

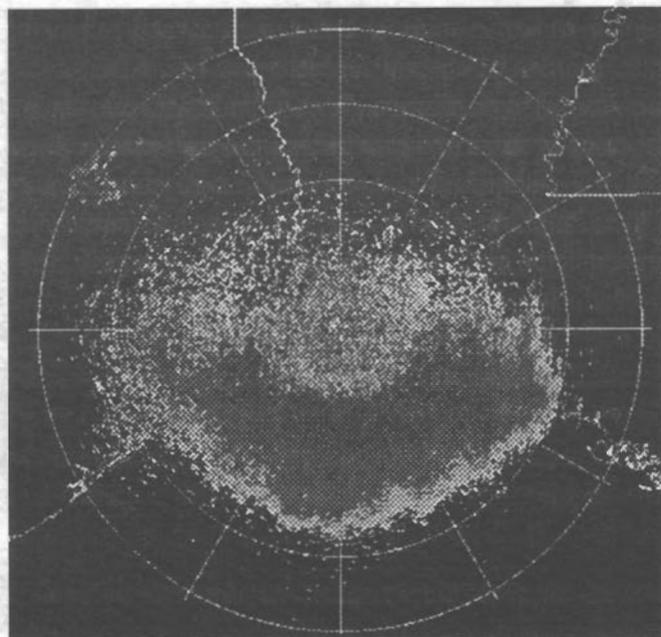
Is it a Bird? Is it Rain?

Using radar to track bird movements is not just a blip on the screen

Chris Eberly

The use of radar to track bird movements began in the late 1930's, quite by accident. British surveillance radar operators noticed mysterious radar returns moving at varying speeds that appeared and disappeared with unexplained regularity. These radar echoes were called "angels" by perplexed operators and technicians. David Lack suggested that some of these angels may be migrating flocks of lapwings, which he knew were migrating in the vicinity at that time. Finally, in 1941, G.C. Varley identified Northern Gannets off the coast of Dover, England, as the source of some radar angels. The field of radar ornithology was born!

Since this rather auspicious beginning, radar has proven itself as a pragmatic tool for detecting, monitoring, and quantifying bird movements in the atmosphere. A combination of weather and airport surveillance radars has been used to study bird migrations and movements. A national network of weather radar stations established throughout the United States by the National Weather Service using the WSR-57 (Weather Surveillance Radar, implemented in 1957) has been extremely valuable for quantitative studies of bird migration. Historical film records for each of these radar stations have been stored permanently at the National Climatic Data Center in Asheville, North Carolina. Analysis of these films by Dr. Sidney Gauthreaux of the Ra-



Severe weather alert? This "storm" is actually migrating neotropical migrants. Radar images courtesy of: Sidney A Gauthreaux / Unisys Corp.

dar Ornithology Lab at Clemson University in South Carolina indicates a serious decline in the number of migrants crossing the Gulf of Mexico since the late 1960's, perhaps by as much as 45 percent. However, the WSR-57 used a monochrome analog screen and did not have a moving target indicator, which allowed ground clutter to obscure objects within 10 - 20 km of the radar. This made estimating the actual number of birds aloft somewhat problematic.

The National Weather Service began modernizing its radar network in 1988 with the new Doppler radar WSR-88D (Weather Surveillance Radar, 1988, with Doppler), more commonly known as NEXRAD (NEXt generation RADar). Developed jointly by the U.S. Departments of Commerce, Defense, and Transportation, NEXRAD is much more sensitive to bird targets than the WSR-57 (it can even

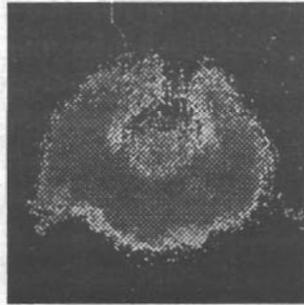
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detect smoke and dust particles in its most sensitive operating mode). Color digital images obviate the need to quantify birds with arbitrary echo intensity and attenuation scales, and the Doppler radar provides information about the direction and speed of bird movements. Dr. Gauthreaux and Carroll Belser have used direct visual observation techniques to develop a method of quantifying bird numbers using only the radar displays. They also have merged radar data and Landsat satellite images using geographic information systems (GIS) technology to pinpoint critical migration stopover areas and the habitat types that migrants require. This information has been invaluable for conservation efforts along the Gulf of Mexico coastline.

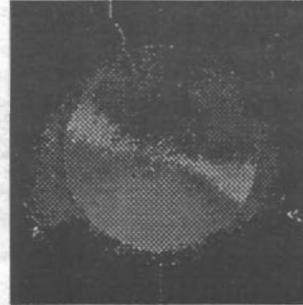
Monitoring bird migrations and locating stopover sites is an important aspect of the PIF effort. It is important that land management agencies know when Neotropical migratory birds stopover on the land they manage and what areas are most crucial for the birds' use. This information can be acquired with the use of the NEXRAD network. In fact, the Department of Defense (DOD) is working with Dr. Gauthreaux to map and characterize these critical stopover areas on military installations so they can be better protected. The DOD is also working with Dr. Gauthreaux to utilize NEXRAD and other radars as a tool to warn military pilots about bird concentrations that may pose a threat to pilots if they try to share the same air space. Flocks of birds can be seen on the radar screen and pilots warned about potential bird strikes in their airspace, much as they are warned about foul weather conditions.

Radar also helps identify specific nesting colonies of wading birds, and feeding and roosting areas where birds concentrate. Using images available over the Internet (www.intellicast.com), Dr.

Gauthreaux and graduate students Kevin Russel and David Mizrahi were able to locate 33 pre-migratory roost sites for Purple Martins in the eastern United States. Kevin studied one large roost near Columbia, South Carolina, in detail. This site is the first designated roosting sanctuary, and is the largest pre-migratory roost in North America. Pre-



NEXRAD images showing migration exodus after sunset on April 25, 1998. Base reflectivity (left) shows the density of migrating flocks, while base velocity (right) shows the speed and direction of movement.



vious estimates of from 75,000 to 1,000,000 Purple Martins were conservatively placed at around 703,000 birds during the peak in late July and early August. In addition, he found that martins traveled up to 65 miles from the roost each day, and

identified a previously unknown roost site in neighboring Georgia.

Birders tend to watch the local weather to plan their birding excursions, and often avoid those areas where it is raining. However, with our current understanding of bird migration and its dependence upon weather conditions and storm fronts, birders are now looking at weather reports with a different eye. A passing cold front in fall might trigger rain showers, but more importantly it means a "warbler fall-out" may immediately follow. Real-time monitoring of bird migration over much of the United States is now a reality, and with more bird watchers in the United States than skiers (*Bird Conservation*, Spring Migration 1997), the Bird Migration Report on weather broadcasts may be a not-too-distant blip on the radar screen. Until then, look closely at that background "clutter" reported by weather forecasters on their radar images. You might be looking at migration in action!

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(Also see *Texbird Radar Hawkwatch results*, appearing on page 22 — Editor)