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Committee on Natural Resources
Subcommittee on Fisheries, Wildlife and Oceans

Oversight Hearing: Going, Going, Gone? An Assessment of the Global Decline in Bird Populations

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I am John Wiens. I hold advanced degrees in zoology, ecology, and behavior. For many years I was a Professor at Oregon State University, the University of New Mexico, and Colorado State University, where I was a University Distinguished Professor. My teaching, graduate programs, and research focused on birds and the ecology of grassland, desert, and marine ecosystems in many parts of the world. I left the hallowed halls of academia in 2002 to become Lead Scientist with The Nature Conservancy. There I worked to bring the insights and findings of science to bear on pressing conservation issues – how to identify the best places for conservation, how to foster recovery of endangered species, how to integrate climate change and land-use change into conservation, how to use the lessons of historical ecology to position conservation to be effective in a rapidly changing world, and how to incorporate the benefits that people derive from functioning natural systems ("ecosystem services") into the conservation agenda. This year I left The Nature Conservancy to join PRBO Conservation Science as Chief Conservation Science Officer.

PRBO Conservation Science is a non-governmental organization devoted to conducting scientific research and outreach to advance the conservation of natural resources, emphasizing birds and the environments they occupy. Working from a central office in Petaluma, California, and several field laboratories, the 120 permanent and seasonal staff conduct research on the population dynamics, long-term trends, and food-web relationships of birds and their responses to habitat management and restoration in a variety of terrestrial, wetland, and marine ecosystems in western North America and Latin America. Through outreach and partnerships with public agencies, private groups, landowners and the scientific community, PRBO uses the results of this research to provide information about the status of bird populations, the effectiveness of management practices, and the value of birds as indicators of the functioning of ecological systems to a large and diverse audience.

Today I'd like to comment on three questions that lie at the heart of the topic of this hearing:

- What is the nature of declines in bird populations?
- How do we really know what is happening to bird populations?
- What can we do about it?

What is the nature of declines in bird populations?

There is no doubt that many bird species are declining in abundance and shrinking in their geographic distribution. Some birds that were once common are now uncommon, and others that were uncommon are becoming rare. Much attention has (justifiably) been given to those species that have declined to the point where they are at risk of extinction – this is the problem that the Endangered Species Act was designed to address. Yet it is equally important to focus

conservation, management, and policy efforts on those species that have not yet reached a crisis stage. It is here that conservation measures may be both more effective and more cost-effective, by addressing the needs of suites of many species rather than focusing on one species at a time.

The decline of songbirds in North America has been noted for some time. Almost 20 years ago the ecologist John Terborgh published a book entitled *Where Have All the Birds Gone*?, in which he drew attention in particular to precipitous declines in the abundance of many Neotropical migrants – birds that breed in North America but overwinter in Central and South America. We notice such declines when familiar species are no longer common, and we are inclined to attribute them to local and regional changes that we witness on the breeding grounds – habitat loss, conversion, and fragmentation. These are certainly important contributors, but Terborgh's message was that the problem is really international in scope. Habitat loss occurs in many of the tropical and subtropical wintering areas of migrant species as well as in their northern breeding areas. What we see when migratory bird populations decline is therefore an amalgamation of factors that have influenced their survival and reproduction at different times and across many scales, from local to hemispheric. Terborgh's work spurred biologists throughout the world to develop an understanding of which birds are declining and what factors are important. This effort remains an active field of research today.

Declines in bird populations have not been the same across all habitats. In North America, the Breeding Bird Survey (BBS), a collaborative effort of the U.S. Geological Survey and the Canadian Wildlife Service, shows that declines over the past several decades have been greater among an assemblage of birds that breed in grassland habitats in North America than in species occupying other habitats. Species such as Grasshopper Sparrow and Henslow's Sparrow are now scarce or absent from many areas in which they were formerly seen often, and common species such as Eastern Meadowlark have declined by over 90% in New England since the 1960s. Grassland habitats have undergone massive conversion to large-scale agriculture and have suffered additional losses to suburban and exurban development, particularly in Midwestern states. These changes are not unique to the United States. Globally, temperate grasslands are the most threatened habitat type on Earth, in terms of the proportion of former native habitat that has been converted in relation to the amount under some form of conservation protection or management.

