

GRAY WOLF:

a comparison of
husbandry and housing practices

Prepared by

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for

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INTRODUCTION

This review of gray wolf husbandry and housing conditions in facilities across North America was prompted by the passage, in early 1999, of the new Fish and Wildlife Conservation Act (FWCA) in the Province of Ontario, Canada. Until passage of the FWCA, Ontario had no legislation governing the keeping of native or exotic wildlife species in zoos, wildlife parks and roadside menageries. The FWCA allows for the creation of regulations governing the keeping of wildlife in captivity, including standards for wildlife care and accommodation.

Overall, the care and accommodation provided for wolves in Ontario's captive wildlife facilities has been appallingly substandard. With few exceptions, little attention has been paid to the spatial and physical requirements of wolves, and even less to their complex sociological needs. Many wolves have lived out their lives in tiny, barren enclosures, pacing endlessly back and forth; their custodians lacking the capacity or motivation to house and care for them properly.

During the last few decades, knowledge of the biology and behavior of many wildlife species has increased substantially. With that increase has come a substantial shift in public attitudes toward wildlife in captivity. Most members of the public no longer find it acceptable to confine animals in substandard conditions that fail to satisfy their needs.

We hope the information contained in this review will assist in the development of standards that satisfy the biological and behavioral requirements of captive gray wolves in the Province of Ontario and other jurisdictions. We also hope that zoological facilities now housing wolves in substandard conditions will look at the examples provided in this report and use them as models for change.

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PREAMBLE

General considerations in enclosure design

Enclosures that are designed and constructed with little or no consideration of the biological and behavioral needs of the animals, rarely, if ever, provide an appropriate quality of life. The provision of complex, variable environments that stimulate physical and mental activity within an appropriate social context is extremely important.

Like their wild conspecifics, captive wild animals need to engage in a variety of behaviors such as seeking shelter, nest sites, mates and food resources; avoiding predators and parasites; defending territories; and exploring new spaces. Most captives are, to a large degree, denied the opportunity to engage in these kinds of "natural" behaviors. This denial may be severely detrimental to animal well-being.

Most progressive zoological facilities now recognize that confining animals in sterile, undersized, biologically irrelevant enclosures compromises animal welfare and is counterproductive from an educational and research standpoint. If wild animals are to be kept in captivity, they must be provided with environments that satisfy their specific biological and behavioral needs.

If an animal spends a great deal of time searching for food in the wild, or marking and defending a territory, the restriction or loss of this activity in captivity must be compensated for. If the activity cannot be replicated or replaced, the captive must be encouraged to engage in other types of activity. For some animals, this can be accomplished through the development and implementation of a program of environmental enrichment.

At its most basic level, environmental enrichment is an attempt to identify and recreate specific factors in an animal's natural environment that are required for its psychological well-being. In captivity, this typically means providing animals with a broader range of behavioral opportunities and more control of their lives than would otherwise be available.

The importance of environmental enrichment is clearly misunderstood by many zoo, wildlife park and menagerie operators. Statements such as, "I threw a ball in the cage last week and he's never used it" or "It's not my job to entertain the animals" are common.

Enrichment is far more involved than simply providing an object or two for animals to play with or manipulate. Creating a changing captive environment that motivates and challenges animals, and gives them a measure of control over their daily activities requires research, planning and commitment.

One of the best ways of ensuring an "enriched" environment for many captive wildlife species is through the provision of a suitably sized, "naturalistic" enclosure where animals can engage in a range and diversity of "normal" behaviors.

Enclosures

An enclosure is defined as any accommodation provided for animals in zoos. The 1994 Canadian Association of Zoos and Aquariums (CAZA) *Standards for Animal Care and Housing* state that,

Animal enclosures in which animals are on public display should:

a) *Be of a size which enables the animals to:*

1) *exercise natural behavior to facilitate public education and interpretation;*

2) *achieve a distance from the public and other specimens at which the animals are not psychologically or physically stressed;*

3) *achieve a full range of body movements and physical movements normally performed.*

b) *Contain furniture and/or procedures to physically and psychologically enrich the environment and stimulate normal physical movement and behavior*

c) *Contain natural or man-made shelters enabling the animals to protect themselves from natural conditions (eg. sun, rain and snow).*

The *European Association of Zoos and Aquaria standards for the care and accommodation of animals in zoos* state that:

3. *Animals to be provided with an environment, space and furniture sufficient to allow such exercise as is needed for the welfare of the particular species.*

4. *Enclosures to be of a sufficient size and animals to be so managed:*

a) *to avoid animals with herds or groups being unduly dominated by individuals;*

b) *to avoid the risk of persistent and unresolved conflict between herd or group members or between different species in mixed exhibits;*

c) *to ensure that the physical carrying capacity of the enclosure is not overburdened;*

5) *to prevent an unacceptable build-up of parasites and other pathogens.*

Enclosure Size

The American Zoo Association publication *Zoological Park and Aquarium Fundamentals* (1982) states the following about space requirements for captive animals,

First, it would be of more than academic interest to investigate what is known about the species' home range or territory, not only to give the planners an idea of the extent to which they will be compressing the species' natural living space, but also to enable them to create a similar environment.

The next step is to investigate the size of existing exhibits for the species in other zoos. Examine not only those which are successful, but also those which by your criteria are unsuccessful. Learn from them all. Talk to the staff, including the keepers assigned to the area. Identify mistakes so they are not perpetuated.

Good enclosure design is rooted in consideration of the biological and behavioral needs of the animals. The design should incorporate sufficient space to facilitate normal movements and a

range of natural behaviors, as well as adequate space for members of the public who come to view them. The provision of an appropriate amount of space, along with factors impacting on animal well-being, at the design stage will help ensure an acceptable quality of life for the captive and prevent animals from constantly searching for escape routes.

Cage Construction

According to Joseph Flanagan and Lou Tsipis in *Wild Mammals In Captivity, Principles and Techniques* (1996),

All enclosures should be constructed of durable materials that can withstand the impact and manipulation attempts of the enclosed animals. Particular attention should be given to fasteners and to all areas where dissimilar materials meet. Even the heaviest construction materials can hold only as securely as the fasteners used to attach them to the support structure.

Enclosures must be designed and constructed with the physical abilities and specific needs of the animals in mind. Failure to do so may result in unsafe, potentially dangerous situations.

Cage Furniture

In addition to structural features incorporated into exhibits at the design/construction phases, there are a multitude of other methods and strategies that can be employed to enrich the lives of captive animals. Some of these, such as enclosure furnishings, are often part of an environmental enrichment program (described above).

