

Elk on Yellowstone's Northern Range:  
Science, Management, and Controversy, 1900-  
1980

by

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Revised Aug. 29, 1994  
Not for Quotation  
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From its inception in 1872, Yellowstone National Park protected elk against hunters, but in the early 1930s scientists and managers began to think that too many elk damaged vegetation on the range and initiated efforts to control the number of elk, especially the herd which roamed the northern reaches of the Park in the drainages of the Lamar and Yellowstone Rivers. In 1934 Yellowstone rangers began shooting the elk of the northern herd to directly control their numbers. In 1967, after years of controversy, Yellowstone stopped using direct reduction, and shortly thereafter, ceased live-trapping and shipment of elk as well.

For the historian, that policy shift stimulates the formation of several questions. Why did Yellowstone initiate this change in wildlife management policy? In what ways did science inform this decision, and how did management imperatives shape the opportunities for science? Why did Yellowstone's policy on range management and ungulates differ from that on the public lands of the Gallatin National Forest just to the north? This paper seeks to demonstrate that management strategies of for ungulate management were shaped by biologists and managers who conceived of Yellowstone as an exemplar and preserve of nature. The officials who regulated the elk hunt in Montana had a very different set of priorities. The perceptions of urban visitors as well as elk hunters regarding nature and the purpose of Yellowstone also had an important influence in the form of political pressure on management decisions. The national controversy over elk reduction and the idea of managing parks to accentuate a natural America as proposed by the Leopold Report created a special circumstance conducive to questioning traditional concepts of range management. Science informed management technique within the greater context of wildlife management decisions influenced by public conceptions of nature and Yellowstone, political pressure, and the ideas managers and biologists held regarding the purpose of Yellowstone.

From the creation of Yellowstone National Park in 1872, managers acted vigorously to protect the native ungulates. Public hunting was proscribed in the national parks in 1894 by the Lacy Act, and poaching was suppressed until 1918 by army troops stationed in Yellowstone to protect the scenic features and wildlife.<sup>1</sup> Government trappers trapped and shot wolves and coyotes, the native predators of Yellowstone. Conservation organizations such as the American Humane Association worried that elk might become extinct in Yellowstone.<sup>2</sup> Horace Albright, superintendent of Yellowstone from 1919 until 1929, also feared the extinction of park elk. He perceived herds of ungulates on the brink of disaster, threatened by hunters as well as the harsh winters which affected the high plateau region that Yellowstone commanded.<sup>3</sup> Writing on behalf of the Permanent Wild Life Protection Fund, William T. Hornaday in 1917 saw the establishment of game reserves as "absolutely the last chance of the West to bring back the big game to its now lifeless and desolate wastes of wilderness."<sup>4</sup> From 1917 to 1919, Superintendent Albright stirred up this sort of anxiety as he communicated with conservationists across the country, warning that "our national elk herds are constantly facing extermination and that some means must be found of giving them perpetual protection."<sup>5</sup>

In 1920 Albright fed the northern herd hay in an attempt to keep them from descending down and out of the Park to winter range and the guns of Montana's hunters. Montana's hunting laws, wrote Albright, were "unworthy of a civilized state."<sup>6</sup> In 1924 Albright's desire to protect the innocent creatures of Yellowstone prompted him to issue a memo urging Yellowstone staff to "finally eliminate cats entirely" from the Park, as he judged the domestic house cat "a dangerous animal" posing a great danger to the song birds migrating through Yellowstone. The purpose of Yellowstone was to protect nature, and like others of his era, Albright separated animals into clear categories of "good" animals such as the song bird and the elk, and "bad" animals like the cat and the wolf. Most scientists and managers saw these

divisions as logical and proper management protecting the good against the bad. The protection offered elk was so effective that the size of the herd in the northern reaches of the park grew noticeably, reassuring Albright that thankfully, the elk in Yellowstone would not become extinct. Until the early 1930s, Park officials welcomed the elk, motivated in part by the belief that tourists came primarily to see wild animals. This urge to protect the elk lasted until 1934, when a new view of the wapiti emerged which dominated Park management for more than thirty years.

In 1929 William Rush, biologist and Assistant Forest Supervisor on the Gallatin National Forest, stood on the sagebrush covered slopes north of the park headquarters at Mammoth, looking out over Mount Everts to the east and northward to where the Gardiner River cut through ancient gravelly depositions on its way to the Yellowstone. With the toe of his boot, Rush thoughtfully poked at a bunch of cheatgrass, kicked at the bare soil between clumps of sagebrush and knelt down, carefully placing his knee between a small rock and one of the cacti adapted to the cold winters of high country. The tufts of grass Rush took in his hand and the specific places on rabbit brush and horsebrush where buds and shoots had been browsed by ungulates yielded clues and spoke to him about the recent passage and dining habits of the wapiti.<sup>7</sup> Yellowstone hired Rush full-time to study the condition of the range, which he did from his arrival in December 1928 until his departure in April 1932. Rush came to believe that the range had deteriorated by fifty percent since 1914.<sup>8</sup> If this trend continued, the elk of Yellowstone would damage the vegetation so severely that the range would no longer support these grazing ungulates. In 1927, Rush noted a curious condition: "It has puzzled me all winter as to how the elk could exist on apparently nothing to eat."<sup>9</sup> How could an estimated 13,000 elk subsist on a range being invaded by the unpalatable cheatgrass?

Rush was not alone in his assumptions about range management. In the 1920s, schools of range science and wildlife management taught the idea of "carrying



capacity," which maintained that the vegetation of a range could support just so many herbivorous animals.<sup>10</sup> If the number of grazing and browsing antelope, deer, elk, or moose exceeded that carrying capacity, the animals would deteriorate the range resource. Although not emphasized, the idea reflected older notions of equilibrium in nature. If ungulates grazed too much, the delicate balance of nature would be upset with the potential for disastrous consequences.

Those dangerous conditions were manifest in the Kaibab herd disaster of the late 1920s in Grand Canyon National Park. After zealously protecting the deer on the northern rim for years, wildlife managers were rewarded with the product of their labors: deer herds increased dramatically. But they had not anticipated was that the vegetation on the range could not possibly support so many animals. As winter gradually covered the dry landscape with cold winds and thin, almost transparent layers of snow, the deer exhausted the supply of grasses and herbaceous vegetation, and finally began to strip trees of their bark in a desperate search for food. Massive numbers of deer starved to death, but found immortality in an apparent lesson for the managers of nature.<sup>11</sup>

Historian Thomas Dunlap argues that managers created a myth, or common wisdom, of a simple answer to the problems of ungulate irruptions and subsequent population crashes. The elimination of predators, especially the wolf, by means of predator control programs caused the problem of ungulate irruption, and substituting human for the missing animal predators provided the solution.<sup>12</sup> Managers had a hard time convincing the hunting community of the need to reduce the size of ungulate populations because for years wildlife managers had worked to increase the size of the herds, and the hunting public and travel industry now expected a bounteous harvest each year, not permanent herd reductions which they saw as unnecessary.<sup>13</sup> Wildlife managers, biologists, and range scientists grew more worried about the numbers of elk on the northern range.

