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The Rewilding of New York's North Country: Beavers, Moose, Canines and the Adirondacks

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THE REWILDING OF NEW YORK'S NORTH COUNTRY:

BEAVERS, MOOSE, CANINES AND THE ADIRONDACKS

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This project examines the restoration histories of beavers (*Castor canadensis*), moose (*Alces alces americana*), and wild canines (*Canis* spp.) within the Adirondack Highlands of northern New York. Devastated by the depredations of nineteenth century woodsmen, the populations of these large mammals rebounded during the twentieth century. Numbering fewer than ten in 1895, the Adirondacks' remnant beaver population recolonized the region's lakes, ponds, streams, and rivers over the next twenty-five years, assisted by the presence of prime habitat, a state-enforced moratorium on beaver trapping, and timely reinforcements. Hunters shot the last of the Adirondacks' moose near Raquette Lake in 1861. Moose began returning naturally to the region during the second half of the twentieth century, dispersing into the Adirondack Highlands from the resurgent woodlands of Vermont. More than four hundred now inhabit northern New York. While the Adirondacks' wolves outlasted the region's moose, bounty-hunters had successfully eliminated canine predators by the early 1890s. But in the next four decades rapidly expanding coyote populations hybridized with wolves as they extended their range eastward around the Great Lakes. Capable of traveling through regions largely impermeable to wolves, coyote hybrids served as hardy vessels of wolf genetic material, interjecting wolf DNA from Canada back into the Adirondack Highlands. The entry and continued evolution of wolf-coyote hybrids within the Adirondack ecosystem thus represents a genetic, if not a physical, restoration. These unique restoration histories together illustrate the considerable resilience of the Adirondack ecosystem and its large mammal species, while providing valuable context for future rewilding efforts within the Northeastern woodlands.

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1 INTRODUCTION

On March 23, 1856, while sitting at a desk in Concord, Massachusetts, two hundred miles east of northern New York's Adirondack Mountains, Henry David Thoreau penned a line destined to be oft-repeated: "When I consider that the nobler animals have been exterminated here,--the cougar, panther, lynx, wolverene [sic], wolf, bear, moose, deer, the beaver, the turkey, etc., etc.,--I cannot but feel as if I lived in a tamed, and, as it were, emasculated country."[1]

Such a pronouncement of mammalian doom was premature for the Adirondacks of 1856, but not for want of effort. In 1830 John Cheney moved to Newcomb, in the central Adirondacks, where in thirteen years he killed 600 white-tailed deer, 400 martens, 19 moose, 48 black bears, 30 otters, and a handful of beavers, mountain lions, and wolves. Either a more efficient hunter or a more competent braggart, Thomas Meacham of St. Lawrence County claimed to have killed 2,550 deer, 219 bears, 214 wolves, and 77 mountain lions prior to his death in 1850.[2]

While bears and deer persisted in the Adirondacks despite such prolific hunting pressure, nineteenth century hunters and trappers came close to eliminating the remainder of the region's "nobler animals"; wolves, mountain lions, lynx, wolverines, and moose did not survive the century, while the beaver population could have been counted on the fingers of an Adirondack trapper's two hands.

As these large mammals were hunted off the Adirondack stage during the course of the nineteenth century, farmers, miners, tanners, and loggers (large mammals of another sort) entered. The change in cast was as audible as it was visible. Sonorous howls, piercing screams, and explosive tail slaps vanished, replaced by the mechanical sounds of axe, saw, and pick. This

[1] Henry David Thoreau, *The Journal of Henry D. Thoreau*, eds. Bradford Torrey and Francis H. Allen (New York: Dover Publications, Inc., 1962), VIII: 220.
[2] Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals* (Fleischmanns, New York: Purple Mountain Press, 1993), 50-51.

North Country chorus matured during the twentieth century, as railroad brakes, car horns, outboard motors, chainsaws, laughing children, hammers, and radios—products of the region's 137,000 permanent residents, 200,000 seasonal residents, and 10,000,000 annual visitors—joined the ensemble.[3]

But if you listened carefully during the twentieth century you would have heard other, wilder, voices gradually joining the chorus; if you watched closely you would have seen other, wilder, characters gradually reentering the Adirondack stage. The return of beavers and moose rejuvenated place names like Big Moose Lake, Moose River, Moose Mountain, Beaver Bay, Beaver Brook, and Beaver Pond. While the region's twentieth century canine immigrants—wolf-coyote hybrids—lacked a cartographic legacy of their own, the Adirondack ecosystem did not seem to mind, welcoming them with a wide-open top-predator niche. By the dawn of the twenty-first century, more beavers, moose, and wild canines inhabited the Adirondacks than at any time since the Civil War.

The region had, at least in part, been rewilded. Christopher McGrory Klyza, in his edited anthology *Wilderness Comes Home: Rewilding the Northeast* (2001), defines rewilding as "action on the landscape level with a goal of reducing human control and allowing ecological and evolutionary processes to reassert themselves." But what actions made the Adirondacks' twentieth century rewilding possible? And how, precisely, did beavers, moose, and canid hybrids manage to return to the region? Finally, what role did human agency play in this rewilding episode? Animal agency?[4]

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[3] The following websites provide broad statistical overviews of the Adirondack Park: New York State Adirondack Regional Tourism Council, "Fast Facts," http://visitadirondacks.com/media/facts.cfm; The Adirondack Council, "The Adirondack Park," http://www.adirondackcouncil.org/adkpark2.html; The Adirondack Park Agency, "More About the Adirondack Park," http://www.apa.state.ny.us/About_Park/more_park.html.

[4] Christopher McGrory Klyza, ed., *Wilderness Comes Home: Rewilding the Northeast* (Hanover: University Press of New England, 2001), 285.

Taken together, the return of beavers, moose, and wild canines to the Adirondacks seems to provide a relatively complete spectrum of rewilding scenarios. Individually, each story vividly illustrates our capacity both to reduce and restore regional biodiversity. These wildlife histories are thus inextricably bound to human history. But while humans have played a profound role in each species' demise and return, each interaction has been unique.

The beaver sits on one end of this Adirondack mammal restoration spectrum. At least one hundred thousand inhabited the Adirondacks that Samuel de Champlain encountered in the first decade of the seventeenth century, but over the next three hundred years intense trapping reduced the Adirondacks' beaver population to fewer than ten individuals living in and around Saranac Lake. This remnant population began to increase following the state's 1895 law that prohibited beaver trapping.[5]

During the first decade of the twentieth century New York State accelerated the restoration of the Adirondacks' beaver population through active, well-supported, collaborative, and state-funded translocation efforts. Used somewhat interchangeably in the popular literature, the terms restoration, reintroduction, and translocation are not synonymous. Restoration, the most general of the trio, "refers to work on a specific parcel of land where active management is used to return ecological functions." Reintroduction, meanwhile, describes "an attempt to establish a subspecies in an area that was once a part of its historic range, but from which it has been extirpated or become extinct." Translocation, an active form of reintroduction, is defined as a "deliberate and mediated movement of wild individuals or populations from one part of their range to another." The Adirondacks' beaver translocations successfully reinforced local remnant populations, promoting rapid and sustained population growth. By the turn of the twenty-first

[5] Harry Radford, *History of the Adirondack Beaver: Its Former Abundance, Practical Extermination, and Reintroduction* (Albany: J.B. Lyon and Co., 1908), 389-417.

century New Yorkers were filing more than two thousand beaver-related complaints each year. *Castor canadensis* was back.[6]

At the other end of the Adirondack mammal restoration spectrum sits the wolf. As Jon Coleman vividly illustrates in his book *Vicious: Wolves and Men in America* (2004), early settlers declared war on the wolf the moment they stepped foot on the continent. Although it took more than two hundred and fifty years, these "nimrods" had eliminated wolves from the Adirondacks by the close of the nineteenth century. Despite a considerable twentieth century campaign for wolf reintroduction, no wolves exist in the Adirondacks today. At least not openly.

But in the past century, rapidly expanding coyote populations have hybridized with wolves as they expanded their range eastward around the Great Lakes. Capable of traveling through regions largely impermeable to wolves, coyote hybrids have served as hardy vessels of wolf genetic material, surreptitiously interjecting wolf DNA from Canada back into the Adirondacks. The entry and continued evolution of wolf-coyote hybrids within the Adirondack Park thus represents a genetic, if not a physical, restoration.[7]

The question of who killed the last Adirondack moose, and when, kindled heated arguments in the villages and hunting cabins of northern New York during the nineteenth century. That no moose survived the Civil War, however, is certain. By the early twentieth century New Yorkers began trying to remedy this situation. Conducted on both public and private lands, early reintroduction efforts were rather archaic in form and ultimately failed. Moose translocation proved to be much more difficult than beaver translocation.

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[6] Christopher McGrory Klyza defines restoration in *Wilderness Comes Home: Rewilding the Northeast*, 285; Philip J. Seddon and Pritpal S. Soorae offer the World Conservation Union definitions of reintroduction and translocation in their article "Guidelines for Subspecific Substitutions in Wildlife Restoration Projects," *Conservation Biology* 13, no. 1 (February 1999), 178; New York State DEC, "New Tools Available for Beaver Nuisance Control," *Furbearer Management News* (2003), 11.

[7] Robert K. Wayne and Niles Lehman, "Mitochondrial DNA Analysis of the Eastern Coyote: Origins and Hybridization," in *Ecology and Management of the Eastern Coyote*, ed. Arnold H. Boer (Fredericton, New Brunswick: Wildlife Research Unit, University of New Brunswick, 1992), 9-22.

Fortuitously, beginning in 1980, moose began wandering back into New York State from Vermont on their own accord. The New York State Department of Environmental Conservation responded in the early 1990s by crafting an Environmental Impact Statement in which they recommended the translocation of one hundred moose into the central Adirondacks to accelerate the growth of the resident population. Significantly, the public's lukewarm response shelved the proposal. The citizens of New York preferred that the moose population continue to grow "naturally." It has, and New York's moose herd now numbers around four hundred, with sightings common near the hamlets of Speculator and Indian Lake.

These three wildlife restoration histories together illustrate the inherent biological, social, and political challenges surrounding large mammal restoration. The complications become particularly acute when large predators are involved, a fact highlighted by Hank Fischer in his book *Wolf Wars* (1995), which chronicles the political complexities of wolf restoration in Yellowstone National Park.[8]

Such challenges may be even more pronounced in the Adirondacks. Unlike Yellowstone, the six million acre Adirondack State Park is itself a mosaic of public and private lands. The interests of permanent residents, seasonal residents, extralocal New York taxpayers, private land owners, timber companies, developers and real estate agents, environmental and wildlife activists, hunters, hikers, the Adirondack Park Agency, the state legislature, and the governor alternatingly combine and conflict to make the restoration of large mammals—especially wolves—a politically complicated and frequently elusive goal.

But not an impossible goal, as the following chapters of this thesis will illustrate. Harbingers of hope, beavers, moose, and wild canines have invigorated the physical, cultural,

[8] Edward Bangs does the same in his essay "Restoring Wolves to the West" in *Reclaiming the Native Home of Hope: Community, Ecology and the American West*, ed. Robert B. Keiter (Salt Lake City: University of Utah Press, 1998), 112-119.

and intellectual landscapes of the Adirondacks and its people, allowing the literary and spiritual heirs of Thoreau to wander wilder woods.

Twentieth century changes in the physical and political landscapes of the Adirondacks—including reforestation and a growing conservation ethic—catalyzed this rewilding, while highlighting the resiliency of landscapes and wildlife if afforded adequate patience and protection. This century-long rewilding episode also demonstrates that the Adirondacks' mammal restoration successes have been products of natural range expansion facilitated by the presence of hunting and trapping regulations, adequate habitat, tenable travel corridors, and viable adjacent populations, not high-priced, high-political stakes translocations, which have uniformly failed in the Adirondacks, dying either in the woods (lynx and elk) or in meeting halls (wolves).

The ability of mammal restoration through range expansion to proceed at its own pace and on its own terms has proven to be a successful formula within the Adirondack State Park, allowing beavers, moose, and wild canines to return when and where physical, political, and social conditions have met their minimal requirements. Fostering the requisite conditions has required, and will continue to require, a great deal of commitment from the citizens of New York. As New Yorkers have opened the door for large mammals to return to their former ranges and reoccupy their former niches within the state, they have also challenged themselves to define and occupy the human niche more responsibly.[9]

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[9] See Bill McKibben's chapter "Human Restoration" in *The Return of the Wolf: Reflections on the Future of Wolves in the Northeast*, ed. John Elder (Hanover: University Press of New England, 2000), 5-21.

Nationally, wildlife and ecosystem restoration has been a popular and intensely polarizing subject at least since the time of Aldo Leopold. Leopold's call to view ourselves as components of a larger ecological community, and to endeavor to return the missing pieces of the original community, has been answered in recent decades by concerned wildlife biologists, geographers, historians, environmentalists, and nature writers.

Reclaiming the Native Home of Hope: Community, Ecology and the American West (1998), a collection of essays edited by Robert Keiter, captures this spirit. Dedicated to the memory of Wallace Stegner, this anthology provides a broad analysis of western restoration through the essays of leading restoration advocates such as Daniel Kemmis, Rick Bass, Dan Flores, Hank Fischer, Stephen Trimble, and William Kittredge. With millions of acres of public lands, the American West has been, and will continue to be, a fertile landscape for large-scale restoration endeavors and the heated debates that surround them. Western wolf restoration efforts in places like Yellowstone National Park, Idaho, Montana, and the Southwest is one significant example; Frank and Deborah Poppers' controversial re-imagining of the Great Plains as a buffalo commons is another.[10]

Far from monopolizing this dialogue, the thinkers and writers of the West have stimulated a parallel conversation in the less-public-land-rich East. Christopher Klyza's thoughtful anthology *Wilderness Comes Home: Rewilding the Northeast* formulates an organic wilderness paradigm for the recovering, second-chance forests of the Northeast. This northeastern wilderness paradigm privileges potential above purity, and envisions public wilderness sown into a quilt of sustainably managed private lands to "create a natural and

[10] For additional discussion of the buffalo commons, see *Where the Buffalo Roam: Restoring America's Great Plains* (Ann Matthews, 1992) and *Bring Back the Buffalo!: A Sustainable Future for America's Great Plains* (Ernest Callenbach, 1996).

political landscape that is conducive to old-growth forests and timber harvesting, to cows and wolves, and to humans in nature rather than alienated from it."[11]

But while the typical vanguard of wildlife experts and advocates has begun, eloquently, to engage the contemporary story of large mammal restoration in the Northeast, a need currently exists to situate this story within a deeper historical context. Although environmental historians have provided thorough declensionist accounts of mammalian "dewilding" (*The Destruction of the Bison* by Andrew Isenberg, 2000; *Vicious: Wolves and Men in America* by Jon Coleman, 2004), the field has not yet begun to explore fully the topic of mammalian "rewilding," of restoration.

Dan Flores alludes to the presence of such a gap in his book *The Natural West: Environmental History in the Great Plains and Rocky Mountains* (2001). In the final chapter, "The West That Was, and the West That Can Be: Western Restoration and the Twenty-first Century," Flores discusses the enshrinement of the "West-That-Was" and the lamentations that have accompanied its fall. "The emphasis on that despoliation," Flores writes, "has become the defining stream in how we think about American environmental history, in the West or anywhere on the continent." Actively connected with contemporary restoration endeavors, Flores argues that restoration will be—and needs to be—the next great conservation theme.[12]

By answering Flores' call, and by analyzing the restoration endeavors of the past, environmental historians can inform the restoration goals of the future. More specifically, the environmental histories surrounding the return of beavers, moose, and wild canines to the

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[11] Christopher McGrory Klyza, "An Eastern Turn for Wilderness," in *Wilderness Comes Home: Rewilding the Northeast*, 23.

[12] Dan Flores, *The Natural West: Environmental History in the Great Plains and Rocky Mountains* (Norman: University of Oklahoma Press, 2001), 183-199, quoted material from 188-189.

Adirondack ecosystem may provide valuable context for future rewilding endeavors throughout the resurgent woodlands of the Northeast.

2 THE ADIRONDACK HIGHLANDS

As a physiographic province—a region with a shared geology and topography—the 11,000 square mile Adirondack Highlands stands prominently above the surrounding lowlands: the Hudson-Mohawk Lowlands to the south, the Erie-Ontario Lowlands to the west, and the St. Lawrence-Champlain Lowlands to the north and east. Rising 5,239 feet above and twenty-five miles to the west of Lake Champlain, Mount Marcy caps the mountainous eastern half of the Adirondack Highlands, a region punctuated by forty-five other peaks with summits over four thousand feet above sea level. Less mountainous and more plateau-like, the western half of the Adirondack Highlands averages 2,000 feet in elevation (see Map I).[1]

The entire bowl-shaped dome, pushed upward by a "slowly rising plume of hot mantle rocks under the Adirondack crust," continues to rise at the geologically-rapid rate of 0.12 inches per year, perhaps thirty times the rate that the rocks are wearing down. This tectonic activity may be the cause of the frequent small-scale earthquakes that center on Blue Mountain Lake, a small hamlet located almost exactly at the center of the uplifting Adirondack dome.[2] But while the mountains of the Adirondacks may be relatively young, their rocks are ancient. A southern extension of the Grenville Province of the Canadian Shield, the exposed Precambrian rocks of the Adirondack Highlands are of igneous and metamorphic stock, forged miles beneath the earth's surface more than one billion years ago.[3]

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[1] Bradford Van Diver, *Roadside Geology of New York* (Missoula: Mountain Press Publishing Co., 2001), viii, 7; David L. Creemens and John P. Hart, eds., *Geoarchaeology of Landscapes in the Glaciated Northeast* (Albany: New York State Education Department, 2003), 7; Howard Lull, *A Forest Atlas of the Northeast* (Upper Darby, Pennsylvania: Northeastern Forest Experiment Station, 1968), 11; The Adirondack Park Agency (APA), "About the Adirondack Park," http://www.apa.state.ny.us/About_Park/more_park.html.

[2] Bradford Van Diver, *Roadside Geology of New York*, 6-8, quote p. 28, 300-301; Paul Schneider, *The Adirondacks: A History of America's First Wilderness* (New York: Henry Holt and Co., 1997), 130.

[3] Bradford Van Diver, *Roadside Geology of New York*, 6, 18-19, 299-300; Gordon Whitney, *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate North America, 1500 to Present* (New York: Cambridge University Press, 1994), 39-40; APA, "Geology of the Adirondack Park," http://www.apa.state.ny.us/About_Park/geology.htm.

Map I: New York State

This map is available online through the University of Texas at Austin's Perry-Castaneda Library map collection: http://www.lib.utexas.edu/maps/us_2001/new_york_ref_2001.jpg.

More recently the sprawling Laurentian ice sheet, at its greatest extent about twenty thousand years ago, buried the Adirondacks beneath a thick mantle of ice and sediment. As this continental ice sheet receded, at rates ranging from 82 to 755 feet per year, the peaks of the Adirondack Mountains emerged. Local glaciers of varying sizes remained on the summits and shoulders of these peaks while the ice sheet, or remnants of it, lingered in many of the valleys below. Trapped between ice, moraines, and mountains, glacial melt-water filled many of the Adirondacks' valleys and lowlands, creating numerous proglacial lakes. Some, like Long Lake, Indian Lake, and Cascade Lake have persisted to the present. Others, like South Meadows Lake, have been transformed by time and sedimentation into striking plains.[4]

While rocks and water replaced ice in the Adirondack Highlands, dying glaciers dominated the surrounding lowlands. Melt-water from these massive but waning ice sheets filled the Ontario Basin, the Hudson-Mohawk Lowlands, and the St. Lawrence-Champlain Lowlands to create glacial lake Iroquois, Albany, and Vermont, respectively. An early and bloated version of Lake Ontario, Lake Iroquois drained eastward through the Iro-Mohawk River to Lake Albany. Lake Vermont, a prehistoric version of Lake Champlain, became an arm of the Champlain Sea about 12,800 years ago as the receding Laurentian ice sheet allowed the Atlantic Ocean to pour through the St. Lawrence valley. By 11,500 years ago Lake Iroquois had shriveled to its current dimensions, while the Champlain Sea persisted until about 10,200 years ago.[5]

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[4] E.C. Pielou, *After the Ice Age: The Return of Life to Glaciated North America* (Chicago: University of Chicago Press, 1991), 15, 107; Bradford Van Diver, *Roadside Geology of New York*, 29-36, 301-303; Donald H. Cadwell et al, "Geomorphic History of New York State," in *Geoarchaeology of Landscapes in the Glaciated Northeast*, 11; John C. Ridge, "The Last Deglaciation of the Northeastern United States: A Combined Varve, Paleomagnetic, and Calibrated 14C Chronology," in *Geoarchaeology of Landscapes in the Glaciated Northeast*, 36-37.

[5] Bradford Van Diver, *Roadside Geology of New York*, 35-37, 43; Ronald J. Mason, *Great Lakes Archaeology* (New York: Academic Press, 1981), 74-5; William Augustus Ritchie, *The Archaeology of New York State* (Garden City: The Natural History Press, 1965), 13; Donald H. Cadwell et al, "Geomorphic History of New York State," in *Geoarchaeology of Landscapes in the Glaciated Northeast*, 10-12, map p. 17; Douglas Frink and Allen Hathaway, "Behavioral Continuity on a Changing Landscape," in *Geoarchaeology of Landscapes in the Glaciated Northeast*, 108.

The Laurentian legacy, however, remained etched on the landscapes of New York, for glacial action had reshaped the state's topography and soil composition through erosion and deposition. But while glaciation had readily eroded the state's softer sedimentary rocks, the hard crystalline rocks of the Adirondack dome proved much more resilient. As a result, the glacial tills wrested from Adirondack rock were thin, sandy, and gravelly. The same descriptors, with acidic and drought-prone added to the list, correctly categorize the Adirondack soils.[6]

Freed from ice, these young soils began to receive floral colonizers from the non-glaciated and deglaciated lands to the south. High winds blowing steadily near the glacial front facilitated a vegetation migration that proceeded at different rates for different species. White pines and oaks, for instance, migrated northward at rates of up to 1,150 feet per year. Less mobile hemlocks and maples extended their ranges between 650 and 820 feet per year, while chestnuts crept northward at about half of that rate. The wind-blown seeds of these species encountered a diversity of ground conditions in the Adirondacks, where a mosaic pattern of till (unsorted, non-stratified sediment left by retreating glacial ice) and outwash (stratified sediment deposited by glacial meltwater) varied locally in productivity.[7]

Mammals also migrated northward into deglaciated New York. Flat-headed peccaries may have foraged in the treeless terrain near the receding glacial front, while long-nosed peccaries, mastodons, mammoths, white-tailed deer, elk, moose, caribou, woodland musk-oxen, bison, horses, beaver, wolves, and bears browsed, grazed, gnawed, and hunted in the woodlands of the region.[8]

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[6] Gordon Whitney, *From Coastal Wilderness to Fruited Plain*, 42-44; APA, "Geology of the Adirondack Park"; Barbara McMartin, *The Great Forest of the Adirondacks* (Utica: North Country Books, 1994), 7; Howard Lull, *A Forest Atlas of the Northeast*, 14.

[7] Ronald Mason, *Great Lakes Archaeology*, 67; E.C. Pielou, *After the Ice Age*, 90-92, 168.

[8] Paul S. Martin and John E. Guilday, "A Bestiary for Pleistocene Biologists," in *Pleistocene Extinctions: The Search for a Cause*, ed. Paul S. Martin and H.E. Wright (New Haven: Yale University Press, 1967), 1-60; William

Paleolithic men and women inhabited New York by the close of the Pleistocene Epoch, about ten thousand years ago. Traveling in small, highly mobile groups, these Paleo-Indian hunter-gatherers were "part of a widely diffused and extremely scanty population." In postglacial New York these groups encountered a patchy environment of lakes, freshwater marshes, and maturing forests. Like the game species they hunted, New York's Paleo-Indians tended to favor the lowlands adjacent to the region's lakes and rivers. Two of New York's earliest known sites of human occupation illustrate this reality. The Davis site near Crown Point in Essex County and the Potts site near Pennellville in Oswego County, occur at what were once the marshy margins of the Champlain Sea and Lake Iroquois, respectively.[9]

The arrival of these human hunters combined with profound climatic changes to transform the floral and faunal communities that had developed in postglacial North America. The equable climatic conditions that had generally prevailed across the continent for millennia began yielding to increased continentality between twelve thousand and ten thousand years ago. While climatic changes were not uniform continent-wide, the trend was towards increasing mean summer temperatures. Along Colorado's Rocky Mountain Front, summer temperatures warmed by nearly ten degrees Fahrenheit during this period.[10] The broadening of seasonal temperature extremes, coupled with changes in regional precipitation regimes, caused plant communities to become, in the words of Gary Haynes, "more zonal in distribution, rather than mosaic in form."

Ritchie, *The Archaeology of New York State*, map depicting New York's Pleistocene mammal discoveries, 10-11; Randolph L. Peterson, *North American Moose* (Toronto: University of Toronto Press, 1955), 15.

[9] William Ritchie, *The Archaeology of New York State*, 1-23, quote from p. 1; Ronald Mason, *Great Lakes Archaeology*, 89-110, see especially 89-90; Douglas Frink and Allen Hathaway, "Behavioral Continuity on a Changing Landscape," in *Geoarchaeology of Landscapes in the Glaciated Northeast*, 103-116.

[10] Scott A. Elias, "The Timing and Intensity of Environmental Changes During the Paleoindian Period in Western North America: Evidence from the Insect Fossil Record," in *Megafauna and Man: Discovery of America's Heartland*, ed. Larry D. Agenbroad et al (Hot Springs, South Dakota: The Mammoth Site of Hot Springs, South Dakota, Inc., 1990), 11; Russell W. Graham, "Evolution of New Ecosystems at the End of the Pleistocene," in *Megafauna and Man*, 54-58; Bjorn Kurten, *Before the Indians* (New York: Columbia University Press, 1988), 141-142; James J. Hester, "The Agency of Man in Animal Extinctions," in *Pleistocene Extinctions*, 182, 188-189; Gary Haynes, *Mammoths, Mastodonts, and Elephants: Biology, Behavior, and the Fossil Record* (New York: Cambridge University Press, 1991), 268-276.

R. Dale Guthrie describes this community simplification process as a shift from a "complex plaid of habitats" to one of "stripes." Both scholars note that such a homogenization of habitats would have adversely affected large herbivores.[11] The considerable and targeted depredations of skilled Paleo-Indian hunters likely exacerbated the effects of this climatic change on large mammal species, as the extinction record of the late-Pleistocene Epoch may illustrate.[12]

In New York, closed forests of white pine, balsam fir, and, increasingly, northern hardwoods—the recognizable northeastern forest of today—replaced the open, park-like forests that had once been dominated by spruce.[13] Native North American megamammals such as mastodons, mammoths, woodland musk-oxen, peccaries, and horses disappeared, leaving moose, elk, white-tailed deer, caribou, beavers, black bears, and wolves to accompany roving bands of Paleo-Indian hunter-gatherers into New York's warmer but less biologically diverse Holocene Epoch.[14]

By 1700 B.C. Northern Iroquoians "in possession of several semi-domesticates and perhaps even a domesticated plant or two" had migrated into central New York from their cultural base further south, displacing the region's Paleo-Indians. These Iroquoian immigrants integrated themselves into a well-developed network of long-distance trade that moved copper

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[11] Haynes, *Mammoths, Mastodonts, and Elephants*, 268-276, quote p. 276; R. Dale Guthrie, "Late Pleistocene Faunal Revolution—A New Perspective on the Extinction Debate," in *Megafauna and Man*, 42-52, quote p. 45.

[12] A considerable debate centers on the potential causes of the large mammal extinction episode of the late-Pleistocene (typically climate change versus human overkill). Martin and Wright's collection of essays (*Pleistocene Extinctions: The Search for a Cause*, 1967) and Agenbroad's anthology (*Megafauna and Man*, 1990) explore the competing hypotheses in detail. Paul Martin has built his career on the human overkill model, which he convincingly synthesizes in his recent book *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America* (Los Angeles: University of California Press, 2005).

[13] E.C. Pielou, *After the Ice Age*, 229-230; William Ritchie, *The Archaeology of New York State*, 16; Douglas Frink and Allen Hathaway, "Behavioral Continuity on a Changing Landscape," in *Geoarchaeology of Landscapes in the Glaciated Northeast*, 105, 108, 112.

[14] It is worth noting that the large mammal species that survived this period tended to be those that evolved in the Old World or were closely related to Old World species (e.g. caribou, elk, moose, gray wolves). Native North American species frequently disappeared (e.g. camels, mastodons, mammoths, ground sloths, horses). White-tailed deer and pronghorn, two species that evolved in North America, are notable exceptions. Paul Martin, "Who or What Destroyed Our Mammoths?," in *Megafauna and Man*, 115; Paul Martin, *Twilight of the Mammoths*, 141-142; E.C. Pielou, *After the Ice Age*, 256; Bjorn Kurten, *Before the Indians*, 137.

from Lake Superior, mica from the southern Appalachians, grizzly bear canines from the West, and chert from Labrador throughout eastern North America. By 200 A.D. New York's Iroquoians had begun occupying relatively large villages; by 1000 A.D. they had begun to cultivate maize, beans, and squash extensively.[15] Over the next five hundred years Iroquoian communities "coalesced into ever fewer but ever larger agglomerations." This demographic shift helped to produce the distinct languages of Mohawk, Oneida, Onondaga, Cayuga, and Seneca from a common proto-Iroquois language. During the sixteenth century the speakers of these five languages formed the Iroquois League present at European contact.[16]

At this time the Five Nations Iroquois, numbering between twenty and thirty thousand, inhabited ten "socially and politically complex," horticulturally-centered towns and several hamlets between the Genesee River valley in the west and the Mohawk River valley in the east. Other culturally-similar Iroquoian-speaking groups, which did not belong to the League, lived on the periphery of Iroquoia: the Susquehannocks along the northern forks of the Susquehanna River; the Wenros in western New York, between the Genesee and Niagara rivers; the Neutrals, Petuns, and Hurons in an arc around Lake Ontario; the Jefferson County and St. Lawrence Iroquois near the northeastern shore of Lake Ontario and along the St. Lawrence River. Algonquian-speakers, including the nearby Mahicans in the Hudson River valley and the Algonquins north of the St. Lawrence River, dominated the remainder of northeastern North America.[17]

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[15] Dean R. Snow, "Iroquois Prehistory," in *Extending the Rafters: Interdisciplinary Approaches to Iroquoian Studies*, ed. Michael Foster et al (Albany: University of New York Press, 1984), 241-257, quote from p. 249; Daniel K. Richter, *The Ordeal of the Longhouse: The Peoples of the Iroquois League in the Era of European Colonization* (Chapel Hill: University of North Carolina Press, 1994), 13-14; James A. Tuck, "Northern Iroquoian Prehistory," in *Handbook of North American Indians, XV, Northeast* (*HNAI*), ed. Bruce G. Trigger (Washington: Smithsonian Institution, 1978), 322-333.

[16] Daniel Richter, *The Ordeal of the Longhouse*, 15.

[17] Daniel Richter, *The Ordeal of the Longhouse*, 15-17 (quoted material p. 15); William Fenton, "Northern Iroquoian Culture Patterns," in *HNAI*, 296-306; James A. Tuck, "Northern Iroquoian Prehistory," in *HNAI*, 324.

