improve working relationships. In the next few years the money through BLM, Forest Service, and SCS will be very limited in most states for range and wildlife improvements. Already in the BLM the contributed funds or labor of a permittee is a consideration in rating the priority of a given project. It is a simple fact that there are more projects than there is money. A side benefit is that the cooperative work leads to excellent working relationships between people because of better communication and understanding.

In conclusion, range improvement projects can be put in (implemented), even under budget cuts. Coopération is going to help make them possible and frequently enjoyable.

# Electric Fencing

**Robert E. Steger**

Many popular trade magazines have articles about economical grazing management programs and mention that several miles of electric powered fencing were used. Many people have had a previous bad exposure to early day electrical chargers. What is this new interest in electric powered fences? Do these successful managers have knowledge that is unknown?

—These questions are best answered by three facts about electric fences:

—They are effective.

—They are relatively inexpensive.

—They provide flexibility.

**Effectiveness**

A properly planned and constructed electric powered fence which utilizes the latest technology is effective. It is different from conventional fencing. An analogy might be drawn to be first exposure of the early day Hereford breeder to his first Brahman bull. Now, consider the current popularity of Bradford cattle.

Essential prior planning can significantly enhance the effectiveness of electric powered fences. Animals cross fences for two reasons—to get something to eat or to join other animals. Specially prepared training areas greatly increase the effectiveness of electric fences. Electric fencing effectiveness is due to the establishment of a mental barrier for the animal. Animals such as horses, bulls, and bison, which are difficult to contain with conventional physical barrier fences, are more easily contained with electric fences.

The question is often asked, "Are the new energizers ("New Zealand type") more effective than earlier day models ("weed chopper type")? The answer is a definite "yes." The "New Zealand type" have a high voltage and a low impedance. They operate at a voltage of 4500 to 6000 volts at a relatively high amperage as compared to other energizers. They are safe due to the short duration of the pulse, and some units are U.L. approved. This higher voltage and amperage is possible through larger capacitors and a pulsating current. The pulses occur at a rate of approximately 55 per minute. The end result is that much of the current passes through the wire, even under relatively heavy vegetational loads. Also, the continuous recurring pulses serve as a follow-through if the animal persists in touching the fence.

The safety feature of these electric currents lies with the short duration of the electric pulse; $\frac{.001}{300}$ second. Also, smooth wire is used instead of barbed wire so that animals can easily get away after being shocked.

The animal being controlled determines the amount of current needed in an electrical fencing program. Cattle, horses, and swine are quite easily contained with 2000 to 3000 volts. Sheep and goats, on the other hand, require 3000 to 4000 volts. Wildlife and predators usually require in excess of 4000 volts. The hollow hair of deer provides a degree of

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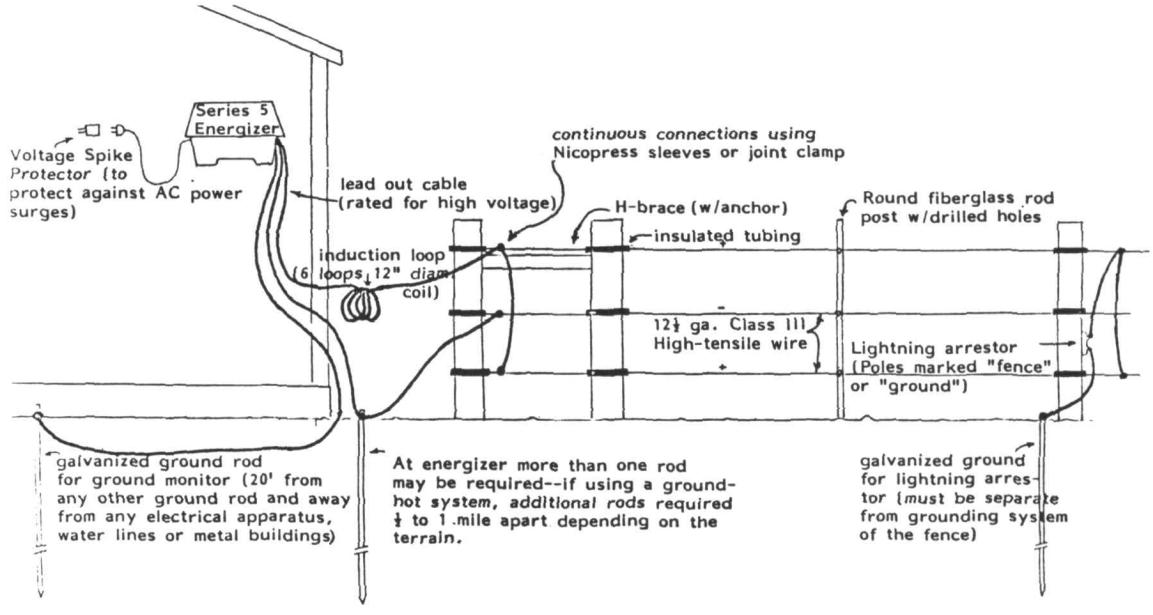

insulation from the electrical charge. Canines are sensitive to electricity, but a hungry, persistent coyote needs an effective barrier to discourage his intentions for a lamb dinner.

