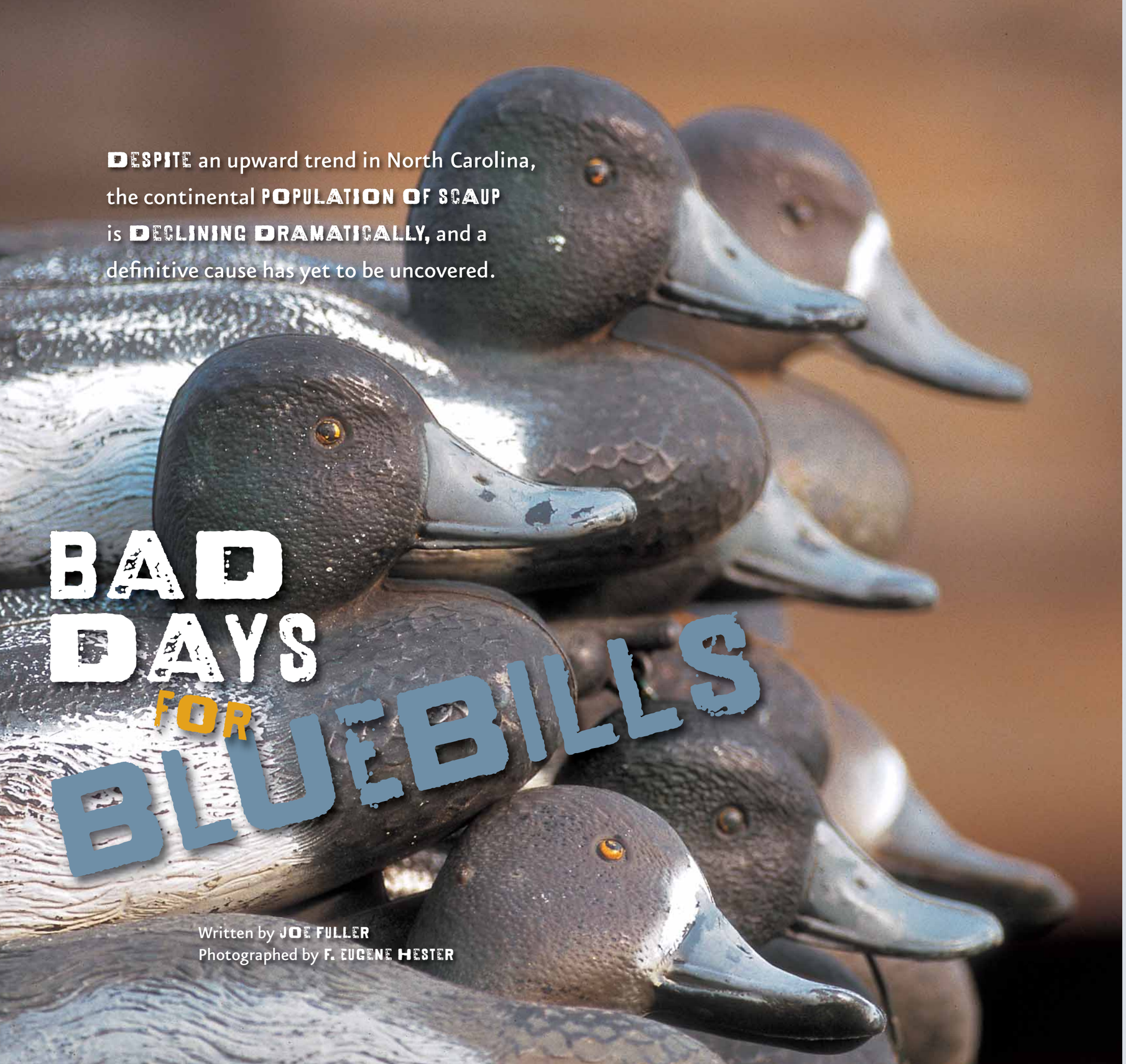

DESPITE an upward trend in North Carolina, the continental **POPULATION OF SCAUP** is **DECLINING DRAMATICALLY,** and a definitive cause has yet to be uncovered.

BAD DAYS FOR BLUEBILLS

Written by **JOE FULLER**
Photographed by **F. EUGENE HESTER**

Diver hunting is a time-honored tradition in North Carolina. From the famed canvasback hunting on Currituck Sound in the early part of the last century, and on the Pamlico Sound through the 1970s, to the traditional redhead hunting along the southern Outer Banks and Core Sound, hunting for diving ducks in North Carolina has a rich history and a dedicated following.

