Initiating Elk Restoration: The Kentucky Case Study

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Abstract: The return of elk to eastern Kentucky in 1997 followed an absence of more than 150 years. This restoration was made possible by combining the financial, human resource, and land assets of several public and private organizations, as well as landscape changes that appear to have created suitable elk habitat. The impetus for the return of elk was based in part on the anticipation that the new herd would be accessible to the public for hunting and viewing. Pre- and post-release outreach included assessing public opinion which was mostly supportive of elk restoration and interacting with agencies from neighboring states. Release protocols were built upon previous elk restoration efforts in the eastern U.S. where success rates were highly variable. Adaptive management practices have been followed to reduce mortality among transported elk. Overall mortality in 1998 was 42% but declined to 4% in 1999.

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The white-tailed deer *(Odocoileus virginianus)* is the only native large mammal that was not extirpated from Kentucky by 1850. Bison *(Bison bison)*, elk *(Cervus elaphus)*, black bear *(Ursus americanus)*, mountain lion *(Puma concolor)*, timber wolf *(Canis lupus)*, and red wolf *(Canis rufus)* succumbed to a combination of overharvest and habitat conversion that left the Commonwealth with fewer large mammals than other states in the southern Appalachians (Funkhouser 1925, Young 1946, Young and Goldman 1946, Barbour and Davis 1974). The loss of large mammals can have grave consequences on their native ecosystems (Terbough 1988, Owen-Smith 1988, Dinerstein 1992, Wikramanayake et al. 1998), so restoring them to historic ranges should be viewed as a conservation priority. Until winter 1997, restoration of large mammals in Kentucky had been restricted to augmentation of native deer populations.

Although the developing field of conservation biology clearly supports the restoration of biotic diversity through reintroductions (Bowels and Whelan 1994, Caughley and Gunn 1996, Meffe and Carroll 1997, Primack 1998), natural resource agencies and the public they serve are not unanimous on this subject (reading and Kellert 1993). The decision to return elk to eastern Kentucky was made after the consideration of biological as well as sociological factors, and included plans for intensive monitoring of translocated stock. Because previous efforts to return elk to eastern North America have been poorly documented and most have failed (Hunter et al. 1979, Witmer 1990), this case study of the most recent elk restoration is intended to serve as a baseline for adaptive management in Kentucky and as a starting point for other states that will consider their own elk restoration programs.

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Historical Perspective

From the Wisconsin glaciation until pre-colonial times, elk were widespread in North America (Peek 1982), and were often associated with the mixed hardwood/cane *(Arundinaria gigantia)* savannas of central Kentucky. Elk, in association with bison and white-tailed deer, were likely responsible for maintaining the patchy forests and grasslands of the prehistoric Bluegrass region (Wharton and Barbour 1991). However, elk were not restricted to open habitats (Peek 1982) and the distribution of modern place names suggests a statewide occurrence. While central Kentucky was well known as an important hunting ground for aboriginal Americans (Wharton and Barbour 1991), their harvest pressure was insufficient to diminish elk herds prior to European settlement. The fertility, gentle topography, and expanses of open land resulted in the denaturing of central Kentucky several decades before other nearby and often more eastward regions (Ulack et al. 1998). By the time Daniel Boone returned to Kentucky in 1810 after a 30-year absence, elk and bison had disappeared, and even white-tailed deer were scarce (Audubon 1926). Elk restoration would not become commonplace in its historic range for about a century (Peek 1982). Today, the elk is more widely distributed in parts of western North America than it was in 1800 (Peek 1982), and it exists in several introduced herds in the eastern United States that number from 35 to 1,400 (Witmer 1990).

