hawk flight. The second part of the book focuses on hawk watching sites, including U.S. hawk migration watch sites, Canadian hawk migration watch sites, Bald Eagle viewing areas, and places to view raptors outside the migration season.

The species accounts provide excellent identification information on new world vultures, ospreys, kites, hawks, eagles, harriers, caracaras and falcons. Each species is described in terms of wingspread, total length, field recognition features, flight style, voice, nest, eggs, maximum recorded longevity, food, habitat, and North American range. It makes for an excellent species summary, even if it lacks references to the bird's conservation status.

I found the chapter on mechanics of hawk flights particularly interesting. Although my general understanding of hawk migration was fairly good when I started reading this book, I had never looked into it in great detail. So I was fascinated to read about the influence of general weather conditions, and the use migrating raptors make of deflective updrafts, lee waves, thermals, thermal streets, squall lines, and leading lines.

I was also interested to read about hawk migration watch sites throughout Canada, including Alberta's Canmore Collegiate High School, Nova Scotia's Brier Island near Digby, Ontario's Holiday Beach Migration observatory near Windsor, and Quebec's Morgan Arboretum at the west end of Montreal – a sampling of Canadian migration watch sites with high ratings. Canadian entries in the Bald Eagle watch sites section include British Columbia's Active Pass in the Gulf Islands, Pacific Rim National Park on Vancouver Island, the Fraser Valley Bald Eagle Festival near Mission, the Squamish Valley, the Greater Vancouver Area, and Prince Rupert.

The section on other raptor viewing areas also offers sites in Canada, including Amherst Island and Wolfe Island in Eastern Ontario, both featuring Rough-Legged Hawks and various owls during the winter season. The other Canadian sites for concentrations of raptors outside the migration season are the Yukon's North Klondike Highway and South Klondike Highway. Both areas offer year-round opportunities to see a wide variety of eagles, hawks, falcons and owls.

The *Guide to Hawk Watching in North America* is an extensive and practical information source for anyone interested in raptor watching on this continent. My only objection about the book is its title, which I feel should be changed to *Guide to Hawk Watching in the United States and Canada*, since it lacks any reference to sites outside those two countries.

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Locust: The Devastating Rise and Mysterious Disappearance of the Insect that Shaped the American Frontier

Jeffrey A. Lockwood. Basic Books, New York. Hardcover. 294 pages, Can. $39.00 Paper.

Locust is much more than an account of a single species of insect. In fact, it is everything the dust cover promises: "A fascinating detective story" that delves into "history, culture, religion, and especially ecology, interwoven by the life story of a common insect. …with vivid prose, epic thoroughness and scientific precision." I would add geography and science to that list. Lockwood writes engagingly. He shares his years of detective work, providing details that only a professional entomologist could. His historical delvings put most historians to shame, and his writing skills exceed those of almost any living science writer.

The book opens in Dodge County, Nebraska, in July 1875, a drought year, with clouds of locusts obscuring the sky, their wings crackling like a horrific blaze. Limbs of willows bent to the ground under the weight of the insects, as adjacent cornstalks were stripped bare. When a sheet of insects six inches thick passed over a perpendicular ledge of rock, they caused a roaring noise similar to a cataract of water. In Utah, locust eggs were counted at 743 million eggs per acre. The voracious insects literally ate the clothing off human limbs, then entered homes to eat objects such as window blinds. When domestic chickens gorged on the locusts, their eggs and flesh became inedible. Farmers and their families lost their gardens and crops, and were on the brink of starvation.

The U.S. Army under General Ord saved many farm family lives by far exceeding normal army routine. Ord issued thousands of infantry coats, shoes and military blankets, as well as large amounts of army rations. Lawmakers apportioned money to distribute wheat seed for planting the following spring. Without Ord, thousands would have died.

North America was blessed with hundreds of species of grasshoppers, but only a single species of locust, the Rocky Mountain locust, *Melanoplus spretus*, named by Benjamin Dann Walsh back in 1866, caused such vast destruction. Ingenious but rather ineffective machines such as suction machines and flame throwers were invented to combat the locust; two men and a team of horses could incinerate ten acres of locust-infested fields in a day. One Minnesota community alone had a thousand coal-tar hopperdozers that could harvest 150 000 locusts per hour.

On the scientific front, three entomologists did their best to help combat the locust. Charles Valentine Riley was the state entomologist for Missouri. Cyrus Thomas and Alphaeus Spring Packard, Jr., held similar posts in Illinois and Massachusetts. Riley was able to show that the locust had the potential to increase its population 100-fold from one generation to the next; he argued that for every bushel of locust eggs destroyed, 100 acres of crop could be saved. He founded the Na-

tional Insect Collection and through his efforts a branch unit in economic ornithology arose. This office became the Bureau of Biological Survey and later metamorphosed into today's U.S. Fish and Wildlife Service.

