Waterfowl

Continued from the Waterfowl Fact Sheet

What Global Warming Means on the Water and in the Field

"Where are the ducks?" That question most likely leads to a discussion of the effects of global warming and changing weather patterns on waterfowl hunting. Waterfowl can fly wherever waterfowl habitat is available and can therefore adapt to some, but by no means all, of the effects of climate change. As birds adapt to new conditions, which probably will include decreased habitat, hunters will have to adapt their expectations and their practices if their sport is to survive over the coming decades.

Fewer birds, shorter seasons

Global warming will alter waterfowl habitats throughout the continent, contributing to a potentially dramatic decline in overall waterfowl numbers. The presence of fewer birds could cause hunt-

ing seasons to be shortened and bag limits to be reduced. Dedicated waterfowl hunters could experience fewer opportunities to enjoy their passion.

Following the birds

As warming continues, hunters can expect delays in the fall and early winter migrations of waterfowl from northern latitudes. Birds finding open water and food sources unrestricted by a cover of ice or snow will stay in northern climates for a longer time. For species such as mallards and Canada geese, only the harshest weather conditions will move them as far south as in the past.

So, for hunters in more northern latitudes, changes in traditional migration patterns will improve hunting in an extended season. Waterfowlers in more southern areas may have to travel to find birds as hunting declines close to home.

Protecting habitat in the fields and in the halls of government

For waterfowl hunting to continue in the coming decades, waterfowl hunters will have to assume responsibilities both in the realm of nature and in the arena of public policy.

In the field, hunters will need to help conserve, protect and restore habitats essential to the survival and resiliency of waterfowl populations. Hunters' support for managing water resources as a public trust will be critical to

- watershed planning
- maintaining river and stream flows
- securing long-term water rights for waterfowl habitat
- implementing wetland conservation programs

Improving the chances of sustaining waterfowl populations will depend on partnerships between the sporting community and management agencies. Hunters who understand the long-term needs of wildlife and participate in shaping policies and management responses to changing conditions will play a critical role. To conserve waterfowl and protect the heritage of hunting in the decades ahead, sportsmen and -women must continue their longstanding tradition of leadership on waterfowl and wildlife conservation issues.

With the mobility afforded by wings, waterfowl may have a better chance to adapt to climate changes than earth-bound species, but ducks and geese will not escape without consequences. Rising temperatures and altered precipitation patterns are predicted to reduce both the quantity and quality of North American waterfowl habitat. As a result, hunters are likely to see declining numbers as well as a major shift in the geographic distribution of migrating birds.

Global Warming and Waterfowl Life Histories

Bird health and reproduction

The number of waterfowl that the nation's hunters see each season depends largely on the birds' breeding success. Studies of mallards and other dabbling ducks suggest that events occurring during breeding season account for as much as 84 percent of the variability in population growth rates.

Rising temperatures will have complex effects on waterfowl breeding, and not necessarily entirely deleterious in every region. For some species in some places, warmer temperatures that melt snow and thaw waterways earlier in the spring may extend the nesting season and increase breeding success.

For example, several studies have found a correlation between increased productivity of lesser snow geese and other white geese and a trend toward earlier spring melt and warmer temperatures in the Hudson Bay region. As average temperatures in Alaska have risen since 1950, arctic geese there have demonstrated a consistent trend toward earlier nesting and hatching. However, a high rate of individual survival may not benefit the overall population in the long run if numbers overwhelm the ecosystem's supportive capacity.

Bird range and migration patterns

In the past 10 years, some hunters in all four North American flyways have noticed that their greatest success has tended to occur later in the season. As yet, there's no definitive proof that birds are migrating later, but hunters' experiences match scientists' predictions that waterfowl will postpone migration in response to climate change.

Seasonal changes in temperatures directly influence when and how far some waterfowl migrate; warmer fall and winter seasons mean waterfowl do not have to fly as far south to find food and ice-free water. As long as open water and plenty of food are available, many birds will remain in northern areas.

Ducks that traditionally winter in Maryland may not migrate that far if their usual stopover points around the Great Lakes stay warmer for the season. On Maryland's eastern shore and in the Chesapeake Bay area, the number of canvasbacks, scaups and mergansers arriving seasonally is already declining.

As a consequence of warming seasons, prime hunting locations could shift. The Midwest and New England may see improved hunting conditions. Spanning colder and warmer regions, states like New York, Illinois and Missouri might see a northerly shift of prime migratory waterfowl destinations within their borders.