Group-living ungulates have a higher likelihood of successful re-establishment than solitary carnivores (Griffith et al. 1989), especially where predators are absent (Gogan and Cochrane 1994). Indeed, re-established elk herds in Arkansas, Michigan, Pennsylvania (Beyer 1987, Thomas and Lyon 1987, Witmer 1990), and even a small herd in central Florida (Layne 1993, 1997) reflect the adaptability of the species. Today, North American elk numbers are at least an order of magnitude greater than their turn-of-the-century low of about 50,000 (Thomas and Lyon 1987), and even smaller populations exhibit tremendous biological potential for increase (McCullough et al.1996). Their meteoric increase is due in large part to the popularity of the species as a game animal and tourist attraction (Thomas and Lyon 1987). This profile gave elk a much higher conservation priority than other extirpated Kentucky species such as black bear or swallow-tailed kite *(Elanoides forficatus)*—species that were contemporaries of the eastern elk and that experienced similar patterns of eradication. Although wildlife such as these are deserving of comparable attention, they have been mostly excluded from restoration due to carnivorous tendencies or obscurity.

Biotic and Landscape Changes in Kentucky

The Kentucky landscape has experienced a considerable transformation during the last 3 centuries. Agriculture and urbanization have affected over 18,000 km^2 and 1,780 km^2, respectively, and strip mining for coal has affected much more than the 6,300 km^2 that have been mined in just the last two decades (Cole et al. 1997, Ulack et al. 1998). While these changes have generally had negative consequences on native flora and fauna, they have also resulted in conditions that appear suitable for elk. In eastern Kentucky, fragmented forests now exist within a matrix of grasslands and shrublands—products of state and federal surface mine reclamation laws. While forest cover is a critical element of elk habitat (Thomas and Lyon 1987), non-forested habitat and ecotones can be preferred on a seasonal or daily basis (Beyer and Haufler 1994, Johnson 1952, Picton 1960). Further, elk have been shown to exhibit considerable plasticity in their use of habitat (McCorquodale et al. 1988). Although it is unknown to what degree the modern plant life of eastern Kentucky will provide satisfactory nutrition for elk, the increasing areas of artificial grasslands have created a landscape that is structurally closer to the western range of the species than the forests of the pre-settlement southern Appalachians.

As the landscape of Kentucky changed with settlement, so did its biotic communities. In addition to the mammalian extinctions mentioned above, other species were also eliminated. The ivory-billed woodpecker *(Campephilus principalis)* and Carolina parakeet *(Conuropis carolinensis)* were distinctive cavity nesters that were once common in Kentucky's old growth hardwood forests. The Passenger pigeon *(Ectopistes migratorius)* likely provided keystone services such as nutrient deposition and as a primary prey species for many predators. These losses, when combined with the loss of the dominant forest canopy species, the American chestnut *(Castanea dentata),* left all of Kentucky's biotic communities in an impoverished state. These organisms and the services they provided will, in all likelihood, not be replaced. Thus, the return of the elk to Kentucky is not the simple challenge of putting them back.

For those native species and communities that remain in modern Kentucky, is there a risk associated with a re-established elk herd? Will elk foraging be additive to deer browsing? Will neotropical migrant birds and other ground nesters be impacted by elk activities? Do elk have the potential to disrupt patterns in terrestrial amphibian distribution and abundance? Will elk exacerbate edge effects that have been operative since the species disappeared in Kentucky nearly 2 centuries ago? And, can such an altered landscape still support elk?

Sociological Considerations

Endter-Wada et al. (1998) recognized the need to incorporate human social data into ecosystem management decision-making. While many managers consider humans as artificial influences on natural process (Noss and Cooperrider 1994), such views have a tendency to alienate people that are critical to the success of management efforts. Elk can create problems for farmers—a situation that led to the failure of an early restoration effort in Alabama (Allen 1965). In addition, elk can cause measurable damage to commercial forests (Lyon and Ward 1982) and other private property. Nonetheless, a general consensus has been achieved that suggests that with proper planning and management, conflicts between humans and elk in the southeast can be kept to an acceptable level (Phillips 1997). Further, the early involvement of local stakeholders in the planning and implementation stages should decrease the chances of a polarized public (Endter-Wada et al. 1998).

The pattern of human settlement in eastern Kentucky created a population that was considered by Caudhill (1962) to be fiercely independent and prone to exploitation. The result of this socioeconomic history is a relatively depressed region (Ulack 1998) that harbors a distrust for government programs. Couple this with the fact that greater than 90% of eastern Kentucky is privately-owned, and the challenges to elk restoration appear daunting.