Population declines are not confined to songbirds in terrestrial environments, where habitat loss and fragmentation are the primary culprits. In marine ecosystems, several species are exhibiting long-term declines in abundance. For example, the Marbled Murrelet has undergone dramatic declines over most of the west coast of North America in association with loss of old-growth forest nesting habitat and increased predation pressure; the species is now listed as threatened under the Endangered Species Act. In Alaska, counts of Pigeon Guillemots at breeding colonies have consistently recorded fewer and fewer birds since the 1970s. Seabirds are closely linked to the food webs of marine ecosystems, and changes in the distribution and availability of favored prey can lead to massive reproductive failure or shifts in foraging areas that affect the energy balance and long-term survival of adults. Long-term studies of Common Murres breeding on the Farallon Islands of California, for example, have shown that a shift in diet from rockfish to anchovies with ocean warming during the 1990s was associated with reduced survival of adults and a decline in abundance; with the recent return of cooler waters linked to the Pacific Decadal Oscillation, murre diets have shifted back to juvenile rockfish, survival is increasing, and the

breeding population on the Farallones is growing rapidly. At the opposite end of the world, populations of Adélie Penguins on the Antarctic Peninsula are declining rapidly where their sea-ice habitat has collapsed. On the other side of the continent where sea ice persists, however, populations have increased over the past two decades.

These examples illustrate an important point: not all population changes are real declines (or increases), even though they might seem so on the basis of a short-term, "snapshot" view. Marine environments undergo cyclic changes at varying periodicities; El Niño Southern Oscillations (ENSO) and Pacific Decadal Oscillations (PDO) are but two examples. The components of marine ecosystems respond to these changes at multiple levels, causing rippling effects in food webs that translate into major changes in top predators such as seabirds (or marine mammals). Separating real declines, such as appear to be occurring in Pigeon Guillemots and Marbled Murrelets, from multiyear population fluctuations, such as those that characterize murres on the Farallones and many other breeding colonies in the northeast Pacific, requires a perspective that can only be obtained from long-term, systematic collection of scientific data. The graphs in Attachment A illustrate trends that have become apparent from PRBO's long-term work on the Farallones.

How do we really know what is happening to bird populations?

It would be a mistake to conclude that all birds are declining everywhere. Many songbirds, such as Northern Cardinal, Inca Dove, Blue Jay, Great-tailed Grackle, and several hummingbirds have expanded their ranges in North America over the past half-century. The BBS data indicate that roughly equal numbers of species are increasing and decreasing, although there are more significant changes among the decreasing species. In many cases, the range expansions and increases in abundance have accompanied changes in land use and land cover, such as reforestation in the East or the spread of trees across the Great Plains as towns have grown and flood control has regulated river flows. They have also included more species that are often regarded as 'pests', such as Canada Goose or Double-crested Cormorant. Societal values aside, the scientific challenge is to determine which species are really declining, which are increasing, which are declining in some places but not in others, and which are simply varying over time, as nature is wont to do. If we are to focus our management, policy, and conservation efforts where they will do the most good, we must be able to answer these questions. And if we are then to undertake management actions or frame policies to halt the declines or implement adaptive management, we must be able to determine whether our actions and investments are having the desired effects.

Assessing trends in bird populations and determining if management reverses downward trends require the perspective and scientific rigor that come from the analysis of long-term data on bird populations and their environments. These data come from monitoring programs that follow a standardized protocol over many years. At a broad scale, the Breeding Bird Survey (BBS) uses volunteer observers to record breeding birds at several thousand survey locations distributed across North America. What the surveys lack in scientific rigor at the individual survey level is more than compensated by the geographic spread and uninterrupted time series. These annual surveys, conducted since the 1960s, have provided invaluable perspectives on trends of populations of several hundred bird species at a continental scale. We know about the declines in grassland birds, for example, largely from analyses of BBS data. However, the BBS does not adequately assess population trends for some important species groups, including shorebirds and secretive marsh birds. Broad-scale programs (e.g., Program for Regional and International

Shorebird Monitoring) are being designed and implemented to address these major gaps in knowledge.

