenomenon called a hydraulic jump—that is, an abrupt rise in the water surface accompanied by turbulent currents and aeration. While not all hydraulic jumps create a counter current, when downstream (“tailwater”) depths rise due to increased discharge or obstructions, the jump becomes submerged and creates a powerful reverse flow (“hydraulic”) that can trap a person with virtually no path for escape (Figure 2). The individual will be plunged underwater as they go over the dam, and then as they resurface just downstream from the dam, the backflow will bring

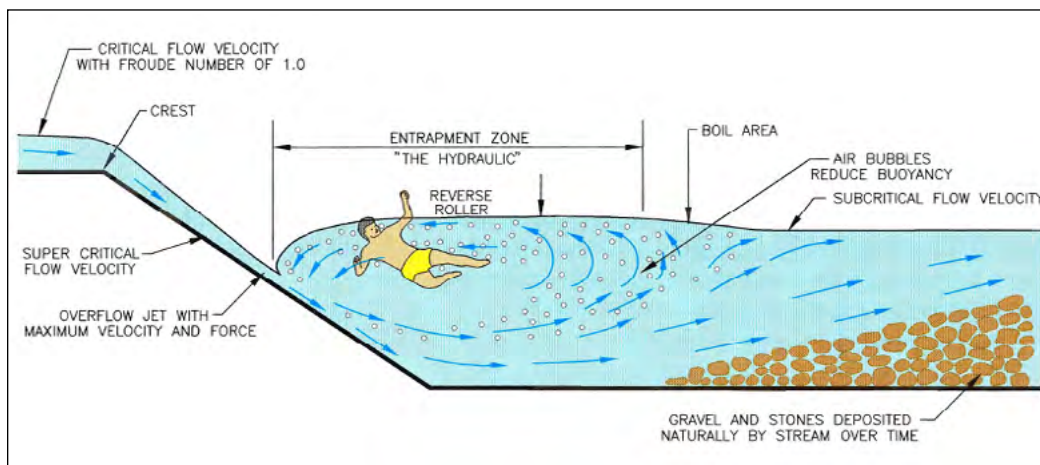


Figure 2 Elevation view of a submerged hydraulic jump at a low-head dam. (Courtesy Wright Water Engineers, Inc. and Wright et al., 1995.)



Figure 3a Low-head dam on the Blue River in Edinburgh, IN. Safe conditions on a low discharge day.



Figure 3b Dangerous conditions during high flow; two young men drowned trying to rescue a young woman; three other young men successfully rescued her, but she sustained a lifelong brain injury.



Figure 4a Emrichsville (16th Street) Dam in Indianapolis, IN. View from upstream, very difficult to see the low-head dam.



Figure 4b View from downstream. Discharge level was safe on that day.

Photos and anecdote courtesy of Manuela Johnson, retired from the Indiana Department of Homeland Security.

Photos courtesy of Manuela Johnson, retired from the Indiana Department of Homeland Security.

them back to the falling water at the dam. The person is forced under again, and the pattern continues until exhaustion. The water going over the dam is also entrained with air, which will reduce buoyancy (McGhin et al., 2018). Low-head dams where this “killer dam” phenomenon occurs can be especially dangerous because the rotating currents may not exist for all water discharges. One day a location might be perfectly safe, but the next day after a rainstorm, it could turn deadly (Figure 3). Low-head dams easily lull people into a false sense of security because of their small height and apparent safe passage conditions.

The American Society of Civil Engineers estimates that 50 people drown each year at low-head dams (Landers, 2021). Owners of low-head dams are unsure of their role in providing warnings to the public, assessing their dams for the existence of a “killer” current, and mitigating any such currents.

Low-head dams present a unique issue that is not present in cases involving larger dams or other drowning cases. The danger of a low-head dam generally is considered hidden and unknown. The surface of the water downstream from a low-head dam as

viewed from upstream may show only a small line of whitewater without much noise or turbulence (Figure 4). Often the hydraulic jump is not even detectible from the surface of the water, and a swimmer or a boater may have no idea that once submerged in the water downstream from the dam, the hydraulic will trap them until they drown. Even rescuers, who see a person struggling downstream from a low-head dam and carefully approach the dam, do not perceive the grave danger presented by the hydraulic jump. In contrast, pools of water downstream from larger dams are not accessible from upstream and have more white rushing water, which creates more noise and provides a warning of grave danger.

The purpose of this article is to analyze cases and state statutes addressing liability for low-head dam owners and states in the United States and to provide recommendations for protecting the public from drownings. General principles of law for low-head dams are first set forth and then followed by an analysis of low-head dam cases and legislation. Conclusions and recommendations are presented last.

TRANSFORMING THE FUTURE OF DAM SAFETY

Engineering Design

Risk Analysis

Hydraulics & Hydrology

Public Safety & Emergency Management

Construction Services



Paul G. Schweiger, PE, CFM
pschweiger@gfnet.com

Dean B. Durkee, PhD, PE
ddurkee@gfnet.com

gannettfleming.com



GENERAL PRINCIPLES OF LAW FOR LOW-HEAD DAMS

Low-head dam owners are most at risk of incurring litigation liability from people who enter their land and are injured. Indeed, negligence claims for bodily injury are extremely common in low-head dam cases. Other claims asserted in low-head dam cases may include gross negligence, wanton and reckless conduct, wrongful death, and survival actions, all of which are based in principles of negligence under state law. Only a brief summary of the law of negligence will be presented here; for more detail, see Hansen and Hotchkiss (forthcoming).

