Bison, like cattle, are routinely handled to maintain herd health and meet the requirements of various regulatory agencies for diseases such as tuberculosis and brucellosis. Injuries and death during handling are more frequent in bison than in cattle, which have been bred for calm temperaments. Bison often break off a horn cap, gore one another, attempt to jump out or smash through a holding pen, and even die due to excessive stress caused by handling. These bison are termed "self-culling" for if they manage to survive the experience, their owners are likely to sell them. Calm handling of bison, an excitable animal, requires attention to detail and strategies that differ greatly from traditional animal handling, including cattle handling.

Habituation (training) changes the animal's perception of a frightening experience or novelty to either a neutral, or positive experience. Habituating bison to routinely accept handling procedures in a squeeze chute will help reduce injuries, thus allowing the wild genetic type to remain in the herd. Bison habituated to enter a handling facility are not tame animals, nor are they domestic in nature. They are simply conditioned to respond to a particular situation in a calm manner. If these same animals are confronted with a new novel experience, they will still respond as wild bison. Short training sessions, similar to the training discussed in this paper, can reduce the overall level of aggression in an animal. Reduction of stress experienced by an animal increases the value of the animal by decreasing abnormal behaviors, improving health, reproductive success, and overall growth. Bison that are habituated to being handled are invaluable. Dead or injured bison have relatively little value.

THE TRAINING PROGRAM

American Plains Bison (*Bison bison*), born in the spring or summer of 1997 to the Rawhide Energy Station herd in Colorado, were conditioned (trained) to some common handling practices. The calves had minimal previous contact with people and had not previously been worked through a squeeze chute. Calves were randomly assigned to either a treatment group (trained) or a control group (not trained). Every other calf exiting the holding pen was assigned to the treatment group. The treatment group was comprised of seven calves: four heifers and five bulls. The control group consisted of two heifers and four bulls.

To prevent bias, people who evaluated bison behavior during handling on January 14, 1998, did
not participate in habituation procedures. On January 14, evaluators and handlers were not aware which calves had been trained and which calves were not trained. Habituation of bison to handling was broken down into two phases; 1) initiation of operant conditioning and 2) introduction to novel experiences. The calves underwent habituation for eighteen non-consecutive days, from December 23, 1997, to January 13, 1998. Due to the short training period, the calves were not expected to learn to stand quietly in the squeeze chute while being ear tagged or the like. The reason for the short training period was due to the animals being weaned on December 22, 1997, and then transported to the National Western Stock Show in Denver, Colorado on January 18, 1998. On January 14 and 17 all thirteen calves were worked through the handling facility for their annual herd maintenance program as governed by the owners, State and Federal regulations, and the National Bison Association Gold Trophy Show and Sale. On both days calf behavior was evaluated during the handling.

Learning to learn

Before the calves could be expected to learn to be calm while being handled, they had to realize that they were safe, and that certain sounds and foods meant that their behavior was acceptable, and that the absence of these sounds and foods meant that they were doing something "wrong." Operant conditioning was used to teach the calves to stand still. Operant conditioning uses rewards and a "bridge." A bridge is an auditory sound (i.e. whistle, clicker) or a visual signal (i.e. a hand signal, a flash of light) that connects a desired behavior to a reward. Our bison really liked pretzels, peanut butter, and supplemental cake. (The cake used as a treat was not the same brand of cake fed to the animals as part of their daily diet.) Association of the reward with a bridge, and not the handler, is instrumental in reducing potential injuries from overly assertive calves. If a pretzel (reward) is only given to the animal when the whistle is blown (bridge), the animal quickly learns that this is the only time they get a treat. The use of a whistle as a bridge controlled the bison's behavior from a distance. This type of conditioning reduces the possibility of the bison rubbing against, nudging or mobbing the handler in expectation of a treat. For example, to get the bison to stand still, we waited until the entire group was standing still, then blew a whistle while tossing a handful of pretzels or "cake" to the bison. The calves quickly learned to stand still in order to hear the whistle and receive the treat. The whistle was always blown before the treat was given. The treat must be given immediately after the whistle is blown for the bison to associate the treat with the whistle. The whistle must be blown as the bison are doing the desired behavior, not before and not after the behavior. Timing is critical for successful training. This type of training has also been found to reduce anxiety in animals that are exposed to sudden noises like slamming gates and people yelling. The calves learned to focus on the trainers, and that the whistle meant tasty treats. Animals, which have had prior positive learning experience's such as being given treats for standing still, are easier to train and are more capable of further learning, than animals that had a frightening or painful experience. Once the calves had learned to learn, the second phase of the habituation began.

