

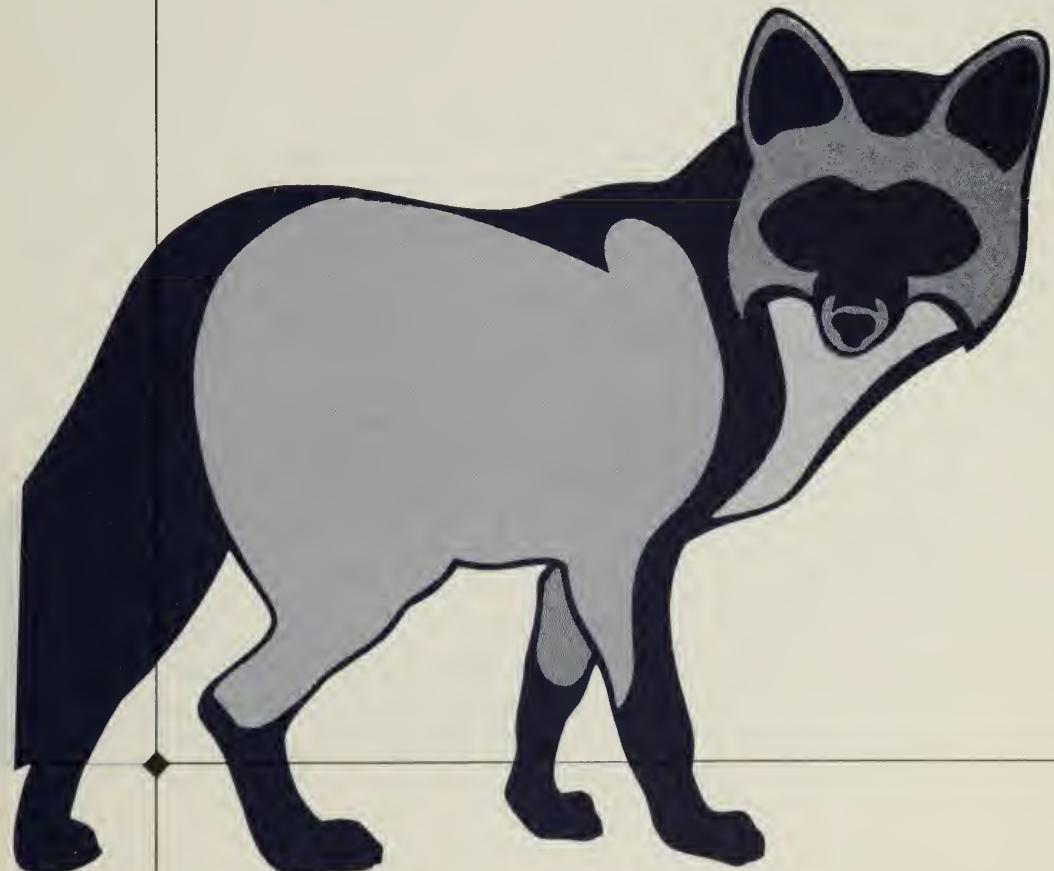
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FOX FARMING IN CANADA

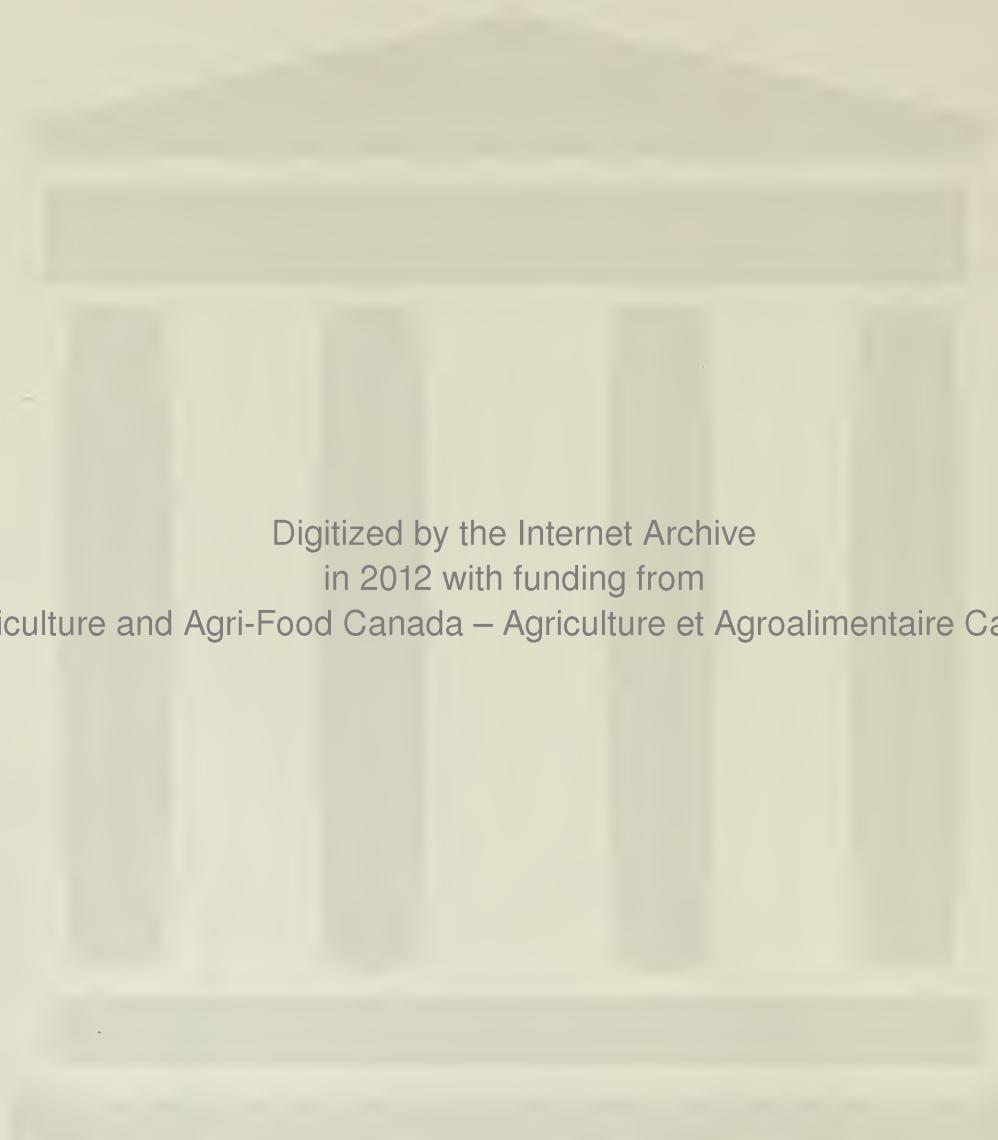


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FOX FARMING IN CANADA

Livestock Division and Animal
Pathology Division

REGIONAL DEVELOPMENT &
INTERNATIONAL AFFAIRS BR.