The tort of negligence is derived from state common law unless the state has passed a statute addressing negligence. The elements of negligence may change state by state. In this article, we explain the principles of negligence law using the Second Restatement of Torts, (“Restatement Second” or “RS”), which summarizes general principles of tort law in the United States. Many states have adopted into law portions of the Restatement Second.

(1) Negligence

Negligence is “conduct which falls below the standard established by law for the protection of others against unreasonable risk of harm” (RS § 282). Conduct involving “unreasonable risk” is conduct that is unduly dangerous and unreasonably dangerous to other persons (RS § 282). According to the Restatement Second, a claimant is required to prove four elements to establish a claim of negligence: (1) Duty - the pertinent interest invaded is protected against unintentional invasion; (2) Breach of Duty - the conduct of the actor is negligent with respect to other persons, or a class of persons; (3) Legal Causation - the actor’s conduct is a legal cause of the invaded interest; and (4) Damages – an invasion resulted in physical or emotional harm to the claimant or the claimant’s family (RS § 281). Only duty and breach of duty, most relevant to low-head dams, will be discussed here. For a more in-depth discussion of these elements, see Hansen and Hotchkiss (forthcoming).

The threshold question in a negligence action is whether the land possessor owes a duty to the claimant, and if so, if the duty meets the required standard of care (57A Am. Jur. 2d Negligence § 70). For negligence claims, a “duty” is “a legally enforceable obligation to conform to a particular standard of conduct with respect to another person, for the protection of such person against unreasonable risk” (57A Am. Jur. 2d Negligence § 72).

In low-head dam cases, a land possessor generally owes a duty to entrants on the land possessor’s property.

Under the Second Restatement, in the context of entry onto land, a land possessor owes a different duty depending on the status of the person entering the land, whether the person is a trespasser, licensee, or invitee.

“A trespasser is a person who enters or remains upon land in the possession of another without a privilege to do so created by the possessor’s consent or otherwise” (RS § 329), while “a licensee is a person who is privileged to enter or remain on land only by virtue of the possessor’s consent.” (RS § 330). An invitee “is either a public invitee or a business visitor” (RS § 332).

For trespassers, a land possessor is not liable for physical harm caused by the failure to exercise reasonable care. A land possessor may have a duty to a trespasser, however, if the land possessor knows, or should know, that trespassers constantly intrude upon the land, and the land possessor fails to carry on an activity involving a risk of death or serious bodily harm with reasonable care for the safety of trespassers (RS § 334).

For licensees, a land possessor generally is subject to liability to licensees for physical harm caused to licensees by a failure to carry on activities with reasonable care for their safety if the land possessor should expect that the licensees will not discover or realize the danger, and the licensees do not know or have reason to know of the risk (RS § 341), while for invitees, a land possessor is subject to liability for physical harm caused by a failure to carry on activities with reasonable care if the land possessor would expect that the invitees will not discover or realize the danger, or will fail to protect themselves against it (RS § 341A). Unlike licensees, invitees are protected against risks, even if the invitees know or should have reason to know the risks.

(2) Other Claims in Low-head Dam Cases

As mentioned above, most other claims brought in low-head dam cases are derived from the common law tort of negligence. These claims include gross negligence, wanton and reckless conduct, wrongful death and survival actions, and negligent infliction of emotional distress. Each is explained briefly here.

- **Gross Negligence** – A higher degree of negligence than ordinary negligence requiring the same elements, but not to the level of willful and wanton conduct (57A Am. Jur. 2d Negligence § 214). Gross negligence constitutes an extreme departure from the ordinary standard of care.

- **Wanton and Reckless Conduct** – Generally this is more than ordinary negligence and gross negligence, but less than deliberate and intentional conduct. Reckless conduct generally requires that the defendant: “(1) have knowledge of existing conditions, and be conscious from such knowledge that injury will likely or probably result from his or her conduct; and (2) with reckless indifference to the consequences, consciously and intentionally do some wrongful act or omit to discharge some duty which produces the injurious result” (57A Am. Jur. 2d Negligence § 238).
- **Wrongful Death and Survival Actions** – Some states allow persons who survived the decedent to bring an action to recover for pecuniary and non-pecuniary damages suffered in the loss of the decedent. A wrongful death action allows relatives and dependents of the deceased who were deprived of financial support or who suffered emotional or financial loss to bring their own cause of action (25 Am. Jur. Proof of Facts 3d 251 § 2). Survival actions permit certain causes of action for close relatives for the pain and suffering of the decedent (25 Am. Jur. Proof of Facts 3d 251 § 3). These claims are common in low-head dam cases (see, e.g., *Goddard v. Dept. of Fish & Wildlife*, 243 Cal. App. 4th 350 (Cal. Ct. App. 2015)).
- **Negligent Infliction of Emotional Distress** – Negligent infliction of emotional distress generally requires the same elements of negligence, and, in addition, emotional harm. Some jurisdictions require physical harm before awarding any damages for emotional harm (86 C.J.S. Torts § 71). Sometimes these claims are asserted in low-head dam cases, but it depends on the circumstances of the case.

