

Preparing for Environmental Damage Claims After a Disaster

Environmental Damage Assessment in Flooding and Storm Events: Site-Specific Realities, Human Alterations, and Legal Complexities

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While events such as fires, floods, and landslides are natural phenomena, the severity and distribution of damages are increasingly shaped by the cumulative impacts of past land-management practices. Environmental changes—including excess fuel loading, the fragmentation of aquatic habitats, and the introduction of invasive species—compound natural risks and complicate the question of causation when disaster strikes. The assessment of environmental damages after such events is therefore highly site-specific and often entangled with damages to human infrastructure, including buildings, roads, bridges, and dams. Government agencies responsible for evaluating environmental injuries sometimes turn to streamlined assessment methodologies to expedite analysis on state and federal lands; however, these methods may not account for localized watershed characteristics or the effects of prior land alterations. To understand, evaluate, and respond to flood-related damage claims effectively, practitioners must consider both the scientific drivers of environmental harm and the legal frameworks that govern allocation of responsibility.

Flooding offers a particularly vivid illustration of why environmental damages cannot be assessed in a vacuum. Three recent examples—chronic tidal flooding in Charleston, catastrophic inland flooding in Columbia during the 2015 historic storm, and the accelerated riverine flooding seen in Western North Carolina during Hurricane Helene—demonstrate how geography, topography, land-use history, and meteorology combine to shape both the nature of the event and

the litigation landscape that follows. These case studies reveal the limits of treating “flooding” as a monolithic hazard and underscore the necessity of understanding local environmental conditions when determining foreseeability, identifying defects, and allocating causation.

Charleston represents a setting in which flooding has evolved into an expected feature of the urban landscape. The city routinely experiences inundation during King Tides, high groundwater events, and moderate storms. Such flooding is no longer viewed as extraordinary but instead reflects the combined effects of low elevation, tidal proximity, sea-level rise, land subsidence, and a long history of wetland filling and coastal development. Stormwater infrastructure designed for a bygone era is frequently overwhelmed, and neighborhood flooding occurs even without significant rainfall. In litigation involving water intrusion or property losses in Charleston, this chronic pattern complicates traditional “act of God” defenses. Because the flooding is predictable and well documented, builders, designers, and developers may be expected to incorporate elevated construction, enhanced drainage systems, or improved waterproofing. As a result, Charleston demonstrates how recurring environmental conditions shape the standard of care and influence determinations about what mitigation measures are reasonable.

Columbia’s 2015 flooding presents a dramatically different scenario. In early October 2015, an intense rainfall event delivered more than twenty inches of precipitation to parts of the Midlands within hours. Natural and engineered systems alike were overwhelmed. Several dams failed, sending massive volumes of water into residential areas, many of which had little or no historic flood exposure. The scale of destruction was shaped not only by the storm’s intensity but also by infrastructure vulnerabilities that amplified the event’s impact. This type of flood occupies the category of low-probability, high-consequence disasters that fall far outside standard design parameters. When claims arise from such extreme events, the legal analysis centers on the reasonableness of design expectations and the apportionment of causation among unprecedented rainfall, infrastructure failures, and any alleged construction deficiencies. Because the storm exceeded all predictive models and historical baselines, defects that may have mattered in ordinary conditions may have been functionally irrelevant. Columbia’s experience highlights the difficulty of evaluating construction-related liability when environmental forces surpass the limits that structures were designed to withstand.

Western North Carolina’s 2024 flooding following Hurricane Helene offers yet another distinct flooding profile shaped by mountainous terrain. In the Southern Appalachians, steep slopes, shallow soils, and narrow valleys produce rapid hydrological responses when heavy rainfall occurs. During Helene, orographic effects intensified precipitation as moist air moved upslope, and the resulting runoff quickly entered creeks and rivers, which rose at astonishing speed. Landslides, debris flows, and sediment surges accompanied the flooding, reflecting both natural watershed dynamics and the legacy of past land disturbances such as grading projects, unretired logging roads, and development on marginal slopes. Litigation involving this type of flooding often focuses on whether builders and land planners reasonably accounted for known slope-

stability risks, drainage pathways, and the mountain region's tendency toward rapid watershed response. Although heavy rainfall from tropical remnants is not unusual in this region, the severity of Helene was exceptional, and courts must examine whether design and construction practices reflected foreseeable risks or whether the magnitude of the event itself was the predominant causal factor.

