

# The Starkey Study

## Perhaps the Biggest and Best Big Game Research Ever

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**Long Range Aid to Navigation (LORAN-C) technology developed by the United States Coast Guard for ship navigation was adapted by Starkey scientists to establish an automated telemetry system (ATS) in 1989. The frequency and order in which radio-collared elk (bottom left), deer, and cattle are relocated can be programmed with hardware and software at the Starkey Base Station. Animal locations can be generated as frequently as every 20 seconds, 24 hours a day, and viewed in real time at the Base Station. A new ATS based on global positioning system (GPS) technology were installed at Starkey in 2005 to replace the LORAN-C technology.**

Deer and elk research at the U.S. Forest Service's (USFS) Starkey Experimental Forest and Range in northeastern Oregon has a long and productive history. One such effort is known simply as "the Starkey Project." The project commenced in the 1980s, stimulated by the intensifying debate over how best to consider habitats and populations of mule deer and elk relative to ongoing management of timber, livestock, and recreation. I, as chief research wildlife ecologist for the USFS at the time, co-founded the Starkey Project along with Dr. Larry Bryant of the USFS and Donavin Leckenby of the Oregon Department of Fish and Wildlife (ODF&W).

We took a new approach to develop definitive information on how dominant public land uses affect mule deer and elk. As part of this approach we instituted a means to immediately transfer the knowledge gained, in forms that could readily be applied to management. That technology transfer effort was headed by Dr. Michael Wisdom. His target audiences included natural resources professionals, industry groups such as timber, livestock, and recreation, students ranging from elementary through college, and the general public. Twenty plus years later, results from the Starkey Project are routinely applied in management, and scientists are taking full advantage of the unique research facilities to investigate new research questions. The Boone and Crockett Club provided initial political support in establishing a research facility that was so "off the charts" in approach and required facilities as to be regarded by many as an impossible dream. In the course of the project, B&C also provided administrative assistance in facilitating research grants.

### **Researchers' Dream, Administrators' Gamble**

The Starkey Project began with the goal to measure habitat, behavioral, and population responses of mule deer and elk to intensively managed forests and rangelands—at the landscape scales where activities such as timber, range, roading, livestock, and wildlife management actually occur. This would require research technology and facilities that were, previously, only a researcher's dream, including:

1. The world's largest research enclosure, containing over 39 square miles (25,000 acres) that allowed measurement of cattle, mule deer, and elk responses to experiments on spring, summer, and fall range;
2. The creation, from scratch, of an automated animal tracking system capable of accurately monitoring animal movements 24 hours a day, 7 days a week, with a location attained every 20 seconds;
3. Installation of a network of traffic counters allowing continuous monitoring of vehicular traffic on all road segments;
4. An animal handling facility where deer and elk could be concentrated during winter months and fed to minimize confounding effects of year-to-year winter variation on animal condition;

4. Construction of facilities that allowed animals to be efficiently and humanely handled during the installation and servicing of radio tracking collars, drawing of blood samples, weighing, and assessing of age, body condition, and pregnancy status;
5. Development of automated data handling and mapping technology capable of storing and displaying hundreds of environmental variables relating to animal movements and human activities; and
6. Establishment of an effective strategy of hunter management to accomplish deer and elk harvest, apply management treatments on wild ungulates, collect data from harvested animals, and evaluate ungulate responses to varying levels and types of hunting pressure.