The provision of appropriate enclosure furnishings is an extremely important factor in addressing the needs of captive wild animals. All enclosures should be equipped with furnishings that encourage animals to become active by engaging in a range of natural behaviors. Lack of activity can lead to a variety of physical and behavioral problems, such as loss of muscle tone and general fitness, and the development of abnormal behaviors (i.e. stereotypic pacing, lethargy, hyper-aggressiveness, etc.). Quality of space, accomplished in part through enclosure furnishings, is a core requirement for animal well-being.

Natural items such as small trees, shrubs, logs with intact bark and leaves, stumps, hillocks, rock piles, earth mounds, deep litter, sand boxes, streams, ponds and pools, and other features can be incorporated into many exhibits increasing their complexity and making them more interesting for the animals. Artificial items can supplement natural features.

In addition to increasing activity, furnishings may also provide other benefits such as the provision of shade, and hiding spots for animals that wish to remove themselves from the view of the public or each other.

Flat, featureless enclosure substrates for most animals are not optimal. Varied topography - "landscape realism"- within the enclosure will increase utilizable ground surface area and create new behavioral opportunities for the animals. Substrates should not be barren or hard.

Utilization of vertical space is another important consideration. While this may not be a critical factor in the housing of wolves, elevated vantage points may provide a previously unavailable behavioral opportunity. Platforms should not be high enough to cause injury if the animals should inadvertently fall.

Privacy and Shelter Areas

All captive wild animals, regardless of how they have been raised, should be provided with the opportunity to remove themselves from the view of the public and each other. Close proximity to visitors or other animals with no opportunity for escape can lead to excessive levels of stress.

Food and Water

The provision of sanitary, species-specific food presentation and potable, drinking water is extremely important. Feeding and watering protocols should be incorporated into a program of environmental (behavioral) enrichment.

Providing potable drinking water, quality feed and appropriate presentation is an important consideration in wild animal husbandry.

Safety

According to Flanagan and Tsipis in *Wild Mammals in Captivity, Principles and Techniques*,

A well-planned, effectively managed security program that protects the public, the zoo's employees, the animals, and the facilities should be a primary objective of all zoos...

The key to an effective security program is prevention. Problems can be avoided through effective planning.

Every aspect of a zoological facility should be planned with the safety of the animals, the staff, and the public in mind. Failure to do so may result in animal escapes, and/or animal or human injury or death.

All enclosures should be designed and constructed with careful consideration of the physical abilities of the animals to be contained. They should be constructed in a solid manner with materials able to withstand the full brunt of the captive, even in exceptional circumstances (i.e. when the animal is severely stressed).

All support posts for enclosures and fences must be solidly secured, and all fencing must be properly affixed to support posts and trusses. Additional cross posts should be placed on the lower levels of enclosure fencing as reinforcement when required, and the bottom of each enclosure should be anchored to the ground at two foot intervals. Wooden support posts should not be exposed to animals, which have the ability to tear, chew or damage them in some other way. They should also be resistant to deterioration due to urine, disinfectant materials, and weather.

Enclosures housing animals, which have a known ability to jump or climb barriers, should be enclosed overhead.

Enclosure gates should be solidly constructed and be able to be secured in a manner appropriate to the species being contained. Gates and doorways should tightly abut fences and support structures, and when closed, should not be warped or leave inviting gaps on the sides, top or bottom.

All barriers should be in good repair with damaged, rusty or broken sections or pieces repaired or replaced. Protrusions and jagged pieces of fencing and exposed nails should be removed or covered immediately.

Enclosures housing potentially dangerous animals should be designed and constructed so that the animals can be moved to a secure secondary containment area prior to staff entering the enclosure. Entry points should be through a set of double gates, so that the first gate can be opened and locked before the second gate into the actual animal enclosure is opened. All entry points and gates should be padlocked when not in use.

Night quarters may be required to secure potentially dangerous animals at times when staff supervision is minimal (i.e. nights and weekends). Night quarters should be carefully designed with the biological and behavioral needs of the animals considered.

Any animal enclosure in a public area must be equipped with stand-off barriers at least four feet in height and a minimum of six feet away from the cage. Stand-off barriers keep visitors a safe distance from the animals and protect the animals from poking and prodding visitors.

Warning signs should be placed on or in front of enclosures housing potentially dangerous animals.

Ideally, a perimeter fence should surround the entire zoological facility. According to Flanagan and Tsipis in *Wild Mammals in Captivity, Principles and Techniques*,

The zoo perimeter should be fenced to prevent unwanted entry by humans and other animals. The fence should have a minimum height of 2.5 m and be constructed of material that will discourage climbing by people and wild animals. The bottom should be buried at least 0.25 m deep, or firmly attached to slab or curb, to prevent burrowing through by packs of wild dogs and other wildlife.

The Canadian Association of Zoos and Aquariums (CAZA) *Standards of Animal Care and Housing* (1994) state,

A complete barrier, natural or man-made perimeter fence, must exist around the animal enclosures which protect the animal collection from direct exposure to the non-visiting public and exposure to feral or domestic animals. The level of security required will vary according to the species in the collection and the proximity of the institution to populated areas, agricultural land and to sensitive wildlife habitat. (Recommended minimum barrier should be the equivalent of a 2 meter high, chain-link fence).

Perimeter fencing is required for a zoo to receive accredited status from the CAZA.

A Discussion of Stereotypic Behavior

[The following section has been included in this report because many captive gray wolves in Ontario exhibit stereotypic behaviors. It was written by Samantha Scott, MRCVS]

Stereotypic behavior is an expression that is too easily used and, even in its proper usage, subject to debate. There have been various definitions of stereotypic behavior:

Repeated, relatively invariable sequence of movements that has no obvious purpose.(Broom)

The prolonged, obsessive performance of apparently purposeless activity. (Webster)

It is a form of behavior that occupies the animal for most of its periods of activity without any apparent normal stimulus bringing it into operation. (Jordan and Ormrod)

The words "ritualized" and "clockwork-like" have been used to describe these behaviors.

The salient points are that the behaviors:

- a) do not occur in the wild
- b) are repetitive
- c) are apparently functionless.

I offer the following as a partial explanation of how I might come to a decision about whether or not a given animal were displaying stereotypic behavior. One might, for example, see an animal that is pacing up and down the perimeter fence of its enclosure. Simply to draw the conclusion then that the animal is displaying stereotypic behavior from the description would be wrong. It may be a displacement activity just prior to feeding; it may even be the first time that the animal has displayed that behavior. However, if one then examines the animal's environment, and its immediate history, one might glean perhaps the fact that feeding time is not for another few hours and evidence that there is a well-worn path along the fencing where the animal is now pacing. Add to this the ease with which the animal is distracted from its activity and how soon it returns to it and one can start to draw conclusions about the behavior. Additional evidence such as expression, the way the feet are placed, certain movements of the head and neck that are common to many animals displaying stereotypic behaviors, means that an experienced eye can quickly fit the available information together.