William Rush believed that the necessary precursor to herd irruption was a bountiful vegetative environment, that a subsequent glut of animals devastated that environment, and that a precipitous drop in population resulted. In the early 1930s, his concern with the condition of the vegetative cover encouraged Yellowstone's managers to reconsider their management of the elk herds they had so carefully protected and nourished toward greater numbers. Additionally, the newly created Wildlife Division of the National Park Service concurred with Rush to nudge Yellowstone toward a program of reductions. In 1933, NPS wildlife biologists Joseph Dixon and Ben Thompson visited Yellowstone and reported the range in "deplorable" condition. They thought the range had deteriorated since they had last seen it in 1929, and believed that the elk herd was on the "brink of disaster" as the hungry times of winter approached.<sup>14</sup> George Wright, head of the NPS's Wildlife Division, and Olaus Murie, who had studied elk food habits in Jackson Hole, both agreed that the size of the herd should be reduced. In 1934, Superintendent Roger W. Toll used the word "overgrazing" for the first time in his annual report. A shortage of precipitation and "heavy overgrazing on the winter range, which has caused serious depletion," said Toll, "will require stringent measures to bring about proper rehabilitation."<sup>15</sup> Yellowstone Park managers accepted the common wisdom of the day and adopted the judgments shared by range science and wildlife biology.

Because scientists located the cause of a deteriorating range in an oversized elk herd, managers faced the practical question of how to eliminate elk. Yellowstone initiated a program to reduce the size of the herd that lasted over 25 years yet seemed to have little effect on the size of the herd and therefore on rehabilitating the range. The program varied little over this time and incorporated three major elements: hunters took a harvest just across the border in Montana every autumn, park personnel trapped elk and shipped them out of the park, and (if those methods

did not cull the herd down to a proper size) park rangers would perform a "direct reduction" by shooting the excess population.<sup>16</sup>

Park personnel began to herd and trap the wild elk, much as cowboys on the range lands surrounding Yellowstone managed their charges. Herding elk into the traps was always a problematic affair. The park built large corral-like structures, with a fence on one side running a third of a mile, to force a moving group of elk into a wooden fence funnel, and finally into a corral where wide gates swung shut behind the nervous animals. For wild animals unused to human proximity, the trapping procedure must have been traumatic--park rangers seized bulls and cut their impermanent antlers off with a saw to prevent harm to the bulls or to other elk as they were shipped. The trapped elk were shipped off to zoos, depleted game ranges in national forests, and state departments of fish and game for restocking purposes. To carry out direct reduction after the yearly Montana hunt, rangers traveled on over-snow vehicles to remote areas of the Park where segments of the herd pawed through the snow to find sustenance on their winter range in the Yellowstone and Lamar River Valleys. Rangers shot the elk with high-powered rifles. The carcasses were dragged off to be butchered as quickly as possible by nearby teams so that the meat would not spoil before its shipment to Indian reservations.<sup>17</sup> From the first direct reduction in 1934 to 1967, 67,440 elk were removed from the Northern Yellowstone herd. Of that number, 13,753 were shot by rangers, while hunters shot 41,400, 6,700 were live shipped and 5541 were counted as the victims of bad weather and insufficient winter forage.<sup>18</sup> Although direct reduction was used from 1935 to remove elk, the method took few animals when compared to the Montana hunt. It never attracted much criticism until the early 1960s, when Park management decisions came under fire from both citizens who wished to save the elk and those who wanted to hunt the elk.

Despite the reductions, mostly by hunter kill, by 1961 the "problem" still pawed, nibbled and browsed its way through the range. Managers had hoped that a smaller herd would allow the range to regain a lush and verdant appearance. Biologists at Montana State College in Bozeman told Superintendent Lon Garrison that Yellowstone was evading its responsibilities by not using their authority to carry out direct reductions.<sup>19</sup> The yearly reductions by live trapping and relocation did not reduce the herd enough to reach the predicted carrying capacity, so Garrison and Chief Ranger Otto Brown planned a significantly larger reduction for the winter of 1961-62. A herd which contained an estimated 10,000 elk would be culled to 5,000 to achieve the carrying capacity calculated in the early 1950s by biologist Walter Kittams. Pondering their choices, the managers, rangers, and wildlife biologists decided that a public hunt could not remove enough of the herd, due to the rugged conditions of winter in Yellowstone. Even if enough hunters could be found, their pack animals would create significant damage to the range. Grand Teton National Park had conducted a public hunt for many years, a legacy of political pressure exerted in 1950 when the Jackson Hole National Monument was abolished and added to Grand Teton.<sup>20</sup> In 1961, rangers distributed maps and copies of the rules and regulations to hunters, yet discovered illegal kills of several coyotes, eleven moose, two bears, and twenty-three elk.<sup>21</sup> Yellowstone managers were not optimistic about enforcing hunter discipline. Moreover, a large hunt in Yellowstone might induce elk to fear and avoid humans; summer visitors thus might not see elk which now wandered in plain view unafraid of humans.

The first public Yellowstone serves is the tourist. Local folks of northwest Wyoming and southwestern Montana stifle a chuckle when visitors to Yellowstone National Park point to the native ungulates grazing in the hot spring basins and ask "Pardon me, but what is that?" In the public imagination wapiti take on

characteristics of nobility and wildness. What the locals don't understand is that for most urban Americans, largely physically and psychically separated from nature by human constructions, Yellowstone becomes a symbol of nature. What the urban visitors do not often realize is that the elk grazing peacefully before them are not quite the essence of wild nature they had envisioned: rather the Yellowstone elk are the product of long human manipulation as well. The reduction of 1961-62, in which rangers shot 4,309 elk, caused a public uproar.<sup>22</sup> This urban public did not understand the necessity of shooting elk.

Hunters were disgruntled because if elk needed shooting, who was more qualified to perform the task? The parks were *national* parks, after all, owned by the people. Local and regional newspapers reflected the protests of the hunters. Pressured by constituents, the Wyoming legislature came out in favor of public hunting. Montana's governor, Donald G. Nutter, and Montana's Fish and Game Department urged controlled public hunting in the park. The International Association of Game and Fish Commissioners "protested the proposed slaughtering of elk by hired killers" and proposed substituting sportsmen for rangers.<sup>23</sup> A group of Wyoming sportsmen considered seeking court action against the Park Service to halt the reduction. The secretary of the Powell, Wyoming, Chamber of Commerce urged sportsmen's clubs to unite to test whether "the will of the people will prevail over that of the park officials."<sup>24</sup> The outcry was so vociferous that Wyoming Senator Gale McGee convened hearings in Bozeman, Montana, to consider the issue.<sup>25</sup>

Superintendent Garrison later described the direct reduction as a "brutal, bloody, abusive process including threats on my life" and midnight phone calls threatening Mrs. Garrison.<sup>26</sup> Dr. W. Leslie Pengelly, wildlife extension director at Montana State University in nearby Bozeman, defended the decisions of park managers. Speaking before the Kiwanis club in Billings, Pengelly explained the necessity of controlling the herd and pointed out the practical limitations of inviting the public to hunt within the

park. Pengelly and other wildlife biologists at Montana State College in Bozeman wrote to NPS Director Conrad Wirth, supporting the elk reductions as well as the Park's position against hunting. This offended the members of the Wyoming Game and Fish Commission, who considered themselves experts on wildlife management. University biologists had second-guessed their expertise and questioned their wisdom. When commission members met in Cheyenne on January 16, they in turn criticized the "few arm-chair game managers whose knowledge of wildlife management is confined largely to textbooks and the classroom."<sup>27</sup>

Managers had a difficult time convincing the hunting public that the practical difficulties of a large hunt in winter and the specific purposes of a national park precluded hunting within Yellowstone. In magazines such as *Sports Afield*, Arthur H. Carhart and others asked "shall we hunt in National Parks?" Carhart thought that the solution to ungulate over-population was "thousands of sportsmen as the only possible number of operators to do the job fully."<sup>28</sup> Organizations like the San Diego Rod and Gun Club and the Casper Sportsmen's Association advocated public hunting in the Park. But park biologists and managers staunchly resisted the idea. Biologists and administrators in Yellowstone first saw public hunting within the Park as a practical problem--it was physically impossible for sportsmen to harvest the desired 4,000 animals, and public hunting might well teach the herd to flee humans and therefore disappoint the camera-bearing summer tourist.