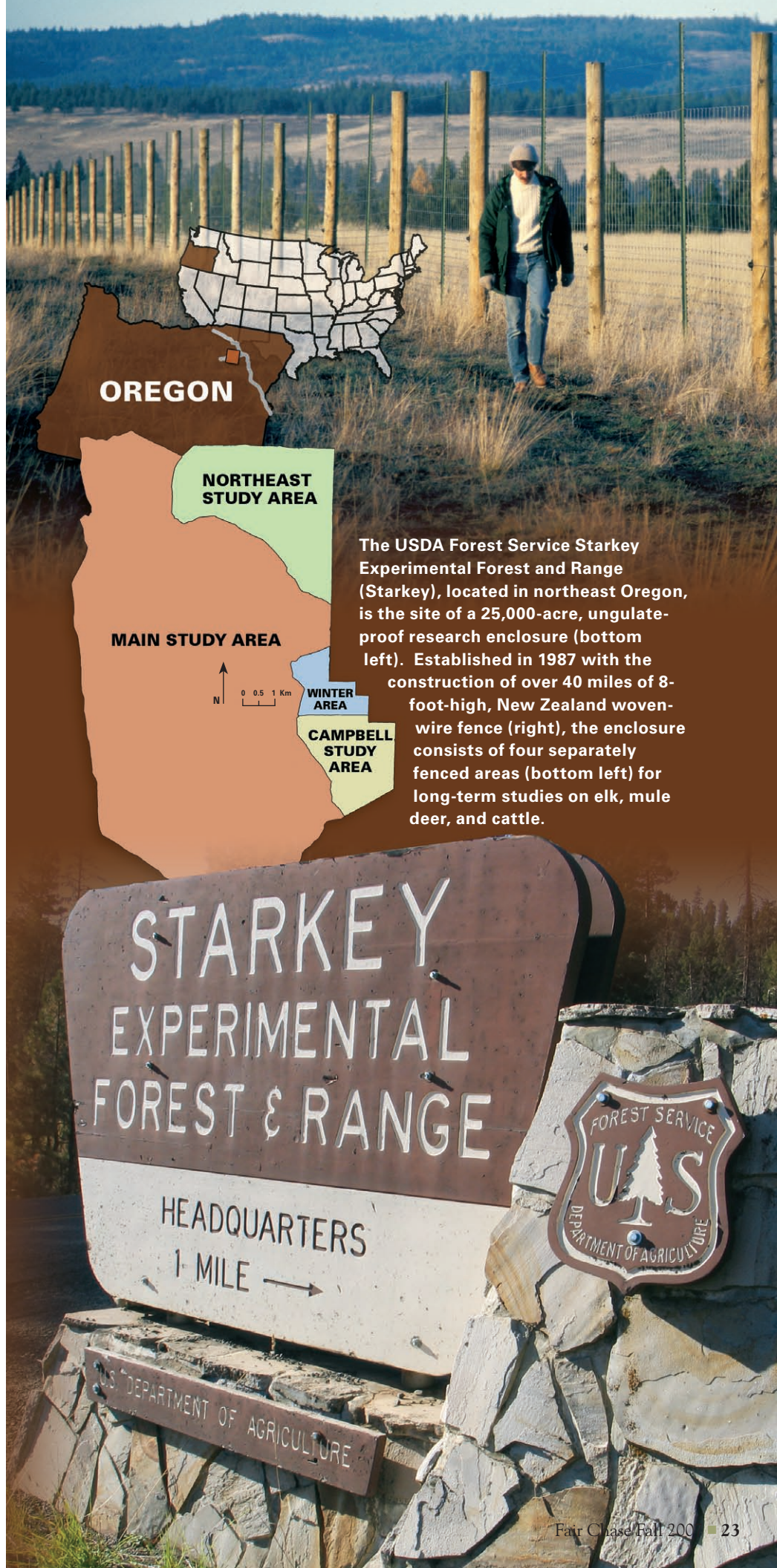
For sponsors of the research, the Starkey Project was an expensive gamble both in terms of money invested and expectations for accomplishment. The initial investment came mostly from the National Forest System rather than the Research Division of the USFS. The gamble required innovation, persistence, persuasion, and risk-taking by research personnel and sponsors of the effort. The USFS, primarily through its management arm, committed millions of dollars for fencing, construction of facilities, radio telemetry, and computer technology. They bet on the outcome that the research personnel involved, both USFS and ODF&W, could turn what some considered a wild-eyed dream into reality. Their gamble paid off big time. Over the years since establishment, both research and supporting dollars have arrived from other agencies, private sources, and universities. Scientists from many organizations besides the USFS and ODF&W have benefited from access to the facilities and data banks of the Starkey Project.

### **New Knowledge Solves Long-standing Problems**

At first, work at Starkey focused on highly contentious issues involving deer and elk. Research subjects included responses to roads and the traffic on roads, responses to intensive timber management activities, relationships between thermal cover and body weight during winter, degree of competition with cattle, and breeding efficiency of male elk relative to age.

#### ***How do roads and traffic affect mule deer and elk?***

Investigators examined how mule deer and elk respond to road-management options (open, closed, and administrative use only) and to the rate of motorized traffic mea-



The USDA Forest Service Starkey Experimental Forest and Range (Starkey), located in northeast Oregon, is the site of a 25,000-acre, ungulate-proof research enclosure (bottom left). Established in 1987 with the construction of over 40 miles of 8-foot-high, New Zealand woven-wire fence (right), the enclosure consists of four separately fenced areas (bottom left) for long-term studies on elk, mule deer, and cattle.

sured as the number of vehicle trips per unit of time. These efforts generated the largest and best data set ever amassed on locations of deer and elk relative to road management and traffic rates. Almost immediately, results were applied by state wildlife agencies and federal land management agencies throughout western North America. Among other significant outcomes, the findings contributed to development of the USFS national roads policy.

