Capture and Translocation

Capture and translocation have and continue to be, integral to pronghorn management. Although restoration of this species through translocations has been phenomenally successful, such programs remain important components of pronghorn management in some areas.

Pronghorn Capture: Pronghorn can be captured using a wide variety of nets, traps, drugs, and under certain conditions, without the aid of either mechanical or chemical means. Each method is designed to either reduce a pronghorn (or a group of pronghorn) to a restrained condition as a requisite management goal or a research need.

Amstrup et al. (1980) suggested parameters to consider when selecting a capture method. Included were the number, age, and sex of animals needed; density of animals in the trapping area; the terrain and proximity to roads; whether pronghorn are accustomed to fences; how wary the animals are; the possibility and acceptability of mortalities; and the cost in terms of time and money per animal captured or marked.

Figure 16. A small herd of pronghorn from New Mexico were translocated to the state of Coahuila in northern Mexico. The new location is a private ranch where herds previously roamed historic rangelands. Such international management cooperation strive to reestablish natural wildlife diversity in North America. Photo by Patrick Robles.

Corral traps: Corral traps were used by Native Americans and have proved their worth many times over as a cost-effective means of capturing large numbers of pronghorn. Various agencies have modified the basic design to meet their specific needs. Detailed accounts of corral trap design and operation were provided by Fisher (1942),

Couey (1949), McLucas (1956), Hoover et al. (1959), Russell (1964), Spillet and Zobell (1967), Moody et al. (1982), and McKenzie (1984). Many of these authors have suggested modifications resulting in improvements to the basic corral trap. Unless otherwise stated, the following trapping guidelines are adapted from McKenzie (1984) and O'Gara et al. (2004).

Placement of a pronghorn corral trap is of utmost importance (Fig. 17). The basic corral trap design consists of 2 linear wings, a containment pen with curtains, a gated corral divided by a moveable burlap curtain, and sometimes, a loading chute. The woven-wire wings of a corral trap usually form a "v" funneling animals into the mouth of the trap proper. Workers in Wyoming (Moody et al. 1982) gradually narrowed the distance between these wings from between 1000 and 1300 feet (300 to 400 m) at the outside edges approximately 0.3 mile (0.5 km) from the trap to the funnel and first curtain. This eased the problem of pronghorn attempting to go over (or through) the trap wings. They also used cargo netting (the same as used in the trap proper) as trap wings for the first 350-400 feet (100 m) from the trap mouth to ease the same problem and reduce injury to pronghorn.

The burlap or canvas containment curtain extending across the funnel facilitates moving animals the final distance of approximately 650 feet (200 m), into the corral trap. The distance between the wings at this point should be about 150 feet (50 m). The curtain is folded in place on the ground between the wings at or near blinds on each side of the funnel. As the target animals cross the folded curtain, workers emerge from the blinds and form a line across the funnel. When the line of workers is complete, the curtain is raised to establish a visual barrier to discourage escape attempts back through the funnel. Alternatively, a netted gate curtained with burlap can be laid across the funnel entrance and raised after the pronghorn have passed through, allowing for the storage of animals in the funnel while another group is worked into and through the trap.

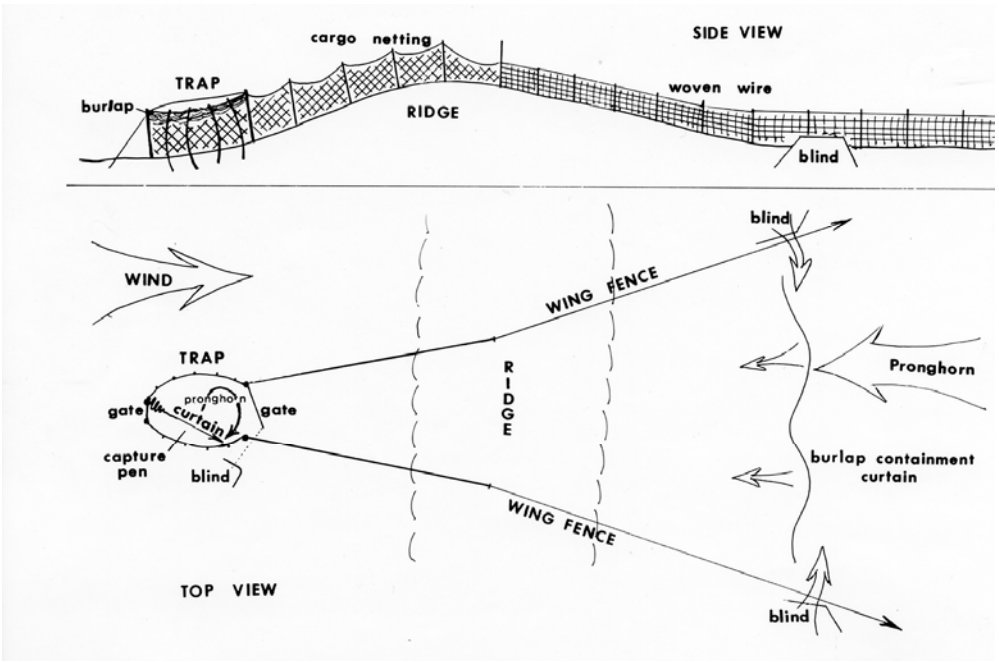

Figure 17. The basic corral trap design consists of 2 linear wings, a containment pen and curtain (gate), a gated corral divided by a moveable burlap curtain and, sometimes, a loading chute. Placement of a pronghorn corral trap, taking advantage of topographic features to hide the corral, is of utmost importance and prevailing winds should be considered. A reconnaissance flight to select a good location for the trap site and to obtain an idea of the number and distribution of pronghorn should be made before erecting corral traps. Traps or nets should be hidden by vegetation or topographic features along known or suspected pronghorn travel routes. Natural and manmade barriers, steep terrain, or tall vegetation should be avoided within the funnel of a corral trap, unless pronghorn are observed routinely using such areas as travel lanes. Existing fences near a trap site should be carefully evaluated. Sketch by Larry Saslaw; courtesy of the U.S. Bureau of Land Management, Rawlings, Wyoming.

