The Value of Marshes: An Essay on Kansas Wetlands

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American Bittern by Bob Gress, BirdsInFocus.com

Things Seen, Heard, and Felt.

On my memory Kansas wetlands have imprinted many experiences, resonant with life and significance. In memory, I can see today the still expanse of reeds and open water near the end of a clear summer's day, broken by the image of a single white egret winging its self-possessed stately way over the reflections of the declining sun's rose-golden rays on the unmoving water beneath its passage. In memory, I see the grotesque, strangely elegant shapes of a group of White-faced Ibis, birds straight out of Egyptian hieroglyphics from 5000 years ago, necks and long legs extended, silhouetted against the blue sky, descending into a pool in front of me, and, indifferent to us viewers fifteen yards away, earnestly pursuing their business, probing the mud with those sickle-like beaks, finding their sustenance in forms of life that teem in the rich matrix of water and decaying vegetation. I recall an American Bittern, stock-still among the cattails, the lines of the pattern of its throat echoing the verticals of its hiding-place, its eyes alone, on either side of its skyward-pointing beak, betraying its camouflaged presence with their glitter. In memory I call up a frigid, windy November morning, shivering in the duck blind, when suddenly the silence of the marsh was torn by the roaring rush of wings as a flock of divers buzzed the blind from behind and disappeared into the mists over the decoys. Instances of the constant movement and activity of the marsh replay in memory: The Piping Plover, tiny ball of fluff invisible in its pale dun plumage against the mudflat at Quivira until suddenly it scurries on rapid orange legs for ten or twelve feet like a mechanical toy, stops, and becomes invisible again against its sand-colored background; the sense of the teeming life of the marsh conveyed by the flocks of Sanderling, Least and Semipalmated and White-rumped Sandpipers, all moving among dowitchers, Greater and Lesser Yellowlegs, plovers, formally attired Black-necked Stilts with "bubblegum pink" legs, avocets elegant in black and white bodies and apricot-hued heads and necks, each individual intently pursuing its own foraging, each species employing its characteristic foraging activity—some probing the mud like a sewing machine, some swinging their beaks from side to side, stirring the water, the Wilson's Phalarope floating on the surface, spinning in circles like water-borne tops, creating little vortices that bring their prey to the surface. I recall the delight of discovering that Cliff Swallows, who make those wonderful jug-shaped nests of mud under bridges and eaves, when collecting the muck that is their building material from puddles on the edges of the roads along the dikes at the Bottoms, gather side by side filling their beaks with mud, all the while all of them with their wings held aloft over their backs, the whole mass of birds' wings quivering like the vibration of bees' wings moving in ritual dance over the surface of their honey-comb.