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FOX FARMING IN CANADA

THE DEVELOPMENT OF FOX FARMING

Until the end of the nineteenth century, most Canadian fox furs were taken from wild animals. Buyers paid the highest prices for rare black and silver pelts.

A few men in Prince Edward Island realized that money was to be made by someone who could produce these rare pelts in quantity. Around 1890, they began raising foxes in captivity, starting with wild animals that had been captured alive.

The first ranchers knew very little about the care and feeding of foxes. Many animals died, and the industry grew slowly. However, pelts brought high prices, and live animals sold as breeding stock went for as much as \$35,000 a pair. Other people were naturally attracted to fox farming, and many invested.

By 1910 the industry was booming. Many people on Prince Edward Island were raising foxes, and although pelts brought high prices, most animals were sold as breeding stock. Then, in 1914, the boom was over; prices of live animals nosedived, and most of the farms which specialized in the sale of livestock went out of business. Within 2 years, however, fox farming was reorganized on the basis of selling pelts and the industry became stable and profitable for many years.

At first, jet black pelts brought the best prices, but gradually the silver varieties became more popular. The silver fox is really a variation of the common red fox; silver pups sometimes show up in red litters. The fur is actually black, with a number of guard hairs that are slate blue next to the skin, black further up, followed by a white bar, and black again at the tip. These white-banded hairs give the pelt a silvery sheen.

Fox raisers were able to meet the market demand for silver foxes by selective breeding, eventually producing animals with better markings than those in the wild. One reason the silver pelts replaced the black in popularity was that common red pelts could easily be dyed to imitate black fur. No one has ever found a way to copy silver fur.

During the period of expansion, Canadian breeding stock was in demand all over the world. Many fine animals were exported, and the Scandinavian countries were particularly successful in producing good-quality silver fox pelts. Norway pioneered in the production of

color mutations — glamorous departures from the conventional black and silver animals.

The first of these, the platina or platinum, was produced in Norway in 1933 from Canadian breeding stock. In January 1940, 400 of the platina fox pelts were auctioned in New York. Following bidding that in the later stages jumped \$1,000 at a time, one fine pelt sold for the record price of \$11,000. Other mutants were developed in Canada and the U.S.A., such as the dawn-glo fox, and the pearl platinum. These attractive foxes are still raised on Canadian farms.

By 1930, world production of silver fox pelts had increased enormously and large quantities were being marketed both in Canada and abroad. This abundance, along with an easing of the demand, weakened the market; by 1939, the peak production year, returns were often lower than production costs.

During the forties a pronounced swing to short-haired furs, notably mink, caused the demand for fox pelts to fall off drastically. For many years prices did not come close to meeting production costs and many ranches went out of business.

Fox Farming in Canada in the 1970's

From about 1948 to 1963 only a few enthusiasts kept animals. Then, interest in the business increased as the market for fox pelts strengthened. Progress was slow, and by the mid-1970's there were only 54 fox farms, with a total of 2,188 breeding animals. Today, most farms are small operations and many breeders are using make-do facilities and materials left over from former years. However, expansion is taking place and, provided the market remains favorable, this growth will continue.

This publication provides information on modern methods of raising foxes which are useful for both large and small operations, and apply equally to silver foxes and mutations.

RAISING FOXES

Ranch Layout

LOCATION

If possible, choose a well-drained location with some light natural cover and protection from excessive sun, wind and snow. It must have a reliable supply of fresh water and should be situated for convenient transportation of feed and supplies. Although foxes quickly become

accustomed to local noises, pick an area where they are not disturbed by excessive noise and sounds such as barking dogs.

GUARD FENCE

A guard fence of 5 cm mesh, 16-gauge wire around the ranch prevents the foxes from escaping and keeps out intruders. Build it about 2 m high, with a 45 cm overhang sloping inwards from the top, to keep the foxes from climbing out. The wire must extend at least 30 cm into the ground to discourage tunneling.

HOUSING

Fox pens should be economical to build, protect the animals from the weather, give proper ventilation and allow easy sanitation. In addition, a good pen provides for effective parasite control, cleanliness of the fur, good breeding results and exercise for growing pups.

Today, most fox pens are in sheds. The double-row shed, with peaked roof and pens on each side of a central aisle provides good conditions for furring foxes. It gives greater protection from driving rain and strong sun, and is economical to build. Have a board-floored central aisle 120 to 135 cm wide and 30 cm lower than the fox pens. This is wide enough to work in without crowding, and helps in catching and examining foxes. If the prevailing wind permits, build sheds so that the pens on one side face west, and on the other side, east.

A good size for individual pens in a furring shed is 90 x 90 x 150 cm long. Use 2.5 x 3.7 cm, 14-gauge galvanized wire for the floors, and bevel the cross beams under the wire to avoid collecting droppings. The pen floors should be approximately 60 cm above the ground. Use 3.7 cm, 14-gauge wire for the sides and roof of the pen, with a framed wire-mesh door, 60 cm deep x 90 cm wide, opening into the aisle. The 60 cm depth will leave a strip of wire mesh, 30 x 90 cm, below the door, to which you may attach the feed trough. Leave a 5 cm space between pens so the foxes cannot get their paws or tongues through the wire, otherwise these will be bitten off by animals in adjacent pens. Vinyl-coated wire, which is easy to clean, is now being used by some fox farmers.

A satisfactory size for breeder pens is 120 x 120 x 240 cm long. Some ranchers solve the problem of providing additional exercise space for breeder vixens by removing the partition between two furring pens. They leave the vixen in this larger area through the winter until the following year when the pups are weaned.

A nest box or whelping den is necessary to provide a comfortable place for the vixen to whelp her pups. Construct a box 120 x 75 x 75 cm high, with a hinged lid. Divide the box into inner and outer compartments. Make a hole 25 cm wide and 5 cm from the floor into

the outer area, to let the vixen enter from the pen. Make a second 25 cm hole in the partition leading to the inner compartment (nest box). Fill the box with hay. The vixen will make a nest here to whelp her pups. In districts where severe weather may occur after the pups arrive, the inner nest can be a separate box about 60 cm square. Place this box at one end of the larger structure and pack shavings or other insulating material around and below it. The nest box also needs ventilation; drill a few small holes in the top to allow damp air to escape.

Several different watering systems are in use. In larger operations, automatic systems with plastic piping and individual push-button nipples work well during the frost-free months. Another method is to hang a pail from the ceiling about 30 cm from the front of the pen. This method is unsuitable for small pups and the water becomes stagnant unless you clean the pail regularly. A third way is a pan with a lip or projection which projects through a board into the fox pen. The fox drinks from this smaller projection while the reservoir rests on a shelf outside. Install the pan at the front of the pen and position it low on the wire for small pups.