Conspicuously absent from the above human geography, the Adirondack Highlands proved unsuitable for permanent Iroquoian habitation owing to the region's incompatibility with indigenous agriculture. Successful Iroquoian swidden horticulture had required low-elevation fields (typically less than five hundred feet above sea level) situated near lakes, streams, and rivers, at least one hundred and twenty frost-free days, and a mean summer temperature of at least sixty-six degrees Fahrenheit.[18] Averaging well above five hundred feet in elevation, well below the critical one hundred and twenty frost-free day threshold, and rarely attaining an average July temperature of sixty-six degrees, the highlands of the Adirondacks escaped the hoe. The Iroquois instead occupied the more temperate lowlands to the north and south of the Adirondack dome, including central New York's fertile Finger Lakes region.[19]

Flanked by different and frequently hostile Indian groups, the Adirondack Highlands evolved as a contested hunting ground, claimed by many but permanently inhabited by none. Five Nations Iroquois penetrated the Adirondack dome from the south while the St. Lawrence and Jefferson County Iroquois, League outsiders, accessed the region from the north. Sometime after 1550, however, "the large and powerful St. Lawrence Iroquoian towns that Cartier had visited, along with the closely related Jefferson County Iroquoians, disappeared." Possible causes include exposure to virgin-soil diseases—probably transferred by Cartier and his crew—or intertribal warfare with the Hurons and Five Nations Iroquois, or the Little Ice Age, a global cold spell that may have doomed horticulture along the St. Lawrence. Regardless of the cause, or the combination of causes, refugees from the St. Lawrence villages fled westward to Huronia or southward to Iroquoia. Algonquins, Montagnais, and Hurons, enemies of the Five Nations,

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[18] M.K. Bennett, "The Food Economy of the New England Indians, 1605-1675," *The Journal of Political Economy* 63, no. 5 (October 1955), 370; Gordon Whitney, *From Coastal Forest to Fruited Plain*, 103.
[19] Howard Lull, *A Forest Atlas of the Northeast*, 18, 33; E.T. Turner, "The Physical Geography of New York State. Part XI. The Climate of New York." *Journal of the American Geographic Society of New York* 32, no. 2 (1900), 112.

filled the power vacuum north of the Adirondacks, intensifying regional conflict during the seventeenth century.[20]

While rivers such as the Oswegatchie, Grasse, St. Regis, Sacandaga, and Moose provided access into the Adirondacks' interior from the north and south, the most efficient route of travel around the Adirondack dome remained the Hudson River-Lake George-Lake Champlain-Richelieu River corridor. Frequented by Mohawk, Montagnais, and Algonquin hunting expeditions and war parties passing between the Hudson and St. Lawrence river valleys, this thoroughfare, not surprisingly, became a perpetual battlefield. Samuel de Champlain participated in a decidedly one-sided battle in 1609, as he and two of his men accompanied sixty Algonquin and Montagnais warriors south up the lake on which he bestowed his name. Paddling at night to avoid detection by their Iroquois foes, this Algonquian war party, aided by the Frenchmen and their muskets, met and defeated a Mohawk force on the Adirondack side of Lake Champlain, perhaps in the vicinity of present-day Ticonderoga.[21]

The animosity engendered by such conflicts reverberated in the Mohawk language. To the Mohawks, their uncivilized northern foes were "Rătīrōntăks," meaning "those who eat trees," a sharp contrast to the Mohawk's self-designation as "Rătīnōnsīōnnī," "those who build cabins."[22] But in addition to reflecting hostility and their disparate lifeways, these Mohawk terms emphasize that the Algonquian "others" inhabited a different landscape, a landscape that privileged trees over corn and itinerancy over village-life.

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[20]William Fenton, "Northern Iroquoian Culture Patterns," in *HNAI*, 297-298; Daniel Richter, *The Ordeal of the Longhouse*, 53 (quote); Bruce G. Trigger, *Natives and Newcomers: Canada's "Heroic Age" Reconsidered* (Montreal: McGill-Queen's University Press, 1985), 144-148, 150; James A. Tuck, "Northern Iroquoian Prehistory," in *HNAI*, 324; Brian Fagan, *The Little Ice Age: How Climate Made History, 1300-1850* (New York: Basic Books, 2000).

[21] Daniel Richter, *The Ordeal of the Longhouse*, 54; Paul Schneider, *The Adirondacks: A History of America's First Wilderness* (New York: Henry Holt and Co., 1997), 20-21. Francis Jennings, in his book *The Ambiguous Iroquois Empire* (New York: W.W. Norton and Co., 1984), terms this Hudson-Champlain corridor the "Mahican Channel."

[22]J. Dyneley Prince, "Some Forgotten Indian Place-Names in the Adirondacks," *The Journal of American Folklore* 13, no. 49 (April 1900), 123.

That the Mohawk appellation for the northern Algonquians fell on the rugged and expansive forests of the Adirondacks is fitting, for the region's environment differed from the landscapes encountered further south, nearer the Iroquois' core. The forests of Iroquoia, like the forests of southern New England, were long-term products of human manipulation, and looked it. Adriaen Van Der Donck, a Dutchman who traveled the Hudson and Mohawk lowlands during the mid seventeenth century, routinely observed large meadows and "young woodland" that he optimistically noted "would bear good corn." What he was seeing, his Indian guides assured him, were abandoned fields that within the past two decades had been planted in corn, beans, squash, and sunflowers—the vegetal foundation of Iroquois subsistence. Such fields, abandoned as they lost their fertility, ringed Iroquois villages, sometimes for miles. Village sites themselves changed at twelve to twenty year intervals, as wooden longhouses and palisades inevitably decayed. As a result, the horticultural heart of Iroquoia was a shifting mosaic of forests and fields in varying stages of succession. [23]

The Rătīnōnsīōnnī manipulated their environment further through annual burns. Van Der Donck, who noted "many instances of wood-burning" in New Netherland, cited three motives: "first, to render hunting easier, as the bush and vegetable growth renders the walking difficult for the hunter…secondly, to thin out and clear the woods of all dead substances and grass, which grow better the ensuing spring," and lastly "to circumscribe and enclose the game within the lines of the fire…" These typically autumnal fires significantly opened the forests of Iroquoia and, as Van Der Donck observed, stimulated the growth of new grasses, forbs, and shrubs. This growth benefited the local white-tailed deer herd and thus the local hunters. The expansive oak

[23] Adriaen Van Der Donck, *A Description of the New Netherlands* (1656), trans. Jeremiah Johnson, ed. Thomas F. O'Donnell (Syracuse: Syracuse University Press, 1968), 18, 20; Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest," *Ecology* 34, no. 2 (April 1953), 329-334; Daniel Richter, *The Ordeal of the Longhouse*, 19, 23-24; Gordon Whitney, *From Coastal Forest to Fruited Plain*, 103-105.

savannas of western New York, which persisted into the nineteenth century, memorialized the Iroquois' capacity to create and sustain a useful environment.[24]

The Adirondack environment, however, reflected its location outside the pale of longhouses, hoes, and fires. As in the forests of northern New England, "the usual incentives for burning" simply did not exist in the Adirondacks: horticulture was absent; "summer travel was by canoe rather than overland; winter travel by snowshoes or on the ice was not hindered by the underbrush; and deer hunting took the form of stalking or still-hunting rather than driving." The denser northern forests of the Adirondacks, moister and thus less flammable than the oak, hickory, and chestnut forests that Van Der Donck encountered along the Hudson and Mohawk rivers, appear to have largely escaped human manipulation.[25]

For any Rătīrōntăks capable of eating trees, the forests of the Adirondacks would have made quite a buffet. Then, as now, spruce, hemlock, and balsam fir mingled with northern hardwoods on low elevation sites with good drainage to form mixed forests. Groves of towering white pines, while comprising no more than three percent of this pre-Euroamerican forest, conspicuously punctuated the Adirondack canopy. On low elevation sites with poor drainage, spruce, hemlock, balsam fir, and tamarack prevailed, out-competing the less tolerant hardwoods.[26]

Above the mixed forests of the lower slopes, in the aptly-named mid-slope region, the classic triumvirate of northern hardwoods—yellow birch, sugar maple, and beech—maintained their co-dominance through an interconnected successional scheme dictated by the trio's range of

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[24] Adriaen Van Der Donck, *A Description of New Netherlands*, 20-21; Gordon Whitney, *From Coastal Wilderness to Fruited Plain*, 110-111, 115; Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest," 338.
[25] Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest," quote pp. 338-339; Gordon Whitney, *From Coastal Forest to Fruited Plain*, 116. William Cronon explores Indian land-use in New England in his classic environmental history *Changes in the Land: Indians, Colonists, and the Ecology of New England* (New York: Hill and Wang, 1983).
[26] Barbara McMartin, *The Great Forests of the Adirondacks*, 9-13.

reproductive strategies. Yellow birch, typically the first of the three to reach a disturbed site, "grows relatively rapidly following its establishment, stabilizes the area in the process, and initiates a pocket of tree succession within the generally stable matrix of the forest." Sugar maple seedlings arrive next, establishing an understory beneath the yellow birch canopy and eventually replacing the original and less shade-tolerant birch pioneers. Sugar maple in turn yields to beech, the least mobile and slowest maturing of the trio, as beech seedlings tend to out-compete sugar maple seedlings beneath a sugar maple canopy.[27]

Red spruce and balsam fir, denizens of the boreal zone, replace hardwoods above twenty-five hundred feet, with yellow birch being the last to surrender the slopes. Above four thousand feet red spruce in turn begins to disappear, yielding the upper slopes to balsam fir. As they near tree-line, these firs become stunted and gnarled, forming dwarf forests known as "krummholz," German for "crooked wood."[28]

These forests stood unchanged and largely unvisited by Euroamericans until well into the nineteenth century. Enterprising and pious New Englanders had climbed Mount Washington, the highest peak in New Hampshire's White Mountains, by 1650. Lewis and Clark had journeyed from St. Louis to the Pacific Ocean and back by 1806. But the Hudson River's source and New York's highest point remained shrouded in mystery. Writing for *The American Journal of Science and Arts* in 1837, W.C. Redfield expressed amazement that "the mountains of this region, appear to have almost escaped the notice of geographical writers." Those writers who did attempt to describe the Adirondacks clearly had no familiarity with the region, as evidenced

[27] Barbara McMartin, *The Great Forests of the Adirondacks*, 9; Lawrence K. Forcier, "Reproductive Strategies and the Co-occurrence of Climax Tree Species," *Science* 189, no. 4205 (September 1975), 808-810.
[28] Barbara McMartin, *The Great Forests of the Adirondacks*, 8-9; APA, "Natural Communities of the Adirondack Park," http://www.apa.state.ny.us/About_Park/natural_commun.htm.

in an 1833 gazetteer that estimated the mountains of Essex County to be twelve hundred feet above sea level.[29]

For a state eager to assess and then exploit its natural resources, within a country captivated by the call of Manifest Destiny, such a cartographic and scientific void was unacceptable. In 1836 New York's Secretary of State, John Adams Dix, with the blessings of the state legislature, determined to examine the state's northern hinterlands as part of the New York Natural History Survey. The state selected Ebenezer Emmons, a nationally-prominent geologist and professor of chemistry at Williams College, to lead the team of experts. Products of the Romantic Age, these men reveled in the "sublime grandeur" of Avalanche Lake, the "magnificent scenery" of Indian Pass, and the "deep and frightful" depths of the Ausable Chasm. Emmons, the most ebullient in his praise, declared the region "unrivalled for its magic and enchantment." Thomas Cole, the most famous of the Hudson River School painters, captured these emotions in his oil and canvas painting "View of Schroon Mountain, Essex County, New York, After a Storm" (1838).[30]

The survey's scientific discoveries corroborated the Adirondacks' wild and enigmatic reputation. Zoologist James DeKay noted the presence of fishers, wolverines, and wolves, species that had largely disappeared from the remainder of the state. In the gorges and valleys of the eastern Adirondacks' High Peaks region, chief botanist John Torrey discovered "the largest trees of Black Spruce that I ever saw." On the morning of August 5, 1837, after passing through

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[29] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 131-132; W.C. Redfield, "Some account of two visits to the Mountains in Essex County, New York, in the years 1836 and 1837; with a Sketch of the Northern Sources of the Hudson," *The American Journal of Science and Arts* 33, no. 2 (January 1838), 322. For additional discussion of the Adirondacks' geographical obscurity, see Russell M.L. Carson's book *Peaks and People of the Adirondacks* (Garden City: Doubleday, Doran & Co., 1928), 3-6.

[30] Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," *Journal of the Early Republic* 3, no. 2 (Summer, 1983), 185-186, quotes from pp. 189, 191, 193. Thomas Cole's painting of Schroon Mountain is in the Cleveland Museum of Art's collection. It can be viewed on their website: http://www.clevelandart.org/explore/artistwork.asp?artistLetter=C&recNo=179&woRecNo=1.

a dense tangle "of dwarfish pines and spruces," Emmons, Torrey, and Redfield crested the "High Peak of Essex." On Mount Marcy's icy summit the team was surprised to discover alpine plant species typically confined to the arctic. The scientists of the Natural History Survey were discovering what New York's Indians had known for centuries: this was a land much different than the "civilized parts of the state." [31]

But while Emmons, DeKay, Torrey, and Redfield appreciated the beauty, solitude, and uniqueness of the Adirondack wilderness, their assignment was fundamentally utilitarian. Looking up at the mountains of the Adirondacks, they saw more than beauty—they saw potential mineral wealth. Emmons believed that where "Nature had stinted, or has been sparing in the bounties which accompany a fertile soil, they [the mountains] must of necessity abound in something else that is valuable." Emmons was not the only educated man to associate mountains and wilderness with silver and gold. John Dix, the survey's Albany-based catalyst, had optimistically hypothesized that the Adirondack region "probably contains a larger amount of valuable metals than all the other counties of the state combined." W.C. Redfield considered the Adirondack Mountains "the Wales of the American continent."[32]

While less well-endowed than hoped, the Adirondack Mountains did yield considerable quantities of iron ore during the nineteenth century. David Henderson and Archibald McIntyre discovered large iron ore deposits near Newcomb, in convenient proximity to thousands of acres of forest. The juxtaposition of timber and ore proved fortuitous, as the production of each ton of

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[31] James E. DeKay, *Zoology of New York; or, the New York Fauna* (5 vols., Albany 1842-1844) and John Torrey, *A Flora of the State of New York* (2 vols., Albany 1843), as quoted in Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," 194; W.C. Redfield, "Some account of two visits to the Mountains in Essex County, New York…," 314-315; Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," 195.

[32] Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," 187; Ebenezer Emmons, *Geology of New York* (Albany 1842) and John Dix, "Report of the Secretary of State," as quoted in Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," 196; W.C. Redfield, "Some account of two visits to the Mountains in Essex County, New York…," 323.

iron required five hundred bushels of charcoal. The opening of Minnesota's Mesabi Range during the 1890s lifted this extractive pressure on the Adirondacks, but not before the iron industry had clear-cut 250,000 acres of forest for charcoal production. Concentrated near roads and railroads, the visibility of these clear-cuts gave them the illusion of being more extensive than they were.[33]

Emmons and the other members of the Natural History Survey also reflected the contemporary idealization of the Jeffersonian/Jacksonian middle landscape, in which a population of small land-holders worked amidst a tamed and settled countryside. But while the Adirondack Mountains remained far from New England-like at the time of the survey, some intrepid farmers had settled in portions of the Adirondack dome. Keene Valley had a farm by 1797; Newcomb, by 1816. In 1798 John Brown—the eighteenth century New England merchant, not the nineteenth century abolitionist—came to own 210,000 acres near the central Adirondacks' Fulton Chain Lakes. Brown hoped to establish eight townships on his expansive tract: Industry, Enterprise, Perseverance, Unanimity, Frugality, Sobriety, Economy, and Regularity. A handful of settlers persevered following Brown's death in 1803, but none of the place-names did.[34]

By 1820, however, Hamilton County, in the heart of the Adirondacks and slightly east of Brown's Tract, reported a mere 1,251 residents, making it the least populated county in New York by a wide margin. To entice more settlers to its rocky northern wilderness, New York had to transform the regional rhetoric. In the *Gazetteer of the State of New York*, published in 1836, Thomas Gordon had honestly, if dourly, depicted Hamilton and the surrounding counties as

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[33] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 137-143; Barbara McMartin, *The Great Forests of the Adirondacks*, 32-36.
[34] Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," 198-200; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 93-97.

"broken and sterile, abounding with swamps and clothed with dreary forests." Emmons optimistically re-imagined this landscape, envisioning that once the timber was cleared there "will be seen the golden grain waving with the gentle breeze, the sleek cattle browsing on the rich pastures, and the framer with well stored granaries enjoying the domestic hearth." Emmons and many others of his time were convinced that this post-wilderness agricultural Valhalla would be accompanied by climatic improvements. As green pastures with contented cows replaced dark forests with hungry moose the climate would inevitably moderate, providing warmer, longer summers better suited to agricultural pursuits.[35]

Such wishful thinking proved as false for homesteaders in the Adirondacks as it would later for homesteaders in the western Dakotas and eastern Montana. But while warmer, longer summers did not follow forest clearance and rain did not follow the plow, land-hungry settlers still followed the hopeful rhetoric. Most settled in the eastern and northeastern margins of the Adirondack Highlands, in low-lying towns like Plattsburgh, Ticonderoga, Crown Point, Queensbury, Luzerne, and Malone within Clinton, Essex, Warren, and Franklin counties. Settlers understandably avoided the central Adirondacks. By 1840, Hamilton County's population had risen modestly to 1,907 residents, easily maintaining its status as the least populated county in New York. In rye production, Hamilton County ranked forty-second out of the forty-four upstate New York counties. In buckwheat, corn, and potato production, Hamilton County ranked last, as it did in dairy products, orchard products, and wool. In skins and furs,

[35] US Census Bureau, 1820 Census, "New York," http://www2.census.gov/prod2/decennial/documents/1820a-02.pdf; Thomas F. Gordon, *Gazetteer of the State of New York* (New York: Printed for the Author, 1836), 476; Ebenezer Emmons, "Third Annual Report," as quoted in Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," 201. See also 199-200.

however, the county ranked sixth, and the township of Old Forge emerged as a trappers' colony of sorts, supporting a small yet colorful local population.[36]

With only one in ten Adirondack acres arable, and growing seasons short, agriculture in the Adirondacks proved no more viable for Euroamericans than it had for Indians. In 1835, settlers had cleared less than five percent of the land that would later be included within the Adirondack State Park. By 1855, this figure had only risen to nine percent. And as the Indians of New York had the more temperate, more fertile lowlands surrounding the Adirondack dome to turn to, American settlers had the deep rich soils of the Midwest. There was no competition; in the next one hundred years, the farmers of Hamilton and adjacent Warren County abandoned between seventy-five and one hundred percent of their agricultural land. Essex, Fulton, and Saratoga counties lost between fifty and seventy-five percent; Herkimer, Lewis, Franklin, and Oneida counties, between twenty-five and fifty percent.[37]

Not surprisingly, forest product industries were more successful in the Adirondacks than livestock and crop production. In 1850, New York overtook Maine as the nation's leading lumber producer. For the next several decades the Adirondacks' rivers bristled with bobbing white pines and spruces, selectively logged close to the rivers. While white pines constituted no more than three percent of the original Adirondack forests, they were the most sought after softwood. Spruce, comprising approximately fifteen percent of the region's trees, was the next most desirable. Needing hemlock bark for use in the tanning process, tanneries also contributed to the softwood assault.[38]

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[36] Barbara McMartin, *The Great Forest of the Adirondacks*, 22; US Census Bureau, 1840 Census, "New York," http://www2.census.gov/prod2/decennial/documents/1840a-02.pdf; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 75-85.
[37] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 96; Barbara McMartin, *The Great Forest of the Adirondacks*, 22; Gordon Whitney, *From Coastal Wilderness to Fruited Plain*, figure 10.3, p. 246.
[38] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 202-217; Barbara McMartin, *The Great Forest of the Adirondacks*, 2, 13-14, 26-27, 30-31.

By the mid 1880s, two-thirds of the Adirondacks' forests had been cut over at least once for spruce. Between 1,000,000 and 1,500,000 acres had been cut over for hemlock. But 2,000,000 acres of old-growth timber remained intact, and 1,300,000 million acres were missing only softwoods. According to Adirondack forest historian Barbara McMartin, "because only spruce, hemlock, and pine were logged, as late as 1885 no more than fifteen to thirty percent of the forest cover had been taken from little more than a third of the original park."[39]

But much of this softwood harvest had occurred near the roads and rivers that tourists frequented, raising public alarm disproportionate to the Adirondacks' total timber harvest. In January 1885 *Harper's Weekly* pointedly juxtaposed two drawings in a one-page spread entitled "Forest Destruction in the Adirondacks—The Effects of Logging and Burning Timber." The first, "A Feeder of the Hudson—As It Was," depicted a stream flowing through a mature, moist, verdant forest; the second, "A Feeder of the Hudson—As It Is," featured the same stream, now but a streambed, bordered by a barren desert.[40]

This well-publicized riparian damage galvanized the citizens and lawmakers of New York to action during the late nineteenth century. Not moved by the desire to preserve wilderness for wilderness' sake, New York's government was instead persuaded by the compellingly utilitarian and apocalyptic arguments originally expounded by George Perkins Marsh in his now-classic work *Man and Nature: or, Physical Geography as Modified by Human Action* (1864). In *Man and Nature* Marsh argued that intact forests provided an essential

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[39] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 216; Barbara McMartin, *The Great Forest of the Adirondacks*, 31, 65, quote from p. 68.
[40] Barbara McMartin, *The Great Forest of the Adirondacks*, 1-2; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 217, 219; *Harper's Weekly* 29, no. 1456 (Jan. 24, 1885), 56, text p. 58.

regulatory service for watersheds, maintaining consistent water levels and thus preventing excessive flooding and erosion.[41]

Conservationists and sportsmen—often the same people—eagerly amplified Marsh's message, employing its utilitarian logic in the battle to preserve the Adirondacks' forests. According to a *Forest and Stream* article from 1882, "few are so ignorant to-day as not to know that the clearing off of timber tends to dry up the springs which flourished on the shady, mossy sides of hills…hence it needs no elaborate argument to show that this region, which is the source of the Hudson…and which is of no value whatever as an agricultural district, should be preserved as a public park." New York's commerce, "as well as the health of the whole people of the state," depended on it. *Harper's Weekly* brought the same message to a potentially different audience three years later.[42]

This message resonated in Albany as the water levels of the commercially critical Hudson River and Erie Canal dropped precipitously during this era. In 1885 New York Governor David Hill and the state legislature responded by creating the Adirondack Forest Preserve, a patchy and discontiguous 715,000 acres. In 1892 Governor Roswell Flower and the legislature created the 2,800,000 acre Adirondack State Park. While this action did not add to the state's landholdings, it did serve to focus land purchases within the park's "Blue Line." Two years later, on the heels of more drought and thus more low water levels, New York's government strengthened its preservationist stance in the region by adding the "Forever Wild" clause to the state constitution, an amendment that protected the state-owned forests of the

[41] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 219-229; Roderick Nash, *Wilderness and the American Mind* (New Haven: Yale University Press, 1967), 105, 118-119; George Perkins Marsh, *Man and Nature* (Cambridge: Belknap Press of Harvard University, 1965), 113-280, see especially 171-172.
[42] *Forest and Stream* 19 (September 14, 1882), 102; C.S. Sargent, "Forest Destruction," *Harper's Weekly* 29, no. 1456 (Jan. 24, 1885), 58.

Adirondack Highlands for perpetuity. As Roderick Nash has noted, an accidental wilderness was born.[43]

But while "the state was acquiring more and more land to preserve" during the 1890s, "loggers were cutting more and more timber from smaller and smaller tracts of forest." The growth of railways into and through the Adirondack region, as well as the ability of the paper industry to use saplings, spurred an increase in Adirondack logging during this time. After peaking in 1905, however, the Adirondack timber harvest steadily declined. As the rocky fields of the Adirondacks could not compete with the rich soils of Ohio, Indiana, and Illinois, neither could the forests of the Adirondacks compete with the more softwood-rich forests of Michigan, Wisconsin, and Minnesota. As logging declined in northern New York, state land purchases increased. In 1912 New York expanded the Blue Line to include more than 4,000,000 acres. By 1931, the Adirondack Park had grown to more than 5,500,000 acres. Across this time the percentage of land in state ownership, and thus off limits to logging, gradually increased to its current rate of forty-three percent (see Map II).[44]

Although New York State has preserved greater proportions of the now 5,821,257 acre Adirondack State Park (roughly the size of Vermont), the human footprint has continued to widen. Millions of visitors pass through the Adirondacks each year. One hundred and thirty thousand people reside year-round within the park; seasonally, this population doubles. Fifty-one percent (2,994,968 acres) of the Adirondacks remain privately owned. These statistics,

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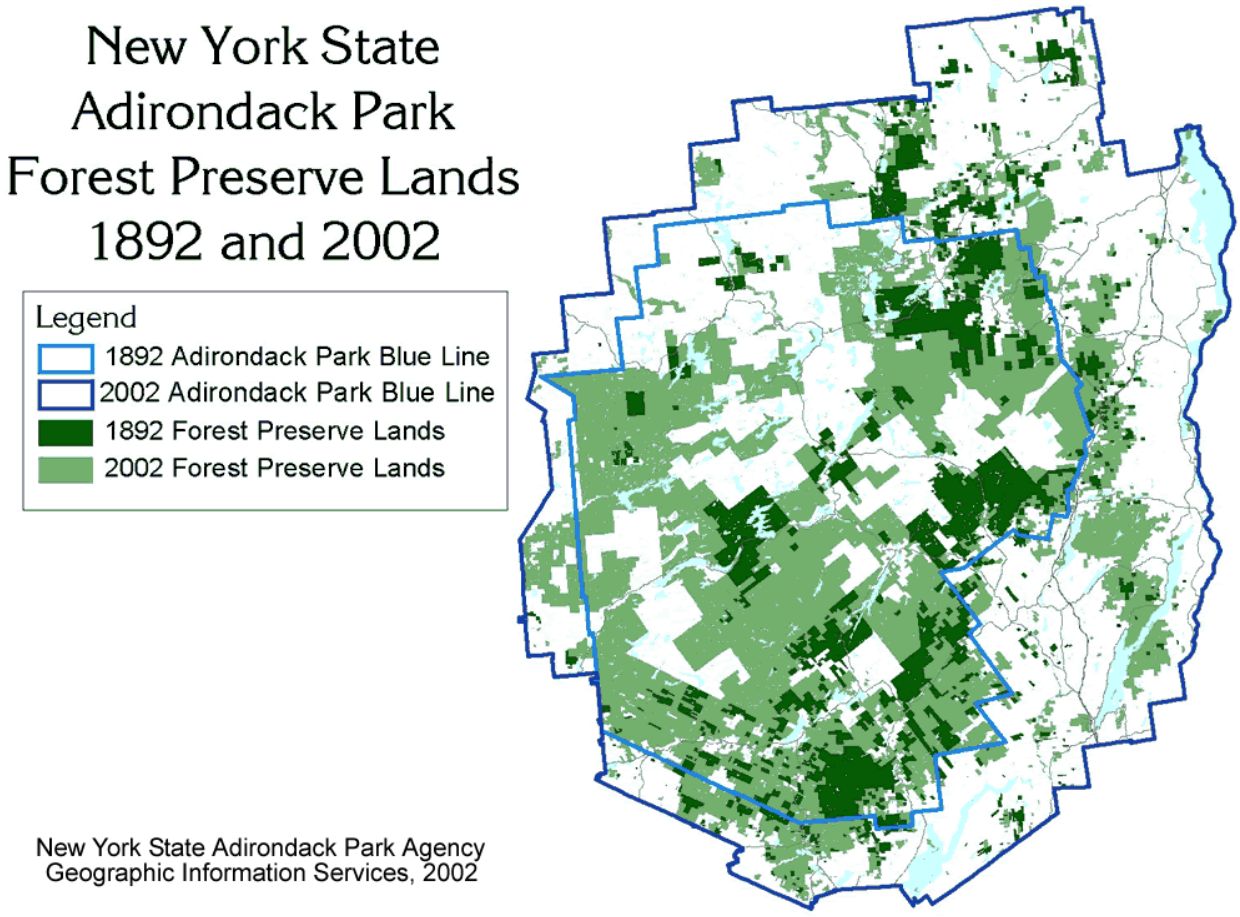
[43] According to the same issue of *Forest and Stream*: "Thirty years ago there was plenty of water in the Hudson below Troy at all seasons…Now a steamboat channel is all that remains in midsummer, and this is so scant that the river is lined with stone dykes to keep the water in the channel" (102). Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 219-229; Roderick Nash, *Wilderness and the American Mind*, 108, 119, 122.

[44] Barbara McMartin, *The Great Forest of the Adirondacks*, quote p. 75; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 227-229; Gary Randorf, *The Adirondacks: Wild Island of Hope* (Baltimore: John Hopkins University Press, 2002), 48-49; APA, "Adirondack Park Land Use Classification Acreage and Percent by County and the Park" (August 28, 2007), http://www.apa.state.ny.us/gis/stats/colc0708.htm. Forty-three percent of the Park is state-owned, fifty-one percent is privately owned, and six percent is water.

Map II



This map is available online through the Adirondack Park Agency's website: http://www.apa.state.ny.us/_assets/img_map_002.gif.

among other things, provide a potent recipe for Adirondack development, as evidenced by the 1,000 homes built each year on private lands within the Blue Line. The Adirondack Park Agency, through its Private Land Use and Development Plan, regulates the nature and scale of this development. In hamlets (0.92% of the Park), houses may be tightly clustered in the usual fashion. Land zoned for "rural use" (17.43% of the Park) allows one dwelling per eight acres, while land zoned for "resource management" (26.5% of the Park) allows one home per forty-three acres.[45] Each house requires a road—or at least a driveway—and access to amenities.

Despite the dangers and uncertainties posed by such fragmentation, 2,491,709 acres in the Adirondacks remain state-owned and protected as "forever wild" by the New York State constitution. This total includes 1,286,433 acres of "wild forest," a designation that prohibits logging but permits mechanized vehicle use. An additional 1,095,138 acres have been designated as wilderness. Five wilderness areas exceed 100,000 acres, including the magnificent 226,435 acre High Peaks Wilderness. One canoe area and four primitive areas provide another 83,851 acres that receive wilderness-level protection. Much of this land is what Christopher Klyza has termed "wilderness in recovery," or what Bill McKibben has labeled "second-chance wilderness." But not all. Mary Davis has estimated that between 60,000 and 200,000 scattered acres of old growth forest have persisted within the Adirondack Highlands, while Barbara McMartin offers an estimate in excess of 500,000 acres. The Five Ponds Wilderness alone includes 50,000 acres of old growth forest, the largest contiguous tract of unlogged forest in the Northeast.[46]

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[45] Gary Randorf, *The Adirondacks: Wild Island of Hope*, xvii, 42-49, 177-179; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 5-7, 296-309; APA, "Adirondack Park Land Use Classification Acreage and Percent by County and the Park" (August 28, 2007), http://www.apa.state.ny.us/gis/stats/colc0708.htm; Christopher McGrory Klyza, "An Eastern Turn for Wilderness" and "Public Lands and Wild Lands in the Northeast," in *Wilderness Comes Home: Rewilding the Northeast*, 7-8, 76-82.

[46] The remaining state lands have been designated as intensive use (19,747 acres), state administrative (1,661 acres), and historic (530 acres). Another 4,359 acres await classification. APA, "Adirondack Park Land Use Classification

Whether old growth or new, whether growing in a never-visited corner of Hamilton County or beside a crumbling foundation near Keene Valley, the resurgent forests of the Adirondacks—with help from New York's citizens and lawmakers—have proven their resiliency. And so have the mammals that have returned to reclaim them.