Conversely, the quality of waterfowl hunting may decline in the Mid-Atlantic region and in the South. Hunters intent on enjoying the pleasures of the season and on passing sporting traditions down to younger generations could face added expense for travel to productive hunting locales.

No matter how distributions of waterfowl change in response to global warming, factors such as loss of breeding habitat could reduce their overall numbers and adversely affect hunting everywhere.

Global Warming and Changes in Waterfowl Habitat

Many waterfowl are well adapted to dynamic landscapes. However, it appears that climate change within this century could disrupt critical ecosystems across the continent at a pace more rapid than the birds' ability to adapt. Anticipated changes in conditions such as the availability of water, the composition of the food web and the presence of emergent cover will influence population numbers and the distribution of waterfowl. Although there might be both

winners and losers among species, in the struggle to find suitable habitat there will mostly be losers.

Wetlands, lakes and forests

Successful breeding in the prairie pothole region, North America's most important waterfowl nursery, greatly influences the size of waterfowl populations throughout the continent. Temperature and precipitation influence the region's wetland availability and emergent cover, conditions that contribute to determining the number and diversity of breeding birds.

Climate models predict that in the prairie pothole region, warmer temperatures will accelerate the evaporation of water bodies and reduce soil moisture, possibly by 25 percent before the end of this century. Up to 90 percent of the potholes could vanish, consequently reducing the number of the region's breeding ducks by as much as 69 percent. Among the species that would be affected are the mallard, Northern pintail, blue-winged teal, canvasback, gadwall, Northern shoveler, redhead, lesser scaup and ruddy duck.

It is unknown whether waterfowl will be able to adapt by moving from their traditional breeding grounds, or how much suitable breeding habitat they will find elsewhere. Primary prairie pothole habitat could shift from the center (the Dakotas and southeastern Saskatchewan) to the region's wetter but less productive eastern and northern fringes. Already waterfowl habitat in these areas is constrained by wetland drainage and agriculture. Economic incentives for etha-

nol production have promoted the further conversion of grassland and prairie nesting cover into cropland, with consequent declines in habitat for waterfowl reproduction and population recruitment.

In the Upper Great Lakes region, scientists expect average temperatures to warm by 3.6 to 7.2 degrees Fahrenheit, while precipitation could increase by 25 percent by the end of the 21st century. Despite this significant increase in precipitation, higher temperatures are expected to increase evaporation and reduce lake water levels by 1.5 to 8 feet by 2100. Shoreline wetlands along the Great Lakes and the St. Lawrence River, habitat especially critical for diving and sea ducks, would dwindle. By 2030, changes in habitat could lead to a decline of 19 percent to 39 percent in the regional numbers of ducks.

Warming temperatures and changes in precipitation are expected to cause a northward shift in the breeding ranges of mallards and blue-winged teal in eastern North America. Geese have already ventured into the Maritimes of eastern Canada in response to three decades of milder winters and warmer springs. In Canada's Northwest Territories, the mallard, green-winged teal, American wigeon, surf scoter and common merganser are among nine bird species that have expanded their ranges northward as average temperatures have risen.

In regions where wetlands have formed on top of permafrost, thawing temperatures allow water to drain into previously frozen ground, reducing the size of present wetlands. In other areas, new wetlands may form where melting permafrost creates depressions. Scientists believe the changes could be beneficial to some species of waterfowl that nest and breed in arctic lands, but unfavorable to others.

Many birds use boreal forests for breeding, molting or staging, particularly when the prairies are dry. Because temperature changes are expected to be greatest at the more northerly latitudes, this ecosystem could be among those most affected by climate change. Little is presently known about the relationship between the boreal forest ecosystem and ducks such as scaup and scoters that breed there, so it is difficult to yet anticipate how climate change will affect them.

Coastal habitat

As hunters know, coastal marshes everywhere provide habitat for large numbers of breeding, migrating and wintering waterfowl. Predicted as a consequence of global warming, rising sea levels threaten this critical habitat. Squeezed between rising oceans and coastal infrastructure such as roads and sea walls, coastal wetlands are expected to decline dramatically. Increased storm surges and higher mean tide levels will further endanger waterfowl habitat and survival by accelerating erosion, altering estuarine salinity and influencing the composition and productivity of coastal vegetation.

Coastal land loss and environmental decline are already affecting waterfowl habitat. For example, over the past century the salt marshes of Jamaica Bay, New York, have experienced dramatic loss of marshland due to sea-level change, increased land use and pollution.