You can make a good, practical feeding system that can be cleaned easily from two boards, 15 x 25 cm, covered with galvanized metal. Position the boards to form a trough along the aisle, with the pen wire between the boards. Hinge the outside board so it can be let down for cleaning.

If you use pelleted feeds, suspend a 10 L galvanized pail from the roof, with the bottom about 75 mm off the floor.

Do not fill the pail more than halfway or the foxes will scratch the pellets out.

Nutrition

TRADITIONAL FEEDING

Traditionally, foxes are fed raw meat (or fish) with ground cereal grains, in a ratio of about 2/3 meat to 1/3 cereal. The meat can be fed in chunks and the cereal mixed with water to form a paste, but it is much better to grind the meat and mix it with the cereal and water until the mixture is like raw hamburger. The extra work pays dividends in better and more uniform development of the fox pups. This uniformity makes selection for pelting easier when the herd is reaching its prime.

The meat in the diet can come from slaughterhouses, poultry processing plants, or fish processing plants. You can use muscle meats, viscera or other waste products. Meat or fish must be kept fresh, because tainted feed can cause food poisoning. Install efficient cold

storage facilities large enough to hold the meat and fish you need for your operation.

Buy the cereal mixture with a vitamin and trace mineral supplement added. This costs very little extra in the amounts needed and gives good insurance against deficiencies. Salt included in the cereal is a convenient way of insuring an adequate intake. Your feed supplier can help determine what vitamins and minerals to add to your cereal mixture and in what quantities.

Make certain you have enough calcium and phosphorus in the diet. Normally, this is no problem, because there is likely to be sufficient bone in the meat portion of the diet to provide both. However, some by-products contain no bone, and after a time cause a calcium and phosphorus deficiency. Consult an animal nutritionist about the particular meat that you are using.

Many different combinations of products will make a satisfactory diet. An example of a satisfactory diet is as follows: red meat 20%, beef tripe 20%, beef liver 5%, fish 25%, and commercial cereal mix 30%. An alternative to this diet, using fish as a substantial component of the ration, could be red meat 10%, beef tripe 15%, beef liver 5%, fish 40% and commercial cereal 30%.

DRY DIETS

Now that meat products are becoming more expensive and difficult to get, and labor costs are increasing, many fox ranchers have been turning to commercially prepared dry feeds that are complete in all nutrients and can be stored without refrigeration. They are available as cubes or pellets, formulated for growing, furring or breeding seasons. Follow the manufacturer's feeding instructions.

A dry diet is likely to be considerably more expensive initially than the traditional diet. However, it has several advantages: you do not need refrigerated storage space; you do not need mixing equipment; and your labor will be reduced because you need not fill feed hoppers every day. Also, a dry diet removes much of the risk from feeding because it is complete in all nutrients and highly uniform. Whether to feed a traditional diet or one of the modern dry diets is therefore a matter of economic trade-offs.

When feeding a dry diet it is particularly important to have a constant supply of clean water. Pelleted or cubed rations are quite low in moisture; if too little water is available the foxes don't eat enough. Providing water is no problem in summer, but can be difficult in winter because of freezing temperatures. Foxes will not eat enough snow to provide an adequate water intake when on a dry diet. For this reason some ranchers return to the traditional feeding program

during the winter rather than go to the expense of installing a heated watering system.

NUTRIENT REQUIREMENTS

The nutrients a fox needs are reasonably well known. This makes it possible for a feed manufacturer to produce a good dry diet. However, to get good performance the diet must contain a high percentage of animal protein. The reason for this is not known, but it means that dry diets tend to be quite expensive. Cutting corners to make them cheaper only results in poorer performance.

With a traditional feeding program, your main concern will be the uniformity of your raw meat supply. If it remains quite uniform in composition you can balance the cereal and meat portions with little difficulty. If it varies considerably in its content of such things as fat, bone and salt, you run more risk of problems.

The meat in the diet determines whether you should add phosphorus, calcium and salt to the cereal portion. If it contains a lot of saltwater fish, there is likely enough salt. If it has considerable bone you won't have to add bone meal or calcium and phosphorus supplements. Consult a good animal nutritionist.

Foxes need vitamins A, D, and E, which are fat-soluble, and the vitamins of the B complex, which are all water soluble. They do not require vitamin C. If the cereal in the diet is supplemented with synthetic vitamins, only two situations remain where difficulties can arise. If you feed foxes a high level of raw fish you could encounter a thiamine (vitamin B₁) deficiency, because certain species of fish contain an enzyme which destroys thiamine. Boiling the fish will inactivate the enzyme. Also, a deficiency of vitamin E may occur when the diet contains very rancid fats; keep the meat and fish refrigerated and it's unlikely to become rancid.

Certain unsaturated fatty acids must be in the diet to ensure optimum pelt development. Like vitamins, they need be present only in very small amounts. They are found in the germ of cereal grains, and in such products as soybean oil, corn oil and linseed oil.

The trace minerals most likely to be lacking in the foxes' diet are iron and copper. You can add these to the cereal. In some areas of the country you may have to include iodine because of natural deficiencies in the soil and water. Other trace minerals are also needed, but they are not as likely to be deficient.

FEEDING THE BREEDING HERD

During the summer, restrict the rations of the adult breeding herd to a level that will keep the foxes contented and in medium condition until fall. A well-balanced ration fed at the daily rate of 300 - 360 g

per animal is usually sufficient. About the middle of November, increase the ration so that both dogs and vixens put on weight and are in good condition by the end of December. From then on, watch the herd closely and reduce the ration as necessary; the foxes must remain lean and trim so they will exercise daily.

Never allow the males or females to become very fat, as this has an adverse effect on breeding performance. After the females become pregnant they need very little change in amount of feed; gestation does not significantly increase the energy they require. However, be sure that pregnant females have a well-balanced diet containing all necessary vitamins and trace minerals. A diet which is imbalanced or deficient in certain nutrients will result in poor litters.

After the litter is born the female requires a great deal more feed because she is nursing her young. At this time, and particularly if the litter is large, her intake of feed increases dramatically. A large litter may make it necessary to increase the fat in her diet to help her sustain her milk production.

Breeding

Breeders refer to the oestral period in foxes as "coming in heat" and this period varies with the individual animal both in duration and intensity. Silver foxes, males and females, born in the spring are generally ready for breeding the following year. Vixens come in heat only once a year, from January to March. Some show the onset of heat for as long as 10 days, but will usually accept the male for about 3 days. The heat period, with few exceptions, is accompanied by a swelling of the vulva. Once the period is past this swelling, which varies in degree from one animal to another, quickly recedes.

When the vixen shows signs of being in heat, take her to the pen of the male. If in true heat she will run around the pen with her tail up over her back. If the male is aggressive he will follow her and, after some sparring, they usually mate. The two animals remain locked together for up to 30 minutes or more. If they mate the first day, you can breed the female again on the second or third day. Some vixens will accept the male three or four times. Use a different male if you have any doubt about the fertility of the first one.