Acreage and Percent by County and the Park" (August 28, 2007), http://www.apa.state.ny.us/gis/stats/colc0708.htm; Christopher Klyza, "Public Lands and Wild Lands in the Northeast" and "An Eastern Turn for Wilderness," in *Wilderness Comes Home*, quote p. 14, 80-85, 290; Bill McKibben, introduction to *The Adirondacks: Wild Island of Hope* by Gary Randorf, xii ; Mary Davis, *Old Growth in the East* (Richmond, VT: Wild Earth Publication, 1993), 33-34; Barbara McMartin, *The Great Forest of the Adirondacks*, 190.

3 MAN AND BEAVER IN THE ADIRONDACKS

As Samuel de Champlain and his Algonquian traveling companions ascended Lake Champlain in 1609, at least one hundred thousand beavers inhabited the Adirondack Highlands to their west. When Harry Radford, New York's leading advocate for beaver and moose restoration, surveyed the region in 1895, fewer than ten beavers remained. As I trudged through murky waist-deep water along the Northville-Lake Placid Trail on a summer morning in 2004—a hiking boot dangling precariously from my mud-covered foot—at least one of the Adirondacks' seventy-five thousand beavers watched me. The Adirondack beaverscape of Champlain's era had returned, and I was mired in its midst.

But long before Champlain sailed from Europe or Radford arrived in the Adirondacks or I tied on my first pair of shoes, Iroquois men hunted within this expansive beaverscape. They left their villages during the autumn and early winter on well-worn paths that wound through the familiar fields and open forests surrounding their villages. These trails radiated outward from the horticultural heart of Iroquoia, carrying the hunters southward onto the Allegheny Plateau or northward into the uninhabited highlands of the Adirondacks. While the archeological record indicates that these hunters chiefly sought white-tailed deer, they targeted beavers as well.[1]

Averaging forty inches long and forty-five pounds, the continent's largest rodent was not difficult to find. Like the trails the hunters followed, beavers seldom strayed too far from the Adirondacks' many waterways. Fifty-five to sixty-seven percent of them inhabited conspicuous conical collections of sticks, stones, and mud that sometimes measured thirty feet in diameter

[1] William Fenton, "Northern Iroquoian Culture Patterns," in *The Handbook of North American Indians, XV, The Northeast*, vol. ed. Bruce G. Trigger (Washington, D.C: Smithsonian Institution, 1978), 297; Dean R. Snow, "Iroquois Prehistory," in *Extending the Rafters: Interdisciplinary Approaches to Iroquoian Studies*, ed. Michael Foster et al (Albany: State University of New York Press, 1984), 256; William A. Ritchie, *The Archaeology of New York State* (Garden City: The Natural History Press, 1965), 55-56; Daniel Richter, *The Ordeal of the Longhouse: The Peoples of the Iroquois League in the Era of European Colonization* (Chapel Hill: University of North Carolina Press, 1992), 76; Gordon M. Day, "The Indian as an Ecological Factor in the Northeastern Forest," *Ecology* 34, no. 2 (April 1953), 332.

and seven feet in height. Those beavers that did not build lodges resided instead in bank-side burrows with entrances beneath the water.[2]

Beaver families, consisting of a breeding pair, the young of the year, the young from the previous year, and, depending on local population densities, two-year-olds, often inhabited multiple lodges during warmer months. As the weather cooled in the fall the family congregated within a single large lodge. Lloyd Trevis, who spent a summer studying a family of seven beavers near Albany, observed that they worked independently on their two lodges three or four nights out of every five. An average night's maintenance included a deposit of four quarts of mud and one large stick.[3]

Beaver dams received the same consistent but independently-initiated attention. Built of mud, sticks, rocks, and uprooted vegetation, beaver dams allowed water to percolate slowly through their intricate latticework while retaining up to ninety percent of the stream's sediment and organic material in the main channel or pond. Families frequently maintained multiple dams in proximity along a watercourse; where colony densities were high, dam frequencies could be startling. Working along the north shore of the Gulf of St. Lawrence, where up to eight beaver

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[2] D. Andrew Saunders, *Adirondack Mammals* (Syracuse: Adirondack Wildlife Program, State University of New York College of Environmental Science and Forestry, 1988), 101-106. Also available online via the SUNY ESF website: Adirondack Ecological Center, "Beaver," http://www.esf.edu/aec/adks/mammals/beaver.htm; Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer* (Ithaca: Comstock Publishing Associates, 2003), 59; Earl Hilfiker, *Beavers: Water, Wildlife and History* (Interlaken, New York: Windswept Press, 1991), 117; Ernest Thompson Seton, *Life Histories of Northern Animals* (New York: Charles Scribner's Sons, 1909), 460-463; Edward Royal Warren, *The Beaver: Its Work and Its Ways* (Baltimore: The Williams and Wilkins Co., 1927), 78-79; Lewis Henry Morgan, *The American Beaver: A Classic of Natural History and Ecology* (New York: Dover Publications, Inc., 1986), 160-162. Originally published as *The American beaver and his works* (Philadelphia: J.B. Lippincott, 1868).

[3] D. Andrew Saunders, *Adirondack Mammals*, 105; Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 30-31; Richard A. Lancia et al, "Winter Activity Patterns of Two Radio-Marked Beaver Colonies," *Journal of Mammalogy* 63, no. 4 (Nov. 1982), 602; Lloyd Trevis, Jr., "Summer Behavior of a Family of Beavers in New York State," *Journal of Mammalogy* 31, no. 1 (February 1950), 53.

colonies can exist in a single square mile, wildlife biologists have counted more than twenty dams bisecting one mile of stream.[4]

Beaver dams, as well as beaver canals, can attain spectacular proportions. Biologists Earl Hilfiker and D. Andrew Saunders have observed dams up to fifteen feet high and three hundred feet long. Near Wanakena Ernest Thompson Seton discovered an abandoned beaver canal that stretched 654 feet from Gal Pond to a distant grove of aspen and birch. Such noteworthy engineering feats were often the products of several generations of sustained activity by local beavers.[5]

In most habitats, including northern New York, beaver densities would have seldom exceeded one or two colonies per square mile. But the ecological effects of dam-building and tree-cutting remained profound.[6] In addition to impounding most of a stream's organic and inorganic material, beaver dams reduced stream velocity, elevated water tables, moderated the stream's seasonal fluctuations, and created and maintained wetlands. Tree-cutting and flooding in the adjacent riparian zone opened the forest canopy and influenced the local composition of floral and faunal communities. As beavers abandoned sites, their dams deteriorated and their ponds drained, initiating a new round of terrestrial succession. The pH and general quality of the old pond-bottom, enriched by years of detritus and nutrient accumulation, combined with the

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[4] Lloyd Trevis, Jr., "Summer Behavior of a Family of Beavers in New York State," 52-53; Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 168; Lewis Henry Morgan, *The American Beaver*, 81-82, 93-99; Earl Hilfiker, *Beavers: Water, Wildlife and History*, 111; Robert J. Naiman et al, "Alteration of North American Streams by Beaver," *Bioscience* 38, no. 11 (December 1988), 754.

[5] D. Andrew Saunders, *Adirondack Mammals*, 101-106. Earl Hilfiker, *Beavers: Water, Wildlife and History*, 110, 115, 124; Ernest Thompson Seton, *Life Histories of Northern Animals*, 458. Lewis Henry Morgan discusses the long sweep of beaver occupancy, and its effects on a landscape, in *The American Beaver: A Classic of Natural History and Ecology*, 83-86. Morgan dismisses earlier notions that beavers worked collaboratively in large associations.

[6] Earl Hilfiker, *Beavers: Water, Wildlife and History*, 16; Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 89; Gary R. Parsons, "Effect of a Four-Year Closure of the Trapping Season for Beaver in Eastern Warren County," *New York Fish and Game Journal* 22, no. 1 (January 1975), 59. Algonquin Provincial Park possesses beaver densities between one and two colonies per square mile as well. Michael R. Broschart et al "Predicting Beaver Colony Density in Boreal Landscapes," *The Journal of Wildlife Management* 53, no. 4 (October 1989), 931.

surrounding plant communities to dictate the rate and nature of revegetation. The cumulative effects of repeated beaver colonizations, abandonments, and recolonizations produced a "spatially and temporally heterogeneous landscape" composed of "diverse hydrologic and vegetative patches." Occupied and molded by beavers for thousands of years, the Adirondack Highlands was beaver country, and looked it.[7]

The Iroquois hunters, penetrating the Adirondacks along the same lake chains, rivers, and streams, were intimately familiar with such a beaverscape. And they were equally familiar with the habits of the animal that had created it. They knew that "the best beaver habitat occurred on relatively wide streams with low gradient on soil with poor drainage." They knew that the timing of their hunt would find beaver families—in their winter coats—concentrated in winter lodges. They knew that on a cold winter day a family's occupancy could be betrayed by warmer air wafting through the lodge's chimney. [8]

Ice made the hunt easier, and the Iroquois men, with their prized beaver-hunting dogs, closed in on occupied lodges. The beavers, snugly encased in structures "no musket ball can pierce," had few avenues of escape. Hunters made holes in the ice near the lodge and baited the area beneath the hole with wood. Nets, perhaps baited with more wood, were lowered into the water to ensnare tempted beavers. When the hunters caught one they pulled it from the hole and killed it with clubs.[9]

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[7] Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 168; Robert J. Naiman et al, "Alteration of North American Streams by Beaver," 753-762; Glenn C. Champagne, "The Beaver in New York," *The Conservationist* 26, no. 1 (Aug.-Sept. 1971), 21; Michael R. Broschart et al "Predicting Beaver Colony Density in Boreal Landscapes," quoted material pp. 929, 932.

[8] Rebecca J. Howard and Joseph S. Larson, "A Stream Habitat Classification System for Beaver," *The Journal of Wildlife Management* 49, no. 1 (January 1985), quote p. 24; Lewis Henry Morgan, *The American Beaver*, 143-144.

[9] Reuben G. Thwaites, ed., *The Jesuit Relations and Allied Documents* (Cleveland: The Burrows Brothers Co., 1898), VI: 299. Each volume of the *Jesuit Relations* has been digitized, and can be accessed online: http://puffin.creighton.edu/jesuit/relations/.

The alternate winter hunting method, considered "more noble" by Jesuit observers, required the lodge's demolition. While physically-taxing, this method invariably succeeded in driving the beavers from their lodge and into the water below, "some on one side, some on the other, seeking hollow and thin places between the water and ice, where they can breathe." The hunters broke the ice at these sections and killed the beavers as they surfaced for air; dogs caught any that escaped to the shore. None was knowingly left behind.[10]

Besides providing clothing and bedding for the Iroquois, beavers provided an energy-rich source of meat, packed with three times as many calories as venison.[11] The Jesuit priest Paul LeJeune rated beaver meat "very good," while the observant Dutchman Adriaen Van Der Donck, appearing in *A Description of the New Netherlands* as something of a beaver connoisseur, compared the appearance of a skinned beaver to that of "fed pork." He noted that the fat, "of which the Indians are very fond," was "frequently two or three fingers thick." No beaver part was eaten as fondly as the tail, which, according to Van Der Donck, excelled "all other flesh taken on land and in the water."[12]

But while beavers (and porcupines) sometimes kept non-horticultural groups north of the Adirondack Highlands from starving during stretches of the winter, this palatable source of fat and protein played a less critical role within pre-contact Iroquoian subsistence. Deriving as much as eighty percent of their diet from the products of their fields—and concentrating their

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[10] *The Jesuit Relations* (*JR*), VI: 299-303; Adriaen Van Der Donck, *A Description of the New Netherlands* (1656), trans. Jeremiah Johnson, ed. Thomas F. O'Donnell (Syracuse: Syracuse University Press, 1968), 116; Paul LeJeune noted among the Indian groups of the St. Lawrence, as Van Der Donck did among the Iroquois, that "when the Savages find a lodge of them [beavers], they kill all, great and small, male and female." *JR*, VIII: 57.

[11] J.V. Wright, "Archeological Evidence for the Use of Furbearers in North America," in *Wild Furbearer Management and Conservation in North America*, ed. Milan Novak (Toronto: Ministry of Natural Resources, 1987), 6.

[12] *JR*, VI: 305; Adriaen Van Der Donck, *A Description of the New Netherlands*, 117, 119-120.

hunting attention primarily on white-tailed deer—the Iroquois likely viewed beavers as tasty and useful supplements (and occasional back-ups) to their late fall and winter diets.[13]

The arrival and entrenchment of Europeans along the St. Lawrence and Hudson rivers during the opening decades of the seventeenth century revolutionized this arrangement. New France, New England, and New Netherlands quickly began to function as the input-side of a vast intercontinental pipeline that transformed New World beavers into Old World hats. In the process fur traders and the European market system of which they were a part redefined the beaver's value. "Not only the best thing and the easiest to make use of in this country," beaver pelts were also "the coin of the greatest value." Appropriately, the seal of New Netherlands featured a beaver beneath a crown. The original North Americans were willing, perceptive, and active participants in the beaver's coronation. An Indian acquaintance revealed much when he joked with Paul LeJeune that "the Beaver does everything perfectly well, it makes kettles, hatchets, swords, knives, bread…in short, it makes everything." While white-tailed deer remained important protein sources for the Iroquois, beavers became the regional currency following European contact.[14]

Entrance into the market system and the frenetic pursuit of beaver pelts fundamentally transformed not only the Iroquoian economy, but also the region's geopolitics and ecology. During the 1610s, when independent Dutch traders first arrived on the upper Hudson River and the fur trade operated on a smaller and less organized scale, the Mohawks and their Algonquian-

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[13] For descriptions of Algonquian and Jesuit winter use of beavers and porcupines along the St. Lawrence, see *JR*, VI: 275-277, 305-307; VII: 47, 121, 147, 159; XI: 211; XXVIII: 27; Ronald J. Mason, *Great Lakes Archaeology* (New York: Academic Press, 1981), 37.

[14] Jean E. Murray, "The Early Fur Trade in New France and New Netherland," *The Canadian Historical Review* 19, no. 4 (December 1938), 365-377; Harold Innis, *The Fur Trade in Canada* (New Haven: Yale University Press, 1962); *JR*, IX: 173; *JR*, VI: 297. At least some Europeans considered beaver uses beyond headwear. According to Adriaen Van Der Donck "medicines prepared from beaver testicles were infallible remedies." Testes taken in water were said to cure idiocy, while beaver oil purportedly alleviated dizziness, trembling, rheumatism, lameness, stomach pain and tooth aches. Those with gout were encouraged to "wear slippers and shoes made of beaver skins." *A Description of the New Netherlands*, 110-111.

speaking neighbors, the Mahicans, "maintained amicable relations." This relationship shifted during the 1620s as the Dutch West India Company, chartered in 1621, began to reorganize the New Netherlands' fur trade. Construction of Fort Orange (present-day Albany) commenced in 1623, and Dutch West India Company officials immediately "began to court trade with the Mahicans' Algonquin allies, who had access to furs of higher quality than those available south of the Great Lakes."[15]

A "violent edge" soon surrounded this far-flung appendage of the Dutch empire as the Mohawks refused to relinquish their conduit into the European economy. Unwilling to be pushed aside, and possessing the manpower to ensure that they were not, the Mohawks began attacking the Mahicans, their former allies, in 1624. By 1628 the Mohawks had successfully driven the last of the Mahicans east of the Hudson River.[16]

The Mohawks, numbering between 8,110 and 10,570 individuals, inhabited several towns along the Mohawk River, about sixty miles west of Fort Orange. Fewer than 500—and potentially fewer than 300—European colonists inhabited the entirety of New Netherlands at this time. Outnumbered by at least sixteen to one, the Dutch relationship with the Iroquois was understandably "one of cautious and calculated appeasement." The most powerful force in New Netherlands, the Mohawks strengthened their monopolization of Fort Orange by forbidding any Algonquian trade there. Capable of enforcing this declaration, the Iroquois effectively separated

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[15] Daniel Richter, *The Ordeal of the Longhouse*, quotes pp. 54-55; Edmund Bailey O'Callaghan, *History of New Netherland; Or, New York Under the Dutch* (New York: D. Appleton & Co., 1845), 46-47, 89-100; Oliver Rink, *Holland on the Hudson: An Economic and Social History of Dutch New York* (Ithaca: Cornell University Press, 1986), 34, 50.

[16] R. Brian Ferguson and Neil L. Whitehead, *War in the Tribal Zone: Expanding States and Indigenous Warfare* (Santa Fe: School of American Research Press, 1992), chapter one: "The Violent Edge of Empire"; Daniel Richter, *The Ordeal of the Longhouse*, 55-56; Jean E. Murray, "The Early Fur Trade in New France and New Netherland," 368-371.

the Dutch from the Algonquians and established themselves as the sole purveyors of furs to Fort Orange.[17]

This arrangement bound the Iroquois and the Dutch tightly as economic partners. Between 1626 and 1632 the Dutch West India Company purchased an annual average of nine thousand beaver pelts. The Fort Orange fur trade peaked between 1654 and 1664, when an average of forty-six thousand pelts passed through the fort each year. Drawing on a seemingly inexhaustible supply of tools, blankets, guns, powder, and ammunition, the Dutch merchants were well-equipped to handle such a surge. But for how long could the beavers of Iroquoia and the Adirondacks sustain this annual harvest?[18]

The pre-contact beaver population estimates for the Adirondacks, like those for North America generally, have varied widely.[19] Champlain estimated that 1,000,000 beavers inhabited the Adirondack Highlands. Because that would require a population density of more than ninety beavers per square mile, such an estimate is likely inflated. More recent pre-contact estimates have revised this figure considerably. Canadian biologist C.H.D Clarke has estimated that 100,000 beavers inhabited the Adirondacks of Champlain's day, a figure that projects the much more realistic population density of nine beavers per square mile.[20]

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[17] Dean R. Snow and William A. Starna, "Sixteenth-Century Depopulation: A View from the Mohawk Valley," *American Anthropologist* 91, no. 1 (March 1989), 147; In "Mohawk Iroquois Populations: A Revision," *Ethnohistory* 27, no. 4 (Autumn 1980), 371-382, William Starna proposed that the Mohawk population prior to the epidemic waves of the 1630s may have been as high as 17,000; *JR*, XXVIII: 113; Oliver Rink, *Holland on the Hudson*, 144, 158, quote p. 215; Daniel Richter, *The Ordeal of the Longhouse*, 56.

[18] Oliver Rink, *Holland on the Hudson*, 90, 257.

[19] Dietland Muller-Schwarze and Lixing Sun note pre-contact North American beaver population estimates of sixty to four hundred million in *The Beaver: Natural History of a Wetlands Engineer*, 97-98; Harold Innis estimates ten million in *The Fur Trade in Canada*, 4; Ernest Thompson Seton, a minimum of eighteen million, *Life Histories of Northern Animals*, 452; Earl Hilfiker, ninety to one hundred and twenty million, *Beavers: Water, Wildlife and History*, 15.

[20] Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 98; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver* (J.B. Lyon Company, 1908), 395-396. Clarke is cited by Philip G. Terrie in his book *Wildlife and Wilderness: A History of Adirondack Mammals* (Fleischmanns, New York: Purple Mountain Press, 1993), 19. Studies conducted in Algonquin Provincial Park in Ontario between 1955 and 1975 determined that one to two beaver colonies existed per square mile. If the average

With an average family size of five to six individuals, and approximately fifty-five to sixty-seven percent of them possessing lodges, more than eleven thousand active winter lodges would have dotted the pre-contact Adirondack beaverscape.[21] Lying between the Mohawk River and Fort Orange and the St. Lawrence River and Quebec, accessed from the south by the Five Nations Iroquois and from the north by the Hurons, Algonquins, and Montagnais, the Adirondacks' beaver population came under serious pressure during the first half of the seventeenth century as these groups descended on the region in large hunting parties that spent one to two months in the field. Rapidly reduced in numbers, the Adirondacks' beavers persisted at population densities that rendered their extraction commercially inefficient within economies that demanded a consistently high annual influx of pelts. Optimal foraging strategy had left the Adirondacks with a small, but vital, beaver population.[22]

Consequently, Iroquois hunters during the latter half of the seventeenth century began to travel hundreds of miles from Iroquoia to acquire pelts.[23] By the early eighteenth century, two-thirds of the fur shipped from Albany originated west of the Niagara River. European forts and trading posts followed the fur trade westward. In 1720 the French built a post below Niagara

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family consisted of four to six beavers, the beaver population density of Algonquin Park would closely approximate the average density found in the Adirondacks (as derived from Clarke's estimate). Michael R. Broschart et al "Predicting Beaver Colony Density in Boreal Landscapes," 931.

[21] D. Andrew Saunders, *Adirondack Mammals*, 105; Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 59.

[22] Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 41; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 397-398; Ernest A. Sterling, "The Return of the Beaver to the Adirondacks," *American Forestry* 19, no. 5 (May 1913), 296; *JR*, XXVIII: 287; Adriaen Van Der Donck, *A Description of the New Netherlands*, 97; Bruce G. Trigger, "Ontario Native People and the Epidemics of 1634-1640," in *Indians, Animals, and the Fur Trade: A Critique of Keepers of the Game*, ed. Shepard Krech III (Athens: University of Georgia Press, 1981), 27-28; Daniel Richter, *The Ordeal of the Longhouse*, 57.

[23] *JR*, XXXIV: 123; Thomas Elliot Norton, *The Fur Trade in Colonial New York, 1686-1776* (Madison: University of Wisconsin Press, 1974), 15, 27; Harold Innis, *The Fur Trade in Canada*, 51; Allen W. Trelease, "The Iroquois and the Western Fur Trade: A Problem in Interpretation," *The Mississippi Valley Historical Review* 49, no. 1 (June 1962), 32-51. By the early 1640s, with their population halved by virgin soil epidemics, the Iroquois exploded aggressively outward in desperate attempts to acquire pelts and captives. In addition to far-ranging hunting and raiding expeditions, the Iroquois became riverine pirates on the St. Lawrence and Ottawa Rivers, essentially blockading parts of these rivers each year in order to intercept the annual canoe convoys bound for Quebec (see Daniel Richter, *The Ordeal of the Longhouse*, 57-59). *JR*, VIII: 57-59, XXIV: 271-297, XXX: 227-289, XXXIII: 259-261, XXXIV: 87-89, 197, 205-207, XLV: 247, LIV: 117.

Falls, matched by the English in 1722 with Fort Oswego on Lake Ontario. Contested, expansive, and rugged, the Adirondack Highlands had become a beaver backwater.[24]

There beavers persisted for the duration of the eighteenth century as settlers pushed the Euroamerican frontier north up the Champlain Valley and west along the Mohawk Valley. The colonial New York fur trade continued to exist, but after 1690 the colony's economy became increasingly centered on agriculture. Once New York's primary export, furs fell to twenty percent of the total exports made to England during the first half of the eighteenth century. Following the French and Indian War, fur exports had fallen to a mere ten percent.[25]

Devastated by war and disease, a much smaller regional Indian population continued to engage in a less significant fur trade with a much reduced Adirondack beaver population. Traveling along Lake Champlain in 1749, Swedish naturalist Peter Kalm noted that the region's Indians continued to hunt beavers and deer within the Adirondacks. Periods of war—the Seven Year's War, the Revolutionary War—briefly released beaver populations, but the rodents' numbers remained generally suppressed. By the end of the eighteenth century no more than 5,000 remained in the 11,000 square mile Adirondack Highlands.[26]

White trappers like Nick Stoner, Nat Foster, William Wood, Green White, Uncle Jock, and Crookneck Simmons began arriving in the Adirondacks during the opening decades of the nineteenth century. These men, alternately amusing and disgusting, joined a diverse assortment of reservation Indians who still hunted and trapped within the region. Armed with recently-

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[24] Glenn C. Champagne, "The Beaver in New York," 18; Daniel Richter, *The Ordeal of the Longhouse*, 248-255; Harold Innis, *The Fur Trade in Canada*, 86.
[25] Thomas Elliot Norton, *The Fur Trade in Colonial New York, 1686-1776*, 101-102.
[26] Daniel Richter, *The Ordeal of the Longhouse*, 188-189, 355-356; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 41-45; Peter Kalm, *Travels Into North America*, trans. John Reinhold Forster (Barre: The Imprint Society, 1972), 379; Harold Innis, *The Fur Trade in Canada*, 102. Peter Thomas examines the correlation between warfare and the quantity of furs traded in his essay "The Fur Trade, Indian Land and the Need to Define Adequate 'Environmental Parameters,'" *Ethnohistory* 28, no. 4 (Autumn 1981), 359-379. Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 400.

developed steel traps, earnest trappers further depressed the beaver population. The War of 1812 offered the Adirondacks' beavers a brief respite, but the following years quickly eliminated any war-time population gain. In 1815 a group of Canadian Indians ascended the Oswegatchie River in St. Lawrence County in pursuit of beavers; they returned after a few weeks with 300. By 1820 fewer than 1,000 beavers remained in the Adirondacks.[27]

The introduction of nutria into the fur market around this time, coupled with the rising popularity of silk hats, may have eased beaver exploitation to a degree, but it certainly did not halt it. As Edward Warren observed, beaver fur was "of too fine a quality not to be utilized." Dressed skins continued to be used for "caps, collars, cuffs, muffs, and gauntlets." During the summer of 1840 naturalist James DeKay, exploring "'those almost interminable forests on the highlands separating the sources of the Hudson and St. Lawrence,'" observed that while beavers "'are not numerous…they are still found in scattered families in the northern part of Hamilton, the southern part of St. Lawrence and the western part of Essex counties.'" Eliminated throughout the rest of the state by this time, beavers persisted in the remote waterways of the Adirondacks (see Map III).[28]

These scattered families seemed to have kept a relatively low profile. The records of those who witnessed the mid- to late-nineteenth century winnowing of the beaver population indicate that the proportion of beavers residing in burrows increased. DeKay observed that "the

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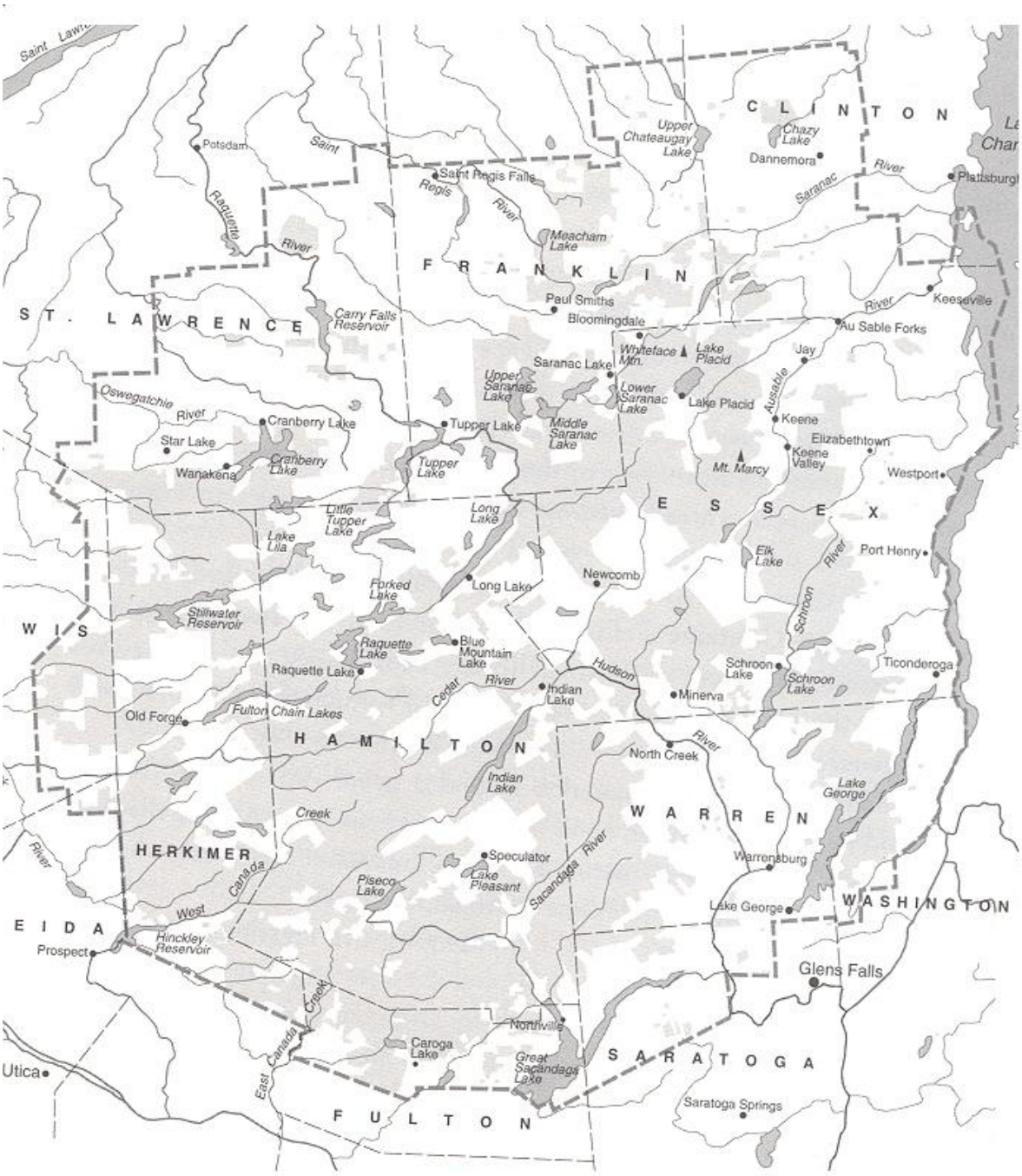
[27] Paul Schneider, *The Adirondacks: A History of America's First Wilderness* (New York: Henry Holt and Company, 1997), 75-85; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 400-401; Ernest A. Sterling, "The Return of the Beaver to the Adirondacks," 293; Clinton Hart Merriam, *The Mammals of the Adirondack Region, Northeastern New York* (New York: Press of L.S. Foster, 1884; reprint, New York: Arno Press, 1974), 253.

[28] Edward R. Warren, "The most Interesting Wild Animal in America," *The Scientific Monthly* 27, no. 1 (July 1928), first quote pp. 39-40; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 401, second quote p. 403; Clinton Hart Merriam covers James DeKay in *The Mammals of the Adirondack Region, Northeastern New York*, 254-255.

MAP III: Counties, Hamlets, and Aquatic Features of the Adirondack State Park



This map is available online at http://people.colgate.edu/ssand/enst480/map.htm.

Beaver has been so much harassed in this State, that it has ceased making dams, and contents itself with making large excavations in the banks of streams." Colonies that maintained dams and lodges, presumably, would have been the easiest targets for trappers; those that excavated burrows along larger watercourses—with entrances beneath the water and often beneath protruding tree roots—would have been more difficult to locate. As decades of exploitation passed, burrow-dwellers likely survived at higher rates.[29]

The beavers of the Adirondacks also responded to the depredations of the period by altering their reproductive patterns. In unexploited populations, where a high percentage of suitable beaver sites are occupied, yearlings do not typically breed. Dietland Muller-Schwarze and Lixing Sun have found that in New York the occupation of forty percent of suitable sites will prevent breeding among this age class. By the mid nineteenth century, however, beavers occupied far less than forty percent of the Adirondacks' suitable sites; as a result, yearling reproduction would not have been inhibited. Additionally, exploitation freed more sites for colonization by dispersing young beavers, reducing the mortality rate of the wandering two-year-old class.[30]

Beaver fecundity, however, could not keep pace with the depredations of masterful trappers armed with steel traps. The next half century whittled the Adirondacks' sparse and scattered beaver population down to a handful of families concentrated in the region's well-watered central core. By 1870 only three or four families, and some additional lone beavers, persisted in and around Saranac Lake in southern Franklin County. By 1885 twenty burrow-

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[29] James DeKay, *Zoology of New York* (1842), as quoted in Clinton Hart Merriam, *The Mammals of the Adirondack Region, Northeastern New York*, 254-255. Note William Clowbridge, Asa Puffer, and William Wood's efforts to find beavers within water bodies in which they knew the beavers existed. Ernest A. Sterling, "The Return of the Beaver to the Adirondacks," 298; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 406; Earl Hilfiker, *Beavers: Water, Wildlife, and History*, 117-118.