### ***Is thermal cover a requirement?***

Thermal cover refers to vegetation and other structural habitat features that help animals maintain homiothermy, or constant body temperature. For deer and elk, thermal cover is defined as a stand of conifers at least 40 feet tall with canopy closure exceeding 70 percent. Managers have long asked whether elk require thermal cover to conserve energy and maintain weight, or whether it is just a matter of comfort.

This question was put to the test using tractable (essentially tame) elk maintained in pens with varying amounts of thermal cover ranging from 100 percent to zero. Diet was standardized and nutritional condition was judged by weighing the animals regularly. Investigators detected no differences in weight that could be related to levels of canopy closure. Based on that finding, land managers modified timber management prescriptions to remove extensive and costly provisions for providing thermal cover. However, retaining some dense stands is still recommended to provide deer and elk with hiding and escapement cover.

### ***Is timber harvesting compatible with mule deer and elk?***

Before Starkey, some investigations indicated that elk and mule deer avoid or substantially reduce their use of areas where timber harvest and associated road construction are going on. They simply shift to alternative habitats where available. Managers wanted to know what would happen if the entire landscape was affected, affording no opportunity for deer and elk to avoid the changed conditions.

Mule deer and elk responses to intensive logging and roading were addressed 1989–1996 in a landscape-scale experiment. Thousands of animal locations were collected before, during, and after completion of a timber sale that substantially reduced canopy closure on over half the area while more than doubling the density of roads. The answer? There was little evidence of

lasting negative effects, suggesting a distinct difference between what animals prefer and what they actually require in the way of habitat conditions. That new information was immediately brought to bear in timber sale planning.

### ***Do mule deer, elk, and cattle compete with one another?***

Starkey investigators sought to measure the degree to which mule deer, elk, and cattle compete for food and space. They determined this by evaluating spatial distributions, resource selection patterns, and behavioral interactions of the three species in a system that rotated cattle among pastures while leaving elk and deer movements undeterred. Forage allocations among cattle, deer, and elk were determined by month. Combined with a subsequent study of diet overlap, this experiment resulted in models for assessing various grazing scenarios on summer ranges shared by cattle, mule deer, and elk. Those models allowed managers to evaluate trade-offs of altering stocking rates

pleted, new management problems had emerged. Some of the pressing questions could be readily and economically addressed using the facilities and technologies already in place and operative at Starkey. Additional research efforts already completed or underway include:

- Studies on how fuels-reduction projects, designed to reduce risk of catastrophic (stand-replacing) forest fires, affect distributions and forage conditions for deer, elk, and cattle;
- Investigations on deer and elk responses to off-road recreation including travel by all-terrain vehicles, horseback, mountain bikes, and foot;
- Development and testing of new road management models for elk habitat management;
- Synthesis and modeling of factors that affect elk vulnerability to harvest by hunters in relation to season length, weapon type, hunter density, level of motorized access, and other hunting-related factors;
- Determination of the energetic costs to deer and elk exposed to hunting, but not harvested, under varying levels of hunting pressure and arrangements of open seasons;
- Consideration of nutritional demands and animal condition to enhance elk productivity; and
- Effects of ungulate herbivory on the development of plant communities and associated risks of wildfire.

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under different assumptions related to differences in ungulate use. Application of the new knowledge facilitated timely completion of new allotment plans.

### ***How does age affect reproductive performance of bull elk?***

Starkey investigators sought to determine how elk productivity, measured as calves per 100 cows, relates to the age of breeding males. This was addressed in two back-to-back studies of five years each. Female elk were found to conceive earlier and more synchronously with increasing age of breeding males. Thus, breeding by older bulls resulted in calves being born earlier and over a shorter time period, which may confer some significant survival benefits. In response to these findings, some states and provinces throughout western North America have modified hunting regulations to increase numbers of older male elk present during breeding seasons.

### **Expanding the Range of Investigation**

By the time the initial studies were com-

These new studies would likely have proven intractable without the facilities, experience, and technology existing at Starkey. Results from these follow-on studies have, in amazingly short order, yielded benefits to managers. For example, defensible options for managing off-road vehicles and other off-road recreation are already being applied. These findings and applications are most timely, considering that motorized recreation is the most rapidly-growing use of public lands in the United States.

Fuels treatments, increasingly undertaken to reduce risk of catastrophic wild fire, are another example of timely response to a new management demand. Starkey has been officially identified as a national research site to address how these management choices affect deer, elk, and other wildlife.