(3) State Recreational Use Statutes

States have enacted statutes that limit the liability of landowners who permit the public to use their land for recreational purposes, which are often called recreational use statutes (57 Am. Jur. 2d Municipal, etc., Tort Liability § 271). The purpose of the statute is to encourage landowners to make their land available to the public for recreational purposes and expand the natural land generally available for the public. Government entities or units are often included within the scope of these statutes, including the United States federal government (see, e.g., *Maldonado v. United States*, 893 F.2d 267 (10th Cir. 1990)). Currently, every state in the United States has passed a recreational use statute (Lunn, 2015). A typical recreational use

statute: (1) states its purpose of encouraging the public use of land, (2) provides that a landowner owes no duty of care to keep the premises safe or give any warnings, (3) defines the scope of recreational use, (4) clarifies the legal implications of permitting entry of the public, and (5) limits immunity to situations where no fee is charged and the landowner is not willful or malicious. Each element is described as follows:

(A) The Purpose

The purpose of a recreational use statute is often stated in the statute, which is to encourage landowners to make land or water areas available to the public for recreational purposes by limiting the landowner’s liability toward persons who enter the property for recreational purposes. If a property has both a recreational and nonrecreational purpose, it may still fall within the scope of the statute (*Wallace v. Metropolitan Pier and Exposition Authority*, 302 Ill. App. 3d 573, 578 (Ill. 1st Dist. 1998) (retail and entertainment property considered “recreational property” under statute)).

(B) No Duty of Care or Duty to Give Warning

Recreational use statutes often eliminate the duty of the landowner to keep the land or water safe for entry or use by others, including to warn of a dangerous condition, use, structure, or activity on the land. See, e.g., Utah Code Ann. § 57-141-201 (owner owes no duty of care or duty to give warning except as otherwise provided).

(C) Definition of “Recreational Purpose”

“Recreational purpose” can be defined broadly or narrowly. Often recreational use statutes contain a laundry list of outdoor activities, and the statute will only be applicable if the claimant was engaging in a listed activity. Sometimes an activity not expressly listed may be included, if the statute uses a nonexhaustive list of activities, using the following language: “includes, but is not limited to.” A statute might cover the following acts: fishing, hunting, camping, water sports, hiking, spelunking, sport parachuting, riding, rock collecting, sightseeing, picnicking, nature study, nature contacting, recreational gardening, gleaning, hang gliding, private noncommercial aviation activities, winter sports, and viewing or enjoying historical, archaeological, scenic, natural, or scientific sites.

(D) Permission of Entry

For a landowner to receive immunity from a recreational use statute, generally the landowner must give permission to the claimant to enter the land without charging a fee or other consideration. If the landowner does so, then the landowner has no obligation to (1) extend any assurance that the premises are safe for that purpose, or (2) confer the person to whom permission has been granted the legal status of an invitee or licensee to whom a duty of care is owed, or (3) assume responsibility for or incur liability for any injury to person or property with some exceptions. This is not a common issue in low-head dam cases.

(E) Exceptions to Immunity

Generally, recreational use statutes do not apply to willful or malicious failure to guard or warn against a dangerous condition, use, structure, or activity. If a landowner was

reckless in failing to guard or warn against a dangerous condition or engaged in gross negligence or willful or wanton misconduct, then the statute may not be applicable (see the “Issue 4: Warning Signs” section).

(4) State Low-head Dam Legislation

As drowning tragedies at low-head dams continue to occur, some states have responded through legislation. Virginia, Illinois, Pennsylvania, Indiana, and Iowa have pioneered legislation addressing low-head dams and protecting the public. A summary is presented in Table 1; for more detail, see Hansen and Hotchkiss (forthcoming).

TABLE 1 SUMMARY OF STATE LOW-HEAD DAM LEGISLATION

STATE	ELEMENTS OF LEGISLATION
Virginia (Va. Code Ann. § 29.1-509)	<ul style="list-style-type: none">• Defines “low-head dam” (Va. Code Ann. § 29.1-509A)• If warning signs and buoys are posted in accordance with regulations, then landowner shall be deemed to have met the duty of care for warning the public of the hazards posed by the dam. (Va. Code Ann. § 29.1-509F)• If landowner fails to mark a low-head dam in accordance with regulations, then the landowner shall be presumed not to have met the duty of care for warning the public of the hazards posed by the dam. (Va. Code Ann. § 29.1-509F)
Illinois (615 Ill. Comp. Stat. 5/23b)	<ul style="list-style-type: none">• The Illinois Department of National Resources will examine dams not subject to regulation regarding safety standards to determine hazards that may exist. (615 Ill. Comp. Stat. 5/23b(b))• The Illinois Department of National Resources shall submit administrative rules regarding safety devices and exclusion zones required at each dam. (615 Ill. Comp. Stat. 5/23b(c) and (d)).