Ultimately, managers and biologists appealed to their conceptions of Yellowstone's purpose. Yellowstone had a significantly different objective than the surrounding national forests. The Parks were intended as "inviolable sanctuaries for all forms of nature," wrote Yellowstone West District Ranger Elt Davis. "Once the bars are let down to hunters, how can we logically reject the stockmen and others who will soon demand that we manage our resources for the economic welfare of these groups rather than retaining them naturally for the higher purpose of public enjoyment." Thus Davis and

others saw public hunting as simply incompatible with the end purposes of the Park. The struggle against public hunting in Yellowstone was crucial: the Park Service was "fighting for their very existence. . . . Everything we have been taught and trained for over the years could be lost if public wildlife reduction ever takes place in the parks."<sup>29</sup> Davis feared that if a public hunt was allowed, state wildlife agencies would soon be setting the terms of management within the parks. Not merely the matter of agency independence, but the more important notion of the National Parks as separate places with a unique mission animated Davis and other Yellowstone scientists and managers through 1967, the last year of direct reductions.

The controversy over the 1961-62 reduction of the northern Yellowstone elk herd was the most publicized problem in wildlife management at that time. Was the reduction of herds necessary and proper? If the numbers of elk must be reduced by direct methods, why could not hunters participate? Secretary of the Interior Stewart Udall reported that he was "under great pressure" to allow hunting during the 1962 elk reduction controversy. In 1962 Howard Stagner, the chief of the NPS's Division of Interpretation and National History, directed an internal examination of NPS research and found it lacking ecological perspective and continuity.<sup>30</sup> In response to this report and to requests from Senators Gale McGee and Joe Hickey of Wyoming, Secretary of the Interior Udall assembled a special advisory board to investigate the problem of irrupting ungulate populations in the national parks.<sup>31</sup> The scientists who served on the panel, Aldo Starker Leopold, Ira Noel Gabrielson, Thomas Kimball, and Clarence Cottam, were well-known and respected in wildlife management circles as well as the land management agencies. The recommendations of the panel, released March 4, 1963, which became known as the "Leopold Report," unequivocally stated that the control of elk populations was necessary, and direct reduction was a proper method of accomplishing this.<sup>32</sup> Removal programs at several national parks had not been large



enough, the report noted, and future removals would "have to be larger and in many cases repeated annually."<sup>33</sup> This panel of wildlife experts affirmed the notion of carrying capacity, the concept that an original balance had been disturbed by human action, and now only some sort of compensating action could restore the balance. The panel reaffirmed Yellowstone's decision on public hunting. The meaning of the Leopold Report was that virtually all wildlife experts in 1963 agreed with the assumptions of the 1930s--the one way to prevent the mass starvation of ungulates was to remove them from the range. Biologists blessed active management of the Yellowstone elk herd.

Although most writers see the Leopold report as a watershed in land management philosophy, its ideas were not entirely new.<sup>34</sup> The Leopold Report did not introduce the concept of national parks as samples of pre-Columbian America: forms of that idea had been percolating among park service managers for many years. Albright, for example, had written about the Parks as places where nature would be protected, to where the urban-bound could escape to view what they called a *primitive* America. Park Superintendent Lon Garrison noted in 1962, before the Leopold Report was released, that Yellowstone was a "natural museum" where wildlife management actions were only justified "when man-caused events threaten the delicate interspecific balance among animals and plants."<sup>35</sup> Park management from Albright to Garrison viewed Yellowstone primarily as a place that protected nature.

Today the Leopold Report is remembered not for its recommendation that direct reduction was necessary and proper, but rather for its clear elucidation of what the panel members thought about the purpose of the Parks. Parks, said the report, should represent a "vignette of primitive America."<sup>36</sup> This is precisely the point where the panel of biologists split away from the assumptions of state commissioners of fish and game. In September, 1962, the International Association of Game, Fish and Conservation Commissioners met at Jackson Lake Lodge just South of Yellowstone



Park. During their meeting, the President of the Colorado Conservation Council, Edward Hilliard, proposed public hunting in the National Parks. Carl Riggan of the Wyoming Fish and Game commission advocated that all the wildlife in the Parks be placed under state control. Dane Conger of the South Dakota Game Fish and Parks Commission blamed the National Park Service for creating the problems, then shirking their responsibilities.<sup>37</sup> The Leopold Report also differed with the state wildlife agencies, rejecting their suggestions for public hunting in the Park.<sup>38</sup> The Report noted that the particular interests of the states did not necessarily coincide with national park values. Since 1962, the Wyoming Game and Fish Commission had agreed to take excess elk from Yellowstone. In 1966 Wyoming State Game Warden Earl M. Thomas wrote that Wyoming accepted large numbers of elk simply to keep them from being slaughtered, and that action "should not be construed as meaning that we either need or even want them." Indeed, the "fewer elk that we are asked to accept, the better we will like it."<sup>39</sup>

Clearly, the Wyoming State Game Commission was at odds with the managers of Yellowstone. On April 3 and 4, 1962, Yellowstone conducted a helicopter census of the northern herd, inviting several interested parties to participate. The Wyoming Commission balked when they were not guaranteed space for an observer on every flight (which was impossible due to the number of outside observers) and threatened to withdraw entirely. F. Howard Brady, Isaak Walton League executive board member, was present at the census and opined that the Wyoming Game and Fish Commission had been "unprofessional . . . in this particular problem this past winter." Brady thought that "the present Fish and Game Commissioner from Wyoming does not have full control over his field men, and as a result, a lot of non-professional statements and charges are being made that will do Wyoming no good."<sup>40</sup> This tension between officials of Wyoming and Yellowstone Park continued through 1967, when controversy again arose about direct reduction. The practical management strategies

of the states and Yellowstone differed because their notions of the National Parks' role and purpose diverged quite completely. The commissioners thought of the Parks as properly accessible for hunting, as places for the enjoyment of the people. The biologists on the advisory panel and the park managers understood Yellowstone as a manageable symbol and preserve of nature.