Two other studies of keen interest and utility to managers are investigating responses of deer and elk to various hunting strategies. Focusing on animals not killed by hunters, these studies examine how different strategies affect movement and energy expenditure. Effects on the nutritional status of elk, expressed through productivity, are being

examined relative to those same strategies. State, federal, private, and provincial resource managers already are using these new findings to meet increasing demands for elk hunting and viewing—activities that generate hundreds of millions of dollars annually to local and regional economies. The goal is to meet these demands while assuring good physical condition of the animals involved.

### **Falling Budgets Require Tough Decisions**

The unique facilities and skilled personnel at Starkey have attracted research support from non-federal sources such as state wildlife agencies, the Boone and Crockett Club, Rocky Mountain Elk Foundation, and National Fish and Wildlife Foundation. Facilities and data have been made freely available to research personnel from Oregon State University, the University of Montana, and other universities. Continuously upgraded over the past 20 years, the research facilities at Starkey provide an optimal environment for conducting manipulative experiments and elucidation of cause-effect responses of ungulates at landscape scales. Research personnel, including wildlife ecologists, range scientists, biometricians, computer experts, and skilled technicians, have decades of experience with the Starkey Project. Recently, the animal-tracking technology pioneered at Starkey was totally replaced with state-of-the-art equipment using funds supplied by the USFS. Simply put, no other existing research facility, or any on the drawing boards, has the exceptional capabilities for experimental control, animal handling and tracking, and data manipulation that are required to carry out timely research on cause-effect relationships at landscape scales. This capability exists at a time when the need for such research is greater than ever.

Unfortunately, the USFS is reeling from successive cuts in funding over the past decade. Due to an archaic funding formula, a growing share of declining budgets is being redirected to deal with wild fires. The point has been reached where one-half the USFS budget is, literally, consumed by wild fires. The Starkey Project has been gradually “bled dry” due to the combined effects of inflation and direct cuts in budget. An annual budget of \$1.5 million, annually adjusted for inflation, is required to support

**The Starkey landscape is a mosaic of forests and rangelands typical of National Forests in the interior western United States with Ponderosa pine, Douglas-fir, and grand fir forests are intermixed with bunchgrass and meadow communities.**

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current research and constant maintenance of the aging physical plant and associated research technology. At this point the Starkey Project is some \$600,000 per year short of requirements to continue ongoing research.

How long before a breaking point is reached? Such a shutdown, ill advised in my opinion, would have immediate consequences. Research partners who wish to tackle the type of problems enabled by Starkey would have to forgo that opportunity or seek other, more expensive alternatives. For example, budget shortfalls made it seem likely that the USFS would have to return over \$400,000 in grants for a new study on how deer and elk are affected by all-terrain vehicle use during archery and rifle hunts. Fortunately, the Research Station Director assigned a high priority to that research and found a way to cover the matching costs. Wildlife managers deem such research critical across the American West as controversy and conflict stew in the absence of reliable data and understanding.

The high fence enclosing the 39-square mile study area must also be dealt with. Either the fence must be removed to allow free movement of deer and elk, or winter feeding of the enclosed animals will have to continue. Released deer and elk, familiar with no habitat areas but Starkey, would have to quickly establish migratory movements to lower elevation winter ranges or die in the deep snows of winter. Clearly, such decisions are difficult as the USFS struggles to cope with reduced funding and increasing redirection of scarce resources to fire-related problems.

These critical decisions can't be put off indefinitely. What research should be maintained and which terminated? Starkey is unique in its potential to support sorely needed, management focused, immediately applicable, and broadly supported research. Must these facilities and operations be shut down? If so, will the shutdown occur via a carefully reasoned, transparent, and forthright decision? Or will it be a case of administrators “whistling past the graveyard?”

The Starkey Project is, in a sense, the “impossible dream” come true. In my opinion, the ongoing work at Starkey ranks among the very best in ungulate research and solution of real-life management problems. Success has always exceeded expectations. Starkey deserves expansion, not a slow and lingering death. That “slow death” scenario seems ever more likely as research budgets decline and fixed costs consume ever higher portions of appropriated budgets. Administrators are losing flexibility at a time when decisive actions are required to protect the most critical ongoing research. I have been assured that such actions are underway.

### **What Will Tomorrow Bring?**

All partners in the Starkey Project should feel pride in the collective achievements of the last two decades. It is well to consider past success, but even more important to look to the future and ask some critical questions. Is Starkey the place to address questions of the future, such as how changes in climate and land use will affect mule deer and elk and those who enjoy those creatures? I think the answer is “Yes!”

Then, the next question is how to ensure that the Starkey Project survives to address relevant and emerging issues. I encourage the USFS and its partners to demonstrate strong and innovative leadership in developing a viable funding model for the Starkey Project. Action is required to avert the “slow death” that appears inevitable under current projections. It has been done before and it can be done again. The ball is squarely in the court of USFS research administrators. ■

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