Beyond the impressions of the senses

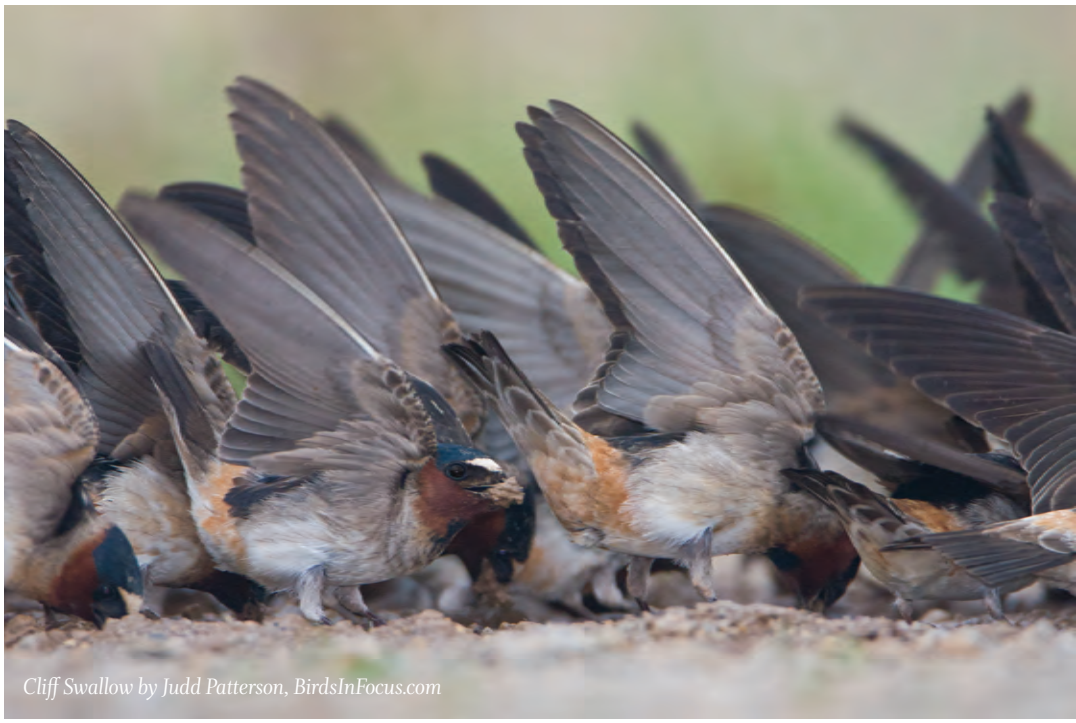
These sense impressions storm our consciousness with delight—at least they do if we bring to them a sense of openness and child-like wonder. If our gaze is clouded by considerations of immediate personal utility and a narrow calculation of "productivity" in the sense of agricultural production or mineral resources, those screens through which mankind has evaluated wetlands through much of our history, they are written off as "wastelands" or marked for drainage and "improvement." Between 1780 and 1980, we lost more than half the wetlands in the present United States to drainage, fill, or significant degradation.[1] But the strangeness and wonder of wetlands ought to engender, not dismissal or hostility, but curiosity, and

as curiosity is progressively satisfied through investigation and knowledge, engagement and appreciation.

Feeding the wonder with knowledge

As wonder leads to curiosity, we discover facts, and the facts and figures relating to the ecological communities of these wetlands stagger the imagination.

Cheyenne Bottoms has been a wetland intermittently since the interglacial period between the third and fourth glaciations during the Pleistocene era, 100,000 years ago. Out of a preserve area of approximately 41,000 acres, the central pool today may cover 3,300 acres, though in nine major floods in the ninety years after 1885, the marsh could become a lake covering 20,000 acres. On the other hand, in dry periods, even without the depletion by center-pivot irrigation of the Ogallala aquifer which indirectly fed the Bottoms, evapotranspiration alone could reduce the marsh to dry, cracking mud in as many as three out of five years. Elaborate canals, dikes, and control structures were constructed by the Kansas Forestry, Fish and Game Commission beginning in 1949 in an attempt to establish and retain sufficient water for the refuge, but about the time those control measures were completed, the new center-pivot irrigation systems reduced the aquifer and the flow in the Arkansas River. Although Cheyenne Bottoms' water right on the Arkansas River has not been restored by the Division of Water Resources, the outcome of the hearings did, in fact, restore the Bottoms' water right on the Wet Walnut Creek. And importantly, irrigators are maintaining profitability with reduced pumping from the aquifer. Heroic measures have been required to keep Cheyenne Bottoms and Quivira as viable refueling stops for migrating waterfowl and shorebirds and vital habitat for many of the 315 species of greatest conservation need living within Kansas. Most of the alternative wetland stopovers for migratory birds have disappeared. Of twelve large marshes, only three remain: Jamestown, Quivira, and Cheyenne Bottoms. And of some two thousand small playa lakes in the state, many not recognized as wetlands, too many have been degraded or disappeared. Just since 1950, the state has lost nearly 50 percent of its total wetlands.



