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SANCTUARY

THE JOURNAL OF THE MASSACHUSETTS AUDUBON SOCIETY



Birds of a Feather

The past, present, and future of flocking birds

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Passing the Torch

Mass Audubon and its leaders have had the opportunity to address many of the issues of the day during the organization's 116-year history and advocate, often forcefully, to effect real change.

Our roots were established by Founding Mothers Harriet Lawrence Hemenway and Minna B. Hall, who persuaded ladies of fashion to forgo the cruelly harvested plumage that adorned their hats. They also enlisted noted ornithologist William Brewster as the Massachusetts Audubon Society's first president (1896-1913) to advance legislation to restrict the killing of birds and sale of their plumage. Brewster passed the torch to Edward Howe Forbush (president from 1914-1925), who opened our first wildlife sanctuary, Moose Hill, in 1922, and expanded the organization's influence from a regional to global scale, resulting in measures for international protection of birds.

The third president (1925-1935), Judge Robert Walcott, promoted education—introducing natural history programs for schools and day camps. Carl Buchheister was at the helm from 1936 to 1939 when the Federation of Bird Clubs in New England was brought into the Mass Audubon fold. He was followed by C. Russell Mason whose tenure (1939-1959) included formation of the Natural Science Workshop to train teachers and youth leaders in natural history education and the founding of residential camp Wildwood. Next came Allen H. Morgan who in the 1960s brought Mass Audubon to the forefront of the nascent environmental movement. Morgan tackled causes like pesticide regulation while never losing sight of our origins in bird conservation. Major accomplishments during his tenure (1959-1980) were passage of Massachusetts wetlands protection legislation in the 1960s and 1970s (first state wetlands laws in the nation) and the milestone in 1976 of 10,000 acres of open space acquired.

Under the leadership (1980-1999) of Gerard A. Bertrand, Mass Audubon spearheaded passage of critical land and water protection legislation, while also maintaining focus on local and international bird protection, launching the Coastal Waterbird Program in 1987 and beginning cooperative work with the Belize Audubon Society in 1984, then forming Programme for Belize in 1988. Bertrand drove expansion of our sanctuary system to ensure a Mass Audubon presence close by for every citizen of the state.

Approaching the year 2000, Mass Audubon came full circle by choosing its first woman leader, a century after our Founding Mothers began their work. I have had the privilege of serving as Mass Audubon's president for 13 years. Mass Audubon now protects nearly 35,000 acres, bird conservation programs are stronger than ever, over the last decade we have pioneered a comprehensive program of sustainable practices at our properties, and our commitment to reaching new audiences and urban environmental education is flourishing.

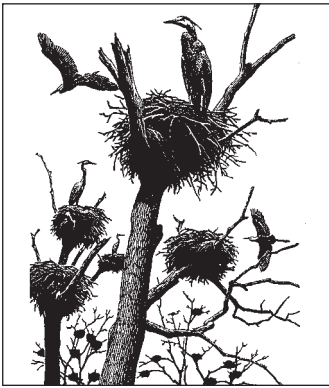
Mass Audubon's next leader will doubtless continue to champion both longstanding and emerging environmental issues in the decades to come.

Laura Johnson, President

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Great blue heron rookery

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Mass Audubon works to protect the nature of Massachusetts for people and wildlife. Together with more than 100,000 members, we care for 34,000 acres of conservation land, provide educational programs for 225,000 children and adults annually, and advocate for sound environmental policies at local, state, and federal levels. Mass Audubon's mission and actions have expanded since our beginning in 1896 when our founders set out to stop the slaughter of birds for use on women's fashions. Today we are the largest conservation organization in New England. Our statewide network of wildlife sanctuaries, in 90 Massachusetts communities, welcomes visitors of all ages and serves as the base for our work. To support these important efforts, call 800-AUDUBON (283-8266) or visit www.massaudubon.org.

North with the Spring



© FRANCIS L. JAUQUES

White ibises

Some years ago, I was visiting family members who lived in a big old house on the banks of the Corsica River on the Eastern Shore of Maryland. The house was located on a point of land and had a long room overlooking the wide expanse of the river. This was late winter, and there were, as there always were in those times, thousands of ducks, geese, and swans massed on the waters—so many that they seemed to form an immense low-lying gray island.

As I watched, the birds on the northeastern side of the river where the flocks were thickest decided, for no apparent reason, to move. The vanguard beat the waters to a froth, and a great gabbling horde of Canada geese, tundra swans, and snow geese curled slowly skyward, bringing others up behind them as they rose. The body of the flock assembled and followed, and, by the time the first groups landed and began to settle, the rearguard was still taking off. The result was that the flocks formed a vast living arch across the wide river, backlit by a silver-gray light of the late afternoon winter sky.

I thought about the scene for years. For some reason, I always associated it in my mind with the slow wavering lines of Bach's majestic *Mass in B minor*.

All this was in the late 1960s, and I had stopped "down home"—as my exiled parents used to phrase it—before moving on northward toward New England. I was coming up from the Everglades that winter on an only-slightly crazy quest to witness the great assemblies of waterbirds

that collect in the Southeastern states every winter.

I began at the southernmost outpost of the United States, on the Dry Tortugas, where flocks of sooty terns numbering over a 100,000 gather, and then moved north to the Everglades to watch the vast gyres of circling wood storks and long wavering lines of ibises straddling the horizon at dawn and dusk. I worked my way northward to the congregations of ducks at St. Marks National Wildlife Refuge in northwestern Florida, and then drove onward up the coast, stopping at wildlife refuges all along the way, and following the assembling northbound flocks. I ended up on the Eastern Shore of Maryland at my family's house, and Blackwater refuge, in Cambridge, Maryland, and then drove north to Bombay Hook, Cape May, and Forsythe National Wildlife Refuge (the former Brigantine refuge).

I was of course amazed by the numbers of waterbirds I encountered on that trip. But as I moved northward, at nearly every refuge and wintering ground I visited, I fell into conversation—as I often do on these journeys—with old people. And from them I got a different story.

In Flamingo on Florida Bay, I met a sun-creased old man in a Trilby hat who knew Marjory Stoneman Douglas, author of *The Everglades: River of Grass* and the driving force behind Everglades National Park. "Not what it used to be, I can tell you that," he said, when I marveled at the number of birds I had seen that day.

At St. Marks there was another old man: "Not like it was when I was a boy," he told me. And at Pea Island in North Carolina, where I went to watch snow geese, a fellow bird-watcher joined me as I watched what I assumed to be a large flock. "Sad, isn't it?" he lamented. The flocks apparently were diminished from previous numbers, although this species has now recovered.

The key to all this may have come from a doddering old ornithologist I met at the Wakulla Springs Lodge in northern Florida. I encountered him on the grounds, wandering under the live oaks where he had gone to look for turkeys, and we fell into conversation. He was on a similar mission as I was, having come northward from the Glades and having stopped at the great spring at Wakulla to see limpkins. He was headed next for St. Marks with a companion. I never got his name, but he had spent years working in the Arctic with two respected bird authorities: Massachusetts state ornithologist Archie Hagar and the bird artist George Miksch Sutton.

"Everything is changing in the Arctic," the old man said. "Not as many shorebirds as there used to be back in the '50s. Don't see those big flocks anymore. Everything is changing everywhere," he continued. "Something's going wrong. And it's probably going to get worse."

Which, I suppose, it has.

JHM

Swarms at Sea

*The best place to get a sense of the great flocks of yesteryear
is just off the Massachusetts coast in winter.*

by Wayne Petersen

As an observer of nature for many years, I have long been fascinated and frequently awed by enormous concentrations of living organisms. These concentrations have variously taken the form of immense schools of fish such as giant balls of sand lances in the murky waters of Stellwagen Bank, or the dusty blur of hundreds of thousands of pounding hoofs of migrating wildebeests on Africa's Serengeti Plain.

Most often, however, it is gigantic concentrations of birds that ultimately hold me spellbound. I have been privileged to witness the uncountable swarms of red-billed queleas leaving their reed bed roosts along the shores of Lake Naivasha in Kenya, mesmerized by a river of hundreds of thousands of sooty shearwaters streaming northward past the coast of New Zealand bound for their austral wintering grounds in the Northern Hemisphere, and humbled by the magnitude of a chinstrap penguin colony in the South Shetland Islands that seemed to stretch as far as the eye could see.

While these examples may seem foreign and exotic, there are also spectacular avian concentrations closer to home. The late-summer gatherings of tree swallows along the Massachusetts coast and the gigantic assemblages of red-winged blackbirds, common grackles, and brown-headed cowbirds streaming into a nighttime roost in autumn are among the greatest spectacles in nature.

What is notable about some of these spectacular avian aggregations is their ephemeral quality. The southward passage in mid-September of thousands of migrating broad-winged hawks at favored viewing locations such as Wachusett Mountain in Princeton sometimes occurs within just a few hours. The greatest of these flights are rendered unpredictable because of their dependence upon just the right combination of weather conditions at precisely the height of the broad-winged hawk's migra-



Long-tailed ducks

© DAVID LARSON

tory passage through New England. Similarly, the late-August migration of common nighthawks through the Connecticut River valley typically coincides with the emergence of swarms of millions of flying ants—an event that has no doubt forged the precise timing of the crepuscular migration of the common nighthawk.

But among the most dramatic—and common—of these local congregations of birds are the great passages of seabirds that occur just off the eastern coast of New England. They are also among the most episodic in nature.

One event that I observed was a horrific “wreck” of dovebies that occurred on Cape Cod on November 2, 1969. Since the intense storm conditions that prevailed that day can produce interesting seabird sightings, a companion and I made our way to outer Cape Cod in order to be at the shore at first light. Winds were intense from the southeast and intermittent sheets of rain periodically obscured visibility; however, between bouts of rain we were able to glimpse a view of the wider seascape.

As dawn lifted we began to see literally hundreds of tiny dovebies struggling southward into the wind as far as the eye could see. Some were in flocks containing dozens of individuals, others were passing by as singles, but all were clearly in trouble. Many of the closest indi-



Male common eider

viduals were flying at the waterline just above the heavy surf as it was hitting the beach. Others were being blown wildly over our heads in the direction of Cape Cod Bay, several miles westward of our point of observation. Great black-backed gulls were coursing overhead, deftly picking dovebies out of the air and swallowing them whole while in midflight. Other dovebies, unable to clear the crashing surf, were slammed onto the beach where they lay helpless on the sand, incapable of taking off from land. This incredible spectacle continued until dusk, and everywhere we looked along the backside of the Cape and in Cape Cod Bay itself there were legions of dovebies on the move, most traveling from north to south.

At the end of the day when we compiled our notes and attempted to quantify the number of dovebies actually involved in this epic event, we agreed that no fewer than 12,000 dovebies passed Cape Cod that day. This was more total dovebies in a single day than I have observed in Massachusetts in half a century of active birding!

Despite the episodic nature of this event, dovebie flights of this magnitude are not without precedent. The ornithological record by Canadian seabird authority Anthony J. Gaston indicates that other major dovebie events have taken place in the northeastern United States at somewhat regular and sequential intervals (e.g., 1930-32, 1948-51, 1962-70, although not in 1964). This pattern suggests that there might be a cyclic connection to these great flights, which ultimately prompts the question, why?

Careful analysis reveals that in years of some of these major events, dovebies began appearing along the New England coast well ahead of when the greatest flights actually took place. Could the clustering of these 20th-century Massachusetts autumn flights be in part

due to oceanographic fluctuations at traditional wintering areas, or to cyclic variations at the high Arctic breeding colonies of the dovebies?

Dovebies are high Arctic breeders, occurring in immense colonies in Greenland, in Svalbard, and at several Russian high Arctic archipelagos. Their primary diet is plankton, mainly copepods and amphipods depending upon the precise foraging locality or the specific seasonal availability of these food items. A principal winter concentration area for dovebies in the western Atlantic Ocean is the plankton-rich perimeter of Newfoundland's Grand Banks, as well as areas with comparable upwelling east of Nova Scotia.