Diving ducks such as canvasbacks and redheads overwinter in shallow wetlands along the Atlantic coast. As the climate warms over the next century, the rise in sea level could eliminate up to 45 percent of this vital habitat.

In the coastal region stretching from California to Alaska, human development has reduced the amount of waterfowl habitat. Projected sea-level rise threatens to diminish habitat further by inundating low-lying areas and degrading the quality of the coastal wetlands.

Historically Gulf Coast marshes lying at the southern confluence of the Mississippi and central flyways have provided winter and migration habitat for up to 25 percent of all North American waterfowl. Approximately 75 percent of the world's redheads winter in these wetlands, and more than 90 percent of the world's mottled ducks find year-round habitat there. Among the millions of migratory birds dependent on these marshes are lesser scaup, pintails, gadwalls, American wigeon, and green-winged and blue-winged teal.

Over the past century, navigation and flood control projects have interfered with natural marsh-building processes, resulting in hundreds of square miles of Gulf Coast wetlands converting to open water. With a mean elevation of about one foot above sea level, most of Louisiana's coastal wetlands are clearly vulnerable to the predicted sea-level rise of at least 18 inches over the next 100 years. Whereas the Chenier Plain marshes of Louisiana can support upwards of 1.3 million waterfowl today, conversion of land to open water caused

by sea-level rise could result in a future system able to support as little as one percent of those birds.

Global Warming and Changing Weather Patterns

Rain and snow

While climate change will affect ecosystems across the globe, it will not change the laws of nature: Moisture in the atmosphere will still condense and fall to earth. But climate change will alter where and how that moisture falls.

Although there will be great variability, precipitation is generally predicted to increase in the northern latitudes and decrease in the middle latitudes. But gains in rainfall could be offset by warmer temperatures' increasing the rate of evaporation from lakes and streams. Higher temperatures also increase plants' use of moisture, adding to the overall drying of the environment. As habitat conditions and food sources respond to changes in the availability of moisture, hunters will see waterfowl shift their traditional ranges.

Even where rainfall is projected to increase, changes in precipitation patterns could damage the environment. If, as expected, precipitation occurs in less frequent but more intense events, such as hurricanes, tornadoes and thunderstorms, waterfowl habitats could suffer increased flooding, erosion and pollution from runoff.

Another predicted change is winter precipitation falling more frequently as rain rather than snow. This has year-round implications because snowpack serves as a water storage system, reducing the volume of winter stream flow and releasing water as runoff in the warmer months of spring and summer.

Because climate is a complex interplay of global factors, precipitation patterns are difficult to predict. In the prairie pothole region, for instance, annual rates of rainfall may not change at all, or they may increase as much as 20 percent, with precipitation concentrated in extreme fall and spring events followed by drier summers. Because the ground absorbs rainwater more readily than it does snowmelt, winter precipitation producing more rain and a smaller snowpack could result in fewer and shallower prairie pothole wetlands that dry faster.

Climate change models indicate that current trends in the Pacific Northwest are likely to continue. Over the past 100 years the region has become warmer and wetter, with the average temperature increasing 1.5 degrees Fahrenheit. The volume of snowpack has decreased 11 percent, and the dates of peak snow accumulation and of stream flow derived from snowmelt have shifted 10 to 30 days earlier. As summer rains diminish, agricultural irrigation, urban users and natural ecosystems vie with waterfowl for dwindling water supplies.

Historically, the Great Basin region receives most of its precipitation in winter, so a northward shift of storm tracks would reduce snowpacks and stream runoff. The result would be a net drying effect with negative implications for wetlands and waterfowl. Another scenario for this region is a northward extension of the monsoons, bringing more summer moisture at least to the southern half of the region. This would not necessarily result in a wetter summer environment, however, as higher temperatures could accelerate evaporation and nullify the gains of moisture from increased rainfall.

In the Sierra Nevada mountains, warmer temperatures are predicted to increase precipitation falling as rain rather than as snow. In most California rivers and streams, the more rapid runoff of rainfall and the earlier melting of snow would increase winter flows and reduce summer flows.

Waterfowl might realize some benefit from future wetter winters in California's Central Valley, as moderate flooding would increase the amount of feeding habitat available, reducing crowding and the likelihood of disease transmission. However, small-volume stream flows in summer could intensify competition for water, to the detriment of waterfowl habitat.

Increased winter precipitation, longer and drier warm seasons, less difference between daytime and nighttime temperatures and increased levels of CO_2 in the atmosphere combined are likely to produce vigorous plant growth. Increasing above-ground biomass could fuel intense, widespread wildfires that alter ecosystem structure and function and lead to permanent changes in waterfowl habitat.

