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BLOG POST

BIRDS AS NATURE'S BAROMETERS



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Birds are commonly known as "barometers of the environment" because they provide valuable insights into the health and sustainability of ecosystems. As highly sensitive creatures, birds respond to changes in their environments, such as habitat loss, climate change, pollution, and shifts in food supply.[1] They serve as crucial indicators for monitoring the well-being of ecosystems, offering not only a reflection of environmental health but also the early warning signs of potential ecological disruptions. In fact, birds provide us with many different "ecosystem services". They can act as pollinators; nectar-feeding birds such as hummingbirds, enable seed fertilization as they move pollen from flower to flower. Many birds are also considered keystone species, as their presence or disappearance affects an ecosystem balance, including influencing the sustainable population levels of other species.[2]

WHY ARE BIRDS EFFECTIVE ECOSYSTEM INDICATORS

Birds are considered "indicator species", as they provide information on the state of the ecosystem and the species that inhabit them. For instance, by monitoring bird populations, scientists can track the evolution and health of ecosystems, such as the development of early-serial forest communities, which is the initial stage of forest development and recovery after a disturbing event such as a wildfire or disease.[3]

One of the reasons birds are effective bioindicators is their sensitivity to changes in the environment. Birds rely on specific habitats and conditions for breeding, feeding and migration, making them highly responsive to shifts in availability of food, pollution levels, and temperature. [4] Consequently, changes in their behavior including breeding and migration, present early warnings on the effects of climate change and human activity. For example, a decline in insect-eating bird populations can be associated with intensive use of pesticides or loss of insects, which then can lead to further inquiries on the causes of such declines.[5]

Furthermore, migratory birds provide crucial information on the environmental conditions of diverse areas across regions and continents. It has been seen that, due to changes in climate conditions and warming temperatures, migration and breeding timings have evolved. Temperature, precipitation and food supply influence breeding behavior.[6] Many birds are migrating earlier to their breeding areas due to higher temperatures, causing a disruption on the ecosystems' balance and food availability. Hence, affecting egg-laying conditions and breeding success rates.[7]

CASE STUDIES: BIRDS AS LIVING SENTINELS OF ECOSYSTEM HEALTH

There are numerous existing examples in which birds have been studied to track and understand the effects of climate change in specific environments. Below are two representative examples.

Penguins as Bioindicators of Environmental Pollutants

Penguins have been studied to assess mercury contamination across different mercury hotspots in the Southern Hemisphere, such as Australia, Antarctica, and Tierra del Fuego. Mercury is a persistent pollutant that enters the environment through both natural processes and human activity. It threatens the health of marine ecosystems due to their bioaccumulation and biomagnification capabilities, meaning that it concentrates in living organisms.[8] To assess and monitor mercury contamination, penguins are considered effective bioindicators: mercury is absorbed and distributed throughout the entire organism of these birds, it is incorporated into their bloods and feathers.[9]

Research has shown that mercury contamination is closely linked to global warming. Penguin feathers can present up to 80-100% of mercury, particularly in the form of methylmercury, which allows the detection of mercury levels.[10] Increasing temperatures due to global warming heighten mercury atmospheric concentrations, which subsequently raises the risks to wildlife, including penguins. By studying mercury levels in penguin populations, researchers gain valuable insights into the broader environmental health of marine ecosystems, supporting the implementation of preventative measures to mitigate the impact and presence of this pollutant.

Flamingos and their Role in Wetlands' Health

Flamingos contribute to the microbial purification and denitrification in saline wetlands. Through their feeding habits and particular way of walking, flamingos stir up sediment and enhance microbial activity in the water. This enhanced microbial production helps purify organic matter in wetlands.[11] In addition, flamingos' behavior and nutrient content in their droppings contribute to denitrification, which is the process of reducing the amount of nitrogen in the water. Denitrification preserves water quality and prevents the accumulation of nitrates, which could be harmful to the ecosystem's health.[12]

In addition, flamingos are also highly dependent on water availability in wetlands. During dry seasons, the flamingo population decreases, and the presence of nutrients such as phosphorus and microbial production decrease as well.[13] Therefore, flamingos play a crucial part in the functioning and well-being of saline wetlands, and conservation efforts to protect them are essential for the long-term health of these environments.

Bird monitoring programs have become an essential part of global conservation efforts. Numerous organizations, including BirdLife International and the National Audubon Society, are at the forefront of these initiatives. These organizations design, fund, and implement bird monitoring programs that collect and analyze data on bird populations. Through such initiatives, researchers can track shifts in bird behaviors and collect valuable information on the overall health of ecosystems.

Birds are much more than just beautiful colored creatures or melodists. They are sentinels of ecosystem health, offering us first-hand insights into the well-being of the natural world. As we face increasing effects of climate change, it is essential that we continue monitoring birds and protecting their habitats, which will also help preserve the delicate balance and ecological health of ecosystems we live in.

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