Together, these examples illustrate the necessity of evaluating flooding through a site-specific lens. Charleston's flooding is chronic and predictable; Columbia's was catastrophic and extraordinary; Western North Carolina's was topography-driven and accelerated by mountainous terrain. These distinctions significantly influence both the scientific and legal analyses that follow. What is reasonable to expect of a builder, designer, or land-use authority in one location may be inappropriate or impossible in another. Understanding the local context—historical, environmental, infrastructural, and regulatory—is therefore essential for any credible damage assessment.

The question of construction defects in flood events further underscores the interplay between human conduct and environmental forces. A defect that is consequential under normal conditions may be overshadowed by extreme environmental loads, while a minor flaw may become environmentally significant when combined with disturbed drainage patterns or vulnerable terrain. Courts routinely grapple with whether the defect was a substantial contributing factor to the loss or whether the event's magnitude rendered the defect effectively irrelevant. This inquiry requires careful reconstruction of both the built environment and the environmental forces at play, as well as an understanding of the relevant engineering standards and codes in place at the time of construction. Reasonableness in design cannot be untethered from what was known or knowable about environmental risks at the time, nor can it assume omniscience about conditions far beyond historical precedent.

The built environment plays a critical role in shaping flood impacts. Urbanization alters hydrology by replacing permeable surfaces with impervious ones, narrowing or burying natural drainage channels, reducing vegetative cover, and introducing structures that redirect or confine water. Over time, these cumulative modifications can transform how water moves through a landscape, creating new flood pathways or exacerbating existing vulnerabilities. In disputes involving neighboring properties, municipalities, or large-scale developments, courts often evaluate whether human alterations unnaturally changed water flow or whether the observed flooding reflects natural hydrological processes. The analysis becomes increasingly complex in older cities, where historic landfills, infilled marshes, and fragmented floodplains distort the boundary between natural and human-created conditions.

This complexity extends to the legal distinction between natural and unnatural flooding. The concept of "natural" flooding presupposes a landscape that has remained largely unchanged, but such landscapes are rare. Most modern environments reflect the cumulative effects of centuries of development, including filled wetlands, redirected streams, modified slopes, and reshaped

floodplains. When flooding occurs in these settings, the loss is often the product of intertwined natural and anthropogenic forces. Courts must determine whether the damages resulted from foreseeable, environmentally driven flooding or from unreasonable alterations of the landscape that channel water in unintended ways. This analysis is inherently factual and requires a deep understanding of the site's history, the nature of prior land-use decisions, and the degree to which those decisions amplified or attenuated the flood impacts.

Environmental restoration has emerged as an important component of risk mitigation in this context. Restoration efforts can reestablish ecological functions that reduce flood severity by enhancing infiltration, slowing runoff, stabilizing slopes, and protecting riparian corridors. These measures benefit natural systems but also serve as practical tools for reducing legal and financial exposure. In many jurisdictions, restoration is increasingly incorporated into development planning, insurance risk assessments, and municipal resiliency programs. When undertaken proactively, such measures may strengthen arguments that parties met or exceeded the applicable standard of care. Restoration also acknowledges the reality that many environmental risks are the product of cumulative degradation rather than isolated decisions. By addressing the underlying ecological deficiencies that heighten flood vulnerability, restoration efforts offer both immediate and long-term protective value.

Ultimately, environmental damage assessments in the aftermath of flooding and storm events require a nuanced understanding of regional environmental characteristics, historical land-use patterns, and the role of human alterations in shaping flood behavior. Whether the issue is chronic tidal flooding in Charleston, the unprecedented rainfall that struck Columbia, or the rapid mountain flooding triggered by Hurricane Helene, practitioners must evaluate environmental harms through a site-specific lens that integrates scientific, engineering, historical, and legal perspectives. Only through this holistic approach can decision-makers accurately distinguish natural from human-amplified damages, apportion responsibility, and develop mitigation strategies that reflect the realities of a changing environmental landscape.