Although scaup have always occurred in reasonable numbers in our state, they did not appear to be the explicit target of the diver hunter in years gone by. This is supported in part by the fact that scaup (also known locally as bluebills or blackheads) were never well represented in the North Carolina decoy culture of the early 20th century.

However, as many hunters will attest and as waterfowl survey data support, scaup numbers and hunting success in North Carolina can be outstanding most years. Over the last two decades, surveys in our state have documented that numbers of wintering scaup have trended upward, with numbers above their long-term average in most years. Couple this with the fact that the proportion of the total state duck harvest comprised of scaup has increased dramatically over the last 10 years, from around 5 percent to 12 to 15 percent, and it is evident that scaup numbers—or at least the pursuit of scaup—has increased tremendously.

The irony of our success and the documented increase in our numbers of wintering scaup is that the overall continental population is declining dramatically. Those hunters who actively pursue scaup are well aware of this because, in response to the decline, scaup hunting regulations have become increasingly conservative.

Just 10 years ago the daily bag limit for scaup was five. This year the allowable bag limit is only one per day for that portion of the season prior to Jan. 2, and two birds per day for the remainder. The continental population of scaup (both greater and lesser scaup combined), as measured by the comprehensive spring breeding population survey, has declined from highs of 7 million birds as recently as the mid-1980s to just around 3.5 million birds today. This quick, dramatic decline has left researchers and managers scratching their heads as to the cause and what, if anything, can be done to reverse this trend. There are several plausible theories; but first, more background.

Although North Carolina hunters have seen increasing numbers of wintering scaup, the continental population has fallen by about half since the mid-1980s.

Because plumage of greater and lesser scaup is nearly identical and thus cannot be differentiated in aerial surveys, breeding population estimates incorporate both species. However, the total estimate is likely comprised of about 89 percent lesser scaup. Although scaup have certainly declined over time, this decline has not been consistent over their geographic range. In fact, scaup numbers have remained relatively stable in the prairie pothole region of the United States and the Alaskan tundra, the latter being the stronghold of greater scaup.

However, scaup populations have declined by 50 percent in the boreal forests of Canada's Northwest Territories and Alaska, a vast area that accounts for nearly 50 percent of the total scaup population. Most scaup breeding in this area are lesser scaup. Therefore most authorities concur that the decline in scaup should be attributed to lesser scaup.

Waterfowl population dynamics are driven by two important factors: survival and reproduction. Unraveling the reasons for the scaup decline begins by taking a hard look at these two factors. This is where the head-scratching begins. Large-scale annual survival rate estimates are generally derived from extensive and expansive banding studies. Unfortunately, a consistent and large-scale banding effort for scaup over time is lacking. Available banding data suggest that adult survival rates have remained relatively unchanged over the long term. Although impacts to scaup survival from hunting or some other cause such as disease cannot be ruled out, many researchers are focusing their attention on the reproductive side of the population equation.

THREE THEORIES

Habitat conditions on spring staging areas. A principal hypothesis focuses on the role of spring migration habitats and related food availability and quality, and their resulting influence on reproduction. This has been described as the *spring condition hypothesis.* This theory asserts that reproductive success has decreased because females are arriving on the breeding grounds in poorer body condition than they did historically. To test this theory, scaup have been collected at various locations in the Mississippi Flyway in late winter and spring to measure indices of body condition, including body mass and nutrient reserves (lipid, protein and mineral).

Collections from the 1980s provide a comparison to these recent collections in the early 2000s. In general, researchers have found that the body condition of scaup was actually higher in southern areas of the flyway (Louisiana and Illinois) than recorded in the 1980s. But the condition after the birds left key staging areas in Illinois was significantly lower when compared to the 1980s. In summary, body condition of scaup on spring migration is fine in Illinois but becomes poor after leaving this general area and heading farther north. The poorer body condition observed likely affects breeding propensity, i.e., the likelihood for females to nest, and overall reproductive success.