Other long-term monitoring efforts have been more tightly focused on particular habitats or geographies, and this has enabled ecologists to employ more probing statistical analyses. In California, for example, PRBO scientists initiated intensive monitoring of songbird populations at the Point Reyes National Seashore in 1966, and detailed research on the population dynamics and demography of seabirds on the Farallon Islands was started in 1971. Studies of Snowy Plovers at Monterey Bay have been conducted for nearly 30 years, and work in tidal marshes and riparian habitats has been going on now for more than a decade. The data and analyses from these long-term monitoring programs are critical to detecting and understanding the dynamics and trends in bird populations, but they can reveal much more. Properly designed and implemented (and with the necessary long-term support), long-term monitoring enables us to:

- *Identify long-term trends versus variations*. For example, studies over two decades at PRBO's Palomarin Field Station on Point Reyes have revealed that most songbird species exhibit considerable year-to-year variation in abundance. However, 16 of the 31 species for which we examined fall capture rates declined over the 20-year period, and rates of decline were greater over the most recent decade. None of the species was increasing. The declines only became apparent and could be separated from the yearly variation when the long-term monitoring data were analyzed. A graph of these trends is included as Attachment B of this testimony.
- *Link population changes to changes in the environment*. For example, during the initial 9 years of a long-term study of Snowy Plovers at the Pajaro River mouth on Monterey Bay, reproductive success was insufficient to maintain population levels, and during the next 9-year period the number of nesting pairs declined dramatically. It became apparent that the poor reproduction was due largely to the combination of disturbance and predation. In response to cooperative management efforts, the number of nesting pairs and their reproductive success quickly increased. In recent years, plovers on this relatively small portion of shoreline have produced up to a third of the young from all Monterey Bay beaches. Population changes and annual reproductive success over the 27-year period are shown in Attachment C of this testimony.
- *Show how changes in bird populations can serve as indicators of changes in other components of ecological systems.* Our studies on the Farallon Islands have shown that seabird breeding success is reduced in years of low ocean productivity, when the availability of favored prey such as krill (a shrimp-like marine invertebrate) is reduced. Chinook salmon juveniles rely on some of the same prey species when they leave the freshwater environment to spend their first year at sea, a particularly sensitive period in their life history. Recent analyses show that the breeding success of Cassin's Auklets and salmon abundance in the following year are closely related, suggesting that seabirds and salmon are affected by the ocean environment in similar ways. This raises the possibility of using seabird monitoring to inform our knowledge of salmon populations and to guide fisheries management. A graph of this relationship is included as Attachment D of this testimony.
- *Reveal episodic events that occur infrequently but may have lasting impacts on bird populations.* The long-term data for Cassin's Auklets on the Farallon Islands provide a good example. Although reproductive success varied annually about a relatively stable mean long-term value from the initiation of our studies in 1971 until 2004, success plummeted in 2005 and 2006, when no young were produced. Our sampling of prey in the waters adjacent to the

Farallones suggests that this episodic breeding failure was related to a drastic reduction in krill. The occurrence of this event, and the evidence of a strong relationship with the prey base, would not have emerged in the absence of the long-term perspective. A graph of auklet reproductive success is provided as Attachment E of this testimony.

- *Document the effectiveness of habitat management or restoration programs.* Aspen is a signature element of western mountains, but in the absence of fire and with extensive livestock grazing, the extent of aspen distribution in western North America has been reduced by as much as 96%. Aspen habitat, especially when associated with riparian vegetation, supports more breeding bird species than any other habitat in the Sierra Nevada Mountains. PRBO scientists, working in collaboration with colleagues from the University of California and the U.S. Forest Service, have documented strong responses by birds to habitat restoration on treated aspen stands in the Lassen National Forest. Within 5 years, restored stands had higher bird species richness, and Mountain Bluebirds, Chipping Sparrows, and several woodpecker species were substantially more abundant, than in unrestored aspen stands or non-aspen conifer sites. Beyond illustrating the effectiveness of the habitat restoration, this work indicates that bird monitoring may be a cost-effective tool for evaluating the effects of management on a broad array of organisms.