Landslides and Erosion After Natural Events: Building the Defense

Defense counsel and risk managers face a recurring problem in post-event environmental claims: the tendency for plaintiffs and courts to conflate damage to infrastructure with ecological injury, and to attribute complex geomorphic outcomes to a single project or land-use decision. In these matters, the defense typically succeeds or fails at the level of causation. Meeting the causation element head-on is best accomplished through a disciplined record—of the storm that occurred, the site's susceptibility, the permit obligations in force, and the controls actually implemented. These facts provide the foundation for limiting liability, allocating responsibility, and right-sizing any ecological restoration.

A sound causation narrative starts with the weather. In most landslide and erosion disputes, the relevant hydrologic driver is not merely that “a big storm happened,” but the duration-specific intensity that mobilized soils and saturated slopes. This analysis should be anchored in precipitation-frequency data and on-site totals, allowing counsel to articulate whether an event was part of the normal design or a statistical outlier. This matters both for engineering expectations and for negligence theories: a claimant’s argument that “you should have foreseen this” is weaker when the event meaningfully exceeded the rainfall input assumed by prevailing design criteria. The same analysis helps distinguish short, intense bursts that produce debris flows from longer events that drive deeper pore pressure increases, a distinction that often separates shallow failures—more sensitive to recent disturbance—from deep-seated slides that reflect geology and antecedent moisture.

Similarly important to this analysis is the site’s baseline susceptibility. USGS landslide inventories and susceptibility maps, along with post-fire debris-flow tools, document where slopes, geology, and burn history already predispose a landscape to fail. If a region has a record of landsliding or if a wildfire recently removed protective vegetation, the defense can reasonably argue that the event was an expression of natural hazard amplified by antecedent conditions rather than a straightforward result of a new project. This is particularly important when plaintiffs assert “development-caused” blame without accounting for the pre-existing risk profile and its evolution over time. The deep-versus-shallow failure distinction becomes central here: deep-seated landslides are often driven by long-term groundwater and geologic factors; shallow landslides and debris flows, in contrast, are more immediately the result of recent land disturbance and drainage choices.

Permitting and compliance form the next layer of defense for attacking causation. Under the Clean Water Act’s Construction General Permit (CGP), projects disturbing an acre or more must develop a Stormwater Pollution Prevention Plan (SWPPP), stabilize exposed soils promptly, and maintain effective erosion and sediment controls. The key task for defense counsel is to convert those obligations into a story of diligence: documented inspections, dated stabilization, turbidity monitoring where required, correction logs, and photos before and after storms. This documentation provides two important benefits. First, it demonstrates that the developer did what the permit actually required—which is the benchmark against which liability should be measured. Second, it creates a basis to rebut generalized claims that “controls were inadequate” with concrete evidence of Best Management Practices being implemented as part of maintenance tied to the sequence of construction and the actual weather timeline.

The post-*Chevron* state of the case law has narrowed the ability of agencies to impose broad “end-result” permit terms that make permittees responsible for ambient receiving-water quality without specifying actionable effluent limits or BMPs. This posture offers favorable clarity to the frame of the case: a client that followed permit-specified actions can push back against theories that treat any downstream water-quality exceedance as strict liability. The permit shield remains

a meaningful part of any defense—compliance with specified terms is the measure, not ambient conditions that can be influenced by multiple sources and extreme weather.

Land-use changes related to development projects such as solar farms have become a greater focus in disputes relating to alleged harm from erosion. In those situations, it is important to separate the applicable science from the site practice. Solar arrays are not inherently erosion engines; properly designed sites with healthy vegetation, infiltration trenches, and dispersion features can manage runoff effectively. Instead, ground cover choices are decisive: grassed surfaces with good infiltration behave very differently from gravel or compacted bare soils. In cases involving these issues, the question for the judge/jury is not “are solar farms bad?” but “what did *this* site do and when?” Layout, slopes, BMP design details, seasonal stabilization windows, inspection cadence, and the timing of corrective actions should be marshaled to show a site-specific, fact-based compliance record. Equally important, contractor oversight should be documented: pre-bid BMP specifications, quality-control hold points, storm triggers for inspections, and escalation protocols demonstrate a proactive regime that can mitigate negligence claims and help allocate fault if a subcontractor failed in execution.

Issues around timber harvest and road building present a different calculus. Clear-cutting and poorly placed roads have been connected to increased shallow landslides and debris flows, resulting in potential liability. Defending against such claims requires putting the site back on its factual footing to focus on the key facts on the ground: harvest timing relative to storm season, retention buffers and root strength, road alignment and slope class, cross-drains and rolling dips, and the rarity of the triggering rainfall. In cases involving deep-seated landslides, emphasizing the dominance of geologic and groundwater conditions undercuts arguments that the party’s activity was a significant contributor to the landslide. For shallow landslides, a party should show that drainage and stabilization conformed to known practices and, again, that the storm intensity exceeded what even well-designed controls are expected to manage without incident.

The bottom line for defense counsel when addressing claims related to erosion and landslides from storm events is straightforward: a disciplined natural-hazard narrative, a clear, documented compliance story, and site-specific technical evidence will allow you to separate extreme natural drivers from incremental, controllable contributions. That separation is the basis for limiting liability, allocating responsibility among contractors and co-defendants, right-sizing ecological restoration, and—most importantly—reducing exposure before the next storm arrives.

Wildfires, Biodiversity & NRDA: How changes in biodiversity following a wildfire affect natural resource damage assessments

Following oil or chemical spills, natural resource damage assessments (NRDAs) commonly use a tool called habitat equivalency analysis (HEA) to quantify reductions in ecological services. In

these conventional toxicity applications, the HEA model incorporates a decrease in services immediately following an incident and then a gradual recovery to pre-incident baseline.

As the frequency and intensity of wildfires in the United States have grown, this model has been applied to the assessment of ecological damages from wildfires. Wildfires, however, can benefit and improve ecological services in ways that chemical and oil spills do not. Forests that are subject to frequent, mixed severity fires support diverse plant and wildlife communities not found in unburned, mature forests. When overly dense forests burn and are allowed to recover under a natural fire regime, the resulting landscape is likely to support higher diversity than the pre-fire forest.

While scientists are increasingly recognizing that diverse fire regimes (pyrodiversity) promote greater biodiversity in ecosystems, these findings are slow to be incorporated into liability assessments. Considering the ecological services provided by regrowing and maturing habitats can help to more accurately calculate the ecological impacts of wildfires and guide appropriate restoration planning.

Before active forest management in the 1900s, frequent natural fires of variable severity facilitated the development of a patchwork of habitats that were healthy and resilient. This landscape mosaic of meadows and early- to late-stage forests provided a variety of habitats for different species of flora and fauna, some of which depend on a specific habitat stage. For example, the black-backed woodpecker has become rare in California's Sierra Nevada range because fire suppression has reduced the extent of its primary habitat — early successional burned forests with an abundance of standing dead trees.

Today's unnaturally dense forests are more susceptible to climate-change related drought and bark beetle infestations, resulting in more homogenous landscapes with greater accumulated fuel loads and encouraging more frequent, more intense, and more widescale wildfires. Despite the current trend of high-intensity fires, wildfire is a natural process that is necessary to restore and maintain healthy and diverse forest habitats. Legal claims for lost ecological services following wildfires should be carefully reviewed not only for how baseline conditions are considered but also for how the recovering landscape may support greater biodiversity. This is important for determining both the types and amount of habitat restoration needed.

The assumption of a gradual recovery to maximum services concurrent with return to a pre-fire climax forest habitat likely fails to completely capture the service flows from early and intermediate habitat stages. In some cases, re-establishing a forest cultivated by a natural fire regime will provide greater ecological services than the pre-burn forest, a factor that should be accounted for in a HEA model. Benefits flowing from increased habitat heterogeneity could, in some cases, offset some losses that may have occurred during the fire, and patches of low-intensity burns may reduce the need for future prescribed burns or other fuels management in the area.

A traditional HEA approach would not be suitable for quantifying service losses following a forest fire since it does not account for the important biodiversity services provided by habitats created immediately post-fire. Furthermore, post-fire management options, such as salvage logging, snag removal, and re-planting, may decrease the biodiversity of these early successional stages by inadvertently suppressing and slowing natural recovery. However, by tracking the variable trajectories of service flows (e.g., biodiversity) as habitats regrow and mature, this information can be used to accurately determine restoration requirements.