While the current global population of this tiny seabird has been estimated at approximately 12 million, one is tempted to speculate on whether the gradual increase in ocean temperatures associated with climate change could at some point begin to perniciously impact the enormous plankton swarms that have traditionally sustained such incredible numbers of this tiny alcid. I hope that it is just a coincidence that Massachusetts has not witnessed a major dovebie flight since the mid-1970s.

Another largely underappreciated flocking spectacle in the Commonwealth is the great autumnal migration and winter gathering of sea ducks on the turbulent ocean waters amid Chatham, Nantucket, and Martha's Vineyard. The waters roughly comprised by this triangle annually sustain upwards of more than a million eiders, scoters, and long-tailed ducks every winter. Few but the hardiest individuals who make their living from the sea and out of necessity frequent these waters at all seasons of the year have the opportunity to survey these massive aggregations.

Common eiders, scoters, and long-tailed ducks are species that spend much of their life on salt water, most of them typically retreating to far northern interior boreal forests or open tundra lakes for nesting. Only common eiders stay close to salt water for most of their life so that even on their sub-Arctic and Arctic nesting grounds they are seldom out of sight of salt water. After nesting, all of these sea duck species make their way to offshore coastal waters. And it just so happens that the waters off the Massachusetts coast serve as the primary winter headquarters for several of these rugged waterfowl.

The vanguard of autumn sea duck migration ordinarily appears in Massachusetts during mid-September, with numbers reaching a migratory peak in mid- to late October. Many of these arriving birds will remain in Massachusetts waters for the winter, reaching their winter maximum by late December or early January. At the height of their passage in mid-October, sometimes thousands of scoters pass outlying coastal points such as Cape Ann, Hull, Duxbury Beach, and Manomet Point in a single day, many bound for the waters south and east of Cape Cod and the Islands.

Though many of these maritime travelers will continue past Long Island and the shores of New Jersey on their way to wintering grounds off the Virginia Capes

and beyond, vast numbers also stop to spend the winter on the shallow shoals off Monomoy, Nantucket, and Martha's Vineyard. It is these great winter gatherings that present a stunning sight to those willing or able to get to vantage points where they may be seen.

Either in pure flocks or mixed with scoters, huge numbers of common eiders in their striking black and white plumage also blanket the offshore shoals throughout the winter. Like scoters, eiders feed primarily on mollusks, particularly blue mussels and clams of several species. Because these mollusks tend to occur in extensive beds in relatively shallow water, sea ducks often form dense rafts over the mussel beds where their concentrations sometimes contain many thousands of individuals. The number of shellfish consumed by these immense aggregations during the course of the winter is undoubtedly staggering, and the periodic shifting of these flocks, sometimes in midseason, as well as from year to year, is probably the result of their need to relocate to areas where the abundance of food will be sufficient to sustain these great flocks throughout the winter.

Much of what is known about the habits, movements, and relative numbers of these offshore flocks is partly the result of detailed accounts in the shooting journals and publications of late 19th-century sportsman-naturalists like George Mackay, a Boston businessman and importer who also devoted much of his life to hunting sea ducks and shorebirds at Nantucket, but who later became a champion of their need for conservation and protection. An indication of the historic abundance of sea ducks in the vicinity of Nantucket may be gained from a quote by Mackay who said that while he was returning to Nantucket from a shooting trip to Muskeget Island on March 18, 1875, he saw a body of scoters that his party estimated to contain 25,000 birds. They were accompanied by about 12,000 eiders, forming the largest body of wild fowl that he had ever seen.

Although recent counts of this magnitude are seldom reported, Mass Audubon sea duck studies conducted in concert with monitoring efforts associated with the proposed offshore development of the Cape Wind project suggest that comparable numbers for some of these same species still occur at certain seasons and in certain areas in the remote shoal waters around Nantucket. Regardless of the precise numbers, the fact remains that Massachusetts today hosts one of the greatest wintering sea duck concentrations on the Atlantic Coast of North America.

No less astounding than the concentration of scoters and eiders frequenting the winter shoals off Nantucket is the number of long-tailed ducks that spend the winter in these same waters. Unlike the aforementioned sea ducks, many long-tailed ducks appear to subsist largely on amphipods while inhabiting Massachusetts waters. Mollusks spend their adult lives on the bottom, but certain species of amphipods occur in dense swarms in the water column much like their larger and more generally familiar relatives, shrimp. In areas on the Nantucket shoals, amphipods occur in myriad abundance, and it is



© JIM FENTON

Long-tailed duck

here that the animated and deep-diving long-tailed ducks pursue them throughout the winter.

Unlike scoters and eiders whose daily movements are largely determined by changing tides, long-tailed ducks actively commute from their feeding grounds on the shoals to the more sheltered waters of Nantucket Sound each night. Consequently, vast numbers of long-tailed ducks may regularly be observed trading back and forth each morning and afternoon between their offshore foraging areas on the shoals and their evening roosting areas in Nantucket Sound.

The magnitude of these movements, though often variable from day to day and season to season, is another one of the greatest avian spectacles in Massachusetts and one that can be appreciated by anyone willing to travel to Nantucket in the winter. Smith's Point is a particularly good vantage point from which to see these great long-tailed duck flocks as they twist and turn their way through the Muskeget Channel.

Largely due to the seabirds' inaccessibility in winter, it is difficult to ascertain with certainty whether the numbers comprising these great flocks have increased, decreased, or remained stable since the days of George Mackay, although results from Mass Audubon's *State of the Birds* report suggest that several species may actually be increasing. Regardless, one thing is unequivocal. For anyone seeking to conceive of what the extravagant numbers of flocking birds were like for our forebears, there is little question that the great winter sea duck concentrations off the Cape and Islands afford as close a look as we will ever again witness in Massachusetts.

Wayne Petersen is director of the Important Bird Areas program for Mass Audubon.

The Mystery of Flocks

How do they all stay together in flight and perform their aerial acrobatics?

by Thomas Conuel



© JIM FENTON

Snow geese on migration

In the skies of Ireland over the River Shannon, a murmuration of 2,700 starlings funnels through the air in a cloud of dark specks, twisting and turning in flight like a distant tornado about to touch down, and inspiring a much-watched online video.

In the autumn skies of New England on almost any day, gaggles of Canada geese plow through the air in tight V formations with an occasional straggler flapping behind.

Starlings and geese are two of the most noticed flocking birds as they move in differing but synchronous flight across the sky. We know why birds gather together in flocks. Basically, they flock for three reasons: feeding, travel, and defense. A single bird is an easier target for a winged predator such as a merlin, which finds it difficult to pick a target out of a moving flock. Flocks of many species migrate together and also perform daily back-and-forth movements from feeding grounds to nightly communal roosts—crows, starlings, and blackbirds come immediately to mind.

And the safety in numbers defense theory governs not only flocks of birds but all sorts of other creatures that travel in herds, swarms, and packs. But how do they manage to stay together and fly in unison while performing breathtaking maneuvers at high speeds?

Physicists have puzzled over the synchronized movements of flocking starlings, pondering whether the birds are governed by forces beyond simple biological instinct; researchers have designed and scrutinized mathematical models analyzing flock dynamics that show how each bird's movement is influenced by its neighbors; and bird lovers have simply looked skyward in appreciation at the graceful undulating flocks in flight overhead. But the near-instantaneous movements of flocking birds reacting as one remains among the most mysterious sights in the natural world.

Many birds flock together in tight formations with an obvious leader, but others prefer flowing aerial assemblages with no discernible head. While following a leader, geese, pelicans, and some waterfowl form lines and Vs in the sky, thought to be an optimum formation for aerodynamic travel and leaving little mystery about their movements. Starlings, blackbirds, robins, and shorebirds eschew rigid formations and fly in great moving avian clouds involving hundreds if not thousands of birds at speeds near 40 miles per hour, rivers of birds flowing across the sky together. Their synchronic movements are difficult to explain.

Many animals integrate their motion; think of the

great herds of buffalo that once roamed the North American prairies, or the caribou that still herd together in astonishing numbers in the far north—not to mention herring running from the ocean to freshwater streams, or crows at twilight gathering to roost. The reason for this behavior is thought to be defensive—aimed at detecting and avoiding predators, and related to finding food with multiple eyes, ears, and noses being superior to one.

But here is where the mystery of flocks deepens. How do thousands of individual birds manage to stay together while executing intricate in-flight maneuvers? Why don't flocks simply fall apart and diminish into smaller groups as the flight moves through each day?

We know that flocking birds operate on the same predator-avoidance principle as schools of fish. If an individual spots a predator and begins a turn or other maneuver such as a dive to avoid the danger, the nearest neighbors in the flock follow and the movement quickly spreads through the entire flock. Some flocks, such as geese, have a leader that initiates movements, but other flocks are leaderless with any member able to start a swing or turn that the nearest other members will emulate, reorienting the flock on a new course.

In a gaggle of a couple dozen geese, it's easy for all the birds flying behind the leader to see and shadow movements. Three thousand starlings swooping, turning, and diving in near-perfect *S* formations is another matter. In a large flock, only a few birds would be in position to spot an approaching predator, yet the entire flock takes unified action. How do they all turn in the direction best suited for avoiding the predator?

Studies on schools of fish done in large open tanks with optimum viewing and photographic possibilities show that an individual fish reacts to a predator by initiating a turn that is then followed by its neighbors with the movement spreading through the school. When a member turns, others in the school of fish that are nearby will do the same.

And so it is with flocking birds that move in great masses without a leader—starlings compared with geese. There are a few ironclad principles for these great flocks. Each bird in the leaderless flock must move in the same direction as the others in the group, fly at the same speed as all the others, and avoid in-flight collisions with neighbors.

Scientists studying flocks have puzzled over this super-fast yet nearly instantaneous reaction of birds flying together that allows the birds to stay together and maneuver at high speed without crashing into each other.

Wayne Potts, a biologist at the University of Utah, studied dunlins on Puget Sound in the late 1970s. He filmed the birds and then analyzed, frame by frame, the movements of individuals within the flock. He discovered that a turn ripples through a flock much as a wave passes through fans at a sports stadium, only faster, around 15 milliseconds between birds except for the first bird to respond, which took 67 milliseconds. This wave spreads in seemingly fluid spontaneous motion until the entire flock is part of the movement. Birds far-

ther away from the initiation site see the approaching wave or movement and ready themselves to respond.

Potts called his observations the “chorus-line hypothesis of manoeuvre coordination,” pointing out that in a well-trained chorus line an individual dancer never waits for an immediate neighbor to move before beginning a leg kick—that would put the dancer hopelessly behind the others. Instead, the chorus line dancer watches several dancers down the line to judge when to begin a movement. Similarly, a dunlin flying in a flock watches several other birds around it, not just its nearest neighbors, for cues.

Spacing is important. Each individual in a flock occupies its own personal space and maintains a physical distance from all others—much like most good drivers operating at high speed on an interstate highway. In massive flocks of thousands of birds flying at high speeds, the space between individuals may be only a body length apart. On a crowded highway, the good driver watches not only the small spaces around his or her vehicle but also multiple vehicles ahead. If a car or truck seven or eight vehicles ahead swerves to the right to avoid a road hazard, vehicles following farther behind than just one car start to take avoidance action.

Potts and other researchers put to rest a variety of the theories, some going back many decades, that some sort of telepathy guides flocking birds, or that electromagnetic communication between individuals dictates the perfectly coordinated movements of the individuals in the flock.

Other researchers have come to similar conclusions. Charlotte Hemelrijk of the University of Groningen in the Netherlands found that flocks of starlings sometimes as dense as 30,000 birds could maneuver into various shapes—changing swiftly from elongated, bulbous, or hourglass-shaped flocks—by watching the neighboring seven birds and by flying at the same speed.

Flocking birds have also inspired computer models. One of the best known by Craig Reynolds in 1986 called “Boids” offers these fundamentals of flocking: separation (steer to avoid crowding local flockmates), alignment (steer toward the average heading of local flockmates), and cohesion (steer to move toward the average position of local flockmates). Flocking requires a bird to “react only to flockmates within a certain small neighborhood around itself.”

