Today's radar detects more than just storms; clouds of ducks forecast hunting opportunities.

Waterfowl on Weather Radar

Story By Ben O'Neal, Joshua Stafford and Ron Larkin
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As the air cools and the fields across Illinois turn from green to gold each fall, millions of waterfowl begin their annual passage from the breeding grounds of the north to the wintering grounds in the south. Along the way, they pause to rest and refuel at stopover sites scattered throughout the state. During these precious few months, Illinoisans savor the historic pastime of waterfowl hunting and the growing hobbies of bird watching and wildlife photography.

For centuries waterfowl enthusiasts have marveled as thousands upon thousands of birds seem to materialize at traditional stopover sites, only to disappear just as quickly when the weather grows too cold and icy. In some years, birds appear to fly nonstop from north to south, whereas other times they seem to leapfrog slowly from one rest area to the next. Their transient ways often leave us wondering: Where did they all go? When and why did they leave? To biologists, these questions are more than curiosities, because in them lie keys to understanding and managing the myriad of migrants loved by so many.

Scientists have been searching for the answers to questions about bird migration for decades. Among them was an Illinois native and one of the forefathers of waterfowl ecology, Dr. Frank C. Bellrose. With his colleagues at the Illinois Natural History Survey, Bellrose employed many techniques trying to determine when waterfowl migrate, where they go, and why they leave. Leg banding, visual observations and aerial inventories provided valuable insights into the migratory patterns of waterfowl, but in 1960 Bellrose discovered that radar could be a valuable tool for studying airborne ducks.

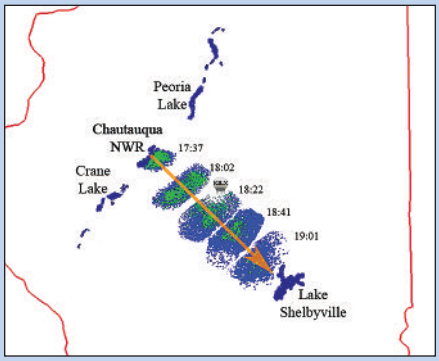
Radar was first used in World War II to detect incoming aircraft. It functions by emitting a pulse of energy, then

Pintails comprised only 1 percent of the Illinois harvest in 2007, and the population is 36 percent below its long-term average.

measuring the size and location of targets based on the echo of energy returned. In 1957, the National Weather Service developed a nationwide network of weather surveillance radars to monitor and forecast atmospheric conditions. As it turned out, weather radars were capable of detecting flocks of migrating birds in much the same way they detect large rain clouds. Using this technology, Bellrose was—for the first time—able to actively observe large-scale movements of migratory ducks otherwise obscured by darkness and distance. Later, he used these data to develop maps of the migratory corridors within the greater Mississippi Flyway.

In 1988, the NWS upgraded the system used by Bellrose with a network of 154 high-resolution Doppler radars known as NEXRAD (NEXt generation RADar). Dr. Ron Larkin of the INHS immediately recognized potential to use this unique system to study large-scale movements of birds, and he published the first quantitative study using bird echoes on NEXRAD in 1991. Through this work with songbirds, he also noticed what appeared to be large movements of ducks from wetlands along the Illinois River during fall. In 2005, University of Illinois Ph.D. student, Ben O'Neal joined Larkin and INHS waterfowl ecologist, Joshua Stafford to initiate the first large-scale study of waterfowl migration using NEXRAD. Improvements in data resolution and availability, as well as computer hardware and software made it possible to begin searching enormous volumes of radar data for the clues needed to answer lingering questions about waterfowl migration.

Conveniently, there is a NEXRAD unit right in our backyard, and it provides brilliant views of migrating waterfowl. This radar, known as KILX, is located in Lincoln and is ideally positioned to observe ducks, geese and other birds as they depart wetlands along the Illinois River, such as Chautauqua National Wildlife Refuge and The Nature Conservancy's Emiquon Preserve. As ducks take flight at dusk and climb into the



(Photo courtesy of Ben O'Neal.)

(Photo courtesy of the Illinois Natural History Survey.)

The late Dr. Frank C. Bellrose inspecting an early radar for migrant waterfowl (above). NEXRAD towers, such as the KILX tower located east of Lincoln, produce a sequence of NEXRAD scans. The map above shows thousands of migrating ducks heading southeast from the Chautauqua National Wildlife Refuge on a fall evening in 2005.

Waterfowl survey results for 2008 show that green-winged teal numbers are at their second-highest level since 1955, and are 57 percent above their long-term average.

night sky they appear as bright splashes of color on KILX, often spanning many miles wide and long. The radar covers a region more than 75 miles wide, allowing researchers to track large groups of ducks for about an hour as they travel across the state. By measuring the direction of departure each night, consistent patterns throughout a season emerged.