Cliff Swallow by Judd Patterson, BirdsInFocus.com

Like the Bottoms, Quivira faces persistent challenges in maintaining adequate water resources for refuge purposes. In 1957, The USF&WS filed for a "senior" water right to divert 22,200 acre-feet of water from Rattlesnake Creek to maintain the refuge wetlands. In 1982, the Fish and Wildlife Service filed a Notice of Proof of completion of work for that water right, permit #7571. But in 1996, the Kansas Division of Water Resources certified a permit for only 14,632 acre-feet of water to be diverted from Rattlesnake Creek, on the grounds that the USF&WS had never diverted the entire 22,200 acre-feet during the period they had in which to demonstrate their need. The actual amount diverted is normally even less than the approved 14,632 acre-feet because sufficient quantities of water are often not available at the time the water is most needed for breeding bird populations and accommodating spring and fall migrants. That is the reason the USF&WS was unable to divert the originally approved 22,200 acre-feet during the proof period in the first place!

Quivira, which differs from the Bottoms in being a salt marsh ecological community, occupies 22,135 acres in Stafford, Rice, and Reno Counties. 48.6 percent of this area is herbaceous wetland (10,819 acres); 13.5 percent (3,005 acres) open water; 22.0 percent grassland (4,898 acres); and the remainder shrub -land, riparian areas and upland woodland. The Cheyenne Bottoms wetland comprises a similar diversity of ecosystems. The broad vista of cattails and open water that greets the viewer passing by the Bottoms on Kansas Highway 156 belies the actual diversity of plant and animal communities that comprise the marsh. John Zimmerman's *Cheyenne Bottoms: Wetland in Jeopardy*

distinguishes no fewer than six different "ecological communities" in the Bottoms: mixed-grass prairie and cropland in the uplands; the wheatgrass and saltgrass communities around the periphery of the basin; the surviving spikesedge community interspersed among the wheatgrass and saltgrass communities; the now-dominant cattail community replacing the formerly dominant spikesedge in water depths of two feet or less; the open-water/mudflat communities so attractive to shorebirds, avocets, and Snowy Plovers at times of low water, and to ducks, grebes, cormorants, pelicans, gulls, terns, herons, Ospreys, and Bald Eagles when flooded; and finally, as a result of the building of the dikes that in the early fifties created the refuge as we know it today, what Zimmerman calls "the dike community" of cottonwoods, green ash, sunflowers, and cockleburs.[2]