Many ranchers test the semen of the males. Remove a sample of fluid from the female's vagina, using a warmed eyedropper. Spread a drop on a warmed glass slide and immediately view it under a 100 power microscope for movement and quantity of sperm. If the whole field is alive with wriggling sperm the test is positive. As sperm do not live very long in the vagina, make the test as soon as possible after a successful mating.

After mating, check the vixen for ear mites and roundworms. If present, treat her as outlined in the section on diseases.

WHELPING

The average gestation period of the fox is 52 days. It is a good idea to install the nest box in the vixen's pen about 3 weeks before whelping. This gives her ample time to get used to it before the litter arrives. In the last 3 or 4 days of pregnancy, vixens nibble away the fur over the breasts to make the nipples accessible to the pups.

A litter contains one to ten pups, with an average of four. At birth they are blind and covered with hair. They may whine continuously for the first day but should settle down after 24 hours. After that, they make very little noise until they leave the nest box. With care, you can open the nest box the day after whelping without alarming the vixen. This lets you remove dead pups and note the number and condition of the living ones. Pups are often born during cold weather, and poor insulation of the nest box can cause many losses.

Reduce the amount of a vixen's feed gradually for a week before whelping. On the day of whelping, offer only 50 or 60 g of feed. Following parturition the vixen may miss one or two feedings but she will usually come out to eat the day after the pups are born. Within a week she will begin eating heartily again and you should give her all the food she will eat at morning and evening feedings. Some mothers cannot produce enough milk to feed their young; in such cases, some or all of the pups have to be placed with other litters. The foster mother usually receives these newcomers without undue fuss.

Weaning

The mother will start carrying feed to the pups when they are about 4 weeks old. When they reach 7 weeks, or even 6 weeks if the female is in poor condition, they should be completely weaned and separated from the mother. Initially you can place pups two to a pen, but put them in individual pens by the first week in August. If they show signs of worms, treat the pups when 3 weeks old.

When they are 2 months old give them 60 - 90 g of finely ground feed per pup daily in two feedings, then increase this amount to whatever they will clean up. Be sure the chill is off the feed before the young pups receive it. The feed must be in fresh condition. Beware of tainted fish or meat, or stale cereal feeds. Also, remember that some fish, when mixed in the raw state with other feed ingredients, destroy the vitamin B₁ content of the ration.

As soon as the pups start moving around, be sure they have a plentiful supply of water that is easy for them to reach.

Growing

Increase the ration for the growing pups weekly. By the time they are 10 weeks old they can be fed once daily, in the evening, except in very hot weather when you can give them one-third of the feed early in the day and the remainder in the evening. By September the young foxes will eat approximately 500 g of mixed feed daily (as-fed basis). At this stage there is some merit in omitting, say, the Sunday feed and adding the missed feed to the ration on the other 6 days.

An important thing to remember is that foxes grow only during a certain period of their life. It is essential, therefore, to feed pups all they will eat of a well-balanced ration during the growth period.

Furring

The value of fox pelts is determined by size, color and quality. To get the proper clear color and full density of the underfur, the fur must reach its peak of primeness before the pelt is taken off. The term "primeness" means the fur is fully grown and the leather (skin) is a clear flesh color without the blue-black pigmentation characteristic of unprime pelts.

In the fall the new fur appears first on the belly of the fox, continues up the sides of the body and finally along the back. The last area on which winter fur grows is along the middle of the back and at the nape of the neck. As noted, in prime condition the leather is a clear flesh color; part the fur at the back of the neck and examine the skin to determine the presence or absence of pigmentation. Take pelts when the skin is clear and the guard hairs and underfur are fully grown. At this stage fur color will be at its best and the value of the pelt greatest. With platinum and other light-colored foxes, the skin pigmentation does not show, and you must determine primeness on the basis of fur growth.

The priming process does not usually take place as early in the season in pup foxes as in adult animals. Pups may be 2 to 3 weeks later than the adults in reaching full primeness.

Selection of Breeding Stock

The selection of breeding stock in the fall, when the animals are priming, is an extremely important phase of fox ranching. Concentrate on the following important points:

1. FUR QUALITY — Look for a dense cushion of underfur with good veiling of strong, silky guard hair which covers the underfur smoothly and completely. The brush should be well-formed and nicely tapered, with a clear, white tip.

2. COLOR — Clear color, with no rustiness or brown in the guard hairs or off-color in the underfur, is very important. The veiling should be lustrous blue-black and the silver bar should be long and sharply defined. The color of the underfur should blend with the color of the guard hairs.
3. SIZE AND CONFORMATION — Length and girth of the animal determine the size of the pelt. Good girth and width across the hip are the usual criteria of a good vixen breeder. Male foxes should be of good length, wide-chested and with good girth. Select all breeding animals for good body conformation.
4. FECUNDITY — Choose vixens that can reproduce young in good numbers. The male fox should also come from a large litter.
5. GOOD MILKING VIXENS — Select vixens from good milking strains. Poor milkers are a cause of small pups and losses in some litters.
6. MATING VIGOR — Watch adult male foxes during the breeding season and select those that mate readily.
7. TEMPERAMENT — Avoid foxes that squeal and bark at the least provocation. Excitable vixens are usually the ones that destroy their young when unusual noises occur on the ranch at whelping time. Eliminate these foxes from the herd if possible.
8. For best results, do not keep dogs or vixens over 6 years of age. This is a general rule; there are exceptions.
9. If you have a small ranch with few sires, take care to obtain unrelated males.
10. For a good many years full silver and silvery pelts have realized the highest prices. Keep this market preference in mind when selecting breeders.

It is not necessary to wait until late fall before you think of selecting next year's breeders. You can complete much of this task ahead of time by eliminating foxes which, according to your records, do not meet the standards outlined in points 4 to 8. You will have far less animals to physically assess in a final selection.

The usual ratio of males to females kept as breeders is 1:3. This can be 1:4 on ranches where more animals are available.

Killing and Pelting

Killing and pelting must be done correctly, as the condition of the pelt is important in determining its market value. A good skin can be ruined by lack of skill in handling the pelt. Although the instructions which follow describe the operation, get experienced help the first year you attempt this.

In Canada, foxes reach their prime and are ready for pelting from

late November through December. Remember that adult foxes usually become prime 2 or 3 weeks before pups. Before killing, check each animal carefully to ensure that the fur is fully grown and the skin creamy-white, with no suggestion of blueness.

Plan and prepare in advance. There are always equipment and tools to be put in working order, stretching boards to be readied and supplies of hardwood sawdust and paper towels to order.

KILLING

Do not feed the foxes but provide water only, for 24 hours before killing.

There are several quick and humane methods to kill foxes. One of these is a hypodermic injection of either a nicotine sulphate solution or a saturated solution of epsom salts. Lay the fox on its right side and with the fingers of your left hand locate the spot, a short distance behind the front leg, where you can feel the heart beating. Insert the needle between the ribs at this point and inject the contents of the syringe directly into the heart. If you do this properly, death is almost instantaneous. Other effective methods are electrocution, clubbing and shooting in the ear. Handle all killing equipment with caution and follow procedures carefully.