Ironically, the very factors that Caudhill (1962) believed led to eastern Kentucky's current situation—coal mining and timber harvesting—have created new landscapes that appear suitable for elk. Today, the largest tracts of private land are those owned by coal mining interests. The results of their activities generally eliminate forests and replace them with topographically and botanically simpler grasslands—the kind of open habitat that appears to be necessary for successful elk restoration in forested regions of eastern North America (Witmer and Cogan 1989). In addition, forest management as practiced in eastern Kentucky (Kingsley and Powell 1978) creates relatively young forests that should provide ample food and cover for this generalist herbivore.

A suitable landscape but a sociological challenge led to agency planning and public meetings that outlined a plan to reestablish an elk population. The protocol that was developed for eastern Kentucky involved a multi-tiered decision-making process that could lead to elk restoration only if all steps were satisfactorily accomplished (Fig. 1).

Like most state fish and wildlife agencies, the Kentucky Department of Fish and Wildlife Resources (KDFWR) is charged not only with the traditional role of

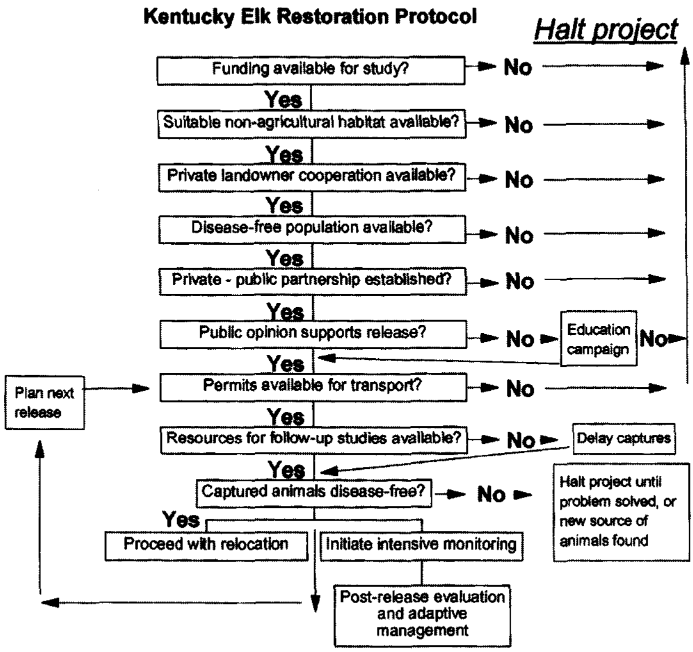

Figure 1. Kentucky elk restoration protocol.

managing game species but is responsible for the more recent mission of conserving biodiversity. During the last 6 decades KDFWR has restored populations of white-tail deer, wild turkey *(Meleagria gallopavo)*, river otter *(Lutra canadensis)* and giant Canada goose *(Branta canadensis)*. A project to re-establish breeding populations of Peregrine falcon *(Falco peregrinus)* is in its seventh year. While these efforts have considered public reaction and support, none has sought the level of informed public consent as has Kentucky's elk restoration project. The Department sought this input before going forward because such a project would be extremely visible and potentially controversial. Further, regardless of the eventual outcome of the process, public involvement in decision-making was expected to create a positive atmosphere for future KDFWR restoration efforts. Before querying the public about their attitudes on elk restoration, however, we addressed 3 important issues.

Identifying Suitable Habitat

Elk could probably survive today in most non-urban regions of Kentucky. However, a restoration zone must be nearly devoid of cropland to avoid substantial depredation conflicts. This greatly narrowed the search for elk habitat and directed our attention to the forested Cumberland Plateau of eastern Kentucky. The proposed restoration zone covered more than 1 million ha of forest (93%), reclaimed mine lands (6%), and agriculture (1%) in a 14-county area in southeastern Kentucky (Fig.