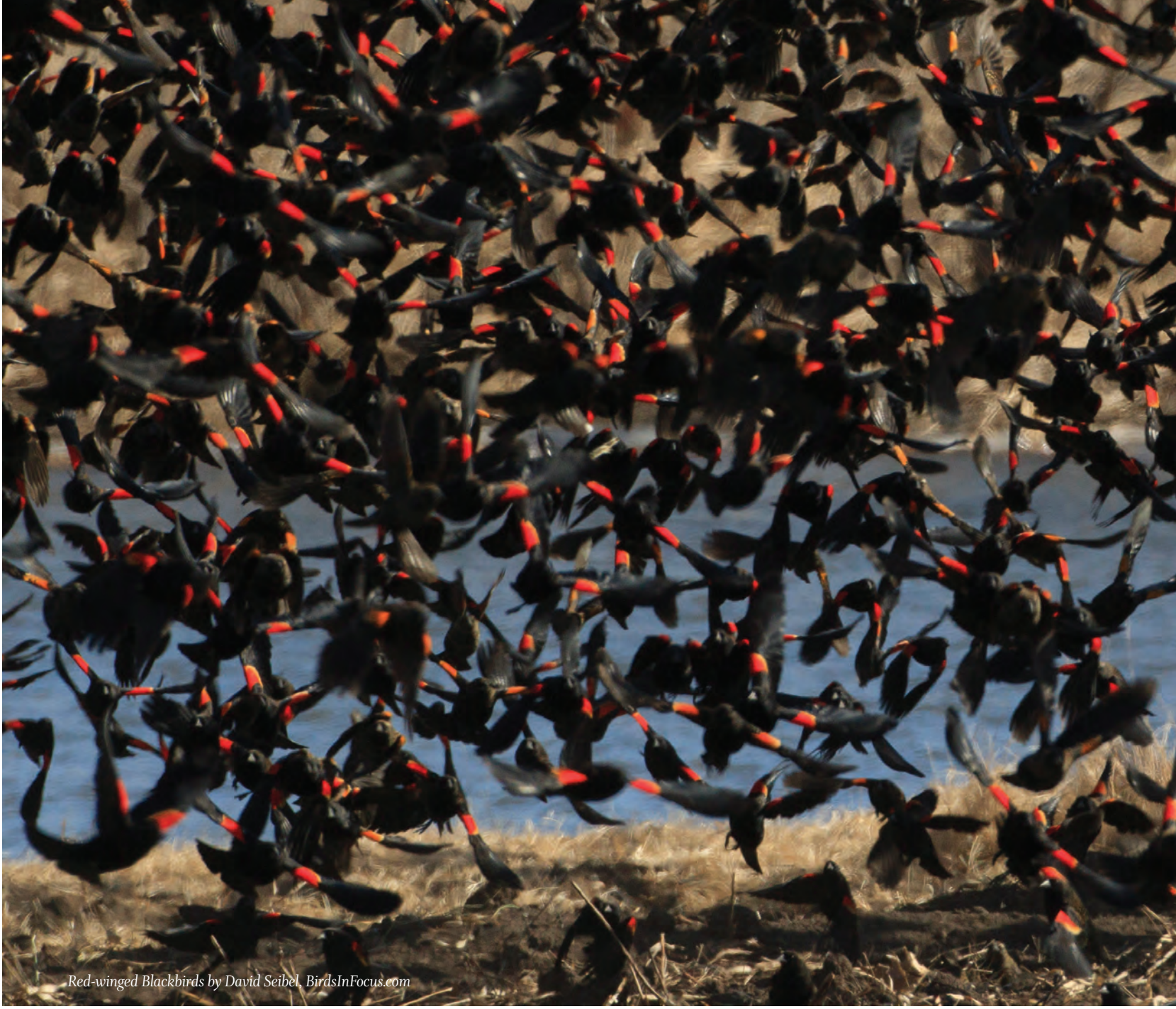
In the case of both marshes, the casual observer will not be aware of constant changes in habitat conditions over time that require trade-offs in the effects produced on different species and communities. Planners have to take into account, not merely local factors and trends and the declared purpose of the particular refuge, but also the native or non-native status of affected species, national or even international population and range distribution trends for a species, and availability of suitable habitat for the species outside the refuge boundaries.[3] Examples of recent additions to the bird communities include some birds that would be hard to miss today: though White-faced Ibis bred in the bulrushes at the Bottoms as early as 1951, large colonies of herons did not arrive until the increasing dominance of cattails over the bulrushes accommodated them in the early 1970s. It is only in the past fifty years that cattails have become the dominant feature in Cheyenne Bottoms (and often a nuisance, tending toward a monoculture), partly as a result of the invasion of the non-native eastern narrow-leaved cattail. Great-tailed Grackles are another relatively recent arrival, having extended their breeding range from central Texas to Kansas by 1969.

All the planning, continuing research, censuses of wildlife and plants, engineering measures, and expense of maintaining these two great marshes are more than justified by their importance, not just to a local ecosystem, or to regional birdwatchers and waterfowlers, but to entire populations of North American shorebirds and waterfowl. Cheyenne Bottoms is the largest marsh in the interior U.S., and the saltmarsh habitat of Quivira is a unique life-zone with its own specialized denizens.

More mind-boggling figures: Waterfowl banded at the Bottoms by local enthusiast Frank W. Robl in the decade after 1924 were recorded being recovered from as far away as California to the west, South Carolina's coast to the east, and Louisiana, Texas, Cuba, Mexico, and Honduras to the south. These were birds that nested from Alaska and the Mackenzie Valley through the prairie provinces and the potholes of the northern plains states. Tundra-nesting shorebirds that use Cheyenne Bottoms as staging area in their spring and fall migrations include Black-bellied Plover, Lesser Golden Plover, Semipalmated Plover, Hudsonian Godwit, Semipalmated Sandpiper, Western Sandpiper, Least Sandpiper, White-rumped Sandpiper, Baird's Sandpiper, Pectoral Sandpiper, Stilt Sandpiper, and Long-billed Dowitcher.