These examples illustrate the insights that can emerge from carefully designed long-term monitoring of bird populations. Long-term data, reinforced by continued monitoring, will become even more critical as we enter a period of rapid environmental change brought about by global climate change and changes in land use that are increasingly driven by global economics (witness the immediate effects of global biofuels markets on commodity prices and land uses in the Midwest). Projections of future changes are necessarily founded on modeling of environments and the responses of species (and people) to these changes. High-quality data that show past population changes and their relationships to environmental variations are necessary to calibrate such models. More importantly, they can reduce the uncertainties associated with projections into the future. Continued monitoring provides a way of determining whether the projections are being played out as expected. Current model projections of sea-level rise associated with global warming, for example, are being used to anticipate potential impacts on coastal and estuarine tidal marshes and shorelines in several areas on the East and West coasts of the United States. These models can in turn be used to project how sea-level rise will impact populations of birds such as California Clapper Rail or Western Snowy Plover that live in tidal marshes and ocean beaches (both species are listed under the Endangered Species Act). Monitoring is an essential component of any management efforts to mitigate the potential effects of sea-level rise.

Of course, not everything can be monitored everywhere, nor need it be. Monitoring programs should be carefully targeted. Ideally, monitoring should be conducted on multiple species, particularly those that may serve as indicators of ecosystem functioning or as surrogates for broader suites of species. This will enhance the cost-effectiveness of monitoring and broaden the scope of its applications. While monitoring programs should be continued where there is a substantial long-term base of data and information on which to build, new monitoring efforts should be directed toward the habitats and locations where they can help direct future conservation investments. Monitoring programs to detect the early effects of climate change, for example, might best be directed toward “hotspots of vulnerability,” where climate-change distributional modeling suggests that a large number of species may be affected. Several groups, including scientists at PRBO, are currently conducting such model analyses.

Finally, it is important to remember that, at its best, monitoring and the analysis of long-term data can reveal trends and associations that point toward possible causal relationships. But the old saw among statisticians that 'correlation does not imply causation' still rings true. Applications of long-term monitoring data to conservation and management can be improved if the correlations are accompanied by a deeper understanding of the ecological mechanisms that account for the correlations. Simply counting the numbers of Common Murres or Cassin's Auklets breeding on the Farallon Islands year after year, for example, would not have revealed the important links with prey abundance and marine food webs that have come from the associated information on reproduction and the at-sea surveys of potential prey. That information also has proved critical in establishing the first links in the chain that may enable us to use information about seabirds to inform the management of salmon fisheries.

What can we do?

There are several actions that can help us better understand the nature of these declines, determine whether they are real or not, and undertake management or pursue policies that may reverse current trends or forestall further declines. They are to:

- *Recognize the value of long-term monitoring of bird population and, support coordinated and standardized monitoring programs.*
- *Make monitoring an integral part of efforts to conserve and manage birds and their habitats.* To generate the reliable, rigorous, and useful data needed to support effective adaptive resource management, monitoring must align with the goals and objectives of management and conservation.
- *Improve the effectiveness of current bird monitoring programs and encourage and support their coordination.* Currently, bird populations are being monitored by a large number of federal and state agencies and non-governmental organizations. The power of these efforts to inform management at multiple scales will be vastly enhanced if the monitoring is coordinated so that the programs are complementary rather than competing or incompatible. Several groups and initiatives, such as the North American Bird Conservation Initiative (NABCI), the Avian Knowledge Alliance (AKA), the Partners in Flight Monitoring Working Group, and Monitoring Avian Productivity (MAPS), are working to foster this coordination. There may be a role for stronger leadership from federal agencies.
- *Invest in developing data-sharing and data-management systems.* Monitoring efforts are of limited value if the data they generate are not available in a form that permits probing scientific analysis at multiple scales. Data from past and ongoing monitoring programs should be broadly available if the power of information is to be brought to bear on managing declining bird populations, maintaining healthy populations, and developing nimble management strategies to address future conservation challenges. For example, the California Avian Data Center (CADC), a partner in the Avian Knowledge Network (AKN), is a new online collaboration among PRBO, the Cornell Lab of Ornithology, and several other North American bird research laboratories. CADC is a central clearinghouse for California bird data and related analytical and visualization tools, to enable scientists to quickly input their data and map these data in real time. It is also important that data on bird populations be integrated with other data sets – land cover, land use, socioeconomics, urban development – to facilitate broad-based management strategies.