**Inexpensive Fencing**

The total quantity of materials and labor for construction is generally less for electric powered fences than conventional barbed wire or net wire fences. Comparatively speaking a four-wire fence on smooth terrain would cost about one-half as much as a four-wire barbed wire fence or one-third of the price of a net wire fence. Typical costs in Central Texas for labor and materials for one mile of net wire fence (1047-6-12 1/2 net wire with one strand of barbed wire on top), without rock, is $.95/ft. ± 10¢/ft. (approximately 40% materials and 60% labor). The reduction for electric powered fences is based principally on fewer posts being required (spacing up to 80' to 100' apart), the economical high-tensile wire, and reduced labor.

Understanding certain features about energizers (chargers), high-tensile wire, and post-insulator combinations can be helpful. Energizers, for example, of the "New Zealand type" vary mainly in their source of power requirement and the size of the capacitor. The specific energizer selected will have either battery, solar, or plug-in requirements for a source of power. Capacitor size determines the distance that a charge can be transmitted along the wire.

The principal limiting factor determining energizer efficiency may be proper grounding. Three or more ground rods may be necessary to obtain a proper ground. Ground rods do not all have to be at the energizer, but may be attached to the ground wire along the fence when both ground and hot wires are needed in dry areas. If more than one energizer is used, each must work independently and have its own ground rods. Do not use existing ground rods for power or telephone facilities.

A new development in energizers eliminated the guess work about adequate grounding and shorts on the fence. The "Smart" Series 5 Energizers are now available that have individual lights that indicate (1) inadequate grounding, (2) trouble on the fence, and (3) output of current. The Pel Electric Fence Systems of New Zealand is the only company that offers an energizer with these features.

Protection of the energizer from lightning damage often saves time and money. A voltage spike protector at the grounded plug-in for 110 volt supply reduces hazards of the lightning coming through the power source. Lightning arrestors and induction loops can also prevent damaging high voltage coming through the fence to the energizers. The Series 5 energizers have more internal protection from lightning with additional fuses and breakers.

Wire size for electrical current is similar to pipe size for transporting water. The 12 1/2 gauge wire is large enough to transport current from one to one hundred-plus miles. The high-tensile wire with 1,308 pounds breaking strength and 170,000 psi tensile strength is adequate for a well-constructed electric powered fence. The ultra high-tensile wire has a greater strength, but is more expensive and much stiffer, and offers no real, useful advantage except in the case of non-electrical fences. The Class III wire galvanization provides almost three times as much protective coating as on traditional net or barbed wire. This heavy protective coating is good in areas of potential high corrosion such as the salty conditions along the coast, or in industrial areas with large amounts of acid deposits.

The post-insulator combination is a major factor in the appearance and effectiveness of electric powered fencing. The fencing technique works best when the wires are free running through the post and/or insulators. If an animal inadvertently runs into the fence, it is thrown back away from the fence. When wires are tied to the post, the posts may not be able to regain their upright position when an animal has hit the fence. Free running wires are able to regain their original position with posts left upright.

The best and most trouble-free fence post has been the self-insulating round fiberglass (sucker rod) post with holes drilled through the posts. These durable posts can be driven most places that a steel T-post is used. These round posts can be fitted with steel galvanized torsion springs to hold the wire and to allow wire height to be adjusted or additional upper wires added.

Fiberglass T-posts are self insulating, but are usually more expensive than the fiberglass sucker rod posts, and are not as durable. Also, the wires are not as free when clipped or tied to the posts.

Steel T-posts are durable and often the least costly at the time of installation. The same can be said about rebar. However, insulators must be installed, which adds to the cost, and they do not have the flexibility required. The problem with using any steel posts is the potential for grounding the intended hot wire, thereby rendering the total fence ineffective.

Structural tubing and wooden posts work well, but require more labor to install and require insulation (except for high-density woods). Cedar posts of 2 1/2" to 3" in diameter are economical and work well for these fences. Plastic pipe (PVC) has been reported to be a conductor of electricity.

Recently, manufacturing techniques and improved chemistry for high-density polyethylene insul-tubing or insulators have allowed for extra long life of insulators. The materials that these insulators are made of have been used in New Zealand for 20 years without problems of weathering. Other plastic insulators may weather crack in a year or less. The traditionally used porcelain insulators are good until the surface is cracked or broken. Broken porcelain insulators, especially when attached to steel posts, have very poor insulation capabilities.