Through the efforts of another avocationist, Edmund Martinez, a total of 58,159 shorebirds representing 32 species were banded on the Bottoms from 1966 through 1978. Fifty percent were Semipalmated Sandpipers; recoveries ranged from the breeding grounds in Alaska to the wintering range in Brazil; the northernmost recoveries were a Long-billed Dowitcher and Pectoral Sandpiper from central Siberia, the southern-most a White-rumped Sandpiper from Argentina. These globe-trotting shorebirds traverse their thousand-mile journeys flying as high as 10,000 feet, and at speeds up to 50-80 kilometers an hour.

Martinez's efforts proved for professional ornithologists and conservationists the central importance of Cheyenne Bottoms in the hemispheric movement of shorebirds. In fact, the International Shorebird Survey (the Manomet Survey) from 1976 through 1983 documented Cheyenne Bottoms' central importance as one of only three major stopovers for shorebirds east of the Rockies (there were only five sites found west of the Rockies, and five in Central and South America). In the Great Plains, of 210 sites surveyed east of the 105th meridian in the Manomet Survey, no other site studied had as much as ten percent of the shorebirds censused in Cheyenne Bottoms. Indeed, an average of 45 percent of all shorebirds counted in the spring Manomet Survey were at the Bottoms. In their return journeys in the fall, 28 percent of shorebirds counted in 454 sites across the region were at the Bottoms. In the spring passage east of the 105th meridian, over 90 percent of all White-rumped, Baird's, and Stilt Sandpipers, Long-billed Dowitchers, and Wilson's Phalarope counted were recorded from Cheyenne Bottoms. Seventy-four percent of the Pectoral Sandpipers counted, 73 percent of the Marbled Godwits, and 59 percent of the Hudsonian Godwits used the Bottoms in the spring, and in the fall, when inexperienced first-year birds choose broader pathways south, numbers of Long-billed Dowitchers still topped 90 percent of the birds censused in the nation. The numbers of individuals of several species reported in the Manomet Surveys from single daily census records are equally staggering: 101, 500 White-rumped Sandpipers, 62,580 Baird's, 210,000



Red-winged Blackbirds by David Seibel, BirdsInFocus.com

Long-billed Dowitchers, 130,000 Wilson's Phalarope. Of the 31 species reported in the Manomet Survey, 20 were present at Cheyenne Bottoms in numbers that exceeded five percent of the total count for all sites. Brian Harrington has suggested that Cheyenne Bottoms may be the most important stopover area for northern shorebirds in the western hemisphere.[4] So the ecological importance of the site cannot be overstated: "The continued existence of shorebird populations, which number in the millions, may depend on a mere handful of geographic foci without which these birds will be unable to make the migratory journeys upon which their life cycles pivot." Yet "Cheyenne Bottoms may become permanently dry, its source of water entirely preempted by the need to maintain the forage-to-beef-to-packing-plant-to-fastfood hamburger commercial pathway."[5]

Population figures from Quivira are no less amazing: More than 300 species of birds are thought to use the refuge, including more than 30 species of shorebirds. "From 2009 to 2010, more than 11,000 ducks, 300,000 Canada Geese, 402,500 White-fronted Geese, and 425,000 Snow Geese were estimated to visit the refuge on independent, bi-monthly survey dates. . .

Three of the fourteen 2009-2010 surveys each reported more then 30,000 Sandhill Cranes. From 2002 to 2006, an annual average of more than 30,000 shorebirds were counted on Quivira Refuge during biweekly migration surveys" and "in 2010, biweekly data counted 55,491 shorebirds on the refuge during the migration periods surveyed." Highest recorded number of Whooping Cranes using the refuge and nearby areas in recent years is 91 in the spring and 112 in the fall—a substantial portion of the estimated population of 250 to 300 birds in the

winter of 2011-2012. Federally endangered birds with critical habitat on Quivira Refuge lands in addition to the Whooping Cranes include the interior Least Tern, whose fluctuating populations have included ten or more nesting pairs over the years, producing as many as 36 to 40 young raised to flight stage; on both Federal and State threatened species lists, the Piping Plover and the western Snowy Plover use critical habitat on Quivira Refuge. [6]