- *Coordinate governmental science programs that can contribute to the conservation of declining bird populations.* Currently, NOAA has state-of-the-art capability for understanding global oceanographic and atmospheric conditions. NASA and USGS-EROS have collaborated to acquire and analyze remote-sensing information. ARS and NRCS have strengths in understanding the effects of socioeconomic and environmental conditions on agriculture and food supplies. USFS Research and Development has supported science for both national and international efforts in bird monitoring, especially in forested areas. USGS has a Status and Trends Program that has contributed to bird monitoring, especially through efforts at the Patuxent Wildlife Research Center, and has worked with their Geographic Information Office to develop the Natural Resources Monitoring Partnership database for collecting monitoring information of all types from all sources. These programs, and similar efforts in USFWS, BLM, and NPS, can all contribute to a powerful, integrated approach to detecting, analyzing, and managing for bird population changes, but this potential will be realized only if there is greater coordination of efforts.
- *Create networks of protected areas for conservation.* Habitat conversion, fragmentation, and loss continue to be the major factors contributing to declines in bird populations and impeding their persistence or recovery. The primary conservation strategy for protecting necessary habitat has been the establishment of protected areas -- places that provide legal protection for birds and their habitats and that are managed for conservation objectives. The effectiveness of such protected areas will be enhanced if they are managed as networks of places rather than individual locales. National Wildlife Refuges, for example, should be explicitly managed as nodes in a network, complementing one another and linked together with other protected areas such as National Parks or preserves owned by NGOs. Such networks can provide the collection of sites required by migratory birds and may serve to buffer the potential impacts of climate change by providing dispersal pathways or 'stepping stones' for species movements as ranges shift.
- *Extend conservation efforts and incentives to include private lands.* Important as they are, protected areas by themselves will not suffice to halt the decline of many bird species. Conservation must include the places where people live and work, and the value of these private lands should be recognized in policy and management. In the Central Valley of California, water allocations can be used in incentive programs to benefit both landowners and bird populations. More broadly, programs such as the Conservation Reserve Program (CRP) have been tremendously successful in providing habitat for declining populations of grassland birds, in some cases contributing to reversing population trends at regional scales. Yet the continued success of this program is threatened as high prices for corn, driven by economic and legislated demands for corn ethanol, lead many farmers to convert CRP lands back to row-crop agriculture and agency administrators to argue for permitting early disenrollment in the program to meet soaring corn demands. Once converted, these lands will be lost as habitat for grassland birds. To build on its past success, the CRP program should be ensured of a firm footing, with adjustable incentives to respond to shifting market forces.
- *Provide long-term support for expanded Joint Ventures.* Joint Ventures are collaborative partnerships among public and private groups that focus on protection, restoration, and enhancement of habitat for wildlife species in designated Joint Venture areas. Joint Ventures originated with the North American Wetlands Conservation Act and North American Waterfowl Management Plan. Although the initial emphasis was on waterfowl, the programs have evolved to consider all wetland species and, increasingly, all bird species. They provide a way of pooling resources to develop and implement population and habitat conservation