To investigate what factors might be affecting scaup body conditions, a review and detailed look at scaup food habitats were undertaken. The prime spring forage item for scaup, especially in the upper Midwest, consists of invertebrate amphipods, also known as freshwater shrimp or scuds. Several researchers have noted that amphipod densities in these wetlands are much lower than historical levels, and concomitantly that scaup are acquiring fewer amphipods than they did earlier. There are a host of reasons to explain the documented decline of amphipod densities in this region. These include natural invasion and purposeful stocking of amphipod predators, which include minnows and game fish, and agricultural sedimentation into natural wetlands.

Although there have been obvious declines in body condition of scaup migrating through this area, and also forage declines as well, researchers do not know whether these conditions are experienced by enough scaup to cause impacts to the continental population. Several questions remain unanswered. Have birds simply shifted their migration patterns to avoid these areas with poorer food resources, and/or can scaup compensate by acquiring sufficient nutrients farther north? Limited studies farther north in the boreal forest suggest that birds arriving in such locations have similar body mass, nest initiation dates and clutch size when compared to some historical estimates—a note of contradiction to the spring condition hypothesis. A remaining question, critical to this theory, is the influence of reduced body condition on a female scaup's ability to breed or even migrate to northern locations.

Contaminants. In association with both decreased forage quality and quantity, additional research has focused on the idea that environmental contaminants may be affecting scaup reproduction in some fashion. Reproduction can be influenced in one of several ways, including decreased propensity to nest, lower clutch size and reduced health of developing ducklings.

After ruling out a host of possible contaminants, research has focused on the possibility of reproductive impairment due to high concentrations of selenium and/or cadmium in the environment. Selenium and cadmium are essential trace elements but can impair health and reproduction when acquired in high concentrations. Research conducted on the industrialized portions of the Great Lakes has confirmed that scaup acquire large amounts of selenium through their foraging on zebra mussels. This nonnative and highly invasive species is a relatively new food item in the Great Lakes region and appears to be a preferred food for scaup, yet these mussels are very efficient accumulators of contaminants and are responsible for the decline in native mussels.

However, additional research has shown that selenium levels from scaup eggs collected on their breeding grounds are below critical levels, and selenium levels in nesting females collected on the breeding grounds had much lower concentrations than females collected on wintering and staging areas. So it appears that if scaup are acquiring high levels of selenium in the Great Lakes or other locations, they are able to eliminate much of it by the time they reach their breeding locations.

Though this might suggest that selenium is unlikely to cause problems for breeding scaup, questions remain as to whether high concentrations of selenium are causing females never to reach their far north breeding grounds, or if the birds do arrive, whether they simply fail to breed there. In contrast to research results from industrial portions of the Great Lakes, selenium levels in scaup collected in other areas, including more remote areas of the Great Lakes and various