[30] Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 30, 90-91, 95-97, 101-102, 112; Earl Hilfiker, *Beavers: Water, Wildlife, and History*, 42.

dwelling beavers remained, to the delight of tourists staying at the Saranac Inn. In his book *The Mammals of the Adirondack Region* (1884), Clinton Hart Merriam noted that beavers "are so exceedingly rare that few people know that they still exist here." The contributors and editors of *Harper's Weekly* certainly did not know of their existence: in February of 1885 the popular magazine featured a beaver—alongside a wolverine, wolf, mountain lion, elk, and moose—in a full-page drawing entitled "'Evicted Tenants' of the Adirondacks." The accompanying text mistakenly reported that "the last recorded beaver was caught on the Raquette River in 1880."[31]

Despite the best efforts of Saranac Inn's management, trappers continued to evict local beavers. Targeting Upper Saranac Lake, trappers removed one or two beavers in 1894 and at least one more in 1895. Five to ten remained as the Adirondacks' beavers reached their nadir. At the urging of Harry Radford, one of the state's leading mammal restoration advocates, the New York State legislature prohibited beaver trapping the same year. By 1900 the population had increased slightly to fifteen.[32]

Now protected, this modest remnant population, clustered in southern Franklin County's dense concentration of lakes, ponds, rivers, and streams, was primed for a population explosion. The Progressive Era's burgeoning conservation ethic, which had driven the creation of the Adirondack State Park, combined with the desires of sportsmen to promote the restoration of the region's non-predatory native fauna. Beginning with moose, the Adirondacks' restoration impulse quickly included beavers.[33]

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[31] Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 404-406; Clinton Hart Merriam, *The Mammals of the Adirondack Region, Northeastern New York*, 253; "'Evicted Tenants' Of The Adirondacks," drawn by Daniel Beard, *Harper's Weekly* 29, no. 1471 (Feb. 28, 1885), 136, text p. 139.
[32] Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 406-407, 417.
[33] *Seventh Report of the Forest, Fish and Game Commission of the State of New York* (Albany: JB Lyon Co., 1902), 234-238; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 113-129.

The timing was perfect. The ecological effects of logging and fire, the region's lack of predators, the creation of the Adirondack State Park, the presence of interested private landowners, and the state-imposed moratorium on beaver trapping combined to create an early twentieth century landscape ideally suited for the return of *Castor canadensis*. Loggers, who for the past several decades had floated the Adirondacks' softwoods down streams and rivers such as the Raquette, Moose, Black, Beaver, St. Regis, Oswegatchie, Grass, and Sacandaga, had understandably focused most of their cuts within one mile of running water. Farmers and charcoal producers had added to this effect, opening large bands of forest in proximity to the Adirondacks' streams and rivers.[34]

Locomotives, which began penetrating the Adirondack Highlands during the 1890s, generated sparks that ignited fires that swept across many of these cut-over districts. "Small and scattered" before 1890, fires razed considerable acreages around the turn of the century. In 1903 more than 400,000 acres burned, including significant swaths between the Independence and Moose rivers in northeastern Herkimer County, along the Oswegatchie River in St. Lawrence County, and in several sections of Franklin County. In 1908 the largest burn occurred southeast of Cranberry Lake, in southeastern St. Lawrence and northwestern Hamilton counties.[35]

Whether cut-over only or cut-over and then burned, the often complementary processes of logging and fire transformed large portions of mature forests along watercourses into prime beaver habitat. "Rapidly growing, generally short-lived, shade intolerant species which reproduced aggressively outside the forest" invaded the new riparian environments in force. Possessing highly mobile seeds and suckers capable of developing up to sixty-six feet from the parent tree, aspens (*Populus* spp.) were particularly well-equipped to pioneer recently logged or

[34] Barbara McMartin, *The Great Forest of the Adirondacks* (Utica: North Country Books, 1994), 1-2, 14, 23-38; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 201-219.
[35] Barbara McMartin, *The Great Forest of the Adirondacks*, 46, 139-143, quote from p. 139.

burned landscapes. Subsequent burns or cutting for pulp promoted aspen suckering and maintained their dominance by inhibiting succession.[36]

In a fateful historical conjunction, fully-protected beaver populations encountered dense, young, even-age stands of aspen, their preferred form of woody vegetation, close to many of the central Adirondacks' lakes, ponds, streams, and rivers. Surrounded by ideal habitat, the fifteen beavers inhabiting Franklin County in 1900 likely could have repopulated the whole of the Adirondack Highlands themselves. But reinforcements soon arrived to accelerate their efforts.[37]

With the support of the New York State Forest, Fish and Game Commission, private landowners—not requiring state funds—initiated the first beaver releases within the Adirondack State Park. These releases were clustered in the Adirondacks' central core. Edward Litchfield, who owned "a very extensive private forest in the southwestern corner of Franklin County," released approximately one dozen beavers into Litchfield Park, beginning in 1901. These beavers and their progeny expanded their range within Franklin County, particularly along the Raquette River, and augmented the rebounding remnant population near Upper Saranac Lake. Other individuals from the Litchfield releases colonized southern St. Lawrence and northern Hamilton counties. In 1902 Timothy L. Woodruff released two beavers from Canada at a private

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[36] Gordon Whitney, *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate North America, 1500 to Present* (New York: Cambridge University Press, 1994), quote p. 193, 195, 197-200; LeRoy C. Stegeman, "The Production of Aspen and Its Utilization by Beaver on the Huntington Forest," *The Journal of Wildlife Management* 18, no. 3 (July 1954), 348; William Lawrence, "Michigan Beaver Populations as Influenced by Fire and Logging" (Ph.D. diss., University of Michigan, 1954), 114, 137-139.

[37] William Lawrence, "Michigan Beaver Populations as Influenced by Fire and Logging," 3-4, 109, 113-114, 193; LeRoy C. Stegeman, "The Production of Aspen and Its Utilization by Beaver on the Huntington Forest," 348; Daniel J. Decker, "The Beaver: New York's Empire Builder," *The Conservationist* 35, no. 3 (Nov.-Dec. 1980), 15; Glenn C. Champagne, "The Beaver in New York," 19. Southwestern New York's Allegany State Park provides a good example of *Castor canadensis'* capacity to repopulate a region. Not a single beaver inhabited the 65,000 acre state park during the opening decades of the twentieth century. In 1937, the state introduced one pair: by the 1950s beavers inhabited all of the park's suitable habitat. Dietland Muller-Schwarze and Lixing Sun, *The Beaver: Natural History of a Wetlands Engineer*, 91-92.

preserve on Lake Kora, about three miles south of Raquette Lake in Hamilton County. One made its way to the south branch of the Moose River.[38]

New York State soon joined private landowners as active participants in the beaver translocation campaign. Pushed by Harry Radford and a coalition of sportsmen and naturalists, the state legislature passed a beaver appropriation bill in 1904 that allocated $500 to the Forest, Fish and Game Commission. In the fall of that year the Commission bought seven beavers from the Louisiana Purchase Exposition in St. Louis. On December 17th the seven beavers arrived at the state fish hatchery in Old Forge. Located at the base of the Fulton Chain Lakes in eastern Herkimer County, Old Forge offered a convenient central location for the eventual releases.[39]

Henry Davidson, the hatchery foreman, and Ned Ball, a local guide, oversaw the beavers' upkeep, while the Brown's Tract Guides Association met the rodents' maintenance expenses. Davidson and Ball kept the beavers in one of the hatchery's cement rearing ponds. Forty feet long, ten feet wide, and fourteen inches deep, the pond was surrounded by a wire fence and fed by running water, which the beavers immediately dammed. Davidson and Ball built a rectangular wooden box over the pond to serve as a surrogate lodge. Six of the seven beavers survived the winter; one was killed in a fight.[40]

On April 27, 1905 the "Army of Liberation" departed Old Forge. Harry Radford and five active members of the Brown's Tract Guides Association rowed two guideboats up the Fulton Chain to Inlet, on Fourth Lake. Disembarking at Inlet, the six men, working in shifts, toted two zinc-lined crates carrying two beavers twelve miles to the cabin of the hermit Frank Gray on the

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[38] Ernest Thompson Seton reports the content of a letter from Harry Radford in his book *Life Histories of Northern Animals*, 478; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 408, 414.
[39] Ernest Thompson Seton, *Life Histories of Northern Animals*, 478; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 408-410.
[40] Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 408-412.

south branch of the Moose River. On April 29th the small army liberated the two beavers on a point in the stream where one of Timothy Woodruff's beavers, released at Lake Kora in 1902, had taken up residence. The next fall Gray noticed a large lodge near the point. Radford and company liberated the remaining four in a small stream at the head of Big Moose Lake, about six miles north of Inlet on the border of Herkimer and Hamilton counties. The beavers soon divided into two pairs and remained in the area east of Big Moose Lake.[41]

The collaborative public/private beaver acquisition and translocation effort continued in 1906. George Stevens of Lake Placid (in western Essex County) released a single beaver from Canada into a brook entering that lake, while the state legislature allocated one thousand dollars to the Forest, Fish and Game Commission to acquire additional beavers. Contracting with the Secretary of the Interior, the Commission purchased twenty-five beavers from Yellowstone National Park. Ned Ball received the first shipment on September 3, 1907. Four of the eight had died in transit; the survivors were soon released near Old Forge. On October 13th eight healthy beavers arrived from Wyoming. Four were released on state land near the Fulton Chain's Fourth Lake; the other four were released ten miles to the north at the outlet of Terror Lake, also on state land. Five days later two more beavers from Yellowstone entered the Adirondacks' waters near the head of Little Tupper Lake in northern Hamilton County.[42]

Between 1901 and 1907 the New York State Forest, Fish and Game Commission, together with private landowners, released thirty-five beavers into the central Adirondacks. Clustered principally in eastern Herkimer, western Hamilton, and southern Franklin counties, these translocated beavers successfully reinforced local populations and promoted rapid and sustained population growth. As an early-breeding herbivore, lacking significant competitors

[41] Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 414-415.
[42] Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 415-416; Ernest Thompson Seton, *Life Histories of Northern Animals*, 478.

and predators, beavers were, and are, ideal candidates for translocation. Abounding with suitable habitat at the core of the beaver's historic range, the Adirondack State Park provided the ideal setting. And the state legislature offered greater protection in 1904, declaring it illegal to "molest or disturb any wild beaver or the dams, houses, homes, or abiding places of the same." This law increased the fine for trapping a beaver from $50 to $100. By the end of 1907 a self-sustaining population of approximately one hundred beavers inhabited the Adirondack State Park.[43]

Reflecting on this success six years later, Ernest Sterling offered an interesting perspective:

> Had they become actually extinct and been re-established from outside sources much interest would still have been attached to the undertaking; but the fact that the line was never quite broken and the species is being perpetuated in a definite region through natural increase resulting from protection, assisted perhaps by the infusion of new blood from introduced stock, seems all the more wonderful.

While wildlife advocates had watched Thoreau's "nobler animals" succumb to the depredations and stresses of the mid to late nineteenth century, the beaver, somehow, had persisted. That a remnant population remained to contribute to the beaver's revival was important to Sterling, and likely many others.[44]

Growing in numbers and attracted to similar habitats, *Castor canadensis* and *Homo sapiens*, engineers both, soon came into conflict in the Adirondacks. The first murmurs of discontent emanated from the State Forest, Fish and Game Commission's 1907 report, which noted early complaints of private timber damage. These complaints grew in number and volume

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[43] Brad Griffith et al, "Translocation as a Species Conservation Tool: Status and Strategy," *Science* 245, no. 4197 (Aug. 1989), 477-479; Michigan State University College of Law Animal Legal and Historical Web Center, "Barrett vs. State of New York" (1917), http://www.animallaw.info/cases/causny220ny423.htm; Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History* (Syracuse: Roosevelt Wildlife Forest Experiment Station, 1927), 537; Harry V. Radford, *The Artificial Preservation of Timber and History of the Adirondack Beaver*, 416.

[44] Ernest A. Sterling, "The Return of the Beaver to the Adirondacks," 295.

as the growing beaver population impounded more and more water and cut more and more trees during the second and third decades of the twentieth century. The rising water levels of ponds and lakes killed, or threatened to kill, shoreline trees, transforming "beautiful and valuable camp or cottage sites…into desolate, worthless wastes." To another critic, the Fulton Chain's Eighth Lake had become "bedraggled and unkempt" since the beaver's return. The *New York Times* amplified these sentiments with the 1913 headline "Want War On Beavers; Adirondack Campers Demand Season When They May Be Trapped."[45]

William Barrett, who owned a valuable tract bounded by Eagle Creek and picturesque Fourth Lake, likely aligned himself with this more militant camp. Barrett hoped to profit from his tract's lovely combination of water and aspen by building homes on it; the local beavers, however, hoped to develop the water and eat his aspen. Between 1909 and 1912 the four beavers from Yellowstone released nearby, and their progeny, felled 198 aspens on Barrett's land and girdled many more. Justifiably upset, Barrett took his case to the courts. He and his lawyers believed that the state, in electing to restore beavers to the region—a species "known to be destructive to property"—should be liable for any beaver-related damages. The law of 1904, charged Barrett and his team, "represented an unconstitutional exercise of police power." Decided in 1917 (*Barrett v. State of New York*), the New York State supreme court ruled that the state "is not liable for the damage that ensued from 'liberating' the beaver." No compensation was necessary for the felled trees and the state's beaver restoration efforts were not in violation

[45] Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 505-506, 509-510, 537; Vernon Bailey, *Beaver Habits, Beaver Control, and Possibilities in Beaver Farming* (Washington: United States Department of Agriculture, 1922, Bulletin Number 1078), 2, 10, first quote p. 10; Robert B. Peck, "The Renaissance of the Beaver," *Forest and Stream* (April 1921), 152-154, 182-187, second quote p. 183; *New York Times*, 13 July 1913.

of the Fifth Amendment. The court noted that "the claimants might have fenced their land" or "driven the beaver away" without violating the law.[46]

Such beaver-related complaints, "numerous" according to the Conservation Commission's 1912 report, were understandably inevitable as private landowners and the state came to terms with the beaver's revival. Realizing that "the subject is not without its complications," the Conservation Commission began issuing occasional trapping permits for problem beavers. But the Commission's 1915 report unequivocally opined that "the attraction and benefit that the animals afford is far in excess of the harm that they cause." Dams, lodges, and canals had become popular tourist attractions while beaver ponds "proved to be the natural breeding pools for trout, to the marked improvement of fishing on all the streams where the beaver have located."[47]

The rhetoric soon shifted as the historic beaverscape began to reemerge. In 1919 rangers counted 587 beaver dams in ten counties. They estimated that the dams had flooded 8,681 acres and produced $51,425 of timber damage. The 1919 Conservation Commission report, which featured the caption "The Busy Beaver Is No Respecter Of Valuable Timber" beneath a photograph of a beaver lodge set amidst a flooded forest, asserted that something needed to be done to control the beavers in the Adirondacks and protect against "such large and wide spread damage." Significantly, the Commission's report claimed more than just timber damage, noting that beavers had "frequently flooded public highways and even railroads," while damaging "improvements such as roads, docks, boathouses, cottages, etc. that have been constructed on privately owned land." The Commission recommended a brief open season, but the state

[46] Michigan State University College of Law Animal Legal and Historical Web Center, "Barrett vs. State of New York" (1917), http://www.animallaw.info/cases/causny220ny423.htm.
[47] *State of New York Second Annual Report of the Conservation Commission, 1912* (Albany: JB Lyon Co., 1913), 133; *State of New York Fifth Annual Report of the Conservation Commission, 1915*, as quoted in Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 537, 572.

legislature declined on the grounds that the Commission's ability to remove nuisance beavers should be sufficient for the time.[48]

Robert B. Peck, writing for *Forest and Stream* in April 1921, noted that beaver activity had adversely affected navigation of the central Adirondacks' waterways. The Raquette River, a historically popular paddling route connecting Long Lake and Raquette Lake, required numerous portages around beaver dams by 1920 despite consistent and significant human-inflicted damage to the dams. The local beavers, "probably the busiest beavers in the world," were "slow to take a hint." "And if they have any spare time," wrote Peck, "they undoubtedly spend it at beaver mass meetings called to adopt resolutions favoring the expulsion of hunters from the woods." Originally "an interesting experiment," *Castor canadensis* had become a "nuisance" to the Conservation Commission, a "vexatious problem" to *Forest and Stream*, and a "menace" to the *New York Times*.[49]

Such a reputation, earned in a short but action-packed fifteen years, may not have been just. Charles Eugene Johnson, who had assumed Harry Radford's mantle as the region's chief beaver advocate, argued that "it is probable that much enlargement of the damages caused by beaver was made for purposes of propaganda in behalf of interests which for one reason or another were opposed to the presence of beaver, or of those who coveted its valuable fur." Johnson found "the gloomy picture depicted in the annual reports of the Conservation Commission" inconsistent with his own observations. In addition to being "somewhat extravagant in the use of figures," the compilers of the beaver damage statistics wielded them imprecisely. No doubt the rangers counted 587 beaver dams in 1919, but these dams were not

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[48] *State of New York Conservation Commission Ninth Annual Report, For the Year 1919* (Albany: JB Lyon Co., 1920), 48-51; Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 541; Robert B. Peck, "The Renaissance of the Beaver," 184.

[49] Robert B. Peck, "The Renaissance of the Beaver," 154, 184, 185; *State of New York Conservation Commission Twelfth Annual Report, For the Year of 1922* (Albany: JB Lyon Co., 1923), 6; *New York Times*, 18 February 1921.

uniformly scattered throughout the Adirondack counties, nor were they evenly distributed on public and private land. Indeed, of the 587 dams, 490 (eighty-three percent) occurred in the adjacent counties of Hamilton and Herkimer, at the epicenter of the beaver restoration effort. Neither Clinton nor Washington counties had any dams; Fulton, Oneida, and Saratoga counties had three each; Franklin County had six, Warren County had nine, and Lewis County had eleven. Additionally, four hundred and ten of the 587 dams noted in 1919 (seventy percent) occurred on state land, from which, according to the New York State Constitution, timber could not legally be extracted. Why calculate damages to timber that is off limits? And why assume "that every acre flooded was covered with a close stand of the more valuable species of trees"?[50]

Johnson drew his own conclusions regarding beaver-inflicted timber damage. First, far fewer locations were susceptible to dam-flooding than the Conservation Commission reports indicated. Second, when estimating timber damage, the size, quantity, and quality of timber should be noted, he thought. And third, the area flooded did not necessarily equal the area that had previously supported timber. Johnson noted that relatively few complaints emanated from owners of large tracts; instead, most came from those with waterfront property—individuals who could have applied to the Conservation Commission for a trapping permit. Furthermore, Johnson claimed that he had never heard of any beaver-related flooding of public roads or railroads, as the 1919 report claimed.[51]

The beavers' affect on trout became an almost equally contentious issue. The 1915 Conservation Commission report had indicated that the presence of beavers in watersheds seemed to have improved trout fishing. In 1916 Tarlton Bean, a state fish culturist, echoed this

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[50] Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 534, 541, 549-550; *State of New York Conservation Commission Ninth Annual Report, For the Year 1919*, 48-51.
[51] Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 553, 572-573; *State of New York Conservation Commission Ninth Annual Report, For the Year 1919*, 48.

report, asserting that "the beaver dams in the Adirondacks make stream pools on a large scale, and have greatly improved trout fishing on the streams where they are located." Such pools increased the food supply by increasing the surface area and volume and often produced larger trout. But dams could also endanger trout by limiting their movement up or down a stream and exposing them to high summer water temperatures and potentially harmful gases. Good or bad, the effects of beaver dams on the regional trout population varied from pool to pool and stream to stream, just as it had for thousands of years. And as *Forest and Stream* noted, fishing had declined throughout the Adirondack Park at this time, regardless of whether beavers were present in the watershed or not.[52]

By the early 1920s the Conservation Commission and various interest groups—including the Adirondack Club—had convinced the state legislature that an open season would not endanger the beaver population, which had risen to between 8,000 and 20,000 individuals by 1921. While a fraction of the pre-contact Adirondack beaver population, 8,000 to 20,000 beavers had not inhabited the region since at least the eighteenth century. The first open season, in March 1924, effectively thinned this population while also placating local landowners. The latter effect cannot be overlooked, for as Michael Conover has demonstrated in the late twentieth century, regulated hunting and trapping "can increase landowner tolerance of wildlife and wildlife damage."[53]

Unfortunately the Conservation Commission did not maintain records for the 1924 and 1925 open seasons. Johnson's forays into the field revealed a much-reduced beaver population

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[52] Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 537, 555-565 (Tarlton Bean quote p. 556); Robert B. Peck, "The Renaissance of the Beaver," 182.

[53] *New York Times*, 7 January 1923; Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 576-581; *State of New York Conservation Commission Twelfth Annual Report, For the Year of* 1922, 8; *State of New York Conservation Commission Fifteenth Annual Report, For the Year 1925* (Albany: JB Lyon Co., 1926), 18; Michael R. Conover, "Effect of Hunting and Trapping on Wildlife Damage," *Wildlife Society Bulletin* 29, no. 2 (Summer, 2001), 528-529.

and his conversations with regional fur buyers provided more quantitative data. While some trappers may have sent their pelts out of state, the buyers that Johnson questioned purchased 2,478 pelts following the first season and 3,573 following the second, numbers that represent the minimum harvest. Justifiably afraid that another open season would adversely affect the beaver population, New York avoided a third.[54]

The state sporadically scheduled open seasons over the next two decades, before making the annual open season a fixture in 1948. In 1953 trappers harvested a then-record 9,194 beavers from New York State. The record held until 1972, when more than 12,000 beavers were trapped—the most in at least two hundred years. For the remainder of the twentieth century annual statewide harvests varied considerably as pelt prices rose and fell. Unfortunately for those who derive a significant portion of their income from trapping, the purchasing power of furs has declined in recent decades. As a result fewer men (a joint study by the New York State Department of Environmental Conservation and Cornell University determined that in the early 1990s ninety-nine percent of trappers were men) have taken to the field. The New York State Department of Environmental Conservation, now confronted with more than 2,000 beaver-related complaints each year—including nearly 500 from the Adirondacks—must attempt to manage the beaver population by "balancing the habitat benefits of beaver against the damages that beaver cause."[55]

Three and a half centuries had transformed the beaver-human relationship. Writing in 1921 Robert Peck jokingly remarked: "How the worthy burghers of Old Fort Orange would blink

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[54] Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 547-548, 581-584.
[55] Glenn C. Champagne, "The Beaver in New York," 19; *New York Times*, 6 May 1941, 21 June 1953; "New York State DEC Historic Furbearer Database, Statewide Harvest, 1958-2001," *Furbearer Management News* (Winter 2003), 5; Robert F. Gotie, "The Fur Market in 2000-01," *Furbearer Management News* (Winter 2002), 6-7; William F. Siemer et al, "Characteristics of Trappers and Trapping Participation in New York," *Wildlife Society Bulletin* 22, no. 1 (Spring 1994), 102; William N. Sharick, "New Tools Available for Beaver Nuisance Control," *Furbearer Management News* (Winter 2003), 11; Mike Ermer, "Beaver Management in New York—Revisited," *Furbearer Management News* (Winter 2002), 1, 3.

could they tread Capitol Hill to-day and see officials of this gigantic New Netherlands scratching their polls to discover a way of thinning out the beaver!" No longer the frantically sought currency of the colonial and early republic periods, beavers, having flirted with extinction, had become ecologically-valuable nuisances within a society that tolerated—even celebrated—ecologically-valuable nuisances.[56]

The beaver had come full circle. And so had its population. In 2000-2001 trappers harvested 2,731 beavers from the three beaver management units that cover the Adirondack Highlands. While an almost identical harvest to that of 1925 in terms of numbers, the first harvest of the twenty-first century was a significantly smaller proportion of the total beaver population; at least 50,000, and potentially more than 75,000, beavers inhabited the Adirondack Highlands at this time. Fifty thousand beavers likely represent more than 9,000 colonies living within a beaverscape studded with more than 5,000 lodges and bisected by more than 10,000 dams. [57]

As a result, thousands of Adirondack acres again exist in varying stages of beaver-driven succession: some are substantial ponds or flowages created by recently erected dams, some are wetlands on the way to ponds, some are wetlands on the way to open fields, and some are open fields on the way to forest. All are unique and all provide habitat to a diversity of plant and animal species that benefit from the edge conditions created by such ecological disturbances.[58]

The beaver has also restored the Adirondacks' topographic and historic legacies, reanimating the region's fifteen Beaver Brooks, seven Beaver Meadow Brooks, six Beaver Creeks, and ten Beaver Ponds. Voted the official state animal in 1975, *Castor canadensis*

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[56] Robert B. Peck, "The Renaissance of the Beaver," 152.
[57] Mike Ermer, "Beaver Management in New York—Revisited," 3-4; D. Andrew Saunders, *Adirondack Mammals*, 101, 105; Charles Eugene Johnson, *The Beaver in the Adirondacks: Its Economics and Natural History*, 579;
[58] Earl Hilfiker, *Beavers: Water, Wildlife and History*, 141-193.

reconnected New York with its beaver-based origins.[59] But perhaps most importantly, the beaver provided the state with its first twentieth century mammal restoration success. Demonstrating the resilience of wildlife if provided with adequate protection and habitat, the beaver offered New Yorkers a hint of what the Adirondack Highlands could become. Besides offering browsing sites for moose and white-tailed deer, breeding sites for spotted salamanders and leopard frogs, and nesting sites for wood ducks and pileated woodpeckers, the beaver offered hope for humans. And proof that a cultural landscape need not exclude the "nobler animals."

[59] The US Board on Geographic Names provides a search-function for the Geographic Names Information System (GNIS) via its website: http://geonames.usgs.gov/domestic/index.html; *New York Times*, 13 August 1975.

4 "THE MIGHTY MOOSE" RETURNS

In August 1861, near Raquette Lake in Hamilton County, James B. Blossom, William Wood, and "a guide by the name of Palmer from Long Lake" shot and killed what may have been the last three moose in New York State. In the days and weeks following their hunts these men likely gathered with their peers at local camps and watering holes where they sought to establish their places in Adirondack lore. A few long-deceased, glassy-eyed, hoppy-smelling moose heads may have observed the scenes, unflinchingly, from mountings on the wall.[1]

While moose-human encounters in the Adirondack Highlands of the mid nineteenth century almost always sent humans scrambling for their guns, such encounters during the opening years of the twenty-first century have sent humans scrambling instead for their cameras. The post-encounter scenes remain contemplatively triumphant, but now the contemplations run forward, not backward. Now the contemplations are lined with hope, not nostalgia.

That nostalgia peaked in the decades following the Civil War. Daniel Beard captured the longing for wilder days with his drawing "'Evicted Tenants' of the Adirondacks." The drawing, dominated by a stout and centrally-located bull moose, left no doubt in the minds of *Harper's Weekly* readers which mammal species was the noblest and most charismatic, as well as the most missed. Madison Grant captured this sentiment in one of the Forest, Fish and Game Commission's annual reports, in which he praised "the mighty moose" as the "largest and grandest of the deer, wary, brave, deep of chest and strong of limb." A prayer followed the

[1] Clinton Hart Merriam, *The Mammals of the Adirondack Region, Northeastern New York* (New York: Press of L.S. Foster, 1884; reprint New York: Arno Press, 1974), 140-143; Madison Grant discusses the practice of displaying moose heads in the *Seventh Report of the Forest, Fish and Game Commission of the State of New York* (Albany: JB Lyon Co., 1902), 233-234.

praise: "May the shadow of his dark form once more fall upon our nothern [sic] lakes, and the gleam of his great antlers be seen in the somber recesses of the North Woods."[2]

The Adirondack Club (later the Tahawus Club), which leased nearly one hundred-thousand acres around the headwaters of the Hudson River from the now-defunct Adirondack Iron and Steel Company, acted first to bring moose back to the Adirondacks' somber recesses. The club released four moose from Canada into their central Adirondack tract during the late 1870s. While two of these transplants soon died, the effort reflected a broad late nineteenth and early twentieth century enthusiasm for—or perhaps infatuation with—non-predatory mammal translocations. In 1890 Verplank Colvin called for New York to introduce mountain goats and bighorn sheep, along with moose and caribou, into the Adirondack ecosystem. A state assemblyman from Essex County suggested that a small herd of bison be released as well. In 1892 New York's Forest Commissioner recommended that wild boar be introduced to the region; Edward Litchfield, captivated by the idea, imported seven from Germany and released them on his private Franklin County preserve. By the end of 1903, private interests had also released twenty-two elk at Forked Lake Carry, forty at Little Tupper Lake, twenty at Raquette Lake, and seventy-three at Paul Smith's. The Forest, Fish and Game Commission estimated that in 1904 two hundred elk were wandering the forests of the Adirondack Highlands. The state augmented this population in 1906 with the release of twenty-six more. The herd, subsisting in habitat poorly suited to elk and looking like magnificently large deer to Adirondack hunters, gradually disappeared.[3]

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[2] *Harper's Weekly* 29, no. 1471 (February 28, 1885), 136; *Seventh Report of the Forest, Fish and Game Commission of the State of New York*, 238.

[3] Barbara McMartin, *The Great Forests of the Adirondacks* (Utica: North Country Books, 1994), 148; Paul Schneider, *The Adirondacks: A History of America's First Wilderness* (New York: Henry Holt and Co., 1997), 268-269; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals* (Fleischmanns, New York: Purple Mountain Press, 1993), 113, 118, 123-128, 131; *Seventh Report of the Forest, Fish and Game Commission of*

Harry Radford, meanwhile, confined his wildlife advocacy to mammal species more commonly associated with the mixed forests and abundant waterways of the Northeastern woodlands, namely moose and beaver. Through his journal *Woods and Waters*, which he founded in 1898, Radford began a vigorous campaign that called for the reintroduction of the eastern moose (*Alces alces americana*) to the Adirondack ecosystem. While Dr. William Seward Webb released five moose from his fenced 10,000 acre preserve onto state land in 1900, Radford mobilized an association of sportsmen in New York City who together prepared a moose appropriation bill for the state legislature. In 1901 the legislature approved the bill and allocated $5,000 to the Forest, Fish and Game Commission for moose acquisition. The state government also banned the killing of moose; violators faced a $250 fine and between three months and one year in prison.[4]

In July 1902 the Forest, Fish and Game Commission received their first moose, one cow and two bulls, which they released, appropriately, near Big Moose Lake on the border of Hamilton and Herkimer counties. The Commission released nine more in the same area later in the year. According to Radford, at least half of the twelve translocated moose were males. Whether this proportioning of the sexes was a conscious management decision or not, it does accurately reflect the fact that male moose disperse at higher rates than females and thus tend to be overrepresented in a pioneering population.[5]

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the State of New York, 38-39; *New York State Forest, Fish and Game Commission Sixteenth Annual Report, For the Year 1910* (Albany: JB Lyon Co., 1911), 203.