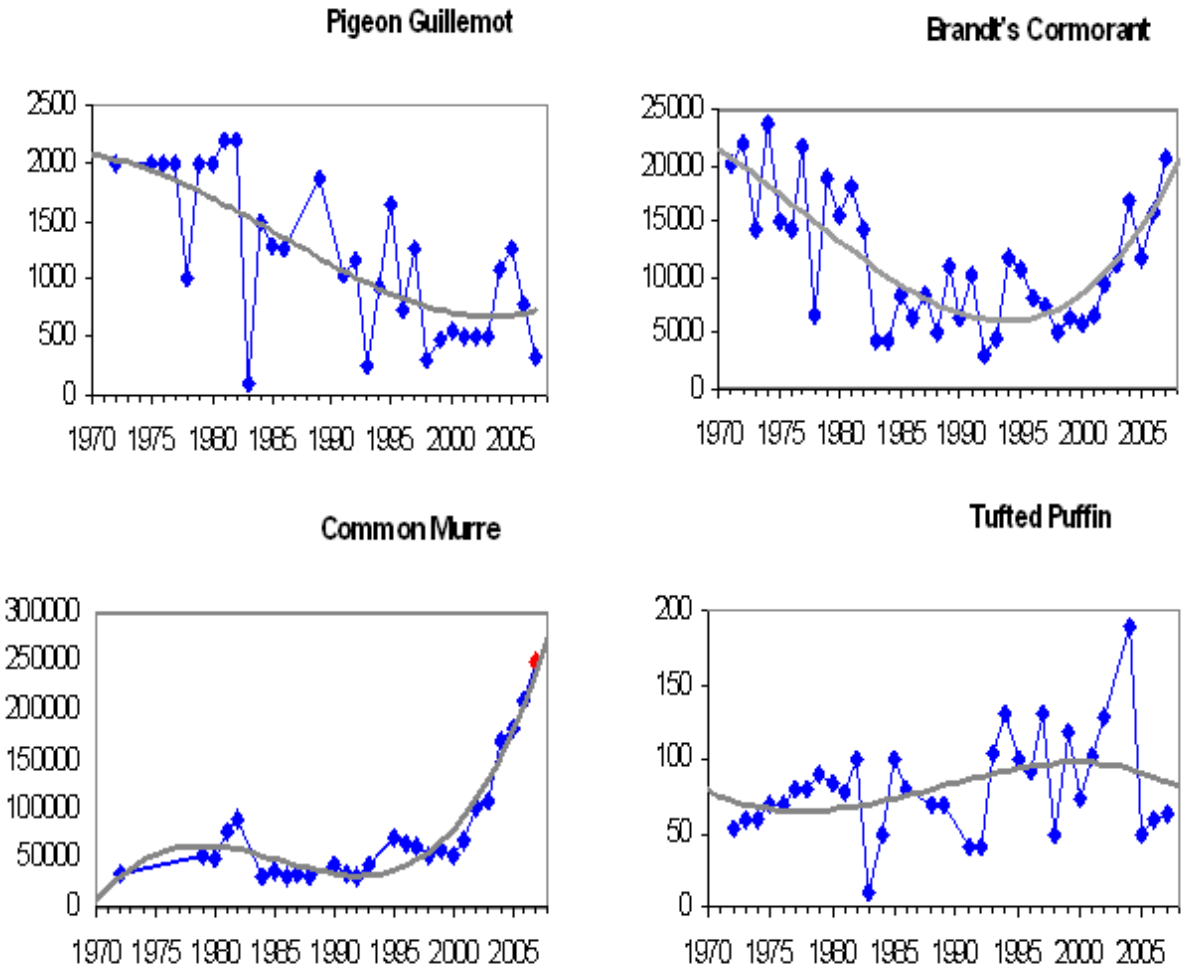
goals developed through national and international bird conservation initiatives (e.g., U.S. Shorebird Conservation Council, Partners in Flight, Waterbirds for the Americas). Joint Ventures have been tremendously successful, both in teaming partners together and in furthering conservation and management. The San Francisco Bay Joint Venture, for example, has placed some 47,575 acres of bay, creek and lake, wetland, and upland habitat under protection since 1996; another 8,821 acres have undergone restoration, and habitat enhancement has been conducted on 5,919 acres (2007 figures). Building on the success of such programs, the number and geographic and taxonomic scope of Joint Ventures are increasing. This creates a pressing need to increase the coordination and scientific capacities within the Joint Ventures; USGS has provided a scientist to work within the Gulf Coast Joint Venture, for example, but this model should be extended across all Joint Ventures. Good adaptive management also requires that the acreage accomplishments as well as the contributions of ongoing restoration projects to wildlife populations be monitored. Funding for Joint Ventures comes from an annual Congressional Appropriation to the Division of Bird Habitat Conservation of the U.S. Fish & Wildlife Service, with substantial matches from other non-federal partners. Federal funding has not kept pace with the growth and success of the program. Joint Ventures are making significant contributions to the conservation and management of habitat for bird populations across the country; their continued success requires enhanced support. Since this success also rests on the participation and support of multiple partners, ensuring a reliable, long-term base of support is essential. Critical habitat delivery programs, such as the North American Wetlands Conservation Act, the Neotropical Migratory Bird Conservation Act, State Wildlife Grants, and private lands programs including Farm Bill conservation programs, should also be supported.