These great marshes appeal to all these birds, resident and migrating waterfowl and shorebirds alike, as well as all the resident passerines and their predators higher up the food chain, as places of rest and shelter, but especially as an over-flowing larder. The casual observer could scarcely miss seeing avocets and Great Egrets or White-faced Ibis; she would probably be much less taken with chironomids—midges and their larvae, bloodworms. Zimmerman reports single-sex swarms of as many as 20,000 to 40,000 midges, and provides a fascinating sketch of their life-histories. And there are 50 bloodworms per square inch in the exposed mud of the Bottoms—65,082 bloodworms per square meter, or 55,045 kilograms of dry weight mass, that is, 61 tons every month, March through November. These humble creatures so unimpressive to most of us are the cornerstone species in the complex web of life in the marsh, and represent a bonanza for the shorebirds. To fuel their migrations of a thousand or more miles, these long-distance travellers must cram fat levels at Quivira and the Bottoms. Taking population estimates of shorebirds during spring migration 1986, Wayne Hoffman used published measurements of flight metabolism and approximations of distances to be travelled to their specific breeding grounds to estimate that migrating shorebirds carried away almost 2800 kilograms of fat (three tons!) which would have required them to consume 165 tons of bloodworm protoplasm. Estimates for waterfowl are more difficult to arrive at, as their diets are more varied than that of shorebirds, and some of them feed away from the marsh for considerable amounts of time. But Hoffman calculated that the around 80,000 ducks and 15,000 geese present at peak fall migration in 1985 would have required a little over 1900 tons of seeds during their 90-day layover.[7] While shorebirds are taking from the marsh's plenitude tons of fat to fuel their flights, the abundant blackbirds that winter in the marsh derive most of their food from outside the marsh, and roosting in the cattails at night leave behind vast amounts of "exogenous nitrogenous fertilizer" in their wake. Hoffman estimated that the more than half a million blackbirds utilizing the cattails in the Bottoms as an ever-shifting roost site in February 1986 would have produced, during the winter of 1985-86, 54 to 108 tons of guano. In the mid 1970s, when the roost was even larger, guano production might have been twenty times greater.[8] The "musky smell, a smell of organic richness" noted by Zimmerman is the aroma of an intricate chain of relationships and dependencies, consumption, guano and decay, sustaining a network that leads up from the humblest bacteria in the muck through bloodworms and sandpipers, ducks and blackbirds, to the Peregrine Falcon and the Bald Eagle.