[4] *Seventh Report of the Forest, Fish and Game Commission of the State of New York*, 39; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 119-121, 131; Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 272; *New York Times*, 11 January 1901, 9 March 1901.

[5] *New York Times*, 27 July 1902; Ernest Thompson Seton relates the contents of a letter from Harry Radford, verbatim, in his book *Life-histories of Northern Animals* (New York: Charles Scribner's Sons, 1909), 152; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 121-122; D.H. Pimlott and W.J. Carberry, "North American Moose Transplantations and Handling Techniques," *The Journal of Wildlife Management* 22, no. 1 (Jan. 1958), 58, 62; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement* (Albany: New York State DEC, Sept. 1, 1992), appendix: p. 1; Dale L. Garner and

Unfortunately, beyond mentioning the Canadian origins and the sex composition of the Adirondacks' moose transplants, the records provide little additional information. Were fifteen to twenty moose considered a sufficient number to repopulate the region? Were the moose in good health at the time of their release? Was a translocated population potentially composed of more males than females a wildlife management blunder? Modern research and accounts of other early moose trapping and translocation efforts may offer valuable insights.

Contemporary moose biologists have established that while a population skewed heavily towards males may not be ideal for maximizing short-term population growth, neither is a population skewed heavily towards females. Because moose in forests often exist at relatively low population densities and "tend to form pairs" during their "relatively short" late September-early October breeding season, a nearly even sex ratio is best to maximize a population's biological potential. "Not only is a high bull/cow ratio important for adequate and timely reproduction," writes wildlife biologist Charles Schwartz, but "the male component of the population also must contain an adequate number of prime bulls."[6]

The Adirondacks' moose cohort certainly contained an adequate number of males, but were they in prime condition? D.H. Pimlott and W.J. Carberry, in their 1958 article "North American Moose Transplantations and Handling Techniques," reported high rates of moose mortality during the trapping and transporting phases of mid-twentieth century translocations. In

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William F. Porter, "Movements and Seasonal Home Ranges of Bull Moose in a Pioneering Adirondack Population," *Alces* 26 (1990), 80.

[6] Charles C. Schwartz, "Reproduction, Natality and Growth," in *Ecology and Management of North American Moose*, eds. Albert W. Franzmann and Charles C. Schwartz (Washington: Smithsonian Institution Press, 2005), quoted material from pp. 162, 164. The contributors to *Ecology and Management of North American Moose* differentiate between tundra and forest moose, at times treating their ecology and management separately. Reproduction and management for different population compositions are two divergences. Regarding moose population densities, see Victor Van Ballenberghe and Warren B. Ballard's chapter "Population Dynamics" in *Ecology and Management of North American Moose*, 225; D. Andrew Saunders, *Adirondack Mammals* (Syracuse: Adirondack Wildlife Program, State University of New York College of Environmental Science and Forestry, 1988), 211-213.

examining data from such efforts in Michigan (1935-1937), Wyoming (1934, 1948, 1950), Cape Breton Island (1947-1948), and Labrador (1953), Pimlott and Carberry observed that, on average, one moose died for every two transported. Earlier translocations may have experienced even greater losses. A 1904 campaign to establish a population of moose in Newfoundland suffered one casualty for every one moose successfully released. Summer transit, for a species stressed by temperatures above sixty degrees, could also prove fatal. Four of the twelve moose bound for Cape Breton Island in August 1947 succumbed "to exhaustion brought about by the extremely hot weather."[7]

While several moose may have died in the Canadian forests to produce the twelve individuals that New York purchased, nothing indicates that any died en route, although a hot July transit would certainly have taxed the transplants. The five moose released by Seward from his preserve would have been spared the stresses associated with long-distance summer travel. Regardless of origin, however, none of the moose in the Adirondacks had any familiarity with their new habitat. And range familiarity, according to wildlife biologists Dale Garner and William Porter, contributes significantly to a moose's survival.[8]

Despite the stresses of translocation and the challenges presented by a new habitat, the citizens of New York had high hopes for what *Woods and Waters* hailed as their "Returning King." With the exception of black bears, which will prey on moose calves, and human poachers, which are less discriminate in their killing, no predators of moose remained in the Adirondack Highlands. Additionally, the ecological disturbances of the late nineteenth and early

[7] D.H. Pimlott and W.J. Carberry, "North American Moose Transplantations and Handling Techniques," 53, 58-62, quote p. 61; Patrick D. Karns, "Population Distribution, Density and Trends," in *Ecology and Management of North American Moose*, 125.
[8] Dale L. Garner and William F. Porter, "Movements and Seasonal Home Ranges of Bull Moose in a Pioneering Adirondack Population," 82-84.

twentieth centuries, a boon to the resurgent beaver population, were equally advantageous to moose, a species that favors "a combination of young and old forest, but chiefly the former."[9]

Logging operations and fires had created patches, often of considerable size, in varying stages of succession. Such areas frequently supported high concentrations of aspen, birch, and balsam fir, the tree species most essential to moose subsistence in the forests of northeastern North America. Indeed, biologists studying moose in Minnesota have asserted that a region's moose population density is dictated, in part, by the amount of time that has elapsed since the last disturbance. Larry Irwin found that the moose population in one burnt-over district more than quadrupled within two growing seasons of a significant fire. The highest moose populations, however, typically occur eleven to thirty years after a fire or cut.[10]

With several thousand ponds and lakes, and 30,000 miles of streams, the Adirondack Highlands also offered the translocated moose an abundance of aquatic habitats. Ponds, streams, lakes, and marshes play a critical role in the formation of moose home ranges, as they provide essential feeding sites during the late spring through early fall. According to wildlife biologist James Peek, these aquatic habitats offer a "forage base with high biomass, high digestability, high sodium concentrations" and an "opportunity for relief from biting insects and hot weather." The Adirondacks' beaver population, working from within these same aquatic habitats, created

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[9] *New York Times*, 27 July 1902, 27 September 1903; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 120-122, *Woods and Waters* quote p. 122; Warren B. Ballard and Victor Van Ballenberghe, "Predator/Prey Relationships," in *Ecology and Management of North American Moose*, 261-262; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem" (MS thesis, State University of New York College of Environmental Science and Forestry, 1989), 67-68; Ian D. Thompson and Robert W. Stewart, "Management of Moose Habitat," in *Ecology and Management of North American Moose*, second quote p. 377; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, 45.

[10] Randolph L. Peterson, *North American Moose* (Toronto: University of Toronto Press, 1955), 114-142, 153-161; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," 53-54; Larry L. Irwin, "Deer-Moose Relationships on a Burn in Northeastern Minnesota," *The Journal of Wildlife Management* 39, no. 4 (October 1975), 653-654, 658; James M. Peek et al, "Moose Habitat Selection and Relationships to Forest Management in Northeastern Minnesota," *Wildlife Monographs* (April 1976), 36, 58, 60-61; James M. Peek, "Habitat Relationships," in *Ecology and Management of North American Moose*, 355-356, 363.

valuable ecotones and perpetuated the growth of useful forage (while also providing a degree of competition).[11]

The success of similarly-sized translocation efforts in other parts of North America may have further reinforced the optimism of New York's moose enthusiasts. In 1878 Canadian wildlife managers translocated two moose, one cow and one bull, from Nova Scotia to Newfoundland. While the fate of this pair remains uncertain, the 1904 translocation, which included two bulls and two cows from New Brunswick, quickly produced a self-sustaining population that expanded its range forty miles from the release site within ten years. By 1958 thirty to forty thousand moose inhabited the island. During the late nineteenth century moose were also successfully translocated to Quebec's Anticosti Island in the Gulf of St. Lawrence.[12]

But despite quality habitat and what appeared to be an adequately-sized cohort, moose translocation in the Adirondacks soon fizzled. Albany provided no additional funds after 1901, and by 1909 the state recognized the project as a failure. The annual Conservation Commission report that year noted that "nothing has been heard from the few moose still remaining in the Adirondacks." But why did New York's early twentieth century moose reintroduction campaign fail?[13]

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[11] Paul Schneider, *The Adirondacks: A History of America's First Wilderness*, 4; Arnold H. Boer, "Interspecific Relationships," in *Ecology and Management of North American Moose*, 347; Kris J. Hundertmark, "Home Range, Dispersal and Migration," in *Ecology and Management of North American Moose*, 320; James M. Peek, "Habitat Relationships," in *Ecology and Management of North American Moose*, 365-367, quote p. 367; Michael R. Broschart et al, "Predicting Beaver Colony Density in Boreal Landscapes," *The Journal of Wildlife Management* 53, no. 4 (Oct. 1989), 929-934; Earl L. Hilfiker, *Beavers: Water, Wildlife and History* (Interlaken, New York: Windswept Press, 1991), 141-193.

[12] D.H. Pimlott and W.J. Carberry, "North American Moose Transplantations and Handling Techniques," 58; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: p. 1.

[13] Dale L. Garner calculated that "the minimum viable population" for restocking northern New York was six (assuming a fifty-fifty sex ratio). "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," 83-84; Philip G. Terrie quotes the Conservation Commission's 1909 report in *Wildlife and Wilderness: A History of Adirondack Mammals*, 122.

First, and not surprisingly, it remained difficult to keep hunters, bullets, and moose from meeting. The text accompanying Beard's "'Evicted Tenants' of the Adirondacks" had accurately predicted in 1885 that "it would be somewhat difficult to restrain the native Adirondack hunter from blazing away at a moose if he should happen to see one." The state's moose-killing ban, fine, and potential imprisonment did not prove to be an adequate deterrent: local hunter Charles Martin shot and killed one of Seward's moose shortly after its release, and Harry Radford reported the deaths of four or five more "at the very outset" of the state's translocation campaign. Most of them, unfortunately, were females. Between 1907 and 1909 a hunter shot a young male that had managed to survive near Newcomb. With less than twenty moose released in the Adirondacks, a loss of at least six was significant.[14]

The Adirondacks' white-tailed deer population, which had grown exponentially during the late nineteenth and early twentieth centuries as humans eradicated predators and opened forests, provided a second obstacle to New York's moose restoration campaign. Both moose and whitetails thrive in habitats in early stages of succession, but deer possess a greater biological potential than moose, allowing them to keep pace reproductively with the intense regional hunting pressure of the late nineteenth century. As hunters were eliminating moose from portions of their southern range in New York and New England, white-tailed deer populations were expanding in the same areas. Rarely existing at population densities above ten deer per square mile in the northern portion of their range prior to Euroamerican arrival, whitetail densities regularly approached, or surpassed, twenty deer per square mile during the late nineteenth century and much of the twentieth. Their high natality rate allowed the species,

[14] *Harper's Weekly* 29, no. 1471 (February 28, 1885), 139; *New York Times*, 3 November 1900, 22 September 1903; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 122; Ernest Thompson Seton, *Life-histories of Northern Animals*, 152; D.H. Pimlott and W.J. Carberry, "North American Moose Transplantations and Handling Techniques," 58; D. Andrew Saunders, *Adirondack Mammals*, 209.

poorly adapted to long, harsh winters with significant snowfall accumulations, to compensate for occasionally massive winter losses.[15]

Direct competition with white-tailed deer for food resources would not have doomed moose in the Adirondacks, however. While both species are considered browsers, trees and shrubs provide ninety percent of the moose's diet but only sixty percent of the deer's. Arnold Boer, commenting on the interspecific relationship between moose and deer, notes that while the two species "compete for similar food items at certain times of the year…differences in forage preference, seasonal spatial segregation and abilities to cope with snow and cold temperatures are mechanisms that help partition resources." During the winter, when food resources are scarcest, the two species tend to occupy different habitats, mitigating the effects of winter dietary overlap (calculated to be forty-one percent in Maine).[16]

Interspecific competition for food may not have been a significant factor in the failure of New York's early twentieth century moose restoration effort, but parasite-mediated competition between the two species certainly was. The brainworm parasite (*Parelaphostrongylus tenuis*) coevolved with white-tailed deer in the eastern United States. Able to mature into a three inch long roundworm within the tissues covering a deer's brain and spinal cord, *P. tenuis* may occupy

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[15] Clinton Hart Merriam, *The Mammals of the Adirondack Region, Northeastern New York*, 107; Gerrit S. Miller, "Preliminary List of the Mammals of New York," *Bulletin of the New York State Museum* 6, no. 29 (Oct. 1899), 300; *State of New York Second Annual Report of the Conservation Commission, 1912* (Albany: JB Lyon Co., 1913), 129; Gordon Whitney, *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate North America, 1500 to Present* (New York: Cambridge University Press, 1994), 313; D. Andrew Saunders, *Adirondack Mammals*, 203-204; Randolph L. Peterson, *North American Moose*, 169; Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 15-16, 60; Peter Lemon, "Of Mites and Moose," *Adirondack Life* 37, no. 8 (Nov./Dec. 2006), 49; William S. Alverson et al, "Forests Too Deer: Edge Effects in Northern Wisconsin," *Conservation Biology* 2, no. 4 (Dec. 1988), 348, 351.

[16] Lyle A. Renecker and Charles C. Schwartz, "Food Habits and Feeding Behavior," in *Ecology and Management of North American Moose*, 403-407; Arnold H. Boer, "Interspecific Relationships," in *Ecology and Management of North American Moose*, 340-341, quote p. 340; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, 43-45; Edmund S. Telfer, "Comparison of Moose and Deer Winter Range in Nova Scotia," *The Journal of Wildlife Management* 31, no. 3 (July 1967), 418-425; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," 73-74.

the nervous system tissue in up to ninety percent of a local white-tailed deer population. In most cases infected deer, which possess, on average, three adult brainworms, remain unaffected. Larvae are passed in the mucous layer covering deer feces 90 to 137 days after infection; rain and melting snow then wash the larvae into the soil where, if they are lucky, they pass through the foot layer of a terrestrial snail or slug. The larvae develop within their gastropod hosts and wait to be inadvertently consumed by browsing deer. The quantity of vegetation that a deer must consume each day makes infection quite likely, regardless of the gastropods' population density.[17]

Because a far greater white-tailed deer population occupied the Adirondack Highlands by the early twentieth century, New York's moose transplants encountered a *P. tenuis*-rich environment. Eating five to ten times more plant matter than a deer each day, and frequently feeding on fallen leaves during the autumn, a moose would have had a good chance of ingesting a snail or slug infected with *P. tenuis*. Brainworm infections in moose generally lead to what twentieth century observers termed "moose disease" or "moose sickness." Marked by weakness, listlessness, and erratic behavior, moose disease typically proves fatal.[18]

Losses to *P. tenuis*, combined with the depredations of poachers, likely combined to produce a mortality rate that exceeded what the transplanted moose population could sustain.

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[17] Arnold H. Boer, "Interspecific Relationships," in *Ecology and Management of North American Moose*, 340-341; Murray W. Lankester and William M. Samuel, "Pests, Parasites and Diseases," in *Ecology and Management of North American Moose*, 494-502; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: p. 4; Dale L. Garner and William F. Porter, "Prevalence of *Parelaphostrongylus tenuis* in white-tailed deer in northern New York," *Journal of Wildlife Diseases* 27, no. 4 (1991), 594.

[18] Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 18, 21-22; Lyle A. Renecker and Charles C. Schwartz, "Food Habits and Feeding Behavior," in *Ecology and Management of North American Moose*, 412, 423; Arnold H. Boer, "Interspecific Relationships," in *Ecology and Management of North American Moose*, 341; Murray W. Lankester and William M. Samuel, "Pests, Parasites and Diseases," in *Ecology and Management of North American Moose*, 498-500; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: 4.

Unable to "replace lost animals through immigration from surrounding but less affected regions," the small number of moose in the Adirondack Highlands quickly disappeared.[19]

A similar scenario occurred in the Upper Peninsula of Michigan during the mid 1930s. While game managers annually reported the presence of a few moose in the Upper Peninsula, Michigan's Department of Conservation hoped to bolster this population with a significant infusion of moose from Isle Royale. Between 1935 and 1938 the state translocated at least seventy-one moose from the island to the peninsula. Ten years later, however, the Upper Peninsula again supported only a few moose. As in the Adirondacks, poaching and a high deer density (it may have reached twenty to thirty individuals per square mile) doomed the effort. Mortality associated with *P. tenuis* also reduced twentieth century moose populations in Nova Scotia, New Brunswick, Maine, and Minnesota.[20]

So while the Adirondacks' beavers thrived, the region's moose, cut-off from other moose populations and challenged by the stresses of translocation, unfamiliar habitat, overhunting, and brainworm, died. By the first decade of the twentieth century neighboring Vermont's native moose population had also disappeared, although occasional immigrants continued to wander into Vermont from northern New Hampshire and southern Quebec.[21]

The Northeast's twentieth century "explosion of green" helped to reverse this process in Vermont, as forests reclaimed abandoned fields and rocky pastures. With only forty-three

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[19] Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: quote p. 6.

[20] D.H. Pimlott and W.J. Carberry, "North American Moose Transplantations and Handling Techniques," 58-59; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: p. 2; Albert W. Franzmann, "Restraint, Translocation, and Husbandry," in *Ecology and Management of North American Moose*, 532; Dale L. Garner and William F. Porter, "Prevalence of *Parelaphostrongylus tenuis* in white-tailed deer in northern New York," 594; Edmund S. Telfer, "Comparison of Moose and Deer Winter Range in Nova Scotia," 418-425.

[21] Frederick L. Osgood, Jr., "The Mammals of Vermont," *Journal of Mammalogy* 19, no. 4 (Nov. 1938), 440; Alicia Daniel and Thor Hanson, "'Remote, Rocky, Barren, Bushy Wild-woody Wilderness': The Natural History of the Northeast," in *Wilderness Comes Home: Rewilding the Northeast*, ed. Christopher McGrory Klyza (Hanover: Middlebury College Press, 2001), 38-39; Stephen C. Trombulak and Kimberly Royar, "Restoring the Wild: Species Recovery and Reintroduction," in *Wilderness Comes Home*, 165-166.

percent of its land area forested at the dawn of the twentieth century, Vermont's forests spread to include seventy-seven percent of the state by 1990. New York, too, shared in this reforestation, adding 1,000,000 acres of forest each decade through 1980 and thus raising its forest cover from thirty-nine percent of the state's total area in 1900 to sixty-two percent by 1990. For an animal that eats trees, this explosion of green was most fortuitous. In addition to the ample forage base—significant areas of which remained in early stages of succession—the resurgence of beavers, the absence of wolves, the presence of legal protection, the gradual reduction in deer densities, and the continued activities of loggers encouraged the regional range expansion of *Alces alces americana*.[22]

Between 1935 and 1980, fifteen to twenty-one moose wandered into northern New York from either southern Quebec or Vermont. New Yorkers shot five of the pioneers and two migrated out of the state; the fates of the other immigrants remain unknown. Regular, documented occupation of the Adirondacks by moose began in 1980, "when about 6 animals entered the state across the eastern border." Between 1985 and 1992 eleven to thirty moose, the majority males, continually occupied the Adirondack Highlands. Since "male moose disperse farther and more often than do female moose," the population's male to female ratio of three to one is not surprising.[23]

During the 1980s the wildlife biologists covering the Adirondack region documented eight moose fatalities: three were illegally shot, one died while being relocated, one died from a

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[22] Bill McKibbon, "An Explosion of Green," *Atlantic Monthly* 275, no. 4 (April 1995), 63; Christopher McGrory Klyza, "An Eastern Turn for Wilderness," in *Wilderness Comes Home*, 6-7; Stephen C. Trombulak and Kimberly Royar, "Restoring the Wild: Species Recovery and Reintroduction," in *Wilderness Comes Home*, 165-166; Patrick D. Karns, "Population Distribution, Density and Trends," in *Ecology and Management of North American Moose*, 139.

[23] *New York Times*, 10 July 1980, 27 December 1983, 22 September 1987; Dale L. Garner and William F. Porter, "Movements and Seasonal Home Ranges of Bull Moose in a Pioneering Adirondack Population," 80; D. Andrew Saunders, *Adirondack Mammals*, 209; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, first quote p. 2; Kris J. Hundertmark, "Home Range, Dispersal and Migration," in *Ecology and Management of North American Moose*, 326, second quote p. 327.

bacterial infection, one died from a fractured leg, and two died in vehicular collisions. Interestingly, *P. tenuis* was not implicated in any of the Adirondacks' moose fatalities during this period, and the small pioneering population continued to experience slow but steady growth.[24]

But why did the moose of the 1980s succeed where the population present eighty years before had failed? Not only were the two populations roughly the same size, but the sex ratio of the 1980s population may have been even more heavily skewed towards males. Additionally, human-caused moose mortality was approximately the same during the two periods: early twentieth century poaching approximates late twentieth century poaching plus vehicular collisions. And *P. tenuis*, white-tailed deer, and gastropods still occurred in the Adirondack Highlands.

In the latter period, however, the moose population in the Adirondacks was linked to the rapidly growing moose population in New England. Numbering only fifteen in Vermont and five hundred in New Hampshire in 1960, the moose populations in these two states had risen to two hundred and two thousand, respectively, by 1980. Five years later Vermont's moose population numbered five hundred; by 1990 it had exceeded one thousand; by 1997, two thousand. Significantly, no portion of Vermont is more than about one hundred miles from the New York border.[25]

The rapid growth of Vermont's moose population changed the nature of westward moose dispersal around Lake Champlain. Wildlife biologists have described two types of moose dispersal: adaptive and nonadaptive. Adaptive dispersal occurs regardless of the local moose

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[24] *New York Times*, 10 January 1988; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: pp. 16-17; Dale L. Garner and William F. Porter, "Prevalence of *Parelaphostrongylus tenuis* in white-tailed deer in northern New York," 597.

[25] Patrick D. Karns, "Population Distribution, Density and Trends," in *Ecology and Management of North American Moose*, 136; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: p. 30; "Vermont Hunting: Records and Information," http://www.ruralvermont.com/vermontweathervane/issues/winter/97011/huntingstories.shtml. Vermont's moose population is currently near 5,000.

population density, and is the process by which moose recolonized the Adirondack Highlands in 1980 despite Vermont's low-density moose population (relative to the state's carrying capacity). Nonadaptive dispersal, however, "involves animals that are forced from natal or established home ranges by social factors inherent in high-density populations." As Vermont's moose population became increasingly dense during the late twentieth century, dispersal from natal ranges became increasingly necessary. Researchers have occasionally documented moose dispersals of more than thirty and even more than one hundred miles, but most moose, male and female, disperse less than three miles from their natal ranges. [26] Vermont's growing moose population thus provided an ever-greater and ever-closer reservoir of reinforcements for the nearby pioneers in the Adirondack Highlands.

The availability of immigrants from such a population reservoir would have helped to offset moose mortality within the Adirondacks' small population. Once again moose restoration efforts in Michigan's Upper Peninsula provide an instructive parallel. While the translocation efforts of the mid 1930s failed to establish a significant moose population there, a second effort made between 1985 and 1987, consisting of fifty-nine moose, succeeded. By this time the Upper Peninsula's deer density had declined to approximately eleven deer per square mile, about half of what it had been fifty years before; *P. tenuis*, however, infected at least sixty-five percent of this population. Despite brainworm leading to thirty-eight percent of the observed moose mortality in the Upper Peninsula during the late 1980s, the population steadily increased to 124 moose by 1989 and more than 200 by 1992. According to Murray Lankester and William Samuel, "the introduced moose experienced high twinning rates, and no wolf or bear predation was suspected. This valuable experiment demonstrated that a protected moose population can grow, despite

[26] Kris J. Hundertmark, "Home Range, Dispersal and Migration," in *Ecology and Management of North American Moose*, 325-328, quote p. 326.

some mortality attributable to *P. tenuis*, at least when other factors are favorable." While black bears will prey on newborn moose calves, typically killing between two and fifty percent of them, this behavior appears to be learned. Dale Garner has theorized that the time needed to learn this behavior may explain the Upper Peninsula's "unusually high rates of calf survival in the first four years post release."[27]

The Adirondack Highlands of the late 1980s offered moose an environment at least the equal of that offered by Michigan's Upper Peninsula. With nearly 6.0 percent of its area covered by water, the Adirondacks provided more aquatic habitats than did the area in the vicinity of the Michigan release site (2.1% water). With elevations ranging from 95 feet above sea level on the shores of Lake Champlain to more than 5,000 feet above sea level in the High Peaks wilderness area, the Adirondack Highlands also possessed a far greater range of topography. As Edmund Telfer concluded in his study "Comparison of Moose and Deer Winter Range in Nova Scotia" (1967), spatial separation in upland habitats during the late winter contributes to higher rates of moose survival in regions inhabited by both species, as moose and deer occupy different habitats during the period of peak potential *P. tenuis* infection. Telfer found that while moose numbers in most of Nova Scotia had declined markedly after 1940 following an increase in the deer population, the moose in the highlands of northeastern Nova Scotia persisted at relatively high population densities. With more expansive upland areas than both Nova Scotia and the Upper Peninsula of Michigan, the Adirondack dome offered the potential for a significant degree of

[27] Albert W. Franzmann, "Restraint, Translocation, and Husbandry," in *Ecology and Management of North American Moose*, 531-532; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: p. 2; Murray W. Lankester and William M. Samuel, "Pests, Parasites and Diseases," in *Ecology and Management of North American Moose*, 499-501, quote p. 501; Warren B. Ballard and Victor Van Ballenberghe, "Predator/Prey Relationships," in *Ecology and Management of North American Moose*, 261-262; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," 67-68, quote p. 68.

winter habitat partitioning. Successful moose enclaves could then provide replacements for nearby populations experiencing higher levels of mortality.[28]

Compared to the Upper Peninsula, the Adirondack Highlands also possessed lower densities of white-tailed deer and lower rates of *P. tenuis* infection among the deer population. By the late twentieth century the central Adirondacks, and most of the remainder of the Adirondack ecosystem, supported fewer than ten deer per square mile. Garner and Porter observed that the rate of *P. tenuis* infection among this population was "lower than or equal to all rates reported previously in northeastern North America." While the parasite's distribution and prevalence varied within the Adirondack Highlands, the overall prevalence of brainworm had decreased since the late 1960s. Pockets of reduced deer densities and low *P. tenuis* infection rates could also have provided reinforcements to areas with higher levels of moose mortality.[29]

The mosaic of public and private land that comprises the Adirondack Park has played an important role in shaping local deer densities. As the decades following the park's creation have revealed, the longer land remains in the state's possession, the fewer deer the land supports. Aging forests provide inferior deer habitat, and the state, bound by the "Forever Wild" clause firmly embedded within its constitution, can not manage the state's forests for deer. While

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[28] Adirondack Park Agency, "Adirondack Park Land Use Classification Acreage and Percent by County and the Park," http://www.apa.state.ny.us/gis/stats/colc0708.htm; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, appendix: pp. 20-22; Edmund S. Telfer, "Comparison of Moose and Deer Winter Range in Nova Scotia," 418-425; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," 63-64, 74.

[29] Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, executive summary, appendix: p. 12; Dale L. Garner and William F. Porter, "Prevalence of *Parelaphostrongylus tenuis* in white-tailed deer in northern New York," 595, 597; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," Figure 2 p. 36, Table 1 p. 60. Garner notes that "local variation in the incidence of *P. tenuis* within the GAE [Greater Adirondack Ecosystem] ranges from 14% (Town of Stony Creek) to 88% (Town of Hopkinton)." P. 67. Both towns lie within the Adirondack State Park: Stony Creek is in Warren County, in the southeastern Adirondacks, while Hopkinton is in St. Lawrence County, at the extreme northern edge of the Adirondack Park.

moose also favor young forests, areas with low deer densities have the potential to support more moose.[30]

So if moose could succeed in the Upper Peninsula of Michigan during the late 1980s, they could succeed in the Adirondack Highlands of New York. But Michigan's moose got a significant head-start. The fifty-nine moose translocated from Algonquin Provincial Park to Marquette, Michigan between 1985 and 1987 arrived in crates on the backs of trucks or dangling in slings beneath helicopters. New York's moose, without the benefit of fossil fuels, had to recolonize the state in moose-time and under moose-power. By 1992 no more than thirty moose inhabited the Adirondack Highlands, about fifteen percent of the population present in the Upper Peninsula.[31]

Michigan's success did not go unnoticed. On May 3, 1989 the commissioner of the New York State Department of Environmental Conservation announced that the DEC would be investigating the possibility of active moose restoration in northern New York. Such an undertaking would further the DEC's stated goal of restoring New York's native fauna, while satisfying what the DEC perceived to be a public desire for more moose. During the spring of 1990, the department distributed three thousand copies of their news release to newspapers, outdoors writers, conservation groups, major landowners, forest and agricultural groups, and town and county officials. The DEC then held open meetings in four counties (two in northern New York, one in central New York, and one downstate) to judge the public's interest and gauge their concerns. Only sixty-two people attended the meetings and only eighteen people submitted

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[30] Philip G. Terrie, *Wildlife and Wilderness: A History of Adirondack Mammals*, 133-134; Peter Lemon, "Of Mites and Moose," 49; Dale L. Garner, "Ecology of the Moose and the Feasibility for Translocation Into the Greater Adirondack Ecosystem," 61-63.

[31] Albert W. Franzmann, "Restraint, Translocation, and Husbandry," in *Ecology and Management of North American Moose*, 531-532; Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, 2.

comments by mail. The chief public concerns expressed by this cohort included restoration costs and funding sources, human safety, moose hunting, and the effects that moose would have on agriculture, forest products, and the white-tailed deer population.[32]

The DEC studied the feasibility of regional moose restoration generally and these issues particularly before releasing their *Draft Environmental Impact Statement* (*DEIS*) in June 1992. The *DEIS* considered four moose management alternatives. The first, "Alternative A," called for the "active elimination" of New York's moose population through unregulated hunting. Under Alternative B the DEC would monitor the state's moose population and relocate nuisances, but would make no effort to accelerate moose recovery. Alan Hicks and Edwin McGowan, the authors of the *DEIS*, calculated that "if immigration rates and survival rates remain at today's levels [1992], it will take approximately 20 years for moose to increase to the 100 animals proposed for release [in Alternative C]." Based on the belief that New Yorkers wanted to hasten the growth of the Adirondacks' moose population, the DEC predicted that both of these alternatives would be unattractive to the public.[33]

Alternative C, which would cost $1,300,000, involved a two-staged translocation of one hundred moose (sixty females and forty males) into the Greater Adirondack Ecosystem. The DEC would then manage the size and distribution of New York's moose population at levels acceptable to local residents. Under this option, the DEC would restrict moose to the northern fourteen counties of New York State, encouraging their population growth within a core area, limiting their population density within a buffer zone, and removing them from the remainder of

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[32] Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, 3, 15-16; Alan Hicks, *The Future of Moose Management in New York State: Based on the Review of the Restoration of Moose in Northern New York Draft Environmental Impact Statement* (New York State DEC: March 29, 1993), 1-2.