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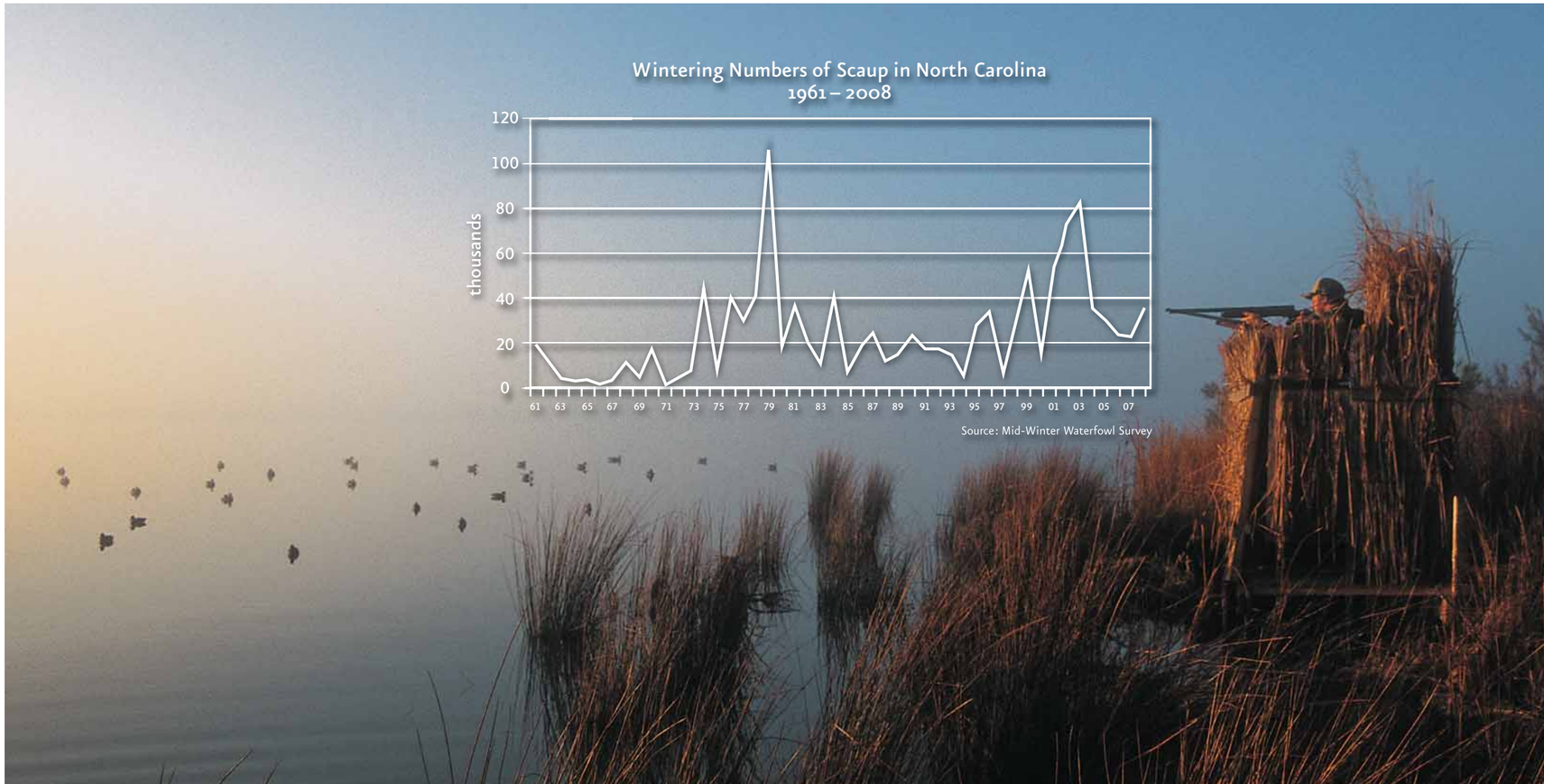
Scaup may be acquiring excessive amounts of selenium by feeding on zebra mussels (above), an exotic species found in the Great Lakes. The mussels accumulate a variety of contaminants and appear to be a preferred food for scaup.