(CONTINUED)

TABLE 1 SUMMARY OF STATE LOW-HEAD DAM LEGISLATION

<p>Pennsylvania (30 Pa. Cons. Stat. § 3510)</p>	<ul style="list-style-type: none">• Defines “low-head dam” (30 Pa. Cons. Stat. § 3510(i))• For new low-head dams, a permit is required and landowners are required to mark dams with warning signs and buoys. (30 Pa. Cons. Stat. § 3510(a))• For existing dams, an inventory is required and owners are required to mark dams with warning signs and buoys. (30 Pa. Cons. Stat. § 3510(b))• Landowners are required to maintain the signs and buoys and follow requirements for the size, content and location of signs and buoys. (30 Pa. Cons. Stat. § 3510(c) and (d))• If warning signs and buoys are posted in accordance with regulations, then landowner shall be deemed to have met the duty of care for warning the public of the hazards posed by the dam. (30 Pa. Cons. Stat. § 3510(f))• Penalties will be imposed for noncompliance. (30 Pa. Cons. Stat. § 3510(h))
<p>Indiana (Ind. Code § 14-27-7.3)</p>	<ul style="list-style-type: none">• Defines “low-head dam” (Ind. Code § 14-27-7.3-2)• Roster of low-head dams required including the owner and location (Ind. Code § 14-27-7.3-4)• Establishing warning standards and providing safety information (Ind. Code § 14-27-7.3-5)• Owners to provide notice if dam is damaged or breached. (Ind. Code § 14-27-7.3-8)• Restricting access within 50 ft of low-head dam when warning signs are present. (Ind. Code § 14-27-7.3-9)• Providing contact information re/ removal or modification• Owners to give notice in change of ownership and to have \$1 million general liability insurance (Ind. Code § 14-27-7.3-6)• State is not liable for any death or injury that occurs at a low head dam that is not owned by the state (Ind. Code § 14-27-7.3-11)• Penalties for non-compliance (Ind. Code § 14-27-7.3-13)

(CONTINUED)

TABLE 1 SUMMARY OF STATE LOW-HEAD DAM LEGISLATION

STATE	ELEMENTS OF LEGISLATION
Iowa (Iowa Code § 464A.11)	<ul style="list-style-type: none">• Establishes a low head dam public hazard program. (Iowa Code § 464A.11(1))• Requires inventory of low head dams for purposes of publicizing hazards. (Iowa Code § 464A.11(2a))• Develops safety measures, including a signage system with design templates and placement guidelines (Iowa Code § 464A.11(2c-d))• Creates criteria for removal or modification of low head dams (Iowa Code § 464A.11(2e))

Many other states have created Low-head Dam Programs or Guidelines, including Colorado, Iowa, Minnesota, Montana, South Dakota, and Ohio. For example, the Colorado Department of Natural Resources (2022) hosts a website that contains a map of low-head dams on major rivers and streams in categories of diversion, grade control, or recreational structures (<https://dnr.colorado.gov/initiatives/colorado-low-head-dams>). The site has links to definitions, danger, and safety.

ANALYSIS OF LOW-HEAD DAM CASES AND LEGISLATION

In litigation against low-head dam owners, the following issues often determine the outcome of the case: (1) whether the danger presented by the low-head dam is open and obvious; (2) whether the defendants owned the low-head dam; (3) whether the state recreational use statute provides immunity to the low-head dam owner; and (4) whether the low-head dam owner was grossly negligent or reckless in maintaining the dam. Table 2 summarizes available court cases involving low-head dams.

TABLE 2 FEDERAL AND STATE CASES INVOLVING LOW-HEAD DAMS. IN EACH CASE THE DECISION APPLIES TO THE PLAINTIFF (SEE HANSEN AND HOTCHKISS (FORTHCOMING) FOR DETAILS)

PLAINTIFF V. DEFENDANT	PLAINTIFF'S ARGUMENT	COURT DECISION
Volpe v. City of Lexington (VA)	Danger not open and obvious.	Agreed
Poindexter v. U.S. Army Corps of Engineers	Danger not open and obvious.	Agreed

(CONTINUED)

TABLE 2 FEDERAL AND STATE CASES INVOLVING LOW-HEAD DAMS. IN EACH CASE THE DECISION APPLIES TO THE PLAINTIFF (SEE HANSEN AND HOTCHKISS (FORTHCOMING) FOR DETAILS)

Perkins v. Byrnes (MO)	Danger not open and obvious.	Agreed
Mayle v. McDonald (OH)	Danger not open and obvious.	Rejected
McDowell v. Kentucky Utilities Co. (KY)	Danger not open and obvious.	Rejected
Suzanne P. v. Joint Bd. Of Directors of Erie-Wyoming County Soil Conservation District (NY)	Public entity was the owner.	Rejected
Goddard v. Dept. of Fisheries and Wildlife (CA)	Public entity was the owner.	Rejected
Pagnotti v. Lancaster Township (PA)	Recreational Use Statute did not apply.	Rejected
City of Indianapolis v. Johnson (IN)	Recreational Use Statute did not apply.	Agreed
Huffman v. Willoughby (OH)	Recreational Use Statute did not apply.	Agreed

Issue 1: Open and Obvious

The question of whether the low-head dam presents an open and obvious danger often arises in legal cases. From an engineering perspective, human passage was not intended when the dam was built. The danger of a low-head dam to swimmers and boaters is the downstream submerged hydraulic jump, which can be hidden and difficult to detect. Based on this conclusion, low-head dams are arguably a latent danger that is not open and obvious but the decisions of the courts on whether a low-head dam is open and obvious are split. Some courts have concluded that the condition is not open and obvious (*Volpe v. City of Lexington* 281 Va. 630, 637 (Va. 2011); *Poindexter v. U.S. ex rel. Corps of Engineers*, 568 F. Supp. 2d 729, W.D. La. 2008). Other courts have concluded that the condition of the low-head dam is open and obvious as a matter of law; but in those cases, there are complicating circumstances that make the entire situation dangerous, and not the low-head dam itself (*Mayle v. McDonald Steel Corp.*, No. 2010-T-0090,

2011 WL 4791019, at *1-2 (Ohio Ct. of App., Oct. 7, 2011); *McDowell v. Kentucky Utilities Co.*, No. 2007-CA-002208-MR, 2009 WL 350656, at *1 (Ky. Ct. App. Feb. 13, 2009)). Finally, other courts have said that this issue is a question for the jury, while acknowledging that the undercurrent downstream from a low-head dam is hidden or deceptive (*Perkins v. Byrnes*, 364 Mo. 849, 856 (Mo. 1954)).