[33] Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, executive summary, 49-50, appendix: p. 30.

the state. Alternative C hinged on the notion that an open season would eventually be implemented to maintain the moose population at a socially acceptable level. The DEC favored this option based on three principles: that "the public should benefit from the presence of moose in as many ways as possible and as soon as those benefits can reasonably be provided"; that "moose are generally an asset but can be undesirable if they occur in excessive numbers or inappropriate locations"; and that "people incurring problems from moose have a right to relief." The final alternative, Alternative D, also involved the translocation of one hundred moose, but unlike Alternative C, it would not be followed by any population control measures. The DEC did not endorse this alternative, arguing that "it would be irresponsible to release moose knowing that problems are likely to develop that we cannot control." In order to allay the public's concerns over funding—the principal issue at the initial scoping sessions—the DEC proposed that private funds from individual donors would cover all of the moose restoration costs.[34]

During the summer of 1992 the DEC distributed two thousand copies of its *DEIS* to the public, including two hundred copies to northern New York's largest landowners. As they did prior to writing the environmental impact statement, the DEC encouraged citizen participation in the decision-making process and solicited public comments for several months. The department held fifteen public meetings throughout the state, including eight in northern New York. The conversations revolved around Alternative C, the DEC's recommended alternative. Nearly five hundred people chose to register at the meetings, and nearly four hundred people wrote letters. A telephone survey provided additional input.[35]

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[34] Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, 46, 50-58, 62-64.

[35] Alan Hicks, *The Future of Moose Management in New York State: Based on the Review of the Restoration of Moose in Northern New York Draft Environmental Impact Statement*, 2-3; Thornton Bruce Lauber, "Moose on the Loose: Fairness and Decision-making in the Adirondacks" (Ph.D. diss., Cornell University, 1996), 4, 18-19.

The public feedback, however, demonstrated more opposition than support. While citizens who lived outside of the Adirondack Park tended to be more supportive of the DEC's preferred moose restoration plan, many who lived within the Blue Line strongly opposed the proposal. Reasons for opposition were many, and included concerns over funding (many seemed unaware that the restoration would be privately funded), concerns over hunting, moose-vehicle collisions (considered a "major cost" in the *DEIS*), and a general distrust of the government. The most frequently cited source of opposition, however, was the fact that moose were returning to the Adirondacks on their own. One letter of opposition highlighted a number of these concerns:

> Of all the hare-brained ideas coming from Albany, this proposal is about the most ridiculous. Why? 1. The moose are walking into the state, so why pay $1.3 million when restocking is happening naturally? 2. I am sure Bendick [a DEC official] has never hit a moose, or he would not be so flippant with the human risk statistics. 3. And $1.3 million would go a long way toward fixing the state's infrastructure or helping pay medical insurance for the needy, all worthwhile uses for this money.

The vocal opposition, coupled with tepid support, led the DEC to abandon Alternative C. While, as follow-up surveys revealed, most of the citizens of New York desired more moose, they did not want them to be reintroduced by the DEC. New Yorkers preferred their nature dispensed on the hoof, not by trucks. This pervasive attitude must have annoyed Hicks, who noted in his post-*DEIS* report that "a moose whose ancestors walked into New York is no different and will behave no differently from a moose whose ancestors rode into New York in the back of a truck."[36]

While they abandoned the substantial translocation effort that they had planned, the DEC continued to monitor the state's moose population closely through 1997. At that time the moose

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[36] Thornton Bruce Lauber, "Moose on the Loose: Fairness and Decision-making in the Adirondacks," 17, 20, 191-192, block quotation p. 191; Alan Hicks, *The Future of Moose Management in New York State: Based on the Review of the Restoration of Moose in Northern New York Draft Environmental Impact Statement*, 4-5, quote p. 12; *New York Times*, 7 April 1993.

population in northern New York had increased to perhaps fifty individuals. The DEC also continued to relocate nuisance moose, mostly bulls, to the Adirondack Highlands. These individuals sometimes came from other states, such as Massachusetts, but New York's own moose also needed to be relocated at times, particularly after wandering into unsuitable locales such as the Arbor Hill neighborhood of downtown Albany, the city of Rochester, and suburban Mahopac (less than fifty miles north of Yankee Stadium).[37]

After 1997 the moose population began to increase rapidly within northern New York, as it had twenty years earlier in Vermont. Alan Hicks suspected that approximately one hundred moose inhabited the region by 2000, and DEC wildlife biologist Ed Reed estimated that New York State's moose population may have surpassed four hundred during the summer of 2007. While moose continued to disperse into New York, the striking population growth of the past decade was fueled primarily by the fecundity of the moose inhabiting the Adirondack Highlands. Moose densities are particularly high in western Saratoga County (especially in the vicinity of Lake Desolation) and Hamilton County (especially around Perkins Clearing and the Cedar River Flow).[38]

As in Michigan, the growing moose population in New York has outpaced any mortality associated with *P. tenuis*, poaching, or black bears. The most socially significant mortality today involves moose-vehicle collisions, the frequency of which has increased with the moose population. In the summer and fall of 2006, six moose died in collisions; in May 2007 alone, three more died. Fortunately no people have died in these collisions, and human casualties from

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[37] Thornton Bruce Lauber and Barbara A. Knuth, "Fairness in Moose Management Decision-Making: The Citizens' Perspective," *Wildlife Society Bulletin* 25, no. 4 (Winter, 1997), 777; Alan Hicks, *The Future of Moose Management in New York State: Based on the Review of the Restoration of Moose in Northern New York Draft Environmental Impact Statement*, 8; Adirondack Almanack, "Animal Encounters: Moose in the Adirondacks" (September 28, 2006), http://adirondackalmanack.blogspot.com/2006/09/animal-encounters-moose-in-adirondacks.html; *Post Star*, 9 September 2000, 22 September 2006; *New York Times*, 25 December 2005.

[38] *Post Star*, 9 September 2000, 22 September 2006; *Press Republican*, 1 June 2007; Michael Virtanen, "Moose Expansion Expected in Adirondacks," *Associated Press* (December 3, 2006).

moose collisions remain rare throughout the region. New Hampshire, possessing human and moose populations that are both at least ten times higher than those in the Adirondack State Park, endures an average of 250 moose-vehicle collisions each year, resulting in, on average, one human death. In the *DEIS*, Hicks and McGowan had employed similar collision data from New England to predict potential collision frequencies in northern New York. They projected that with a future population of 1,300 moose, New Yorkers would experience between thirty-five and forty-two accidents each year, with a fatal accident occurring once every 2.6 years. While these figures pale in comparison to the 20,215 vehicular accidents that occurred in the fourteen counties of northern New York in 1989, hundreds of which resulted in death, each fatality is tragic and the safety of New York's drivers in moose-country understandably remains a serious concern.[39]

The Adirondacks' burgeoning moose population has thus been accompanied by an increasing number of two-dimensional moose, painted in black on tilted yellow signs posted strategically along winding North Country roads. Whereas stuffed three-dimensional moose memorialized the passing of New York's largest mammal following the Civil War, two-dimensional moose—uploaded onto websites, hung on living room walls, printed on the front pages of local newspapers—now celebrate the species' return. Moose have rewarded New Yorkers for their patience and forbearance, returning under moose-power to a viable Adirondack ecosystem that responsible human stewardship managed to preserve.

[39] *Press Republican*, 1 June 2007; Michael Virtanen, "Moose Expansion Expected in Adirondacks," *Associated Press* (December 3, 2006); Alan Hicks and Edwin McGowan, *Restoration of Moose in Northern New York State: Draft Environmental Impact Statement*, 31-39.

5 THE GENESIS OF A SECOND-CHANCE CANINE

The raven, which has recently returned to the Adirondack Highlands after a lengthy absence, cannot distinguish between the eastern wolf and the eastern coyote. Neither can the beaver, which must now restrict its terrestrial ramblings. Neither can the deer, which knows only that it is chased by a malevolent canine. But humans can distinguish between the two. We can read the indelible nametag of genetics that elevates the wolf above the coyote, and no matter what percentage of deer comprise the coyote's diet, no matter how many beavers they kill, no matter their social organization, coyotes, to us, are not wolves.

But they may be getting closer, as hybridization and rapid evolution have clouded the division between these species in the Northeast. Besides illustrating the natural world's resilience and dynamism, the emergence of a hybridized canine within the Adirondacks has transformed the conversation on regional wolf restoration. After we evicted the eastern wolf from the Adirondacks' canine niche, the "canid evolutionary forge," provided with the necessary biological materials, produced a replacement.[1] This insidious threat to the purity of wolf genetics makes some humans very uncomfortable, and the coyote very unpopular. The bastard of a fallen but recovering wilderness, the eastern coyote was not expected, but cannot easily be expelled. This second-chance canine has provided the Adirondacks, a second-chance wilderness, with an appropriate and tailor-made predator.

But will human society accept it? Having made strides to transcend the wolf-hate that has marked Euroamerican society on this continent for over three hundred years, can we now transcend a wolf-fetish? These questions await answers, and the debate will reveal as much about *Homo sapiens* as it does about *Canis*. Meanwhile, from diverse corners of society, more

[1] John Theberge, "An Ecologist's Perspective on Wolf Recovery in the Northeastern United States," in *The Return of the Wolf: Reflections on the Future of Wolves in the Northeast*, ed. John Elder (Hanover: Middlebury College Press, 2000), 26.

voices join in the howling chorus: Bring Back the Wolf! No longer a slinking beast in a savage wilderness, the wolf has become the charismatic symbol of a healthy ecosystem.[2]

But while wilderness has returned to the Adirondacks and other parts of the Northeast, wolves have not. This situation continues to motivate wolf restoration advocates, who often view wolves as Mother Nature's seal of approval, capable of certifying a landscape as grade-A wilderness while simultaneously redeeming its ecological and ideological integrity. The efforts of conservation biology to preserve ecosystems through the protection and restoration of umbrella species such as the wolf have validated such beliefs. In our society, then, the scientific wolf buttresses the commodified wolf. Infused with monolithic meanings, words like wolf, wilderness, and wild become difficult to separate from one another within the rhetoric of rewilding, where science, pop culture, and hope mingle freely. Kristin DeBoer (director of RESTORE: The North Woods), in discussing the potential return of wolves to the Northeast, writes that "wilderness needs wolves" because "without wolves, wilderness is not truly wild."[3]

What does wilderness needing wolves and wolves needing wilderness really mean? And who dictates the terms of this need: wolves, wilderness, or humans? Rick Bass and Bill McKibben have wrestled with these questions. Although ultimately supporters of northeastern wolf restoration, they take a more cautious approach, proposing that we question—or at least reflect upon—our motives. When analyzed closely, our motives often reveal a yearning for what McKibben calls "human restoration," a desire for wolves to recalibrate our culture by

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[2] According to L. David Mech, founder of the International Wolf Center in Ely, Minnesota, at any one time there have been as many as fifty-one pro-wolf recovery organizations. "Wolf Restoration to the Adirondacks: The Advantages and Disadvantages of Public Participation in the Decision," in *Wolves and Human Communities: Biology, Politics, and Ethics*, eds. Virginia A. Sharpe, Bryan G. Norton, and Strachan Donnelley (Washington, D.C.: Island Press, 2001), 18.

[3] Umbrella species are "large, wide-ranging, charismatic animals" whose persistence requires "big, ecologically diverse areas for year-round water, forage, and shelter." Such species provide "an umbrella of resources for many other, perhaps less appealing species." Michael E. Soulé and John Terborgh, "Conserving Nature at Regional and Continental Scales: A scientific Program for North America," *BioScience* 49, no. 10 (Oct. 1999), 810. Kristin DeBoer, "Dreams of Wolves," in *The Return of the Wolf*, 75, 80.

challenging us both to reduce our impacts on their habitat and to tolerate the consequences of their presence. In the end, then, wolf restoration may be more beneficial to humans than to wolves. But we must be careful, Bass cautions, lest we "try to mash wild wolves into places and situations where we are not yet ready for them."[4]

The wolf has long been, and as DeBoer, McKibben, and Bass illustrate, the wolf continues to be, a litmus test for the potency of human agency. We eradicated them to exert our power to dominate; we now restore them to exert our power to harmonize. We must appreciate, however, that the harmony counts more than the wolf.

And we must realize the need for a new harmony, as the cumulative effects of "progress" render the distant past irretrievable. Certainly forests can and will recover, but identical species compositions and faunal assemblages will not. An old growth forest of one hundred thousand acres surrounded by more original forest cannot compare with a similar tract bounded and bisected by hamlets, farms, and roads. Human development of this sort has near-time costs that we must not only acknowledge, but accept. One such cost may be the continued absence of the wolf, and the acceptance of another, less idealized canine, which has developed in its stead.

While the wolf—personifying traits that we find irresistible—stars in calendars and on magazine covers, the coyote—described by Mark Twain as "scrawny, and ribby, and coarse-haired, and pitiful"—draws cartoon assignments.[5] Why? What privileges *Canis lupus* over *Canis latrans*? Certainly the coyote can compete on equal footing in a contest of predator-extermination horrors.[6] But the quality and the quantity of persecution matters less than its

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[4] Bill McKibben, "Human Restoration," in *The Return of the Wolf*, 20; Ernest Partridge, "The Tonic of Wilderness," in *Wolves and Human Communities*, 206; Rick Bass, "Vermont as Montana," in *The Return of the Wolf*, 114.
[5] Mark Twain, *Roughing It* (New York: Penguin Books, 1981), 76.
[6] See Charles L. Cadieux' *Coyotes: Predators and Survivors* (Washington, D.C.: Stonewall Press, Inc., 1983). Despite the 3,612,220 coyote scalps procured by the Fish and Wildlife Service between 1937 and 1981, despite the den hunts, aerial hunts, traps, poisons, dog hunts, and coyote-getters (trademarked, this device tempts a coyote with

duration. In this regard, the historical and mythological weight of a vicious history shared with humans privileges the wolf, for the shared Euroamerican-coyote history remains under two hundred years. Additionally, while the wolf serves as the premier mammalian ambassador of wilderness and wildness, many Americans associate the coyote with more modest and often more humanized landscapes, making it less exotic and less wild.[7]

But there is more. Today the wolf needs us; the coyote does not. When we persecute wolves with dogs, circle hunts, snares, rifles, and poisons, their populations decline. Pitted against man, wolves lose.[8] The coyote is of a different sort. It has managed to expand its range despite intense human persecution. Coyotes have thus stripped contemporary American society of the coveted role of magnanimous giver: for if we cannot eliminate them, we cannot resuscitate them. While wolves have receded with wilderness within the United States, coyotes have fattened themselves amidst manipulated landscapes, seamlessly occupying "second-chance" landscapes such as the Adirondacks.

Possessing a diversity of environments manipulated to varying degrees, could New York have harbored both wolves and coyotes prior to European settlement? Certainly edge habitats and human-induced ecological disturbances—conditions favorable to coyotes—existed throughout Iroquoia. Indeed, in 1696 Frontenac's army encountered an Onondaga town with planted fields that extended four to six miles from the village center. In 1669 another Frenchman, Galinee, reported passing through expansive meadows and oak plains on his way to

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a delightfully rancid-smelling rag and then shoots a cloud of exploding gunpowder and cyanide into its face), the coyote exists in unprecedented abundance throughout an unprecedented geographic range.

[7] Daniel Kemmis discusses wolves and their roles as "bioregional sovereigns" and charismatic megafauna in "Wolves as Bioregional Sovereigns," in *Wolves and Human Communities*, 9-12. For analysis of human valuations of coyotes, see Thomas H. Stevens, Thomas A. Moore, and Ronald J. Glass' study "Public Attitudes About Coyotes in New England," *Society and Natural Resources* 7 (1994): 57-66; Jaime Echeverria, "Existence Values for Bald Eagle, Coyote, and Wild Turkey in New England" (MS thesis, University of Massachusetts, Department of Agricultural and Resource Economics, 1990).

[8] Jon Coleman, *Vicious Wolves and Men in America* (New Haven: Yale University Press, 2004).

a Seneca town near what is today Victor, New York. The town was situated within a clearing six miles wide.[9] Such towns were abandoned at intervals of ten to twenty years, as firewood grew scarce, wooden structures rotted, trash accumulated, and insects proliferated. The Onondagas (living near what is today Syracuse) abandoned and rebuilt their chief town at least nine times between 1610 and 1780.[10]

While such processes created a mosaic of habitats in varying states of succession, could the cumulative effects of twenty to thirty thousand Iroquois dispersed through ten towns and their auxiliary hamlets and camps have been significant enough to allow coyotes to survive in proximity to stable wolf populations? If originally absent from New York, could coyotes have arrived from the Great Plains by island-hopping along a series of zones manipulated for hunting and horticulture by eastern forest peoples? If the effects of indigenous occupation in temperate North America were, in fact, significant enough to allow for coyote survival and dispersal, coyotes would have had more than five hundred years of access to eastern habitats along such a discontinuous corridor of periodically-intense human use.

Such a pre-Euroamerican coyote range expansion appears unlikely, however. As Harold Hickerson has demonstrated, contested zones existed between Indian groups in the eastern woodlands of North America. The Adirondacks were one such zone, but many more would have existed between Iroquoia and the Great Plains. Contested regions generally precluded permanent Indian habitation, and consequently the forest clearance and other landscape changes that accompanied swidden horticulture. Fear of armed conflict kept indigenous incursions into

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[9] Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest," *Ecology* 34, no. 2 (April 1953), quote from 333, 338.

[10] Gordon Day, "The Indian as an Ecological Factor in the Northeastern Forest," 341; Daniel Richter, *The Ordeal of the Longhouse: The Peoples of the Iroquois League in the Era of European Colonization* (Chapel Hill: University of North Carolina Press, 1992), 23-24.

contested zones brief. As a consequence these zones contained concentrations of ungulates, which, presumably, would have supported stable local wolf populations.[11]

Coyote range expansion through the eastern woodlands, however, seems to have required declining wolf densities, a scenario unlikely to have occurred in the interstices between tribes. Such bands of wilderness, possessing stable wolf populations, would have proven largely impermeable to coyotes. But if wolves and coyotes had coexisted in the West, why could they not in the East? The answer may lie with prey availability. According to Warren Ballard, "coyotes might be largely excluded by wolves where the main food is deer, since wolves are likely to consume all or most of a deer carcass after killing it. Moose and elk, on the other hand, are large enough to satiate a wolf pack and allow scavenging by other species." Eastern wolves' primary reliance on white-tailed deer, as opposed to the more diverse assortment of ungulates found in the West, likely precluded coyote colonization of the eastern woodlands.[12]

But could coyotes have been native New York inhabitants all along, as Ben Tullar argues?[13] A native coyote population should have thrived during the nineteenth century as the zone of early American settlement, with its forest clearance, chickens, geese, lambs, and calves, expanded throughout New York in conjunction with the American war on wolves. Logically, nineteenth century coyotes should have been every bit as difficult to eliminate as their twentieth century heirs. Yet New York State mammal inventories from 1836-1840, 1884, and 1899

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[11] Harold Hickerson, *The Chippewa and Their Neighbors: A Study in Ethnohistory* (New York: Holt, Rinehart, and Winston, Inc., 1970), 106-117; Gordon Whitney, *From Coastal Wilderness to Fruited Plain*: *A History of Environmental Change in Temperate North America, 1500 to Present* (New York: Cambridge University Press, 1994), 98-120.

[12] John B. Theberge, *Wolf Country: Eleven Years Tracking the Algonquin Wolves* (Toronto: M&S Press, 1998), 256, 273; Warren B. Ballard, Ludwig N. Carbyn, and Douglas W. Smith, "Wolf Interactions with Non-prey," in *Wolves: Behavior, Ecology, and Conservation*, ed. L. David Mech and Luigi Boitani (Chicago: The University of Chicago Press, 2003), 266-268, quote p. 266; Rolf O. Peterson and Paolo Ciucci, "The Wolf as a Carnivore," in *Wolves: Behavior, Ecology, and Conservation*, 109, 111; D.H. Pimlott et al *The Ecology of the Timber Wolf in Algonquin Provincial Park* (Ontario: Department of Lands and Forests, 1969), 36.

[13] Ben Tullar, "The Eastern Coyote—Always a New York State Native," *Conservationist* 46, issue 4 (January 1992), 34-39.

mention neither coyotes nor brush wolves, a conspicuous absence considering coyotes had been identified and classified as a species distinct from the wolf in 1823.[14]

Perhaps, however, *Canis latrans* remained hidden, cloaked in the amorphous canine designations that persisted through the twentieth century. Between 1899 and 1999, for instance, the *New York Times* referred to the canines of New York as wolves, Canadian wolves, wolf-like animals, coyotes, coy-dogs, coy-wolves, brush wolves, and timber wolves.[15] If such confusion dominated the twentieth century, it follows that individuals in previous centuries may have been equally befuddled, including those who paid the wolf bounties.

Advocates of the coyote-as-native hypothesis argue that the "wolf" bounties paid in the late nineteenth century may have included both wolves and coyotes.[16] But a closer examination of the bounties paid seems to undermine this view. Of the ninety-eight wolf bounties paid by the state of New York between 1871 and 1897, all but two came from Adirondack counties. The high-mark was reached in 1882, when hunters claimed bounties on twenty-one wolves. This year presents an anomaly, however, for of the preceding eleven years, only three yielded more than five canines. Of the following fifteen years, only four produced more than five canines. Hunters claimed no bounties from 1889 through1894. Then, from 1895 through 1897, hunters claimed six bounties each year, all from Lewis and St. Lawrence counties, located in the eastern Adirondacks and close to southeastern Ontario.[17]

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[14] Philip G. Terrie, "The Natural History Survey in the Adirondack Wilderness, 1836-1840," *Journal of the Early Republic* 3, no. 2 (Summer 1983); Clinton Hart Merriam, *The Mammals of the Adirondack Region, Northeastern New York* (NY: Press of L.S. Foster, 1884); Gerrit S. Miller, "Preliminary List of the Mammals of New York," *Bulletin of the New York State Museum* 6, no. 29 (October 1899). Thomas Say designated the brush wolf, or coyote, as *Canis latrans* in 1823.

[15] *New York Times* (New York), September 7, 1899 through June 1, 1999.

[16] Ben Tullar, Jr., "The Eastern Coyote—Always a New York State Native," 34-39.

[17] Data from table in Gerrit S. Miller's "Preliminary List of the Mammals of New York," *Bulletin of the New York State Museum* 6, no. 29 (October 1899), 344-346.

This flurry of bounties may represent the elimination of New York's late nineteenth century wolves, lingering in remote stretches of the North Country. Or, perhaps, these last bounties represent dispersing Canadian wolves, the first waves of colonizing coyotes, or early coyote-wolf hybrids, all of which would have entered from Ontario. Regardless of which scenario is correct, all point to the absence of native New York wolves in the Adirondacks by the opening of the twentieth century. And if coyotes had been included in the wolf bounties claimed, why were the bounty numbers so low? If they existed in New York during the nineteenth century, could they have remained unseen during six consecutive bountyless years (1889 to 1894)? Such an assertion appears unlikely when considering the proficiency with which Euroamericans have historically located and destroyed predators.

But while coyotes did not inhabit New York during historic times, they soon arrived, trotting eastbound along a man-made, coyote-friendly corridor. From the Atlantic Ocean to the coyote's core range in the center of the continent, Euroamerican settlement had transformed trees and forests into houses, fields, and woodlots. Wolves and deer were replaced by dogs and calves. *Canis latrans*, omnivorous, adaptable, early-maturing, fecund, and seemingly indestructible—"the ultimate opportunist"—expanded eastward as canine competition evaporated and edge habitat proliferated.[18]

The typical saga of the coyote's eastern range expansion proceeds like this: late nineteenth century commercial logging in the Upper Great Lakes region opened the landscape, drawing coyotes into Minnesota, Wisconsin, and the Upper Peninsula of Michigan. By 1919, coyotes had reached southern Michigan and southwestern Ontario. During the 1920s, they

[18] Gordon Whitney, *From Coastal Wilderness to Fruited Plain*, 305-313; Charles L. Cadieux, *Coyotes: Predators and Survivors*, quote p. 36; John A. Litvaitis, "Niche Relations Between Coyotes and Sympatric Carnivora," in *Ecology and Management of the Eastern Coyote*, ed. Arnold H. Boer (Fredericton, New Brunswick: Wildlife Research Unit, University of New Brunswick, 1992), 74.

spread into southeastern Ontario, and by the 1930s, coyotes had penetrated northern New York. These dates reflect consistent sightings of what were likely self-sustaining populations; pioneering individuals and groups, however, must have preceded them, perhaps by years if not by decades.[19]

As demonstrated by the headlines of the *New York Times*, New Yorkers made little effort to accurately classify these early pioneers. Arriving in New York sporadically and in small numbers, these canines rekindled memories of the wolves eradicated only a few years before. Reports of wild canines surfaced in 1906, 1916, 1920, and 1926. New Yorkers reflexively labeled these canines as wolves during the 1930s, before beginning to question their identity during the 1950s. A 1951 headline in the *New York Times* read "Wolves or coyotes? Experts split on deerslayers of Adirondacks…" Described as "wolf-like" in 1952, New York canines became "coydogs" during the 1960s.[20] Larger and more wolf-like than western coyotes, New York's canines inspired many questions in the decades that followed.

During the early 1990s the academic community produced two hypotheses to explain the greater size of the eastern coyote. Joanne Thurber and Rolf Peterson suggested that larger coyotes were a "phenotypic response to enhanced food supply, possibly involving no genetic selection." In other words, better diets led to bigger coyotes.[21] Two years later, Canadian

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[19] Marc Bekoff, *Coyotes: Biology, Behavior, and Management* (NY: Academic Press, 1978), 12, 211; Alan Pristorius, "Coyotes on the Move," *Northern Woodlands* 5, no. 2 (Autumn 2002), 32; Gary C. Moore and Gerry R. Parker, "Colonization by the Eastern Coyote," in *Ecology and Management of the Eastern Coyote*, 26-28. Joseph Grinnell, in "The Role of the 'Accidental'" (1922), argues that nothing is "accidental" about pioneering individuals. An individual's presence outside of a home range "is the regular thing," an inevitable and invaluable component "of the ordinary evolutionary program." Grinnell's article can be found in *Foundations of Biogeography: Classic Papers with Commentaries*, ed. Mark V. Lomolino et al (Chicago: University of Chicago Press, 2004): Paper #27, quote p. 457. Coyotes must have been constantly testing and probing the eastern marches of their range, expanding when and where possible, as they now do around Algonquin Provincial Park.

[20] Robert Chambers, "A Howling Success: The Eastern Coyote," *New York State Conservationist* (August 2000), 19; Ben Tullar, "The Eastern Coyote—Always a New York State Native," 34-39; *New York Times* (New York), 24 March 1951, 18 December 1952, 27 November 1960, 24 November 1965.

[21] Joanne M. Thurber and Rolf O. Peterson, "Changes in Body Size Associated with Range Expansion in the Coyote (*Canis latrans*), *Journal of Mammalogy* 72, no. 4 (November 1991), 754.

researchers came to the opposite conclusion, arguing that "the larger size of eastern coyotes constitutes an evolutionary adaptation to a larger prey, namely, the white-tailed deer, and that the increased size reflects a genotypic response…from either hybridization with gray or red wolves, or from natural selection."[22] Both claims have proved to be valid. Through genetic studies, biologists have been able to determine that the eastern coyote is indeed a product of wolf-coyote hybridization, although its diet has also contributed to its greater size.[23]

The absence of wolves in New York indicates that hybridization must have occurred prior to the coyote's arrival in the state. But where, and with what type of wolf? During the early twentieth century, coyotes moved east through regions that were rapidly losing their wolves. In 1915, wolves remained in northeastern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan. Within fifty years, hunters and trappers had eliminated wolves from Wisconsin, and only twelve to fifteen were thought to remain in the forests of Michigan's Upper Peninsula. The high levels of human-driven wolf mortality in this region created socially fractured populations, facilitating both coyote dispersal and wolf-coyote hybridization.[24]

This Upper Great Lakes genetic exchange appears to have been unidirectional—from coyotes to wolves—suggesting that a male wolf and a female coyote (or a female hybrid) typified the hybridization. In a genetic study conducted in the early 1990s, sixty-eight percent of the Minnesota wolves sampled possessed coyote-type DNA. In southeastern Ontario, this figure rose to one hundred percent. Of the wolves sampled in Alaska, Montana, and Manitoba, none

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[22] Serge Lariviere and Michel Crete, "The Size of Eastern Coyotes (*Canis latrans*): A Comment," *Journal of Mammalogy* 74, no. 4 (November 1993), 1073.
[23] Robert K. Wayne and Niles Lehman, "Mitochondrial DNA Analysis of the Eastern Coyote: Origins and Hybridization," in *Ecology and Management of the Eastern Coyote*, 9-22.
[24] Stanley P. Young and Edward A. Goldman, *The Wolves of North America* (New York: Dover Publications, Inc., 1944), I: 58; L. David Mech, *The Wolf: The Ecology and Behavior of an Endangered Species* (New York: Natural History Press, 1970), 341; John Theberge, *Wolf Country*, 241-256; John and Mary T. Theberge, *The Wolves of Algonquin Park: A Twelve Year Ecological Study* (University of Waterloo Department of Geography, 2004), 126-127.

possessed any coyote DNA. It appears, then, that a "hybrid zone," stretching from northeastern Minnesota to southern Quebec, emerged as coyotes moved east through wolf populations on the decline.[25]

Social, political, and biological factors have made this zone fluid. The sexual boundaries between wolves and coyotes, softened during periods of intense human exploitation, hardened as wolf densities recovered. The Endangered Species Act (1973) encouraged this transition. By reducing the levels of human-driven wolf mortality, wolf numbers grew and populations became more stable, discouraging hybridization and thus allowing "pure" wolves to reclaim parts of the hybrid zone.

The legacy of the initial hybrid zone persisted within the mitochondrial DNA of the region's wolves, however. Transferred by females only, mitochondrial DNA connects generations, providing evidence of past interbreeding even after hybridization has ceased. This process has taken place in northeastern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan, where wolves once again dominate and coyotes survive where they can.

In the eastern portion of this hybrid zone, particularly in Ontario, a different scenario has emerged. As in the United States, coyotes and coyote-wolf hybrids moved east during the early twentieth century, encountering populations of wolves subjected to rigorous campaigns of extermination. Low wolf densities and the ensuing social fragmentation led to hybridization. Unlike in the United States, no bans on wolf killing existed or evolved in Ontario during this time, allowing human exploitation (and thus the physical and social fragmentation of wolves) to continue for the duration of the twentieth century. With its rural landscape and a lack of laws

[25] Niles Lehman, Andrew Eisenhawer, Kimberly Hansen, L. David Mech, Rolf O. Peterson, Peter J.P. Gogan, and Robert Wayne, "Introgression of Coyote Mitochondrial DNA Into Sympatric North American Gray Wolf Populations," *Evolution* 45, no. 1 (February 1991), 104-119.

protecting wolves, southeastern Ontario has provided a more permanent source of coyote-wolf hybrids.

Created in 1893, Algonquin Provincial Park adopted a policy of wolf eradication in its first year in order to maintain the park's white-tailed deer numbers. Park game officials pursued this policy until 1958, killing, on average, forty-nine wolves each year. With a park population of between ninety and one hundred-ten wolves during the late 1960s, such annual mortality rates would have had profound effects on the social structures of the early twentieth century packs, encouraging hybridization with the coyotes that had begun appearing around the park's margins in increasing numbers at this time. Annual wolf kills within Algonquin ended in 1959, but until 2004 no bans existed outside the park's borders. [26]

As a result, Ontario has developed a unique canine dynamic. While wolves within Algonquin's 2,900 square miles received protection, those without frequently fell victim to the dangerous trifecta of people, roads, and guns. Coyotes and hybrids, better equipped to negotiate these dangers, dominated the landscapes outside of the park. According to John and Mary Theberge, local "exploitation appears capable of flipping the canid population from wolf to coyote-wolf hybrids in such a zone occupied by both." More wolf-like canines exist in habitat with low road densities, high total forest cover, and low fragmentation, while more coyote-like canines exist in habitat with higher road densities, less total forest cover, and more fragmentation. This canine variation is not the direct result of habitat, but rather the product of the human exploitation facilitated by the habitat.[27]

Coincidentally, one of the region's largest deer yards lies outside Algonquin's borders, annually enticing the park's wolf packs to its deer herds. Such an entrepot, located at the

[26] Average derived from Table 1 of D.H. Pimlott et al's *The Ecology of the Timber Wolf in Algonquin Provincial Park*, 11; see also p. 23.
[27] John and Mary Theberge, *The Wolves of Algonquin Park*, 125-127.

interface between public and private lands, has been termed a "singles bar" by the wolf biologists of Algonquin. From such melting pots new pairings and packs have emerged, possessing a diversity of genetic backgrounds.[28]

With wolves, coyotes, and hybrids inhabiting the same general region—southeastern Ontario—the degree of human exploitation determines where each can dwell. A diversity of canines thus assimilates into a diversity of landscapes via hybridization, dispersal, natural selection, and human selection. Corridors closed to wolves are thus open to wolf genetics through the dispersal of hybrids, which transmit a cornucopia of canine genetics to such places as the Adirondacks.