Locust has important Canadian content. Entomologist Norman Criddle of Manitoba devised a widely-used mixture of copper acetoarsenite, molasses and horse manure to combat later outbreaks of somewhat less harmful grasshoppers. Criddle also collected the world's last two specimens of *Melanoplus spretus* on 19 July 1902. Three Saskatchewan men, Paul Riegert, Bill Chapco, and Bob Randell, also helped solve problems discussed in later chapters.

Why did the Rocky Mountain grasshopper become extinct? Five different theories in turn held sway: the spread of alfalfa; the demise of the Bison; changes in weather; overgrazing of grasslands; widespread prairie fires – but each was discredited, though two were later revisited as contributing factors..

To allow DNA studies and do radiocarbon dating, Lockwood determined to find locust specimens entombed in glacial ice for a century or more. His first try, in 1987, yielded a quarter pound of dried grasshopper parts; when results were submitted to a leading entomological journal, the editor rejected the paper and informed Lockwood that "you have mistaken natural history for science." In 1988, Lockwood and colleagues collected 134 specimens of twenty species of grasshopper, but no locust, on the glacier. In 1989, they obtained 4 mg of grasshopper parts, including mandibles that appeared to match those of extant preserved specimens of *Melanoplus spretus*. Finally, in 1990, at the melting edge of glaciers, they collected 250 locust bodies, including 14 males with well-preserved abdomens and genitalia, allowing unequivocal identification and DNA analysis. These insect bodies had taken about 150 years to travel 300 m as the ice moved from the crevasses where they had been entombed.

Why, indeed, had *Melanoplus spretus* become extinct? For once, the unplanned effects of human activity had an effect for the better. Lockwood explains that the "base locality" of the locust was, between outbreaks, restricted to a few relatively small areas in valleys within the Rocky mountains, where eggs could be deposited in sand and gravel. Following European settlement, floods occurred more often due to overgrazing on the slopes, irrigation periodically flooded the valleys, and the locust eggs lost their vitality. Ploughing and harrowing destroyed the eggs. The new alfalfa crops were inimical to development of the locust nymphs. The enigma has been solved.

Lockwood is a consummate writer. His eminently readable book is a detective story, keeping the reader in suspense to the final chapter. Admittedly this review has given away the ending and thus has spoiled some of that suspense, but the pleasure of this book lies more in its details and insights than it does in the suspense. I strongly recommend this book to everyone with an interest in a good story well told.

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Mammals of the World: A Checklist

By A. Duff and A. Lawson. 2004. Yale University Press, P.O. Box 209040 New Haven, Connecticut 06520-9040 USA. 312 pages, U.S.$45.00.

Perhaps I should have bought this book some time ago, or at least its predecessor; *Mammal Species of the World* (Edited by D. E. Wilson, and D. M. Reeder, 1993, Smithsonian Institution Press), which contains the names of the recognized species of mammals documented at that date. So many times I have struggled to understand which species are present in a specific area. With birds this is fairly easy to resolve. English names are reasonably standard and scientific names are the ultimate guide. With birds I have rarely had to probe recent literature to catch up on the latest splits. With mammals this is much more difficult. It took some time to clarify the species and distribution of fur seals. The confusion of English names for wildebeest left me very perplexed. My latest book on African mammals was particularly mystifying. It is a translation from German to English and uses different English names for the plates and the text. The scientific names are not current. Starting with this book it took a lot of work to create a list of lemurs that showed the currently known species and sub-species. With *Mammals of the World* this exercise is simple.

This current list contains 5069 species. From the Wilson and Reader list of 4629 the authors have subtracted 41 species that were extinct prior to 1800. These include such creatures as Steller's Sea Cow, hunted to extinction by 1768. More recently extinct species are left in, presumably as, in theory, there is a chance of still finding one alive. The Thylacine comes to mind. Duff and Lawson have added 522 "new" species. A large portion of these come from two sources. Juliette Clutton-Brock's work on domestic animals has elevated numerous creatures to species status (the Domestic Pig goes from *Sus scrofa* to *Sus domesticus* for example). The second source of change is the assignment of species status to numerous sub-species (Colin Groves of the Australian National University has been active in this exercise). Finally, 41 species have been demoted in synonymy. Sadly this loses us the Queen of Sheba's Gazelle (now a subspecies of the Arabian Gazelle), a romantic loss at least. The changes in all the above categories are fully explained in the appendices. Also included are the nomenclatural changes in scientific names.