In Rome, flocks of starlings are a growing problem. The birds now winter in the Eternal City in such density that they darken the sky at evening as they return to roost. Those who have studied the flocking behavior of the starlings of Rome think that warmer temperatures in the winter are attracting more birds, which then gather in denser flocks, and in turn create a growing nuisance. But there is a positive side to this. The sight of so many birds flocking together, pirouetting above ancient buildings in a timeless avian ballet and swooping in formation over Rome at twilight, is said to be awesome.

Thomas Conuel is a field editor for Sanctuary magazine.

The Gantlet

The saga of the 19th-century war on shorebirds

by Chris Leahy

“A large-bore gun, say a 10, with the lightest shot, is the best weapon to use for the destruction of the [shorebird] family”— Parker Gillmore, in *Prairie and forest: a description of the game of North America, with personal adventures in their pursuit*, 1874

On September 11, 2011, an adult female whimbrel nicknamed Machi, bearing a green leg flag and a satellite transmitter, left the Virginia beach where she was first captured by researchers two years before. She took off on her customary southwest trajectory to the north coast of South America and flew straight into the teeth of Hurricane Maria. Like other birds that survive a hurricane’s buffeting or are forced to make a detour off their direct route, Machi headed for a landfall in the West Indies to catch her breath and feast on Antillean invertebrates before resuming her journey.

On the morning of September 12, she landed on tiny Montserrat, but perhaps realizing that good aquatic habitat is scarce to nonexistent on this volcanic rock, she immediately moved south 60 miles or so to Guadeloupe, an overseas department of France. There she attempted to land on the food-rich mudflats in a mangrove swamp and was shot and killed by hunters engaged in a traditional fall shorebird shoot.

A second wired whimbrel, Goshen, was killed in the same place later that morning.

Guadeloupe is not bound by the International Migratory Bird Treaty Act that protects shorebirds almost everywhere else in the Western Hemisphere and is the island home to as many as 3,000 well-to-do hunters who each fall kill uncounted thousands of these birds stopping to rest and feed in the island’s mangrove swamps.

To anyone familiar with the history of bird conservation in the Americas and the fate of our native shorebird populations in particular, Machi’s end eerily evokes one of the darkest chapters in the chronicle of European settlement in the United States, a shockingly brief period during the nineteenth century when vast tracts of forest, wetland, and virgin prairie were heedlessly destroyed and wildlife that had existed in an abundance unimaginable by today’s standard was slaughtered with maniacal abandon.

As we are reminded elsewhere

in this magazine, the passenger pigeon doubtless provides the ultimate paradigm for the wanton and absolute extirpation of a species at our hands: sky-darkening flocks that passed overhead for hours at a time reduced to mere millions within a few decades and then, rather quickly, to Martha, the last of her species, who died at the Cincinnati Zoo 100 years ago. But the decimation of the great shorebird flocks is at least as disturbing a memory since it involved many different species and was visited on a group of birds that with a couple of exceptions no American considers fair game today.

Two species of shorebirds especially deserve recognition in the same ranking as Martha and her kind as symbols of their fallen legions: the American goldenplover and Machi’s next of kin, the Eskimo curlew. They shared a number of characteristics that would prove to be their undoing as symbols of abundance.

Both originally occurred in prodigious numbers. In the journal of his Labrador expedition, John James Audubon could scarcely believe the locals’ descriptions of the fall curlew migration: “The Curlews are coming’... is as much of a saying here as that about the Wild Pigeons in Kentucky. The accounts given of these Curlews border on the miraculous, and I shall say nothing about them until I have tested the fishermen’s stories.”

But the stories are amply corroborated by numerous naturalists (and shooters). Of his own experience in Labrador in 1860, the young Alpheus Spring Packard, later a professor of zoology, wrote: “On the 10th of August...the Curlews appeared in great numbers. We saw one flock which may have been a mile long and nearly as broad; there must have been in that flock four or five thousand. The sum total of their notes sounded at times like the wind whistling through the ropes of a thousand-ton vessel....”

Audubon and others witnessed flocks of plovers estimated to contain millions. As with the pigeons, these huge populations, returning to be harvested year after year, made it seem impossible that their numbers could be meaningfully reduced.

Like many Arctic species, the curlew and the plover also shared a “personality trait” variously interpreted as innocence, empathy, or stupidity. The shooting journals repeatedly recount scenarios in which a dense flock remains stationary while its members fall dead



JOHN JAMES AUDUBON

Whimbrel

in repeated volleys or a flock flushed by the first deadly fusillade circles back into range as if to investigate the cause of the commotion.

A common technique among the gunners was to approach roosting flocks at night with lanterns; mesmerized by the light, the birds would passively allow their assailants to knock them dead with sticks or just pick them up and wring their necks without ever raising a general alarm. Most touching of all are instances when

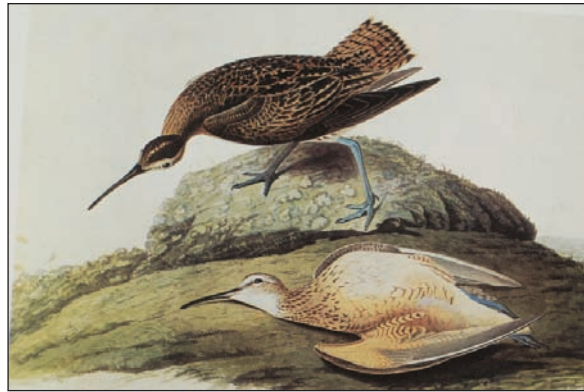
a curlew, having narrowly escaped death, returns to the side of a fallen bird (typically assumed to be a mate) and eyes it with what appears to be sympathy. Such a tableau is depicted by Audubon in his painting of an Eskimo curlew, a gambit that also allowed him to show both dorsal and ventral plumage details.

Though sport alone was deemed sufficient rationale for taking aim at wildlife (including big game such as bison no less than all forms of birdlife) during this era of careless exploitation, shorebirds—and especially the Eskimo curlew, golden-plover, and upland sandpiper—were esteemed for the succulence of their flesh. Some of the appeal of the Arctic species among epicures may have derived from the “curlew-berries” (aka black crowberries, *Empetrum nigrum*) on which these species gorged before heading south. Probably more important though was the thick layer of subcutaneous fat that the transoceanic migrants put on as fuel reserves for their long nonstop flights.

The curlews were known to the gunners as “doughbirds” because when downed birds hit the ground the skin of the breast would burst like the seams of a gourmand’s trousers, revealing the yellowish doughy mass of fat laid on for the journey. Upland sandpiper breasts were esteemed not only as “luscious morsels” but enjoyed an international reputation as an aphrodisiac—a fanciful attribute that has put many a creature on an endangered species list.

If one were to identify a single phenomenon encompassing the collective perils that brought the plover, curlew, and other shorebirds into the shadow of extinction after the middle of the 19th century, it would be what might be called the road map of their existence. Initially evolved as an arduous and dangerous, yet sustainable life cycle, it became a deadly gantlet when men with guns appeared along the route.

Simply to contemplate the scope of the great ellipse flown annually by our heroes on migration forces one to surrender any notions of avian fragility: about 18,000 miles round-trip for each from the high Arctic across the Atlantic Ocean and most of the South American continent to the Argentine pampas and Patagonia and then across two continents again by an inland route homeward bound to the tundra.



JOHN JAMES AUDUBON

Eskimo curlews

Oddly enough, the eight weeks the birds spent on their nesting grounds in the heathy barrens of the far North were the most “carefree” in the late 1800s. There were predators to be sure—foxes and jaegers and rough-legged hawks—but there is no evidence that the native Inuit wasted much time hunting such small game. By early August, however, the migratory imperative would pull the birds toward their fall staging areas.

Like most migrants that nest in the northern reaches of the continent, Arctic shorebirds don’t fly due south to their winter quarters but ride to the southeast on the prevailing northwest winds of autumn and then head south by a variety of routes.

In the days before the shooting began, the entire populations of Eskimo curlews and golden-plovers “staged” in eastern Canada, especially Newfoundland/Labrador, accounting for the “miraculous” flocks of which Audubon heard rumors. Here during August they gorged to bursting on seasonal berries and insects, awaiting the signals from internal clocks that it was time to cross the ocean. And here they got their first taste of birdshot, as the local fishermen killed them in thousands and salted them down in barrels as winter stores.

If weather conditions were ideal, the birds were programmed and fat enough to make a nonstop flight from the Canadian Maritimes to the northern coast of South America, a crossing of more than 3,000 miles. But then as now, this was hurricane season, and often the great flocks were caught in storms and forced to make land-fall. Very likely, numbers of birds perished in the fierce gales, a loss that evolution had built into the species’ demographics, ensuring their survival despite occasional losses. Yet, what awaited them on land, especially after 1870, was a new kind of catastrophe far more threatening to the birds’ long-term existence.

Thanks to the shooting journals of George Mackay—passionate sportsman, diligent naturalist, Boston Brahmin, and founding director of the Massachusetts Audubon Society—we have a vivid record of what was in store for the curlews and plovers on Nantucket and Cape Cod in his day after a severe September northeaster. In the “immense flight” of September 5, 1863, for example, the vast flocks were described in the stock phrase used for the passages of the wild pigeons: they “almost darkened the sun.” So good was the shooting on Nantucket that the gunners ran out of powder after 7,000 to 8,000 birds were bagged and had to send to the mainland for fresh supplies. Mackay notes that such great “fall outs” were rare and that in most years the birds tended to appear in dozens or hundreds rather than thousands. Still, the relentless pursuit of the sport that the journals record—“Saw five curlew, shot three” etc.—fall

uncomfortably on the modern ear.

Accounts of shorebird shooting in the Argentine where many of our shorebirds winter are scant. Some South American authorities allege that relatively few birds were killed on the wintering grounds in the 19th century because the human population was relatively thin and firearms and ammunition were not widely available. But such anecdotal accounts as do exist suggest otherwise, and anyone familiar with the cultures that colonized Argentina will not easily imagine voluminous flocks of tame and highly edible birds remaining unharvested. Even today restaurants in Buenos Aires and elsewhere bear the name *Batitú*, a favorite dish that translates as upland sandpiper and derives from the bird's three-syllable alarm note.

While the gantlet that curlews and plovers were forced to run between Newfoundland and Argentina was brutal and pitiless, it was genteel sport compared with what awaited the birds during their return flight along the back side of their great ellipse route, especially after they entered the corridor of plains and wetlands between the Mississippi River and the Rocky Mountains. Here they joined millions of other sandpipers and plovers at a final rest and feeding stop before making the last dash to the Arctic breeding grounds. They were met at every stop by artillery battalions.

One of the several accidents of misfortune that befell the shorebirds was the decline of the passenger pigeon as an inexhaustible resource. Following the Civil War, the market for wild game experienced a boom, so that in addition to idle sport there was now a significant profit motive in killing palatable birds and shipping them to the larger cities where they commanded good prices as delicacies in markets and restaurants. The advent of this commercial "market gunning" is widely acknowledged as the coup de grâce for the pigeon population. Upland sandpipers as well as Eskimo curlews and golden-plovers were then anointed as the next best thing and dubbed "prairie pigeons."

To put the matter in perspective, the commercial gunners at least treated their quarry as a valuable commodity and endeavored to get their product to market without undue wastage. They had only contempt for the likes of the provincial grandees who filled wagons to overflowing with birds and, if there were still birds to shoot, dumped the wagons and filled them again, leaving the carcasses to rot on the plains.