Following the controversy of 1962, Yellowstone managers did their best to mend fences and explain the necessity of reduction. On April 16, Yellowstone conducted a "show-me" trip, hosting twenty four members of rod and gun clubs, representatives of the Wyoming Wildlife Federation, the press, the Range Management Department of Montana State College, Montana Fish and Game Department, and the U.S. Forest Service. Examining the grass, sagebrush, and rabbit brush on coalmine flats south of Gardiner, in the vicinity of Eagle Creek and in the Lamar River drainage, most of the delegation became convinced that the Park's reduction policy was necessary. Earl R. Nott, of the Montana Wildlife Federation, complimented Park Service personnel in their "handling of the problem in the face of extreme opposition by mis-informed but well-meaning individuals and groups."<sup>41</sup> Robert C. Sykes, President of the Montana Wildlife Federation, urged the public to accept the decisions of professional fish and wildlife managers. Although he was the beneficiary of indoor plumbing, wrote Sykes, he was by no means a plumber. Too many sportsmen thought that by virtue of their hunting skill, they also were expert in wildlife management. "One of our greatest needs today is an expansion of our biological phase of big game management and more plumbers and less plungers."<sup>42</sup> Thus in 1963 wildlife biologists, range experts, and hunters all agreed that the range was in poor shape, elk caused that condition, and reducing the herd as absolutely necessary.

Yellowstone Park Management Biologist Robert Howe hoped that the Leopold report would "make our management more acceptable" because it represented the opinions of widely respected wildlife managers. By 1964 Howe felt that the general

public had come to understand and accept Yellowstone's wildlife management practices. Not all the public understood, however. In February, 1964 the Gallatin Canyon Elk Protective Association filed suit against Yellowstone Superintendent Lemuel Garrison and Chief Park Biologist Robert Howe, seeking an injunction against herd reduction by any means. The Gallatin Elk Protective Association was the creation of several outfitters and sportsmen who were convinced that the range in the Gallatin Canyon just northeast of the Park could support more, not fewer, elk.<sup>43</sup> The suit was quickly thrown out of the United States District Court in Butte, Montana, which ruled that it did not have jurisdiction, yet the case demonstrated that not all sportsmen understood the problem as scientists and game managers did.<sup>44</sup>

Public protest largely died down from 1962 until the winter of 1966, because the Park did not employ direct reduction. Once again, however, during the winter of 1966-67 Yellowstone managers carried out a large-scale culling of the herd. With no advance warning, news of the immanent direct reduction seemed to take the public by surprise and anger both sportsmen and state game commissioners. Public objections were strong enough to initiate a second round of Congressional hearings on the issue.<sup>45</sup> On March 11, 1967, Senator Gale W. McGee of Wyoming convened Senate hearings on the Yellowstone reductions in Casper, Wyoming. At the start of the meeting, Senator McGee announced that as "a direct result of a conference that I just had with the Secretary of Interior, Mr. Udall, and director of the Park Service, Mr. Hartzog, as of today the direct kill of elk in the park is stopped."<sup>46</sup> Political pressure, not the arguments at the hearings, nor a scientific rationale, persuaded the Park Service to halt the reduction. Rangers reducing the elk herd on a production line basis was a method the public would not abide.

The protests of a hunting public halted the direct reduction of elk in Yellowstone. Wyoming game commissioners, the governor, and the hunting public simply would not permit their game be slaughtered like Wyoming's cattle, even if the meat went to Indian reservations where people made good use of it. The game, they thought, should be trapped and moved to areas where sportsmen could have a chance at it. If the Park couldn't trap enough elk, George Stanich, president of the Skyline Sportsmen of Butte, Montana, offered to come to the Park and "show them how its done."<sup>47</sup> Ranchers reluctant to share substantial portions of their crops with the elk in Montana's Big Horn range called upon the Skyline Sportsmen, who baited portable traps with hay and moved the elk to nearby State land. If trapping wouldn't work, then the public should be allowed to hunt in Yellowstone: groups such as the Izaak Walton League supported public hunting in Yellowstone.

Although representatives from several sportsmen's clubs spoke in favor of public hunting in Yellowstone, support for the Park's ban on hunting came from a somewhat surprising source. Nedward Frost of Cody Wyoming stood in front of Senator McGee and declared that the Wyoming Outfitter's Association was "unalterably opposed to any public hunting in Yellowstone National Park."<sup>48</sup> Outfitters make a living by equipping and escorting hunters in their pursuit of game and might be expected to welcome any sort of hunt. Frost, however, eloquently argued that the National Parks represented "the esthetic principle," and that the Parks "must be kept inviolate."<sup>49</sup> He went on to suggest that direct reduction should continue at all seasons of the year and in all parts of the park; although he did not say so, such management would yield the happy result of pushing the elk out of the park into the national forests where the outfitters pursued their trade.

Yellowstone Research Biologist William J. Barmore felt that the cause of the protest against direct reduction was "widespread public misunderstanding" of the Park's management program.<sup>50</sup> That was absolutely true. What urban people expected of

national parks had not changed since the days of Horace Albright: they expected that wildlife would find protection within the borders of the national parks. On the other hand, most hunters resented the "slaughter" of elk inside the Park's border, preferring the individualistic and sporting hunt outside Yellowstone's border. Indeed, the public did not understand the rationale of Park Service managers and biologists.

Additionally, some people felt that the Park Service had not wished to communicate with the public, that a federal bureaucracy was acting in a high-handed fashion. At the Senate hearings, the outdoor editor of the Casper Star-Tribune, Chuck Morrison, exclaimed "I have been your friend for many years, but if you people do not remove some of your empire building, political-oriented personnel and clean house from top to bottom, you will lose my friendship and my respect for what was, at one time, a fine service."<sup>51</sup> The efforts of wildlife biologists to educate the public about the need to reduce herds had in the end failed to overcome urban attitudes about protecting nature in the parks, as well as sportsmens' conceptions of a proper hunt.

Scientists have long interacted with managers of the national parks, and at times exerted considerable influence on park management. Historian Alfred Runte examined Joseph Grinnell's role during the 1910s and 1920s in establishing a "science of sanctuary" in Yosemite National Park.<sup>52</sup> Runte argues that Grinnell and other scientists from the 1920s into the 1930s advocated that Yosemite become an "open-air classroom, a sanctuary where every native resource . . . would be protected and studied in its natural environment. Up against that ideal were the traditional park values of increased access, development, and economic self-interest."<sup>53</sup> National Park Service management from the 1930s through the 1950s was "characterized by intermittent periods of ecological awareness followed by a return to traditional policies openly favorable to development."<sup>54</sup> Although this model may work for Yosemite, in Yellowstone National Park the debates over wildlife management can not

be characterized as a confrontation between two ideal poles of scientists' protection and a management ultimately biased toward development. The Yellowstone case demonstrates that management decisions resulted from a complex interaction between scientists, management imperatives and needs, and political pressure from outside the park as animal lovers and animal hunters expressed their conceptions of Yellowstone.