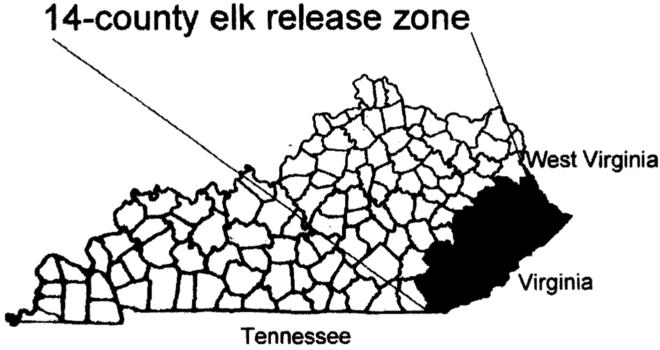

Figure 2. The elk restoration zone in eastern Kentucky. The 14 counties are Bell, Breathitt, Clay, Floyd, Harlan Knott, Knox, Johnson, Leslie, Letcher, Magoffin, Martin, Perry, and Pike.

2). Although the high proportion of forest in this region is greater than that found in the west, the range of the prehistoric eastern elk was almost entirely forested with few natural openings.

Release sites of successful elk restoration in the east differed in terms of topography, climate, and vegetation, but were all similar in having >58,000 ha of forested and rural land available (Phillips 1997). From the perspective of low road densities, low human densities, and little agriculture (Ulack et al. 1998), the 14-county region of eastern Kentucky seemed ideal as a release area. A specific release site was chosen when Cypress/Amax Coal Company offered a 12,500-ha area consisting of reclaimed surface mines and remnant forest patches. Not only is this site centrally located in the 14-county area, but the mined landscape is adjacent to a 4,000-ha forest managed by the University of Kentucky (Robinson Forest).

Locating a donor population

Unlike situations where restoration involves the genetic supplementation of an existing population (e.g., Florida panther [*P. c. coryi*]), elk restoration in Kentucky is not complicated by issues such as the potential for outbreeding depression from the introduction of distantly related individuals (Maehr and Caddick 1995), nor by the need to manage introductions so that the local genotype is not swamped. Thus, the challenge for us was to find a disease-free donor population with sufficient surplus to facilitate the rapid establishment of an eastern Kentucky herd. Because some of the unsuccessful restoration efforts were attributed to small introduction numbers (Witmer 1990), a common problem in population re-establishment (Stanley Price 1989), we established a goal of 200 individuals per release for each of 9 consecutive years. These numbers are somewhat arbitrary, but they are intended to improve the probabilities for establishment by increasing initial stocking rates over those used in other eastern locations where success rates were highly variable. In addition, this number represents the upper limit of elk that can be captured, processed, and transported during winter conditions at Hardware Ranch, Utah.

Several potential donors were located, but only Utah had an ample surplus and a relatively disease-free herd. In this case, over-abundant elk conflicted with local agriculture and cattle operations, and the trapping and shipment of elk to Kentucky was viewed as mutually beneficial to both states.

Economic Feasibility

Restoration of the wild turkey and white-tailed deer in Kentucky were expensive projects—$1.8 million and more than $3 million, respectively. Based on personnel and equipment needs, we estimated that out-of-state elk capture and transport, and in-state monitoring and research would cost $1.3 million over the first 3 years and $200,000 per year thereafter. A limited budget committed to statewide wildlife habitat conservation and management precluded the direct use if KDFWR funding to support elk restoration—outside funding would be necessary. This led to the partnership with the Rocky Mountain Elk Foundation (RMEF) as the primary source of funds for the project. RMEF is a member-based, international, nonprofit, wildlife conservation organization that targets elk restoration and the management of other wildlife and their habitat. The foundation used its membership as the vehicle for fund-raising to cover the early costs of planning, as well as the long term activities associated with restoration. Because KDFWR does not have an internal research branch, faculty at the University of Kentucky, Department of Forestry, became the principal investigators of the elk monitoring and research. Funding from RMEF is also being used to support graduate students and field staff.

Assessing Public Concerns

Before assaying the public's response to the proposed restoration, we prepared ourselves for common questions that were likely to be asked. We predicted that most concerns would revolve around human safety and depredation.

Conflicts with agriculture—Due to the grazing tendencies of elk, we acknowledged that some level of crop depredation was likely to occur in the 1% of the release zone that supports some form of farming. Further, we developed a plan that would financially subsidize farmers for the construction of protective fences (Lyon and Ward 1982) to prevent continued depredation.