The only virtue that can be salvaged from such atrocities is that they eventually awakened the specter of extinction and helped ignite America's first wildlife conservation movement. Though he continued to shoot the diminished supply of curlews and plovers that came his way and

JOHN JAMES AUDUBON



Upland sandpipers

always denied that eastern sportsmen bore any significant culpability in the birds' decline, George Mackay became an ardent supporter of restricted seasons and bag limits as well as federal laws and international treaties that eventually all but ended shorebird hunting. He especially abominated the grotesque scope of the Midwestern massacres. In his last report on the status of the golden-plover and Eskimo curlew to the American Ornithologists'

Union's Bird Protection Committee in 1898, he wrote: "It has been several years since any considerable numbers of these birds have landed on the Atlantic seaboard during August or September. I believe the danger line has been passed long since. Protection is generally the laggard in the race. Our Western Associates should look to this matter and endeavor to put a stop to such annihilation if possible."

In current summaries of the conservation status of the Eskimo curlew and golden-plover, one commonly reads that shooting was not the sole cause of the present diminished estates of these and other shorebird species, and a list of other factors from pesticides and habitat conversion to wind farms and climate change are offered as contributing to their decline and barriers to their recovery. But while there is some slight factual support for such assertions—especially as regards current ongoing threats to these beleaguered species—anyone who has studied the history of the war on birds in the 19th century must find it difficult to disagree with the ornithologist Arthur Cleveland Bent that "...there was only one cause, slaughter by human beings, slaughter in Labrador and New England in summer and fall, slaughter in South America in winter, and slaughter, worst of all, from Texas to Canada in the spring.... The gentle birds ran the gantlet all along the line and no one lifted a finger to protect them until it was too late."

As for recovery, there has been no recovery. Some of the most heavily persecuted species have managed to make modest population gains and can be seen in some dozens or even hundreds in a few favorable localities. The Western Hemisphere Shorebird Reserve Network considers the majority of our shorebirds to be either highly imperiled or of high concern. The whimbrel population that migrates through the Western Atlantic has lost 50 percent of its population since the 1990s, and the current population of the American golden-plover is a tragic vestige of its presettlement glory. The last verified Eskimo curlew was shot on Barbados in 1963. The immense clouds of migratory shorebirds that filled the skies as recently as 120 years ago are gone. No one will see their like again.

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Fate of the Flocks

*Populations of ducks, geese, and swans, while declining in general,
have also shown increases among certain species.*

by Gayle Goddard-Taylor

...he heard a wild cacophony, a rumble which seemed to move the earth yet came from the sky, and he rushed out to see descending toward his marsh a veritable cloud of huge birds, all of them crying in loud voices, 'Onk-or, onk-or!'...they flew past, arguing loudly, and then more came, and more, and more; they were so numerous he had no system of numbers to count them.

Chesapeake, James A. Michener

Michener's novel *Chesapeake* includes descriptions of a time when indigenous people along the Chesapeake Bay lived lightly on the land, taking geese and ducks when they arrived on their wintering grounds and collecting crabs after the birds departed. The spectacle of skies darkened by waterfowl during migration can only be imagined now. By the early 20th century, these vast flocks had been decimated. There were many reasons for this—but humankind's signature was written all over them.

Settlement by the Europeans and the resulting development in the New World gradually placed unsustainable pressures to bear on populations of birds that once seemed limitless. Unrestricted hunting of birds for food and feathers, or just for sport, shrinking wetlands, and degradation of habitat formed an unholy trinity that forced many species to the brink of extinction.

In the 18th and 19th centuries, market hunting—taking birds in enormous numbers for food and feather markets—made many a colonist a handsome living. One particularly efficient hunting method made use of a large-bore shotgun that could spray enough lead pellets to bring down as many as thirty birds with one shot.

With guns mounted in flat-bottomed boats, at night hunters could sneak up on sleeping flocks in the darkness and blast away.

"For a long time, people hunted whatever they wanted, as much as they wanted," says Joan Walsh, Mass Audubon's director of bird monitoring.

By the late 19th century, the slaughter began to evoke a visceral response in many individuals, including hunters themselves, and as a result a conservation ethic began to emerge. The Massachusetts Audubon Society was created during this period, born out of outrage over the feather trade. By 1918, the Migratory Bird Treaty Act was passed requiring a hunting license for such birds. Then, in 1934, the federal government passed the Migratory Bird Hunting Stamp Act, which mandated hunters to purchase a stamp as well as a license for hunting waterfowl. Revenues from stamp purchases funded the conservation of waterfowl habitat to the tune of 4.5 million acres. Further, other not-for-profit organizations sprang up, such as Ducks Unlimited in 1937, which espoused the ethic that hunting a species to the brink of extinction was not just unsustainable but also morally unacceptable. Founded when waterfowl numbers had dipped to unprecedented lows, Ducks Unlimited set out to save habitat for threatened wetland game birds. Seventy-five years later, Ducks Unlimited is the world's foremost private waterfowl and wetlands conservation organization.

Over the past century, most species of waterfowl along the eastern seaboard have been recovering—some gradually, others quickly—thanks, for the most part, to this shift in thinking.

"We've been studying populations of waterfowl throughout their breeding grounds since 1955, so we know more about them than any other bird group in North America," says John Coluccy, PhD, manager of conservation planning for the Ducks Unlimited Great Lakes/Atlantic regional offices.

Because of an abundance of rain on the breeding grounds for the past fourteen years, most species are responding favorably with growing populations, according to Coluccy. But not all. Among the species that are lagging are American black ducks, canvasbacks, northern pintails, and lesser scaup.



Atlantic brant feeding

Chesapeake and Delaware bays, a magnet for 3 million wintering waterfowl as recently as 50 years ago, now draws only 1 million. The reasons for the drop are no secret.

Kurt Dryoff, Ducks Unlimited manager of conservation programs for the Mid-Atlantic and Great Lakes, notes that over the past two centuries some 2.5 million acres of wetlands were lost to urban and industrial development and agricultural expansion in his 18-state region from Virginia north to Maine and west to Wisconsin and Illinois. Not surprisingly, this led to degraded water quality in the remaining wetlands because of nutrient and sediment loading.

“Chesapeake Bay has lost more than 90 percent of the bay grasses and subaquatic vegetation that ducks rely on heavily,” says Dryoff. “Also decreasing are oysters, blue crabs, and striped bass.”

One species whose low numbers have conservationists baffled is the American black duck, whose numbers have declined by two-thirds over the past 50 years. Less tolerant of human presence than other species, the American black duck is harder to study and therefore less understood than its cousins. Once found as far west as Wisconsin and Minnesota, it is primarily confined today to the Atlantic Flyway, a major migratory route, and its population hovers between 600,000 and 800,000 breeding pairs.

Black ducks breed in salt marshes along the New England coast and up into eastern Canada, as well as in interior freshwater ponds. It is believed that they spend their winters anywhere from Long Island to Chesapeake and Delaware bays.

Mass Audubon’s Joan Walsh has studied this reclusive bird on its breeding grounds and is also puzzled as to why it is not thriving. Fairly widespread throughout Massachusetts in the 1970s, the American black duck is now confined to the Cape Cod coast and scattered ponds in Worcester County. The updated Massachusetts Breeding Bird Atlas indicates that the species has declined on its breeding grounds here by 56 percent—one of the highest rates of decline of any species.

“You’d think with all of the beaver activity, especially in Worcester County, the black duck would have a bonanza, but it hasn’t helped,” says Walsh, referring to the increased number of ponds created by beaver dams.

Numbers are also falling for lesser and greater scaup, canvasbacks, and northern pintails, the latter a rare breeder in Massachusetts. Considered the icon of Chesapeake Bay, the canvasback was once so numerous that people used to quip that “the bay was white with them,” according to Coluccy. The total population now hovers around 500,000.

Canvasbacks and northern pintails migrate across flyways to breed in the Prairie Pothole grasslands of the Midwestern United States and Canada. Because of its importance to so many species of breeding and migrating waterfowl, this region has been dubbed the Duck Factory.

But these lands continue to be churned into agricultural fields, abetted by new technology that has allowed

clearances for corn and soy in areas previously deemed unsuitable. It’s a development that has Ducks Unlimited scrambling to protect as much of the prairies as it can.

Although studies are also being conducted on the carrying capacity—the amount and quality of food resources needed to support a population of waterfowl—of Chesapeake and Delaware bays, the breeding grounds remain the most critical component in the life cycles of all waterfowl. What happens during migration, things the birds face in late fall and winter such as hunting—they’re all minor compared with what happens on the breeding grounds, according to Craig LeSchack, Ducks Unlimited director in the region that stretches from the lower Chesapeake to Florida.

The grasslands have become the group’s highest priority, and, in tandem with other nonprofits and Fish and Wildlife agencies in both the US and Canada, Ducks Unlimited has devised a mosaic of conservation strategies. One offers farmers the option of a conservation easement, which would allow animals to graze on the land. While about 900 landowners remain interested in easements, funds to purchase them are limited.

Another approach gaining traction is varying the kinds of crops planted. The northern pintail’s preference for nesting in the previous year’s crop stubble puts it squarely in the path of the plow at the start of the growing season. Many farmers are now planting winter wheat in the fall, which is harvested after the young have fledged.

Declines in lesser and greater scaup, which breed in the boreal forests of Alaska and Canada, may be linked to global warming. “Some think changing temperatures are causing their food sources to hatch earlier than when the birds arrive to nest,” says LeSchack.

For the most part, ducks have claimed the spotlight with regard to population declines. But for a while, certain goose species had their dark moments. The Atlantic brant, a sea goose that winters from Long Island to the Chesapeake, breeds in the Arctic tundra. Studied since the 1970s, when it was at a low of 50,000 breeding pairs, this small goose today has climbed to about 175,000 pairs. Reduced eelgrass beds, representing a major food source, are thought to have played a role when the population ebbed.

Snow geese, found nationwide in winter and in far northern tundra during breeding season, also endured a severe decline but have rebounded. Like other geese, snow geese are herbivores, but unlike the others they wrench grass up by the roots when they’re feeding, causing extensive damage on both breeding and wintering grounds.

And like Canada geese, snow geese have adapted well to scavenging on corn and seeds in the Prairie Pothole fields. Those that have fed in these fields arrive on their breeding grounds plumper than those that haven’t dined on crop waste. In fact, researchers believe this adaptation has contributed greatly to a snow goose population explosion.

The Canada goose, a handsome but locally disparaged species, congregates in great numbers on golf courses, in agricultural fields, and anyplace where there are large open areas with ponds. Coyote decoys, herding dogs, and



Snow geese in Bosque del Apache National Wildlife Refuge

even hunting have failed to dent their numbers. But this giant seemingly permanent fixture on the landscape is only one of multiple subspecies. At one time, the Canada goose was believed to have been market hunted out of existence along the eastern seaboard. To restore opportunities for hunters, geese were brought in from the Midwest, their wings clipped, to remain year-round and raise young that were imprinted to do likewise.

“The giant Canada goose has really become...I hate to use the word...a nuisance,” says former U.S. Fish and Wildlife Service biologist and New England Ducks Unlimited director of Conservation Programs Ray Whittemore.

Mostly found in nonhunting areas, this subspecies nests with great success in the absence of natural predators that might provide some kind of check. They are easily confused with the migratory Atlantic Canada goose, which breeds farther north and, up until a decade ago, was counted in with the giant subspecies. More recently, hunting seasons on the giant Canada goose were set to skirt the spring and fall migration periods of the Atlantic species. Even so, the numbers of the giant Canada goose continue to mushroom.

The trumpeter swan, the only native swan once thought to have wintered in New England, was nearly hunted to extinction for its large feathers, which made the best quill pens. Breeding in Alaska and western Canada, the trumpeter no longer winters in the East. The swan familiar to New Englanders today

is the mute swan, an introduced species.

The tundra swan, another North American native, nests in the far north but migrates much farther south to winter. In fact, 80 percent of the species’ population winters in eastern North Carolina, particularly in the Mattamuskeet and Pocosin Lakes national wildlife refuges. Once a cause for concern, tundra swan populations are increasing—again beneficiaries of prairie agriculture.

Although waterfowl populations, with a few exceptions, are doing relatively well, Ducks Unlimited’s John Coluccy is hopeful they’ll improve. Various private and public partnerships on seabed and wetlands restoration are helping, as are Farm Bill appropriations that encourage the conversion of eroding crop fields to grass, and thirty-year wetland easements. But Coluccy sees the need for much broader measures.