The corral portion of the trap should be an oval 40-100 feet (13-30 m) in diameter with nylon-netting walls and posts on the outside. The tops of the posts should be offset 3-foot (1 m) offset to increase the "give" when pronghorn hit the net and to prevent collisions with posts. A visual barrier curtain (Fig. 10) is recommended for the top 2/3 of the trap proper. This burlap or canvas curtain reduces escape attempts (and injury to pronghorn) through the sides of the trap, and its suspension from the top of the trap walls discourages escape attempts over the top. Most importantly, the curtain is lowered simultaneously with the closing of the trap gate when the pronghorn enter the trap. Prior to being dropped, it is rolled up and secured at the top of the net with a quick-release string-washer-cotter pin assembly.

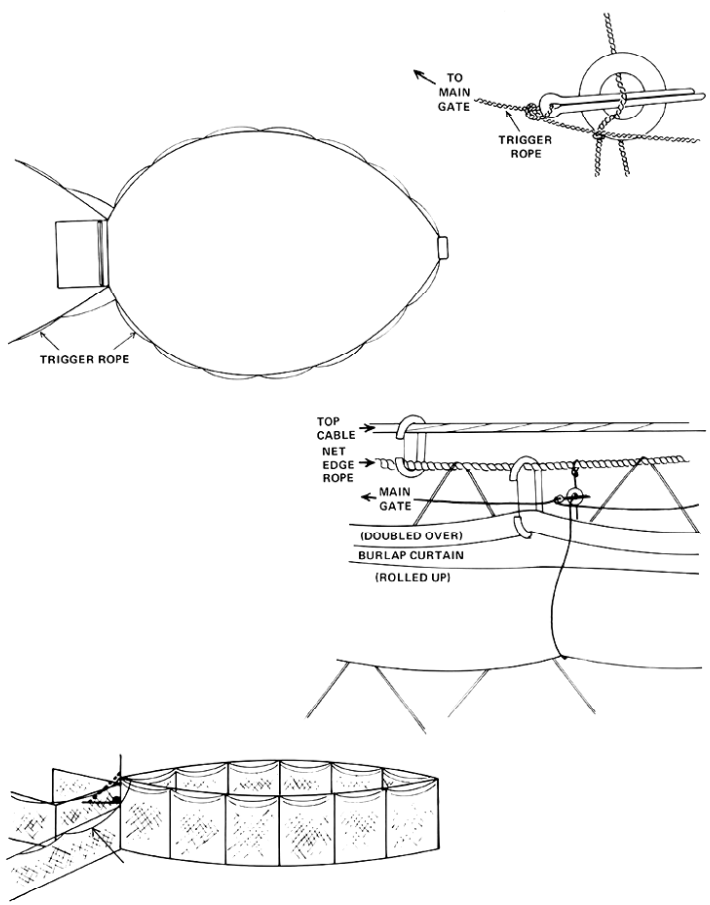

Figure 18. A visual barrier curtain reduces escape attempts and injuries to pronghorn. Trigger detail and placement of a trap drop curtain are shown here. Courtesy of the Texas Parks and Wildlife Department.

Correct trap placement, and the taking advantage of topographic features, is vital for the success of any attempt to trap pronghorn with fixed traps or nets. A reconnaissance flight to locate the animals to be trapped and to select the best trap location and is an essential first step in any trapping effort (McLucas 1956). To maximize the chances for success, it is also advisable to use vegetation or topographic features to conceal the traps or nets along known or suspected pronghorn travel routes. The funnel of a corral trap should not contain any natural or manmade barriers, steep terrain, or tall vegetation, unless pronghorn are observed routinely using such areas as travel lanes. Existing fences near a potential trap site should be carefully evaluated. Their presence may either aid or hinder a successful trapping operation depending on the reaction of the target pronghorn. Safety precautions for both workers and animals should be strictly followed. The mouth and wings of a corral trap should be positioned so that pronghorn run into the prevailing wind and are a safe distance from flight hazards (power lines, trees, etc.). Other flight precautions should depend on the pilot's judgment.

Herding pronghorn by aircraft during trapping operation stresses the animals. Thermal stress may occur during warm weather, and corral trapping is not recommended when the ambient air temperature is greater than 70ºF (21ºC) and, preferably, it should be 50ºF (10ºC) or cooler. Pronghorn are sometimes captured during the cool of the morning and placed in transport vehicles only to have the temperature rise to lethal levels later in the day during transport. During catch-and-release operations the temperature may not be as critical because of the short duration of captivity. Amstrup et al. (1980) and Reeves (1982) successfully trapped pronghorn during August, when ambient temperatures were high, but they usually trapped during early morning or late evening and avoided handling or herding animals during the heat of the day.