Automobile collision—Due to their large mass elk can be safety problems on highways. In Washington, highway mortality was exceeded by poaching and agricultural damage control and was not considered to depress population growth (Potter 1982). Our correspondence with managers of existing eastern elk herds suggested that automobile collisions with elk ranged from almost none in Minnesota, to about 5 per year in Michigan. Due to similarity in forest cover and topography, we anticipate that the frequency of collision in eastern Kentucky should be similar to the 0.4 per year experienced in Arkansas (Cartwright 1991).

Disease considerations—Disease transmission among native ungulates and domesticated livestock is controversial, especially in the western United States (Thorne et al. 1979, Maegher and Meyer 1994) where elk are known to carry brucellosis, chronic wasting disease, bovine tuberculosis, and paratuberculosis (Johne's disease). In most cases, disease transmission from wild elk to domestic livestock is exceedingly rare and elk are not considered as important disease reservoirs for domestic cattle or humans (Kistner et al. 1982). However, because of the importance of the cattle and thoroughbred industries in Kentucky, translocation stock are obtained only from disease-free populations. In addition, each animal is tested for tuberculosis, brucellosis, anaplasmosis, paratuberculosis, vesicular stomatitis, and blue tongue, quarantined for 1 week, and determined free of disease before shipment to Kentucky. Handling and testing procedures developed in cooperation with the Kentucky State Veterinarian and the Southeastern Cooperative Wildlife Disease Study (Univ. Ga.) were approved by the University of Kentucky Institutional Animal Care and Use Committee (#97−0029A), and were integral components of our restoration protocol (Fig. 1). Although translocated elk derive from disease-free areas, each animal that dies after leaving the capture site is thoroughly necropsied for chronic wasting disease. This protocol was adopted primarily due to the concerns of the Kentucky Cattleman's Association, and resulted in the radio-instrumentation of every elk released into Kentucky during the first 2 years of the project. The discovery of disease in the donor herd would halt additional shipments from that area, and would result in the reconsideration of elk restoration in Kentucky. Depending upon the specific pathogen, the discovery of disease could lead to the removal of Kentucky elk.

The meningeal worm *(Parelaphostrongylus tenuis)* can limit the success of ungulate introductions and has been implicated in the failures of several elk restoration efforts (Raskevitz et al. 1991). This nematode parasite commonly infects white-tailed deer in the eastern United States without causing clinical disease, but causes fatal neurologic symptoms in abnormal hosts such as elk. However, even in areas where elk inhabit meningeal worm range, some populations have exhibited growth (Rakevitz et al. 1991). We have documented 2 confirmed cases of the disease among 77 instances

Table 1. Causes of mortality in elk translocated to eastern Kentucky during 1998 and 1999 (the 1998 total includes 7 animals released during December 1997).

Cause of Death	1998 (N = 168)	1999 (N = 143)
Transport/pre-release	7	3
Post-release		
Capture myopathy	34	0
Automobile collision	3	2
Meningeal worm	1	0
Removed (left area)	2	0
Poached	2	0
Septicemia	2	0
Euthenized due to injury	2	0
Unknown	18	1
Total	**71**	**6**
% annual mortality	42	4

of known mortality (Table 1). Susceptibility to infection in some eastern Kentucky areas may be reduced because elk tend to use open habitats where larval-bearing gastropods are less common than in forested habitat. Thus, reclaimed strip mines may be particularly important in limiting the meningeal worm infection rate in elk.

Conflicts with resident wildlife—Although the elk is a native species in Kentucky, there is some potential for competition with white-tailed deer. In western North America, however, elk and white-tailed deer have different food habits, and direct competition is unlikely (Nelson 1982). Further, elk are expected to prefer more open habitats than deer. Nonetheless, research is underway that will examine elk, deer, and coyote *(C. latrans)* interactions, vegetation exclosures have been built in the vicinity of elk release sites, and local breeding bird and amphibian populations are being monitored in order to establish a biotic baseline against which future, post-elk-release studies can be compared.