During the two periods of controversy over the northern Yellowstone elk during the 1960s, scientists and managers in the Park Service became increasingly aware that scientific data was needed to help inform management. Ecological studies promised to render scientific understanding which could inform wildlife management policy. In 1961 Lowell Sumner, the Principal Biologist of the NPS, noted that a constrained research budget limited the NPS to "emergency studies designed to counterbalance . . . gross disturbances."<sup>55</sup> Sumner pointed to the NPS desire to get beyond problem-oriented research to basic ecological research which would give a data base to inform proper management. The annual budget for 1961 was only \$28,000, however, and given the 61 major locations in the National Park System, budget limitations hampered significant ecological research.<sup>56</sup>

George Sprugel, Chief Scientist for the NPS, predictably used the 1963 Leopold Report to argue for the importance of more research in the Parks. Sprugel invoked an historical theme as he argued for recreating the vignette of primitive America. If the Park Service was to respond to its legislative mandate, "every reasonable effort must be made to reestablish and/or maintain the natural conditions as they obtained when the national parks and monuments were authorized."<sup>57</sup> Conservation groups such as National Parks for the Future called for more research in National Parks, reflecting a growing public understanding that knowledge of ecology and ecosystems would require more scientific research.<sup>58</sup>

In 1963, the National Academy of Sciences formed an advisory group which submitted a report on research in the National Parks that frankly criticized the NPS

research program. Research in the national parks was "marked by expediency rather than by long-term considerations."<sup>59</sup> The "Robbins Report" (named for William J. Robbins, chairman of the committee) suggested that park research should be mission-oriented to focus on park problems, and that research should be long-term in nature so that it might warn of impending problems. The study did not, however, emphasize the notion of basic research in the parks, something the scientists within the NPS thought valuable.<sup>60</sup> The idea of mission-oriented research was not new in scientific thinking nor was it new to the National Park Service. Albright recognized the need for more information to delineate and describe the deterioration of the range that Rush had perceived in 1927.

The NPS incorporated the Leopold and Robbins reports into its management style and into its scientific investigations.<sup>61</sup> In 1968 Robert D. Barbee, later Superintendent of Yellowstone, examined ecological management in the national parks. Barbee noted the dilemma of the Park Service's mission: to protect park resources, yet provide for visitor access. The Park Service must manage with the end goal of "naturalness," yet the very presence of people compromised the goal. "It is the 'compromise' that the Service is most concerned with minimizing," wrote Barbee. Indeed, the Service still faced the familiar dilemma of preservation versus development, but in the 1960s critics shifted from pleas to save the scenic towards arguments oriented around ecological conceptualizations of the landscape.<sup>62</sup> Barbee emphasized that the mission of the national parks had not changed in any significant sense, yet rather than protect individual species, parks would emphasize concepts of ecological management. Barbee noted that the Leopold Report recommended that the Park Service should not abandon active management, but manage so that "operative factors of the environment" became "the primary controlling factors."<sup>63</sup> Thus Park Service management rationales changed as scientific conceptions altered: shifts in management policy were "directly related to the growing sophistication of the technology ('science') of ecological land



management."<sup>64</sup> Barbee was partly correct. Ecology did have a great influence on Yellowstone's management practices and rationales for its actions, yet people's conceptions of what they expected from Yellowstone also had an important effect on how Yellowstone would manipulate nature. In the end, the public decided that nature could be manipulated outside of Park boundaries, but it was not the place of the Park Service to kill elk, science or management plan notwithstanding.

Critic Alston Chase has argued that Park managers adopted a bankrupt philosophy of natural regulation in the late 1960s and, furthermore, suggested that Yellowstone used bad science to cover the mistakes of management. The ecosystem concept in this account "was just a fictitious axiom," the scientific hypothesis of natural regulation "an attempt to make a scientific virtue out of a political necessity," and the philosophy of allowing nature to take the lead role in Yellowstone "a rationale for doing nothing."<sup>65</sup> A careful examination of Park history reveals a more complex story of how scientists operated within the larger context of management imperatives created in part by public and agency perceptions of Yellowstone. After the halt of direct reduction, Park ecological research maintained established traditions of focusing on problem-oriented research, and in attempting to answer managers' dilemmas developed a concept simmering on science's back burner--the idea of natural regulation.

When the elk reduction program halted in 1967, McLaughlin and Barmore considered their options. The public understood overpopulation and the visible signs of starving elk, so removal could still be carried out by trapping and transplanting, or by hunting over on the Montana side of the border. The previous practical limitations regarding hunting outside boundaries, trapping, and relocating elk still existed, however. After the Casper hearings, the National Park Service changed its methods, but held on to its policy.



The National Park Service transferred Jack K. Anderson, Superintendent of Grand Teton National Park, to occupy the hot seat at Yellowstone. At about the same time, Glen F. Cole, the NPS Midwest Region Field Research Biologist who had studied the elk of Grand Teton, was also transferred to Yellowstone as Supervisory Biologist. Cole used the notion of problem-oriented research to give Park science direction toward addressing the Park's unique situation. Problem oriented research was nothing new in Yellowstone; Director Horace Albright had urged such practical research back in 1914, but only enough for the immediate purpose at hand. Beginning with problem-oriented research in the late 1960s and early 1970s, science in Yellowstone adopted a greater emphasis on ecological research, both on ungulates and on range resources.

From 1962 through 1967, Cole researched elk ecology in Grand Teton National Park, located just south of Yellowstone, sharing borders as well as the southern elk herd. Grand Teton was the exception to the rule in the National Park system: it allowed public hunting. Cole's management recommendations in 1965 suggested adjustments in the season so a quota could be set on a 48 hour notice. His goal was to remove 200-300 more elk than were produced in the calf crop. In these recommendations, Cole echoed the conventional wisdom of range and wildlife managers. Ultimately, Cole had it in mind to restore "historical elk distributions and migrations."<sup>66</sup> This emphasis on restoring the primitive echoed The *Fauna* reports issued by the Wildlife Division in the early 1930s, the Leopold Report, and the Park Service mandate to preserve natural resources. Cole thought that restoring historical patterns of migration and distribution would "eventually reduce the need for large yearly elk kills on Park lands."<sup>67</sup>

In October, 1967, Cole saw a possible solution to the Park's problem. Cole examined the history of elk harvests and controls both in and out of the Park, and pointed out that from 1934 to 1955, hunters in Montana had effected 84 percent of elk removals, about 1,700 per year. The only problem with those hunting yields was

that "consistent boundary line hunting" forced the elk to remain inside the Park, where they exerted a heavy grazing pressure on the northern range.<sup>68</sup> Local residents called the Park boundary just south of Gardiner, Montana, the "firing line" because on hunting season's opening day, hunters simply lined up and waited for elk to cross the boundary. For years forest rangers noted the crowded atmosphere, arguments over who killed which elk, and the unsafe conditions as hunters advanced beyond the firing line to claim their kill by tagging the game with a hunting permit. Here was an essential key for Cole: hunting pressure held the elk within the Park and away from their native winter feeding grounds, with the sad result of range depletion within the Park.