A helicopter is the best tool for herding pronghorn into the wings of a corral trap. Constant pressure applied by a helicopter appears to stress pronghorn, so the pilot should hold back and let the animals drift toward the net at a moderate pace until time for the rush into the wings and corral. Extended chases may result in increased mortality. Workers in Wyoming found mortality rates of animals chased for 40 minutes to be twice as high as for those chased for 20 minutes. The maximum chase time should not exceed 20 minutes.

The line of people with the containment curtain should advance toward the trap mouth when the pronghorn move in that direction, stop when the pronghorn stop, and move when they move. Gentle, but constant pressure is used until the animals enter the corral, the gate is closed, and the curtain barrier is released. Noise should be kept to a minimum.

It is recommended that captured pronghorn be allowed to settle down in the trap without human harassment for 10-40 minutes (or whatever appears to be a reasonable period of time). This is a judgment call depending on how far and how long the

pronghorn have been moved and the ambient temperature. Once handling begins pronghorn should be processed as quickly as possible.

Trapping usually requires many volunteers and others who are not familiar with the trapping operation and handling of animals. A thorough briefing of all of the participants in the operation is therefore essential. The briefing should include: purpose of the operation, description of the trapping process, proper handling of animals, how injured animals are to be dispatched, and precautions for the safety of workers and animals. A detailed protocol of the capture operation is also required by the Federal Animal Care and Use Act.

Within the trap proper, there should be a canvas curtain that can be drawn across a portion of the corral, hiding the workers from the animals. This curtain is used for segregating small groups of 6-10 animals from the main body of trapped pronghorn during the hand-capture phase. Segregating animals into small groups reduces the chance of injury to workers and pronghorn while expediting the handling of the animals.

Handling and Loading - Handling and loading, as described here, applies primarily to capturing pronghorn in corral traps. Other methods of capture usually involve smaller numbers of animals and are considered as hand captures.

For each pronghorn segregated by the catch net, two persons should be available to hand capture the animal and restrain it as quickly and effectively as possible. The front handler should control the head of the animal with one arm and lift it with the other arm just behind the front legs. The rear handler should clasp his hands under the animal just forward of the hind legs. The animal should then be lifted just enough to get its feet off the ground. Each restrained or carried pronghorn should be positioned with its sternum down and its head well above the level of the rumen to prevent aspiration of rumen contents. At this point, the period of restraint is dependent upon the number of procedures (tagging, injecting, measuring, etc.) deemed necessary and whether tranquilizing drugs are used; nevertheless, during a translocation effort, all procedures should be kept to a minimum.

Tranquilizing drugs promote tameness and ease of handling. Two such drugs, Valium (5 mg/cc) and Acepromazine (50 mg/cc) are routinely used by some biologists during pronghorn translocations. Dosages are 1 cc for adults and 0.5 cc for fawns. Use of drugs should be avoided in most cases, however, because of the added hazards to the animal. An animal during transport could become physically incapacitated and be trampled by other animals and a released animal may be more susceptible to predation or accident before the affects of the drug wears off.

When groups of pronghorn are to be translocated, and individual handling for marking is not required, the use of a cattle-type loading chute (Fig. 19a & 19b) can reduce stress to the animals and expedite the loading process. The chute should be constructed specifically for pronghorn with solid wooden sides and runway, canvas top, and a width of approximately 22.5 inches (0.5 m) (McLucas 1956).

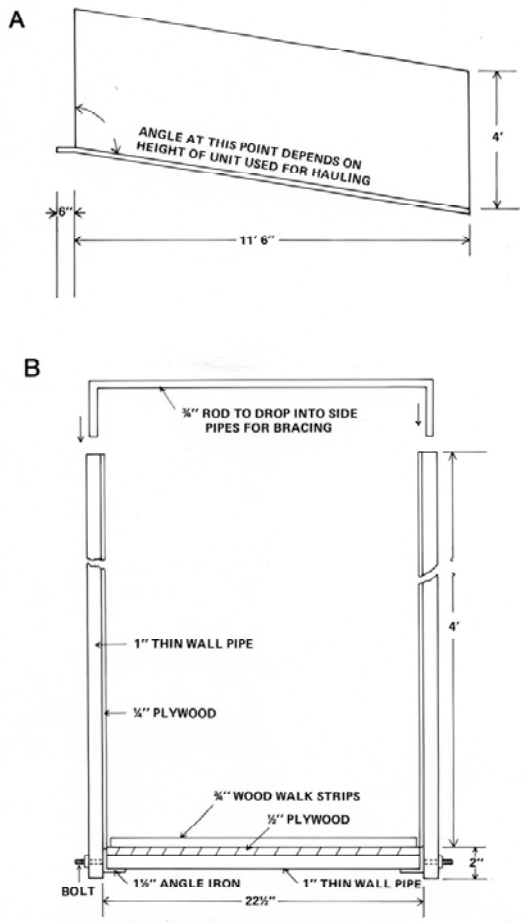

Figure 19a. Construction details of pronghorn loading chute, A = side view and B = end view (from McKenzie 1984).