A few special tools make construction and checkups of electric powered fences easy. These include the spinning jenny (wire dispenser) to help dispense the somewhat stiff high-tensile wire; the nicopress tool (crimping tool) and sleeves (wire splices) for fast, strong splices, as well as excellent connections; and the chain removable tool with clamps to grasp the smooth wire for stretching, and voltmeter testers to find the occasional short.

**They Add Flexibility**

The flexibility afforded by electric powered fencing makes it a valuable tool for a rancher, farmer, researcher, bee keeper, livestockman protecting hay stacks from wildlife, or a housewife keeping dogs and racoons out of the garden, to name a few. The rancher that leases ranch land can often re-fence with electric powered fences cheaper than to repair old fences. Also, land that is currently unfenced and ungrazed

can be economically fenced.

Providing insulation for all wires provides two benefits. The location of ground or hot wires can be changed if all are insulated. The performance of the energizer is improved when all wires are insulated. The performance of the energizer is improved when all wires are insulated.

In areas of extreme hot and cold where wire tension is a problem, or where it is necessary to lay fences down during the winter, the inline wire strainer (serves as a stretcher for later taking up wire slack), is a valuable tool. On some wire strainers, a small tool or crescent wrench is all that is required to adjust wire tension. Tension springs can also be added to maintain wire tension, but are more costly, and not necessary in all situations.

Flexibility in grazing management can be maximized when numerous pastures or paddocks are created through fencing. Specific improvements through labor saving, improved forage quality and production, protection of newly seeded areas, improved animal husbandry, fewer hunter-livestock related problems, and even increased watershed protection can be a few of the benefits derived as a result of economical fencing. Fencing may well be one of the few effective, proven, and economical techological tools available to the resource manager in today's troubled economy.

# Long-Lived Grazing Study Becomes an Idaho Tradition

**George Savage**

*Editor's Note:* Readers may wish to read the article "Experimental Area Renamed for Idaho Range Professor" which appeared in the February 1985 issue of *Rangelands* 7(1):46.

A grazing study begun over 32 years ago in southern Idaho's Raft River country may well be one of the longest-running research projects now extant anywhere. Over those three decades-plus, the study has developed and provided rangeland management strategies currently used throughout the Intermountain region. But what's special about this project is not just its results, not just its longevity, but the fact that few research projects have so immediately and intimately united a university, public agencies, and private citizens in working toward a common goal.

The study's origin lies in halogeton—a poisonous weed that moved into western rangelands in the '30s and '40s, threatening their viability for grazing. The study's subject is crested wheatgrass—a hardy perennial imported from Asia in the 1890s. The study's keystone is Lee A. Sharp, a University of Idaho range resources professor and faculty member since 1949.

The study story begins in the early '50s, when the Bureau of Land Management seeded some 200,000 acres of Western rangelands with crested wheatgrass. The bureau's idea was to control the poisonous annual weed by putting it up against a tougher competitor. As Sharp explains, "The best way to control halogeton is to put in a perennial grass that will out-compete it, not spray it with poison."

The crested wheatgrass took, and it did contain the halogeton. That question was answered. But others remained. What to do with the crested wheatgrass? How was it to be managed for grazing?

Enter Lee Sharp. Through the early '50s, Sharp, then a young assistant professor of range resources, gravitated among academia, cattle country, and the federal government, selling the need for a long-term study of crested wheatgrass. He was persuasive. In 1954, a union of the University of Idaho, southern Idaho cattlemen, and the Bureau of Land Management established the Point Springs Range Experimental Area—960 acres of depleted, halogeton-infested sagebrush range dedicated to answering the crested wheatgrass questions.

The University provided the science, the ranchers provided the cattle, the BLM provided the land, and everybody provided the plain hard word necessary to carry out the project: sagebrush to be cleared; wheatgrass to be planted, clipped and sampled; cattle to be weighed. Sharp provided the research acumen, the tenacity, and the spirit.

As the years passed and the research continued, the relationship among the cattlemen, range scientists, and BLM personnel was cemented through a common goal, shared work, and mutual respect. The yearly "weigh-off" of the cattle, necessary to the research, became an annual tradition in the Raft River country, a much anticipated reunion of old friends. And those original 960 acres have now grown to 7,000 as more and more ranchers have become supporters of the crested wheatgrass project.

Over those years, too, Lee Sharp—now senior faculty member of the UI College of Forestry, Wildlife and Range Sciences and former head of the Department of Range Resources—has become synonymous with crested wheatgrass and Point Springs. In 1984—on the occasion of the area's 30th birthday—that synonymity was made official. The Point Springs Experimental Area was renamed the Lee A. Sharp Experimental Area.

On that occasion, too, Sharp's work was lauded by BLM Director Robert Burford, who also presented Sharp with a letter of appreciation from Interior Secretary William Clark, citing his "outstanding contributions to grazing management practices on public lands."