

Psychological and Environmental Enrichment for Orphaned Beavers (*Castor canadensis*)

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INTRODUCTION

One of the wildlife rehabilitator's most challenging problems is that of providing psychological support for orphaned juvenile mammals. Even if one or more siblings are present, the infant is deprived of the comforting care of its mother, and the immeasurable benefits that her constant tending provides. Specific features of the den and its surrounding environment are also missing. Obviously, many of these benefits can never be replicated in a rehabilitation setting, but there are certainly many ways of creating an environment that will provide extra comfort and psychological and behavioral stimuli for the developing juvenile. The purpose of this paper is to describe a variety of methods used at the Alabama Wildlife Center to create a psychologically satisfying environment especially tailored to the needs of orphaned beavers. It is hoped that this paper will encourage wildlife rehabilitators to explore ways to enhance the captive environment for other species of infant mammals.

[**Author's Note:** The Alabama Wildlife Center follows the excellent book *Rehabilitation of North American Wild Mammals, Feeding and Nutrition* by Debbie Marcum in raising most species of baby mammals. It is not the purpose of this article to duplicate the information provided by Marcum related to the feeding and nutrition of beavers. The reader is encouraged to combine information provided by Marcum with the information in this paper to develop an effective program for raising baby beavers.]

NATURAL HISTORY OF BEAVERS

Beavers are born fully furred, with their eyes open and incisors erupting. They usually weigh about 1 lb (454 g). Litter size is usually two to five kits. Beavers

spend the first month of life in the lodge, nurtured by the mother. The lodge is composed primarily of piled up branches and mud, with a two-level chamber in the center that is accessed by an underwater entrance. Beavers are highly social, and orphaned beavers being raised in isolation without a sibling or, if single, without close contact with a human caregiver, have been known to succumb to the stress of isolation.

Beavers are strictly vegetarian, and their normal diet includes the cambium layer of trees, leaf buds, and leaves, as well as a wide range of aquatic plants. Infant beavers primarily depend on the mother's milk for the first month of life, although they are able to begin nibbling on branches as early as the second or third week. Newborn beavers are reluctant to swim, and it is only at about one month of age they begin to venture out of the lodge for short swims, remaining close to the mother until they are weaned at about six to eight weeks.

A typical beaver colony consists of a pair of monogamous adults, with their young of the year, plus the juveniles born the previous year. Only one female is sexually active in each colony, and their offspring are usually forced out of the parental territory only when they are close to two years old, as they reach sexual maturity. Obviously, there are many advantages to the juvenile beaver in spending its second year of life within its natal colony. The colony allows juveniles and adults to work together to construct and maintain dams, dig canals, build and maintain lodges, and store food underwater for winter access in northern areas, where water freezes over for much of the winter. However, first-year beavers are quite capable of foraging for food, and they also have the ability to build a sheltering lodge, even though they lack the size and strength of adults. In the South, where streams and lakes remain open year round and winters are generally mild, storage of food for winter is not a problem for first-year beavers, as vegetation is available year

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Figure 1. One of the baby beavers photographed shortly after admission.

around. Orphaned beavers that have had appropriate release preparation can be released by about six months of age. In the North, it may be necessary to hold young beavers over and release them the following spring.

BEAVER ADMISSION CASE HISTORY

Two young beavers were admitted to the Alabama Wildlife Center on February 21, 2005, after their lodge had been destroyed and their mother killed by animal control personnel in Etowah County, Alabama. The two orphans were in good health, and their weight (566 g and 578 g), appearance, and behavior indicated that they were less than two weeks old (Figure 1). The Wildlife Center staff immediately initiated efforts to provide the young beavers with an environment that was as natural and as psychologically appropriate as possible in a captive setting.

SURROGATE MOTHER FIGURE

The presence of a large, maternal figure is obviously one of the most important elements in the environment of a baby animal. The Wildlife Center makes a practice of putting some kind of large soft object in the enclosures of most precocial birds and many species of mammals. Bottle racks are used to feed a number of different mammal species, including deer (*Odocoileus virginianus*), raccoons (*Procyon lotor*), and coyotes (*Canis latrans*). Many young mammals can easily be trained to drink from a bottle rack that is appropriate to the species, permitting the caregiver to avoid handling the infants. For the young beavers, it was decided to combine the concept of a bottle rack with the surrogate mother figure.