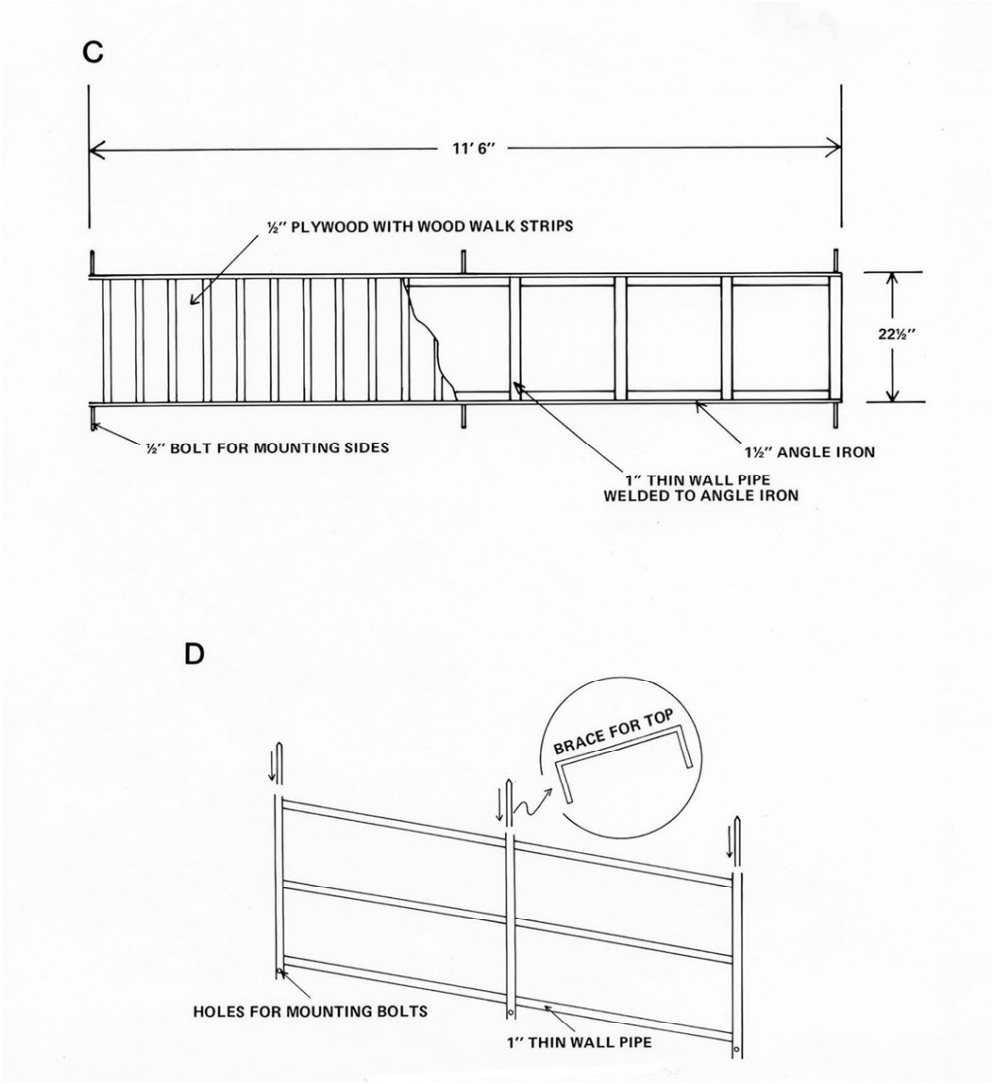

Figure 19b. Construction details of pronghorn loading chute. C = details of the bottom frame and D = details of the side frame (from McKenzie 1984).

Thomas and Allred (1943) described the conversion of 1/2 and 3/4 ton trucks with stake beds to transport deer. Such vehicles are practical for transporting pronghorn. Vehicles especially built for hauling pronghorn should be well ventilated, completely covered with a canvas top to make them as dark as possible, compartmentalized (to segregate horned males), and easy to load. Additionally, the space requirement for each pronghorn during transportation should be about 3.2 ft^2 (0.3 m^2).

Blindfolding horned males during transportation may be advisable, even when they are segregated from other pronghorn. Blindfolds are an alternative to removing the horn tips and likely serve the same purpose.

Each vehicle should start the trip to the release site immediately upon loading. The vehicular motion has a definite calming effect on pronghorn during transit. Pronghorn

should not be transported when ambient temperatures are above 70°F (21°C), but if such a situation arises, the animals should be periodically sprayed with water.

Recommendations are for a gentle release (open the gates and walk away) as soon after arriving at the release site as possible or immediately after research needs are met. Should a transportation trailer be used, it is often beneficial to provide or build up a ramp to allow the pronghorn easy egress as newly released animals may fall down when jumping out of the trailer.

Linear Tangle Nets - Linear tangle nets have gained popularity in the capture of big game animals. Tangle nets are similar to corral traps in that animals must be herded into them. The axis of a tangle net should be positioned so pronghorn hit it while running into the wind. This helps to prevent animals from smelling the capture crew and facilitates control of the aircraft. These nets are best suited for the capture of a select number of target animals. A linear tangle net consists of a net 350-1,050 feet (100-300 m) long, approximately 8 feet (2.4 m) high, suspended vertically by notched wooden stakes or draped on vegetation. Sufficient nets to span at least 3,500 feet (1,000 m) are used in most operations. The best mesh size for pronghorn appears to be 7inch (18 cm) bar measure. Nets should be anchored about every 100 yards (100 m) so pronghorn cannot knock down whole nets or run into any backup nets. Nets should be hung loosely, with about 1 foot (30 cm) of net remaining on the ground, because animals can often back out of tight nets.

Amstrup et al. (1980) found that the linear tangle net could be successfully employed to capture small groups of pronghorn. They deployed the net as a cul-de-sac below a pass through rim rocks or at the end of woven wire wing fences along travel routes. A helicopter was needed to herd pronghorn successfully into the net. A major problem was collapse of the net with the impact of the first few animals, resulting in the rest of the herd jumping the net at that point. To prevent this, a second net was deployed a few yards beyond the first to form a double cul-de-sac to increase the catch. Amstrup et al. (1980) also thought a person hidden at the point in the net where lead animals tend to hit could stand up just before impact to scatter the herd and increase the number of contact points.