The expression "obsessive-compulsive" has also been used although arguably this is misleading because it is a term drawn from human psychiatry. Although obsessive-compulsive disorders (OCDs) are referred to throughout the literature on companion animal behavior problems, we can neither say with certainty that the patient is obsessed nor feels a compulsion in the way we would normally understand it. Since some obsessive-compulsive disorders are thought to stem from a lack of self-esteem and problems with self-image, the term is inappropriate for the behavior with which we are dealing.

Stereotypic Behavior vs. Displacement Behavior

Stereotyped behavior should be distinguished from displacement behavior with which it could be confused by the uninitiated. Displacement behavior usually occurs when an animal (or human for that matter) is frustrated in its aims (e.g., to obtain food or to win a confrontation). The behavior may be unrelated to the original aim (e.g., grooming, scratching or pacing) and its purpose would appear to be an attempt to reduce the feelings of conflict and frustration.

Many dogs will chase their tails in response to excitement or anxiety. Nevertheless, it is only when the stimulus cannot be discerned, when the behavior continues relentlessly, interferes with the animal's normal behavioral repertoire, cannot be easily interrupted and is rapidly resumed that the behavior is said to have become stereotyped.

It is probable by extending the argument that a displacement activity helps to relieve frustration and conflict, and by the discovery that endorphins are released in animals who are performing stereotypies, that the suggestion arose that these behaviors were a way of coping for the animal and were therefore not necessarily a "bad thing." Indeed, the argument has run that with the release of natural opiates the animal is even "happy" in its activity, as though on some kind of "high." The fact that endorphins are released when the body is under a stressful stimulus such as pain reverses this line of thinking.

The discussion is still based upon whether or not stereotypies are a sign of:

- a) conscious distress
- b) an indication that the animal is coping with its lifestyle
- c) mental disturbance.

Lawrence and Rushden (1993) conclude that "abnormal or stereotypic behavior is an indication of chronic suffering caused by frustration, boredom, depression, and anxiety" but that they may be a form of "coping". The difficulty with the term "coping" is that it can imply that an animal or person is dealing successfully with its new situation, by whatever means. However, while an animal or person is busy coping, they find it increasingly difficult to cope with other challenges, such as infection, temperature changes, conflict within a group, etc. And however one regards the arguments, the bottom line is that these behaviors are produced as a result of an unsatisfactory environment/husbandry and that some degree of mental suffering has occurred along the way.

There is one more significant, but frequently overlooked, behavioral change. While some animals (and humans) express their frustrations and conflicts in the performance of outwardly recognizable behaviors, it should be remembered that inactivity and lethargy could also be signs of a depressive mental state. Beyond this is what the psychologists term "learned helplessness."

Here it is worth quoting what John Webster has to say about this state, in his *book A Cool Eye Towards Eden*:

...a loss of responsiveness to stimuli in animals, acquired after long periods in which they have been denied the opportunity to perform constructive behaviors designed to achieve pleasure (e.g. food) or avoid pain (e.g. electric shocks). This is sometimes described as an adaptive response an interpretation which I find chilling. Learned helplessness defines the state of mind in which an animal has given up. I prefer to call it hopelessness.

GRAY WOLF FACTS

Although wolves outwardly resemble large German shepherd or husky dogs, they tend to be lankier, with longer legs, larger feet and a narrower chest.

Their color is variable, ranging from snow white to dark black.

Male wolves are typically larger than females. A large male may measure more than 6' in length from nose to tail. Adults may weigh from 50 - 175 pounds.

Wolves possess an excellent sense of smell and acute hearing. They have a bounding method of locomotion and can attain speeds of up to 28 miles per hour for short distances, or twenty miles per hour for a mile or two.

Wolves typically live in extremely complex family units or packs numbering from 3-15 individuals. Within the pack, there is social hierarchy dominated by a male alpha wolf.

Sexual maturity is reached at 10-22 months, with life expectancy being 10-16 years.

Typical prey species include deer, elk, moose, caribou, bison, muskox, mountain sheep and beaver.

METHODOLOGY

In a random phone survey, seven zoological facilities in Canada and the United States were identified by peers as providing an above average level of care and accommodation for captive gray wolves (*Canis lupus*).

These facilities were approached by e-mail, fax and/or telephone and requested to participate in a comparative analysis of gray wolf husbandry and housing practices by providing information listed in the categories listed below. Where possible, the original wording submitted by study participants has been used.

In addition, the medium and large canid standards contained in the American Zoo and Aquarium Association's *Minimum Husbandry Guidelines for Mammals* have been included (the Canadian Association of Zoos and Aquariums (CAZA) does not have a comparable set of standards), as well as the relevant sections of the Manitoba *Guidelines for Keeping Wildlife in Captivity* (1984) and the Newfoundland *Guidelines for Facilities Holding Captive Wildlife*.

Information categories

Social grouping (*e.g., single, pair, family, pack.*)

Number of animals in enclosure

Enclosure type (*e.g., open paddock, fenced natural area, island*)

Enclosure shape (*e.g., rectangular, square, circular, irregular*)

Enclosure size

- length
- width
- height
- Total surface space per individual/pair

Barrier type (*e.g., dry moat, wet moat, wall, fence, net, glass, hot wire*)

- Gauge (for fencing only)
- Height
- Depth (if buried)

Substrate (*e.g., natural ground, concrete/gunite, natural rock, gravel bed, earth, wood floor*)

Environmental conditions

- Shade
- Shelter (*e.g., overhead rain/snow guards, windbreaks [not including sleep/rest/shelter areas as described below]*)
- Temperature
- Humidity
- Ventilation
- Lighting

- Water Quality

Indoor accommodation

- Dimensions (length, width and height)
- Total indoor surface space available to animals
- Total surface space per individual/pair

Enclosure furnishings (*outdoor and indoor*)

- Natural fixed features (e.g., large trees, rockwork, hills, streams, ponds)
- Artificial fixed features (e.g., platforms, concrete pipes, concrete pools for bathing/drinking)
- Other natural features (e.g., small trees, shrubs and ground plants, logs, stumps)
- Other artificial features

Sleep/rest/shelter area (*e.g., wooden box, underground den, concrete pipe, trees and natural cover, burrows, indoor facility*)

Privacy area/visual baffles (*e.g., fencing, tree cover, netting, landscaping [hills, gullies], rock piles*)

Environmental enrichment (*outdoor and indoor*)

- Consummatory (e.g., whole carcasses, commercially prepared food items, dog biscuits, eggs, insects, live fish, etc.)
- Non-consummatory (e.g., rawhides, feed tubes, hollow logs, branchwork, scents for olfactory stimulation, etc.)

Food and water

- Type
- Amount
- Frequency of feeding
- Presentation (e.g., in designated feeding area, scattered throughout exhibit, in containers)
- Fresh drinking water available
- Are containers non-tippable

Staff and public safety and security

- Double door entry system
- Secure secondary containment area
- Public stand-off barriers
- Perimeter fence

Veterinary care requirements

- Fecal exams
- Vaccinations
- Other

Other requirements

- Enclosure cleaning (e.g., frequency)
- Hard surfaces (are they disinfected)

- Other miscellaneous

PARTICIPATING INSTITUTIONS

Aspen Valley Wildlife Sanctuary
Rosseau, Ontario, Canada

The Greater Vancouver Zoo
Aldergrove, British Columbia, Canada

Haliburton Forest & Wild Life Reserve
Haliburton, Ontario, Canada

International Wolf Center
Ely, Minnesota, USA

Wild Canid Survival and Research Center
Eureka, Missouri, USA

The Wolf Education and Research Center
Winchester, Idaho, USA

Wolf Park
Battle Ground, Indiana, USA

NUMBER OF ANIMALS, SOCIAL GROUPING & TOTAL ENCLOSURE SIZE

Aspen Valley Wildlife Sanctuary

Information not provided.

Greater Vancouver Zoo

9 animals (4.5) - share exhibit with 6 adult American black bears.
Housed as a pack/ family unit
405,000 sq. ft total area.

Haliburton Forest and Wild Life Reserve

9 animals (1.2.6)
Housed as a pack/family unit.
15 acres total area.

International Wolf Center

3-5 animals
Housed as a pack.
1.25 acres total area.

Wild Canid Survival and Research Center

1-13 animals
Housed in pairs or pack/family groups, unless advanced age/health preclude social pairing.
Multiple enclosures ranging from .25 - 3 acres (larger groupings in large enclosures only).

Wolf Education and Research Center

10 animals
Housed as a pack.
20 acres total (0.6 mile circumference).

Wolf Park

Number unknown.
Housed as pack/family unit.
13 enclosures ranging in size from 2500 sq. ft to 1 acre

American Zoo and Aquarium Association –
Minimum Husbandry Guidelines for Mammals

No specific requirement or recommendation regarding social grouping or number of animals.

Province of Manitoba –
Guidelines for Keeping Wildlife in Captivity

No specific requirement or recommendation regarding social grouping or number of animals.

Province of Newfoundland –
Guidelines for Facilities Holding Captive Wildlife

No specific requirement or recommendation regarding social grouping or number of animals.

ENCLOSURE TYPE, SHAPE & SPACE/WOLF

Aspen Valley Wildlife Sanctuary

Fenced natural area
Irregularly shaped.
Minimum 2 acres per pair of wolves (4,032 sq. m/wolf)

Greater Vancouver Zoo

Fenced natural area
Basically rectangular in shape. (900' x 450')
405,000 sq. ft total (6,271 sq. m/wolf)

Haliburton Forest and Wild Life Reserve

Fenced natural forested area
Irregular, somewhat of a wedge shape with narrower end at observation area
15 acres total area (6,271 sq. m/wolf)

International Wolf Center

Fenced outdoor enclosure
Oval shaped
1.25 acres total area (1,590 – 2,650 sq.m/wolf)

Wild Canid Survival and Research Center

Fenced natural areas. 13 enclosures. 2 quarantine/isolation areas.
Irregular shapes
Enclosures: 3 acres (1), 2 acres (1), 1 acre (5), .75 acre (3), .50 acre (3). Quarantine/isolation pens: 400 sq. ft. (20' x 20') and 600 sq. ft. (20' x 30'). Space per wolf variable.

Wolf Education and Research Center

Fenced natural area incorporating forest cover and rock outcroppings.
Irregular shape, molded to include a variety of natural features.
Enclosure: 20 acres. (12,542 sq. m/wolf)

Wolf Park

Fenced natural areas. 10 enclosures
Irregular shapes
Enclosures: 1 acre (2), 37,500 sq. ft (1), 20,000 sq. ft (1), 10,000 sq. ft (2), 2,500 sq. ft (4).
Additional pens: 450 sq. ft (1), 150 sq. ft (1), 64 sq. ft (1). Space per wolf variable.

No permanent wolf enclosure for non-socialized wolves should be less than one acre in size.

American Zoo and Aquarium Association –
Minimum Husbandry Guidelines for Mammals

150 sq. ft per animal

75 sq. ft. per additional animal

Where feasible, enclosures should be designed without square corners.

Province of Manitoba –
Guidelines for Keeping Wildlife in Captivity

400 sq. meters per pair

20 sq. meters per additional animal

Province of Newfoundland –
Guidelines for Facilities Holding Captive Wildlife

4,500 sq. meters per pair

2,000 sq. meters per additional animal

ENCLOSURE BARRIER & SUBSTRATE

Aspen Valley Wildlife Sanctuary

12 gauge (2" x 5") wire fencing 12' in height. 6' apron on ground extends into the enclosure.

All natural substrates.

Greater Vancouver Zoo

8 gauge black vinyl coated chain link fence is 12' high and is buried to a depth of 1'-2'. A 4' chain link apron extends inward buried to a depth of 1'-2' to prevent escape by digging. Solar powered hot wire at top, and additional hot wire four feet above ground on interior side of fence to prevent climbing.

Natural ground substrate. 1/4 open meadow, 1/8 blueberry, blackberry, raspberry and willow, marsh-like area, 1/8 water, and 1/2 wooded area with numerous large cedar, cottonwood, vine maple, and other naturally occurring vegetation.

Haliburton Forest and Wild Life Reserve

Enclosure is double fenced.

Interior fence: 8' high chain link with 2 lines of barbed wire angled inward at the top to prevent climbing or jumping. A 3 foot apron of chain link runs along the bottom of the fence on the interior side of the enclosure to prevent digging.

Exterior fence: High tensile fencing approximately 10' in height.

All natural substrates.

International Wolf Center

10' high 9 gauge galvanized wire mesh fencing with overhang. Buried approximately 6" beneath the surface extending into the enclosure 2.5 feet.

Substrate is entirely natural ground except along fencelines where 1.5" of gravel cover buries the apron.

Wild Canid Survival and Research Center

8' high wire mesh (1- 2" gauge) fencing extending inward and buried to a depth of 1.5 - 2 ft. Gauge depends on whether or not the barrier is a "common" fence or if it will be used for puppies. Smaller mesh always used on common fencelines, feeding/isolation areas within each enclosure and in breeding enclosures.

Substrate is natural ground, rock, gravel bed, earth, and vegetation (grass).

Wolf Education and Research Center

Enclosure surrounded by a double fence. Inner fence is 10' high. Outer fence is 8' high. Distance between fences is 10'. Fencing is not buried but there is a 4' apron extending inward on both. There is also a hot wire running along the top.

Substrate is a mixture of natural ground and rock outcroppings.

Wolf Park

Enclosures surrounded by 7' high woven wire fencing with 2" x 4" x 10' treated cedar posts sunk three feet into the ground extending below the frostline. An overhang of 18 gauge woven hexagonal wire mesh 1.5" x 1.5" projects inside the enclosure at a 45 degree angle. The same wire is fastened to the bottom of the fence with stainless steel rings and lays on top of the ground. The other edge is anchored with tent pegs. This apron is covered with about 3" of No. 73 mixed-sized stone which prevents a muddy track along the fence during rain.

All natural substrates.

American Zoo and Aquarium Association – *Minimum Husbandry Guidelines for Mammals*

Perimeter barriers should be at least 8' high and include an inward-facing overhang, the top protected by either electric cable or a 45 degree overhang. In addition to vertical barriers, all perimeters should also have either a concrete footing or horizontal protective mat around the entire enclosure.

No requirement for substrate type.

Province of Manitoba – *Guidelines for Keeping Wildlife in Captivity*

No specific requirement for barrier or substrate type for wolves.

Province of Newfoundland - *Guidelines for Facilities Holding Captive Wildlife*

No specific requirement regarding barrier or substrate type.

ENVIRONMENTAL CONDITIONS (shelter, shade, temperature, humidity, ventilation, lighting)

Aspen Valley Wildlife Sanctuary

Trees and other natural cover in the enclosure provide shade and shelter. The wolves also excavate holes and dens.

Outdoor enclosure so environmental conditions not regulated.

Greater Vancouver Zoo

Natural cover in the enclosure provides ample shade and shelter. There are no artificial features or structures. The terrain is flat in approximately half of the exhibit and rolling in the other half.

Outdoor enclosure so environmental conditions not regulated.

Haliburton Forest and Wild Life Reserve

Natural cover. There are several wolf-excavated den sites within the enclosure that the alpha female has used for pupping.

Outdoor enclosure so environmental conditions not regulated.

International Wolf Center

Currently one den with rock walls and wooden roof covered with soil. A new den of concrete with natural rock facing will be provided.

Shade provided by natural cover. At least $\frac{3}{4}$ of the enclosure is wooded. The wolves have also excavated their own den and there are numerous overhangs from the roof of the observation building which provide shelter.

Temperature, humidity and ventilation controlled by natural conditions. Night lighting used occasionally for feeding programs.

Wild Canid Survival and Research Center

Wooden den boxes using untreated lumber constructed primarily by Eagle Boy Scouts according to WCSRC plans (adopted by Red and Mexican wolf SSP plans). Have also used concrete pipe laid above ground in breeding enclosures. Wolves also dig their own dens. These are monitored for safety and proximity to the fence line.

Primarily natural cover for shade. Tarps are put over feeding/isolation pens within enclosures if animals need to be confined. Shade tarp also provided if summer conditions and animals require it.

Outdoor enclosure so environmental conditions not regulated. Invalid or old animals may have heat source added to their den box if weather warrants it.

Wolf Education and Research Center

The natural forest cover and dens dug into the ground by the wolves provide sufficient shade and shelter.

The enclosure is entirely outdoors so environmental conditions are not artificially regulated.

Wolf Park

Wooden shelters provided. Wolves also excavate their own dens.

Shade provided by natural cover.

Outdoor enclosure so environmental conditions not regulated.

American Zoo and Aquarium Association – Minimum Husbandry Guidelines for Mammals

Animals kept outside should always have access to shade, especially during warmer parts of the year. When acclimated, most canid species without young, only require minimal, unheated shelters at night; in cold climates, wooden pallets should be provided for sleeping to prevent the loss of body heat. Dens should be dry, small and cramped. If animals are given spacious dens, smaller “hide” boxes should also be provided. These smaller boxes enable individuals to retreat or fend off conspecifics. A separate den or hide box should be provided for each pregnant female.

Natural lighting is optimal for all species of canids. Indoor exhibits should have a negative air pressure with a regular air change of non-recirculated air. Relative humidity should be within the range of 30-70 percent. Separate air handling systems should be maintained between the visitor and animal exhibit area to prevent possible disease transmission and complaints about odor.

Province of Manitoba – Guidelines for Keeping Wildlife in Captivity

A weatherproof concrete or cement block den box 1 m high, 1 m wide and 1.2 m long should be

provided for each animal, or one box 1.2 m high, 1.2 m wide and 2 m long for two animals. The floor of the den box should be concrete or covered with fiberglass or tile. The top of the den should serve as an outdoor loafing deck. Den floors would be sloped for drainage and to facilitate cleaning. Den entrance should be 0.8 m high and 0.7 m wide.

Province of Newfoundland – Guidelines for Facilities Holding Captive Wildlife

General provision. No person shall fail to provide for captive wildlife: adequate shelter for use in times of inclement weather or to avoid direct sunlight; adequate facilities for an animal to rest or

retreat from people or fellow exhibit mates; living quarters that maintain a temperature suitable for their biological needs.

Den enclosed on all sides except for opening large enough to allow entry and exit. Large enough to hold all animals in enclosure, but not so large to allow excessive loss of body heat. Den to be at least one foot off the ground or, if not, then thus positioned to prevent drainage into it.

ENCLOSURE FURNISHINGS, ENRICHMENT & PRIVACY

Aspen Valley Wildlife Sanctuary

Natural forest area incorporating large trees, small trees, rockwork, mounds of mud for digging and tunneling, etc.

Other enrichment not required.

Wolves are able to remove themselves from public view by moving to the rear of the enclosure or utilizing natural features to hide.

Greater Vancouver Zoo

Enclosure is 1/2 West Coast temperate rainforest (large cedar, cottonwood, and vine maple), open meadow, marsh-like areas and ponds. One pond is an irregular shape (140' x 250') with a central island, while the other is a stream draining pond (10' x 160').

There is some interaction with the six bears in the enclosure. Mixing of the species has been an outstanding success. We did have to remove the initial male Alpha wolf from the pack in the fall of 1998 because he would aggressively antagonize certain bears (the smaller females in particular). Once he was removed, peace was restored and has remained since that time. Other enrichment not required.

Wolves have ample opportunity to remove themselves from public view. The only public viewing is in enclosed 24 seat buses.

Haliburton Forest and Wild Life Reserve

Natural forest area incorporating large trees, small trees, logs, stumps, shrubs, ground plants, overturned root balls, rocky areas, ponds, etc. Wolves chase, eat or chew on, small mammals, birds, logs, saplings, berries, grass, etc.

Other enrichment not required.

Majority of the enclosure is out of public view. The public observation area only allows 1/8 –1/4 of the total enclosure to be viewed depending on the season. As well, the natural forest structure, incorporating various vegetation layers, gullies, rock formations, and other features allows the wolves to seek out resting areas away from the view of the public or each other.

International Wolf Center

Natural woods with large trees, large rocks, logs and other natural furnishings. A pond and short stream are to be added.

Artificial enrichment not required.

The wolves are able to remove themselves from public view at will. The enclosure is large and varied enough to provide visual cover throughout.

Wild Canid Survival and Research Center

Large trees, rock outcroppings, hills, gullies, etc. Platforms and concrete pipes also available.

Wolves chase, consume, and chew on raccoon, opossum, passerine birds, wild turkeys, snakes, other reptiles and amphibians, fish, and vegetation. Bones, frozen guinea pigs, etc. are provided from time to time. Occasionally supply coniferous tree piles and hollow logs. No other enrichment required.

Natural features provide numerous opportunities for wolves to remove themselves from the view of the public or each other.

Wolf Education and Research Center

Large trees (predominantly Ponderosa Pine and Douglas Fir), hills, rock outcroppings, stream with natural flood area. Also small trees, shrubs, ground plants, fallen trees, stumps and other natural material.

Artificial enrichment not required.

The trees and landscape combined with limited public viewing allow the pack a high degree of privacy. Approximately 60% of the enclosure is not viewable by the public.

Wolf Park

Fenced semi-natural areas featuring mature and young hickory trees. There are two mounds about 3' high and 15-20' long, oval shaped, one in each main enclosure. One enclosure has small pond, approximately 25' in diameter. A joint waterway drains off excess surface water. Hardy grasses and weeds blanket the enclosures, and they are periodically mowed.

Artificial enrichment not required.

Wolves are able to remove themselves from public view if they desire because of the design of the enclosure.

American Zoo and Aquarium Association – Minimum Husbandry Guidelines for Mammals

No specific requirements.

Province of Manitoba – Guidelines for Keeping Wildlife in Captivity

General Provision

For captive wildlife, accommodations must approximate natural conditions in physical appearance and duplicate their functions. All animals require physical exercise. Provisions must be made to provide captive wildlife with suitable opportunities to exercise.

Every animal requires privacy, including an opportunity to retreat from the sight of humans and other species.

Province of Newfoundland –
Guidelines for Facilities Holding Captive Wildlife

General Provision.

No person shall fail to provide wildlife with exercising implements of the type indicated in Table 1 for such species. The specifications for the various implements shall be as follows:

Type C: Trees or trunks or simulated structures for activities such as rubbing.

[Only Type C is applicable to wolves. Type A, B, D, E, F are not.]

All exercising implements to be provided in sufficient numbers so that all individuals in an enclosure will have access to them.

FOOD & WATER

Aspen Valley Wildlife Sanctuary

Food

Wolves are fed raw meat (often fresh roadkill skinned to prevent maggot growth). Large bones are also provided from time to time. Food items are presented in a designated feeding area.

Water

Fresh drinking water is always available in large non-tippable containers.

Greater Vancouver Zoo

Food

Wolves are fed raw horsemeat, beef, turkey and dog chow. Animal care attendant feeds animals by driving into pen with an enclosed John Deere gator vehicle and either throws the food out the window and/or dumps food on ground in various places with the use of hydraulic dump box on the back of the vehicle.

Water

Water is naturally occurring in the ponds and stream within the enclosure. In addition, a self-filling water bowl is attached to the fence approximately 1 ft. above the ground at one end of the enclosure. The wolves are regularly seen drinking out of this container.

Haliburton Forest and Wild Life Reserve

Food

Wolves are fed natural prey species such as moose, white-tailed deer and beaver. Moose and deer are acquired as fresh roadkill. Beaver are provided by local trappers. Food is presented at a designated feeding site in view of the public observation area. This provides the public with an opportunity to view pack interactions during feeding. Feeding takes place twice per week but not within a rigid schedule. This prevents “routines” from being established. The pack is fed approximately 5 (35-50 lbs.) beaver or one complete moose or deer per feeding. This allows all wolves to gorge themselves and still have caches for later on. If a large moose or deer is fed, one feeding per week is sufficient.

Water

Fresh drinking water is available in the pond found in the enclosure. The pond is fed by an intermittent stream and natural runoff from the hillside. Drying up of the pond is unlikely, as it is part of a permanent natural wetland area.

International Wolf Center

Food

Animals are fed road-killed deer and hunter-supplied scraps of moose, deer and beaver. Occasionally, they will be fed canned or dry commercially prepared dog food, bones, beaver tails, etc. Approximately 4 lbs. of meat per wolf per day. Food is brought into enclosure and placed in one area but wolves drag the food and cache it throughout the enclosure.

Water

Automatic waterers are set in concrete. Continual fresh water available.

Wild Canid Survival and Research Center

Food

WCSRC assisted in the development, and recommend, Purina Mills Inc. Exotic Canine diet (kibble). This is presented in specially designed metal communal feeders. 2 lbs. per animal is offered daily. Since wildlife also consume some of this food, the quantity is increased so there is also some left. This is to ensure that the most subordinate animals get enough food. Puppy kibble is added to the adult diet when pups are present in the enclosure. The Exotic Canine diet results in less diet consumed, good coat, and normal fecals.

Zupreme and Nebraska Canine logs have been offered in the past but may be a potential source of disease (especially salmonella) and are problematic in hot temperatures.

Deer carcasses are provided to releasable wolves whenever possible. They have them for approximately 48 hours depending upon the ambient temperature because of concern of spoilage.

Water

Many enclosures have artificial ponds but fresh water is provided daily (twice a day during hot spells). The wolves have large Rubbermaid water vats that hold at least 50 gallons each. Automatic (heated) hog waterers have also been used, but they are problematic in cold weather. On hot days, misters are provided for the wolves. Main water sources are located in the feeding/shift areas.

Wolf Education and Research Center

Food

Primarily roadkill (usually whole carcass of deer with occasional elk or moose), wild game butcher scraps, and chickens. Amount is variable from season to season ranging from 100 – 200 lbs. per feed. Frequency of feeding varies by season to mimic wolves natural eating habits (usually every 7-10 days). Food is brought into a designated feeding area but the pack is allowed to carry the food throughout the enclosure.

Water

Drinking water is available from a natural stream flowing through the enclosure. During the summer, a 300 gallon non-tippable container is used to supplement the water supply.

Wolf Park

Food

Wolves are fed carcasses of road-killed deer, calves, steers, and heifers up to 700 lbs., ponies, small horses and goats. Causes of death for cattle, etc. are stillbirths, injuries, bloating, and “shipping fever”. All animals are picked up within 24 hours, except on cold winter days. Wolf Park is licensed by the state to pick up these animals, and records are kept on each specimen. Animals too large for immediate feeding are butchered and excess parts are stored in a meat cooler or walk-in freezer. In addition, Nebraska Brand feline food is kept as backup rations. Feline diet has been found preferable to canine diet.

Water

No information provided.