Threats to humans—Although elk have been documented to exhibit aggression against potential predators such as wolves (Cowan 1947) and coyotes (Geist 1982), elk are generally timid in the presence of humans (Maurie 1951). Nonetheless, some members of the public expressed fear of attack by "bull" elk. The source of such fears are unknown, but it is probably not an unusual reaction toward animals that are large and unfamiliar.

Coordination with neighboring states—Wildlife agencies from West Virginia, Virginia and Tennessee, and the National Park Service were contacted by the KDFWR after the decision was made to release elk in eastern Kentucky. In addition, a presentation by the Commissioner of KDFWR at the May 1997 Southeastern Association of Fish and Wildlife Agencies (SEAFWA) directors meeting, and a presentation at the 1997 fall SEAWFA conference by the KDFWR Division of Wildlife Director outlined the blueprints for restoring elk to Kentucky. Official coordination occurred during fall 1998 in a meeting attended by representatives from all 5 agencies to discuss protocols for handling interstate elk. Part of the discussion involved the disposition of a female elk that had traveled >90 km into Virginia near the town of Grundy. Efforts to relocate this elk to Kentucky were unsuccessful, so the animal was destroyed. Agency opinion regarding a large elk restoration in a neighboring state ranged from accepting to ambivalent. Two states preferred that KDFWR remove all elk that left Kentucky. This was primarily due to the lack of personnel to deal with individual elk that could become nuisances in gardens or agricultural areas, and because none of these states had approved their own elk restoration programs (all of them are considering elk restoration). Subsequently, no other elk have left Kentucky, but we closely monitor all elk that approach site borders so that these situations can be promptly addressed. We did not poll public opinion in neighboring states, but we received 1 unsolicited letter from Ohio that was against elk restoration in Kentucky.

Message Delivery

Approval of an elk restoration feasibility proposal by the KDFWR Commission in March 1997 allowed us to seek direct input from the public. Public meetings were preceded by feature stories in major Kentucky newspapers, and by coverage on television and radio. Printed fliers and news releases described the proposed project and invited the reader to offer input by sending opinions to the KDFWR headquarters in Frankfort. Public meetings were designed to gauge statewide opinion as well as the attitudes of residents in the restoration zone. Presentations in 7 eastern Kentucky cities were conducted during May and June 1997 in local schools and courthouses on week nights from 1900 to 2100 hours. The format of each meting included a 30-minute slide presentation outlining the proposed program, responding to questions from the audience, then polling the 30 to 150 attendants with a written questionnaire. The questionnaire was composed of a single, open-ended request for a written response to the proposal. In addition, the chairman of the Kentucky Chapter of RMEF sent the questionnaire to each of the Foundation's 821 members in the Commonwealth. Responses were subjectively evaluated as either in favor or opposed to the restoration plan.

Additional presentations were made upon request or to specially targeted audiences including the Kentucky Farm Bureau, the State Department of Agriculture, the State Association of Conservation Districts, the Kentucky Cattleman's Association, the Kentucky Chapter of The Wildlife Society, the University of Kentucky, and local civic organizations. Key members of the agricultural community were provided a helicopter view of the restoration zone to demonstrate the very limited agricultural presence in the region.

During the 3 months that written comments were received, a total of 3,040 individuals from across the state responded to the public meetings, fliers, and news releases. Most (1,908) of the responses were in the form of letters or petitions with multiple signatures, and 90% of the comments reflected statewide support for elk restoration. Comments received from the 14-county release zone were 98% in favor of restoration (23 out of 1,258 opposed). We received 663 letters from individuals. Greater than 95% of these were in favor of elk restoration in eastern Kentucky (Table 2). More organized, group responses indicated polar views. The largest group of negative responses was prompted by an editorial that predicted automobile accidents, crop depredation, and harm to people (Kinner 1997). Included with the opinion was a form letter in opposition to elk restoration that could be signed, clipped, and mailed

Table 2. Primary public interests and concerns regarding elk restoration in Kentucky. Numbers in parentheses represent total number of responses to public opinion polls conducted at 7 eastern Kentucky cities. The sum of opposing concerns does not equal the total for each column because each individual respondents often listed more than 1 concern.