In summary, the courts in *Volpe* and *Poindexter* found that the danger presented by the low-head dam was not open and obvious because of the hidden hydraulic jump. The courts in *Mayle* and *McDowell*, while noting the hidden hydraulic jump, nonetheless found the danger of the low-head dam was open and obvious. But the courts in *Mayle* and *McDowell* considered complicating factors, namely, a 15-ft abutment and the claimant going over the low-head dam in a small boat with oars or a motor. These extenuating factors obviously influenced the court and were likely the reason the courts found the danger to be open and obvious. In each case, the

danger was augmented by the conditions surrounding the low-head dam, and not the nature of the low-head dam itself. In short, without a complicating factor or extenuating circumstance, courts generally have found low-head dams to present a latent danger that is not open and obvious.

Issue 2: Ownership

Sometimes it is difficult to determine the true owner of a low-head dam. Land records may be unclear, or it is unclear when the dam was built and who built it. If a defendant in a lawsuit can show that it is not the owner of the low-head dam, then the court may find that the defendant has no duty to the claimant, and the defendant may be dismissed from the lawsuit. *See Suzanne P. v. Joint Bd. of Directors of Erie-Wyoming County Soil Conservation District*, 107 N.Y.S. 3d 595, 595 (N.Y. Sup. Ct. 2019) (town dismissed from lawsuit).

In short, if the claimant cannot prove that the defendant owned, occupied, controlled, or made special use of the low-head dam, then the defendant likely owes no duty to the claimant and may be dismissed from the lawsuit. *See, e.g., Goddard*, 243 Cal. App. 4th at 352 (state department did not own or control the dam and was dismissed from lawsuit).

Issue 3: Recreational Use Statutes

Recreational use statutes may provide low-head dam owners immunity from negligence and other actions, but this is not guaranteed. Recreational use statutes are often narrowly interpreted by courts and contain many requirements. For example, if the claimant is not engaged in a recreational activity, as defined by the state statute, then the statute will not apply. Or if the landowner charges a fee for entry or other consideration, then the recreational use statute may not apply. *See, e.g., City of Indianapolis v. Johnson*, 736 N.E.2d 295, 298 (Ind. Ct. App. 2000) (narrowly interpreting Indiana's recreational use statute and finding no immunity for the low-head dam owner under the statute).

In short, state recreational use states are not a guaranteed protection from lawsuits in low-head dam cases. Often whether the recreational use statute is applicable depends on the facts and circumstances of the matter, including the definition of "recreational purpose" in the state statute and the activity engaged in by the claimant. *See, e.g., Pagnotti v. Lancaster Township*, 751 A.2d 1226, 1228 (Pa. Commw. Ct. 2000) (finding low-head dam owner satisfied requirements of the Pennsylvania recreational use statute and was thus entitled to immunity).

Issue 4: Warning Signs

The issue of whether the dam owner has placed adequate warning signs often arises with gross negligence and recklessness actions and recreational use statutes. Placing warning signs may provide the low-head dam owner with evidence supporting arguments against recklessness and gross negligence claims and put the owner in a better position to be immunized under a recreational use statute.

For gross negligence claims, the claimant must show that the defendant's conduct was higher than simple negligence and was reckless with indifference to the injurious consequences to another. Courts have found that placing adequate warning signs and maintaining them often undermines a claimant's allegations of gross negligence and recklessness and has been a factor contributing to courts dismissing those claims. For example, an Alabama court found that the defendant state units could be immune under the Alabama state recreational use statute and dismissed claims of recklessness and gross negligence because "warning signs were in place," (*Clark v. Tennessee Valley Auth.*, 606 F. Supp. 130, 132 N.D. Ala. 1985). In *Simpson v. United States* (564 F. Supp. 945, 946 C.D. Cal. 1982), the court found in favor of the defendant U.S. Forest Service, that it did not willfully and maliciously fail to guard against dangerous conditions because warning signs were posted and maintained by the Forest Service. For negligence claims, generally courts have found that the danger of a low-head dam is not open and obvious. But placing adequate warning signs at the low-head dam and maintaining them may strengthen a landowner's argument that the danger is open and obvious. In most states, if the dangerous condition is open and obvious, then the landowner owes no duty to invitees.