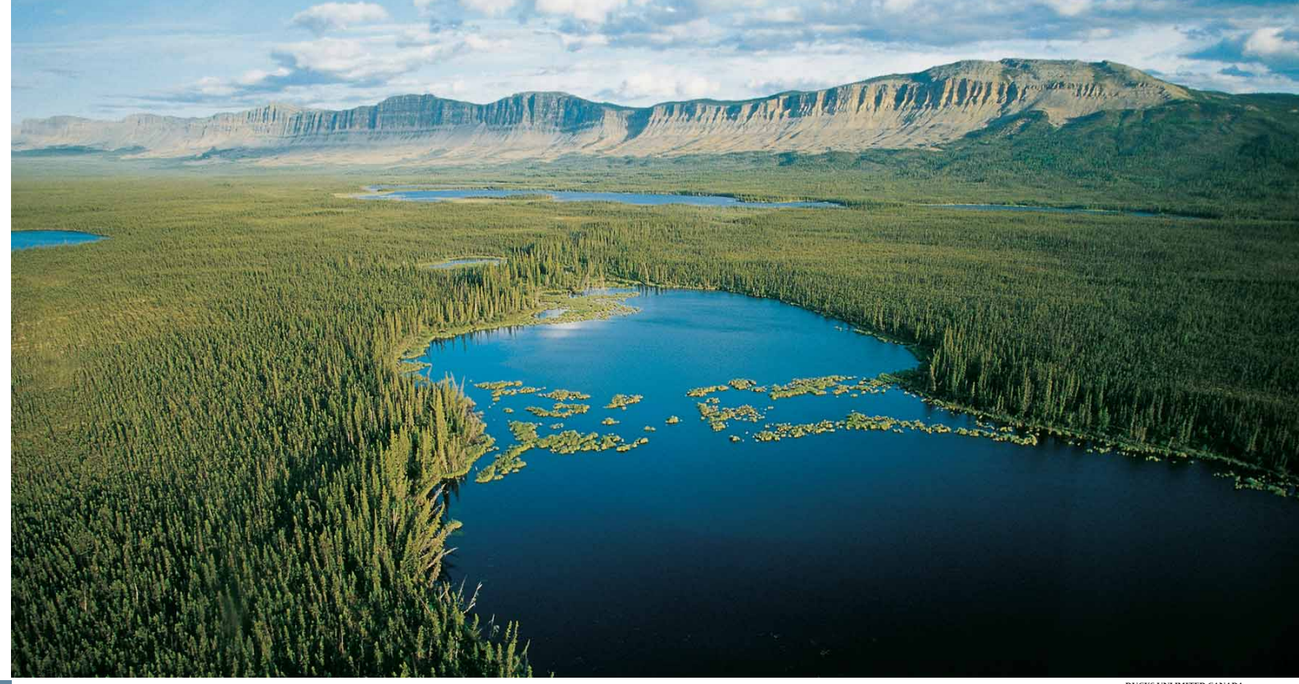


places throughout the Midwest, appear within normal background levels. However, research conducted in these areas suggests that concentrations of cadmium are at elevated levels and may play some role in affecting nutrient and lipid reserves.

Environmental changes on the breeding grounds. The third principal hypothesis involves environmental changes to wetland habitats in the western boreal forests of Alaska and Canada. Although densities of breeding waterfowl are relatively low throughout the boreal forest, the sheer vastness of the area (1.8 million square miles) accounts for up to 40 percent of the continental duck population each year. Although the prairie pothole region is referred to as the "duck factory," the importance of the boreal forest is recognized by its own nickname as "the other duck factory."

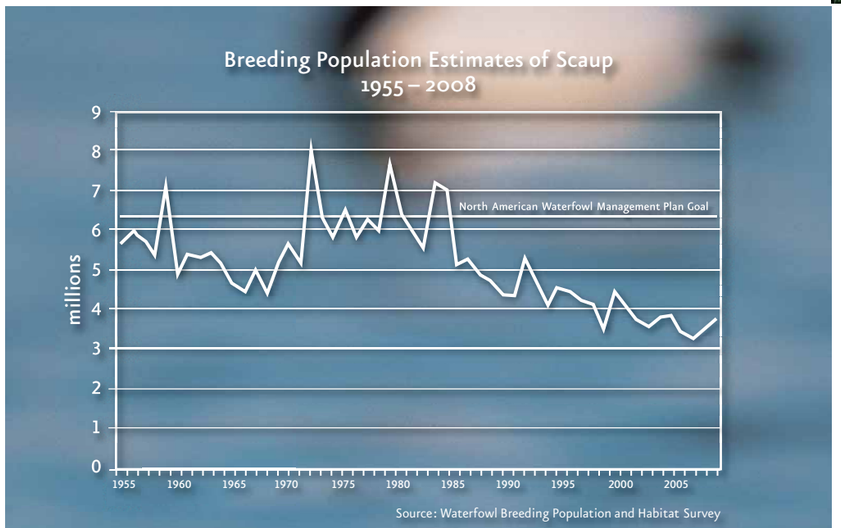
The western boreal forest is pristine in nature, a seemingly unspoiled wilderness miles from significant human habitat and influence, but changes are occurring there. Increasing oil and gas exploration and development, and industrial forest management, are viewed as threats to wetland habitats in the area. In addition, climate change has been documented as causing profound changes to wetlands. Currently, we know that the climate is warming at a faster rate in higher latitudes, including the boreal forest. In fact, this area has warmed about 2 degrees Celsius (3.6 degrees Fahrenheit) over the last 30 years.

Although warming trends generate increased precipitation, higher evaporation rates due to warmer temperatures are causing wetlands, especially smaller wetlands favored by scaup, to dry. Permafrost, which holds water at the surface, is now starting to thaw, allowing water to be channeled out of wetlands into adjacent surface waters or become lost to groundwater systems. Melting of permafrost also increases the water-holding capacity of upland soils, which reduces runoff into adjacent wetlands. Researchers have documented a loss of nearly 25 percent of surface water on several important scaup breeding areas in Alaska, mostly in the last 20 years. In addition, research suggests that changes in water chemistry due to warming conditions are causing shifts in invertebrate communities, including a reduction in foods such as amphipods that scaup hens and ducklings prefer to eat.



DUCKS UNLIMITED CANADA

Climate change might be playing a role in the substantial reduction of scaup breeding populations in the boreal forests of Alaska and western Canada.