- *Incorporate bird population and predator-prey relationships into policies and management practices for fisheries and ocean systems.* In the marine realm, seabirds and commercially valuable fish stocks are both closely linked to marine food webs. With shifts in oceanographic conditions associated with climate change, the distribution and abundance of components of these food webs will change, and fisheries will change their targets and practices in response. This may increase the potential for commercial fishing to exacerbate declines in seabird populations. These effects could be reduced by implementing ecosystem-based management that incorporates predator-prey relationships, competition, spatial and temporal dynamics, and projections of future changes in marine food webs into stock assessments and fishery management plans. It may be especially important to protect key foraging areas around seabird colonies, as well as pelagic "hotspots" of reliable prey concentrations (as occur in association with the upwelling plume and mixing area south of Pt. Arena, California). Understanding of the factors contributing to changes in the distribution and abundance of marine birds would also be enhanced by incorporating more biological information into NOAA's Integrated Ocean Observing System.
- *Inform the public about the value of birds and the consequences of their decline.* Scientifically informed resource management and well-crafted policy can only go so far in countering declines in bird populations or forestalling the erosion of biodiversity. To be effective, these efforts must have public support. Birds have a broad appeal to the public, which creates a diverse constituency for bird conservation. The public should understand why it is important to conserve birds, and be educated about the importance of monitoring, data management, identification and prioritization of places to protect, and the critical role of private lands and public participation in ensuring that diverse populations of birds will continue to be part of our lives.

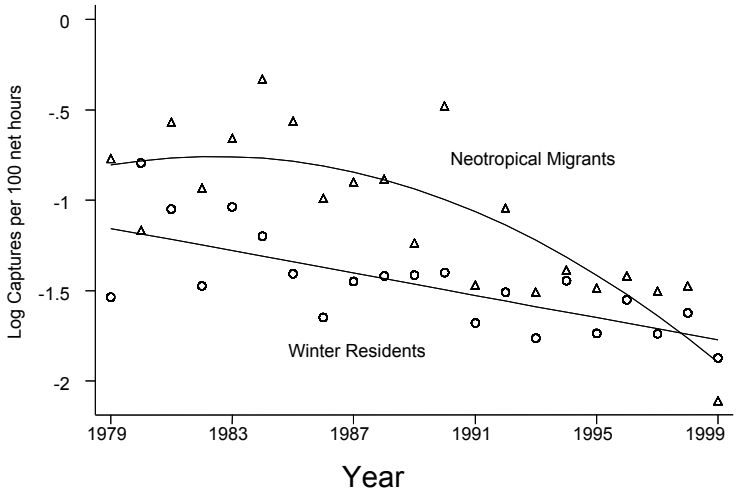
The bottom line

Projections of climate change and land-use change suggest that we are entering a more variable, changing, and uncertain world. It is likely that more species will decline and more will become threatened with extinction. We cannot afford to play catch-up, attempting to save species at the last minute. We must become proactive resource managers, anticipating changes to ecological systems and communities rather than reacting to them. This means we must be judicious and effective in our use of limited conservation and management resources, targeting them on the places, species, and systems where investments will yield the greatest returns. It means that we must be able to separate real declines in bird populations from short-term variations in abundance. It means that our decisions about resource management must include current biological information. It means that our models of future conditions should be reinforced by data about past dynamics and verified with continued data collection. And all of this rests on a foundation of targeted monitoring, coordinated data management, scientifically rigorous analysis, broad collaborations and partnerships, fully supported conservation programs, and engagement of the public in the issues and their solutions.

