Artificial Light at Night

Reducing Impacts to Birds and Mission

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Department of Defense
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Our Mission

Providing expertise on the management and conservation of birds and their habitats to sustain and enhance the military mission

Issue Overview

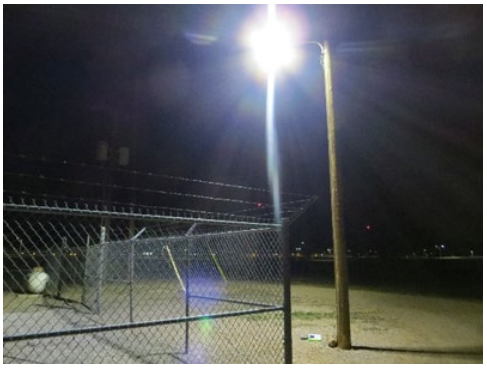
Millions of birds are killed each year by outdoor lighting associated with tall buildings, navigation beacons, communications towers, and other illuminated facilities. Attraction to artificial light at night (ALAN) causes avian mortality when migrating birds become "captured," circling light sources to the point of exhaustion or colliding with obstacles and other birds. Indirect effects from outdoor lighting include localized loss of habitat or loss of breeding productivity and ALAN related mis-navigation causing the depletion of energy reserves that ultimately can affect survival and productivity. This fact sheet describes avian capture by ALAN and precipitating factors, then summarizes best management practices with reference to policy tools that will guide the reduction of ALAN impacts to individuals, populations, and vulnerable species.

ALAN impacts are particularly relevant in the military context because many DoD facilities have extensive outdoor lighting for operational and security reasons. DoD conservation programs have mandated reductions in energy consumption through the conversion of outdoor lighting to efficient new technology. However, typical LED fixtures emit "cool" (blue) light spectrums believed to be more harmful to wildlife than incandescent lights. Furthermore, over-illumination is commonplace because the cool spectrum is perceived as less bright than the "warm" (yellow) spectrum by the human eye, and the incremental cost for the extra output is negligible.

The wholesale replacement of outdoor lighting represents a unique opportunity to reduce existing and potential ALAN impacts by right-sizing and right-timing output, optimizing spectrum, and ensuring fixtures are fully shielded. These modifications also provide important benefits to missions requiring dark skies for testing of equipment, training, or concealment of sensitive facilities because they reduce light pollution.

Avian Capture

Avian and human vision are profoundly different, therefore specific biological mechanisms for avian attraction to ALAN are difficult to pinpoint. In one hypothesis, ALAN overrides celestial navigational cues or obscures reference points on the horizon; once adopted as a visual cue, a bird must circle an anthropogenic light source to maintain its position within the field of vision. In another hypothesis, high intensity light temporarily impairs birds' low light vision; then, circling the light source becomes the most effective short-term survival strategy and the only way to avoid "flying blind."



Conspicuous light sources can attract and trap birds, sometimes leading to mortality. Photo credit: Duncan Eccleston

ALAN mortality tends to be episodic, characterized by discrete events of tens, hundreds, thousands or even ten thousand mortalities, with the largest events being most unusual. In maritime settings, ALAN mortality events may be driven by the breeding cycle of