“Sweeping policy changes have to take place to make people responsible for actions that change water quality, not just in the Chesapeake but up and down the eastern seaboard,” says Coluccy.

Mounting pressures and new threats to waterfowl populations notwithstanding, at least nowadays individuals and organizations are concerned, and many species are doing well. But the epic populations of migrating waterfowl that once darkened the skies of the continent are gone forever.

Gayle Goddard-Taylor is a field editor for Sanctuary magazine.

Rivers of Birds

Notes on the dynamic beauty of blackbird flocks

by Joe Choiniere

On a promising morning one October, a violet dawn resolved its opaque mists into thousands of purplish blackbirds. This visual spectacle was faintly discernable from the hilltop at Wachusett Meadow Wildlife Sanctuary, looking eastward across a stream to a lush green fall meadow, now darkened by the birds. The distant murmur of this aggregation of living beings, even at an eight-mile distance, had a musical quality, akin to that of radio music with the volume turned very low. I moved toward the site, circling around to the north on woodland trails, and then proceeded downhill above the congregation. Below me the south meadow was completely covered by an enormous flock of common grackles.

Millions of refractive feathers flashed colors of an odd rainbow; oil-on-the-water shades of bronze, copper, and ultramarine, along with that indescribable grackle vio-

let. Truly this was a sea of birds, reflecting light the way the surface of ocean water might: surprisingly sparkling. This reverie of color was broken abruptly by a question: How many birds are there?

The birds appeared to be equally spaced, occupying every square yard of the six-acre field, so at least an estimate seemed possible—I could determine how many birds in a small space, how many of those small spaces it took to fill the field, and do the math.

The meadow held roughly 250,000 square feet of land; the birds, staying just out of range of each other's beaks, conservatively owned five square feet apiece. That meant 50,000 grackles were afoot on this scene! I began a more exact count (bird records look more reliable if you report 49,671 rather than 50,000 I have been told). But my calculations were again interrupted by a question: What are the birds doing here?

Red-winged blackbirds



© JIM FENTON

I supposed that the birds were ground feeding. Unlike an American robin's calculated beak thrusts, the technique of these birds was clearly more random. Whatever the grackles pecked at in the short grass was apparently there in such an abundance that any and every peck procured an edible bite. It was impossible to see what the edible bites were, however, and, instead of analyzing things, I was suddenly struck by the sheer beauty of abundance. I was reminded that far fewer of such natural spectacles exist anywhere, anymore. Was this the biggest flock of birds I had ever seen, bigger than a flock of shorebirds at the Bay of Fundy in August, for example?

But there were to be no more reveries that day, whether blurry or crystal clear. The grackles abruptly rose, lifting off in a great widening conical mass, a Black Watch tartan pattern tablecloth of purple and bronze wings, pulled upward magicianlike from the meadow table by a single pinch point. The flock formed an aerial chain, which took fully two minutes to disappear southward over a wetland. The avian fabric blocked the sun briefly—only long enough for me to realize the brightness it left in both sky and meadow in its wake. Such a clatter was this liftoff that I examined the field immediately, expecting the chaos to have resulted in dead or maimed birds. There were no casualties, not even a feather left behind, and no evidence of what food may have attracted the colossal convocation. Alone, in the now-brightening dawn, with not even a feather, I was left to wonder and speculate: When, how, and why do grackles flock?

One hears and reads about huge blackbird flocks—these mixings include the larger common grackles along with red-winged blackbirds, European starlings, and brown-headed cowbirds. Winter congregations in the Great Dismal Swamp have been estimated at 25 million mixed blackbirds even in recent years. These winter gatherings break up and move north in late winter, arriving at our bird feeders as mixed flocks of mostly male birds. One might find up to a hundred near household feeder stations or drive to the river valleys and see perhaps thousands in the spring congregations. Spring blackbird maxima as reported in *Birds of Massachusetts* can reach ten thousand.

These birds' activities and interests will soon involve territory and nesting, so flocks dissipate and diffuse into the habitat. Autumn will find them together again, adults and juveniles of the year, in gatherings a couple of powers of ten greater than spring, grown now into hundreds of thousands. Flocks have been estimated as a million for some Massachusetts autumn roosts. These birds will move southward by late fall and congregate in even greater numbers in the southeastern US in places such as the



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Red-winged blackbird

aforementioned Great Dismal Swamp.

During a three-week period in October 1991, I observed the largest congregations of common grackles of my lifetime in numerous flyovers. At that time, every autumn large flocks of grackles moved overhead and easterly for a few weeks, sometimes alighting in the sanctuary's 85-acre wetland. Once named Wachusett Meadow and the source of the sanctuary's name, this open wet meadow in the late 18th century had succeeded to a forested red maple swamp by the early 1900s. Then it morphed to a beaver pond by the early 1990s, and currently it's an open cattail marsh. In the 1980s the red maple wetland was replete with summer nesting common grackles and red-winged blackbirds, which burgeoned when beavers moved in then declined as the waters of the marsh deepened.

It was the size of these aerial grackle flocks that grabbed my attention in the years before the huge flight described in the beginning paragraphs. According to my journal, one large overflight in October of 1990 contained "14,000 grackles by organized estimate".... I calculated this by counting the number of birds flying each second past a notebook edge held overhead in such a way as to equal the width of the bird stream, coupled with the number of seconds for the flock stream to pass overhead. There is no third dimension to such a calculation; as with stars in the night sky one sees a flat image, devoid of the depth of the flock.

There is an extravagant quality in a mile-long bird flock stream moving across part of the sky for four and a half minutes. But this is nothing. Imagine observing a passenger pigeon flock requiring fourteen hours to pass overhead, an estimated 300 miles of birds, including perhaps a billion of these forest doves. Such extremes are common in the writings of ornithologists and naturalists who experienced what was probably once the most abundant bird in North America. So large were these flocks that even at drastically reduced yet incredible numbers in the millions by the late 1800s, the populations were already unsustainable, some scientists believe, the theory being that something about their astronomical density perpetuated their existence. Soon these huge flocks crashed and left the passenger pigeon as an icon for "I-can't-believe-it-happened" extinction.

Whether flocking is essential for survival, as a seasonal or year-round part of many bird species' life histories, bird groups need to assemble before they can stay together. Mixed flocks often have nucleus species, the common grackle being reported as the blackbirds' leader. I believe, for example, that black-capped chickadees are the leaders of winter flocks, seemingly able to assemble other species at a moment's notice. Flocks of



© DEBBIE STAHRE

Flocking blackbirds

fall warblers often seem to form around yellow-rumped warblers. But do small groups join together into larger groups, or do birds join in individually? How do they hear, see, or otherwise notice a flock forming?

I suspect that, as with drops of water moving with gravity—spawning and building into freshets, streams, and rivers—some invisible attraction joins flocking birds into forever larger flocks by whatever means works.

One thing noticeable about common grackle flocks: while they retain flock cohesiveness and fly in a reasonable formation, they don't show off the advanced synchronized maneuvering that even small flocks of European starlings demonstrate. Starling flocks, sometimes known as murmurations, have an ability to move en masse like a silk handkerchief tumbling through the air, swirling, expanding, and contracting in three dimensions. This herring-school-style behavior is the most striking of flock phenomena and hence has been widely studied. Especially interesting is what allows the birds to move together as a single organism.

The “Boids” computer program developed by Craig Reynolds in 1986 simulated bird flocking by assigning digital entities with specific parameters to produce video-game-style “digital flocks” with an ability to fly in formation, seemingly proving that geometric parameters of “separation, cohesion, and alignment” were all that was needed to control the flock. Of course, the Boids, or real birds in real flocks, needed to be able to measure both the distance and the relative angle to their nearest neighbors in the flock in three dimensions. But to fly in flocks like starlings, expanding and contracting the flock midflight in rapid succession, one set of distances and angles won't work.

In 2007, a group of scientists posed the idea that the

number of adjacent neighbors to any bird in a flock—seven to be exact—was responsible for collective behavior of starlings, not a set of distances as earlier models postulated. The scientists discovered that “each bird interacts on average with a fixed number of neighbors (six to seven), rather than with all neighbors within a fixed metric distance.”

However they do it, the question remains: Why do they do it? Even casual birders will propose that birds flock for protection, to find food, and to save energy in flight. These are all reasonable solutions but as often happens not easy to prove empirically. Flocks, herds, and schools of animals attract predators in their numbers, although the average chance of being the unlucky herring or zebra may be almost negligible—safety in numbers. And a murmuration can startle and confuse a flying predator with its magical appearance and disappearance, crescendo and diminuendo. If food exists in scattered local foci of huge abundance, it may be better utilized by a flock, more birds surviving as a group than would as individuals. Certainly, mixed bird flocks can take advantage of a diverse environment such as a forest and locate a resource more easily with multiple eyes.

Flocks are phenomena of nature—natural experiences that we sometimes forget are as much a part of biodiversity as species and their habitats. But quite apart from the science of such matters, I am ever attracted to ephemeral marvels such as river whirlpools, disparate weather, and bird flocks—these things cannot be completely understood. How do you truly translate the meaning of a violet October dawn painted with a vast flock of blackbirds?

Joe Choiniere is property manager at Wachusett Meadow and Broad Meadow Brook wildlife sanctuaries.

Flight to Oblivion

*Nobody ever believed that one of the most populous species
on earth could be driven to extinction.*

by Michael J. Caduto

“The wild antelope and the prairie chicken are on the point of following the wild bison and the passenger pigeon into memory.”

— President Theodore Roosevelt, 1912

To an eye that has never seen a flock of migrating passenger pigeons so vast that it obscures the sun, an interruption of light on an otherwise clear day is just a cloud floating by. Eventually, as the memory of an extinct species fades with each passing generation, we reach a point that no one is aware that there is something of wonder and beauty missing from our lives. We don't grieve for what we never knew.

With their unparalleled abundance and awe-inspiring breadth of sky-wide flocks, passenger pigeons are the archetype of extinction—an unseen vision that haunts the imaginations of countless lovers of birds and all of things wild. But how many contemporary birders, hiking a trail through a beech forest, can accurately envision branches filled with a raucous throng of thousands upon thousands of passenger pigeons? Such images can only be conjured vicariously through historical firsthand accounts.

Sadly, even the journals of our earliest explorers foreshadowed what was to come. In *An Account of Two Voyages to New-England, Made During the Years 1638, 1663*, John Josselyn observes, “I have seen a flight of Pidgeons in the spring, and at Michaelmas, when they return back to the Southward, for four or five miles, that to my thinking had neither beginning nor ending, length nor breadth, and so thick that I could see no Sun, they join Nest to Nest, and Tree by Tree by their Nests many miles together in Pine-Trees. I have bought at Boston a dozen Pidgeons ready pull'd and garbided for three pence. But of late they are much diminished, the English taking them in Nets.”

The Passenger Pigeon, W. B. Merston's 1907 anthology of firsthand testimonies, brings to light the natural history, abundance, decline, and disappearance of this alluring species. These elegant birds—with their black beaks, scarlet eyes, and plumage that ranged from slate blue to hues of gold, green, and crimson—captivated the minds and moved the hearts of 19th-century birdwatchers.

During the autumn of 1813, John James Audubon wrote about traveling through the barrens near Hardinsburg, Kentucky. “The air was literally filled with Pigeons; the light of noon-day was obscured as by an eclipse; the dung fell in spots, not unlike melting flakes of snow; and the con-



JOHN JAMES AUDUBON

Passenger pigeon

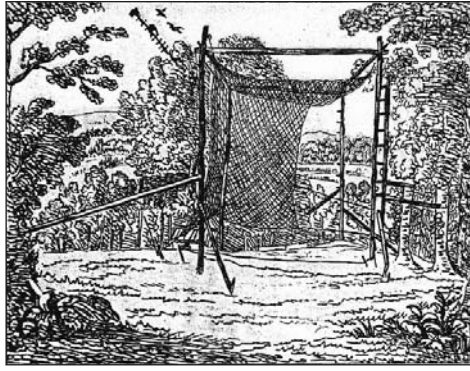
tinued buzz of wings had a tendency to lull my senses to repose.... Before sunset I reached Louisville, distant from Hardensburgh fifty-five miles. The Pigeons were still passing in undiminished numbers, and continued to do so for three days in succession.”