The arrival of coyotes to eastern Canada has created a canine spectrum that stretches from Ontario south through New York. Individuals in Ontario's Frontenac Axis, a region immediately to the southeast of Algonquin Park, appear the most wolf-like. Adirondack canines, although less wolf-like than those in the Frontenac Axis, are more closely related to Algonquin wolves than to western coyotes. Wild canines from New York's southern tier more closely resemble *Canis latrans*.[29]

Coyotes came close to genetically swamping the red wolves of the Southeast out of existence; advocates of Algonquin's wolves fear the same will happen in Ontario. John Theberge estimates that since 1960 the prevalence of coyote DNA has increased by thirty percent within Algonquin's wolf population. Unusually small individuals have been found within the park and the average skull size has decreased over the decades. A smaller wolf found in the

[28] John and Mary Theberge, *The Wolves of Algonquin Park*, 79.
[29] John and Mary Theberge, *The Wolves of Algonquin Park*, 15-28, 125-127; Paul C. Paquet, James R. Strittholt, and Nancy L. Staus, *Wolf Reintroduction Feasibility in the Adirondack Park* (Corvallis, Oregon: Corvallis Biology Institute, October 1999), 10-15; Robert Chambers, "A Howling Success: The Eastern Coyote," 19.

Frontenac Axis, labeled the "Tweed wolf," has been one product of this hybridization. The eastern coyote of the Adirondacks has been another.[30]

The fear of losing the Algonquin wolf, traditionally classified as *Canis lupus lycaon*, has intensified as researchers have come to better understand its identity. *Canis lupus lycaon*, the eastern gray wolf, originally ranged throughout northern and western New York, southeastern Ontario, and southern Quebec. This subspecies of *Canis lupus* is—and was—smaller than either its New or Old World relations, as Adriaen Van Der Donck noted in his *Description of the New Netherlands* (1656). According to Van Der Donck, the wolves of New Netherlands "are not so large and ravenous as the Netherlands wolves are."[31]

More recent studies have corroborated this finding. In a sampling of adult wolves from the Northwest Territories, males averaged ninety-eight pounds in weight while females averaged eighty-five pounds, significantly more than the Ontario averages of sixty-one and fifty-four pounds, respectively.[32] Cranial measurements of preserved specimens indicate that individuals from New York and Pennsylvania may have been even smaller than their Ontario counterparts, closely paralleling the recorded sizes of red wolves (*Canis rufus*) from the American Southeast.[33]

Examining such data proves useful, as it illustrates the existence of a North American-wide canine spectrum, reflective of morphological and genetic gradations as opposed to stark species and subspecies boundaries. Because "rates of gene flow among North American wolf

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[30] John and Mary Theberge, *The Wolves of Algonquin Park*, 7, 23, 28; John Theberge, *Wolf Country*, 253-254.
[31] Ronald Nowak, "Wolf Evolution and Taxonomy," in *Wolves: Behavior, Ecology, and Conservation*, ed. L. David Mech and Luigi Boitani (Chicago: University of Chicago Press, 2003), 243; Stanley P. Young and Edward A. Goldman, *The Wolves of North America*, (New York: Dover Publications, Inc., 1944), II: 437; Adriaen Van Der Donck, *A Description of the New Netherlands* (1656), trans. Jeremiah Johnson, ed. Thomas F. O'Donnell (Syracuse: Syracuse University Press, 1968), 46.
[32] L. David Mech, *The Wolf: The Ecology and Behavior of an Endangered Species* (New York: Natural History Press, 1970), 12; Stanley P. Young and Edward A. Goldman, *The Wolves of North America*, II: 405.
[33] *Lycaon* measurements (rostrum widths) from New York and Pennsylvanian specimens overlap in size with individuals of the eastern subspecies of the red wolf, *Canis rufus niger* and *Canis rufus gregoryi*. While this data is from Young and Goldman's *The Wolves of North America* (II: 490-507), the nomenclature has been updated here to reflect Nowak's revision of red wolf taxonomy.

populations are high," Robert Wayne has argued that "typological species concepts may be inappropriate." Wayne's call to view wolves "as a series of intergrading populations" with "subtle or undetectable patterns of clinal change" assists our understanding of the evolutionary history of eastern North American wolves.[34]

Indeed, such dynamic models are essential when considering the recent genetic research of Paul Wilson. Wilson has determined that the Algonquin wolf (*Canis lupus lycaon*) is more closely related to the red wolf (*Canis rufus*) than to the gray wolf (*Canis lupus*). Reflecting this genetic reality, Wilson has recommended a new designation, *Canis lycaon*, for both red wolves and eastern Canadian wolves.[35] Wilson explains minor differences between the eastern Canadian red wolf and the red wolf of the American Southeast by the latter's slightly more recent divergence from a common canine ancestor, of which the coyote is the modern manifestation. Such a divergence likely occurred between 300,000 and 150,000 years ago, explaining *lycaon's* affinity for hybridizing with coyotes.[36] Ronald Nowak, relying more heavily upon morphological and ecological data to explain wolf evolution, maintains that *rufus* is a distinct species and that *lycaon* "may have resulted from natural hybridization as its range was simultaneously invaded by *C. lupus nubilus* from the west and *C. rufus* from the south when the most recent Pleistocene glaciation retreated."[37] Regardless of which hypothesis proves correct

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[34] Robert K. Wayne and Carles Vila, "Molecular Genetic Studies of Wolves," in *Wolves: Behavior, Ecology, and Conservation*, 218-237, quotes pp. 236, 223.

[35] Paul J. Wilson et al, "DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf," *Canadian Journal of Zoology* 78 (2000): 2156-2166. John and Mary Theberge were two of the fifteen co-authors of the above study. Additional discussion of this effort to classify both the Algonquin wolf and the red wolf as *lycaon* can be found in their book *The Wolves of Algonquin Park: A Twelve Year Ecological Study* (2004).

[36] Wilson et al, "DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf," 2164; John Theberge, "An Ecologist's Perspective on Wolf Recovery in the Northeastern United States," in *The Return of the Wolf*, 26-27; Ronald Nowak provides a hypothetical diagram of *Canis* evolution (Figure 9.1) in "Wolf Evolution and Taxonomy," in *Wolves: Behavior, Ecology, and Conservation*, 240.

[37] Ronald Nowak, "Wolf Evolution and Taxonomy," in *Wolves: Behavior, Ecology, and Conservation*, 249, 254.

(if either are correct), the fact that *lycaon*—like *rufus*—will hybridize with coyotes has had profound implications for the Adirondack region.

Coyote-*lycaon* hybrids dispersing from Ontario moved through landscapes that by the early twentieth century had become largely impermeable to wolves as a result of human development. Upon entering the Adirondacks, such hybrids—hereafter labeled eastern coyotes (*Canis latrans* var.)—restored genetic traces of the region's original canine, *Canis lycaon*. The timing of the eastern coyote's arrival could not have been better. Entering the park during the first decades of the twentieth century, these canines encountered a diversity of landscapes and habitats. On a patchwork of public and private lands existed significant tracts of old growth forests, selectively logged forests, and open clear-cuts. Pastures and fields in the early stages of succession mixed with a few working farms. Roads and hamlets dissected large wilderness areas. A new canine began to take form, as evidenced through its significant dietary shift.

During the late 1950s, snowshoe hares and red squirrels provided between forty-one and sixty-one percent of the diet of Adirondack eastern coyotes. At this time, white-tailed deer existed at historic highs, yet comprised only sixteen to thirty-nine percent of the canines' diet. Importantly, eastern coyotes restricted their deer use at this time to winter-killed deer. This practice had shifted by the second study, conducted from 1975-1980. Although done during a period of comparatively low deer densities within the Adirondack Park, white-tailed deer then accounted for seventy-four to eighty-nine percent of the eastern coyote's diet. Adirondack canines now hunted and killed deer throughout the year, with hares and squirrels providing no more than fifteen to twenty-eight percent of the diet. The significance of hares and squirrels in the diet fell to between three and thirteen percent by the time of the third study, conducted from 1986 to 1989, when deer constituted twenty-eight to ninety-four percent of the eastern coyote's

diet, varying significantly by season. The Adirondack's eastern coyotes had also begun preying consistently on beavers during the spring and summer months, a hunting strategy characteristic of wolves.[38]

The diet of the eastern coyote in the Adirondacks has thus changed significantly since it colonized the park. The original diet appears quite coyote-like. By the time of the third study, Adirondack canines displayed widely varying seasonal diets. Deer accounted for nearly the entire winter diet—ninety-four percent—while less than one-third of the fall diet, at which time they relied heavily upon fruits, insects, and small mammals. Such a seasonally diversified diet is wolf-like in nature if not degree.[39] Unlike several subspecies of *Canis lupus*, however, eastern coyotes do not hunt moose. But the wolves of Algonquin Provincial Park are not known as moose hunters themselves. Pimlott et al, studying Algonquin's wolves during the late 1960s, found that moose comprised only eight percent of the total diet. Thirty years later moose remained a minor dietary component.[40]

The social structures of the Adirondacks' eastern coyotes have also evolved. Gary Brundige, in observing the contiguous territories of packs and the large movements of transient animals, suggests that Adirondack canines have saturated their range. As a result, the young delay their dispersal, remaining with the breeding pair to assist in rearing the next year's young. In the absence of high rates of human-driven mortality, packs have restricted breeding in non-

[38]These figures illustrate the diet in terms of percent occurrence, not percent of volume. Gary C. Brundige, "Predation Ecology of the Eastern Coyote, *Canis latrans var*., In the Adirondacks, New York" (Ph.D. diss., State University of New York College of Environmental Science and Forestry, 1993), 23-30; Robert Chambers, "A Howling Success: The Eastern Coyote," 20-21; Peter J. Perkins, "Winter Diet and Bioenergetics of Eastern Coyotes: A Review," in *Ecology and Management of the Eastern Coyote*, ed. Arnold Boer, 88; Rolf O. Peterson and Paolo Ciucci, "The Wolf as a Carnivore," in *Wolves: Behavior, Ecology, and Conservation*, 110-111.
[39] Brundige, "Predation Ecology of the Eastern Coyote," 24-25, 122; Mech, *The Wolf*, 178-179.
[40] Pimlott et al, *The Ecology of the Timber Wolf in Algonquin Provincial Park*, 36; John Theberge, *Wolf Country*, 273.

dominant individuals.[41] Such packs possess home ranges one hundred to two hundred percent larger than western coyotes, likely reflecting the reliance on larger prey and the less efficient use of hares and rodents.[42]

Despite these rapid dietary and behavioral adaptations, the plastic canines of the Adirondacks may not be done evolving. John Theberge reports that size selection in breeding occurs for wolves as well as for hybrids.[43] In this way, the eastern coyotes inhabiting the Adirondacks, particularly if human exploitation remains minimal and populations are near saturation, may continue on the path to near-wolfdom. But will this canine ever be considered a wolf?

Unlike *Canis lupus*, the eastern coyote's image seldom appears on mugs, calendars, or inspirational classroom posters. Instead, its image appears squarely in the sights of hardcore advocates of red wolf restoration. Approximately one hundred red wolves now roam in and around the Alligator River National Wildlife Refuge (ARNWR) of northeastern North Carolina. Holy vessels of sacred genetic material, these wolves are earnestly studied and guarded by the US Fish and Wildlife Service. Their 1999 "Population and Habitat Viability Assessment" cited miscegenation with local coyotes as the preeminent threat to the restoration effort. Their 2000 "Adaptive Management Plan" seeks to minimize the introgression of coyote genes into the red wolf population through canine zoning. In zone one, the ARNWR itself, field biologists remove all coyotes and hybrids. Zone two, maintained as an experimental population area, lies to the

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[41] Such restrictions would be lifted in the face of human exploitation, in which case the removal of seventy percent of the canine population each year would be necessary to achieve sustained population reductions. Robert Chambers, "The Coyote in New York State," accessed via the SUNY College of Environmental Science and Forestry website: www.esf.edu/pubprog/brochure/coyote/coyote.htm; Brundige, "Predation Ecology of the Eastern Coyote," 110-116.

[42] Daniel J. Harrison, "Social Ecology of Coyotes in Northeastern North America: Relationships to Dispersal, Food Resources, and Human Exploitation," in *Ecology and Management of the Eastern Coyote*, ed. Arnold Boer, 61, 66.

[43] John and Mary Theberge provide a table comparing canines from different regions in terms of the "most similar population," *The Wolves of Algonquin Park*, 23-24; Robert Chambers, "A Howling Success: The Eastern Coyote," 19.

west of the ARNWR. Here, coyotes and hybrids may remain, but only after sterilization. In zone three, on the western reaches of the experimental population area, hybrids may persist with their reproductive systems intact.[44]

The results of the "Adaptive Management Plan," at least those from 1999 through 2002, do not look altogether promising for the red wolf in the long term. In zone one, understandably, all canines are unadulterated red wolves. In zone two, understandably, management practices have eliminated hybrid litters. Zone three, however, remains a canine melting pot.[45] How can such a system ever extend the range of red wolves without turning the entire region into a zone one or two? Such a feat would require incredibly intensive management on an immense scale, and the coyote has proven its resilience again and again during the twentieth century. And what happens when one elusive yet single-minded male hybrid infiltrates the segregated zones?

A similar genetic battle looms in the north, with Algonquin Provincial Park as the focal point. Clearly Ontario desires to preserve their Algonquin wolves, as does the international conservation biology community. In 2004, Ontario placed a ban on wolf hunting around the park, an action that should allow the wolf packs to fend off hybrid and coyote incursions more efficiently. But while the integrity of core areas can be augmented and solidified, a frontier will always exist at some point. And at that frontier, hybridization will continue to occur as long as eastern coyotes persist in the East.

Less than one hundred miles from the Adirondack Highlands, such a fringe of Canadian hybridization could maintain a consistent stream of southbound hybrids. Returning red wolves to the Adirondacks, then, would merely create another Algonquin Park, another Alligator River

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[44] Jennifer Adams, "Using Molecular Approaches to Evaluate Hybridization Between Two Closely Related Species, *Canis rufus* and *Canis latrans*" (MA thesis, University of Idaho, 2002), 1-23.
[45]Jennifer Adams, "Using Molecular Approaches to Evaluate Hybridization Between Two Closely Related Species, *Canis rufus* and *Canis latrans*," 13, 14.

National Wildlife Refuge. Such a restoration, through intense vigilance and a program of canine eugenics, could return wolves to the Adirondacks, a region capable of supporting them. But for how long and at what costs? As the authors of the 1999 report on the feasibility of wolf reintroduction to the Adirondacks conclude, existence should not be confused with persistence.[46]

In the twenty-first century Northeast, a new definition of canine fitness has emerged, favoring the hybrid over the wolf for life in a cultural landscape. Not only does the eastern coyote largely fill the wolf niche, but it can disperse through and survive amidst greater social and ecological fragmentation. A versatile survivor and an inherently plastic genetic entity, the eastern coyote can traverse highly-manipulated corridors to colonize remote regions in which it can evolve to fill a spectrum of canine niches.

Constant surveillance and programs of canine elimination and sterilization, if applied to the Adirondack Park, may stifle evolution. Such static solutions cannot provide long-term answers. We should challenge ourselves not with debating, reintroducing, monitoring, and analyzing the appropriate wolf, but with accepting and tolerating the canine species that has evolved in our midst. Our efforts and resources may be better spent in preserving more of the Northeast, allowing canines to determine their own ranges in their own time.

In the Adirondacks we have the opportunity to learn a valuable and humbling lesson. We have the opportunity to watch the "canid evolutionary forge" produce an appropriate canine, a second-chance canine for a second-chance wilderness. This process should be looked upon with hope and fascination, not fear. The infusion of coyote genetic material and the forging of hybrids may enrich rather than diminish canine biodiversity in the Northeast. Over sixty thousand "pure" wolves can still be found within the United States and Canada. And these

[46] Paul Paquet et al, *Wolf Reintroduction Feasibility in the Adirondack Park*, 41. According to Gary Brundige, sustained reductions in the eastern coyote population would require an annual harvest of over fifty-five percent of the population. "Predation Ecology of the Eastern Coyote, *Canis latrans* var., In the Adirondacks, New York," 116.

populations are either stable or increasing.[47] Perhaps the spectrum of canines that evolution has discharged between wolves and coyotes should be allowed to attain its own fluid equilibrium in the Northeast.

If we insist on reintroducing *lycaon* into the Adirondacks, we should do so fully aware of the potential for hybridization, and the intensive management required to prevent it. Establishing pure *lycaon* populations in the Adirondacks would require the total elimination of *Canis latrans* var. from within the park. Once a critical population of wolves developed, they would conceivably prevent coyotes and hybrids from infiltrating. But, as in Algonquin, an extensive hybridization frontier would then ring the park's boundaries. Such a hybrid fringe would provide a ready supply of canines prepared to invade the park if wolf population densities began diminishing.

The creation of such an Adirondack "wolf 'fortress'" would not be cheap or easy. John Theberge, a forward-thinking wolf biologist, writes:

> Instead of re-establishing a wolf population free of hybrid influence, the more likely result of reintroduction would be a shift toward wolfness in the existing coyote-dominated gene pools…Such a goal for species recovery—gene pool shift rather than species reintroduction—is unique, never having been attempted or even contemplated before. The Northeast offers a grand opportunity to try it.[48]

If we choose to return wolves to the Adirondacks, Theberge's concept of gene-shifting is the model that should guide us. It may be the best option for wolves, for the hybrids already dwelling within the Adirondacks, and for us.

But what of the wolf's ability to restore balance to an increasingly consumerist human society? Possessing living requirements that are at odds with human development, the wolf could push us to moderate our environmental impacts. But what should come first, the wolf or a

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[47] Luigi Boitani, "Wolf Conservation and Recovery," in *Wolves: Behavior, Ecology, and Conservation*, 322.
[48] John Theberge, "An Ecologist's Perspective on Wolf Recovery in the Northeastern United States," in *The Return of the Wolf*, 59.

reduction in our environmental exploitation? Perhaps we need to prove to the wolf, and to ourselves, that it belongs in the Adirondacks. We can do that through the continued preservation of Northeastern landscapes, through the creation of tenable corridors connecting critical habitats, and through the careful scrutiny of development within the Adirondack Park and other beautiful and wild places in the Northeast. Environmentally-concerned citizens would do well to heed the calls of such activists as Jamie Sayen, Stephen Trombulak, and John Davis, who implore our communities, governments, and interest groups to think big in our conservation endeavors.[49]

Although we cannot necessarily return to a perceived ecological ideal, we can proceed sensibly to a more balanced future. Along the way, we must be willing to accept the cumulative consequences of forty, four hundred, or four thousand years of human occupation. We should, like the raven, accept what canine evolution provides. It may not be what we want, but it will be what our northeastern landscapes deserve.

[49] Jamie Sayen, "An Opportunity for Big Wilderness in the Northern Appalachians," in *Wilderness Comes Home: Rewilding the Northeast*, 124-156; Stephen C. Trombulak, "Ecological Reserve Design in the Northeast," in *Wilderness Comes Home*, 107-123; John Davis, "Some Lessons from Wilderness, East and West," in *Wilderness Comes Home*, 263-271.

6 CONCLUSION

As Ebenezer Emmons, James DeKay, and John Torrey stood atop Mount Marcy in the late summer of 1837, the trio of naturalists gazed out over the heavily wooded shoulders and bare summits of the Adirondacks' High Peaks, and the vast green and blue-dotted expanses beyond. In those still largely unlogged forests of beech, birch, maple, fir, spruce, and hemlock persisted a full complement of large mammals: wolves, mountain lions, wolverines, lynx, black bears, moose, white-tailed deer, and beavers.[1]

Sixty-four years later, in the summer of 1901, Louis Marshall brought his six month old son Robert from New York City to Knollwood, the family "camp" on Lower Saranac Lake. The hyperkinetic Bob took naturally to the woods and waters of the Adirondacks. By his twenty-fifth birthday the long-striding Bob had climbed each of the forty-six highest peaks in the Adirondack Mountains at least once, and his day hikes routinely exceeded forty miles. These considerable travels gave Marshall ample opportunity to observe the region's rebounding beaver population, but he would not have encountered wolves, mountain lions, wolverines, lynx, or moose. At least not in New York. The Adirondack wilderness of Bob Marshall's youth, as Thoreau had observed from the far tamer shores of Walden Pond, remained incomplete.[2]

But the Adirondack landscape has been nothing if not resilient. By creating the Adirondack Forest Preserve and constitutionally protecting it as "Forever Wild," by creating the Adirondack State Park and consistently adding to it, New York State managed to preserve a vital

[1] Philip G. Terrie, "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840," *Journal of the Early Republic* 3, no. 2 (Summer, 1983), 185-206.
[2] Phil Brown, ed., *Bob Marshall in the Adirondacks: Writings of a Peak-Bagger, Pond-Hopper and Wilderness Preservationist* (Saranac Lake: Lost Pond Press, 2006), xix-xxiii. Forty-two of the peaks stand above four thousand feet (two exceed five thousand feet); the other four included on the Adirondack Forty-Sixers' itinerary are slightly lower. http://www.adk46r.org/

core of forestlands and waterways in which a breadth of natural processes could proceed on regionally unparalleled scales. Few have enjoyed this accidental wilderness as much as Bob Marshall, who, unfortunately, died in 1939. [3]

The Adirondacks that Marshall left at thirty-eight, however, were not the same Adirondacks that he had entered at six months. Numbering fewer than twenty in 1901, the Adirondacks' beaver population had boomed in the four decades since. Coyote-wolf hybrids, traveling eastward around the Great Lakes, had established themselves within northern New York. Even an occasional moose wandered into the state. A century of mammalian dewilding had yielded to a century of large mammal rewilding.

While each rewilding episode is unique, the restoration histories of beavers, moose, and wild canines in the Adirondack Highlands all demonstrate the resiliency of wildlife if afforded suitable habitat, appropriate levels of protection, and tenable travel corridors. The Adirondacks' remnant beaver population received a nonessential but beneficial infusion of reinforcements to accelerate their recovery. By the end of the twentieth century *Castor canadensis* had recolonized the entire state. Moose and canines returned to the Adirondack Highlands on their own, without active human intervention. By naturally expanding their ranges through dispersal, these species effectively bypassed the contested terrain of town halls, state capitals, and editorial pages.

Significantly, New Yorkers seem to prefer this type of animal-driven restoration over more human-driven alternatives. This preference was quite evident in the discussions initiated by the Department of Environmental Conservation regarding moose restoration, and this preference has been equally evident in the debates surrounding a potential wolf restoration. Public debates sparked by such translocation proposals, and their accompanying environmental

[3] Roderick Nash discusses unintentional wilderness preservation in his book *Wilderness and the American Mind* (New Haven: Yale University Press, 1967), 108, 122.

impact statements, tend to shift public discourse from the ecological realm into the political arena. The restoration of a species through that species' dispersal and range expansion, however, may achieve the same ecological result with less political, social, and financial costs.

Wolf restoration in the northern Rockies clearly juxtaposes these dichotomous alternatives. The US Fish and Wildlife Service's *Northern Rocky Mountain Wolf Recovery Plan* "recommended that wolves be encouraged to naturally repopulate Montana and Idaho, but that they be reintroduced as an 'experimental population' to Yellowstone." Both approaches produced viable wolf populations in each of the three regions, but the public responded differently to the two strategies. Doug Honnold, who advocated for the northern Rocky Mountains' wolves as an Endangered Species Act litigator, contrasts Yellowstone's "mediagenic Fish & Wildlife Service translocation effort," which produced countless "images of wolves captured, wolves darted, wolves translocated, and wolves set 'free' by man," with Montana's "story of wolves naturally, magically, on their own reclaiming their native lands." Whereas the initial wolf restoration effort in Yellowstone provoked fierce opposition (the *Wolf Wars*), wolves recolonized Montana "with relatively little fanfare and comparatively little political opposition from any quarter."[4]

Hank Fischer, a major force behind Yellowstone's successful wolf restoration, acknowledges its status "as a landmark conservation achievement." But Fischer also concedes that Yellowstone's wolf restoration provides "a poor conservation model for at least three reasons: It took too long, it cost too much, and too many people are still angry about it."[5]

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[4] Edward Bangs, "Restoring Wolves to the West," *Reclaiming the Native Home of Hope: Community, Ecology and the American West*, ed. Robert B. Keiter (Salt Lake City: University of Utah Press, 1998), 112-120, first quote p. 114; Doug Honnold, "Wolves, Bears, and the Spirit of the Wild: Asking the Right Questions," in *Reclaiming the Native Home of Hope: Community, Ecology and the American West*, 127-133, Hank Fischer, *Wolf Wars: The Remarkable Inside Story of the Restoration of Wolves to Yellowstone* (Helena: Falcon Press, 1995).

[5] Hank Fischer, "Moving Past the Polarization: Wolves, Grizzly Bears, and Endangered Species Recovery," in *Reclaiming the Native Home of Hope: Community, Ecology and the American West*, 121-126, quote p. 121.

Northern New York, possessing a different physical geography, human geography, and ecology, has grown wilder while largely avoiding these problems. Presented with the opportunity, beavers, moose, and wild canines reclaimed their historic habitats within the wildlands of the Adirondacks cheaply and relatively quietly, if not always quickly. More large and mobile mammal species, including wolves, mountain lions, and lynx, may follow.

In order to facilitate the range expansion of these species and others the Adirondack dome, described by Gary Randorf as a "wild island of hope," must maintain its wild character while continuing to become less island-like. Moose returned to the Adirondacks after Vermont's forests rebounded and its hunting regulations tightened; other species can also return to New York's North Country once appropriate species-specific corridors emerge.[6]

Linking core areas such as the Adirondack Highlands with other protected cores will be the challenge of the next century as humans endeavor to preserve regional and global biodiversity. The Wildlands Project (TWP) has argued that a wilder North America can be achieved through a continental reserve network consisting of cores ("areas where the conservation of biodiversity, ecological integrity, wilderness, or similar values takes precedence over other values and uses"), buffers ("areas that maintain some degree of wildness but allow sustainable economic uses that are compatible with the goals of the reserve network as a whole"), and corridors ("large, regional connections that are meant to facilitate animal movements and other essential flows between different sections of the landscape"). Such a system could tie local ad hoc preservation efforts into a regional and national matrix.[7]

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[6] Gary Randorf, *The Adirondacks: Wild Island of Hope* (Baltimore: John Hopkins University Press, 2002).
[7] Michael E. Soulé and John Terborgh, "The Policy and Science of Regional Conservation," in *Continental Conservation: Scientific Foundations of Regional Reserve Networks*, eds. Michael E. Soulé and John Terborgh (Washington, D.C: Island Press, 1999), 1-16; definitions pp. 99, 132, 172; Michael E. Soulé and John Terborgh, "Conserving Nature at regional and Continental Scales: A Scientific Program for North America," *Bioscience* 49, no. 10 (Oct. 1999), 809-817.

Because of its size, low population density, and relative ecological health, the Adirondack State Park will provide an important core area within any future network of northeastern reserves. Conservation biologists have recently begun to envision a corridor linking Algonquin Provincial Park with the Adirondack State Park, known as the "Algonquin to Adirondack Connectivity Zone" (or "A2A"), a far more modest parallel to the West's Yellowstone-to-Yukon Project. With the stated desire of allowing the wolves of Algonquin to disperse into the Adirondack ecosystem, The Wildlands Project has called for increased land preservation within the A2A corridor. A proposed 3,200,000 acre Maine Woods National Park, favored by seventy percent of Maine's citizens, would preserve for the Northeast another viable core to the east of the Adirondacks.[8]

The rewilding paradigm offered by the twentieth century Adirondack experience, emphasizing the resilience and range-expanding potential of mammal species like beavers, moose, and canines when afforded adequate environmental and social conditions, flows smoothly into the twenty-first century rewilding paradigm proposed by groups such as The Wildlands Project. While not excluding the translocation of large mammal species into the northeastern woodlands, such models direct society's attention, energies, and financial resources more heavily towards ecosystem preservation.

The residents and visitors of the Adirondack Highlands have proven that humans can coexist with wildlife within a patchwork of wilderness areas and sustainably managed and strictly-zoned human environments. Indeed, the Adirondack State Park has even proven that an

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[8] Peter Quinby et al, *Opportunities for Wildlife Habitat Connectivity between Algonquin Park, Ontario and the Adirondack Park, New York* (Burlington, VT: The Greater Laurentian Wildlands Project, July 1999): http://www.ancientforest.org/a2a.html; Stephen C. Trombulak, "Ecological Reserve Design in the Northeast," in *Wilderness Comes Home: Rewilding the Northeast*, ed. Christopher McGrory Klyza (Hanover: University Press of New England, 2001), 112-113, map p. 114; Jamie Sayen, "An Opportunity for Big Wilderness in the Northern Appalachians," in Wilderness Comes Home, 146-148; "RESTORE: Maine Woods National Park," http://www.restore.org/Maine/overview.html.

ecosystem that includes *Homo sapiens* can grow wilder and more complete under responsible stewardship.

How the Adirondacks and other wild regions in the Northeast evolve over the next century will depend on the choices made by the region's human citizens. Large mammals will continue to expand their ranges when and where they can, but their fates largely rest in human hands. If increasing numbers of people allow their citizenship to extend beyond the human-dominated spaces of family portraits, neighborhoods, and state capitals, and into the forests, mountains, and watersheds of the Northeastern woodlands, the region's rewilding may continue through the twenty-first century. While this process could certainly benefit mammal species like lynx, mountain lions, wolves, and woodland caribou, humans are the large mammals likely to benefit the most. By learning to limit ourselves to coexist with other species that possess considerable space and resource requirements, we may begin to practice the forbearance and sustainability necessary to extend our own tenure on this planet.

BIBLIOGRAPHY

Adams, Jennifer. "Using Molecular Approaches to Evaluate Hybridization Between Two Closely Related Species, *Canis rufus* and *Canis latrans*." Thesis, University of Idaho, 2002.

Adirondack Almanack. http://adirondackalmanack.blogspot.com/2006/09/animal-encounters-moose-in adirondacks.html

Adirondack Council. "The Adirondack Park." http://www.adirondackcouncil.org/adkpark2.html

Adirondack Moose Central. http://www.snowyinn.com/page3.htm

Adirondack Mountain Club. "Adirondack Park Wilderness Areas." http://www.adk.org/ad_quest/wilderness.aspx

Adirondack Park Agency. http://www.apa.state.ny.us/index.html

Adirondack Park Agency. "Wildlife of the Adirondack Park." http://www.apa.state.ny.us/About_Park/wildlife.htm

Agenbroad, Larry D., Jim I. Mead, Lisa W. Nelson, eds. *Megafauna and Man: Discovery of America's Heartland*. Hot Springs, South Dakota: Mammoth Site of Hot Springs, South Dakota, Inc., 1990.