Cole reasoned that the number of elk were out of control after 1955 because "the development of political pressures" prevented proper coordination between State game agencies and the NPS, and that for effective control of elk numbers trapping and transplanting was simply unrealistic. Cole thought that Montana Fish and Game was now willing to be more flexible in setting the dates of their hunt, with the important result that elk would not remain in the Park out of range of the hunters' rifles. Cole's central scheme was the "restoration of control by hunting outside boundaries."<sup>69</sup> Cole recommended to the superintendent a plan cooperatively developed with state agencies, similar to the program he had developed in Grand Teton. Herd size might vary between 4,000 to 6,000 animals during three year periods. Communication and therefore cooperation would be enhanced by a new agreement between the state wildlife agencies, the state governors, and the Secretary of the Interior.<sup>70</sup>

Yellowstone continued to remove elk in the winter of 1967-68, reducing the herd by about 1,100 elk by means of hunting outside the boundary, biological collection, and live trapping for shipment. After about 800 elk had been removed, or the equivalent of the year's calf production, Cole recommended that the removal be halted, rather than continuing to bring the herd down to 4,100. Cole felt that shipping

the elk to Wyoming could become a political issue in Montana, and in "deference to Montana already participating in meetings" to work out management agreements with the National Park Service, the trapping should halt. The herd was at a sufficiently low level, and because Montana Fish and Game now seemed willing to institute a new type of hunting system, Cole thought the Park had "a new ball game."<sup>71</sup>

Officials of the Montana Department of Fish and Game, Yellowstone National Park, and the Wyoming Game and Fish Commission met at Mammoth Hot Springs on September 27, 1968. Superintendent Anderson clearly stated that direct reduction was still an option for Park policy which was fully supported by the Director of the Park Service and the Secretary of the Interior.<sup>72</sup> Nevertheless, Yellowstone discontinued reduction of elk numbers, ending its program of trapping and live shipment, initiating what Resource Management Specialist Edmund J. Bucknall called the "total ecosystem approach to management of wildlife."<sup>73</sup> The management program for the northern Yellowstone herd was to allow natural "controls" and migratory patterns to develop as much as possible, and to "permit population adjustment by predation, reduced reproduction, natural winter loss, and outside hunting." Management would consider "artificial controls" only when "range damage is imminent," or when other species were harmed.<sup>74</sup>

Yellowstone signed a new memorandum of understanding with the Montana Department of Fish and Game and the U.S. Forest Service, which provided for modifications in the hunt which they believed would allow "unrestricted elk movements outside Yellowstone before hunting begins."<sup>75</sup> The key to the new agreement was the "variable quota hunt system," whereby yearly targets for the Montana hunt could vary from zero up to 2,500 elk. The size of the herd would not be reduced every year, but when harsh winters forced the elk to seek winter range at lower elevations outside of the Park, the number of elk permits and hopefully hunter success would increase. During mild winters when more food was available to the elk

at higher elevations within the Park, fewer animals would be taken with the intent of keeping the herd habituated to its migratory path.<sup>76</sup> In this cooperation with Montana's state game agency, Yellowstone did not completely abandon active wildlife management, but during the years after the 1967 controversy continued attempts to cull the herd using hunter kill.

Although the Park enjoyed a reprieve from the public furor, now scientists questioned management technique. John Craighead, of the Montana Cooperative Wildlife Research Unit in Missoula, Montana, wrote to Superintendent Jack Anderson, reminding him of past support of the scientific community during the 1962 debate over Park reductions. Craighead noted that the annual increase of elk had not been removed by any method, and he asked "on what biological basis the present management is founded."<sup>77</sup> Craighead suggested that there was no scientific evidence which demonstrated any need for a change in policy. Park Biologist Barmore warned Cole that people would expect a scientific rationale for the new management which relied on natural control mechanisms.<sup>78</sup> So far, the Park had little ecological baseline data to support its new policy. Barmore was reluctant to embrace the idea of a naturally regulated population, and found himself "crosswise" with Cole, in disagreement on several issues.<sup>79</sup>

Cole's reply, drafted for the Superintendent, was brief and to the point. For Cole, the Senate hearings in Casper showed that the NPS "was very much alone in its attempts to manage the Northern Yellowstone elk."<sup>80</sup> There was a very clear danger that the proponents of public hunting in the park might prevail. But it was not only the purpose of the Park and the issue of hunting in Yellowstone that drew Cole's attention. Cole suggested that the interpretations scientists found amenable for the management of wildlife in the National Forests were not necessarily appropriate for the management of natural areas in the National Parks.

As Cole hiked among the bluebunch wheatgrass, and the Idaho fescue grass which covered the knolls rising above the Lamar River, and as he spent hours viewing the movements of elk through binocular and spotting scope, Cole asked himself what forces affected the population of the elk herds. His study of the elk herd which browsed in the central part of Yellowstone led Cole to believe that given an entire, complete habitat, elk numbers would maintain a general equilibrium, or be "naturally regulated" by factors such as food availability and disease.<sup>81</sup> To many Montana and Wyoming ranchers, and to many urbanites, this sounded suspiciously like starvation.

Cole set forth his ideas in two documents: "Elk and the Yellowstone Ecosystem" (February 1969) and "Mission-oriented Research in Natural Areas of the National Park Service" (May 1969). Using his own prior work and that of ecologist Graham Caughley, Cole suggested that given an opportunity to wander over an ecologically whole habitat, an elk herd's numbers would be naturally regulated without the benefit of human interference.<sup>82</sup> Cole's hypothesis of natural regulation included a novel emphasis on nutritional factors while downplaying the importance of predators.<sup>83</sup> Cole also pointed out that "reserving natural relationships between an interacting biota and its environment . . . requires a directly opposite approach from that of the applied field of wildlife management."<sup>84</sup> Here Cole declared independence from the conventional wisdom on wildlife management on the public domain. Managing a natural area had different objectives, the greatest being that natural area management did not call for the sustained yield of wild animals for hunting. Different purposes would require different management, which would in turn require different scientific questions and research to inform management.

From 1970 to 1979, the research of Yellowstone biologists led to new interpretations that questioned the basic assumptions underlying the policy of direct herd reduction. Research Biologist Douglas Houston, who came to Yellowstone in 1968,

combed management records, reviewed the food habits of elk, and employed comparative photography in questioning the old assumptions.<sup>85</sup>

The traditional view assumed that elk had not historically wintered in the Park and that changes in the plant communities reflected intense grazing pressure. Perhaps, suggested Cole and Houston, some elk had always wintered in the Lamar River Valley. Houston suggested that the northern range in the Yellowstone and Lamar River Valleys constituted a complete year-round habitat for the herd. Population estimates from the first sixty years of the Park were suspect, he suggested, and photographs revealed that the range had not deteriorated but looked very much the same as it had in the 1880s.<sup>86</sup>

Traditional conceptions of range science also claimed that too many ungulates could damage the range. Biologist William Barmore had studied the aspen stands in Yellowstone using exclosures, or fenced-in areas, to examine the impact of ungulates on aspen communities. Barmore concluded that although some browsing pressure stimulated aspen production, on the northern range elk were browsing on aspen too much and therefore reducing the extent and number of aspen. Processes of plant succession, said Cole, must be considered when scientists interpreted relationships between elk and vegetation. Grazing pressure could hasten the replacement of a seral stage of vegetation, if environmental changes also affected the range at the same time.<sup>87</sup> In other words, changes in plant communities might be caused by climate, as well as by grazing pressure.

In 1972 Resources Management Specialist Edmund Bucknall pointed to the "continued insistence . . . that evaluation of range conditions be based on the economics of domestic livestock production."<sup>88</sup> Peoples' expectations of a healthy range might not be the same as the range nature created. Here was an important key to understanding shifting perceptions of the northern range. Shifting public conceptions of wilderness and scientific conceptions of ecosystems both encouraged

mangers to look at the northern range in new ways. The controversies over elk reduction, a new emphasis on manipulating nature to present an image of the wild encouraged by the Leopold Report, the provisional halt in direct reductions and a new scientific hypothesis met at a moment which encouraged Park biologists to question traditional assumptions of range management.