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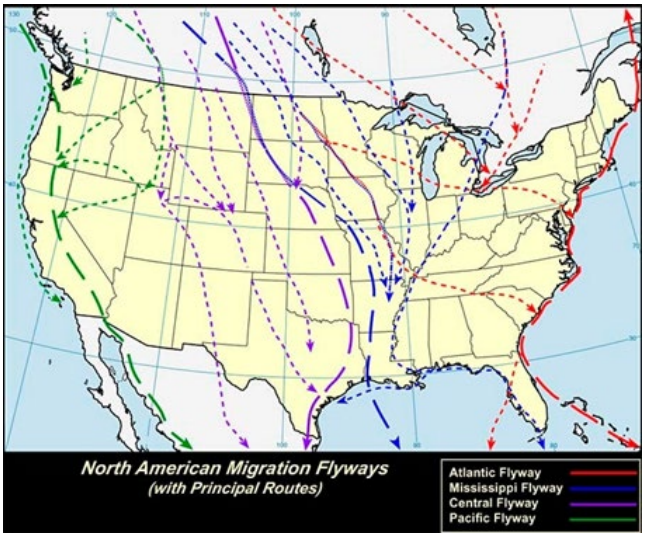
susceptible seabirds, whereas in the continental U.S. events are most closely associated with spring and fall migration. Most passerines (songbirds) migrate nocturnally, typically at altitudes of 200-600 m above ground surface. Peak migration typically coincides with favorable wind and weather conditions, with most birds holding in place on nights with unfavorable conditions. The largest ALAN mortality events occur when favorable evening conditions trigger large-scale migration, then weather deteriorates rapidly during the night. Birds descend when high altitude flight becomes impossible, coming into close proximity with bright artificial lights.

A single extreme ALAN source can affect migration at distances of up to 10 km and altitudes of up to 4 km. ALAN sources in proximity to water crossings, ridgelines, mountain passes, or other landscape features that funnel migrants have high hazard potential because so many birds are exposed. Communication towers are a primary ALAN concern because they are often sited in high exposure locations, their extensive guying poses a collision risk, and all towers higher than 61 m require aviation lighting. Many of the estimated 7 million annual fatalities at communications towers are ALAN-related.



North American migration corridors (NPS)

Mortality Detection

Early records of mass ALAN mortality events came from lighthouse keepers who observed and quantified events in real time. Numerous studies have shown that most small passerine carcasses are removed by scavengers within hours or days, and even trained searchers using formal protocols find only a subset of carcasses present. Today, many facilities with significant ALAN sources are visited by humans only occasionally, and those individuals are on site to complete unrelated tasks. Carcass detection would be opportunistic, and observers would have little incentive to report the incident to personnel who would know to carry out an investigation and external reporting. Only a very small proportion of ALAN mortality events are fully documented, so it is safe to assume that many mass mortality events have occurred, undetected, at DoD facilities. Significant events probably occur repeatedly at specific hazardous DoD ALAN sources.

Best Practices

Best practices to minimize avian mortality from ALAN, as articulated by federal and state agencies, focus on the following elements:

- Prevent light trespass by selecting fully shielded fixtures and installing as directed.
- Avoid over-lighting by using the minimum intensity required.
- Select warm spectrum (CCT <=3,000K) lights.
- Use timers, motion-sensors, and dimmers to reduce or eliminate unnecessary light.
- Consider nightly or seasonal blackouts or reduced lighting regimes for sensitive areas.
- Ensure eligible communications towers are upgraded to flashing aviation lights meeting the 2015 FAA standard.

Policies and Guidance

A number of policy directives support migratory bird conservation, including Executive Order 13186 and the February 6, 2018 memorandum from the Deputy Assistant Secretary of Defense for Environment, Safety and Occupational Health. The 2014 DoD and U.S. Fish & Wildlife Service (USFWS) MOU (and it's 2022 extension) set goals and strategies for DoD migratory birds conservation. The Endangered Species Act requires Section 7 Consultation where adverse effects to listed species may occur. NEPA requires impacts to wildlife from federal ALAN-related actions be assessed, with significant impacts mitigated to the extent practicable.

United Facilities Criteria 3-530-01 requires full shielding for outdoor lighting, and provides standards for brightness, controls, and spectrum; in sensitive areas for mission and habitat, adherence to USFWS and state lighting design recommendations is mandated. Facility-specific INRMPs and Installation Design Guides or Lighting Plans may offer further guidance or requirements. In cases where these documents do not address avian considerations for outdoor lighting, future revisions are an opportunity to spur improvements across the installation.

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