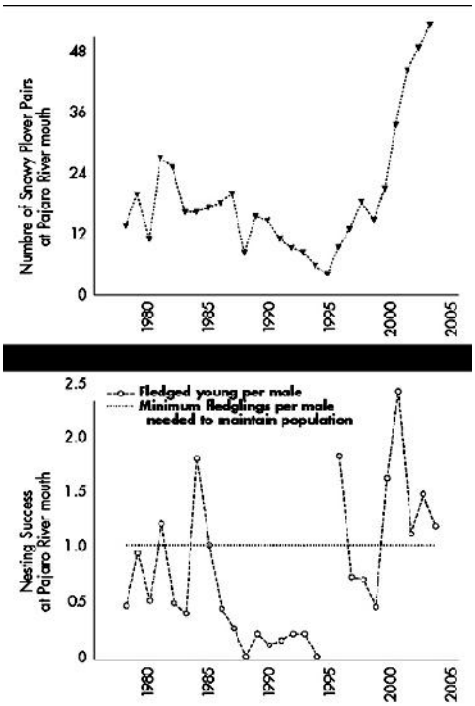
Attachment A. Population counts and long-term trends for four seabirds breeding on the Farallon Islands, California, 1971-2007. All species exhibited substantial year-to-year variation, but trend analysis indicated that the Pigeon Guillemot population declined steadily over this period, whereas Brandt's Cormorants showed a decline followed by an increase in recent years. The population of Common Murres remained roughly stable until 2000, when numbers increased dramatically. The small population of Tufted Puffins has varied considerably but shows no long-term trends. All data and analyses from PRBO Conservation Science.



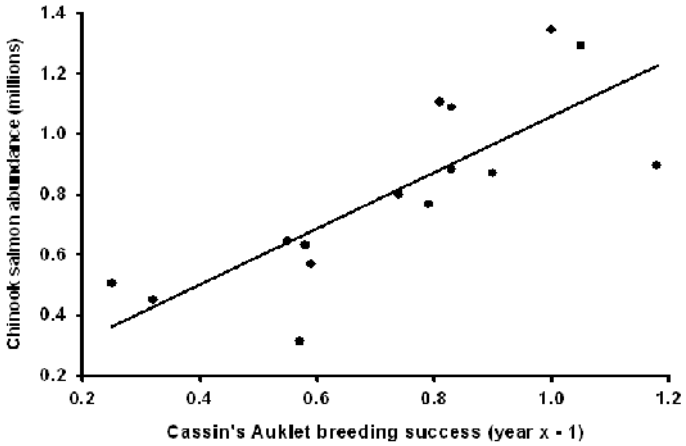
Attachment B. Long-term trends in several species of Neotropical migrant songbirds and winter resident songbirds at PRBO's Palomarin Field Station, Point Reyes, California, over a 20-year period.



Attachment C. Population changes and reproductive success of Western Snowy Plovers at the Pajaro River mouth, Monterey Bay, California, 1978-2004. Reproduction was poor early in the study and plummeted in the early 1990s, when the population also declined. Both population levels and reproduction have been substantially greater in recent years. From studies conducted by PRBO science staff.



Attachment D. The relationship between long-term breeding success of Cassin's Auklets on the Farallon Islands, California, and counts of Chinook salmon in the following year. The close fit suggests that seabird breeding may provide a useful indicator of subsequent salmon numbers, information that could be used in setting fishery practices. Analysis from PRBO Conservation Science.



Attachment E. Breeding success of Cassin's Auklets on the Farallon Islands, California, 1971-2007. Breeding success varied about a relatively stable long-term average until 2005 and 2006, when no young were produced. This episodic breeding failure may be related to changes in the abundance and distribution of krill that were associated with changes in oceanographic conditions. Data from PRBO Conservation Science.