Clover Trap - Two adult pronghorn does were caught in clover traps in Oregon (M. Willis, pers. comm.). The traps were pre-baited with alfalfa hay and salt (salt appeared to be the most effective). Several other pronghorn were observed in the trap, but the drop panel froze open preventing their capture. If the panel had not been frozen trapping success would have been three trap-days per animal.

Cannon Nets - The cannon net can be used to capture select numbers of pronghorn. Animals must be enticed to feed or drink at a central point, and when they are at the target site, rockets are fired, propelling a 40 by 60-foot (12 by 18 m) net over the animals, the net being secured on the side of the cannons. The only baits that consistently attracted pronghorn were apple pomace (pulp remaining after the cider is squeezed out) and salt blocks (Amstrup et al. 1980). In arid regions water may serve as bait (Beale 1966).

Amstrup et al. (1980) found that one of 13 pronghorn captured in 4 netting attempts died in the trap. Another 4 were known to have died within two weeks from either capture myopathy or coyote predation. Because of the high mortality rate, this technique was not recommended for pronghorn. Pronghorn are not excessively stressed by a moderate amount of running, but they do not struggle as violently in a tangle net as they do under a cannon net. Violent activity is probably more conducive to capture myopathy, when the muscles have not been warmed by running. Also, pronghorn hitting tangle nets lose their footing almost immediately and can only struggle against the flexible net and soon cease struggling. Those under a cannon net often kept their feet on the ground and fought the net with all of their strength, not giving up until restrained by hand or exhausted. Pronghorn captured under cannot or drop nets lose much of their hair during the struggle under the net—a major consideration when trapping in cold weather.

Surround Net - Reeves (1982) devised a surround net for the capture of pronghorn. He constructed a 5-foot (1.5 m) woven-wire trap that arched around half of a pond or waterhole. The remainder of the pond was surrounded by nylon netting 9 feet (2.7 m) high and with a 5.6-inch (14 cm) mesh. A 350-foot (100 m) section of the netting was furled on the ground. This section was lifted by counterweights suspended from four 12-foot (3.7 m) poles when pronghorn entered the trap. The releasing mechanism for the counterweights was electrically activated from a distant blind. The trapping crew then rapidly approached the trap from the woven wire side. The startled pronghorn flushed into the netting, collapsed it, and became entangled.

Cancino et al. (2002) described how a combination corral trap and surround net were used to capture pronghorn in Baja California Sur. This technique employed fixed fences, an irrigation system, an observation tower with optical equipment, VHS radios and 2 person teams with vehicles.

Advantages of this trap include the ability to select the number, age, and sex of the animals to be captured, and minimal stress to the pronghorn. Reeves (1982) reported no post-release mortality among the 17 animals caught. Costs were considerably less than a corral trap or a drive net due to fewer materials and personnel and no aircraft being needed.

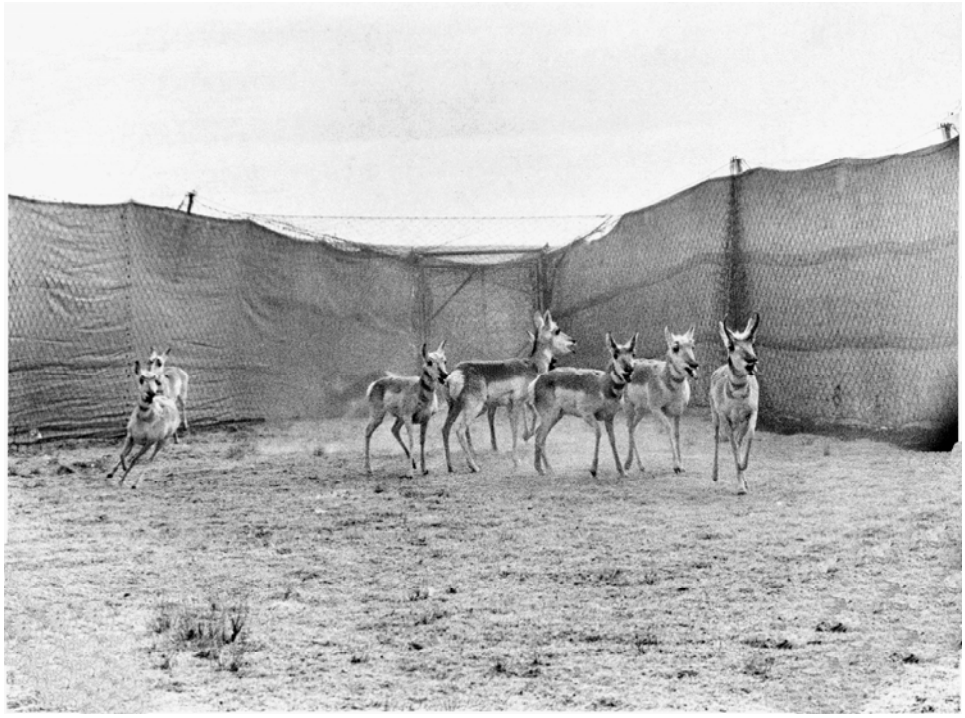

Figure 20. Within a corral trap, a canvas curtain should be rigged so that it can be drawn across a portion of the trap to facilitate hand-capture of pronghorn. The smaller area makes capture easier and reduces stress on the animals; it also can be used to separate 6-10 animals from a larger group. This reduces stress on the animals in the larger portion of the trap. Alfalfa hay scattered on the ground before capture reduces the amount of dust kicked up and inhaled by pronghorn during capture. Photo by Paul Wertz; courtesy of the California Department of Fish and Game.