Newly orphaned baby beavers usually require

several days to adjust to a substitute formula and a baby bottle and rubber nipple. But once the adjustment has been made, beavers usually make it very plain to their human caregivers that nursing is more than just an opportunity to get vitally needed nutrients. When the bottle is empty, the caregiver must remove the bottle swiftly and firmly, or an all-out tug of war may result, as the infant struggles to keep on sucking the nipple. Recognizing this 'need to nurse' that is typical of baby beavers, it was decided to provide the beavers with the opportunity to nurse from a surrogate mother figure that would be available at all times, not just at feeding times.

A large, stuffed figure made of fake fur was fabricated shortly after the two baby beavers arrived at the Wildlife Center (Figure 2). The figure was equipped with an abdominal pouch closed with VELCRO® (Velcro Industries B.V., Manchester, NH) that could hold two baby bottles inside the pouch with only the nipples protruding. At regular feeding times, the baby beavers nursed on the surrogate figure to receive their milk formula. As soon as the bottles were empty, they were replaced with sterilized bottles filled with plastic wrap, so the baby beavers could continue to nurse without ingesting air. Both the milk bottles and the 'pacifier' bottles were carefully cleaned and sterilized each time they were removed from the pouch.

While the surrogate mother figure was being constructed, the baby beavers were being introduced to substitute formula, following guidelines established by Marcum (1997). They accepted the substitute formula well, and the surrogate mother figure was immediately introduced. For the first few days, they had to be helped to find the nipples by a caregiver positioned behind a low barrier on the other side of the mother figure. One infant quickly learned to locate and suck on the nipple, while the smaller kit required assistance for several more days. Within a few days, both beavers were able to locate the nipples without assistance (Figure 3). From that time on, the beavers clearly bonded with the large mother figure and spent all of their resting time nursing and sleeping next to the giant figure.

HABITAT ARRANGEMENT

The two young beavers were initially housed in a small, secluded room within the Wildlife Center clinic. The chamber measures 5 x 10 ft (1.5 x 3 m), and the floors and walls are tile. The beavers were restricted to about two thirds of this area, which was barricaded with large Rubbermaid® (Rubbermaid,

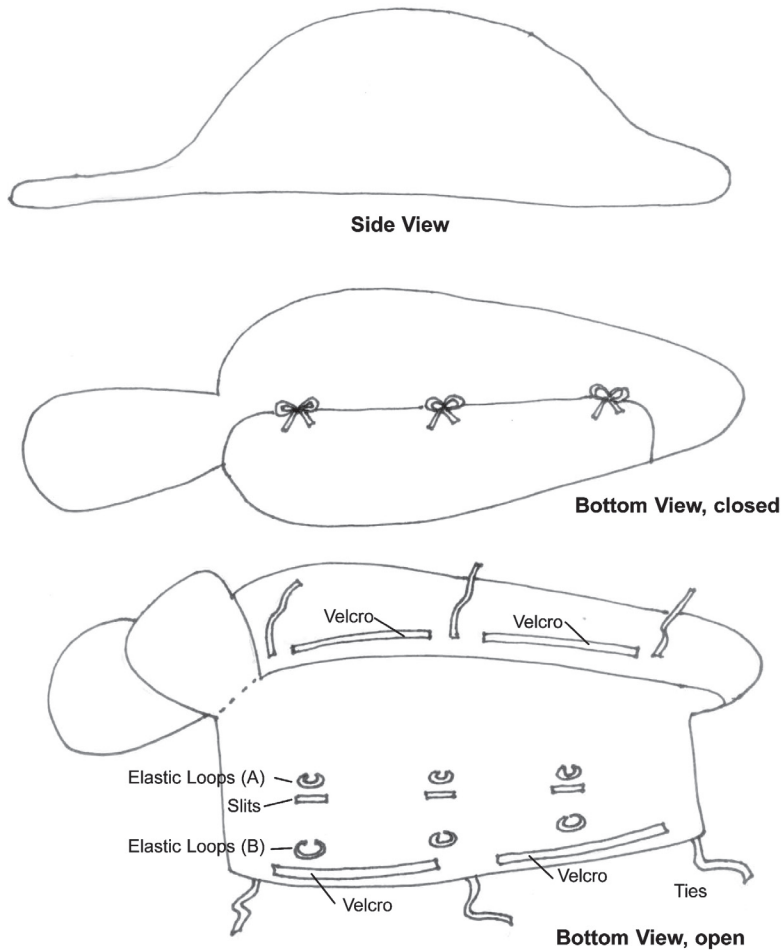


Figure 2. Volunteer Cynthia Bolding made the surrogate mother figure from dark brown fake fur. Beavers have relatively small heads and are widest close to the tail. The figure has the general outline, size, and bulk of an adult beaver, but no attempt was made to create any detail in the figure. The chief characteristics are its size, color, softness, and overall shape. An ordinary bed pillow provided the stuffing. A patterned, dark brown leatherette material can be used for the flat tail. A pair of elastic loops inside the abdominal cavity holds the bottle in place. A small slit next to loop A allows the nipple to protrude, while the rest of the bottle remains stationary inside the cavity. To position the bottle in the loops, slide the tip of the nipple through loop A and push it through the slit. Then rotate the bottle 180 degrees and slip loop B over the end of the bottle. After the bottles are securely in place, close the covering flap and fasten shut with VELCRO®, reinforced in the middle and at either end by the ribbon ties.

ered with incontinence pads covered with an ordinary bed sheet. The sheet was changed out frequently—sometimes once or twice a day, while the incontinence pads were changed at longer intervals. After their morning feeding, the beavers were gently placed in a high-sided plastic tub covered with a towel while the bedding was changed. At this time the beavers could also be weighed. Weights were obtained about twice a week until the beavers were close to weaning age (Table 1). The enclosure was warm, and since the beavers were fully furred, it was not necessary to provide a heating pad or other supplemental heat. In fact, because of their aquatic environment, beavers lack efficient means of giving off excess

Atlanta, GA) tubs to prevent the baby beavers from straying out of their section of the enclosure. The tubs served as an improvised wall that could not be knocked over but could be moved out of the way if necessary. A cloth curtain was suspended from the ceiling of the enclosure to the top of the tubs. This barrier created a small service area adjacent to the door where caregivers could carry out feeding and cleaning routines without being in full view of the beavers. The mother beaver figure was positioned just on the other side of the barrier of tubs, which also helped to hold her in a natural position.

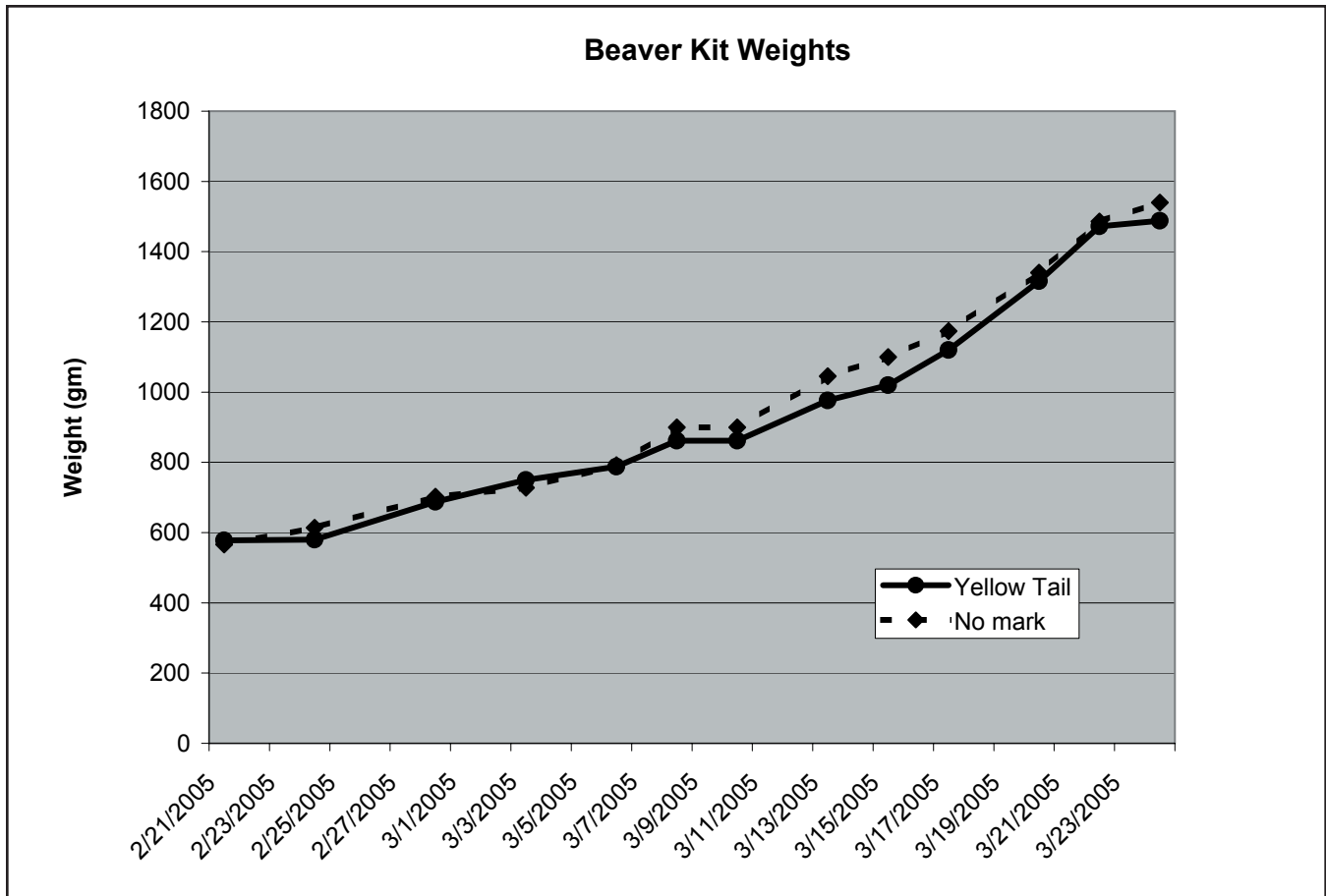
The infants were also provided with a 'lodge,' consisting of a cardboard box about 16 x 20 x 8 in (40 x 50 x 20 cm) tall, with a 6-inch (15 cm) doorway at one end on the long side of the box. When they first arrived at the Center, the baby beavers showed a strong preference for sleeping in the 'lodge,' rather than sleeping in the open. After the introduction of the surrogate mother figure, the beaver kits abandoned the cardboard lodge, and spent all of their time snuggled up next to 'mom.'

The entire floor of the holding area was cov-



Figure 3. Baby beavers nursing from the surrogate mother.

Table 1. Beaver kit weights.



heat. It is the author's experience in the South that caregivers must be alert to the danger of overheating beavers in the summer months if they are removed from their aquatic environment.

From the very beginning, the young beavers were free to roam around their small enclosure. At first, however, they spent most of their time in direct contact with the mother figure, venturing away only for brief trips to the pool or a twig pile.

Water Access. The beavers were provided with a swimming pool made of a shallow plastic tub. Rolled towels edged the plastic tub to make it easier for the small beavers to climb in and out, while also helping to soak up excess water. Very young beavers are reluctant to go in the water by themselves. They were approximately three to four weeks old before they would go in the pool without assistance and encouragement. Infant beavers do not need to be stimulated, since they defecate and urinate unassisted in water. Handling the beavers for this purpose was done with minimal contact from behind the curtain. The pool had to be removed for cleaning several times a day. One of the Rubbermaid® tubs could be moved aside

to permit the pool to be pulled back into the service area. When they were six to seven weeks old, they were given a larger pool, which was a small kiddie pool equipped with a ramp covered with AstroTurf® (American Sports Products Group, Inc., White Plains, NY). By this time, the beavers were almost ready to move outside.

Noise Control. Caregivers were required to remain silent while servicing the beaver enclosure. To screen out background noise of people working in other areas, a device was installed in the enclosure that played a continuous tape of natural sounds, with the dominant sound being frogs and crickets.

Observation. An infrared video camera was installed in the enclosure, positioned to provide a clear view of the beaver kits and the surrogate mother figure. The monitor was positioned outside the clinic so that both staff and visitors to the Wildlife Center could observe the beavers without disturbing them. This 'Beaver Cam' was very useful and was relatively inexpensive. The Beaver Cam allowed us to observe the beavers and see what they were doing when left



Figure 4. One of the beavers arriving at the release site.

completely undisturbed. For the first month, the babies spent most of their time cuddled next to the mother figure, nursing and dozing for hours at a time. Often they nursed lying on their backs, waving their webbed hind feet in the air (Figure 3).

Feeding Solid Diet. Beavers are able to eat solid food even though they are still nursing. From the day they were admitted, the beavers were offered Mazuri[®] Rodent Pellets (PMI Nutrition, Inc., St. Louis, MO) free choice at all times, as the staple portion of their diet. The food was offered on a flat tray to keep it from getting damp. According to Marcum (1997), the staple should compose about 90 percent of the post-weaning diet. Marcum also recommends offering freshly cut tree branches as well as algae and water plants, including roots. The Wildlife Center had access to an unlimited supply of freshly cut saplings and branches of sweet gum (*Liquidambar styraciflua*), maple (*Acer* spp.), and other tree species, and these were used as the main natural forage for a twig pile. The beavers were first observed nibbling twigs just a week after their arrival.

Weaning. By the time the beavers approached weaning age (six weeks), they had become much more active, and they spent a good deal of time in their shallow pool or browsing on fresh twigs and buds along with

Mazuri[®] Rodent Pellets.

While they were still being weaned, the young beavers gradually abandoned the mother figure and began to drag twigs and small branches into the cardboard box 'lodge' described above. Following Marcum (1997), the formula feedings were gradually decreased without any difficulty, as the beavers simply lost interest in nursing. At about seven to eight weeks, they stopped sleeping next to the mother entirely and slept instead in the 'lodge.' It was absolutely clear that the reassuring presence of the huge mother figure was no longer central to their sense of well-being.

RELEASE PREPARATION

When the beavers were about eight weeks old, they were moved outside to a spacious enclosure containing a good-sized pool (8 x 12 x 2 ft [2.5 x 4 x 0.6 m]). The pool area contained a wooden den box measuring 2 x 2 x 4 ft (0.6 x 0.6 x 1.2 m), which normally stood on the pavement adjacent to the pool. To make the den box into a 'lodge' for the beavers, volunteer Kathy Early boarded up the doorway and cut a round opening 14 inches in diameter in the floor of the wooden box to create an underwater entrance. The front of the box was pushed forward so that about one third of its length projected out over the water, and 2x4 studs were attached to each front corner to serve as legs. When the pool was full of water, the beavers would be able to swim in and out of their 'lodge' through an underwater entrance. The beavers were moved into the pool area in their familiar cardboard 'lodge,' which was



Figure 5. Returning to the wild.

placed on an AstroTurf[®] mat close to the new lodge with the underwater entrance. This gave the young beavers time to adjust to the new surroundings while remaining in the psychologically reassuring surroundings of their previous home. After hiding in the old lodge for about an hour, they came out, ate some food, and entered the new lodge with the underwater entrance. The beavers visited both lodges for the next few days until the cardboard lodge became weakened from water damage and was removed. Allowing the beavers this opportunity to make a gradual transition to the new shelter was a small but important part of the protocol for creating a stress-free environment.

After the cardboard lodge was removed, the beavers still did not fully commit to the new lodge—they often could be seen crouched in a corner of the pool enclosure. Apparently the large, empty wooden box was not sufficiently ‘beaver friendly’, and certain alterations were made. A thick bed of cypress landscaping mulch was spread over the wooden floor of the box, and a network of branches was wedged into the upper part of the box, leaving a much smaller space for the beavers to inhabit. As soon as these modifications were made, the beavers took up residence in the box, and thereafter were not to be seen outside before dusk when they became active for the night.

The pool was supplied with an abundance of large, freshly cut saplings of sweet gum, pine (*Pinus* spp.), maple, and tulip poplar (*Liriodendron tulipifera*). Over time, the beavers became so adept at processing these food items that a 15-foot sweet gum placed standing in the pool on one day would be reduced to a heap of portable branches by the following day. The large main trunks were stripped of all bark and were left floating in the pool. The beavers dragged the cut branches up the ramp from the pool and added them to a growing pile positioned directly behind the lodge. They also accumulated a mushy mixture of bark chips, leaf particles, and other small debris that created a thick, damp substrate around and within the branch pile.

A brood of six young wood ducks (*Aix sponsa*) maturing about this time was introduced into the pool enclosure. While the main reason was the lack of an alternative environment for the ducks, the mixing of species had added benefits for both, as they were exposed to the presence of other species that would be a familiar part of their environment after release. The wood ducks appeared comfortable in the environment created (and altered nightly) by the beavers, and they spent part of their day sheltering in the large pile of branches the beavers were constructing behind their ‘lodge.’ The peeled floating logs made good perches

when the ducks were in the water.

As time went on, the branch pile grew ever larger, but it was only when the beavers were captured for release that its true significance came to light. In early September, with the pool drained and the underwater entrance blocked, one side of the hinged roof of the wooden box was raised to permit the capture of the beavers. The box was found to be empty, because the beavers had chewed an opening in the back wall of the box and had moved into the lodge they had constructed for themselves up against the back of the box, under the ever-growing pile of branches. Sometime over the previous weeks, the wooden box had been converted into a tunnel leading to their real lodge, which was just like the one they would soon need to construct at the release site. This was solid proof that the beavers were indeed ready for release and would certainly be able to care for themselves in the wild. The two young beavers were herded into pet carriers and transported to the release site (Figure 4).

Release Site Selection and Release. Beavers are highly adaptable and inhabit a wide range of water sources, although they prefer low-gradient streams, ponds, and small, mud-bottomed lakes. In deeper streams and existing lakes or ponds they may not build a dam at all. Such areas are ideal release sites for young beavers, since they will not have to expend the energy to build a dam during the first few months after release. In the North, it is especially important to select a release site where water will not freeze all the way to the bottom.

It is the usual policy of the Alabama Wildlife Center to return animals to the place where they were found. However, in this case, the beavers had been orphaned when animal control personnel destroyed the colony because of nuisance complaints. Because of this, the decision was made not to return them to their natal area. Instead, we selected a sizeable swampy area fed by a small river, a tributary of the Black Warrior River. The swamp is extensive and is seldom visited by people. Hence, there are few roads or dwellings, and the likelihood of conflict with humans is minimal. Ample vegetation is available and the slow-flowing river provides a safe corridor for the young beavers to seek out a territory in which to settle (Figure 5).

CONCLUSION

All the methods used in this case were simple and inexpensive, and volunteers constructed most items.

Continued on page 25.

(Forrester, continued.)

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(Lord, continued.)

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(Miller, continued.)

It is hoped that this will encourage wildlife rehabilitators to look for other applications of some of these ideas to provide psychological and environmental enrichment for infant wild creatures, whether in a home based setting or in a rehabilitation center. In particular, the surrogate mother figure was so successful with the beavers that the author would be interested in hearing from others if they successfully make use of the device for other mammal species.

ACKNOWLEDGEMENTS

The author would like to thank Mammal Intern Catherine Britt for her dedicated assistance in working with the beavers and for her help in sorting through the records for this article. Thanks also to Cynthia Bolding and Kathy Early for their creativity in helping to provide a nurturing environment for the beavers. Special thanks to Carol McWhorter for drawing the diagram of 'Mother Beaver' for this article.

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[**Editor's Note:** Rehabilitators may have difficulty locating a copy of the Marcum publication cited for this article. The NWRA *Principles of Wildlife Rehabilitation, The Essential Guide for Novice and Experienced Rehabilitators* contains much of Debbie Marcum's information in the Mammal Nutrition chapter.] (NR)

(McFarland, continued.)

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