In favor of elk restoration (623)	Opposed to elk restoration (40)
Increased hunting opportunity (169)	Crop damage (27)
Increased watchable wildlife (162)	Automobile collision (16)
Create tourist revenue (156)	Human safety (10)
Unspecified but supportive (136)	Fear for elk's safety (7)

to KDFWR—222 of these forms were returned. The Kentucky Farm Bureau board passed a resolution against elk reintroduction based on fears that were similar to those expressed in the editorial. Nonetheless, we received very few letters from individuals claiming Farm Bureau connection. On the other hand, and not surprisingly, greater than 99% of the 247 questionnaires returned by members of RMEF were in favor of elk restoration in Kentucky.

Project Status

The KDFWR Commission approved implementation of the elk restoration project in June 1997, after the public response was summarized and determined to be in general favor of restoration. At this point, the final stages of the elk restoration protocol (Fig. 1) were implemented. On 17 December 1997 the first wild, free-ranging elk were released in eastern Kentucky. Since that time, 6 additional releases have been made and a total of 311 elk have been introduced into the release zone. None of the animals have tested positive for any of the disease with the potential to halt the project, and all dead animals continue to be thoroughly necropsied after death. The intensive monitoring of the entire herd has revealed that most mortality was associated with the 1997–1998 releases, and was primarily the result of stress and trauma during transport (Table 1). After the high mortality experienced by relocated elk in 1998, we changed handling protocols in Utah. This included the replacement of wooden fencing at Hardware Ranch with smooth metal piping and burlap screens, the diet was changed from a moderate ration of mixed prairie grasses to unlimited pure alfalfa, B-vitamins were administered in year 2, the hauling trailers were replaced with compartments containing rounded corners, and the average number of elk per trailer declined from 52 in 1998 to 35 in 1999. Second-year survival was likely further enhanced by a mild winter and excellent highway conditions that facilitated rapid transport to the release site. Through August 1999, there have been only 6 mortalities associated with the second-year releases. Most radio-collared elk have stayed within 15 km of the release sites, and at least 34 adult females gave birth to calves during 1998. On-going research is addressing the potential for elk to impact forest interior songbirds, and Secrist 2000 has shown that forest interior amphibians have thus far not been subject to interactions with elk.

Because very few adult male elk were translocated, we were concerned that slow recruitment in the initial release years would result from inconsistent breeding by inexperienced younger males. In 1998, 46 cows produced a minimum of 29 calves that were sired by mature Utah males. In 1999, 52 adult elk (the increase is due to the maturation of translocated yearlings) produced at least 22 calves that were sired by young males in Kentucky.

Conclusion

Clearly, elk restoration is a complicated process that involves an array of biological and social issues. Even before we assayed public opinion on the subject, funding, land use, and disease issues were investigated. The findings of these efforts, and the partnerships that ensued became important components of our public meetings. The public was placed near the end of our step-down protocol not because we viewed their consent as unimportant, but because we were adamant about being fully prepared to respond to their concerns. Because of this, we were prepared with answers that demonstrated an understanding of elk biology, elk management, and the eastern Kentucky landscape. Although fervent opposition to and support for Kentucky elk restoration were evident, these extremes did not appear to represent mainstream views. Rather, the public was generally in support of returning elk to the Commonwealth as was demonstrated by individual responses to our questionnaire and the more than 4,000 people who watched the first group of elk exit the trailer.

All of the first 6 steps in the elk restoration protocol were successfully completed (Fig. 1) before arrangements were made to capture and transport elk to Kentucky. The failure of any one of these steps would have resulted in the cessation of the restoration activities—at least until the problem (such as funding or locating a disease-free herd) could be resolved. We strongly advise other states that may be considering elk restoration to follow a similar protocol. Ours has evolved through a process of adaptive resource management and trial and error in part because there was little information available that documented the preliminary components of elk relocation. We anticipate that 2 of the important dividends of this approach will be a healthy, disease-free herd, and a public that is supportive of the work. We did not fully anticipate the challenges of interagency consultation early in the planning process. Finally, because all relocated animals during the first 2 years will be radio-collared and monitored, we will develop a detailed history of the factors that lead to the failure or success of the largest elk restoration attempt in eastern North America.

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