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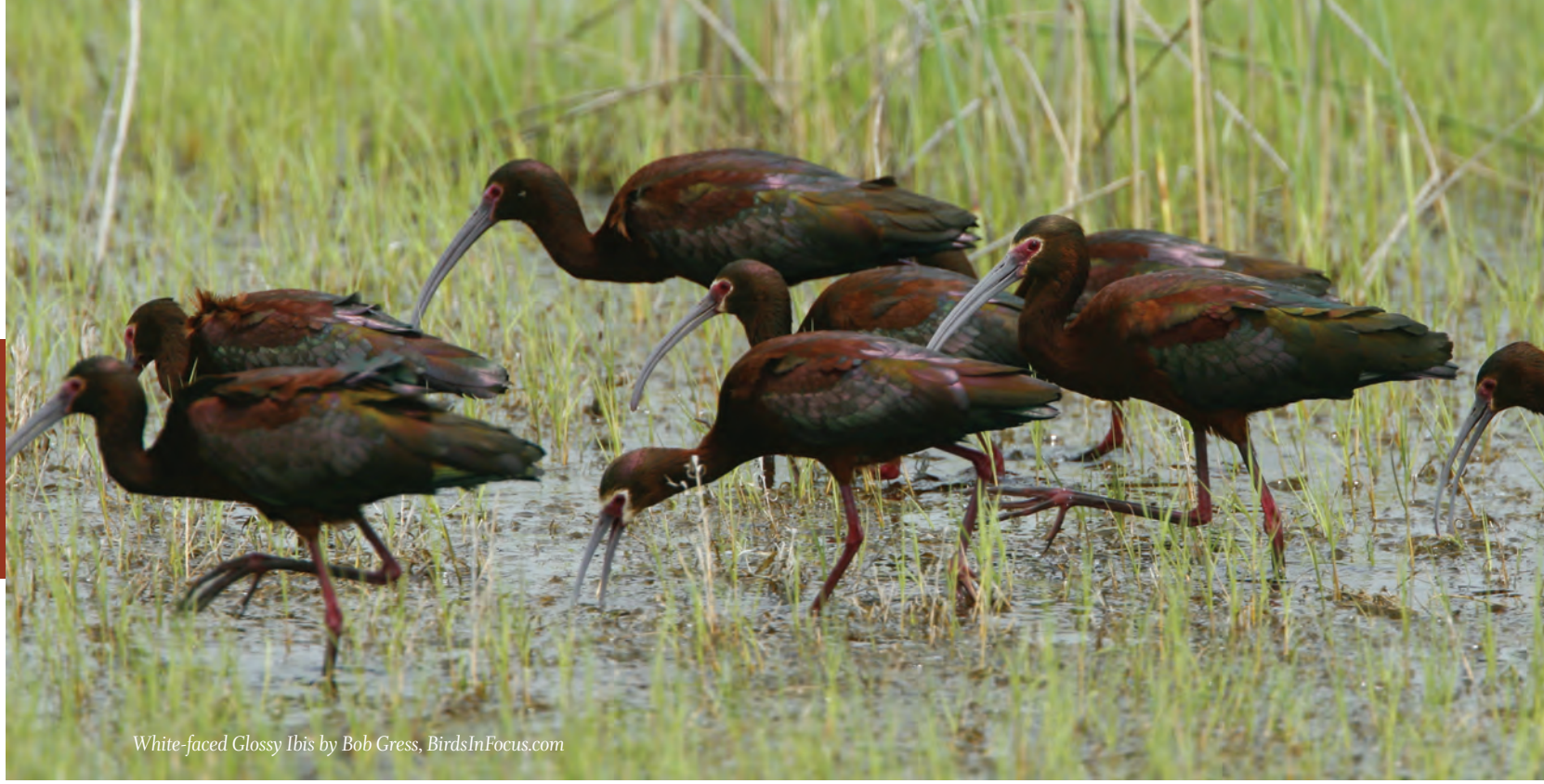
What the wetlands teach

Great reaches of water mirror the immense dome of the sky; marsh reeds and sedges roll in waves before the winds that bring the open water to life; synchronized flocks of birds—blackbirds, ducks, geese, cranes, sandpipers—rise and fall, swirl tightly in randomly choreographed patterns, or break up into smaller bunches or pairs to drop into the cover of the marsh vegetation, or to ride the water in huge rafts, seeking food or rest. Like the open prairie, like the sea out of sight of shore, the big marsh inspires consciousness of an immensity on a scale incommensurate with our normal comfortable, often unconscious relations to our surroundings. Our senses are awakened and heightened by the exhilarating Otherness of these places and the creatures that inhabit them.

The marsh teaches that there are other forms of life whose ways are not our ways, who share with us our most basic, fundamental biological needs and urges, but whose lives are circumscribed by their relations to food, to weather, to the seasons, to changes in their habitat, much more sharply and completely than we are normally conscious of being. How perfectly their lives and activities integrate into the ongoing pattern of life in their rich, but precariously balanced environment. Being in the midst of the great marsh at once braces, excites, and paradoxically calms with the apprehension of forms of life that proceed without us. As spectators, for a time we immerse ourselves and share in a grand order of things that transcends our daily round.

