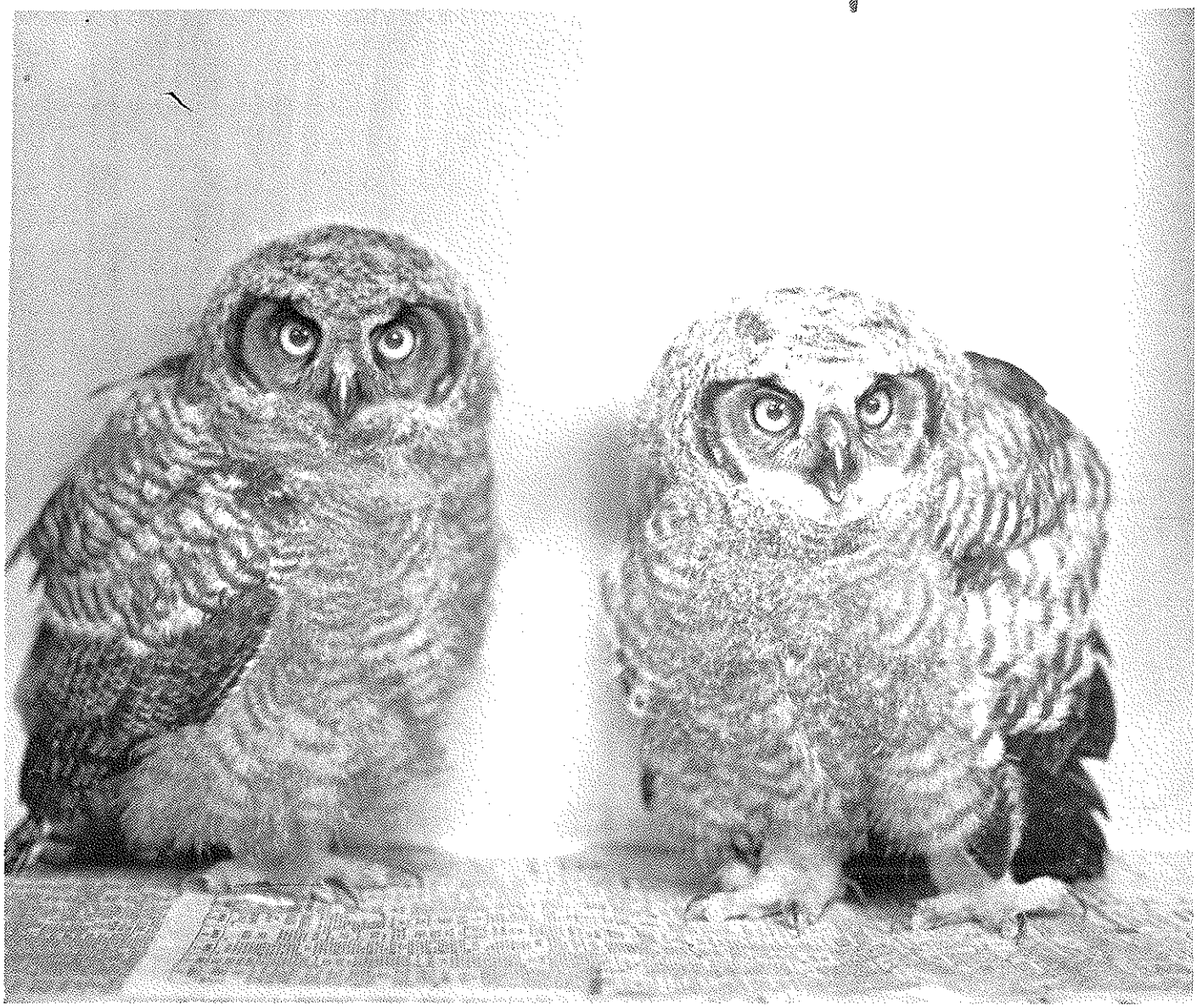
Vol. 10, No. 2

WILDLIFE JOURNAL

Journal of the International Wildlife Rehabilitation Council

Sample



Raising Orphan Raptors . . .Page 3

WILDLIFE HOTLINE! A Little Help From Your Friends!

Wildlife emergencies usually happen at the most inconvenient times — leaving many rehabilitators feeling isolated and helpless. Are you a rehabilitator who can't reach your veterinarian? Are you a veterinarian who can't reach your rehabilitator? The WILDLIFE HOTLINE was designed to help people in such instances by offering advice, or referring you to an expert who can. Whether it's a "strange" animal you've never seen before...or a "problem" you've never dealt with...the WILDLIFE HOTLINE is open 24 hours a day — manned by experts who care. (And the WILDLIFE HOTLINE is not limited to emergencies. It is also available for questions regarding any kind of wildlife care. Non-emergency calls should be made during regular hours; Pacific Time.)

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Need Some Help?



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1. Submissions should be typed and double-spaced, with 1 inch margins.
2. Full length articles run between 1500 and 2500 words.
3. Fillers and short articles run between 500 and 1500 words.
4. The writer's name and address and organization should be typed on the first page, and name and page number should appear on all consecutive pages.
5. It is the writer's obligation to obtain permission or reprint rights if submitted copy has been published elsewhere.
6. Provide a stamped, self-addressed envelope if you wish manuscript and/or photos returned.
7. We accept black and white glossy photos only, preferably 8 × 10.
8. We pay $25 for any feature article accepted; $5 for any fillers and "Handy Hints" under 500 words.

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WILDLIFE JOURNAL

Summer 1987 Vol. 10, No. 2

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1114 Cypress Lane
Davis, Ca 95616

Printing By Peninsula Blueprint
Mountain View, California

Typesetting by Ancona Graphics
San Mateo, California

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EDITORIAL . . . .

—Pathfinders

As the field of wildlife rehabilitation progresses through its many stages of development it seems to take two steps forward and one back. Ironically; this is as it should be, for growth and development are risky and require leaders/managers who are willing to take risks. We in the non-profit world tend to forget that while we are unique to the business world, owing to the commitment of boards of directors who donate their leadership as board members, we have many similarities with corporate America. Harold Leavitt wrote *Corporate Pathfinders* (Penguin Books) in 1986, and because it is so relevant to the problems that we face in non-profit corporate management I plan to devote the next two editorials relating what he has said to my experience in this field.

By creating a field of work that previously did not exist, we are pathfinders. Pathfinding is a process of developing a vision or a mission of what this field should be. As Leavitt says, "#1 pathfinding is about getting the right questions rather than the right answers. It is not about figuring out the best way to get there from here, nor even making sure that we get there. It is rather about pointing to where we ought to try to go." Pathfinders are easier to identify than to develop.

Leavitt's model divided management into three components: #1 pathfinding, #2 problem solving, and #3 implementing. The #2 problem solving component requires managers to take ill-defined problems and organize them systematically. "They have to make order out of chaos." Does this sound familiar?

The #3 component is the implementation of the solutions. This is an area where "movers and shakers" can shine. It is also where we see the most participation, since everyone seems to have an idea about how solutions should be implemented.

Leavitt describes the interaction of these three components. It is this interaction that I see on various boards of directors that helps understand to me why some groups are static, some flounder, and some flourish. Power struggles often occur between the #1 and #3 pathfinder-implementer and the #2 problem solvers. "For obvious reasons, #2 problem solvers don't want stubborn, intractable, impractical visionaries around. Pathfinders often ignore the rules, or act impulsively, or wave off what they see as trivial details." He then describes problem solvers as follows: "Decentralization is valued by #2s because it permits tighter control over the organization. Decentralization pinpoints responsibility to a few key profit centers. By controlling at those points, one can more effectively control the whole show. For #2s, decentralization thus helps bring about the conditions they love: order out of chaos, clearly defined key jobs, and measurable results."

This discussion will be continued in the next editorial.

Jan White

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REARING AND RELEASE TECHNIQUES FOR ORPHANED RAPTORS

GLENN R. STEWART
Ventana Wilderness Sanctuary
Carmel Valley, California

INTRODUCTION

For more than a decade, endangered raptor population restoration specialists have used hacking release methods to reestablish nesting populations to areas of extinction. The techniques for rearing and release have been proven to be effective for peregrine falcons, bald eagles, Harris' hawks, elf owls, Andean condors, ospreys, white-tailed sea eagles, and other species. However, the techniques have not been widely adopted by the rehabilitation community for use with common raptor releases.

Under a cooperative agreement with the Monterey County SPCA Wildlife Center's director, Lisa Hoefler, Ventana Wilderness Sanctuary assisted with the rearing and conducted the releases of 31 orphaned raptors during 1986. The primary departure from generally accepted methods was the elimination of "live-preying" in a flight aviary in favor of placement on a "hack tower" and release at the natural fledging age.

Elizabeth Adams managed the releases and documented post-release behavior of the raptors under this initial year of the project.

Our intent is to conduct several years of releases supported by radio-telemetry monitoring of post-release behavior of a variety of raptorial species. This research was initiated under a grant from the Helen V. Brach Foundation with the understanding that our results would be shared with the wildlife rehabilitation community to increase the post-release survivability of orphaned raptors, nationwide.

GOALS

The goals of this program are to 1) raise orphaned raptors in a manner that will preserve their wildness; 2) provide appropriate food; 3) release the birds at their natural fledging time; and 4) offer post-release support to the birds through established hacking methods.

THE ORPHANED RAPTOR BARN

A facility was needed in which to rear 2 to 5 week old raptors that would eliminate exposure to humans and the stress of near proximity to other species. A 10 x 26 foot barn was constructed. It has a partitioned nest shelf and barred windows to permit sunlight and view the surrounding, natural setting.

Sliding door food ports allow the use of hand puppets for feeding younger birds. Later, food is simply dropped through the port for the birds to tear apart themselves. Generally, the youngsters are able to begin tearing apart food as soon as they can stand upright and walk.

Raptors are held in the barn in sibling groups from about ten days of age to five weeks of age with some variation among species.

An alternative to puppet feeding is the use of a surrogate parent. The use of a surrogate will substantially reduce the level of human care required to rear the young. A minumum 10 x 10 foot room must be provided for each surrogate parent. This rearing method may be a consideration for rehabilitators with non-releaseable adults.



Young Barn Owls

FOOD AND FOOD PRODUCTION

A 10 x 10 foot room is the minimum space needed for a freezer and chicken brooder. If the brooder may be operated elsewhere, for example a cooperator's facility or residence, so much the better.

Chickens grown to two and a half or three weeks of age are the principal food source for the birds. We supplement the young raptors with rats and mice, quail, and day old chicks occasionally and as available from our cooperators at the SPCA and the Santa Cruz Predatory Bird Research Group.

We have the very fortunate luxury of donated day-old cockrel chicks from the Cal-Cruz Hatchery in Santa Cruz. These chicks have a few nutritional advantages, particularly the yolk sac, but are not an adequate food source for growing raptors because of their lack of calcium. A steady diet of day-old chicks will cause metabolic bone disease among young birds of prey. It is for that reason that we raise the chickens in a brooder for two or three weeks and also supplement with full-grown quail, mice, and rats.

REARING METHODS

Newly hatched to one week old raptors may be hand-fed with tweezers without fear of improper imprinting. Such young birds are very uncommon in rehabilitation centers currently but this may increase as efforts to salvage eggs and young from the path of bulldozers increase.

Beginning at about 10 days of age, a puppet should be used to present food to the young raptors. The actual artistic design of the puppet is not as important as its proper use. Our main objective is to eliminate human contact and the association of humans as the food providers. It is the completion of this parental duty that is the foundation for bonding that we refer to as "imprinting." Improper imprinting can ruin a raptor's chance for survival in the wild!

Sibling identification will occur among nestmates reared together on one of the raptor barn's nestshelf compartments. Interaction among siblings from three weeks of age through fledging and dispersal will insure proper imprinting in the absence of natural parents.

It is important that the eyasses, or nestlings, be left completely alone from three to five weeks of age. The birds may be observed through a peephole and should be watched during feeding to be sure each one receives adequate amounts of food.

At five weeks old, eyasses should be banded and moved to the hacking structure.

HACK SITE PREPARATIONS AND PRE-RELEASE CONSIDERATIONS

Hack boxes built to The Peregrine Fund's specifications are adequate for the hacking release of most species commonly encountered by wildlife rehabilitators. These boxes are 3 x 4 x 5 foot plywood enclosures with a vertical barred front set either on inaccessible cliffs or towers. The box provides a safe place for the birds to complete their development and feather growth that is similar to a natural nest site. It can be secretly approached from behind for feeding and observation of the young.

Care should be taken in the selection of release sites. Factors to consider include: 1) orientation of the box to wind and weather, 2) proximity to the nest sites of resident raptors, and 3) attitudes of neighboring property owners toward raptors.

Scavengers and predators will be attracted to the hack site by the uneaten food scraps that are an inevitable by-product of any hacking release operation. Measures must be taken to eliminate access of these animals to the tower platform where young raptors will be vulnerable to attack.

THE HACKING PROCEDURE

Hacking release methods have been perfected during the past decade and a half primarily by The Peregrine Fund in their efforts to restore the peregrine falcon population nationwide. Since their pioneering work with the peregrine, the methods have been used successfully to restore extinct populations of bald eagles, Harris' hawks, elf owls, ospreys, aplamado falcons, white-tailed eagles and other species.

Captive reared eyasses are placed in hack boxes for the week prior to their natural fledging date (42 days of age for peregrines). The birds are fed through a food chute and observed through peepholes during that week to insure good health. The barred front of the box is removed on a predetermined fledge date after the birds have been ushered into a "hide" at the rear corner of the hack box. A three day supply of food is scattered about in and around the box before the surrounding area is cleared of human activity.

The birds are left alone to leave the box and fledge at their discretion. Short flights occur in the area of the release site as the youngsters practice flight and landing skills.

One of the most important events in the hacking process occurs when each bird makes its first return to the hack box for food. Once that connection is made, the birds usually continue to expand their area of exploration and flight until independence and dispersal from the hack site occur (for peregrines that is usually 35 days after fledging).

It should be noted that the hacking procedure was developed for reintroduction of peregrine falcons following extensive observations of behavior at wild peregrine eyries. This work was conducted primarily by Dr. Steve Sherrod. Dr. Sherrod discovered that the development of flight and hunting skills in fledged peregrines at hack sites was very similar to that observed at wild eyries or nesting sites. Properly hacked raptors then, do not suffer developmentally from a lack of parental care.

The importance of release at the natural fledging date should be emphasized. Young raptors become difficult to hold in the hack box after that time and release will cause premature

dispersal since the birds have the ability and desire to fly a long distance from the hack site making it difficult or impossible for them to navigate back to their source of food when they become hungry.

ADVANTAGE OVER TRADITIONAL METHODS

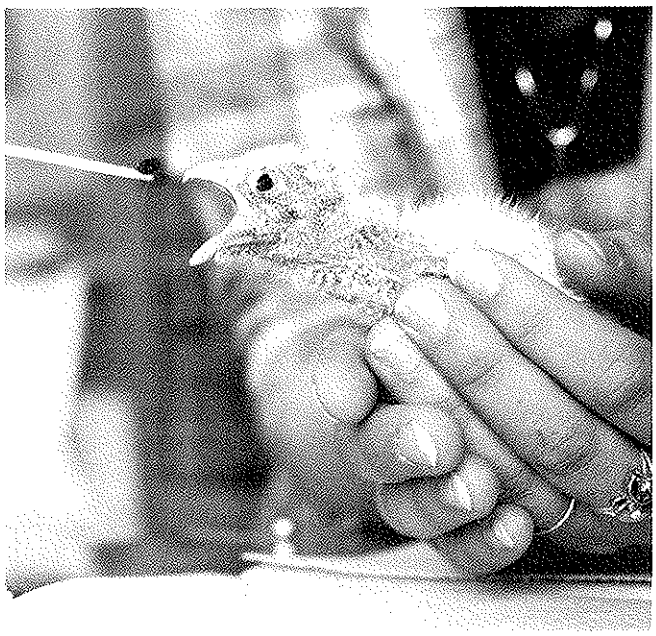
Orphaned raptors are often held in aviaries of various sizes and given live prey for a period of time after the normal fledging date. I would suggest that such procedures deny the birds a proper opportunity to develop open air flight skills and muscular conditioning. The subsequent release of aviary-held birds without the advantage of a dependable post-release food source while they acquire the necessary skills and conditioning, must certainly diminish their post-release survival.

1986 RESULTS

Thirty-one (31) raptors were released under our program during 1986. These included eight kestrels; three red-tailed hawks; thirteen burrowing owls; and seven prairie falcons. Beth Adams, a former hack site attendant for The Peregrine Fund, managed the release of all the birds in an heroic effort that was aimed at demonstrating that a commitment of time similar to that required for traditional methods could produce improved survivability.

KESTRELS

The kestrel were provided to us for release in two groups after their normal fledging date. We nevertheless attempted hacking releases by creating a two foot square by one foot high box mounted atop a ten foot pole. Predictably, they dispersed immediately and with one exception, were not seen in the area again. That kestrel was seen feeding at the burrowing owl hack site on several occasions.



Three day old Kestrel

REDTAILS

Two red-tailed hawks were brought to us as "early fledges," or birds that had recently fledged and were picked up by well meaning, through uninformed people. They were placed in a hack box for only two days prior to release. The release was successful with the two returning regularly to eat at a hack board where the box had been for six weeks.

A third red-tailed hawk, also an early fledge, was released from the platform where the previously released red-tails were feeding. It was placed upon the platform with abundant food in the pre-dawn twilight on its proper fledge date.

The bird formed a social bond with the slightly older hawks and continued to use the feeding platform until its dispersal toward the Salinas Valley was documented by radio-telemetry monitoring seven weeks post-fledging.

PRAIRIE FALCONS

Seven prairie falcons were provided for release in groups of two birds and five birds. The group of five were placed in the hack box one week after the group of two fledged. The earlier released birds continued to feed at the hack box apparently unaffected by the presence of the other prairie falcons being held for release.

Four of the seven prairie falcons were fitted with backpack radio transmitters. The mortalities of two of them were documented by telemetry tracking. At four days and two week post-fledging, the prairie falcons were found to have been killed by great-horned owls. Dispersal was documented for the other two telemetry tagged falcons six weeks post-fledging. Observations at the hack site indicated that the non-radio tagged birds dispersed at about the same time.

BURROWING OWLS

Thirteen burrowing owls were released under the program. These birds were rescued as eggs from nest burrows known to Joan Priest of the Humane Society of Santa Clara Valley. The burrows were excavated by her immediately prior to the commencement of bulldozing in the area that would have destroyed the nests.

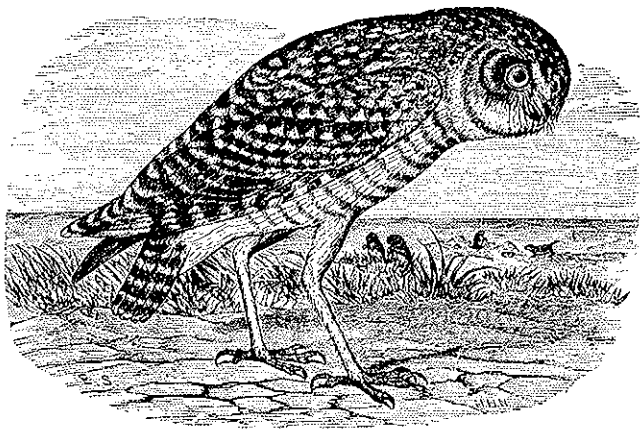
The eggs were hatched at The Peregrine Fund's Santa Cruz facility and the chicks reared in part by them and Joan Priest. We released the birds from two adjacent burrows that we designed and constructed for the purpose.

The burrows consisted of 12 x 18 x 12 inch cast concrete water meter boxes and a 4 inch diameter by 6 foot long entrance tunnel. Food was dropped through the door at the top of the box that is usually used to read the meter. Fledging was prohibited for three and four days by a mesh barrier at the mouth of the tunnel.

The owls returned to the burrows after fledging and took refuge there from about 10 am until 4 pm each day. They perched upon nearby fence posts in the afternoon and were found to be quite active in the surrounding fields during the darkness.

Photos courtesy of Peninsula Humane Society, San Mateo, California.

Dispersal occurred during the fourth week post-fledging and no owls were observed feeding at the hack site during the fifth week after fledging.



Burrowing Owl

THE USE OF RADIO-TELEMETRY EQUIPMENT

We mounted backpack radio-telemetry transmitters on selected individuals in an effort to provide data in addition to our occular surveys on the post release survivability of the young.

We will increase our use of radio telemetry during future years to further quantify the success or failure of these release methods for the rehabilitation community. Radio telemetry is a useful research tool but is not necessary for successful hacking releases. It should be attached to birds carefully by experienced and properly permitted personnel.

Our radio transmitters were built by L. L. Electronics of Mohamet, Illinois. The units weighed 11 grams, were attached with a one quarter inch teflon sleeving harness, and had a battery life of three to five months. The attachment method allows the units to be shed.

SUMMARY

Orphaned raptors are rescued or delivered to wildlife rehabilitation centers at all stages of their development. The early preparation of facilities designed to eliminate taming of the young and stress caused by proximity to other species will allow introduction of the birds into an established system of rearing. Timely release by hacking methods will improve post-release survivability.

Such rearing and release methods have been developed, refined and proven for the reintroduction of threatened and endangered populations of raptors. The universal application of these methods to orphaned raptor rehabilitation is both feasible and needed.

This paper is intended to serve as an introduction to hacking methods for raptors held by rehabilitators. We will continue our work in this area and produce a comprehensive guide to rearing and release upon the accumulation of results from several years of banding, radio-telemetry monitoring, and observations.

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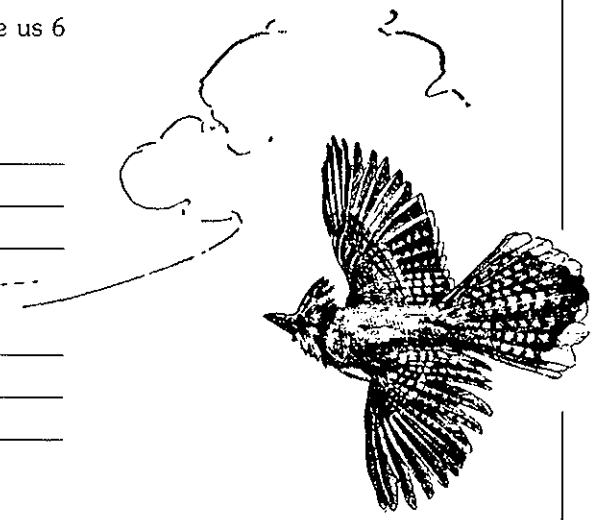
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Some comments on outdoor flight/exercise cages in general...

Within practical limits, the cage should be as large as possible. It's almost impossible to build a flight cage too big - but it's very possible to build one too small. A long, rectangular shaped cage offers a greater straight-line flying distance than does a square shaped cage with the same sq. ft. area, and so is more desirable.

The following are suggested minimum sizes:

Large species (Red-tailed Hawk, Great Horned Owl, etc.)
24' x 12' x 8' high

Medium species (Cooper's Hawk, Long-eared Owl, etc.)
20' x 8' x 8' high

Small species (Am. Kestrel, Screech Owl, etc.)
16' x 8' x 8' high

It is important to have air-flow through the cage, allow sunlight to enter, and yet at the same time offer privacy to the bird.

We have found that walls built from a combination of solid plywood sheets and vertical slats, and roofs made of vinyl covered chain link wire best accomplish these ends. Wire, of any kind, should not be used for walls or vertical partitions on exercise and per-release flight cages. Wire can be used on ceilings. Crushed gravel covered with sand is the best medium for floors. Perches should be covered with hemp rope, astro-turf, or indoor/outdoor carpeting.

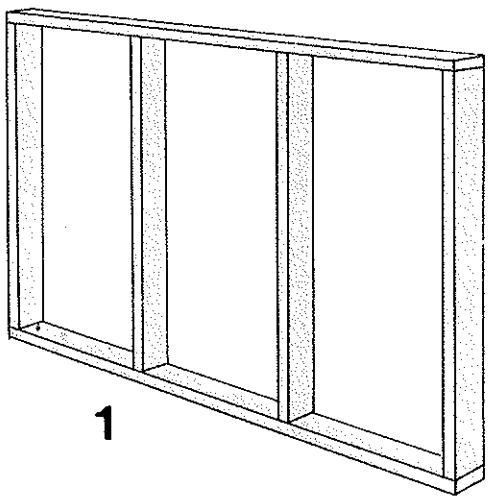
Flight and pre-release exercise cages of this type have been in use at The Raptor Trust for nearly twenty years. Our experience has shown cages built in this manner to be functional, long-lasting, easy to erect, and reasonably maintenance free. Because we use treated (CCA) lumber wherever possible and only new, high-grade materials, the cages are expensive to build; the approximate cost of the materials for a 24' x 12' x 8' high cage is $1,200.00, but we feel the benefits of quality caging, to the birds and to us, justify the expense.

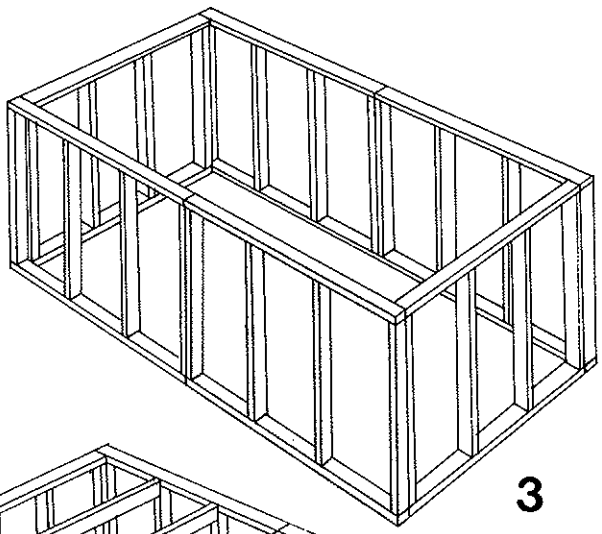
Site preparation . . .

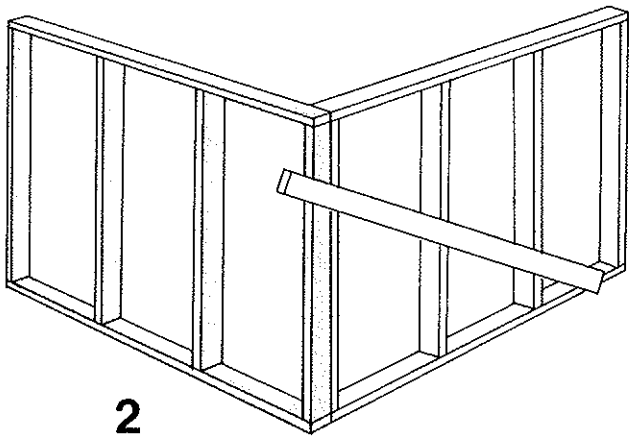
Clear the area where cage will be located, then spread a base of 3/8" clean, crushed gravel about 4 to 6 inches deep over the entire area the cage will occupy. Approximately 10 tons of gravel will be required. The gravel permits easy leveling of the cage and also allows water to percolate, keeping the floor area dry.

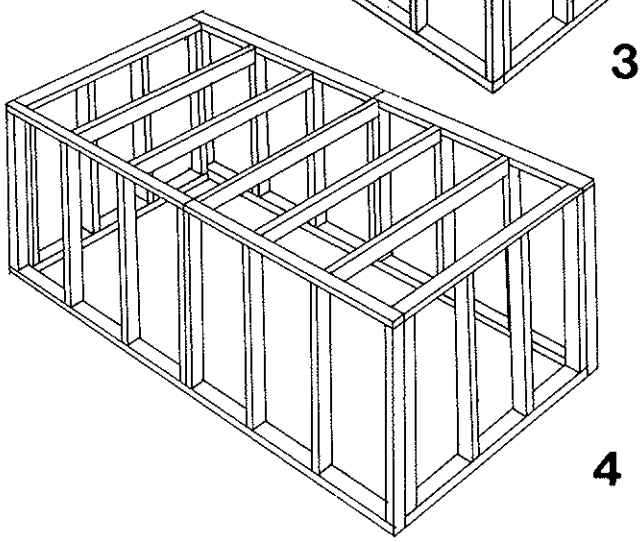
The cage described in these plans is 24' x 8' x 8' high.

1. Begin by building wall sections 12' long x 8' high out of 2" x 4"s. Six such sections are required for the exterior frame of this 24' x 12' cage. Space the 2" x 4" uprights on 48" centers. This will allow easy attachment of the 4' x 8' plywood sheets later on. Use 16d nails.
2. Erect the sections on the prepared site and nail them together with 16d nails. Diagonal supports can be used to help hold the sections in proper alignment and can be removed later.
3. Orient the cage so one 12' wall faces north. This wall will be made completely solid later on, giving protection from wind and weather. With all six sections erected and nailed in place, the cage, although a bit shaky at this point, will stand on its own.
4. Install 2" x 4" x 12' long roof rafters, on edge, for maximum support. Use 10d nails. Cover the cage floor with mason sand 4"-6" deep before closing in the walls.
5. Nail on the 1/2" plywood sheets and the 1" x 4" x 8' slats using 6d nails. Keep the cage frame level and plumb as you go up. Make the 12' long north wall and an 8' long section of each 24' long wall adjacent to the north wall, solid plywood. This forms a closed "U" shaped section giving the bird protection from wind and drafts. Any combination of slatted and solid plywood sections can be made in the remainder of the cage, but it will facilitate air movement if the slatted sections are placed directly opposite each other. Space the slats approximately 1" to 1-1/4" apart.
6. Build two door frames approx. 80" x 30", out of 2" x 4"s. (The 30" width will allow a wheelbarrow to pass through.) The doors can be either solid plywood or slatted. If slatted, a diagonal brace (not pictured) should be nailed on to prevent the doors from sagging. Hinge the exterior door to open out and the interior door to open in. Hook and eyes, hasps or other suitable latching devices can be used to keep doors closed. We advise that all flight cages be double-doored in this manner to avoid any possibility of a bird escaping prematurely. The interior wall of the double-door cubicle can be solid or slatted.





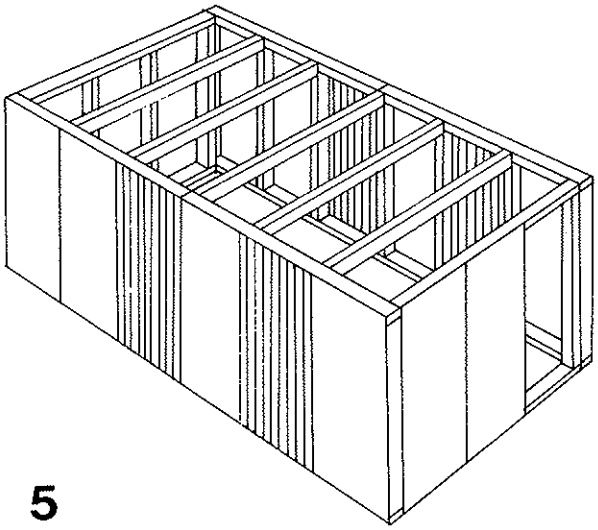


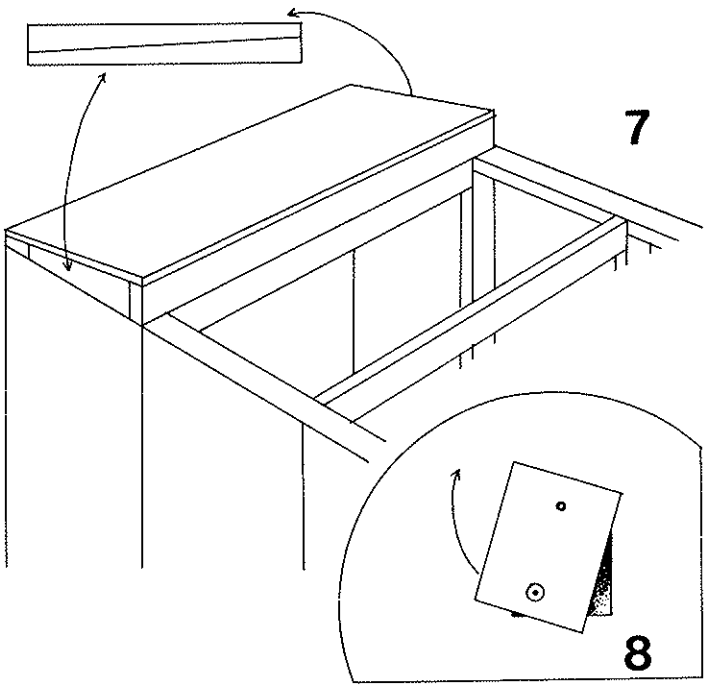


7. Build a solid 4" x 12" roof at the north end of the cage opposite the door, using 5/8" thick plywood sheets. Pitch the roof slightly to the rear to shed rainwater. Cover this roof with 90lb. roofing paper or roofing shingles.
8. Cut a 5" dia. hole through the plywood wall and attach a 12" square, moveable plywood cover. This will allow you to feed the occupants through the "food drop" without entering the cage. To insure that a bird does not escape if the plywood cover is accidently left ajar, tack a 12" square canvas flap over the opening, on the inside of the cage.
9. Cover the rest of the open roof area with vinyl coated chain link wire. Fasten the wire securely using 1" galvanized staples. We paint the inside of the cage with glossy white latex paint and stain the outside with redwood exterior latex stain.

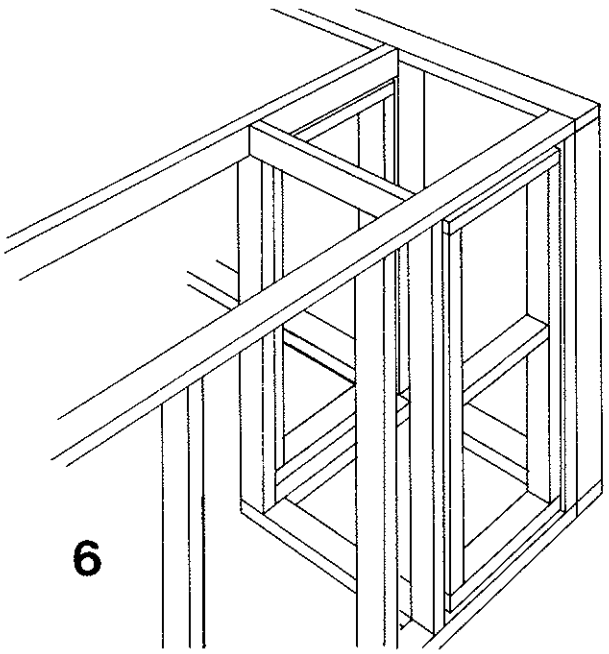
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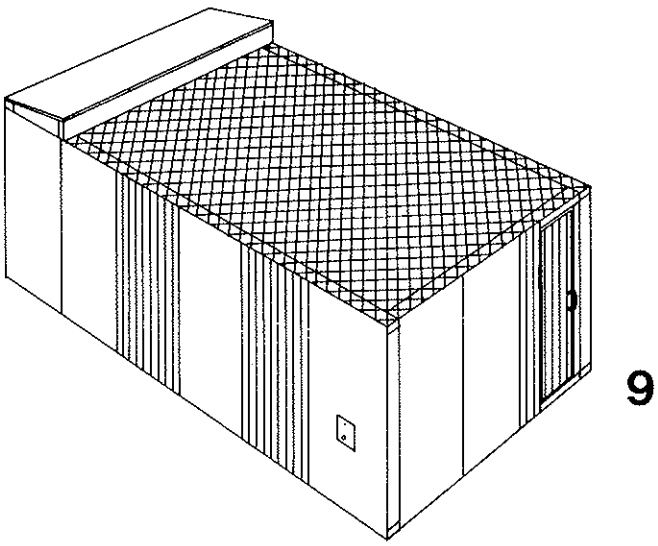
2" x 4" x 8" #1 CCA Southern Pine
2" x 4" x 12" #1 CCA Southern Pine
1" x 4" x 8' #2 CCA Southern Pine
4' x 8' x 1/2" CD Exterior Fir Plyscore
4' x 8' x 5/8" CD Exterior Fir Plyscore
6d galvanized common nails
10d galvanized common nails
16d galvanized common nails
1" galvanized wire staples
90 lb. mineral surface roofing paper
3/4" galvanized roofing nails
9 gauge 2" mesh vinyl covered chain link wire, or:
11 gauge 1-1/2" mesh vinyl covered chain link wire
3/8" clean crushed gravel
Mason sand
Gloss white exterior latex paint
Exterior latex stain
4 - 3-1/2" brass hinges
4 - 6" door pulls


5


7

8


6


9

1987 East Coast Spring Graduates of the Basic Wildlife Rehabilitation 1AB Class

All individuals listed below received a passing score of 70% or better on the IWRC Basic Wildlife Rehabilitation Exam and have completed two sets of homework on nutrition and calculating drug dosages. Additionally, all participants have successfully demonstrated adequate skills in wildlife care and handling in a supervised laboratory session. These individuals are IWRC certified in Basic Wildlife Rehabilitation.

Patricia O'Connell
Drexel Hill, PA

Lynn Stemmy
Seabrook, MD

Nancy Foster
Castroville, MD

Jean Ketchel
Gaithersburg, MD

Cynthia & Bruce Archer
Great Falls, VA

Susan Sullivan
Glenelg, MD

Mary Pollnitz
Cherverly, MD

Jennifer Koch
College Park, MD

Patricia Curran
Derwood, MD

Beth Hawfield
Pineville, NC

Scott Deibler
Fairfax, VA

Jean Ketchel
Gaithersburg, MD

Cheryl Belknap
Silver Spring, MD

Donna Biscieglia
Accokeek, MD

Cindy Easton
Silver Spring, MD

Peter Coughlan
Silver Spring, MD

Maria Hille
District Heights, MD

Theresa Ostazeski
Lanham, MD

Micheal Pinder
Bowie, MD

Karen Alt
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Jim Bentson
Centerport, NY

John Bergmann
West Creek, NJ

Blake Boudreau
Wading River, NY

Evelyn Callahan
Commach, NY

Jean Eno
Bayport, NY

Amy Freiman
Hauppauge, NY

Alan Goodman
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Bronx, NY

Lilith Jones
Locust Valley, NY

Michael Hall
E. Northport, NY

Joan Hughes
Westbury, NY

Pat Johnson
Port Washington, NY

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Margaret Kelly
Sound Beach, NY

Rachael Kruisky
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Sally Lane
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Pat Lineback
Fr. Tilden, NY

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Mary Harvey
Frankford, DE

Carol Henszey
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Steve & Debbie Koth
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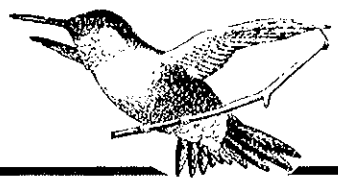
Robin Sehl
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Parvovirus in Raccoons— Two Case Studies

Pam Getson
Little Feet Wildlife Refuge
Vincentown, New Jersey

INTRODUCTION

Raccoons are susceptible to a parvovirus (RPV) which is biologically identical to and genetically barely distinguishable from feline parvovirus or feline panleukopenia (FPV) (Evans 1987). *The Merck Veterinary Manual* defines feline parvovirus as follows: "a highly contagious viral disease of cats, characterized by sudden onset, fever, anorexia, depression, dehydration, severe enteritis, marked leukopenia, dramatic subnormal temperature late in the disease, and high mortality." (*The Merck Veterinary Manual* 1986).

Infected animals shed the virus in feces, saliva, vomitus and urine. The virus can be transmitted via direct contact or through contact with contaminated inanimate objects. The incubation period is three to seven days. When the infected animal's temperature rises (normal temperature for a raccoon is 100° to 102°F) there is a concurrent loss of appetite, depression, lethargy and general weakness. Diarrhea and vomiting may occur after the initial rise in body temperature (*The Merck Veterinary Manual* 1986). The diarrhea is often hemorrhagic (Evans 1984).

Treatment should include measures to rehydrate and maintain hydration, prevention of secondary infections and the provision of nutrients and electrolytes (*The Merck Veterinary Manual* 1986). A survivor of this disease may continue to shed contagious viral organisms in its feces for up to 90 days after the onset of clinical symptoms (Evans 1986). Carrier states may also exist (Evans 1987).

CASE #1— INCORRECT MEDICAL MANAGEMENT

On 8/3/86, a female raccoon approximately nine weeks old was presented to another wildlife rehabilitation facility. This animal had been hand-raised, but, no other history was given. This raccon was transferred to our refuge 24 hours later to be paired with another single 10 week old male raccoon (which is the subject of Case #2). This female raccoon was weaned, extremely gentle, had a good appetite and passed a normal bowel movement.

On the morning of 8/5/86, the raccoon had a small amount of dark green foul-smelling diarrhea which was incorrectly attributed to two dietary changes in 48 hours. That afternoon she vomited once and the diarrhea increased in volume and odor.

Starting with 8/5/86 as "Day 1," Table 1 shows the raccoon's case history, its symptoms, what we thought was wrong and how we treated her. Many of the things we did proved to be the incorrect treatment, as this paper will show.

POST MORTEM—CASE #1

GROSS FINDINGS:

The gall bladder was bright green and enlarged to kidney size.

The edges of the liver were thickened.

There where white spots on the tongue and in the mouth.

HISTO-PATHOLOGY REPORT:

DIAGNOSIS:

1. Focal erosive glossitis with fungal colonies (*Candida* sp.)—(tongue).
2. Moderate to severe subacute enteritis with crypt loss and dilation—(small intestine).
3. Moderate acute to subacute colitis—(colon).
4. Lymphoid depletion—(spleen).
5. Blood clot (post mortem)—(heart).
6. Eye, pancreas, liver, kidney, lung, brain—no significant lesions found.

The etiology of the enteritis and colitis is undetermined; however, the loss of intestinal crypts and the splenic lymphoid depletion is evidence for a parvoviral infection in this animal. Small round to oval bodies resembling cryptosporidial organisms were also observed on the luminal surface of some enterocytes. Autolysis precluded postive identification of these bodies.

The tentative conclusion from these results is that the animal had a parvoviral infection with a secondary infection of *Klebsiella* (diagnosed from fecal study done on Day 3) and possibly *Cryptosporidia*.

The actual cause of death is in question, but we do know we made *many* errors. They include:

1. Food should have been withheld early in illness for 24 to 48 hours at the onset of symptoms. This enhanced the diarrhea (Evans 1984).
2. Antibiotics should have been given intramuscularly (IM), not orally. Oral antibotics may enhance diarrhea and can contribute to secondary infections (Evans 1984).

3. Fluids were not started early enough and not enough fluids were given. At the end of illness, fluids were given all at once. They should have been given in portions throughout the day.
4. Toward the end of illness, food was offered that the animal was incapable of digesting. An isotonic, lactose-free, tube feeding formula, such as Isocal, should have been used (White 1986).

CASE #2— SUCCESSFUL MEDICAL MANAGEMENT

The second case history reads quite differently. At this point contact had been made with Jan White and Dr. Richard Evans. Their guidance made the difference.

At the onset of clinical symptoms the subject of Case #2 was a weaned 11 week old male raccoon which had been in our care for 10 weeks. On 8/8/86, the second raccoon was exposed to the raccoon in Case #1 for only a few hours. On 8/10/86, the second raccoon's stool was looser than normal; he weighed approximately 4.5 pounds (2.05 Kg). Over the next several days the stool remained slightly loose. On 8/15/86, he refused food. 8/15/86 will be "Day 1" on Table 2.

LABORATORY FINDINGS:

On September 15, 31 days after the onset of clinical symptoms, samples of whole blood and serum were sent to Hansen's Veterinary Service in Dixon, California, to check antibody levels. Fur and feces from the second raccoon were sent to Cornell University's Veterinary Diagnostic Laboratory for testing. Fur and fecal studies were done to assure that we were not releasing an animal likely to infect others. The blood tests showed positive results for parvovirus. Dilution florescent antibody end-point titer technique was used. The finding was 1:100. The fur and fecal samples were found to be negative for viral contamination (after bathing four times at daily intervals with Johnson's Baby Shampoo). No significant organisms were found in the fecal aerobic bacterial culture.

Although some factors in the second raccoon's survival may have been beyond our control (general health, etc.), we realize that we made several mistakes and yet at the same time we did a number of things correctly.

1. The second raccoon should never have been exposed to the first raccoon.
2. We should not have given the antibiotic orally; this may contribute to secondary infections and enhance the diarrhea.
3. The animal was housed indoors in "semi-isolation." We are concerned about next year's raccoons as this virus is very hearty and we cannot guarantee that we have removed viral contamination.

We feel the raccoon was helped by:

1. The large quantity of fluids given frequently and the early administration of fluids.
2. The fact that oral antibiotics were stopped and gentamycin was initiated IM.
3. The withdrawal of food at an appropriate time (no Nutrical). Food given orally may enhance the diarrhea (Evans 1984).
4. The reintroduction of food was in a form the animal could utilize considering its compromised state (Isocal).

FLUID THERAPY

Fluid therapy should be administered by or under the supervision of a veterinarian.

The following formulas were used to assess how much fluid should be given to the raccoon in Case #2. Animals need a daily maintenance supply of fluid and dehydrated animals need additional replacement fluid.

Maintenance Fluid (daily)

55 ml/Kg body weight = ml maintenance fluid daily

Replacement Fluid (given over 2 days)

Assess how dehydrated the animal is:
Slightly dehydrated = 5% (.05)
Moderately dehydrated = 7% (.07)
Severely dehydrated = 10% (.10)
Body weight in grams X % fluid lost = ml replacement fluid needed over 2 days

Total Fluid

Maintenance fluid + half of replacement fluid = total fluid needed daily (Murray 1985).

For the raccoon in Case #2 the formulas were worked as follows:

Maintenance Fluid

Convert body weight to Kg:

$$\frac{4.5 \text{ lb}}{1} \times \frac{\text{Kg}}{2.2} = 2.05 \text{ Kg}$$

Formula:

$$\frac{55 \text{ ml}}{\text{Kg}} \times \frac{2.05 \text{ Kg}}{1} = 112.8 \text{ ml (maintenance fluid)}$$

Replacement fluid

The raccoon in Case #2 was only slightly dehydrated (5%) because the problem was recognized early.

Convert body weight to grams.
4.5 lb X 454 g = 2043.0 g

Formula:
(Weight) (% Lost)
2043 g X .05 = 102 ml
Divide in ½ for equal parts over 2 days
102 ml/2 = 512 ml per day replacement fluid

Total Fluid

Add maintenance and replacement fluids for total daily fluid for the first 2 days of treatment.
113 + 51 = 164 ml total fluid

This fluid can be given in three to four doses subcutaneously throughout the day. (We chose to give five doses at five hour intervals around the clock.)

If fluid losses were not ongoing the fluid replacement could have been reduced to the maintenance dose of 113 ml starting with day 3. However, because hydration is important when gentamycin is being administered and because parvovirus victims often have ongoing fluid loss due to diarrhea, we chose to continue with the larger amounts of fluid through day 11.

TABLE 1/CASE #1

DAY	SYMPTOMS/COMMENTS	TENTATIVE DIAGNOSIS	TREATMENT GIVEN
1	Dark green, foul diarrhea, vomit, quiet, not lethargic, good appetite	Dietary upset	Pepto Bismol 5 cc, 4x daily (QID) bland diet (steamed chicken and rice, pablum)
2	Greenish diarrhea dilated pupils, not responsive to light,- quiet, good appetite	Coccidia Dietary upset	Bactrovet, 100 mg, 1x daily (SID) orally Pepto Bismol 5 cc, QID bland diet
3	Less diarrhea, now greyish third eyelid closing, dilated pupils, not responsive to light, white spots on tongue and roof of mouth, poor appetite	Salmonella	Stool sample sent to lab animal housed in dim light Pepto Bismol 5 cc, QID Bactrovet, 50 mg, SID, orally bland diet
4	Less diarrhea, greyish symptoms same as Day 3 plus animal had foul, rotting odor, poor appetite	?	Acidophilus powder 1/8 tsp., 2x daily (BID) Same as Day 3
5	Stopped eating small amount of yellow discharge in eyes, weight loss evident—appears to be wasting away, also same symptoms as Day 3	?	Acidophilus powder 1/8 tsp., BID stopped Bactrovet started BioSol-M, 10 mg, BID, orally 2½% Lactated Ringers with 10% amino acid, 20 cc 3x daily (TID), subcutaneously (SQ) Housed in dim light—Pepto Bismol
6	Refused food and water also symptoms as Day 5	?	Force-fed Nutri-cal QID Same as Day 5
7	Same as Day 6	?	Put in veterinary isolation ward Treatments same as Day 6
8	Diarrhea grey and watery, animal weak and wobbly on feet, lapped some water	?	2½% Lactated Ringers with 10% amino acids given, 30 cc, BID, SQ BioSol-M, 10 mg, BID, orally Acidophilus powder Nutri-cal
9	No diarrhea overnight, some during day, ate food (boiled chicken, baby chicken, rice pablum). More energetic and coordinated, by evening animal was eating ravenously, vomited once	?	SQ fluid given 55 cc, SID same as Day 8
10	Ate baby chicken and rice, pablum; diarrhea—foul grey liquid with undigested food particles; animal looks thin, weak, and wobbly	?	Same as Day 9
11	Severe weight loss evident—ribs are pronounced, ate ravenously, diarrhea—looks like chicken soup with bits of undigested chicken and oil animal weak—can no longer climb, belly seems full (post mortem shows fullness attributable to edema of abdominal tissue)	?	Same as Day 9
12	Animal died at 8:00 AM, post mortem performed at 5:00 PM; tissues sent to laboratory	?	

TABLE 2/CASE #2

DAY	SYMPTOMS/COMMENTS	TENTATIVE DIAGNOSIS	TREATMENT GIVEN
1	Refused food most of day, ate small amount—vomited, stool slightly loose	Parvovirus	2½% Lactacted Ringers, 20 cc, TID, SQ
2	Refused food hemorrhagic diarrhea	Parvovirus	2½% Lactated Ringers with 10% amino acid, 30 cc, TID, SQ; 2½% Lactated Ringers with no amino acid, 30 cc, BID, SQ Pepto Bismol 5 cc, QID; amoxicillin—20 mg, TID, orally Acidophilus 1/8 tsp., BID; withdrew food
3	Diarrhea—foul in odor, grey, very mucousy; third eyelid closing; yellow discharge in eyes	Parvovirus	Same as Day 2
4	Weight 3.5 pounds (down approximately 22%); Diarrhea—much less, grey; third eyelid partially closed, pupils dilated and not responsive to light	Parvovirus	Same as Day 2 Animal housed in dim light through day 13 as a precaution due to dilated pupils
5	Diarrhea much less, grey; third eyelid partially closed, pupils dilated and not responsive to light	Parvovirus	SQ fluids, same as Day 2; stopped amoxicillin, started gentamycin, 9 mg, SID, IM; Pepto Bismol 5 cc, QID; began to force feed Isocal*, 20 cc every 2-3 hours (we used a teat cannula on a syringe and inserted between teeth).
6	Less diarrhea, grey; ate voluntarily—ate most of the Isocal, but left most of the chicken in bottom of bowl	Parvovirus	SQ fluids as Day 2; gentamycin, 9 mg, SID, IM; started Isocal "formula"**—first two feedings animal was offered two tablespoons 1½ hours apart. Next 24 hours animal offered ¼ cup every 2-3 hours.
7	One small normal bowel movement—NO diarrhea, NO vomiting; ate Isocal formula—left most of chicken	Parvovirus	SQ fluids same as Day 2; gentamycin, 9 mg, SID, IM; Isocal formula—¼ cup offered every two hours
8	One loose bowel movement, vomited once after very stressful SQ injection; one firm bowel movement	Parvovirus	Chicken in Isocal increased to two ounce chicken/one cup Isocal; 2½% Lactated Ringers with 10% amino acids reduced to 30 cc, SID; 2½% Lactated ringers with no amino acids increased to 30 cc, QID; gentamycin, 9 mg, SID, IM
9	SQ fluid not being readily absorbed—raccoon seemed well hydrated	Parvovirus	Same as Day 8; food removed 1½ hours before and ½ hour after SQ injections to reduce stress-induced vomiting
10	SQ fluid not being readily absorbed, vomited once after strenuous exercise and the consumption of plain chicken left in bottom on bowl; some mucous in stool	Parvovirus	Last gentamycin, 9 mg, SID, IM; SQ fluids same as Day 8; feeding same as Day 8
11	One incidence of dark brown, slightly mucousy diarrhea—not foul in odor	Parvovirus	SQ fluids decreased to 20 cc 4x daily with no amino acids; diet as above
12	Small amounts of dark loose stool with some mucous; SQ fluids not readily absorbed	Parvovirus	SQ fluids same as Day 11; diet as above

TABLE 2/CASE #2 (continued)

DAY	SYMPTOMS/COMMENTS	TENTATIVE DIAGNOSIS	TREATMENT GIVEN
13	Last loose bowel movement; drinking water	Parvovirus	Discontinued SQ fluids; Isocal formula now three ounce chicken/one cup Isocal
14	All signs normal	Parvovirus	Same as Day 13
15	All signs normal; animal chose Isocal formula over chicken pieces	Parvovirus	Started small amounts of plain, skinned chicken with fat removed
16	All signs normal; began eating chicken pieces	Parvovirus	Introduced whole chicken, skin removed, fat pockets left on; introduced ten pieces of puppy chow
17-20	All signs normal	Parvovirus	Raccoon returned to outdoor cage; soaked puppy chow and added to Isocal formula as animal would not eat plain puppy chow
21	All signs normal; good appetite, diet now plain puppy chow	Parvovirus	Isocal formula discontinued

*Isocal is an isotonic, complete human liquid diet for tube feeding. Medium chain triglycerides are provided as an easily digested and well-absorbed fat source. Isocal is easily and almost completely digestible.

**Isocal formula—Steam chicken thighs. Remove and discard all skin and visible fat. Blot very dry with paper towels. Puree one ounce of chicken in one cup of Isocal. (White 1986).

RECOMMENDATION

In the future, preventative measures at Little Feet Wildlife Refuge will include the vaccination of our raccoons with *killed* feline panleukopenia vaccine. There is no proof that this is effective, but it may be helpful. Incoming raccoons will be quarantined for 10 days in an attempt to control any incidence of raccoon parvovirus.

We find it difficult to make recommendations concerning treatment. Certainly we feel that it is possible for a raccoon with parvovirus, showing clinical signs, to survive. However, the price in terms of time, energy and money is *very* high. A small refuge, such as ours, can afford those costs. Yet, there is perhaps a higher price we will pay. This virus can only be contained by strict isolation. The virus is highly contagious, long lived and resistant to most disinfectants; bleach 1:30 is effective. Our raccoon cage, many pet carriers, most of our bedding, clothes, medical instruments, etc., were all contaminated. Worst of all, parts of our home were exposed. As this virus can survive long periods of time (years) without its host, under many conditions, we worry about infecting next year's orphaned raccoons. We ask ourselves, was every single thing these raccoons were in contact with decontaminated? Euthanasia was suggested by several veterinarians because the raccoons' chances for survival were so slim and the possibility of contamination was so great. Under the same circumstances (we were not housing large numbers of raccoons) we would probably attempt treatment rather than euthanize. However, we hope that we have not traded many lives for one.

ACKNOWLEDGEMENTS

These acknowledgements are of particular importance because my husband and I are very new to wildlife rehabilitation. The contrast between Case #1 and Case #2 is a study in guesswork by a rehabilitator versus treatment advised by knowledgeable veterinarians. All of the suggestions in case #2 (those that worked) came from these sources.

Dr. Richard Evans was of particular help in pinpointing the possible cause of illness, telling us what to expect, and he helped us to avoid certain diasters (ie., releasing a raccoon still shedding contagious viral organisms!). Dr. Linda Squires, Dr. Edward Frame and Sandra Frame supplied us with information, medication and supplies, taught us necessary nursing skills and performed post mortem studies. A special acknowledgement must go to Jan White, who guided us step by step through the treatment of Case #2. Her patience with our nightly hour-long conversations and her genuine joy over the raccoon's progress leave us greatly indebted to her.

GLOSSARY

Colitis: inflammation of the colon.
Crypt loss: loss of epithelial lined pits in the intestines.
Cryptosporidial organisms: minute protozoan parasites transmitted by the fecal-oral route.
Enteritis: inflammation of the intestines, more particularly of the mucous and submucous tissues of the intestines.

Edema: a local or generalized condition in which the body tissues contain an excessive amount of tissue fluid.

Glossitis: inflammation of the tongue.

Klebsiella: gram negative bacilli which are frequently associated with respiratory infections and may cause urinary tract infections.

Leukopenia: abnormal decrease of the white blood corpuscles.

For further information please see:

EVANS, Richard M., D.V.M., 1984, "Parvoviruses of Wild Carnivores." *Wildlife Rehabilitation—A Publication of the Proceedings of the Second National Wildlife Rehabilitation Symposium March 23-27, 1983*, Volume 2: pp. 138-150.

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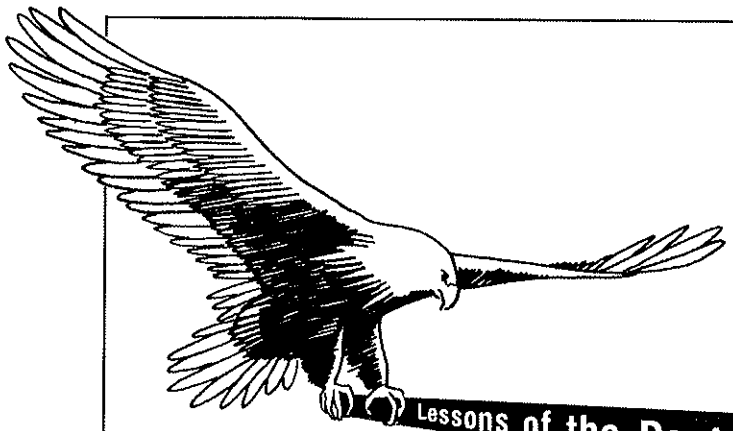


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