A single roost in Kentucky measured several miles wide and forty miles long. Each day a flock would fly out from its roost, venturing sixty to eighty miles to feed in large stands of beech trees. Passenger pigeons ate mostly beechnuts, but they also consumed acorns, American chestnuts, wild rice, corn, buckwheat, hackberries, huckleberries, holly berries, and more.

There were as many as 100 nests per tree in a typical roost, each containing only one egg or occasionally two. Pigeon guano built up several inches deep, preventing plants from growing in the understory for years thereafter.

Witnessing daybreak at one such roost sight, Audubon wrote: “The howling of the wolves now reached our ears, and the foxes, the lynx, the cougars, bears, racoons, opossums, and polecats, were seen sneaking off the spot, whilst

A net for catching passenger pigeons



Passing clouds of passenger pigeons

the eagles and hawks of different species, supported by the hoard of buzzards and carrion-crows, came to supplant them, and reap the benefit of this night of destruction.”

Human predators wielded imaginative tools of annihilation and were relentless in the killing. In one region of Michigan, 3 million birds were killed in a single year using guns, nets, axes, and fire. Pigeon calls induced the birds to roost, where they were killed with clubs, poles, sulphur pots, and pine-knot torches. Live birds, called “stool pigeons,” were tied down as decoys that lured passing flocks to the ground where they were captured under sprung nets in groups of 300 to 500 at a time. Trees were strategically felled so that they brought to the ground as many other trees as possible, along with countless nests and young birds. Trappers caught up to 2,500 birds a day, selling them for 40 cents a dozen.

One voice that rose up against the annual binge of slaughter was Simon Pokagon of the Pokagon Band of the Pottawatomie Indians. In May of 1880, he described how passenger pigeons were killed while roosting in white birches along the Platte River in Benzie County, Michigan. “Here, for the first time, I saw with shame and pity a new mode for robbing these birds’ nests, which I look upon as being devilish. These outlaws to all moral sense would touch a lighted match to the bark of the trees at the base, when with a flash—more like an explosion—the blast would reach every limb of the tree, and while the affrighted young birds would leap simultaneously to the ground, the parent birds, with plumage scorched, would rise high in air amid flame and smoke. I noticed that many of these squabs were so fat and clumsy they would burst open on striking the ground. Several thousands were obtained during the day by this cruel process.”

Eventually, the seemingly infinite multitudes of passenger pigeons succumbed to this relentless pressure. By the late 1800s, the species was nearing extinction. In October of 1896, their numbers were so diminished that when someone saw a “small nesting” near the headwaters of the Au Sable River in Michigan it was a newsworthy discovery. Birds were still being seen in the Upper Peninsula of Michigan in 1897, as well as in Missouri, Wisconsin, and

Nebraska. Then in 1900, it was reported that the last wild passenger pigeon was shot. In April 1906, however, Charles W. Benton—a birdwatching friend of naturalist John Burroughs—saw a half-mile-long flock of several thousand passenger pigeons winging over Prattsville, New York. Other birdwatchers also saw them in that part of New York during the same spring.

Then, on May 18, 1907, President Theodore Roosevelt, an avid and accomplished birdwatcher and hunter who knew

the species well, saw some passenger pigeons near Charlottesville, Virginia. “There were about a dozen,” he wrote, “unmistakable with their pointed tails and brown-red breasts, flying in characteristically tight formation to and fro before alighting on a tall, dead pine.”

The last of its kind, a captive passenger pigeon named Martha, died at the Cincinnati Zoo on September 1, 1914.

A friend of mine from the Abenaki nation says: “If you don’t remember

where you’ve been, then you don’t know where you’re going.” To allow the recollections of species long past to fade from our collective memory risks repeating over and over again.

As a nation of diverse cultures and spiritual traditions, we memorialize presidents, civil rights leaders, laborers, and war veterans with national holidays. In our spiritual traditions, we mark all manner of religious occasions regarding prophets, saints, feasts, and festivals.

Yet we have no formal occasion to remember even a single extinct species. Perhaps the time has come to establish a new national holiday, such as All Species Day, to honor the plants and animals that we have driven to extinction and recall—with events in scientific and artistic realms—the diversity and ecological value they once brought to the world. With a day of remembrance of this sort, we might better appreciate the value of the species that remain and take care that they will be around for generations to come.

Michael J. Caduto is coauthor of the Keepers of the Earth series. His website is www.p-e-a-c-e.net.

Perhaps the time has come to establish a new national holiday, such as All Species Day, to honor the plants and animals that we have driven to extinction and recall...the diversity and ecological value they once brought to the world.

Project Passenger Pigeon

*Remembering the loss of the passenger pigeon to inspire
conservation of currently common birds*

by Ann Prince



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Once numbering in the billions, the passenger pigeon has become a symbol for extinction.

Only a century after the sunlit morning sky could darken like nightfall as it filled with passing flocks of millions of passenger pigeons, the last one died on September 1, 1914—a tragic end for a species whose numbers seemed inexhaustible. Now nearly another century has passed, and all that remains is a reminder that even the most ubiquitous species are not exempt from extinction. This reality is even more heartrending considering that the irreversible fate of this iconic bird came about at the hands of humanity.

Spanish-American poet-philosopher George Santayana's famous quotation, "Those who cannot remember the past are condemned to repeat it," is a germane warning. To make certain that we remember, in 2014 an organization known as Project Passenger Pigeon is commemorating the 100th anniversary of the last individual of this avian species taking its final breath. The foremost goal of this nationwide ini-

tiative is to increase awareness of the precarious state of extant species and to ensure that people cherish and save those animals with which we still share the planet.

According to primary organizer Joel Greenberg, we don't have to accept our pattern of driving other species to oblivion as inevitable. "I see this as an opportunity to share the passenger pigeon's story," he says. "It's important to emphasize its relevance in the 21st century and beyond."

Mass Audubon plans to join with other environmental groups, universities, zoos, and historical societies throughout the passenger pigeon's former range in North America to expose the problems species face in an age when humans have an unprecedented impact on ecosystems and wildlife. "Project Passenger Pigeon will bring to the table individuals with a wide range of expertise to recognize this extinction in some meaningful way," says Mass Audubon Director of the Important



While the passenger pigeon, Ectopistes migratorius, vanished a century ago, it's not too late to parlay wildlife protection to honor its legacy.

Areas Program Wayne Petersen. “The passenger pigeon serves as a bellwether for other seemingly abundant species that could face future problems for anthropogenic reasons.”

In January, Petersen and Mass Audubon Chief Scientist/Director of Bird Conservation Kimberly Peters attended the first Project Passenger Pigeon meeting in the Northeast, hosted by Harvard University’s Museum of Comparative Zoology and attended by representatives from other partner institutions including Yale University, Cornell University, Plimoth Plantation, the EcoTarium, and Connecticut Audubon. “The centenary of the passenger pigeon’s extinction provides a portal through which we can highlight the connection all of us have to the natural world,” says Greenberg, “and the power we each have to influence the world for good.”

Through an interdisciplinary approach, scientists and conservationists, educators and historians, musicians and artists will present the concept that human activity impacts wildlife and then motivate people to promote biodiversity and work to prevent future extinctions. “A lot of people haven’t even heard of a passenger pigeon,” says Mass Audubon’s Kimberly Peters. “First we need to help them to envision the sheer numbers in these flocks.”

Cornell University professor and sculptor Todd McGrain provides a description: “Let’s imagine a flock that’s a mile wide and 200 miles long, and it’s working its way up the prairie, and the front birds are coming up to glean from the field, and the next birds land in front of them, and the next in front, and imagine this crashing wave working its way up the continent.” McGrain, through his Last Bird Project, has created five-foot sculptures of extinct birds and has placed each work of art in the place that the species was last seen. He’s installed a heath hen on Martha’s Vineyard and a passenger pigeon by the Scioto River outside Columbus, Ohio.

In the early 1800s, before the passenger pigeon population crashed as result of rampant wasteful shooting, American composer Anthony Phillip Heinrich wrote several symphonies devoted to the bird. Professor and conductor

Neely Bruce of Wesleyan University plans orchestral performances of Heinrich’s eight-movement symphony, *The Migration of the Passenger Pigeon*, as one of the highlights of the yearlong project. Also, Harvard’s Museum of Comparative Zoology is planning an exhibition related to the passenger pigeon, as are other institutions throughout the country.

Kimberly Peters believes that the nationwide effort will inform the public that “human-induced extinction is very real and can happen very quickly.”

“Let’s make sure people realize that our common birds won’t necessarily always be common,” says Peters. “Some are giving signals that they are really in trouble.” Mass Audubon’s recently published *State of the Birds* shows this trend in several species. “Birds that we see all the time such as red-winged blackbirds, blue jays, and white-throated sparrows may be disappearing before our own eyes,” she says.

“Let’s not let this happen again—we need to make a huge investment in preserving biodiversity,” says Wayne Petersen. “We have to take care of these common birds before they reach the tipping point, while they’re still abundant. With our legacy of bird conservation, Mass Audubon can be front and center.”

Ann Prince is associate editor of Sanctuary.

A Shower for Baby Blues

by Ann Prince



© LARRY TREADWELL

Great blue heron nestlings with adult

Since the 1970s, confirmed breeding locations for great blue herons in the state have increased twenty-five-fold, according to Mass Audubon's Breeding Bird Atlases 1 and 2. The population explosion of this winsome wader whose giant nests are built in tall trees of flooded landscapes can be attributed in part to beavers, which have also multiplied in the state. The more beavers, the more dams, the more wetlands where great blue herons can establish nesting colonies.

Arcadia Wildlife Sanctuary in Easthampton has been the home in recent years to a "locally famous and much-loved" great blue heron rookery. In 1998, the first year the great blues arrived, there were three nests and six fledglings. Fifteen years later, the sanctuary's extensive silver maple floodplain forest, adjacent to the oxbow of the Connecticut River, hosts over fifty active nests. According to Arcadia Education Registrar Chuck Horn, the pairs start the nesting season in late March. They begin with their breeding rituals and, once the eggs are laid, share in the incubation and guarding of eggs.

While great blues form rookeries with their own kind, not associating with mixed colonies that combine sever-

al heron and egret species, they don't mind a pair of raptors converging on their breeding territory. These avian colony crashers are harmless and for the most part disregarded by the herons. Chuck Horn points out that this is the case at Arcadia, where for several years now one great horned owl pair has repossessed a nest in a tree in the midst of the colony to brood and raise their owlets. In addition, a bald eagle pair has been adding to one of the existing nests, quadrupling its size. Apparently, the pair is the next nonconformist couple to set up housekeeping in the floodplain. Perhaps the bald eagles are not perceived as benign as the owls since the herons occupy nests in trees farthest from the eagle pair first, according to Arcadia Education Coordinator Patti Steinman, who leads walks to view the rookery.

The great blue herons' blue-green eggs hatch just shy of a month after they are laid. While nests contain an average of four eggs, typically two or three of the chicks survive. The broods are comical-looking creatures only a mother (and father) could love. For two months, the dotting parents tend their chicks as the young gradually become more independent and finally learn about life outside the nest. For another month, the fledglings return at night; but then they leave the nest for good and disperse until the southward migration in September.

In April, Mass Audubon held its annual Great Blue Heron Baby Shower in anticipation of the hatch date and the arrival of the chicks. Arcadia Visitor Services Coordinator Emma Evans says that the celebration was held at a beautiful hall in a nearby park, and included cocktails and a delicious dinner at a local Connecticut Valley restaurant, as well as an entertaining and educational presentation. This year's program featured Mass Audubon Director of Bird Monitoring and Coordinator of Breeding Bird Atlas 2 Joan Walsh, whose lecture, entitled *The World in an Egg: Herons*, Arcadia, and the State of the Birds, focused on the tremendous resurgence of the great blue heron at the sanctuary and throughout the Commonwealth.