That wasn't so scary!
Now that the calves had learned that standing still caused a whistle to be blown and then a treat to be thrown, it was time to expand their learning. They were now taught to stand still when scared. It is important to note that learning to stand still is very different than "freezing in place" (tonic immobility). The calves were gradually exposed to a variety of new experiences and novelty, such as noises, people in different types of clothes, rattling of squeeze chute gates and bars, and walking through the handling facility. Novelty was gradually introduced to ensure that the animals would not become overly fearful. This is the most important part of any conditioning. First experiences are critical. If the first experience is frightening and causes the animal to run, the animal will be harder to convince to re-enter the same situation. However, if the experience is pleasant and does not cause the animal to flee, future encounters with the situation will be relatively smooth. If the animals were about to panic, we temporarily stopped the training, and allowed them to calm down. The novelty was never so great as to cause the calves to panic and run blindly. It was the very small steps used in presenting the object, or situation, which allowed the bison to remain calm enough to learn that it (the novelty) wasn't so scary after all! With this simple training, the calves learned that if they stood still after a "scary" experience instead of crashing into fences, they would receive a treat.

HANDLERS

Two categories of bison handlers were needed for this research: trainers and workers. Trainers were actively involved in shaping and desensitizing the experimental group to novelty. Workers were the individuals who handled both groups of calves on the 14th and 17th of January, 1998. Workers were assigned specific jobs during bison handling. Throughout the day, each worker performed the same task for all thirteen calves (seven experimental calves and six control calves). Job consistency enabled an accurate measure of the effect of habituation of bison to routine handling. The workers used calm handling techniques for both groups. Every attempt was made to keep all thirteen animals calm during handling. Brooms were used instead of whips and electric prods.

EVALUATION OF BISON BEHAVIOR

4 January 1998

Prior to working the calves, three evaluators measured each group's flight zone, from fifty feet away, from atop a fence twelve feet away, and from each group's home pen fence. The evaluators then threw a novel object, a plastic bag weighted with a rock, into the middle of the pen. Each group's response to the object was evaluated. Twenty minutes after each group was worked, this sequence was repeated using a white cotton glove as the novel object. The twenty minute wait allowed the calves time to quiet down after being handled. During handling, the evaluators recorded the time required to move the animals through different parts of the handling facility. Calves were individually separated from the group in their home pen and brought to the working facility. Evaluators also noted any signs of agitation, such as, struggling in the squeeze chute, vocalizations, pacing, head butting the fences, or head butting pen mates.
17 January 1998

Due to a change in protocol by the managers of the bison herd, handling and evaluation of the calves was greatly altered. As a group, the trained calves were brought up from their home pen to the handling facility and held as a group in the crowd pen. Once all the habituated calves had been worked, the control calves then came up as a group and were held in the crowd pen. The evaluators were the first and fourth authors and the handlers were the third author and a CSU employee who had also been a handler on the 14th. No pre- or post-handling evaluation, or timing of animal movement from one area to another, of either group was possible.

OUR TRAINING WORKED!

The average weight of trained calves was 503 pounds, while the average weight of the control calves was 498 pounds. Thus, any concerns that training would cause weight loss were quickly dispelled. Habituated calves were easier to handle, were handled with fewer people, and caused fewer injuries amongst themselves on both the 14th and 17th of January. On both days there was no difference between the two groups reaction to a novel object thrown into their pen, either before or after handling.

14 January 1998

Trained calves moved from their home pen to the working area better than the control calves. Habituated calves walked quietly, without hesitation, milling or fence running, and with no injuries, while all of the untrained calves ran in circles in their pen, ran from their home pen to the working area, and one calf received a bloody nose after running into a fence. The average time required to separate one calf from the group and move him from the home pen to the working area was 41.5 seconds for the trained calves and 4 minutes for the control calves. After arriving in the working area, the trained calves stood quieter in the holding pens than did the control calves. Habituated calves moved from the crowd pen to the single file alley easier than did the control calves, 27.2 seconds verses 42 seconds on average, respectively.

Group evaluations, before and after working of the calves, showed the conditioned calves were calmer with increasing flight zone pressure than the control calves. The trained calves paced less and were less bunched than the control calves. After handling, the distance between the conditioned calves (one to fifteen feet) did not change as the evaluators approached their home pen fence. Control calves were watchful of the evaluators. After having been handled, control calves bunched together as evaluators approached their home pen fence. Distance between the calves went from one to fifteen to two feet. Bunching is a sign of fear and vigilance.

17 January 1998
The control calves were so agitated that they required two people to move them out of their home pen. In their home pen the calves ran frantically around the perimeter of the pen and bunched as a group in the furthest corner from the gate. Once they were in the crowd pen, they had to be divided into three small groups in order to prevent them from injuring each other, and to move them into the single file alley. In the crowd pen, the calves attempted to jump out of the pen; they began goring one another and milled continuously. Once the calves had been separated into smaller groups, they decreased the number of escape attempts and were less likely to gore one another. When the gate from the crowd pen to the single file alley was opened, all of the untrained calves "froze in place" and refused to leave the crowd pen. Flags, loud noises, touching, and looming over the untrained calves, were needed to move them into the squeeze chute. There were no electric prods on the property. One person successfully moved the habituated calves from their home pen and through the handling facility. To move the conditioned calves from the crowd pen to the squeeze chute, the handler walked past their point of balance, and/or made small noises.