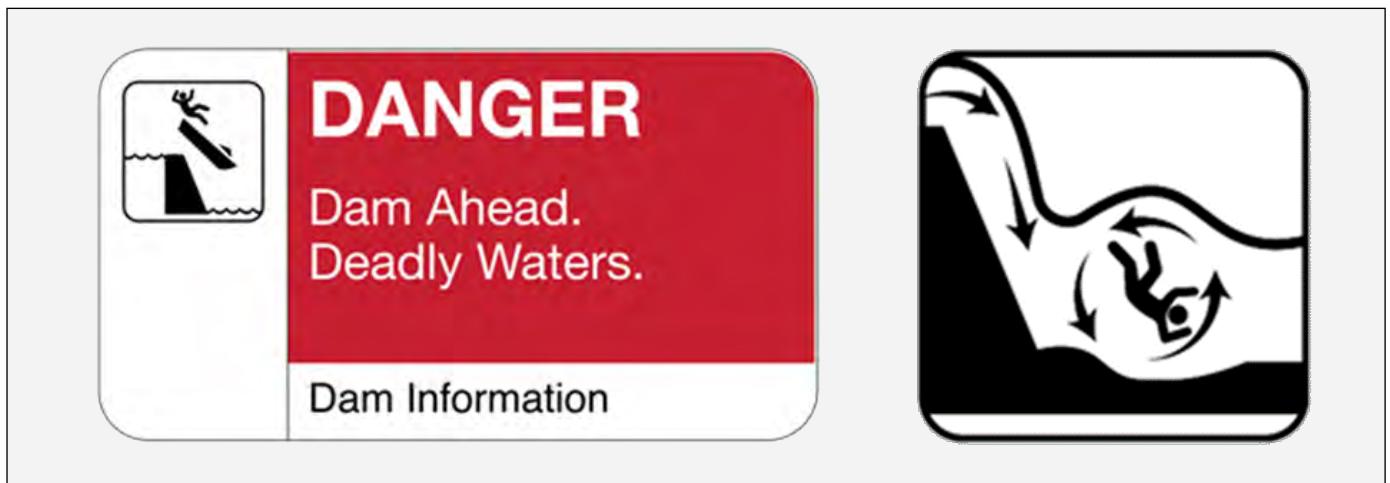
For a state recreational use statute to apply, there is often a requirement that the landowner not be found grossly negligent or reckless. The recreational use statute in Washington requires warning signs for the landowner to enjoy immunity (Wash. Rev. Code § 4.24.210). In some cases, failing to place warning signs has been a factor in favor of finding a landowner grossly negligent or reckless, and thus not entitled to immunity under the state recreational statute. For example, in *Volpe*, the Court addressed whether the City was grossly negligent, and found that, viewing the evidence most favorable to the plaintiff, *Volpe*, there was credible evidence to support a jury finding of gross negligence. In particular, the Court noted that the City knew the river could be dangerous in certain conditions because of the low-head dam and that the hydraulic downstream from the dam would be deadly (*Volpe*, 281 Va.

630 at 640). Despite this knowledge, it was undisputed that the City did not take any safety precautions for invitees swimming in the river (*Volpe*, 281 Va. 630 at 640). If the City had placed adequate warning signs, then the court may have found that the city could not be grossly negligent as a matter of law.

In drowning cases not involving low-head dams, some courts have found that failing to post warning signs to protect the public against a known dangerous condition takes the landowner outside the protection of the state recreational use statute and may support a claim for gross negligence or recklessness. *See* Hansen and Hotchkiss (forthcoming).

If a landowner wants to be immunized by the state recreational use statute, then the landowner should not place a sign stating “Keep Out” or “No Trespassing,” because a court may then determine the statute is inapplicable because this is evidence that the land was not open to the public.

In conclusion, placing warning signs around the dam in accordance with state regulations, if state regulations exist, may provide the low-head dam owner with the strongest arguments against negligence claims, and may support immunity under a state recreational use statute. If a state does not have regulations, then there are federal guidelines. The Federal Emergency Management Agency (FEMA) recently issued a best practices report for dam safety warning signs that provides design standards and guidance for messaging, placement, and symbology. Figure 5 shows an example of a warning sign and pictogram appropriate for low-head dams.



Source: FEMA, 2021.

Figure 5 Sign (left) and pictogram (right) for low-head dams.

Issue 5: Potential State Liability for Taking Action

States may be concerned about increasing their potential liability by creating an inventory of low-head dams or by requiring signs be posted at low-head dams. In the low-head dam cases reviewed for this article, a court has not determined that a state or government entity or unit was liable by creating an inventory or by requiring warning signs. Obviously, claimants may use any action taken by the state as an argument that the state is somehow liable for injuries occurring at low-head dams, but these arguments did not appear to have adequate legal support.

Legislation may be a way to address this issue. For example, the Indiana legislature enacted legislation stating: “The state is not

liable for any death or injury that occurs on or resulting from a low-head dam that is not owned by the state,” (Ind. Code § 14-27-7.3-11). Although the statute has not been litigated, the statute aims to eliminate the liability of the state for any of its actions in making requirements for low-head dams, including an inventory or posting signs. In short, while state action may provide claimants an argument that the state should somehow incur liability for taking action, there does not appear to be any legal support for these arguments.

Table 3 summarizes likely outcomes involving these five issues.