American Zoo and Aquarium Association – Minimum Husbandry Guidelines for Mammals

Food

Medium and large canids are easily maintained when fed commercially or custom made diets. Commercial preparations containing all necessary vitamins and minerals are readily available, but may also be custom-made by the holding institution. On a daily basis, canids require 1-3 kg. of high quality, low fat diet per 25 kg of body weight. Whole animals used as feed should be limited to freshly killed carcasses, and should be removed at regular intervals. Diets containing high percentages of fowl, and especially ones containing chicken or turkey necks, should be avoided due to inadequate levels of calcium and phosphorus.

The quantity of rations fed will also depend on individual condition and whether or not feeding is communal or done on an individual basis. Where communal feeding is practiced, weights of subordinate animals and juveniles must be closely monitored. Obesity also occurs where communal feeding is practiced, and fasting all members one day a week may be used for weight control.

Milk substitutes used to hand-rear infants should be specifically formulated for canids. Milk replacers should contain low levels of lactose to prevent eye problems.

Water

Fresh clean water for drinking should be available at all times. Watering devices should consist of either built-in devices or sturdy portable containers. Regardless of size, water containers should be cleaned and disinfected daily.

Province of Manitoba –
Guidelines for Keeping Wildlife in Captivity

General Provision.

In order to maintain animals in good condition, food normally eaten in the wild should be provided. Since this is not always feasible, a varied diet of whatever native foods are available, plus comparable substitutes, should be offered. Constant availability of fresh water is imperative.

Province of Newfoundland –
Guidelines for Facilities Holding Captive Wildlife

Food

General provisions only.

- Feed preparation area must be kept sufficiently clean to prevent contamination of feed and feed preparation utensils.
- Food must be stored in such a way to prevent damage to food from weather and animals.
- Meat, fish, fresh fruit and vegetables to be fed to wildlife must be refrigerated to prevent spoilage.
- All scraps left after feed preparation must be stored outside of feed preparation area until it can be properly disposed.
- All diets shall be prepared according to the age, species, condition, size and type of animal. Variety should be considered.
- Food must be adequate, palatable and free of any contamination.
- Feed must not be placed on floor of substrate except as approved by a person authorized by the Director.
- Captive wildlife should be fed daily except as recommended otherwise by a veterinarian or by other accepted professional practices.
- All vessels used to hold feed must be capable of being sanitized. Such vessels must be kept in a sanitary condition.
- All uneaten perishable food is to be removed daily.

Water

General provision only.

- No person shall fail to provide captive wildlife with an adequate supply of potable drinking water to meet its biological need.
- Drinking water must not be left standing and allowed to become stagnant.
- All vessels used to hold drinking water must be capable of being sanitized. Such vessels must be kept in a sanitary condition.

HEALTH & VETERINARY CARE

Aspen Valley Wildlife Sanctuary

Daily visual monitoring of wolves. Annual vaccinations and other veterinary care as required.

Greater Vancouver Zoo

Full time veterinarian on staff. Dewormed routinely every 3 months with Strongid-T for ascarids. Random fecal exams done twice yearly. Wolves vaccinated with Distemper/Adenovirus/Parainfluenza/Parvovirus vaccines twice as pups, then every two years after. Killed rabies vaccine given to wolves every 3 years. If animal requires veterinary attention, it is immobilized with a tranquilizer dart and removed from the enclosure for treatment.

Haliburton Forest and Wild Life Reserve

Daily visual monitoring of wolves accompanied by a staff observation book allows identification of irregularities or injuries, which may require veterinary assistance. If deemed necessary, the individual animal is tranquilized and attended to by a veterinarian.

Regular program of de-worming of the wolves.

International Wolf Center

Fecal exams conducted annually or as needed. Vaccinations given annually. All wolves receive a full medical examination every three years.

Wild Canid Survival and Research Center

Annual physical examinations and vaccinations (rabies/Imrab, DA2PPLCVK) for all adult wolves. Puppies according to puppy schedule (same as for domestic dogs). Heartworm tests are conducted annually and a complete blood panel at least once every two years as a baseline.

Fecal exams are done once per month; treated as needed. Fecals are done weekly for quarantine animals or animals with known problems. We also put heartworm preventative (liquid-sprayed) on food year round. Use ivermectin as required.

Wolf Education and Research Center

Fecal exams done when pack manager feels it is necessary. Medical examinations are done on an as needed basis on the decision of the pack manager.

Heartworm pilling and vaccinations for rabies, distemper corona and parvovirus are given annually.

Wolf Park

Routine medical procedures, as well as some emergency operations, are carried out on premises. Since the animals are tame, they can be readily handled for routine injections, application of ointments, and cleaning of wounds the wolves are unable to lick. Staff members manually inspect socialized wolves for wounds and parasites. Any ticks found are removed.

American Zoo and Aquarium Association – Minimum Husbandry Guidelines for Mammals

Services of an experienced veterinarian should be available to all holders of non-domestic canids. Overall examinations should be performed annually, blood samples collected, serum banked as a baseline control, and the results recorded. Fecal examinations should be made twice a year to check for parasitic infestation. Infant canids are especially susceptible to parasite infection and should be screened monthly during the first six months.

Routine deworming with a broad spectrum antihelminthic at six and eight weeks of age is highly recommended. Preventative heartworm medication should be given to all canids housed in areas where this parasite is prevalent, and an occult heartworm test performed annually.

All canids should receive annual prophylactic vaccinations for protection against canine distemper and parvovirus; modified live virus (MLV) products should be used. For protection against rabies, wild canids should be vaccinated with a killed virus (KV) product. Vaccination for leptospirosis, parainfluenza, and hepatitis is not generally required but, if deemed necessary, should be given and from KV products only.

Fleas can be a problem in some areas and should be controlled by spraying the enclosure with an approved commercial insecticide.

Province of Manitoba – Guidelines for Keeping Wildlife in Captivity

Several sections of the guidelines relate to health and veterinary care. It is unclear as to what is actually required and what is simply described.

Health and General Care

A trained observer or animal keeper can detect changes in animal activities that signal health problems. It is the responsibility of every person keeping wildlife to become acquainted with information on food requirements and likely health problems of the species under his/her care. A licensed veterinarian should be accessible and his/her services requested when health problems are first detected.

Physical Maintenance

Captive animals often develop features not normally found in the wild such as corns and overgrown bills, talons, toenails or incisors. These conditions can be remedied by trimming the abnormal growth and partly avoided by providing adequate perches, bill-reducing materials, proper flooring, etc. Adequate protection from flies or other insects is necessary, especially during hot, dry periods. Special holding facilities must be provided for animals of a size or type,

which cannot easily be restrained in order to treat health problems. For operators holding more than 10 animals, a hospital holding area, surgical facility and quarantine area should be available.