After exceeding management plan goals in the 1970s and '80s, scaup populations have declined rapidly and now stand at about 3.5 million birds.

ROLE OF DISEASES

Other factors could be playing a role in the decline of scaup. The impact of disease mortality on waterfowl populations is often difficult to quantify, and whether these factors can depress waterfowl populations over the long term is largely unknown. There is growing evidence that numbers of waterfowl lost to disease have increased substantially in recent decades. Scaup, like other waterfowl, are susceptible to a variety of diseases and likely have coexisted with them for eons. However, since 2002 approximately 30,000 waterbirds (primarily lesser scaup and coots) have died from a newly emerging disease found in upper portions of the Mississippi River and Minnesota. The disease occurs when scaup ingest the exotic faucet snail. The causative agents, however, are two parasitic trematodes (flatworms) that use the faucet snail as their host. Depending on the level of snail infection, a lethal dose can be acquired in less than 24 hours of feeding, and death occurs within three to eight days. At this time, the disease itself is not thought to be a significant contributor to the continental decline of scaup. Nevertheless, this situation warrants close monitoring and is another example of the many environmental challenges facing scaup today.

THE ROLE OF HUNTING

The role of hunting in the decline of scaup has been a controversial and, quite frankly, contentious issue among resource managers. Most biologists agree that hunting is not the root cause of the scaup population decline. However, the extent to which current harvest is exacerbating the decline is debatable. Extensive data with which to quantify the relationship of harvest and population dynamics is for the most part lacking. The available data include the annual breeding population survey, harvest estimates and limited banding data, where survival and harvest rates are inferred.

Using this information, the U.S. Fish and Wildlife Service, with input from partners, has developed a model that looks at the relationship of the scaup population and harvest. This model suggests that current levels of harvest are approaching or exceeding the harvest potential of the population. Stated simply, harvest may be exceeding the ability of the population to sustain itself through current levels of survival and reproduction. However, this model is not without its detractors, who believe that harvest is playing no role at all in the population decline. Because harvest is really the only thing that can be controlled by waterfowl managers, and given the possibility that harvest may be playing some role, further harvest restrictions were enacted this year and likely will remain in place for at least several years.

The process by which a harvest reduction should occur through adjustments of season length and bag limits presents a dilemma for state wildlife agencies. Most managers agree that a reduction in the daily bag limit from two to one will almost certainly impact hunter participation. Many big-water diver hunters simply will not gear up for scaup, and this will impact both short- and long-term trends in duck hunting participation. Conversely, allowing a higher bag limit of two or three scaup for a limited number of days and no scaup for the remainder of the 60-day duck season is unsatisfactory to managers who desire the least-complicated regulations possible, and also because of concerns about duck misidentification.

A short scaup season within the general duck season is a real concern for states that winter large numbers of ring-necked ducks and is problematic for hunters where ring-necks and scaup comingle. The unintentional harvest of a scaup during hunting for ring-necks and other species is a valid concern to state managers and law enforcement. For the 2008–2009 duck season, the Atlantic Flyway successfully lobbied for a "hybrid" season that allows for 20 days with a daily bag of two scaup; the remaining 40 days permit one scaup per day. This should allow some time for traditional diver hunters to make it worthwhile to pursue scaup. In addition, allowing at least one scaup per day for the entire season will ease the misidentification issue.

NEXT STEPS

At more than 3 million birds, scaup are obviously still quite numerous; however, their unabated decline is of great concern. Though progress is being made to understand the factors behind this decline, strategies necessary to stop or reverse the trend really do not exist. In contrast to the situation with many prairie-nesting ducks, a good nesting cover program like the Conservation Reserve Program and abundant rainfall are not the key elements in turning the tide for scaup.

Of the three leading hypotheses, all involve some aspect of long-term environmental change, and none offer a quick remedy. A Scaup Action Team working under the broad auspices of the North American Waterfowl Management Plan is a newly formed group of scientists and resource managers who hope to focus attention on the plight of scaup and to help guide scaup research appropriately. There is the distinct possibility that all three theories may be acting in concert and playing a role in the decline. Many experts believe that if scaup are responding to long-term environmental changes, the population will equilibrate at a point that can be supported by habitat and environmental conditions. But at this point it's anyone's guess at what level the population will stabilize. Let's hope this occurs sooner rather than later.

Joe Fuller is the migratory game bird coordinator for the N.C. Wildlife Resources Commission.