REMOVING THE PELT

After the fox has been killed, hang the carcass by a hind leg to cool. Do not crowd the carcass among other hanging foxes while the body heat remains. If there is any blood on the fur, wash it off immediately with cold water. After the carcass is cool, or nearly so, place it on its back on a worktable. Beginning with a front leg, use a sharp knife to slit the skin from the center of the paw down the inside of the leg to the elbow joint. Skin both forelegs out to the toes and ease the pelt off, leaving the pads and claws on the carcass.

Next, turn the carcass on its belly. Skin one hind leg, beginning at the pad and cutting directly to the hock, then from the hock up the back of the leg in a nearly straight line to the bottom of the vent.

Do this with the other hind leg and join the cuts around the vents. Use fingers mostly, and the knife sparingly, and remove the pelt from the hind legs. Skin out the feet so that the pads and claws come off with the pelt. With your fingers, free the pelt around the hips and the butt of the tail. Work carefully to prevent tearing the pelt, and keep the fur free from grease.

Now place the carcass on its back and slit the underside of the tail for about 10 centimetres from the butt. Get a grip on the exposed tailbone then, with a steady pull, remove the bone from the tail.

Continue the slit in a straight line to the tip to open the tail completely. With sick or thin animals, the skin may adhere to the bone so the two cannot be pulled apart without risk of breaking the tail. In such cases, slit the tail in a straight line from butt to tip and free the bone carefully. Throughout these operations spread sawdust liberally on the carcass for a better grip. Also keep paper towels handy to wipe your hands free of grease

After freeing the hindquarters and the tail, hang the fox by the hind legs and continue removing the pelt from the carcass. Use your fingers to free the pelt but be careful not to exert downward pressure which might overstretch the pelt. By working your fingers between the skin and the carcass you can easily and quickly separate the two as far as the forelegs. Work the pelt over each shoulder, withdraw the forelegs and continue along the neck. Use the knife to skin the head. When you skin under the ears, cut close to the head and leave no flesh on the pelt. Skin carefully around the eyes and take care to remove the eyelids, lips and nose with the pelt. Use a sharp knife to thin the lips down for proper drying. After the pelt is free of the carcass, hang it up flesh side out. When it is completely cold you can start fleshing.

FLESHING

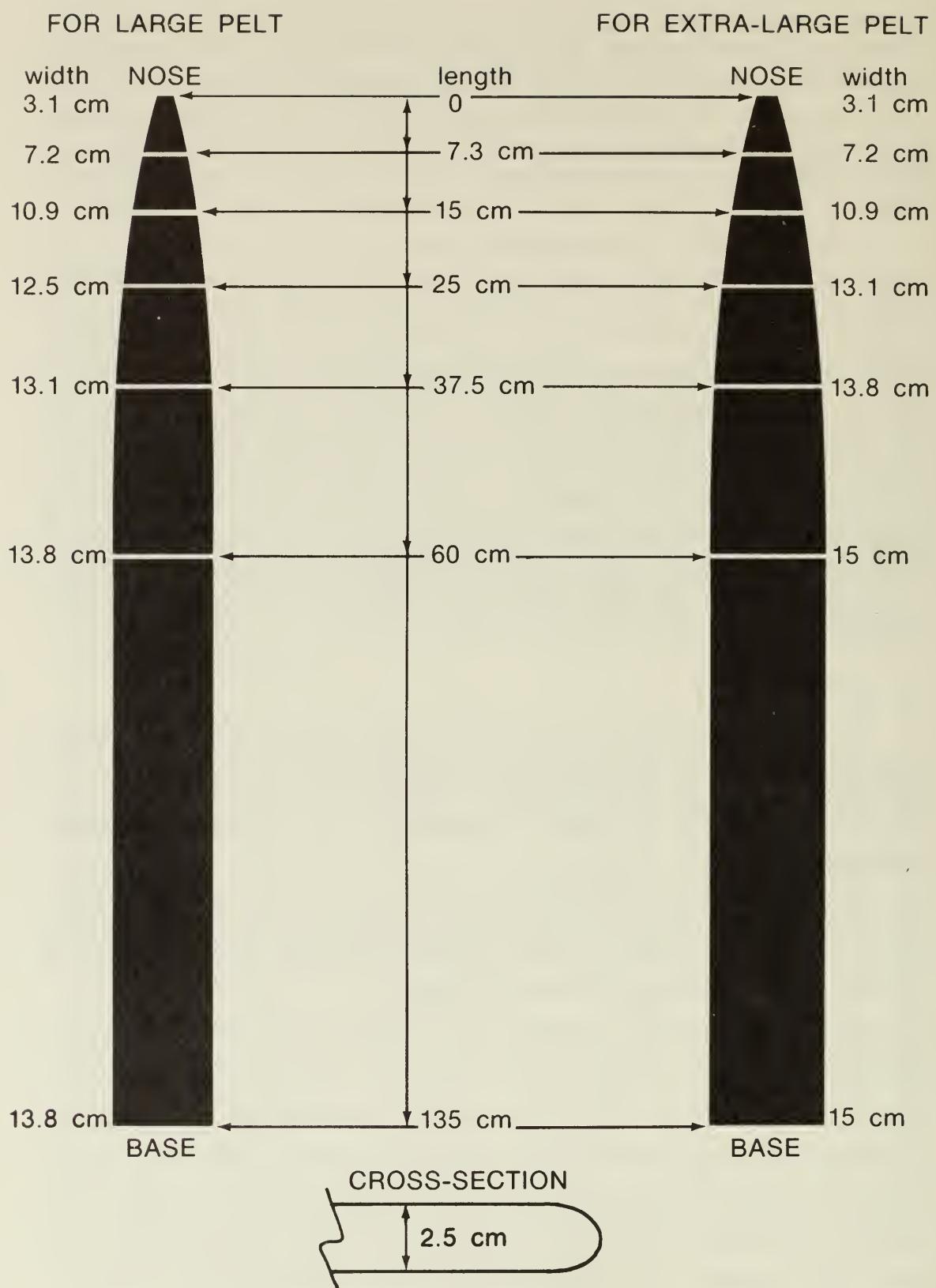
Fleshing removes all surface fat and flesh so the pelt will dry without tainting or greaseburning. If poorly fleshed and tainted, the dressed pelt shows bare patches of leather in the affected areas. This will place it in the "damaged" category. A badly greaseburnt pelt is valueless.

Fleshing is done with a fleshing beam, a smooth round pole, about 125 cm long and 10 cm in diameter for two-thirds of its length, tapering to 5 cm over the final one-third. Mount the beam horizontally on a stand, at a comfortable working height.