Habituated calves stood calmly in the squeeze chute before being head restrained, while the control calves jumped, kicked, and backed up in the squeeze chute before being head caught. Since there was not have enough time to habituate the calves to restraint in the squeeze chute, all thirteen calves struggled when caught in the headgate. The habituated calves were much calmer than the control calves until they were suddenly confronted with the new experience of being caught in the headgate. We are confident that the calves could have been habituated to head restraint with more time.

NOTES ON THE TRAINING

The experimental group walked through the squeeze chute approximately 60 times and was exposed to many novel situations throughout the experiment without injury to calves or people. Training animals with prior squeeze chute experience would be more difficult and require an extensive timetable. Research with other species has shown that if an animals first experience with novelty is frightening or painful (i.e. ear tagging in a squeeze chute), the animals will balk or refuse to enter in the future. This held true for this study, as the control calves were very difficult to move from their pen to the handling facility on January 17, 1998. Once in the crowd pen, they gored one another, attempted to escape, and finally froze in their tracks.

It was important to desensitize the calves to different sounds of the squeeze chute. From outside of the squeeze chute the authors rattled the chute, worked the levers, and slammed gates. The authors then stood inside the squeeze chute and shook the chute. While someone was inside the squeeze chute shaking the bars, another person operated the levers from the outside. Although it was difficult for the trainers to tell a difference in sound between shaking the squeeze chute from the outside or from within, it was evident that the bison could distinguish between the two sounds. Habituation, to shaking the squeeze chute from the outside and working the levers of the chute, took one day. Shaking the squeeze chute, while standing inside the chute, took three days to habituate the calves to the noise of the chute. The types of problems encountered in this
project are common problems with animal conditioning. These problems are discussed in the order that they occurred.

1. The calves initially ignored the treats thrown into their pen, either due to fear of the treats or the presence of the trainer. A variety of possible treats was provided in the feed trough overnight to allow the calves to investigate and sample them. Food that was eaten overnight (pretzels, peanut butter and supplemental pellets (cake)) was used as training treats.

2. The calves tended to "lose" their flight zone to people who entered their pen. This presented a safety hazard to the handlers that was overcome by the establishment of the "ten foot rule." When a calf came within ten feet of a trainer, the trainer used sudden jerky motions and (or) vocalizations to prevent the calf from coming closer.

3. The more confident calves were more willing to approach novel situations. Therefore, these dominant calves received more conditioning than the subordinate calves. Splitting the calves into smaller groups solved this problem.

4. After calves began moving through the squeeze chute, the dominant calves, which tended to be in the lead, would stop in the alley when they exited the squeeze chute. This resulted in a pile-up of subordinate calves in the squeeze chute. Solving this problem was accomplished by splitting the calves into smaller groups, and delaying the reward until all bison exited the single file alley following the squeeze chute, and were standing still in the holding area.

5. It was not possible to differentiate individual calves that voluntarily wandered through the chute. The trainers intentionally did not try to distinguish individuals, since this might lead to biased training. Therefore, it was not known if all calves were comfortable walking through the squeeze chute, or just the confident animals. This problem was not solvable in the context of this experiment.

6. The dominant bull calf behaved independently of the other calves, which turned out to be beneficial in one aspect, as he progressed more rapidly than the rest of the group. The downside to this was that it was not possible for one person to move all seven calves as a group into the training area. Therefore, two people were used to move the group from their home pen to the training area. Dominant animals tend to have a lower fear level than subordinate animals.

7. During the last week of training, aggression between the calves increased when the entire group was worked, versus splitting the group into subgroups. When the calves were split into two or more groups, the calves waiting to be worked always fought with each other. Placing fresh hay in the holding pen solved this problem.
THANKS!

The authors of this paper would like to thank the many people and organizations who made this experiment possible. Colorado's Rawhide Energy Station and Claude Carpenter for allowing us to use their bison calves in this study, as well as providing the personnel to assist in the handling of the calves. Other people and organizations who assisted with this project are: Gary Greathouse of Colorado State University, Alfred Keller and John Painter of the Cerro San Cristobal Ranch, New Mexico. The trainers were Clara, Tammy, April and Tom Chaffin of Buffalo Wilds Ranch, Colorado; Dan Doherty, Patrick Doyle, Eric Downing, Temple Grandin, Jennifer Lanier, and Bambang Sasonko; Colorado State University. Christa Bruns, Mike Jaroz, Guy Loneragan, and Chad Smith, from Colorado State University and Claude Carpenter were the evaluators.