In recent years, nearly all of the ducks leaving the middle Illinois River Valley have traveled in a southeasterly direction, perpendicular to the course of the river. This result was different from that reported by Bellrose and the common opinion of many of today's waterfowl enthusiasts, who largely believe ducks use rivers as migratory pathways. This may be due to a more thorough and accurate measurement of migratory directions, or it could be because waterfowl have shifted the dominant direction of migration. Although the researchers cannot be certain if a shift in migratory pathways has occurred, or what may have led to such a shift, they do know that four major waterfowl destinations (Clinton Lake, Lake Shelbyville, Lake Carlyle and Rend Lake) have been added to the landscape since Bellrose's work in the 1960s. The tracks of migrating birds measured on NEXRAD, along with the scores of ducks counted each year on these reservoirs, strongly suggest that fall visitors to the Illinois River are traversing the state to find the isolated habitats provided by these sites and beyond.

Clearly, much remains unknown about waterfowl migration, but thanks to NEXRAD, a powerful new tool allows researchers to study the movements of the birds that capture our wonder each fall.

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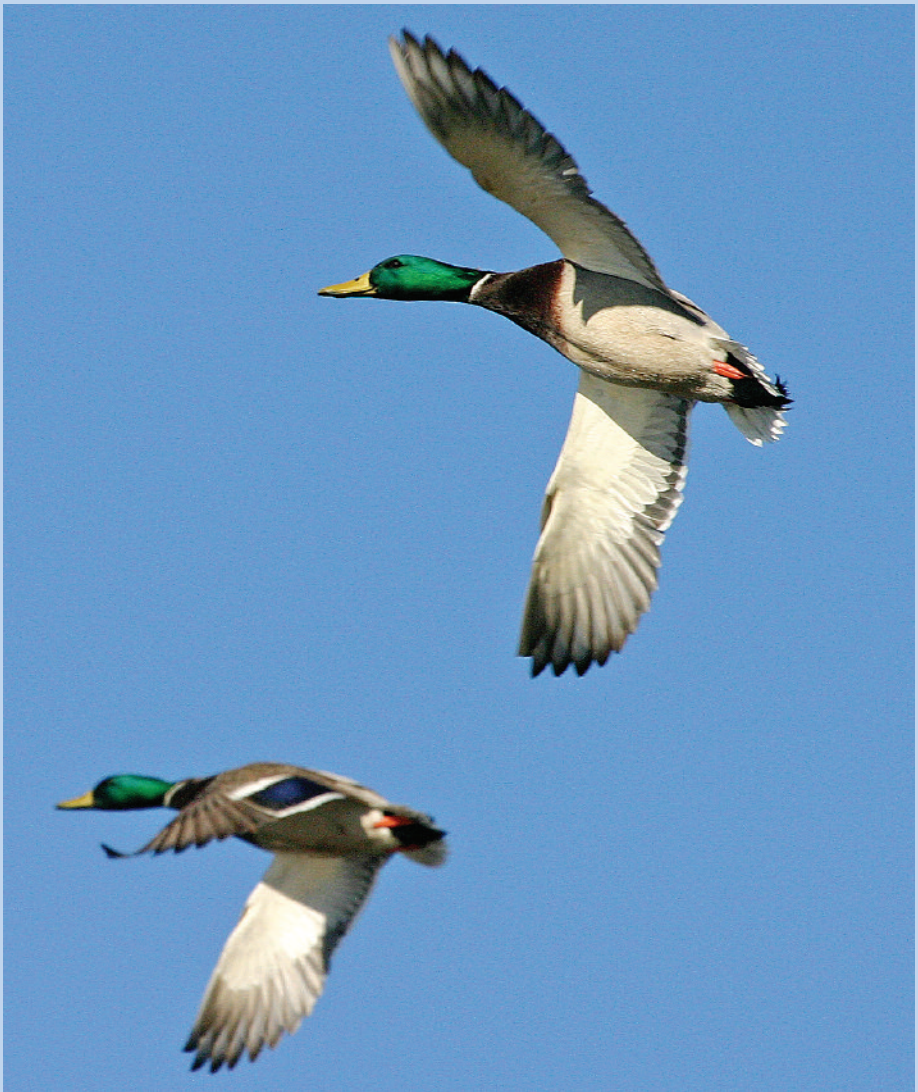
The mallard was chosen as the preferred duck by 78 percent of Illinois waterfowl hunters surveyed.