Place the pelt skin side out on the beam, with the head towards the tapered end. Using a dull knife, start at the butt and remove all fat and flesh cleanly. Flesh the tail also. Do not scrape so closely that the roots of the guard hairs are exposed. Be especially careful on the belly, where the skin is quite thin. Take care to avoid cuts or damage. Use plenty of sawdust as you proceed, and avoid getting grease on the fur. After fleshing rub the skin with clean sawdust and wipe it off with a clean cloth. If there are any cuts or tears sew these neatly, while the pelt is green, and before placing it on the stretching board.

STRETCHING

Draw the pelt, skin side out, gently over the stretching board. Be careful to place the pelt so the center of the back is exactly on the



Stretching boards are made of 2.5 cm wood, usually pine, and are shaped to accommodate the pelt. They may be 13.8 or 15 cm wide at the base, for large or extra-large pelts. Note in the cross-section that both sides are rounded off so they will not crease or give shape to the skin as it dries.

centerline of the board. Fasten the nose of the pelt to the small end of the board with a tack, then work the pelt gently until the sides are even. Do not overstretch the pelt. Tack the lower lip out flat so it will dry.

On the underside of the pelt, about 2.5 cm in front of the forelegs, grasp the pelt with both hands and draw it towards the nose 2.5 cm or so and fasten it in front of the forelegs with two tacks. This gives the pelt a chance to thicken at the neck and shoulders, an area where many pelts are weak in fur. Without stretching the pelt, tack the lower edges on the underside or belly of the pelt, making sure the pelt lies along the centerline of the board. At the back of the pelt draw the skin of the butt, on each side of the tail, in towards the root of the tail and fasten with enough tacks to hold in place. The wrinkles add density to the fur in this area after the pelt is dry.

With the pelt now fastened in place, bring the tail down the center of the board but, before tacking, grasp it a few centimetres from the butt and push it towards the body about 5 cm. This allows the skin, as it contracts in drying, to close up the space that makes the tail appear thinly connected to the pelt. A convenient and quick way to fasten the tail for drying is to use two light wooden slats; spread the tail on the board and place a slat on each side, parallel to the tail, on the fur along the edges. Fasten each slat to the board with a nail. On either side of the tail, tack the hind legs, arranged so they are as close in and as even as possible with the butt. Finally, tack each foreleg to a slat, 0.6 cm thick and tapered from 3 cm to 7.5 cm wide, running the full length of the foreleg.

FINAL PREPARATION OF THE PELT

Stand the board on end in a well-ventilated room with a temperature of 10-15° C and humidity at about 55%. Leave the pelt from 3 to 4 days, then remove any excess fat by light scraping. Wipe the pelt with paper towelling, then give a final rubdown with coarse sacking. Where large numbers of pelts are being prepared, nail a framework of slats to the walls of the drying room. This permits full use of the available space by arranging the boarded pelts horizontally. Leave 20 cm space above and below each pelt.

After 3 to 4 days remove the pelt and replace it on the board fur side out, remove the slats from the forelegs and turn the legs so they are on the outside of the pelt. To reverse the pelt, tuck the head inside the pelt, starting with the nose, and follow through in an inside-out fashion. Replace the pelt (now fur side out) on the stretcher squarely, without tacking, and leave it another 24 hours. When you finally remove the pelt from the stretcher, a good shaking will get rid of any sawdust in the fur, bring the fur up, and in general enhance



Fine silver fox pelts.

its appearance. Before you pack it for shipment, be sure the entire pelt, especially at the nose, ears and feet, is completely dry.

The Canadian National Silver Fox Breeders Association (CNSFBA)

The CNSFBA was formed in 1920, with head office at Summerside, P.E.I., as a national organization of Canadian fox ranchers, and was granted a charter by the (then) Dominion Department of Agriculture. A system of registration of foxes was adopted, similar to those used by other livestock associations, under the Canadian National Live Stock Records at Ottawa. Registered foxes are tattooed in the right ear with the owner's registered tattoo letter or letters, and in the left ear with a serial number and a year letter. From the late 1940's to the early 1960's the returns for fox pelts were below the cost of production, and the CNSFBA played an important role in encouraging Canadian fox breeders to maintain the nucleus of a breeding herd on which to rebuild when the market came again to recognize the fine qualities of fox furs.

FOX DISEASES

General Recommendations for Control of Diseases

- Observe each animal daily. Changes in behavior are often early signs of disease.
- Keep foxes in wire-bottomed pens, raised off the ground.
- Clean food and water containers regularly.
- Keep pens and nest boxes free of accumulated food and droppings (feces).
- Limit access of visitors, dogs and wildlife to the ranch.
- Separate new foxes brought to the ranch from the rest of the herd, so that you may keep them under observation.
- Separate sick animals from the others. Feed and handle them last.
- Keep fox cubes stored in a cool dry place, free from rats and mice.
- Keep meat products frozen or refrigerated until just before use. In warm weather, remove uneaten food from the pen between feedings and scrape the area clean.
- Keep flies under control. At regular intervals, remove waste food and droppings from under the pens. Spread lime under the pens to kill fly larvae.

- Clean and disinfect pens and nest boxes as soon as they are empty and before reuse, especially if they have contained sick animals.
- Use a high-pressure water system or steam cleaner to remove dirt and grease. Disinfect with a non-toxic product that kills both bacteria and viruses; several are available, e.g., the quaternary ammonium and tamed iodine compounds. Follow the specific directions of the manufacturer.
- Establish a working relationship with local veterinarians or the nearest veterinary diagnostic laboratory. Several diseases have similar clinical signs and expert help is needed to make an accurate diagnosis. Early diagnosis and prompt action are the key to control of diseases.
- Before submitting specimens to the laboratory, telephone the veterinarian to find out what is required and how it should be shipped. The pelleted carcass may be used for diagnosis in many cases. Keep specimens cool but not frozen.

Diseases Caused by Viruses

There is no treatment for diseases caused by viruses. Control is accomplished by preventing contact with the virus (such as keeping healthy foxes from contact with sick foxes, wild mammals, and dogs), and by raising the resistance of the foxes with a safe, proven vaccine. Virus diseases are difficult to diagnose on appearance alone; laboratory examination of tissues is usually necessary.

DISTEMPER

Distemper in foxes is caused by the same virus that causes the disease in dogs, mink, skunks and raccoons.

In the early stages, foxes are listless, tend to remain in the nest box and are off feed. Their eyes become watery; the exudate increases in quantity, becomes dried and crusty, and eventually seals the eyelids. Their eyelids may be a bright red color. A nasal exudate, watery at first, becomes thick and pus-like. Labored breathing, small ulcers on lips and gums, diarrhea, unkempt appearance of fur and loss of condition may follow. Convulsions, especially when the fox is excited, may be terminal, or may be the only sign of disease. The animal may twitch and show excessive nervousness. Any combination of signs may be present, depending on the severity and duration of the outbreak.