TABLE 3 SUMMARY OF MOST COMMON ISSUES IN LOW-HEAD DAM LITIGATION

ISSUE	OUTCOME
Is the danger at a low-head dam "open and obvious?"	The courts are divided. Some courts have determined that low-head dams present a latent danger that is not open and obvious, while other courts have determined that the danger is open and obvious.
Ownership	If it cannot be proven that a defendant owned, occupied, controlled, or made special use of the lowhead dam, then the defendant likely owes no duty to the claimant and may be dismissed from the lawsuit.
Recreational Use Statutes	Statutes are in force in every state, but do not guarantee protection from lawsuits involving low-head dams.
Warning signs	Placing warning signs may provide the low-head dam owner with evidence supporting arguments against negligence claims, and may support arguments that the low-head dam owner is immune under a state recreational use statute
Potential state liability for taking action	Taking action such as creating an inventory or posting warning signs or other safety measures has not been a factor considered by courts in assessing the liability of low-head dam owners, but claimants may try to use these actions to support claims of liability.

CONCLUSION AND RECOMMENDATIONS

Deaths by drowning at low-head dams continue to occur in part because the submerged hydraulic jump is hidden from view and the danger is generally not perceived or appreciated by the everyday swimmer or boater. Some states, like Virginia, Illinois, Pennsylvania, Indiana, and Iowa have passed legislation to address the situation. Every state has enacted a recreational use statute, but these statutes were not designed specifically for low-head dams and have many requirements and exceptions that make it difficult to predict whether a low-head dam owner will be immunized from liability. We recommend that legislation regarding low-head dams be enacted and that warning signs be posted at low-head dams. Each recommendation is explained here.

For governments and government entities, we recommend enacting legislation specifically addressing low-head dams

and suggest considering the approach taken by the state of Indiana that: (1) defines low-head dams, (2) requires a statewide inventory of low-head dams and owners, (3) sets warning standards, (4) publishes information on low-head dam safety, (5) furnishes information to owners on low-head dam removal and modification, (6) requires notification to the state of changes in ownership, (7) restricts persons from accessing low-head dams, and (8) declares state immunity for those dams not owned by the state, (Ind. Code Ann. § 14-27-7.3). Other elements may also be useful, such as increasing the penalties for noncompliance, as in Pennsylvania (30 Pa. Cons. Stat. § 3510(h)) or deeming landowners to have met the duty of care for warning the public of the hazards posed by the dam, as in Virginia (Va. Code Ann. § 29.1-509F).

For all low-head dam owners, we recommend posting and maintaining adequate warning signs to help reduce the number of recreationists passing over low-head dams. Warning signs

can also provide advantages in defending negligence claims and seeking immunity under state recreational statutes. First, warning signs can undermine claims that the danger of the dam is not open and obvious, which can lead a court to determine that the low-head dam owner owes no duty to an invitee. Second, warning signs can also undermine claims of gross negligence and recklessness because they show that the landowner took precautions to protect the public. Finally,

warning signs may also undermine claims that the low-head dam owner should not be immunized under a state recreational statute, which often exclude from immunity grossly negligent or reckless conduct. Notably, many states and FEMA have provided guidance on the placement, content, and maintenance of signs.

Most importantly, by following these recommendations, states and low-head dam owners will increase public awareness of the latent dangers of low-head dams and reduce drownings.

References

25 Am. Jur. Proof of Facts 3d 251 §§ 2 and 3.

30 Pa. Cons. Stat. § 3510(a) – (i)30

Pa. Cons. Stat. § 923 (5).

30 Pa. Cons. Stat. § 923(1).

57 Am. Jur. 2d Municipal, etc., Tort Liability § 271.

57A Am. Jur. 2d Negligence §§ 70, 72, 214, 238.

86 C.J.S. Torts § 71.

615 Ill. Comp. Stat. 5/23b(b) – (d)

Brewitt, P. K., & Colwyn, C.L.(2020). Little dams, big problems: The legal and policy issues of nonjurisdictional dams. *WIREs Water*, 7, e1393. <https://doi.org/10.1002/wat2.1393>

Clark v. Tennessee Valley Auth., 606 F. Supp. 130, 132 (N.D. Ala. 1985).

City of Indianapolis v. Johnson, 736 N.E.2d 295 (Ind. Ct. App. 2000).

Colorado Department of Natural Resources. (2022). *Colorado's Low Head Dams*. <https://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=095-0020>

Dietrich, L. (2021, winter). National Low-head Dam Inventory Task Force. *EWRI Currents* <https://www.asce.org/communities/institutes-and-technical-groups/environmental-and-water-resources-institute/news/national-low-head-dam-inventory-task-force>.

Federal Emergency Management Agency. (2021, September). *Dam safety warning signs best practices: promoting public awareness and preventing loss of life*. FEMA P-2188.

Federal Register. 2017. Vol 82(4): 1997.

Goddard v. Dept. of Fish & Wildlife, 243 Cal. App. 4th 350 (Cal. Ct. App. 2015).

Hansen, F. R. & Hotchkiss, R. H. (Under Review). “Low-head Dams (aka Drowning Machines) Are Deadly: An Analysis of Liability for Landowners and States, and Recommendations for Legislation and Warnings,” 15 Ky. J. Eq. Ag. & Nat'l Res. L. (forthcoming in spring 2023). Ind. Code § 14-27-7.3

Iowa Code § 464A.11(1) and (2)

Landers, J. (2021). Engineers Work to Reduce Drowning Deaths at Low-Head Dams. *Civil Engineering Magazine*. American Society of Civil Engineers. <https://www.asce.org/publications-and-news/civil-engineering-source/civilengineering-magazine/article/2021/01/engineers-work-to-reduce-drowning-deaths-at-low-head-dams/>

Maldonado v. United States, 893 F.2d 267 (10th Cir. 1990)

Mayle v. McDonald Steel Corp., No. 2010-T-0090, 2011 WL 4791019 (Ct. App., Oct. 7, 2011)

McDowell v. Kentucky Utilities Co., No. 2007-CA-002208-MR, 2009 WL 350656, (Ky. Ct. App. Feb. 13, 2009).