Science in Yellowstone National Park did not seek to justify policy, but continued the problem oriented research it began under Horace Albright.<sup>89</sup> After 1969, Park science clearly moved away from the assumptions of range science toward hypotheses on factors limiting ungulates and toward long term ecological monitoring which did not justify management, but sought answers to the questions raised by management policies brought about through political pressure. Ultimately, science could only inform management technique within the context of Park wildlife management policies which were created in response to images Americans held of their National Parks.



# Endnotes

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- <sup>1</sup>Haines, 64, 482.
- <sup>2</sup>Bartlett, 336-37.
- <sup>3</sup>Bartlett, 336-37; Aubrey L. Haines, *The Yellowstone Story: A History of Our First National Park* Vol. II. (Yellowstone National Park: Yellowstone Library and Museum Association, 1977), 459.
- <sup>4</sup>William T. Hornaday, "The Wyoming Legislature at the Bar of Public Opinion," broadside, February 23, 1917; File "Elk File Winter 1917-20" Box N-23, Yellowstone National Park Archives, Mammoth Hot Springs, Wyoming, hereafter cited as YNP Archives.
- <sup>5</sup>Letter Horace M. Albright to Charles C. Adams, December 6, 1919; File "Elk File Winter 1917-20" Box N-23, YNP Archives.
- <sup>6</sup>Yellowstone National Park, Annual Superintendent's Report, 1920, YNP Archives.
- <sup>7</sup>Forage utilization habits of elk can be gleaned from YNP Annual Wildlife Reports, especially 1967-68, and from scientific studies such as Glen F. Cole, "The Elk of Grand Teton and Southern Yellowstone National Parks." Yellowstone National Park: National Park Service, 1969, 1978.
- <sup>8</sup>Yellowstone National Park, "Wildlife Management Background Information," December 4, 1964, file "Elk Management Program 1967," Box N70, YNP Archives.
- <sup>9</sup>W.M. Rush. Report of April 8, 1927, file "Reports-Yellowstone," Box N-23, YNP Archives.
- <sup>10</sup>W. Leslie Pengelly, "Thunder on the Yellowstone," *Naturalist* 14 (1963): 18-25, especially 22.
- <sup>11</sup>C. John Burk, "The Kaibab Deer Incident: A Long-Persisting Myth," *Bioscience* 23 (February 1973).
- <sup>12</sup>Donald Worster, *Nature's Economy: A History of Ecological Ideas* (1977; reprint, Cambridge: Cambridge University Press, 1985), 258-290; Thomas Dunlap, "Values for Varmits: Predator Control and Environmental Ideas, 1920-1939," *Pacific Hist. Review*, 53 (1984): 141-161; Thomas Dunlap, *Saving America's Wildlife* (Princeton: Princeton University Press, 1988), 48-61.
- <sup>13</sup>Thomas Dunlap, "That Kaibab Myth," *Journal of Forest History*, 32 (1988): 60-68.
- <sup>14</sup>Richard West Sellars, "The Rise and Decline of Ecological Attitudes in National Park Management, 1929-1940; Part II: Natural Resource Management Under Directors Albright and Cammerer," *The George Wright Forum*, 10 (1993): 79-109; quotations on 86-87.
- <sup>15</sup>Roger W. Toll, Superintendent's Report, 1934.
- <sup>16</sup>See elk reduction files, Boxes N-64, N-65, N-66, N67, N-70, Natural Science Records, YNP Archives.
- <sup>17</sup>See elk reduction files, Boxes N-64, N-65, N-66, N67, N-70, Natural Science Records, YNP Archives.
- <sup>18</sup>Yellowstone National Park, "A Cooperative Management Plan for the Northern Yellowstone Elk Herd and its Habitat," 1967, file "Elk Management Program 1967," Box N70, YNP Archives.
- <sup>19</sup>Letter Lon Garrison to John D. Hunter, March 6, 1980, file A-1, file "Lon Garrison," YNP Archives.
- <sup>20</sup>Alfred Runte, *National Parks: The American Experience*, 2nd ed. (Lincoln: University of Nebraska Press, 1987), 144.
- <sup>21</sup>Ted Trueblood, "Too Many Elk," *Field & Stream*, (July 1963): 36-39+.
- <sup>22</sup>Yellowstone National Park, "Record of Elk Reductions," file "Elk Management Program 1967," Box N-70, YNP Archives; Scott Edward Hanley, "Wildlife Management in Yellowstone National Park, 1962-1976," M.A. Thesis, University of Wyoming, 1992, 10-22.
- <sup>23</sup>"Group Wants Hunting," *Billings Gazette*, Dec. 10, 1961. "Nutter Seeks Public Hunting," *Billings Gazette*, Dec. 9, 1961; Hanley, op. cit.



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- <sup>24</sup>"Elk Slaughter Protests Rage On," *The Billings Gazette* Dec. 6, 1961, p.18.
- <sup>25</sup>U.S. Congress, Committee on Interior and Insular Affairs, "Elk Reduction Program in Yellowstone National Park," Bozeman, Montana, December 18, 1962, YNP Library.
- <sup>26</sup>Letter Lon Garrison to John D. Hunter, March 6, 1980, file A-1, file "Lon Garrison," YNP Archives.
- <sup>27</sup>Hanley, 20; See also W. Leslie Pengelly, "Thunder on the Yellowstone," *Naturalist* 14 (1963): 18-25.
- <sup>28</sup>Arthur H. Carhart, "Shall We Hunt in the National Parks?" *Sports Afield*, Dec. 1961, 36-37, 100-102.
- <sup>29</sup>Memo Elt Davis to Regional Director, December 27, 1960, Box N-64, YNP Archives.
- <sup>30</sup>R. Gerald Wright, *Wildlife Research and Management in the National Parks* (Urbana: University of Chicago Press, 1992), 25.
- <sup>31</sup>Wright, 26; Hanley, 22, 28.
- <sup>32</sup>Leopold, A. S., S.A. Cain, C.M. Cottam, I.N. Gabrielson, and T.L. Kimball. "Wildlife Management in the National Parks," Washington, D.C.: Advisory Board on Wildlife Management, 1963, 10; The Leopold Report was reprinted in several places including *Transactions of the North American Wildlife and Natural Resources Conference* 28(1963): 28-45.
- <sup>33</sup>Leopold, et al., 10.
- <sup>34</sup>Chase, 31-35, 240-41, ; Runte, *National Parks*, 197-208.
- <sup>35</sup>Lemuel A. Garrison, Foreward to "Meeting At Canyon Village," May 25, 1962, file "Northern Yellowstone Elk Herd 1962," Box N-78, YNP Archives.
- <sup>36</sup>Leopold, et al., passim.
- <sup>37</sup>Hanley, 27.
- <sup>38</sup>Hanley, 30-31.
- <sup>39</sup>Letter Earl M. Thomas to Fred Hafner, January 25, 1966, file "Management Plans, Wildlife and Range," Box n75, YNP Archives.
- <sup>40</sup>F. Howard Brady to Alden J. Erskine, April 26, 1962, file "overall Animal Census and Inventory 1957-1962," Box N-9, YNP Archives.
- <sup>41</sup>Earl R. Nott, "Report of Show-me Trip," file "Wildlife Management (general) 1957-1962," Box N-9, YNP Archives.
- <sup>42</sup>Robert C. Sykes, "Plumbers Vs. Plungers," file "overall Animal Census and Inventory 1957-1962," Box N-9, YNP Archives.
- <sup>43</sup>Allan Lovaas. "People and the Gallatin Elk Herd." Helena, Montana: Montana Fish and Game Department, 1970.
- <sup>44</sup>See file "Laws & Legal Matters 1964," Box N 77, YNP Archives.
- <sup>45</sup>Newspaper articles on the 1967 reduction can be found in file "1967 Elk Reduction, YNP/Newspaper Articles," Box N70, YNP Archives.
- <sup>46</sup>U.S. Senate Committee on Appropriations, "Control of Elk Population, Yellowstone National Park," Casper, Wyoming, March 11, 1967, [Hereafter cited as Casper hearings], 1.
- <sup>47</sup>Casper hearings, 77.
- <sup>48</sup>Casper hearings, 70.
- <sup>49</sup>Casper hearings, 71.
- <sup>50</sup>Robert Howe, 1963 Annual Wildlife Report; William J. Barmore, 1967 Annual Wildlife Report; File N26 "Annual Wildlife Report 1962-1978," Box N75, YNP Archives.
- <sup>51</sup>Casper hearings, 69.
- <sup>52</sup>Alfred Runte, *Yosemite: The Embattled Wilderness* (Lincoln: University of Nebraska Press, 1990), 135.

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- <sup>53</sup>Runte, 135.
- <sup>54</sup>Runte, 174.
- <sup>55</sup>Lowell Sumner, "Ecological Research in the National Parks of the United States," file NPS/Other Parks, Vertical Files, YNP Archives.
- <sup>56</sup>Ibid; Chase, 241-242.
- <sup>57</sup>George Sprugel, Howard Stagner and Robert M Linn, "National Parks as Natural Science Research Areas," *Trends in Parks & Recreation*, 1 (1964).
- <sup>58</sup>Ronald A. Foresta, *America's National Parks and Their Keepers*, (Washington, D.C.: Resources for the Future, 1984), 98.
- <sup>59</sup>Wright, 26.
- <sup>60</sup>Wright, 26-27, 32.
- <sup>61</sup>Wright, 42.
- <sup>62</sup>F. Fraser Darling and Noel D. Eichhorn. *Man and Nature in the National Parks*. Washington: The Conservation Foundation, 1967; Noel D. Eichhorn, "The Special Role of National Parks," in *Future Environments of North America*, ed. F. Fraser Darling and John P. Milton (Garden City, N.Y.: Natural History Press, 1966), 335-341; Robert Cahn, "Will Success Spoil the National Parks?" *Christian Science Monitor* 1968, Vertical Files, YNP Archives. Many writers have addressed the dilemma of use and preservation; see William C. Everhart, *The National Park Service* (New York: Praeger, 1972), 80-98.
- <sup>63</sup>Robert D. Barbee, "A Discussion of Ecological Management in the National Park System," Master's Thesis, Colorado State University, August 1968, 35.
- <sup>64</sup>Barbee, 51.
- <sup>65</sup>Chase, 319, 47, 373.
- <sup>66</sup>Cole, Glen F. "Elk Ecology and Management Investigations<" NPS Report, March 1965, 53; Vertical Files, YNP Archives.
- <sup>67</sup>Ibid, 53.
- <sup>68</sup>Ibid.
- <sup>69</sup>Memo Cole to YNP Superintendent, October 11, 1967, file "Management Plans, Wildlife & Range," Box N75, YNP Archives.
- <sup>70</sup>Ibid.
- <sup>71</sup>Memo Cole to YNP Superintendent, January 29, 1968, file "Management Plans, Wildlife & Range," Box N75; YNP Annual Wildlife Report, 1967-68, file "Annual Wildlife Reports 1962-1978," Box N75, YNP Archives.
- <sup>72</sup>Minutes of Northern Yellowstone Elk Herd Management Meeting, Mammoth, Yellowstone National Park, September 27, 1968, file "1966-72/Elk" Box N69, YNP Archives.
- <sup>73</sup>YNP Annual Wildlife Report, 1968-69, file "Annual Wildlife Reports 1962-1978," Box N75, YNP Archives.
- <sup>74</sup>YNP Annual Wildlife Report, 1968-69, file "Annual Wildlife Reports 1962-1978," Box N75, YNP Archives.
- <sup>75</sup>Glen F. Cole, "Elk and the Yellowstone Ecosystem," Office of Natural Science Studies, NPS, February 1969, Vertical Files, YNP Archives.
- <sup>76</sup>Memo Cole to YNP Superintendent, January 29, 1968, file "Management Plans, Wildlife & Range," Box N75, YNP Archives.
- <sup>77</sup>Craighead to Superintendent Anderson, June 25, 1969, file "1966-72/Elk" Box N69, YNP Archives.
- <sup>78</sup>Memo Barmore to Cole, March 13, 1968; Chase, 52.
- <sup>79</sup>Interview with William J. Barmore, July 28, 1992.
- <sup>80</sup>Anderson to Craighead, July 2, 1969, file "1966-72/Elk" Box N69, YNP Archives.

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- <sup>81</sup>Glen F. Cole, "The Elk of Grand Teton and Southern Yellowstone National Parks." Research Report GRTE-N-1, 1969. Reissue by Office of Natural Science Studies, National Park Service, 1978. Vertical Files, YNP Archives. See also "An Ecological Rationale for the Natural or Artificial Regulation of Native Ungulates in Parks." *Transactions of the North American Wildlife and Natural Resources Conference* 36 (1971): 417-25.
- <sup>82</sup>See G. Caughley, "Eruption of Ungulate Populations with Emphasis on Himalayan Thar in New Zealand," *Ecology*, 51: 53-71.
- <sup>83</sup>Glen F. Cole, "Elk and the Yellowstone Ecosystem," Yellowstone National Park: National Park Service, 1969; "Mission-Oriented Research in Natural Areas of The National Park Service," May, 1969, Wildlife/Briefing Book, Yellowstone National Park Library.
- <sup>84</sup>Glen F. Cole, "Mission-Oriented Research in Natural Areas of The National Park Service," May, 1969, Wildlife/Briefing Book, Yellowstone National Park Library.
- <sup>85</sup>Douglas B. Houston, *The Northern Yellowstone Elk: Ecology and Management* (New York: Macmillan, 1982).
- <sup>86</sup>Houston, op. cit.
- <sup>87</sup>See Glen F. Cole, "Elk and the Yellowstone Ecosystem," Yellowstone National Park: National Park Service, 1969; "Mission-Oriented Research in Natural Areas of The National Park Service," May, 1969, Wildlife/Briefing Book, Yellowstone National Park Library.
- <sup>88</sup>YNP Annual Wildlife Report, 1971-72, file "Annual Wildlife Reports 1962-1978," Box N75, YNP Archives.
- <sup>89</sup>For a critique of the natural regulation paradigm, see Charles Edward Kay, "Yellowstone's Northern Elk Herd: A Critical Evaluation of the 'Natural Regulation' Paradigm." Ph. D. Diss., Utah State U., 1990