Although losses can be high, all affected foxes may not die. However, sick foxes are a source of infection and should be removed from the group.

Distemper virus may be carried over short distances in the air, and can be transmitted by direct contact between animals and on gloves and equipment used to handle sick foxes.

Distemper may be introduced to the ranch by infected dogs or wild mammals, by introducing new fox stock or by foxes which have been exposed to the virus at shows.

In November or December, vaccinate all breeding foxes not previously vaccinated. Also, vaccinate all pups 10 to 14 days after weaning, with an attenuated live-virus vaccine. The vaccine used for ranch-raised mink appears to be safe for foxes.

If an outbreak occurs, immediately vaccinate all foxes *without signs of disease*. It is useless to treat foxes which are already infected, and handling these spreads the virus to others. Begin vaccinating foxes in pens farthest from known infected animals. Signs of disease may not be evident until several days after a fox has been infected. Since vaccination does not alter the course of the disease once an animal has become infected, there may be some losses among treated foxes which were apparently well at the time they were vaccinated.

FOX ENCEPHALITIS

Fox encephalitis is caused by the virus which causes infectious canine hepatitis (ICH) in dogs.

Pups are more susceptible than adult foxes. The spread of encephalitis on the ranch may be slow. Signs include increased excitability and convulsions, or paralysis, general weakness and loss of energy. Foxes may be off feed with resulting loss of condition. They may have diarrhea with or without blood. Death can be sudden, without previous signs of illness or loss of weight. When several foxes on a ranch are infected, a combination of any or all of the above signs may be present. Foxes which recover are immune to further infection.

The virus may be transmitted by direct contact with infected foxes or by utensils, gloves, etc., that have been contaminated by urine, saliva or feces containing virus. Virus may remain infective on pens for long periods of time.

In regions where the disease is present among dogs or when the disease occurs on a ranch, vaccinate fox pups 10-14 days after weaning with an attenuated live-virus vaccine. Consult a veterinarian for the vaccine recommended for foxes. If adult foxes have not been vaccinated previously, vaccinate them at the same time as the pups. "Blue eye" (corneal opacity) occasionally follows the use of live-virus vaccine. This condition may also appear in foxes which have recovered from encephalitis. It is usually temporary. Vaccination usually protects a fox for life. Observe other precautions as for distemper.

RABIES

Many mammals, including foxes, skunks, dogs and cats, may carry the virus of rabies. Foxes kept in raised wire pens are unlikely to become infected as the virus is carried in the saliva of infected animals and is generally transmitted by bite. However, keep foxes introduced from the wild isolated from the herd and under observation; 6 months or more may pass before an infected animal shows signs of rabies.

The usual signs are abnormal behavior, including a decreased alertness or increased restlessness and aggressiveness. The animal may bite at the wire or water dish. This is followed by progressive weakness, incoordination and convulsions. In some foxes, paralysis may be the only sign. The fox may refuse food and appear to have difficulty swallowing. It usually dies within 4 days of the time signs first appear.

If rabies is suspected, notify the nearest Agriculture Canada veterinarian or a local veterinarian immediately. Keep the carcass cool, in a watertight container. Do not handle it with bare hands.

PSEUDORABIES

Pseudorabies, also known as Aujeszky's Disease or Mad Itch, is a virus disease which has affected farm-raised foxes in the United States and other parts of the world. It is unlikely to appear in Canada in foxes which have not been exposed outside this country.

Signs of the disease include marked and continual scratching and rubbing, which result in loss of hair, especially on the head. This is followed by loss of appetite, increased salivation, convulsions and death.

Swine are the usual host of the virus, and transmission to foxes may result from feeding them uncooked offal of infected swine. Rats and other small rodents may also be carriers of the disease.

Pseudorabies should be suspected when signs of intense itching and scratching are followed by death. Contact the nearest Agriculture Canada or local veterinarian at once. This is a reportable disease.

Remove affected foxes from the herd as the disease may be transmitted by direct contact with other animals. Control rodents and cook pork scraps before use as food. Vaccination is not satisfactory.

Diseases Caused by Bacteria

Enteric bacteria, such as *Salmonella* and *E. coli*, are harbored in the intestines of many species of apparently healthy animals, but these

bacteria can cause severe outbreaks of disease, especially among young animals. Proper precautions in the preparation and storage of food, good sanitation and immediate treatment are required to control diseases caused by enteric bacteria.

SALMONELLOSIS

Salmonellosis may result when fox food is contaminated by intestinal contents or feces from carrier animals.

Signs of infection include loss of appetite, a rough fur coat, dehydration and sunken eyes, sometimes with a watery or purulent discharge. Diarrhea and/or nervous signs may be present. Especially in young foxes, death may follow if treatment with antibacterial medication is delayed.

The signs of salmonellosis resemble those of distemper. Dual infections have been reported, so it is important to obtain an accurate diagnosis, as salmonellosis can be treated.

COLIFORM DISEASE

Coliform disease has signs similar to those of salmonellosis, and generally results from eating food contaminated by *E. coli*.

Shortly after birth, foxes in soiled nest boxes may also become infected with *E. coli* via the navel.

BRUCELLOSIS

Brucellosis, a bacterial disease causing abortion in cattle, may be transmitted to foxes by feeding them meat from aborted calves. The result is sterility and abortion.

BOTULISM

Foxes are more resistant than mink to botulism, but may die from eating meat containing toxins (poisons). Meat which is carelessly handled can become contaminated with a soil-borne bacterium (*Clostridium botulinum*) that produces a potent toxin. Treatment of affected foxes is unsatisfactory. For safety, especially if seal meat or whale meat is used in the ration, vaccinate fox pups with the botulism vaccine (toxoid) used for mink. A combined distemper-botulism vaccine is available.

INFECTED WOUNDS AND ABRASIONS

Breaks in the skin, such as bites or scratches, can develop, if infected, into large open wounds, "boils", or general infections with fever and loss of condition. Pups are particularly susceptible at the time they shed milk teeth. Gum infections cause swollen heads ("big

head"). Clean affected areas with a disinfectant solution such as hydrogen peroxide. General infections require antibiotic treatment.

SALMON POISONING DISEASE

Salmon poisoning disease is caused by bacteria-like organisms (rickettsia) carried by flukes (flat worms) found mainly in salmon and trout. Foxes become infected by feeding on raw fish. The disease is unlikely to occur inland because a specific snail host, found only on the west coast of the United States, is necessary for the complete life cycle of the fluke.

The signs of disease in foxes are fever (indicated by increased thirst), loss of appetite, vomiting and diarrhea, accompanied by loss of condition and dry fur. Watery eyes and a nasal exudate may be seen. Death usually occurs within 2 weeks.

If an early diagnosis is made, salmon poisoning disease responds to antibiotic or chemotherapeutic treatment. Avoid feeding foxes any salmon or trout waste which originates on the west coast of the United States.