Net Gun - Barrett et al. (1982) concluded pronghorn are captured easily with a net gun; however, considerable effort may be required to reduce capture myopathy and losses from trauma. Eighteen adult pronghorn were captured successfully using a 3-barreled net gun during 3 capture operations in Colorado (Firchow et al. 1986); two of the 20 pronghorn (10%) captured, or pursued for capture, died; 5 females captured during March and April were pregnant and carried fawns to full term. Initially the authors used 12 minutes as a cut-off point for hazing animals, but changed to a 7 minute maximum after signs of stress were noted in animals during the first capture operation. Fifty pronghorn (16%) died during 311 reported captures in Arizona, more than half from broken necks. Others were destroyed because of broken legs, and two died about two weeks after capture, apparently from capture myopathy.

The high cost of using helicopters encouraged Scott (1994) to net gun pronghorn from the ground in Yellowstone National Park. During net gunning of 21 pronghorn from a pickup, an average of one pronghorn was captured per 8-hour day at a cost of about $167 per animal; approximately 25% of the shots resulted in a capture (Scott 1994). Seventeen pronghorn were netted from a helicopter during the same study; in 3.5 hours of flying time (4.9 animals per hour), at a cost of about $403 per animal. Net gunning from the pickup truck resulted in 14% mortality compared to 47% for those netted from the helicopter. Scott (1994) concluded that ground net gunning was simpler, safer, and less expensive than aerial net gunning in Yellowstone. Additionally, ground capture caused

fewer pronghorn mortalities and less public disturbance than did aerial captures. Captures in Yellowstone were only possible, however, because the animals were habituated to vehicles, a situation seldom encountered outside of parks or refuges.

The net gun is the tool of choice for capturing small numbers of pronghorn, particularly if few animals are present, if certain age or sex classes are needed for radio collaring, or if the capture area is difficult to reach by land-based vehicles. Pojar (2000) compared net gunning with the conventional corral trap method in terms of labor, equipment, and costs, and found net gunning using experienced commercial companies to be a practical and competitive capture method. Commercial companies that specialize in net gunning wild ungulates have recently become available. There are only a few of these companies in existence so choice and availability are presently limited. However, there are advantages to seeking out and using these companies, the most important being their net-gunning experience. The number of captures these companies have accomplished far exceeds those of individual agencies and this experience is of value in the efficiency, safety, and effectiveness of the technique.

A commercial company (Helicopter Wildlife Management, Salt Lake City, Utah) was used to capture 68 pronghorn in Colorado and 30 pronghorn in Utah (Pojar 2000). There was but a single mortality in the Utah operation and none in Colorado. This mortality rate is far lower than most agency operations and is attributed to operators' experience and familiarity with the technique.

Because the immediate control of the capture operation is often out of the hands of agency personnel, it is important to have a detailed protocol that addresses critical aspects of animal treatment. This protocol should be reviewed with the capture crew prior to the capture effort. The protocol should include standards for chase time and handling of captured animals as well as when animals should not be captured. A protocol for net gunning pronghorn from a helicopter is provided in Pojar (2000).

Figure 21. The net gun is the tool of choice for capturing small numbers of pronghorn, particularly if few animals are in an area, if certain age or sex classes are needed for radio collaring, or if the capture area is difficult to reach by vehicles. However, gunners should be thoroughly briefed before attempting captures as this technique can be dangerous for pilots and gunners. Photo by Richard Ockenfels.

Capture of Fawns - Fawns are captured for various management and research purposes including mortality studies. Most early captures were undertaken to raise fawns for eventual release in unoccupied, historical rangelands. In recent times, wildlife managers have conducted numerous studies to determine the causes of high fawn mortality by capturing newborn pronghorn and using radio telemetry to monitor their survival. Newborn fawns have also been marked to determine dispersal patterns upon maturing. Pronghorn fawns develop rapidly and can be easily captured only until about three days after birth. This short period necessitates specific procedures to minimize search time and ensure proper handling to avoid abandonment by does.

During fawning season observers should position themselves at strategic observation points. Binoculars and spotting scopes are useful for observing pre-parturient does or doe/fawn behavior. A doe signals impending parturition by leaving her band, frequent standing and lying, raising her tail, humping her back, and licking her

belly and flanks. Surveillance should continue for about 4 hours after birth until fawns have nursed and mother/young imprinting is completed. This waiting period is critical to reduce incidences of abandonment and insure that fawns are several hours old at time of capture. The exact bedding location should be carefully noted and the fawns should be allowed to settle down for half an hour before being approached.

Lone does with large udders should be observed carefully, as they typically nurse their fawns about every 4 hours. Early morning and late evening are the most productive times to watch an animal, the doe sometimes glancing toward her fawns prior to nursing. After nursing and grooming, the fawns bed down and the doe leaves the immediate area.

Bedded fawns should be approached slowly and quietly from their rear, and a large long-handled net about 36-inch (1 m) in diameter should be gently placed over them to assure capture. Blindfolding fawns keep them calm while handling and wearing surgical gloves minimizes the transmission of human scent. Returning fawns to their original position and gently rubbing their tails reduces their tendency to run after release (Amstrup et al. 1980). The use of nets also allows the capture of some older fawns (up to 7 days old) without a chase.

Fawns too old or wary for daylight capture can be caught with spotlights at night (Brownlee and Hailey 1970). Observations of single females at dusk often indicate the presence of fawns, and it may be worthwhile to conduct a spotlight search in that locality after dark (Tucker 1979).

From 1953 to 1957, an intensive fawn-capture project was conducted in adjoining regions of California (Ackerly and Regier 1956), Nevada (Foree 1956), and Oregon (Hansen 1955, Yoakum 1957, Compton 1958). More than 600 captures were made, some taking place four weeks after the first capture. An adult, well-trained Labrador retriever, taught to heel behind a horse ridden by a biologist, assisted in recaptures of fawns more than a week old. When a fawn was flushed and began to run, the dog chased, caught, and held it until the biologists arrived. This technique did not result in any injuries to fawns during 156 captures in a 3-year period. Horses greatly assisted in the captures as mounted biologists were able to concentrate on looking for hidden fawns, and had the advantage of a high vantage point and ease and speed of travel. The average lone worker caught 25 fawns in a season, whereas the worker with the dog and horse caught 75 (Yoakum, pers. com).

Byers (1997) handled and marked fawns for 13 years on the National Bison Range and found no significant correlation between capture effort and survival. He concluded that proper handling of pronghorn fawns did not increase the risk of predation or cause an increase in mortality.

Chemical Immobilization -- Pronghorn seem to have a narrow tolerance to most immobilizing drugs. Occupying open country, pronghorn are especially difficult to drug with darts. Having thin skins, small muscle masses, and slender, fragile bones, pronghorn also are susceptible to injury from darts.

Kreeger(1996), in the *Handbook of Wildlife Chemical Immobilization*, recommended 0.04 mg/kg Carfentanil plus 1 mg/kg Xylazine and a repeated full dose if the animal did not go down in 20 minutes, and also recommended 100 mg Naltrexone, or Naloxone, per mg of Carfentanil given, plus 0.125 mg/kg Yohimbine to be used as an antagonist. Alternative drugs listed were either: (1) 0.1 mg/kg Etorphine plus 1 mg/kg Xylazine (antagonize with 2 mg Diprenorphine per mg Etorphine given, plus 0.125 mg/kg Yohimbine); (2) 5 mg/kg Ketamine plus 0.3 mg/kg Medetomidine (antagonize with 1.5 mg/kg Atipamezole). Keeger (1996) stated that to reduce renarcotization with Carfentanil, one should give a double dose of the antagonists, one IV and the other IM. Even after antagonism, expect the animal to undergo up to 30 minutes of excitement (rapid pacing, tongue hanging out, etc.). Do not give Xylazine to a pronghorn if you are not going to use an antagonist - prolonged hyperexcitability may ensue. Although Etorphine-Xylazine can be used on pronghorn, the Carfentanil-Xylazine combination has provided a safe and effective method for capturing large numbers of pronghorn with <5% mortality (Kreeger et al. 1998).

The Ketamine-Medetomidine combination has also been used with some success on unexcited captive pronghorn. In general, pronghorn are extraordinarily difficult to immobilize so one should be prepared for less than satisfactory results. Tiletamine hydrochloride with Zolazepam hydrochloride (Telazol) is now available in the United States on an experimental basis. Nothing has been published concerning its use on pronghorn, but Bill Lance (pers. comm.) reported satisfactory immobilization of pronghorn with 13 mg/kg Telazol. Such a dose would require a 2-ml dart, which is larger than desirable for pronghorn. O'Gara (pers. comm.) broke femurs of pronghorn bucks with 2-ml darts propelled by light (green) charges from a distance of 30 yards (30 m).

Little is known concerning the effect of immobilizing drugs on fetuses of does immobilized during late pregnancy, but attempts should not be made to immobilize pronghorn during the rut. As soon as a doe becomes unsteady on her feet, bucks in the area will attempt to breed her. This can result in an extended, fast chase and the death of the doe. When a buck becomes unsteady, other bucks attempt to kill him. If they do not succeed outright, the exertion can still result in death of the drugged buck. Bucks have been observed running as far as two miles (3.2 km) at top speed to mount or fight an unsteady animal.

Carfentanil and Rompun are probably the best drug combination available today for darting pronghorn. However, the net gun seems safer for the animals and more efficient than drugs.

Tranquilizing drugs - Tranquilizing drugs promote tameness and ease of handling. They act slowly, but last for a long time. Rompun used with Carfentanil for immobilization reduces the amount of Carfentanil needed. It also lessens convulsions and reduces excitement during handling.

Immobilizing or tranquilizing pronghorn with drugs administered orally in bait would eliminate many of the dangers associated with darting or drive-trapping. However, exact dosages cannot be administered, and the animals must be accustomed to feeding on the bait. Thus, the drug must have a wide safe-dosage range.

Valium has a wide safety margin, lacks toxicity, and has been administered orally to several species of deer in enclosures, resulting in successful captures. It has been administered orally to in livestock feed and functioned well in quieting and facilitating the handling of farm animals.

Pusateri et al. (1982) mixed oral tranquilizers with grain and fed it to pronghorn. Valium showed some possibilities, but dominance hierarchies established by gregarious pronghorn made the capture of large groups (10 or more) unfeasible. Dominant animals consistently ingested most of the bait. When severely tranquilized, the animals required constant attention. Poorly tranquilized pronghorn showed signs of hyperexcitability or had difficulty gaining their feet when bedded, and stumbled and lurched when approached. Interactions with non-tranquilized animals and continued capture attempts can cause such animals to injure themselves. Extended recovery periods of up to 30 hours also pose problems. Tranquilized animals require constant attention to prevent bloat, exposure, and predation.