McGhin, R. F. III, Hotchkiss, R. H., Kern E. (2018). "Submerged hydraulic jump remediation at low-head dams: partial width deflector design." *Journal of Hydraulic Engineering*, 144(12): 04018074.

Michael J. Lunn, *Class Dismissed: Forty-Nine Years Later, Recreational Use Statutes Finally Align with Legislation's Original Intent*, 20 Drake J. Agric. L. 137 (2015).

National Dam Inspection Act (PL 92-367. <https://www.govinfo.gov/content/pkg/COMPS-2975/pdf/COMPS-2975.pdf>.

Pagnotti v. Lancaster Township, 751 A.2d 1226, 1228 (Pa. Commw. Ct. 2000)

Perkins v. Byrnes, 364 Mo. 849 (Mo. 1954). *Poindexter v. U.S. ex rel. Corps of Engineers*, 568 F. Supp. 2d 729, 736 (W.D. La. 2008)
Restatement (Second) of Torts §§ 282, 329, 330, 332, 334, 341, 341a (1965).

Simpson v. United States, 564 F. Supp. 945, 946 (C.D. Cal. 1982).

Suzanne P. v. Joint Bd. of Directors of Erie Wyoming County Soil Conservation District, 107 N.Y.S. 3d 595, 595 (N.Y. Sup. Ct. 2019).



Lost Creek Dam - USA - 1997

Celebrating 25 years since Carpi executed the first full dam, underwater geomembrane installation in the world! The Carpi Sibelon[®] geomembrane system continues to perform maintenance-free.

Carpi[®] geomembrane systems have stopped leakage in more than 260+ dams, canals, reservoirs and tunnels worldwide.

Geomembranes are:

- Impermeable, flexible, durable
- Resistant to settlements
- Installed quickly, even underwater
- Applicable to all types of structures
- Environmentally friendly
- Efficiently monitored
- Cost effective

CARPI USA, Inc. | 540-776-7727
carpi.usa@carpitech.com | www.carpitech.com
4370 Starkey Rd. Suite 4D, Roanoke, VA 24018



Since 1963

Tschantz, B. (2014). What we know and don't know about low-head dams. *The Journal of Dam Safety* 12(4): 37–45.

Utah Code Annotated § 57-14-201.

Va. Code Ann. § 29.1-509A and F.

Volpe v. City of Lexington, 281 Va. 630 (Va. 2011).

Wallace v. Metropolitan Pier and Exposition Authority, 302 Ill. App. 3d 573 (Ill. 1st Dist. 1998).

Walter, R. C. & Merritts, D. J. (2008). Natural streams and the legacy of water-powered mills. *Science* 319(5861): 299 – 304.

Wash. Rev. Code § 4.24.210.

Wright, K., Kelly, J.M., Houghtalen, R.J. & Bonner, M.R. (1995, September). *Emergency rescues at low-head dams*. [Paper presentation]. Dam Safety 1995, the 12th annual conference of the Association of State Dam Safety Officials., Atlanta, GA, September.



Rollin H. Hotchkiss, Ph.D., P.E., D.WRE, F.ASCE

Professor, Civil and Construction Engineering Department, Brigham Young University
430 Engineering Building, Provo, UT 84602 • 801-422-6234 • rhh@byu.edu

Rollin H. Hotchkiss is a water resources engineering professor in the Civil and Construction Engineering Department at Brigham Young University. His current research areas include mitigating drowning at low-head dams, extending the useful life of dams and reservoirs, and the economics of sustainability. He is a co-leader of a task force to create an inventory of low-head dams in the United States. Dr. Hotchkiss has authored more than 50 refereed journal papers and more than 100 conference papers. He teaches courses in fluid mechanics, 2D river modeling, hydraulic structures, and leadership.



Forrest R. Hansen, J.D.

Executive Director, J. Reuben Clark Law Society
JRCB • Provo, UT 84602 • 801-422-3285 • hansenf@law.byu.edu

Forrest Hansen represents multinational corporations in complex cross-border regulatory investigations and litigation. He often provides advice on international trade and drafts international agreements. His practice focuses on finance, banking, and manufacturing in the areas of antitrust, FCPA, international trade, compliance, and fraud. He also is a lecturer of comparative constitutional law at Université Paris Descartes: Faculté de Droit. Mr. Hansen previously served as in-house counsel for a global financial institution and has practiced law in Paris, France.

Mr. Hansen serves as the executive director for the J. Reuben Clark Law Society. Mr. Hansen often speaks on issues concerning corporate internal investigations, professional responsibility, attorney well-being, and constitutional law.

Mr. Hansen is a 2007 *cum laude* graduate of American University, Washington College of Law, where he was on the senior editorial board of the *American University Law Review*, and a 2003 graduate of Brigham Young University.



ASDSO Peer Reviewers

This article was peer-reviewed by James Gallagher, P.E. (Former, New Hampshire) and Greg Paxson, P.E., D.WRE (Schnabel Engineering).