It would not be frivolous to compare Sunday morning in the great marsh to a visit to a great cathedral. In its appeal to apprehensions outside our preoccupation with mundane concerns, attending to Nature can have influences on our consciousness not unlike those offered by religion. Religion, among many salutary effects (to limit our reflections solely to the practical realms of moral and psychological influence), properly enforces upon us humility: a sense that there are much greater things in



White-faced Glossy Ibis by Bob Gress, BirdsInFocus.com

the world than our busy preoccupations to weigh; that the scale employed by the Universe is much grander than the inches and feet and miles, the ounces and pounds, dollars and cents of our usual calculations; that in all we see, hear and feel, there is not insignificance and chaos, but an over-arching order into which everything is integrated, serving its purpose, and contributing to the functioning and well-being of the whole; finally, that we are not nomads, but have a moral obligation to play a role, participating with others in contributing to the support of an order that is greater than our narrow personal ends.

What do we do with what we have experienced, and learned?

In this survey of facts and figures, I have not touched on the economic value of marshes and wetlands nationally, not only as contributing to the $150 billion added to the U.S. economy annually by the 101.6 million people who fish, hunt, or watch birds, but as filters that clean our waters by removing sediments and nitrogenous fertilizer pollutants, even supplementing or replacing municipal water treatment systems; as replenishers of ground water (the surviving wetlands, playas, and riverbeds of the region are the only sources recharging the Ogallala aquifer); and as barriers to flooding and storm damage. [9]

I want to concentrate instead on the non-utilitarian, or at least non-monetary, contributions of these wetlands. The marshes teach the complex interdependency of all creatures in the web of life, from bacteria and chironomids in the muck through the myriad thousands of shorebirds and waterfowl that visit twice a year. But the wetlands' history also testifies to the delicate balance of forces that maintain the wetlands as the indispensable basis for that web of life; to the vulnerability of communities eons old that we did not make, but which our thoughtless or short-sighted actions can erode, degrade, and undo in decades. Not only do we share the earth with these myriad others, our history has brought us to the point where we must take responsibility for stewardship of their lives and habitats, because our cumulative actions, greedy or careless, unintentional as well as intentional, can irrevocably tip that balance and rend that web of life. We must bend every effort, individually and as citizens, to assure that the great wetlands in the center of Kansas are preserved and maintained, so that our children and their children and children's children can see the great flocks of shorebirds, thirty or more different kinds, wheeling in unison over the mudflats or single-mindedly storing up from the mud energy to fuel their epic journeys across two continents; can hear the whinny of the Sora hidden in reeds, and the clatter of flocks of cranes leaving their roosting areas at dawn.

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1 "The Many Benefits of Wetlands Conservation," J. Dale James and Ellen R. Herbert, *Ducks Unlimited*, vol. 82, no. 6 (November/December 2018), p. 49.
2 John L. Zimmerman, *Cheyenne Bottoms: Wetland in Jeopardy* (University Press of Kansas, 1999), pp. 77-93. Zimmerman's book is an essential read for anyone interested in birds and conservation in general, and is beautifully written.
3 See *Comprehensive Conservation Plan, Quivira National Wildlife Refuge*, U.S. Fish & Wildlife Service, October 2013, p. 40
4 Harrington, B.A., and R. I. G. Morrison, 1979. "Semipalmated sandpiper migration in North America," in *Shorebirds in Marine Environments*, ed. F. A . Pitelka, *Studies in Avian Biology 2*: 83-100. Cooper Ornithological Society, Allen Press, Lawrence, KS.
5 Figures in the preceding three paragraphs come from Zimmerman, *Cheyenne Bottoms: Wetland in Jeopardy*, pp. 130-136, as does this final quotation.
6 Statistics from *Comprehensive Conservation Plan, Quivira National Wildlife Refuge*, U.S. Fish & Wildlife Service, October 2013, pp. 41-46.
7 Zimmerman, *op. cit*., p. 73.
8 *Ibid*., pp. 74-76.
9 See, for instance, James and Herbert, "The Many Benefits of Wetlands Conservation," pp. 50-52, Zimmerman, *Cheyenne Bottoms*, pp. 127-129, and USF&WS *Comprehensive Conservation Plan, Quivira National Wildlife Refuge*, pp. 59-61.