Allen, J.A. "The Distribution of the Moose in New England." *The American Naturalist* 4, no. 9 (Nov. 1870): 535-536.

Alverson, William S., Donald M. Walker, and Stephen L. Solheim. "Forests Too Deer: Edge Effects in Northern Wisconsin." *Conservation Biology* 2, no. 4 (Dec. 1988): 348-358.

Associated Press. "Wolf Reintroduction Debate Clouded by DNA Debate: Which Wolf?" Forests.org, Sept. 8, 2001. http://www.forests.org/archive/america/woredeba.htm

Atlas of the World, 8th ed. Washington, D.C.: National Geographic Society, 2005.

Bailey, Vernon. *Beaver Habits, Beaver Control, and Possibilities in Beaver Farming*. Washington: United States Department of Agriculture, 1922. Bulletin No. 1078.

Ballou, William Hosea. "An Adirondack National Park." *The American Naturalist* 19, no. 6 (June 1885): 578-582.

Bekoff, Marc. *Coyotes: Biology, Behavior, and Management*. New York: Academic Press, 1978.

Bennett, M.K. "The Food Economy of the New England Indians, 1605-1675." *The Journal of Political Economy* 63, no. 5 (Oct. 1955): 369-397.

Bergerud, A.T. and Wyett B. Snider. "The Role of Wolf Predation in Limiting a Moose Population." *The Journal of Wildlife Management* 47, no. 4 (Oct. 1983): 977-988.

Boer, Arnold H., ed. *Ecology and Management of the Eastern Coyote*. Fredericton, New Brunswick: Wildlife Research Unit, University of New Brunswick, 1992.

Broschart, Michael R., Carol A. Johnston, and Robert J. Naiman. "Predicting Beaver Colony Density in Boreal Landscapes." *The Journal of Wildlife Management* 53, no. 4 (Oct.1989): 929-934.

Brown, Phil. *Bob Marshall in the Adirondacks: Writings of a Pioneering Peak-Bagger, Pond-Hopper and Wilderness Preservationist*. Saranac Lake: Lost Pond Press, 2006.

Brundige, Gary C. "Predation Ecology of the Eastern Coyote, *Canis latrans* var., In the Adirondacks, New York." Ph.D. diss., State University of New York College of Environmental Science and Forestry, 1993.

Byers, Dick. "Is the Eastern Coyote Becoming a Wolf?" From the Westmoreland Conservancy website: http://www.westmorelandconservancy.org/CCWolfCoyote.html

Carson, Russell M.L. *Peaks and People of the Adirondacks*. Garden City: Doubleday, Doran & Co., Inc., 1928.

Cadieux, Charles L. *Coyotes: Predators and Survivors*. Washington, D.C.: Stonewall Press, Inc., 1983.

Chambers, Robert E., Jr. "The Coyote in New York State." From the SUNY College of Environmental Science and Forestry website: www.esf.edu/pubprog/brochure/coyote/coyote.htm

Chambers, Robert E., Jr. "A Howling Success: The Eastern Coyote." *New York State Conservationist* (Aug. 2000): 19-21.

Champagne, Glenn C. "The Beaver in New York." *The Conservationist* 26, no. 1 (Aug./Sept. 1971): 18-21.

Coleman, Jon T. *Vicious: Wolves and Men in America*. New Haven: Yale University Press, 2004.

Conover, Michael R. "Effect of Hunting and Trapping on Wildlife Damage." *Wildlife Society Bulletin* 29, no. 2 (Summer 2001): 521-532.

Cook, David B. "History of a Beaver Colony." *Journal of Mammalogy* 24, no. 1 (Feb. 1943): 12-18.

Cremeens, David L. and John P. Hart, editors. *Geoarchaeology of Landscapes in the Glaciated Northeast*. Albany: The New York State Education Department, 2003.

Cronon, William. *Changes in the Land: Indians, Colonists, and the Ecology of New England*. New York: Hill and Wang, 1983.

Curtis, Paul D. and Paul G. Jensen. "Habitat Features Affecting Beaver Occupancy Along Roadsides in New York State." *The Journal of Wildlife Management* 68, no. 2 (Apr. 2004): 278-287.

Decker, Daniel J. "The Beaver: New York's Empire Builder." *The Conservationist* 35, no. 3 (Nov.-Dec. 1980): 14-17, 40.

Davis, Mary Byrd. *Old Growth in the East: A Survey*. Richmond, Vermont: Wild Earth Publication, 1993.

Day, Gordon M. "The Indian as an Ecological Factor in the Northeastern Forest." *Ecology* 34, no. 2 (Apr. 1953): 329-346.

Echeverria, Jaime. "Existence Values for Bald Eagle, Coyote, and Wild Turkey in New England." Thesis, University of Massachusetts, Department of Agricultural and Resource Economics, 1990.

Elder, John, ed. *The Return of the Wolf: Reflections on the Future of Wolves in the Northeast*. Hanover: Middlebury College Press, 2000.

Enck, Jody W., Paul G. Bishop, Tommy L. Brown, and Joseph E. Lamendola. *Beaver-related Attitudes, Experiences, and Knowledge of Key Stakeholders in Wildlife Management Unit 21*. Cornell: Human Dimensions Research Unit, Dept. of Natural Resources, New York State College of Agriculture and Life Sciences, 1992.

Fagan, Brian. *The Little Ice Age: How Climate Made History, 1300-1850*. New York: Basic Books, 2000.

Ferguson, R. Brian and Neil L. Whitehead, eds. *War in the Tribal Zone: Expanding States and Indigenous Warfare*. Santa Fe: School of American Research Press, 1992.

Fischer, Hank. *Wolf Wars: The Remarkable Inside Story of the Restoration of Wolves to Yellowstone*. Helena: Falcon Press, 1995.

Flores, Dan. *The Natural West: Environmental History in the Great Plains and Rocky Mountains*. Norman: University of Oklahoma Press, 2001.

Forcier, Lawrence K. "Reproductive Strategies and the Co-occurrence of Climax Tree Species." *Science* 189, no. 4205 (Sept. 1975): 808-810.

Foster, Michael K., Jack Campisi, and Marianne Mithun, eds. *Extending the Rafters: Interdisciplinary Approaches to Iroquoian Studies*. Albany: State University of New York Press, 1984.

Franzmann, Albert W. "*Alces alces*." *Mammalian Species*, no. 154 (May 8, 1981): 1-7.

Franzmann, Albert W. and Charles C. Schwartz. *Ecology and Management of the North American Moose*. Washington: Smithsonian Institute Press, 1997.

Garner, Dale L. "Ecology of the Moose and the Feasibility for Translocation into the Greater Adirondack Ecosystem." MS thesis, State University of New York College of Environmental Science and Forestry, 1989.

Garner, Dale and William F. Porter. "Movements and Seasonal Home Ranges of Bull Moose in a Pioneering Adirondack Population." *Alces* 26 (1990): 80-85.

Garner, Dale L. and William F. Porter. "Prevalence of *Parelaphostrongylus tenuis* in White-tailed Deer in Northern New York." *Journal of Wildlife Diseases* 27, no. 4 (1991): 594-598.

Goodwin, George G. "Big Game Animals in the Northeastern United States." *Journal of Mammalogy* 17, no. 1 (Feb. 1936): 48-50.

Gordon, Thomas F. *Gazetteer of the State of New York*. New York: Printed for the Author, 1836.

Griffith, Brad, J. Michael Scott, James W. Carpenter, and Christine Reed. "Translocation as a Species Conservation Tool: Status and Strategy." *Science* 245, no. 4917 (Aug. 1989): 477-480.

Gunn, Alastair S. "The Restoration of Species and Natural Environments." *Environmental Ethics* 13, no. 4 (Winter 1991): 291-310.

Hall, E. Raymond, and Keith R. Kelson. *The Mammals of North America*. New York: Ronald Press Company, 1959. Reprinted, New York: Wiley, 1981.

Hamilton, W.J. "The Fur-Bearers of New York State." *The Scientific Monthly* 40, no. 2 (Feb. 1935): 182-187.

Haynes, Gary. *Mammoths, Mastodonts, and Elephants: Biology, Behavior, and the Fossil Record*. New York: Cambridge University Press, 1991.

Heilman, Carl II. *The Adirondacks*. New York: Rizzoli International Publications, 2006.

Hickerson, Harold. *The Chippewa and Their Neighbors: A Study in Ethnohistory*. New York: Holt, Rinehart and Winston, Inc., 1970.

Hicks, Alan and Edwin McGowan. *Restoration of Moose in Northern New York: Draft Environmental Impact Statement*. Albany: New York State DEC, September 1, 1992.

Hicks, Alan. *The Future of Moose Management in New York State*. Based on the Review of Restoration of Moose in Northern New York Draft Environmental Impact Statement. New York State DEC: March 29, 1993.

Hilfiker, Earl L. *Beavers: Water, Wildlife and Histor*y. Interlaken, NY: Windswept Press, 1991.

Hodgdon, Harry E. and Joseph S. Larson. *A Bibliography of the Recent Literature on Beaver*. Amherst, Massachusetts: Massachusetts Agricultural Experiment Station, 1980.

Hodgson, Angie. "Wolf Restoration in the Adirondacks: The Questions of Local Residents." July 1997. From the Wildlife Conservation Society website: http://www.wcs.org/media/file/wcswp8.pdf

Howard, Rebecca J. and Joseph S. Larson. "A Stream Habitat Classification System for Beaver." *The Journal of Wildlife Management* 49, no. 1 (Jan. 1985): 19-25.

Hunt, George T. *The Wars of the Iroquois: A Study in Intertribal Trade Relations*. Madison: University of Wisconsin Press, 1960.

Innis, Harold. *The Fur Trade in Canada*. New Haven: Yale University Press, 1962.

Irwin, Larry L. "Deer-Moose Relationships on a Burn in Northeastern Minnesota." *The Journal of Wildlife Management* 39, no. 4 (Oct. 1975): 653-662.

Johnson, Charles Eugene. *The Beaver in the Adirondacks: Its Economics and Natural History*. Syracuse: Roosevelt Wild Life Forest Experiment Station, 1927.

Jolliffe, Norm. *Bear and Moose: The Saga of Big Game Hunting in the Northeast Wilderness*. Thorndike, Maine: North Country Press, 1987.

Kalm, Peter. *Travels Into North America*. Translated by John Reinhold Forster. Barre: The Imprint Society, 1972.

Keiter, Robert B., editor. *Reclaiming the Native Home of Hope: Community, Ecology and the American West*. Salt Lake City: University of Utah Press, 1998.

Klyza, Christopher McGrary, ed. *Wilderness Comes Home: Rewilding the Northeast*. Hanover: University Press of New England, 2001.

Krech, Shepard III, ed. *Indians, Animals, and the Fur Trade*. Athens: University of Georgia Press, 1981.

Kurten, Bjorn. *Before the Indians*. New York: Columbia University Press, 1988.

Lancia, Richard A., Wendell E. Dodge, and Joseph S. Larson. "Winter Activity Patterns of Two Radio-Marked Beaver Colonies." *Journal of Mammalogy* 63, no. 4 (Nov. 1982): 598-606.

Lariviere, Serge, and Michel Crete. "The Size of Eastern Coyotes (*Canis latrans*): A Comment." *Journal of Mammalogy* 74, no. 4 (Nov. 1993): 1072-1074.

Lauber, Thornton Bruce. "Moose on the Loose: Fairness and Decision-Making in the Adirondacks." Ph.D. Diss., Cornell University, 1996.

Lauber, T. Bruce and Barbara A. Knuth. "Fairness in Moose Management Decision-Making: The Citizens' Perspective." *Wildlife Society Bulletin* 25, no. 4 (Winter 1997): 776-787.

Lawrence, William. "Michigan Beaver Populations as Influenced by Fire and Logging." Ph.D. Diss., University of Michigan, 1954.

Lehman, Niles, Andrew Eisenhawer, Kimberly Hansen, L. David Mech, Rolf O. Peterson, Peter J.P. Gogan, and Robert K. Wayne. "Introgression of Coyote Mitochondrial DNA into Sympatric North American Gray Wolf Populations." *Evolution* 45, no. 1 (Feb. 1991): 104-119.

Lemon, Peter. "Of Mites and Moose." *Adirondack Life* 37, no. 8 (Nov./Dec. 2006): 44-49, 60-61.

Leptich, David J. and James R. Gilbert. "Summer Home Range and Habitat Use by Moose in Northern Maine." *The Journal of Wildlife Management* 53, no. 4 (Oct. 1989): 880-885.

Lomolino, Mark V., Dov F. Sax, and James H. Brown. *Foundations of Biogeography: Classic Papers with Commentaries*. Chicago: University of Chicago Press, 2004.

Lorenz, Jay Ronald. "Physical Characteristics, Movement, and Population Estimate of the Eastern Coyote in New England." Unpublished thesis, University of Massachusetts, 1978.

Lull, Howard W. *A Forest Atlas of the Northeast*. Upper Darby, Pennsylvania: Northeastern Forest Experiment Station, 1968.

Luoma, Jon R. "Back to Stay." *Audubon* 98, issue 1 (Jan./Feb. 1996): 52-58.

Lynch, Mike. "On the Hunt for the Elusive Adirondack Wolf." From the *Adirondack Daily Enterprise* website: http://www.adirondackdailyenterprise.com/include/articles.asp?articleID=4071

Marsh, George Perkins. *Man and Nature*. Cambridge: Belknap Press of Harvard University, 1965.

Marshall, Jennifer. "Size and Distance to Water of Trees Felled by Beaver in the Central Adirondacks." http://www.esf.edu/ResOrg/RooseveltWildlife/Research/JenMarshall/Jen_Marshall.htm

Martin, Calvin. "The European Impact on the Culture of a Northeastern Algonquian Tribe: An Ecological Interpretation." *The William and Mary Quarterly*, 3rd Series, vol. 31, no. 1 (Jan. 1974): 3-26.

Martin, Paul S. and H.E. Wright, eds. *Pleistocene Extinctions: A Search for a Cause*. New Haven: Yale University Press, 1967.

Mason, Ronald J. *Great Lakes Archaeology*. New York: Academic Press, 1981.

Maxwell, Jessica. "Leave it to Beavers." *Audubon* 96, issue 2 (Mar./Apr. 1994): 104-108.

McKibben, Bill. "An Explosion of Green." *The Atlantic Monthly* 275, no. 4 (Apr. 1995): 61-76.

McMartin, Barbara. *The Great Forest of the Adirondacks*. Utica: North Country Books, 1994.

Mech, L. David. *The Wolf: The Ecology and Behavior of an Endangered Species*. New York: Natural History Press, 1970.

Mech, L. David and Luigi Boitani, eds. *Wolves: Behavior, Ecology, and Conservation*. Chicago: The University of Chicago Press, 2003.

Merriam, Clinton Hart. *The Mammals of the Adirondack Region, Northeastern New York*. New York: Press of L.S. Foster, 1884. Reprint, New York: Arno Press, 1974.

Messier, Francois. "The Significance of Limiting and Regulating Factors on the Demography of Moose and White-Tailed Deer." *The Journal of Animal Ecology* 60, no. 2 (June 1991): 377-393.

Miller, Gerrit S. "Preliminary List of the Mammals of New York." *Bulletin of the New York State Museum* 6, no. 29. (Oct. 1899): 271-390.

Morgan, Lewis Henry. *The American Beaver: A Classic of Natural History and Ecology*. New York: Dover Publications, Inc., 1986. Originally published as *The American beaver and his works*. Philadelphia: J.B. Lippincott, 1868.

Muller-Schwarze, Dietland and Lixing Sun. *The Beaver: Natural History of a Wetlands Engineer*. Ithaca: Comstock Publishing Associates, 2003.

Murray, Jean E. "The Early Fur Trade in New France and New Netherland." *The Canadian Historical Review* 19, no. 4 (Dec., 1938): 365-377.

Naiman, Robert J., Carol A. Johnston, and James C. Kelley. "Alteration of North American Streams by Beaver." *BioScience* 38, no. 11 (Dec. 1988): 753-762.

Nash, Roderick. *Wilderness and the American Mind*. New Haven: Yale University Press, 1967.

New York Atlas and Gazetteer. Yarmouth, Maine: Delorme, 2001.

New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources. *Furbearer Management News*, 2000, 2001, 2002, 2003: http://www.dec.ny.gov/animals/9361.html

New York State Department of Environmental Conservation. "Trapping." http://www.dec.ny.gov/outdoor/355.html

New York State Department of Environmental Conservation. "Adirondack Forest Preserve." http://www.dec.ny.gov/lands/5263.html

New York Times. Headlines and articles concerning beaver, moose, wolves, and coyotes. Assorted dates.

North American Moose Foundation. http://www.moosefoundation.org

Norton, Thomas Elliot. *The Fur Trade in Colonial New York, 1686-1776*. Madison: University of Wisconsin Press, 1974.

Novak, Milan, ed. *Wild Furbearer Management and Conservation in North America*. Toronto: Ministry of Natural Resources, 1987.

Nowak, Ronald M. "The Red Wolf is Not a Hybrid." *Conservation Biology* 6, no. 4 (Dec. 1992): 593-595.

Nowak, Ronald M. "Hybridization: The Double-Edged Threat." *Canid News* 3, 1995. http://www.canids.org/PUBLICAT/CNDNEWS3/hybridiz.htm

Nowak, Ronald M., and N.E. Federoff. "Validity of the Red Wolf: Response to Roy et al." *Conservation Biology* 12, no. 3 (June 1998): 722-725.

Nowak, Ronald M. "The Original Status of Wolves in Eastern North America." *Southeastern Naturalist* 1, no. 2 (2002): 95-130.

Nowak, Ronald M. *Walker's Carnivores of the World*. Baltimore: Johns Hopkins University Press, 2005.

O'Callaghan, Edmund Bailey. *History of New Netherland; Or, New York Under the Dutch*. New York: D. Appleton & Company, 1845. Two volumes.

Osgood, Frederick L. "The Mammals of Vermont." *Journal of Mammalogy* 19, no. 4 (Nov. 1938): 435-441.

Paquet, Paul C., James R. Strittholt, and Nancy L. Staus. "Wolf Reintroduction Feasibility in the Adirondack Park." Corvallis, Oregon: Corvallis Biology Institute, October 1999. http://www.protectadks.org/issues/wolves/cbi-feasibility-study.pdf

Parker, Linda R. *Feasibility Assessment for the Reintroduction of North American Elk, Moose, and Caribou into Wisconsin*. Wisconsin Department of Natural Resources, August 1990.

Parsons, Gary R. "Effect of a 4-year Closure of the Trapping Season for Beaver in Eastern Warren County." *New York Fish and Game Journal* 22, no. 1 (Jan. 1975): 57-61.

Parsons, Gary and Mark Brown. "Effect of a Four-Year Closure of Trapping for Beaver in Fulton County, New York." *New York Fish and Game Journal* 25, no. 1 (Jan. 1978): 23-30.

Peck, Robert B. "The Renaissance of the Beaver." *Forest and Stream* (Apr. 1921): 152-154, 182-187.

Peek, James M., David L. Urich, and Richard J. Mackie. "Moose Habitat Selection and Relationships to Forest Management in Northeastern Minnesota." *Wildlife Monographs*, no. 48 (Apr. 1976): 4-65.

Peterson, Rolf O., and Joanne M. Thurber. "Changes in Body Size Associated with Range Expansion in the Coyote (*Canis latrans*)." *Journal of Mammalogy* 72, no. 4 (Nov. 1991): 750-755.

Peterson, Randolph L. *North American Moose*. Toronto: University of Toronto Press, 1955.

Peterson, Rolf O., and Joanne M. Thurber. "The Size of Eastern Coyotes (*Canis latrans*): A Rebuttal." *Journal of Mammalogy* 74, no. 4 (Nov. 1993): 1075-1076.

Philips, Michael K., and V. Gary Henry. "Comments on Red Wolf Taxonomy." *Conservation Biology* 6, no. 4 (Dec. 1992): 596-599.

Pielou, E.C. *After the Ice Age: The Return of Life to Glaciated North America*. Chicago: University of Chicago Press, 1991.

Pimlott, D.H., J.A. Shannon, and G.B. Kolenosky. *The Ecology of the Timber Wolf in Algonquin Provincial Park.* Ontario: Department of Lands and Forests, 1969.

Pimlott, D.H and W.J. Carberry. "North American Moose Transplantations and Handling Techniques." *The Journal of Wildlife Management* 22, no. 1 (Jan. 1958): 51-62.

Post Star. www.poststar.com

Press Republican. www.pressrepublican.com

Prince, J. Dyneley. "Some Forgotten Indian Place-Names in the Adirondacks." *The Journal of American Folklore* 13, no. 49 (Apr. 1900): 123-128.

Pristorius, Alan. "Coyotes on the Move." *Northern Woodlands* (Autumn 2002): 30-53.

Quinby, Peter, Steve Trombulak, Thomas Lee, Jeff Lane, Michael Henry, Robert Long, and Paula MacKay. *Opportunities for Wildlife Habitat Connectivity between Algonquin Park, Ontario and the Adirondack Park, New York.* Burlington, Vermont: The Greater Laurentian Wildlands Project, July 1999. http://www.ancientforest.org/a2a.html#study

Radford, Harry V. *Artificial Preservation of Timber and History of the Adirondack Beaver*. Albany: J.B. Lyon Co., 1908. Reprinted from the tenth, eleventh and twelfth reports of the New York Forest, Fish and Game Commission.

Randorf, Gary A. *The Adirondacks: Wild Island of Hope*. Baltimore: Johns Hopkins University Press, 2002.

Redfield, W.C. "Some account of two visits to the Mountains in Essex County, New York, in the years 1836 and 1837; with a Sketch of the Northern Sources of the Hudson." *The American Journal of Science and Arts* 33, no. 2 (Jan. 1838): 301-323.

Reid, Catherine. *Coyote: Seeking the Hunter in Our Midst*. New York: Houghton Mifflin Co., 2004.

Reschke, Carol. *Ecological Communities of New York State*. Latham, New York: New York State Department of Environmental Conservation, 1990.

Richter, Daniel K. *The Ordeal of the Longhouse: The Peoples of the Iroquois League in the Era of European Colonization*. Chapel Hill, N.C.: University of North Carolina Press, 1992.

Rink, Oliver A. *Holland on the Hudson: An Economic and Social History of Dutch New York*. Ithaca: Cornell University Press, 1986.

Ritchie, William Augustus. *The Archaeology of New York State*. Garden City: The Natural History Press, 1965.

Roy, Michael S., Eli Geffen, Deborah Smith, and Robert K. Wayne. "Molecular Genetics of Pre-1940 Red Wolves." *Conservation Biology* 10, no. 5 (Oct. 1996): 1413-1424.

Russell, F. Leland, David B. Zippin, and Norma L. Fowler. "Effects of White-tailed Deer (*Odocoileus Virginianus*) on Plants, Plant Populations and Communities: A Review." *American Midland Naturalist* 146, no. 1 (July 2001): 1-26.

Sarrazin, François, and Robert Barbault. "Reintroduction: Challenges and Lessons for Basic Ecology." *Trends in Ecology and Evolution* 11 (Nov. 1996): 474-477.

Saunders, D. Andrew. *Adirondack Mammals*. Syracuse: Adirondack Wildlife Program, State University of New York College of Environmental Science and Forestry, 1988.

Schneider, Paul. *The Adirondacks: A History of America's First Wilderness*. New York: Henry Holt and Co., 1997.

Schneider, Richard and Shawn Wasel. "The Effect of Human Settlement on the Density of Moose in Northern Alberta." *The Journal of Wildlife Management 64*, no. 2 (Apr. 2000): 513-520.

Seddon, Philip J. and Pritpal S. Soorae. "Guidelines for Subspecific Substitutions in Wildlife Restoration Projects." *Conservation Biology* 13, no. 1 (Feb. 1999): 177-184.

Seton, Ernest Thompson. *Life-histories of Northern Animals*. Two volumes. New York: Charles Scribner's Sons, 1909.

Sharp, Virginia A., Bryan G. Norton, and Strachan Donnelley, eds. *Wolves and Human Communities: Biology, Politics, and Ethics*. Washington, D.C.: Island Press, 2001.

Siemer, William F., Gordon R. Batcheller, Ronald J. Glass, Tommy L. Brown. "Characteristics of Trapper and Trapping Participation in New York." *Wildlife Society Bulletin* 22, no. 1 (Spring 1994): 100-111.

Snow, Dean R. and William A. Starna. "Sixteenth-Century Depopulation: A View from the Mohawk Valley." *American Anthropologist* 91, no. 1 (Mar. 1989): 142-149.

Soulé, Michael E. and John Terborgh. "Conserving Nature at regional and Continental Scales: A Scientific Program for North America." *BioScience* 49, no. 10 (Oct. 1999): 809-817.

Soulé, Michael E. and John Terborgh. *Continental Conservation: Scientific Foundations of Regional Reserve Networks*. Washington, D.C.: Island Press, 1999.

Soulé, Michael E. and Gordon H. Orians, eds. *Conservation Biology: Research Priorities for the Next Decade*. Washington: Island Press, 2001.

Starna, William A. "Mohawk Iroquois Populations: A Revision." *Ethnohistory* 27, no. 4 (Autumn 1980): 371-382.

State of New York Conservation Commission Annual Reports (Albany: JB Lyon Co.).

State of New York Forest, Fish and Game Commission Annual Reports (Albany: JB Lyon Co.).

Stegeman, LeRoy C. "The Production of Aspen and Its Utilization by Beaver on the Huntington Forest." *The Journal of Wildlife Management* 18, no. 3 (July 1954): 348-358.

Sterling, Ernest A. "The Return of the Beaver to the Adirondacks." *American Forestry* 19, no. 5 (May 1913): 292-299.

Stevens, Thomas H., Thomas A. Moore, and Ronald J. Glass. "Public Attitudes About Coyotes in New England." *Society and Natural Resources* 7 (1994): 57-66.

Stilgoe, John R. *Common Landscape of America, 1580 to 1845*. New Haven: Yale University Press, 1982.

Sturtevant, William C., gen. ed. *Handbook of North American Indians, XV, Northeast*, edited by Bruce G. Trigger. Washington, D.C.: Smithsonian Institution, 1978.

SUNY College of Environmental Science and Forestry. "Beaver." http://www.esf.edu/aec/adks/mammals/beaver.htm

SUNY College of Environmental Science and Forestry, Adirondack Ecological Center. "Adirondack Ecosystem." http://www.esf.edu/aec/adks/default.htm

SUNY College of Environmental Science and Forestry, Adirondack Ecological Center. "Adirondack Mammals." http://www.esf.edu/aec/adks/mammals/

SUNY College of Environmental Science and Forestry, Adirondack Ecological Center. "Moose." http://www.esf.edu/aec/adks/mammals/moose.htm

Telfer, Edmund S. "Comparison of Moose and Deer Winter Range in Nova Scotia." *The Journal of Wildlife Management* 31, no. 3 (July 1967): 418-425.

Terrie, Philip G. *Wildlife and Wilderness: A History of Adirondack Mammals*. Fleischmanns, New York: Purple Mountain Press, 1993.

Terrie, Philip G. "The New York Natural History Survey in the Adirondack Wilderness, 1836-1840." *Journal of the Early Republic* 3, no. 2 (Summer 1983): 185-206.

Theberge, John. *Wolf Country: Eleven Years Tracking the Algonquin Wolves*. Toronto: M&S, 1998.

Theberge, John, and Mary T. Theberge. *The Wolves of Algonquin Park: A Twelve Year Ecological Study*. University of Waterloo Department of Geography, 2004.

Thomas, Peter A. "The Fur Trade, Indian Land and the Need to Define Adequate 'Environmental' Parameters." *Ethnohistory* 28, No. 4 (Autumn 1981): 359-379.

Thwaites, Reuben G., ed. *The Jesuit Relations and Allied Documents*. Cleveland: The Burrows Brothers Co., 1898. Available online: http://puffin.creighton.edu/jesuit/relations/

Trelease, Allen W. "The Iroquois and the Western Fur Trade: A Problem in Interpretation." *The Mississippi Valley Historical Review* 49, no. 1 (June 1962): 32-51.

Trevis, Lloyd. "Summer Behavior of a Family of Beavers in New York State." *Journal of Mammalogy* 31, no. 1 (Feb. 1950): 40-65.

Trigger, Bruce G. *Natives and Newcomers: Canada's "Heroic Age" Reconsidered*. Montreal: McGill-Queen's University Press, 1985.

Tullar, Ben. "Eastern Coyote—Always a New York Native." *Conservationist* 46, issue 4 (Jan. 1992): 34-39.

Turner, E.T. "The Physical Geography of New York State. Part XI. The Climate of New York." *Journal of the American Geographic Society of New York* 32, no. 2 (1900): 101-132.

USGS, US Board on Geographic Names. http://geonames.usgs.gov/domestic/index.html

United States Census Bureau. http://www.census.gov/index.html

Van Der Donck, Adriaen. *A Description of the New Netherlands* (1656). Translated by Jeremiah Johnson. Edited by Thomas F. O'Donnell. Syracuse: Syracuse University Press, 1968.

Van Diver, Bradford B. *Upstate New York*. Toronto: Kendall/Hunt Publishing Co., 1980.

Van Diver, Bradford B. *Roadside Geology of New York*. Missoula: Mountain Press Publishing Company, 2001.

Warren, Edward R. *The Beaver: Its Work and Its Ways*. Baltimore: The Williams and Wilkins Co., 1927.

Warren, Edward Royal. "The Most Interesting Wild Animal in America." *The Scientific Monthly* 27, no. 1 (July 1928): 33-41.

Wayne, Robert. "Red Wolves: To Conserve or Not to Conserve." *Canid News* 3 (1995): http:www.canids.org/PUBLICAT/CNDNEWS3/2conserv.htm

Wayne, Robert K, Niles Lehman, Marc W. Allard, and Rodney L. Honeycutt. "Mitochondrial DNA Variability of the Gray Wolf: Genetic Consequences of Population Decline and Habitat Fragmentation." *Conservation Biology* 6, no. 4 (Dec. 1992): 559-569.

Wayne, Robert K., Michael S. Roy, and John L. Gittleman. "Origin of the Red Wolf: Response to Nowak and Federoff and Gardener." *Conservation Biology* 12, no. 3 (June 1998): 726-729.

Whitney, Gordon G. *From Coastal Wilderness to Fruited Plain: A History of Environmental Change in Temperate North America, 1500 to Present*. New York: Cambridge University Press, 1994.

Will, Gary and Mark Brown. "Adirondack Furbearers." *The Conservationist* 35, no. 4 (Jan.-Feb. 1981): 32-37. A publication of the NYS DEC.

Wilson, Paul J., Sonya Grewal, Ian D. Lawford, Jennifer N.M. Heal, Angela G. Grenacki, David Pennock, John B. Theberge, Mary T. Theberge, Dennis R. Voigt, Will Waddell, Robert E. Chambers, Paul C. Paquet, Gloria Goulet, Dean Cluff, and Bradley N. White. "DNA profiles of the eastern Canadian wolf and the red wolf provide evidence for a common evolutionary history independent of the gray wolf." *Canadian Journal of Zoology* 78 (2000): 2156-2166.

Young, Stanley P., and Edward A. Goldman. *The Wolves of North America*. Two volumes. New York: Dover Publications, Inc., 1944.