A dose of 2-17 mg/kg of Promazine hydrochloride given orally to wild pronghorn fawns, and one adult, did not produce visible signs of tranquility (Pusateri et al. 1982). Doses of up to three times that recommended for a 1,200-pound (544-kg) horse were administered and still produced no signs of tranquilization. Pronghorn refused to eat bait containing doses of Promazine hydrochloride crystals that would result in dosages greater than 17 mg/kg.

Capture Myopathy--Pronghorn are delicate and excitable animals. Broken legs and necks are common occurrences when capturing pronghorn in corral traps or drive nets. Broken legs have also been reported when pronghorn were herded at high speed over rough country. A more subtle form of mortality, *capture myopathy*, sometimes results when pronghorn are captured and handled. Capture myopathy usually is associated with the animal's concerted and vigorous use of muscles during pursuit and capture, chemical immobilization, and transportation. Sub-lethal capture myopathy can predispose pronghorn to predation.

Using drive traps, Chalmers and Barrett (1977) captured 594 adult pronghorn in Alberta of which 29 succumbed to acute trauma. Some signs of capture myopathy appeared within an hour of capture, but most symptoms were delayed until handling or soon after release. A capture myopathy-like syndrome was associated with an estimated 20 additional deaths as the pronghorn were being processed.

Despite the normal appearance of 32 drive-trapped pronghorn that were radio-collared and released, 6 were found dead or recumbent within 2-8 days, and within 0.5-5 miles (0.8-8 km) of the trap (Chalmers and Barrett 1977). Coyotes had consumed some

of the carcasses, and only one animal was found intact, so that determining the relative contributions of capture myopathy and predation was a problem. Some animals might not have been affected sufficiently to cause death, but were debilitated enough to become easy prey. Whatever the case, these data indicate an additional 19% of the processed and released pronghorn succumbed to capture myopathy and/or predation.

Seventy drive-trapped Alberta pronghorn were transported to rangeland enclosures and four to holding pens; three of the 70 animals were injured during transport and subsequently euthanized (Chalmers and Barrett 1977). However, the main cause of death (17 animals) appeared to be associated with capture myopathy. Most of these animals died 2-5 days after capture and transport; two died after 13 days. These investigators also examined two 2-week old fawns that died after being pursued by a vehicle. Both animals displayed clinical signs typical of capture myopathy. O'Gara et al. (2004) necropsied a fawn that was chased by a golden eagle and died of capture myopathy-like symptoms after its sibling had been killed by the same raptor.

Capture myopathy appeared more prevalent in pronghorn trapped during warm weather than cold weather and affected at least 4.2% of all pronghorn handled (Chalmers and Barrett 1977). During the later years of their study, these investigators found that the most effective practices in reducing acute cases of capture myopathy were less intensive aircraft pursuit, minimal handling, use of darkened trailers for transportation, and cold weather drive-trapping. Mortalities attributable to capture myopathy also were fewer when the transportation distance was short.

Although corral trap mortality of pronghorn generally is reported to be between two and 5%, overall mortality due to a trapping and translocating operation may be considerably higher. Mortality (probably acute trauma) at the trap site reported for 5,751 pronghorn (summation of reports) was 4.3%; mortality reported for 1,600 pronghorn transported to a release site was 7.5% (O'Gara et al. in prep.). Combining these percentages with Chalmers and Barrett's (1977) estimates of capture myopathy, overall pronghorn mortality from a trapping and translocating project ranges from 19 to 25%, and may, even under optimal conditions and reasonable precautions, approach 30%.

Chalmers and Barrett (1977) stated that chemical immobilization can also lead to capture myopathy. O'Gara (pers. comm.) noted that the only two pronghorn he immobilized with M-99 died within 2 days, even though they were immobilized for only a short time and appeared to recover without complications. One carcass was necropsied, and the cause of death was attributed to shock although clinical signs of capture myopathy were also present. Amstrup (pers. comm.) immobilized adult pronghorn with 8-10 mg of Succinylcholine chloride, but experienced a number of mortalities and observed symptoms of capture myopathy.

Pronghorn are highly susceptible to capture myopathy for a number of reasons: they have highly insulative coats that hold heat; their capture often involves long and occasionally arduous pursuit, which contributes to metabolic acidosis; and their highly excitable nature appears to predispose them to the psychological stresses of capture.

The first signs of capture myopathy include an increase in temperature, respiration, and heart rate. More advanced stages are recognized by stiffness, poor coordination, and variable paralysis. Terminal signs include a thready (faint, irregular) pulse, and a muffled heartbeat; the animal may then collapse and/or become prostrate. Severity of the disease ranges from minimal clinical signs to 100% mortality (Harthoorn 1975).

Treatment of capture myopathy in North American ungulates has been highly variable. Vitamin E and selenium preparations sometimes are administered, and although Chalmers and Barrett (1982) concluded that the injections did not necessarily reverse clinical signs, they did reduce mortality rates when used in conjunction with corticosteroids. In Oregon, Dexamethasone (5 ml) has been administered intramuscularly to moderately stressed animals, and Prednisolone Sodium Succinate (100 mg) has been used intravenously to treat advanced cases. In acute cases, Ringers Lactate Solution (500 ml) is administered intravenously with sodium bicarbonate (400 mEq/100 kg) intraperitoneally.