Parasites

Ranch foxes kept in clean, wire-bottomed pens that are raised off the ground have few parasite problems, but occasional outbreaks may occur.

FLEAS

Foxes, especially pups, become restless and scratch if affected by fleas. Look for fleas in the groin or on the side of the chest near the front legs. Reddish-black flakes of dried blood on the fur or skin are the fecal droppings of fleas.

Treatment consists of repeatedly dusting affected foxes with rotenone flea powder. Clean pens and nest boxes and dust the nest boxes with flea powder, especially in the cracks. Change the bedding. As fleas remaining in the old bedding will hop back to the foxes, place it quickly in plastic bags, remove it from the ranch area and burn it.

If fleas are a recurring problem, and nest boxes are suitably constructed, attach small portions of an insecticide strip (dichlorvos) on the inside of the nest-box roof. Be sure the strip is behind wire or in a perforated container so the foxes cannot reach it. The size of the piece of strip must be accurately measured. Calculate the volume of the nest box in relation to the volume one strip is recommended to cover. Then cut the strip to the required size. Ventilation must be provided.

Example Assuming the strip is recommended for 28 m³, and that the nest box measures 75 x 75 x 120 cm (approximately 0.68 m³), 1/40 of a strip will be required for each box.

Caution

1. Do not exceed the recommended amount, but after 3 months or so replace the strip if still needed.
2. If incoordination occurs in fox pups, remove the strip at once and provide extra ventilation.
3. Use this method with extreme caution and only after the fox pups begin to leave the nest.

EAR MITES

Ear mites are tiny spider-like parasites which live in the outer ear and ear passages. Irritation causes the fox to scratch — the skin becomes reddened, and a wet, crusty exudate forms in the ear. Mites found in this brownish crusty material can be seen if it is removed, placed on a glass slide and examined in good light or under a 50x microscope.

Examine pups at the time of weaning and at regular intervals throughout the summer. Examine adult foxes shortly after mating and in late summer, or more frequently if mites are found.

Treat by cleaning the ears with absorbent cotton dipped in mineral oil. If ears are red and inflamed, apply an antibiotic ointment. Continue treatment at 2-3 day intervals until signs of mites disappear and the wounds are healed.

Clean pens and nest boxes and dust with rotenone powder, as for fleas.

ROUNDWORMS

Pups heavily infected with this internal parasite are thin and "pot-bellied". Their fur becomes harsh and dry. They occasionally are constipated or have diarrhea, and there is evidence of pain. They may retch and vomit; vomit containing roundworms indicates a heavy infection.

Roundworms have a complicated life history and immature forms migrate through the tissues of the adult fox. Adults seldom show signs of infection, but they are a source of infection for pups.

Unborn pups may be infected while in the uterus if the vixen has harbored roundworms, or after birth if their food is contaminated with her feces. The vixen's feces contain eggs which reach the infective stage while in the nest box.

Later, the vixen becomes reinfected if she eats feces containing young roundworms passed by her pups. Thus, the risk exists of continuing infection to each generation.

For diagnosis, a small quantity of feces (size of a walnut) is mixed in a saturated salt or sugar solution in a small container. After 10 minutes a drop of the surface layer (eggs float to the top) is transferred to a glass slide and examined under a 50x microscope. Small rounded eggs with a thick shell (capsule) indicate infection. Treatment is the same as for dogs; consult your veterinarian.

Check vixens in late fall and before or shortly after breeding. If they are infected, treat them to avoid infecting the pups. Keep pens and nest boxes dry and free from feces to prevent reinfection.

HOOKWORMS

Hookworms look like roundworms but are much smaller (about a quarter the size). They are armed with tooth-like structures enabling them to burrow into the wall of the intestine. Signs of hookworm infection are unthriftiness, general lassitude and anemia (pale lips and gums). Heavily infected young pups may become ill and die before eggs are passed in the feces, so it is important to keep pups under observation.

Immature worms sometimes migrate through tissues and get into the milk of the vixen; pups can become infected when they nurse.

In mature foxes with intestinal infections, a diagnosis may be made by examining the feces (as for roundworms). Hookworm eggs are oval and thin shelled. Development of the larvae (the infective stage) depends on the egg getting into the soil, thus the disease is controlled by raising pens off the ground. Control of intestinal infections is similar to that for roundworms although different anthelmintic drugs may be required.

LUNGWORMS

Lungworms are pale, slender worms found in the windpipe and lungs. Large numbers cause problems in young foxes. Infected foxes cough and wheeze, lose condition, have difficulty breathing and may die from pneumonia. Consult a veterinarian if coughing persists.

Prevent infection by keeping pens free of droppings and raised off the ground.

Nutritional Deficiencies

RICKETS

Rickets in young foxes results from an imbalance between calcium and phosphorus in the diet. Rations high in red meat (phosphorus) and lacking bone (calcium) are the usual cause. Vitamin D (sunlight) is essential for adequate utilization of these minerals.

Signs of rickets include distorted heads, "rubbery" bones, and an inability to bear weight on the limbs. Pups lose weight and become listless.

Treat by correcting the dietary deficiency. Feed pups a well-balanced wet ration, such as various meat products mixed with a well-balanced cereal containing bone meal, and/or complete-diet fox cubes.

CHASTEK'S PARALYSIS

Chastek's Paralysis is a Vitamin B₁ (thiamin) deficiency disease. A thiamin-inactivating factor (thiaminase) is found in several species of freshwater and some marine fishes, e.g., herring and smelt. If foxes eat raw fish containing thiaminase over a period of time, they will go off feed. This is followed by a stiff-legged gait. Foxes become paralyzed, are unable to rise or hold weight on their legs, and have convulsions. They may have labored breathing and an abnormal sensitivity to pain.

Nursing fox pups may die without showing signs of disease if the mother has a thiamin deficiency.

Thiamin hydrochloride injected daily for 3 days produces dramatic recovery. Remove raw fish from the ration. As heat destroys thiaminase, cook fish containing this factor before use as a food. Fish containing thiaminase have been used as part of some rations every second or third day, but the foxes have had to be kept under close observation.

Miscellaneous

FUR CHEWING

Fur chewing may be related to fur shedding in pups, in late summer, and may lead to self mutilation. In other cases, it is related to abnormal fur. Check for causes of irritation, such as parasites or skin infections. Often it is a vice associated with boredom from inactivity. Supply a small rock or hard bone as a distraction, or move the fox to another pen. A plastic collar will prevent rump biting. Tranquilizers may be useful in some cases. Extreme nervousness may be inherited; select quiet breeders.

POISONS

Insecticides, rodenticides and strong chemicals may be toxic to foxes if food or water become contaminated. Signs are usually non-specific. A diagnosis is difficult without an accurate history.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm^2)	x 0.15	square inch
square metre (m^2)	x 1.2	square yard
square kilometre (km^2)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm^3)	x 0.06	cubic inch
cubic metre (m^3)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre