Bridge Lighting

Concerns for Nature

Mark Grosz- July 25, 2025

Effects on Nature from Bridge Lighting



Artificial light at night (ALAN) from bridge lighting significantly impacts aquatic environments and adjacent terrestrial habitats in many ways, disrupting natural ecological processes and species behaviors across aquatic and terrestrial ecosystems.

Polarized Light Pollution (PLP)

Bridge lighting can induce polarized light pollution (PLP), altering the natural optical conditions of water surfaces and making roadways appear as water surfaces for breeding and egg laying. This disrupts navigational cues for polarotactic aquatic insects, such as chironomids, which rely on horizontally polarized moonlight to locate breeding sites. A 2024 study on the Spree River in Berlin found that ALAN from illuminated bridges creates PLP, potentially acting as an ecological trap by attracting insects to unsuitable habitats.

Behavior Barriers for Fish

ALAN from bridges can act as a behavioral barrier for migratory fish. A 2024 pilot study on the Spree River quantified light levels at seven illuminated bridges and proposed a conceptual model showing impacts on Atlantic salmon smolts (Salmo salar) and European silver eels (Anguilla anguilla). Rapid changes in light intensity disrupt migration patterns, potentially reducing successful navigation to spawning or feeding grounds.

Invertebrate Behavior and Community Composition

Bridge lighting alters the behavior of aquatic invertebrates, affecting movement, habitat choice, and foraging. A 2023 review highlighted that ALAN attracts emergent aquatic insects, increasing their mortality and altering community composition. For example, lights suppress the drift of aquatic insects and increase adult emergence under illuminated areas, disrupting aquatic-terrestrial energy fluxes and increasing predation pressure, including from diurnal predators.

Primary Producers and Ecosystem Processes

ALAN can influence aquatic primary producers like micro-algae and cyanobacteria, which are sensitive to light changes. A 2018 study noted that bridge lighting disrupts natural light cycles, potentially affecting photosynthesis and nutrient cycling at the base of aquatic food webs. This can cascade up the food chain, altering ecosystem dynamics.

Insect Attraction & Predator-Prey Dynamics

Bridge lighting attracts large numbers of emergent aquatic insects, creating a food surplus for terrestrial predators for a short while. A 2020 field experiment showed that illuminated areas near water had 51% more tetragnathid spiders, with increased body mass (34% for males, 176% for females), due to abundant insect prey. This alters predator-prey dynamics and reduces insect dispersal into riparian zones, affecting terrestrial food webs.

Cross-Ecosystem Resource Flux

ALAN concentrates aquatic insect emergence near bridges, reducing the flux of resources (e.g., insect biomass) into terrestrial ecosystems. A 2017 study in a German nature reserve found that streetlights near waterways changed predator communities in adjacent grass, favoring species that exploit light-attracted insects. This disrupts the natural exchange of energy and nutrients between aquatic and terrestrial systems.

Amphibian and Vertebrate Impacts

Amphibians, which rely on both aquatic and terrestrial habitats, face dual risks from ALAN. A 2023 study noted that bridge lighting disrupts their nocturnal behaviors, such as foraging and reproduction, due to altered light regimes. This can suppress immune responses during metamorphosis, increasing vulnerability to pathogens.

Terrestrial vertebrates like bats benefit from insect aggregations near lights but may face habitat fragmentation if ALAN acts as a barrier to movement along waterways. Light can also increase predation of smaller bat species by larger bats.

Wasted Energy

Decorative bridge lighting has little to do with public safety and since LEDs are very controllable, the lights could be dimmed or turned off in the early morning hours to save money and lessen the negative effect on the environment.

Bridge Lights and Birds

Bird Attraction & Disorientation

Many migratory birds, such as warblers, orioles, and seabirds, navigate using moonlight and starlight. Bright artificial lights on bridges can attract these birds, causing them to veer off their migratory paths. This disorientation can lead to birds circling lit structures, depleting their energy reserves, and increasing the risk of exhaustion or collisions with bridge components.

For example, the U.S. Fish and Wildlife Service notes that lights can draw birds from up to 5 kilometers away, particularly on foggy or cloudy nights when birds fly at lower altitudes, amplifying the risk of disorientation.

Collision Risks

Birds attracted to bridge lighting are at higher risk of colliding with structural elements like cables, spires, or railings. Collisions can result in injury or death, with estimates suggesting 365–988 million birds die annually in the U.S. from collisions with human-made structures, including bridges and buildings.

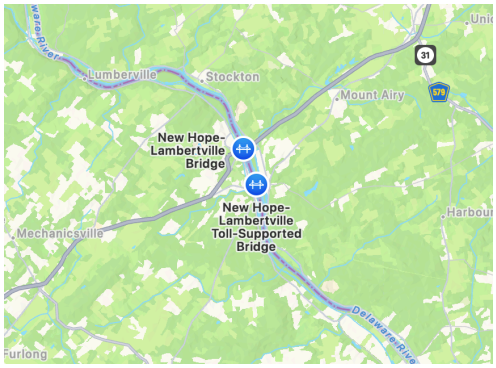
A notable case is the Bob Kerrey Pedestrian Bridge in Omaha, where the U.S. Fish and Wildlife Service expressed concerns about ornamental lighting on spires and cabling confusing birds, potentially leading to deadly strikes. However, city officials argued there's no definitive evidence of bird deaths at this bridge and prioritized public safety lighting.

Habitat Disruption

Bridge lighting can alter birds' perception of habitat quality, drawing them into urban areas where they face additional threats like predation, starvation, or further collisions with glass during daylight hours. This is particularly problematic for birds needing stopover sites to rest and feed during migration.

Light pollution may also disrupt biological clocks, causing birds to migrate too early or late, missing optimal conditions for nesting or foraging.

Example: New-Hope Lambertville Bridge



In 2025, the Bucks County Audubon Society urged the Delaware River Joint Toll Bridge Commission to conduct an environmental impact assessment for the New Hope-Lambertville Bridge's vanity and pier lights. DarkSkyPA also wrote a letter to support the desire of residents and Lenape Nation of Pennsylvania's concerns. The bridge's lighting is seen as counter to efforts to reduce light pollution in flyways during migration seasons, potentially contributing to bird disorientation and collisions. This highlights ongoing local advocacy for bird-safe lighting practices. Advocacy for an environmental impact assessment continues, driven by concerns about the bridge's role in the Atlantic Flyway, a critical migration corridor.