Proceeds from ticket sales fund protecting critical habitat for great blue herons and other wildlife species at the Connecticut Valley Sanctuaries. For more information about Arcadia's great blue heron rookery or the annual event email: arcadia@massaudubon.org.

Poetry

Edited by Wally Swist

April 7, 2011

by Emily Grosholz

A cool, gray, bitter spring day
Chases me out to the farmroads,
Where some sweet racket arrests me
By a brake of leafless trees
Shielding the wrecked cornfields.

Look: a flock of migrant robins,
Their warm chests puffed out
Against the sharpening wind, as if
The trees were full of apricots,
And apricots could sing and fly away.

Emily Grosholz teaches philosophy at Pennsylvania State University. She has been an advisory editor for The Hudson Review for over 25 years and has published five books of poetry.



© E. F. BROLEY

Procession

by Brad Davis

An unbroken line, more a river
of starlings passed over the library
courtyard, my fresh coffee going cold,

and just as it seemed the last
pilgrim had straggled by, another wave,
hundreds, no thousands more cleared

the treetops, streaming into view,
their chatter ecstatic—for twenty minutes
running—wave after wave after wave.

A bad day would make of them a figure
for how dismal never seems to quit:
word after word of shootings, suicides,

the heart's upwelling—felt as never ending—
of raunch, revenge, temptations to silence
conscience, do whatever damn well pleases.

But they are birds, not emblems.
They did not arise from my dismal heart.
They do not regard me as significant,

even less themselves. Their regard reserved
for the ineffable amen moving in each
that moves them all to join the long flight south.

Brad Davis works at Hill-Stead Museum as a literary editor and Pomfret School as a counselor. He has taught creative writing at Pomfret School, College of the Holy Cross, and Eastern Connecticut State University. His most recent publication is a chapbook: SELF PORTRAIT w/ DISPOSABLE CAMERA.

Sustaining Nature's Green Infrastructure

by Jennifer Ryan and Heidi Ricci



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Landing in a Beaver Pond—Black Ducks

Even though we average 45 inches per year of rain here in Massachusetts, rivers such as the Ipswich regularly run dry. Contributing reasons are many, but they can be broken down into one simple equation: we withdraw water faster than it can be naturally replenished. We pump too much for home use such as watering lawns, especially in the summer when streams and groundwater are lower naturally. And we cover the land with pavement and buildings, directing runoff quickly toward the ocean rather than letting it soak back into the ground.

There have been lawsuits and legislation filed concerning water use, but finally in late 2009 environmental groups, protesting actions made by the Patrick Administration, walked out of negotiations on how to define an environmentally safe amount of water that a

water supplier can pump. In response, the Administration convened the Sustainable Water Management Initiative, bringing together water suppliers, Mass Audubon and other conservation groups, academics, and others to map out the best way forward to ensure a water policy that can meet both the needs of wildlife and people. This Sustainable Water Management Initiative is now winding down after two years of meetings and tense negotiations.

The state has developed a framework for classifying rivers and streams into five categories based on scientific analysis on the effects of water withdrawals on river fish. More than 20 percent of streams in Massachusetts are seriously or severely impacted in terms of their ability to support fish that depend on flowing water. This classification system is helpful in

identifying which streams need to have more of their natural flow restored. However, as of this writing, the state still has failed to propose an appropriate upper limit for safe yield—the amount of water that can be withdrawn throughout the year while still maintaining fish and other life in a river. Mass Audubon continues to advocate for a better approach on this crucial issue.

In 2010, the Massachusetts legislature, recognizing our failing water infrastructure, established a Water Infrastructure Finance Commission to “develop a comprehensive, long-range water infrastructure finance plan for the commonwealth and municipalities.” Senator Jamie Eldridge (D-Acton) and Representative Carolyn Dykema (D-Holliston) chaired the commission. The commission report details environmental and economic challenges and how our old infrastructure constrains both environmental health and economic growth. Findings include the fact that water and sewer pipes in older cities date back to the early 1800s and many treatment plants built in the 1970s are outdated.

All this is of course bad for the environment and constrains economic development. Environmental compliance costs are going up as water resources are more polluted and standards become stricter; and there are new requirements on redundant systems to ensure continuous supply of water. The report estimates that there is a nearly \$40 billion gap between water infrastructure needs over the next twenty years and available funding. The commission recommended improvements in planning and financing to bridge this gap.

Fortunately, along with new legislation, there are steps

that can be taken to reduce impacts to our rivers and streams while also reducing the financial costs of water infrastructure. Examples include capturing clean roof runoff and reusing it for irrigation and other purposes; filtering stormwater through rain gardens and other plants and returning it into the ground; and landscaping in ways that are more friendly to wildlife while requiring less water consumption. Increasing the efficiency of water use in both the home and businesses also reduces the amount of water to be pumped, protecting rivers from excessive withdrawal. Efficiency allows existing supplies to meet the needs of economic growth without the expense of building new wells. And water that is not flushed or directed into storm drains reduces costs of sewer and stormwater management. Removing obsolete dams and replacing undersized culverts helps restore fish populations while reducing costs of infrastructure maintenance. The more we rely on the natural “green infrastructure” of our forested landscape and use precious water more carefully, the better the environmental and fiscal health of our communities across the state.

To find out more about Mass Audubon advocacy work on water and other conservation initiatives, sign up for the Beacon Hill Weekly Roundup by emailing action@massaudubon.org. For more information on Green Infrastructure, see www.massaudubon.org/shapingthefuture/toolkit.php.

Jennifer Ryan is Mass Audubon’s legislative director. Heidi Ricci is Mass Audubon’s senior policy analyst.



*Private Passions:
The Art of Collecting*

Through September 16

Mass Audubon Visual Arts Center
963 Washington St, Canton
Tuesday-Sunday—1-5 p.m.



© RENE LAUBACH

Common redpoll

Get Ready for Fall

FEEDER SALE

**Double discount
for Members!
on feeders
and accessories**

August 4-19

The Audubon Shop
Open Tuesday through Sunday
from 10 a.m.-5 p.m.
781-259-2214

We’re located at Drumlin Farm Wildlife Sanctuary.

Birding Programs

BERKSHIRE SANCTUARIES

Lenox, 413-637-0320

Canoe Meadows Bird Walks

September 7, 14, 21, 28—
8-10 a.m.

BLUE HILLS

Milton, 617-333-0690

Hawk Migration Watch at Chickatawbut Hill

September 15, 16—
10 a.m.-3 p.m.
Rain dates: September 29, 30—
10 a.m.-3 p.m.

BOSTON NATURE CENTER

Mattapan, 617-983-8500

Fall Bird Walk

October 20—8-10 a.m.

BROAD MEADOW BROOK

Worcester, 508-753-6087

Friday Morning Birds

Every Friday, August 31-
October 26—7-9:30 a.m.

Migration of the

Common Nighthawk

August 22—6-8 p.m.

BROADMOOR

South Natick, 508-655-2296

Hawk Watch at Pack

Monadnock
September 8, 15—10 a.m.-3p.m.

CONNECTICUT RIVER

VALLEY

Easthampton, 413-584-3009

Nighthawks at Park

Hill Orchard

August 25—6:30-8:30 p.m.

IPSWICH RIVER

Topsfield, 978-887-9264

Warm-Water Seabirds of

Stellwagen Bank

August 10—8 a.m.-1:30 p.m.

Migrating Shorebirds at

Plum Island

August 12—6:30-10:30 a.m.

Birdwatcher's Getaway for the

Day Series

Once a month from September
through December.

JOPPA FLATS

Newburyport, 978-462-9998

Wednesday-Morning Birding

Every Wednesday (except in
July)—9:30 a.m.-12:30 p.m.

WACHUSETT MEADOW

Princeton, 978-464-2712

Hawk Watching from

Brown Hill

September 16—12:30-3:30 p.m.

WELLFLEET BAY

South Wellfleet, 508-349-2615

Coastal Field Ornithology

Field School

August 23-26

Birding Trips to Chatham

Barrier Island

Weekly tours in July, August,
and September

Call the individual sanctuaries
for more information, fees, and
to register.



Family Programs

BERKSHIRE SANCTUARIES

Lenox, 413-637-0320

Insect Safari

July 20, August 17—10 a.m.-noon

Twilight World of Bats

July 27—7-8:30 p.m.

August 10—6:30-8 p.m.

Evening at the Beaver Ponds

August 8—6:30-8 p.m.

September 5—6-7:30 p.m.

BLUE HILLS

Milton, 617-333-0690

Fall Festival Celebration

October 6, 7, 8—10 a.m.-4:30 p.m.

BOSTON NATURE CENTER

Mattapan, 617-983-8500

Tree Detectives

November 3—2-3:30 p.m.

BROAD MEADOW BROOK

Worcester, 508-753-6087

Barbara J. Walker Butterfly Festival

August 11—10 a.m.-4 p.m.

Third-Week Wonders Preschool Story Hours

Once a month on Wednesdays, Thursdays,
and Saturdays—10-11 a.m.

Dream Big at Burncoat Pond!

August 7—10:30 a.m.-12:30 p.m.

BROADMOOR

South Natick, 508-655-2296

Ice Cream and Bats

July 31—7:30-9 p.m.

DRUMLIN FARM

Lincoln, 781-259-2206

Friday Evening Hayride

August 10—4-5:30 p.m., or 6-7:30 p.m.

FELIX NECK

Edgartown, 508-627-4850

Marine Discovery Cruise

Tuesdays through August 28—
5:30-7:30 p.m.

For adults and children ages 4 and up

HABITAT

Belmont, 617-489-5050

Ice Cream and Insects

August 1—6-7:30 p.m.

MOOSE HILL

Sharon, 781-784-5691

Carve a Pumpkin

October 25—1-8:30 p.m.

SOUTH SHORE

Marshfield, 781-837-9400

Once in a Blue Moon

August 1—7-8:30 p.m.

August 31—6:30-8 p.m.

For families with children ages 4 and up

WACHUSETT MEADOW

Princeton, 978-464-2712

Whale Watch/Pelagic Bird Trip

August 5—all day

WELLFLEET BAY

South Wellfleet, 508-349-2615

Seashore Rambles

Monday through Friday
throughout the summer

Marine Life Cruises

Twice weekly on summer evenings

Call the individual sanctuaries for more
information, fees, and to register.

For a full listing of Mass Audubon programs and events, visit our online catalog at www.massaudubon.org/programs.



Mass Audubon Camps, Putting Smiles on Kids' Faces for over 60 years!

With 18 day camps from the
Berkshires to the Cape and Islands,
and



Mass Audubon's overnight camp
there's something for everyone.

www.massaudubon.org/camps

Mass Audubon Camps are accredited by the American Camp Association. The new Joppa Flats Day Camp and Urban Adventures Day Camp will be seeking accreditation for summer 2013.



FALL CELEBRATIONS

BOSTON NATURE CENTER

Mattapan, 617-983-8500

Rockin' with Raptors

September 29—1-4 p.m.

BROAD MEADOW BROOK

Worcester, 508-753-6087

Boo Meadow Brook

October 12, 13—6:30-8:30 p.m.

BROADMOOR

South Natick, 508-655-2296

Creepy Crawlies

October 28—1-2 p.m.

DRUMLIN FARM

Lincoln, 781-259-2206

Tales of the Night

October 25, 26—6:30-9 p.m.

IPSWICH RIVER

Topsfield, 978-887-9264

Halloween Happenings

October 26, 27

MOOSE HILL

Sharon, 781-784-5691

Halloween Prowl

October 26—6:15-8 p.m.

October 27—5:30-8 p.m.

October 28—5:30-7:30 p.m.

WACHUSETT MEADOW

Princeton, 978-464-2712

Hey Day

October 6—11 a.m.-4 p.m.

Rain date: October 7—11 a.m.-4 p.m.