Animal Protection

A veterinarian other than the owner of a wildlife farm must be designated in writing as being available for consultation and animal care. A veterinarian from, or recommended by, the Manitoba Department of Agriculture Veterinary Services Branch should annually inspect the condition of all animals.

Province of Newfoundland – ***Guidelines for Facilities Holding Captive Wildlife***

General Provisions.

The facility must have a veterinarian on staff, or if not, then a veterinarian must agree in writing that he/she will adequately service the facility and do regular checks of the animals.

In the event of an illness, disease, injury, or other form of poor health in an animal, records must be kept of the day to day progress or regress of the animal and all treatments, medicinal or otherwise, that are administered.

Records must be kept of all routine procedures such as fecal checks.

No person shall fail to segregate a diseased or injured animal from its enclosure mates if, in the opinion of a veterinarian, continued contact poses further threat to any animal.

No person shall fail to provide care for injuries and to control contagious, parasitic and nutritional diseases of captive animals.

Each animal must be given a general health examination every six months by a veterinarian and records kept of each examination.

A fecal test for internal parasites must be done for each animal every three months and records kept of each test.

All persons holding captive animals will practice preventative medicine to help prevent illness or injury.

SAFETY & SECURITY

Aspen Valley Wildlife Sanctuary

Enclosures equipped with double-door entry gates. Public stand-off barriers at all visitor viewing areas. Secure secondary containment areas available for wolves if confinement required.

Greater Vancouver Zoo

Double security gate system and solar powered electric fence. The only public viewing is in enclosed 24 seat buses. Animal care attendants equipped with 2 way radios in case of emergency. Protocol established for animal escapes.

Haliburton Forest and Wild Life Reserve

All viewing of the wolves is from the indoor facility. There is no physical or visual (all viewing through one way glass). Enclosure is double fenced.

Wolves are not socialized to humans, so staff/wolf interactions are minimal. They do not greet staff who enter the enclosure but remain at a distance, thereby minimizing potentially dangerous situations. At least two staff must enter enclosure and must carry “Bear Scare” (a cayenne pepper spray). Keys allowing entry into the buffer zone between the double fences is restricted. Only the Haliburton Forest and Wild Life Reserve owner and one senior staff member have keys to the interior fence gate leading into the wolf enclosure.

International Wolf Center

Enclosure is equipped with a double door entry system and the entire enclosure is double fenced. There are secure secondary containment areas to isolate animals and all public viewing areas are equipped with stand-off barriers, with fabric visual barrier where necessary.

Wild Canid Survival and Research Center

To access any enclosure, you first enter an area that can be shut off from the main enclosure – the feeding/isolation pen. There are two of these side by side per enclosure. They each measure about 10’ x 20’ and are equipped with guillotine/shift doors. Food and water are provided here so the animals are used to entering it. These can be used to capture animals or to isolate them if they are ill or injured. The public is kept back from enclosure fencing by wood or rope barriers at designated observation points. The entire research center is surrounded by a perimeter fence.

Wolf Education and Research Center

All enclosure entry points are equipped with double door entry systems. There is a separate one acre containment area within the main enclosure.

The majority of public viewing is done from a platform approximately 50 yards from the enclosure. Tours are provided to visitors to an area between the outer and inner fences. These are limited in size and conducted by experienced staff members.

Wolf Park

All enclosures are surrounded by a three-strand barbed electric wire stand-off fence, which is not hot, but is perceived as such by visitors. It is three feet high and four feet from all fences where the public can view the wolves. No one, including park personnel, is allowed to pet a wolf through the fence. We also discourage running along the fence, eating in front of the wolves, and feeding through the fence by anyone.

The entire enclosure is illuminated by five strategically placed mercury vapor farm yard lights of 150 watts each. One light is turned on at dusk and off at dawn by a photocell-operated switch. This allows instant observation in case of emergency at night. This precaution is necessary since mercury vapor lights take about five minutes to reach their full brightness.

Detailed protocols established for staff interaction with socialized and non-socialized wolves and wolf escapes.

American Zoo and Aquarium Association – *Minimum Husbandry Guidelines for Mammals*

No specific requirements for wolves.

Province of Manitoba – *Guidelines for Keeping Wildlife in Captivity*

General Provision.

The “Public Protection” portion of the guidelines states “A proper barrier must be in place to prevent viewers from contacting animals or vice versa. A safe feeding and watering facility is essential to protect caretakers...Such measures as moats, Texas gates and vehicles may be used to separate viewers from wildlife, and still allow animals to be seen by the viewing public.”

Province of Newfoundland – *Guidelines for Facilities Holding Captive Wildlife*

General Provisions only.

Enclosures must constructed with sufficient structural strength so as to prevent escape of the wildlife they are containing as well as provide safety to the public.

All enclosures must be key or combination locked, except under special circumstances and with the prior approval of the Director.

Enclosures must have signs warning of any known or suspected problem or behavior that might be dangerous to humans (e.g., Animals May Bite).

All enclosures will be built to a standard that will reasonably ensure that the proposed exhibit animal does not escape.

CONCLUSION

All of the facilities housed their wolves in large natural paddocks (one acre or more per social group). All facilities reported that natural features and plant growth precluded the need for artificial shelters, although in a few cases, these were provided. Since all the enclosures were outdoors, environmental conditions were not artificially regulated. All animals had the ability to remove themselves from the view of the public and cagemates at will.

No artificial environmental enrichment was required at any facility. All reported that the physical and mental (psychological) requirements of their wolves were satisfied by living in intact social groupings in large paddocks. No facilities reported stereotypes or other abnormal behaviours.

The standards for medium and large canids contained in the American Association of Zoos and Aquariums (AZA) Minimum Husbandry Guidelines for Mammals did not compare favorably with any of the participating facilities in two key areas: space and social groupings.

After looking at the AZA guidelines for space, one respondent stated,

The [AZA] standards for enclosure size seem appallingly small! An enclosure of 10' x 15' (150 sq.ft.) is very small for a large cursorial canid. When considering the social aspects of canids, in which case it would better to have at least two animals [housed together], increasing the enclosure by 50% [as required in the guidelines] gives a 15' x 22.5' (225 sq. ft.) space. This is incredibly small. Most institutions have spatial restrictions which limit the sizes of enclosures, but those institutions wanting to house large canids should make the space suitable for the animals or make the decision not to house them.

The Province of Manitoba's *Guidelines for Keeping Wildlife in Captivity* and Newfoundland's *Guidelines for Facilities Holding Captive Wildlife* had substantially better spatial requirements but only Newfoundland's compared favorably to the facilities surveyed.

From the information supplied by facilities participating in this study, it is clear that the two most critical aspects of gray wolf housing and husbandry are the provision of appropriate natural space and social structure. These should be the primary consideration whenever gray wolves are kept in captivity.