Models vary in projecting climate changes for the South Central states, although the trend is expected to be toward greater extremes of weather, including flood and drought.

Drought

Prolonged drought is clearly detrimental to waterfowl, diminishing the availability of water and disrupting aquatic food webs. Drought can decrease the likelihood of breeding among prairie ducks. If breeding does occur, drought may still adversely affect nesting success, brood survival, clutch size and the likelihood of re-nesting.

Drier conditions will inevitably increase competition for water. Hunting clubs and wildlife refuges — and waterfowl themselves — will be among the throng of users competing for water resources. Without ensuring adequate water to maintain suitable conditions for waterfowl, clubs and refuges could experience silent seasons as birds seek habitat elsewhere.

Global Warming and Waterfowl Food Sources

No matter how high up the food chain a feeder is, weather ultimately controls its food resources. Factors such as the length of the growing season, the availability of water and the difference between daytime and nighttime temperatures — all factors that global warming will influence — affect the kinds and quantities of vegetation that grow, which in turn affect the animals that eat the vegetation and the animals that feed on those vegetation eaters.

The effects of global warming on food resources will be pervasive. Already there are places where scientists have observed a correlation between rising sea-surface temperatures and a reduction in bird numbers. For example, in Alaska's Prince William Sound populations of white-winged scoters, surf scoters and other waterfowl have declined as warmer waters reduced the availability of the fish that they eat.

Persistently low lake levels could reduce the growth of the kinds of submerged vegetation most important to canvasbacks and redheads. In warming waters, algae and other non-duck foods could replace protein-rich foods such as arthropods. Feeding habitat for species dependent on an invertebrate diet could shrink.

In estuarine habitats, reductions in freshwater stream flows would increase salinity levels and change the availability of waterfowl foods. Everywhere, warmer lake water temperatures and decreased oxygenation could result in increased uptake and concentrations of contaminants throughout the food web.

Warmer temperatures and a longer growing season with fewer days below freezing will most likely favor the northward expansion of non-native, invasive plants, which typically are nutritionally inferior to native plants. Some such species' ranges have been held in check by climate-related factors such as cold and ice. Their advance could

cause shifts in the relative abundance and distribution of native species and significantly alter vegetative communities' structures in ways detrimental to waterfowl.

Summary

The effects of climate change are expected to be both beneficial and detrimental to waterfowl. On balance, however, waterfowl will face serious harm primarily from the dramatic loss of wetland habitat. The critical prairie pothole region of the upper Midwest, known to many waterfowlers as "the duck factory," will become increasingly imperiled, with the probable loss of as much as 90 percent of its wetlands. This in turn could reduce waterfowl populations by as much as 69 percent, an overwhelming impact on these birds and on the ability of hunters to practice their sport. Other areas are likely to be similarly affected. The Chenier Plain marshes of Louisiana will lose their ability to support 99 percent of the 1.3 million birds that currently rely on them for wintering habitat. Waterfowl production in the Upper Great Lakes region is anticipated to decline by as much as 39 percent. Sea-level rise will inundate the Atlantic coast, destroying 45 percent of current canvasback, redhead and pintail habitat. Warming will threaten as many as 15 million breeding waterfowl that depend on the Western Boreal Forest of Alaska and Canada. In short, climate change may lead to catastrophic losses of waterfowl habitat and species populations throughout North America.

Climate change most likely will have profound, negative effects on waterfowl hunting. The most obvious effect will be that hunters will have fewer birds to hunt and kill each season. This likely will result in lower bag limits and perhaps even compressed hunting seasons. In addition to the loss of habitat and associated waterfowl populations, shifting migration patterns will challenge the ability of hunters to plan hunting trips and successfully find birds at traditional hunting areas in the fall. Already, waterfowl hunters are experiencing noticeable changes in the migration patterns of ducks, geese and other species as the birds migrate south later and later each year. Migrating birds also are taking different routes, in some cases stopping as far north as North Dakota due to warmer weather, more open water and less snow covering their food sources. The changes associated with warming will challenge waterfowl hunters to design and implement creative conservation responses to maintain critical wetland and riparian habitat, including restoring previously drained wetlands and maintaining instream flows.

To read this chapter's scientific basis, go to http://www.seasonsend.org/reports_from_organizaitons.shtml
To view or download a PowerPoint presentation on Waterfowl, go to http://www.seasonsend.org/powerpoint/Waterfowl.ppt