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#### WHY BIRD NUMBERS ARE DWINDLING

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John Terborgh (1989) wrote a book entitled "Where Have All the Birds Gone?" and numerous other articles on the same theme. There was an article in the Lincoln, NE Sunday Journal-Star, June 19, 1994 concerning dwindling bird numbers on the grasslands. The answer to declining bird numbers is the degradation, fragmentation, and loss of habitats. Sometimes ornithologists disagree on whether the breeding habitats or wintering habitats are impacted most, yet there is nearly universal agreement that habitat is the key. Further evidence for the impact of humans on birds can be obtained by noting those species that are flourishing in human-modified environments. Examples of these include Cattle Egret, Ring-necked Pheasant, Northern Bobwhite, Rock Dove, European Starling, House Finch, and House Sparrow.

The easy answer is to blame someone else - the Department of Roads, developers, farmers, or urban sprawl. However, I am to blame and so are you, your neighbor, and all other humans. In the rest of this article, I will discuss how we impact habitats. The causes are apparent, but how we deal with them will continue to be debatable. How much time do we have left to debate?

Humans have a tremendous impact on the quality of the environment. That impact is the product of (1) the number of people, (2) the per capita rate of resource use, and (3) pollution associated with resource use. The effect on the environment can be lessened by fewer people, a decrease in rate of resource use, and a decrease in pollution by increased technology (clean up outputs, increase efficiency, use less polluting alternative resources, etc.). While we have choices, we cannot have continued growth on a finite planet. We need to address this pressing problem because tomorrow may be too late.

The inequitable distribution of wealth results in variable per capita impacts. The impact of an individual from a more developed nation (MDN) compared to that of an individual from a developing nation (DN) may vary by a factor of 20. Thus, the population of the United States (250,000,000) may not seem too high to many, but environmentally its impact is equivalent to that of about 5 billion in India! Globally, the impact of increases in the standard of living of DNs will more than offset technological gains of MDNs in decreasing their pollution. A July 19, 1994 article in the Wall Street Journal noted that as societies go from DNs toward MDNs, they have quantum increases in energy use, which result in increased prices of natural resources and energy. Likely there will also be concomitant shortages of many of those resources. The rush to acquire sufficient energy for industrialization will have tremendous global environmental impacts. We should all wish a higher standard of living, better health, improved human rights, etc. for DNs, but these accomplishments will be impossible without population limitation.

Population awareness and forecasting potential populations is a numbers game. Just as one figures interest on a bank account, the growth increment (interest) is the product of the rate of increase (interest rate) and the population size (principal). From this simple analysis, we can forecast annual increments and doubling times. Thus, a world population of 5.5 billion increasing at 1.8% results in 99 million added to the world's population each year. This is equivalent to adding an entire U.S. population to the world every 2.5 years. At this rate of increase, the world's population would double every 38.5 years. After this doubling to 11 billion, if the growth rate remains the same, 198 million people would be added to the earth's population each year. Thinking optimistically, let's assume that the annual rate of increase is decreased by 50% to 0.9%. With 11 billion people, 99 million would still be added yearly because the starting population doubled. It is imperative to keep in mind the two factors affecting the growth of a population: (1) the rate of increase, and (2) the population size.

What are the consequences of growth? We need to increase food and fiber production, but some of the best agricultural land is lost to urban sprawl, exacerbating the demand for increased production. Thus, more marginal land is forced into agricultural uses. Streets are widened, shopping centers are built, needs for solid-waste disposal increase, and on and on. These are the causes of loss, degradation, and fragmentation of habitats, and the major causes of dwindling bird numbers. Other factors include agricultural chemicals, poaching, and introduced competitors and predators, but these actions only intensify the habitat story.

Technology and reduced rates of resource use can buy us some time, but we cannot neglect reining population growth to equilibrium. We sprawl across the countryside, establishing cities, villages, or acreages, and affect habitat. We convert land to food and fiber production and affect habitat. Pollution that we generate affects habitat. We need to change how we behave and use resources to overcome the loss, degradation, and fragmentation of habitat.

Biologists often talk of proximate and ultimate factors. Birds migrate south in the fall because of changing daylength (proximate factor). However, they migrate so that they do not have to face the winter climate and the likely shortage of food (ultimate factors). Habitat loss, degradation, and fragmentation are the proximate factors leading to decreased bird populations. However, the ultimate factors are those associated with human populations - rate of resource use and pollutants associated with resource use. We can restore some habitats, enhance others, and create new habitats, but we cannot keep pace with ultimate factors. Those are the issues that must be addressed if we are to leave Earth a decent place for our children and grandchildren. E. O. Wilson (1984) summed up the situation, "The one process ongoing in the 1980s [and continuing today] that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us."

#### Literature Cited

Terborgh, J. 1989. Where Have All the Birds Gone? Essays on the Biology and Conservation of Birds that Migrate to the American Tropics. Princeton University Press, Princeton, NJ.

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