WELLFLEET BAY

South Wellfleet, 508-349-2615

Discovery Day

October 20—10 a.m.-3 p.m.

Call the individual sanctuaries for more information, fees, and to register.

For a full listing of Mass Audubon programs and events, visit our online catalog at www.massaudubon.org/programs.



CANOE AND KAYAKING PROGRAMS

BERKSHIRE SANCTUARIES

Lenox, 413-637-0320

Goose Ponds Canoe Trips

July 29, September 15—8 a.m.-noon

Housatonic River Canoe Trips

August 4, September 2, October 13—8:30 a.m.-12:30 p.m.

Buckley Dunton Lake Canoe Trips

August 5, September 8, October 7—9 a.m.-noon

BROAD MEADOW BROOK

Worcester, 508-753-6087

Family Canoeing at Ekblaw Landing

July 22—1:30-3:30 p.m.

Family Canoeing on Rice City Pond

August 19—1:30-3:30 p.m.

Family Canoeing on the

Quinsigamond River

September 8—1:30-3:30 p.m.

BROADMOOR

South Natick, 508-655-2296

Fall Foliage Canoes

Weekends—September 29-October 21

CONNECTICUT RIVER VALLEY

Easthampton, 413-584-3009

Beaver Ecology Along the Mill River

August 24—6:30-8:30 p.m.

FELIX NECK

Edgartown, 508-627-4850

Shorebirds by Kayak

August 11—9:30-11:30 a.m.

IPSWICH RIVER

Topsfield, 978-887-9264

Paddle to Thacher Island

Kayak Trip for Adults

July 21—10 a.m.-4 p.m.

Family Dusk Paddles

Owls on the Ipswich River:

July 27—6-8 p.m.

Discovering Wetlands:

August 10—6-8 p.m.

WACHUSETT MEADOW

Princeton, 978-464-2712

Canoe Rentals on Wildlife Pond

Through October

WELLFLEET BAY

South Wellfleet, 508-349-2615


Coastal Ecology by Kayak Field School

August 15-18, September 13-16

Kayak Trips On Outer Cape

Weekly tours in July and August

Call the individual sanctuaries for more information, fees, and to register.




Calling All Shutterbugs!

Photo by Josh Brooks, taken at Wellfleet Bay Wildlife Sanctuary.
Winner of Best Wildlife Sanctuary photo, Under 18




Mass Audubon Photo Contest

Picture This:




Your Great Outdoors

We're seeking photographs of people in nature and those that highlight the beauty of Massachusetts wildlife and landscapes.

For complete rules, visit:
www.massaudubon.org/picturethis
 Deadline: September 30, 2012



Mass Audubon

Protecting the Nature of Massachusetts

MASS AUDUBON'S BIRDSEED DAY FUNDRAISER

Help support your local sanctuary's education and conservation programs with your purchase of birdseed.

Call for an order form and information about dates and times of sales.

BERKSHIRE SANCTUARIES

Lenox, 413-637-0320

Ordering deadline: October 17

Pickup: November 3—9 a.m.-1 p.m.

For more information:

berkshires@massaudubon.org

BROADMOOR

South Natick, 508-655-2296

Ordering deadline: October 18

Pickup: November 3—10 a.m.-4 p.m.

For more information:

broadmoor@massaudubon.org



Explore the world's most natural regions with Mass Audubon in 2012



© DAVID LARSON

Bosque del Apache, New Mexico.

INTERNATIONAL TOURS

New Zealand: October 28-November 14, 2012

Bird Banding in Belize: December 1-9, 2012

Colombia: February 10-20, 2013

Tigers and Birds of India: February 14-28, 2013

Trinidad: March 17-24 (optional extension to Tobago, March 24-27)

Botswana: March 11-21, 2013

US TOURS

Summer Owl Prowl Family Campout:

August 4-5—6 p.m.-9 a.m.

For more information, contact Ipswich River, 978-887-9264

Birding the Olympic Peninsula:

September 6-14, with David Larson

For more information, contact Joppa Flats, 978-462-9998

Monhegan Island Weekend: September 21-23

For more information, contact Ipswich River, 978-887-9264

Block Island Birding Weekend: September 28-30

For more information, contact Ipswich River, 978-887-9264, or South Shore Sanctuaries, 781-837-9400

Discover the Nature of Martha's Vineyard: October 12-14

For more information, contact Broadmoor, 508-655-2296, Habitat, 617-489-5050, or Felix Neck, 508-627-4850

Hawk Mountain Express Raptor Adventure:

October 13-16

For more information, contact Drumlin Farm, 781-259-2206

Birding the Mid-Atlantic Coast:

October 23-28, 2012, with René Laubach

For more information, contact Berkshire Sanctuaries, 413-637-0320, or email berkshires@massaudubon.org.

Birding the Delmarva Peninsula: November 29-December 2

For more information, contact Ipswich River, 978-887-9264, or South Shore Sanctuaries, 781-837-9400

For detailed itineraries:

www.massaudubon.org/travel

800-289-9504

Email: Travel@massaudubon.org

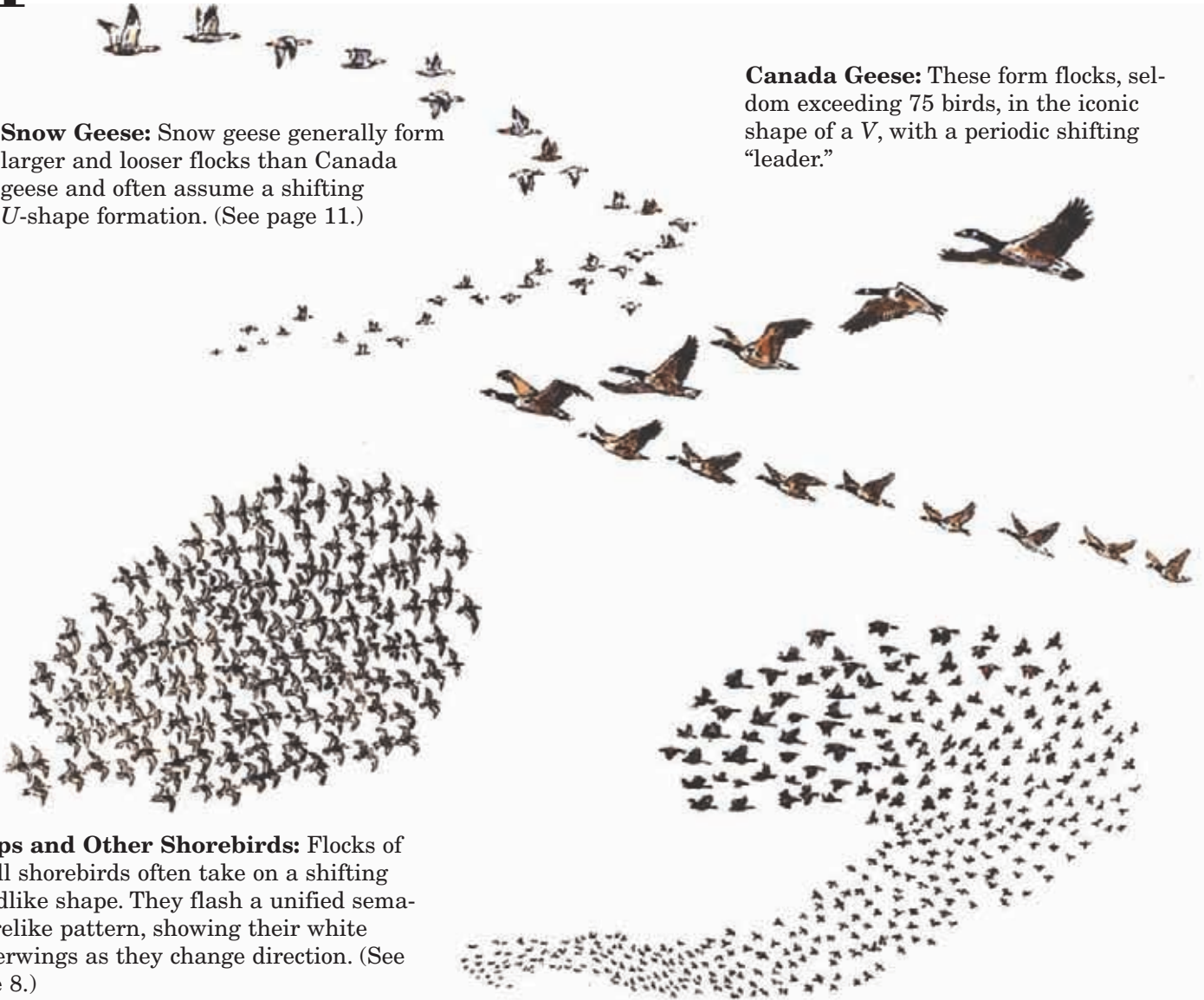
Birds by Their Flocks

Illustrated by Gordon Morrison

You don't necessarily have to see individual birds to identify them flying overhead. Various species assume distinctive flock formations on migration and also as they fly from place to place.

Snow Geese: Snow geese generally form larger and looser flocks than Canada geese and often assume a shifting U-shape formation. (See page 11.)

Canada Geese: These form flocks, seldom exceeding 75 birds, in the iconic shape of a V, with a periodic shifting "leader."



Peeps and Other Shorebirds: Flocks of small shorebirds often take on a shifting cloudlike shape. They flash a unified semaphorelike pattern, showing their white underwings as they change direction. (See page 8.)

Sea Ducks: The most commonly seen sea duck form is the long undulating line of eiders flying low over the horizon. Other sea duck species assume various loosely shaped formations. (See page 3.)

Blackbirds: Grackles, red-wings, and other blackbirds often travel in vast mixed flocks that, when seen from a clear vantage point, form long winding rivers in the sky. (See page 14.)



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Audubon Society
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Outdoor Almanac Summer 2012



July 2012

July 25 Shorebirds begin migrating. Watch for flocks along the coast.

July 27 Look for Indian pipes and beechdrops in forested areas.

August 2012



August 2 Full moon. The Thunder Moon.

August 5 Yellow warblers and northern waterthrushes begin moving south.

August 9 Black fruits appear on the curving stems of Solomon's seal.

August 14 Goldfinches are nesting at this time. Watch for them in gardens and field edges.

August 16 Sweet pepperbush blooms near lakes and ponds about this time; sniff the air for its spicy odor.

August 18 Woodland asters begin blooming.

August 23 Cardinal flower blooms along clean freshwater streams.

August 26 Watch for migrating nighthawks overhead at dusk.

August 29 Fall webworms begin to appear; look for their nests at the tips of tree branches.

August 31 Full moon. The second full moon in a month is known as the blue moon.

September 2012

September 6 This is the peak of the fall warbler migration; watch for them in backyard shrubbery and treetops.

September 10 Broad-winged and sharp-shinned hawks migrate about this time of year.

September 22 Autumnal equinox; days and nights are of equal length.



September 26 Look for ripening wild grapes along old stone walls. Wild cherries, elderberries, and dogwood berries are ripe. Watch the thickets for feeding migratory birds.



September 30 Full moon. The Corn Moon

October 2012



October 2 Green darner dragonflies migrate about this time. See them over sunny meadows.

October 5 First juncos arrive from the north.

October 6 Phoebes are still around.

October 9 Watch for squirrel middens on stumps and rocks.

October 14 Yellow crab spiders may be seen inside goldenrod flowers.

October 17 Look for daddy longlegs in meadows.

October 19 Watch for large flocks of blackbirds.

October 21 Yellow-rumped warblers migrate. Listen for their *check* call as they perch in small trees and shrubs.

October 23 Oaks are still holding their leaves.

October 26 Once the leaves are off the trees, look for oriole nests at the ends of willow and elm branches.

October 29 Full moon. The Hunter's Moon.

November 2012

November 4 Mushrooms are still coming up: look for the bright caps of yellow *Pholiota* growing on logs and vase-shaped clusters of oyster mushrooms on tree trunks.

November 12 Peak migration date for snow buntings.

